Chapter 8
Tables

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Table 8 - 1. Summary of SZ Modeling TSPA Analyses.

TSPA	Domain Size	Dimensions	Flow	Transport
TSPA-1991 (Barnard et al. 1992). Travel times in the SZ based on previous 2-D modeling	80 km x 60 km (irregular area from Czarnecki and Waddel (1984)	2-D	steady state, porous medium	particle tracking to derive travel times, abstraction to 1-D flowtubes
TSPA-1993 (Wilson et al. 1994). Two calibrated alternative conceptual models included	8 km x 8 km x 200 m	3-D	steady state, porous medium	conservative solute transport solution, abstraction to 1-D single porosity flowtubes
TSPA-1995 (Atkins et al., 1995). Incorporated revised site and design information	5 km accessible environment, 30 km dose exposure point, 50 m mixing depth	Used 2-D fluxes from TSPA-1993, 1-D transport	steady state, porous medium	Analytic solution for dilution, "stirred-tank" mixing model
TSPA-VA (this report). Groundwater flow field simulated with 3-D model used to determine flowpath for transport model. Explicit transport modeling using six 1-D flowtubes.	20 km x 36 km x 950 m (flow model), 20 km long (transport model)	3-D flow, 1-D transport	steady state, porous medium	Transport simulations with sorption, abstraction using convolution integral method (including decay and climate change).

Table 8 - 2. DTNs For Models and Data in the SZ Base Case Analyses.

Component	Section	Data Tracking Number(s)	Q-Status
USGS Regional-Scale Flow Model	8.2.2.1 8.3.5	GS960808312144.003 GS970708312144.003	NQ NQ
USGS Site-Scale Flow Model	8.2.2.2	GS970708312333.001 GS970808312333.002	NQ NQ
UZ Site-Scale Flow Model (Percolation Flux)	8.3.3 8.3.5	SNT05091597001.009	NQ
TSPA 3-D SZ Flow Model	8.3.2	SNT05082597001.P06	NQ
TSPA 1-D SZ Transport Model	8.3.3	SNT05082597001.P05	NQ
Parameter Uncertainty Analysis	8.4.2	SNT05082597001.001 SNT05082597001.003	NQ NQ

NQ = Non-qualified data

Table 8 - 3. Computer Codes Used in SZ Analyses.

Computer Code	Version	Computer Software Configuration Item Number	Code Usage	Q-Status
FEHMN Computer type: UNIX	2.0	NA	USGS site-scale flow model TSPA 3-D flow model (Base Case and Sensitivity Studies) TSPA 1-D transport model (Base Case and Sensitivity Studies) Dual-Porosity Model (Sensitivity Studies)	NQ (M&O)
MODFLOWP Computer type: UNIX	2.3	NA	USGS regional-scale flow model	NQ (M&O) Q (USGS)
PEST Computer type: UNIX	2.01	NA	USGS site-scale flow model	NQ (M&O) Q (USGS)
SZ_CONVOLUTE Computer type: PC	1.0	30038V1.0	RIP subroutine in TSPA-VA calculations	NQ (M&O)
STRATAMODEL Computer type: UNIX	3.1.5	NA	USGS regional-scale flow model USGS site-scale flow model TSPA 3-D flow model (hydrogeologic framework)	Exempt
STATISTICA Computer type: PC	5.1	NA	Parameter statistical analysis	Exempt
GEOMESH Computer type: UNIX	Aug. 97	NA	USGS site-scale flow model	NQ (M&O)
POSTCON Computer type: UNIX	1.0	NA	Post-processing of TSPA 1-D transport model output	NQ (M&O)
RIP Computer type: PC	5.19.01	30055V5.19.01	Sampling of SZ parameter values	NQ (M&O)
3DADE Computer type: PC	1.0	NA	Analytical solution for 3-D solute transport (Sensitivity studies)	NQ (M&O)
SGSIM Computer type: UNIX	1.40	NA	Geostatistical simulation of heterogeneous permeability using sequential gaussian method (Sensitivity studies)	Q (SNL QAIP 19-1) NQ (M&O)
SISIMPDF Computer type: UNIX	1.40	NA	Geostatistical simulation of heterogeneous permeability using indicator simulation method (Sensitivity studies)	Q (SNL QAIP 19-1) NQ (M&O)
ARC/INFO Computer type:UNIX	7.0 and 7.1	NA	Geographical database and visualization: USGS Regional-scale flow model USGS Site-scale model	Exempt

Note: NA = not applicable

Table 8 - 4. Summary of Codes, Input/Output Files, and DTNs Associated With Technical Figures.

Figure	Subject	Code *	Input filename	Output filename	Data Tracking Number	Q-Status
Figure 8-3	Geologic framework model	STRATAMODEL (Si Graphics)			GS960808312144.003	NQ
Figure 8-5	Potentiometric surface	ARC/INFO			GS960808312144.003	NQ
Figure 8-6	Groundwater sub-basins	ARC/INFO			GS960808312144.003	NQ
Figure 8-8	Model grid	ARC/INFO			GS960808312144.003	NQ
Figure 8-9	Evapotranspiration areas	ARC/INFO			GS960808312144.003	NQ
Figure 8-10	Recharge zones	ARC/INFO			GS960808312144.003	NQ
Figure 8-11	Model calibration	MODFLOWP ARC/INFO (UNIX)			GS960808312144.003	NQ
Figure 8-12	Simulated discharge locations	MODFLOWP ARC/INFO (UNIX)			GS970708312144.003	NQ
Figure 8-13	Model boundaries	N/A			GS970808312333.002	NQ
Figure 8-14	Geologic framework model	STRATAMODEL (Si Graphics)			GS970708312333.001	NQ
Figure 8-15	Boundary conditions	N/A			GS970808312333.002	NQ
Figure 8-16	Model calibration	FEHMN			GS970808312333.002	NQ
Figure 8-17	Normalized vectors	FEHMN			GS970808312333.002	NQ
Figure 8-18	3-D boundary conditions	FEHMN	site2.dat zone.file.40mlk.rch.ex	site2.dat zone.file.40mlk.rch.ex	SNT05082597001.P06	NQ
Figure 8-19	3-D permeability distribution	FEHMN	site2.dat	site2.dat	SNT05082597001.P06	NQ

Table 8 - 4. Summary of Codes, Input/Output Files, and DTNs Associated With Technical Figures. (Continued)

Figure	Subject	Code *	Input filename	Output filename	Data Tracking Number	Q-Status
Figure 8-20	3-D model calibration	FEHMN	site2.dat zone.file.40mlk.rch.ex	head.out s2calib.out	SNT05082597001.P06	NQ
Figure 8-21	3-D simulated pathlines	FEHMN	site2a.dat site2.fin.18j zone.file.40mlk.rch.ex	site2a.trc postp.output	SNT05082597001.P06	NQ
Figure 8-26 through Figure 8-28	Input parameter distributions	STATISTICA (PC P590 processor)	perm_tds.xls porosity_tds.xls	perm_tds.xls porosity_tds.xls	SNT05082597001.003	NQ
Figure 8-29	Radionuclide concentration breakthrough curves - expected value realization	FEHMN POSTCON.F	trans.dat trac[1 – 11].0000 zone1.0000	sz[01 – 11]_01.0000 [a]	SNT05082597001.P05	NQ
Figure 8-30	Radionuclide concentration breakthrough curves – ^{14}C	FEHMN POSTCON.F	trans.dat trac1.[0001 – 0100] zone.[0001 - 0100]	sz01_01.[0001 – 0100] [a]	SNT05082597001.P05	NQ
Figure 8-31	Radionuclide concentration breakthrough curves – ^{129}I	FEHMN POSTCON.F	trans.dat trac2.[0001 – 0100] zone.[0001 - 0100]	sz02_01.[0001 – 0100] [a]	SNT05082597001.P05	NQ
Figure 8-32	Radionuclide concentration breakthrough curves – ^{237}Np	FEHMN POSTCON.F	trans.dat trac3.[0001 – 0100] zone.[0001 - 0100]	sz03_01.[0001 – 0100] [a]	SNT05082597001.P05	NQ
Figure 8-33	Radionuclide concentration breakthrough curves – ^{231}Pa	FEHMN POSTCON.F	trans.dat trac4.[0001 – 0100] zone.[0001 - 0100]	sz04_01.[0001 – 0100] [a]	SNT05082597001.P05	NQ

Table 8 - 4. Summary of Codes, Input/Output Files, and DTNs Associated With Technical Figures. (Continued)

Figure	Subject	Code *	Input filename	Output filename	Data Tracking Number	Q-Status
Figure 8-34	Radionuclide concentration breakthrough curves – ^{239}Pu	FEHMN POSTCON.F	trans.dat trac5.[0001 – 0100] zone.[0001 - 0100]	sz05_01.[0001 – 0100] [a]	SNT05082597001.P05	NQ
Figure 8-35	Radionuclide concentration breakthrough curves – ^{239F}Pu	FEHMN POSTCON.F	trans.dat trac6.[0001 – 0100] zone.[0001 - 0100]	sz06_01.[0001 – 0100] [a]	SNT05082597001.P05	NQ
Figure 8-36	Radionuclide concentration breakthrough curves – ^{242}Pu	FEHMN POSTCON.F	trans.dat trac7.[0001 – 0100] zone.[0001 - 0100]	sz07_01.[0001 – 0100] [a]	SNT05082597001.P05	NQ
Figure 8-37	Radionuclide concentration breakthrough curves – ^{242F}Pu	FEHMN POSTCON.F	trans.dat trac8.[0001 – 0100] zone.[0001 - 0100]	sz08_01.[0001 – 0100] [a]	SNT05082597001.P05	NQ
Figure 8-38	Radionuclide concentration breakthrough curves – ^{79}Se	FEHMN POSTCON.F	trans.dat trac9.[0001 – 0100] zone.[0001 - 0100]	sz09_01.[0001 – 0100] [a]	SNT05082597001.P05	NQ
Figure 8-39	Radionuclide concentration breakthrough curves – ^{99}Tc	FEHMN POSTCON.F	trans.dat trac10.[0001 – 0100] zone.[0001 - 0100]	sz10_01.[0001 – 0100] [a]	SNT05082597001.P05	NQ
Figure 8-40	Radionuclide concentration breakthrough curves – ^{234}U	FEHMN POSTCON.F	trans.dat trac11.[0001 – 0100] zone.[0001 - 0100]	sz11_01.[0001 – 0100] [a]	SNT05082597001.P05	NQ
Figure 8-42	Simulated solute plumes for two values of vertical transverse dispersivity.	3DADE (Computer type: Pc)	ade12.in ade13.in ade14.in ade15.in	ade14.out ade15.out ade16.out ade17.out	SNT05082597001.004	NQ

Table 8 - 4. Summary of Codes, Input/Output Files, and DTNs Associated With Technical Figures. (Continued)

Figure	Subject	Code *	Input filename	Output filename	Data Tracking Number	Q-Status
NQ	Uncertainty distribution of dilution factor and relationship between vertical transverse dispersivity and dilution factor.	3DADE (Computer type: Pc)	ade22.in through ade35.in	ade22.out through ade35.out prbvsdis.dat sheet5.dat	SNT05082597001.P07	
Figure 8-44	Solute plumes for six source sub-regions	3DADE (Computer type: Pc)	ad1.in through ad7.in	ad1.out through ad7.out post_plume_95.xls	SNT05082597001.P07	NQ
Figure 8-46	Faults in USGS site-scale flow model	STRATAMODEL	faultcspm.blk	faultcspm.blk	SNT05082597001.P07	NQ
Figure 8-47a	Root mean squared error of head residuals	FEHMN	hetero/site2.ini hetero/site2.transp hetero/site_perm#.out	s2_conc_hist.o###.dat	SNT05082597001.P07	NQ
Figure 8-47b	Root mean squared error of head residuals	FEHMN	faults/site2.ini faults/site2.transp faults/site_perm#.out	s2_conc_hist.o###.dat	SNT05082597001.P07	NQ
Figure 8-48a	Maximum simulated concentrations	FEHMN	hetero/site2.ini hetero/site2.transp hetero/site_perm#.out	all100_het.out s2.0###.trc	SNT05082597001.P07	NQ
Figure 8-48b	Maximum simulated concentrations	FEHMN	faults/site2.ini faults/site2.transp faults/site_perm#.out	all100_het.out s2.0###.trc	SNT05082597001.P07	NQ
Figure 8-49a	Histogram of travel times	FEHMN	hetero/site2.ini hetero/site2.transp hetero/site_perm#.out	all100_het.out s2.0###.trc	SNT05082597001.P07	NQ
Figure 8-49b	Histogram of travel times	FEHMN	faults/site2.ini faults/site2.transp faults/site_perm#.out	all100_het.out s2.0###.trc	SNT05082597001.P07	NQ
Figure 8-50a	Cross-section of simulated peak	FEHMN	hetero/site2.ini	s2_conc_hist.0###.dat	SNT05082597001.P07	NQ

Table 8 - 4. Summary of Codes, Input/Output Files, and DTNs Associated With Technical Figures. (Continued)

Figure	Subject	Code *	Input filename	Output filename	Data Tracking Number	Q-Status
	concentrations		hetero/site2.transp hetero/site_perm#.out	s2.0###.trc fence.dat		
Figure 8-50b	Cross-section of simulated peak concentrations	FEHMN	faults/site2.ini faults/site2.transp faults/site_perm#.out	s2_conc_hist.0###.dat s2.0###.trc fence.dat	SNT05082597001.P07	NQ
Figure 8-55	Different fracture spacings	FEHMN	dual/flow/flow.dat dual/1/trans8.dat 2d/spacing/flow1b/flow.dat 2d/spacing/trans1b/trans8.dat dual/2.5/trans8.dat 2d/spacing/flow2.5b/flow.dat 2d/spacing/trans2.5b/trans8.dat dual/5/trans8.dat 2d/spacing/flow5b/flow.dat 2d/spacing/trans5b/trans8.dat	flow.out dual/1.con 2d/spacing/4a-1.con 2d/spacing/1b.con 2d/spacing/4-1b.con dual/2.5.con dual/4a2-5.con 2d/spacing/2-5b.con 2d/spacing/4-2-5b.con dual/5.con dual/4a5.con 2d/spacing/5b.con	SNT05082597001.P07	NQ

Table 8 - 4. Summary of Codes, Input/Output Files, and DTNs Associated With Technical Figures. (Continued)

Figure	Subject	Code *	Input filename	Output filename	Data Tracking Number	Q-Status
				2d/spacing/4-5b.con		
Figure 8-56	Different fracture spacings	FEHMN	single/flow/flow.dat	flow.out	SNT05082597001.P07	NQ
			single/ori1/trans8.dat	single/5d-1.con		
			2d/spacing/flow01b/flow.dat	single/4d-1.con		
			2d/spacing/trans01b/trans8.dat	2d/spacing/01b.con		
			2d/spacing/flow1b/flow.dat	2d/spacing/4-01b.con		
			2d/spacing/trans1b/trans8.dat	2d/spacing/1b.con		
			2d/spacing/flow2.5b/flow.dat	2d/spacing/4-1b.con		
			2d/spacing/trans2.5b/trans8.dat	2d/spacing/2-5b.con		
			2d/spacing/flow5b/flow.dat	2d/spacing/4-2-5b.con		
			2d/spacing/trans5b/trans8.dat	2d/spacing/5b.con		
			2d/spacing/flow10b/flow.dat	2d/spacing/4-5b.con		
			2d/spacing/trans10b/trans8.dat	2d/spacing/10b.con		
			2d/spacing/flow100b/flow.dat	2d/spacing/4-10b.con		
			2d/spacing/trans100b/trans8.dat	2d/spacing/100b.con		

Table 8 - 4. Summary of Codes, Input/Output Files, and DTNs Associated With Technical Figures. (Continued)

Figure	Subject	Code *	Input filename	Output filename	Data Tracking Number	Q-Status
			single/ori/trans8.dat	2d/spacing/4-100b.con single/5ad-1.con single/4ad-1.con		
Figure 8-57	Variations of molecular diffusion coefficient	FEHMN	2d/spacing/flow1b/flow.dat 2d/diffus/1.0/trans8.dat 2d/diffus/3.2/trans8.dat 2d/diffus/5.0/trans8.dat	flow.out 2d/diffus/5diffus-1.con 2d/diffus/4diffus-1.con 2d/diffus/5diffus-32.con 2d/diffus/4diffus-32.con 2d/diffus/5diffus-5.con 2d/diffus/4diffus-5.con	SNT05082597001.P07	NQ
Figure 8-58	Variations of fracture spacing and radioactive decay	FEHMN	2d/spacing/flow01b/flow.dat 2d/spacing/trans01a/trans8.dat 2d/spacing/trans01b/trans8.dat 2d/spacing/flow1b/flow.dat 2d/spacing/trans1a/trans8.dat 2d/spacing/trans1b/trans8.dat	flow.out 2d/spacing/5a-01.con 2d/spacing/4a-01.con 2d/spacing/01b.con 2d/spacing/4-01b.con 2d/spacing/5a-1.con	SNT05082597001.P07	NQ

Table 8 - 4. Summary of Codes, Input/Output Files, and DTNs Associated With Technical Figures. (Continued)

Figure	Subject	Code *	Input filename	Output filename	Data Tracking Number	Q-Status
			2d/spacing/flow10b/flow.dat	2d/spacing/4a-1.con		
			2d/spacing/trans10a/trans8.dat	2d/spacing/1b.con		
			2d/spacing/trans10b/trans8.dat	2d/spacing/4-1b.con		
				2d/spacing/5a-10.con		
				2d/spacing/4a-10.con		
				2d/spacing/10b.con		
				2d/spacing/4-10b.con		
Figure 8-59	Variations of sorption coefficient	FEHMN	2d/spacing/flow1b/flow.dat	flow.out	SNT05082597001.P07	NQ
			2d/kd/0.0/trans8.dat	2d/kd/5kd-0.con		
			single/flow/flow.dat	2d/kd/4kd-0.con		
			single/kd0/trans8.dat	single/5kd-0.con		
			2d/kd/0.1/trans8.dat	single/4kd-0.con		
			single/kd0.1/trans8.dat	2d/kd/5kd-01.con		
			2d/kd/0.5/trans8.dat	2d/kd/4kd-01.con		
			single/kd0.5/trans8.dat	single/5kd-01.con		

Table 8 - 4. Summary of Codes, Input/Output Files, and DTNs Associated With Technical Figures. (Continued)

Figure	Subject	Code *	Input filename	Output filename	Data Tracking Number	Q-Status
			2d/kd/1.0/trans8.dat single/kd1.0/trans8.dat	single/4kd-01.con 2d/kd/5kd-05.con 2d/kd/4kd-05.con single/5kd-05.con single/4kd-05.con 2d/kd/5kd-1.con 2d/kd/4kd-1.con single/5kd-1.con single/4kd-1.con		
Figure 8-60	Variations of matrix porosity	FEHMN	2d/spacing/flow1b/flow.dat 2d/poro-matrix /0.1/trans8.dat 2d/poro-matrix /0.25/trans8.dat 2d/poro-matrix /0.4/trans8.dat 2d/poro-matrix /0.1/trans8.dat	flow.out 2d/poro matrix/5mp-01.con 2d/poro matrix/4mp-01.con 2d/poro matrix/5mp-025.con 2d/poro matrix/4mp-	SNT05082597001.P07	NQ

Table 8 - 4. Summary of Codes, Input/Output Files, and DTNs Associated With Technical Figures. (Continued)

Figure	Subject	Code *	Input filename	Output filename	Data Tracking Number	Q-Status
				025.con 2d/poro matrix/5mp-04.con 2d/poro matrix/4mp-04.con		
Figure 8-61	Variations of matrix porosity	FEHMN	2d/porosity/1e-5/flow/flow.dat 2d/porosity/1e-5/trans/trans8.dat 2d/spacing/flow1b/flow.dat 2d/spacing/trans1b/trans8.dat 2d/porosity/1e-3/flow/flow.dat 2d/porosity/1e-3/trans/trans8.dat	flow.out 2d/porosity/5porle-5.con 2d/porosity/4porle-5.con 2d/porosity/5porle-3.con 2d/porosity/4porle-3.con 2d/spacing/1b.con 2d/spacing/4-1b.con	SNT05082597001.P07	NQ
Figure 8-62	Variations of longitudinal dispersivity	FEHMN	2d/spacing/flow1b/ flow.dat 2d/dispersion/25/ trans8.dat 2d/dispersion/50/ trans8.dat 2d/spacing/trans1b/ trans8.dat	flow.out 2d/dispersion/5dis25.con 2d/dispersion/4dis25.con 2d/dispersion/5dis50.con	SNT05082597001.P07	NQ

Table 8 - 4. Summary of Codes, Input/Output Files, and DTNs Associated With Technical Figures. (Continued)

Figure	Subject	Code *	Input filename	Output filename	Data Tracking Number	Q-Status
			2d/dispersion/200/ trans8.dat	2d/dispersion/4dis50.con		
			2d/dispersion/400/ trans8.dat	2d/dispersion/5dis200.con		
				2d/spacing/1b.con		
				2d/spacing/4-1b.con		
				2d/dispersion/4dis200.con		
				2d/dispersion/5dis400.con		
				2d/dispersion/4dis400.con		
Figure 8-63	Variations of darcy velocity	FEHMN	2d/velocity/flow6.0/flow.dat	flow.out	SNT05082597001.P07	NQ
			2d/velocity/trans6.0/trans8.dat	2d/velocity/5vel6.con		
			2d/spacing/flow1b/flow.dat	2d/velocity/4vel6.con		
			2d/spacing/trans1b/trans8.dat	2d/spacing/1b.con		
			2d/velocity/flow0.2/flow.dat	2d/spacing/4-1b.con		
			2d/velocity/trans0.2/trans8.dat	2d/velocity/5vel-02.con		
			2d/velocity/flow0.06/flow.dat	2d/velocity/4vel-02.con		
			2d/velocity/trans0.06/trans8.dat	2d/velocity/5vel006.con		

Table 8 - 4. Summary of Codes, Input/Output Files, and DTNs Associated With Technical Figures. (Continued)

Figure	Subject	Code *	Input filename	Output filename	Data Tracking Number	Q-Status
				2d/velocity/4vel006.con		
Figure 8-64	Variations of fracture spacing and effective porosity	FEHMN	single/flow/ flow.dat	flow.out	SNT05082597001.P07	NQ
			single/ori/trans8.dat	single/5ad-1.con		
			single/por0.0005/trans8.dat	single/4ad-1.con		
			single/por0.001/trans8.dat	single/5por-0005.con		
			single/por0.005/trans8.dat	single/4por-0005.con		
			single/por0.01/trans8.dat	single/5por-001.con		
			single/por0.025/trans8.dat	single/4por-001.con		
			single/por0.05/trans8.dat	single/5por-005.con		
			single/por0.075/trans8.dat	single/4por-005.con		
			single/por0.1/trans8.dat	single/5por-01.con		
			single/por0.15/trans8.dat	single/4por-01.con		
			single/ori1/trans8.dat	single/5por-025.con		
			2d/spacing/flow100b/flow.dat	single/4por-025.con		

Table 8 - 4. Summary of Codes, Input/Output Files, and DTNs Associated With Technical Figures. (Continued)

Figure	Subject	Code *	Input filename	Output filename	Data Tracking Number	Q-Status
			2d/spacing/trans100b/ trans8.dat	single/5por-05.con		
			2d/spacing/flow10b/flow.dat	single/4por-05.con		
			2d/spacing/trans10b/ trans8.dat	single/5por-075.con		
			2d/spacing/flow5b/flow.dat	single/4por-075.con		
			2d/spacing/trans5b/ trans8.dat	single/5por-1.con		
			2d/spacing/flow2.5b/flow.dat	single/4por-1.con		
			2d/spacing/trans2.5b/ trans8.dat	single/5por-15.con		
			2d/spacing/flow1b/flow.dat	single/4por-15.con		
			2d/spacing/trans1b/trans8.dat	single/5d-1.con		
			2d/spacing/flow01b/flow.dat	single/4d-1.con		
			2d/spacing/trans01b/ trans8.dat	2d/spacing/100b.con		
				2d/spacing/4-100b.con		
				2d/spacing/10b.con		
				2d/spacing/4-10b.con		

Table 8 - 4. Summary of Codes, Input/Output Files, and DTNs Associated With Technical Figures. (Continued)

Figure	Subject	Code *	Input filename	Output filename	Data Tracking Number	Q-Status
				2d/spacing/5b.con 2d/spacing/4-5b.con 2d/spacing/2-5b.con 2d/spacing/4-2-5b.con 2d/spacing/1b.con 2d/spacing/4-1b.con 2d/spacing/01b.con 2d/spacing/4-01b.con		
Figure 8-65	Average and population dose	RIP ?	dose1.xls	dose1.xls	SNT05082597001.P07	NQ
Figure 8-66	Fracture flow model	FEHMN	fig8-66.dat	plot8-66.txt	SNT05082597001.P07	NQ
Figure 8-68	Equilibrium and kinetic reactions	FEHMN	pa19.dat pa109.dat	pu&pc-pa19&109.txt	SNT05082597001.P07	NQ
Figure 8-69	Variations on colloid formation	FEHMN	pa16.dat pa17.dat pa18.dat pa19.dat pa20.dat pa21.dat	pc-pa16topa21.txt pu-pa16topa21.txt	SNT05082597001.P07	NQ

Table 8 - 4. Summary of Codes, Input/Output Files, and DTNs Associated With Technical Figures. (Continued)

Figure	Subject	Code *	Input filename	Output filename	Data Tracking Number	Q-Status
Figure 8-70	Variations in k_f and k_r	FEHMN	pa45.dat pa46.dat pa48.dat pa49.dat pa50.dat	pc-pa45topa50.txt pu-pa45topa50.txt	SNT05082597001.P07	NQ
Figure 8-71	Variations in Pu sorption	FEHMN	pa119.dat pa120.dat pa121.dat pa122.dat pa123.dat	pc-pa119topa123.txt pu-pa119topa123.txt	SNT05082597001.P07	NQ
Figure 8-72	Variations in Pu sorption	FEHMN	pa67.dat pa68.dat pa69.dat pa70.dat	pc-pa67topa70.txt pu-pa67topa70.txt	SNT05082597001.P07	NQ
Figure 8-73	Filtration sensitivity	FEHMN	pa114.dat pa115.dat pa116.dat pa117.dat	pc-pa114topa117.txt pu-pa114topa117.txt	SNT05082597001.P07	NQ
Figure 8-74	Filtration sensitivity	FEHMN	pa76.dat pa77.dat pa78.dat pa79.dat pa93.dat	pc-pa76topa79.txt pu-pa76topa79.txt	SNT05082597001.P07	NQ
Figure 8-75	Variations of colloid injection and ambient colloid concentration	FEHMN	pa61.dat pa62.dat pa63.dat	pc-pa61topa63.txt pu-pa61topa63.txt	SNT05082597001.P07	NQ
Figure 8-76	Variations of colloid injection and ambient colloid concentration	FEHMN	pa64.dat pa65.dat pa66.dat	pc-pa64topa66.txt pu-pa64topa66.txt	SNT05082597001.P07	NQ
Figure 8-77	Variations in K_c	FEHMN	fig8-77a.dat fig8-77b.dat	plot8-77a.txt plot8-77b.txt	SNT05082597001.P07	NQ
Figure 8-78	Adding colloid filtration to reactive transport emulation of PA model.	FEHMN	fig8-78a.dat fig8-78b.dat fig8-78c.dat	plot8-78a.txt plot8-78b.txt plot8-78c.txt	SNT05082597001.P07	NQ
Figure 8-79	Kinetic effects of the Pu-colloid reaction	FEHMN	fig8-79a.dat fig8-79b.dat fig8-79c.dat	plot8-79a.txt plot8-79b.txt plot8-79c.txt	SNT05082597001.P07	NQ

Table 8 - 4. Summary of Codes, Input/Output Files, and DTNs Associated With Technical Figures. (Continued)

Figure	Subject	Code *	Input filename	Output filename	Data Tracking Number	Q-Status
Figure 8-80	Variations in Pu-colloid formation rates	FEHMN	fig8-80a.dat fig8-80b.dat fig8-80c.dat	plot8-80a.txt plot8-80b.txt plot8-80c.txt	SNT05082597001.P07	NQ
Figure 8-81	Variations in Pu-colloid formation rates	FEHMN	fig8-81a.dat fig8-81b.dat	plot8-81a.txt plot8-81b.txt	SNT05082597001.P07	NQ

a The concentrations listed in this file are the unscaled concentration values. Divide the unscaled concentration by the scaling factor listed at the top of the file to obtain the actual concentration as shown on the figure.
Note: Unless otherwise noted, the codes were run on a Sun Ultra Sparc (UNIX operating system)
refers to the realization number 1-100
refers to the realization number 1-100

Table 8 - 5. Relationship Among Numerical Models Used for the Saturated Zone Analyses.

Model	Description	Dimensions	Model Size/Grid Block Size	Model Output	How Output Used
USGS Regional-Scale Flow Model (D'Agnese et al. 1997a)	Developed for site-characterization. Hydrogeologic framework based on Faunt (1994). Used MODFLOWP, finite-difference groundwater flow code.	3-D	Domain: 230 km wide x 245 km long x 2.75 km deep Grid Cells: 1500 m x 1500 m x 3 layers (500 m, 750 m, 1500 m)	Groundwater flux rate multiplier for the three different TSPA climate states. Groundwater flux for present day. Groundwater potentiometric surface map.	Determine input groundwater flux values for TSPA 1D SZ transport model. Consistency check for simulated groundwater flux from USGS site-scale flow model.
USGS Site-Scale Flow Model (Czarnecki et al, 1998)	Developed for site-characterization. Hydrogeologic framework based on USGS regional-scale model. Used FEHM, finite-element/finite volume flow and transport code.	3-D	Domain: 30 km wide x 45 km long x 1.25 km deep Grid Cells: 1500 m x 1500 m x variable thickness	Coarse grid caused large numerical dispersion when used for transport calculations. Downward flow gradients into lower carbonate aquifer.	Motivation for revised site-scale model.
TSPA 3-D SZ Flow Model	Developed to simulate groundwater flow field for TSPA SZ calculations. Hydrogeologic framework based on refined USGS regional-scale model. Used FEHM, finite-element/finite volume flow and transport code.	3-D	Domain: 20 km wide x 36 km long x 950 m deep Grid Cells: 500 m x 500 m x 50 m	Flow path for simulated plume.	Determination of hydrogeologic units and percentage of flow path occupied by each unit to include in TSPA 1D SZ transport model.
TSPA 1-D SZ Transport Model	Developed to conduct multiple simulations of transport for TSPA-VA. Used FEHM, finite-element/finite volume flow and transport code.	1-D	Six 1-D flow tubes, each 20 km long with regular grid spacing of 5 m.	Unit breakthrough curves 20 km away from the repository.	Input for TSPA-VA RIP calculations.

Table 8 - 6. Estimated Hydraulic Conductivity of Regional Hydrogeologic Units (D'Agnese et al. 1997a, Table 1).

Hydrogeologic Unit	Description	Hydraulic Conductivity (meters/day)
Quaternary playa deposits (Qp)	lake bed deposits of silt and clay	1×10^{-5} to 2×10^{-3}
Quaternary-Tertiary valley fill (QTvf)	alluvial (stream channel and fan gravels), colluvial, ash fall, and lake deposits	1×10^{0} to $7 \times 10^{+1}$
Quaternary-Tertiary volcanic rocks (QTv)	rhyolitic, andesitic, and basaltic lava flows	5×10^{-5} to 1×10^{0}
Tertiary volcanic rocks (Tv)	dominantly rhyolitic ash flow tuffs	5×10^{-5} to 5×10^{0}
Tertiary volcanic and volcaniclastic rocks (Tvs)	tuffs and tuffaceous clastic rocks	5×10^{-5} to 5×10^{-3}
Tertiary-Lake Jurassic granite rocks (TJg)	crystalline granite rocks	2×10^{-8} to 6×10^{-1}
Mesozoic sedimentary and metavolcanic rocks (Mvs)	dominantly sandstones	6×10^{-3} to 4×10^{-1}
Paleozoic carbonate rocks (P2)	limestones, dolomites, and calcareous shales	7×10^{-4} to 1×10^{3}
Paleozoic-Precambrian clastic rocks (P1)	conglomerates, argillites, and quartzites	2×10^{-8} to 6×10^{-1}
Precambrian igneous and metamorphic rocks (pCgm)	crystalline rocks (gneisses, schists, and migmatites)	2×10^{-8} to 6×10^{-1}

[Sources: Waddell 1982; Bedinger et al. 1989a; Bedinger et al. 1989b; Winograd and Thordarson 1975; Plume and Carlton 1988]

Table 8 - 7. Water-Budget Components for the Death Valley Regional Groundwater Flow System (D'Agnese et al. 1997a, Table 13) (DTN GS970708312144.003)

	m^3/d
INFLOW	
Recharge (infiltration)	312,300
Flux In	
Pahranagat Valley	20,000
Sand Spring Valley	1,700
Railroad Valley	3,400
Stone Cabin Valley	3,400
Ralston Valley	3,400
TOTAL INFLOW	**344,200**
OUTFLOW	
Discharge	
(Evapotranspiration)	148,600
(Springs)	125,400
Flux Out	
(Death Valley saltpan/Saratoga Springs	100,000
TOTAL OUTFLOW	**374,000**
CHANGE IN STORAGE (from pumpage)	**-89,400**

Table 8 - 8. Hydrologic Properties of Hydrogeologic Units in USGS Site-Scale Saturated-Zone Flow Model (from Czarnecki et al. 1998; Table 3)**.

Hydrogeologic Unit	Model Unit Number	Hydraulic Conductivity (meters/second)		Permeability (meters^2)		Permeability Specified in USGS site-scale flow model (meters^2)	Porosity (percent)	
		High	Low	High	Low		High	Low
Valley fill aquifer	19	6.0×10^{-05} m	9.2×10^{-07} m	6.0×10^{-12} m,*	9.2×10^{-14} m,*	8.8×10^{-14}	23 b	12 b
Valley-fill confining unit	18	3.9×10^{-05} e	1.2×10^{-10} b	3.9×10^{-12} e,*	1.2×10^{-17} *,b	3.0×10^{-16}	66 e	29 b
Lava-flow aquifer	16	1.2×10^{-06} b	5.8×10^{-10} b	1.2×10^{-13} *,b	1.1×10^{-18} g, †,	4.5×10^{-14}	19 b	0.4 b
Upper volcanic aquifer	15	3.2×10^{-04} m	9.6×10^{-12} b	1.8×10^{-13} f	0.0×10^{-00} a	1.6×10^{-14}	54.4 k	1.4 g
Upper volcanic confining unit	14	4.6×10^{-05} m	2.9×10^{-11} f	3.9×10^{-14} a	3.0×10^{-18} f	1.0×10^{-18}	50.3 c	12.3
Middle volcanic aquifer	13	1.6×10^{-05} l,n	9.6×10^{-12} h	4.5×10^{-14} a	0.0×10^{-00} a	1.6×10^{-14}	43.6 g	1.8 g
Middle volcanic confining unit	12	1.3×10^{-06} l,n	6.4×10^{-11} j,n	2.6×10^{-16} a	0.0×10^{-00} a	1.9×10^{-16}	27.4 a	9.2 g
Lower volcanic aquifer	11	no data	no data	no data	no data	5.0×10^{-13}	38.4 c	8.1 c
Lower volcanic confining unit	10	1.7×10^{-08} d,†,	1.7×10^{-08} d,†	4.0×10^{-16} g	8.3×10^{-18} g	1.0×10^{-16}	17 g	8.8 j
Undifferentiated valley fill	9	3.5×10^{-06} b	3.5×10^{-13} b	3.5×10^{-13} b,*	3.5×10^{-20} b,*	2.9×10^{-14}	30 b	10 b
Limestone aquifer	17	no data	no data	no data	no data	1.0×10^{-14}	no data	no data
Granitic confining unit	2	4.6×10^{-06} b	2.3×10^{-13} b	4.6×10^{-13} b,*	2.3×10^{-20} b,*	3.5×10^{-14}	7 b	0.004 b
Upper carbonate aquifer	8	4.6×10^{-05} b	5.8×10^{-09} b	4.6×10^{-12} b,*	5.8×10^{-16} b,*	6.7×10^{-13}	16 b	0.5 b
Upper clastic confining unit	6	no data	no data	no data	no data	5.5×10^{-19}	15.1 g	0.6 g
Lower carbonate aquifer	3,5,7	2.6×10^{-03} m	5.8×10^{-09} b	5.4×10^{-15} g	1.1×10^{-18} g	4.4×10^{-12}	16 b	0 g
Lower clastic confining unit	4	4.6×10^{-06} b	2.3×10^{-13} b	5.5×10^{-19} g	3.9×10^{-20} g	2.0×10^{-15}	7 b	0.004 b

References: High and low values taken from 16.5 (low) and 83.5 (high) percentiles of probability distribution. References denoted by superscripts: a) Anderson 1994; b) Bedinger et al. 1989 a-d; a synthesis of hydraulic conductivity measurements for rocks in Basin and Range province. Study area includes parts of Neveda, California, Utah, Arizona, New Mexico and Texas (Figure 2, p. A4); c) Blankennagel and Weir 1973; d) Craig and Robison 1984; e) Czarnecki 1990; f) Flint and Flint 1990; g) Geldon 1993; h) Lahoud et al. 1984; i) Lobmeyer 1986; j) Rush et al. 1984; k) Thordarson 1983; l) Whitfield et al. 1985; m) Winograd and Thordarson 1975; n) Luckey et al. 1996.

**) ranges include both field and laboratory testing results conducted over very wide range of scales.

*) permeability value obtained by converting reported hydraulic conductivity value if no explicit permeability value was available.

†) only one value available.

Table 8 - 9. Estimated Water-Budget Components For the USGS Site-Scale Flow Model Area (from Czarnecki et al. 1998) (DTN GS970808312333.002).

RECHARGE (inflow)	m^3/d
Northern boundary	15,500
Western boundary	7,600
Eastern boundary	16,100
Fortymile Wash *	1,600
TOTAL IN:	40,800
DISCHARGE (outflow)	m^3/d
Southern boundary	27,200
Lower boundary	4,500
Well pumpage	9,100
TOTAL OUT:	40,800

*Simulated as areal recharge in upper Fortymile Wash area in the regional flow model.

Table 8 - 10. High-Priority Issues From the SZ Abstraction/Testing Workshop.

Category 1: Conceptual Models of SZ Flow		Category 2: Conceptual Models of SZ Geology		Category 3: Transport Processes and Parameters		Category 4: Coupling to Other Components of TSPA	
1.6:	Regional dis-charge	2.1:	Channelization in vertical fea-tures	3.1:	Dispersivity	4.1:	Climate change
1.5:	Regional recharge	2.4:	Properties of faults	3.2:	Matrix diff-usion (effective porosity)	4.4:	UZ and SZ coupling
1.4:	Vertical flow	2.2:	Channelization in stratigraphic features	3.3:	Matrix sorption	4.2:	Thermal and chemical plume
1.1:	Alternative conceptual models	2.8:	Distribution of zeolites	3.4:	Fracture sorp-tion	4.3:	Well with-drawal scenarios
		2.6:	Fracture net-work connec-tivity				

Table 8 - 11. TSPA 3-D SZ Flow Model Hydrogeologic Units.

Unit Number	Hydrogeologic Unit	Description of Modeled Units [a]
18	Valley-Fill Aquifer	Alluvium
17	Valley-Fill Confining Unit	Playa Deposits
16	Limestone Aquifer	Limestone in Northern Amargosa Valley
15	Basalt in Crater Flat	Basalt flows
14	Upper Volcanic Aquifer	Paintbrush Group and Timber Mountain: Rainier Mesa Tuff Rhyolite of Comb Peak Tiva Canyon Tuff Yucca Mountain Tuff Pre-Yucca Mountain Bedded Tuff Pah Canyon Tuff Pre-Pah Canyon Bedded Tuff Topopah Spring Tuff Pre-Topopah Spring Tuff
1	Upper Volcanic Confining Unit	Calico Hills Formation Pre-Calico Hills Bedded Tuff
12	Middle Volcanic Aquifer	Crater Flat Group: Prow Pass Tuff Pre-Prow Pass Bedded Tuff Bullfrog Tuff Pre-Bullfrog Bedded Tuff Tram Tuff Pre-Tram Tuff Bedded Tuff Lava and Flow Breccia Bedded Tuff Lithic Ridge Tuff Bedded Tuff
11	Middle Volcanic Confining Unit	Lithic Ridge Tuff and Tunnel Formation
10	Lower Volcanic Aquifer	Older Volcanics (includes Tub Spring)
9	Lower Volcanic Confining Unit	Older Volcanics
8	Undifferentiated Valley Fill	Alluvium and Other Rock Types
7	Upper Carbonate Aquifer	Tippipah Limestone
6	Lower Carbonate Aquifer	Lone Mountain Dolomite
5	Upper Clastic Confining Unit	Elena Formation
4	Lower Carbonate Aquifer	Roberts Mountain Dolomite
3	Lower Clastic Confining Unit	Quartzite
2	Lower Carbonate Aquifer	Roberts Mountain Dolomite
19	Granitic Confining Aquifer	Small Intrusion

a Upper part taken from Table 1, Clayton et al. (1997); below middle volcanic aquifer taken from Zyvoloski et al.(1997, Table 3-2).

Table 8 - 12. Summary of Permeabilities For the TSPA 3-D SZ Flow Model (DTN SNT05082597001.P06).

Hydrogeologic Unit	Unit Number	Permeability k (m^2)
Valley-Fill Aquifer	18	7.7×10^{-12} [a]
Valley-Fill Confining Unit	17	1.0×10^{-14} [b]
Limestone Aquifer	16	1.1×10^{-12} [d]
Basalt in Crater Flat	15	4.5×10^{-14} [e]
Upper Volcanic Aquifer	14	2.4×10^{-12} [a]
Upper Volcanic Confining Unit	1	3.6×10^{-14} [a]
Middle Volcanic Aquifer	12	2.4×10^{-12} [a]
Middle Volcanic Confining Unit	11	1.0×10^{-12} [b]
Lower Volcanic Aquifer	10	1.0×10^{-12} [b]
Lower Volcanic Confining Unit	9	5.0×10^{-13} [e]
Undifferentiated Valley Fill	8	4.0×10^{-12} [b]
Upper Carbonate Aquifer	7	1.1×10^{-12} [d]
Upper Clastic Confining Unit	5	1.0×10^{-14} [b]
Lower Carbonate Aquifer	6,4,2	1.1×10^{-12} [a]
Lower Clastic Confining Unit	3	1.0×10^{-14} [b]
Granitic Confining Unit	19	3.5×10^{-14} [e]
Solitario Canyon Fault		
Southern Section	51	5.0×10^{-17} [b]
Northern Section	54	4.0×10^{-15} [b]
Center Section	55	1.0×10^{-15} [b]
Yucca Wash Extension Barrier	53	1.0×10^{-17} [b]
E-W low-K Barrier	52	5.0×10^{-18} [b]

a Expected value from aggregate permeability reported by the experts (CRWMS M&O 1997).
b Based on results of trial and error calibration and analyst knowledge of the flow system.
d Assumed expected value from aggregate permeability reported by the experts (CRWMS M&O 1997) of similar unit (lower carbonate aquifer).
e Permeability based on USGS site-scale flow model (see Table 8-8)

Table 8 - 13. TSPA 3-D SZ Flow Model Calibration Results.

Well Number	Well Name	Easting (m)	Northing (m)	Observed Head [a] (m)	Simulated Head [b] (m)	Residual (m)
3	UE-25 WT6	549352	4083100	1034.52	1000.43	-34.09
4	USW G-2	548143	4082540	1019.79	1028.64	8.85
5	UE-25 WT#16	551146	4081230	738.51	825.55	87.04
6	USW UZ-14	548032	4080260	778.43	733.05	-45.38
7	UE-25 WT#18	549468	4080240	730.26	731.89	1.63
8	USW G-1	548306	4080020	754.2	736.18	-18.02
9	UE-25a 3	561084	4079700	748.28	761.87	13.59
10	UE-25 WT#4	550438	4079410	730.84	731.23	0.39
11	UE-25 WT#15	554034	4078690	729.15	734.47	5.32
12	USW G-4	548933	4078600	730.15	732.77	2.62
13	UE-25a #1	549925	4078330	730.97	731.86	0.89
14	UE-25 WT#14	552630	4077330	729.98	729.96	-0.02
15	USW WT#2	548595	4077030	730.81	731.2	0.39
16	UE-25c 1 HTH	550955	4075930	730.09	731.11	1.02
19	UE-25 WT#13	553730	4075830	729.18	729.04	-0.14
20	USW WT#7	546151	4075470	775.96	821.51	45.55
21	USW WT#1	549152	4074970	730.64	729.81	-0.83
22	USW G-3	547543	4074620	730.52	732.43	1.91
23	J-13 WW	554017	4073520	728.22	729.92	1.7
24	USW WT#10	545964	4073380	775.97	794.31	18.34
25	UE-25 WT#17	549905	4073310	729.4	728.83	-0.57
27	UE-25 WT#3	552090	4072550	729.66	728.02	-1.64
29	UE-25 WT #12	550168	4070660	729.37	727.26	-2.11
30	USW WT#11	547542	4070430	730.68	727.67	-3.01
31	J-12 WW	554444	4068770	727.34	725.48	-1.86
32	JF-3 Well	554498	4067970	727.8	724.76	-3.04
33	Cind-R-Lite Wel	544027	4059810	729.81	723.75	-6.06
34		553704	4056230	718.41	712.21	-6.2
35		553808	4055460	705.4	711.7	6.3
36		553883	4055400	704.09	711.47	7.38
37		554131	4055400	705.61	711.9	6.29
38		554008	4055340	701.65	711.47	9.82
39	NDOT Well	553685	4055240	705.48	711.47	5.99
40		549863	4054910	705.44	708.75	3.31
41	Airport Well	552818	4054930	705.36	710.54	5.18

Table 8 - 13. TSPA 3-D SZ Flow Model Calibration Results. (Continued)

Well Number	Well Name	Easting (m)	Northing (m)	Observed Head [a] (m)	Simulated Head [b] (m)	Residual (m)
42	TW-5	562604	4054690	724.96	723.18	-1.78
43		549746	4053650	706.1	707.31	1.21
44		549679	4052320	704.39	704.85	0.46
45		543481	4050070	695.81	695.14	-0.67
49		553471	4049850	722.25	705.96	-16.29
50		545596	4049400	696.93	695.24	-1.69
55		546718	4048670	692.2	694.77	2.57
62		547120	4047960	686.38	693.53	7.15
63		547941	4047780	696.16	694.32	-1.84
65		552390	4047680	709	701.77	-7.23
68	Cooks West Well	553609	4047630	720.32	711.48	-8.84
69	Cooks East Well	554006	4047630	718.41	711.25	-7.16
70		548466	4047260	688.3	695.33	7.03
71	Amargosa Town C	548492	4047080	688.85	695.33	6.48
72		550431	4047060	691.2	692.85	1.65
73		553612	4047080	713.99	713.16	-0.83
74		553687	4047080	723.63	713.16	-10.47
75	Amargosa Valley	548393	4046950	701.34	700.36	-0.98
79		552097	4046880	698.51	701.25	2.74
83	USW H-1 Tube4	548727	4079930	730.78	732.28	1.5
84	USW H-5 Upper	547668	4078840	775.41	732.57	-42.84
87	UE-25b #1 Upper	549949	4078420	730.56	732.98	2.42
88	USW H-6 Upper	546188	4077820	775.75	861.34	85.59
90	USW H-4 Upper	549188	4077310	730.16	732.82	2.66
92	USW H-3 Upper	547562	4075760	731.04	731.77	0.73
94	UE-25p#1 PTH	551501	4075660	752.62	735.94	-16.68

a. Observed head data from Czarnecki et al. (1998, Table 2)
b. TSPA 3-D SZ flow model results

Table 8 - 14. Simulated Groundwater Fluxes From the UZ Site-Scale Flow Model For the Source Subregions of the SZ Streamtubes (DTN SNT05091597001.009).

Climate State	Volumetric UZ Groundwater Flux, Repository Horizon (m^3/yr)						
	Region 1	Region 2	Region 3	Region 4	Region 5	Region 6	Total
Present	3162	3482	3993	4060	10103	2077	26877
Long-Term-Average	17213	18950	21731	22095	54988	11303	146280
Superpluvial	46477	51169	58677	59661	148475	30519	394978

Table 8 - 15. Climate Changes in the Five-Climate Test Case.

Time (yr) of Climate Change	Flux Factor
0	1.0
2000	0.1
3000	1.0
5000	4.0
10000	0.5

Table 8 - 16. SZ Flux Factors For Alternative Climate States (e-mail, Pat Tucci, USGS, 12/11/97).

	Present	Long-Term Average	Super-Pluvial
Flux Factor	1.0	3.9	6.1

Table 8 - 17. Selected Transport Parameters For the 1-D SZ Transport Model.

Hydrogeologic Unit	Unit Number	Matrix Porosity n (-/-)	Effective Porosity n_{eff} (-/-)	Bulk Density ρ_b (kg/m^3)
Upper Volcanic Aquifer	14	0.163 [a]	LHS	2090 [a]
Middle Volcanic Aquifer	12	0.227 [a]	LHS	1940 [a]
Middle Volcanic Confining Unit	11	0.303 [b]	LHS	1740 [b]
Undifferentiated Valley Fill (Alluvium)	8	0.40 [d]	LHS	2120 [c]

Note: Matrix porosity is used in conjunction with the value of effective porosity for a given realization to scale the sorption parameter as explained in Section 8.4.2.
LHS = sampled parameter (see Table 8 - 19 for distribution)
a Expected value from statistical data analysis (DTN SNT05082597001.003)
b Assumed value from similar unit (i.e., upper volcanic confining unit) in statistical data analysis (DTN SNT05082597001.003)
c Estimated from relationship where $\rho_b = (1 - n)\rho_s$, (Hillel, 1980; p.14, Eqn 2.17) assuming ρ_s is the particle density equal to 2.65 g/cm^3 (Hillel, 1980; p.10) and n is the matrix porosity equal to 0.2.
d Porosity within range reported for sandy silt and gravel (Freeze and Cherry 1979, Table 2.4, pg. 37)

Table 8 - 18. Summary of Sorption Coefficients (K_d) for the TSPA 1-D SZ Transport Model (DTN SNT05082597001.P05

Hydrogeologic Unit	Unit Number	Kd[C14]	Kd[I]	Kd[Np]	Kd[Pa]	Kc [Pu]	Kd[Se]	Kd[Tc]	Kd[U]
Volcanics [a]	11,12,14	0 [c]	0 [c]	LHS	LHS	LHS	LHS	0 [c]	LHS
Alluvium [b]	8	0 [c]	0 [c]	LHS	LHS	LHS	LHS	0 [c]	LHS

LHS = sampled parameter (see Table 8 - 19 for assumed distribution).
Note: Pu was only considered in colloidal form (see Sections 8.2.3.3 and 8.3.6).
a All volcanic units assigned the same Kd value (i.e. upper volcanic aquifer, middle volcanic aquifer, and middle volcanic confining unit).
b Alluvium was comprised of undifferentiated valley fill.
c A Kd of 0 indicates no retardation, a conservative assumption.

Table 8 - 19. Summary of Stochastic Parameters For the TSPA 1-D SZ Transport Model (DTN SNT05082597001.P05).

Parameter	Units	TSPA 3D SZ FlowModel Unit(s)	Distribution Type	Distribution Statistics
DFSZ, dilution factor	-/-	All	Piecewise cdf (see Figure 8-43)	10[1.0 to 100] [1]
NAL, Effective Porosity Alluvium	-/-	8	Truncated Normal [a]	Mean: 0.25, SD: 0.075, Bounds: 0.0, 1.0 [a]
NUVA, Effective Porosity Upper Volcanic Aquifer	-/-	14	Triangular in log-space [c]	log(MO[x]): -1.7, log (lower bound): -5.0, log(upper bound): -0.79 [c]
NMVCU, Effective Porosity Middle Volcanic Confining Unit	-/-	11[l]	Triangular in log-space [c]	log(MO[x]): -1.7, log (lower bound): -5.0, log(upper bound): -0.52 [c]
NMVA, Effective Porosity Middle Volcanic Aquifer	-/-	12	Triangular in log-space [c]	log(MO[x]): -1.7, log (lower bound): -5.0, log(upper bound): -0.64 [c]
NPU, Effective Porosity-Plutonium Transport	-/-	11,12,14	Loguniform	log(lower bound): -5.0, log(upper bound): -3.0 [a]
KDNPAL, Neptunium Sorption Coefficient in Alluvium	ml/g	8	Uniform[d]	Lower Bound: 5.0, Upper Bound: 15.0[d]
KDNPVO, Neptunium Sorption Coefficient in Volcanics	ml/g	11,12,14	Beta(exp) [e]	E[x]: 1.5, SD: 1.3, Lower bound: 0.0, Upper bound: 15. [e]
KDPAAL, Protactinium Sorption Coefficient in Alluvium	ml/g	8	Uniform	Lower Bound: 0.0, Upper Bound: 550. [2]
KDPAVO, Protactinium Sorption Coefficient in Volcanics	ml/g	11,12,14	Uniform [f]	Lower Bound: 0.0, Upper Bound: 100. [f]
KDSEAL, Selenium Sorption Coefficient in Alluvium	ml/g	8	Uniform	Lower Bound: 0.0, Upper Bound: 150. [2]
KDSEVO, Selenium Sorption Coefficient in Volcanics	ml/g	11,12,14	Beta(exp) [g]	E[x]: 2.0, SD: 1.7, Lower Bound: 0.0, Upper bound: 15. [g]
KDUAL, Uranium Sorption Coefficient in Alluvium	ml/g	8	Uniform [d]	Lower Bound: 5.0, Upper Bound: 15.[d]

Table 8 - 19. Summary of Stochastic Parameters For the TSPA 1-D SZ Transport Model (DTN SNT05082597001.P05). (Continued)

Parameter	Units	TSPA 3D SZ FlowModel Unit(s)	Distribution Type	Distribution Statistics
KDUVO, Uranium Sorption Coefficient in Volcanics	ml/g	11, 12, 14	Uniform [e]	Lower Bound: 0.0, Upper Bound: 4.0 [e]
KCPUSZ, Kc for Plutonium	-/-	All	Loguniform	log(lower bound): -5.0, log(upper bound): 1.0 [h]
LDISP , Longitudinal Dispersivity at 20 km	m	All	Lognormal [a]	log(E[x]): 2.0, log(SD): 0.75
FRACAL, Fraction of flow path in Alluvium	-	8	Piecewise cdf FRACAL / Prob. 0.0 / 0.0 0.0 / 0.1 0.1 / 0.4 0.2 / 0.7 0.3 / 1.0	0.15[0.0 to 0.30]

Input and output files for Rip sampling are included in DTN SNT0508259001.P05 (input file: sz_siten.rp, outputfile: reslts.txt)
cdf = cummulative distribution function
E[x] = expected value
SD = standard deviation
MO = most likely value
1 = Aggregate distribution from expert elicitation (Table 3-3d, CRWMS M&O 1998), where 10 is the most likely value (cdf=0.5) and numbers in brackets indicate range.
2 = Upper limit is expected value reported by Thibault et al. (Table 4, 1990)
a SZ expert elicitation input about average velocity (Table 3-2, p. 3-20, CRWMS M&O, 1997)
c Inference based on expert elicitation input (CRWMS M&O, 1997). See discussion in text.
d Distribution for alluvium assumed based on the presence of oxidizing conditions and that alluvium contains less than 5% calcite.
e Triay et al. 1997 (Table 59) distribution for vitric units
f Triay et al. 1997 (Table 59) distribution for devitrified, vitric, and zeolitic units
g Triay et al. 1997 (Table 59) distribution for zeolitic units
h Analyst concensus
i Assumed distribution from similar unit, upper volcanic confining unit.

Table 8 - 20 Stochastic Parameter Values For the 100 realizations and Expected-Value Case Used In TSPA-VA Base Case SZ Analyses (DTN SNT05082597001.P05).

Realization	Dilution factor	Effective porosity-alluvium	Effect. porosity Upper Volc. Aquifer	Effective porosity-Middle Volcanic Confining Unit	Effective porosity-Middle Volcanic Aquifer	Effective Porosity-[Pu]	Kd[Np] alluvium (ml/g)	Kd[Np] Volc. (ml/g)	Kd[Pa] alluvium (ml/g)	Kd[Pa] Volc. (ml/g)	Kd[Se] alluvium (ml/g)	Kd[Se] volcanics (ml/g)	Kd[U] alluvium (ml/g)	Kd[U] volcanics (ml/g)	Kc[Pu]	Longitud. Dispersiv. (m)	Fraction of flow path in alluvium
1	17.9	0.244	1.67E-02	1.81E-02	1.80E-01	1.05E-04	9.3	0.83	176.7	30.9	36.2	2.59	7.9	3.96	2.75E-04	2.25E+02	0.147
2	41.7	0.299	1.39E-02	2.45E-01	3.00E-03	1.21E-04	8.8	0.63	136.4	70.2	92.4	0.81	14.9	0.95	1.28E-01	1.06E+02	0.077
3	8.7	0.292	1.21E-01	3.31E-03	2.21E-03	4.43E-05	8.1	1.92	341.0	28.3	125.0	7.05	7.4	2.73	1.25E-02	1.24E+02	0.049
4	29.8	0.436	2.68E-03	2.43E-03	1.25E-03	3.05E-05	12.1	0.59	458.3	98.8	30.6	0.65	11.9	2.08	1.75E-02	4.47E+01	0.171
5	26.8	0.237	2.03E-03	1.35E-03	1.50E-02	1.71E-04	7.9	5.70	112.8	23.3	127.4	2.46	10.1	2.18	9.43E-04	2.99E+01	0.244
6	91.2	0.228	1.13E-03	1.74E-02	1.07E-03	4.66E-04	14.8	0.49	465.9	68.5	17.0	1.59	10.5	1.30	2.80E-04	1.68E+02	0.034
7	7.3	0.213	1.38E-02	1.15E-03	1.25E-01	2.52E-05	7.3	1.80	64.9	51.0	20.5	1.75	8.3	0.98	4.85E-02	5.32E+02	0.250
8	6.1	0.290	9.95E-04	1.75E-01	6.66E-04	4.79E-04	11.8	1.19	73.9	54.8	109.0	0.93	7.4	2.46	1.04E+00	2.45E+01	0.004
9	4.9	0.208	9.57E-02	7.43E-04	1.39E-02	1.67E-05	10.2	1.29	397.6	32.9	21.5	0.68	11.2	3.32	1.60E-04	5.66E+02	0.011
10	25.2	0.415	6.29E-04	1.56E-02	5.29E-03	1.86E-05	10.4	0.69	81.4	24.6	29.2	2.05	13.4	0.82	1.12E+00	1.29E+01	0.207
11	4.6	0.196	1.24E-02	5.67E-03	6.36E-03	2.78E-04	8.2	0.50	109.9	61.8	116.1	3.56	7.1	3.36	4.83E-05	1.51E+01	0.015
12	72.4	0.285	4.82E-03	6.85E-03	1.50E-03	1.93E-05	7.5	1.51	426.3	83.7	127.7	0.55	13.5	0.46	6.13E-05	2.85E+02	0.033
13	3.8	0.253	5.54E-03	1.61E-03	7.64E-04	2.47E-05	11.1	2.65	468.3	21.0	19.4	3.72	6.2	0.53	2.11E-01	1.64E+01	0.225

Table 8 - 20 Stochastic Parameter Values For the 100 Realizations and Expected-Value Case Used In TSPA-VA base case SZ analyses (DTN SNT05082597001.P05). (Continued)

14	23.5	0.258	1.32E-03	8.06E-04	9.56E-03	3.59E-04	13.4	0.41	67.0	84.4	137.1	0.31	6.4	2.88	7.22E-05	2.26E+01	0.253
15	10.9	0.216	7.04E-04	1.05E-02	2.97E-02	5.04E-04	7.0	2.76	503.7	11.7	28.2	0.37	12.2	0.58	1.51E-04	3.79E+02	0.008
16	13.7	0.197	8.48E-03	3.48E-02	5.42E-04	1.78E-05	13.5	0.22	103.3	13.8	78.6	2.69	6.4	0.79	4.33E-01	6.45E+02	0.271
17	5.2	0.273	2.59E-02	5.70E-04	3.21E-02	6.72E-04	6.2	0.26	287.4	72.7	52.1	0.38	7.0	3.08	1.34E+00	1.41E+01	0.029
18	4.0	0.323	5.11E-04	3.74E-02	2.01E-04	2.34E-05	6.3	2.00	188.5	14.0	104.5	0.52	12.8	3.41	5.74E-05	1.03E+03	0.143
19	18.3	0.189	2.74E-02	2.12E-04	2.46E-04	1.12E-04	12.2	0.29	382.5	19.1	112.7	3.07	13.5	0.51	3.02E+00	2.17E+01	0.083
20	38.7	0.327	1.77E-04	2.61E-04	1.73E-02	4.84E-05	6.4	0.40	412.5	77.0	132.6	3.79	6.3	3.65	1.29E-04	1.13E+02	0.199
21	3.3	0.162	2.22E-04	1.85E-02	2.72E-04	2.47E-04	6.9	2.28	489.2	85.8	66.1	0.34	14.1	0.73	1.38E-02	5.01E+01	0.219
22	39.0	0.168	1.50E-02	2.88E-04	4.63E-04	3.18E-04	12.7	2.80	246.9	12.9	5.7	4.70	6.9	2.10	1.16E-03	2.39E+02	0.260
23	2.4	0.296	2.60E-04	5.25E-04	2.19E-02	5.99E-04	13.5	0.25	16.8	91.3	1.0	0.51	10.3	1.36	1.52E-01	3.27E+02	0.115
24	2.5	0.172	4.55E-04	2.47E-02	3.46E-02	7.65E-05	6.2	3.46	4.9	18.0	4.1	1.66	8.5	2.78	3.37E-01	7.88E+02	0.000
25	27.8	0.186	1.96E-02	3.92E-02	2.13E-04	1.19E-05	14.1	0.37	11.5	52.8	109.9	0.99	11.9	3.01	2.02E+00	7.90E+01	0.000
26	2.7	0.306	2.92E-02	2.32E-04	5.49E-02	1.04E-05	6.9	1.23	402.7	34.1	59.0	2.49	12.5	3.54	4.79E-03	4.63E+00	0.000
27	3.3	0.330	2.10E-04	6.39E-02	4.12E-04	1.11E-05	10.3	0.73	218.5	69.5	87.8	2.89	13.8	1.79	1.65E-05	9.99E-01	0.213
28	32.1	0.163	4.46E-02	4.43E-04	5.73E-03	2.90E-04	8.4	1.83	320.5	75.6	142.3	4.14	9.5	0.13	1.14E-05	3.38E+00	0.099
29	40.3	0.355	3.95E-04	6.23E-03	1.66E-03	6.12E-05	12.0	2.14	518.3	88.6	130.0	1.31	5.4	0.04	1.40E-05	3.03E+02	0.163
30	2.4	0.184	5.16E-03	1.77E-03	1.44E-02	1.46E-04	12.6	3.16	476.1	44.9	124.1	0.09	5.0	0.10	2.66E-01	6.44E+01	0.281
31	46.3	0.254	1.57E-03	1.60E-02	1.92E-02	7.59E-04	13.9	0.98	453.0	3.0	12.0	0.02	5.2	2.92	2.41E-03	1.44E+02	0.256

Table 8 - 20 Stochastic Parameter Values For the 100 Realizations and Expected-Value Case Used In TSPA-VA base case SZ analyses (DTN SNT05082597001.P05). (Continued)

32	3.1	0.219	1.30E-02	2.20E-02	4.17E-02	5.43E-04	9.5	0.08	45.2	0.4	100.4	0.06	12.4	1.58	3.15E-02	1.49E+03	0.242
33	11.9	0.288	1.78E-02	4.98E-02	3.45E-03	4.47E-04	5.3	0.02	364.8	2.0	146.6	2.76	9.0	2.33	4.79E+00	6.55E+02	0.000
34	5.5	0.302	3.45E-02	3.72E-03	4.70E-05	1.48E-05	5.1	0.05	536.2	73.6	115.5	1.14	10.9	3.76	1.56E+00	4.89E+02	0.190
35	24.5	0.340	3.11E-03	5.71E-05	1.27E-05	2.18E-04	5.2	2.05	419.7	39.7	50.3	1.93	14.4	3.45	8.91E-01	9.48E+00	0.290
36	30.7	0.240	5.54E-05	1.86E-05	3.45E-05	8.98E-04	12.4	0.84	185.3	58.6	9.3	5.18	13.7	3.28	3.29E-05	2.06E+02	0.221
37	43.4	0.117	1.33E-05	4.06E-05	1.82E-02	3.38E-04	8.9	1.42	34.4	94.1	94.0	3.92	13.3	0.33	1.00E-01	2.65E+03	0.080
38	7.8	0.074	4.23E-05	2.01E-02	2.45E-03	4.60E-05	10.9	4.02	341.2	86.5	24.0	3.49	5.8	2.65	6.86E+00	3.44E+02	0.000
39	1.4	0.102	1.58E-02	2.67E-03	8.17E-03	1.36E-05	14.4	2.92	83.0	82.6	10.9	0.23	11.7	3.89	3.80E-01	4.79E+01	0.176
40	1.0	0.298	2.28E-03	8.54E-03	6.93E-02	1.76E-04	13.6	2.60	41.5	8.6	136.0	2.34	14.8	3.08	9.63E-04	6.94E+00	0.018
41	1.3	0.231	7.22E-03	9.01E-02	3.77E-02	2.07E-05	13.3	0.17	499.3	66.8	2.7	6.49	12.7	1.35	2.55E-05	1.76E+02	0.000
42	28.9	0.267	5.47E-02	4.33E-02	2.94E-02	1.38E-05	5.8	1.73	9.8	97.9	67.7	2.96	8.4	0.28	5.51E-02	1.75E+01	0.268
43	6.3	0.368	3.15E-02	3.25E-02	1.33E-04	6.44E-04	11.6	5.00	250.2	76.3	61.5	0.96	5.6	2.52	8.41E-05	8.69E+00	0.000
44	16.7	0.334	2.46E-02	1.42E-04	1.24E-02	1.08E-05	14.7	2.22	230.1	33.3	72.6	0.18	11.2	0.64	2.84E-05	9.32E+02	0.118
45	49.2	0.321	1.15E-04	1.37E-02	1.11E-01	8.19E-05	12.6	0.71	266.8	6.2	101.9	2.12	6.5	0.30	2.82E+00	2.06E+00	0.104
46	41.3	0.147	1.08E-02	1.41E-01	2.09E-02	6.78E-05	8.3	0.13	369.0	63.0	139.3	0.42	5.7	3.61	1.15E-05	8.33E+01	0.128
47	37.4	0.281	8.49E-02	2.36E-02	1.58E-03	9.35E-05	5.7	1.56	507.6	15.3	37.8	0.19	14.0	0.08	5.59E-03	6.95E+01	0.191
48	2.0	0.392	1.80E-02	1.66E-03	9.20E-05	2.24E-04	11.3	0.31	141.8	7.8	34.4	4.55	5.1	1.81	3.01E-03	9.34E+01	0.276
49	22.0	0.305	1.47E-03	9.86E-05	1.00E-02	6.94E-04	6.6	0.15	126.1	90.4	55.3	0.04	9.5	1.65	7.78E-03	2.15E+02	0.053

Table 8 - 20 Stochastic Parameter Values For the 100 Realizations and Expected-Value Case Used In TSPA-VA base case SZ analyses (DTN SNT05082597001.P05). (Continued)

50	66.2	0.219	9.23E-05	1.10E-02	3.08E-04	3.17E-05	5.7	3.31	202.1	1.9	14.4	1.38	9.2	1.94	1.10E-01	1.17E+03	0.043
51	31.1	0.137	8.73E-03	3.40E-04	1.09E-04	2.80E-05	14.0	0.04	53.0	45.4	94.9	1.21	9.9	2.70	3.33E+00	3.23E+01	0.090
52	5.3	0.274	3.06E-04	1.10E-04	5.09E-02	5.27E-05	5.1	1.02	346.7	41.2	84.8	1.49	11.7	3.71	3.22E-04	2.72E+01	0.000
53	1.7	0.175	1.11E-04	6.06E-02	3.09E-05	1.58E-05	9.6	0.90	311.8	48.4	74.4	2.37	14.2	1.01	2.10E-04	5.62E+01	0.179
54	19.1	0.144	4.00E-02	3.12E-05	3.50E-03	1.84E-04	9.1	1.10	275.0	67.1	80.0	4.83	7.6	0.89	1.56E-03	1.08E+01	0.155
55	2.7	0.349	2.77E-05	3.83E-03	2.83E-03	1.38E-04	9.8	1.75	293.5	92.9	43.6	0.70	7.2	1.48	3.77E-05	1.80E+02	0.132
56	1.8	0.095	3.22E-03	3.03E-03	4.50E-03	9.62E-05	11.7	3.67	164.2	25.0	82.8	0.61	8.7	0.36	6.41E-02	1.34E+02	0.145
57	44.8	0.241	2.55E-03	4.89E-03	1.28E-02	1.17E-04	14.2	0.52	307.1	22.9	133.6	1.03	5.9	2.54	2.58E-02	9.62E+01	0.065
58	1.2	0.234	4.06E-03	1.44E-02	6.05E-02	3.93E-05	7.5	0.46	492.7	36.1	7.5	0.25	11.4	2.26	9.79E-03	1.15E+02	0.150
59	8.2	0.247	1.18E-02	7.15E-02	8.00E-04	1.30E-04	7.3	0.77	33.0	9.0	65.4	2.17	10.6	2.00	1.63E-02	3.86E+01	0.265
60	6.8	0.284	4.58E-02	9.04E-04	6.38E-04	6.24E-04	8.6	0.18	238.4	63.0	139.7	1.84	10.0	2.14	5.64E-04	1.30E+02	0.000
61	9.3	0.358	7.49E-04	6.97E-04	1.97E-03	1.31E-05	5.9	1.58	512.6	56.7	98.8	1.52	10.3	1.19	2.12E-02	8.49E+02	0.112
62	22.9	0.202	5.93E-04	2.08E-03	1.38E-04	7.43E-05	11.4	1.35	363.0	49.2	119.6	1.71	8.0	2.22	2.22E+00	6.59E+00	0.278
63	47.5	0.194	1.75E-03	1.54E-04	1.08E-02	7.38E-04	10.6	1.13	435.4	53.1	120.8	0.82	10.6	3.57	2.17E-05	7.37E+01	0.186
64	4.1	0.224	1.49E-04	1.16E-02	6.95E-03	2.07E-04	10.0	1.25	440.5	29.1	97.1	1.79	13.9	0.24	4.12E-03	1.33E+03	0.232
65	3.6	0.153	9.56E-03	7.99E-03	4.52E-03	3.91E-04	10.3	0.60	355.9	55.2	143.7	4.29	5.5	1.74	4.05E+00	2.00E+02	0.236
66	5.8	0.276	6.45E-03	4.97E-03	5.95E-03	4.16E-04	8.0	1.31	526.4	89.7	6.1	0.13	9.3	3.75	8.15E-02	4.18E+02	0.181
67	2.1	0.262	4.10E-03	6.64E-03	1.15E-03	1.92E-04	10.5	3.19	25.4	5.8	32.0	1.29	14.3	2.64	6.05E-01	4.41E+02	0.286

Table 8 - 20 Stochastic Parameter Values For the 100 Realizations and Expected-Value Case Used In TSPA-VA base case SZ analyses (DTN SNT05082597001.P05). (Continued)

68	19.9	0.249	5.23E-03	1.26E-03	6.66E-03	8.07E-04	13.9	0.12	119.0	43.4	75.4	4.95	11.6	3.17	6.33E-01	1.92E+02	0.000
69	14.8	0.257	1.05E-03	7.15E-03	4.67E-02	1.24E-05	5.5	0.95	275.5	93.7	47.6	2.27	12.9	3.23	7.33E-02	1.76E+03	0.038
70	9.7	0.210	5.96E-03	5.27E-02	8.16E-05	2.64E-05	9.3	3.76	173.0	65.9	24.2	3.22	13.0	2.60	5.49E+00	5.16E+00	0.136
71	12.8	0.260	3.78E-02	8.40E-05	3.08E-03	1.03E-04	14.3	1.69	89.0	79.9	144.7	3.28	11.4	3.83	1.75E-05	2.52E+01	0.073
72	4.8	0.345	7.55E-05	3.40E-03	6.21E-02	4.20E-05	11.6	2.41	532.1	80.5	71.3	2.20	14.5	0.19	1.98E-04	1.02E+02	0.023
73	14.1	0.129	2.84E-03	7.66E-02	1.16E-02	2.09E-05	12.9	2.44	263.8	64.2	16.4	5.46	5.4	0.84	1.01E-02	4.25E+01	0.290
74	44.3	0.238	5.07E-02	1.31E-02	2.39E-02	8.41E-04	13.1	1.62	55.7	95.5	26.4	0.13	7.1	2.04	7.58E-04	1.89E+01	0.126
75	1.6	0.367	1.07E-02	2.81E-02	2.61E-02	8.84E-05	11.5	4.28	94.7	4.7	121.7	0.59	10.1	1.26	9.69E-05	2.25E+03	0.001
76	7.6	0.280	2.09E-02	3.01E-02	1.13E-02	1.64E-05	14.6	0.09	446.8	21.1	55.5	1.58	8.2	0.66	5.88E+00	9.14E+01	0.025
77	47.9	0.312	2.22E-02	1.22E-02	7.72E-02	2.19E-05	5.4	0.44	207.9	50.8	86.5	0.89	6.7	3.86	6.90E-03	1.10E+01	0.240
78	21.7	0.315	9.86E-03	9.58E-02	5.83E-05	4.23E-04	7.2	1.16	318.6	31.5	61.1	0.44	14.6	1.92	4.39E-05	1.98E+01	0.090
79	34.2	0.278	5.96E-02	6.29E-05	5.78E-04	5.51E-05	10.1	0.65	223.4	16.4	53.8	5.98	9.8	0.41	1.12E-04	4.82E+02	0.158
80	35.1	0.377	5.94E-05	5.86E-04	5.09E-03	1.40E-04	8.2	0.33	192.7	96.4	41.8	1.44	6.0	0.72	8.02E-01	5.78E+01	0.101
81	20.8	0.123	5.15E-04	5.47E-03	1.32E-03	6.50E-05	6.7	4.50	153.2	47.1	117.7	0.28	6.7	3.27	1.77E-03	1.36E+02	0.084
82	49.9	0.190	4.36E-03	1.49E-03	3.55E-04	5.24E-05	14.7	1.06	432.2	10.1	39.6	0.48	13.2	1.50	2.77E-02	6.50E+01	0.059
83	1.6	0.251	1.21E-03	3.73E-04	8.71E-02	3.48E-05	9.8	0.21	143.7	17.8	89.5	3.38	8.8	2.30	2.88E-03	5.26E+01	0.229
84	3.5	0.214	3.17E-04	1.18E-01	4.11E-03	3.69E-04	6.0	0.36	328.2	81.5	90.5	1.07	10.8	1.62	1.27E-03	3.59E+01	0.053
85	10.7	0.178	6.98E-02	4.35E-03	1.73E-04	3.32E-05	6.7	2.55	331.3	37.5	131.7	1.85	9.1	1.41	4.68E-04	3.91E+02	0.165

Table 8 - 20 Stochastic Parameter Values For the 100 Realizations and Expected-Value Case Used In TSPA-VA base case SZ analyses (DTN SNT05082597001.P05). (Continued)

86	5.1	0.382	3.68E-03	1.79E-04	4.02E-04	1.55E-04	13.1	0.80	478.6	57.8	69.5	1.17	8.5	1.10	5.41E-01	3.31E+01	0.169
87	2.9	0.245	1.56E-04	4.01E-04	2.71E-02	1.62E-04	8.8	1.39	256.9	40.8	112.2	1.03	7.7	3.13	3.77E-04	1.51E+02	0.259
88	51.9	0.156	3.73E-04	3.02E-02	2.07E-03	5.68E-04	10.8	0.89	408.5	35.1	107.3	0.76	12.9	1.08	3.56E-02	1.58E+02	0.123
89	9.2	0.181	2.31E-02	2.29E-03	7.32E-03	8.64E-05	9.0	0.76	394.1	27.3	148.6	3.15	7.6	2.38	4.56E-02	7.28E+02	0.214
90	2.2	0.318	1.97E-03	8.04E-03	2.55E-03	3.05E-04	8.5	0.57	547.9	78.9	64.2	0.72	10.9	2.42	1.84E+00	8.77E+01	0.205
91	3.0	0.226	6.75E-03	2.81E-03	1.82E-03	2.68E-04	7.8	2.33	232.9	26.5	57.5	1.96	11.0	3.50	6.09E-03	3.11E+02	0.298
92	36.5	0.264	2.35E-03	1.96E-03	9.86E-04	9.84E-04	12.9	0.55	213.7	60.0	46.5	1.99	13.7	1.85	2.92E-01	2.68E+02	0.109
93	5.9	0.233	1.69E-03	1.05E-03	2.30E-02	7.15E-05	7.6	1.45	167.9	60.2	105.6	4.00	9.6	3.00	2.06E-01	1.45E+04	0.095
94	15.6	0.222	9.29E-04	2.56E-02	9.07E-04	5.82E-05	10.9	1.49	385.3	87.9	42.7	1.40	12.5	2.84	9.27E+00	7.32E+01	0.069
95	6.5	0.205	1.97E-02	9.15E-04	8.62E-03	4.02E-05	11.1	3.05	154.3	46.7	148.5	2.84	12.2	3.98	3.49E-03	5.97E+01	0.200
96	5.7	0.309	8.15E-04	9.03E-03	9.07E-03	2.62E-04	13.8	1.04	541.7	74.2	34.9	2.66	15.0	1.70	2.00E-03	4.06E+01	0.062
97	4.5	0.203	7.38E-03	9.54E-03	4.07E-02	3.75E-05	9.7	2.11	129.1	71.5	102.5	7.92	9.2	1.52	7.23E-04	2.59E+02	0.295
98	33.5	0.269	7.92E-03	4.79E-02	3.81E-03	9.30E-04	12.5	1.94	375.8	99.7	77.7	1.24	8.9	1.20	1.70E-01	3.83E+01	0.046
99	4.2	0.271	3.40E-02	4.08E-03	1.85E-02	2.93E-05	12.1	6.34	284.0	42.6	82.1	1.12	8.1	2.84	4.86E-04	3.85E+03	0.195
100	17.1	0.336	3.49E-03	2.09E-02	1.61E-02	2.35E-04	15.0	0.93	300.2	38.5	48.9	0.85	12.1	1.14	8.19E+00	2.87E+01	0.139
expected value	**10.0**	**0.250**	**3.19E-03**	**3.96E-03**	**3.56E-03**	**1.00E-04**	**10.0**	**1.50**	**275.0**	**50.0**	**75.0**	**2.00**	**10.0**	**2.00**	**1.00E-02**	**1.00E+02**	**0.100**

Table 8 - 21. Radionuclide Decay and Transport Characteristics (DTN SNT05082597001.P05).

Radionuclide	Radionuclide Number (RN#)	Half-Life [a] (years)	Retardation Potential
^{99}Tc	10	213,000	Low
^{129}I	2	15,700,000 [d]	Low
^{14}C	1	5,729	Low
^{237}Np	3	2,140,000 [d]	Moderate
^{79}Se	7	64,960	Moderate
^{234}U	9	244,500	Moderate
^{231}Pa	4	32,770	High
^{239}Pu ^{239F}Pu	5 [b] 10 [c]	24,060	High
^{242}Pu ^{242F}Pu	6 [b] 11 [c]	386,900	High

RN # = radionuclide identification number assigned for numerical transport.
a. from Wilson et al. (1994).
b. Reversibly sorbed colloid.
c. Irreversibly sorbed colloid
d. Assumed no radioactive decay for computational efficiency.

Table 8 - 22. Input Parameters For Vertical Dispersivity Sensitivity Models.

Input parameter	Vertical-Dispersivity Model	Streamtube-mixing Model
Initial concentration	1.0	1.0
Retardation Factor	1.0	1.0
Longitudinal Dispersivity, α_x (m)	100	100
Transverse Dispersivity, α_y (m)	0.5	0.5
Transverse Dispersivity, α_z (m)	0.0016 to 14	0.16
Distance in x direction (km)	20	20
Time (yrs)	10000	2000 to 4000
contaminant source dimension, "a" (m)	1500	varies for each of the source regions
contaminant source dimension, "b" (m)	10	varies for each of the source regions

Table 8 - 23. Permeability For Major Hydrogeologic Units From Model Calibration of the USGS Site-Scale Flow Model and From Hydraulic Testing.

Hydrogeologic Unit	Unit Number [a]	Calibrated Permeability log10 (m^2) [a]	Mean Measured Permeability log10 (m^2)	Standard Deviation Permeability log10(m^2)
Upper Volcanic Aquifer (Paintbrush and Timber Mountain)	15	-13.8	-12 (air perm)	0.67
Upper Volcanic Confining Unit (Calico Hills)	14	-18.0	-13.2 (SW) -13.0 (MW)	0.52 (SW) 0.12 (MW)
Middle Volcanic Aquifer (Crater Flat)	13	-13.8	-13.9 (SW) -12.1 (MW)	(SW) 0.64 (MW)

a from Czarnecki et al. (1998) model
SW = single-well test
MW = multi-well test

Table 8 - 24. Permeability Values Obtained Through Calibration of the USGS Site-Scale Flow Model and the TSPA 3-D SZ Flow Model.

Hydrogeologic Unit	Unit Number [a]	USGS Site-Scale Flow Model Calibrated Permeability (meters^2)	TSPA 3-D Flow Model Calibrated Permeability (meters^2)
Valley-fill aquifer	19	8.8×10^{-14}	7.7×10^{-12}
Valley-fill confining unit	18	3.3×10^{-16}	1.0×10^{-14}
Lava-flow aquifer	16	4.5×10^{-14}	4.5×10^{-14}
Upper volcanic aquifer	15	1.6×10^{-14}	2.4×10^{-12}
Upper volcanic confining unit	14	1.0×10^{-18}	3.6×10^{-14}
Middle volcanic aquifer	13	1.6×10^{-14}	2.4×10^{-12}
Middle volcanic confining unit	12	1.9×10^{-16}	1.0×10^{-12}
Lower volcanic aquifer	11	5.0×10^{-13}	1.0×10^{-12}
Lower volcanic confining unit	10	1.0×10^{-16}	5.0×10^{-13}
Undifferentiated valley fill	9	2.9×10^{-14}	4.0×10^{-12}
Limestone aquifer	17	1.0×10^{-14}	1.1×10^{-12}
Granitic confining unit	2	3.5×10^{-14}	3.5×10^{-14}
Upper carbonate aquifer	8	6.7×10^{-13}	1.1×10^{-12}
Upper clastic confining unit	6	5.5×10^{-19}	1.0×10^{-14}
Lower carbonate aquifer	3,5,7	4.4×10^{-12}	1.1×10^{-12}
Lower clastic confining unit	4	2.0×10^{-15}	1.0×10^{-14}

a from Czarnecki et al. (1998) model

Table 8 - 25. Permeability Values Used In Indicator Geostatistical Simulations of Alluvial Deposits.

Hydrogeologic Unit	Unit Number [a]	Estimated Mean log10 k (m^2)	Bimodal permeability distribution [b]	Geometric Mean permeability
Valley Fill Aquifer	19	-13.1	-14.1 (1/3) -12.5 (2/3)	-13.1
Valley Fill Confining Unit	18	-15.5	-17.0 (1/3) -14.8 (2/3)	-15.5
Undifferentiated Valley Fill	9	-13.5	-15.0 (1/3) -12.8 (2/3)	-13.5

a from Czarnecki et al. (1998) model

b fraction indicates the fraction of that unit which was assigned the specified permeability

Table 8 - 26. Parameter Values Used in the Geostatistical Simulations of Permeability in the SZ.

Hydrogeologic Unit	Mean log10 k	σ (standard deviation) log 10 k	λ_x (correlation length) (m)	λ_y (correlation length) (m)	λ_z (correlation length) (m)	Simulation Algorithm
Upper Volcanic Aquifer	-13.8	0.4	1000	1000	75	gaussian
Upper Volcanic Confining Unit	-18.0	0.3	1000	1000	75	gaussian
Middle Volcanic Aquifer	-13.8	0.7	1000	1000	75	gaussian
Alluvium	-13.1	NA	1000 [a] 1000 [b]	3000 [a] 1000 [b]	150 [a] 50 [b]	indicator indicator
Undifferentiated Valley Fill	-13.5	NA	1000 [a] 1000 [b]	3000 [a] 1000 [b]	150 [a] 50 [b]	indicator indicator

Note: See Deutsch and Journel (1992) for definitions of geostatistical parameters
a assigned to high permeability fraction
b assigned to low permeability fraction

Table 8 - 27. Porosity of Geologic Units Used In the Dual-Porosity Sensitivity Studies.

Hydrogeologic Unit	Matrix porosity	Fracture porosity
Upper Volcanic Unit	0.163	1.0×10^{-4}
Middle Volcanic Unit	0.227	1.0×10^{-4}
Middle Volcanic Confining Unit	0.183	1.0×10^{-4}
Undifferentiated Valley Fill	0.25	0.25

Note: Coefficient of molecular diffusion = 3.2×10^{-11} m^2/s for all units unless otherwise specified.
Fracture Spacing = 2 meters unless otherwise specified.
All other required input parameters were equal to TSPA SZ 1-D transport model (Section 8.4.2).

Table 8 - 28. Fracture Apertures and Fluxes Used for Different Fracture Spacings In the Dual-Porosity Sensitivity Studies.

Fracture spacing (m)	Grid width in y-direction (m)	Fracture aperture (m)	Fluxes (kg/s)
0.2	0.1	1.0×10^{-5}	1.9×10^{-6}
2	1	1.0×10^{-4}	1.9×10^{-5}
5	2.5	2.5×10^{-4}	4.75×10^{-5}
10	5	5.0×10^{-4}	9.5×10^{-5}
20	10	1.0×10^{-3}	1.9×10^{-4}
200	100	1.0×10^{-2}	1.9×10^{-3}

Table 8 - 29. Retardation Factors With Matrix Diffusion or Sorption or Both Used in the Dual-Porosity Sensitivity Study.

Simulation	1d-0.0	1d-0.1	1d-0.5	1d-1.0	2d-0.0	2d-0.1	2d-0.5	2d-1.0
$t_{0.5}^{x}$(years)	2.6	3	5.2	7.6	6000	10000	28000	52000
R	1.0	1.2	2.0	2.9	2307.7	3846.2	10769.2	20000.0

$t_{0.5}^{x}$ = time to mid-point of break through curve
R = retardation factor

Table 8 - 30. Fracture Spacing and Approximate Effective Porosity.

Fracture Spacing, s (m)	0.2	2	5	10	20	200
Effective Porosity, ϕ_e	ϕ_m	0.19	0.15	0.05	0.005	0.0005

ϕ_m = matrix porosity value

Table 8 - 31. Reaction Parameters For the Reactive Colloid Transport Sensitivity Analyses.

		Pu-Colloid Formation			Pu Sorption			Colloid and Pu-Colloid Filtration		
Figure	Description	K_d	k_f	k_r	K_d	k_f	k_r	K_d	k_f	k_r
8-68	**Base** - Equilibrium Formulation	10^8			100			100		
	Base - Kinetic Formulation	10^8	10^8	10^0	100	10^8	10^6	100	100	1
8-69	**PuColloid(aq) Formation**	10^4 to 10^9	10^4 to 10^9	1	100	10^8	10^6	100	100	1
8-70	**PuColloid(aq) Formation**	10^8	10^{-4} to 10^6	10^{-12} to 10^{-2}	100	10^8	10^6	100	100	1
8-71	**Pu Sorption** - Effect of Kd (Equilibrium Pu-Colloid[aq] formation)	10^8	10^8	10^0	3 to 3000	$3x10^6$ to $3x10^9$	10^6	100	100	1
8-72	**Pu Sorption** - Effect of Kd (Kinetic Pu-Colloid[aq] formation)	10^8	10^4	10^{-4}	3 to 3000	$3x10^6$ to $3x10^9$	10^6	100	100	1
8-73	**Filtration** of Colloids and PuColloids (Equilibrium Pu-Colloid[aq] formation)	10^8	10^8	10^0	100	10^8	10^6	10^{-1} to 10^3	10^{-1} to 10^3	1
8-74	**Filtration** of Colloids and PuColloids (Kinetic Pu-Colloid[aq] formation)	10^8	10^4	10^{-4}	100	10^8	10^6	10^{-1} to 10^3	10^{-1} to 10^3	1
8-75 8-76	**Ambient Colloid Concentration.** Range from 10^3 time LESS to 10^3 times MORE than base-case colloid concentration.	10^8	10^4	10^{-4}	100	10^8	10^6	100	100	1

Table 8 - 32. Parameter Ranges for Reactive Colloid-Facilitated Pu Transport.

Parameter	Lab Range and units	Model Range and units	Relevant Equations in Section 8.5.2.5 and comments
Pu-Colloid Complexation			
K_d	10^3 - 10^9 (kg H_2O/kg Colloid)	10^3 - 10^9 (kg H_2O/Mole Colloid)	8-38 to 8-42
K_c	10^{-5} - 10		8-39
k_f		10^3 - 10^9 (1/hr)	
k_r		10^{-6} - 10^2 (1/hr)	
Pu Sorption			
K_d	3 – 3000 (kg H_2O/kg Rock)	3-3000 (kg H_2O/kg Rock)	8-43
k_f		10^{-3} - 10^9 (1/hr)	
k_r		10^{-3} - 10^9 (1/hr)	$k_r = k_f/K_d$
Colloid and PuColloid Filtration			
K_d		10^{-3} - 10^4	$K_d = k_f/k_r$
k_f	0.1 - 20 (1/hr)	10^{-3} - 10^4 (1/hr)	from CRWMS M&O (1997)
k_r		1 (1/hr)	

Table 8 - 33. Relationship Between K_c and TSPA Model Parameters.

Case	K_c	R_f	$\hat{R}_f$	$\hat{K}_d$	$\hat{K}_d$
a	0.01	2.5×10^6	2.5×10^6	99	1.2
b	0.1	2.5×10^6	2.5×10^6	91	1.1
c	1	2.5×10^6	2.5×10^6	50	0.6
d	10	2.5×10^6	2.5×10^5	9.1	0.11

Note: Assuming K_d =100 ml/g, n_{eff} = 0.003, n_{matrix} = 0.25, $n_{fracture}$ =0.0001

Table 8 - 34. Relationship Between Kc Reaction Transport Model Parameters.

Case	K_c	Equation 8 - 29 K_d [a]	Equation 8 - 30 $\widehat{K}_d$ [b]
a	0.01	1.60×10^6	1.2
b	0.1	1.60×10^7	1.2
c	1	1.60×10^8	1.2
d	10	1.60×10^9	1.2

Note: Assuming K_d =100 ml/g, n_{eff} = 0.003, n_{matrix} = 0.25, $n_{fracture}$ =0.0001

a computed with Equation 8-42

b computed with Equation 8-50

Table 8 - 35. Reaction Parameters for 25-km Stream Tube Simulations.

Figure	Description	Pu-Colloid Formation			Pu Sorption			Colloid and Pu-Colloid Filtration		
		K_d	k_f	k_r	K_d	k_f	k_r	K_d	k_f	k_r
8-80	PA - equilibrium (Kc=10)	1.5×10^{9}	1.5×10^{9}	1	1.2	1.2×10^{6}	10^{6}	-	-	-
	Kinetic -	1.5×10^{9}	1	1.5×10^{-9}	1.2	1.2×10^{6}	10^{6}	-	-	-
	Kinetic - with filtration	1.5×10^{9}	1	1.5×10^{-9}	1.2	1.2×10^{6}	10^{6}	100	100	1
8-81	Pu Sorption and Filtration. Pu sorption scaled Kd increased to represent less effective porosity.	1.5×10^{9}	1	1.5×10^{-9}	15	1.5×10^{7}	10^{6}	.1	.1	1