NUMERICAL FLOW AND TRANSPORT SIMULATIONS SUPPORTING THE SALTSTONE DISPOSAL FACILITY PERFORMANCE ASSESSMENT

G. P. Flach
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JUNE 2009

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Prepared for the U.S. Department of Energy Under Contract Number DE-AC09-08SR22470

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Prepared For
U.S. Department of Energy

SRNL-STI-2009-00115, REVISION 1

Key Words:
PORFLOW

Retention:
Permanent

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6/4/09

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6/16/09

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6/16/09

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Dave Crowley, Manager, Environmental Analysis and Performance Monitoring — Date

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REVISIONS

Revision 0	Initial issue.
Revision 1	The projected inventory for Vault 4 changed after issuance of Revision 0. Transport simulations were repeated with the newer inventory values. Revision 1 also reflects assignment of a "ReModerate" initial condition to the Upper Mudmat instead of "OxModerate", and corrects for use of an obsolete inventory table for Case C runs.

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LIST OF ACRONYMS

CFD	Computational Fluid Dynamics
DCF	Dose Conversion Factor
DOE	United States Department of Energy
EPA	Environmental Protection Agency
GCL	Geosynthetic Clay Liner
GSA	General Separations Area
HDPE	High Density Polyethylene
INL	Idaho National Laboratory
MCL	Maximum Contaminant Level
NDAA	Ronald W. Reagan National Defense Authorization Act for Fiscal Year 2005
PA	Performance Assessment
SDF	Saltstone Disposal Facility
SOF	Sum Of Fractions
SQAP	Software Quality Assurance Plan
SPF	Saltstone Processing Facility
SRS	Savannah River Site
UV	Ultraviolet light
WSRC	Westinghouse Savannah River Company

EXECUTIVE SUMMARY

The Saltstone Disposal Facility (SDF) Performance Assessment (PA) is being revised to incorporate requirements of Section 3116 of the Ronald W. Reagan National Defense Authorization Act for Fiscal Year 2005 (NDAA), and updated data and understanding of vault performance since the 1992 PA and related Special Analyses. This report describes development of PORFLOW models supporting the SDF PA, and presents sample results to illustrate model behaviors and define impacts relative to key facility performance objectives. The SDF PA document, when issued, should be consulted for a comprehensive presentation of results.

Immediately after closure of the Saltstone Disposal Facility, the newly installed cover system is expected to reduce infiltration to less than 0.01 in/yr, greatly retarding contaminant migration through the vadose zone. Similarly, the intact vault concrete and HDPE/GCL liners are predicted to form a highly competent barrier to contaminant release, such that diffusion controls leaching from Saltstone vaults. Corresponding PORFLOW simulations indicate very low contaminant releases early in the 10,000 year period of performance.

Over time, engineered materials and systems are expected to degrade. Engineering analyses described herein suggest that the cover system and HDPE/GCL liners will become significantly degraded within several hundred years, and essentially fully degraded after a few thousand years. The concrete barriers are predicted to degrade more slowly through sulfate attack lasting many thousands of years. The earliest failure is forecast at 10,000 years for the relatively thin Vault 4 roof. Chemical degradation from reducing moderate-aged concrete to oxidized and/or old-aged concrete is projected to occur well past the period of performance in general. Thus the overall vault containment system, although degraded, remains intact and effective through the period of performance. PORFLOW simulations indicate that peak contaminant levels for the baseline scenario will satisfy dose performance objectives of the Performance Assessment (PA) supported by this work.

Through 10,000 years Vault 4 is the largest contributor to the peak Tc-99 concentration, while Vault 2 future disposal cells drive the I-129 and Nitrate peaks. As a fraction of MCL, the peak 100 meter concentrations through 10,000 years in descending order are 0.26 for I-129, 0.12 for Nitrate, 0.10 for Ra-226 ingrowth from Th-230, and 0.02 for Tc-99. Other sensitivity cases were postulated for diagnostic purposes, to better understand the range of possible vault behavior. For the fast flow path Case C scenario, the peak fractions are 2.79 for I-129, 0.95 for Tc-99 and 0.43 for Nitrate. Concentrations for some species peak after 10,000 years. Through 20,000 years, the peak fractions are 9.5 for I-129, 0.76 for Tc-99, 0.14 for Ra-226 ingrowth from Pu-238, and 0.13 for Nitrate. For the fast flow path Case C scenario, the peak fractions are 2.8 for I-129, 0.95 for Tc-99 and 0.43 for Nitrate through 20,000 years

The present effort embodies a number of modeling advances in comparison to prior Special Analyses and Performance Assessment for the SDF. Degradation from sulfate attack is based on STADIUM simulations of the coupled transport and chemistry processes associated with ettringite formation in concrete. Although lacking explicit simulation of damage mechanics, STADIUM nonetheless represents the state-of-the-art in first-principles sulfate attack modeling. PORFLOW simulations for Tc-99 couple transport properties to local reduction capacity, which is depleted through exposure to dissolved oxygen. This approach represents an advance over earlier Saltstone modeling efforts that used spatial average reduction capacity to control Tc-99 release. The present simulations also incorporate the effects of cracking on cementitious material properties. The baseline scenario assumes cracks in the Vaults 1 and 4 walls, and Case E assumes that Saltstone is cracked for diagnostic purposes. Cracks are predicted to become active when capillary suctions are less than approximately 100 cm, conditions that occur after the cover system degrades.

1.0 INTRODUCTION

The Saltstone Disposal Facility Performance Assessment (PA) is being revised to incorporate requirements of Section 3116 of the Ronald W. Reagan National Defense Authorization Act for Fiscal Year 2005 (NDAA), and updated data and understanding of vault performance since the 1992 PA (Cook and Fowler 1992) and related Special Analyses. A hybrid approach was chosen for modeling contaminant transport from vaults and future disposal cells to exposure points. A higher resolution, largely deterministic, analysis is performed on a best-estimate Base Case scenario using the PORFLOW numerical analysis code. A few additional sensitivity cases are simulated to examine alternative scenarios and parameter settings. Stochastic analysis is performed on a simpler representation of the SDF system using the GoldSim code to estimate uncertainty and sensitivity about the Base Case. This report describes development of PORFLOW models supporting the SDF PA, and presents sample results to illustrate model behaviors and define impacts relative to key facility performance objectives. The SDF PA document, when issued, should be consulted for a comprehensive presentation of results.

2.0 SALTSTONE DISPOSAL FACILITY

The Z-Area Saltstone Disposal Facility (SDF) resides in the General Separations Area (GSA) of the Savannah River Site (SRS) near Aiken, South Carolina (Figure 1). The GSA is bounded to the north by Upper Three Runs, to the south by Fourmile Branch, and to the east by McQueen Branch. The western boundary extends beyond F-Area, but is not precisely defined. Shallow groundwater beneath the SDF discharges to McQueen Branch or Upper Three Runs. Phifer and others (2006, Section 4.0) provide additional background information about regional and site hydrogeology.

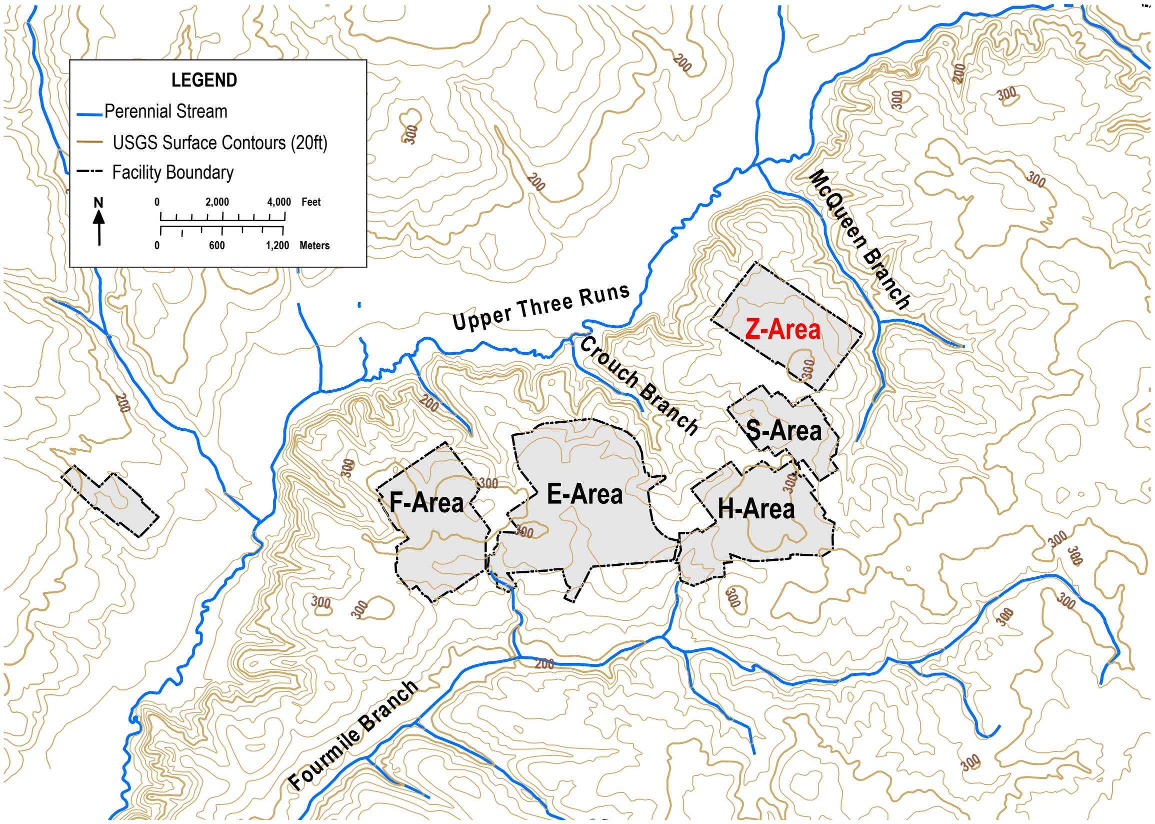


Figure 1. Location of the Z-Area Saltstone Disposal Facility.

2.1 FACILITY LAYOUT

The SDF currently comprises a grout mixing plant and two existing rectangular concrete vaults or disposal units named Vault 1 and Vault 4 (Figure 2). Future disposal capacity is planned in the form of cylindrical concrete tanks, the first pair of which is named the Vault 2 disposal unit, comprising two disposal cells (tanks). Additional disposal cells will be grouped in sets of two or four tanks to form a disposal unit. Figure 3 illustrates the layout of existing and planned vault disposal cells, and Figure 4 defines the naming convention and base elevations of each disposal unit. A total of sixty-four Vault 2 type cylindrical tanks are anticipated to meet Saltstone disposal requirements during a 30-year operational period.

Figure 2. Aerial photograph of Z-Area showing Vault 4 (foreground), Vault 1 (background, left) and grout mixing plant and supporting infrastructure (background, right).

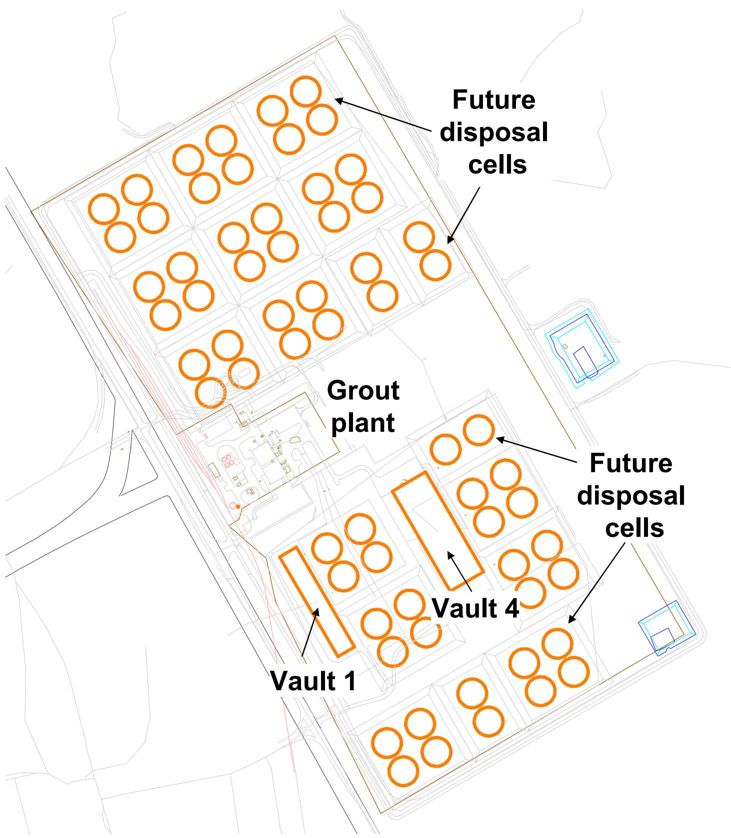


Figure 3. Disposal cell layout within the Saltstone Disposal Facility.

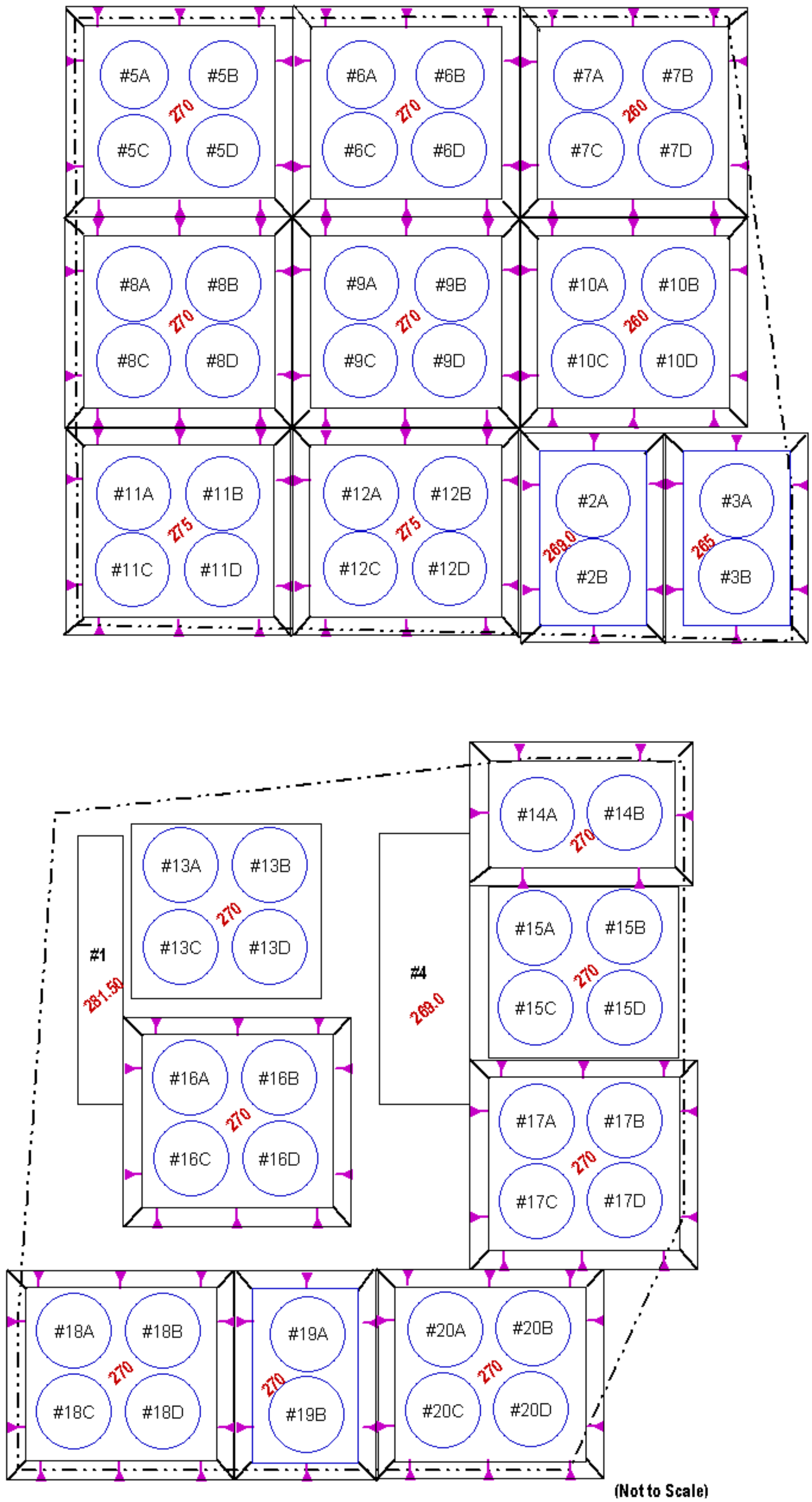


Figure 4. Disposal cell naming convention and base elevations (shown by red diagonal text).

2.2 VAULT CONSTRUCTION

The design and construction of the three vault types are described by Phifer and others (2006, Section 4.6) and detailed engineering drawings cited in the sections below. The summary descriptions below focus on the key materials and dimensions controlling long-term contaminant release after facility closure. Appendix A includes copies of the drawings used to build the associated PORFLOW flow and transport models.

2.2.1 Vault 1

Vault 1 (Figure 5) is a rectangular reinforced concrete vault measuring approximately 600 feet (183 m) long by 100 ft (30.5 m) wide by 25 ft (7.6 m) high. The disposal unit is divided into 6 disposal cells, A-F, that are nominally 100 ft (30.5 m) square (Figure 6). Disposal cells A-C are currently filled. A three inch gap exists between cells C and D, midway along the length. Figure 7 is a simplified schematic diagram of a cross-section through a filled and closed disposal cell, showing key dimensions and materials expected to control contaminant release. Dimensions are taken from drawings W774260 Rev. 7, W780625 Rev. 7, and C-CC-Z-0015 Rev. A.

A Vault 1 cell filled with Saltstone consists of the following materials and dimensions (Phifer and others, 2006, Section 4.6.1):

- Controlled compacted backfill soil base
- 4-inch (0.1 m) thick, concrete work slab
- 2-foot (0.61 m) thick, reinforced concrete, floor slab
- 18-inch (0.46 m) thick, reinforced concrete walls
- Continuous waterstop seals at all concrete joints
- 24-feet (7.3 m) of Saltstone or other cementitious waste forms poured into the cell from above
- Minimum 6-inch (0.15 m) thick clean grout cap
- Poured-in-place concrete roof with an approximately 2% slope (the roof is poured-in-place after the vault has been filled with waste and the clean grout cap)
- 60 mil polyester-reinforced EPDM roof membrane

The concrete mixes used in the foundation and walls of Vault 1 are listed in Table 1 (Phifer and others, 2006, Table 4-5).

Table 1. Vault 1 concrete formulations from WSRC-TR-2006-00198.

Ingredient	Working Slab Quantity (lbs/yd^3)	Floor Slab and Walls Quantity (lbs/yd^3)	Roof Quantity (lbs/yd^3)
Type II cement (ASTM C 150)	413	419	400
Grade 120 Blast Furnace Slag (ASTM C 989)	0	278	0
Type F Fly Ash (ASTM C 618)	73	0	70
Sand (ASTM C 33)	1356	1133	1149
No. 67 Aggregate (maximum 0.75 inches) (ASTM C 33)	1698	1798	1900
Water (maximum)	272	268	292
Water to Cementitious Material Ratio	0.56	0.385	0.62
Minimum Compressive Strength at 28 days	2000 psi	4000 psi	3000 psi

Figure 5. Aerial photograph of Vault 1 looking to the north.

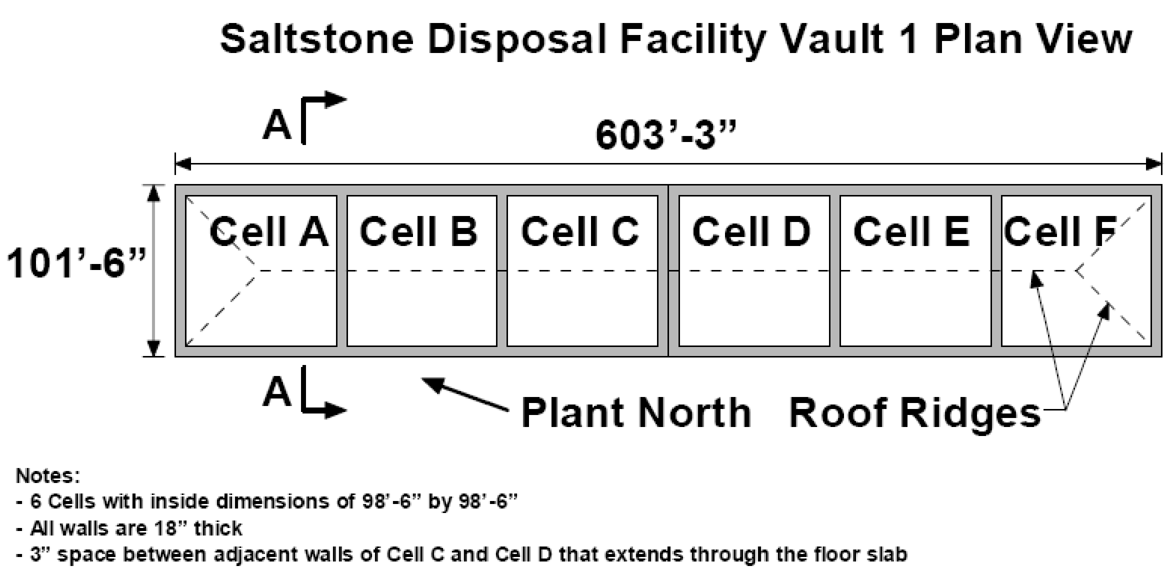
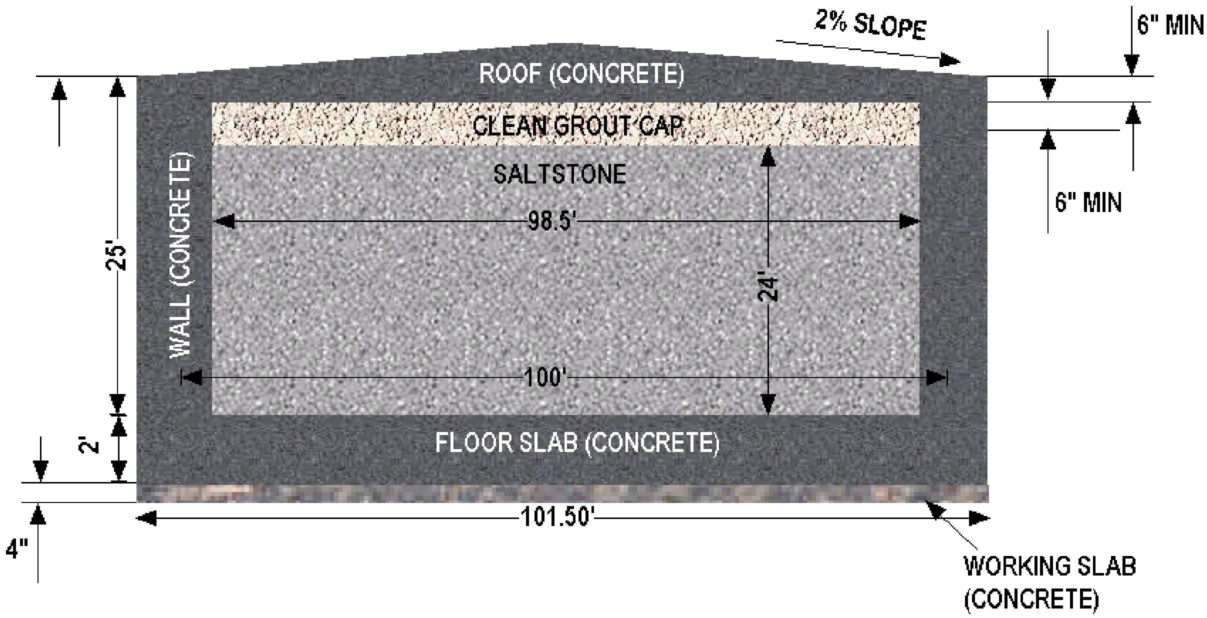


Figure 6. Disposal cells composing Vault 1 (reproduced from WSRC-STI-2006-00198).



Label	Thickness	Material
Roof (2 % slope)	6 inches - minimum	Concrete
Grout Cap	12 inches modeled (~6 inches min.)	Clean Grout
Saltstone	288 inches	Saltstone
Floor Slab	24 inches	Concrete
Wall	18 inches	Concrete
Working Slab	4 inches	Concrete

Figure 7. Schematic diagram of Vault 1 cross-section (not to scale).

2.2.2 Vault 4

Vault 4 (Figure 1) is a rectangular reinforced concrete vault measuring approximately 600 feet (183 m) long by 200 ft (61 m) wide by 26 ft (7.9 m) high. The disposal unit is divided into 12 disposal cells, A-L, that are nominally 100 ft (30.5 m) square (Figure 9). A three inch gap exists midway along the length of the vault between cells C/I and D/J. Figure 10 is a simplified schematic diagram of a cross-section through a filled and closed pair of disposal cells, showing key dimensions and materials expected to control contaminant release. Dimensions are taken from drawings W828992 Rev. B1, C-CC-Z-0012 Rev. 4, C-CC-Z-0013 Rev. 3, C-CS-Z-0002 Rev. 2.

A Vault 4 cell filled with Saltstone consists of the following materials and dimensions (Phifer and others, 2006, Section 4.6.2):

- Controlled compacted backfill soil base
- 4-inch (0.1 m) thick, concrete work slab

- 2-foot (0.61 m) thick, reinforced concrete, floor slab
- 18-inch (0.46 m) thick, exterior and interior reinforced concrete walls
- Cells B, D, E, F, H, J, K, and L have sheet drains (polystyrene sheet with 7/16 inch dimples covered on one side with a non-woven, needle-punched polypropylene filter fabric) installed on the walls to limit the build up of hydrostatic head on the walls by removing Saltstone bleed water and condensate from the cells
- Each Vault 4 cell contains two to three 1-inch (0.025 m) diameter through-wall drain lines in the bottom of an exterior wall. It also contains a 2-inch (0.051 m) diameter, through-wall, schedule 40, stainless steel pipe through an exterior wall of Cells B, D, E, F, H, J, K, and L, in order to drain collected liquids from inside the cell. Additionally each pair of cells (i.e., A/G, B/H, C/I, D/J, E/K, and F/L) are connected by a 4-inch (0.102 m) diameter, schedule 40 pipe at the based of their shared interior wall. Finally partial penetrations exist in Vault 4 exterior walls from anchor bolts used for ladders, pipe supports, etc.
- Continuous waterstop seals at all concrete joints
- Maximum 24.75-feet (7.5 m) of Saltstone or other cementitious waste form poured into each cell through a 6-inch diameter pipe sleeve located in the roof in the center of each cell
- Minimum 15-inch (0.15 m) thick clean grout cap poured into each cell through a series of 50 3-inch diameter pipe sleeves located in the roof of each cell
- Roof at an approximately 2% slope, consisting of 4 to 6-inch (0.1 to 0.15 m) thick poured-in-place, reinforced concrete over 20 gauge corrugated metal, supported by steel joists and 10-inch (0.25) diameter standard pipe columns filled with lean concrete (the pipe columns are bolted to the floor with anchor bolts) (the roof is in place prior to the Saltstone pour except for Cell A)
- Vault 4 contains the following through-wall penetrations in the roof of each cell, except for cell A whose roof contains no penetrations:
  - Fifty 3-inch (0.076 m) diameter pipe sleeves per cell for the clean cap pour (only 49 in cell G)
  - Two 12-inch (0.3 m) diameter pipe sleeves per cell for venting
  - One 6-inch (0.15 m) diameter pipe sleeve per cell for pouring Saltstone
  - One 3-foot by 3-foot (0.91 m) personnel/camera access opening per cell
  - One 1-inch (0.03 m) diameter pipe sleeve per cell for radiological monitoring
- Additionally the roof contains partial penetrations from anchor bolts used for handrails, ladders, pipe supports, etc. Disposal cells A-C are currently filled.

The concrete mixes used in the foundation and walls of Vault 4 are listed in Table 2 (Phifer and others, 2006, Table 4-6).

Table 2. Vault 4 concrete formulations from WSRC-TR-2006-00198.

Ingredient	Working Slab Quantity (lbs/yd^3) [a] (AP-Z000-6C)	Floor Slab and Walls to 25 feet Quantity (lbs/yd^3) [a] (Z2-4000-5C)	Walls above 25 feet and Roof (lbs/yd^3) [a]	Lean Concrete for roof support columns (lbs/yd^3) [b]
Type II cement (ASTM C 150)	413	419	466	486
Grade 120 Blast Furnace Slag (ASTM C 989)	0	278	0	0
Type F Fly Ash (ASTM C 618)	73	0	62	0
Sand (ASTM C 33)	1356	1133	1190	1272
No. 67 Aggregate (maximum 0.75 inches) (ASTM C 33)	1698	1798	1800	1800
Water (maximum)	273 (32.7 gallons)	254 (30.4 gallons)	296 (35.5 gallons)	296 (35.5 gallons)
Water to Cementitious Material Ratio	0.56	0.36	0.56	0.61
Minimum Compressive Strength at 28 days	2000 psi	4000 psi	4000 psi	2000 psi

[a] [SRNL-EST-2005-00105]
[b] [C-CC-Z-0011, C-SPS-G-00041]

Figure 8. Aerial photograph of Vault 4 looking to the north.

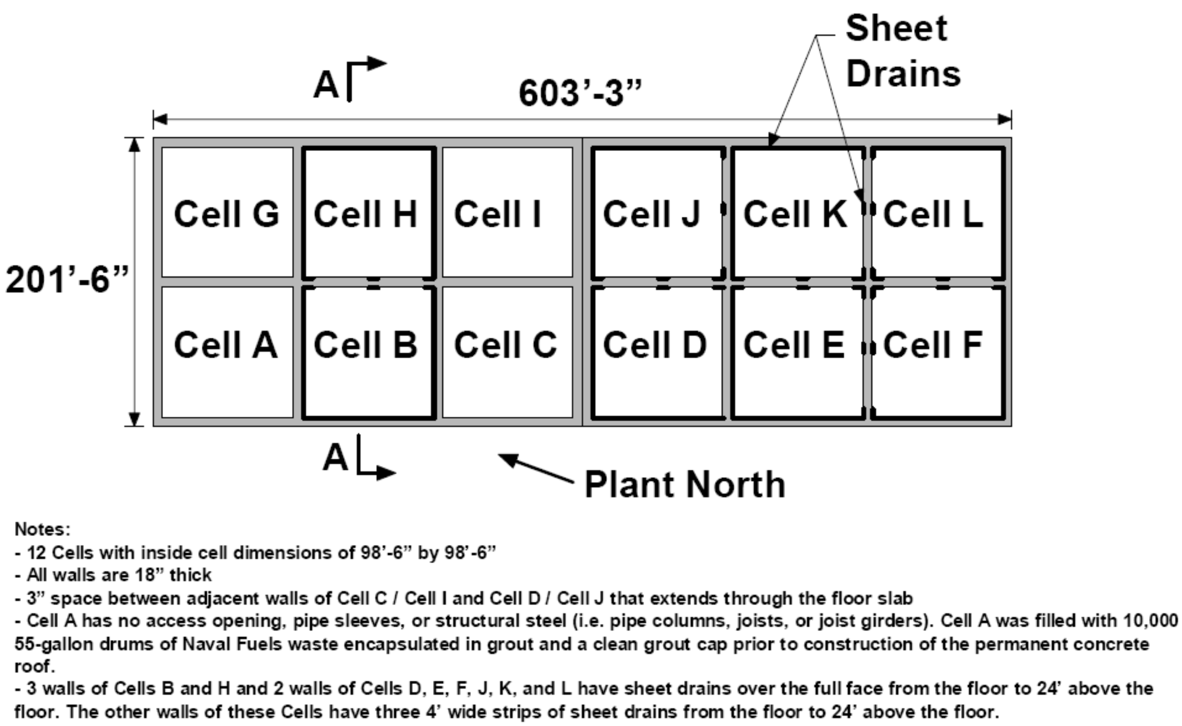
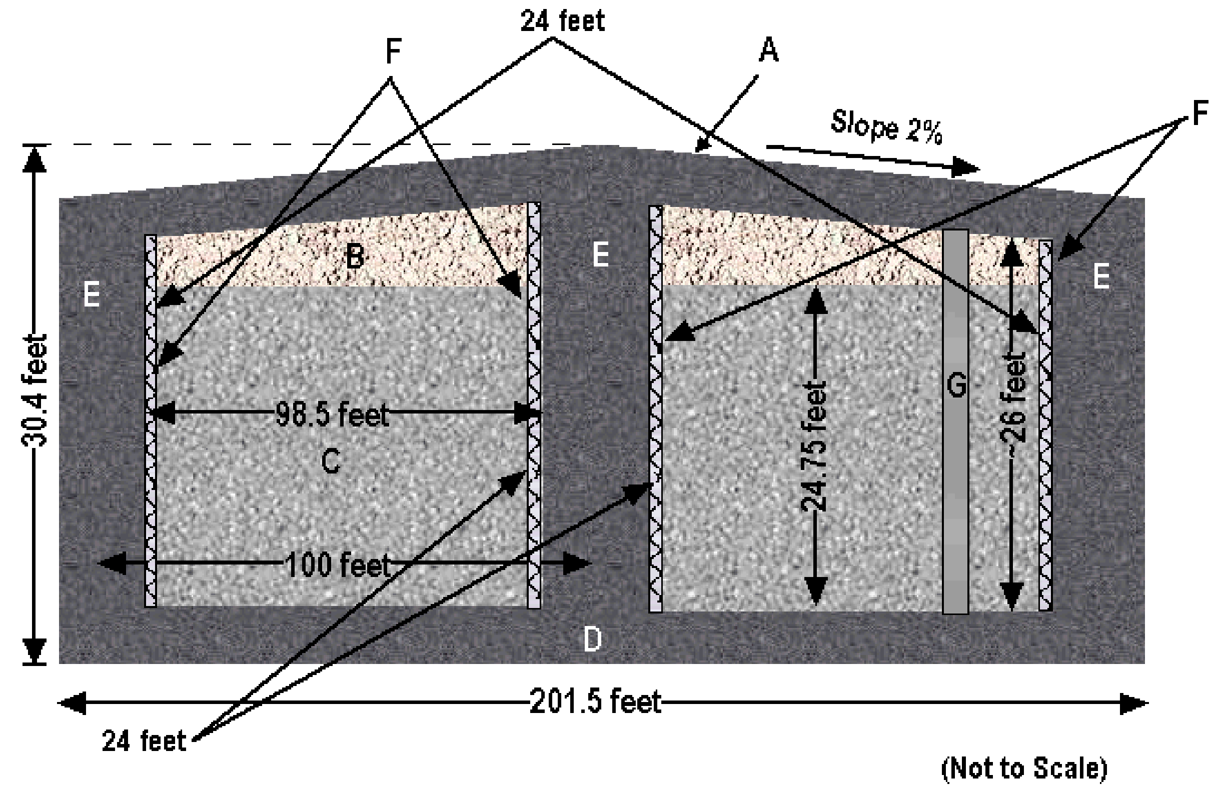


Figure 9. Disposal cells composing Vault 4 (reproduced from WSRC-STI-2006-00198).



Label	Thickness	Material
A – Roof (2% slope)	4 inches minimum	Concrete (see Table 4-1)
B – Clean Grout	15 inches minimum	Grout
C - Saltstone	297 inches maximum	Saltstone
D – Floor Slab	24 inches	Concrete (see Table 4-1)
E - Wall	18 inches	Concrete (see Table 4-1)
F – Sheet Drain [a]	0.4375 inch	Polystyrene
G – Column (9 per cell) [b]	10 inch diameter	Lean Concrete (see Table 4-1) Filled Carbon Steel Pipe

[a] All cells except cells A, C, G, and I
[b] All cells except cell A

Figure 10. Schematic diagram of Vault 4 cross-section (not to scale).

2.2.3 Future disposal cells

Vault 2 disposal cells have been designed, but not yet constructed. The design is based on commercial water storage tanks, such as the one displayed in Figure 11. Future disposal cells following Vault 2 are expected to have the same or similar design. For modeling purposes, we assume all future disposal cells are constructed identically to the current Vault 2 design, as defined by drawings QB00485K-011-D, QB00485K-012-D, QB00485K-014-D, QB00485K-015-D, and C-CH-Z-00014 Rev. 0 among others.

Vault 2 comprises two cylindrical tanks, approximately 150 feet (45.7 m) in diameter by 22 feet (6.7 m) high. The reinforced concrete tanks are below grade to the roof line until facility closure. Figure 12 illustrates the floor plan of a single tank or disposal cell. Figure 13 is a simplified schematic diagram of a centerline cut through a filled disposal cell, showing key dimensions and materials expected to control contaminant release.

A Vault 2 tank filled with Saltstone consists of the following materials and key dimensions (Phifer and others, 2006, Section 4.6.3):

- Controlled compacted backfill soil base
- 6-inch (0.15 m) thick, mudmat
- Geosynthetic Clay Liner (GCL) consisting of a minimum 0.75 lbs/ft^2 sodium bentonite
- 100-mil high density polyethylene (HDPE) geomembrane
- 4-inch (0.1 m) thick mudmat
- Minimum 8 inch (0.3 m) thick cast-in-place reinforced concrete floor slab
- Minimum 8 inch (0.2 m) thick reinforced concrete walls
- The interior of the walls will be coated with a waterproofing material
- The exterior side of the walls will be covered with a 100-mil HDPE geomembrane
- Maximum 20-feet (6.7 m) of Saltstone or other cementitious waste form poured into the tank through a roof penetration
- Minimum 2-foot (0.61 m) clean grout cap to fill between the Saltstone and roof poured into the tank through roof penetrations
- Minimum 8 inch (0.2 m) thick reinforced concrete roof at a minimum 2% slope (the roof is in place prior to the Saltstone pour)
- Roof penetrations will exist to pour Saltstone, to pour the clean grout cap, for ventilation, for monitoring (temperature and cameras), personnel access, etc.

Material specifications for Vault 2 are listed in Table 3. The current concrete formulation is "Mix 2", summarized in Table 4 (Dixon and others, 2008).

Table 3. Vault 2 material specifications based on WSRC-TR-2006-00198.

Material	Thickness (Inches)	Technical Details	Reference
Concrete Roof	8	Type V, Class III sulfate resistant, 0.5 inch bar reinforced	QB00485K, Sheet 14, 16
Concrete Wall	8	Type V, Class III sulfate resistant, 0.5 inch bar reinforced	QB00485K, Sheet 13, 14, 34
Concrete Cell Floor	8	Same as roof but with 0.625 inch reinforcement bar, 75 feet inner radius and 77 feet – 7 inches outer radius	WSP-SSF-2005-00023; § 4.7; QB00485K, Sheet 14
Upper Mud Mat	4	Type V, Class III sulfate resistant concrete	QB00485K, Sheet 13, 21
Lower Mud Mat	4	Concrete	QB00485K, Sheet 13, 21
Clean Grout	~ 24	Same as Saltstone	WSRC-TR-2006-00098
Saltstone Grout	~ 240	TBD	WSRC-TR-2006-00098
Internal Coating		TBD	WSP-SSF-2005-00023 § 4.11
ShotCrete	At least 1	Type II	QB00485K, Sheet 13, 20, 21
HDPE Layer	100 mil	For details refer to QB00485K, Sheet 22	" "
GCL	Note 1	Claymax 200R	QB00485K, Sheet 21 QB00485K, Sheet 28

Note 1: Thickness not provided in available vendor literature. Value of 0.2 inch provided in WSP-SSF-2005-00022 is assumed.

Table 4. Vault 2 concrete formulation from Dixon and Phifer (2008b, Table 9); "Mix 2" 710 lbs/cu yd cementitious material, Class 3 sulfate resistant concrete.

Ingredient	Quantity (lbs/cu yd)
Type V cement (Lehigh T-V #2 ; ASTM C 150)	213
Grade 100 Blast furnace slag (Holcim Grade 100 Slag; ASTM C 989)	284
Silica Fume (W. R. Grace Silica Fume; ASTM C 1240)	47.3
Type F Fly ash (SEFA Class “F” Fly Ash; ASTM C 618)	165.7
sand (Rinker Aggregates Company - Augusta Sand - Natural Washed Sand); ASTM C 33)	911
aggregate (Rinker Aggregates Company - Dogwood Quarry - #67 Granite; ASTM C 33)	1850
Water (maximum)	269.8
Water (maximum; gal/ cu yd)	32.3
Maximum water to cementitious material ratio	0.38
Grace WRDA 35 (oz/cwt c+p)	5
Grace Darex II (oz/cwt c+p)	0.4 to 0.5
Grace Adva 380 (oz/cwt c+p)	3 to 4
Minimum compressive strength of at 28 days	5000 psig
Slump range/target of before Super-P	1 – 3 inches / 2 inches
Slump range/target of after Super-P	6 – 8 inches / 7 inches

Figure 11. Photograph of a commercial reinforced concrete water storage tank (http://www.dutchlandinc.com/product_pages/circulair_5_lewistown.html, 11/17/08).

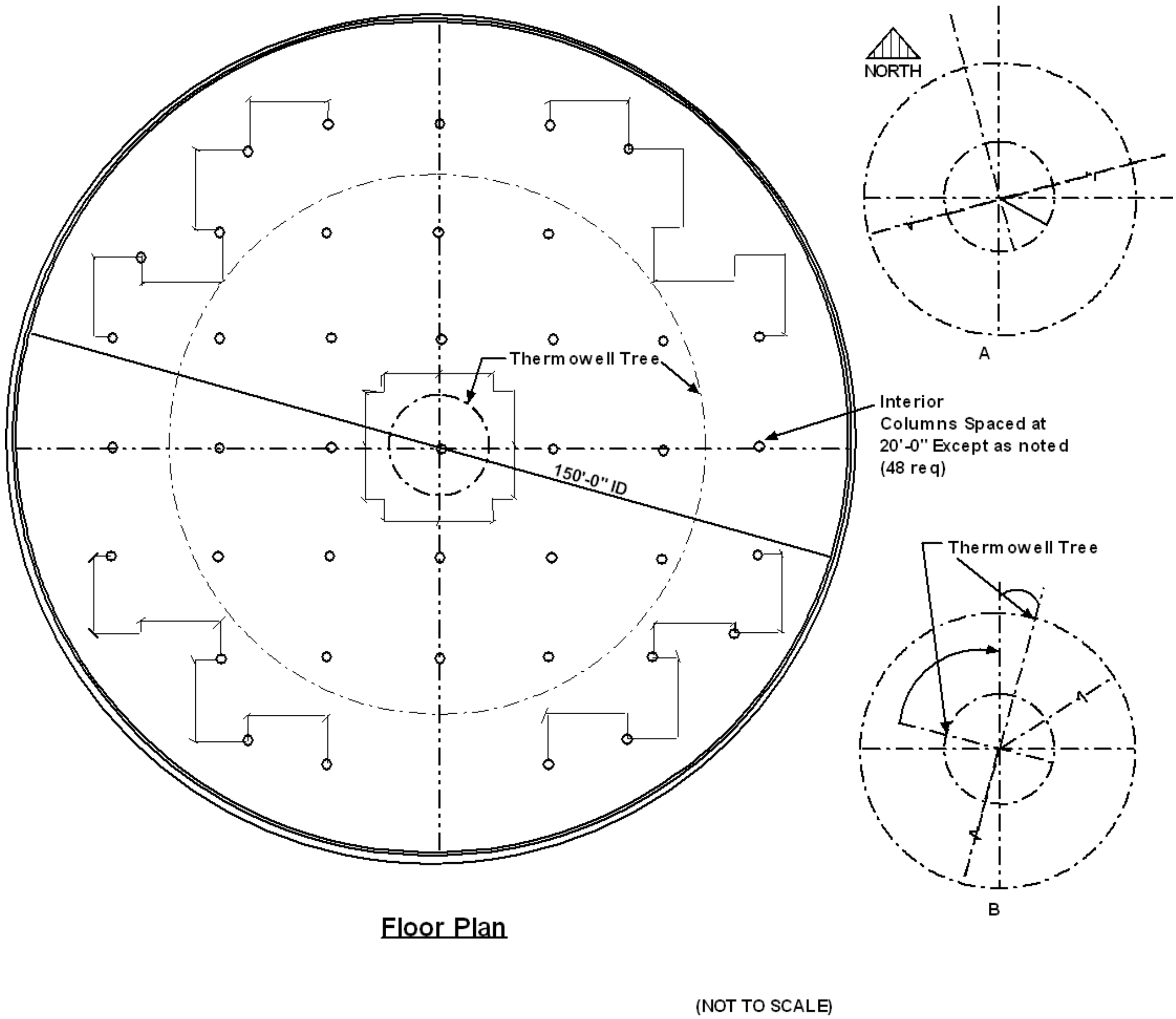
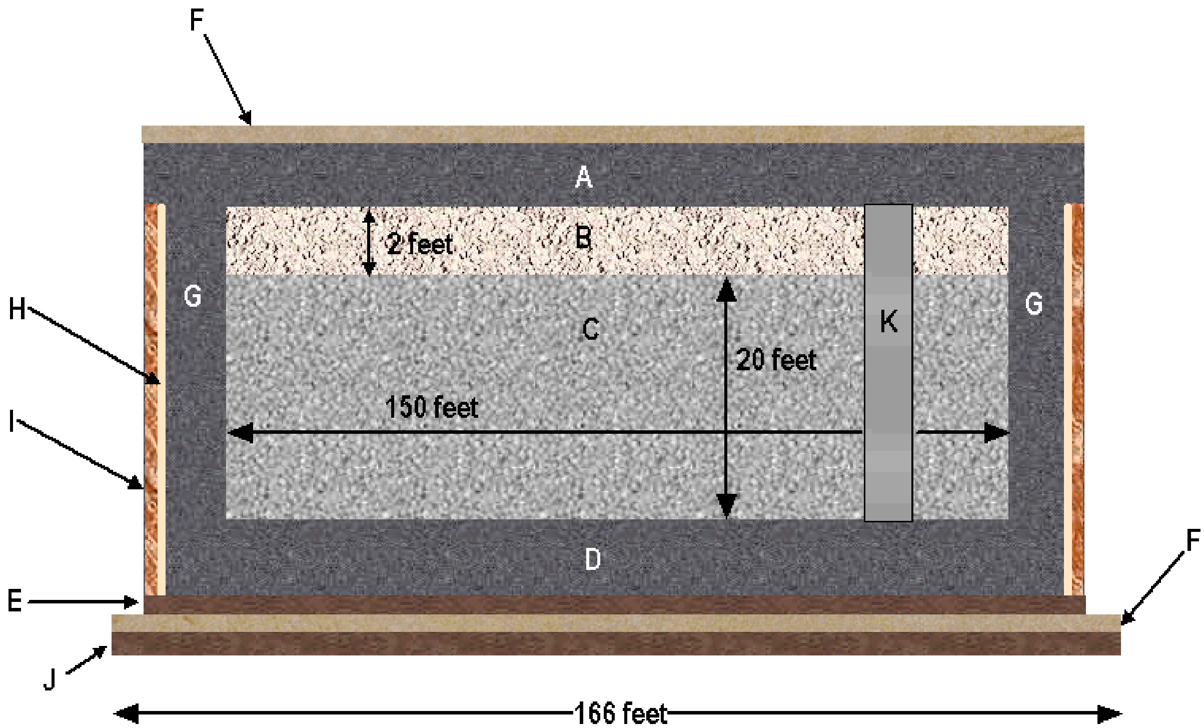


Figure 12. Floor plan for Vault 2 disposal cell.



Label	Thickness	Material
A - Roof	8 inches minimum	Class II Concrete
B - Clean Grout	24 inches	Grout
C - Saltstone	240 inches	Saltstone
D - Floor	8 inches	Class III Concrete
E - Upper Mud Mat	4 inches	Class III Concrete
F - Textile	0.3 inch	HDPE / GCL
G - Wall	8 inches	Class III Concrete
H - Diaphragm	0.0187 inch	Carbon Steel
I - Textile	0.1 inch	HDPE
J - Lower Mud Mat	4 inches	Concrete
K - Column (48 total)	14 inches diameter	Reinforced Concrete

Figure 13. Schematic diagram of centerline cut through Vault 2 (not to scale).

2.3 OPERATION

Saltstone is a cementitious waste form made by mixing salt solution originating from liquid waste storage tanks in F- and H-Areas with a dry mix containing blast furnace slag, fly ash, and cement or lime (Table 5). The primary soluble salts present in the salt solution in descending order are sodium nitrate, sodium hydroxide, sodium nitrite, sodium aluminum hydroxide (NaAl(OH)4), sodium carbonate, and sodium sulfate (Phifer and others, 2006, Section 4.6.4). The primary solid components of Saltstone in descending order are silicon dioxide, aluminum oxide, calcium oxide, magnesium oxide, and iron (III) oxide. Solidified Saltstone is a dense, alkaline, reducing, micro-porous, monolithic, cementitious matrix, consisting of solids such as calcium aluminosilicate and containing a solution of salts within its pore structure. The pore fluid consists predominately of sodium, nitrate, and nitrite. The clean grout, made from process water, has a bulk composition similar to Saltstone (Table 6).

Saltstone grout is prepared within a grout mixing plant known as the Saltstone Processing Facility (SPF), and pumped to disposal cells in nominal 12-inch self-leveling lifts that set a minimum of 12 hours between pours. After Saltstone waste form has been poured to the desired height within Vault 1 cells and solidified, a clean grout cap is poured and the poured-in-place concrete roof is then constructed. In Vault 4 cells or Vault 2 type tanks, a clean grout cap is poured to fill the gap between the Saltstone and existing roof. Through-wall penetrations in Vault 4 cells will also be cut, filled with non-shrink grout, and capped. Through roof penetrations of Vault 4 cells and Vault 2 type tanks will be filled with clean grout and capped.

Prior to solidification through a curing process, Saltstone is a liquid slurry that exerts hydrostatic pressure on the containing walls of a disposal cell. In a typical lift of one foot, this pressure is small. However, bleed water can seep into a gap between cured Saltstone and the vault wall, creating up to 25 ft of fluid pressure. In addition to bleed water, other sources of liquid include flush water to clean transfer lines, condensation from temperature cycling, and rainwater infiltration. Early operations resulted in hydrostatic pressures exceeding original design parameters for Vault 1 and 4 walls (Liner 2006), and macroscopic cracks appeared in the outside walls of the affected disposal cells. Thermal shock and drying shrinkage resulting from a non-ideal concrete mix and inadequate curing practices also contributed to fissures in Vault 1. In later operations, vertical sheet drains were installed to remove free water and relieve hydrostatic fluid pressure. Vault 2 cells, being based on commercial water tanks, are designed to handle hydrostatic fluid pressure, but nonetheless include sheet drains to remove any free liquid near the inside of a wall.

Table 5. Saltstone cementitious waste formulation (WSRC-STI-2006-00198, Table 4-8).

Ingredient	Quantity (wt%)
Salt solution (average 28% by weight salts)	47
Blast furnace slag (grade 100 or 120)	25
Fly ash (Class F)	25
Cement (ASTM C 150 Type II) or lime	3

Table 6. Clean grout formulation (WSRC-STI-2006-00198, Table 4-9).

Ingredient	Quantity (wt%)	Quantity (lbs/cu yd)
Type II cement (ASTM C 150)	6.250	168 to 179
Grade 120 Blast furnace slag (ASTM C 989)	28.125	759 to 805
Type F Fly ash (ASTM C 618)	28.125	759 to 805
Water (maximum)	37.5	1012 to 1073
Maximum water to cementitious material ratio = 0.60	-	-
Specific Gravity = 1.6 to 1.7 (100 to 106 lbs/cu ft) (includes both hydrated and free water)	-	-

2.4 CLOSURE

Following an operational period lasting a projected 30 years, the Saltstone Disposal Facility will be closed with installation of an integrated closure cover system (Figure 14). The cover system is designed to physically stabilize the site, minimize infiltration, and deter potential site intruders. Jones and Phifer (2008) provide a detailed description of the conceptual design, and estimate infiltration and selected cap properties over a 10,000 year period of performance.

The closure cap is composed of the following layers: vegetative cover, topsoil, upper backfill, erosion barrier, geotextile fabric, middle backfill, geotextile filter fabric, upper lateral drainage layer, geotextile fabric, high density polyethylene (HDPE) geomembrane, geosynthetic clay liner (GCL), foundation layer, lower backfill, and lower drainage layer (Figure 15).

Prior to final closure an evaluation will be conducted to determine whether vault roof penetrations cause unacceptable long-term vault performance. If so, these penetrations will be sealed and/or encased. Immediate before installation of the final cover system, an HDPE/GCL liner will be installed over the roof of each Vault 2 class disposal cell (Figure 13).

Infiltration through the cover system immediately after placement is estimated to be 0.00042 in/yr (Jones and Phifer, 2008, Table 1), compared to a general recharge rate of 10-15 in/yr.

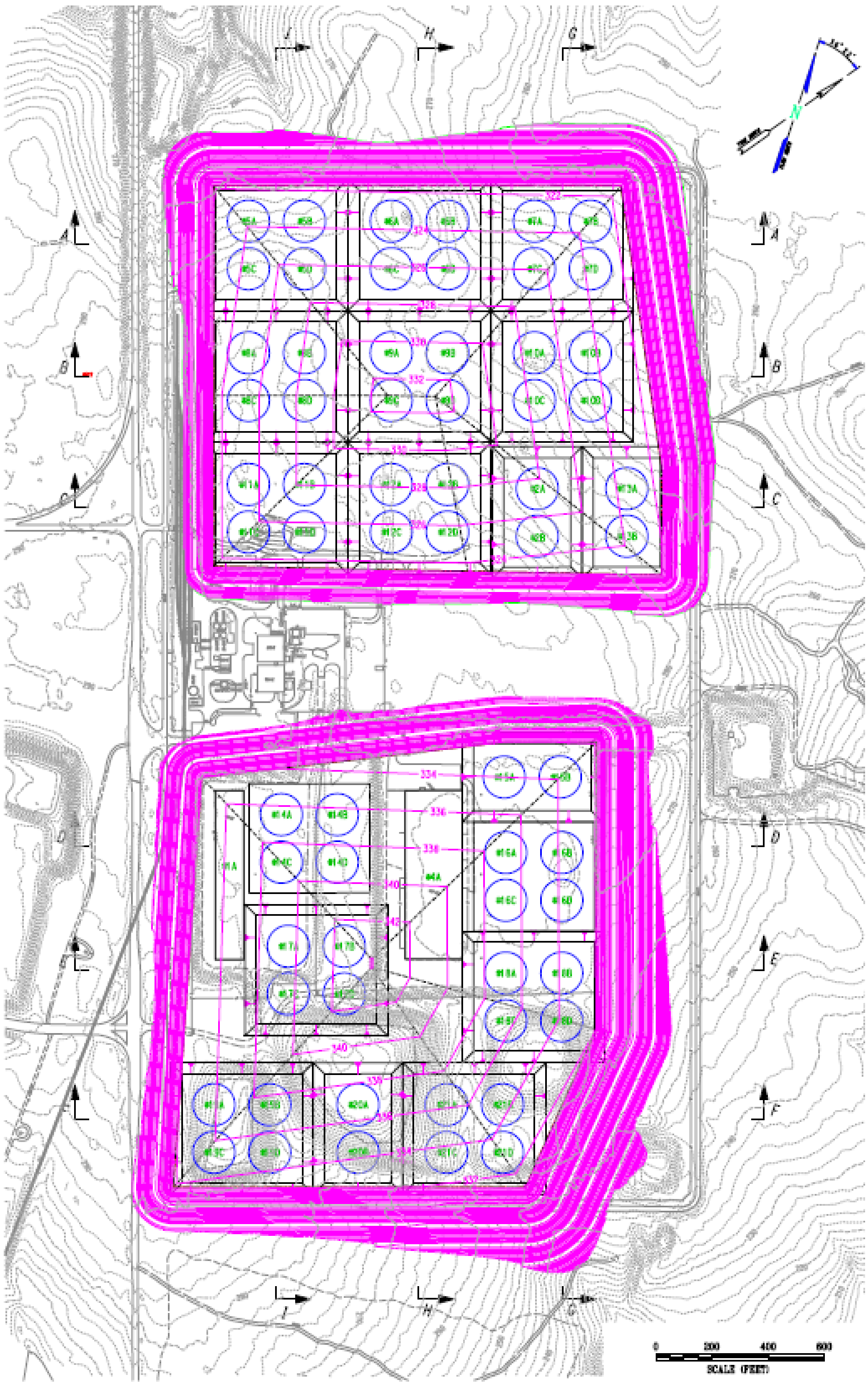


Figure 14. Extent of SDF final cover system.

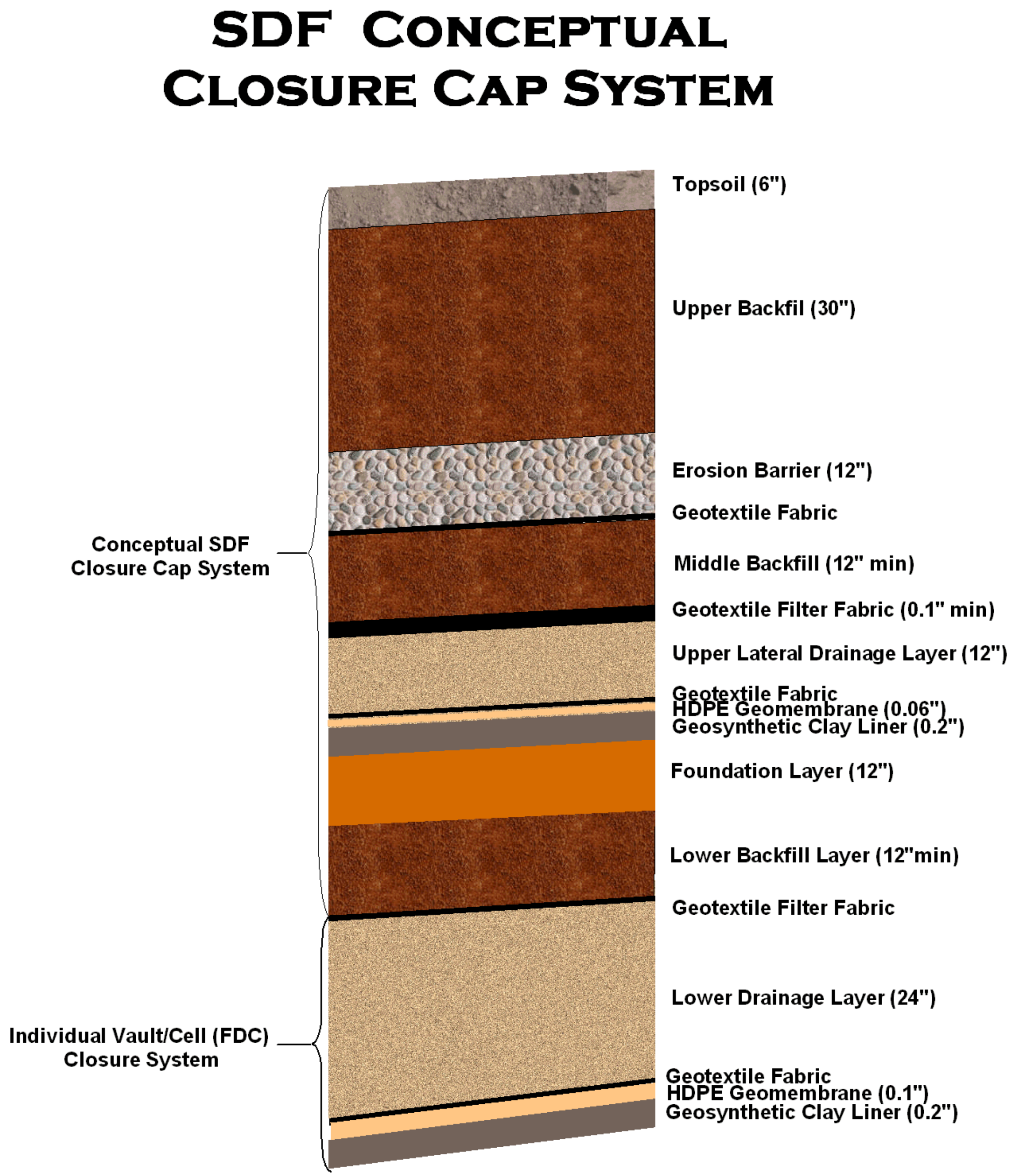


Figure 15. Layers composing the conceptual design of the SDF cover system.

2.5 CONTAMINANT SPECIES

Dean (2009a) has estimated the inventory of radiological and chemical contaminant species that will be disposed of in the SDF over its lifespan. These projections are broken out by vault type and radionuclide versus chemical classification in Table 7 through Table 12. The Vault 1 tables reflect the current inventory of the 3 filled cells out of 6 total. The tables for Vault 4 reflect the inventory of currently filled cells, and projected future additions. Table 10 was taken from a draft version of Dean (2009a) and reflects minor differences between the draft and final documents. The projected inventory of all future disposal units, including Vault 2, is defined by Table 11 and Table 12. However, note that values are provided on a per disposal cell basis, assuming a total of 64 future tanks (Figure 3).

Appendix B defines decay rates, progeny and branching fractions for radionuclides, and atomic and molecular weights for non-radiological species. All data are taken from the 2005 Wallet Cards (Tuli 2005).

Table 7. Current radionuclide inventory for Vault 1.

Radionuclide	Inventory at Closure (Ci)
Am-241	4.7E-04
Ba-137m	4.1E+00
C-14	1.3E+00
Cl-36	7.6E-04
Co-60	8.2E-05
Cs-137	4.3E+00
Eu-152	1.8E-03
Eu-154	2.3E-04
H-3	6.1E+00
I-129	1.1E-01
K-40	7.6E-04
Nb-93m	2.5E-01
Nb-94	2.5E-03
Ni-59	3.5E-02
Ni-63	7.8E-01
Np-237	4.5E-03
Pd-107	1.9E-03
Pt-193	3.7E-01
Pu-238	7.8E-03
Pu-239	1.2E-02
Pu-240	1.2E-02
Pu-241	9.8E-03

Radionuclide	Inventory at Closure (Ci)
Pu-242	9.0E-04
Ra-226	6.4E-07
Rh-106	1.5E-10
Ru-106	1.5E-10
Sb-125	1.6E-01
Sb-126	1.4E-01
Sb-126m	1.0E+00
Se-79	3.0E-01
Sn-126	1.0E+00
Sr-90	6.9E-03
Tc-99	1.1E+02
Te-125m	3.8E-02
Th-229	3.0E-01
Th-230	4.1E-01
U-233	2.8E-01
U-234	2.8E-01
U-235	3.2E-03
U-236	3.2E-03
U-238	7.4E-03
Y-90	6.9E-03
Zr-93	2.5E-01
Total	**1.3E+02**

Table 8. Current chemical inventory for Vault 1.

Chemical	Inventory at Closure (kg)
Silver	2.0E+01
Arsenic	4.4E+01
Barium	2.0E+01
Cadmium	3.9E+02
Chromium	1.8E+02
Mercury	1.5E+00
Nitrite	7.4E-01
Nitrate	3.4E+01
Lead	2.3E+01
Selenium	6.1E+01

Table 9. Projected radionuclide inventory for Vault 4.

Radionuclide	Inventory at Closure (Ci)
Ac-227	1.6E-05
Al-26	3.4E-01
Am-241	1.3E+02
Am-242m	6.7E-02
Am-243	1.8E+00
Ba-137m	2.8E+05
Bk-249	1.8E-28
C-14	2.7E+01
Ce-144	1.8E-09
Cf-249	6.5E-13
Cf-251	1.2E+00
Cf-252	1.8E-18
Cl-36	3.0E-03
Cm-242	6.7E-02
Cm-243	2.1E-01
Cm-244	1.3E+02
Cm-245	9.2E-01
Cm-247	3.9E-06
Cm-248	1.2E-13
Co-60	4.6E-01
Cs-134	5.2E-01
Cs-135	5.4E+00
Cs-137	3.0E+05
Eu-152	9.7E-02
Eu-154	1.2E+01
Eu-155	6.8E-01
H-3	2.6E+02
I-129	2.8E-01
K-40	3.0E-03
Na-22	1.5E-01
Nb-93m	8.4E+00
Nb-94	8.7E-02
Ni-59	4.0E-01
Ni-63	2.2E+01
Np-237	6.1E-01

Radionuclide	Inventory at Closure (Ci)
Pa-231	9.3E-05
Pd-107	5.0E-02
Pm-147	4.1E-01
Pr-144	1.8E-09
Pt-193	1.0E+01
Pu-238	9.1E+03
Pu-239	3.8E+02
Pu-240	1.2E+02
Pu-241	2.4E+03
Pu-242	8.1E-01
Pu-244	1.6E-02
Ra-226	4.1E+00
Ra-228	1.6E-06
Rh-106	9.1E-07
Ru-106	9.1E-07
Sb-125	5.7E+00
Sb-126	9.0E-01
Sb-126m	6.4E+00
Se-79	4.6E+01
Sm-151	4.2E+01
Sn-126	6.4E+00
Sr-90	2.4E+05
Tc-99	5.8E+02
Te-125m	1.4E+00
Th-229	2.5E+01
Th-230	7.5E+00
Th-232	3.2E-04
U-232	4.4E-02
U-233	2.4E+01
U-234	2.6E+01
U-235	4.7E-01
U-236	7.7E-01
U-238	5.9E-01
Y-90	2.4E+05
Zr-93	8.4E+00
Total	**1.1E+06**

Table 10. Projected chemical inventory for Vault 4.

Chemical	Inventory at Closure (kg)
Silver	2.7E+01
Arsenic	7.6E+02
Barium	2.6E+01
Cadmium	3.8E+01
Chromium	3.1E+03
Copper	7.1E+02
Fluorine	3.5E+03
Iron	6.9E+02
Mercury	9.7E+02
Manganese	4.1E+02
Nickel	8.9E+01
Nitrite	4.0E+05
Nitrate	3.0E+06
Lead	4.5E+02
Selenium	5.2E+03
Uranium	2.0E+02
Zinc	1.3E+03

Table 11. Projected radionuclide inventory for future disposal cells (e.g. Vault 2).

Radionuclide	Inventory per cell at Closure (Ci)
Ac-227	1.7E-07
Al-26	1.9E-01
Am-241	1.4E+00
Am-242m	5.9E-04
Am-243	3.7E-02
Ba-137m	2.2E+01
Bk-249	1.8E-28
C-14	2.0E+00
Ce-144	3.6E-10
Cf-249	6.7E-13
Cf-251	2.3E-14
Cf-252	1.8E-18
Cl-36	4.2E-04
Cm-242	6.3E-19
Cm-243	2.1E-04
Cm-244	9.5E-01
Cm-245	2.4E-04
Cm-247	7.1E-14
Cm-248	7.4E-14
Co-60	5.4E-02
Cs-134	1.5E-05
Cs-135	1.3E-04
Cs-137	2.3E+01
Eu-152	9.8E-02
Eu-154	1.8E+00
Eu-155	1.3E-01
H-3	3.0E+01
I-129	3.8E-01
K-40	4.2E-04
Na-22	6.9E-02
Nb-93m	3.7E-01
Nb-94	3.8E-03
Ni-59	8.4E-02
Ni-63	2.4E+00
Np-237	5.0E-02

Radionuclide	Inventory per cell at Closure (Ci)
Pa-231	9.8E-07
Pd-107	5.6E-03
Pm-147	7.7E-02
Pr-144	3.6E-10
Pt-193	1.1E+00
Pu-238	1.7E+02
Pu-239	1.5E+01
Pu-240	4.1E+00
Pu-241	4.2E+01
Pu-242	3.9E-03
Pu-244	1.6E-05
Ra-226	7.8E-07
Ra-228	8.7E-05
Rh-106	1.2E-06
Ru-106	1.2E-06
Sb-125	2.4E-01
Sb-126	1.2E+00
Sb-126m	8.2E+00
Se-79	1.4E+00
Sm-151	5.9E+01
Sn-126	8.2E+00
Sr-90	3.7E+01
Tc-99	5.4E+02
Te-125m	5.8E-02
Th-229	3.9E-02
Th-230	1.9E-01
Th-232	1.4E-03
U-232	3.1E-04
U-233	3.7E-02
U-234	1.3E-01
U-235	3.0E-03
U-236	1.6E-02
U-238	1.0E-01
Y-90	3.7E+01
Zr-93	3.7E-01
Total	**1.0E+03**

Table 12. Projected chemical inventory for future disposal cells (e.g. Vault 2).

Chemical	Inventory per cell at Closure (kg)
Silver	3.4E-01
Arsenic	1.6E+02
Barium	1.7E+00
Cadmium	8.0E+00
Chromium	4.0E+02
Copper	2.9E+02
Fluorine	2.0E+02
Iron	3.5E+01
Mercury	1.5E+02
Manganese	1.1E+02
Nickel	2.2E+01
Nitrite	7.7E+04
Nitrate	2.2E+05
Lead	9.7E+01
Selenium	5.5E+02
Uranium	9.6E+00
Zinc	4.0E+02

2.6 MATERIALS

A number of natural and engineered materials affect leaching from Saltstone disposal cells, including undisturbed and backfilled soils, concrete, high density polyethylene (HDPE) liners, geo-synthetic clay liners (GCL), and Saltstone grout. The physical and chemical properties of these materials, generally in an initial and/or undegraded state, are defined in the following two sections. The term "physical properties" refers to properties that result from the physical structure of the porous material, such as hydraulic conductivity, porosity, density, and effective diffusion coefficient. "Chemical properties" refers to attributes related to the chemistry of the material, such as sorption coefficient and reduction capacity.

2.6.1 Physical properties

WSRC-STI-2006-00198 (Phifer and others, 2006) recommends physical property assignments for all of the soils and cementitious materals encountered in the SDF, based on site-specific data where available, and scientific literature otherwise. These recommendations are adopted as the default specifications for all materials, except the HDPE/GCL liners. The properties of the latter are specified in WSRC-STI-2008-00244 (Jones and Phifer 2008), based in part on WSRC-TR-2005-00101 (Phifer 2005a). Most recently, Dixon and Phifer (2008b) measured physical properties of Saltstone grout and some vault concretes (WSRC-STI-2008-00421). Recommendations from this study supersede those of WSRC-STI-2006-00198.

Table 13 summarizes the initial and/or undegraded physical properties of porous materials that may be represented in numerical modeling described later. References are indicated to the right of each column or set of columns of data. For consistency, materials and soil characteristic (water retention and relative permeability) curves are identified with the same names used in numerical modeling.

The table is typically referred to as the "materials palette", in analogy with an artist's palette from which certain colors are drawn to produce a specific painting. Thus, all materials in the palette are available for numerical modeling, but not all are currently used. Most materials are in fact used, as discussed in Section 4.0. Some materials are included for completeness with the original WSRC-STI-2006-00198 reference, and/or to serve as the basis for other materials (e.g. "ClaySand", "Clay", "Gravel" soils). Others are included for generality/flexibility, but are not used in current scenarios (e.g. steel "diaphragm", which is ignored as a contaminant barrier).

Hypothetical porous materials are defined to serve as surrogates for non-porous features, or to create a desired effect. For example, the "sheet_drain" material is assigned the properties of "Gravel" to achieve the effect of a preferential fast flow path, and the "impervious" material was created to prevent any significant advection and/or diffusion from occurring where needed.

The porosity (n), bulk density (ρ_b) and solid (rock grain, particle) density (ρ_s) are related through the expression $\rho_b = (1\text{-}n)\ \rho_s$. For convenience all three values are specified. In the table, the solid density is computed from porosity and bulk density, rather than being drawn directly from the associated reference document. As a result, occasionally slight discrepancies in solid density between the materials palette and original reference occur.

The "vault1_wall" and "vault4_wall" saturated hydraulic conductivity values and soil characteristic curves reflect the presence of the existing macroscopic cracks mentioned in Section 2.3. Justification for these properties is deferred until Section 3.7, where cracked cementitious materials are discussed in the more general context of degradation over time. Similarly, discussion of "saltstone_cracked" properties is postponed until Section 3.7.

Soil characteristics curves for Saltstone are based on Idaho National Laboratory (INL) measurements of water retention in a Saltstone MCU sample reported in WSRC-STI-2007-00649 (Dixon and Phifer, 2008a), rather than data from SRNL-STI-2008-00421 (Dixon and Phifer 2008b). The former dataset encompasses a greater range of suctions, and is believed to produce a more reliable estimate of relative permeability inferred from water retention data through the van Genuchten (1980) relationship.

"z_clean_cap" refers to grout made from clean water and a dry mix similar to that of Saltstone (Phifer and others, 2006, Tables 4-8 and 4-9). The Clean Cap which covers the waste grout and provides shielding, serves as a leaching barrier, and fills the void space between Saltstone and the underside of the vault roof. The properties of the clean grout are assumed to be identical to Saltstone.

"HDPE" is not physically a porous material, but is represented as such in porous-media numerical simulations. The porosity, density, and soil curves of backfilled soil are used as surrogate values for "HDPE", and similarly for the composite "HDPE_GCL" liner. The other properties of "HDPE_GCL" are discussed in Section 3.4, in the broader context of material degradation.

The "diaphragm" material is not currently used in modeling.

The "concrete_mat" material is a generic low quality concrete (e.g. lower mudmat in Vault 2 construction), and the "E-Area CIG Concrete Mats" material in WSRC-STI-2006-00198 is assumed to be a reasonable surrogate in assigning properties.

The "shot_crete" material is part of the Vault 2 design, and refers to the shotcrete itself and embedded tensioning wire and reinforcing bars (rebar). The properties of this composite material have not been measured, but are not expected to create a significant barrier to contaminant release, especially in the long term. Thus no credit is taken for this material, and backfilled soil is used as a surrogate for assigning porous medium properties.

The "sheet_drain" and "column_crack" represent hypothetical fast flow paths due to the presence of sheet drains, and degraded support columns or macroscopic cracks (fissures), respectively. These materials are represented as gravel and sand filled seams in porous media modeling, to achieve the desired hydraulic effect of preferential flow paths.

The "impervious" material is used to preclude flow and transport in certain materials and directions. For example, flow is permitted perpendicular to the HDPE liner, but not within the plane of the material sheet.

Further discussion of material properties is provided in the context of material degradation and numerical model development.

Table 13. Materials palette defining the physical properties of undegraded materials.

Material	Horizontal conductivity	Vertical conductivity	ref.	Effective diffusion coefficient	ref.	Porosity	ref.	Bulk density	Particle density	ref.	Soil curves	ref.	Primary reference and other comments
numerical model id	Kh cm/s	Kv cm/s		De cm^2/s		n unitless		ρb g/cm^3	ρs g/cm^3		numerical model id		
UpperVz	6.2E-05	8.7E-06	a	5.3E-06	a	0.39	a	1.65	2.70	a	UpperVz	a	Upper Vadose Zone, WSRC-STI-2006-00198 Table 5-18
native_soil	3.3E-04	9.1E-05	a	5.3E-06	a	0.39	a	1.62	2.66	a	LowerVz	a	Lower Vadose Zone, WSRC-STI-2006-00198 Table 5-18
OscBefore	1.2E-04	1.2E-04	a	5.3E-06	a	0.46	a	1.44	2.65	a	OscBefore	a	E-Area Operational Soil Cover Prior to Dynamic Compaction, WSRC-STI-2006-00198 Table 5-18
OscAfter	1.4E-05	1.4E-05	a	4.0E-06	a	0.27	a	1.92	2.65	a	OscAfter	a	E-Area Operational Soil Cover after Dynamic Compaction, WSRC-STI-2006-00198 Table 5-18
backfill	7.6E-05	4.1E-05	a	5.3E-06	a	0.35	a	1.71	2.63	a	CcBackfill	a	Control Compacted Backfill, WSRC-STI-2006-00198 Table 5-18
IlvPermeableBackfill	1.4E-03	7.6E-04	a	8.0E-06	a	0.41	a	1.56	2.64	a	IlvPermeableBackfill	a	IL Vault Permeable Backfill, WSRC-STI-2006-00198 Table 5-18
SingleVadoseZone	1.9E-04	3.0E-05	a	5.3E-06	a	0.39	a	1.63	2.67	a	SingleVadoseZone	a	Single Vadose Zone, WSRC-STI-2006-00198 Table 5-18
Sand	5.0E-04	2.8E-04	a	8.0E-06	a	0.38	a	1.65	2.66	a	Sand	a	<25% Mud, WSRC-STI-2006-00198 Table 5-18
ClaySand	8.3E-05	2.1E-05	a	5.3E-06	a	0.37	a	1.68	2.67	a	ClaySand	a	25-50% Mud, WSRC-STI-2006-00198 Table 5-18
Clay	2.0E-06	9.5E-07	a	4.0E-06	a	0.43	a	1.52	2.67	a	Clay	a	>50% Mud, WSRC-STI-2006-00198 Table 5-18
Gravel	1.5E-01	1.5E-01	a	9.4E-06	a	0.30	a	1.82	2.60	a	Gravel	a	WSRC-STI-2006-00198 Table 5-18

Material	Horizontal conductivity	Vertical conductivity	ref.	Effective diffusion coefficient	ref.	Porosity	ref.	Bulk density	Particle density	ref.	Soil curves	ref.	Primary reference and other comments
numerical model id	Kh cm/s	Kv cm/s		De cm^2/s		n unitless		ρb g/cm^3	ρs g/cm^3		numerical model id		
vault14_work_slab	5.0E-09	5.0E-09	b	1.0E-07	b	0.136	b	2.22	2.57	b	Concrete_Qmedium	b	WSRC-STI-2006-00198 Table 6-47
vault1_wall_uncracked	3.1E-10	3.1E-10	c	5.0E-08	b	0.120	c	2.24	2.55	c	Concrete_Qhigh	b	SRNL-STI-2008-00421 Table 39
vault1_wall	1.67E-01	1.7E-01	>	5.0E-08	b	0.120	c	2.24	2.55	c	FracturedConcrete	>	SRNL-STI-2008-00421 Table 39 + Or and Tuller (2000) fracture
vault1_floor	3.1E-10	3.1E-10	c	5.0E-08	b	0.120	c	2.24	2.55	c	Concrete_Qhigh	b	SRNL-STI-2008-00421 Table 39
vault1_roof	5.0E-09	5.0E-09	b	1.0E-07	b	0.145	b	2.20	2.57	b	Concrete_Qmedium	b	WSRC-STI-2006-00198 Table 6-47
vault4_wall_uncracked	3.1E-10	3.1E-10	c	5.0E-08	b	0.120	c	2.24	2.55	c	Concrete_Qhigh	b	SRNL-STI-2008-00421 Table 39
vault4_wall	1.67E-01	1.7E-01	>	5.0E-08	b	0.120	c	2.24	2.55	c	FracturedConcrete	>	SRNL-STI-2008-00421 Table 39 + Or and Tuller (2000) fracture
vault4_floor	3.1E-10	3.1E-10	c	5.0E-08	b	0.120	c	2.24	2.55	c	Concrete_Qhigh	b	SRNL-STI-2008-00421 Table 39
vault4_roof	5.0E-09	5.0E-09	b	1.0E-07	b	0.136	b	2.21	2.56	b	Concrete_Qmedium	b	WSRC-STI-2006-00198 Table 6-47
vault2_wall	9.3E-11	9.3E-11	c	5.0E-08	b	0.110	c	2.22	2.49	c	Concrete_Qhigh	b	SRNL-STI-2008-00421 Table 39; Vault 2 Mix 2
vault2_floor	9.3E-11	9.3E-11	c	5.0E-08	b	0.110	c	2.22	2.49	c	Concrete_Qhigh	b	SRNL-STI-2008-00421 Table 39; Vault 2 Mix 2
vault2_roof	9.3E-11	9.3E-11	c	5.0E-08	b	0.110	c	2.22	2.49	c	Concrete_Qhigh	b	SRNL-STI-2008-00421 Table 39; Vault 2 Mix 2
saltstone	2.0E-09	2.0E-09	d>	1.0E-07	>	0.580	c	1.01	2.40	c	Saltstone	e>	SRNL-STI-2008-00421 Table 22; K = median SWPF 90 day; De based on cementitious materials with similar K; Curves based on INL MCU measurements
saltstone_cracked	1.67E-03	1.7E-03	>	1.0E-07	>	0.580	c	1.01	2.40	c	FracturedSaltstone	>	SRNL-STI-2008-00421 Table 39 + Or and Tuller (2000) fracture
z_clean_cap	2.0E-09	2.0E-09	>	1.0E-07	>	0.580	>	1.01	2.40	>	Saltstone	>	same as Saltstone

Material	Horizontal conductivity	Vertical conductivity	ref.	Effective diffusion coefficient	ref.	Porosity	ref.	Bulk density	Particle density	ref.	Soil curves	ref.	Primary reference and other comments
numerical model id	Kh cm/s	Kv cm/s		De cm^2/s		n unitless		ρb g/cm^3	ρs g/cm^3		numerical model id		
HDPE	2.0E-13	2.0E-13	f	4.0E-11	g	0.30	>	1.50	2.14	>	CcBackfill	>	other properties set to "backfill"
HDPE_GCL	2.8E-12	2.8E-12	>	1.2E-10	>	0.30	>	1.50	2.14	>	CcBackfill	>	K and De from blending 100 mil HDPE with 200 mil GCL; other properties set to "backfill"
diaphragm	5.0E-15	5.0E-15	>	1.0E-13	>	0.30	>	1.50	2.14	>	Concrete_Qmedium	>	currently not used
concrete_mat	1.0E-08	1.0E-08	b	8.0E-07	b	0.211	b	2.06	2.61	b	Concrete_Qlow	b	E-Area CIG Concrete Mats WSRC-STI-2006-00198 Table 6-47
shot_crete	7.6E-05	7.6E-05	>	5.3E-06	>	0.35	>	1.71	2.63	>	CcBackfill	>	no credit taken as a barrier; assumed to behave as "backfill" with isotropic K
sheet_drain	1.5E-01	1.5E-01	>	9.4E-06	>	0.30	>	1.82	2.60	>	Gravel	>	assumed to behave as a "Gravel" filled seam
sand_drain	5.0E-02	5.0E-02	h	8.0E-06	>	0.417	h	1.65	2.66	>	Sand	>	WSRC-STI-2008-00244 Table 49; other properties set to "Sand"
impervious	5.0E-15	5.0E-15	>	1.0E-13	>	0.30	>	1.50	2.14	>	Concrete_Qmedium	>	hypothetical impermeable material
column_crack	5.0E-04	2.8E-04	>	8.0E-06	>	0.38	>	1.65	2.66	>	Sand	>	assumed to behave as a "Sand" filled seam

Reference key:
a = WSRC-STI-2006-00198 Table 5-18
b = WSRC-STI-2006-00198 Table 6-47
c = SRNL-STI-2008-00421 Table 39
d = SRNL-STI-2008-00421 Table 22
e = WSRC-STI-2007-00649 Table 9 INL
f = WSRC-STI-2008-00244 Section 6.6
g = Rowe (1998, Table 17, Chloride Sg = 1)
h = WSRC-STI-2008-00244 Table 49
> = see Comment column

2.6.2 Chemical properties

Contaminant concentrations in Saltstone are not generally expected to be limited by solubility. Transport is assumed to be primarily controlled by sorption that can be adequately represented by a linear isotherm, i.e., a constant soil-solute distribution coefficient (K_d). The release of some species, most notably Tc-99, is strongly controlled by Eh conditions. Saltstone and most vault concretes contain blast furnace slag to produce reducing conditions that greatly inhibit Tc-99 release. Some elements are influenced by pH conditions.

Table 14 lists the K_d values used in Saltstone modeling for a variety of materials and Eh/pH conditions. The "Sandy" material refers to SRS sediments with <25 wt% silt + clay, and "Clayey" sediments contains 25-45 wt% fines. "Oxidizing" and "Reducing" refer to the Eh condition of cementitious materials that may be "Young", "Middle" or "Old" aged. The latter category corresponds to Bradbury and Sarott's (1995) "Region I, II and III" classification of changing cement mineralogy and pH conditions. The "waste" material is not used in the Saltstone PA.

With a couple of exceptions, sediment values are taken by default from WSRC-TR-2006-00004 (Kaplan 2006), or where possible from the more recent SRNL-RPA-2007-00006 (Kaplan 2007a). Zinc (Zn) is drawn from SRS-REG-2007-00036 (Kaplan 2007b), which corrects two inadvertent omissions from SRNL-RPA-2007-00006. Technetium (Tc) values are drawn from recommendations contained in SRNL-TR-2009-00019 (Kaplan 2009) and based on data and statistical analysis reported in WSRC-STI-2008-00286, Rev. 1 (Kaplan et al. 2008b). Oxidized cementitious material K_d values are taken from WSRC-STI-2007-00640 (Kaplan and Coates 2007), except for Pu values which come from SRNL-TR-2009-00019 (Kaplan 2009). For reducing cementitious materials, K_d values are drawn when possible from SRNS-STI-2008-00045 (Kaplan et al. 2008a), or else from WSRC-STI-2007-00640. Where K_d recommendations are unavailable, a value of zero is assumed. Common examples are rapidly decaying radionuclides with negligible environmental dose impact. The affected elements, for at least one material type, are Au, Be, Bi, Ca, Es, Ga, Ge, Hf, Ho, In, Ir, La, Lu, P, Pm, Pr, Pt, Rh, Ru, Sc, Si, Ta, Ti, Tl, V and Y.

Kaplan et al. (2008a) measured reduction capacities for Vault 2 Mix 1 concrete and DDA Simulant Saltstone. As shown in Table 15, these values are used as surrogates for slag concrete and Saltstone in general. Note that the Vault 1 and 4 roof concretes do not contain slag.

Table 14. Sorption coefficients for soils and cementitious materials.

Element	Material	Kd	Units	Reference
Ac	clayey	8500	mL/g	WSRC-TR-2006-00004
Ac	oxidizing middle	6000	mL/g	WSRC-STI-2007-00640
Ac	oxidizing old	600	mL/g	WSRC-STI-2007-00640
Ac	oxidizing young	6000	mL/g	WSRC-STI-2007-00640
Ac	reducing middle	5000	mL/g	WSRC-STI-2007-00640

Element	Material	Kd	Units	Reference
Ac	reducing old	1000	mL/g	WSRC-STI-2007-00640
Ac	reducing young	5000	mL/g	WSRC-STI-2007-00640
Ac	sandy	1100	mL/g	WSRC-TR-2006-00004
Ac	waste	0	mL/g	none
Ag	clayey	150	mL/g	SRNL-RPA-2007-00006
Ag	oxidizing middle	1	mL/g	WSRC-STI-2007-00640
Ag	oxidizing old	0.1	mL/g	WSRC-STI-2007-00640
Ag	oxidizing young	1	mL/g	WSRC-STI-2007-00640
Ag	reducing middle	1	mL/g	WSRC-STI-2007-00640
Ag	reducing old	0.1	mL/g	WSRC-STI-2007-00640
Ag	reducing young	1	mL/g	WSRC-STI-2007-00640
Ag	sandy	60	mL/g	SRNL-RPA-2007-00006
Ag	waste	0	mL/g	none
Al	clayey	1300	mL/g	SRNL-RPA-2007-00006
Al	oxidizing middle	6000	mL/g	WSRC-STI-2007-00640
Al	oxidizing old	600	mL/g	WSRC-STI-2007-00640
Al	oxidizing young	6000	mL/g	WSRC-STI-2007-00640
Al	reducing middle	5000	mL/g	WSRC-STI-2007-00640
Al	reducing old	1000	mL/g	WSRC-STI-2007-00640
Al	reducing young	5000	mL/g	WSRC-STI-2007-00640
Al	sandy	1300	mL/g	SRNL-RPA-2007-00006
Al	waste	0	mL/g	none
Am	clayey	8500	mL/g	WSRC-TR-2006-00004
Am	oxidizing middle	6000	mL/g	WSRC-STI-2007-00640
Am	oxidizing old	600	mL/g	WSRC-STI-2007-00640
Am	oxidizing young	6000	mL/g	WSRC-STI-2007-00640
Am	reducing middle	5000	mL/g	SRNS-STI-2008-00045
Am	reducing old	1000	mL/g	SRNS-STI-2008-00045
Am	reducing young	5000	mL/g	SRNS-STI-2008-00045
Am	sandy	1100	mL/g	WSRC-TR-2006-00004
Am	waste	0	mL/g	none
Ar	clayey	0	mL/g	WSRC-TR-2006-00004
Ar	oxidizing middle	0	mL/g	WSRC-STI-2007-00640
Ar	oxidizing old	0	mL/g	WSRC-STI-2007-00640
Ar	oxidizing young	0	mL/g	WSRC-STI-2007-00640
Ar	reducing middle	0	mL/g	WSRC-STI-2007-00640
Ar	reducing old	0	mL/g	WSRC-STI-2007-00640
Ar	reducing young	0	mL/g	WSRC-STI-2007-00640
Ar	sandy	0	mL/g	WSRC-TR-2006-00004
Ar	waste	0	mL/g	none
As	clayey	200	mL/g	SRNL-RPA-2007-00006
As	oxidizing middle	1000	mL/g	WSRC-STI-2007-00640
As	oxidizing old	100	mL/g	WSRC-STI-2007-00640
As	oxidizing young	1000	mL/g	WSRC-STI-2007-00640
As	reducing middle	1000	mL/g	WSRC-STI-2007-00640
As	reducing old	100	mL/g	WSRC-STI-2007-00640
As	reducing young	1000	mL/g	WSRC-STI-2007-00640
As	sandy	100	mL/g	SRNL-RPA-2007-00006
As	waste	0	mL/g	none
At	clayey	0.6	mL/g	WSRC-TR-2006-00004
At	oxidizing middle	15	mL/g	WSRC-STI-2007-00640
At	oxidizing old	4	mL/g	WSRC-STI-2007-00640
At	oxidizing young	8	mL/g	WSRC-STI-2007-00640

Element	Material	Kd	Units	Reference
At	reducing middle	10	mL/g	WSRC-STI-2007-00640
At	reducing old	4	mL/g	WSRC-STI-2007-00640
At	reducing young	2	mL/g	WSRC-STI-2007-00640
At	sandy	0	mL/g	WSRC-TR-2006-00004
At	waste	0	mL/g	none
Au	clayey	0	mL/g	assumed value
Au	oxidizing middle	0	mL/g	assumed value
Au	oxidizing old	0	mL/g	assumed value
Au	oxidizing young	0	mL/g	assumed value
Au	reducing middle	0	mL/g	assumed value
Au	reducing old	0	mL/g	assumed value
Au	reducing young	0	mL/g	assumed value
Au	sandy	0	mL/g	assumed value
Au	waste	0	mL/g	assumed value
Ba	clayey	17	mL/g	WSRC-TR-2006-00004
Ba	oxidizing middle	100	mL/g	WSRC-STI-2007-00640
Ba	oxidizing old	70	mL/g	WSRC-STI-2007-00640
Ba	oxidizing young	100	mL/g	WSRC-STI-2007-00640
Ba	reducing middle	3	mL/g	WSRC-STI-2007-00640
Ba	reducing old	20	mL/g	WSRC-STI-2007-00640
Ba	reducing young	0.5	mL/g	WSRC-STI-2007-00640
Ba	sandy	5	mL/g	WSRC-TR-2006-00004
Ba	waste	0	mL/g	none
Be	clayey	0	mL/g	assumed value
Be	oxidizing middle	0	mL/g	assumed value
Be	oxidizing old	0	mL/g	assumed value
Be	oxidizing young	0	mL/g	assumed value
Be	reducing middle	0	mL/g	assumed value
Be	reducing old	0	mL/g	assumed value
Be	reducing young	0	mL/g	assumed value
Be	sandy	0	mL/g	assumed value
Be	waste	0	mL/g	none
Bi	clayey	0	mL/g	assumed value
Bi	oxidizing middle	0	mL/g	assumed value
Bi	oxidizing old	0	mL/g	assumed value
Bi	oxidizing young	0	mL/g	assumed value
Bi	reducing middle	0	mL/g	assumed value
Bi	reducing old	0	mL/g	assumed value
Bi	reducing young	0	mL/g	assumed value
Bi	sandy	0	mL/g	assumed value
Bi	waste	0	mL/g	none
Bk	clayey	8500	mL/g	WSRC-TR-2006-00004
Bk	oxidizing middle	6000	mL/g	WSRC-STI-2007-00640
Bk	oxidizing old	600	mL/g	WSRC-STI-2007-00640
Bk	oxidizing young	6000	mL/g	WSRC-STI-2007-00640
Bk	reducing middle	5000	mL/g	WSRC-STI-2007-00640
Bk	reducing old	1000	mL/g	WSRC-STI-2007-00640
Bk	reducing young	5000	mL/g	WSRC-STI-2007-00640
Bk	sandy	1100	mL/g	WSRC-TR-2006-00004
Bk	waste	0	mL/g	none
C	clayey	0	mL/g	WSRC-TR-2006-00004
C	oxidizing middle	10	mL/g	WSRC-STI-2007-00640
C	oxidizing old	0	mL/g	WSRC-STI-2007-00640

Element	Material	Kd	Units	Reference
C	oxidizing young	20	mL/g	WSRC-STI-2007-00640
C	reducing middle	10	mL/g	WSRC-STI-2007-00640
C	reducing old	0	mL/g	WSRC-STI-2007-00640
C	reducing young	20	mL/g	WSRC-STI-2007-00640
C	sandy	0	mL/g	WSRC-TR-2006-00004
C	waste	0	mL/g	none
Ca	clayey	0	mL/g	assumed value
Ca	oxidizing middle	0	mL/g	assumed value
Ca	oxidizing old	0	mL/g	assumed value
Ca	oxidizing young	0	mL/g	assumed value
Ca	reducing middle	0	mL/g	assumed value
Ca	reducing old	0	mL/g	assumed value
Ca	reducing young	0	mL/g	assumed value
Ca	sandy	0	mL/g	assumed value
Ca	waste	0	mL/g	none
Cd	clayey	10	mL/g	SRNL-RPA-2007-00006
Cd	oxidizing middle	4000	mL/g	WSRC-STI-2007-00640
Cd	oxidizing old	1000	mL/g	WSRC-STI-2007-00640
Cd	oxidizing young	4000	mL/g	WSRC-STI-2007-00640
Cd	reducing middle	5000	mL/g	SRNS-STI-2008-00045
Cd	reducing old	1000	mL/g	SRNS-STI-2008-00045
Cd	reducing young	5000	mL/g	SRNS-STI-2008-00045
Cd	sandy	4	mL/g	SRNL-RPA-2007-00006
Cd	waste	0	mL/g	none
Ce	clayey	1500	mL/g	SRNL-RPA-2007-00006
Ce	oxidizing middle	6000	mL/g	WSRC-STI-2007-00640
Ce	oxidizing old	600	mL/g	WSRC-STI-2007-00640
Ce	oxidizing young	6000	mL/g	WSRC-STI-2007-00640
Ce	reducing middle	5000	mL/g	SRNS-STI-2008-00045
Ce	reducing old	1000	mL/g	SRNS-STI-2008-00045
Ce	reducing young	5000	mL/g	SRNS-STI-2008-00045
Ce	sandy	1000	mL/g	SRNL-RPA-2007-00006
Ce	waste	0	mL/g	none
Cf	clayey	8500	mL/g	WSRC-TR-2006-00004
Cf	oxidizing middle	6000	mL/g	WSRC-STI-2007-00640
Cf	oxidizing old	600	mL/g	WSRC-STI-2007-00640
Cf	oxidizing young	6000	mL/g	WSRC-STI-2007-00640
Cf	reducing middle	5000	mL/g	WSRC-STI-2007-00640
Cf	reducing old	1000	mL/g	WSRC-STI-2007-00640
Cf	reducing young	5000	mL/g	WSRC-STI-2007-00640
Cf	sandy	1100	mL/g	WSRC-TR-2006-00004
Cf	waste	0	mL/g	none
Cl	clayey	0	mL/g	WSRC-TR-2006-00004
Cl	oxidizing middle	20	mL/g	WSRC-STI-2007-00640
Cl	oxidizing old	2	mL/g	WSRC-STI-2007-00640
Cl	oxidizing young	20	mL/g	WSRC-STI-2007-00640
Cl	reducing middle	20	mL/g	WSRC-STI-2007-00640
Cl	reducing old	2	mL/g	WSRC-STI-2007-00640
Cl	reducing young	20	mL/g	WSRC-STI-2007-00640
Cl	sandy	0	mL/g	WSRC-TR-2006-00004
Cl	waste	0	mL/g	none
Cm	clayey	8500	mL/g	WSRC-TR-2006-00004
Cm	oxidizing middle	6000	mL/g	WSRC-STI-2007-00640

Element	Material	Kd	Units	Reference
Cm	oxidizing old	600	mL/g	WSRC-STI-2007-00640
Cm	oxidizing young	6000	mL/g	WSRC-STI-2007-00640
Cm	reducing middle	5000	mL/g	WSRC-STI-2007-00640
Cm	reducing old	1000	mL/g	WSRC-STI-2007-00640
Cm	reducing young	5000	mL/g	WSRC-STI-2007-00640
Cm	sandy	1100	mL/g	WSRC-TR-2006-00004
Cm	waste	0	mL/g	none
Co	clayey	30	mL/g	WSRC-TR-2006-00004
Co	oxidizing middle	4000	mL/g	WSRC-STI-2007-00640
Co	oxidizing old	1000	mL/g	WSRC-STI-2007-00640
Co	oxidizing young	4000	mL/g	WSRC-STI-2007-00640
Co	reducing middle	5000	mL/g	SRNS-STI-2008-00045
Co	reducing old	1000	mL/g	SRNS-STI-2008-00045
Co	reducing young	5000	mL/g	SRNS-STI-2008-00045
Co	sandy	7	mL/g	WSRC-TR-2006-00004
Co	waste	0	mL/g	none
Cr	clayey	10	mL/g	SRNL-RPA-2007-00006
Cr	oxidizing middle	20	mL/g	WSRC-STI-2007-00640
Cr	oxidizing old	2	mL/g	WSRC-STI-2007-00640
Cr	oxidizing young	20	mL/g	WSRC-STI-2007-00640
Cr	reducing middle	5000	mL/g	WSRC-STI-2007-00640
Cr	reducing old	1000	mL/g	WSRC-STI-2007-00640
Cr	reducing young	5000	mL/g	WSRC-STI-2007-00640
Cr	sandy	4	mL/g	SRNL-RPA-2007-00006
Cr	waste	0	mL/g	none
Cs	clayey	250	mL/g	WSRC-TR-2006-00004
Cs	oxidizing middle	20	mL/g	WSRC-STI-2007-00640
Cs	oxidizing old	10	mL/g	WSRC-STI-2007-00640
Cs	oxidizing young	2	mL/g	WSRC-STI-2007-00640
Cs	reducing middle	2	mL/g	SRNS-STI-2008-00045
Cs	reducing old	10	mL/g	SRNS-STI-2008-00045
Cs	reducing young	0	mL/g	SRNS-STI-2008-00045
Cs	sandy	50	mL/g	WSRC-TR-2006-00004
Cs	waste	0	mL/g	none
Cu	clayey	70	mL/g	SRNL-RPA-2007-00006
Cu	oxidizing middle	1	mL/g	WSRC-STI-2007-00640
Cu	oxidizing old	0.1	mL/g	WSRC-STI-2007-00640
Cu	oxidizing young	1	mL/g	WSRC-STI-2007-00640
Cu	reducing middle	1	mL/g	WSRC-STI-2007-00640
Cu	reducing old	0.1	mL/g	WSRC-STI-2007-00640
Cu	reducing young	1	mL/g	WSRC-STI-2007-00640
Cu	sandy	50	mL/g	SRNL-RPA-2007-00006
Cu	waste	0	mL/g	none
Es	clayey	0	mL/g	assumed value
Es	oxidizing middle	0	mL/g	assumed value
Es	oxidizing old	0	mL/g	assumed value
Es	oxidizing young	0	mL/g	assumed value
Es	reducing middle	0	mL/g	assumed value
Es	reducing old	0	mL/g	assumed value
Es	reducing young	0	mL/g	assumed value
Es	sandy	0	mL/g	assumed value
Es	waste	0	mL/g	none
Eu	clayey	8500	mL/g	WSRC-TR-2006-00004

Element	Material	Kd	Units	Reference
Eu	oxidizing middle	6000	mL/g	WSRC-STI-2007-00640
Eu	oxidizing old	600	mL/g	WSRC-STI-2007-00640
Eu	oxidizing young	6000	mL/g	WSRC-STI-2007-00640
Eu	reducing middle	5000	mL/g	WSRC-STI-2007-00640
Eu	reducing old	1000	mL/g	WSRC-STI-2007-00640
Eu	reducing young	5000	mL/g	WSRC-STI-2007-00640
Eu	sandy	1100	mL/g	WSRC-TR-2006-00004
Eu	waste	0	mL/g	none
F	clayey	0	mL/g	SRNL-RPA-2007-00006
F	oxidizing middle	20	mL/g	WSRC-STI-2007-00640
F	oxidizing old	2	mL/g	WSRC-STI-2007-00640
F	oxidizing young	20	mL/g	WSRC-STI-2007-00640
F	reducing middle	20	mL/g	WSRC-STI-2007-00640
F	reducing old	2	mL/g	WSRC-STI-2007-00640
F	reducing young	20	mL/g	WSRC-STI-2007-00640
F	sandy	0	mL/g	SRNL-RPA-2007-00006
F	waste	0	mL/g	none
Fe	clayey	400	mL/g	SRNL-RPA-2007-00006
Fe	oxidizing middle	6000	mL/g	WSRC-STI-2007-00640
Fe	oxidizing old	600	mL/g	WSRC-STI-2007-00640
Fe	oxidizing young	6000	mL/g	WSRC-STI-2007-00640
Fe	reducing middle	5000	mL/g	WSRC-STI-2007-00640
Fe	reducing old	1000	mL/g	WSRC-STI-2007-00640
Fe	reducing young	5000	mL/g	WSRC-STI-2007-00640
Fe	sandy	200	mL/g	SRNL-RPA-2007-00006
Fe	waste	0	mL/g	none
Fr	clayey	250	mL/g	WSRC-TR-2006-00004
Fr	oxidizing middle	20	mL/g	WSRC-STI-2007-00640
Fr	oxidizing old	10	mL/g	WSRC-STI-2007-00640
Fr	oxidizing young	2	mL/g	WSRC-STI-2007-00640
Fr	reducing middle	2	mL/g	WSRC-STI-2007-00640
Fr	reducing old	10	mL/g	WSRC-STI-2007-00640
Fr	reducing young	0	mL/g	WSRC-STI-2007-00640
Fr	sandy	50	mL/g	WSRC-TR-2006-00004
Fr	waste	0	mL/g	none
Ga	clayey	0	mL/g	assumed value
Ga	oxidizing middle	0	mL/g	assumed value
Ga	oxidizing old	0	mL/g	assumed value
Ga	oxidizing young	0	mL/g	assumed value
Ga	reducing middle	0	mL/g	assumed value
Ga	reducing old	0	mL/g	assumed value
Ga	reducing young	0	mL/g	assumed value
Ga	sandy	0	mL/g	assumed value
Ga	waste	0	mL/g	assumed value
Gd	clayey	8500	mL/g	WSRC-TR-2006-00004
Gd	oxidizing middle	6000	mL/g	WSRC-STI-2007-00640
Gd	oxidizing old	600	mL/g	WSRC-STI-2007-00640
Gd	oxidizing young	6000	mL/g	WSRC-STI-2007-00640
Gd	reducing middle	5000	mL/g	WSRC-STI-2007-00640
Gd	reducing old	1000	mL/g	WSRC-STI-2007-00640
Gd	reducing young	5000	mL/g	WSRC-STI-2007-00640
Gd	sandy	1100	mL/g	WSRC-TR-2006-00004
Gd	waste	0	mL/g	none

Element	Material	Kd	Units	Reference
Ge	clayey	0	mL/g	assumed value
Ge	oxidizing middle	0	mL/g	assumed value
Ge	oxidizing old	0	mL/g	assumed value
Ge	oxidizing young	0	mL/g	assumed value
Ge	reducing middle	0	mL/g	assumed value
Ge	reducing old	0	mL/g	assumed value
Ge	reducing young	0	mL/g	assumed value
Ge	sandy	0	mL/g	assumed value
Ge	waste	0	mL/g	none
H	clayey	0	mL/g	WSRC-TR-2006-00004
H	oxidizing middle	0	mL/g	WSRC-STI-2007-00640
H	oxidizing old	0	mL/g	WSRC-STI-2007-00640
H	oxidizing young	0	mL/g	WSRC-STI-2007-00640
H	reducing middle	0	mL/g	WSRC-STI-2007-00640
H	reducing old	0	mL/g	WSRC-STI-2007-00640
H	reducing young	0	mL/g	WSRC-STI-2007-00640
H	sandy	0	mL/g	WSRC-TR-2006-00004
H	waste	0	mL/g	none
Hf	clayey	0	mL/g	assumed value
Hf	oxidizing middle	0	mL/g	assumed value
Hf	oxidizing old	0	mL/g	assumed value
Hf	oxidizing young	0	mL/g	assumed value
Hf	reducing middle	0	mL/g	assumed value
Hf	reducing old	0	mL/g	assumed value
Hf	reducing young	0	mL/g	assumed value
Hf	sandy	0	mL/g	assumed value
Hf	waste	0	mL/g	none
Hg	clayey	1000	mL/g	SRNL-RPA-2007-00006
Hg	oxidizing middle	300	mL/g	WSRC-STI-2007-00640
Hg	oxidizing old	300	mL/g	WSRC-STI-2007-00640
Hg	oxidizing young	300	mL/g	WSRC-STI-2007-00640
Hg	reducing middle	1000	mL/g	SRNS-STI-2008-00045
Hg	reducing old	300	mL/g	SRNS-STI-2008-00045
Hg	reducing young	1000	mL/g	SRNS-STI-2008-00045
Hg	sandy	800	mL/g	SRNL-RPA-2007-00006
Hg	waste	0	mL/g	none
Ho	clayey	0	mL/g	assumed value
Ho	oxidizing middle	0	mL/g	assumed value
Ho	oxidizing old	0	mL/g	assumed value
Ho	oxidizing young	0	mL/g	assumed value
Ho	reducing middle	0	mL/g	assumed value
Ho	reducing old	0	mL/g	assumed value
Ho	reducing young	0	mL/g	assumed value
Ho	sandy	0	mL/g	assumed value
Ho	waste	0	mL/g	none
I	clayey	0.6	mL/g	WSRC-TR-2006-00004
I	oxidizing middle	15	mL/g	WSRC-STI-2007-00640
I	oxidizing old	4	mL/g	WSRC-STI-2007-00640
I	oxidizing young	8	mL/g	WSRC-STI-2007-00640
I	reducing middle	9	mL/g	SRNS-STI-2008-00045
I	reducing old	0	mL/g	SRNS-STI-2008-00045
I	reducing young	5	mL/g	SRNS-STI-2008-00045
I	sandy	0	mL/g	WSRC-TR-2006-00004

Element	Material	Kd	Units	Reference
I	waste	0	mL/g	none
In	clayey	0	mL/g	assumed value
In	oxidizing middle	0	mL/g	assumed value
In	oxidizing old	0	mL/g	assumed value
In	oxidizing young	0	mL/g	assumed value
In	reducing middle	0	mL/g	assumed value
In	reducing old	0	mL/g	assumed value
In	reducing young	0	mL/g	assumed value
In	sandy	0	mL/g	assumed value
In	waste	0	mL/g	none
Ir	clayey	0	mL/g	assumed value
Ir	oxidizing middle	0	mL/g	assumed value
Ir	oxidizing old	0	mL/g	assumed value
Ir	oxidizing young	0	mL/g	assumed value
Ir	reducing middle	0	mL/g	assumed value
Ir	reducing old	0	mL/g	assumed value
Ir	reducing young	0	mL/g	assumed value
Ir	sandy	0	mL/g	assumed value
Ir	waste	0	mL/g	none
K	clayey	60	mL/g	SRNL-RPA-2007-00006
K	oxidizing middle	20	mL/g	WSRC-STI-2007-00640
K	oxidizing old	10	mL/g	WSRC-STI-2007-00640
K	oxidizing young	2	mL/g	WSRC-STI-2007-00640
K	reducing middle	2	mL/g	WSRC-STI-2007-00640
K	reducing old	10	mL/g	WSRC-STI-2007-00640
K	reducing young	0	mL/g	WSRC-STI-2007-00640
K	sandy	10	mL/g	SRNL-RPA-2007-00006
K	waste	0	mL/g	none
Kr	clayey	0	mL/g	WSRC-TR-2006-00004
Kr	oxidizing middle	0	mL/g	WSRC-STI-2007-00640
Kr	oxidizing old	0	mL/g	WSRC-STI-2007-00640
Kr	oxidizing young	0	mL/g	WSRC-STI-2007-00640
Kr	reducing middle	0	mL/g	WSRC-STI-2007-00640
Kr	reducing old	0	mL/g	WSRC-STI-2007-00640
Kr	reducing young	0	mL/g	WSRC-STI-2007-00640
Kr	sandy	0	mL/g	WSRC-TR-2006-00004
Kr	waste	0	mL/g	none
La	clayey	0	mL/g	assumed value
La	oxidizing middle	0	mL/g	assumed value
La	oxidizing old	0	mL/g	assumed value
La	oxidizing young	0	mL/g	assumed value
La	reducing middle	0	mL/g	assumed value
La	reducing old	0	mL/g	assumed value
La	reducing young	0	mL/g	assumed value
La	sandy	0	mL/g	assumed value
La	waste	0	mL/g	none
Lu	clayey	0	mL/g	assumed value
Lu	oxidizing middle	0	mL/g	assumed value
Lu	oxidizing old	0	mL/g	assumed value
Lu	oxidizing young	0	mL/g	assumed value
Lu	reducing middle	0	mL/g	assumed value
Lu	reducing old	0	mL/g	assumed value
Lu	reducing young	0	mL/g	assumed value

Element	Material	Kd	Units	Reference
Lu	sandy	0	mL/g	assumed value
Lu	waste	0	mL/g	none
Mn	clayey	200	mL/g	SRNL-RPA-2007-00006
Mn	oxidizing middle	100	mL/g	WSRC-STI-2007-00640
Mn	oxidizing old	10	mL/g	WSRC-STI-2007-00640
Mn	oxidizing young	100	mL/g	WSRC-STI-2007-00640
Mn	reducing middle	100	mL/g	WSRC-STI-2007-00640
Mn	reducing old	10	mL/g	WSRC-STI-2007-00640
Mn	reducing young	100	mL/g	WSRC-STI-2007-00640
Mn	sandy	15	mL/g	SRNL-RPA-2007-00006
Mn	waste	0	mL/g	none
Mo	clayey	120	mL/g	SRNL-RPA-2007-00006
Mo	oxidizing middle	0.1	mL/g	WSRC-STI-2007-00640
Mo	oxidizing old	0.1	mL/g	WSRC-STI-2007-00640
Mo	oxidizing young	0.1	mL/g	WSRC-STI-2007-00640
Mo	reducing middle	0.1	mL/g	WSRC-STI-2007-00640
Mo	reducing old	0.1	mL/g	WSRC-STI-2007-00640
Mo	reducing young	0.1	mL/g	WSRC-STI-2007-00640
Mo	sandy	6	mL/g	SRNL-RPA-2007-00006
Mo	waste	0	mL/g	none
N	clayey	0	mL/g	SRNL-RPA-2007-00006
N	oxidizing middle	0	mL/g	WSRC-STI-2007-00640
N	oxidizing old	0	mL/g	WSRC-STI-2007-00640
N	oxidizing young	0	mL/g	WSRC-STI-2007-00640
N	reducing middle	0	mL/g	WSRC-STI-2007-00640
N	reducing old	0	mL/g	WSRC-STI-2007-00640
N	reducing young	0	mL/g	WSRC-STI-2007-00640
N	sandy	0	mL/g	SRNL-RPA-2007-00006
N	waste	0	mL/g	none
Na	clayey	25	mL/g	SRNL-RPA-2007-00006
Na	oxidizing middle	1	mL/g	WSRC-STI-2007-00640
Na	oxidizing old	0.5	mL/g	WSRC-STI-2007-00640
Na	oxidizing young	0.5	mL/g	WSRC-STI-2007-00640
Na	reducing middle	1	mL/g	WSRC-STI-2007-00640
Na	reducing old	0.5	mL/g	WSRC-STI-2007-00640
Na	reducing young	0.5	mL/g	WSRC-STI-2007-00640
Na	sandy	5	mL/g	SRNL-RPA-2007-00006
Na	waste	0	mL/g	none
Nb	clayey	0	mL/g	WSRC-TR-2006-00004
Nb	oxidizing middle	1000	mL/g	WSRC-STI-2007-00640
Nb	oxidizing old	500	mL/g	WSRC-STI-2007-00640
Nb	oxidizing young	1000	mL/g	WSRC-STI-2007-00640
Nb	reducing middle	1000	mL/g	WSRC-STI-2007-00640
Nb	reducing old	500	mL/g	WSRC-STI-2007-00640
Nb	reducing young	1000	mL/g	WSRC-STI-2007-00640
Nb	sandy	0	mL/g	WSRC-TR-2006-00004
Nb	waste	0	mL/g	none
Ni	clayey	30	mL/g	WSRC-TR-2006-00004
Ni	oxidizing middle	4000	mL/g	WSRC-STI-2007-00640
Ni	oxidizing old	1000	mL/g	WSRC-STI-2007-00640
Ni	oxidizing young	4000	mL/g	WSRC-STI-2007-00640
Ni	reducing middle	5000	mL/g	WSRC-STI-2007-00640
Ni	reducing old	1000	mL/g	WSRC-STI-2007-00640

Element	Material	Kd	Units	Reference
Ni	reducing young	5000	mL/g	WSRC-STI-2007-00640
Ni	sandy	7	mL/g	WSRC-TR-2006-00004
Ni	waste	0	mL/g	none
Np	clayey	35	mL/g	WSRC-TR-2006-00004
Np	oxidizing middle	1600	mL/g	WSRC-STI-2007-00640
Np	oxidizing old	250	mL/g	WSRC-STI-2007-00640
Np	oxidizing young	1600	mL/g	WSRC-STI-2007-00640
Np	reducing middle	4000	mL/g	SRNS-STI-2008-00045
Np	reducing old	3000	mL/g	SRNS-STI-2008-00045
Np	reducing young	4000	mL/g	SRNS-STI-2008-00045
Np	sandy	0.6	mL/g	WSRC-TR-2006-00004
Np	waste	0	mL/g	none
P	clayey	0	mL/g	assumed value
P	oxidizing middle	0	mL/g	assumed value
P	oxidizing old	0	mL/g	assumed value
P	oxidizing young	0	mL/g	assumed value
P	reducing middle	0	mL/g	assumed value
P	reducing old	0	mL/g	assumed value
P	reducing young	0	mL/g	assumed value
P	sandy	0	mL/g	assumed value
P	waste	0	mL/g	none
Pa	clayey	35	mL/g	WSRC-TR-2006-00004
Pa	oxidizing middle	1600	mL/g	WSRC-STI-2007-00640
Pa	oxidizing old	250	mL/g	WSRC-STI-2007-00640
Pa	oxidizing young	1600	mL/g	WSRC-STI-2007-00640
Pa	reducing middle	5000	mL/g	SRNS-STI-2008-00045
Pa	reducing old	500	mL/g	SRNS-STI-2008-00045
Pa	reducing young	5000	mL/g	SRNS-STI-2008-00045
Pa	sandy	0.6	mL/g	WSRC-TR-2006-00004
Pa	waste	0	mL/g	none
Pb	clayey	5000	mL/g	WSRC-TR-2006-00004
Pb	oxidizing middle	500	mL/g	WSRC-STI-2007-00640
Pb	oxidizing old	250	mL/g	WSRC-STI-2007-00640
Pb	oxidizing young	500	mL/g	WSRC-STI-2007-00640
Pb	reducing middle	500	mL/g	WSRC-STI-2007-00640
Pb	reducing old	250	mL/g	WSRC-STI-2007-00640
Pb	reducing young	500	mL/g	WSRC-STI-2007-00640
Pb	sandy	2000	mL/g	WSRC-TR-2006-00004
Pb	waste	0	mL/g	none
Pd	clayey	30	mL/g	SRNL-RPA-2007-00006
Pd	oxidizing middle	4000	mL/g	WSRC-STI-2007-00640
Pd	oxidizing old	1000	mL/g	WSRC-STI-2007-00640
Pd	oxidizing young	4000	mL/g	WSRC-STI-2007-00640
Pd	reducing middle	5000	mL/g	WSRC-STI-2007-00640
Pd	reducing old	1000	mL/g	WSRC-STI-2007-00640
Pd	reducing young	5000	mL/g	WSRC-STI-2007-00640
Pd	sandy	7	mL/g	SRNL-RPA-2007-00006
Pd	waste	0	mL/g	none
Pm	clayey	0	mL/g	assumed value
Pm	oxidizing middle	0	mL/g	assumed value
Pm	oxidizing old	0	mL/g	assumed value
Pm	oxidizing young	0	mL/g	assumed value
Pm	reducing middle	0	mL/g	assumed value

Element	Material	Kd	Units	Reference
Pm	reducing old	0	mL/g	assumed value
Pm	reducing young	0	mL/g	assumed value
Pm	sandy	0	mL/g	assumed value
Pm	waste	0	mL/g	assumed value
Po	clayey	5000	mL/g	WSRC-TR-2006-00004
Po	oxidizing middle	500	mL/g	WSRC-STI-2007-00640
Po	oxidizing old	250	mL/g	WSRC-STI-2007-00640
Po	oxidizing young	500	mL/g	WSRC-STI-2007-00640
Po	reducing middle	500	mL/g	WSRC-STI-2007-00640
Po	reducing old	250	mL/g	WSRC-STI-2007-00640
Po	reducing young	500	mL/g	WSRC-STI-2007-00640
Po	sandy	2000	mL/g	WSRC-TR-2006-00004
Po	waste	0	mL/g	none
Pr	clayey	0	mL/g	assumed value
Pr	oxidizing middle	0	mL/g	assumed value
Pr	oxidizing old	0	mL/g	assumed value
Pr	oxidizing young	0	mL/g	assumed value
Pr	reducing middle	0	mL/g	assumed value
Pr	reducing old	0	mL/g	assumed value
Pr	reducing young	0	mL/g	assumed value
Pr	sandy	0	mL/g	assumed value
Pr	waste	0	mL/g	assumed value
Pt	clayey	0	mL/g	assumed value
Pt	oxidizing middle	0	mL/g	assumed value
Pt	oxidizing old	0	mL/g	assumed value
Pt	oxidizing young	0	mL/g	assumed value
Pt	reducing middle	0	mL/g	assumed value
Pt	reducing old	0	mL/g	assumed value
Pt	reducing young	0	mL/g	assumed value
Pt	sandy	0	mL/g	assumed value
Pt	waste	0	mL/g	none
Pu	clayey	5900	mL/g	WSRC-TR-2006-00004
Pu	oxidizing middle	10000	mL/g	SRNL-TR-2009-00019
Pu	oxidizing old	1000	mL/g	SRNL-TR-2009-00019
Pu	oxidizing young	10000	mL/g	SRNL-TR-2009-00019
Pu	reducing middle	10000	mL/g	SRNS-STI-2008-00045
Pu	reducing old	10000	mL/g	SRNS-STI-2008-00045
Pu	reducing young	10000	mL/g	SRNS-STI-2008-00045
Pu	sandy	270	mL/g	WSRC-TR-2006-00004
Pu	waste	0	mL/g	none
Pu_4	clayey	6000	mL/g	WSRC-TR-2006-00004
Pu_4	oxidizing middle	10000	mL/g	SRNL-TR-2009-00019
Pu_4	oxidizing old	1000	mL/g	SRNL-TR-2009-00019
Pu_4	oxidizing young	10000	mL/g	SRNL-TR-2009-00019
Pu_4	reducing middle	10000	mL/g	SRNS-STI-2008-00045
Pu_4	reducing old	10000	mL/g	SRNS-STI-2008-00045
Pu_4	reducing young	10000	mL/g	SRNS-STI-2008-00045
Pu_4	sandy	300	mL/g	WSRC-TR-2006-00004
Pu_4	waste	0	mL/g	none
Pu_5	clayey	5000	mL/g	WSRC-TR-2006-00004
Pu_5	oxidizing middle	10000	mL/g	SRNL-TR-2009-00019
Pu_5	oxidizing old	1000	mL/g	SRNL-TR-2009-00019
Pu_5	oxidizing young	10000	mL/g	SRNL-TR-2009-00019

Element	Material	Kd	Units	Reference
Pu_5	reducing middle	10000	mL/g	SRNS-STI-2008-00045
Pu_5	reducing old	10000	mL/g	SRNS-STI-2008-00045
Pu_5	reducing young	10000	mL/g	SRNS-STI-2008-00045
Pu_5	sandy	16	mL/g	WSRC-TR-2006-00004
Pu_5	waste	0	mL/g	none
Ra	clayey	17	mL/g	WSRC-TR-2006-00004
Ra	oxidizing middle	100	mL/g	WSRC-STI-2007-00640
Ra	oxidizing old	70	mL/g	WSRC-STI-2007-00640
Ra	oxidizing young	100	mL/g	WSRC-STI-2007-00640
Ra	reducing middle	3	mL/g	WSRC-STI-2007-00640
Ra	reducing old	20	mL/g	WSRC-STI-2007-00640
Ra	reducing young	0.5	mL/g	WSRC-STI-2007-00640
Ra	sandy	5	mL/g	WSRC-TR-2006-00004
Ra	waste	0	mL/g	none
Rb	clayey	250	mL/g	WSRC-TR-2006-00004
Rb	oxidizing middle	20	mL/g	WSRC-STI-2007-00640
Rb	oxidizing old	10	mL/g	WSRC-STI-2007-00640
Rb	oxidizing young	2	mL/g	WSRC-STI-2007-00640
Rb	reducing middle	2	mL/g	WSRC-STI-2007-00640
Rb	reducing old	10	mL/g	WSRC-STI-2007-00640
Rb	reducing young	0	mL/g	WSRC-STI-2007-00640
Rb	sandy	50	mL/g	WSRC-TR-2006-00004
Rb	waste	0	mL/g	none
Re	clayey	0.2	mL/g	WSRC-TR-2006-00004
Re	oxidizing middle	0.8	mL/g	WSRC-STI-2007-00640
Re	oxidizing old	0.5	mL/g	WSRC-STI-2007-00640
Re	oxidizing young	0.8	mL/g	WSRC-STI-2007-00640
Re	reducing middle	5000	mL/g	WSRC-STI-2007-00640
Re	reducing old	5000	mL/g	WSRC-STI-2007-00640
Re	reducing young	5000	mL/g	WSRC-STI-2007-00640
Re	sandy	0.1	mL/g	WSRC-TR-2006-00004
Re	waste	0	mL/g	none
Rh	clayey	0	mL/g	assumed value
Rh	oxidizing middle	0	mL/g	assumed value
Rh	oxidizing old	0	mL/g	assumed value
Rh	oxidizing young	0	mL/g	assumed value
Rh	reducing middle	0	mL/g	assumed value
Rh	reducing old	0	mL/g	assumed value
Rh	reducing young	0	mL/g	assumed value
Rh	sandy	0	mL/g	assumed value
Rh	waste	0	mL/g	assumed value
Rn	clayey	0	mL/g	WSRC-TR-2006-00004
Rn	oxidizing middle	0	mL/g	WSRC-STI-2007-00640
Rn	oxidizing old	0	mL/g	WSRC-STI-2007-00640
Rn	oxidizing young	0	mL/g	WSRC-STI-2007-00640
Rn	reducing middle	0	mL/g	WSRC-STI-2007-00640
Rn	reducing old	0	mL/g	WSRC-STI-2007-00640
Rn	reducing young	0	mL/g	WSRC-STI-2007-00640
Rn	sandy	0	mL/g	WSRC-TR-2006-00004
Rn	waste	0	mL/g	none
Ru	clayey	0	mL/g	assumed value
Ru	oxidizing middle	0	mL/g	assumed value
Ru	oxidizing old	0	mL/g	assumed value

Element	Material	Kd	Units	Reference
Ru	oxidizing young	0	mL/g	assumed value
Ru	reducing middle	0	mL/g	assumed value
Ru	reducing old	0	mL/g	assumed value
Ru	reducing young	0	mL/g	assumed value
Ru	sandy	0	mL/g	assumed value
Ru	waste	0	mL/g	none
Sb	clayey	2500	mL/g	SRNL-RPA-2007-00006
Sb	oxidizing middle	100	mL/g	WSRC-STI-2007-00640
Sb	oxidizing old	2	mL/g	WSRC-STI-2007-00640
Sb	oxidizing young	100	mL/g	WSRC-STI-2007-00640
Sb	reducing middle	5000	mL/g	WSRC-STI-2007-00640
Sb	reducing old	1000	mL/g	WSRC-STI-2007-00640
Sb	reducing young	5000	mL/g	WSRC-STI-2007-00640
Sb	sandy	2500	mL/g	SRNL-RPA-2007-00006
Sb	waste	0	mL/g	none
Sc	clayey	0	mL/g	assumed value
Sc	oxidizing middle	0	mL/g	assumed value
Sc	oxidizing old	0	mL/g	assumed value
Sc	oxidizing young	0	mL/g	assumed value
Sc	reducing middle	0	mL/g	assumed value
Sc	reducing old	0	mL/g	assumed value
Sc	reducing young	0	mL/g	assumed value
Sc	sandy	0	mL/g	assumed value
Sc	waste	0	mL/g	assumed value
Se	clayey	1000	mL/g	WSRC-TR-2006-00004
Se	oxidizing middle	300	mL/g	WSRC-STI-2007-00640
Se	oxidizing old	150	mL/g	WSRC-STI-2007-00640
Se	oxidizing young	300	mL/g	WSRC-STI-2007-00640
Se	reducing middle	300	mL/g	SRNS-STI-2008-00045
Se	reducing old	300	mL/g	SRNS-STI-2008-00045
Se	reducing young	300	mL/g	SRNS-STI-2008-00045
Se	sandy	1000	mL/g	WSRC-TR-2006-00004
Se	waste	0	mL/g	none
Si	clayey	0	mL/g	assumed value
Si	oxidizing middle	0	mL/g	assumed value
Si	oxidizing old	0	mL/g	assumed value
Si	oxidizing young	0	mL/g	assumed value
Si	reducing middle	0	mL/g	assumed value
Si	reducing old	0	mL/g	assumed value
Si	reducing young	0	mL/g	assumed value
Si	sandy	0	mL/g	assumed value
Si	waste	0	mL/g	none
Sm	clayey	8500	mL/g	WSRC-TR-2006-00004
Sm	oxidizing middle	6000	mL/g	WSRC-STI-2007-00640
Sm	oxidizing old	600	mL/g	WSRC-STI-2007-00640
Sm	oxidizing young	6000	mL/g	WSRC-STI-2007-00640
Sm	reducing middle	5000	mL/g	WSRC-STI-2007-00640
Sm	reducing old	1000	mL/g	WSRC-STI-2007-00640
Sm	reducing young	5000	mL/g	WSRC-STI-2007-00640
Sm	sandy	1100	mL/g	WSRC-TR-2006-00004
Sm	waste	0	mL/g	none
Sn	clayey	5000	mL/g	WSRC-TR-2006-00004
Sn	oxidizing middle	4000	mL/g	WSRC-STI-2007-00640

Element	Material	Kd	Units	Reference
Sn	oxidizing old	2000	mL/g	WSRC-STI-2007-00640
Sn	oxidizing young	4000	mL/g	WSRC-STI-2007-00640
Sn	reducing middle	5000	mL/g	SRNS-STI-2008-00045
Sn	reducing old	2000	mL/g	SRNS-STI-2008-00045
Sn	reducing young	5000	mL/g	SRNS-STI-2008-00045
Sn	sandy	2000	mL/g	WSRC-TR-2006-00004
Sn	waste	0	mL/g	none
Sr	clayey	17	mL/g	WSRC-TR-2006-00004
Sr	oxidizing middle	30	mL/g	WSRC-STI-2007-00640
Sr	oxidizing old	15	mL/g	WSRC-STI-2007-00640
Sr	oxidizing young	3	mL/g	WSRC-STI-2007-00640
Sr	reducing middle	3	mL/g	SRNS-STI-2008-00045
Sr	reducing old	20	mL/g	SRNS-STI-2008-00045
Sr	reducing young	0.5	mL/g	SRNS-STI-2008-00045
Sr	sandy	5	mL/g	WSRC-TR-2006-00004
Sr	waste	0	mL/g	none
Ta	clayey	0	mL/g	assumed value
Ta	oxidizing middle	0	mL/g	assumed value
Ta	oxidizing old	0	mL/g	assumed value
Ta	oxidizing young	0	mL/g	assumed value
Ta	reducing middle	0	mL/g	assumed value
Ta	reducing old	0	mL/g	assumed value
Ta	reducing young	0	mL/g	assumed value
Ta	sandy	0	mL/g	assumed value
Ta	waste	0	mL/g	none
Tc	clayey	1.8	mL/g	SRNL-TR-2009-00019
Tc	oxidizing middle	0.8	mL/g	WSRC-STI-2007-00640
Tc	oxidizing old	0.5	mL/g	WSRC-STI-2007-00640
Tc	oxidizing young	0.8	mL/g	WSRC-STI-2007-00640
Tc	reducing middle	5000	mL/g	SRNS-STI-2008-00045
Tc	reducing old	5000	mL/g	SRNS-STI-2008-00045
Tc	reducing young	5000	mL/g	SRNS-STI-2008-00045
Tc	sandy	0.6	mL/g	SRNL-TR-2009-00019
Tc	waste	0	mL/g	none
Te	clayey	1000	mL/g	WSRC-TR-2006-00004
Te	oxidizing middle	300	mL/g	WSRC-STI-2007-00640
Te	oxidizing old	150	mL/g	WSRC-STI-2007-00640
Te	oxidizing young	300	mL/g	WSRC-STI-2007-00640
Te	reducing middle	300	mL/g	WSRC-STI-2007-00640
Te	reducing old	150	mL/g	WSRC-STI-2007-00640
Te	reducing young	300	mL/g	WSRC-STI-2007-00640
Te	sandy	1000	mL/g	WSRC-TR-2006-00004
Te	waste	0	mL/g	none
Th	clayey	2000	mL/g	WSRC-TR-2006-00004
Th	oxidizing middle	5000	mL/g	WSRC-STI-2007-00640
Th	oxidizing old	500	mL/g	WSRC-STI-2007-00640
Th	oxidizing young	5000	mL/g	WSRC-STI-2007-00640
Th	reducing middle	5000	mL/g	WSRC-STI-2007-00640
Th	reducing old	500	mL/g	WSRC-STI-2007-00640
Th	reducing young	5000	mL/g	WSRC-STI-2007-00640
Th	sandy	900	mL/g	WSRC-TR-2006-00004
Th	waste	0	mL/g	none
Ti	clayey	0	mL/g	assumed value

Element	Material	Kd	Units	Reference
Ti	oxidizing middle	0	mL/g	assumed value
Ti	oxidizing old	0	mL/g	assumed value
Ti	oxidizing young	0	mL/g	assumed value
Ti	reducing middle	0	mL/g	assumed value
Ti	reducing old	0	mL/g	assumed value
Ti	reducing young	0	mL/g	assumed value
Ti	sandy	0	mL/g	assumed value
Ti	waste	0	mL/g	none
Tl	clayey	0	mL/g	assumed value
Tl	oxidizing middle	0	mL/g	assumed value
Tl	oxidizing old	0	mL/g	assumed value
Tl	oxidizing young	0	mL/g	assumed value
Tl	reducing middle	0	mL/g	assumed value
Tl	reducing old	0	mL/g	assumed value
Tl	reducing young	0	mL/g	assumed value
Tl	sandy	0	mL/g	assumed value
Tl	waste	0	mL/g	assumed value
U	clayey	300	mL/g	WSRC-TR-2006-00004
U	oxidizing middle	250	mL/g	WSRC-STI-2007-00640
U	oxidizing old	70	mL/g	WSRC-STI-2007-00640
U	oxidizing young	250	mL/g	WSRC-STI-2007-00640
U	reducing middle	2500	mL/g	SRNS-STI-2008-00045
U	reducing old	2500	mL/g	SRNS-STI-2008-00045
U	reducing young	2500	mL/g	SRNS-STI-2008-00045
U	sandy	200	mL/g	WSRC-TR-2006-00004
U	waste	0	mL/g	none
V	clayey	0	mL/g	assumed value
V	oxidizing middle	0	mL/g	assumed value
V	oxidizing old	0	mL/g	assumed value
V	oxidizing young	0	mL/g	assumed value
V	reducing middle	0	mL/g	assumed value
V	reducing old	0	mL/g	assumed value
V	reducing young	0	mL/g	assumed value
V	sandy	0	mL/g	assumed value
V	waste	0	mL/g	none
Y	clayey	0	mL/g	assumed value
Y	oxidizing middle	5000	mL/g	WSRC-STI-2007-00640
Y	oxidizing old	500	mL/g	WSRC-STI-2007-00640
Y	oxidizing young	5000	mL/g	WSRC-STI-2007-00640
Y	reducing middle	5000	mL/g	SRNS-STI-2008-00045
Y	reducing old	1000	mL/g	SRNS-STI-2008-00045
Y	reducing young	5000	mL/g	SRNS-STI-2008-00045
Y	sandy	0	mL/g	assumed value
Y	waste	0	mL/g	assumed value
Zn	clayey	200	mL/g	srs-reg-2007-00036
Zn	oxidizing middle	4000	mL/g	WSRC-STI-2007-00640
Zn	oxidizing old	1000	mL/g	WSRC-STI-2007-00640
Zn	oxidizing young	4000	mL/g	WSRC-STI-2007-00640
Zn	reducing middle	5000	mL/g	WSRC-STI-2007-00640
Zn	reducing old	1000	mL/g	WSRC-STI-2007-00640
Zn	reducing young	5000	mL/g	WSRC-STI-2007-00640
Zn	sandy	100	mL/g	srs-reg-2007-00036
Zn	waste	0	mL/g	none

Element	Material	Kd	Units	Reference
Zr	clayey	2000	mL/g	WSRC-TR-2006-00004
Zr	oxidizing middle	5000	mL/g	WSRC-STI-2007-00640
Zr	oxidizing old	500	mL/g	WSRC-STI-2007-00640
Zr	oxidizing young	5000	mL/g	WSRC-STI-2007-00640
Zr	reducing middle	5000	mL/g	WSRC-STI-2007-00640
Zr	reducing old	500	mL/g	WSRC-STI-2007-00640
Zr	reducing young	5000	mL/g	WSRC-STI-2007-00640
Zr	sandy	900	mL/g	WSRC-TR-2006-00004
Zr	waste	0	mL/g	none

Table 15. Reduction capacities assigned to materials.

id	Reduction capacity	Reference	Reference material
numerical model id	meq/g		
UpperVz	NA		
native_soil	NA		
OscBefore	NA		
OscAfter	NA		
backfill	NA		
IlvPermeableBackfill	NA		
SingleVadoseZone	NA		
Sand	NA		
ClaySand	NA		
Clay	NA		
Gravel	NA		
vault14_work_slab	NA		
vault1_wall_uncracked	0.240	SRNS-STI-2008-00045 Table 8	Vault 2 concrete (mixture 1)
vault1_wall	0.240	SRNS-STI-2008-00045 Table 8	Vault 2 concrete (mixture 1)
vault1_floor	0.240	SRNS-STI-2008-00045 Table 8	Vault 2 concrete (mixture 1)
vault1_roof	NA		
vault4_wall_uncracked	0.240	SRNS-STI-2008-00045 Table 8	Vault 2 concrete (mixture 1)
vault4_wall	0.240	SRNS-STI-2008-00045 Table 8	Vault 2 concrete (mixture 1)
vault4_floor	0.240	SRNS-STI-2008-00045 Table 8	Vault 2 concrete (mixture 1)
vault4_roof	NA		
vault2_wall	0.240	SRNS-STI-2008-00045 Table 8	Vault 2 concrete (mixture 1)
vault2_floor	0.240	SRNS-STI-2008-00045 Table 8	Vault 2 concrete (mixture 1)
vault2_roof	0.240	SRNS-STI-2008-00045 Table 8	Vault 2 concrete (mixture 1)
saltstone	0.822	SRNS-STI-2008-00045 Table 8	DDA Simulant Saltstone
saltstone_cracked	0.822	SRNS-STI-2008-00045 Table 8	DDA Simulant Saltstone
z_clean_cap	0.822	SRNS-STI-2008-00045 Table 8	DDA Simulant Saltstone
HDPE	NA		
HDPE_GCL	NA		
diaphragm	NA		
concrete_mat	NA		
shot_crete	NA		
sheet_drain	NA		
sand_drain	NA		
impervious	NA		
column_crack	NA		

3.0 VAULT PERFORMANCE

The long-term performance of Saltstone vaults depend the durability of the engineered materials and exposure conditions (e.g. seismic, climatic events). In this section we define performance measures, discuss degradation of SDF materials and components, present potential vault performance scenarios, and describe conceptual models of subsurface flow and transport controlling waste release.

3.1 PERFORMANCE MEASURES

For scoping assessments of Saltstone vault performance, groundwater concentrations were monitored at a distance of 100 meters from the facility boundary using the following criteria to measure impact:

- Environmental Protection Agency (EPA) Maximum Contaminant Levels (MCLs) (http://www.epa.gov/safewater/contaminants/index.html, accessed 12/1/2008)
    - primary water standards for non-radionuclides, or secondary if no primary
    - 15 pCi/L for alpha-emitters
    - 4 mrem/yr for beta-emitters
    - 5 pCi/L for radium
    - 30 μg/L for uranium
- U.S. Department of Energy (DOE) 25 mrem/yr dose from water ingestion only

Other assessment points include 1 meter and seepline locations. The period of performance after SDF facility closure is assumed to be 10,000 years.

Table 16 lists the primary or secondary drinking water standards for stable (non-rad.) species, identifies alpha-emitters subject to a 15 pCi/L MCL, and includes the radium MCL of 5 pCi/L. Alpha-emitters are limited to those with half-lives between 5 and 1.e+15 years inclusive, and identified through the Nuclear Wallet Cards Search webpage (http://www.nndc.bnl.gov/nudat2/indx_sigma.jsp, accessed 12/1/2008). Table 17 reproduces EPA-derived concentrations yielding 4 mrem/yr for beta and photon emitters in drinking water (http://www.epa.gov/safewater/radionuclides/pdfs/guide_radionuclides_table-betaphotonemitters.pdf, accessed 12/1/2008). Table 18 relates the 30 μg/L MCL to more convenient activity units of pCi/L. Table 19 lists derived concentrations corresponding to a 25 mrem/yr dose from water ingestion. Consumptions rates and dose conversion factors (DCFs) are taken from the F-Tank Farm Performance Assessment (WSRC Site Regulatory Integration & Planning, 2008, Tables 4.6-7 and 4.7-1). Table 20 identifies the most limiting concentration among those listed in Table 16 through Table 19, sorted alphabetically by species. For brevity, the limiting concentration is subsequently referred to as the "MCL", whether based on an EPA MCL or derived from a DOE 25 mrem/yr drinking water dose.

To assess the impact of multiple species, whether from multiple parents and/or from radionuclide chains, fractions of the MCL are computed from simulated groundwater concentrations. The sum of fractions (SOF) is used to assess the cumulative impact of multiple species. A SOF less than one indicates that performance objectives are met in aggregate.

Table 16. Primary and secondary drinking water standard for stable species, alpha-emitters subject to 15 pCi/L MCL, and radium MCL.

Nuclide	MCL	Units	DWS	Units	Notes
U	30	ug/L			
Sb	6	ug/L	0.006	mg/L	antimony
As	10	ug/L	0.01	mg/L	arsenic
Ba	2000	ug/L	2	mg/L	barium
Be	4	ug/L	0.004	mg/L	beryllium
Cd	5	ug/L	0.005	mg/L	cadmium
Cr	100	ug/L	0.1	mg/L	chromium
Cu	1300	ug/L	1.3	mg/L	copper
F	4000	ug/L	4	mg/L	flouride
Pb	15	ug/L	0.015	mg/L	lead
Hg	2	ug/L	0.002	mg/L	mercury
NO_3	10000	ug/L	10	mg/L	nitrate as N
NO_2	1000	ug/L	1	mg/L	nitrite as N
N	10000	ug/L	10	mg/L	nitrogen (use nitrate value)
Se	50	ug/L	0.05	mg/L	selenium
Tl	2	ug/L	0.002	mg/L	thallium
Al	50	ug/L	0.05	mg/L	aluminum (secondary DWS)
Fe	300	ug/L	0.3	mg/L	iron (secondary DWS)
Mn	50	ug/L	0.05	mg/L	manganese (secondary DWS)
Ag	100	ug/L	0.1	mg/L	silver (secondary DWS)
Zn	5000	ug/L	5	mg/L	zinc (secondary DWS)
Ra-226	5	pCi/L			
Ra-228	5	pCi/L			
alpha	15	pCi/L			
Pm-145	15	pCi/L			
Sm-146	15	pCi/L			
Sm-147	15	pCi/L			
Gd-148	15	pCi/L			
Gd-150	15	pCi/L			
Gd-152	15	pCi/L			
Dy-154	15	pCi/L			
Re-187	15	pCi/L			
Os-184	15	pCi/L			
Os-186	15	pCi/L			
Pt-190	15	pCi/L			
Pb-210	15	pCi/L			
Bi-210	15	pCi/L			
Po-209	15	pCi/L			
Ra-226	15	pCi/L			
Ac-227	15	pCi/L			
Th-229	15	pCi/L			
Th-230	15	pCi/L			
Th-232	15	pCi/L			
Pa-231	15	pCi/L			
U-232	15	pCi/L			

Nuclide	MCL	Units	DWS	Units	Notes
U-233	15	pCi/L			
U-234	15	pCi/L			
U-235	15	pCi/L			
U-236	15	pCi/L			
U-238	15	pCi/L			
Np-225	15	pCi/L			
Np-236	15	pCi/L			
Np-237	15	pCi/L			
Pu-229	15	pCi/L			
Pu-238	15	pCi/L			
Pu-239	15	pCi/L			
Pu-240	15	pCi/L			
Pu-241	15	pCi/L			
Pu-242	15	pCi/L			
Pu-244	15	pCi/L			
Am-241	15	pCi/L			
Am-242	15	pCi/L			
Am-243	15	pCi/L			
Cm-243	15	pCi/L			
Cm-244	15	pCi/L			
Cm-245	15	pCi/L			
Cm-246	15	pCi/L			
Cm-247	15	pCi/L			
Cm-248	15	pCi/L			
Cm-250	15	pCi/L			
Bk-247	15	pCi/L			
Bk-248	15	pCi/L			
Cf-249	15	pCi/L			
Cf-250	15	pCi/L			
Cf-251	15	pCi/L			

Table 17. Derived concentrations (pCi/L) for beta and photon emitters.

Nuclide	MCL	Units
Ag-105	300	pCi/L
Ag-110m	90	pCi/L
Ag-111	100	pCi/L
As-73	1,000	pCi/L
As-74	100	pCi/L
As-76	60	pCi/L
As-77	200	pCi/L
Au-196	600	pCi/L
Au-198	100	pCi/L
Au-199	600	pCi/L
Ba-131	600	pCi/L
Ba-140	90	pCi/L
Be-7	6,000	pCi/L
Bi-206	100	pCi/L
Bi-207	200	pCi/L
Bk-249	2,000	pCi/L
Br-82	100	pCi/L
C-14	2,000	pCi/L

Nuclide	MCL	Units
Ca-45	10	pCi/L
Ca-47	80	pCi/L
Cd-109	600	pCi/L
Cd-115	90	pCi/L
Cd-115m	90	pCi/L
Ce-141	300	pCi/L
Ce-143	100	pCi/L
Ce-144	30	pCi/L
Cl-36	700	pCi/L
Cl-38	1,000	pCi/L
Co-57	1,000	pCi/L
Co-58	300	pCi/L
Co-58m	9000	pCi/L
Co-60	100	pCi/L
Cr-51	6,000	pCi/L
Cs-131	20,000	pCi/L
Cs-134	80	pCi/L
Cs-134m	20,000	pCi/L

Nuclide	MCL	Units
Cs-135	900	pCi/L
Cs-136	800	pCi/L
Cs-137	200	pCi/L
Cu-64	900	pCi/L
Dy-165	1,000	pCi/L
Dy-166	100	pCi/L
Er-169	300	pCi/L
Er-171	300	pCi/L
Eu-152	200	pCi/L
Eu-154	60	pCi/L
Eu-155	600	pCi/L
F-18	2,000	pCi/L
Fe-55	2,000	pCi/L
Fe-59	200	pCi/L
Ga-72	100	pCi/L
Gd-153	600	pCi/L
Gd-159	200	pCi/L
Ge-71	6,000	pCi/L

Nuclide	MCL	Units
H-3	20,000	pCi/L
Hf-181	200	pCi/L
Hg-197	900	pCi/L
Hg-197m	600	pCi/L
Hg-203	60	pCi/L
Ho-166	90	pCi/L
I-126	3	pCi/L
I-129	1	pCi/L
I-131	3	pCi/L
I-132	90	pCi/L
I-133	10	pCi/L
I-134	100	pCi/L
I-135	30	pCi/L
In-113m	3,000	pCi/L
In-114m	60	pCi/L
In-115	300	pCi/L
In-115m	1,000	pCi/L
Ir-190	600	pCi/L
Ir-192	100	pCi/L
Ir-194	90	pCi/L
K-42	900	pCi/L
La-140	60	pCi/L
Lu-177	300	pCi/L
Mn-52	90	pCi/L
Mn-54	300	pCi/L
Mn-56	300	pCi/L
Mo-99	600	pCi/L
Na-22	400	pCi/L
Na-24	600	pCi/L
Nb-93m	1,000	pCi/L
Nb-95	300	pCi/L
Nb-97	3,000	pCi/L
Nd-147	200	pCi/L
Nd-149	900	pCi/L
Ni-59	300	pCi/L
Ni-63	50	pCi/L
Ni-65	300	pCi/L
Np-239	300	pCi/L
Os-185	200	pCi/L
Os-191	600	pCi/L
Os-191m	9,000	pCi/L
Os-193	200	pCi/L
P-32	30	pCi/L

Nuclide	MCL	Units
Pa-230	600	pCi/L
Pa-233	300	pCi/L
Pb-203	1,000	pCi/L
Pd-103	900	pCi/L
Pd-109	300	pCi/L
Pm-147	600	pCi/L
Pm-149	100	pCi/L
Pr-142	90	pCi/L
Pr-143	100	pCi/L
Pt-191	300	pCi/L
Pt-193	3,000	pCi/L
Pt-193m	3,000	pCi/L
Pt-197	300	pCi/L
Pt-197m	3,000	pCi/L
Pu-241	300	pCi/L
Rb-86	600	pCi/L
Rb-87	300	pCi/L
Re-186	300	pCi/L
Re-187	9,000	pCi/L
Re-188	200	pCi/L
Rh-103m	30,000	pCi/L
Rh-105	300	pCi/L
Ru-103	200	pCi/L
Ru-105	200	pCi/L
Ru-106	30	pCi/L
Ru-97	1,000	pCi/L
S-35 inorg	500	pCi/L
Sb-122	90	pCi/L
Sb-124	60	pCi/L
Sb-125	300	pCi/L
Sc-46	100	pCi/L
Sc-47	300	pCi/L
Sc-48	80	pCi/L
Se-75	900	pCi/L
Si-31	3,000	pCi/L
Sm-151	1,000	pCi/L
Sm-153	200	pCi/L
Sn-113	300	pCi/L
Sn-125	60	pCi/L
Sr-85	900	pCi/L
Sr-85 m	20,000	pCi/L
Sr-89	20	pCi/L
Sr-90	8	pCi/L

Nuclide	MCL	Units
Sr-91	200	pCi/L
Sr-92	200	pCi/L
Ta-182	100	pCi/L
Tb-160	100	pCi/L
Tc-96	300	pCi/L
Tc-96m	30,000	pCi/L
Tc-97	6,000	pCi/L
Tc-97m	1,000	pCi/L
Tc-99	900	pCi/L
Tc-99m	20,000	pCi/L
Te-125m	600	pCi/L
Te-127	900	pCi/L
Te-127m	200	pCi/L
Te-129	2,000	pCi/L
Te-129m	90	pCi/L
Te-131m	200	pCi/L
Te-132	90	pCi/L
Tl-200	1,000	pCi/L
Tl-201	900	pCi/L
Tl-202	300	pCi/L
Tl-204	300	pCi/L
Tm-170	100	pCi/L
Tm-171	1,000	pCi/L
V-48	90	pCi/L
W-181	1,000	pCi/L
W-185	300	pCi/L
W-187	200	pCi/L
Y-90	60	pCi/L
Y-91	90	pCi/L
Y-91m	9,000	pCi/L
Y-92	200	pCi/L
Y-93	90	pCi/L
Yb-175	300	pCi/L
Zn-65	300	pCi/L
Zn-69	6,000	pCi/L
Zn-69m	200	pCi/L
Zr-93	2,000	pCi/L
Zr-95	200	pCi/L
Zr-97	60	pCi/L

Table 18. Uranium 30 µg/L MCL expressed as pCi/L.

Nuclide	MCL	Conc	Halflife	Halflife	CiPerMol	~MW	CiPerGram
	pCi/L	µg/L		yr	Ci/mol	g/mol	Ci/g
U		30					
U-230	8.19E+11	30	20.8 d	5.69E-02	6.28E+06	230	2.73E+04
U-232	6.71E+08	30	68.9 yr	6.89E+01	5.19E+03	232	2.24E+01
U-233	2.89E+05	30	159200 yr	1.59E+05	2.25E+00	233	9.64E-03
U-234	1.87E+05	30	245500 yr	2.46E+05	1.46E+00	234	6.22E-03
U-235	6.48E+01	30	704000000 yr	7.04E+08	5.08E-04	235	2.16E-06
U-236	1.94E+03	30	23420000 yr	2.34E+07	1.53E-02	236	6.47E-05
U-237	2.45E+12	30	6.75 d	1.85E-02	1.93E+07	237	8.16E+04
U-238	1.01E+01	30	4468000000 yr	4.47E+09	8.00E-05	238	3.36E-07
U-240	2.78E+13	30	14.1 hr	1.61E-03	2.22E+08	240	9.26E+05

Table 19. Derived concentrations (pCi/L) for radionuclides based on a 25 mrem/yr dose from water ingestion (DOE).

Nuclide	Concentration (pCi/L)	Dose Conversion Factor, DCF (mrem/yr per pCi/L)
Ac-227	1.82E+01	1.37159
Al-26	5.71E+03	0.004381
Am-241	1.00E+02	0.24938
Am-242m	1.00E+02	0.236911
Am-243	9.98E+01	0.250378
C-14	3.45E+04	0.000725
Cf-249	5.71E+01	0.4381
Cl-36	2.16E+04	0.001159
Cm-243	1.34E+02	0.187035
Cm-244	1.67E+02	0.149628
Cm-245	9.55E+01	0.261849
Cm-247	1.05E+02	0.237017
Cm-248	2.60E+01	0.96045
Co-60	5.89E+03	0.004246
Cs-135	1.00E+04	0.002494
Cs-137	1.54E+03	0.01621
Eu-152	1.43E+04	0.001746
Eu-154	1.00E+04	0.002494
H-3	1.11E+06	2.24E-05
I-129	1.82E+02	0.137159
K-40	3.24E+03	0.007717
Mo-93m	2.50E+31	3.88E-03
Nb-93m	1.67E+05	0.00015
Nb-94	1.18E+04	0.00212
Ni-59	3.18E+05	7.85E-05
Ni-63	1.34E+05	0.000187
Np-237	1.81E+02	0.137159
Pa-231	2.82E+01	0.88631

Nuclide	Concentration (pCi/L)	Dose Conversion Factor, DCF (mrem/yr per pCi/L)
Pb-210	2.91E+01	0.85935
Pd-107	5.41E+05	4.62E-05
Pu-238	8.72E+01	0.286787
Pu-239	8.02E+01	0.311725
Pu-240	8.02E+01	0.311725
Pu-241	4.17E+03	0.005999
Pu-242	8.35E+01	0.299256
Pu-244	8.32E+01	0.299256
Ra-226	7.13E+01	0.35048
Ra-228	2.41E+01	0.85935
Rn-222	8.02E+04	0.000312
Se-79	6.93E+03	0.003606
Sm-151	2.04E+05	0.000122
Sn-126	3.95E+03	0.006336
Sr-90	6.51E+02	0.035048
Tc-99	3.13E+04	0.000799
Th-228	2.79E+02	0.089642
Th-229	3.27E+01	0.60997
Th-230	9.55E+01	0.261849
Th-232	8.72E+01	0.286787
U-232	6.08E+01	0.41114
U-233	3.93E+02	0.063693
U-234	4.10E+02	0.060997
U-235	4.23E+02	0.059063
U-236	4.26E+02	0.058638
U-238	4.13E+02	0.056279
Zr-93	1.82E+04	0.001372

Table 20. Limiting concentration for scoping vault performance assessment.

Species	Concentration Limit	Units	Limiting Criterion
Ac-227	15	pCi/L	MCL
Ag	100	ug/L	MCL
Al-26	5706	pCi/L	25 mrem
Am-241	15	pCi/L	MCL
Am-242m	105.5	pCi/L	25 mrem
Am-243	15	pCi/L	MCL
As	10	ug/L	MCL
Ba	2000	ug/L	MCL
Ba-137m	1.00E+30	NA	NA
Bk-249	2000	pCi/L	4 mrem
C-14	2000	pCi/L	4 mrem
Cd	5	ug/L	MCL
Ce-144	30	pCi/L	4 mrem
Cf-249	15	pCi/L	MCL
Cf-251	15	pCi/L	MCL
Cf-252	1.00E+30	NA	NA
Cl-36	700	pCi/L	4 mrem
Cm-242	1.00E+30	NA	NA
Cm-243	15	pCi/L	MCL
Cm-244	15	pCi/L	MCL
Cm-245	15	pCi/L	MCL
Cm-246	15	pCi/L	MCL
Cm-247	15	pCi/L	MCL
Cm-248	15	pCi/L	MCL
Co-60	100	pCi/L	4 mrem
Cr	100	ug/L	MCL
Cs-134	80	pCi/L	4 mrem
Cs-135	900	pCi/L	4 mrem
Cs-137	200	pCi/L	4 mrem
Cu	1300	ug/L	MCL
Eu-152	200	pCi/L	4 mrem
Eu-154	60	pCi/L	4 mrem
Eu-155	600	pCi/L	4 mrem
F	4000	ug/L	MCL
Fe	300	ug/L	MCL
Gd-152	15	pCi/L	MCL
H-3	2.00E+04	pCi/L	4 mrem
Hg	2	ug/L	MCL
I-129	1	pCi/L	4 mrem
K-40	3239	pCi/L	25 mrem
Mn	50	ug/L	MCL
Mo-93	1.00E+30	NA	NA
N	1.00E+04	ug/L	MCL
Na-22	400	pCi/L	4 mrem
Nb-93m	1000	pCi/L	4 mrem
Nb-94	1.18E+04	pCi/L	25 mrem
Ni	1.00E+30	NA	NA
Ni-59	300	pCi/L	4 mrem
Ni-63	50	pCi/L	4 mrem
Np-237	15	pCi/L	MCL
Pa-231	15	pCi/L	MCL
Pb	15	ug/L	MCL
Pb-210	15	pCi/L	MCL
Pd-107	5.42E+05	pCi/L	25 mrem
Pm-147	600	pCi/L	4 mrem
Pr-144	1.00E+30	NA	NA
Pt-193	3000	pCi/L	4 mrem
Pu-238	15	pCi/L	MCL
Pu-239	15	pCi/L	MCL
Pu-240	15	pCi/L	MCL
Pu-241	15	pCi/L	MCL
Pu-242	15	pCi/L	MCL
Pu-244	15	pCi/L	MCL
Ra-226	15	pCi/L	MCL
Ra-228	5	pCi/L	MCL
Rh-106	1.00E+30	NA	NA
Rn-222	8.02E+04	pCi/L	25 mrem
Ru-106	30	pCi/L	4 mrem
Sb-125	300	pCi/L	4 mrem
Sb-126	1.00E+30	NA	NA
Sb-126m	1.00E+30	NA	NA
Se	50	ug/L	MCL
Se-79	6933	pCi/L	25 mrem
Sm-147	15	pCi/L	MCL
Sm-151	1000	pCi/L	4 mrem
Sn-126	3946	pCi/L	25 mrem
Sr-90	8	pCi/L	4 mrem
Tc-99	900	pCi/L	4 mrem
Te-125m	600	pCi/L	4 mrem
Th-229	15	pCi/L	MCL
Th-230	15	pCi/L	MCL
Th-232	15	pCi/L	MCL
Tracer	1.00E+30	NA	NA
U	30	ug/L	MCL
U-232	15	pCi/L	MCL
U-233	15	pCi/L	MCL
U-234	15	pCi/L	MCL
U-235	15	pCi/L	MCL
U-236	15	pCi/L	MCL
U-238	10.09	pCi/L	30 ug/L
Y-90	60	pCi/L	4 mrem
Zn	5000	ug/L	MCL
Zr-93	2000	pCi/L	4 mrem

Key:
Limiting concentration from

25 mrem = **Table 19**
30 ug/L = **Table 18**
4 mrem = **Table 17**
MCL = **Table 16**

3.2 COVER SYSTEM DEGRADATION

The facility cover system initially reduces infiltration to a very low level (estimated to be 0.00042 in/yr as noted earlier). The cap will degrade over time, primarily through (Jones and Phifer, 2008, Table 33)

- vegetative succession from bahia grass to pine forest
- erosion of soil above the erosion barrier
- root penetration of the erosion barrier, lateral drainage, HDPE geomembrane and GCL layers
- antioxidant depletion, thermal oxidation, and tensile stress cracking of the HDPE geomembrane
- exposure of the GCL to divalent cations

Table 21 lists the infiltration rate predicted to flow past the cap GCL over time (Jones and Phifer, 2008, Table 1). The cap infiltration rate is viewed as a surface attribute and used as a boundary condition for vadose zone modeling described subsequently.

The Lower Drainage Layer of the SDF cover system is a 2 ft thick sand layer residing on the top of each vault and disposal cell roof, and extending approximately 25 ft past the roof edge. As fines infiltrate the cap system, this sand layer becomes increasingly plugged with silt, degrading its hydraulic properties. Jones and Phifer (2008, Table 49) estimated sand drain properties through 10,000 years.

Table 22 is an extension of these calculations to the point of complete infilling with silt, predicted to occur at approximately 19,000 years.

Table 21. Projected infiltration through SDF cover system (WSRC-STI-2008-00244).

Elapsed time (yr)	Infiltration (in/yr)
0	0.00042
100	0.00333
180	0.04520
220	0.05676
300	0.17110
380	0.47236
460	0.72342
560	1.0211
1,000	2.2638
1,800	4.340
3,200	6.795
5,412	10.6
5,600	10.6
10000	10.6

Table 22. SDF Lower Drainage Layer hydraulic properties (extension of WSRC-STI-2008-00244).

Year After Cap Construction	Hydraulic Conductivity (cm/s)	Porosity (vol/vol)	Field Capacity (vol/vol)	Wilting Point (vol/vol)
0	5.000E-02	0.417	0.045	0.018
100	5.000E-02	0.416999928	0.045000222	0.018000175
180	5.000E-02	0.416999184	0.045002522	0.018001986
220	5.000E-02	0.416998402	0.045004937	0.018003888
300	5.000E-02	0.416994907	0.045015734	0.01801239
380	4.999E-02	0.416985039	0.045046224	0.018036398
460	4.998E-02	0.416966699	0.045102884	0.018081015
560	4.995E-02	0.416933255	0.045206212	0.01816238
1000	4.974E-02	0.416656166	0.046062294	0.018836492
1800	4.899E-02	0.415643353	0.04919143	0.021300498
3200	4.676E-02	0.412654785	0.05842477	0.028571196
5412	4.126E-02	0.405278213	0.081215073	0.046517183
5600	4.069E-02	0.404514133	0.083575738	0.048376064
10000	2.736E-02	0.386631414	0.138825332	0.091881783
13500	1.675E-02	0.372406524	0.182773872	0.126488605
16500	7.657E-03	0.360213762	0.22044405	0.156151595
18000	3.111E-03	0.35411738	0.239279139	0.17098309
18800	6.867E-04	0.350865977	0.24932452	0.178893221
19013	4.100E-05	0.35	0.252	0.181

3.3 DIFFERENTIAL SETTLEMENT

Differential settlement of the ground beneath Saltstone vaults has the potential to create large cracks or fissures in the structures. Static settlement occurs from consolidation of soil/sediment layers in response to the loading created by initial vault placement. Dynamic settlement may occur in response to earthquakes. If either settlement is sufficiently uneven (differential) and spatially distributed in certain ways, then fissures can form or gaps open between dissimilar materials, depending on vault design and material properties. Peregoy (2003) analyzed the structural response of Vault 4 to static settlement, and PC-3 and PC-4 magnitude seismic events. The statistical (Monte Carlo) analysis suggests that up to a few transverse cracks at construction joints may occur over a 10,000 year period of performance. A scoping analysis of an early Vault 2 design suggests that thru-cracks will not form, and those that do form will be limited in extent and aperture (Peregoy 2005).

3.4 HDPE/GCL LINER DEGRADATION

In the Vault 2 disposal cell design, HDPE lines the outside of the wall and a composite HDPE/GCL liner covers the roof and floor area. Phifer (2005a) assessed the long-term performance of HDPE as a Saltstone vault liner, considering a variety of degradation mechanisms: ultraviolet (UV) light, chemical, antioxidant depletion, thermal oxidation, high energy irradiation, tensile stress cracking, and biological means. The resulting physical degradation was categorized as breaks through the HDPE in the form of 2.5 mm^2 pinholes, 50 mm^2 holes, 5000 mm^2 tears, 10 mm^2 small cracks, and 1000 mm^2 large cracks. Over the lifespan of the liner, total hole area is dominated by large cracks. The large cracks are equivalent to in area to 35.7 mm (1.4 in) diameter circular hole. Jones and Phifer (2008, Section 8.2) recommended applying the methods of Phifer (2005a) to the current Saltstone PA effort, and summarize the cumulative area on HDPE holes over time. The authors also recommend conservatively degrading the GCL component of the composite liner from 5.e-9 cm/s to 1.e-7 cm/s after 100 years, due to exposure to divalent cation (Ca^{+2}) exposure.

Table 23 shows calculations that estimate degradation of hydraulic conductivity and effective diffusion coefficient for the HDPE and HDPE/GCL liners. Columns (1) through (7) follow Jones and Phifer (2008) and Phifer (2005a) using different points in time. Hydraulic conductivity and effective diffusion coefficient are taken from the materials palette, Table 13. Holes in the thin HDPE are assumed to be filled with soil with properties similar to backfill (K = 7.5e-6 cm/s, De = 1.e-5 cm^2/s), rather than being open (completely fluid filled). Arithmetic averaging is chosen to estimate the effective properties of degraded HDPE (columns (12) and (21)) for flow and transport perpendicular to the liner. Within the plane of the liner, HDPE is assumed to remain practically impervious to flow and transport.

For the composite HDPE/GCL liner, the averaging approach chosen is illustrated in Figure 16. In Method A, arithmetic averaging is used to compute a single, effective, value for the degraded HDPE material. Then, harmonic averaging is used to compute the effective composite for the combined HDPE/GCL materials. Method A implicitly assumes that holes have a wide influence, well beyond their footprint. In Method B, the order is reversed. Harmonic averaging is applied to intact HDPE in contact with GCL, and soil filled holes in contact with GCL. Then arithmetic averaging is applied to these intermediate values to arrive at an effective HDPE/GCL value. Method B implicitly assumes that the influence of holes is confined to just the area of the holes. Reality is expected to lie between Methods A and B. Thus, the results of Method A and B are blended using geometric averaging to achieve the final composite HDPE/GCL values shown in columns (18) and (27) of Table 23.

The HDPE and HDPE/GCL liners are observed to degrade quickly in comparison to a 10,000 year period of performance, on the order of several hundred years.

Table 23. HDPE and HDPE/GCL liner degradation calculations.

Based on WSRC-TR-2005-00101

										1	7.6E-05															
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)	(26)	(27)
Stage	Year	Total Stage Hole Size (mm^2/ hectare)	Total Cumulative Hole Size (mm^2/ hectare)	Hole density (no./ hectare)	Spacing (m)	Fraction of HDPE membrane with Holes	thickness HDPE (mil)	thickness GCL (mil)	Ksat HDPE (cm/s)	Ksat hole (cm/s)	Ksat Eff HDPE (cm/s)	Ksat GCL (cm/s)	Ksat Liner (cm/s)	Ksat HDPE GCL (cm/s)	Ksat hole GCL (cm/s)	Ksat Liner (cm/s)	Ksat Liner (cm/s)	Diff HDPE (cm^2/s)	Diff hole (cm^2/s)	Diff Effective (cm^2/s)	Diff GCL (cm^2/s)	Diff Liner (cm^2/s)	Diff HDPE GCL (cm^2/s)	Diff hole GCL (cm^2/s)	Diff Liner (cm^2/s)	Diff Liner (cm^2/s)
1	0	550	550	1	135	5.50E-08	100	200	2.0E-13	7.6E-05	4.38E-12	5.0E-09	1.31E-11	6.00E-13	7.50E-09	6.00E-13	2.81E-12	4.0E-11	1.0E-05	4.05E-11	5.0E-06	1.22E-10	1.20E-10	6.00E-06	1.20E-10	1.21E-10
2	2	0	550	1	135	5.50E-08					4.38E-12	5.0E-09	1.31E-11	6.00E-13	7.50E-09	6.00E-13	2.81E-12			4.05E-11	5.0E-06	1.22E-10	1.20E-10	6.00E-06	1.20E-10	1.21E-10
3	10	0	550	1	135	5.50E-08					4.38E-12	5.0E-09	1.31E-11	6.00E-13	7.50E-09	6.00E-13	2.81E-12			4.05E-11	5.0E-06	1.22E-10	1.20E-10	6.00E-06	1.20E-10	1.21E-10
4	90	35,750	36300	36	16.6	3.63E-06					2.76E-10	5.0E-09	7.46E-10	6.00E-13	7.50E-09	6.27E-13	2.16E-11			7.63E-11	5.0E-06	2.29E-10	1.20E-10	6.00E-06	1.42E-10	1.80E-10
5	140	51,000	87300	87	10.7	8.73E-06					6.64E-10	1.0E-07	1.96E-09	6.00E-13	1.50E-07	1.91E-12	6.12E-11			1.27E-10	5.0E-06	3.82E-10	1.20E-10	6.00E-06	1.72E-10	2.57E-10
6	150	8,730	96,030	96	10.20	9.60E-06					7.30E-10	1.0E-07	2.16E-09	6.00E-13	1.50E-07	2.04E-12	6.64E-11			1.36E-10	5.0E-06	4.08E-10	1.20E-10	6.00E-06	1.78E-10	2.69E-10
6	200	52,380	139,680	140	8.46	1.40E-05					1.06E-09	1.0E-07	3.12E-09	6.00E-13	1.50E-07	2.69E-12	9.17E-11			1.80E-10	5.0E-06	5.39E-10	1.20E-10	6.00E-06	2.04E-10	3.31E-10
6	250	96,030	183,330	183	7.39	1.83E-05					1.39E-09	1.0E-07	4.07E-09	6.00E-13	1.50E-07	3.35E-12	1.17E-10			2.23E-10	5.0E-06	6.70E-10	1.20E-10	6.00E-06	2.30E-10	3.93E-10
6	300	139,680	226,980	227	6.64	2.27E-05					1.73E-09	1.0E-07	5.00E-09	6.00E-13	1.50E-07	4.00E-12	1.42E-10			2.67E-10	5.0E-06	8.01E-10	1.20E-10	6.00E-06	2.56E-10	4.53E-10
6	350	183,330	270,630	271	6.08	2.71E-05					2.06E-09	1.0E-07	5.93E-09	6.00E-13	1.50E-07	4.66E-12	1.66E-10			3.11E-10	5.0E-06	9.32E-10	1.20E-10	6.00E-06	2.82E-10	5.13E-10
6	400	226,980	314,280	314	5.64	3.14E-05					2.39E-09	1.0E-07	6.84E-09	6.00E-13	1.50E-07	5.31E-12	1.91E-10			3.54E-10	5.0E-06	1.06E-09	1.20E-10	6.00E-06	3.09E-10	5.73E-10
6	450	270,630	357,930	358	5.29	3.58E-05					2.72E-09	1.0E-07	7.74E-09	6.00E-13	1.50E-07	5.97E-12	2.15E-10			3.98E-10	5.0E-06	1.19E-09	1.20E-10	6.00E-06	3.35E-10	6.32E-10
6	500	314,280	401,580	402	4.99	4.02E-05					3.05E-09	1.0E-07	8.63E-09	6.00E-13	1.50E-07	6.62E-12	2.39E-10			4.42E-10	5.0E-06	1.32E-09	1.20E-10	6.00E-06	3.61E-10	6.91E-10
6	600	401,580	488,880	489	4.52	4.89E-05					3.72E-09	1.0E-07	1.04E-08	6.00E-13	1.50E-07	7.93E-12	2.87E-10			5.29E-10	5.0E-06	1.59E-09	1.20E-10	6.00E-06	4.13E-10	8.10E-10
6	700	488,880	576,180	576	4.17	5.76E-05					4.38E-09	1.0E-07	1.21E-08	6.00E-13	1.50E-07	9.24E-12	3.34E-10			6.16E-10	5.0E-06	1.85E-09	1.20E-10	6.00E-06	4.66E-10	9.28E-10
6	800	576,180	663,480	663	3.88	6.63E-05					5.04E-09	1.0E-07	1.37E-08	6.00E-13	1.50E-07	1.05E-11	3.81E-10			7.03E-10	5.0E-06	2.11E-09	1.20E-10	6.00E-06	5.18E-10	1.05E-09
6	900	663,480	750,780	751	3.65	7.51E-05					5.71E-09	1.0E-07	1.54E-08	6.00E-13	1.50E-07	1.19E-11	4.27E-10			7.91E-10	5.0E-06	2.37E-09	1.20E-10	6.00E-06	5.70E-10	1.16E-09
6	1,000	750,780	838,080	838	3.45	8.38E-05					6.37E-09	1.0E-07	1.69E-08	6.00E-13	1.50E-07	1.32E-11	4.72E-10			8.78E-10	5.0E-06	2.63E-09	1.20E-10	6.00E-06	6.23E-10	1.28E-09
6	1,200	925,380	1,012,680	1013	3.14	1.01E-04					7.70E-09	1.0E-07	2.00E-08	6.00E-13	1.50E-07	1.58E-11	5.62E-10			1.05E-09	5.0E-06	3.16E-09	1.20E-10	6.00E-06	7.28E-10	1.52E-09
6	1,400	1,099,980	1,187,280	1187	2.90	1.19E-04					9.02E-09	1.0E-07	2.29E-08	6.00E-13	1.50E-07	1.84E-11	6.50E-10			1.23E-09	5.0E-06	3.68E-09	1.20E-10	6.00E-06	8.32E-10	1.75E-09
6	1,600	1,274,580	1,361,880	1362	2.71	1.36E-04					1.04E-08	1.0E-07	2.57E-08	6.00E-13	1.50E-07	2.10E-11	7.35E-10			1.40E-09	5.0E-06	4.20E-09	1.20E-10	6.00E-06	9.37E-10	1.98E-09
6	1,800	1,449,180	1,536,480	1536	2.55	1.54E-04					1.17E-08	1.0E-07	2.84E-08	6.00E-13	1.50E-07	2.36E-11	8.19E-10			1.58E-09	5.0E-06	4.73E-09	1.20E-10	6.00E-06	1.04E-09	2.22E-09
6	2,000	1,623,780	1,711,080	1711	2.42	1.71E-04					1.30E-08	1.0E-07	3.10E-08	6.00E-13	1.50E-07	2.62E-11	9.01E-10			1.75E-09	5.0E-06	5.25E-09	1.20E-10	6.00E-06	1.15E-09	2.45E-09
6	2,300	1,885,680	1,972,980	1973	2.25	1.97E-04					1.50E-08	1.0E-07	3.46E-08	6.00E-13	1.50E-07	3.02E-11	1.02E-09			2.01E-09	5.0E-06	6.03E-09	1.20E-10	6.00E-06	1.30E-09	2.80E-09
6	2,600	2,147,580	2,234,880	2235	2.12	2.23E-04					1.70E-08	1.0E-07	3.80E-08	6.00E-13	1.50E-07	3.41E-11	1.14E-09			2.27E-09	5.0E-06	6.82E-09	1.20E-10	6.00E-06	1.46E-09	3.16E-09
6	2,900	2,409,480	2,496,780	2497	2.00	2.50E-04					1.90E-08	1.0E-07	4.13E-08	6.00E-13	1.50E-07	3.80E-11	1.25E-09			2.54E-09	5.0E-06	7.60E-09	1.20E-10	6.00E-06	1.62E-09	3.51E-09
6	3,200	2,671,380	2,758,680	2759	1.90	2.76E-04					2.10E-08	1.0E-07	4.43E-08	6.00E-13	1.50E-07	4.20E-11	1.36E-09			2.80E-09	5.0E-06	8.39E-09	1.20E-10	6.00E-06	1.78E-09	3.86E-09
6	3,600	3,020,580	3,107,880	3108	1.79	3.11E-04					2.36E-08	1.0E-07	4.81E-08	6.00E-13	1.50E-07	4.72E-11	1.51E-09			3.15E-09	5.0E-06	9.43E-09	1.20E-10	6.00E-06	1.98E-09	4.33E-09
6	4,000	3,369,780	3,457,080	3457	1.70	3.46E-04					2.63E-08	1.0E-07	5.17E-08	6.00E-13	1.50E-07	5.24E-11	1.65E-09			3.50E-09	5.0E-06	1.05E-08	1.20E-10	6.00E-06	2.19E-09	4.79E-09
6	4,500	3,806,280	3,893,580	3894	1.60	3.89E-04					2.96E-08	1.0E-07	5.58E-08	6.00E-13	1.50E-07	5.90E-11	1.81E-09			3.93E-09	5.0E-06	1.18E-08	1.20E-10	6.00E-06	2.46E-09	5.38E-09
6	5,000	4,242,780	4,330,080	4330	1.52	4.33E-04					3.29E-08	1.0E-07	5.95E-08	6.00E-13	1.50E-07	6.55E-11	1.97E-09			4.37E-09	5.0E-06	1.31E-08	1.20E-10	6.00E-06	2.72E-09	5.96E-09
6	5,500	4,679,280	4,766,580	4767	1.45	4.77E-04					3.62E-08	1.0E-07	6.30E-08	6.00E-13	1.50E-07	7.21E-11	2.13E-09			4.81E-09	5.0E-06	1.44E-08	1.20E-10	6.00E-06	2.98E-09	6.55E-09
6	6,000	5,115,780	5,203,080	5203	1.39	5.20E-04					3.95E-08	1.0E-07	6.62E-08	6.00E-13	1.50E-07	7.86E-11	2.28E-09			5.24E-09	5.0E-06	1.57E-08	1.20E-10	6.00E-06	3.24E-09	7.13E-09
6	6,500	5,552,280	5,639,580	5640	1.33	5.64E-04					4.29E-08	1.0E-07	6.92E-08	6.00E-13	1.50E-07	8.51E-11	2.43E-09			5.68E-09	5.0E-06	1.70E-08	1.20E-10	6.00E-06	3.50E-09	7.72E-09
6	7,000	5,988,780	6,076,080	6076	1.28	6.08E-04					4.62E-08	1.0E-07	7.20E-08	6.00E-13	1.50E-07	9.17E-11	2.57E-09			6.12E-09	5.0E-06	1.83E-08	1.20E-10	6.00E-06	3.77E-09	8.30E-09
6	7,500	6,425,280	6,512,580	6513	1.24	6.51E-04					4.95E-08	1.0E-07	7.46E-08	6.00E-13	1.50E-07	9.82E-11	2.71E-09			6.55E-09	5.0E-06	1.96E-08	1.20E-10	6.00E-06	4.03E-09	8.89E-09
6	8,000	6,861,780	6,949,080	6949	1.20	6.95E-04					5.28E-08	1.0E-07	7.71E-08	6.00E-13	1.50E-07	1.05E-10	2.84E-09			6.99E-09	5.0E-06	2.09E-08	1.20E-10	6.00E-06	4.29E-09	9.47E-09
6	8,500	7,298,280	7,385,580	7386	1.16	7.39E-04					5.61E-08	1.0E-07	7.93E-08	6.00E-13	1.50E-07	1.11E-10	2.97E-09			7.43E-09	5.0E-06	2.22E-08	1.20E-10	6.00E-06	4.55E-09	1.01E-08
6	9,000	7,734,780	7,822,080	7822	1.13	7.82E-04					5.94E-08	1.0E-07	8.15E-08	6.00E-13	1.50E-07	1.18E-10	3.10E-09			7.86E-09	5.0E-06	2.35E-08	1.20E-10	6.00E-06	4.81E-09	1.06E-08
6	9,500	8,171,280	8,258,580	8259	1.10	8.26E-04					6.28E-08	1.0E-07	8.35E-08	6.00E-13	1.50E-07	1.24E-10	3.22E-09			8.30E-09	5.0E-06	2.48E-08	1.20E-10	6.00E-06	5.08E-09	1.12E-08
6	10,000	8,607,780	8,695,080	8695	1.07	8.70E-04					6.61E-08	1.0E-07	8.54E-08	6.00E-13	1.50E-07	1.31E-10	3.34E-09			8.74E-09	5.0E-06	2.61E-08	1.20E-10	6.00E-06	5.34E-09	1.18E-08
6	20,000	17,337,780	17,425,080	17425	0.76	1.74E-03					1.32E-07	1.0E-07	1.09E-07	6.00E-13	1.50E-07	2.62E-10	5.34E-09			1.75E-08	5.0E-06	5.20E-08	1.20E-10	6.00E-06	1.06E-08	2.35E-08
6	30,000	26,067,780	26,155,080	26155	0.62	2.62E-03					1.99E-07	1.0E-07	1.20E-07	6.00E-13	1.50E-07	3.93E-10	6.86E-09			2.62E-08	5.0E-06	7.78E-08	1.20E-10	6.00E-06	1.58E-08	3.51E-08
6	40,000	34,797,780	34,885,080	34885	0.54	3.49E-03					2.65E-07	1.0E-07	1.26E-07	6.00E-13	1.50E-07	5.24E-10	8.13E-09			3.49E-08	5.0E-06	1.03E-07	1.20E-10	6.00E-06	2.11E-08	4.66E-08
6	50,000	43,527,780	43,615,080	43615	0.48	4.36E-03					3.31E-07	1.0E-07	1.30E-07	6.00E-13	1.50E-07	6.54E-10	9.24E-09			4.37E-08	5.0E-06	1.29E-07	1.20E-10	6.00E-06	2.63E-08	5.82E-08
6	100,000	87,177,780	87,265,080	87265	0.34	8.73E-03					6.63E-07	1.0E-07	1.39E-07	6.00E-13	1.50E-07	1.31E-09	1.35E-08			8.73E-08	5.0E-06	2.53E-07	1.20E-10	6.00E-06	5.25E-08	1.15E-07
6	1,000,000	872,877,780	872,965,080	872965	0.11	8.73E-02					6.63E-06	1.0E-07	1.49E-07	6.00E-13	1.50E-07	1.31E-08	4.41E-08			8.73E-07	5.0E-06	1.94E-06	1.20E-10	6.00E-06	5.24E-07	1.01E-06

Table 23 continued

Column notes		
(8)	page 30 of WSRC-TR-2005-00101	
(9)	page 30 of WSRC-TR-2005-00101	
(10)	page 8 of WSRC-TR-2005-00101	
(11)	see separate worksheet	
(12)	arithmetic mean of HDPE hole and intact area	METHOD A
(13)	GCL from Bill Jones draft report (start transition at 90 years, finish by 140)	
(14)	harmonic mean of HDPE and GCL	
(15)	harmonic mean of HDPE intact and GCL	METHOD B
(16)	harmonic mean of HDPE hole and GCL	
(17)	arithmetic mean of intact and hole composites	
(18)	geometric mean of Method A and Method B	BLEND
(19)	Rowe et al. (1995) (chloride diffusion through 80-mil HDPE)	
(20)	approximate with gravel value from page 125 of WSRC-STI-2006-00198	
(21)	arithmetic mean of HDPE hole and intact area	METHOD A
(22)	approximate value of generic fine-grained unconsolidated porous medium from page 140 of WSRC-STI-2006-00198	
(23)	harmonic mean of HDPE and GCL	
(24)	harmonic mean of HDPE intact and GCL	METHOD B
(25)	harmonic mean of HDPE hole and GCL	
(26)	arithmetic mean of intact and hole composites	
(27)	geometric mean of Method A and Method B	BLEND

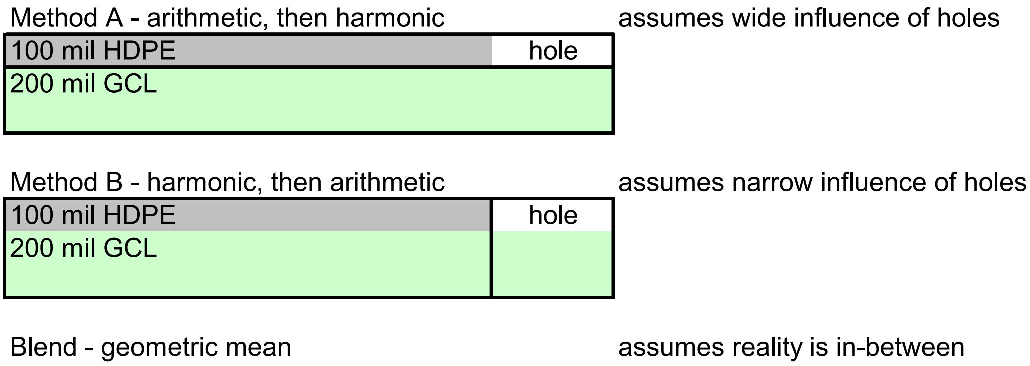


Figure 16. Averaging approach for estimating the effective properties of the composite HDPE/GCL liner.

3.5 CONCRETE DEGRADATION

The dominant mechanism for physical damage to Saltstone vault concrete is believed to be external sulfate attack. Sulfate is present in Saltstone feedwater and, after grout curing, remains at significant concentrations in pore water. Sulfate reaction with cement paste creates ettringite, an expansive mineral phase often associated with spalling or cracking. Estimates of degradation to vault hydraulic conductivity and diffusion coefficient from sulfate attack are needed for SDF performance assessment under a variety of scenarios and conditions.

Under subcontract to SRNL, SIMCO Technologies Inc. used their proprietary STADIUM code to simulate ettringite formation in Vaults 1/4 and 2 concretes under specific conditions. In the development that follows, the STADIUM results are cast into a closed-form approximation and extended to more general conditions. Degradation of hydraulic properties is then estimated assuming concrete ahead of the ettringite front retains its initial properties while concrete behind the front is cracked or otherwise degraded.

STADIUM simulations: SIMCO used the STADIUM code to simulate the advance of an ettringite front through surrogate vault concretes representing a 20 cm (8") Vault 2 wall thickness and a 46 cm (18") Vaults 1 and 4 wall thickness (SIMCO 2008). In the model simulations extending over 10,000 years, one side of the concrete was exposed to a Saltstone leachate simulant while the other boundary contacted vadose zone soil at 100% relative humidity. Three compositions were considered, corresponding to high, medium, and low sulfate concentration: 0.2, 0.02, and 0.002 mol/L SO_4^{2-}. Figure 17, reproduced from SIMCO (2008), summarizes the STADIUM results. The "Slag" concrete is the Vaults 1/4 surrogate and "Ternary" concrete refers to the Vault 2 simulation. Further information on the SIMCO work is provided by Langton (2008).

Correlations: Figure 18 illustrates a generic moving front that consumes reactants that are delivered to the front through quasi-steady diffusion. The latter implies that the timescale of diffusion is much shorter than the timescale of the moving front, which is expected for sulfate attack. As the front advances, the diffusion length increases, slowing reactant delivery and further advance of the front. A differential equation describing the movement of the front is

$$R\frac{dx}{dt} = \frac{nD_e c}{x} \tag{1}$$

where x is front position (e.g. cm), t is time (s), R is a reaction capacity (mol/cm), n is porosity, De is effective diffusion coefficient (cm^2/s), and c is a fixed aqueous concentration of reactant at x = 0 (mol/cm^3). The analytic solution to Equation (1) is

$$x = \left[\frac{2nD_e ct}{R}\right]^{1/2} \tag{2}$$

Thus we can anticipate a square root dependence on porosity, diffusion coefficient, exposure concentration, and time in STADIUM results, if the conceptual model depicted in Figure 18 is approximately correct.

For a given vault and leachate exposure scenario, the position of the ettringite front as predicted by STADIUM is indeed proportional to the square root of time, as shown by the linear correlations in Figure 19 and Figure 20, which plot x against $\sqrt{t}$. The leading coefficient or proportionality factor indicated in the plots varies with sulfate concentration in a non-linear manner. A power-law function of sulfate concentration fits the proportionality factor data with adequate agreement, as shown in Figure 21 and Figure 22. The power-law relationship appears as a straight-line when plotted in log-log coordinates.

Combining the correlations in Figure 19 through Figure 22 produces an equation for front position (x) as a function of time (t) and sulfate concentration (c) of the form

$$x = Ac^B\sqrt{t} \tag{3}$$

where A and B are constants specific to Vaults 1/4 and 2. For Vaults 1/4 in particular,

$$A = 0.412\frac{cm}{(mol/L)^B\sqrt{yr}} \tag{4}$$

$$B = 0.380 \tag{5}$$

For Vault 2,

$$A = 0.626\frac{cm}{(mol/L)^B\sqrt{yr}} \tag{6}$$

$$B = 0.467 \tag{7}$$

Figure 23 and Figure 24 compare the semi-empirical correlations to the original STADIUM predictions for Vault 1/4 and Vault 2 respectively.

Further inspection of Equation (2) indicates that the constant B should be approximately 0.5, which can be seen by rewriting Equation (2) as

$$x = \left[\frac{2nD_e c}{R}\right]^{0.5} \sqrt{t} = Ac^{0.5}\sqrt{t} \tag{8}$$

where the factor, A, is defined as

$$A = \left[\frac{2nD_e}{R}\right]^{0.5} \tag{9}$$

The empirical values of 0.380 and 0.467 are consistent with the predicted value, and further support the conceptual model of Figure 18.

Generalizations: The STADIUM simulations assumed a nominal diffusion coefficient of ~10^{-7} cm^2/s for ionic transport. Based on Equation (2), Equation (3) can be further generalized as

$$x = Ac^B \sqrt{\frac{D_e}{D_{ref}}}\sqrt{t} \tag{10}$$

where $D_{ref} = 10^{-7}$ cm^2/s is implicitly embedded in the empirical constant A. The rate of change in front position is

$$\frac{dx}{dt} = Ac^B \sqrt{\frac{D_e}{D_{ref}}}\frac{1}{2\sqrt{t}} \tag{11}$$

Equation (10) is based on constant values of sulfate concentration and diffusion coefficient. If the front speed under changing conditions is assumed to follow Equation (11) at any instant in time

$$\frac{dx}{dt} = Ac(t)^B \sqrt{\frac{D_e(t)}{D_{ref}}}\frac{1}{2\sqrt{t}} \tag{12}$$

then the front position for varying sulfate concentration and diffusion coefficient can be computed by integrating Equation (12) as

$$x = \int_0^T Ac(t)^B \sqrt{\frac{D_e(t)}{D_{ref}}}\frac{1}{2\sqrt{t}}dt \tag{13}$$

where T is cumulative time. Equation (13) can be numerically evaluated for arbitrary variations in concentration and diffusion coefficient.

Physical degradation: The STADIUM code simulates coupled transport and chemical reaction, but does not consider damage mechanics. Thus the model does not predict whether physical damage will occur, nor consider the impact on transport properties if damage does occur. To define concrete degradation from STADIUM results, two key assumptions are made:

1) Transport properties, with respect to predicting ettringite front position, are unchanged by passage of the front.

2) The presence of ettringite coincides with physical damage to concrete, for the purpose of estimating effective transport properties for Saltstone contaminant release.

Assumption 1) would be accurate if ettringite formation does not damage the concrete, or if changes in morphology do not significantly increase transport properties for given exposure conditions. For example of the latter, spalling or cracking under unsaturated conditions may not accelerate sulfate attack, because the fractures would be dewatered with sufficient suction, and relatively inactive. On the other hand, Assumption 1) would not be accurate under saturated conditions, for which cracks/fractures typically control transport. Assumption 1) may be neutral, or non-conservative if cracking accelerates attack. Assumption 2) may be neutral, or conservative if damage does not occur.

With these key assumptions and the front position defined by Equation (13), effective transport properties can be estimated by averaging the intact and degraded regions. Using saturated hydraulic conductivity (K) as an example

$$\Delta x K_{eff}{}^{p} = \Delta x_i K_i{}^{p} + \Delta x_d K_d{}^{p} \tag{14}$$

or equivalently

$$K_{eff} = \left[\frac{\Delta x_i K_i{}^{p} + \Delta x_d K_d{}^{p}}{\Delta x} \right]^{1/p} \tag{15}$$

where $-1 \le p \le +1$ and Δx denoted thickness. The subscripts "i" and "d" refer to the intact and degraded regions ahead and behind the front respectively, and "eff" is the effective (composite) value. Arithmetic averaging corresponds to $p = 1$ and harmonic averaging is obtained with $p = -1$. The former would be used for transport parallel to the ettringite front, and the latter for transport transverse to the front.

Sulfate concentration at vault interface: The sulfate concentration indicated in Equation (13) is a pore water value at the interface between Saltstone and the vault concrete. When sulfate laden Saltstone is conceptually brought into contact with clean vault concrete (physically when a waterproof interior coating degrades), the interface concentration will equilibrate to an intermediate value (Figure 26), depending on the properties of the two porous media. The interface concentration can be estimated using analytic solutions for diffusion in semi-infinite regions.

The equations describing heat conduction and mass diffusion are mathematically identical, differing only in the symbols and terminology conventionally associated with each application. Thus analytic solutions to heat conduction problems can be readily adapted to mass diffusion. The analogy between heat and mass diffusion is evident from a comparison of governing and flux equations for a non-sorbing, non-decaying, species:

Heat Transfer (Myers, 1971)	Mass Transfer (de Marsily, 1986)	Equation
$\frac{\partial t}{\partial \theta} = \alpha \frac{\partial^2 t}{\partial x^2}$	$\frac{\partial c}{\partial t} = D \frac{\partial^2 c}{\partial x^2}$	(16a,b)
$q = -k \frac{\partial t}{\partial x}$	$f = -nD \frac{\partial c}{\partial x}$	(17a,b)
t = temperature θ = time x = length α = k/ρc = thermal diffusivity k = thermal conductivity ρc = heat capacity q = heat flux	c = concentration t = time x = length D = effective diffusion coefficient n = porosity f = mass flux	

The heat transfer equations above describe heat conduction in a homogeneous, non-porous, medium. The mass transfer equation set describes mass diffusion in a homogeneous, porous, medium. The analogy between material properties is

$$k \leftrightarrow nD$$
$$\rho c \leftrightarrow n$$
$$\alpha \leftrightarrow D$$

The heat and mass transfer analogy can be used to derive the solution to a mass transfer problem from an existing heat transfer solution.

Myers (1971, Figure 6-9) derives the interface temperature of two contacting semi-infinite materials. The contact value is a function of the initial values and properties of the two materials. Taking advantage of the analogy between heat and mass transfer produces the following results:

Heat Transfer	Mass Transfer	Equation
$t_i = \frac{t_0\sqrt{(k\rho c)_0} + t_1\sqrt{(k\rho c)_1}}{\sqrt{(k\rho c)_0} + \sqrt{(k\rho c)_1}}$ Myers (1971, eqn 6.4.37)	$c_i = \frac{c_0 n_0\sqrt{D_0} + c_1 n_1\sqrt{D_1}}{n_0\sqrt{D_0} + n_1\sqrt{D_1}}$ by analogy	(18a,b)
t_i = interface/contact temperature	c_i = interface/contact concentration	

where the subscripts distinguish the two materials. Note that the interface value is time invariant. For given concentrations, the interface value is seen to depend on the property $n\sqrt{D}$ for each material.

Over time, the assumption of diffusion in semi-infinite domains will break down, due to the finite thickness of the vault and/or advection becoming dominant, and the concentration will decline. Nonetheless, the interface concentration is assumed to be constant for the purpose of estimating concrete degradation, which is expected to be conservative.

For vault roof concrete, an interface concentration can be computed for the Saltstone and clean grout using Equation (18b). The concentration at the underside of the roof on the opposite side of the clean grout can be estimated from another analytic solution for diffusion in a semi-infinite region. For a homogeneous region with a uniform initial value (temperature or concentration) and subjected to a value of zero at the boundary surface, the corresponding heat and mass transfer solutions are

Heat Transfer	Mass Transfer	Equations
$t = t_0 \operatorname{erfc}\left(\frac{x}{2\sqrt{\alpha\theta}}\right)$ Myers (1971, eqn 6.4.29)	$c = c_0 \operatorname{erfc}\left(\frac{x}{2\sqrt{Dt}}\right)$ by analogy	value (19a,b)
$q = \frac{k t_0}{\sqrt{\pi\alpha\theta}} \exp\left(\frac{-x^2}{4\alpha\theta}\right)$ Myers (1971, cf. eqn 6.4.35)	$f = n c_0 \sqrt{\frac{D}{\pi t}} \exp\left(\frac{-x^2}{4Dt}\right)$ by analogy	flux (20a,b)

The concentration solution is of direct interest, but the flux solution is provided for completeness. Equation (19b) can be used to estimate roof exposure concentration by setting c_0 to the Saltstone/clean grout interface concentration from Equation (18b) and evaluating Equation (19b) at the thickness of the clean grout.

Effective property estimates: The effective properties of vault components (wall, floor, roof) can be estimated from vault dimensions (Section 2.2), initial/intact material property values (Section 2.6.1), assumed properties for degraded concrete, and an estimate of the sulfate concentration in Saltstone feed water. Values for selected input parameters are provided in Table 24. The properties of degraded concrete are assumed to be similar to those of backfilled soil, and thus not a barrier to contaminant release in comparison to the environment surrounding the vault. The sulfate concentration in feedwater to the SDF grout plant is estimated to be 0.1 mol/L (Dean 2009b).

Salt solution is combined with dry cementitious materials ("Saltstone pre-mix") to make Saltstone. As dry cement is hydrated, the concentration of sulfate in Saltstone pore water tends to increase compared to salt solution feed water. Malek et al. (1985) measured pore water sulfate concentration for four cement (limestone)-fly ash-slag mixes and observed little change for three mixes (Langton 1987). For Slag Mix I, which is closest to the current Saltstone Pre-Mix, sulfate concentration increased from 16,500 mg/L to 24,000 mg/L. In the 1992 Z-Area PA (Cook and Fowler 1992), sulfate pore water concentration was predicted to increase from 11,700 to 15,000 mg/L using the MINTEQ code. These values suggest that the pore water sulfate concentration might increase by as much as 1.5x compared to feedwater.

The resulting interface sulfate concentration values for Vaults 1, 2 and 4 are provided in Table 25 through Table 27. For the wall and floor, the interface is between Saltstone and vault concrete. For the roof, the contacting materials are Saltstone and the clean grout. The interface concentration between Saltstone and concrete is biased toward the Saltstone value, because of higher porosity and diffusion coefficient ($n\sqrt{D}$ product) in Saltstone. Between Saltstone and clean grout the interface concentration is at the midpoint, because the materials have the same $n\sqrt{D}$ value.

Effective conductivity and diffusion coefficient as a function of time are calculated for each vault and component (wall, floor, roof) in Table 28 through Table 36. The front position (x) is computed from the front speed (dx/dt) through numerical integration. The intact material thickness is identified as "L-x". The effective properties are computed using harmonic averaging ($p = -1$). If the vault component fails before 100k years, the time is indicated in the last column. Failure times are summarized in Table 37. The Vault 4 roof fails at approximately 10,000 years, because of its thin (4") dimension. The other vault components all fail outside the 10k year period of performance. Figure 27 through Figure 29 show the position of the ettringite front for Vaults 1, 2 and 4 respectively. Figure 30 through Figure 32 illustrate effective conductivity for each vault type.

Table 24. Selected input parameters for effective property calculations.

Property	Vault 1/4	Vault 2
SO_4^{2-} concentration in SDF feed water, c	0.1 mol/L	0.1 mol/L
Wall thickness, L	45.7 cm (18 in)	20.3 cm (8 in)
Floor thickness, L	61.0 cm (24 in)	30.5 cm (12 in)
Roof thickness, L	10.2 cm (4 in)	20.3 cm (8 in)
Wall initial conductivity, K_i	3.1e-10 cm/s	9.3e-11 cm/s
Floor initial conductivity, K_i	3.1e-10 cm/s	9.3e-11 cm/s
Roof initial conductivity, K_i	5.0e-09 cm/s	9.3e-11 cm/s
Degraded conductivity, K_d	1.0e-5 cm/s	1.0e-5 cm/s
Wall initial diffusion coefficient, D_i	5.0e-8 cm^2/s	5.0e-8 cm^2/s
Floor initial diffusion coefficient, D_i	5.0e-8 cm^2/s	5.0e-8 cm^2/s
Roof initial diffusion coefficient, D_i	1.0e-7 cm^2/s	1.0e-7 cm^2/s
Degraded diffusion coefficient, D_d	5.0e-6 cm^2/s	5.0e-6 cm^2/s

Table 25. Interface sulfate concentration calculation for Vault 1.

Vault Wall and Floor

Saltstone grout		
porosity, n	0.58	unitless
effective diffusion coefficient, D	1.0E-07	cm^2/s
$n\sqrt{D}$	1.83E-04	$cm/\sqrt{s}$
Vault concrete		
porosity, n	0.12	unitless
effective diffusion coefficient, D	5.0E-08	cm^2/s
$n\sqrt{D}$	2.68E-05	$cm/\sqrt{s}$
Sulfate concentration		
feedwater concentration	0.1	mol/L
pore water/feedwater factor	1.5	unitless
pore water concentration	**0.150**	mol/L
concrete concentration	0	mol/L
interface concentration	**0.131**	mol/L

Vault Roof

Saltstone grout		
porosity, n	0.58	unitless
effective diffusion coefficient, D	1.0E-07	cm^2/s
$n\sqrt{D}$	1.83E-04	$cm/\sqrt{s}$
Clean grout		
porosity, n	0.58	unitless
effective diffusion coefficient, D	1.0E-07	cm^2/s
$n\sqrt{D}$	1.83E-04	$cm/\sqrt{s}$
Sulfate concentration		
feedwater concentration	0.1	mol/L
pore water/feedwater factor	1.5	unitless
pore water concentration	**0.150**	mol/L
concrete concentration	0	mol/L
interface concentration	**0.075**	mol/L

Table 26. Interface sulfate concentration calculation for Vault 2.

	Vault Wall and Floor			Vault Roof	
Saltstone grout			**Saltstone grout**		
porosity, n	0.58	unitless	porosity, n	0.58	unitless
effective diffusion coefficient, D	1.0E-07	cm^2/s	effective diffusion coefficient, D	1.0E-07	cm^2/s
n√D	1.83E-04	cm/√s	n√D	1.83E-04	cm/√s
Vault concrete			**Clean grout**		
porosity, n	0.11	unitless	porosity, n	0.58	unitless
effective diffusion coefficient, D	5.0E-08	cm^2/s	effective diffusion coefficient, D	1.0E-07	cm^2/s
n√D	2.46E-05	cm/√s	n√D	1.83E-04	cm/√s
Sulfate concentration			**Sulfate concentration**		
feedwater concentration	0.1	mol/L	feedwater concentration	0.1	mol/L
pore water/feedwater factor	1.5	unitless	pore water/feedwater factor	1.5	unitless
pore water concentration	**0.150**	mol/L	pore water concentration	**0.150**	mol/L
concrete concentration	0	mol/L	concrete concentration	0	mol/L
interface concentration	**0.132**	mol/L	interface concentration	**0.075**	mol/L

Table 27. Interface sulfate concentration calculation for Vault 4.

	Vault Wall and Floor			Vault Roof	
Saltstone grout			**Saltstone grout**		
porosity, n	0.58	unitless	porosity, n	0.58	unitless
effective diffusion coefficient, D	1.0E-07	cm^2/s	effective diffusion coefficient, D	1.0E-07	cm^2/s
n√D	1.83E-04	cm/√s	n√D	1.83E-04	cm/√s
Vault concrete			**Clean grout**		
porosity, n	0.12	unitless	porosity, n	0.58	unitless
effective diffusion coefficient, D	5.0E-08	cm^2/s	effective diffusion coefficient, D	1.0E-07	cm^2/s
n√D	2.68E-05	cm/√s	n√D	1.83E-04	cm/√s
Sulfate concentration			**Sulfate concentration**		
feedwater concentration	0.1	mol/L	feedwater concentration	0.1	mol/L
pore water/feedwater factor	1.5	unitless	pore water/feedwater factor	1.5	unitless
pore water concentration	**0.150**	mol/L	pore water concentration	**0.150**	mol/L
concrete concentration	0	mol/L	concrete concentration	0	mol/L
interface concentration	**0.131**	mol/L	interface concentration	**0.075**	mol/L

Table 28. Degradation calculation for Vault 1 wall concrete.

	Vault 1 wall	
A	0.412	cm/[(mol/L)^B sqrt(yr)]
B	0.380	unitless
SO_4^{2-}	0.131	mol/L
D_{ref}	1.0E-07	cm^2/s
D_i	5.0E-08	cm^2/s
D_d	5.0E-06	cm^2/s
K_i	3.1E-10	cm/s
K_d	1.0E-05	cm/s
L	45.7	cm
	18.0	in
p	-1	unitless
factor	1.414214	

time	conc	dx/dt	x	L-x	Deff	Keff	De factor	K factor	failure time
yr	mol/L	cm/yr	cm	cm	cm^2/s	cm/s	unitless	unitless	**0**
0	0.1309		0	45.7	5.00E-08	3.10E-10	1.00E+00	1.00E+00	0
100	0.1309	6.73E-03	0.67	45.0	5.07E-08	3.15E-10	1.01E+00	1.01E+00	0
200	0.1309	4.76E-03	1.15	44.6	5.13E-08	3.18E-10	1.03E+00	1.03E+00	0
300	0.1309	3.88E-03	1.54	44.2	5.17E-08	3.21E-10	1.03E+00	1.03E+00	0
400	0.1309	3.36E-03	1.87	43.8	5.21E-08	3.23E-10	1.04E+00	1.04E+00	0
500	0.1309	3.01E-03	2.17	43.5	5.25E-08	3.25E-10	1.05E+00	1.05E+00	0
600	0.1309	2.75E-03	2.45	43.3	5.28E-08	3.28E-10	1.06E+00	1.06E+00	0
700	0.1309	2.54E-03	2.70	43.0	5.31E-08	3.29E-10	1.06E+00	1.06E+00	0
800	0.1309	2.38E-03	2.94	42.8	5.34E-08	3.31E-10	1.07E+00	1.07E+00	0
900	0.1309	2.24E-03	3.16	42.6	5.37E-08	3.33E-10	1.07E+00	1.07E+00	0
1000	0.1309	2.13E-03	3.38	42.3	5.39E-08	3.35E-10	1.08E+00	1.08E+00	0
2000	0.1309	1.50E-03	4.88	40.8	5.59E-08	3.47E-10	1.12E+00	1.12E+00	0
3000	0.1309	1.23E-03	6.11	39.6	5.76E-08	3.58E-10	1.15E+00	1.15E+00	0
4000	0.1309	1.06E-03	7.17	38.5	5.92E-08	3.68E-10	1.18E+00	1.19E+00	0
5000	0.1309	9.51E-04	8.12	37.6	6.07E-08	3.77E-10	1.21E+00	1.22E+00	0
6000	0.1309	8.68E-04	8.99	36.7	6.21E-08	3.86E-10	1.24E+00	1.24E+00	0
7000	0.1309	8.04E-04	9.80	35.9	6.35E-08	3.95E-10	1.27E+00	1.27E+00	0
8000	0.1309	7.52E-04	10.55	35.2	6.48E-08	4.03E-10	1.30E+00	1.30E+00	0
9000	0.1309	7.09E-04	11.26	34.5	6.61E-08	4.11E-10	1.32E+00	1.33E+00	0
10000	0.1309	6.73E-04	11.93	33.8	6.74E-08	4.19E-10	1.35E+00	1.35E+00	0
12000	0.1309	6.14E-04	13.16	32.6	6.99E-08	4.35E-10	1.40E+00	1.40E+00	0
14000	0.1309	5.68E-04	14.29	31.4	7.24E-08	4.51E-10	1.45E+00	1.45E+00	0
16000	0.1309	5.32E-04	15.36	30.4	7.49E-08	4.67E-10	1.50E+00	1.51E+00	0
18000	0.1309	5.01E-04	16.36	29.4	7.74E-08	4.83E-10	1.55E+00	1.56E+00	0
20000	0.1309	4.76E-04	17.31	28.4	8.00E-08	4.99E-10	1.60E+00	1.61E+00	0
25000	0.1309	4.25E-04	19.44	26.3	8.63E-08	5.39E-10	1.73E+00	1.74E+00	0
30000	0.1309	3.88E-04	21.38	24.3	9.31E-08	5.82E-10	1.86E+00	1.88E+00	0
35000	0.1309	3.60E-04	23.18	22.5	1.00E-07	6.29E-10	2.01E+00	2.03E+00	0
40000	0.1309	3.36E-04	24.86	20.9	1.08E-07	6.79E-10	2.17E+00	2.19E+00	0
45000	0.1309	3.17E-04	26.44	19.3	1.17E-07	7.35E-10	2.34E+00	2.37E+00	0
50000	0.1309	3.01E-04	27.95	17.8	1.27E-07	7.97E-10	2.53E+00	2.57E+00	0
60000	0.1309	2.75E-04	30.69	15.0	1.49E-07	9.43E-10	2.98E+00	3.04E+00	0
70000	0.1309	2.54E-04	33.24	12.5	1.78E-07	1.14E-09	3.57E+00	3.66E+00	0
80000	0.1309	2.38E-04	35.61	10.1	2.18E-07	1.40E-09	4.37E+00	4.52E+00	0
90000	0.1309	2.24E-04	37.85	7.9	2.77E-07	1.80E-09	5.55E+00	5.81E+00	0
100000	0.1309	2.13E-04	39.98	5.7	3.72E-07	2.47E-09	7.45E+00	7.97E+00	0

Table 29. Degradation calculation for Vault 1 floor concrete.

	Vault 1 floor	
A	0.412	cm/[(mol/L)^B sqrt(yr)]
B	0.380	unitless
SO_4^{2-}	0.131	mol/L
D_{ref}	1.0E-07	cm^2/s
D_i	5.0E-08	cm^2/s
D_d	5.0E-06	cm^2/s
K_i	3.1E-10	cm/s
K_d	1.0E-05	cm/s
L	61.0	cm
	24.0	in
p	-1	unitless
factor	1.414214	

time	**conc**	**dx/dt**	**x**	**L-x**	**Deff**	**Keff**	**De factor**	**K factor**	**failure time**
yr	mol/L	cm/yr	cm	cm	cm^2/s	cm/s	unitless	unitless	**0**
0	0.1309		0	61.0	5.00E-08	3.10E-10	1.00E+00	1.00E+00	0
100	0.1309	6.73E-03	0.67	60.3	5.06E-08	3.13E-10	1.01E+00	1.01E+00	0
200	0.1309	4.76E-03	1.15	59.8	5.10E-08	3.16E-10	1.02E+00	1.02E+00	0
300	0.1309	3.88E-03	1.54	59.4	5.13E-08	3.18E-10	1.03E+00	1.03E+00	0
400	0.1309	3.36E-03	1.87	59.1	5.16E-08	3.20E-10	1.03E+00	1.03E+00	0
500	0.1309	3.01E-03	2.17	58.8	5.18E-08	3.21E-10	1.04E+00	1.04E+00	0
600	0.1309	2.75E-03	2.45	58.5	5.21E-08	3.23E-10	1.04E+00	1.04E+00	0
700	0.1309	2.54E-03	2.70	58.3	5.23E-08	3.24E-10	1.05E+00	1.05E+00	0
800	0.1309	2.38E-03	2.94	58.0	5.25E-08	3.26E-10	1.05E+00	1.05E+00	0
900	0.1309	2.24E-03	3.16	57.8	5.27E-08	3.27E-10	1.05E+00	1.05E+00	0
1000	0.1309	2.13E-03	3.38	57.6	5.29E-08	3.28E-10	1.06E+00	1.06E+00	0
2000	0.1309	1.50E-03	4.88	56.1	5.43E-08	3.37E-10	1.09E+00	1.09E+00	0
3000	0.1309	1.23E-03	6.11	54.9	5.55E-08	3.45E-10	1.11E+00	1.11E+00	0
4000	0.1309	1.06E-03	7.17	53.8	5.66E-08	3.51E-10	1.13E+00	1.13E+00	0
5000	0.1309	9.51E-04	8.12	52.8	5.76E-08	3.58E-10	1.15E+00	1.15E+00	0
6000	0.1309	8.68E-04	8.99	52.0	5.85E-08	3.64E-10	1.17E+00	1.17E+00	0
7000	0.1309	8.04E-04	9.80	51.2	5.95E-08	3.69E-10	1.19E+00	1.19E+00	0
8000	0.1309	7.52E-04	10.55	50.4	6.03E-08	3.75E-10	1.21E+00	1.21E+00	0
9000	0.1309	7.09E-04	11.26	49.7	6.12E-08	3.80E-10	1.22E+00	1.23E+00	0
10000	0.1309	6.73E-04	11.93	49.0	6.20E-08	3.85E-10	1.24E+00	1.24E+00	0
12000	0.1309	6.14E-04	13.16	47.8	6.36E-08	3.95E-10	1.27E+00	1.28E+00	0
14000	0.1309	5.68E-04	14.29	46.7	6.51E-08	4.05E-10	1.30E+00	1.31E+00	0
16000	0.1309	5.32E-04	15.36	45.6	6.66E-08	4.14E-10	1.33E+00	1.34E+00	0
18000	0.1309	5.01E-04	16.36	44.6	6.81E-08	4.24E-10	1.36E+00	1.37E+00	0
20000	0.1309	4.76E-04	17.31	43.6	6.96E-08	4.33E-10	1.39E+00	1.40E+00	0
25000	0.1309	4.25E-04	19.44	41.5	7.31E-08	4.55E-10	1.46E+00	1.47E+00	0
30000	0.1309	3.88E-04	21.38	39.6	7.66E-08	4.77E-10	1.53E+00	1.54E+00	0
35000	0.1309	3.60E-04	23.18	37.8	8.02E-08	5.00E-10	1.60E+00	1.61E+00	0
40000	0.1309	3.36E-04	24.86	36.1	8.39E-08	5.23E-10	1.68E+00	1.69E+00	0
45000	0.1309	3.17E-04	26.44	34.5	8.76E-08	5.47E-10	1.75E+00	1.77E+00	0
50000	0.1309	3.01E-04	27.95	33.0	9.16E-08	5.72E-10	1.83E+00	1.85E+00	0
60000	0.1309	2.75E-04	30.69	30.3	9.97E-08	6.24E-10	1.99E+00	2.01E+00	0
70000	0.1309	2.54E-04	33.24	27.7	1.09E-07	6.82E-10	2.17E+00	2.20E+00	0
80000	0.1309	2.38E-04	35.61	25.3	1.19E-07	7.46E-10	2.37E+00	2.40E+00	0
90000	0.1309	2.24E-04	37.85	23.1	1.30E-07	8.18E-10	2.60E+00	2.64E+00	0
100000	0.1309	2.13E-04	39.98	21.0	1.43E-07	9.01E-10	2.85E+00	2.91E+00	0

Table 30. Degradation calculation for Vault 1 roof concrete.

	Vault 1 roof	
A	0.412	cm/[(mol/L)^B sqrt(yr)]
B	0.380	unitless
SO_4^{2-}	0.075	mol/L
D_{ref}	1.0E-07	cm^2/s
D_i	1.0E-07	cm^2/s
D_d	5.0E-06	cm^2/s
K_i	5.0E-09	cm/s
K_d	1.0E-05	cm/s
L	30.5	cm
	12.0	in
p	-1	unitless
factor	1.414214	

time	**conc**	**dx/dt**	**x**	**L-x**	**Deff**	**Keff**	**De factor**	**K factor**	**failure time**
yr	mol/L	cm/yr	cm	cm	cm^2/s	cm/s	unitless	unitless	**50000**
0	0		0	30.5	1.00E-07	5.00E-09	1.00E+00	1.00E+00	0
100	0.0408	6.11E-03	0.61	29.9	1.02E-07	5.10E-09	1.02E+00	1.02E+00	0
200	0.0501	4.67E-03	1.08	29.4	1.04E-07	5.18E-09	1.04E+00	1.04E+00	0
300	0.0545	3.94E-03	1.47	29.0	1.05E-07	5.25E-09	1.05E+00	1.05E+00	0
400	0.0571	3.47E-03	1.82	28.7	1.06E-07	5.32E-09	1.06E+00	1.06E+00	0
500	0.0590	3.14E-03	2.13	28.3	1.07E-07	5.38E-09	1.07E+00	1.08E+00	0
600	0.0603	2.89E-03	2.42	28.1	1.08E-07	5.43E-09	1.08E+00	1.09E+00	0
700	0.0614	2.70E-03	2.69	27.8	1.09E-07	5.48E-09	1.09E+00	1.10E+00	0
800	0.0623	2.54E-03	2.95	27.5	1.10E-07	5.53E-09	1.10E+00	1.11E+00	0
900	0.0630	2.40E-03	3.19	27.3	1.11E-07	5.58E-09	1.11E+00	1.12E+00	0
1000	0.0636	2.29E-03	3.41	27.1	1.12E-07	5.63E-09	1.12E+00	1.13E+00	0
2000	0.0669	1.65E-03	5.06	25.4	1.19E-07	6.00E-09	1.19E+00	1.20E+00	0
3000	0.0684	1.36E-03	6.42	24.1	1.26E-07	6.33E-09	1.26E+00	1.27E+00	0
4000	0.0693	1.18E-03	7.60	22.9	1.32E-07	6.66E-09	1.32E+00	1.33E+00	0
5000	0.0699	1.06E-03	8.66	21.8	1.39E-07	6.98E-09	1.39E+00	1.40E+00	0
6000	0.0703	9.70E-04	9.63	20.9	1.45E-07	7.31E-09	1.45E+00	1.46E+00	0
7000	0.0707	9.00E-04	10.53	20.0	1.51E-07	7.64E-09	1.51E+00	1.53E+00	0
8000	0.0709	8.43E-04	11.37	19.1	1.58E-07	7.97E-09	1.58E+00	1.59E+00	0
9000	0.0712	7.95E-04	12.17	18.3	1.64E-07	8.32E-09	1.64E+00	1.66E+00	0
10000	0.0714	7.55E-04	12.92	17.6	1.71E-07	8.68E-09	1.71E+00	1.74E+00	0
12000	0.0717	6.91E-04	14.30	16.2	1.85E-07	9.42E-09	1.85E+00	1.88E+00	0
14000	0.0719	6.40E-04	15.59	14.9	2.00E-07	1.02E-08	2.00E+00	2.05E+00	0
16000	0.0721	6.00E-04	16.78	13.7	2.17E-07	1.11E-08	2.17E+00	2.22E+00	0
18000	0.0723	5.66E-04	17.92	12.6	2.36E-07	1.21E-08	2.36E+00	2.42E+00	0
20000	0.0724	5.37E-04	18.99	11.5	2.57E-07	1.33E-08	2.57E+00	2.65E+00	0
25000	0.0727	4.81E-04	21.40	9.1	3.20E-07	1.68E-08	3.20E+00	3.35E+00	0
30000	0.0729	4.40E-04	23.59	6.9	4.14E-07	2.21E-08	4.14E+00	4.42E+00	0
35000	0.0731	4.07E-04	25.63	4.8	5.69E-07	3.14E-08	5.69E+00	6.27E+00	0
40000	0.0732	3.81E-04	27.54	2.9	8.73E-07	5.16E-08	8.73E+00	1.03E+01	0
45000	0.0733	3.60E-04	29.34	1.1	1.76E-06	1.32E-07	1.76E+01	2.63E+01	0
50000	0.0734	3.41E-04	30.48	0.0	5.00E-06	1.00E-05	5.00E+01	2.00E+03	50000
60000	0.0735	3.12E-04	30.48	0.0	5.00E-06	1.00E-05	5.00E+01	2.00E+03	0
70000	0.0736	2.89E-04	30.48	0.0	5.00E-06	1.00E-05	5.00E+01	2.00E+03	0
80000	0.0737	2.70E-04	30.48	0.0	5.00E-06	1.00E-05	5.00E+01	2.00E+03	0
90000	0.0738	2.55E-04	30.48	0.0	5.00E-06	1.00E-05	5.00E+01	2.00E+03	0
100000	0.0739	2.42E-04	30.48	0.0	5.00E-06	1.00E-05	5.00E+01	2.00E+03	0

Table 31. Degradation calculation for Vault 2 wall concrete.

	Vault 2 wall	
A	0.626	cm/[(mol/L)^B sqrt(yr)]
B	0.467	unitless
SO_4^{2-}	0.132	mol/L
D_{ref}	1.0E-07	cm^2/s
D_i	5.0E-08	cm^2/s
D_d	5.0E-06	cm^2/s
K_i	9.3E-11	cm/s
K_d	1.0E-05	cm/s
L	20.3	cm
	8.0	in
p	-1	unitless
factor	1.414214	

time	**conc**	**dx/dt**	**x**	**L-x**	**Deff**	**Keff**	**De factor**	**K factor**	**failure time**
yr	mol/L	cm/yr	cm	cm	cm^2/s	cm/s	unitless	unitless	**18000**
0	0.1323		0	20.3	5.00E-08	9.30E-11	1.00E+00	1.00E+00	0
100	0.1323	8.60E-03	0.86	19.5	5.22E-08	9.71E-11	1.04E+00	1.04E+00	0
200	0.1323	6.08E-03	1.47	18.9	5.39E-08	1.00E-10	1.08E+00	1.08E+00	0
300	0.1323	4.97E-03	1.97	18.4	5.53E-08	1.03E-10	1.11E+00	1.11E+00	0
400	0.1323	4.30E-03	2.40	17.9	5.66E-08	1.05E-10	1.13E+00	1.13E+00	0
500	0.1323	3.85E-03	2.78	17.5	5.78E-08	1.08E-10	1.16E+00	1.16E+00	0
600	0.1323	3.51E-03	3.13	17.2	5.90E-08	1.10E-10	1.18E+00	1.18E+00	0
700	0.1323	3.25E-03	3.46	16.9	6.01E-08	1.12E-10	1.20E+00	1.21E+00	0
800	0.1323	3.04E-03	3.76	16.6	6.12E-08	1.14E-10	1.22E+00	1.23E+00	0
900	0.1323	2.87E-03	4.05	16.3	6.23E-08	1.16E-10	1.25E+00	1.25E+00	0
1000	0.1323	2.72E-03	4.32	16.0	6.33E-08	1.18E-10	1.27E+00	1.27E+00	0
2000	0.1323	1.92E-03	6.24	14.1	7.19E-08	1.34E-10	1.44E+00	1.44E+00	0
3000	0.1323	1.57E-03	7.82	12.5	8.07E-08	1.51E-10	1.61E+00	1.63E+00	0
4000	0.1323	1.36E-03	9.18	11.1	9.04E-08	1.70E-10	1.81E+00	1.82E+00	0
5000	0.1323	1.22E-03	10.39	9.9	1.01E-07	1.90E-10	2.03E+00	2.05E+00	0
6000	0.1323	1.11E-03	11.50	8.8	1.14E-07	2.14E-10	2.28E+00	2.30E+00	0
7000	0.1323	1.03E-03	12.53	7.8	1.28E-07	2.43E-10	2.57E+00	2.61E+00	0
8000	0.1323	9.62E-04	13.49	6.8	1.46E-07	2.77E-10	2.92E+00	2.98E+00	0
9000	0.1323	9.07E-04	14.40	5.9	1.68E-07	3.19E-10	3.35E+00	3.43E+00	0
10000	0.1323	8.60E-04	15.26	5.1	1.95E-07	3.74E-10	3.90E+00	4.02E+00	0
12000	0.1323	7.86E-04	16.83	3.5	2.78E-07	5.42E-10	5.56E+00	5.83E+00	0
14000	0.1323	7.27E-04	18.29	2.0	4.59E-07	9.30E-10	9.17E+00	1.00E+01	0
16000	0.1323	6.80E-04	19.65	0.7	1.17E-06	2.81E-09	2.34E+01	3.02E+01	0
18000	0.1323	6.41E-04	20.32	0.0	5.00E-06	1.00E-05	1.00E+02	1.08E+05	18000
20000	0.1323	6.08E-04	20.32	0.0	5.00E-06	1.00E-05	1.00E+02	1.08E+05	0
25000	0.1323	5.44E-04	20.32	0.0	5.00E-06	1.00E-05	1.00E+02	1.08E+05	0
30000	0.1323	4.97E-04	20.32	0.0	5.00E-06	1.00E-05	1.00E+02	1.08E+05	0
35000	0.1323	4.60E-04	20.32	0.0	5.00E-06	1.00E-05	1.00E+02	1.08E+05	0
40000	0.1323	4.30E-04	20.32	0.0	5.00E-06	1.00E-05	1.00E+02	1.08E+05	0
45000	0.1323	4.06E-04	20.32	0.0	5.00E-06	1.00E-05	1.00E+02	1.08E+05	0
50000	0.1323	3.85E-04	20.32	0.0	5.00E-06	1.00E-05	1.00E+02	1.08E+05	0
60000	0.1323	3.51E-04	20.32	0.0	5.00E-06	1.00E-05	1.00E+02	1.08E+05	0
70000	0.1323	3.25E-04	20.32	0.0	5.00E-06	1.00E-05	1.00E+02	1.08E+05	0
80000	0.1323	3.04E-04	20.32	0.0	5.00E-06	1.00E-05	1.00E+02	1.08E+05	0
90000	0.1323	2.87E-04	20.32	0.0	5.00E-06	1.00E-05	1.00E+02	1.08E+05	0
100000	0.1323	2.72E-04	20.32	0.0	5.00E-06	1.00E-05	1.00E+02	1.08E+05	0

Table 32. Degradation calculation for Vault 2 floor concrete.

	Vault 2 floor	
A	0.626	cm/[(mol/L)^B sqrt(yr)]
B	0.467	unitless
SO_4^{2-}	0.132	mol/L
D_{ref}	1.0E-07	cm^2/s
D_i	5.0E-08	cm^2/s
D_d	5.0E-06	cm^2/s
K_i	9.3E-11	cm/s
K_d	1.0E-05	cm/s
L	30.5	cm
	12.0	in
p	-1	unitless
factor	1.414214	

time	**conc**	**dx/dt**	**x**	**L-x**	**Deff**	**Keff**	**De factor**	**K factor**	**failure time**
yr	mol/L	cm/yr	cm	cm	cm^2/s	cm/s	unitless	unitless	**40000**
0	0.1323		0	30.5	5.00E-08	9.30E-11	1.00E+00	1.00E+00	0
100	0.1323	8.60E-03	0.86	29.6	5.14E-08	9.57E-11	1.03E+00	1.03E+00	0
200	0.1323	6.08E-03	1.47	29.0	5.25E-08	9.77E-11	1.05E+00	1.05E+00	0
300	0.1323	4.97E-03	1.97	28.5	5.34E-08	9.94E-11	1.07E+00	1.07E+00	0
400	0.1323	4.30E-03	2.40	28.1	5.42E-08	1.01E-10	1.08E+00	1.09E+00	0
500	0.1323	3.85E-03	2.78	27.7	5.50E-08	1.02E-10	1.10E+00	1.10E+00	0
600	0.1323	3.51E-03	3.13	27.3	5.57E-08	1.04E-10	1.11E+00	1.11E+00	0
700	0.1323	3.25E-03	3.46	27.0	5.63E-08	1.05E-10	1.13E+00	1.13E+00	0
800	0.1323	3.04E-03	3.76	26.7	5.70E-08	1.06E-10	1.14E+00	1.14E+00	0
900	0.1323	2.87E-03	4.05	26.4	5.76E-08	1.07E-10	1.15E+00	1.15E+00	0
1000	0.1323	2.72E-03	4.32	26.2	5.82E-08	1.08E-10	1.16E+00	1.17E+00	0
2000	0.1323	1.92E-03	6.24	24.2	6.27E-08	1.17E-10	1.25E+00	1.26E+00	0
3000	0.1323	1.57E-03	7.82	22.7	6.70E-08	1.25E-10	1.34E+00	1.34E+00	0
4000	0.1323	1.36E-03	9.18	21.3	7.12E-08	1.33E-10	1.42E+00	1.43E+00	0
5000	0.1323	1.22E-03	10.39	20.1	7.55E-08	1.41E-10	1.51E+00	1.52E+00	0
6000	0.1323	1.11E-03	11.50	19.0	7.98E-08	1.49E-10	1.60E+00	1.61E+00	0
7000	0.1323	1.03E-03	12.53	17.9	8.43E-08	1.58E-10	1.69E+00	1.70E+00	0
8000	0.1323	9.62E-04	13.49	17.0	8.90E-08	1.67E-10	1.78E+00	1.79E+00	0
9000	0.1323	9.07E-04	14.40	16.1	9.39E-08	1.76E-10	1.88E+00	1.90E+00	0
10000	0.1323	8.60E-04	15.26	15.2	9.91E-08	1.86E-10	1.98E+00	2.00E+00	0
12000	0.1323	7.86E-04	16.83	13.6	1.10E-07	2.08E-10	2.21E+00	2.23E+00	0
14000	0.1323	7.27E-04	18.29	12.2	1.23E-07	2.32E-10	2.46E+00	2.50E+00	0
16000	0.1323	6.80E-04	19.65	10.8	1.38E-07	2.62E-10	2.76E+00	2.81E+00	0
18000	0.1323	6.41E-04	20.93	9.5	1.56E-07	2.97E-10	3.12E+00	3.19E+00	0
20000	0.1323	6.08E-04	22.15	8.3	1.78E-07	3.40E-10	3.56E+00	3.66E+00	0
25000	0.1323	5.44E-04	24.87	5.6	2.60E-07	5.05E-10	5.20E+00	5.43E+00	0
30000	0.1323	4.97E-04	27.35	3.1	4.48E-07	9.06E-10	8.96E+00	9.75E+00	0
35000	0.1323	4.60E-04	29.65	0.8	1.36E-06	3.42E-09	2.71E+01	3.68E+01	0
40000	0.1323	4.30E-04	30.48	0.0	5.00E-06	1.00E-05	1.00E+02	1.08E+05	40000
45000	0.1323	4.06E-04	30.48	0.0	5.00E-06	1.00E-05	1.00E+02	1.08E+05	0
50000	0.1323	3.85E-04	30.48	0.0	5.00E-06	1.00E-05	1.00E+02	1.08E+05	0
60000	0.1323	3.51E-04	30.48	0.0	5.00E-06	1.00E-05	1.00E+02	1.08E+05	0
70000	0.1323	3.25E-04	30.48	0.0	5.00E-06	1.00E-05	1.00E+02	1.08E+05	0
80000	0.1323	3.04E-04	30.48	0.0	5.00E-06	1.00E-05	1.00E+02	1.08E+05	0
90000	0.1323	2.87E-04	30.48	0.0	5.00E-06	1.00E-05	1.00E+02	1.08E+05	0
100000	0.1323	2.72E-04	30.48	0.0	5.00E-06	1.00E-05	1.00E+02	1.08E+05	0

Table 33. Degradation calculation for Vault 2 roof concrete.

	Vault 2 roof	
A	0.626	cm/[(mol/L)^B sqrt(yr)]
B	0.467	unitless
SO_4^{2-}	0.075	mol/L
D_{ref}	1.0E-07	cm^2/s
D_i	5.0E-08	cm^2/s
D_d	5.0E-06	cm^2/s
K_i	9.3E-11	cm/s
K_d	1.0E-05	cm/s
L	20.3	cm
	8.0	in
p	-1	unitless
factor	1.414214	

time	conc	dx/dt	x	L-x	Deff	Keff	De factor	K factor	failure time
yr	mol/L	cm/yr	cm	cm	cm^2/s	cm/s	unitless	unitless	**40000**
0	0		0	20.3	5.00E-08	9.30E-11	1.00E+00	1.00E+00	0
100	0.0011	9.35E-04	0.09	20.2	5.02E-08	9.34E-11	1.00E+00	1.00E+00	0
200	0.0065	1.49E-03	0.24	20.1	5.06E-08	9.41E-11	1.01E+00	1.01E+00	0
300	0.0121	1.62E-03	0.40	19.9	5.10E-08	9.49E-11	1.02E+00	1.02E+00	0
400	0.0169	1.64E-03	0.57	19.8	5.14E-08	9.57E-11	1.03E+00	1.03E+00	0
500	0.0208	1.62E-03	0.73	19.6	5.18E-08	9.65E-11	1.04E+00	1.04E+00	0
600	0.0241	1.59E-03	0.89	19.4	5.23E-08	9.73E-11	1.05E+00	1.05E+00	0
700	0.0269	1.55E-03	1.04	19.3	5.27E-08	9.80E-11	1.05E+00	1.05E+00	0
800	0.0293	1.51E-03	1.20	19.1	5.31E-08	9.88E-11	1.06E+00	1.06E+00	0
900	0.0314	1.47E-03	1.34	19.0	5.35E-08	9.96E-11	1.07E+00	1.07E+00	0
1000	0.0332	1.43E-03	1.48	18.8	5.39E-08	1.00E-10	1.08E+00	1.08E+00	0
2000	0.0440	1.15E-03	2.64	17.7	5.74E-08	1.07E-10	1.15E+00	1.15E+00	0
3000	0.0493	9.91E-04	3.63	16.7	6.07E-08	1.13E-10	1.21E+00	1.22E+00	0
4000	0.0526	8.84E-04	4.51	15.8	6.41E-08	1.20E-10	1.28E+00	1.29E+00	0
5000	0.0549	8.07E-04	5.32	15.0	6.75E-08	1.26E-10	1.35E+00	1.35E+00	0
6000	0.0566	7.47E-04	6.07	14.3	7.10E-08	1.33E-10	1.42E+00	1.43E+00	0
7000	0.0579	6.99E-04	6.76	13.6	7.46E-08	1.39E-10	1.49E+00	1.50E+00	0
8000	0.0590	6.60E-04	7.42	12.9	7.83E-08	1.47E-10	1.57E+00	1.58E+00	0
9000	0.0599	6.26E-04	8.05	12.3	8.23E-08	1.54E-10	1.65E+00	1.66E+00	0
10000	0.0606	5.98E-04	8.65	11.7	8.64E-08	1.62E-10	1.73E+00	1.74E+00	0
12000	0.0618	5.51E-04	9.75	10.6	9.52E-08	1.79E-10	1.90E+00	1.92E+00	0
14000	0.0628	5.14E-04	10.78	9.5	1.05E-07	1.98E-10	2.11E+00	2.13E+00	0
16000	0.0636	4.83E-04	11.74	8.6	1.17E-07	2.20E-10	2.34E+00	2.37E+00	0
18000	0.0642	4.58E-04	12.66	7.7	1.30E-07	2.47E-10	2.61E+00	2.65E+00	0
20000	0.0648	4.36E-04	13.53	6.8	1.47E-07	2.78E-10	2.93E+00	2.99E+00	0
25000	0.0658	3.93E-04	15.50	4.8	2.04E-07	3.92E-10	4.08E+00	4.21E+00	0
30000	0.0666	3.61E-04	17.30	3.0	3.18E-07	6.25E-10	6.36E+00	6.73E+00	0
35000	0.0673	3.35E-04	18.98	1.3	6.62E-07	1.41E-09	1.32E+01	1.51E+01	0
40000	0.0678	3.15E-04	20.32	0.0	5.00E-06	1.00E-05	1.00E+02	1.08E+05	40000
45000	0.0682	2.98E-04	20.32	0.0	5.00E-06	1.00E-05	1.00E+02	1.08E+05	0
50000	0.0685	2.83E-04	20.32	0.0	5.00E-06	1.00E-05	1.00E+02	1.08E+05	0
60000	0.0691	2.59E-04	20.32	0.0	5.00E-06	1.00E-05	1.00E+02	1.08E+05	0
70000	0.0695	2.41E-04	20.32	0.0	5.00E-06	1.00E-05	1.00E+02	1.08E+05	0
80000	0.0699	2.26E-04	20.32	0.0	5.00E-06	1.00E-05	1.00E+02	1.08E+05	0
90000	0.0702	2.13E-04	20.32	0.0	5.00E-06	1.00E-05	1.00E+02	1.08E+05	0
100000	0.0704	2.03E-04	20.32	0.0	5.00E-06	1.00E-05	1.00E+02	1.08E+05	0

Table 34. Degradation calculation for Vault 4 wall concrete.

	Vault 4 wall	
A	0.412	cm/[(mol/L)^B sqrt(yr)]
B	0.380	unitless
SO_4^{2-}	0.131	mol/L
D_{ref}	1.0E-07	cm^2/s
D_i	5.0E-08	cm^2/s
D_d	5.0E-06	cm^2/s
K_i	3.1E-10	cm/s
K_d	1.0E-05	cm/s
L	45.7	cm
	18.0	in
p	-1	unitless
factor	1.414214	

time	conc	dx/dt	x	L-x	Deff	Keff	De factor	K factor	failure time
yr	mol/L	cm/yr	cm	cm	cm^2/s	cm/s	unitless	unitless	**0**
0	0.1309		0	45.7	5.00E-08	3.10E-10	1.00E+00	1.00E+00	0
100	0.1309	6.73E-03	0.67	45.0	5.07E-08	3.15E-10	1.01E+00	1.01E+00	0
200	0.1309	4.76E-03	1.15	44.6	5.13E-08	3.18E-10	1.03E+00	1.03E+00	0
300	0.1309	3.88E-03	1.54	44.2	5.17E-08	3.21E-10	1.03E+00	1.03E+00	0
400	0.1309	3.36E-03	1.87	43.8	5.21E-08	3.23E-10	1.04E+00	1.04E+00	0
500	0.1309	3.01E-03	2.17	43.5	5.25E-08	3.25E-10	1.05E+00	1.05E+00	0
600	0.1309	2.75E-03	2.45	43.3	5.28E-08	3.28E-10	1.06E+00	1.06E+00	0
700	0.1309	2.54E-03	2.70	43.0	5.31E-08	3.29E-10	1.06E+00	1.06E+00	0
800	0.1309	2.38E-03	2.94	42.8	5.34E-08	3.31E-10	1.07E+00	1.07E+00	0
900	0.1309	2.24E-03	3.16	42.6	5.37E-08	3.33E-10	1.07E+00	1.07E+00	0
1000	0.1309	2.13E-03	3.38	42.3	5.39E-08	3.35E-10	1.08E+00	1.08E+00	0
2000	0.1309	1.50E-03	4.88	40.8	5.59E-08	3.47E-10	1.12E+00	1.12E+00	0
3000	0.1309	1.23E-03	6.11	39.6	5.76E-08	3.58E-10	1.15E+00	1.15E+00	0
4000	0.1309	1.06E-03	7.17	38.5	5.92E-08	3.68E-10	1.18E+00	1.19E+00	0
5000	0.1309	9.51E-04	8.12	37.6	6.07E-08	3.77E-10	1.21E+00	1.22E+00	0
6000	0.1309	8.68E-04	8.99	36.7	6.21E-08	3.86E-10	1.24E+00	1.24E+00	0
7000	0.1309	8.04E-04	9.80	35.9	6.35E-08	3.95E-10	1.27E+00	1.27E+00	0
8000	0.1309	7.52E-04	10.55	35.2	6.48E-08	4.03E-10	1.30E+00	1.30E+00	0
9000	0.1309	7.09E-04	11.26	34.5	6.61E-08	4.11E-10	1.32E+00	1.33E+00	0
10000	0.1309	6.73E-04	11.93	33.8	6.74E-08	4.19E-10	1.35E+00	1.35E+00	0
12000	0.1309	6.14E-04	13.16	32.6	6.99E-08	4.35E-10	1.40E+00	1.40E+00	0
14000	0.1309	5.68E-04	14.29	31.4	7.24E-08	4.51E-10	1.45E+00	1.45E+00	0
16000	0.1309	5.32E-04	15.36	30.4	7.49E-08	4.67E-10	1.50E+00	1.51E+00	0
18000	0.1309	5.01E-04	16.36	29.4	7.74E-08	4.83E-10	1.55E+00	1.56E+00	0
20000	0.1309	4.76E-04	17.31	28.4	8.00E-08	4.99E-10	1.60E+00	1.61E+00	0
25000	0.1309	4.25E-04	19.44	26.3	8.63E-08	5.39E-10	1.73E+00	1.74E+00	0
30000	0.1309	3.88E-04	21.38	24.3	9.31E-08	5.82E-10	1.86E+00	1.88E+00	0
35000	0.1309	3.60E-04	23.18	22.5	1.00E-07	6.29E-10	2.01E+00	2.03E+00	0
40000	0.1309	3.36E-04	24.86	20.9	1.08E-07	6.79E-10	2.17E+00	2.19E+00	0
45000	0.1309	3.17E-04	26.44	19.3	1.17E-07	7.35E-10	2.34E+00	2.37E+00	0
50000	0.1309	3.01E-04	27.95	17.8	1.27E-07	7.97E-10	2.53E+00	2.57E+00	0
60000	0.1309	2.75E-04	30.69	15.0	1.49E-07	9.43E-10	2.98E+00	3.04E+00	0
70000	0.1309	2.54E-04	33.24	12.5	1.78E-07	1.14E-09	3.57E+00	3.66E+00	0
80000	0.1309	2.38E-04	35.61	10.1	2.18E-07	1.40E-09	4.37E+00	4.52E+00	0
90000	0.1309	2.24E-04	37.85	7.9	2.77E-07	1.80E-09	5.55E+00	5.81E+00	0
100000	0.1309	2.13E-04	39.98	5.7	3.72E-07	2.47E-09	7.45E+00	7.97E+00	0

Table 35. Degradation calculation for Vault 4 floor concrete.

	Vault 4 floor	
A	0.412	cm/[(mol/L)^B sqrt(yr)]
B	0.380	unitless
SO_4^{2-}	0.131	mol/L
D_{ref}	1.0E-07	cm^2/s
D_i	5.0E-08	cm^2/s
D_d	5.0E-06	cm^2/s
K_i	3.1E-10	cm/s
K_d	1.0E-05	cm/s
L	61.0	cm
	24.0	in
p	-1	unitless
factor	1.414214	

time	conc	dx/dt	x	L-x	Deff	Keff	De factor	K factor	failure time
yr	mol/L	cm/yr	cm	cm	cm^2/s	cm/s	unitless	unitless	**0**
0	0.1309		0	61.0	5.00E-08	3.10E-10	1.00E+00	1.00E+00	0
100	0.1309	6.73E-03	0.67	60.3	5.06E-08	3.13E-10	1.01E+00	1.01E+00	0
200	0.1309	4.76E-03	1.15	59.8	5.10E-08	3.16E-10	1.02E+00	1.02E+00	0
300	0.1309	3.88E-03	1.54	59.4	5.13E-08	3.18E-10	1.03E+00	1.03E+00	0
400	0.1309	3.36E-03	1.87	59.1	5.16E-08	3.20E-10	1.03E+00	1.03E+00	0
500	0.1309	3.01E-03	2.17	58.8	5.18E-08	3.21E-10	1.04E+00	1.04E+00	0
600	0.1309	2.75E-03	2.45	58.5	5.21E-08	3.23E-10	1.04E+00	1.04E+00	0
700	0.1309	2.54E-03	2.70	58.3	5.23E-08	3.24E-10	1.05E+00	1.05E+00	0
800	0.1309	2.38E-03	2.94	58.0	5.25E-08	3.26E-10	1.05E+00	1.05E+00	0
900	0.1309	2.24E-03	3.16	57.8	5.27E-08	3.27E-10	1.05E+00	1.05E+00	0
1000	0.1309	2.13E-03	3.38	57.6	5.29E-08	3.28E-10	1.06E+00	1.06E+00	0
2000	0.1309	1.50E-03	4.88	56.1	5.43E-08	3.37E-10	1.09E+00	1.09E+00	0
3000	0.1309	1.23E-03	6.11	54.9	5.55E-08	3.45E-10	1.11E+00	1.11E+00	0
4000	0.1309	1.06E-03	7.17	53.8	5.66E-08	3.51E-10	1.13E+00	1.13E+00	0
5000	0.1309	9.51E-04	8.12	52.8	5.76E-08	3.58E-10	1.15E+00	1.15E+00	0
6000	0.1309	8.68E-04	8.99	52.0	5.85E-08	3.64E-10	1.17E+00	1.17E+00	0
7000	0.1309	8.04E-04	9.80	51.2	5.95E-08	3.69E-10	1.19E+00	1.19E+00	0
8000	0.1309	7.52E-04	10.55	50.4	6.03E-08	3.75E-10	1.21E+00	1.21E+00	0
9000	0.1309	7.09E-04	11.26	49.7	6.12E-08	3.80E-10	1.22E+00	1.23E+00	0
10000	0.1309	6.73E-04	11.93	49.0	6.20E-08	3.85E-10	1.24E+00	1.24E+00	0
12000	0.1309	6.14E-04	13.16	47.8	6.36E-08	3.95E-10	1.27E+00	1.28E+00	0
14000	0.1309	5.68E-04	14.29	46.7	6.51E-08	4.05E-10	1.30E+00	1.31E+00	0
16000	0.1309	5.32E-04	15.36	45.6	6.66E-08	4.14E-10	1.33E+00	1.34E+00	0
18000	0.1309	5.01E-04	16.36	44.6	6.81E-08	4.24E-10	1.36E+00	1.37E+00	0
20000	0.1309	4.76E-04	17.31	43.6	6.96E-08	4.33E-10	1.39E+00	1.40E+00	0
25000	0.1309	4.25E-04	19.44	41.5	7.31E-08	4.55E-10	1.46E+00	1.47E+00	0
30000	0.1309	3.88E-04	21.38	39.6	7.66E-08	4.77E-10	1.53E+00	1.54E+00	0
35000	0.1309	3.60E-04	23.18	37.8	8.02E-08	5.00E-10	1.60E+00	1.61E+00	0
40000	0.1309	3.36E-04	24.86	36.1	8.39E-08	5.23E-10	1.68E+00	1.69E+00	0
45000	0.1309	3.17E-04	26.44	34.5	8.76E-08	5.47E-10	1.75E+00	1.77E+00	0
50000	0.1309	3.01E-04	27.95	33.0	9.16E-08	5.72E-10	1.83E+00	1.85E+00	0
60000	0.1309	2.75E-04	30.69	30.3	9.97E-08	6.24E-10	1.99E+00	2.01E+00	0
70000	0.1309	2.54E-04	33.24	27.7	1.09E-07	6.82E-10	2.17E+00	2.20E+00	0
80000	0.1309	2.38E-04	35.61	25.3	1.19E-07	7.46E-10	2.37E+00	2.40E+00	0
90000	0.1309	2.24E-04	37.85	23.1	1.30E-07	8.18E-10	2.60E+00	2.64E+00	0
100000	0.1309	2.13E-04	39.98	21.0	1.43E-07	9.01E-10	2.85E+00	2.91E+00	0

Table 36. Degradation calculation for Vault 4 roof concrete.

	Vault 4 roof	
A	0.412	cm/[(mol/L)^B sqrt(yr)]
B	0.380	unitless
SO_4^{2-}	0.075	mol/L
D_{ref}	1.0E-07	cm^2/s
D_i	1.0E-07	cm^2/s
D_d	5.0E-06	cm^2/s
K_i	5.0E-09	cm/s
K_d	1.0E-05	cm/s
L	10.2	cm
	4.0	in
p	-1	unitless
factor	1.414214	

time	**conc**	**dx/dt**	**x**	**L-x**	**Deff**	**Keff**	**De factor**	**K factor**	**failure time**
yr	mol/L	cm/yr	cm	cm	cm^2/s	cm/s	unitless	unitless	**10000**
0	0		0	10.2	1.00E-07	5.00E-09	1.00E+00	1.00E+00	0
100	0.0011	1.57E-03	0.16	10.0	1.02E-07	5.08E-09	1.02E+00	1.02E+00	0
200	0.0065	2.14E-03	0.37	9.8	1.04E-07	5.19E-09	1.04E+00	1.04E+00	0
300	0.0121	2.22E-03	0.59	9.6	1.06E-07	5.31E-09	1.06E+00	1.06E+00	0
400	0.0169	2.18E-03	0.81	9.3	1.08E-07	5.43E-09	1.08E+00	1.09E+00	0
500	0.0208	2.12E-03	1.02	9.1	1.11E-07	5.56E-09	1.11E+00	1.11E+00	0
600	0.0241	2.04E-03	1.23	8.9	1.13E-07	5.69E-09	1.13E+00	1.14E+00	0
700	0.0269	1.97E-03	1.42	8.7	1.16E-07	5.81E-09	1.16E+00	1.16E+00	0
800	0.0293	1.90E-03	1.62	8.5	1.18E-07	5.94E-09	1.18E+00	1.19E+00	0
900	0.0314	1.84E-03	1.80	8.4	1.21E-07	6.08E-09	1.21E+00	1.22E+00	0
1000	0.0332	1.79E-03	1.98	8.2	1.24E-07	6.21E-09	1.24E+00	1.24E+00	0
2000	0.0440	1.41E-03	3.38	6.8	1.48E-07	7.50E-09	1.48E+00	1.50E+00	0
3000	0.0493	1.20E-03	4.58	5.6	1.79E-07	9.10E-09	1.79E+00	1.82E+00	0
4000	0.0526	1.06E-03	5.65	4.5	2.20E-07	1.12E-08	2.20E+00	2.25E+00	0
5000	0.0549	9.67E-04	6.61	3.5	2.76E-07	1.43E-08	2.76E+00	2.86E+00	0
6000	0.0566	8.93E-04	7.51	2.7	3.62E-07	1.91E-08	3.62E+00	3.82E+00	0
7000	0.0579	8.34E-04	8.34	1.8	5.11E-07	2.78E-08	5.11E+00	5.57E+00	0
8000	0.0590	7.85E-04	9.12	1.0	8.34E-07	4.89E-08	8.34E+00	9.77E+00	0
9000	0.0599	7.45E-04	9.87	0.3	2.08E-06	1.72E-07	2.08E+01	3.44E+01	0
10000	0.0606	7.10E-04	10.16	0.0	5.00E-06	1.00E-05	5.00E+01	2.00E+03	10000
12000	0.0618	6.53E-04	10.16	0.0	5.00E-06	1.00E-05	5.00E+01	2.00E+03	0
14000	0.0628	6.08E-04	10.16	0.0	5.00E-06	1.00E-05	5.00E+01	2.00E+03	0
16000	0.0636	5.72E-04	10.16	0.0	5.00E-06	1.00E-05	5.00E+01	2.00E+03	0
18000	0.0642	5.41E-04	10.16	0.0	5.00E-06	1.00E-05	5.00E+01	2.00E+03	0
20000	0.0648	5.15E-04	10.16	0.0	5.00E-06	1.00E-05	5.00E+01	2.00E+03	0
25000	0.0658	4.63E-04	10.16	0.0	5.00E-06	1.00E-05	5.00E+01	2.00E+03	0
30000	0.0666	4.25E-04	10.16	0.0	5.00E-06	1.00E-05	5.00E+01	2.00E+03	0
35000	0.0673	3.95E-04	10.16	0.0	5.00E-06	1.00E-05	5.00E+01	2.00E+03	0
40000	0.0678	3.70E-04	10.16	0.0	5.00E-06	1.00E-05	5.00E+01	2.00E+03	0
45000	0.0682	3.50E-04	10.16	0.0	5.00E-06	1.00E-05	5.00E+01	2.00E+03	0
50000	0.0685	3.33E-04	10.16	0.0	5.00E-06	1.00E-05	5.00E+01	2.00E+03	0
60000	0.0691	3.05E-04	10.16	0.0	5.00E-06	1.00E-05	5.00E+01	2.00E+03	0
70000	0.0695	2.83E-04	10.16	0.0	5.00E-06	1.00E-05	5.00E+01	2.00E+03	0
80000	0.0699	2.65E-04	10.16	0.0	5.00E-06	1.00E-05	5.00E+01	2.00E+03	0
90000	0.0702	2.50E-04	10.16	0.0	5.00E-06	1.00E-05	5.00E+01	2.00E+03	0
100000	0.0704	2.38E-04	10.16	0.0	5.00E-06	1.00E-05	5.00E+01	2.00E+03	0

Table 37. Vault failure times (years).

Region	Vault 1	Vault 2	Vault 4
Wall	>100k	18,000	>100k
Floor	>100k	40,000	>100k
Roof	50,000	40,000	10,000

Figure 17. Progression of the ettringite front from the saltstone leachate/concrete interface; reproduced from SIMCO (2008).

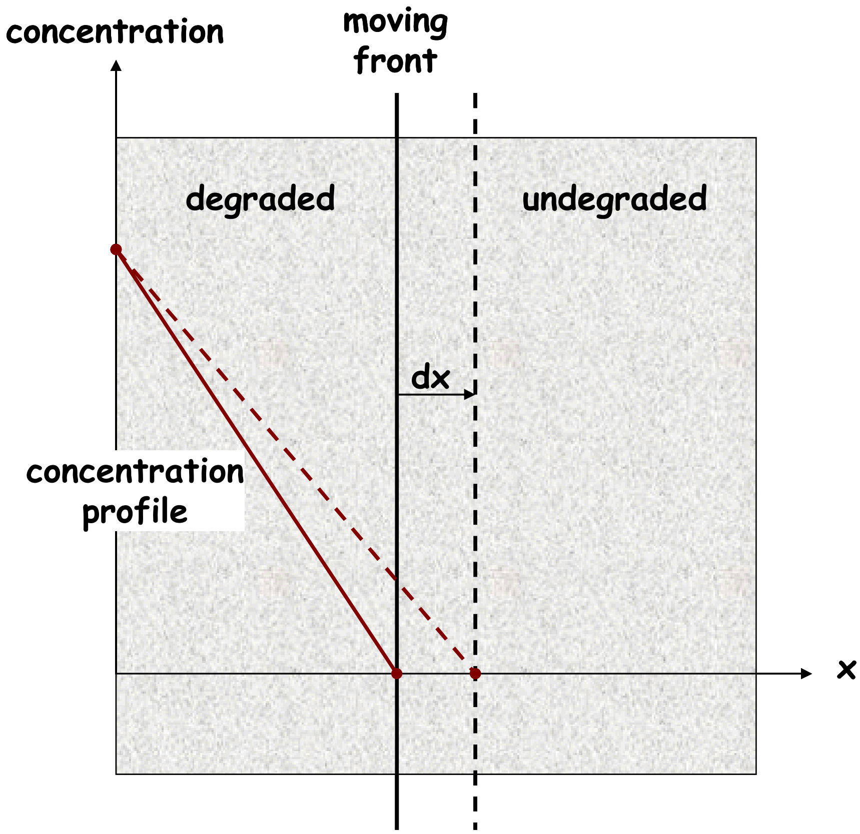


Figure 18. Generic moving front.

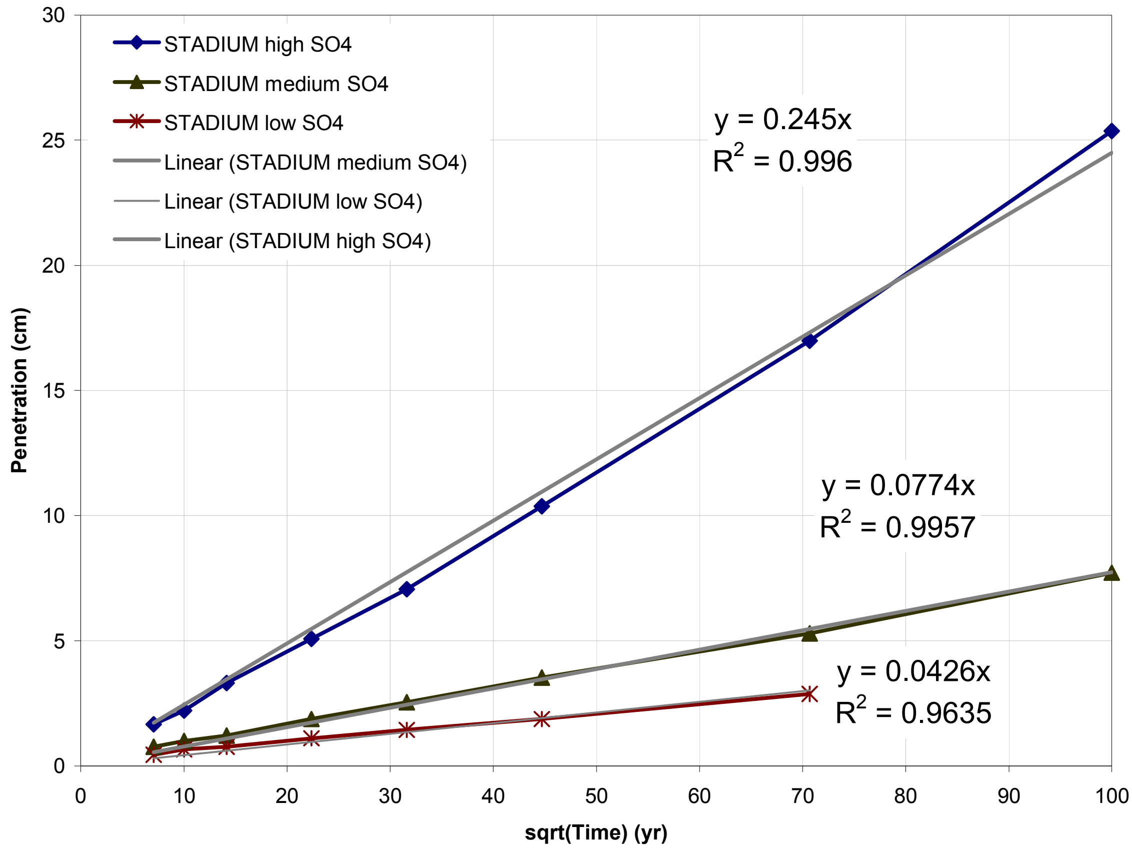


Figure 19. STADIUM simulation results for Vaults 1 and 4.

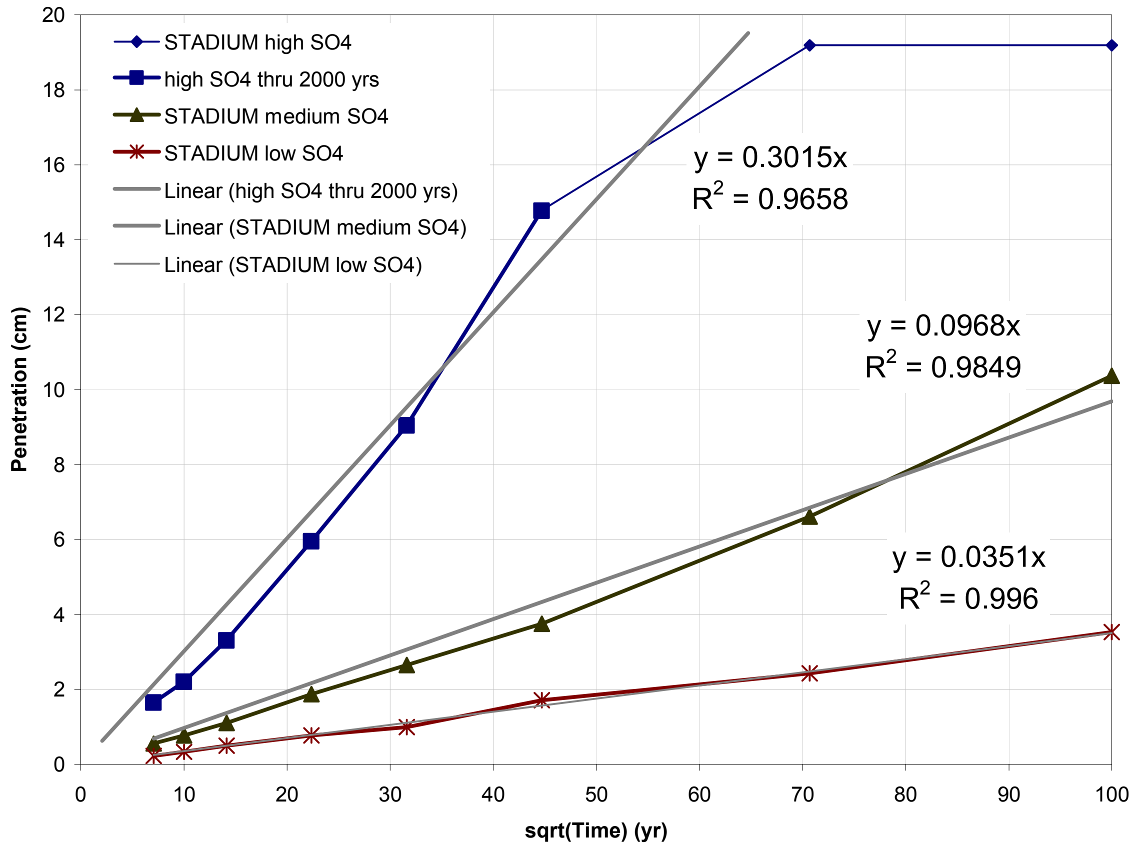


Figure 20. STADIUM simulation results for Vault 2.

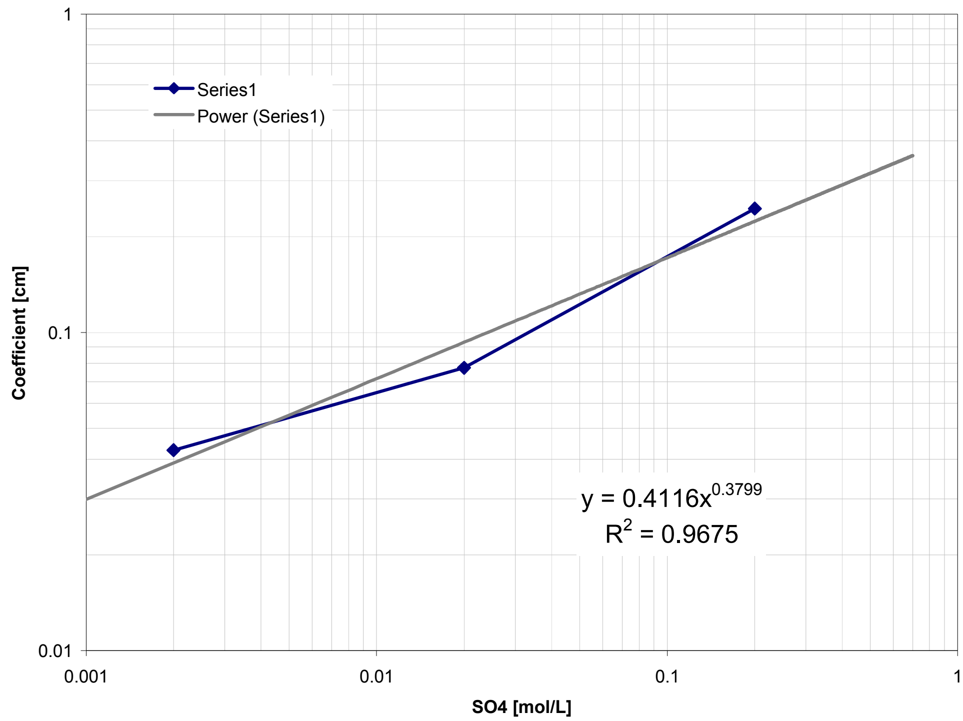


Figure 21. Power law fit to Vaults 1 and 4 proportionality data shown in Figure 19.

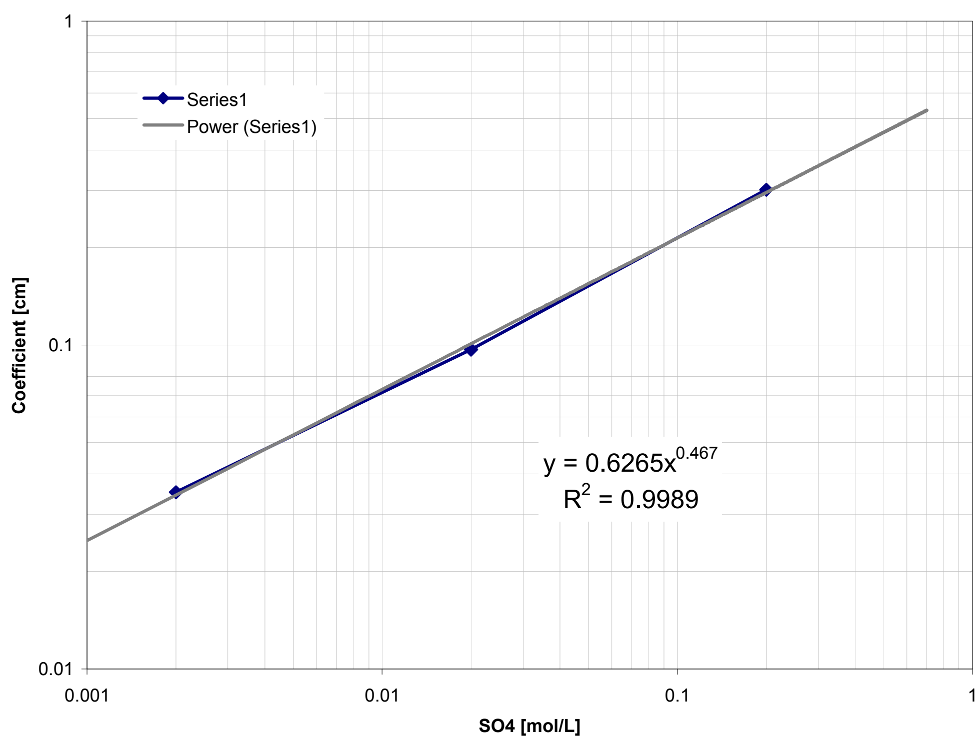


Figure 22. Power law fit to Vault 2 proportionality data shown in Figure 20.

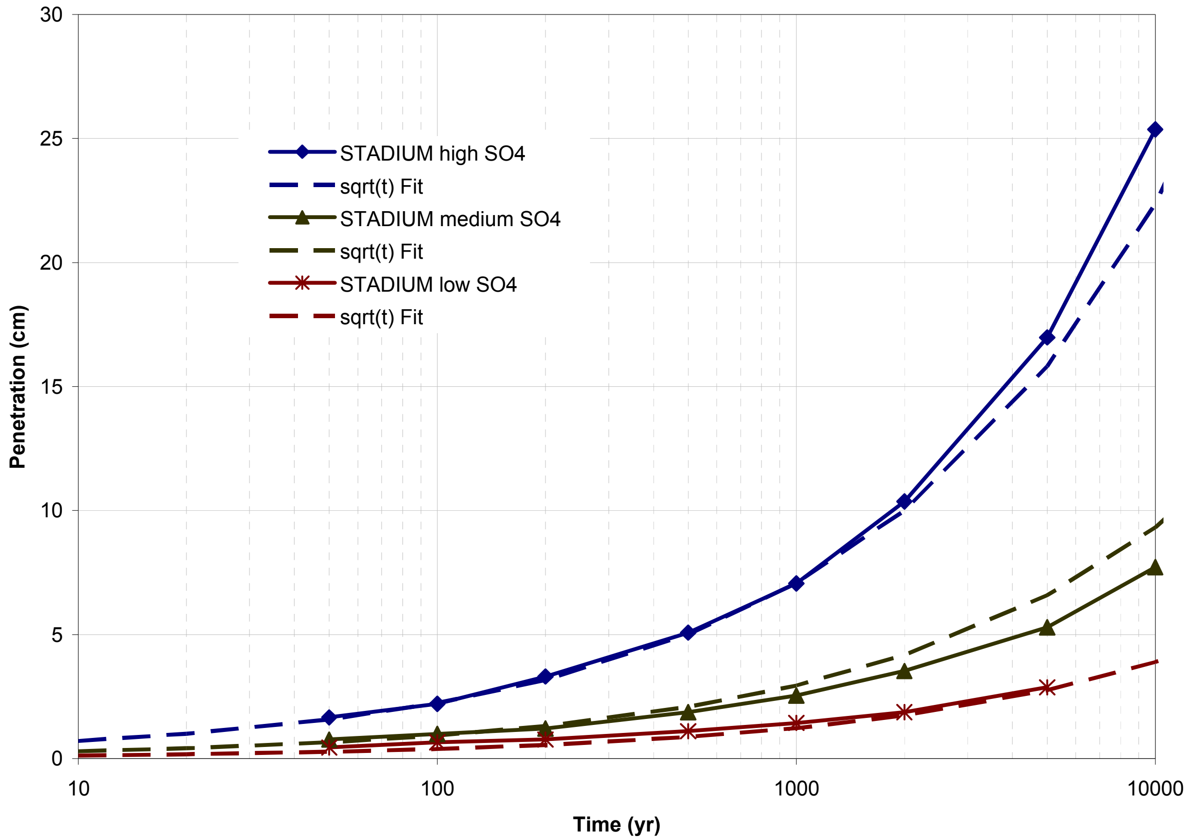


Figure 23. Comparison of general correlation to original STADIUM results for Vaults 1/4.

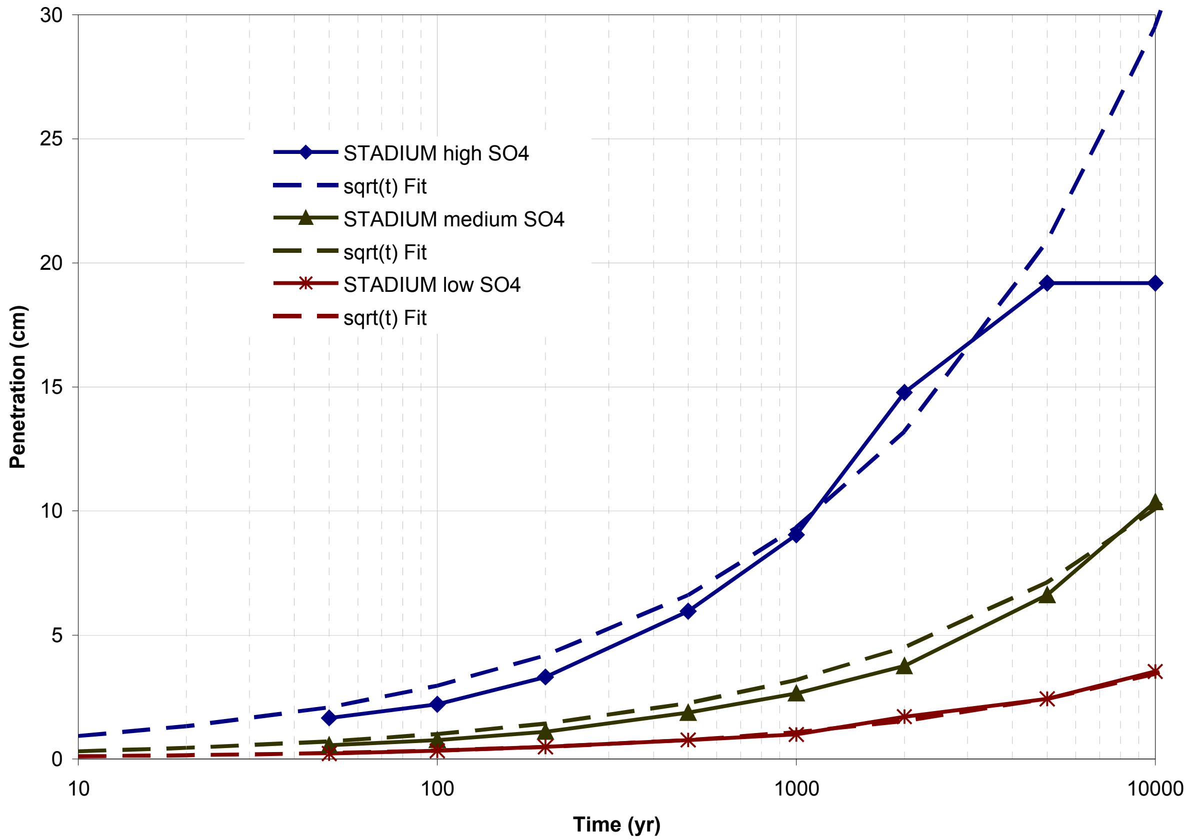


Figure 24. Comparison of general correlation to original STADIUM results for Vault 2.

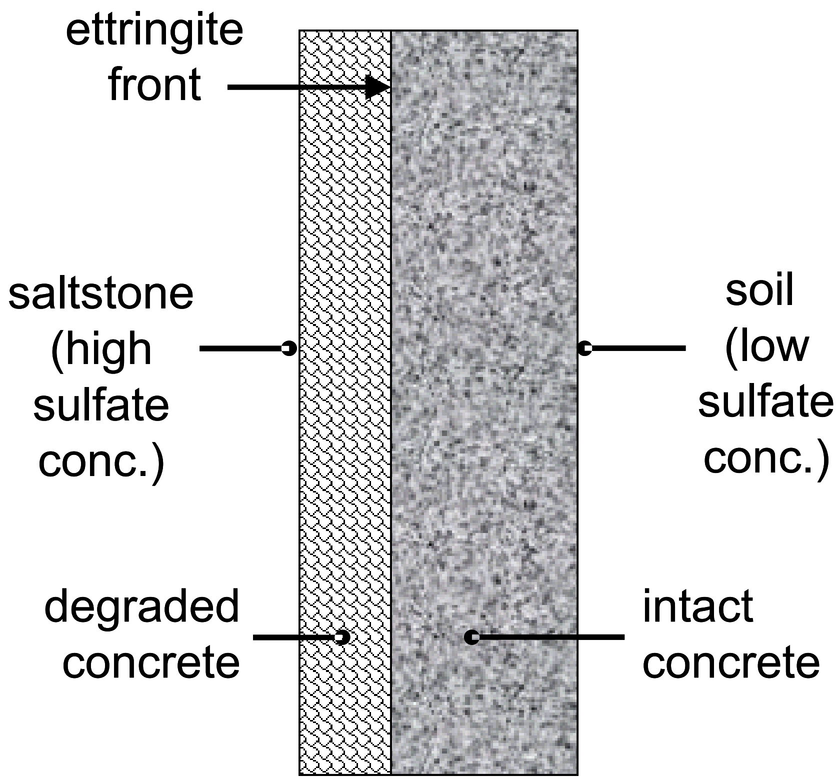


Figure 25. Conceptual model for concrete damage associated with ettringite formation.

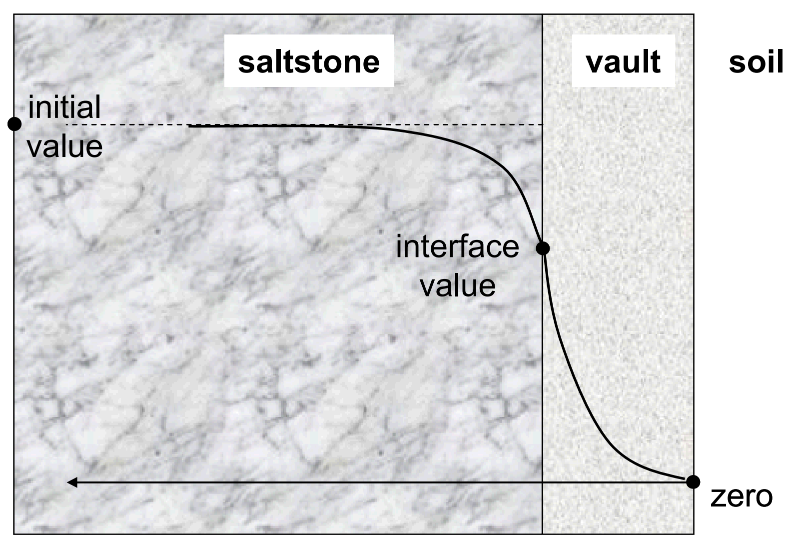


Figure 26. Interface concentration between Saltstone and vault concrete.

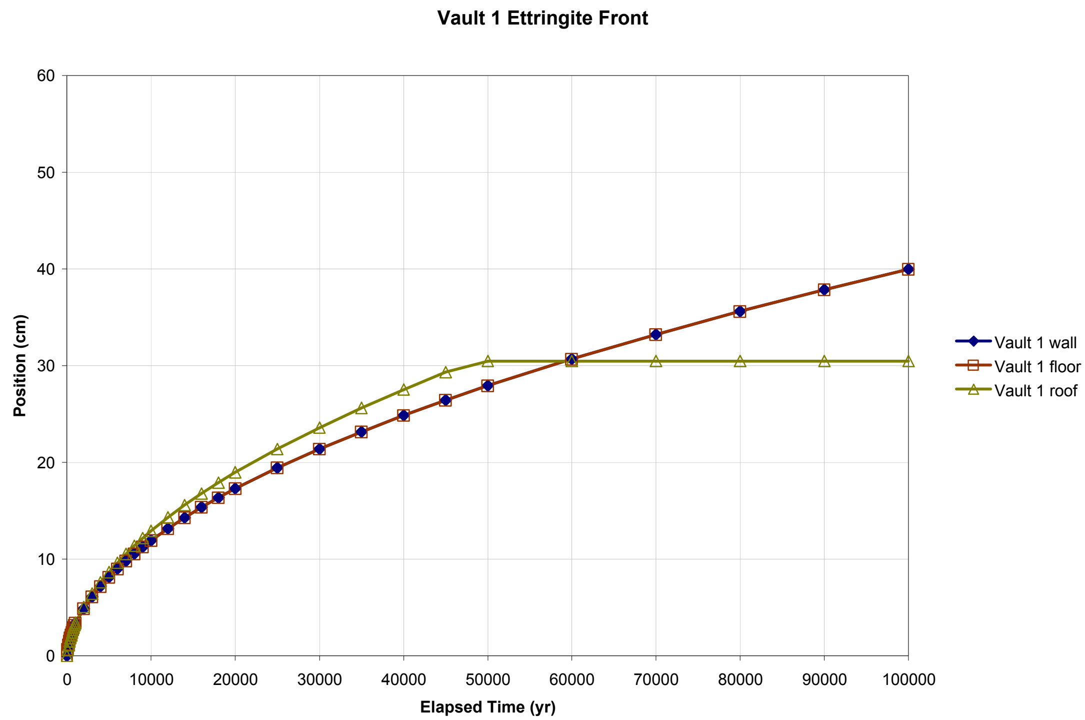


Figure 27. Position of sulfate attack front for Vault 1 components.

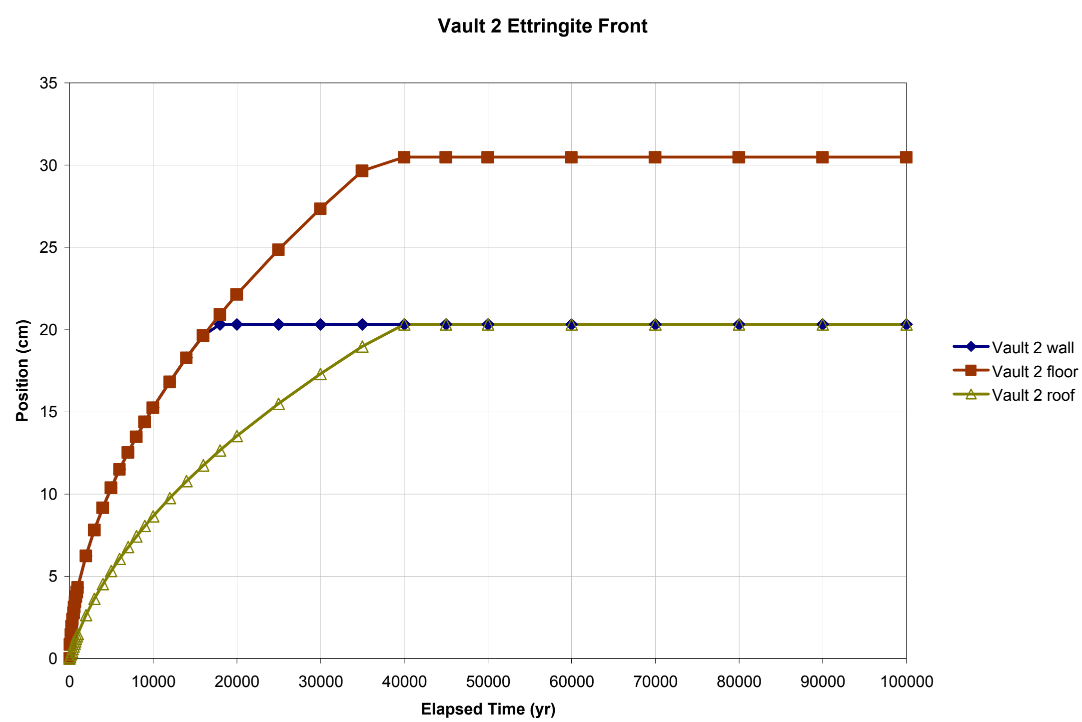


Figure 28. Position of sulfate attack front for Vault 2 components.

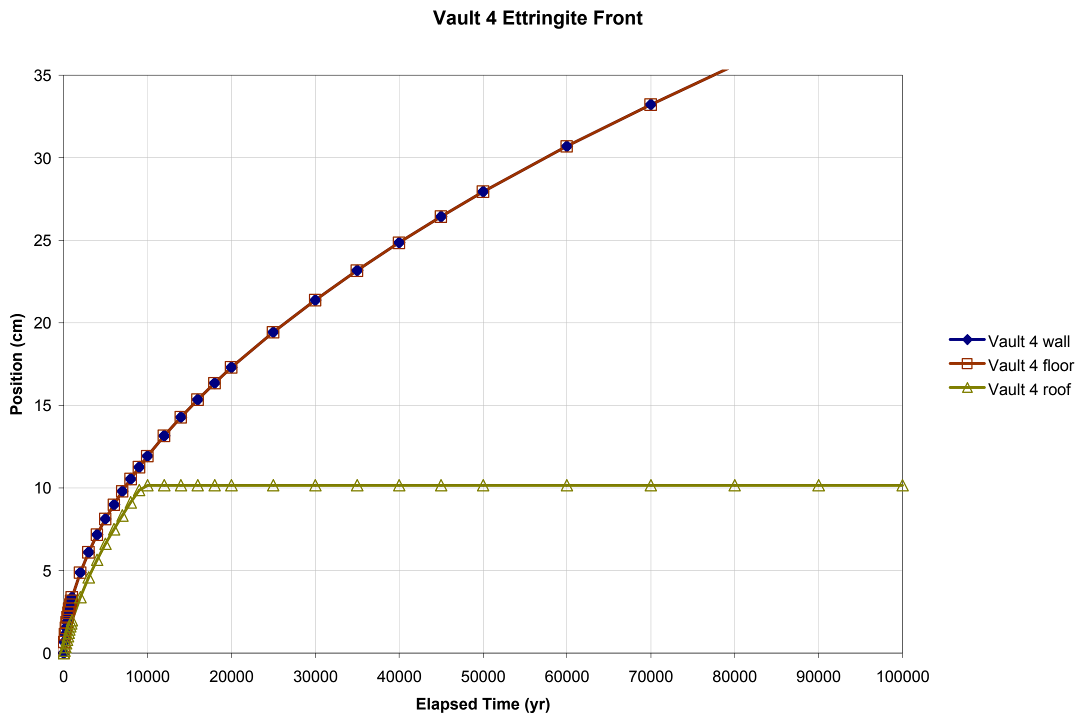


Figure 29. Position of sulfate attack front for Vault 4 components.

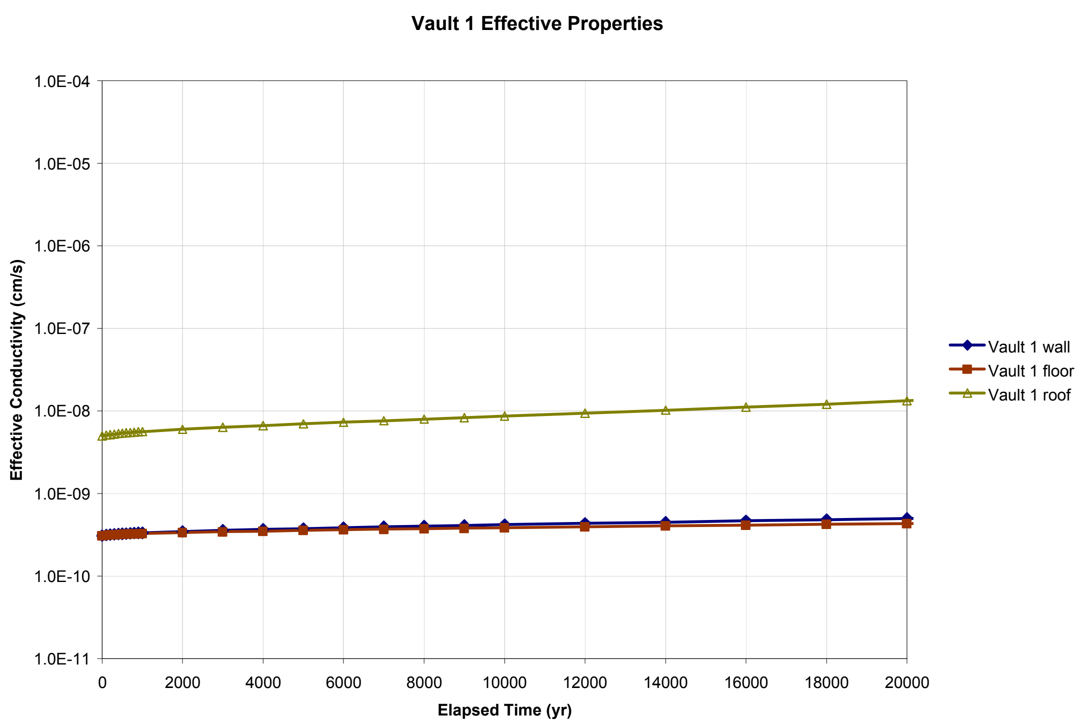


Figure 30. Effective hydraulic conductivity for Vault 1 components.

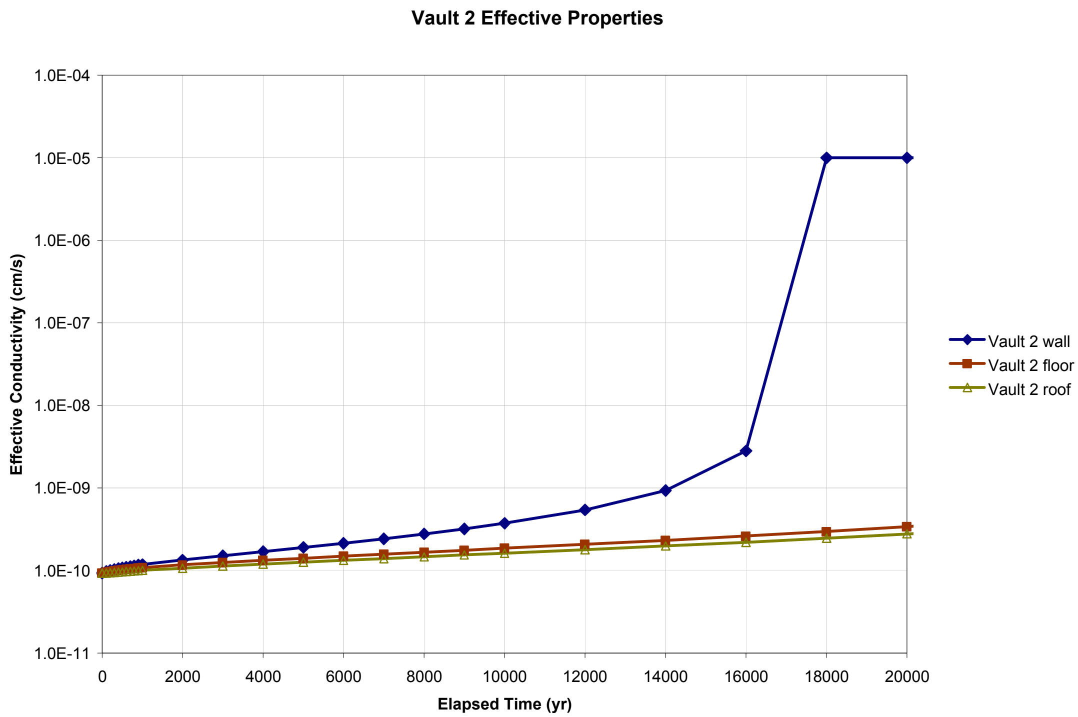


Figure 31. Effective hydraulic conductivity for Vault 2 components.

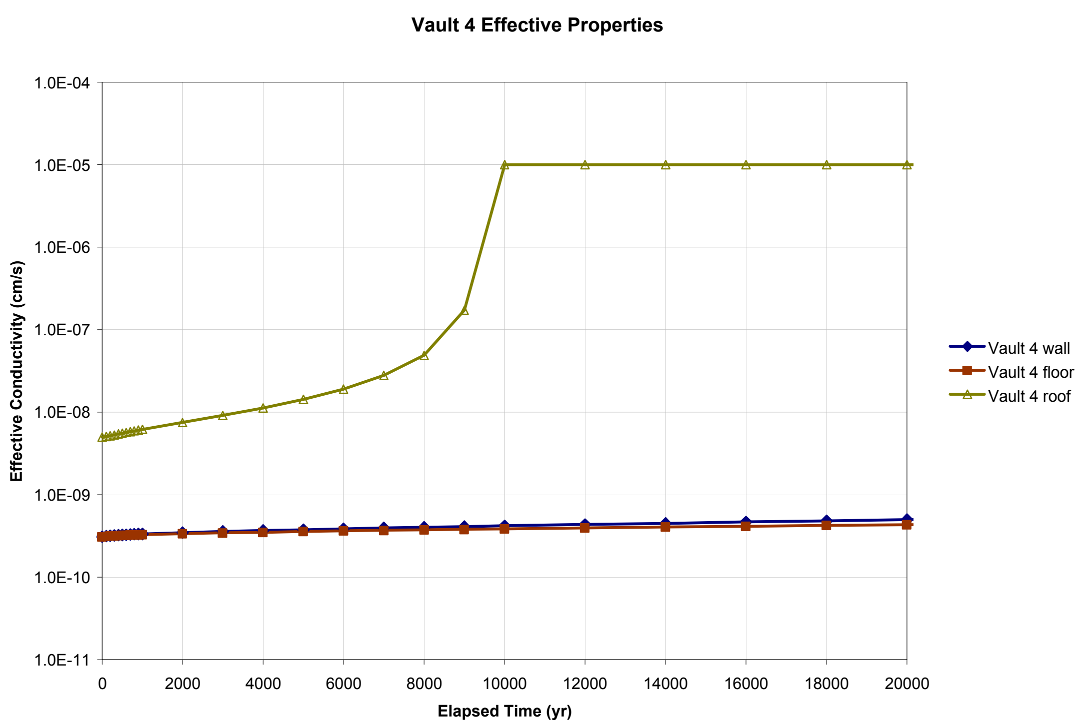


Figure 32. Effective hydraulic conductivity for Vault 4 components.

3.6 SALTSTONE DEGRADATION

Saltstone grout is designed to indefinitely immobilize contaminants in a low permeability medium. The potential for physical degradation is uncertain. Denham (2008a) investigated the formation of expansive mineral phases in Saltstone from exposure to rainwater or rainwater equilibrated with cement, using a reactive transport model. The volumetric change was observed to be small in comparison to the pore space. Denham concluded that "fracturing that initiates in pores by expansive phase precipitation is unlikely to occur in saltstone because the maximum amount of porosity filled is 34%".

3.7 CRACKED CEMENTITIOUS MATERIALS

The Vault 1 and 4 walls presently contain macroscopic cracks or fissures (Section 2.3), and Saltstone grout can conceivably degrade into a fractured medium with smaller microcracks (Section 3.6). Under saturated conditions, cracks typically dominate flow and transport. Under unsaturated conditions, with sufficient suction, fractures become dewatered and relatively inactive in transporting water and aqueous contaminants. Vadose conditions at the Savannah River Site exhibit relatively low soil suctions compared to arid locations, and suggest that cracks in cementitious materials would be important to accurate vault performance assessment. Experimental characterization data for cracked vault concrete and Saltstone grout are not available, so we resort to an analytical work by Or and Tuller (2000) to derive representative properties for cracked cementitious materials.

Water flow through a rough walled crack in a porous medium occurs in at least three distinct regimes:

1. Saturated flow, that is, liquid completely filling the aperture.
2. “Thick” film flow on each crack wall, where water is present as a film completely filling surface pits and grooves and the air-water interface is relatively flat.
3. “Thin” film flow, where water recedes into surface pits/grooves by capillary forces and adheres to flat surfaces by adsorption.

The saturated flow regime occurs at positive or very slightly negative pressures. The “thick” and “thin” film flow regimes occur at increasing negative pressures or suction in the surrounding porous medium. The spectrum of flow regimes is analyzed by Or and Tuller (2000) in the context of a uniform crack width and simplified geometry.

An implicit assumption in the analysis is that the source of liquid to the crack is steady rather than episodic/transient, and that the resulting fracture flow is steady. Unsteady fracture flow has been observed at laboratory scale and inferred at field scale (Persoff and Pruess 1995; Su et al. 2001; Nativ et al. 1995; Fabryka-Martin et al. 1996; Pruess 1999). At laboratory scale, unsteady flow appears to be associated with relatively low suctions in a variable aperture setting. Under these conditions, water fills the smaller apertures while larger apertures are desaturated. At field scale (e.g. Yucca Mountain), unsteady flow has been inferred under high matrix suction. Temporal and spatial variations in infiltration and physical heterogeneity are thought to be factors leading to episodic flow.

The Saltstone closure cover system is expected to insulate cracks from episodic rainfall and lead to a relatively steady influx of water. Saltstone itself is expected to exhibit uniform properties in comparison to fractured geologic media. Cracks forming from differential settlement are expected to be unsaturated in general. All of these conditions favor steady flow.

Saturated flow: The height of capillary liquid rise H between two parallel surfaces of aperture b is given by (e.g. Looney and Falta 2000)

$$H = \frac{2\sigma}{\rho g b} \tag{21}$$

where σ is surface tension, ρ is liquid density, and g is gravitational acceleration. In the context of a fracture subject to a given pressure P in the surrounding matrix, the aperture will be liquid filled under the condition

$$P > -\frac{2\sigma}{b} \tag{22}$$

where suction is indicated by a negative pressure value (e.g. Wang and Narasimhan 1985). The equivalent permeability of the fracture is

$$k = \frac{b^2}{12} \tag{23}$$

and the hydraulic conductivity is

$$K = \frac{\rho g k}{\eta} = \frac{\rho g b^2}{12\eta} \tag{24}$$

where η is liquid viscosity. Figure 33 shows hydraulic conductivity as a function of aperture for water at 20°C. Note that even narrow cracks have a high conductivity compared to typical low-permeability cementitious materials.

Film Flow: When $P < -2\sigma/b$, liquid can no longer span an aperture and the crack will desaturate. For this condition, a rough fracture face can be conceptually simplified as a repeating series of vertical flat surfaces and V-shaped grooves to facilitate further analysis (Or and Tuller 2000, Figure 1), as shown in Figure 34. At pressures slightly below $-2\sigma/b$, liquid will completely fill a groove and form a flat liquid-vapor interface. At a sufficiently low pressure, liquid will recede into the corner of the groove and be retained by capillary forces (Figure 35). Under this condition, the matric potential

$$\mu = \frac{P}{\rho} = gH \tag{25}$$

determines the radius of the liquid vapor interface in a groove (Or and Tuller 2000, Figure 2):

$$r(\mu) = -\frac{\sigma}{\rho\mu} \tag{26}$$

For a groove of depth L and angle γ, the maximum radius accommodated by the groove geometry is

$$r_c = \frac{L\tan(\gamma/2)}{\cos(\gamma/2)} \tag{27}$$

The critical pressure defining the transition between flat and curved interfaces is

$$P_c = -\frac{\sigma}{r_c} \tag{28}$$

and is the result of combining equations (25) through (27). Thus the three flow regimes identified earlier occur over the following pressure ranges for the assumed geometry of the fracture face:

1. Saturated flow: $P > -\frac{2\sigma}{b}$
2. “Thick” film flow: $-\frac{\sigma}{r_c} < P < -\frac{2\sigma}{b}$
3. “Thin” film flow: $P < -\frac{\sigma}{r_c}$

Liquid not being held by capillary suction will adhere to the remaining surfaces of the fracture face as a thin film. Considering only van der Waal forces, liquid adsorption on solid surfaces can be characterized by

$$h(\mu) = \left[\frac{A_{svl}}{6\pi\rho\mu}\right]^{1/3} \tag{29}$$

where h is film thickness and A_{svl} is a Hamaker constant.

Liquid held in groove corners by capillary suction and adhering as a thin film to remaining surfaces flows downward under the force of gravity. Or and Tuller (2000) present a detailed analysis of the liquid area and average velocity associated with corner and film flows in a vertical fracture, which is summarized in the Appendix C. Figure 36 illustrates equivalent film thickness and average hydraulic conductivity for a representative “rough” fracture surface (Or and Tuller 2000, Figure 6a). The critical matric potential defining the transition between “thick” and “thin” film flow is $\mu_c = -0.22$ J/kg or approximately 2 cm of suction head. A discontinuity in film thickness is observed in Figure 36(a) at this matric potential.

Application to Saltstone materials: The approach of Or and Tuller (2000) provides a means to compute flow through a hypothetical, simplified, crack geometry. The properties of the intact surrounding matrix are provided in Table 13 and supporting material. The effective properties of a composite cracked cementitious material can be computed by specifying a crack spacing, and then averaging properties in proportion to the crack and intact matrix thicknesses.

Table 38 and Table 39 summarize the values selected for macrocracked Vault 1/4 wall concrete and microcracked Saltstone grout. Appendix D presents the associated calculations in spreadsheet form. Figure 37 and Figure 38 compare unsaturated hydraulic conductivity for intact and cracked concrete and Saltstone grout, respectively. The calculations were inadvertently carried out using a porosity of 0.l8 instead of values from Table 13. However, the unsaturated conductivity values are unaffected by porosity, and the effect on water retention is negligible.

The curves for cracked materials show two discontinuities at low suction. The first occurs when the flow regime jumps from saturated to thick film flow. The second occurs between thick and thin film flow. In subsequent PORFLOW modeling, these discontinuities are removed to avoid potential numerical convergence problems. These adjusted curves are also depicted in Figure 37 and Figure 38. At suctions below 100 cm, cracks in the Vault 1/4 wall concrete are predicted to enhance flow and transport through the vault. For the derived Saltstone properties, microcracks impact flow and transport below a few hundred centimeters of suction.

Table 38. Selected parameters for macrocracked Vault 1/4 concrete.

Parameter	Symbol	Value	Units
ratio of pit spacing to pit depth	b	1	unitless
pit connectivity factor	δ	1	unitless
pit angle	γ	60	deg
pit depth	L	5.0E-04	m
		0.500	mm
		0.020	in
width of unit element	W	1.08E-03	m
actual aperture	b	1.27E-03	m
		0.05	in
		50	mil
		1.27	mm
		1270	micron
spacing between fractures	B	1	m
		100	cm
saturated matrix conductivity	Kmatrix	3.1E-12	m/s
		3.1E-10	cm/s
porosity	n	0.18	unitless

Table 39. Selected parameters for microcracked Saltstone.

Parameter	Symbol	Value	Units
ratio of pit spacing to pit depth	b	1	unitless
pit connectivity factor	δ	1	unitless
pit angle	γ	60	deg
pit depth	L	5.0E-05	m
		0.050	mm
		0.002	in
width of unit element	W	1.08E-04	m
actual aperture	b	1.27E-04	m
		0.005	in
		5	mil
		0.127	mm
		127	micron
spacing between fractures	B	0.1	m
		10	cm
saturated matrix conductivity	Kmatrix	2.0E-11	m/s
		2.0E-09	cm/s
porosity	n	0.18	unitless

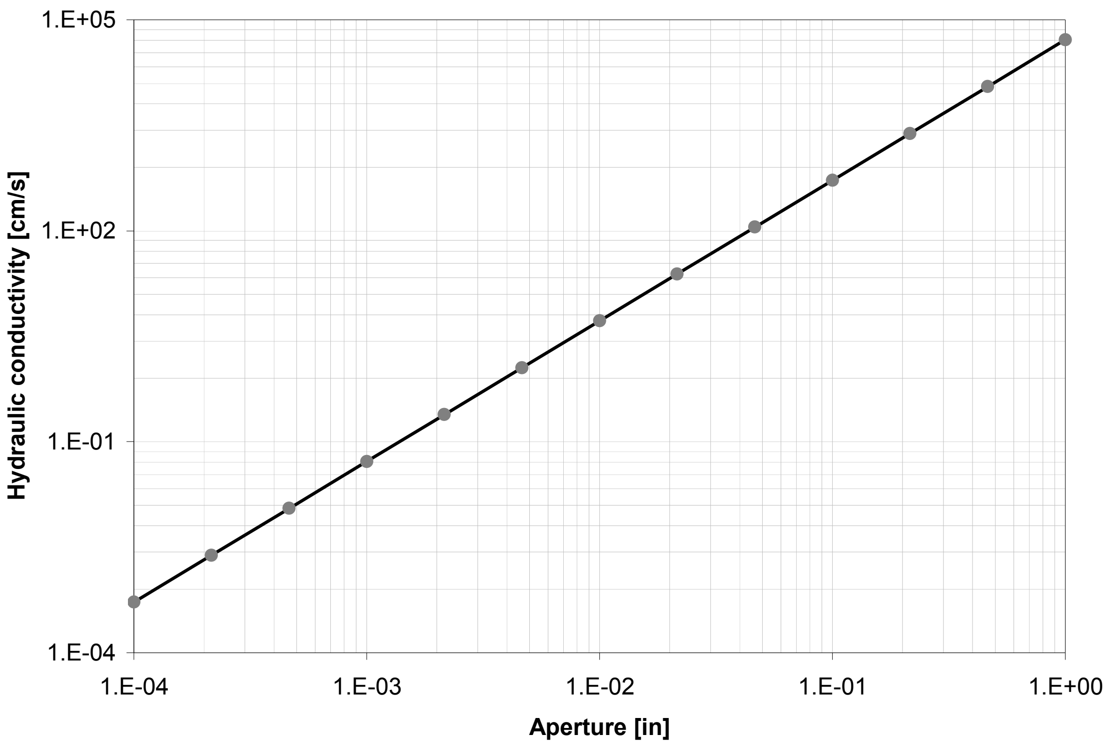


Figure 33. Hydraulic conductivity of saturated cracks as a function of aperture.

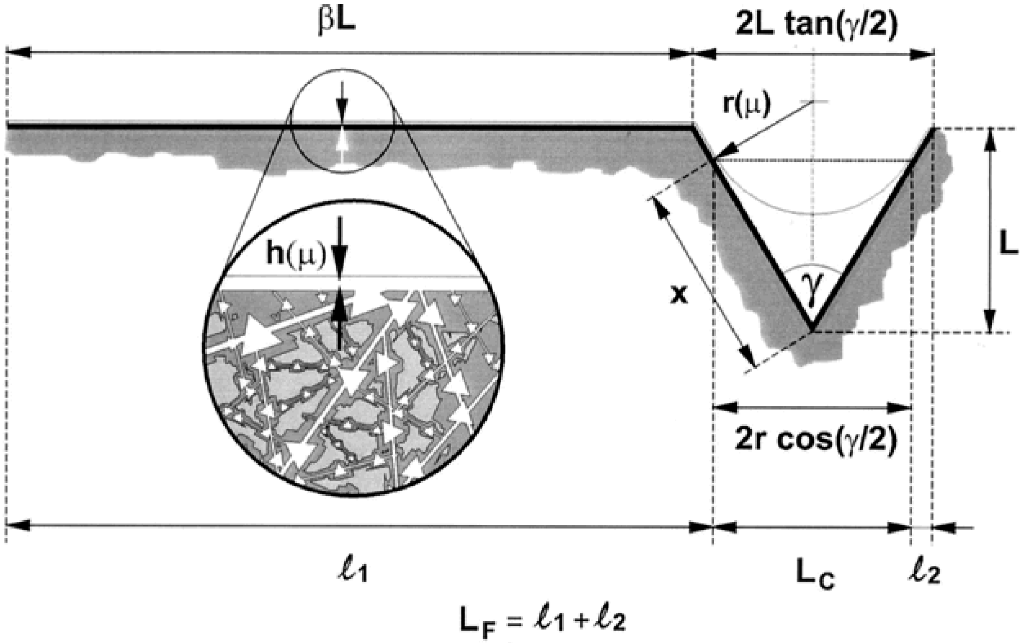


Figure 1. Definition sketch for a unit element representing unsaturated fracture surface with a single pit of depth L and angle γ. Liquid-vapor interfaces are functions of the matric potential μ, which determines the radius of curvature in the pit $r(\mu)$ and film thickness $h(\mu)$. The inset represents the partially saturated porous rock matrix forming the fracture; water in the rock matrix pore space is in equilibrium with water on the fracture surface.

Figure 34. Simplified crack geometry; reproduced from Or and Tuller (2000).

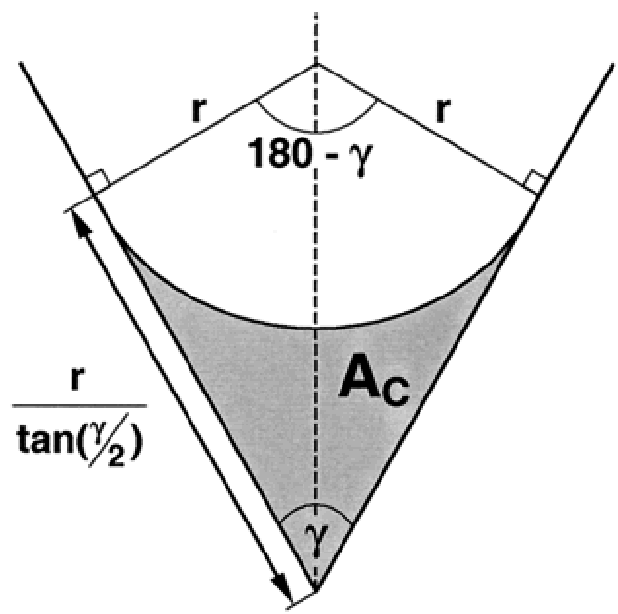


Figure 2. Liquid-vapor interfacial configuration and liquid-filled cross-sectional area in a corner.

Figure 35. Crack detail; reproduced from Or and Tuller (2000).

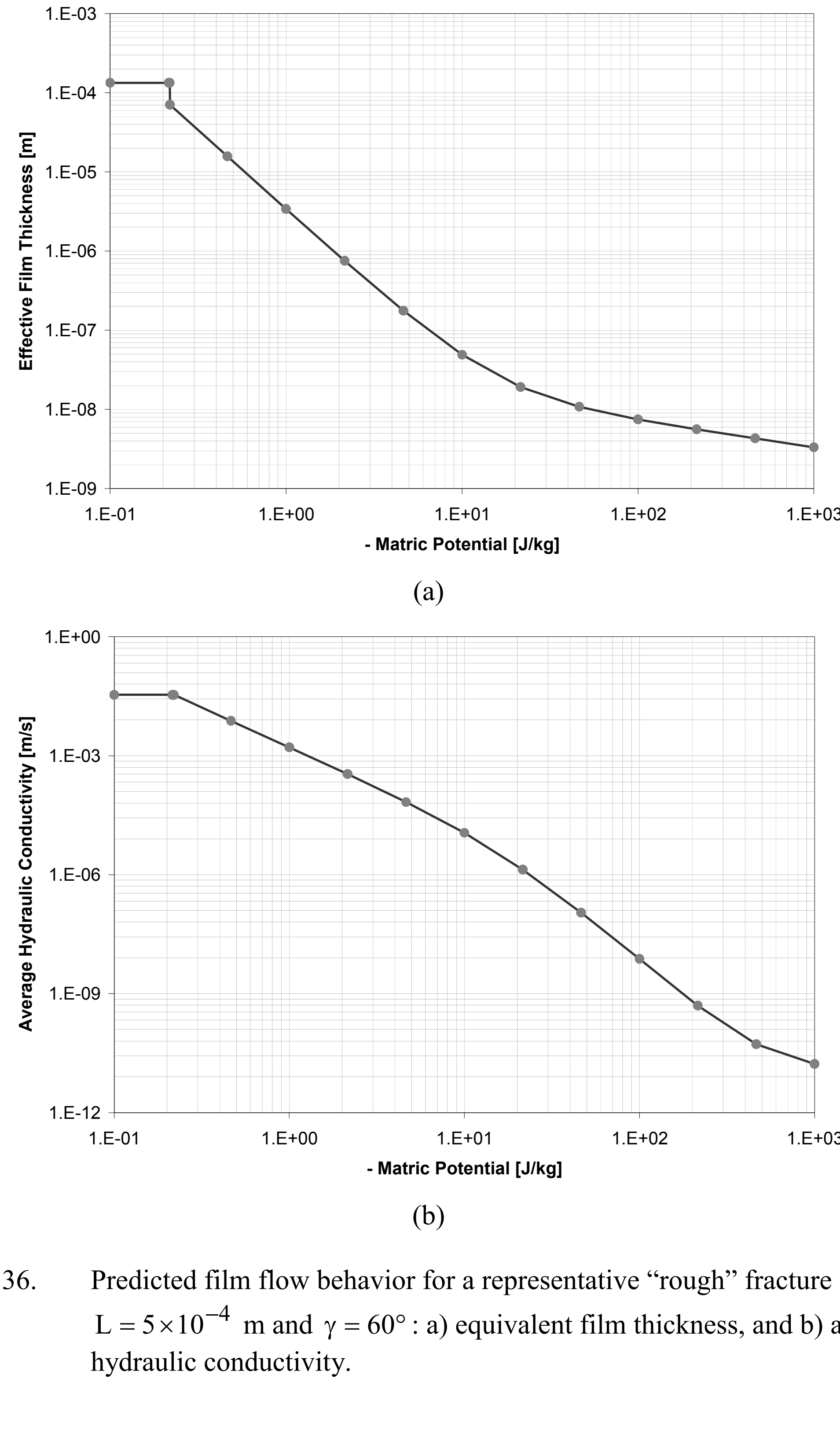


Figure 36. Predicted film flow behavior for a representative "rough" fracture face with $L = 5 \times 10^{-4}$ m and $\gamma = 60°$: a) equivalent film thickness, and b) average hydraulic conductivity.

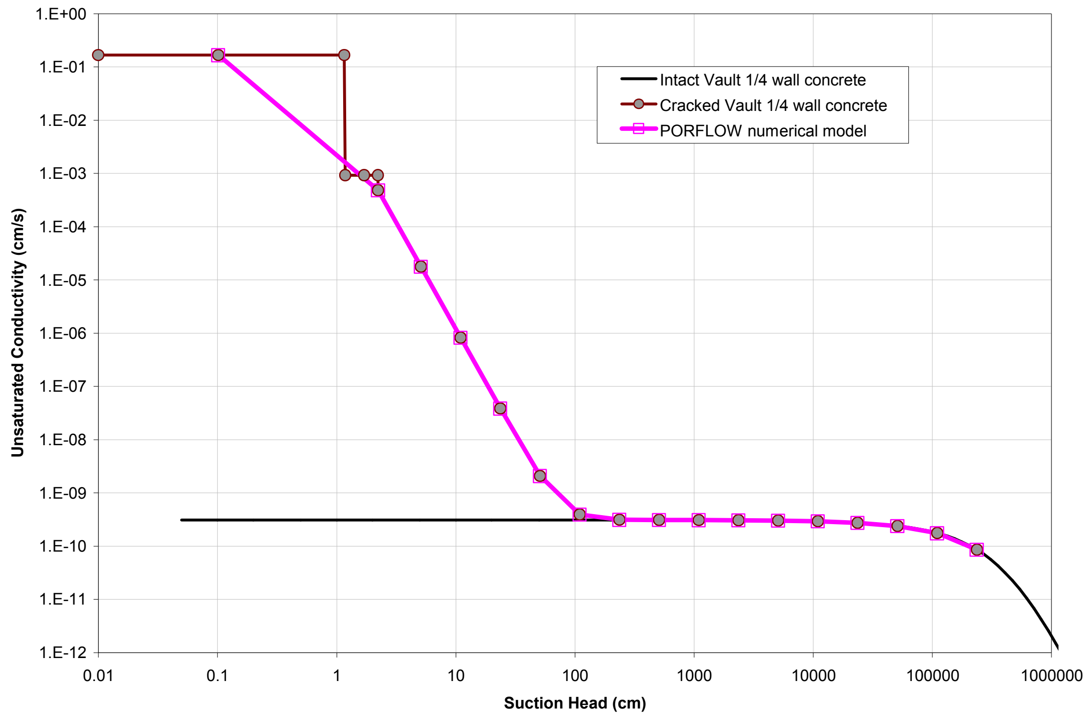


Figure 37. Derived unsaturated hydraulic conductivity variation for macrocracked Vault 1/4 wall concrete.

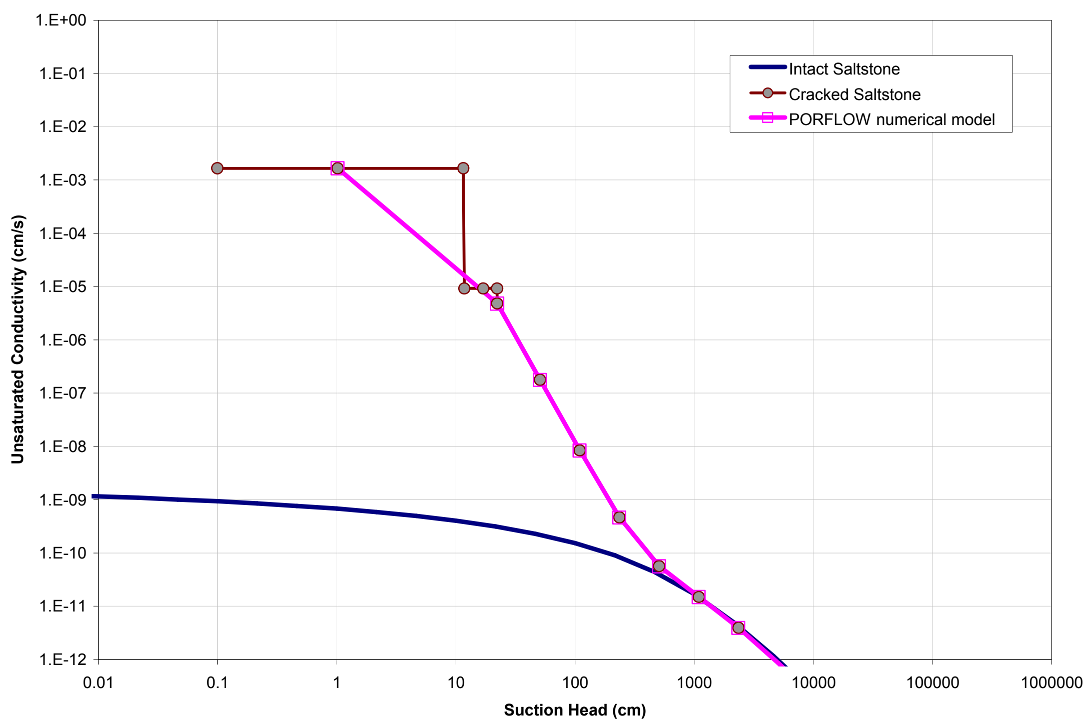


Figure 38. Derived unsaturated hydraulic conductivity variation for microcracked Saltstone grout.

3.8 CHEMICAL DEGRADATION

Beyond the concrete and saltstone degradation processes discussed above, the mineral compositions of cementitious materials are expected to slowly change as water flows through pores and reacts with the solid matrices. Reduced materials will oxidize with exposure to dissolved oxygen in groundwater (increasing Eh), and pH will decrease as acidic groundwater dissolves the cement paste. These Eh and pH changes will affect sorption coefficients (Section 2.6.2) and generally increase the rate of contaminant transport. Technetium is particularly sensitive to redox conditions, being practically insoluble at low Eh and relatively mobile under oxidized conditions.

Denham (2008b) performed detailed coupled transport and reactive chemistry simulations using The Geochemist's Workbench® (Bethke, 2005) to estimate changes in Eh and pH as a function of pore volumes passed through cementitious materials. For Saltstone grout, three permeants were considered:

1) groundwater
2) groundwater equilibrated with calcite
3) groundwater equilibrated with CSH

Case 1) represents groundwater that directly contacts Saltstone, bypassing vault concrete. Case 2) reflects water that passes through and equilibrates with oxidized, Region III, concrete before contacting Saltstone. Case 3) mimics groundwater that equilibrates with oxidized, Region II, concrete before reaching Saltstone. The three cases cover a range of potential chemical exposure situations. The Region II and III terms are taken from Bradbury and Sarott (1995) and correspond to Middle and Old respectively in the parlance of Section 2.6.2. For Vault 2 concrete the only permeant was groundwater. Based on the similarity of the material, pore volume transitions for the Vault 1 and Vault 4 concrete were assumed to be the same as those for Vault 2. Table 40 summarizes the results of the study. The timing associated with these transitions depends on the flow history.

Oxidation of the slag-bearing vault concrete and Saltstone grout can also be simulated concurrently in solute transport simulations by accounting for the reduction capacity of the materials (Table 15), tracking dissolved oxygen transport alongside contaminant species, and modeling the redox reaction. This approach is adopted for Tc-99 transport and discussed further in Section 4.6.

Table 40. Estimated pore volumes at Eh and pH transitions from Denham (2008b).

	Eh Transition		pH Transition	
Case	Pore Volume (unitless)	Value Range	Pore Volume (unitless)	Value Range
Saltstone/fluid=GW (no fluid contact with vault)	2734	-0.45 to +0.66	2274	11.0 to 9.5
Saltstone/fluid=GW+calcite (vault oxidized Region III)	2775	-0.45 to +0.61	2558	11.0 to 10.3
Saltstone/fluid=CW+CSH (vault oxidized (Region II)	2806	-0.45 to +0.56	10422 (extrapolated)	11.0 to ?
Vault 2/fluid=GW	3230	-0.46 to +0.57	4206 (extrapolated)	11.0 to ?

3.9 PERFORMANCE SCENARIOS

Over a 10,000 year period of performance, Saltstone disposal cells are expected to degrade physically and chemically. Sulfate attack and slag oxidation are prominent examples of physical and chemical degradation, respectively. For these examples and similar mechanisms, quantitative modeling predictions are feasible. For other phenomena quantitative forecasts are not realistic, due to incomplete physical understanding and/or uncertain future conditions (e.g. earthquakes). Examples include potential Saltstone grout degradation, and vault structural response to differential settlement and corrosion of steel components. These uncertainties imply a number of potential vault performance scenarios.

To assess the intended, as designed, performance of Saltstone vaults, and conceivable alternative scenarios, several vault configurations have been conceptually identified for subsequent numerical modeling. Base Case A for Vault 2, depicted in Figure 39, reflects the expected condition of Vault 2. Here intact vault concrete and Saltstone waste lead to a diffusion-dominated release, at least until the cover system and vault become significantly degraded at late times. Other sensitivity cases were postulated for diagnostic purposes, to better understand the range of possible vault behavior. Diagnostic Case B assumes that a fast flow path forms between Saltstone grout and the vault wall at time zero, due to the presence of a sheet drain at the wall and connecting breaches through the roof and floor (Figure 40). Diagnostic Case C is similar to Case B with additional fast flow paths passing through the Saltstone interior, possibly due to corrosion of support columns or fissures in response to differential settlement (Figure 41). Diagnostic Case D is similar to Case A, except that an open sheet drain creates a capillary break, precluding transport across the gap under unsaturated conditions (Figure 42). Diagnostic Case E is similar to Case A, except that the Saltstone grout is postulated to be fully degraded at time zero (Figure 43). The concept is that degradation takes the form of an extensive network of smaller-scale cracks. Explicit simulation of a fracture network is not feasible in the present porous-medium modeling framework. Instead, equivalent porous medium properties for cracked Saltstone are developed in Section 3.7. Case E uses these properties.

Analogous configurations can be postulated for the existing Vaults 1 and 4, as summarized in Table 41. Vault 1 does not contain a sheet drain system, so Cases B and D are not applicable.

Case C for Vault 4 differs from Case C for Vault 2 only in the physical initiator envisioned for the fast flow path through Saltstone grout, crack versus support column. In Diagnostic Case C for Vaults 1 and 4, the model crack is intended to capture the impact of transverse structural cracks predicted to form after differential settlement and seismic events (Section 3.3). The single longitudinal crack in the Vault 1 and 4 half-width models is equivalent to two 600 ft longitudinal cracks in the full width. The equivalent number of transverse cracks, in terms of cumulative crack length, is 6 for Vault 4 and 12 for Vault 1. Physical cracks are predicted to range from none up to a few (Peregoy 2003), less than the number of equivalent transverse cracks represented in the models.

Table 41. Performance scenarios postulated for Vaults 1, 2 and 4.

Case	Vault 1	Vault 4	Vault 2
A	Base case vault wall degraded, saltstone intact	Base case vault wall degraded, saltstone intact	Base case vault intact, saltstone intact
B	NA (no sheet drains)	Fast flow walls fast flow along walls from roof thru basemat, vault wall degraded	Fast flow walls fast flow along walls from roof thru basemat
C	Fast flow walls & crack fast flow along cracks from roof thru basemat, vault wall degraded	Fast flow walls & crack fast flow along walls and cracks from roof thru basemat, vault wall degraded	Fast flow walls & columns fast flow along walls and columns from roof thru basemat
D	NA (no sheet drains)	Capillary break base case with no diffusion to walls	Capillary break base case with no diffusion to walls
E	Base case w/degraded saltstone	Base case w/degraded saltstone	Base case w/degraded saltstone

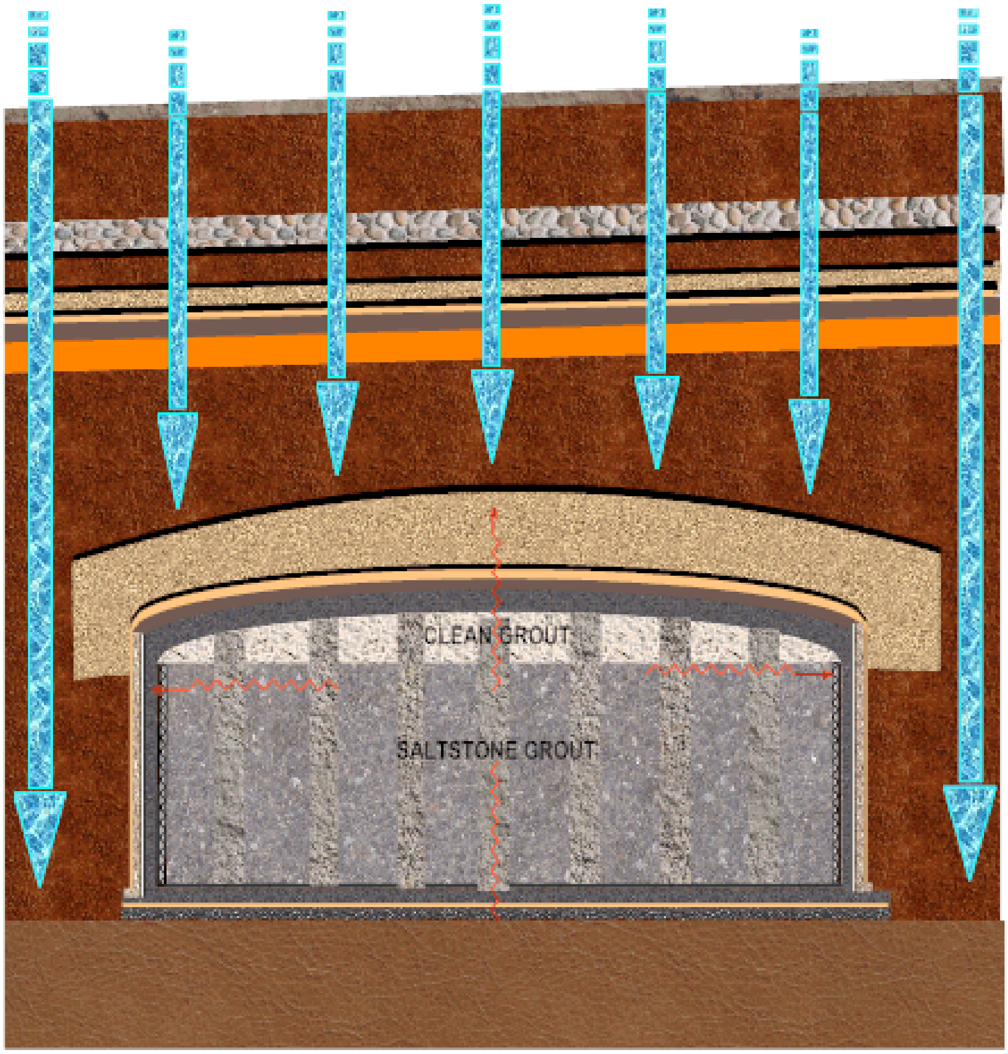


Figure 39. Base case A: As designed intact vault and Saltstone; initial release dominated by diffusion.

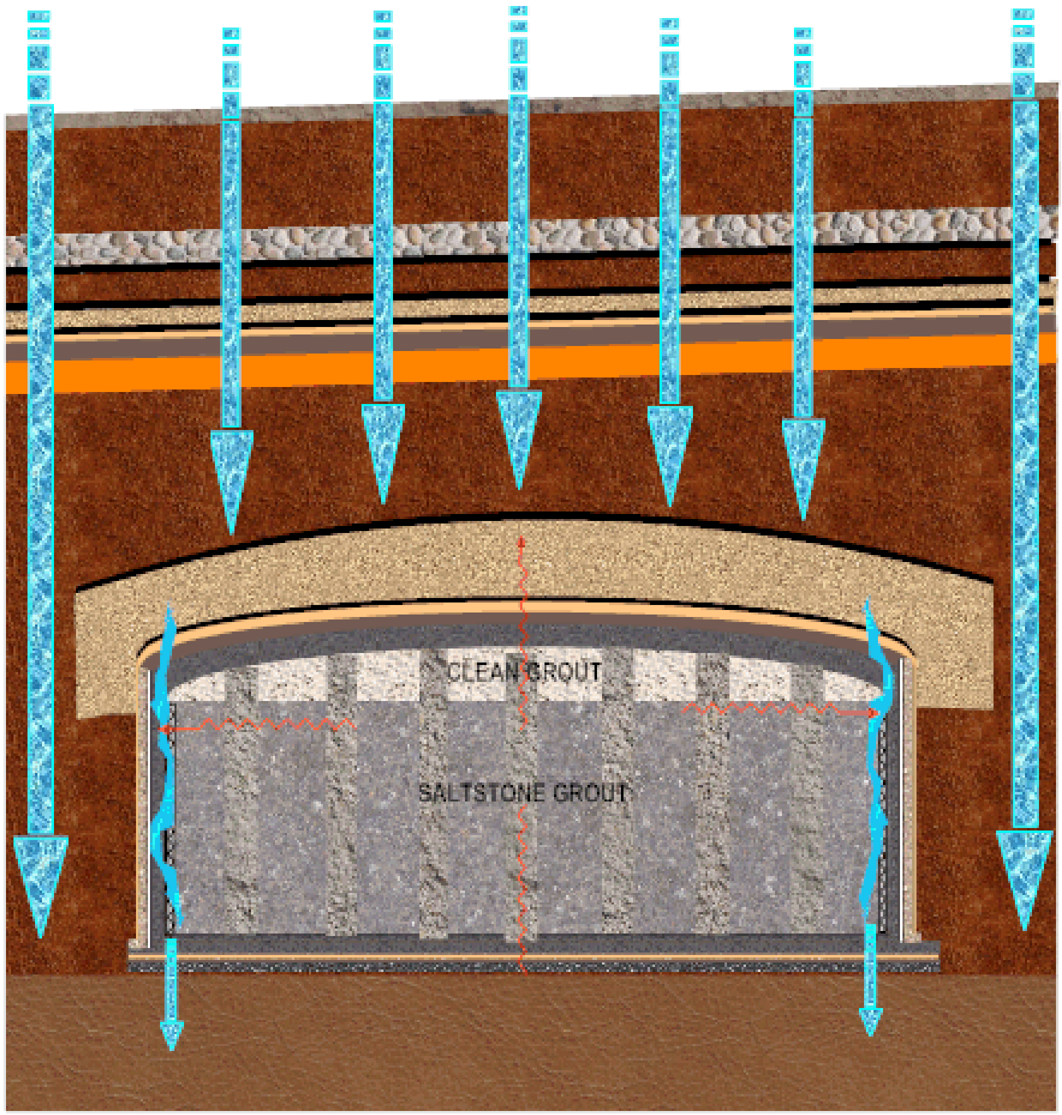


Figure 40. Diagnostic case B: Case A plus advective flow path through sheet drain and/or shrinkage gap at wall and breaches through roof and floor.

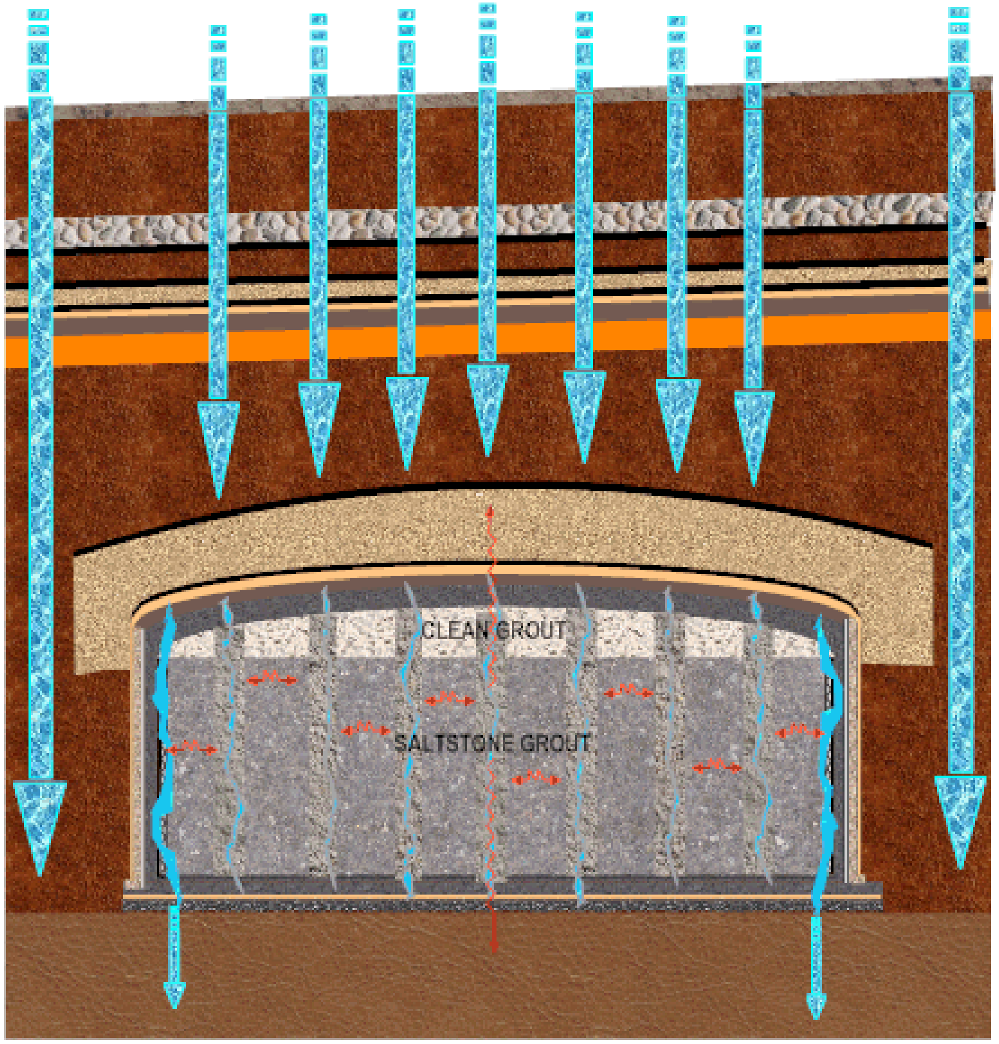


Figure 41. Diagnostic case C: Case B with additional fast flow path through interior of Saltstone .

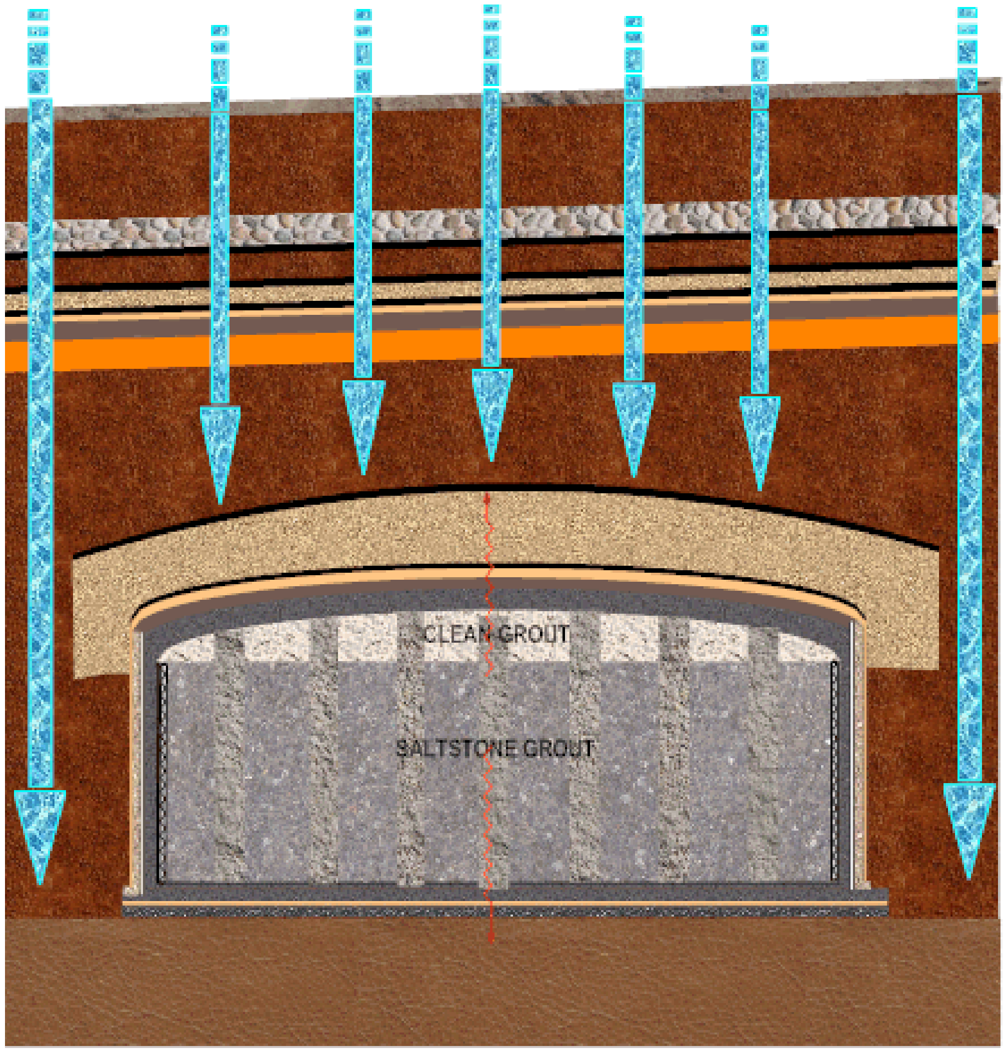


Figure 42. Diagnostic case D: Case A with capillary break between Saltstone and vault wall due to sheet drain and/or shrinkage gap.

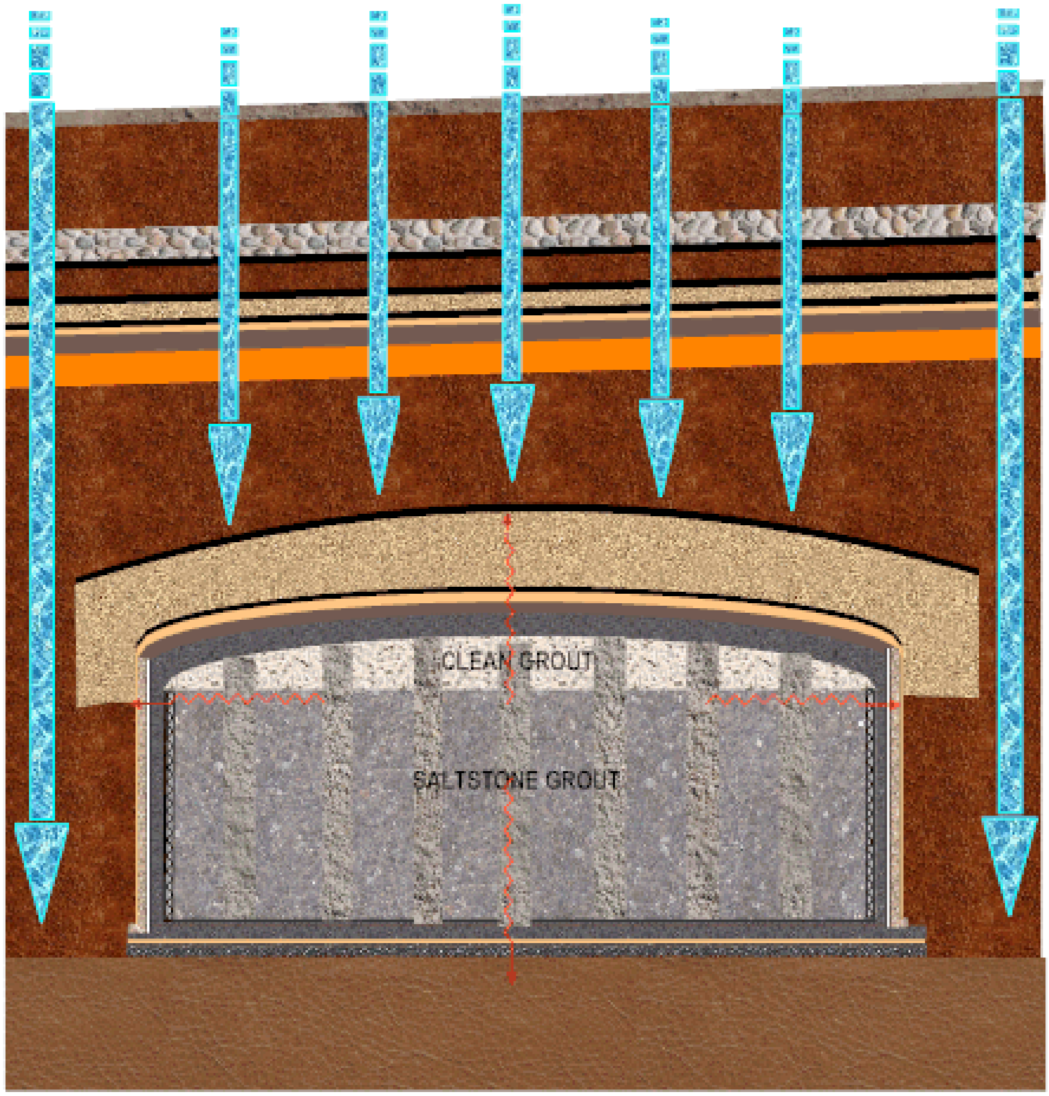


Figure 43. Diagnostic case E: Case A with degraded Saltstone grout.

3.10 CONCEPTUAL MODELS OF FLOW AND TRANSPORT

Subsurface water flow through Saltstone vaults and their surroundings primarily involves porous media. However, some of the performance scenarios contain features such as open sheet drains, shrinkage gaps, macroscopic cracks or fissures, and conduits formed by drainage piping or corrosion/degradation of steel support columns. For brevity we generically refer to these features as fractures. Fractured medium flow can be conceptualized in several ways (e.g. Pruess et al. 1999). For example, some approaches explicitly track flow through discrete fractures. Conversely, in continuum approaches the fractured medium is conceptually homogenized and represented with effective properties.

For Saltstone modeling, we choose to represent fractures and conduits in a continuum manner. The continuum approach tends to be valid under steady non-localized flow conditions, produces reasonable predictions of average seepage rates (flow integrated across time and/or space), and avoids sophisticated characterization of the fracture network (e.g. Finsterle 2000, Liu et al. 2003). These attributes complement Saltstone performance assessment needs and data availability. The SDF cover system produces a quasi-steady infiltration rate through its GCL, shielding vaults from episodic rainfall events. The primary interest in vadose analysis is prediction of time average flux to the water table; details in time and space are not important to 100 meter dose calculations over a 10,000 year period of performance. Finally, the fracture features all reflect future hypothetical conditions that can not be characterized in detail.

Specifically, we conceptually replace open fractures with surrogate, larger aperture, sand- or gravel-filled seams. The surrogate porous media mimic the key behavior of fractures. Under saturated and low suction conditions, the high-permeability porous media create a fast, advective, flow path. At high suction, the surrogates become less important and potentially insignificant contributors to overall seepage.

Because disposal cells receive low-level residual aqueous waste from the SRS Tank Farms, Saltstone pore water concentrations are generally expected to fall below any solubility limits. For modeling efficiency, we conceptualize transport as occurring at relative low concentrations, such linear isotherms (constant Kd's) are appropriate and no solubility controls exist. For the purpose of generating groundwater concentrations, we neglect gas phase transport of contaminants.

Gas phase transport of oxygen is expected to be significant in unsaturated soils, and maintain dissolved oxygen levels at saturation. However, cementitious materials are expected to be practically completely saturated with liquid at the low suction levels that are anticipated. Therefore gas phase oxygen transport in slag-bearing (reduced) cementitious materials is assumed to be negligible. Slag oxidation is expected to occur by liquid phase transport of oxygen.

4.0 NUMERICAL MODEL DEVELOPMENT

Numerical models are used to simulate subsurface flow and contaminant transport from ground surface to exposure points. The overall flow path is broken into three components: 1) Simulation of water flow through the SDF cover system using the HELP code, 2) Simulation of moisture flow and contaminant transport in the vadose zone beneath the cover system GCL, and 3) Simulation of groundwater flow and contaminant transport from the water table beneath the vaults to 1 meter, 100 meter and seepline locations. HELP modeling is presented in WSRC-STI-2008-00244 (Jones and Phifer, 2008). This section addresses the second and third components, subsurface modeling using the PORFLOW code.

4.1 COMPOSITE MODEL

Figure 44 provides further detail on the relationship between HELP and PORFLOW modeling to support the Saltstone PA, and GOLDSIM-based probabilistic uncertainty and sensitivity analysis. PORFLOW modeling encompasses four separate analyses: flow and transport in the vadose and aquifer zones. Vadose flow feed both GOLDSIM and PORFLOW vadose transport simulations.

PORFLOW is a commercial Computational Fluid Dynamics (CFD) tool developed by Analytic & Computational Research, Inc. (http://www.acricfd.com/software/porflow/). PORFLOW numerically solves problems involving transient or steady state fluid flow, heat, salinity and mass transport in multi-phase, variably saturated, porous or fractured media with dynamic phase change. PORFLOW is an appropriate code because it can accommodate calculations in both the saturated and unsaturated zones and more importantly has the ability to simulate first-order decay and progeny in-growth associated with radionuclide chains, which is necessary for calculations involving radioactive stabilized contaminant disposal.

Analytic & Computational Research, Inc. has provided the following documentation associated with PORFLOW:

• A user's guide (ACRi-2002) which provides instructions for PORFLOW use.

• Validation data for PORFLOW (ACRi-1994).

The Software Quality Assurance Plan (SQAP) for the PORFLOW 6.10.3 version used in Saltstone PA calculations is covered by WSRC-SQP-A-00028 and G-TR-G-00002 documents formal software testing.

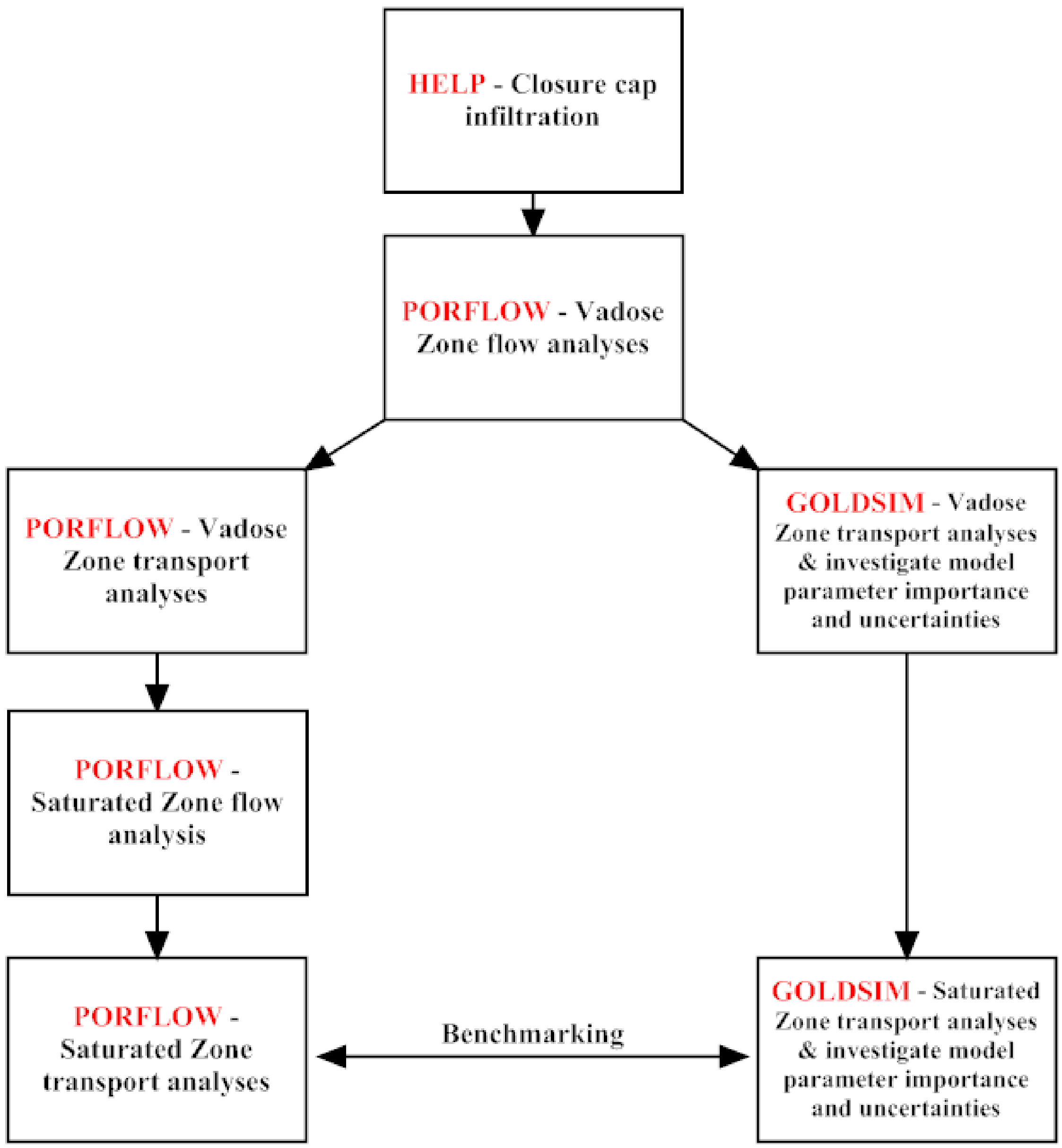


Figure 44. Relationship between HELP, PORFLOW and GOLDSIM modeling to support the Saltstone PA.

4.2 ABBREVIATED CHAINS

For efficient modeling of radionuclide transport, we omit short-lived progeny from explicit transport simulation and assume these species are in secular equilibrium with their longer-lived ancestors. We assume a halflife cutoff of 5 years is reasonable in relation to overall vadose zone and aquifer transport times. Table 42 lists the long-lived radioactive progeny of parents that remain after pruning decay trees of stable species and those with a halflife less than 5 years. Table 43 lists short-lived progeny omitted from chains, but not omitted stable species. Both tables include long-lived, short-lived, and stable species in the parent "Nuclide" column for consistency with the original data table in Appendix B. The progeny listed in Table 43 are assumed to be in secular equilibrium with the parent nuclide on the same line.

Table 42. Halflives and long-lived (>5yr halflife) progeny of parent nuclides.

Nuclide	*Halflife*	*Units*	*Progeny*	*Branching fraction*	*Progeny*	*Branching fraction*	*Progeny*	*Branching fraction*
Ac-225	1.00E+01	d						
Ac-227	2.18E+01	yr						
Ac-228	6.15E+00	hr						
Ag-107	stable	yr						
Ag-108	2.37E+00	min						
Ag-108m	4.38E+02	yr						
Al-26	7.17E+05	yr						
Am-237	7.30E+01	min	Np-237	1.00E+00	U-233	3.42E-04		
Am-241	4.32E+02	yr	Np-237	1.00E+00				
Am-242	1.60E+01	hr	Pu-238	8.27E-01	Pu-242	1.73E-01		
Am-242m	1.41E+02	yr	Pu-238	8.28E-01	Pu-242	1.72E-01		
Am-243	7.37E+03	yr	Pu-239	1.00E+00				
Am-245	2.05E+00	hr	Cm-245	1.00E+00				
Am-246m	2.50E+01	min	Cm-246	1.00E+00				
Ar-36	stable	yr						
Ar-40	stable	yr						
At-217	3.23E+01	ms						
At-218	1.50E+00	s	Pb-210	1.00E+00				
Au-194	3.80E+01	hr						
B-10	stable	yr						
Ba-134	stable	yr						
Ba-135	stable	yr						
Ba-137	stable	yr						
Ba-137m	2.55E+00	min						
Ba-138	stable	yr						
Be-10	1.51E+06	yr						
Bi-209	1.90E+19	yr						
Bi-210	5.01E+00	d						
Bi-210m	3.04E+06	yr						
Bi-211	2.14E+00	min						
Bi-212	6.06E+01	min						
Bi-213	4.56E+01	min						
Bi-214	1.99E+01	min	Pb-210	1.00E+00				
Bk-247	1.38E+03	yr	Am-243	1.00E+00				
Bk-249	3.30E+02	d	Cf-249	1.00E+00	Cm-245	1.40E-05		
Bk-250	3.21E+00	hr	Cf-250	1.00E+00				
Br-79	stable	yr						
C-14	5.70E+03	yr						
Ca-40	stable	yr						
Ca-41	1.02E+05	yr						
Ca-44	stable	yr						
Cd-108	1.00E+18	yr						
Cd-113	7.70E+15	yr						

Nuclide	*Halflife*	*Units*	*Progeny*	*Branching fraction*	*Progeny*	*Branching fraction*	*Progeny*	*Branching fraction*
Ce-138	9.00E+13	yr						
Ce-140	stable	yr						
Ce-144	2.85E+02	d						
Cf-249	3.51E+02	yr	Cm-245	1.00E+00				
Cf-250	1.31E+01	yr	Cm-246	9.99E-01				
Cf-251	8.98E+02	yr	Cm-247	1.00E+00				
Cf-252	2.65E+00	yr	Cm-248	9.69E-01				
Cl-36	3.01E+05	yr						
Cm-241	3.28E+01	d	Am-241	9.90E-01	Np-237	1.00E-02	U-233	4.20E-07
Cm-242	1.63E+02	d	Pu-238	1.00E+00				
Cm-243	2.91E+01	yr	Pu-239	9.97E-01	Am-243	2.90E-03		
Cm-244	1.81E+01	yr	Pu-240	1.00E+00				
Cm-245	8.50E+03	yr	Pu-241	1.00E+00				
Cm-246	4.76E+03	yr	Pu-242	1.00E+00				
Cm-247	1.56E+07	yr	Am-243	1.00E+00				
Cm-248	3.48E+05	yr	Pu-244	9.16E-01				
Cm-250	8.30E+03	yr	Cm-246	1.80E-01	Cf-250	8.00E-02		
Co-59	stable	yr						
Co-60	1.93E+03	d						
Co-60m	1.05E+01	min	Co-60	9.98E-01				
Cr-53	stable	yr						
Cs-134	2.07E+00	yr						
Cs-135	2.30E+06	yr						
Cs-137	3.00E+01	yr						
Cu-63	stable	yr						
Er-166	stable	yr						
Es-253	2.05E+01	d	Cf-249	1.00E+00	Cm-245	1.40E-05		
Eu-151	stable	yr						
Eu-152	1.35E+01	yr	Gd-152	2.79E-01				
Eu-154	8.59E+00	yr						
Eu-155	4.75E+00	yr						
Fe-60	1.50E+06	yr	Co-60	9.98E-01				
Fr-221	4.90E+00	min						
Fr-223	2.20E+01	min						
Ga-68	6.77E+01	min						
Gd-152	1.08E+14	yr						
Gd-154	stable	yr						
Gd-155	stable	yr						
Ge-68	2.71E+02	d						
H-3	1.23E+01	yr						
He-3	stable	yr						
Hf-176	stable	yr						
Hf-180	stable	yr						
Hf-182	8.90E+06	yr						
Hg-194	4.44E+02	yr						
Hg-198	stable	yr						
Hg-202	stable	yr						
Ho-166m	1.20E+03	yr						
I-129	1.57E+07	yr						
In-113	stable	yr						
In-115	4.41E+14	yr						
Ir-192	7.38E+01	d						

Nuclide	*Halflife*	*Units*	*Progeny*	*Branching fraction*	*Progeny*	*Branching fraction*	*Progeny*	*Branching fraction*
Ir-192m	2.41E+02	yr						
Ir-193	stable	yr						
K-40	1.25E+09	yr						
K-41	stable	yr						
La-137	6.00E+04	yr						
La-138	1.02E+11	yr	Ce-138	3.44E-01				
Lu-176	3.76E+10	yr						
Mg-26	stable	yr						
Mn-53	3.74E+06	yr						
Mo-93	4.00E+03	yr	Nb-93m	1.00E+00				
Mo-94	stable	yr						
Mo-97	stable	yr						
N-14	stable	yr						
Na-22	2.60E+00	yr						
Nb-93	stable	yr						
Nb-93m	1.61E+01	yr						
Nb-94	2.03E+04	yr						
Nd-142	stable	yr						
Nd-143	stable	yr						
Nd-144	2.29E+15	yr						
Ne-22	stable	yr						
Ni-59	7.60E+04	yr						
Ni-60	stable	yr						
Ni-63	1.00E+02	yr						
Np-233	3.62E+01	min	U-233	1.00E+00				
Np-236a	1.54E+05	yr						
Np-237	2.14E+06	yr	U-233	1.00E+00				
Np-238	2.12E+00	d	Pu-238	1.00E+00				
Np-239	2.36E+00	d	Pu-239	1.00E+00				
Np-240	6.19E+01	min	Pu-240	1.00E+00				
Np-240m	7.22E+00	min	Pu-240	1.00E+00				
Os-186	2.00E+15	yr						
Os-187	stable	yr						
Os-192	stable	yr						
P-32	1.43E+01	d						
Pa-230	1.74E+01	d	Th-230	9.16E-01	Pb-210	8.40E-02		
Pa-231	3.28E+04	yr	Ac-227	1.00E+00				
Pa-232	1.31E+00	d						
Pa-233	2.70E+01	d	U-233	1.00E+00				
Pa-234	6.70E+00	hr	U-234	1.00E+00				
Pa-234m	1.17E+00	min	U-234	1.00E+00				
Pb-202	5.25E+04	yr						
Pb-205	1.73E+07	yr						
Pb-206	stable	yr						
Pb-207	stable	yr						
Pb-208	stable	yr						
Pb-209	3.25E+00	hr						
Pb-210	2.22E+01	yr						
Pb-211	3.61E+01	min						
Pb-212	1.06E+01	hr						
Pb-214	2.68E+01	min	Pb-210	1.00E+00				
Pd-106	stable	yr						

Nuclide	*Halflife*	*Units*	*Progeny*	*Branching fraction*	*Progeny*	*Branching fraction*	*Progeny*	*Branching fraction*
Pd-107	6.50E+06	yr						
Pd-108	stable	yr						
Pm-147	2.62E+00	yr	Sm-147	1.00E+00				
Po-210	1.38E+02	d						
Po-211	5.16E-01	s						
Po-212	9.48E-15	yr						
Po-213	3.65E+00	us						
Po-214	1.64E+02	us	Pb-210	1.00E+00				
Po-215	1.78E+00	ms						
Po-216	1.45E-01	s						
Po-218	3.10E+00	min	Pb-210	1.00E+00				
Pr-144	1.73E+01	min						
Pt-192	stable	yr						
Pt-193	5.00E+01	yr						
Pt-194	stable	yr						
Pu-236	2.86E+00	yr	U-232	1.00E+00				
Pu-237	4.52E+01	d	Np-237	1.00E+00	U-233	4.20E-05		
Pu-238	8.77E+01	yr	U-234	1.00E+00				
Pu-239	2.41E+04	yr	U-235	1.00E+00				
Pu-240	6.56E+03	yr	U-236	1.00E+00				
Pu-241	1.43E+01	yr	Am-241	1.00E+00	Np-237	2.50E-05		
Pu-242	3.75E+05	yr	U-238	1.00E+00				
Pu-243	4.96E+00	hr	Am-243	1.00E+00				
Pu-244	8.00E+07	yr	Pu-240	9.99E-01				
Pu-246	1.08E+01	d	Cm-246	1.00E+00				
Ra-221	2.80E+01	s						
Ra-222	3.80E+01	s	Pb-210	1.00E+00				
Ra-223	1.14E+01	d						
Ra-224	3.63E+00	d						
Ra-225	1.49E+01	d						
Ra-226	1.60E+03	yr	Pb-210	1.00E+00				
Ra-228	5.75E+00	yr						
Rb-87	4.97E+10	yr						
Re-186	3.72E+00	d						
Re-186m	2.00E+05	yr						
Re-187	4.12E+10	yr						
Rh-106	2.98E+01	s						
Rn-217	5.40E-01	ms						
Rn-218	3.50E+01	ms	Pb-210	1.00E+00				
Rn-219	3.96E+00	s						
Rn-220	5.56E+01	s						
Rn-222	3.82E+00	d	Pb-210	1.00E+00				
Ru-106	3.74E+02	d						
Ru-97	2.79E+00	d	Tc-97	1.00E+00				
Ru-98	stable	yr						
Ru-99	stable	yr						
S-32	stable	yr						
S-36	stable	yr						
Sb-123	stable	yr						
Sb-125	2.76E+00	yr						
Sb-126	1.24E+01	d						
Sb-126m	1.92E+01	min						

Nuclide	*Halflife*	*Units*	*Progeny*	*Branching fraction*	*Progeny*	*Branching fraction*	*Progeny*	*Branching fraction*
Sc-44	3.97E+00	hr						
Se-79	2.95E+05	yr						
Si-32	1.32E+02	yr						
Sm-146	1.03E+08	yr						
Sm-147	1.06E+11	yr						
Sm-148	7.00E+15	yr						
Sm-151	9.00E+01	yr						
Sm-152	stable	yr						
Sm-154	stable	yr						
Sn-115	stable	yr						
Sn-126	2.30E+05	yr						
Sr-87	stable	yr						
Sr-90	2.89E+01	yr						
Ta-180	8.15E+00	hr						
Ta-180m	1.20E+15	yr						
Ta-182	1.14E+02	d						
Tc-97	4.21E+06	yr						
Tc-97m	9.14E+01	d	Tc-97	1.00E+00				
Tc-98	4.20E+06	yr						
Tc-99	2.11E+05	yr						
Te-123	9.20E+16	yr						
Te-125	stable	yr						
Te-125m	5.74E+01	d						
Te-126	stable	yr						
Th-226	3.06E+01	min	Pb-210	1.00E+00				
Th-227	1.87E+01	d						
Th-228	1.91E+00	yr						
Th-229	7.34E+03	yr						
Th-230	7.54E+04	yr	Ra-226	1.00E+00				
Th-231	2.55E+01	hr	Pa-231	1.00E+00				
Th-232	1.41E+10	yr	Ra-228	1.00E+00				
Th-234	2.41E+01	d	U-234	1.00E+00				
Ti-44	6.00E+01	yr						
Ti-49	stable	yr						
Tl-202	1.22E+01	d						
Tl-205	stable	yr						
Tl-206	4.20E+00	min						
Tl-207	4.77E+00	min						
Tl-208	3.05E+00	min						
Tl-209	2.16E+00	min						
Tl-210	1.30E+00	min	Pb-210	1.00E+00				
U-230	2.08E+01	d	Pb-210	1.00E+00				
U-232	6.89E+01	yr						
U-233	1.59E+05	yr	Th-229	1.00E+00				
U-234	2.46E+05	yr	Th-230	1.00E+00				
U-235	7.04E+08	yr	Pa-231	1.00E+00				
U-236	2.34E+07	yr	Th-232	1.00E+00				
U-237	6.75E+00	d	Np-237	1.00E+00				
U-238	4.47E+09	yr	U-234	1.00E+00				
U-240	1.41E+01	hr	Pu-240	1.00E+00				
V-49	3.29E+02	d						
W-180	1.80E+18	yr						

Nuclide	*Halflife*	*Units*	*Progeny*	*Branching fraction*	*Progeny*	*Branching fraction*	*Progeny*	*Branching fraction*
W-182	8.30E+18	yr						
W-186	2.70E+19	yr						
Xe-129	stable	yr						
Y-90	6.41E+01	hr						
Zn-68	stable	yr						
Zr-90	stable	yr						
Zr-93	1.53E+06	yr	Nb-93m	1.00E+00				

Table 43. Halflives and short-lived (<5yr halflife) progeny of parent nuclides.

Nuclide	*Halflife*	*Units*	*Progeny*	*Branching fraction*	*Progeny*	*Branching fraction*	*Progeny*	*Branching fraction*	*Progeny*	*Branching fraction*	*Progeny*	*Branching fraction*	*Progeny*	*Branching fraction*	*Progeny*	*Branching fraction*	*Progeny*	*Branching fraction*	*Progeny*	*Branching fraction*	*Progeny*	*Branching fraction*
Ac-225	1.00E+01	d	Fr-221	1.00E+00	At-217	1.00E+00	Bi-213	1.00E+00	Po-213	9.80E-01	Pb-209	1.00E+00	Tl-209	2.09E-02	Ra-221	1.00E-03	Rn-217	1.00E-03				
Ac-227	2.18E+01	yr	Th-227	9.86E-01	Ra-223	1.00E+00	Rn-219	1.00E+00	Po-215	1.00E+00	Pb-211	1.00E+00	Bi-211	1.00E+00	Tl-207	9.97E-01	Po-211	2.80E-03	Fr-223	1.38E-02		
Ac-228	6.15E+00	hr	Th-228	1.00E+00	Ra-224	1.00E+00	Rn-220	1.00E+00	Po-216	1.00E+00	Pb-212	1.00E+00	Bi-212	1.00E+00	Po-212	6.41E-01	Tl-208	3.59E-01				
Ag-107	stable	yr																				
Ag-108	2.37E+00	min																				
Ag-108m	4.38E+02	yr	Ag-108	8.70E-02																		
Al-26	7.17E+05	yr																				
Am-237	7.30E+01	min	Pu-237	1.00E+00	Np-233	3.00E-04																
Am-241	4.32E+02	yr																				
Am-242	1.60E+01	hr	Cm-242	8.27E-01																		
Am-242m	1.41E+02	yr	Am-242	9.95E-01	Cm-242	8.23E-01	Np-238	4.59E-03														
Am-243	7.37E+03	yr	Np-239	1.00E+00																		
Am-245	2.05E+00	hr																				
Am-246m	2.50E+01	min																				
Ar-36	stable	yr																				
Ar-40	stable	yr																				
At-217	3.23E+01	ms	Bi-213	1.00E+00	Po-213	9.79E-01	Pb-209	1.00E+00	Tl-209	2.09E-02												
At-218	1.50E+00	s	Bi-214	1.00E+00	Po-214	1.00E+00	Tl-210	2.00E-04														
Au-194	3.80E+01	hr																				
B-10	stable	yr																				
Ba-134	stable	yr																				
Ba-135	stable	yr																				
Ba-137	stable	yr																				
Ba-137m	2.55E+00	min																				
Ba-138	stable	yr																				
Be-10	1.51E+06	yr																				
Bi-209	1.90E+19	yr																				
Bi-210	5.01E+00	d	Po-210	1.00E+00																		
Bi-210m	3.04E+06	yr	Tl-206	1.00E+00																		
Bi-211	2.14E+00	min	Tl-207	9.97E-01	Po-211	2.80E-03																
Bi-212	6.06E+01	min	Po-212	6.41E-01	Tl-208	3.59E-01																
Bi-213	4.56E+01	min	Po-213	9.79E-01	Pb-209	1.00E+00	Tl-209	2.09E-02														
Bi-214	1.99E+01	min	Po-214	1.00E+00	Tl-210	2.00E-04																
Bk-247	1.38E+03	yr																				
Bk-249	3.30E+02	d	Am-245	1.40E-05																		
Bk-250	3.21E+00	hr																				
Br-79	stable	yr																				
C-14	5.70E+03	yr																				
Ca-40	stable	yr																				
Ca-41	1.02E+05	yr																				
Ca-44	stable	yr																				
Cd-108	1.00E+18	yr																				

Nuclide	*Halflife*	*Units*	*Progeny*	*Branching fraction*	*Progeny*	*Branching fraction*	*Progeny*	*Branching fraction*	*Progeny*	*Branching fraction*	*Progeny*	*Branching fraction*	*Progeny*	*Branching fraction*	*Progeny*	*Branching fraction*	*Progeny*	*Branching fraction*	*Progeny*	*Branching fraction*
Cd-113	7.70E+15	yr																		
Ce-138	9.00E+13	yr																		
Ce-140	stable	yr																		
Ce-144	2.85E+02	d	Pr-144	1.00E+00																
Cf-249	3.51E+02	yr																		
Cf-250	1.31E+01	yr																		
Cf-251	8.98E+02	yr																		
Cf-252	2.65E+00	yr																		
Cl-36	3.01E+05	yr																		
Cm-241	3.28E+01	d	Pu-237	1.00E-02																
Cm-242	1.63E+02	d																		
Cm-243	2.91E+01	yr																		
Cm-244	1.81E+01	yr																		
Cm-245	8.50E+03	yr																		
Cm-246	4.76E+03	yr																		
Cm-247	1.56E+07	yr	Pu-243	1.00E+00																
Cm-248	3.48E+05	yr																		
Cm-250	8.30E+03	yr	Pu-246	1.80E-01	Am-246m	1.80E-01	Bk-250	8.00E-02												
Co-59	stable	yr																		
Co-60	1.93E+03	d																		
Co-60m	1.05E+01	min																		
Cr-53	stable	yr																		
Cs-134	2.07E+00	yr																		
Cs-135	2.30E+06	yr																		
Cs-137	3.00E+01	yr																		
Cu-63	stable	yr																		
Er-166	stable	yr																		
Es-253	2.05E+01	d	Bk-249	1.00E+00	Am-245	1.40E-05														
Eu-151	stable	yr																		
Eu-152	1.35E+01	yr																		
Eu-154	8.59E+00	yr																		
Eu-155	4.75E+00	yr																		
Fe-60	1.50E+06	yr	Co-60m	1.00E+00																
Fr-221	4.90E+00	min	At-217	1.00E+00	Bi-213	1.00E+00	Po-213	9.80E-01	Pb-209	1.00E+00	Tl-209	2.09E-02	Ra-221	1.00E-03	Rn-217	1.00E-03				
Fr-223	2.20E+01	min	Ra-223	1.00E+00	Rn-219	1.00E+00	Po-215	1.00E+00	Pb-211	1.00E+00	Bi-211	1.00E+00	Tl-207	9.97E-01	Po-211	2.80E-03				
Ga-68	6.77E+01	min																		
Gd-152	1.08E+14	yr																		
Gd-154	stable	yr																		
Gd-155	stable	yr																		
Ge-68	2.71E+02	d	Ga-68	1.00E+00																
H-3	1.23E+01	yr																		

Nuclide	*Halflife*	*Units*	*Progeny*	*Branching fraction*	*Progeny*	*Branching fraction*	*Progeny*	*Branching fraction*	*Progeny*	*Branching fraction*	*Progeny*	*Branching fraction*	*Progeny*	*Branching fraction*	*Progeny*	*Branching fraction*	*Progeny*	*Branching fraction*	*Progeny*	*Branching fraction*	*Progeny*	*Branching fraction*
He-3	stable	yr																				
Hf-176	stable	yr																				
Hf-180	stable	yr																				
Hf-182	8.90E+06	yr	Ta-182	1.00E+00																		
Hg-194	4.44E+02	yr	Au-194	1.00E+00																		
Hg-198	stable	yr																				
Hg-202	stable	yr																				
Ho-166m	1.20E+03	yr																				
I-129	1.57E+07	yr																				
In-113	stable	yr																				
In-115	4.41E+14	yr																				
Ir-192	7.38E+01	d																				
Ir-192m	2.41E+02	yr	Ir-192	1.00E+00																		
Ir-193	stable	yr																				
K-40	1.25E+09	yr																				
K-41	stable	yr																				
La-137	6.00E+04	yr																				
La-138	1.02E+11	yr																				
Lu-176	3.76E+10	yr																				
Mg-26	stable	yr																				
Mn-53	3.74E+06	yr																				
Mo-93	4.00E+03	yr																				
Mo-94	stable	yr																				
Mo-97	stable	yr																				
N-14	stable	yr																				
Na-22	2.60E+00	yr																				
Nb-93	stable	yr																				
Nb-93m	1.61E+01	yr																				
Nb-94	2.03E+04	yr																				
Nd-142	stable	yr																				
Nd-143	stable	yr																				
Nd-144	2.29E+15	yr																				
Ne-22	stable	yr																				
Ni-59	7.60E+04	yr																				
Ni-60	stable	yr																				
Ni-63	1.00E+02	yr																				
Np-233	3.62E+01	min																				
Np-236a	1.54E+05	yr																				
Np-237	2.14E+06	yr	Pa-233	1.00E+00																		
Np-238	2.12E+00	d																				
Np-239	2.36E+00	d																				
Np-240	6.19E+01	min																				
Np-240m	7.22E+00	min	Np-240	1.20E-03																		
Os-186	2.00E+15	yr																				
Os-187	stable	yr																				
Os-192	stable	yr																				

Nuclide	*Halflife*	*Units*	*Progeny*	*Branching fraction*	*Progeny*	*Branching fraction*	*Progeny*	*Branching fraction*	*Progeny*	*Branching fraction*	*Progeny*	*Branching fraction*	*Progeny*	*Branching fraction*	*Progeny*	*Branching fraction*	*Progeny*	*Branching fraction*	*Progeny*	*Branching fraction*	*Progeny*	*Branching fraction*
P-32	1.43E+01	d																				
Pa-230	1.74E+01	d	U-230	8.40E-02	Th-226	8.40E-02	Ra-222	8.40E-02	Rn-218	8.40E-02	Po-214	8.40E-02										
Pa-231	3.28E+04	yr																				
Pa-232	1.31E+00	d																				
Pa-233	2.70E+01	d																				
Pa-234	6.70E+00	hr																				
Pa-234m	1.17E+00	min	Pa-234	1.60E-03																		
Pb-202	5.25E+04	yr	Tl-202	1.00E+00																		
Pb-205	1.73E+07	yr																				
Pb-206	stable	yr																				
Pb-207	stable	yr																				
Pb-208	stable	yr																				
Pb-209	3.25E+00	hr																				
Pb-210	2.22E+01	yr	Bi-210	1.00E+00	Po-210	1.00E+00																
Pb-211	3.61E+01	min	Bi-211	1.00E+00	Tl-207	9.97E-01	Po-211	2.80E-03														
Pb-212	1.06E+01	hr	Bi-212	1.00E+00	Po-212	6.41E-01	Tl-208	3.59E-01														
Pb-214	2.68E+01	min	Bi-214	1.00E+00	Po-214	1.00E+00	Tl-210	2.00E-04														
Pd-106	stable	yr																				
Pd-107	6.50E+06	yr																				
Pd-108	stable	yr																				
Pm-147	2.62E+00	yr																				
Po-210	1.38E+02	d																				
Po-211	5.16E-01	s																				
Po-212	9.48E-15	yr																				
Po-213	3.65E+00	us	Pb-209	1.00E+00																		
Po-214	1.64E+02	us																				
Po-215	1.78E+00	ms	Pb-211	1.00E+00	Bi-211	1.00E+00	Tl-207	9.97E-01	Po-211	2.80E-03												
Po-216	1.45E-01	s	Pb-212	1.00E+00	Bi-212	1.00E+00	Po-212	6.41E-01	Tl-208	3.59E-01												
Po-218	3.10E+00	min	Pb-214	1.00E+00	Bi-214	1.00E+00	Po-214	1.00E+00	Tl-210	2.00E-04	At-218	2.00E-04										
Pr-144	1.73E+01	min																				
Pt-192	stable	yr																				
Pt-193	5.00E+01	yr																				
Pt-194	stable	yr																				
Pu-236	2.86E+00	yr																				
Pu-237	4.52E+01	d																				
Pu-238	8.77E+01	yr																				
Pu-239	2.41E+04	yr																				
Pu-240	6.56E+03	yr																				
Pu-241	1.43E+01	yr	U-237	2.50E-05																		
Pu-242	3.75E+05	yr																				
Pu-243	4.96E+00	hr																				
Pu-244	8.00E+07	yr	U-240	9.99E-01	Np-240m	9.99E-01	Np-240	1.20E-03														
Pu-246	1.08E+01	d	Am-246m	1.00E+00																		
Ra-221	2.80E+01	s	Rn-217	1.00E+00	Po-213	1.00E+00	Pb-209	1.00E+00														
Ra-222	3.80E+01	s	Rn-218	1.00E+00	Po-214	1.00E+00																
Ra-223	1.14E+01	d	Rn-219	1.00E+00	Po-215	1.00E+00	Pb-211	1.00E+00	Bi-211	1.00E+00	Tl-207	9.97E-01	Po-211	2.80E-03								
Ra-224	3.63E+00	d	Rn-220	1.00E+00	Po-216	1.00E+00	Pb-212	1.00E+00	Bi-212	1.00E+00	Po-212	6.41E-01	Tl-208	3.59E-01								

Nuclide	*Halflife*	*Units*	*Progeny*	*Branching fraction*	*Progeny*	*Branching fraction*	*Progeny*	*Branching fraction*	*Progeny*	*Branching fraction*	*Progeny*	*Branching fraction*	*Progeny*	*Branching fraction*	*Progeny*	*Branching fraction*	*Progeny*	*Branching fraction*	*Progeny*	*Branching fraction*	*Progeny*	*Branching fraction*
Ra-225	1.49E+01	d	Ac-225	1.00E+00	Fr-221	1.00E+00	At-217	1.00E+00	Bi-213	1.00E+00	Po-213	9.80E-01	Pb-209	1.00E+00	Tl-209	2.09E-02	Ra-221	1.00E-03	Rn-217	1.00E-03		
Ra-226	1.60E+03	yr	Rn-222	1.00E+00	Po-218	1.00E+00	Pb-214	1.00E+00	Bi-214	1.00E+00	Po-214	1.00E+00	Tl-210	2.00E-04	At-218	2.00E-04						
Ra-228	5.75E+00	yr	Ac-228	1.00E+00	Th-228	1.00E+00	Ra-224	1.00E+00	Rn-220	1.00E+00	Po-216	1.00E+00	Pb-212	1.00E+00	Bi-212	1.00E+00	Po-212	6.41E-01	Tl-208	3.59E-01		
Rb-87	4.97E+10	yr																				
Re-186	3.72E+00	d																				
Re-186m	2.00E+05	yr	Re-186	1.00E+00																		
Re-187	4.12E+10	yr																				
Rh-106	2.98E+01	s																				
Rn-217	5.40E-01	ms	Po-213	1.00E+00	Pb-209	1.00E+00																
Rn-218	3.50E+01	ms	Po-214	1.00E+00																		
Rn-219	3.96E+00	s	Po-215	1.00E+00	Pb-211	1.00E+00	Bi-211	1.00E+00	Tl-207	9.97E-01	Po-211	2.80E-03										
Rn-220	5.56E+01	s	Po-216	1.00E+00	Pb-212	1.00E+00	Bi-212	1.00E+00	Po-212	6.41E-01	Tl-208	3.59E-01										
Rn-222	3.82E+00	d	Po-218	1.00E+00	Pb-214	1.00E+00	Bi-214	1.00E+00	Po-214	1.00E+00	Tl-210	2.00E-04	At-218	2.00E-04								
Ru-106	3.74E+02	d	Rh-106	1.00E+00																		
Ru-97	2.79E+00	d																				
Ru-98	stable	yr																				
Ru-99	stable	yr																				
S-32	stable	yr																				
S-36	stable	yr																				
Sb-123	stable	yr																				
Sb-125	2.76E+00	yr																				
Sb-126	1.24E+01	d																				
Sb-126m	1.92E+01	min	Sb-126	1.40E-01																		
Sc-44	3.97E+00	hr																				
Se-79	2.95E+05	yr																				
Si-32	1.32E+02	yr	P-32	1.00E+00																		
Sm-146	1.03E+08	yr																				
Sm-147	1.06E+11	yr																				
Sm-148	7.00E+15	yr																				
Sm-151	9.00E+01	yr																				
Sm-152	stable	yr																				
Sm-154	stable	yr																				
Sn-115	stable	yr																				
Sn-126	2.30E+05	yr	Sb-126m	1.00E+00	Sb-126	1.40E-01																
Sr-87	stable	yr																				
Sr-90	2.89E+01	yr	Y-90	1.00E+00																		
Ta-180	8.15E+00	hr																				
Ta-180m	1.20E+15	yr																				
Ta-182	1.14E+02	d																				
Tc-97	4.21E+06	yr																				
Tc-97m	9.14E+01	d																				
Tc-98	4.20E+06	yr																				
Tc-99	2.11E+05	yr																				
Te-123	9.20E+16	yr																				
Te-125	stable	yr																				
Te-	5.74E+01	d																				

Nuclide	*Halflife*	*Units*	*Progeny*	*Branching fraction*	*Progeny*	*Branching fraction*	*Progeny*	*Branching fraction*	*Progeny*	*Branching fraction*	*Progeny*	*Branching fraction*	*Progeny*	*Branching fraction*	*Progeny*	*Branching fraction*	*Progeny*	*Branching fraction*	*Progeny*	*Branching fraction*	*Progeny*	*Branching fraction*
125m																						
Te-126	stable	yr																				
Th-226	3.06E+01	min	Ra-222	1.00E+00	Rn-218	1.00E+00	Po-214	1.00E+00														
Th-227	1.87E+01	d	Ra-223	1.00E+00	Rn-219	1.00E+00	Po-215	1.00E+00	Pb-211	1.00E+00	Bi-211	1.00E+00	Tl-207	9.97E-01	Po-211	2.80E-03						
Th-228	1.91E+00	yr	Ra-224	1.00E+00	Rn-220	1.00E+00	Po-216	1.00E+00	Pb-212	1.00E+00	Bi-212	1.00E+00	Po-212	6.41E-01	Tl-208	3.59E-01						
Th-229	7.34E+03	yr	Ra-225	1.00E+00	Ac-225	1.00E+00	Fr-221	1.00E+00	At-217	1.00E+00	Bi-213	1.00E+00	Po-213	9.80E-01	Pb-209	1.00E+00	Tl-209	2.09E-02	Ra-221	1.00E-03	Rn-217	1.00E-03
Th-230	7.54E+04	yr																				
Th-231	2.55E+01	hr																				
Th-232	1.41E+10	yr																				
Th-234	2.41E+01	d	Pa-234m	1.00E+00	Pa-234	1.60E-03																
Ti-44	6.00E+01	yr	Sc-44	1.00E+00																		
Ti-49	stable	yr																				
Tl-202	1.22E+01	d																				
Tl-205	stable	yr																				
Tl-206	4.20E+00	min																				
Tl-207	4.77E+00	min																				
Tl-208	3.05E+00	min																				
Tl-209	2.16E+00	min	Pb-209	1.00E+00																		
Tl-210	1.30E+00	min																				
U-230	2.08E+01	d	Th-226	1.00E+00	Ra-222	1.00E+00	Rn-218	1.00E+00	Po-214	1.00E+00												
U-232	6.89E+01	yr	Th-228	1.00E+00	Ra-224	1.00E+00	Rn-220	1.00E+00	Po-216	1.00E+00	Pb-212	1.00E+00	Bi-212	1.00E+00	Po-212	6.41E-01	Tl-208	3.59E-01				
U-233	1.59E+05	yr																				
U-234	2.46E+05	yr																				
U-235	7.04E+08	yr	Th-231	1.00E+00																		
U-236	2.34E+07	yr																				
U-237	6.75E+00	d																				
U-238	4.47E+09	yr	Th-234	1.00E+00	Pa-234m	1.00E+00	Pa-234	1.60E-03														
U-240	1.41E+01	hr	Np-240m	1.00E+00	Np-240	1.20E-03																
V-49	3.29E+02	d																				
W-180	1.80E+18	yr																				
W-182	8.30E+18	yr																				
W-186	2.70E+19	yr																				
Xe-129	stable	yr																				
Y-90	6.41E+01	hr																				
Zn-68	stable	yr																				
Zr-90	stable	yr																				
Zr-93	1.53E+06	yr																				

4.3 AQUIFER FLOW

The SRS is underlain by sediment of the Atlantic Coastal Plain. The Atlantic Coastal Plain consists of a southeast-dipping wedge of unconsolidated and semi-consolidated sediment that extends from its contact with the Piedmont province at the Fall Line to the edge of the continental shelf (Figure 45). The sediment ranges from Late Cretaceous to Miocene in age and comprises layers of sand, muddy sand, and mud with subordinate calcareous sediment. The sediment rests unconformably on crystalline and sedimentary basement rock. The nomenclature applied to shallow lithostratigraphic and hydrostratigraphic units is identified in Figure 46. The E-Area PA document (WSRC 2008) summarizes the general hydrogeology of the SRS as follows:

"The hydrogeology at the SRS has several general characteristics. In general, recharge for the deeper aquifers occurs updip of the SRS, near the Fall Line. Some recharge also occurs in the northern-most fringe of the site. In contrast, recharge for the water table aquifers (e.g., Upper Three Runs Aquifer) primarily comes from local precipitation. The upper two aquifer units, the Upper Three Runs aquifer and the Gordon aquifer, discharge to local streams at the SRS in addition to recharging underlying units. Within the confining units, an abundance of clay-sized material and clay minerals helps to limit the vertical migration of contaminants. Furthermore, the presence of an upward vertical gradient or “head reversal” between the Crouch Branch aquifer and the overlying Gordon and Upper Three Runs aquifers plays a significant role in preventing the downward vertical migration of contaminants."

Figure 47 is a hydrogeologic conceptual model of groundwater flow beneath the GSA. Water enters the Upper Three Runs (UTR) aquifer as surface recharge. Groundwater in the UTR aquifer, composed of an Upper Aquifer Zone (UAZ) and Lower Aquifer Zone (LAZ) separated by a Tan Clay Confining Zone (TCCZ), generally discharges to Fourmile Branch or Upper Three Runs. However, roughly 1/3 of surface recharge leaks through the Gordon Confining Unit (GCU) to the Gordon Aquifer Unit (GAU) (Flach and Harris 1999).

As seen from Figure 1, the Z-Area SDF lies on a topographic high in the General Separations Area (GSA), loosely bounded by Upper Three Runs, McQueen Branch and Crouch Branch. Figure 48 show the general pattern of groundwater flow from the SDF to discharge points along Upper Three Runs and McQueen Branch, in the form of three-dimensional simulated pathlines emanating from each Vault 2 type future disposal cell. The pathline simulations are based in an existing groundwater flow model known as the GSA/PORFLOW model (Flach 2004), which is adopted for aquifer flow simulations in the current study.

The areal grid resolution of the GSA/PORFLOW model is 200 ft by 200 ft, except in peripheral areas (Figure 49). Vertically the grid extends from ground surface to the bottom of the GAU (Figure 50). The UAZ is represented with up to 10 finite-elements depending on topography. The TCCZ, LAZ, GCU and GAU contain 2, 5, 2 and 2 element layers respectively, for a total of 21 elements at the highest elevation in the model. The 3D grid comprises 102,294 active cells. Flach (2004) and Flach and Harris (1999) provide further description of the GSA/PORFLOW model and its ancestor GSA/FACT.

A grid resolution finer than 200 ft x 200 ft is required to avoid excessive numerical dispersion at the 100 meter plume scale. The amount of numerical dispersion depends on the numerical algorithm, grid spacing, and time stepping. For one-dimensional finite difference simulation using upstream spatial weighting and central temporal differencing, the effective dispersivity arising from numerical dispersion alone is equal to $\Delta x/2$, where Δx is the grid resolution (Zheng and Bennett 1995, Equation 6-45). Typical modeling practice, arising from field scale tracer tests, is to assume a longitudinal dispersivity that is 10% of the plume travel distance. For SDF PA aquifer simulations, the length scale is taken as 100 meters and an appropriate physical dispersivity is 10 meters. An adequate grid resolution for 100 meter plume simulations is 50 ft or 15 meters. Numerical dispersion associated with this resolution is thus equivalent to a dispersivity less than 8 meters. Therefore, a 50 ft mesh spacing does not introduce excessive numerical dispersion. This conclusion is supported by numerical studies presented in Section 6 of WSRC-STI-2007-00150, Rev. 0 "PORFLOW Testing and Verification Document" (Aleman 2007).

A 50 ft resolution velocity field can be generated directly from the coarser scale GSA velocity model by subdividing a portion of the GSA/PORFLOW grid and computing velocities on the finer sub-grid using a mass-conserving linear interpolation scheme (Flach 2007). This approach avoids a separate flow model requiring its own boundary conditions and properties, while ensuring strict mass consistency with the original aquifer flow field. Figure 51 shows the footprint chosen for the higher resolution SDF aquifer flow field. The SDF velocity field includes the entire vertical extent of the GSA model within the horizontal confines of the SDF domain. No vertical refinement is applied.

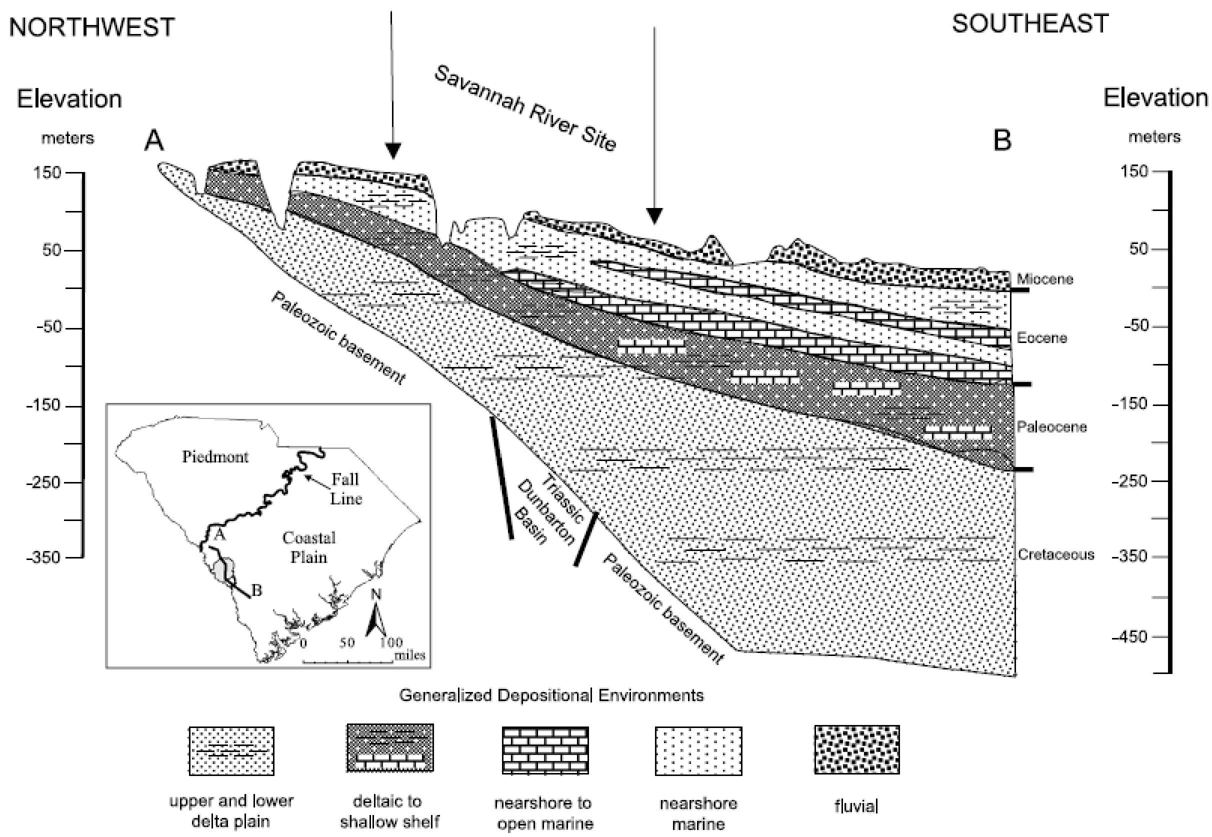


Figure 45. Generalized regional geologic cross section and physiographic location of the study area (reproduced from Jean et al. 2004).

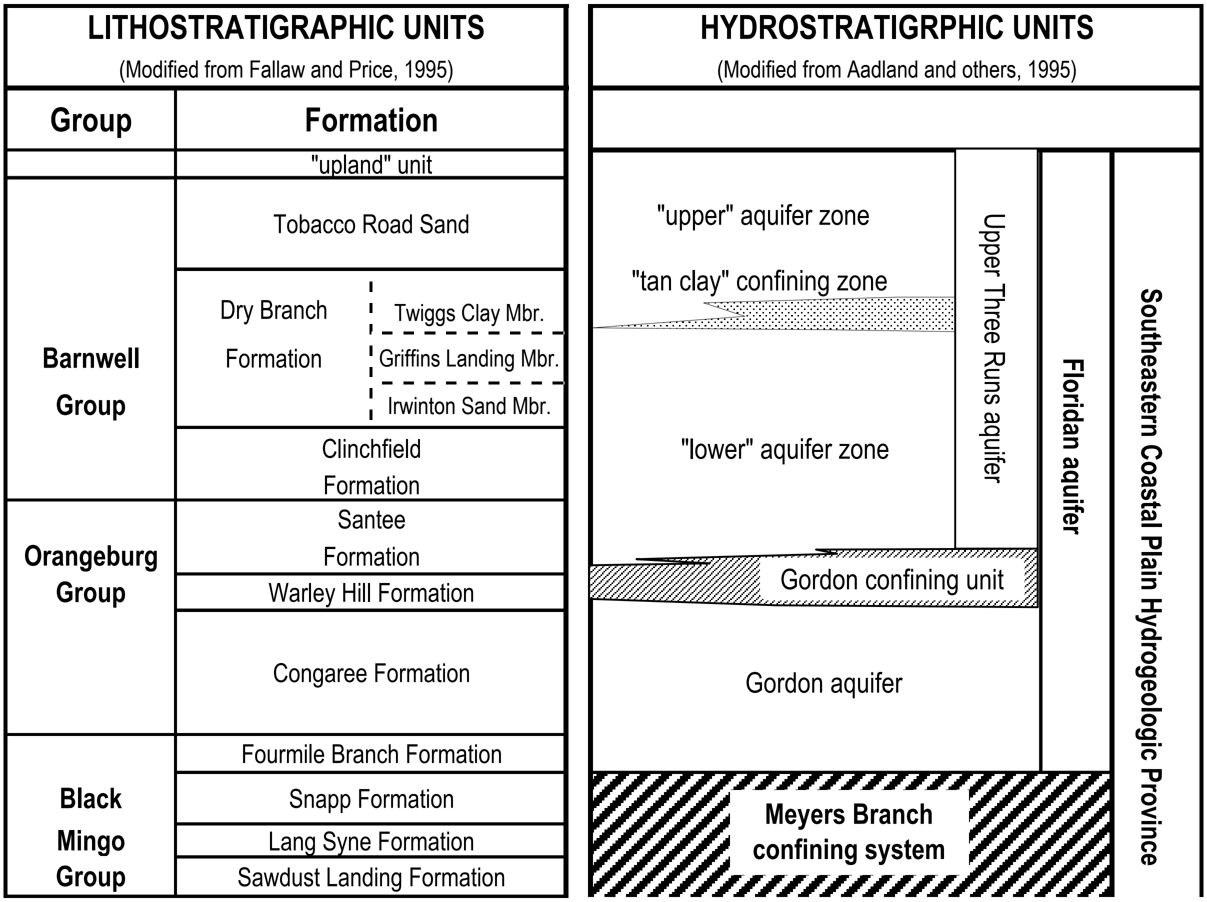


Figure 46. Hydrostratigraphy of the Savannah River Site.

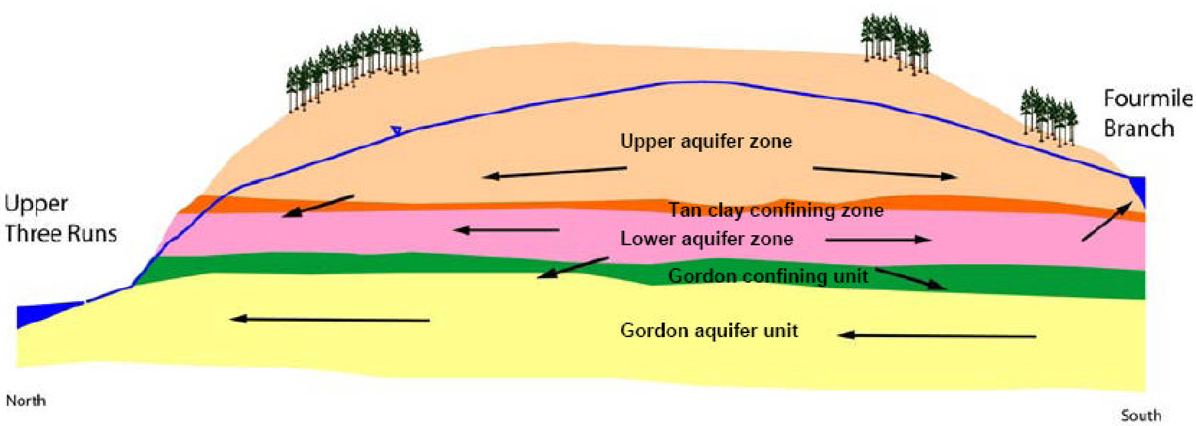


Figure 47. Hydrogeologic conceptual model of groundwater flow beneath the General Separations Area (GSA); reproduced from WSRC (2008, Figure 3-14).

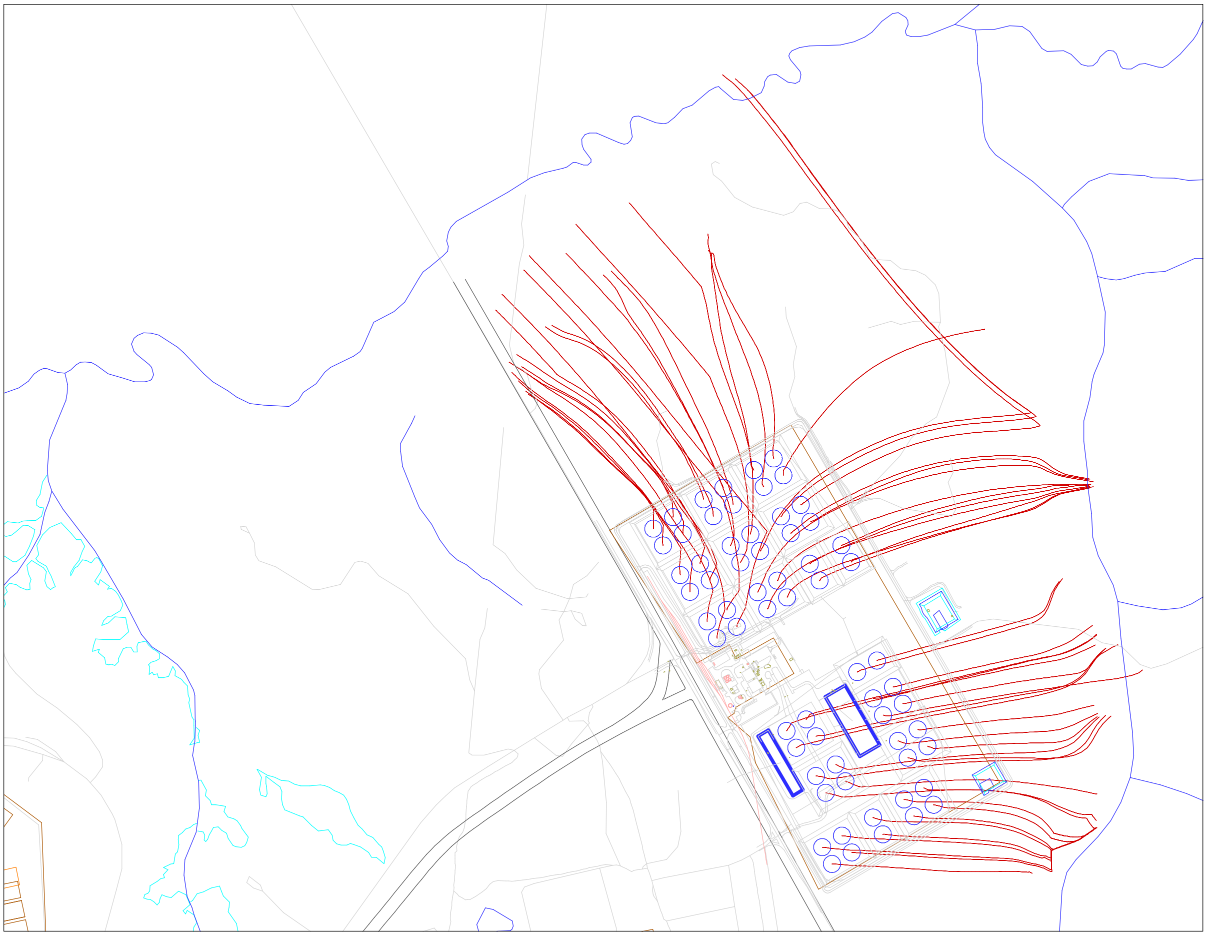


Figure 48. Simulated three-dimensional groundwater pathlines emanating from Vault 2 type future disposal cells.

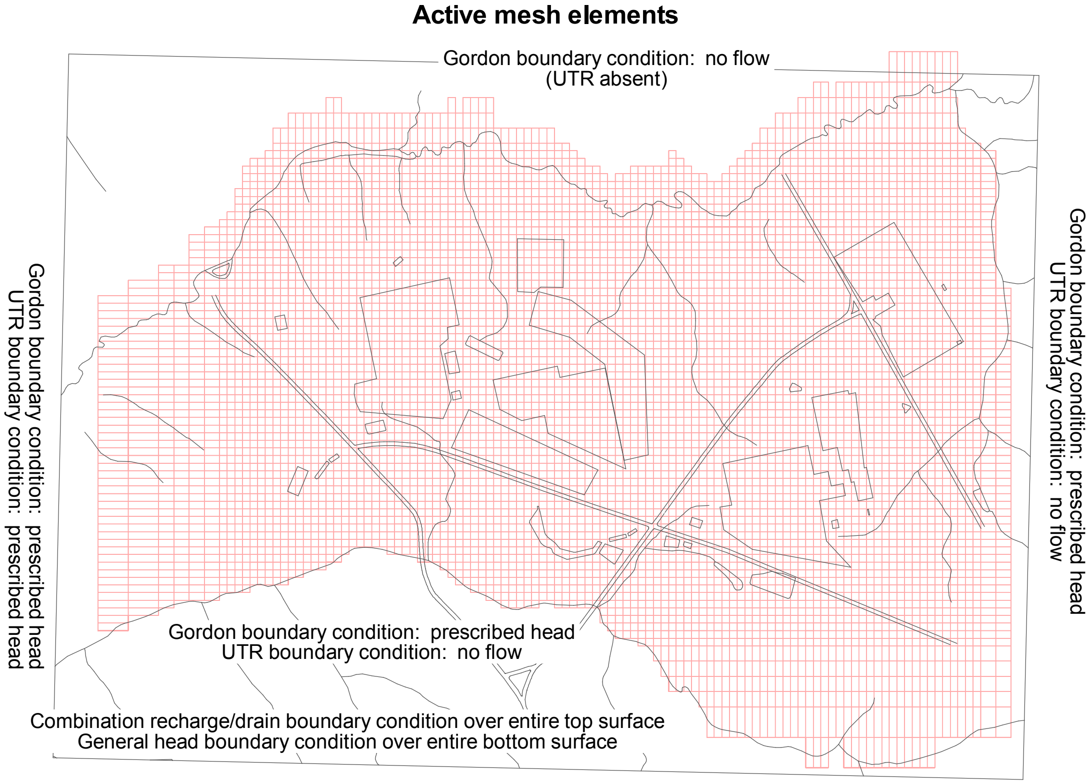


Figure 49. Areal view of active grid elements and boundary conditions in GSA/PORFLOW model.

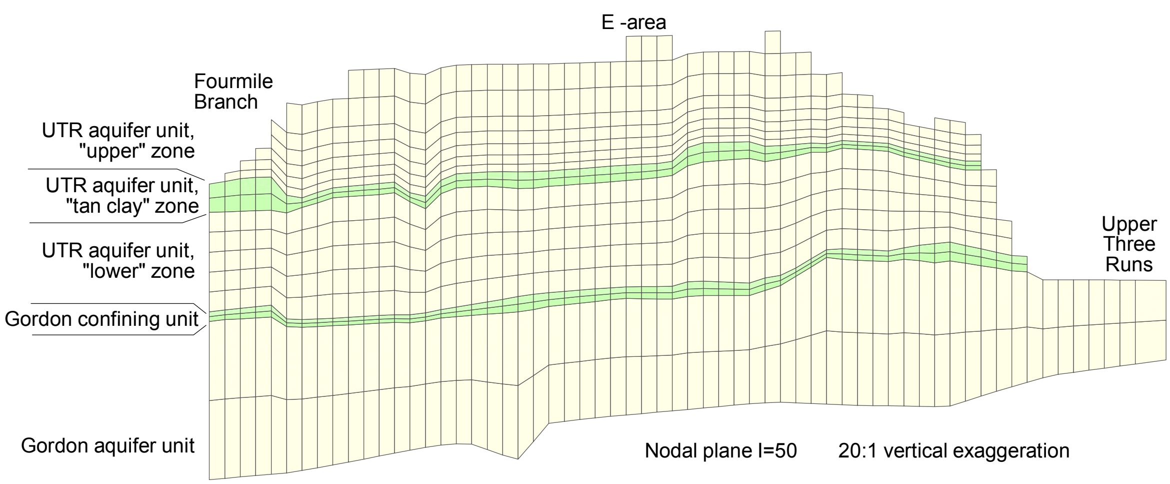


Figure 50. Typical north-south cross-section through the GSA/PORFLOW model grid.

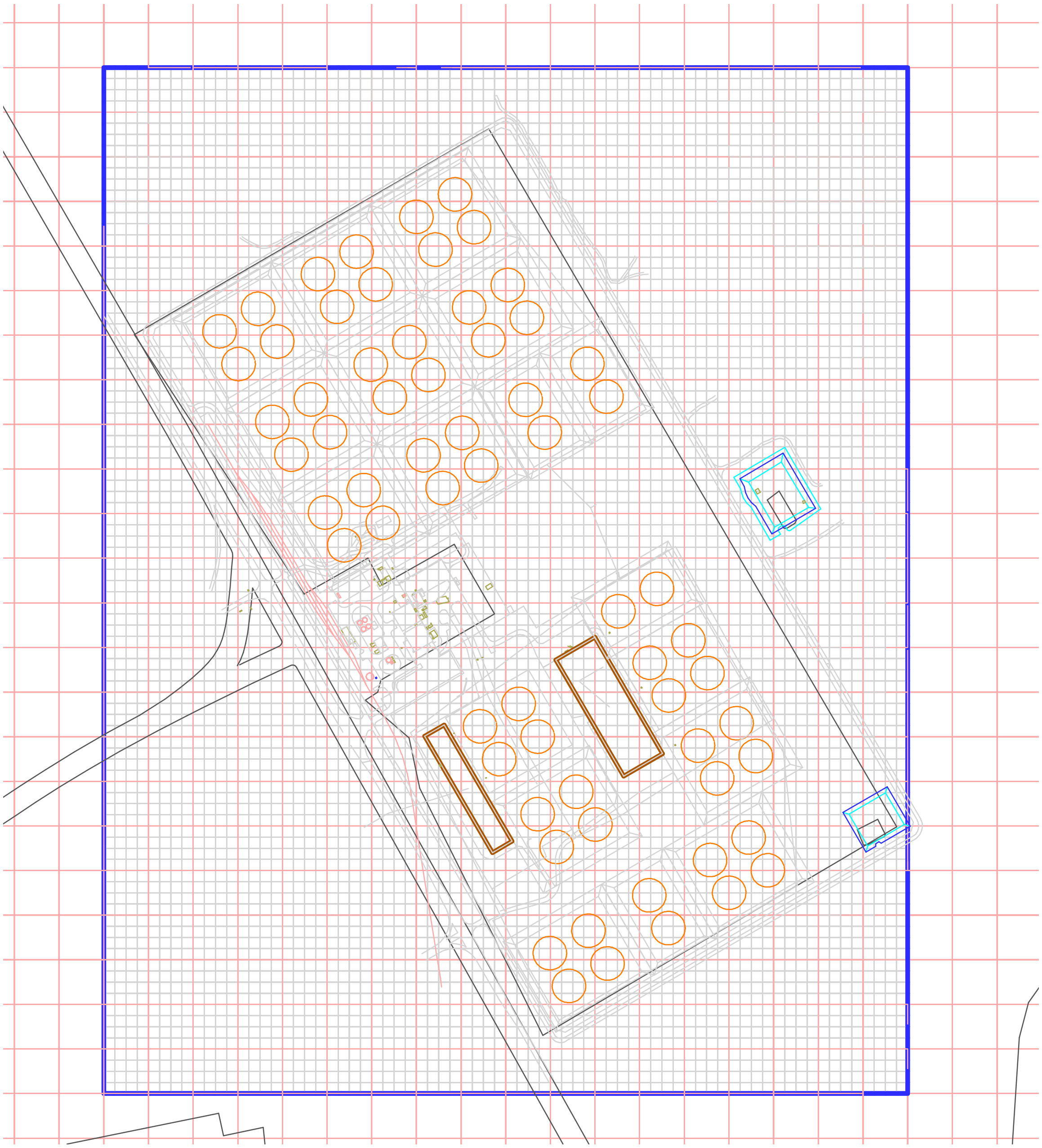


Figure 51. Footprint and grid resolution of the SDF aquifer flow field derived from the GSA/PORFLOW model.

4.4 AQUIFER TRANSPORT

Inputs to aquifer transport simulations include the refined SDF velocity field described in the previous section, a contaminant flux from vadose transport modeling described later, sorption coefficients from Table 14, and dispersivities. "Sandy" values are applied to grid cells for which the vertical hydraulic conductivity is greater than or equal to 1.e-7 cm/s; "Clayey" values are used otherwise. Within the SDF footprint, "Clayey" values coincide with the GCU and "Sandy" values are applied elsewhere. Longitudinal dispersity in the horizontal plane is set to 10 meters, or 10% of the distance to 100 meter assessment points. Transverse dispersivity in the horizontal plane is set 1 meter. Vertical dispersitivities are set to zero, but some numerical dispersion occurs nonetheless.

"Source" nodes corresponding to vaults and future disposal cells are depicted in Figure 52. Also shown are "1 meter" and "100 meter" nodes composing the groundwater assessment perimeter surrounding SDF disposal cells. In mathematical parlance, the 1 meter nodes are created by first defining the convex hull of all vaults and future disposal cells. The convex hull can be thought of as a taut rubberband enveloping the collection of vaults and future disposal cells. The 1 meter perimeter cells are defined as those grid nodes that adjoin on any side or corner with nodes inside the convex hull of source regions. The 100 meter nodes are constructed by defining 100 meter buffer zones for each vault and future disposal cell, and joining these with the convex hull of the source zones. By definition, the 100 meter perimeter nodes adjoin at least one buffer node on a face or corner. For diagnostic purposes we also divide the 1 meter and 100 meter assessment into "Sectors" labels A-L, as shown in Figure 53. For the 1 meter distance, the collection of Sector nodes are identical to those depicted in Figure 52, except that upgradient nodes are omitted. For the 100 meter Sectors, the original 100 meter perimeter is slightly modified to lie exactly 100 meters beyond the 1 meter perimeter for consistency.

For seepline assessment, the original GSA/PORFLOW model grid is used. Grid nodes corresponding to sources and seepage faces are identified in Figure 54. The figure also shows groundwater pathlines emanating from various disposal cells to indicate general groundwater flow patterns.

A uniform time step of 2.5 years was chosen for SDF PA transport simulations. Simulations involving a mobile species that releases as a sharp pulse may exhibit modest numerical dispersion, resulting from larger than ideal time stepping.

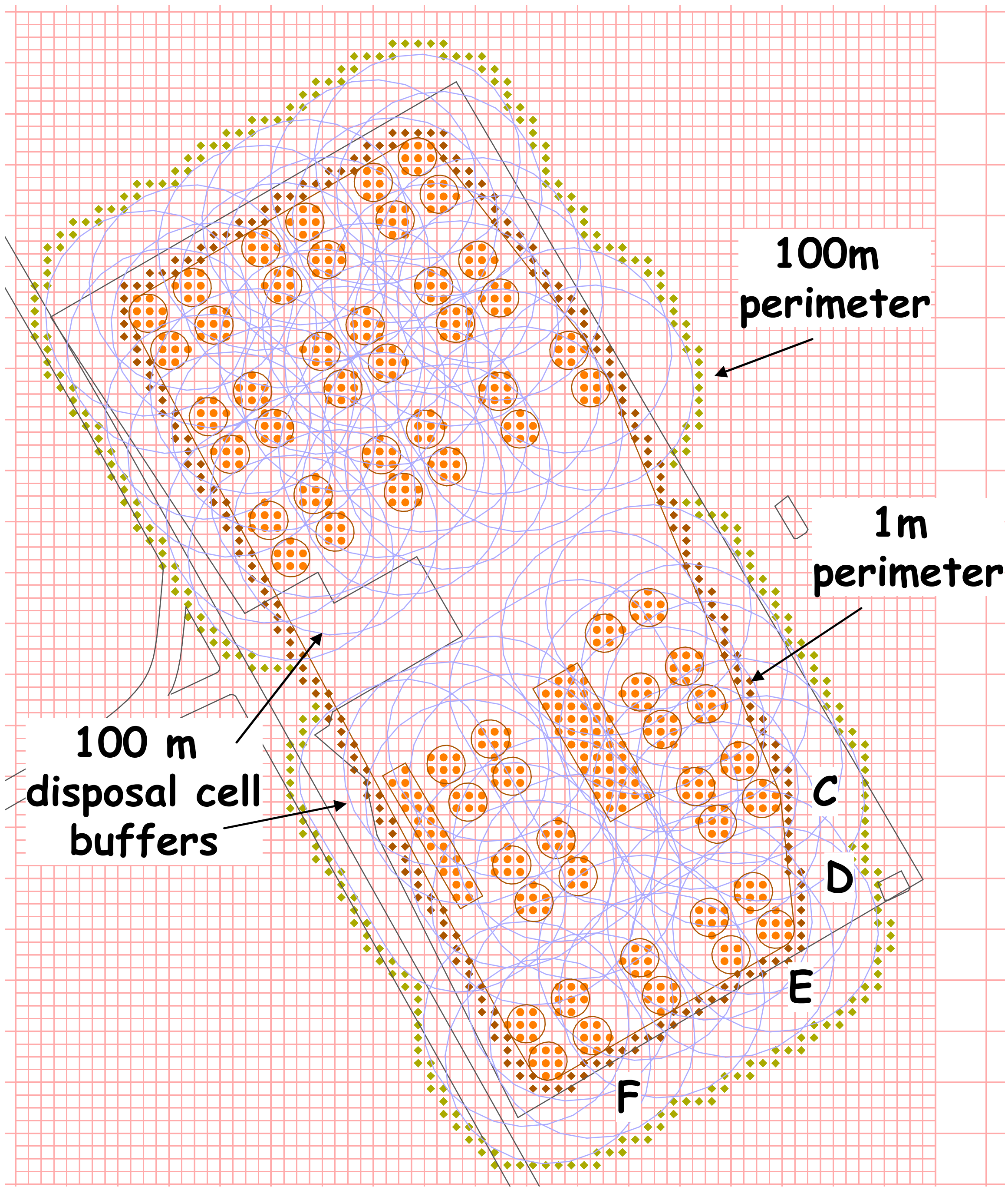


Figure 52. Grid nodes defining the 1 meter and 100 meter perimeters for groundwater assessment.

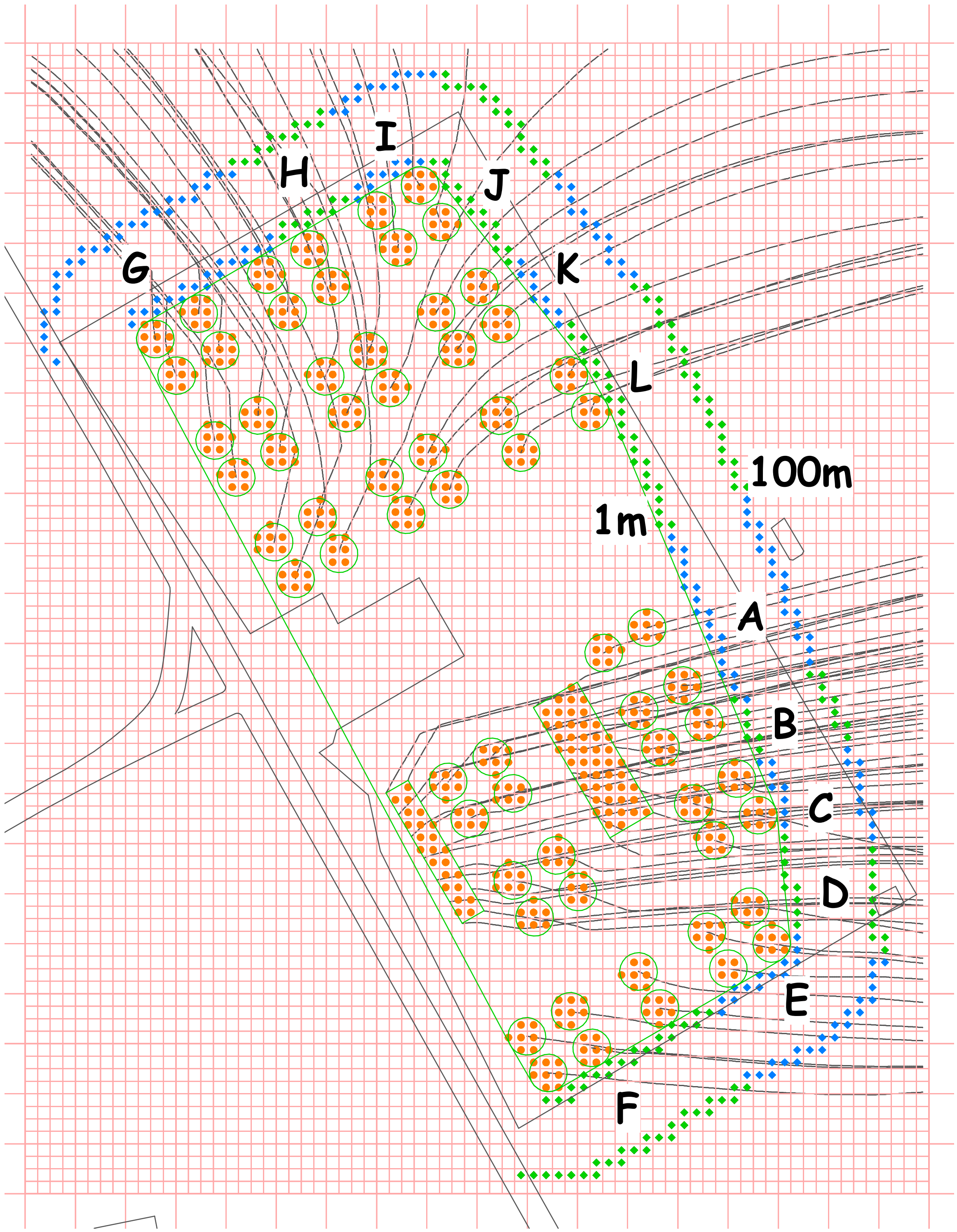


Figure 53. Diagnostic 1 meter and 100 meter sectors for (A-L) with simulated groundwater pathlines.

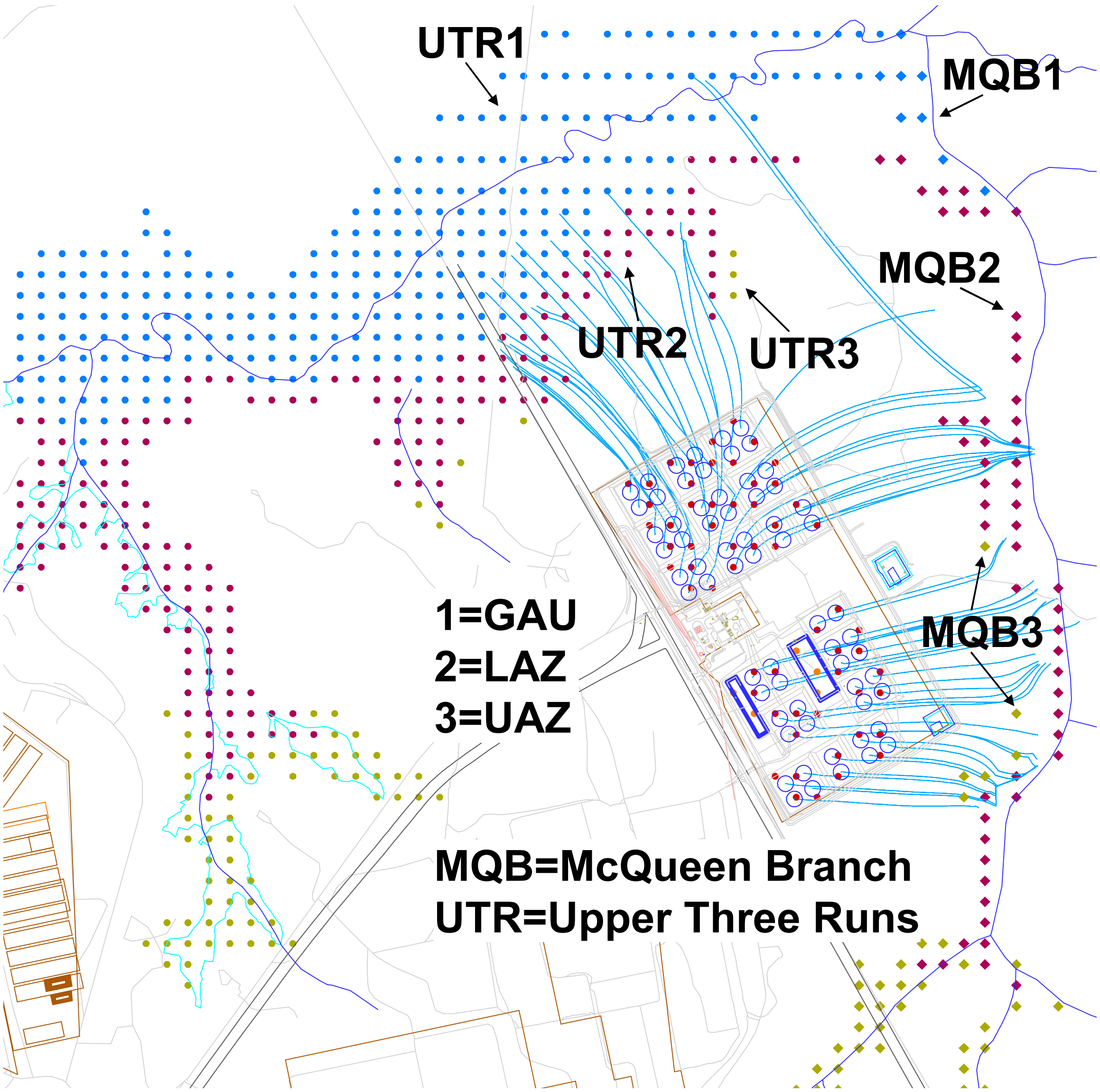


Figure 54. Grid nodes defining seepline assessment points.

4.5 VADOSE ZONE FLOW

Infiltration through the cover system and the properties of engineered materials are predicted to change through time, creating a transient flow in the vadose zone. However, the computational costs of simulating transient flow are excessive, and a reasonable model representation can be achieved through a series of steady-state flow simulations. In this chosen approach, each steady-state flow run represents average conditions over a time interval. The chosen time intervals are listed in Table 44. The periods are shorter in early years when cap infiltration and HDPE/GCL liner properties are changing more rapidly. After the 10,000 year period of primary interest, the intevals coarsen for computational efficiency. This approach inherently creates "stair step" changes in conditions, when individual runs are assembled into a quasi-transient flow simulation. As an example, the effective variation in infiltration for the time periods in Table 44 is depicted in Figure 55 through 10,000 years.

The sizable length to width aspect ratio of Vaults 1 and 4 and the axisymmetric nature of Vault 2 are amenable to computational efficient two-dimensional modeling. For the existing rectangular vaults, we model half of a representative 2D cross-section, taking advantage of symmetry about the centerline and using Cartesian coordinates. For future disposal cells, we model a radial slice using 2D cylindrical coordinates, assuming axisymmetric conditions. Figure 56 through Figure 58 illustrate the material zones and computational mesh chosen for each vault type. Figure 59 through Figure 61 identify key features and properties of each grid.

The numerical grids reflect actual dimensions of engineered materials, except in the case of the HDPE and HDPE/GCL liners and hypothetical fast flow paths. The 100 mil (0.1") HDPE and 300 mil (0.3") HDPE/GCL are modeled as being 1.0" thick to avoid numerical difficulties. Hydraulic conductivity perpendicular to these layers is increased by 10x and 3.33x respectively, in order to preserve the physical leakance of the materials. Sheet drain (Vaults 2, 4) and crack (Vaults 1, 4) features are modeled as being 2.0" thick. The 7.0" annular gap in Vault 2 is equivalent in cross-sectional area of the 48 internal roof support columns. Depth to the watertable is set to an average value in the case of the 64 future disposal cells (Table 45) based on the watertable map shown in Figure 62 and base elevations from Figure 4.

The cover system infiltration is prescribed at the upper boundary of each mesh. The lower boundary coincides with the water table is assigned a fixed pressure head of zero. The sides are no flow boundaries due to symmetry or sufficient distance from the vault.

A total of 18 "material zone" numbered identifiers have been defined for collective use in building the Vault 1, 2 and 4 numerical models:

1 = NATIVE_SOIL
2 = BACKFILL
3 = LOWER_MUD_MAT
4 = SHOT_CRETE
5 = UPPER_MUD_MAT
6 = FLOOR
7 = SALTSTONE
8 = CLEAN_GROUT
9 = HDPE
10 = SHEET_DRAIN
11 = WALL
12 = DIAPHRAGM
13 = FLOOR_HDPE_GCL
14 = ROOF
15 = ROOF_HDPE_GCL
16 = SAND_DRAIN
17 = CRACK
18 = COLUMN

The material zone is a subzone of the grid that receives a material property assignment. The labels are suggestive of a typical material property assignment (e.g. "SALTSTONE" zone 7 ↔ "saltstone" material from Table 13). However, a material zone can be associated with any material from the palette. For example, sheet drains, cracks, and support columns through Saltstone are inactive in Base Case A and are assigned the "saltstone" material from Table 13. In Diagnostic Case C, these zones become fast flow paths and are assigned the higher conductivity "Gravel" or "Sand" material.

The "SHEET_DRAIN", "CRACK" and "COLUMN" material zones are extended through the roof and floor of the vault, and represent the corresponding physical feature as well as hypothetical breaches through the vault. A complete fast flow path is formed when the hydraulic conductivity is set to a high value in one of these zones. When not activated, the horizontal conductivity is set to that of the neighboring Saltstone material, and the zone is made practically impermeable in the vertical direction. The latter assignment prevents unintended leakage out of the vault, due to Saltstone being more permeable than the vault concrete. If Saltstone filled the portion of the aperture passing through floor and roof, then an artificial breach of the vault would occur. This approach to modeling a fast flow path avoids the need to change multiple material zones in order to activate the conduit, but requires a modified vertical conductivity.

For each time interval, material properties are assigned to a material zone by specifying a material from the palette, and two time-dependent multipliers to the base value (from Table 13). The value (v) used for a time interval (TI##) is the base value (b) times the two time-dependent factors (f_1,f_2), averaged over the time period.

$$v = b \times \overline{f_1(t)} \times \overline{f_2(t)} \quad (30)$$

The factors are defined by linear interpolation of discrete data pairs. By convention, the first factor is used to effect property changes due to degradation. The second factor is used to correct for differences between physical and model geometry (e.g. HDPE thickness discussed above). Often both factors are 1.0 (e.g backfilled soil).

Figure 63 through Figure 65 illustrate changes in key properties and conditions though time for Base Case A. Other, diagnostic, scenarios are described in Section 3.9 and summarized below:

Case A – Baseline case
Case B – Fast flow path via sheet drain system
Case C – Fast flow paths via sheet drain system, cracks, and columns
Case D – Sheet drain system intact to maintain gap between saltstone grout and walls
Case E – Baseline case with degraded saltstone

Vault 1 does not have a sheet drain system, so Cases B and D are not applicable to that disposal unit. Table 46 summarizes material property differences between the Diagnostic Cases B-E and Base Case A. Appendix E provides a complete listing of all material property specifications through time for Cases A-E.

Table 44. Vadose zone flow simulation time intervals.

Time interval	Starting year	Ending year
TI01	0	50
TI02	50	100
TI03	100	150
TI04	150	200
TI05	200	250
TI06	250	300
TI07	300	350
TI08	350	400
TI09	400	450
TI10	450	500
TI11	500	600
TI12	600	700
TI13	700	800
TI14	800	900
TI15	900	1000
TI16	1000	1200
TI17	1200	1400
TI18	1400	1600
TI19	1600	1800
TI20	1800	2000
TI21	2000	2300
TI22	2300	2600
TI23	2600	2900
TI24	2900	3200
TI25	3200	3600
TI26	3600	4000
TI27	4000	4500
TI28	4500	5000
TI29	5000	5500
TI30	5500	6000
TI31	6000	6500
TI32	6500	7000
TI33	7000	7500
TI34	7500	8000
TI35	8000	8500
TI36	8500	9000
TI37	9000	9500
TI38	9500	10000
TI39	10000	11000
TI40	11000	12000
TI41	12000	15000
TI42	15000	20000
TI43	20000	50000
TI44	50000	100000

Table 45. Depth from vault bottom to water table.

Vault number	Disposal cells	Watertable (ft m.s.l.)	Vault elevation (ft m.s.l.)	Distance (ft)	Number of disposal cells
2	A-B	225.5	269	43.5	2
3	A-B	224.3	265	40.7	2
5	A-D	226.5	270	43.5	4
6	A-D	224.2	270	45.8	4
7	A-D	223.7	260	36.3	4
8	A-D	228.8	270	41.2	4
9	A-D	226.8	270	43.2	4
10	A-D	224.4	260	35.6	4
11	A-D	230.4	275	44.6	4
12	A-D	228.4	275	46.6	4
13	A-D	232.1	270	37.9	4
14	A-B	229.2	270	40.8	2
15	A-D	228.3	270	41.7	4
16	A-D	230.9	270	39.1	4
17	A-D	225.5	270	44.5	4
18	A-D	229.8	270	40.2	4
19	A-B	226.5	270	43.5	2
20	A-D	222.3	270	47.7	4
Vault 2	average			42.0	
Vault 1	A-F	233.5	281.5	48	1
Vault 4	A-L	230.6	269	38.4	1

Table 46. Changes relative to Base Case A for Diagnostic Configurations.

Vault 1	**Case A**	**Case B**	**Case C**	**Case D**	**Case E**
Crack K_h	2.0E-09	- -	1.5E-01 [(a)]	- -	2.0E-09
Crack K_v	5.0E-15	- -	1.5E-01 [(a)]	- -	5.0E-15
Saltstone K_h	2.0E-09	- -	2.0E-09	- -	1.67E-03 [(d)]
Saltstone K_v	2.0E-09	- -	2.0E-09	- -	1.67E-03 [(d)]
Vault 4	**Case A**	**Case B**	**Case C**	**Case D**	**Case E**
Crack K_h	2.0E-09	2.0E-09	1.5E-01 [(a)]	2.0E-09	2.0E-09
Crack K_v	5.0E-15	5.0E-15	1.5E-01 [(a)]	5.0E-15	5.0E-15
Saltstone K_h	2.0E-09	2.0E-09	2.0E-09	2.0E-09	1.67E-03 [(d)]
Saltstone K_v	2.0E-09	2.0E-09	2.0E-09	2.0E-09	1.67E-03 [(d)]
Sheet Drain K_h	2.0E-09	1.5E-01 [(a)]	1.5E-01 [(a)]	5.0E-15 [(c)]	2.0E-09
Sheet Drain K_v	5.0E-15	1.5E-01 [(a)]	1.5E-01 [(a)]	5.0E-15	5.0E-15
Vault 2	**Case A**	**Case B**	**Case C**	**Case D**	**Case E**
Column K_v	5.0E-15	5.0E-15	2.8E-04 [(b)]	5.0E-15	5.0E-15
Column K_h	2.0E-09	2.0E-09	5.0E-04 [(b)]	2.0E-09	2.0E-09
Saltstone K_h	2.0E-09	2.0E-09	2.0E-09	2.0E-09	1.67E-03 [(d)]
Saltstone K_v	2.0E-09	2.0E-09	2.0E-09	2.0E-09	1.67E-03 [(d)]
Sheet Drain K_h	2.0E-09	1.5E-01 [(a)]	1.5E-01 [(a)]	5.0E-15 [(c)]	2.0E-09
Sheet Drain K_v	5.0E-15	1.5E-01 [(a)]	1.5E-01 [(a)]	5.0E-15	5.0E-15

(a) To model a fast flow path along the sheet drains and crack conditions, the conductivity for gravel (1.5E-1 cm/sec, Table 5-18, WSRC-STI-2006-00198) is assigned to the sheet drains and the "crack" material zone.

(b) To model a fast flow path through the columns, the conductivity for sand (Table 5-18, WSRC-STI-2006-00198) is assigned to the columns.

(c) To model an intact sheet drain system that provides a break between the saltstone grout and the vault/cell wall, the horizontal conductivity is assigned the "impervious" value of 5.0E-15 cm/sec.

(d) To model a degraded saltstone condition the conductivities are assigned values of 1.67E-3 cm/sec material palette.

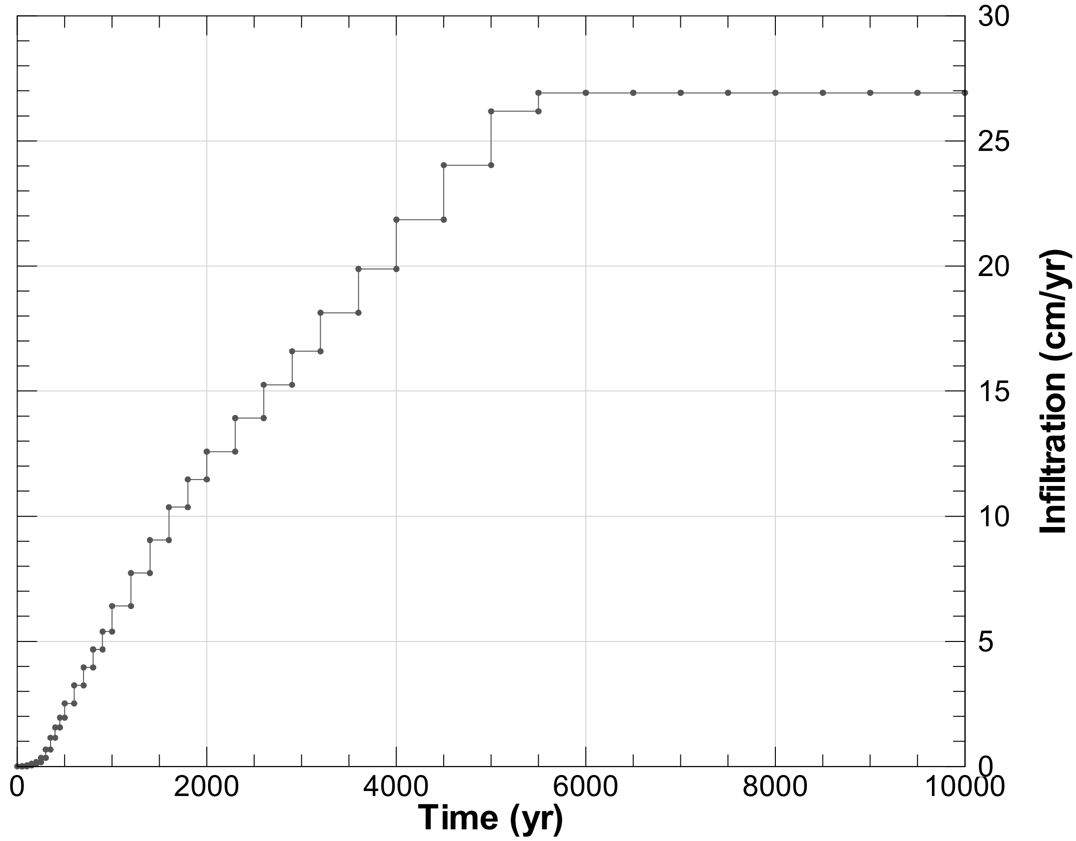
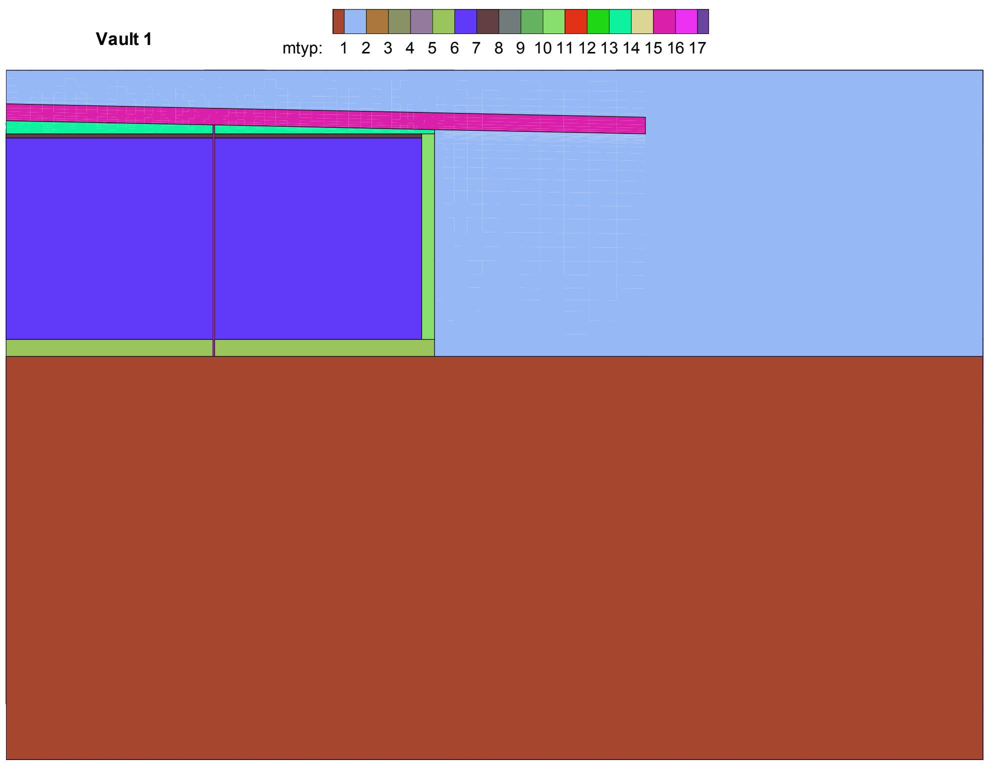
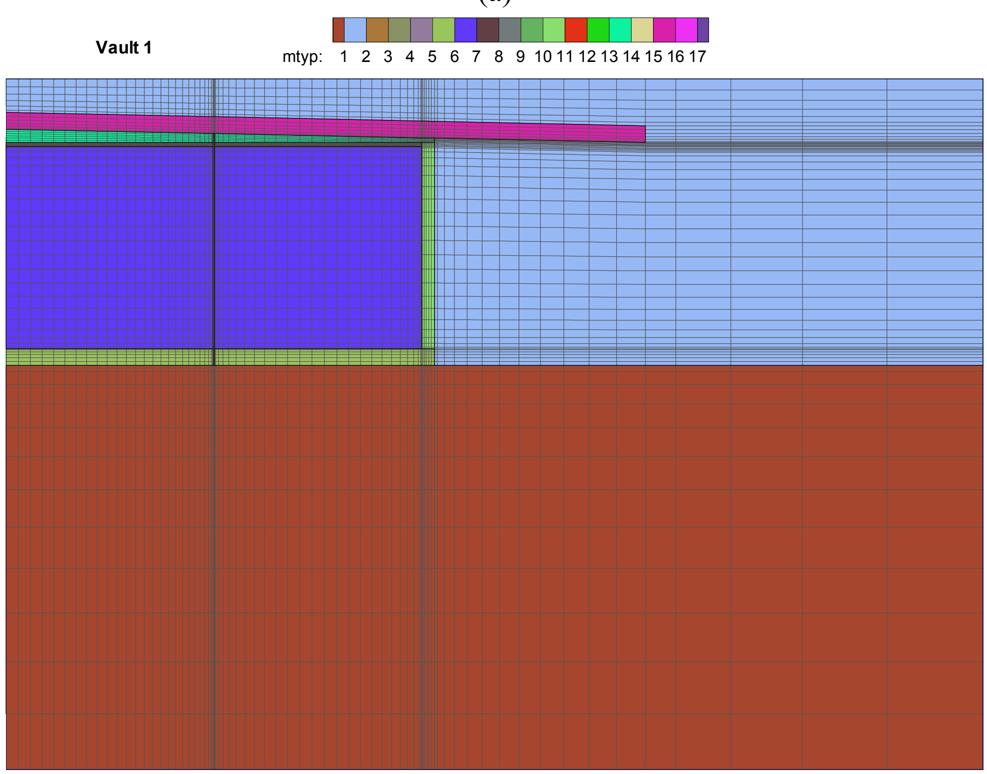


Figure 55. Modeled variation in infiltration.

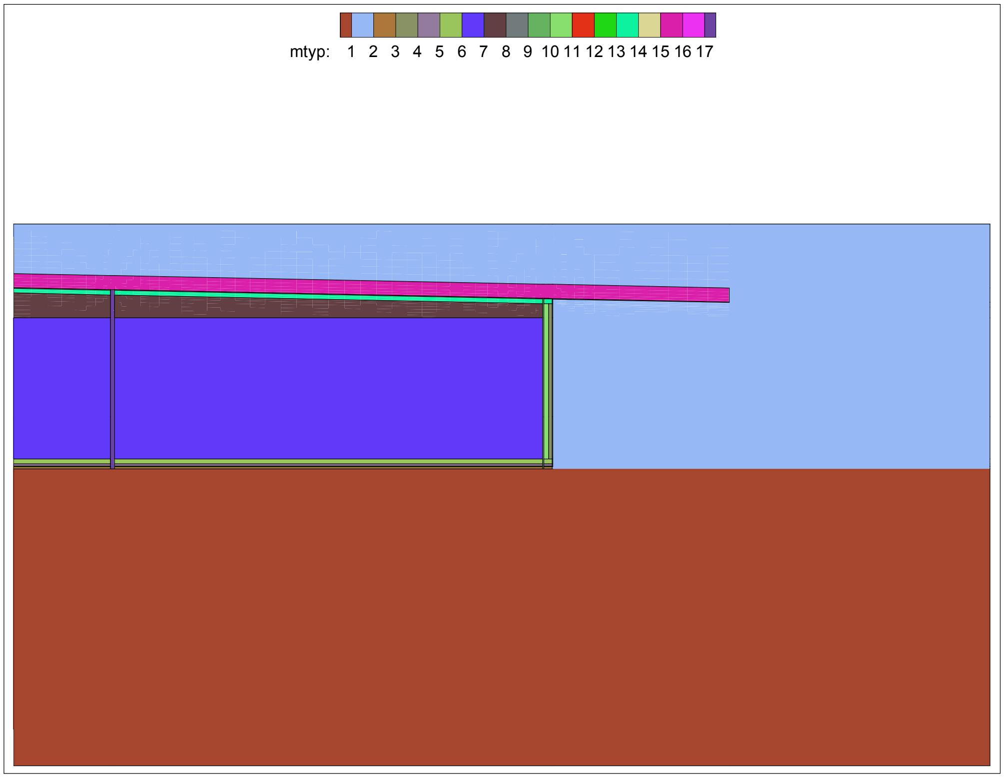


(a)

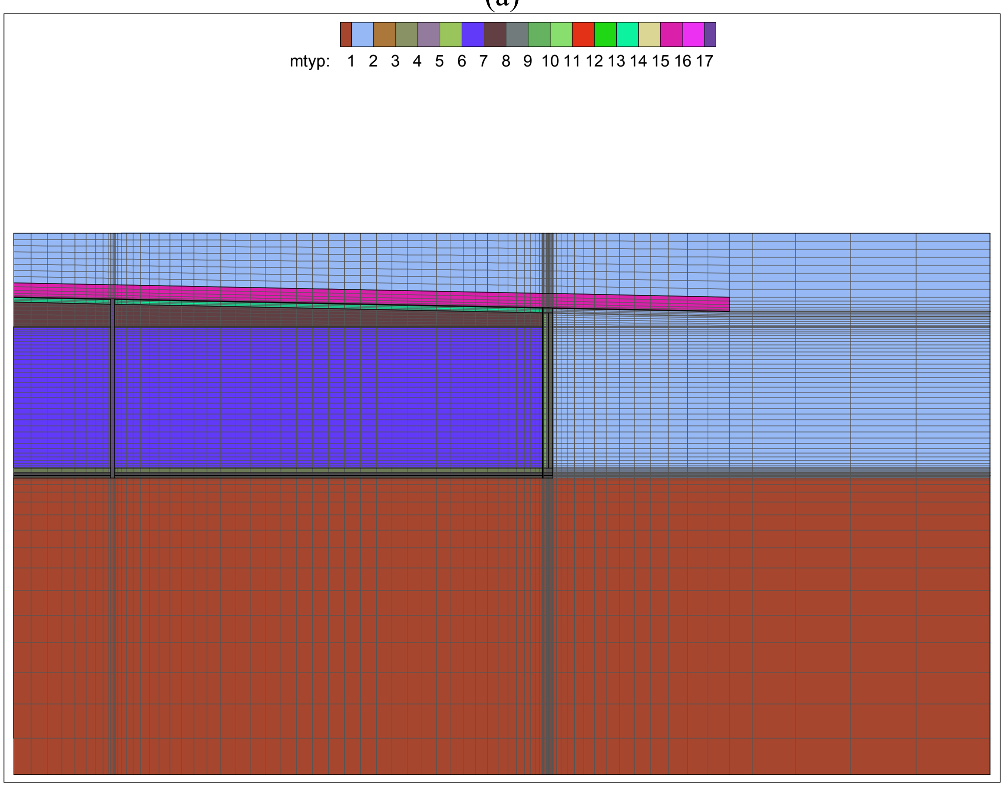


(b)

Figure 56. Material zones (a) and computational mesh (b) for Vault 1 vadose zone simulations.

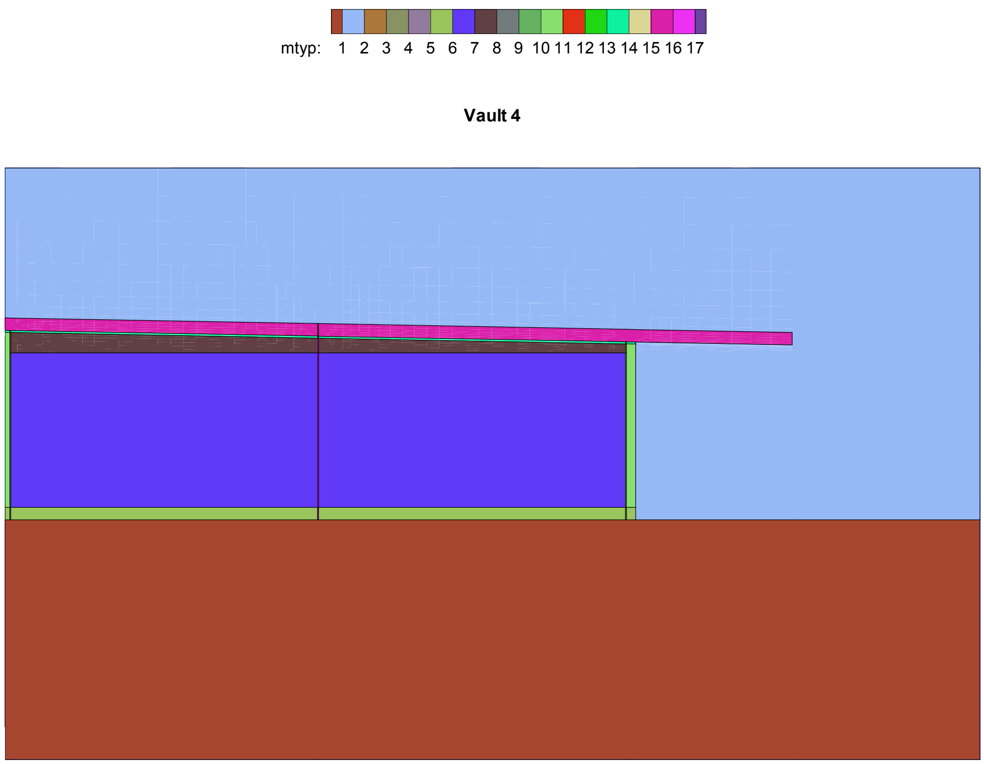


(a)

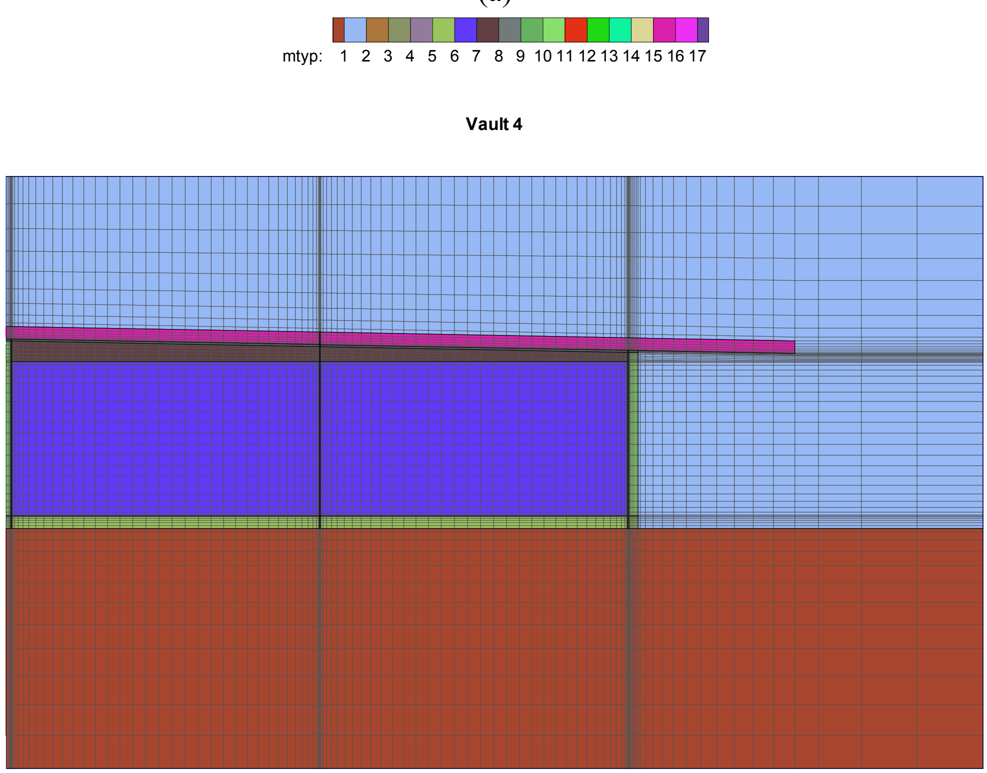


(b)

Figure 57. Material zones (a) and computational mesh (b) for Vault 2 vadose zone simulations.

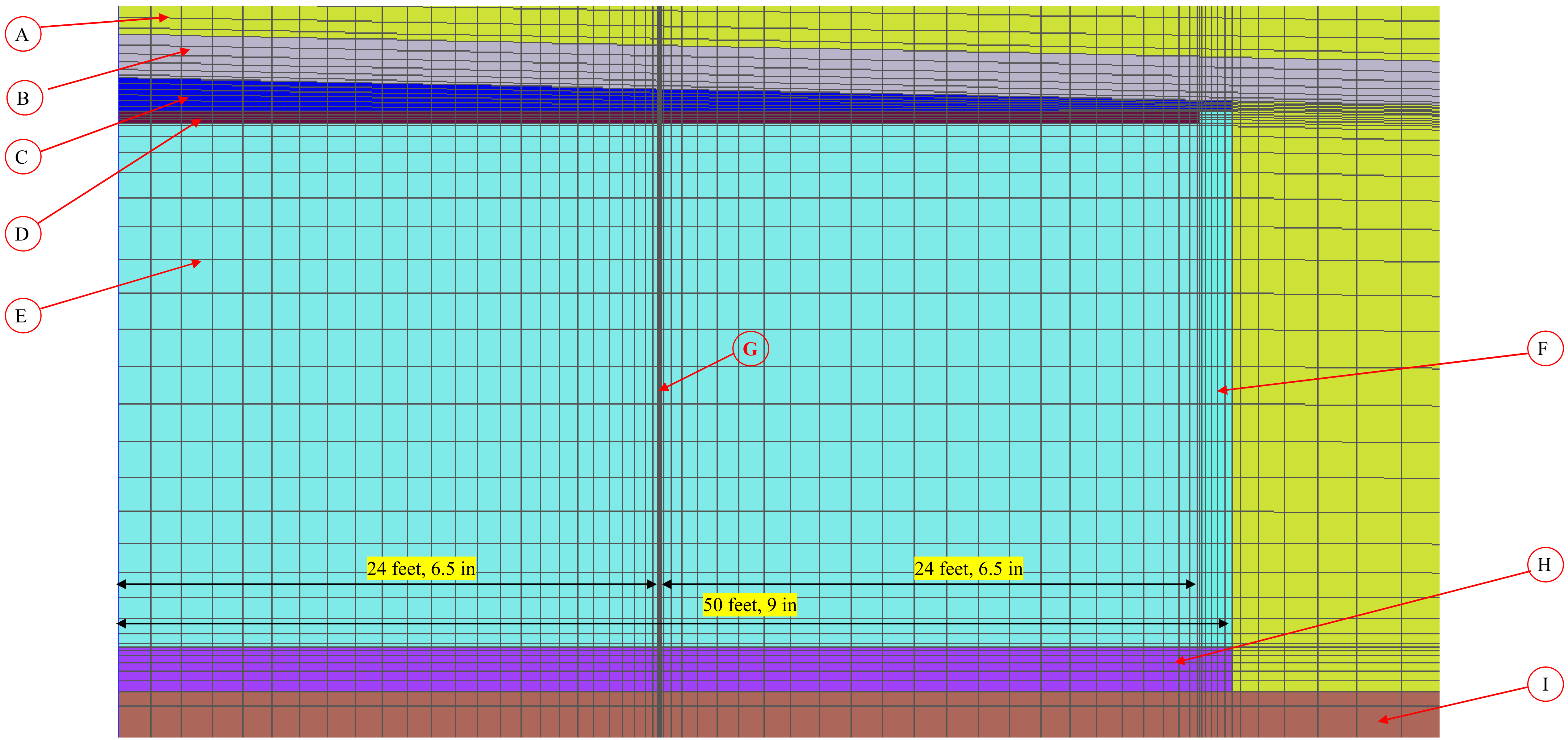


(a)



(b)

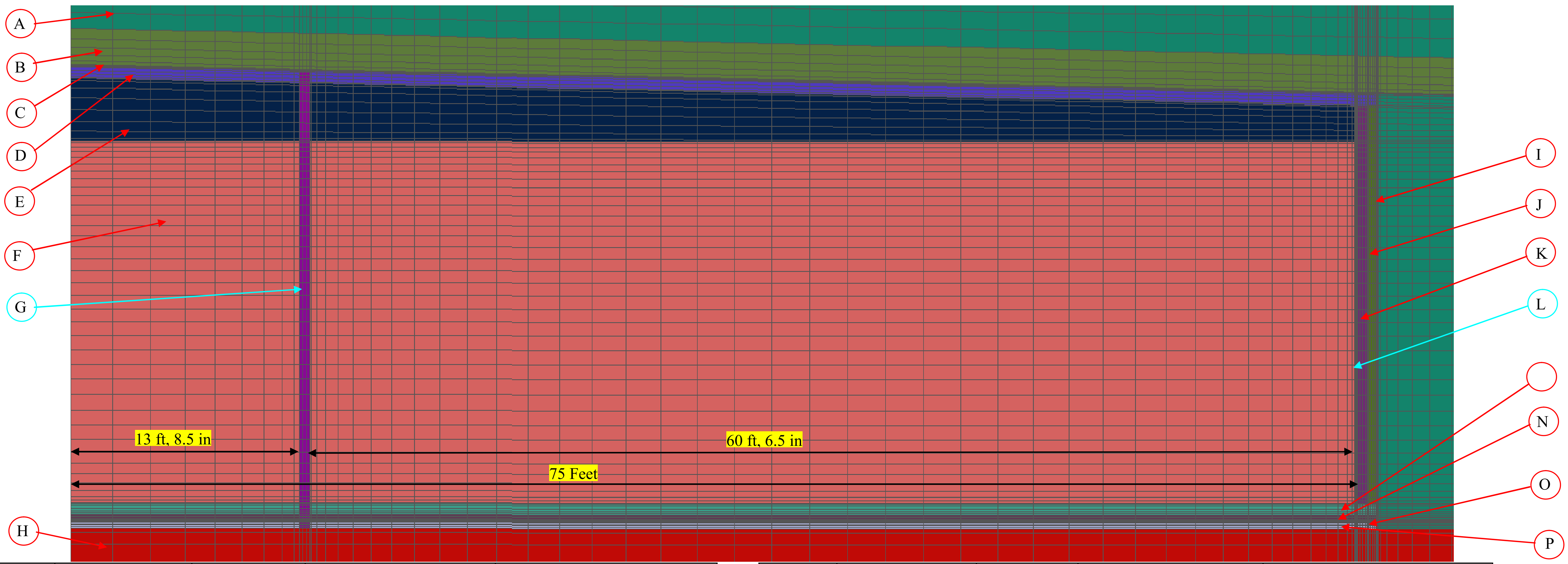
Figure 58. Material zones (a) and computational mesh (b) for Vault 4 vadose zone simulations.



Region	Material	Thickness	Conductivity (cm/sec)	Comments
A	Backfill	4 feet (min)	k_v = 4.1E-5 k_h = 7.6E-5	Thickness varies with roof slope
B	Sand drainage	2 feet	k_v , k_h = 5.0E-2	$k_{v,h}$ = 2.7E-2 in 10,000 yrs $k_{v,h}$ = 4.1E-5 in 19,000 yrs
C	Concrete roof	6 inches (min) 12 inches (avg)	k_v , k_h = 5.0E-9	$k_{v,h}$ = 8.7E-9 in 8,000 yrs $k_{v,h}$ = 1.3E-8 in 10,000 yrs
D	Clean grout cap	6 inches	k_v , k_h = 2.0E-9;	$k_{v,h}$ = 4.0E-8 in 10,000 yrs
E	Saltstone	24 feet (height)	D_e = 1E-7 cm^2/s	D_e = 1.0E-5 in 10,000 yrs

Region	Material	Thickness	Conductivity (cm/sec)	Comments
F	Concrete wall	18 inches	k_v , k_h = 3.1E-10	$k_{v,h}$ = 4.2E-10 in 10,000 yrs $k_{v,h}$ = 5.0E-10 in 20,000 yrs
G	Cracks	2 inches	k_h = 5.0E-4 k_v = 2.8E-4	Used in fast flow cases only
H	Concrete Floor	2 feet	k_v , k_h = 3.1E-10	$k_{v,h}$ = 3.9E-10 in 10,000 yrs $k_{v,h}$ = 4.3E-10 in 20,000 yrs
I	Native Soil	48 feet	k_v = 9.1E-5 k_h = 3.3E-4	

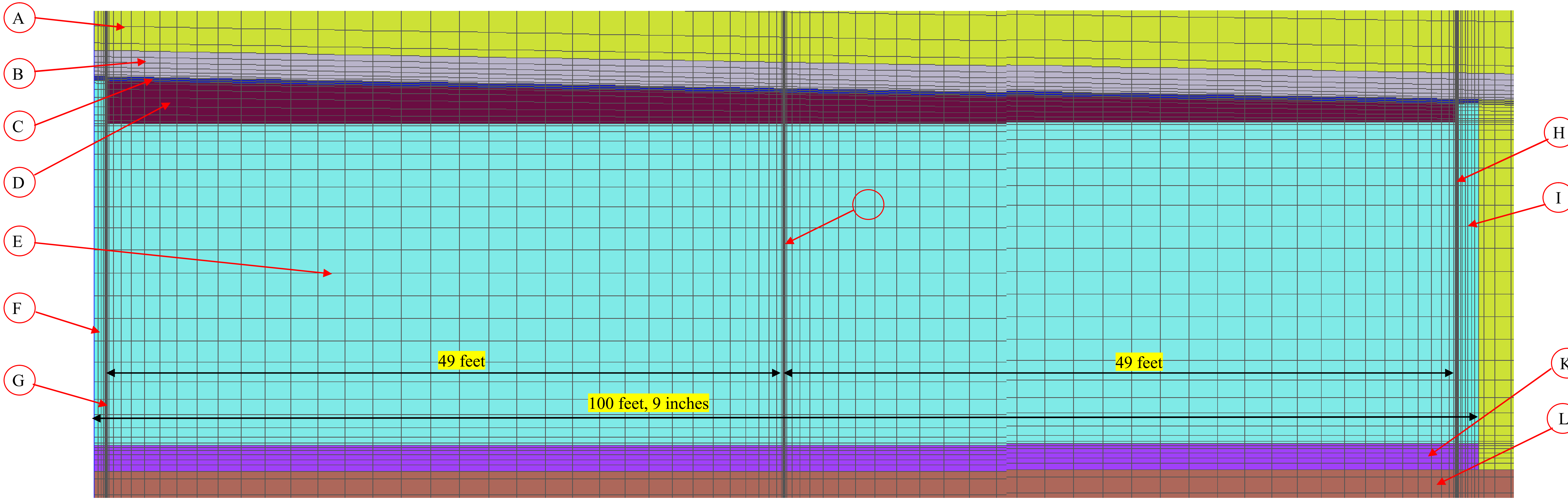
Figure 59. Computational grid for Vault 1 vadose zone simulation.



Region	Material	Thickness	Conductivity (cm/sec)	Comments
A	Backfill	7 ft (min)	k_v = 4.1E-5 k_h = 7.6E-5	Thickness varies with roof slope
B	Sand drainage	2 feet	k_v , k_h = 5.0E-2	$k_{v,h}$ = 2.7E-2 in 10,000 yrs $k_{v,h}$ = 4.1E-5 in 19,000 yrs
C	HDPE-GCL	1 inch (actual 0.3)	k_v , k_h = 2.8E-12	$k_{v,h}$ = 3.3E-9 in 10,000 yrs $k_{v,h}$ = 5.3E-9 in 20,000 yrs
D	Concrete roof	8 inches	k_v , k_h = 9.3E-11	$k_{v,h}$ = 1.6E-10 in 10,000 yrs $k_{v,h}$ = 2.8E-10 in 20,000 yrs
E	Clean grout cap	2 ft (min)	k_v , k_h = 2.0E-9; D_e = 1E-7 cm²/s	$k_{v,h}$ = 4E-8 in 10,000 yrs D_e = 1E-5 in 10,000 yrs
F	Saltstone	20 ft (height)		
G	Columns	7 inches	k_v = 2.8E-4 k_h = 5.0E-4	Used in fast flow cases only
H	Native soil	42 ft (avg)	k_v = 9.1E-5 k_h = 3.3E-4	Varies from 48 to 36 feet – model uses wgt. avg. 42 ft

Region	Material	Thickness	Conductivity (cm/sec)	Comments
I	HDPE	1 inch (actual 0.1)	k_v , k_h = 4.4E-12	$k_{v,h}$ = 6.6E-8 in 10,000 yrs $k_{v,h}$ = 1.3E-7 in 20,000 yrs
J	Shotcrete	6 inches	k_v = 4.1E-5 k_h = 7.6E-5	Material is assumed to be backfill
K	Concrete Wall	8 inches	k_v , k_h = 9.3E-11	$k_{v,h}$ = 3.7E-10 in 10,000 yrs $k_{v,h}$ = 1E-5 in 18,000 yrs
L	Sheet Drains	2 inches	k_v , k_h = 1.5E-1	Used in fast flow cases only
M	Concrete Floor	8 inches	k_v , k_h = 9.3E-11	$k_{v,h}$ = 1.9E-10 in 10,000 yrs $k_{v,h}$ = 3.4E-10 in 20,000 yrs
N	Upper Mud Mat	4 inches		
O	HDPE-GCL	1 inch (actual 0.3)	k_v , k_h = 2.8E-12	$k_{v,h}$ = 3.3E-9 in 10,000 yrs $k_{v,h}$ = 5.3E-9 in 20,000 yrs
P	Lower Mud Mat	4 inches	k_v , k_h = 1.0E-8	No degradation in model

Figure 60. Computational grid for Vault 2 vadose zone simulation.



Region	Material	Thickness	Conductivity (cm/sec)	Comments
A	Backfill	24 ft (min)	k_v = 4.1E-5 k_h = 7.6E-5	Thickness varies with roof slope
B	Sand drainage	2 feet	k_v , k_h = 5.0E-2	$k_{v,h}$ = 2.7E-2 in 10,000 yrs $k_{v,h}$ = 4.1E-5 in 19,000 yrs
C	Concrete roof	4 inches	k_v , k_h = 5.0E-9	$k_{v,h}$ = 4.9E-8 in 8,000 yrs $k_{v,h}$ = 1.0E-5 in 10,000 yrs
D	Clean grout cap	1 ft, 5 in (min)	k_v , k_h = 2.0E-9;	$k_{v,h}$ = 4.0E-8 in 10,000 yrs
E	Saltstone	24 ft, 9 in (height)	D_e = 1E-7 cm²/s	D_e = 1.0E-5 in 10,000 yrs
F	Interior concrete wall	9 inches (from midpoint)	k_v , k_h = 3.1E-10	$k_{v,h}$ = 4.2E-10 in 10,000 yrs $k_{v,h}$ = 5.0E-10 in 20,000 yrs

Region	Material	Thickness	Conductivity (cm/sec)	Comments
G, H	Sheet Drains	2 inches	k_v , k_h = 1.5E-1	Used in fast flow cases only
I	Exterior concrete wall	18 inches	k_v , k_h = 3.1E-10	$k_{v,h}$ = 4.2E-10 in 10,000 yrs $k_{v,h}$ = 5.0E-10 in 20,000 yrs
J	Cracks	2 inches	k_h = 5.0E-4 k_v = 2.8E-4	Used in fast flow cases only
K	Concrete Floor	2 feet	k_v , k_h = 3.1E-10	$k_{v,h}$ = 3.9E-10 in 10,000 yrs $k_{v,h}$ = 4.3E-10 in 20,000 yrs
L	Native Soil	38 ft, 5 in	k_v = 9.1E-5 k_h = 3.3E-4	

Figure 61. Computational grid for Vault 4 vadose zone simulation.

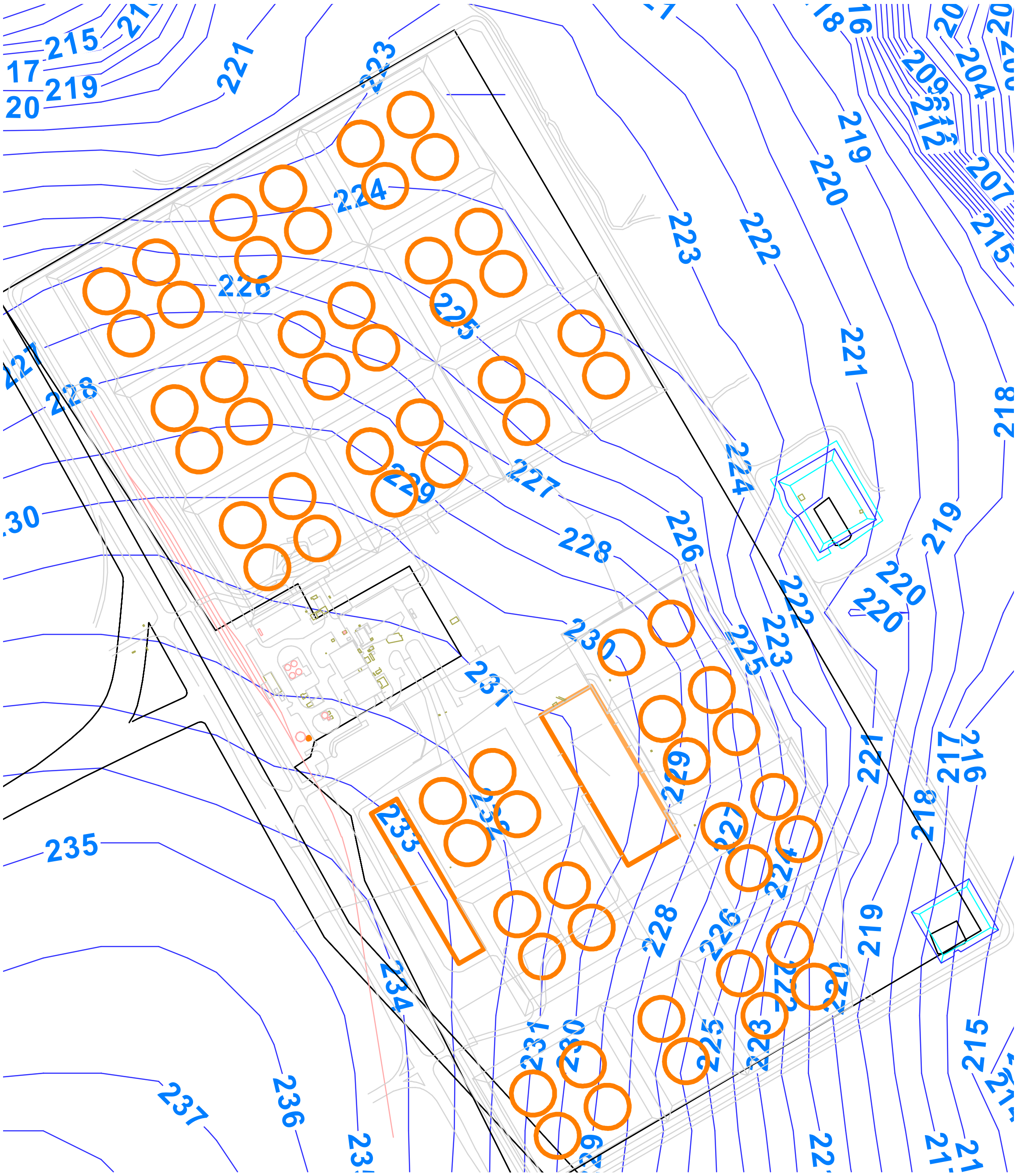


Figure 62. Water table map based on calibrated GSA/PORFLOW model.

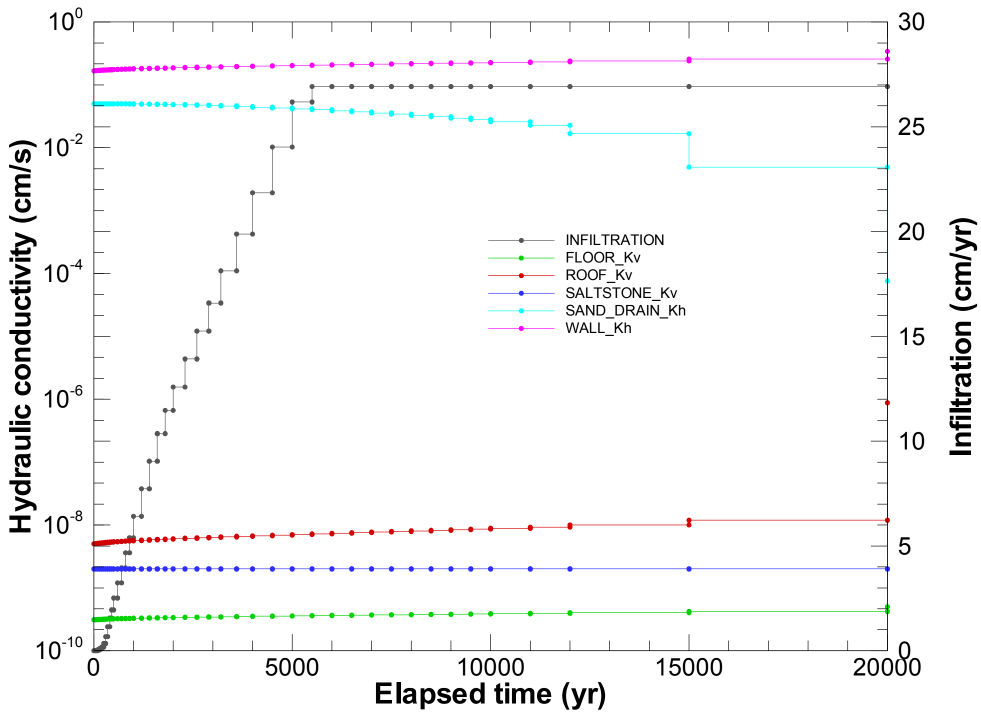


Figure 63. Timeline for Vault 1 and Base Case A.

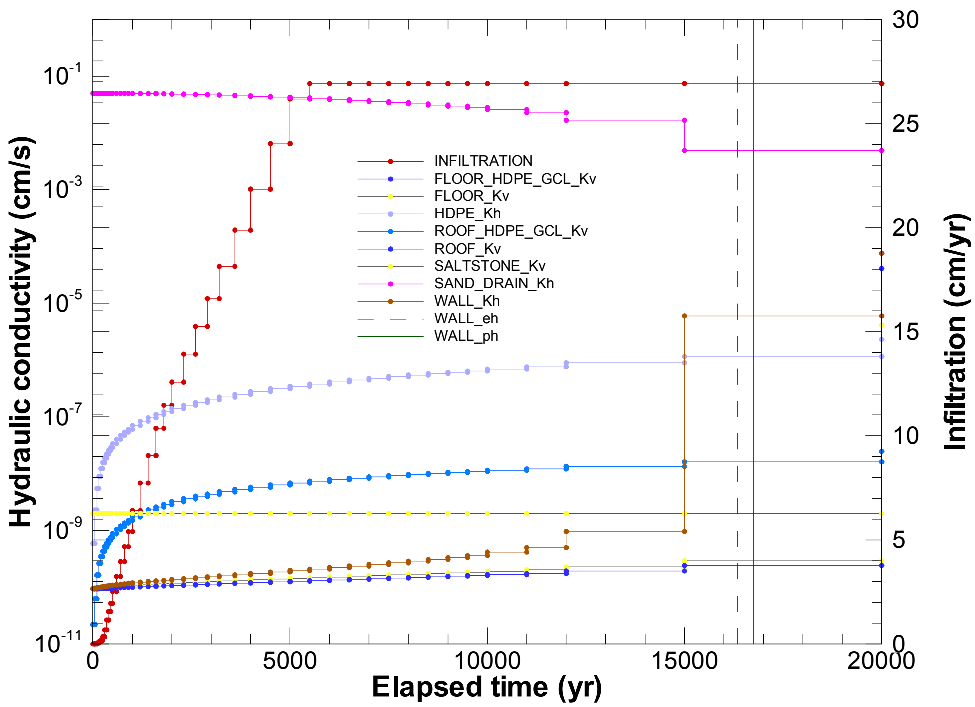


Figure 64. Timeline for Vault 2 and Base Case A.

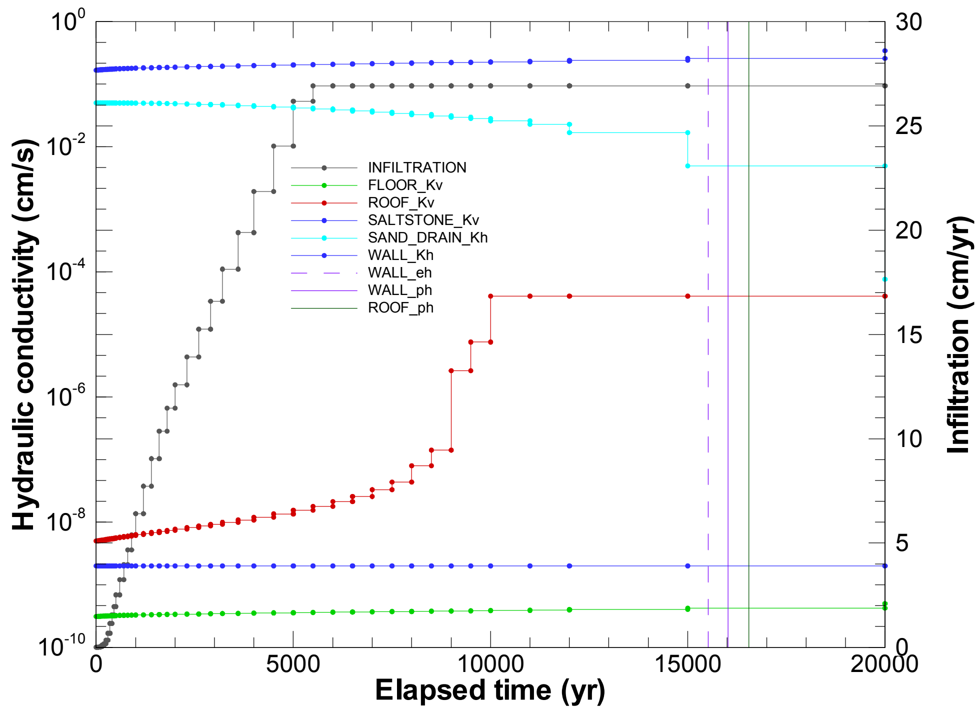


Figure 65. Timeline for Vault 4 and Base Case A.

4.6 VADOSE ZONE TRANSPORT

Fully transient transport is simulated using the sequences of steady-state flow simulations described above. When a time interval is crossed (e.g. from TI01 to TI02 at 50 years), velocity and saturation are updated with the new fields, while preserving contaminant mass. Changes in saturation create corresponding abrupt changes in the concentration field. Default time stepping is set to 1 year.

Palette material "native_soil" is assigned "sandy" sorption coefficients, and "backfill" is associated with "clayey" values (Table 14). Cementitious materials are initially assigned "oxidized middle" values by default. Slag bearing materials receive "reducing middle" Kd values. The number of pore volumes passed through cementitious regions is monitored during simulations. When an Eh or pH transition is reached according to Table 40, the Kd material changes to "oxidizing" (if in a "reducing" condition) or "old", respectively. As an outcome of vadose zone flow results to be presented later, geochemical transitions occurring within 20,000 years are depicted in timeline Figure 63 through Figure 65. This approach to Kd assignments applies to all species except Tc-99. Appendix F provides a full listing of material property specifications through time for Cases A-E, each vault type, and I-129. The "Sorption material" is common to all simulations, and can be used to deduce the Kd assignment for species other than I-129.

The Vault 1 and 4 walls are presently cracked as described in Section 2.3. This condition allows deeper penetration of Saltstone bleed water into the walls, at least in the vicinity of cracks, prior to curing. Rather than try to estimate the extent of enhanced bleed water penetration, we conservatively assume that bleed water has fully penetrated the Vault 1 and 4 walls. In the model implementation we expand inventory source volume to include both the "SALTSTONE" and "WALL" material zones. The inventory is distributed throughout the combined volume such that aqueous concentration is preserved. The Vault 2 wall is expected to be intact during operations, and also includes a waterproof interior coating to prevent bleed water permeation. The initial inventory is confined to the "SALTSTONE" zone for Vault 2.

A more sophisticated shrinking-core treatment of oxidation is used for Tc-99, following Kaplan and Hang (2003) and Kaplan et al. (2005). Reduction capacity (Table 15) and oxygen concentration are tracked in each grid cell. Oxygen entering the cell by liquid phase transport oxidizes the slag, thereby depleting the reduction capacity. Gas phase transport is ignored because the slag bearing materials are practically 100% saturated with water. Also, oxygen in the soil effectively stays at its saturation value, 1.06 meq e-/L (Kaplan and Hang 2003, Table 3) in the model due to higher liquid transport rates relative to the reducing materials. When the reduction capacity in a cell has been consumed, previously immobile Tc-99 is made mobile. Tc-99 is made immobile in the model by setting Kd in the model to 1000 mL/g. Figure 66 illustrates how sorption coefficient is artificially varied to achieve Tc-99 immobilization and release as a function of local reduction capacity. A cubic Hermitian polynomial defines a smooth variation in the transition zone between 0 and 0.005 meq e-/mL. The underlying physical process is not one of sorption, rather Kd variation is simply used as a convenient means to control Tc-99 release. Accordingly, the figure identifies Kd as a "pseudo-sorption coefficient" to call attention to its non-physical nature. Time stepping is reduced to 0.05 for Tc-99 simulations to ensure adequate numerical accuracy.

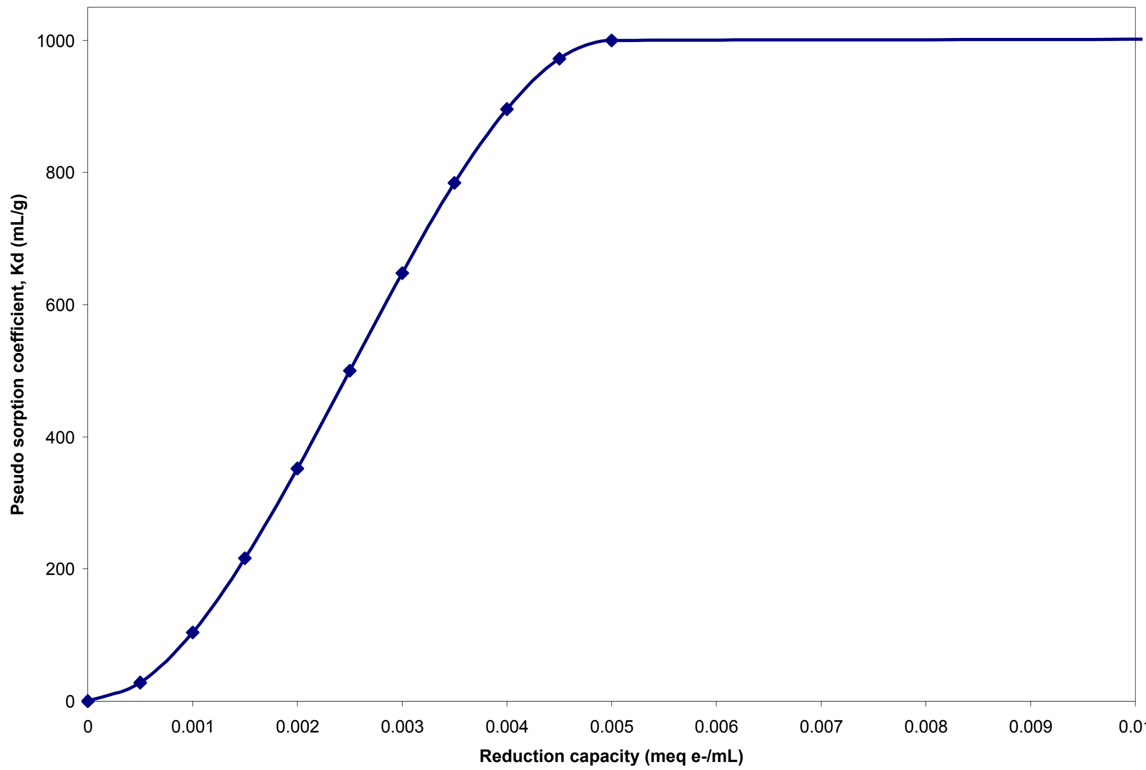


Figure 66. Pseudo-sorption coefficient (Kd) as a function of reduction capacity for Tc-99 simulations.

5.0 SIMULATIONS

5.1 VADOSE ZONE FLOW

Figure 67 through Figure 78 illustrate simulated saturation and Darcy velocity for Base Case A, each vault type, and selected time periods (100, 1000, 5000 and 10000 years). Figure 79 through Figure 90 are the same series of plots for fast flow path Case C. Arrows on the plots are proportional to Darcy velocity, and indicate high values in and around the sand drain and hypothetical fast flow paths, especially at later times when cap infiltration is higher. Velocities in the sand drain layer are lower for Vault 1 compared to Vault 4 because the roof span is half as long. The sand drain layer overlying each vault sheds water that might otherwise pond on the roof, and maintains a negative pressure head around the vaults through 10,000 years. Cementitious materials are observed to be practically fully saturated for both scenarios through time, precluding significant gas phase transport of oxygen. Figure 91 through Figure 93 show Peclet number for each vault type and Case A conditions. The Peclet (Pe) is defined as the ratio of diffusion to advection time scales, and is computed as

$$Pe = \frac{UL}{nD_e} \tag{31}$$

where U = Darcy velocity, L = characteristic length, n = porosity, and D_e = diffusion coefficient. The calculations behind the figures use nominal values for diffusion coefficient (1.e-7 cm^2/s) and characteristic length (20 ft, approximate height of saltstone). Pe < 1 implies diffusion dominated transport, and Pe > 1 indicated advection controlled transport. Transport is expected to be diffusion controlled initially, and then become modestly dominated by advection after a few hundred years. The Peclet number for Vault 4 increases significantly approaching to 10,000 years due to substantial thinning and impending failure of the roof.

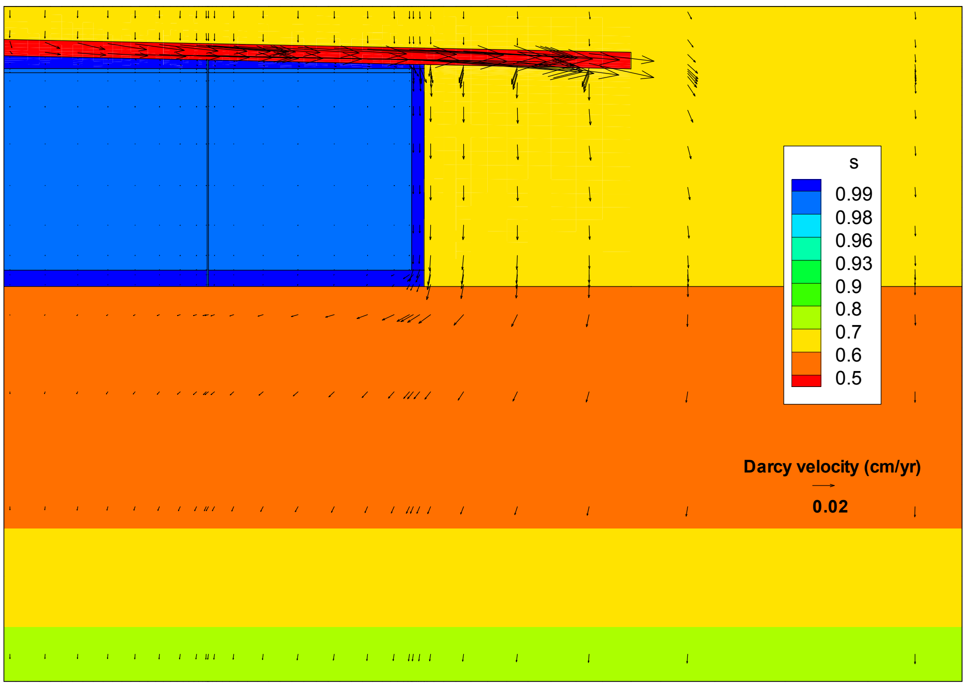


Figure 67. Vault 1 saturation and Darcy velocity fields for Base Case A at 100 yrs.

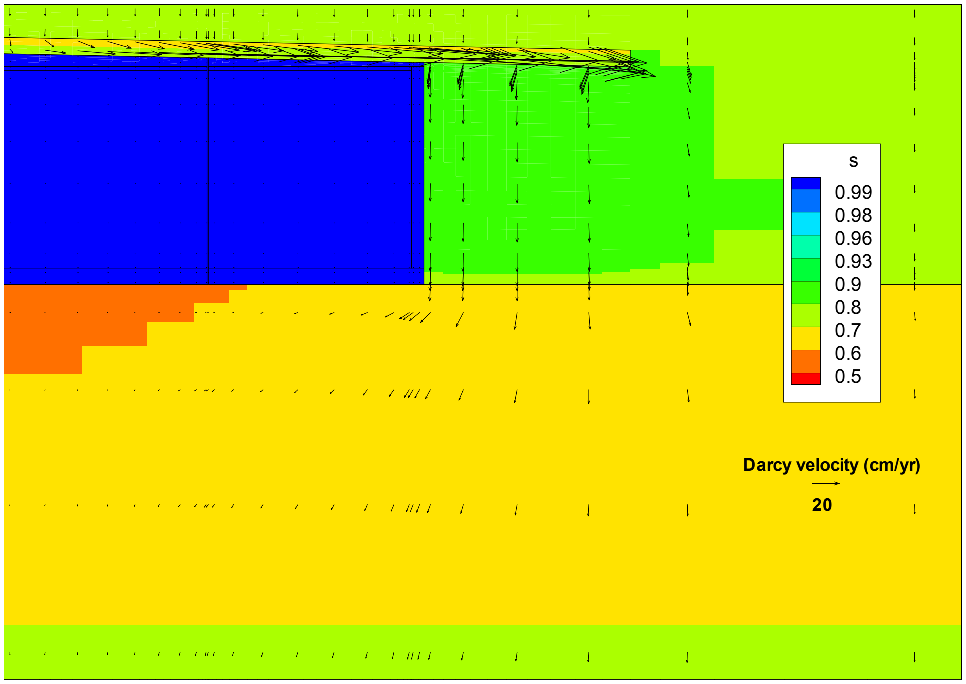


Figure 68. Vault 1 saturation and Darcy velocity fields for Base Case A at 1000 yrs.

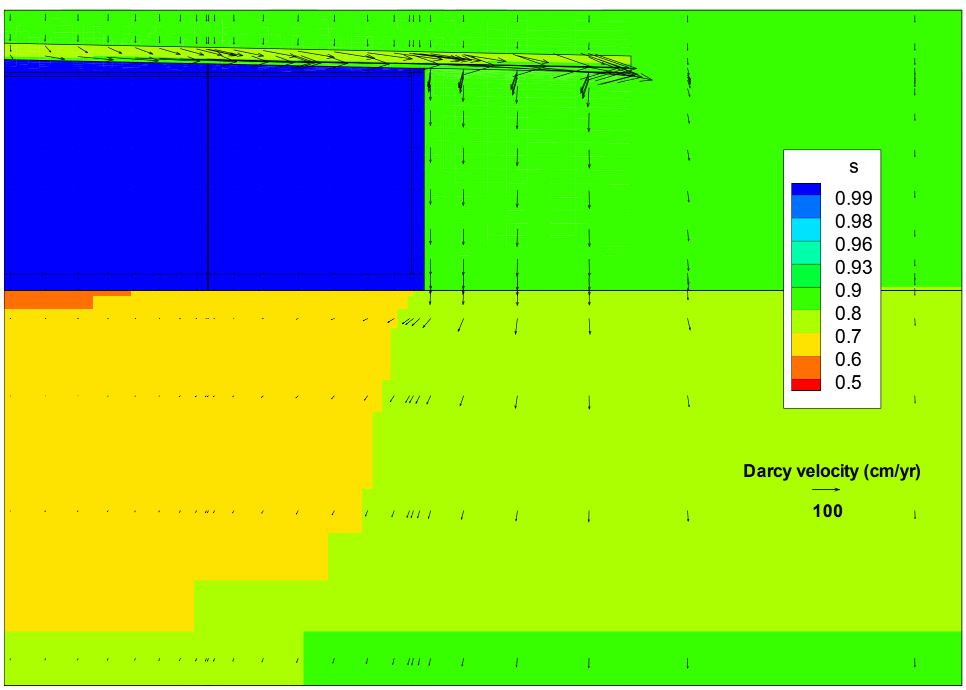


Figure 69. Vault 1 saturation and Darcy velocity fields for Base Case A at 5000 yrs.

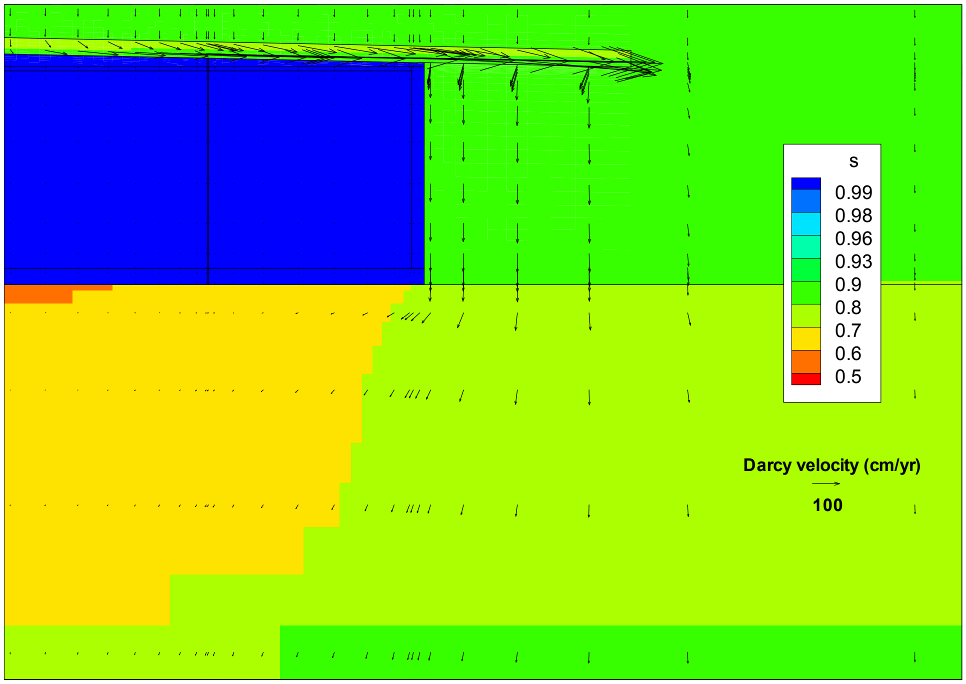


Figure 70. Vault 1 saturation and Darcy velocity fields for Base Case A at 10000 yrs.

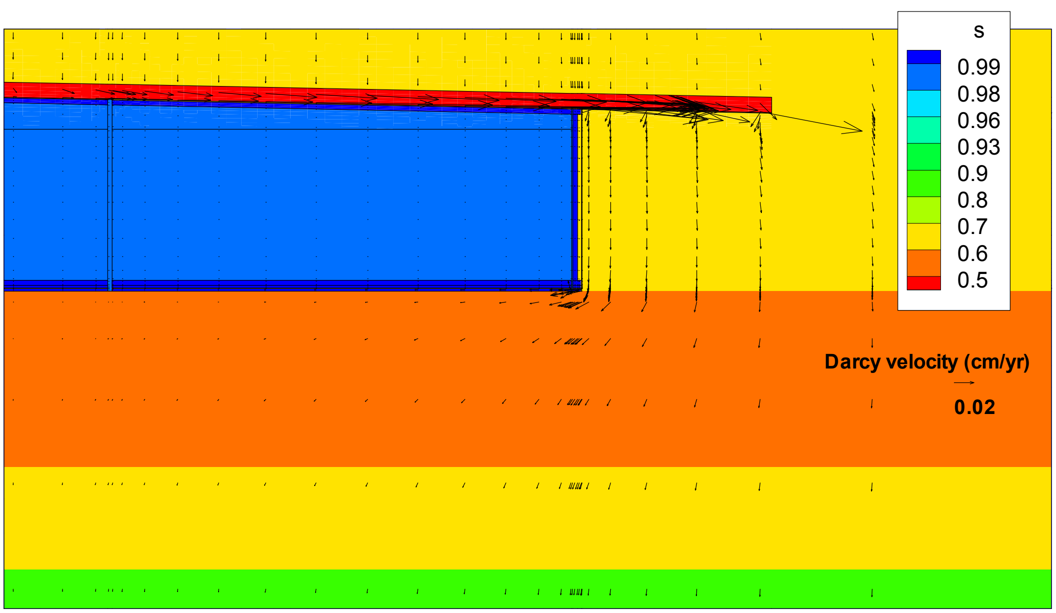


Figure 71. Vault 2 saturation and Darcy velocity fields for Base Case A at 100 yrs.

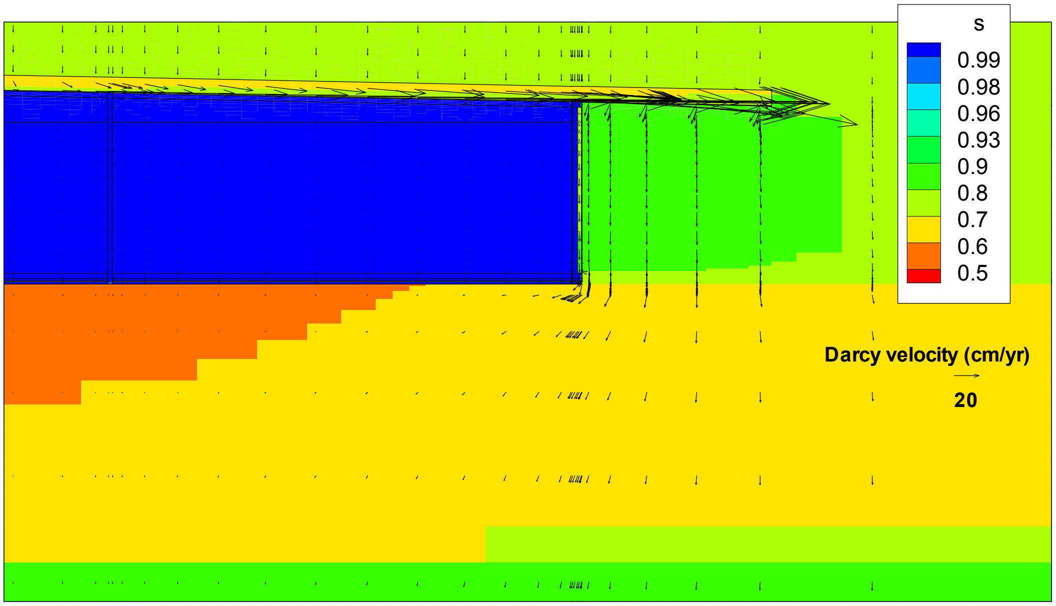


Figure 72. Vault 2 saturation and Darcy velocity fields for Base Case A at 1000 yrs.

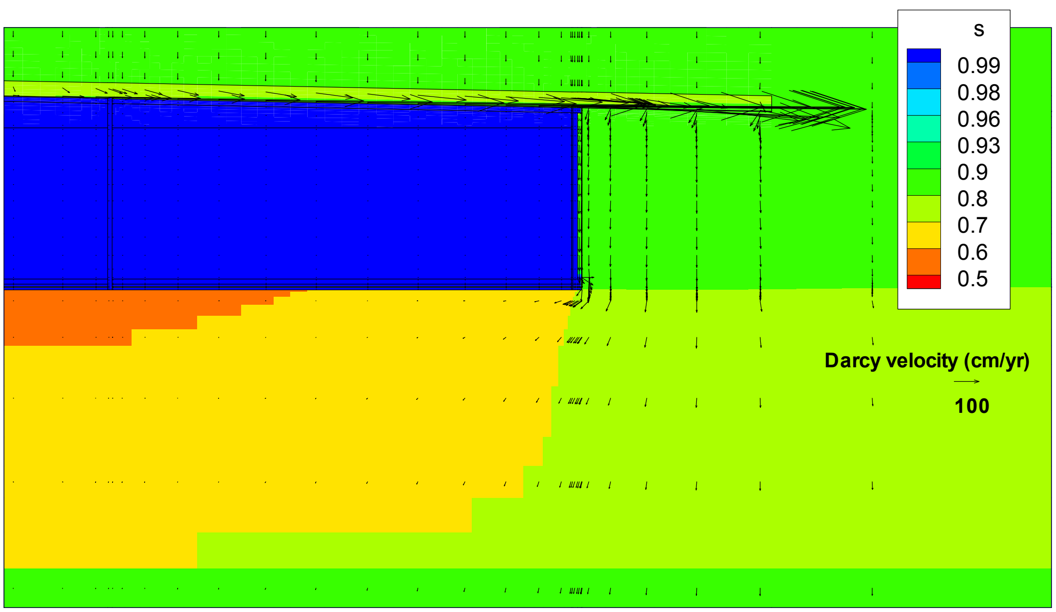


Figure 73. Vault 2 saturation and Darcy velocity fields for Base Case A at 5000 yrs.

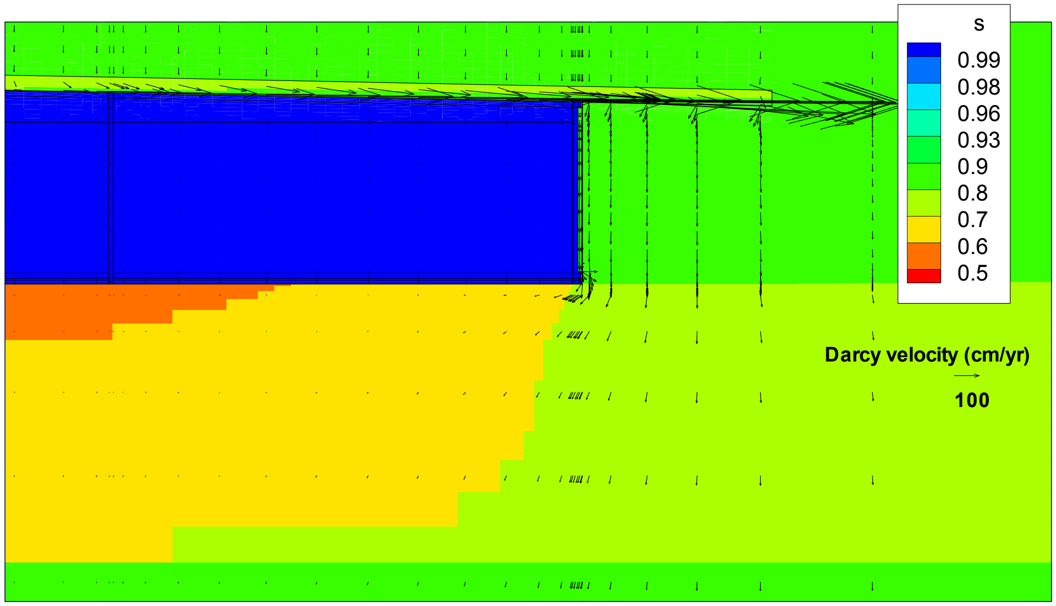


Figure 74. Vault 2 saturation and Darcy velocity fields for Base Case A at 10000 yrs.

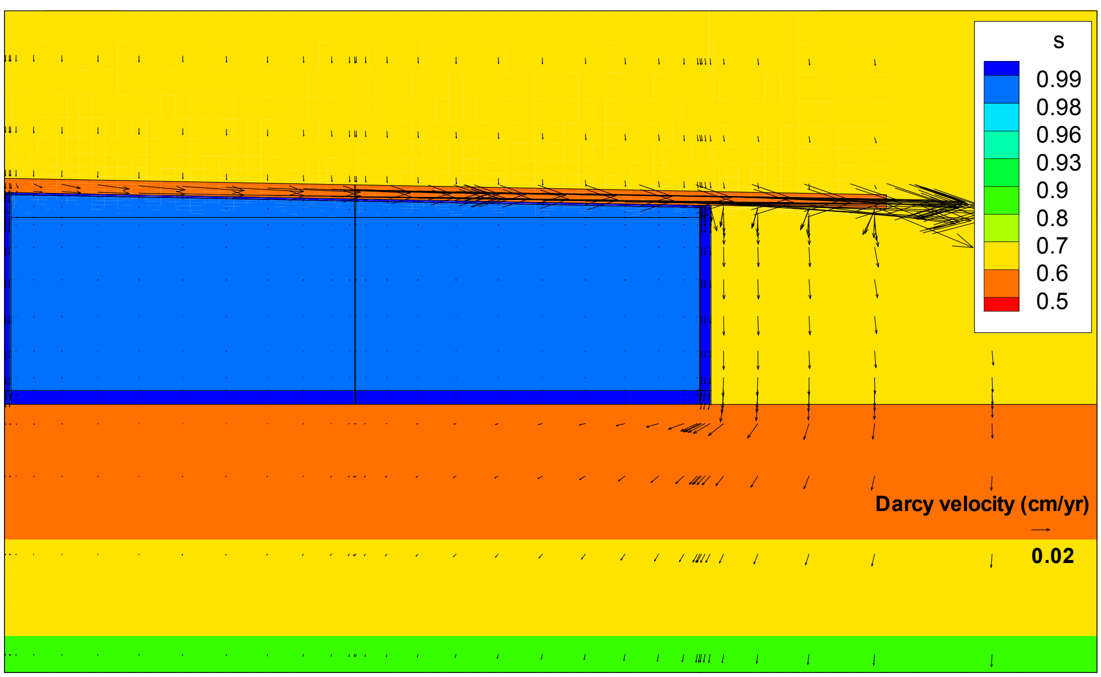


Figure 75. Vault 4 saturation and Darcy velocity fields for Base Case A at 100 yrs.

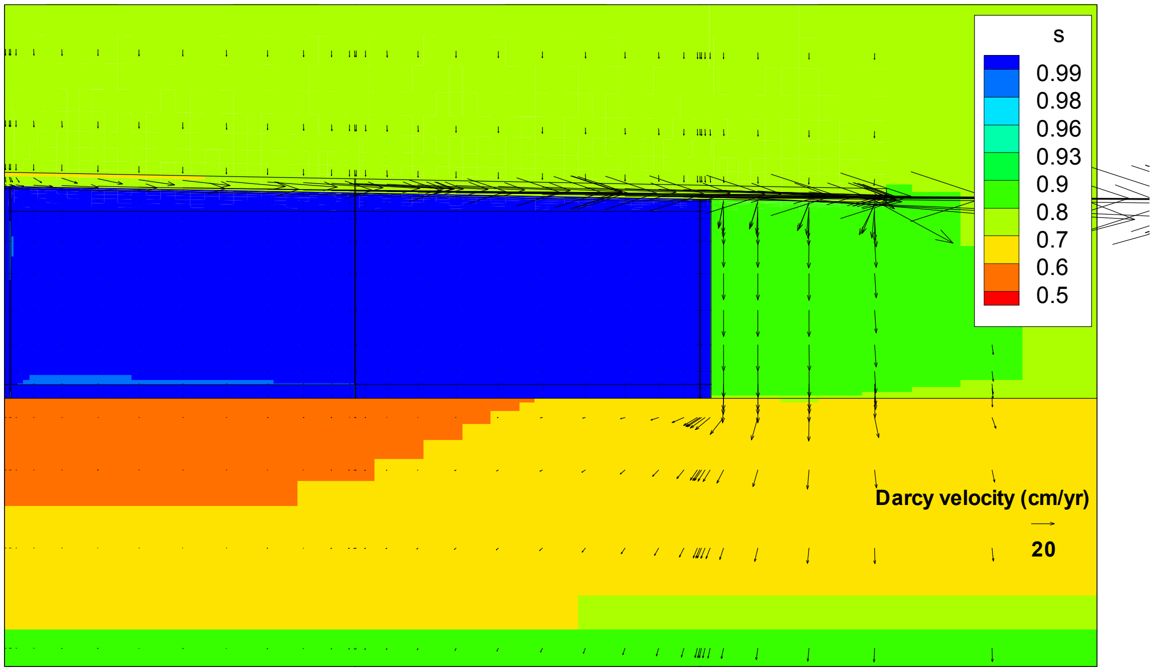


Figure 76. Vault 4 saturation and Darcy velocity fields for Base Case A at 1000 yrs.

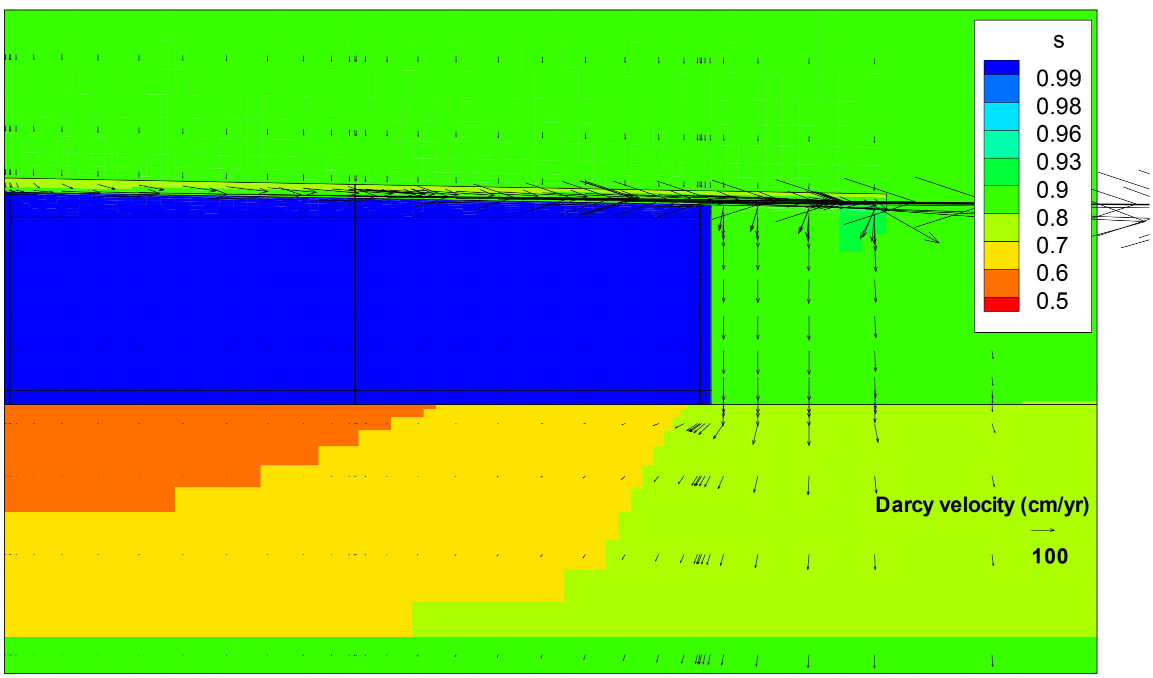


Figure 77. Vault 4 saturation and Darcy velocity fields for Base Case A at 5000 yrs.

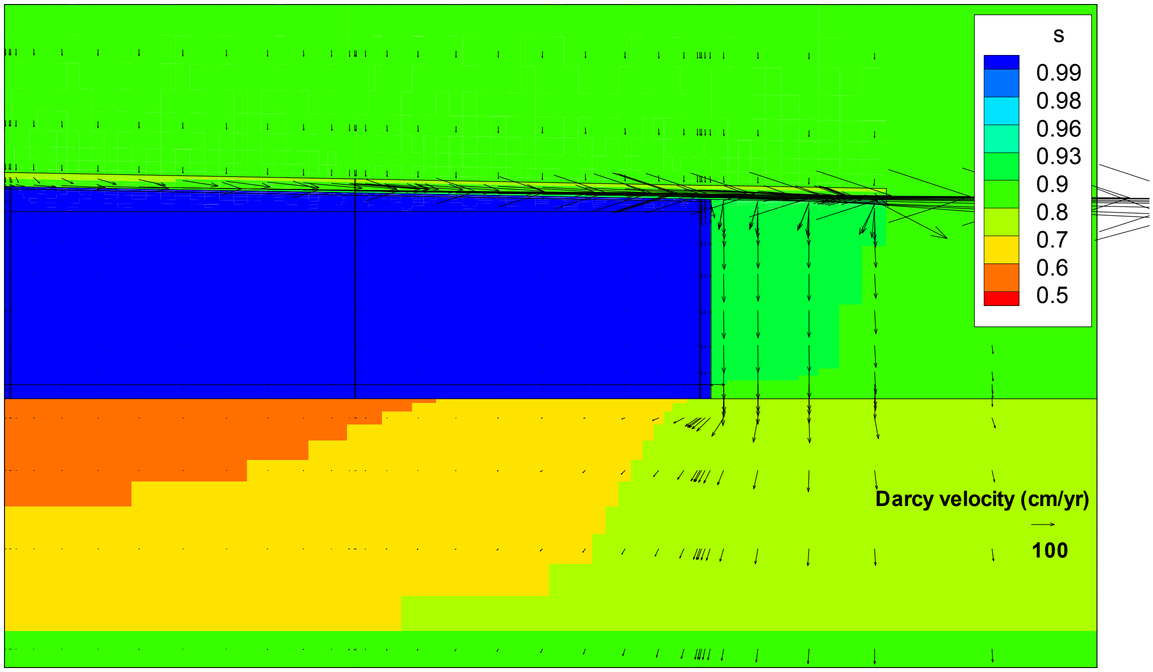


Figure 78. Vault 4 saturation and Darcy velocity fields for Base Case A at 10000 yrs.

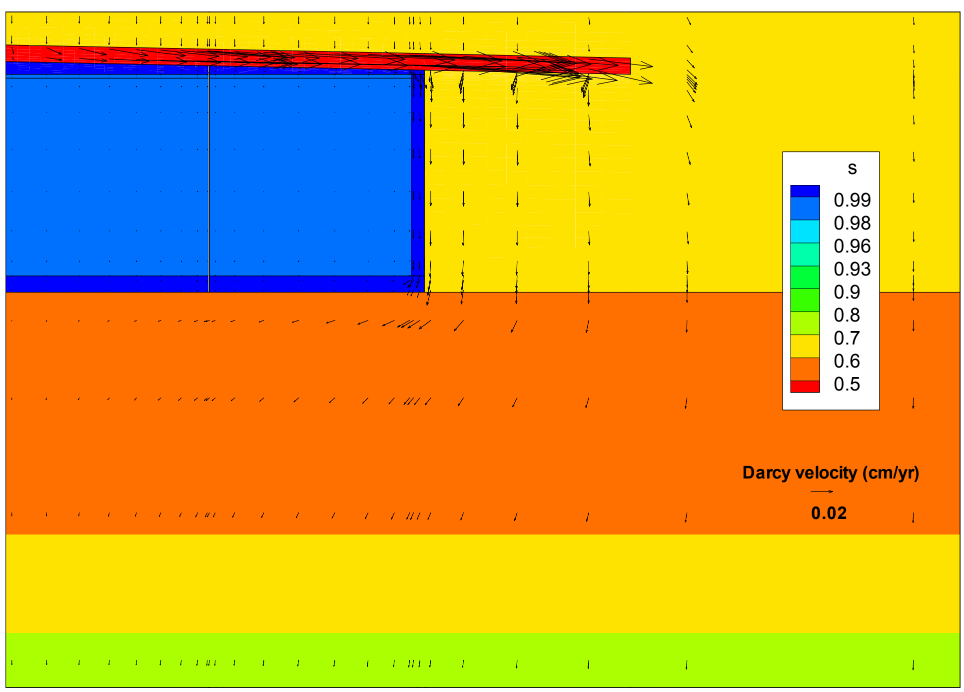


Figure 79. Vault 1 saturation and Darcy velocity fields for fast flow path Case C at 100 yrs.

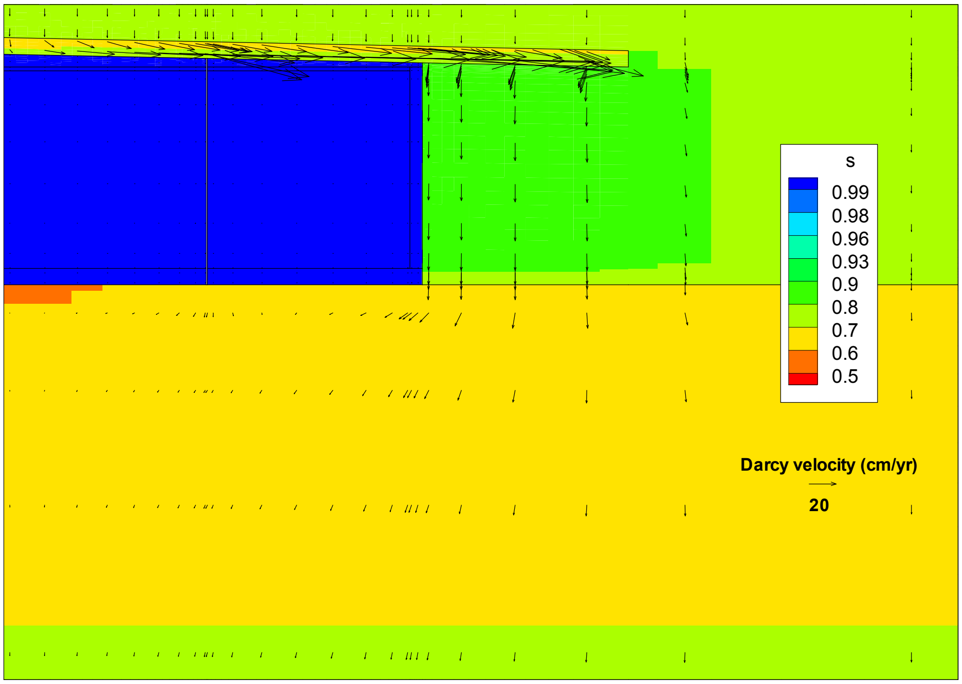


Figure 80. Vault 1 saturation and Darcy velocity fields for fast flow path Case C at 1000 yrs.

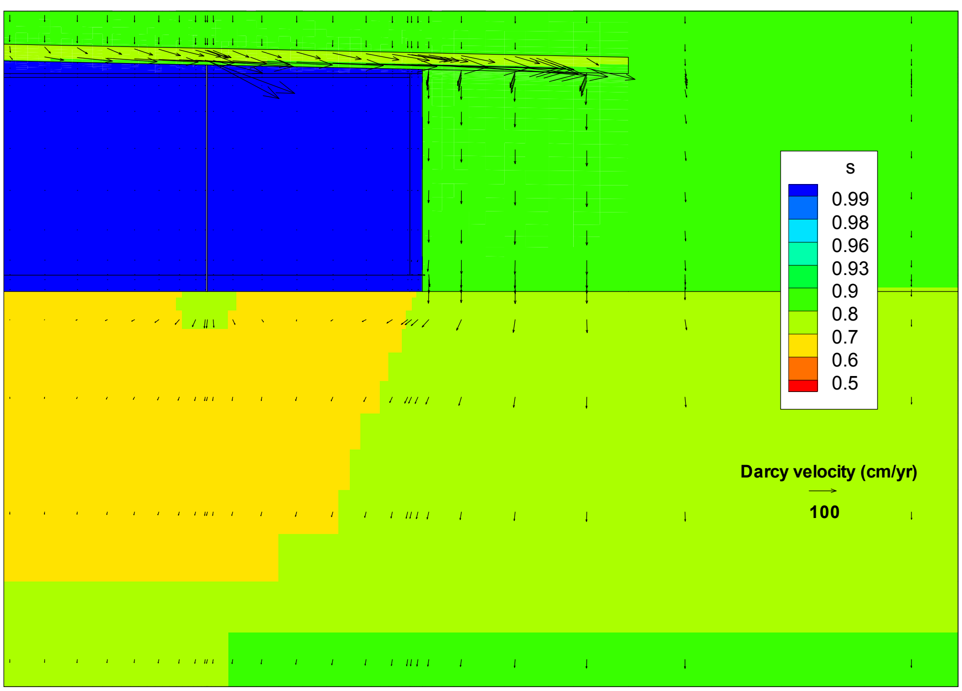


Figure 81. Vault 1 saturation and Darcy velocity fields for fast flow path Case C at 5000 yrs.

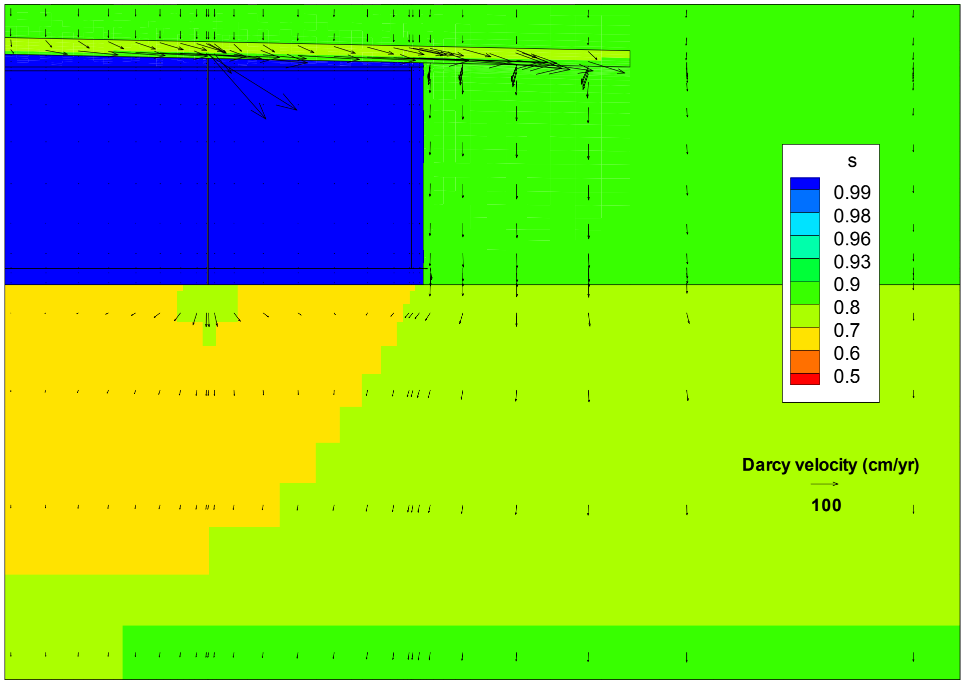


Figure 82. Vault 1 saturation and Darcy velocity fields for fast flow path Case C at 10000 yrs.

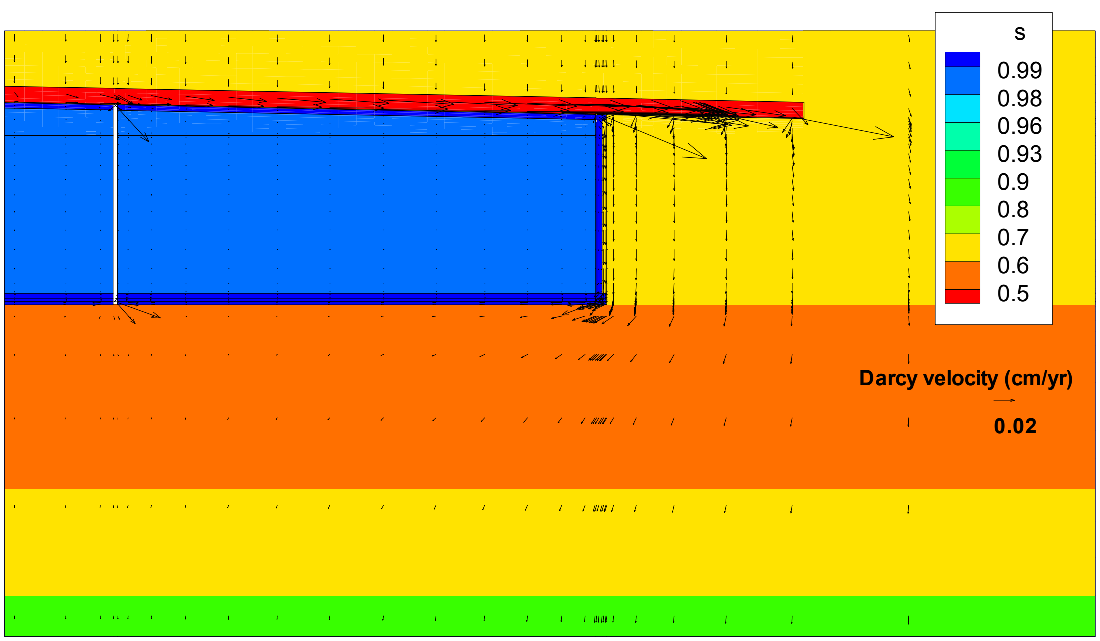


Figure 83. Vault 2 saturation and Darcy velocity fields for fast flow path Case C at 100 yrs.

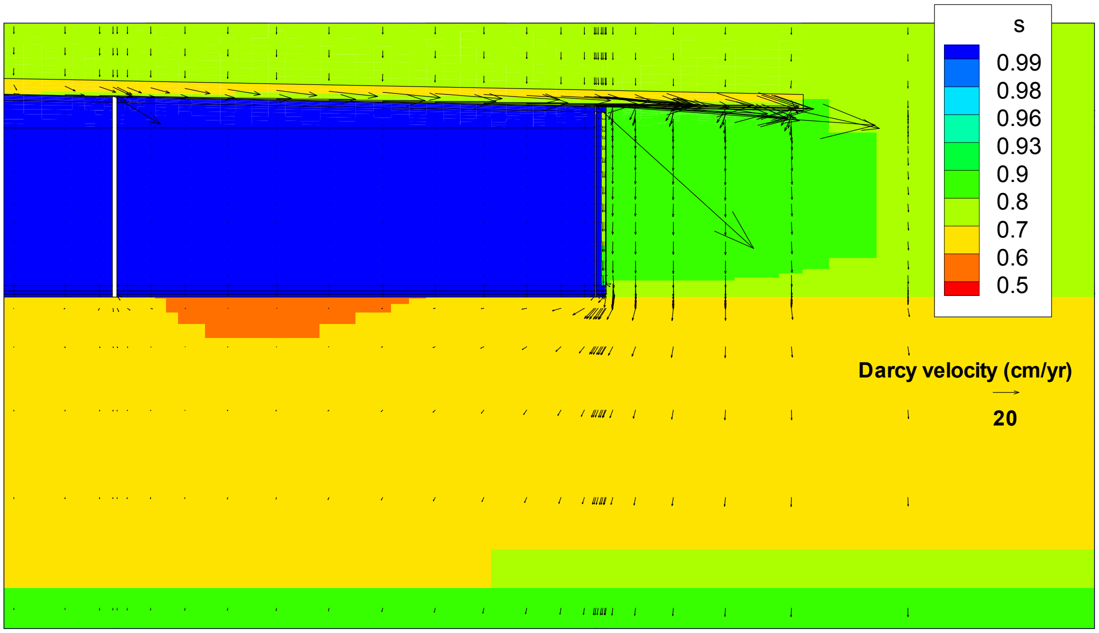


Figure 84. Vault 2 saturation and Darcy velocity fields for fast flow path Case C at 1000 yrs.

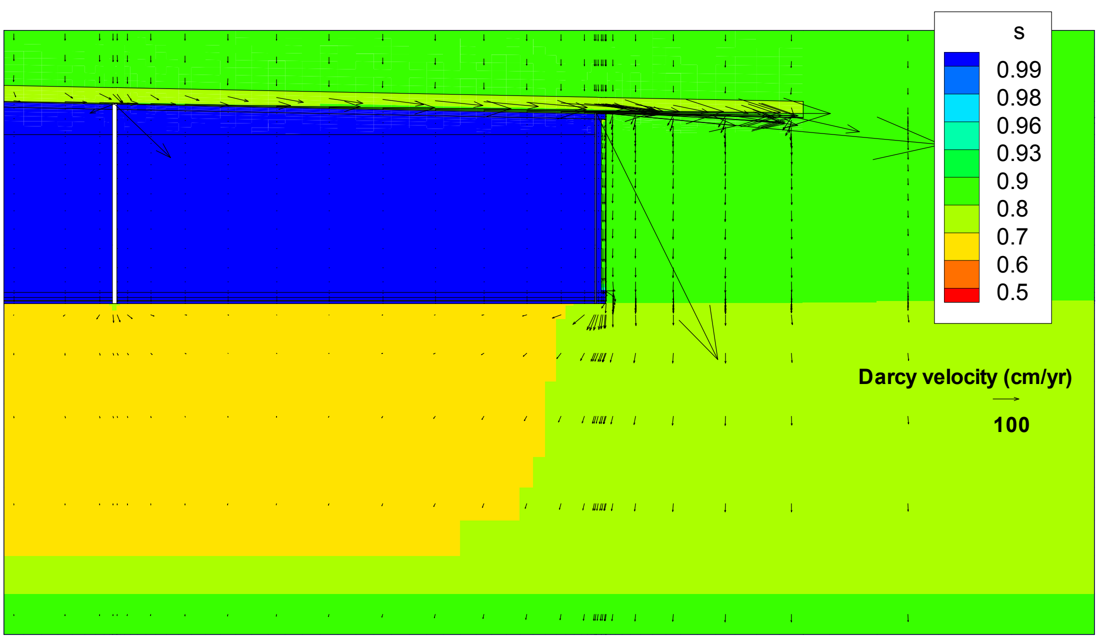


Figure 85. Vault 2 saturation and Darcy velocity fields for fast flow path Case C at 5000 yrs.

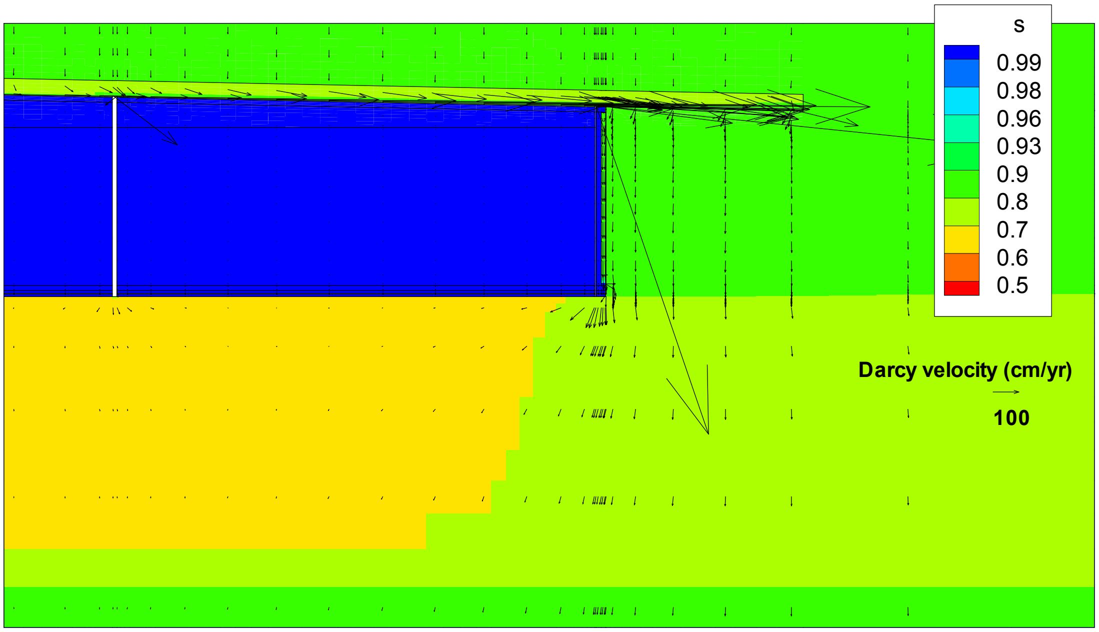


Figure 86. Vault 2 saturation and Darcy velocity fields for fast flow path Case C at 10000 yrs.

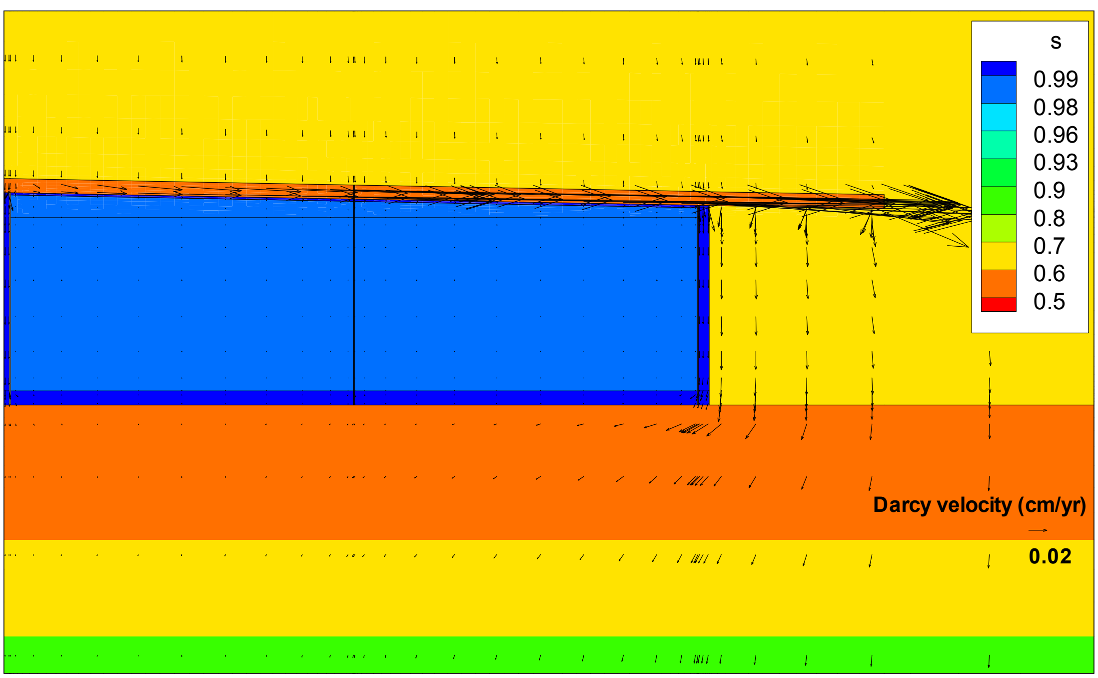


Figure 87. Vault 4 saturation and Darcy velocity fields for fast flow path Case C at 100 yrs.

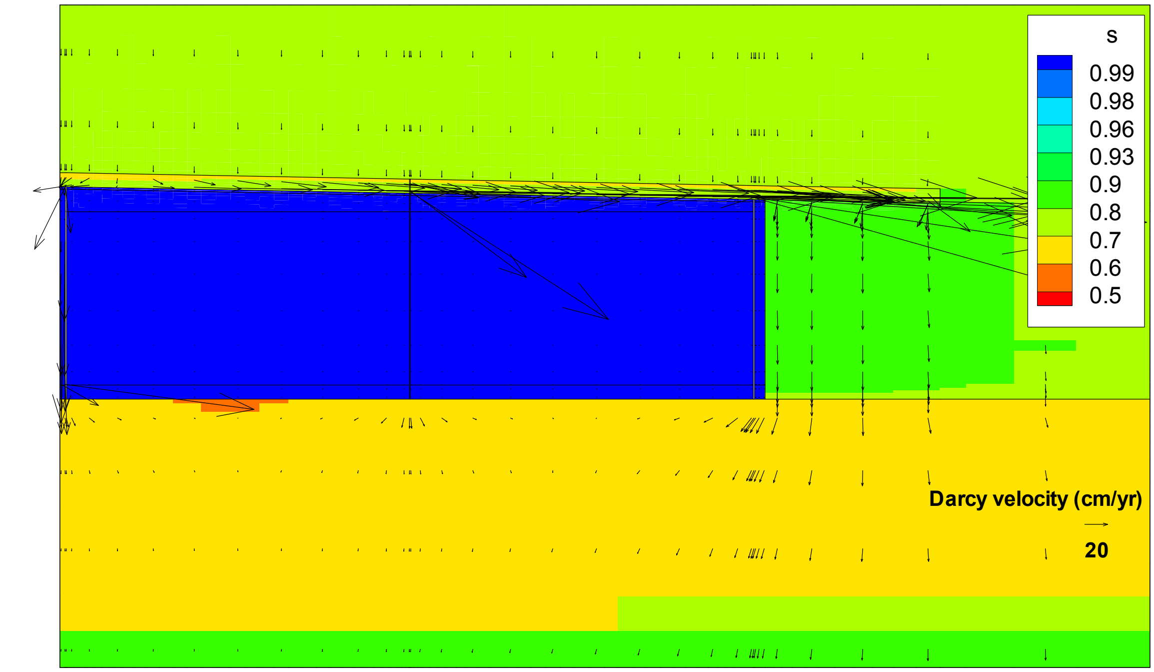


Figure 88. Vault 4 saturation and Darcy velocity fields for fast flow path Case C at 1000 yrs.

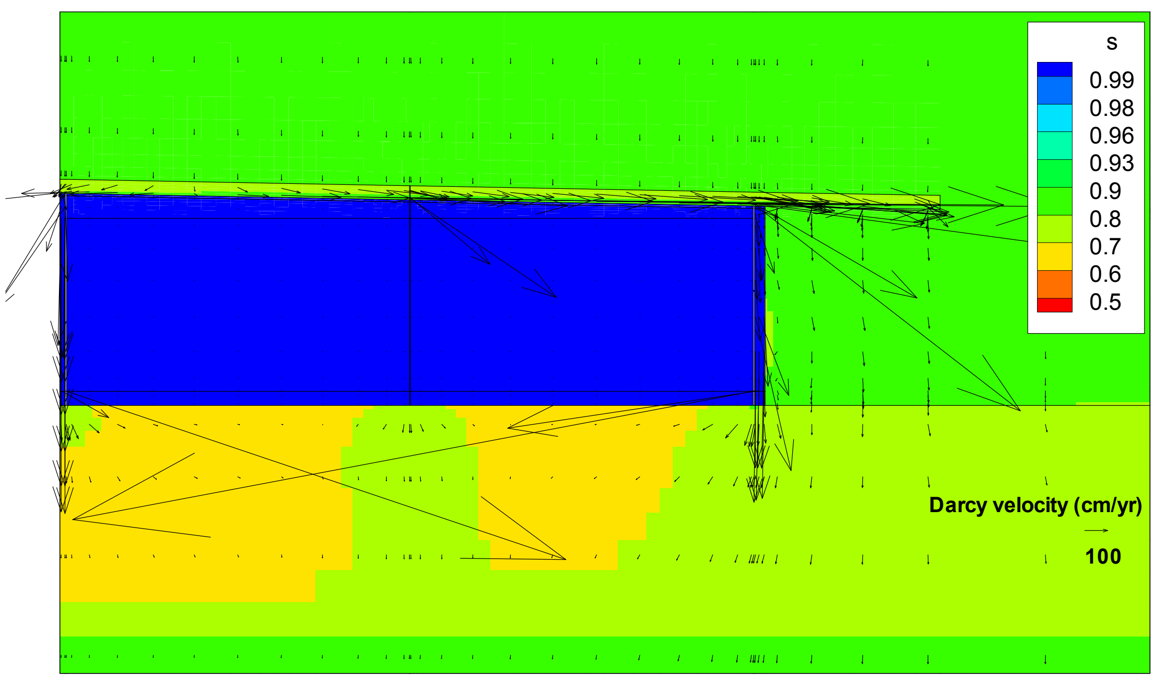


Figure 89. Vault 4 saturation and Darcy velocity fields for fast flow path Case C at 5000 yrs.

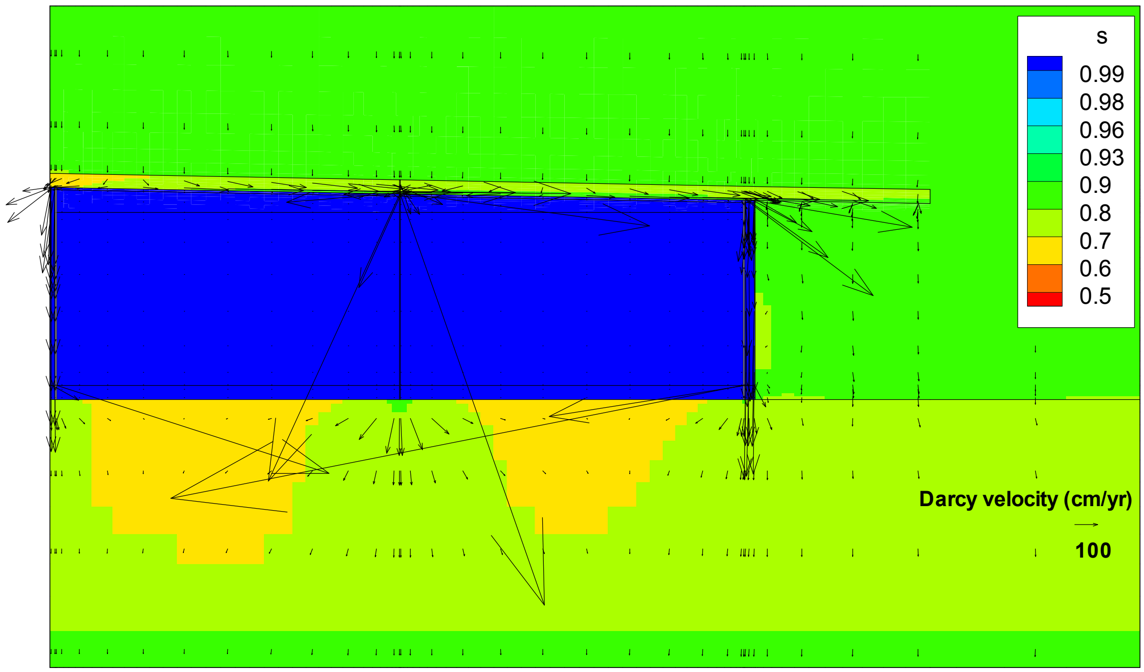


Figure 90. Vault 4 saturation and Darcy velocity fields for fast flow path Case C at 10000 yrs.

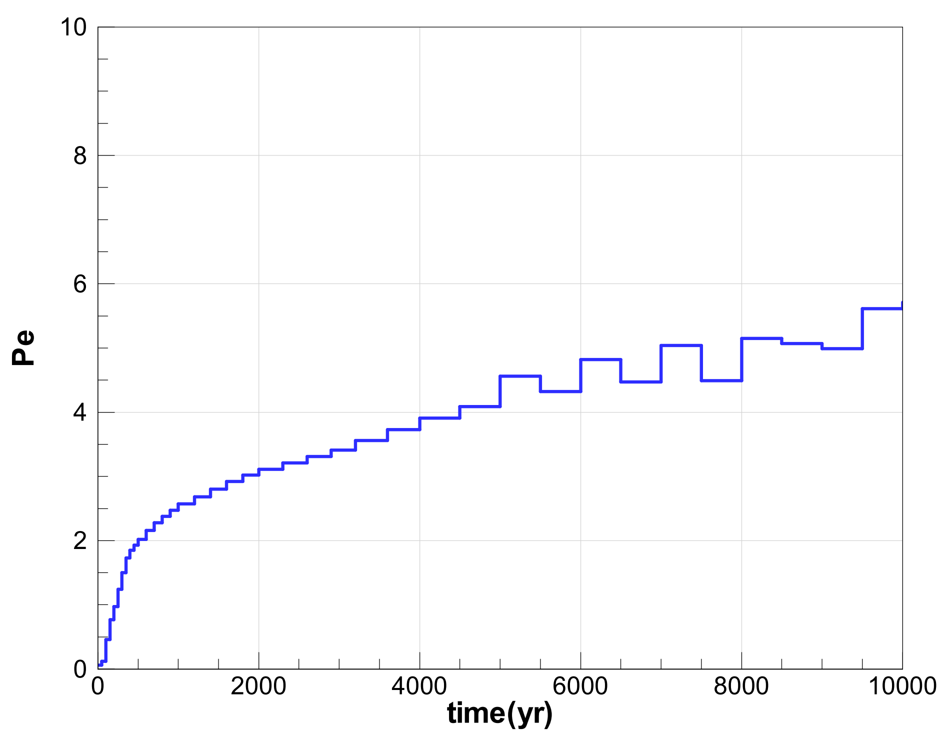


Figure 91. Peclet number for Saltstone grout in Vault 1 and Case A, based on a nominal diffusion coefficient of 1.e-7 cm^2/s and a characteristic length of 20 ft.

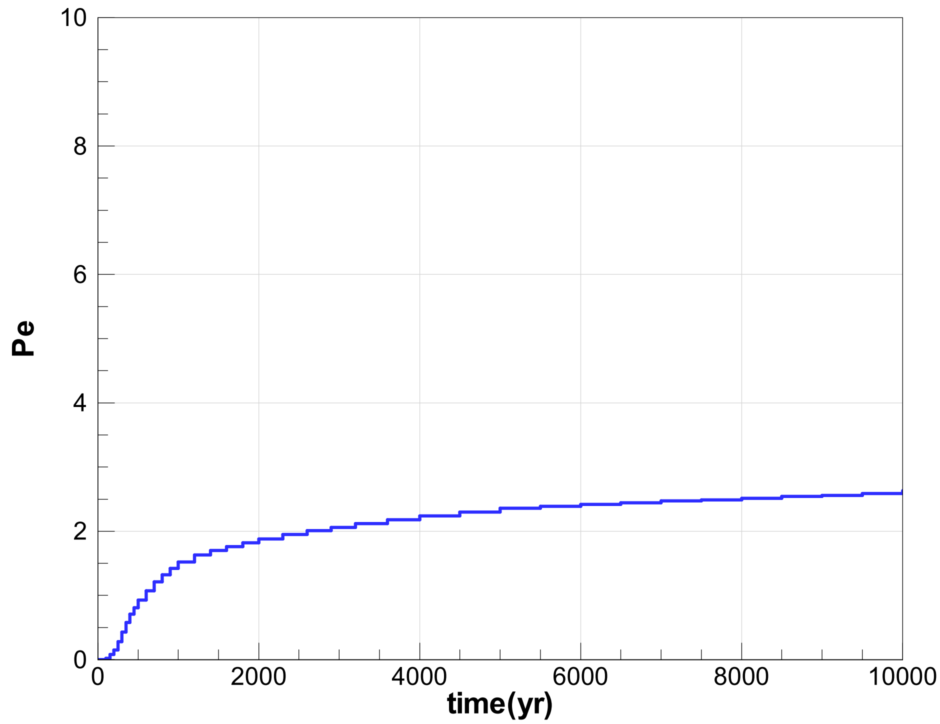


Figure 92. Peclet number for Saltstone grout in Vault 2 and Case A, based on a nominal diffusion coefficient of 1.e-7 cm^2/s and a characteristic length of 20 ft.

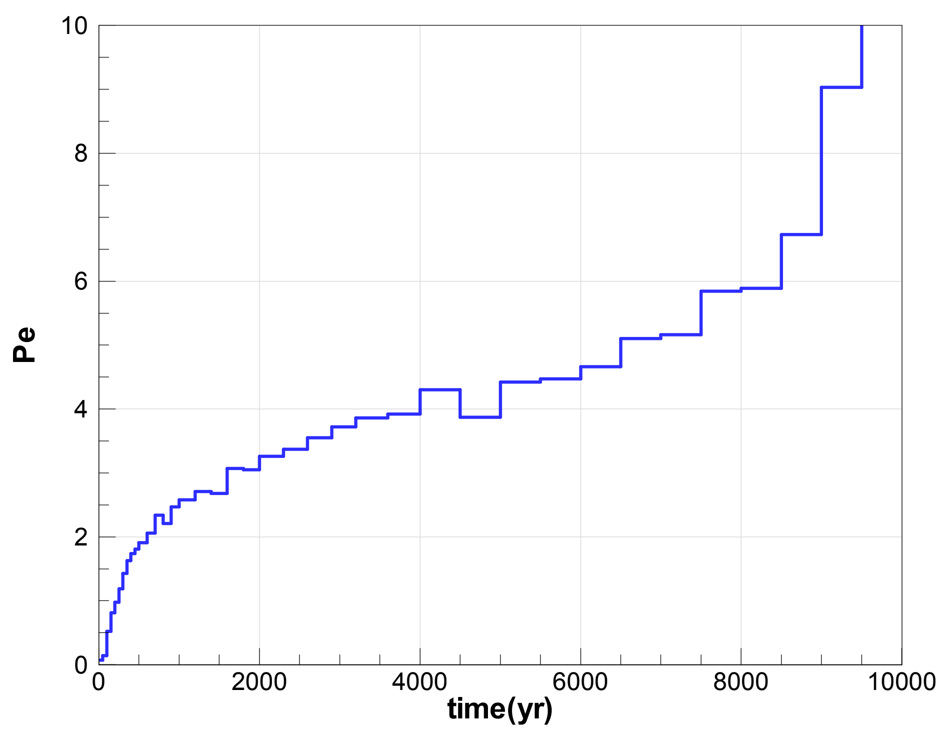


Figure 93. Peclet number for Saltstone grout in Vault 4 and Case A, based on a nominal diffusion coefficient of 1.e-7 cm^2/s and a characteristic length of 20 ft.

5.2 VADOSE ZONE TRANSPORT

Figure 94 through Figure 138 present water table flux and concentration snapshots at 1000, 3000, 10000 and 20000 years for the three vault types and Nitrate, I-129, and Tc-99. Nitrate was selected because the non-sorbing, non-decaying species can serve as a groundwater tracer for diagnostic interpretations, and it produces the largest chemical (non-radiological) impact on SDF performance objectives. Scoping runs indicate I-129 produces the largest radiological impact. Tc-99 simulations differ from all other species in that oxidation is explicitly modeled and controls local transport properties. The flux plots often have a "sawtooth" character that reflects the abrupt changes in flow conditions that occur when switching from one steady-state flow field to the next. These artifacts should be ignored as flux would vary more smoothly in a transient flow and transport simulation that better represents gradual changes.

Flux to the water table for all of the species that were modeled are presented in Appendix G. The flux is presented for each vault type.

Within several hundred years, Nitrate releases from all three vault types reach a plateau that lasts through at least 10000 years. By 20000 years the release rates are declining for all three vaults. The degraded walls in Vaults 1 and 4 produce higher releases between 10000 and 20000 years as soil suction levels become lower and activate cracks in the wall concrete. Vault 2 flux peaks at a few thousand years and then slowly declines as the core of Nitrate embedded in Saltstone shrinks.

I-129 is mobile in soils, but moderately sorbing in cementitious materials unlike Nitrate, producing a different character of release. Figure 139 is an annotated plot of I-129 flux from Vault 4 for Case A. The initial release is diffusive and due to I-129 placed in the degraded wall at time zero. After a few thousand years advection dominates and accelerates release of comtamination residing in the wall. At around 10000 years, I-129 in the wall is largely depleted, and release from Saltstone itself occurs. A spike occurs at 15000 years when the flow abruptly increases due to sand drain failure. The release from Vault 1 is similar to Vault 4 in behavior. For Vault 2 the walls are initially free of contamination, and contaminant release slowly increases as I-129 diffuses through the vault. An abrupt increase in flux occurs at 15000 years when conditions change to reflect a failed sand drain and vault wall within the 15000-20000 year flow period.

Tc-99 flux exhibits spikes due to flow field changes, like Nitrate and I-129, and also depletion of reduction capacity in individual grid cells. When a grid cell becomes oxidized, the Tc-99 present in the cell suddenly becomes mobile, creating a pulse. These spikes are an artifact of the coarse mesh chosen for these simulations. The actual flux would vary smoothly with time. For Vault 2, Tc-99 release occurs as a result of wall failure due to concrete degradation, which exposes Saltstone to more rapid oxidation. For Vaults 1 and 4, release occurs from degraded (cracked) walls at time zero, which permits rapid oxidation of the concrete and Tc-99 present within the walls. Longer term releases occur from Saltstone as it is slowly oxidized (shrinking core).

Figure 140 through Figure 148 present flux to the water table for diagnostic Case C for each vault type and Nitrate, I-129, and Tc-99.

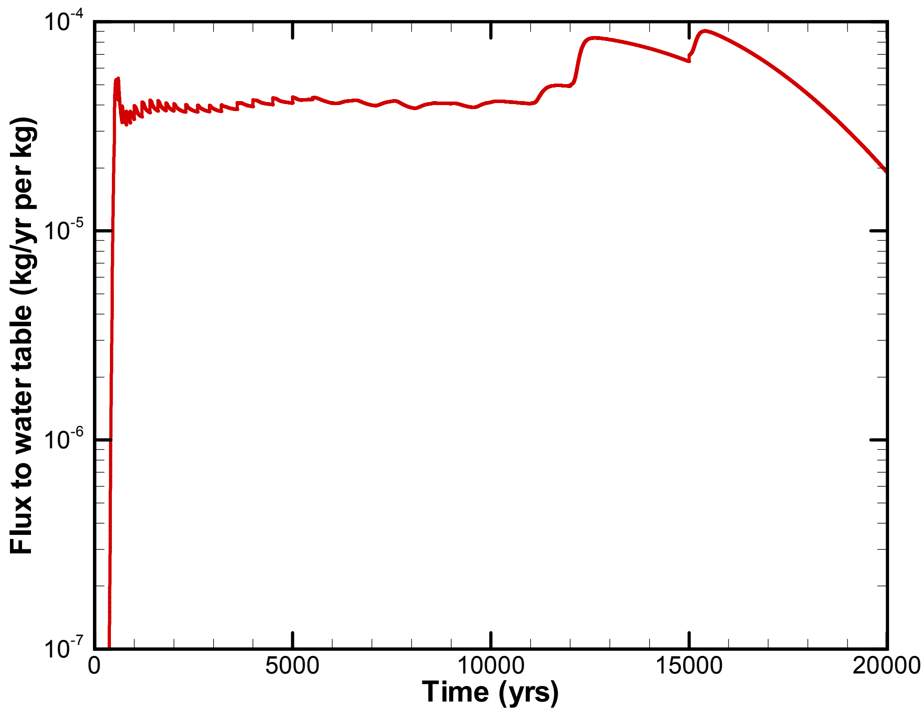


Figure 94. Nitrate flux to water table for Vault 1 and Case A.

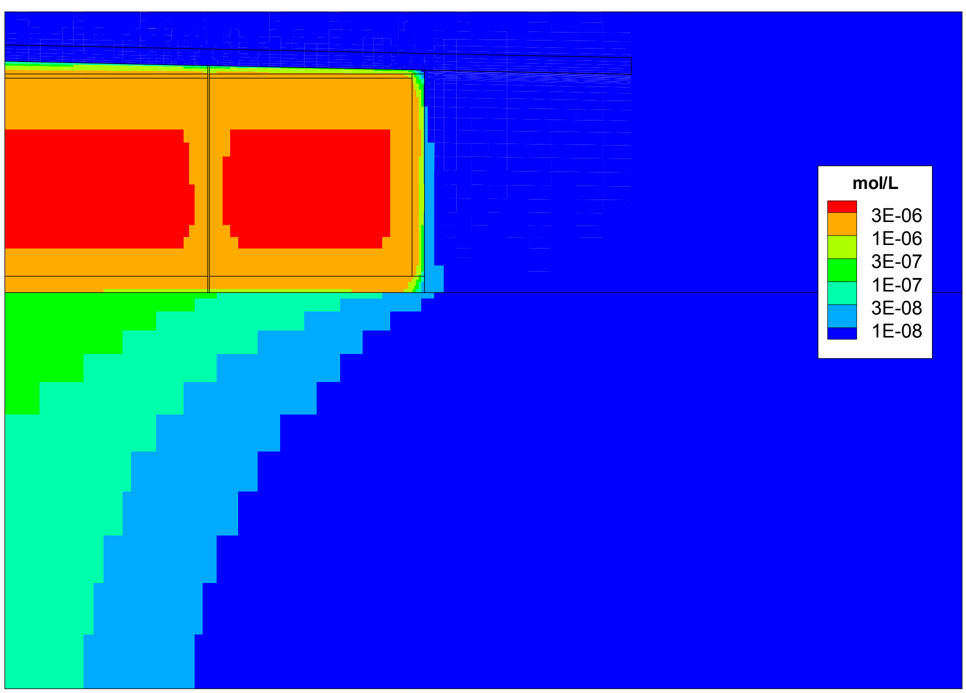


Figure 95. Nitrate concentration at 1000 yrs for Vault 1 and Case A.

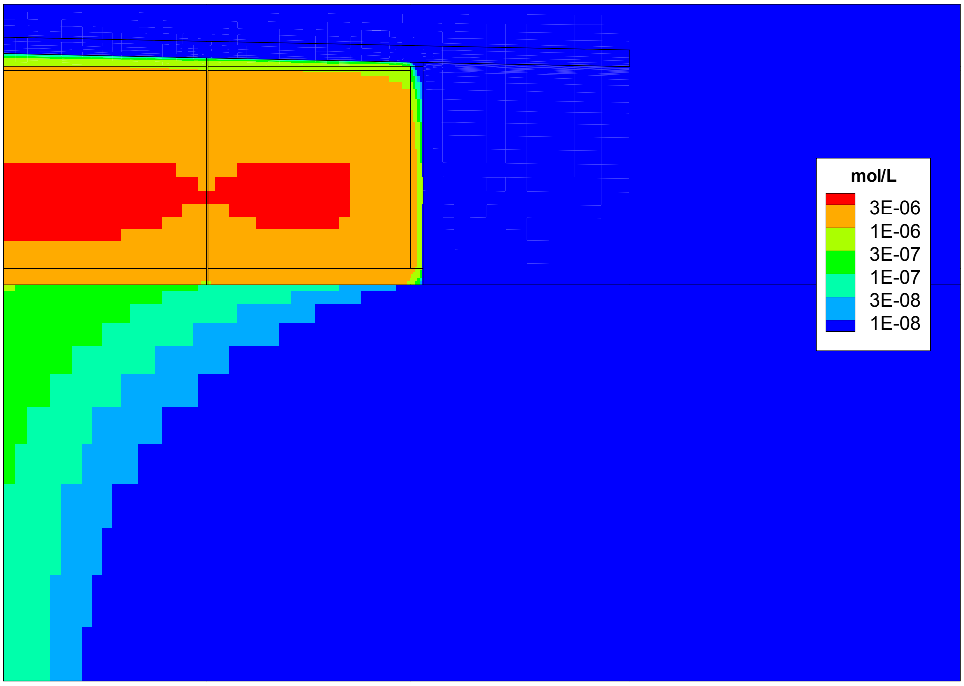


Figure 96. Nitrate concentration at 3000 yrs for Vault 1 and Case A.

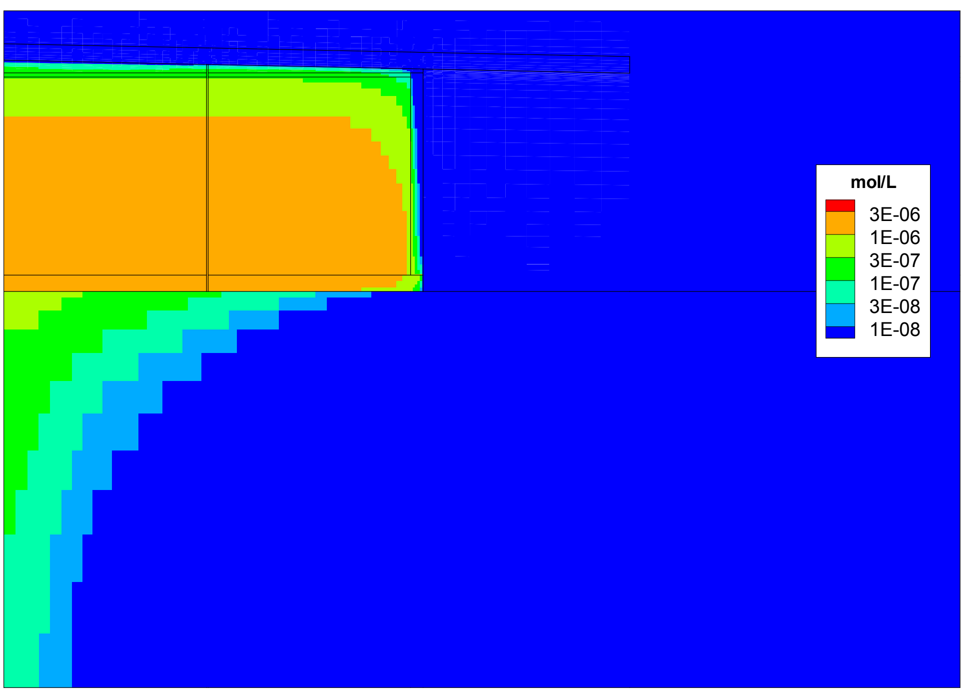


Figure 97. Nitrate concentration at 10000 yrs for Vault 1 and Case A.

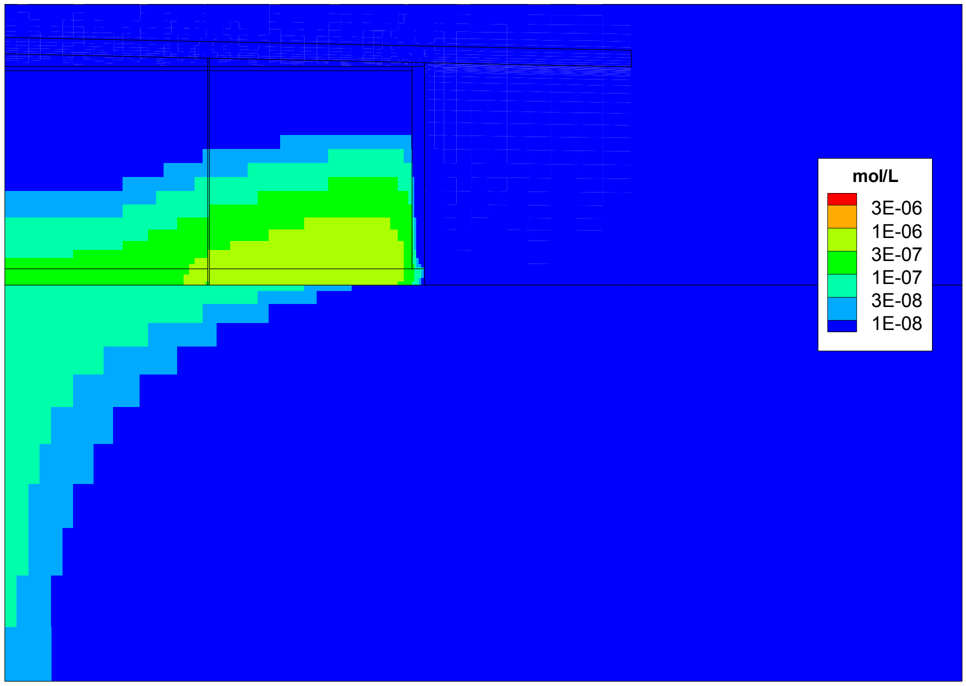


Figure 98. Nitrate concentration at 20000 yrs for Vault 1 and Case A.

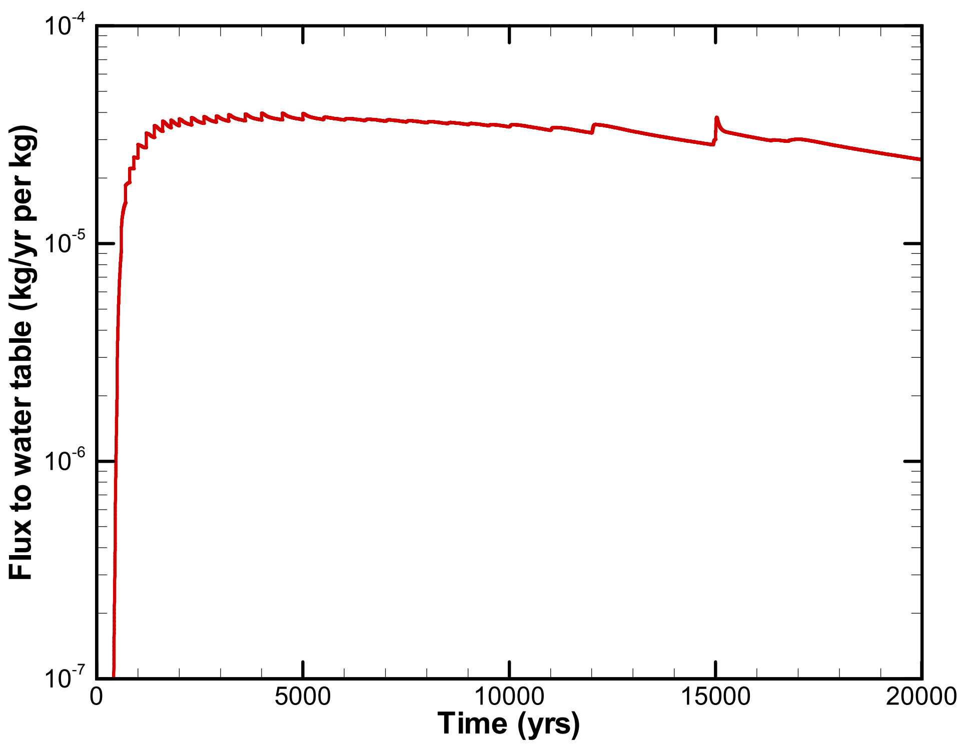


Figure 99. Nitrate flux to water table for Vault 2 and Case A.

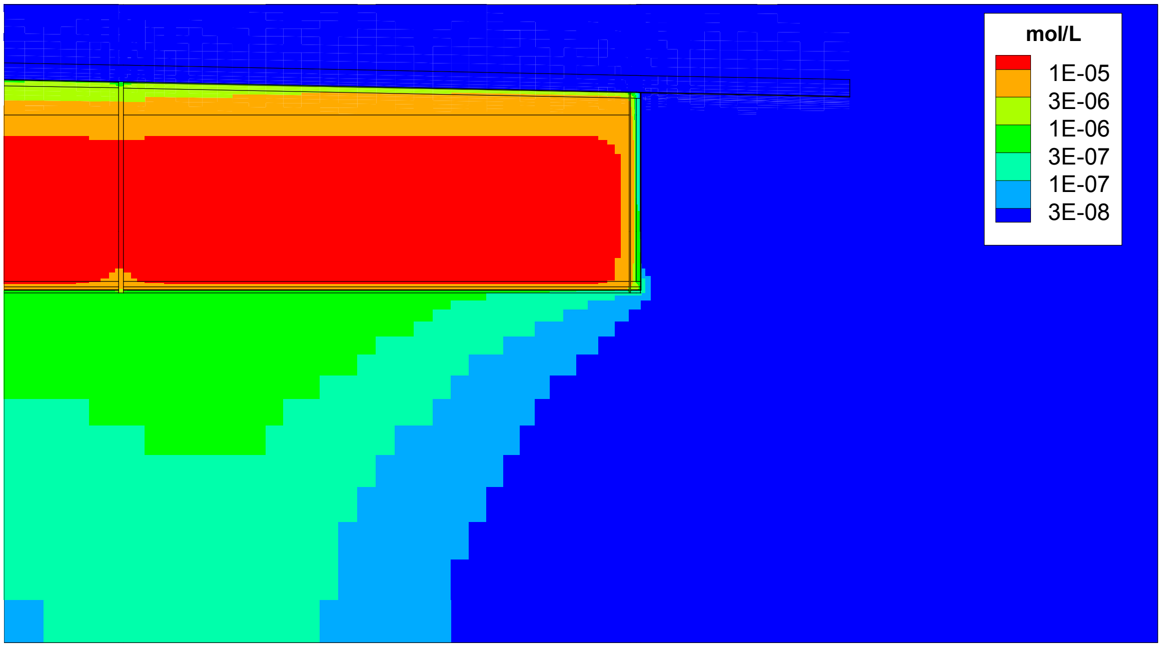


Figure 100. Nitrate concentration at 1000 yrs for Vault 2 and Case A.

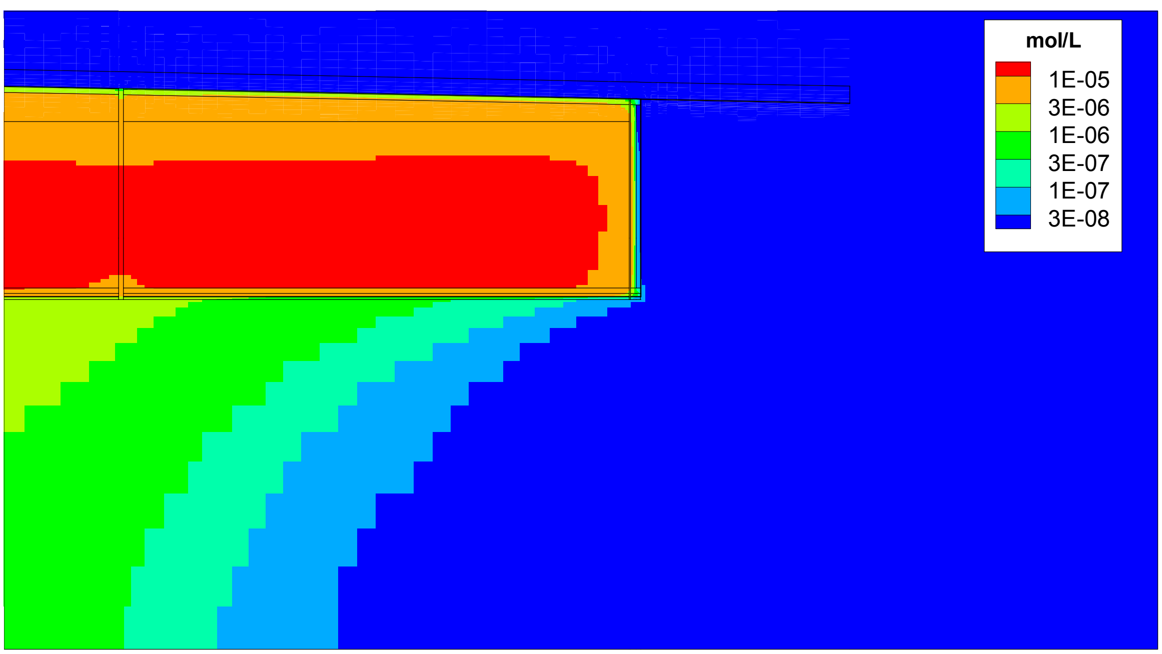


Figure 101. Nitrate concentration at 3000 yrs for Vault 2 and Case A.

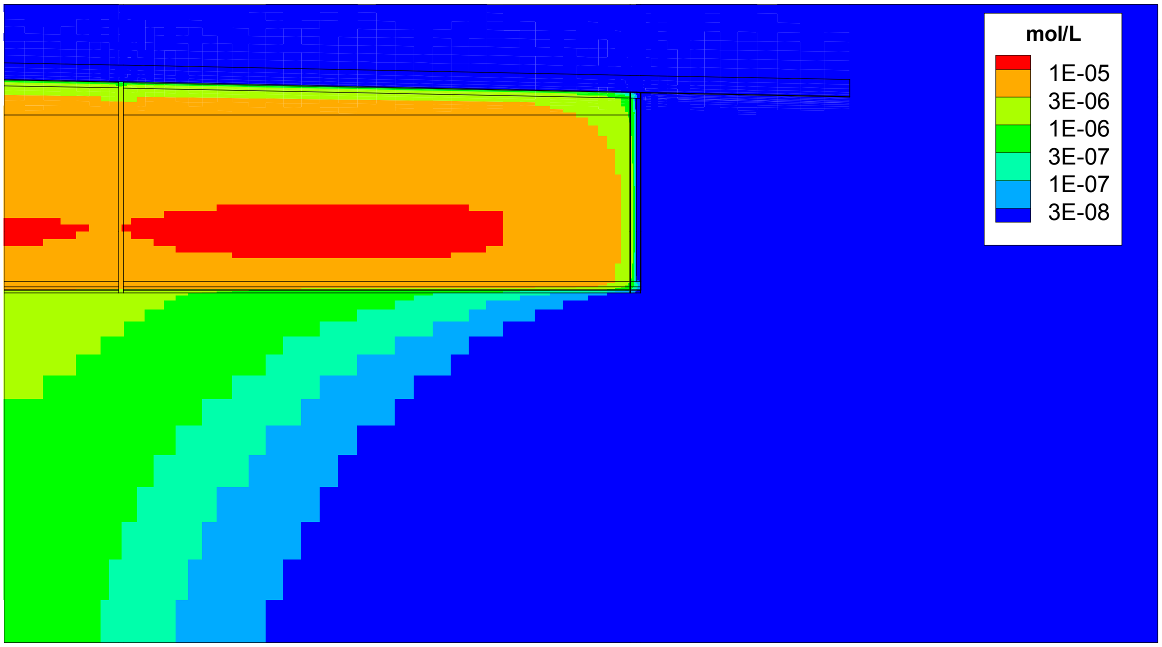


Figure 102. Nitrate concentration at 10000 yrs for Vault 2 and Case A.

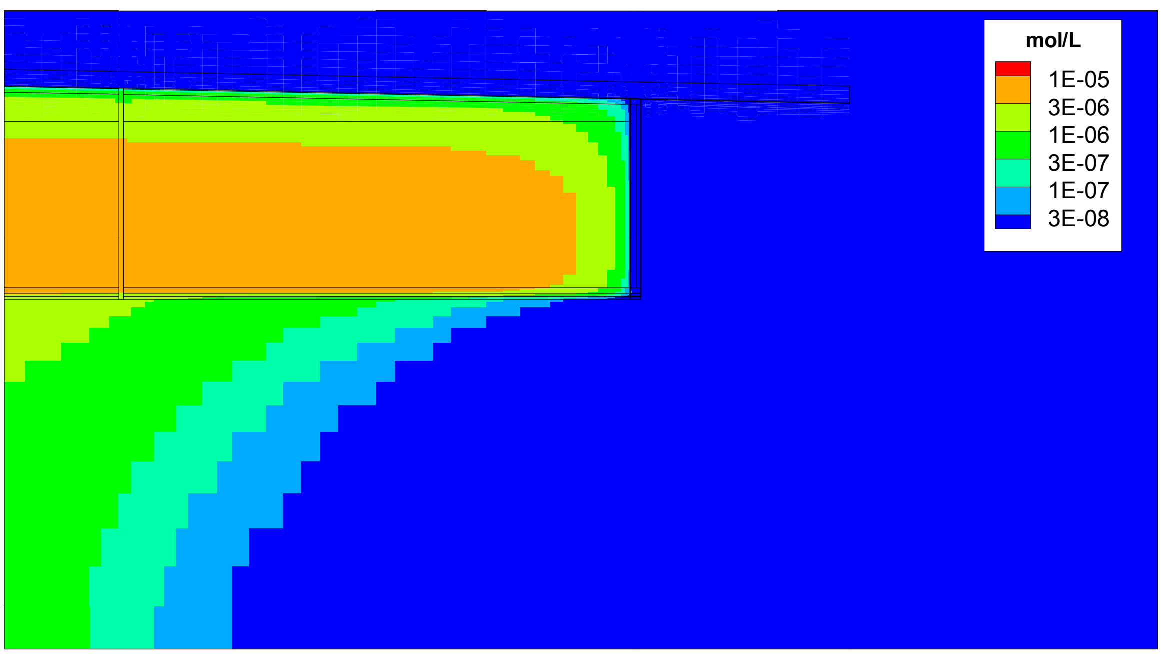


Figure 103. Nitrate concentration at 20000 yrs for Vault 2 and Case A.

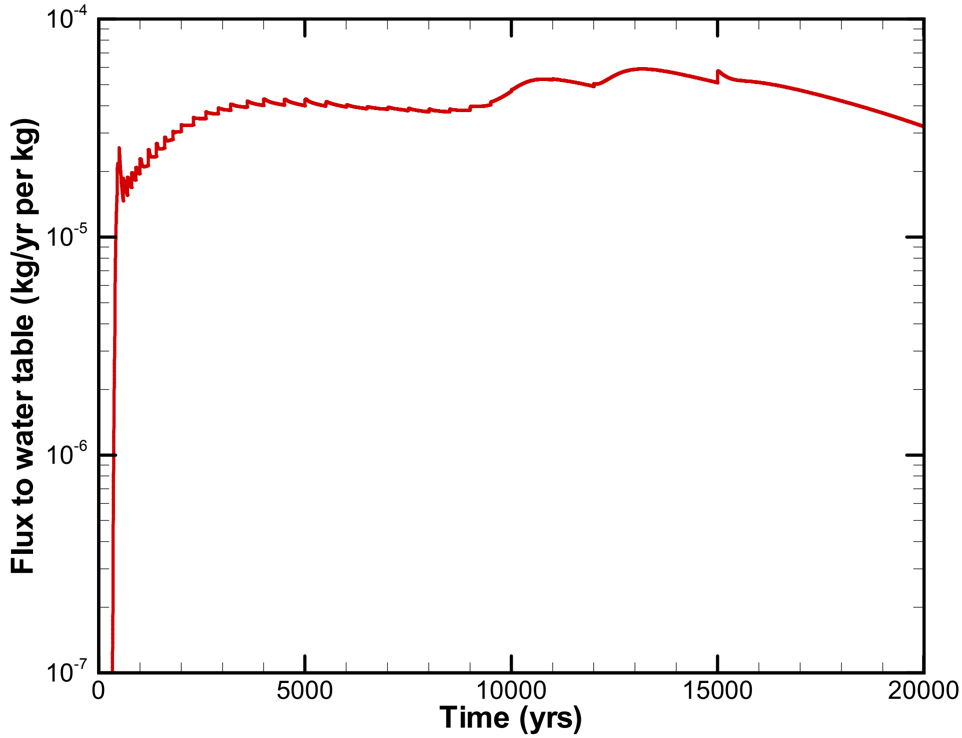


Figure 104. Nitrate flux to water table for Vault 4 and Case A.

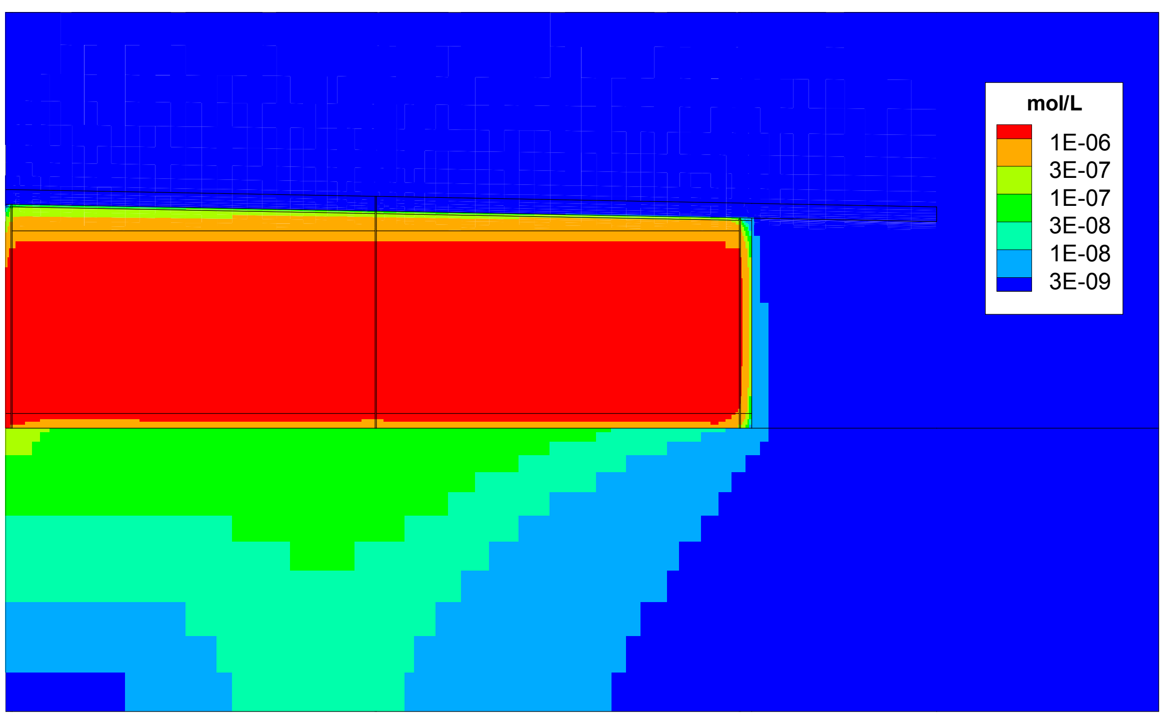


Figure 105. Nitrate concentration at 1000 yrs for Vault 4 and Case A.

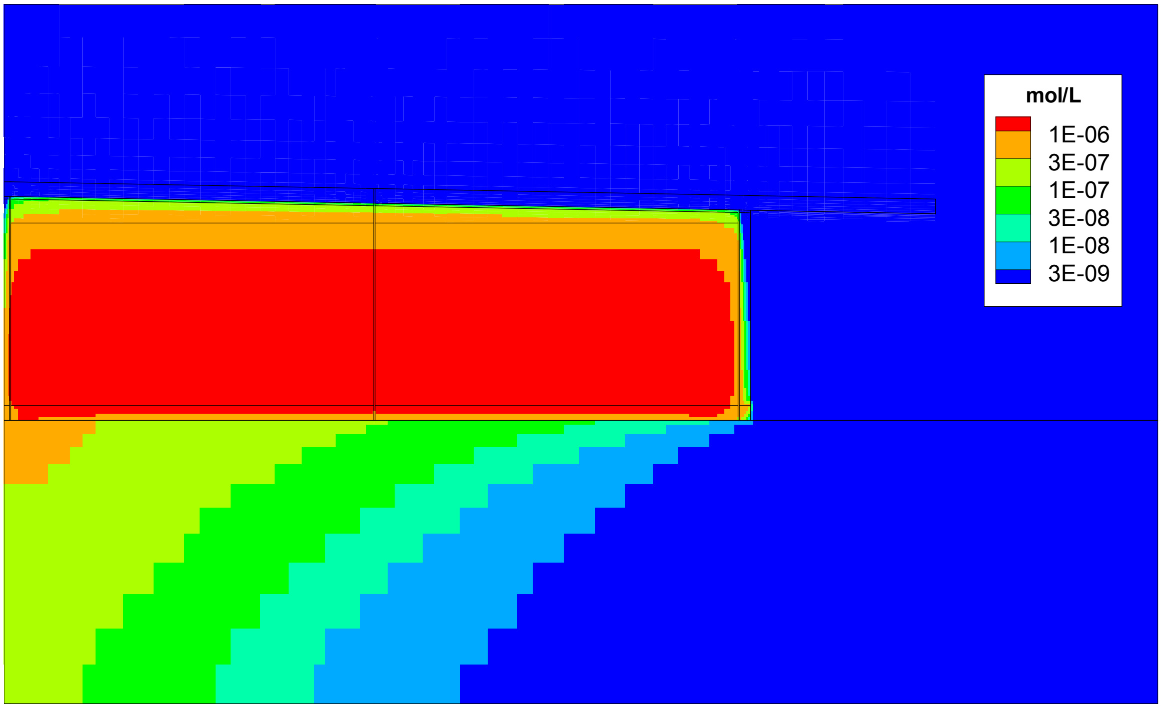


Figure 106. Nitrate concentration at 3000 yrs for Vault 4 and Case A.

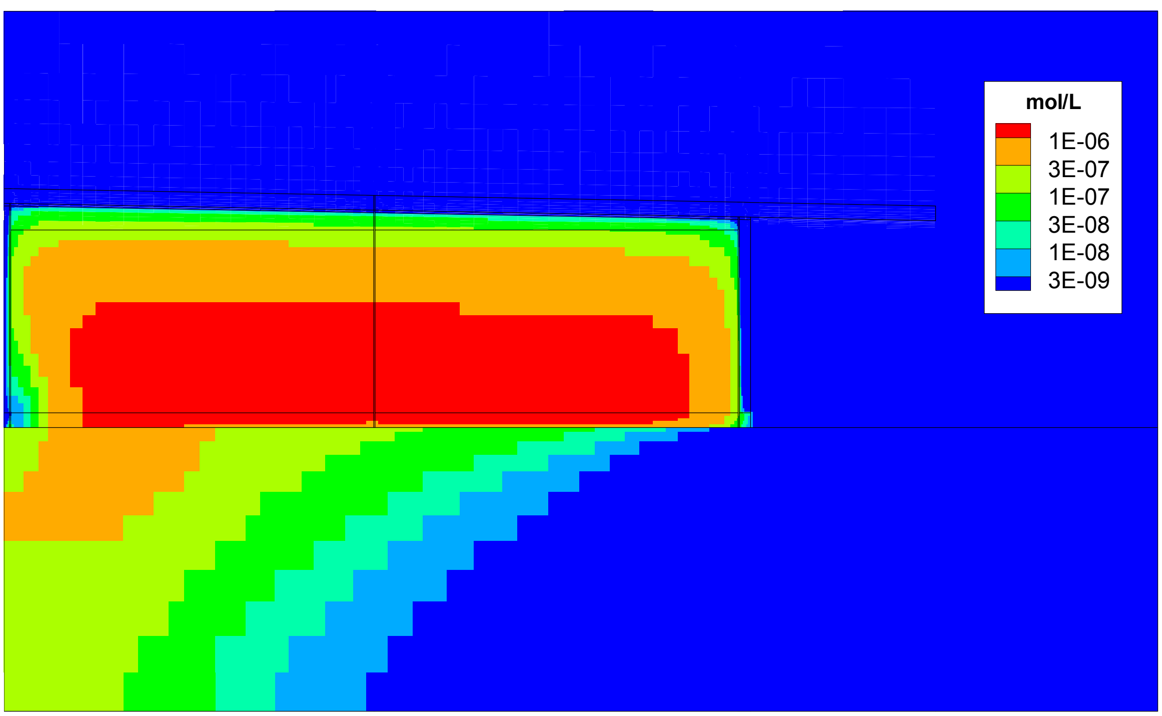


Figure 107. Nitrate concentration at 10000 yrs for Vault 4 and Case A.

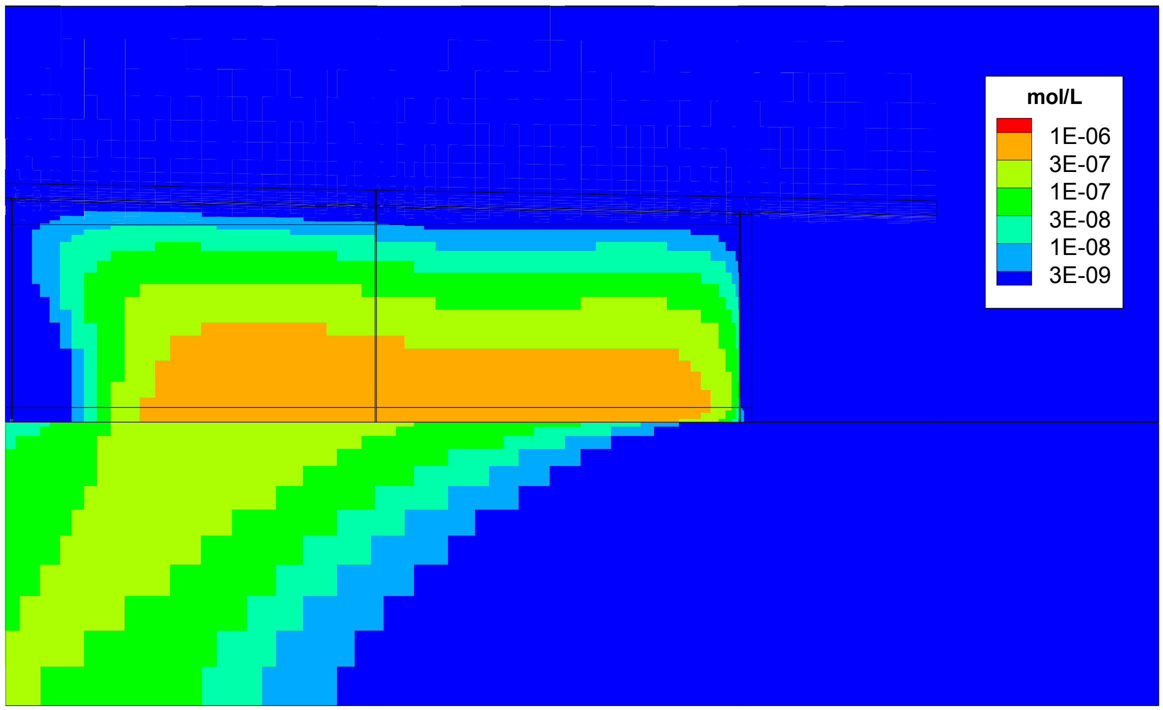


Figure 108.	Nitrate concentration at 20000 yrs for Vault 4 and Case A.

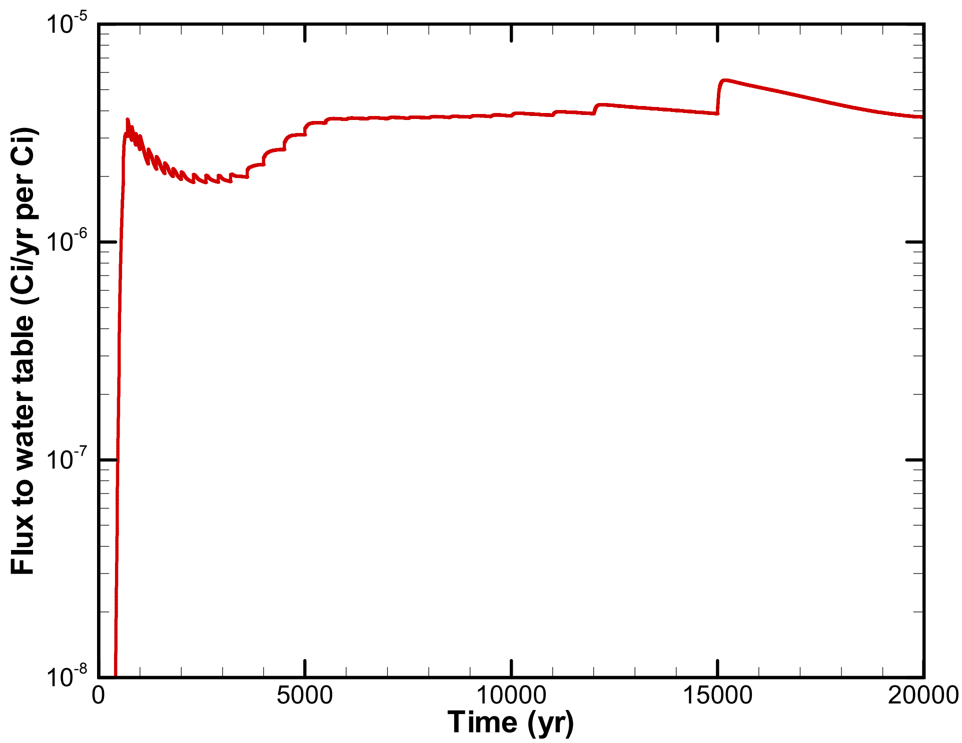


Figure 109.	I-129 flux to water table for Vault 1 and Case A.

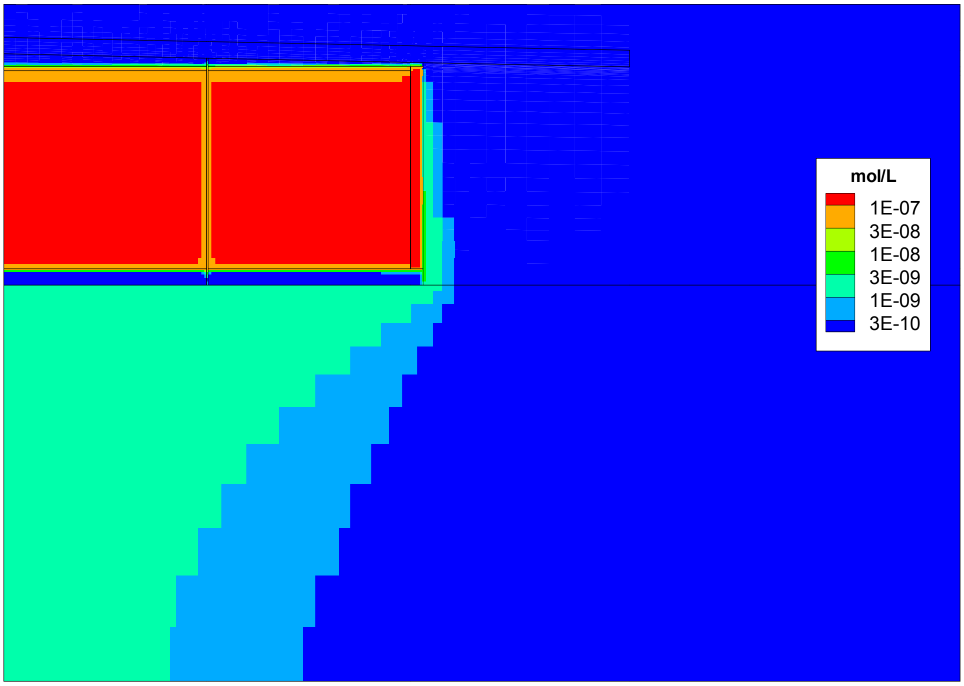


Figure 110. I-129 concentration at 1000 yrs for Vault 1 and Case A.

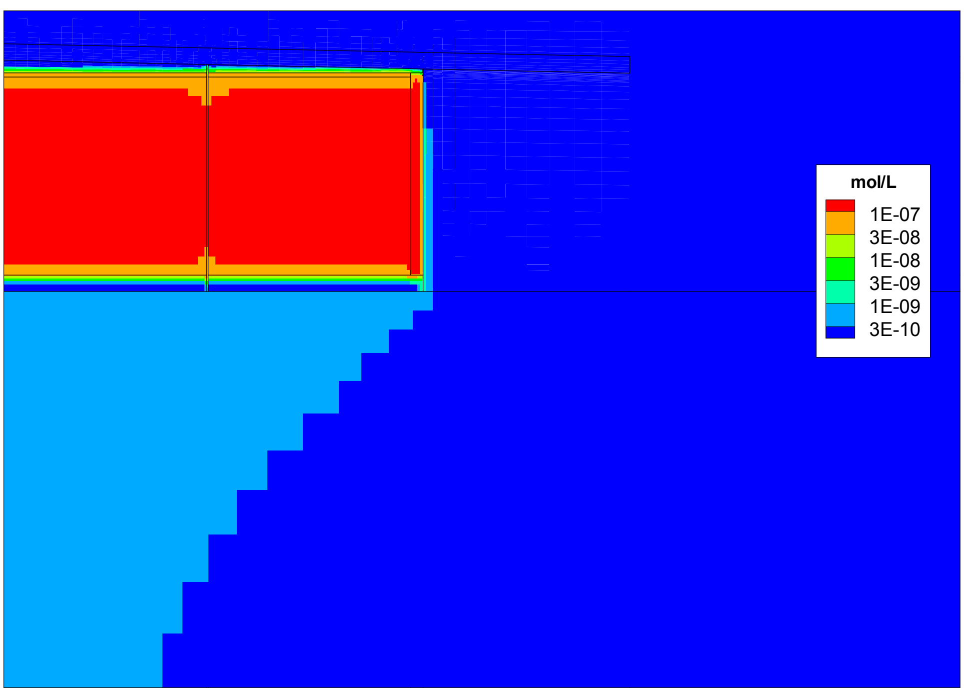


Figure 111. I-129 concentration at 3000 yrs for Vault 1 and Case A.

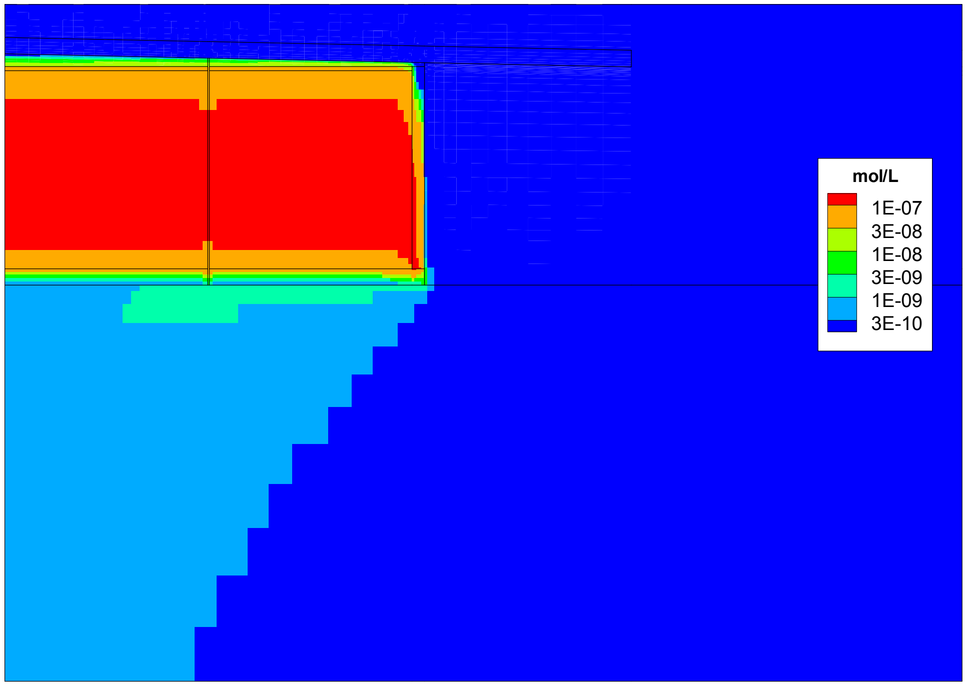


Figure 112. I-129 concentration at 10000 yrs for Vault 1 and Case A.

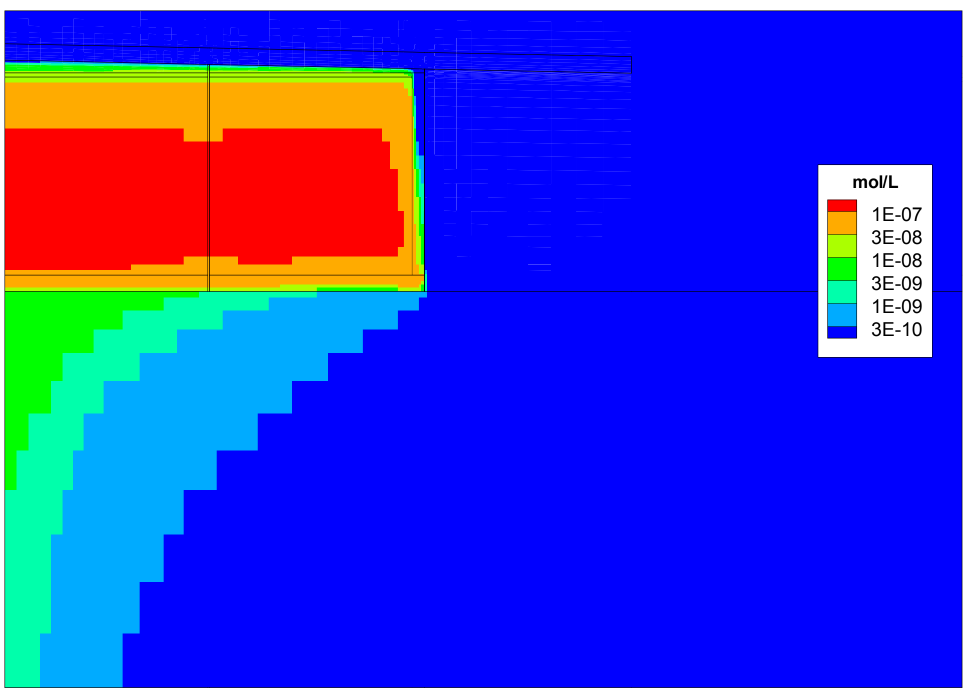


Figure 113. I-129 concentration at 20000 yrs for Vault 1 and Case A.

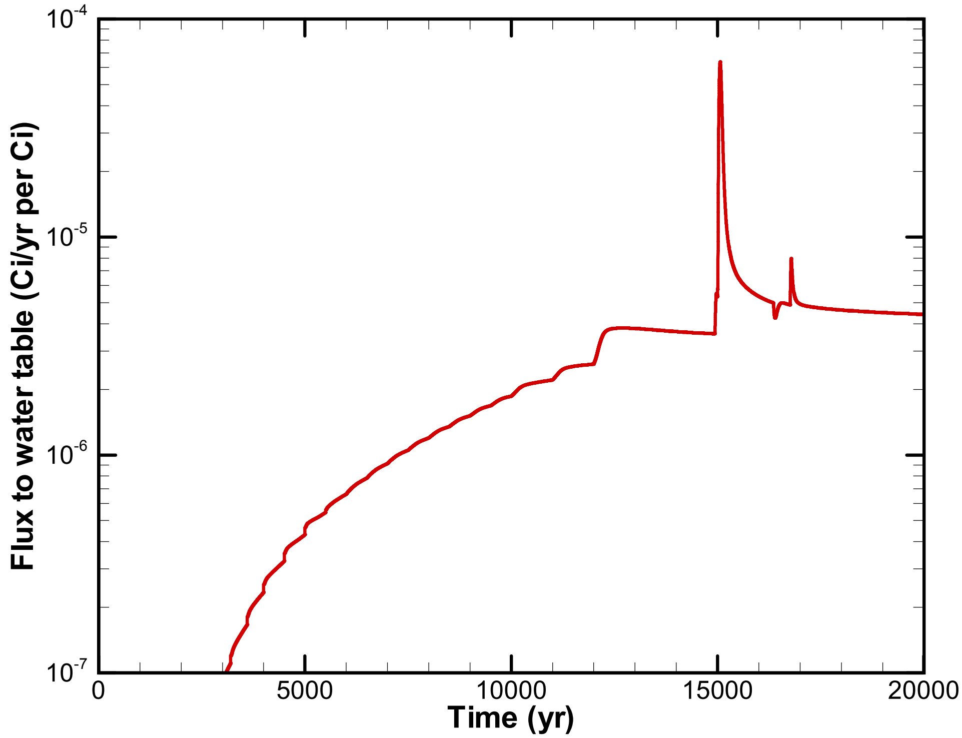


Figure 114. I-129 flux to water table for Vault 2 and Case A.

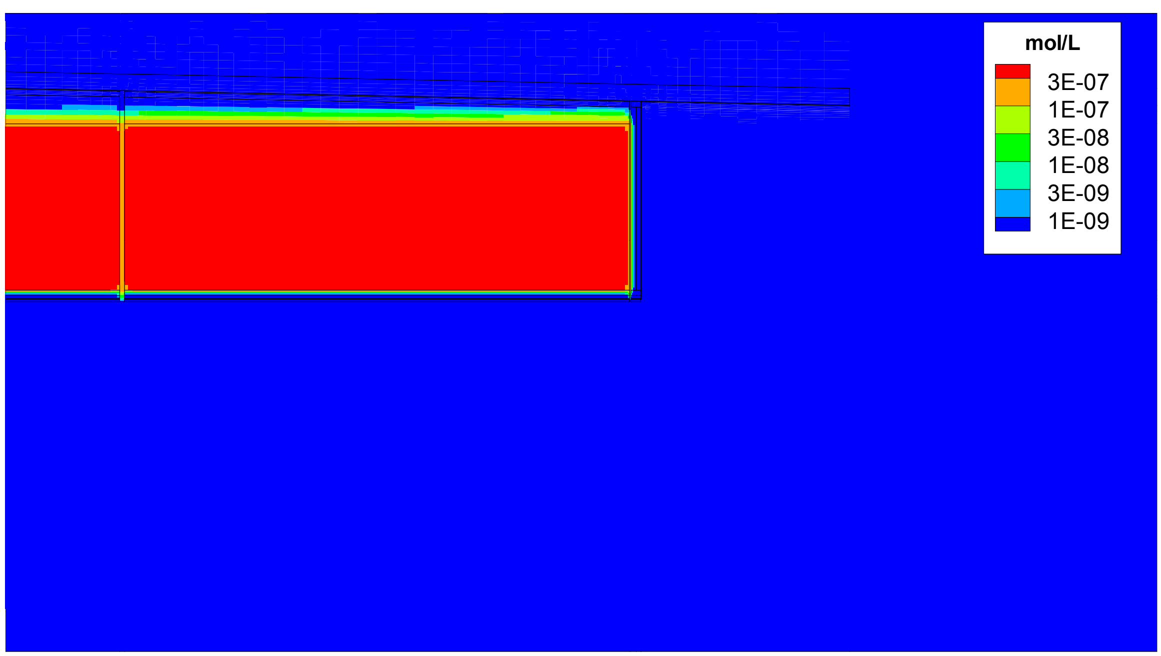


Figure 115. I-129 concentration at 1000 yrs for Vault 2 and Case A.

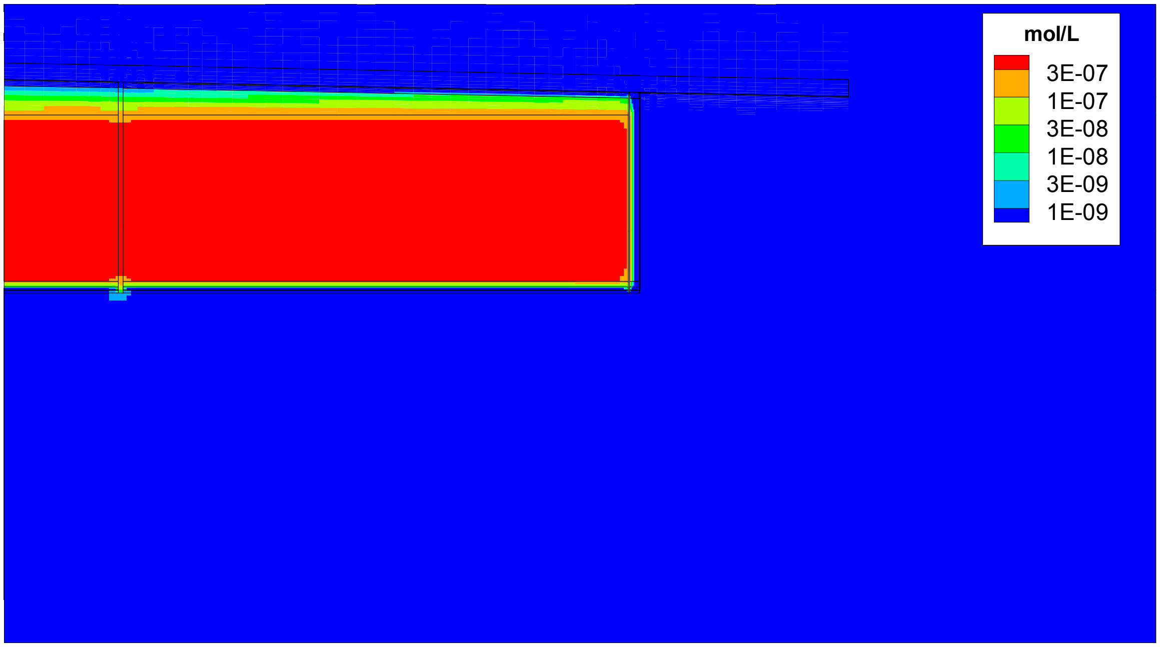


Figure 116. I-129 concentration at 3000 yrs for Vault 2 and Case A.

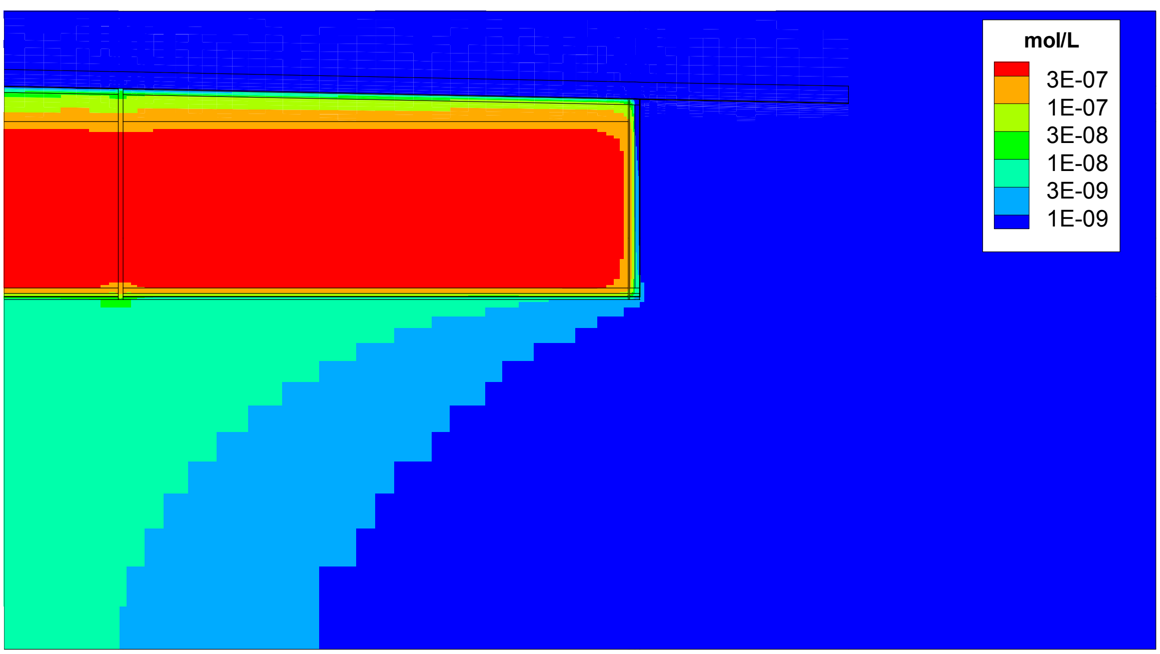


Figure 117. I-129 concentration at 10000 yrs for Vault 2 and Case A.

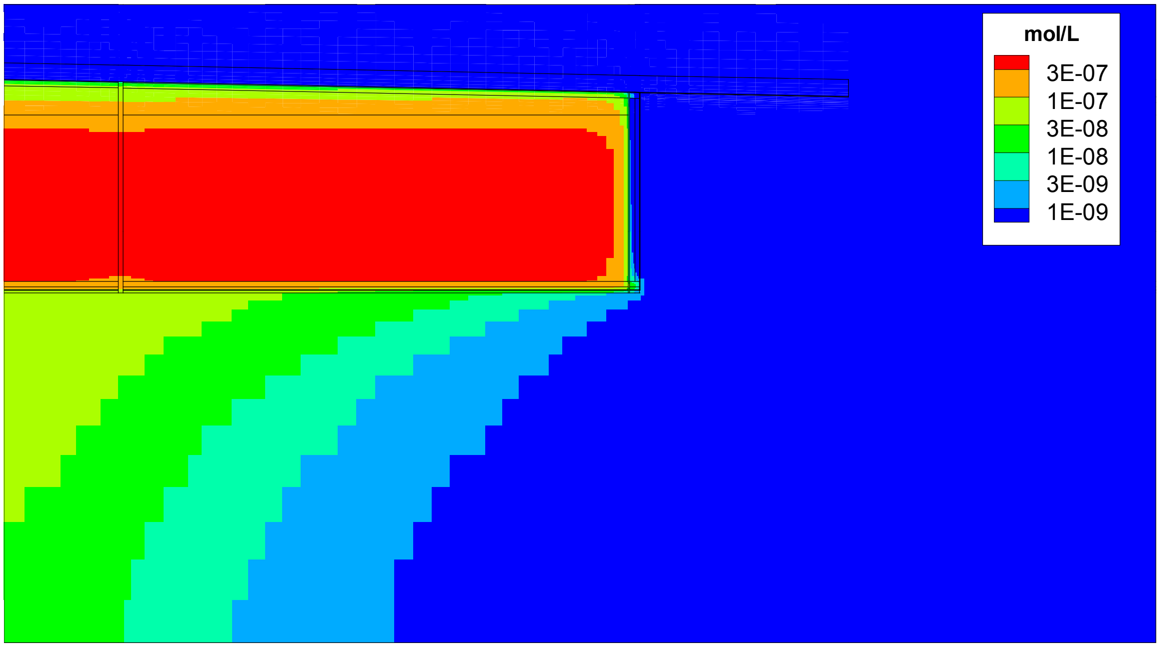


Figure 118. I-129 concentration at 20000 yrs for Vault 2 and Case A.

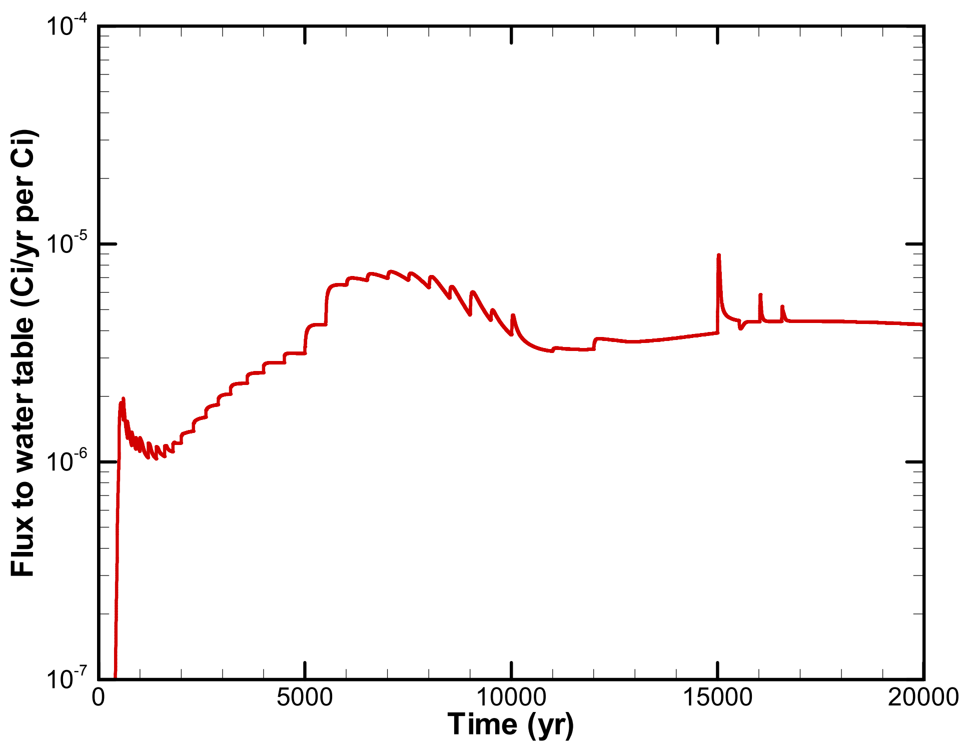


Figure 119. I-129 flux to water table for Vault 4 and Case A.

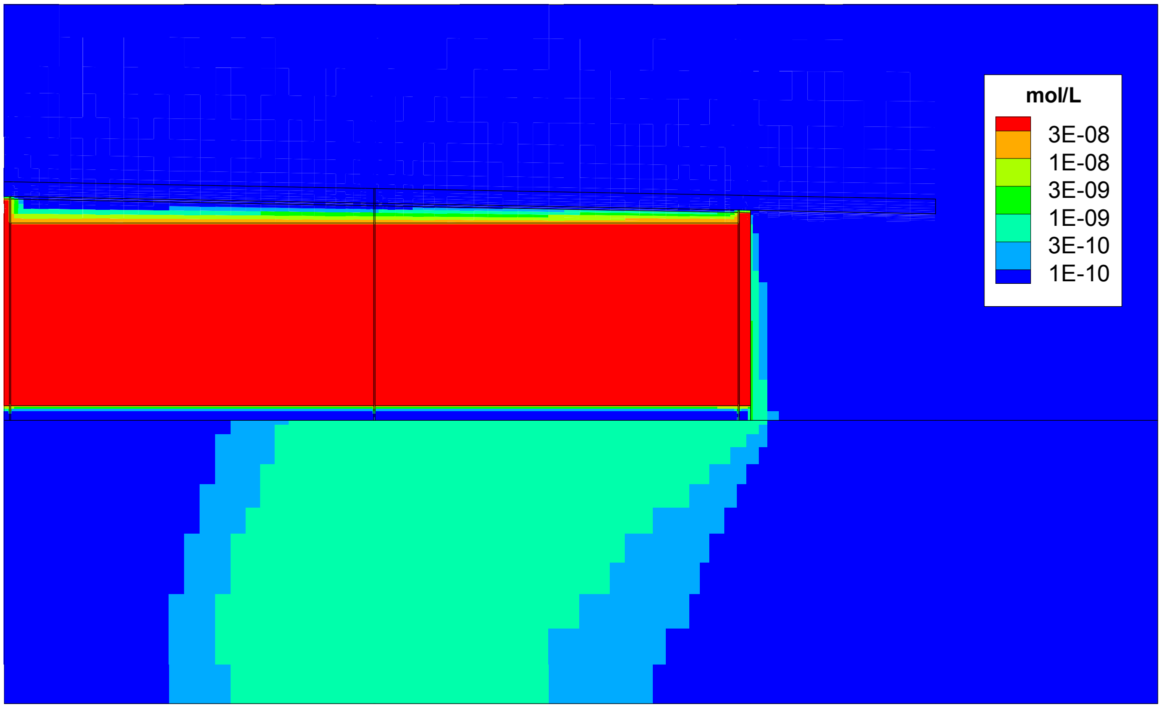


Figure 120. I-129 concentration at 1000 yrs for Vault 4 and Case A.

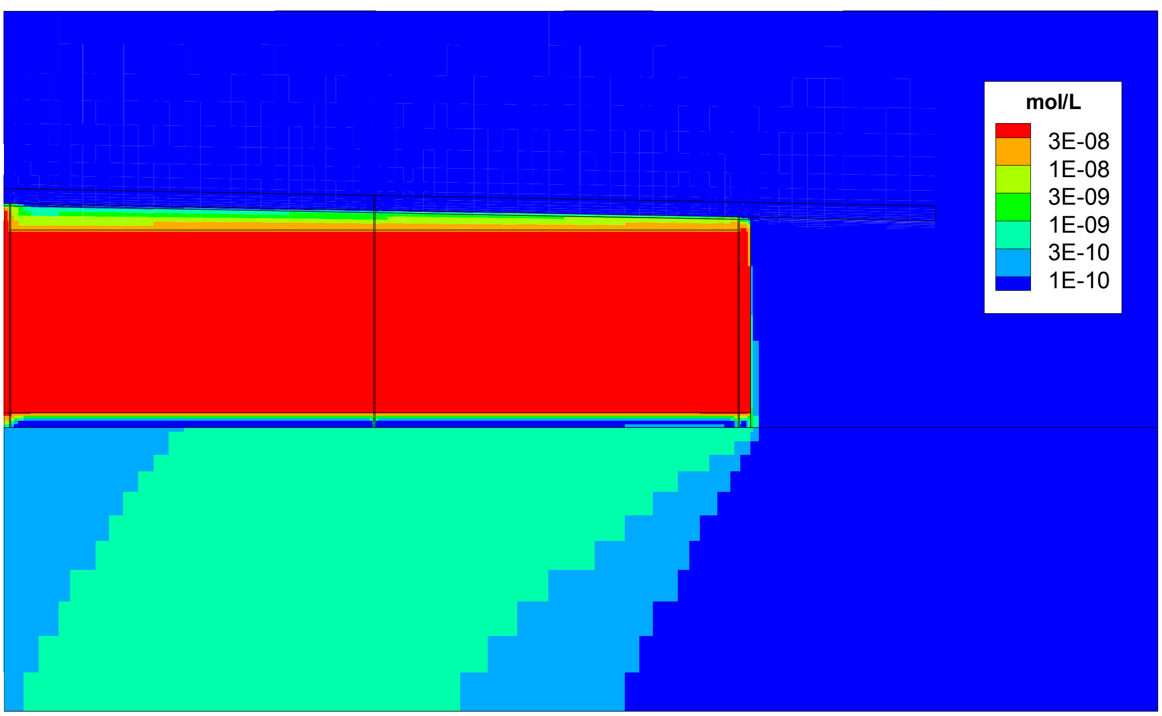


Figure 121. I-129 concentration at 3000 yrs for Vault 4 and Case A.

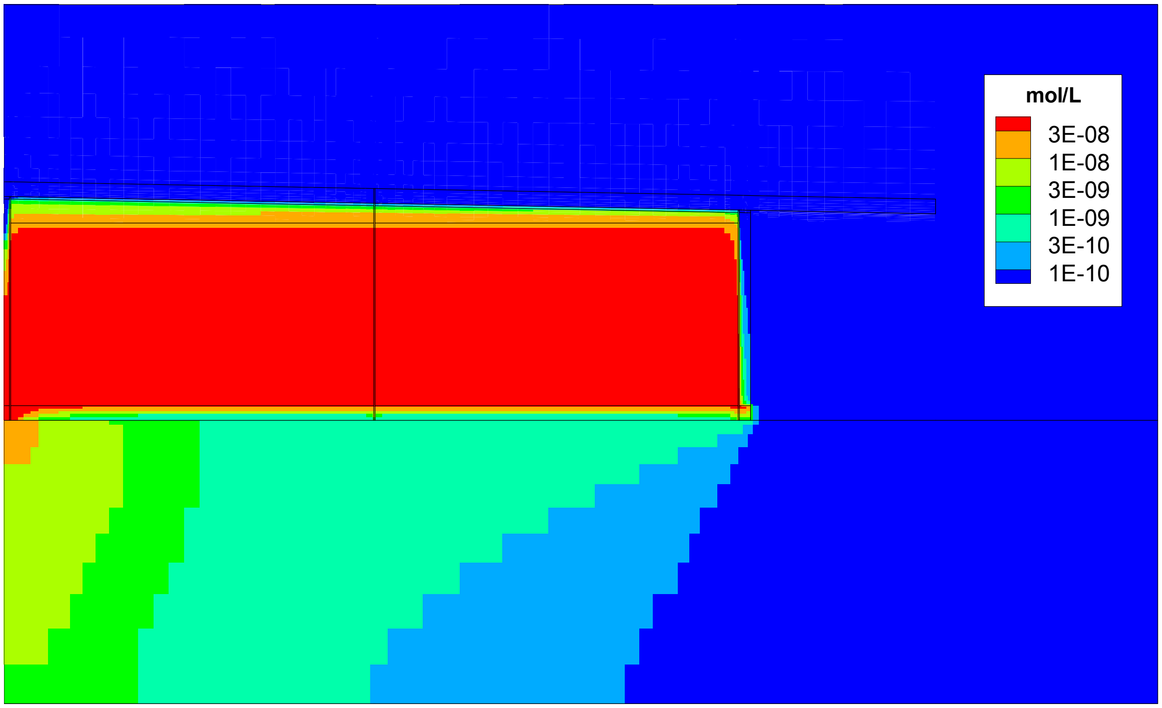


Figure 122. I-129 concentration at 10000 yrs for Vault 4 and Case A.

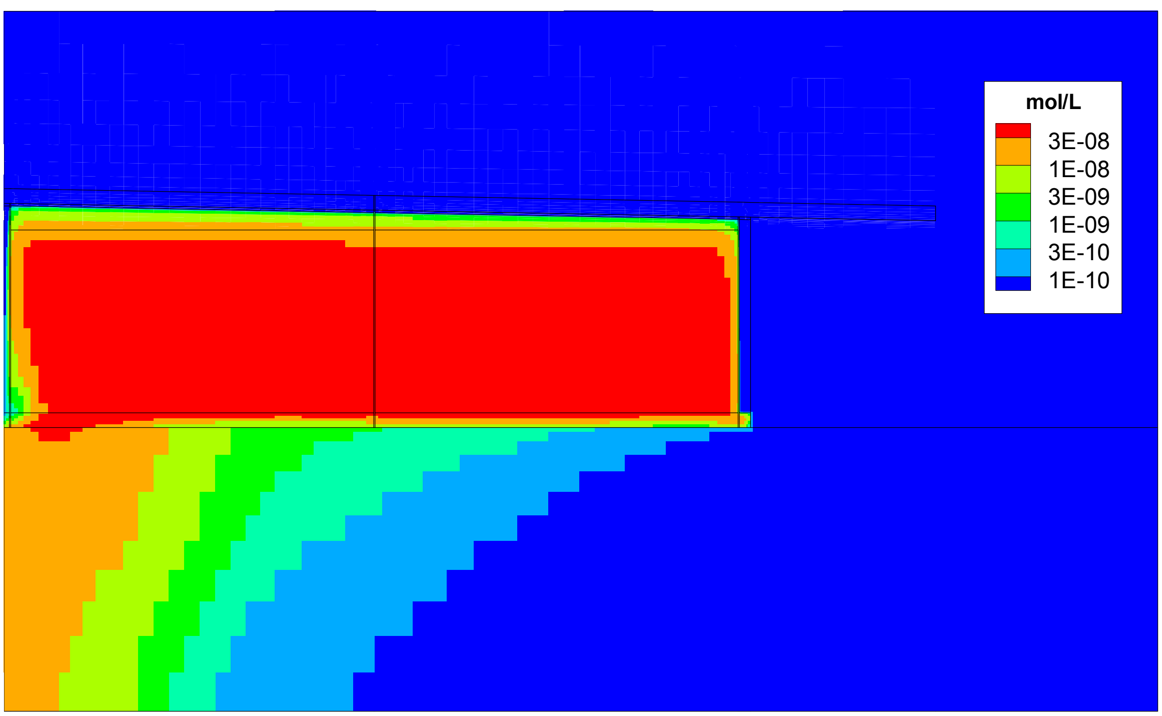


Figure 123. I-129 concentration at 20000 yrs for Vault 4 and Case A.

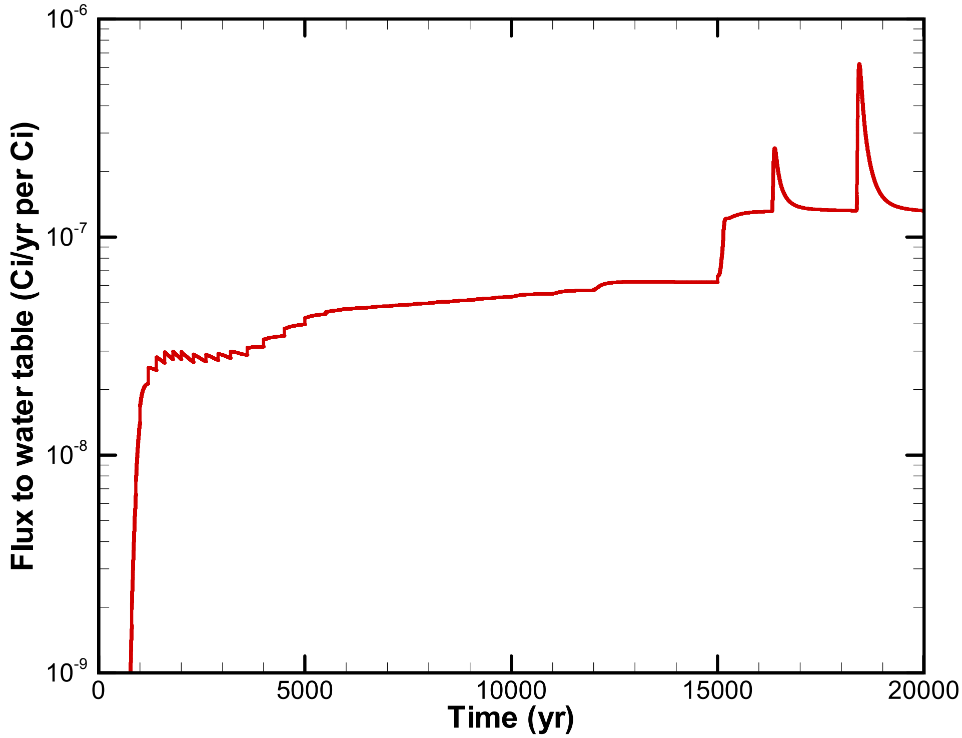


Figure 124. Tc-99 flux to water table for Vault 1 and Case A.

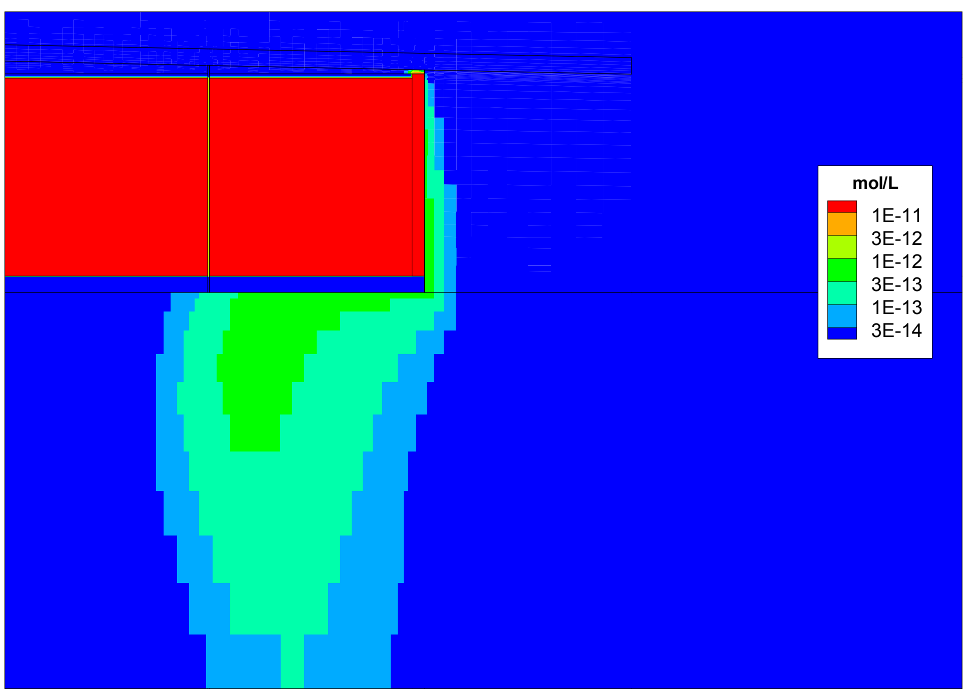


Figure 125. Tc-99 concentration at 1000 yrs for Vault 1 and Case A.

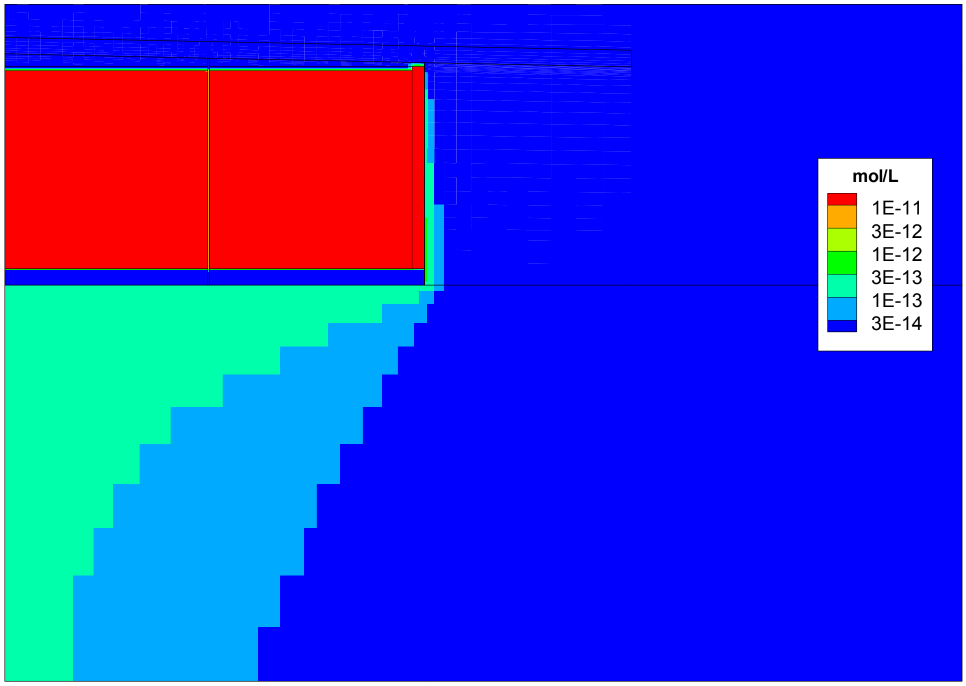


Figure 126. Tc-99 concentration at 3000 yrs for Vault 1 and Case A.

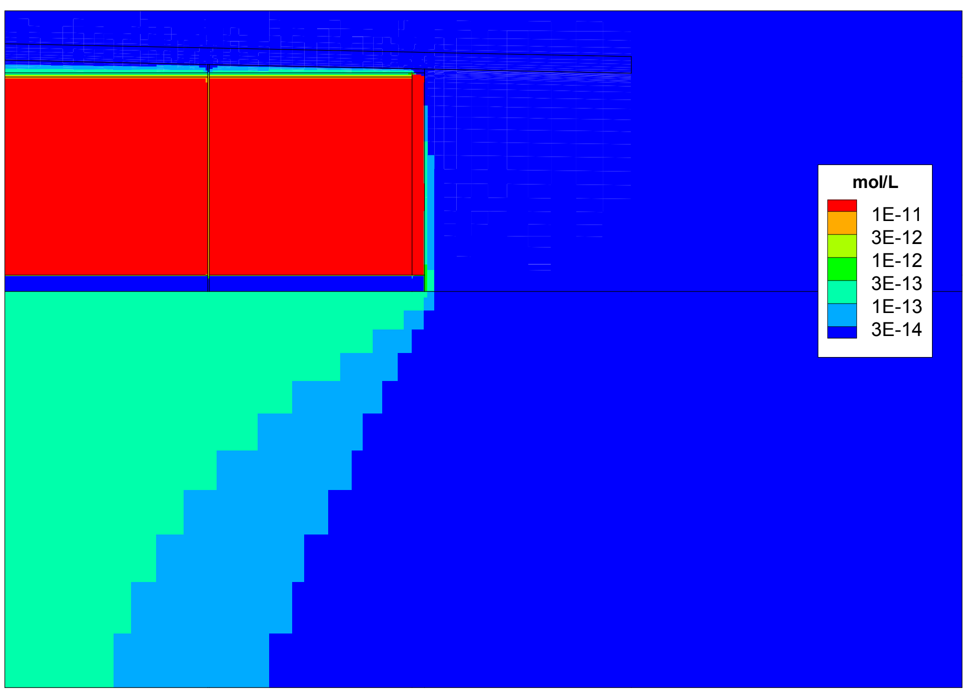


Figure 127. Tc-99 concentration at 10000 yrs for Vault 1 and Case A.

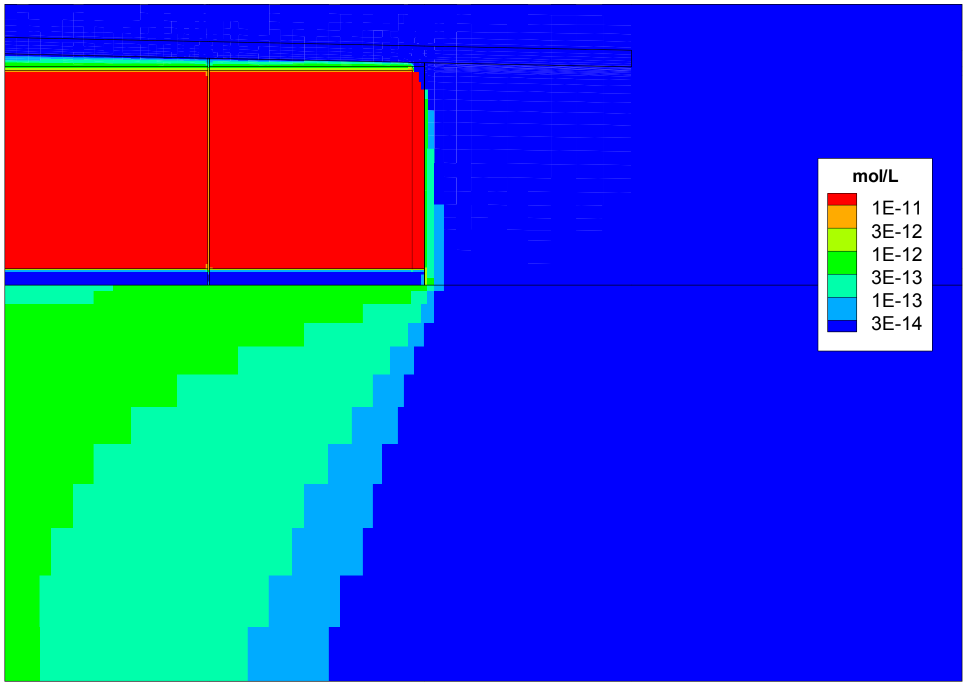


Figure 128. Tc-99 concentration at 20000 yrs for Vault 1 and Case A.

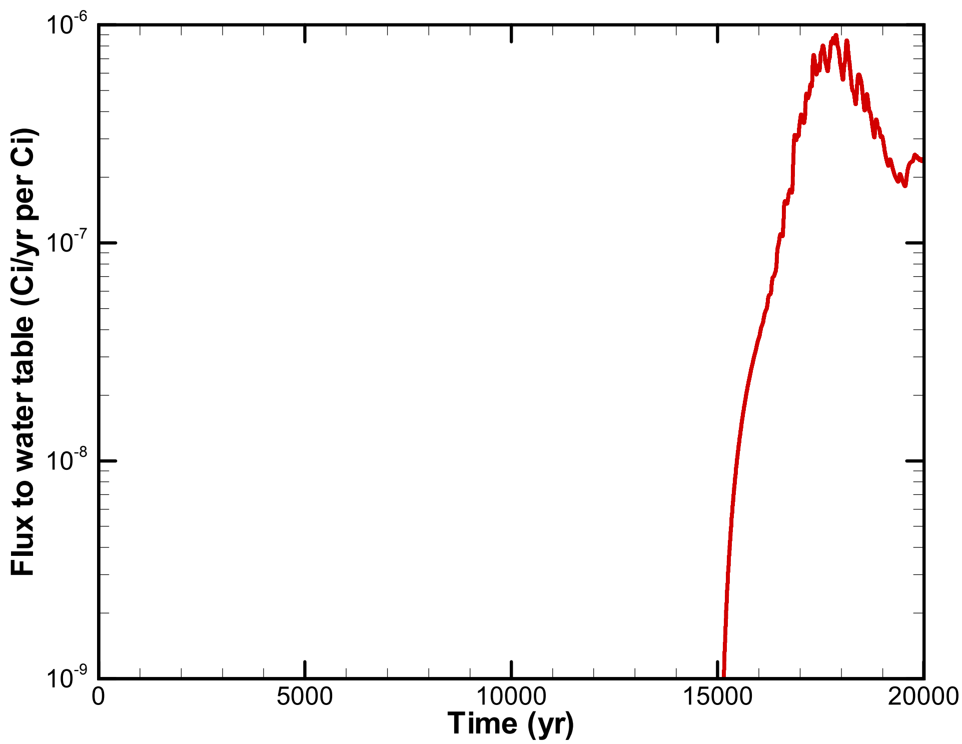


Figure 129. Tc-99 flux to water table for Vault 2 and Case A.

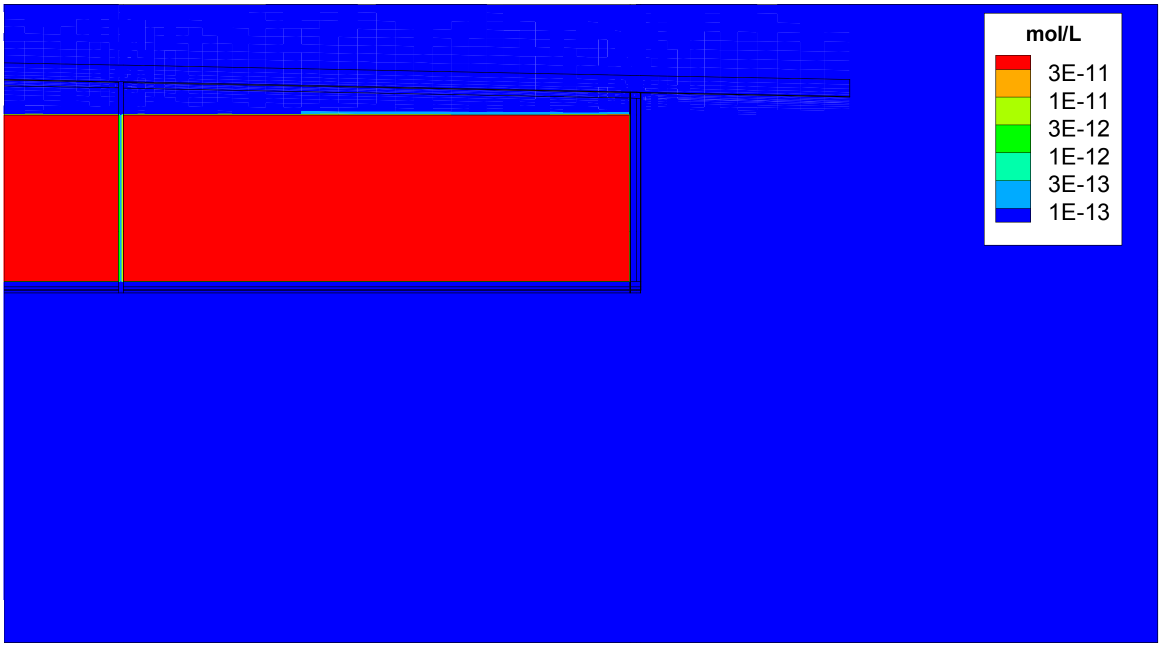


Figure 130. Tc-99 concentration at 1000 yrs for Vault 2 and Case A.

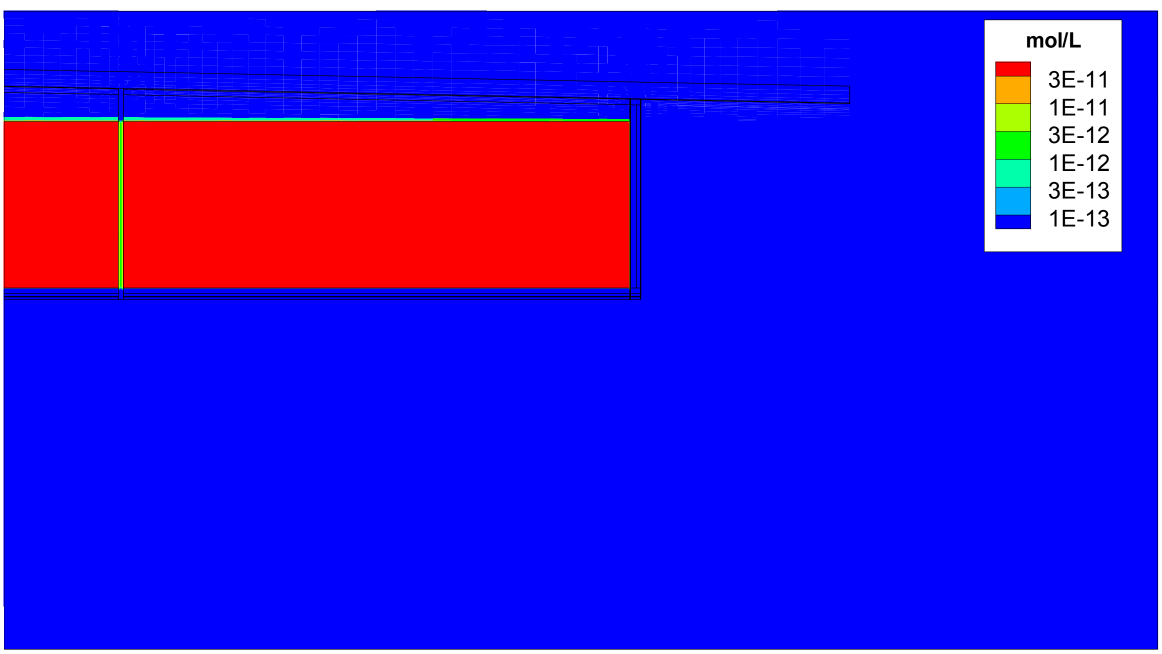


Figure 131. Tc-99 concentration at 3000 yrs for Vault 2 and Case A.

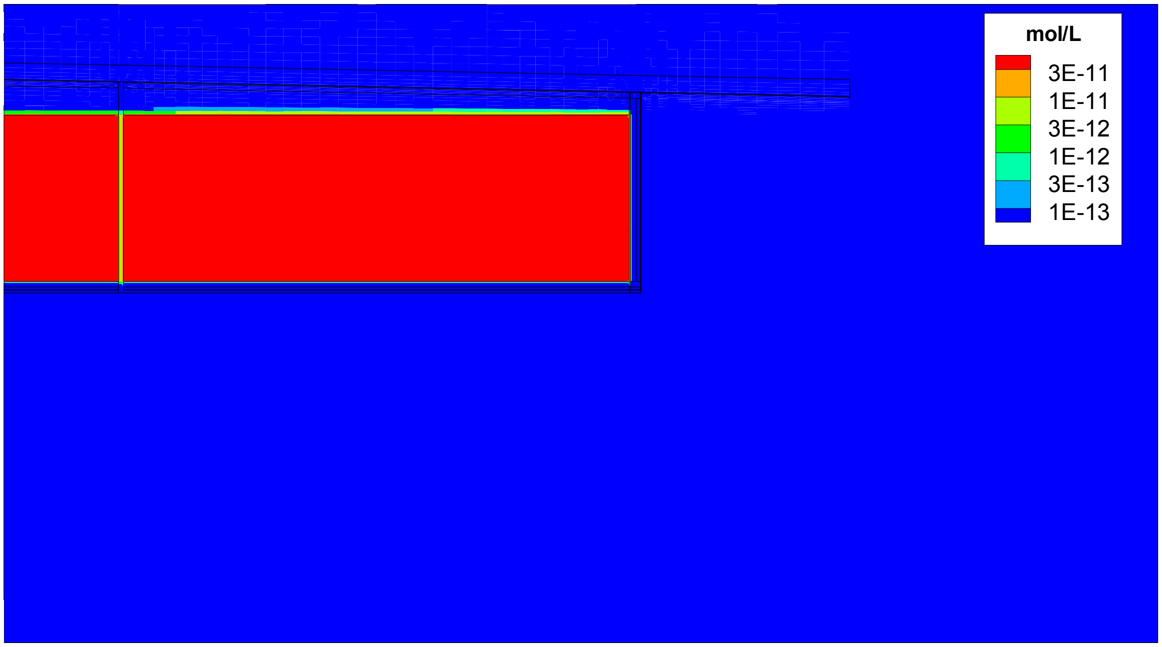


Figure 132. Tc-99 concentration at 10000 yrs for Vault 2 and Case A.

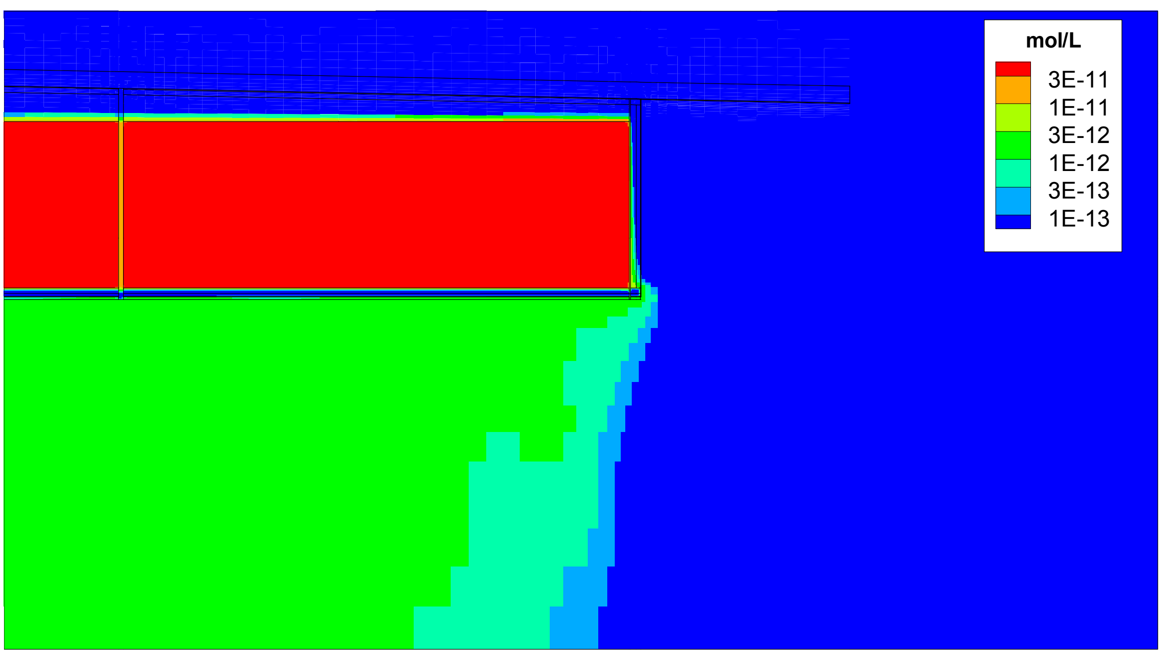


Figure 133. Tc-99 concentration at 20000 yrs for Vault 2 and Case A.

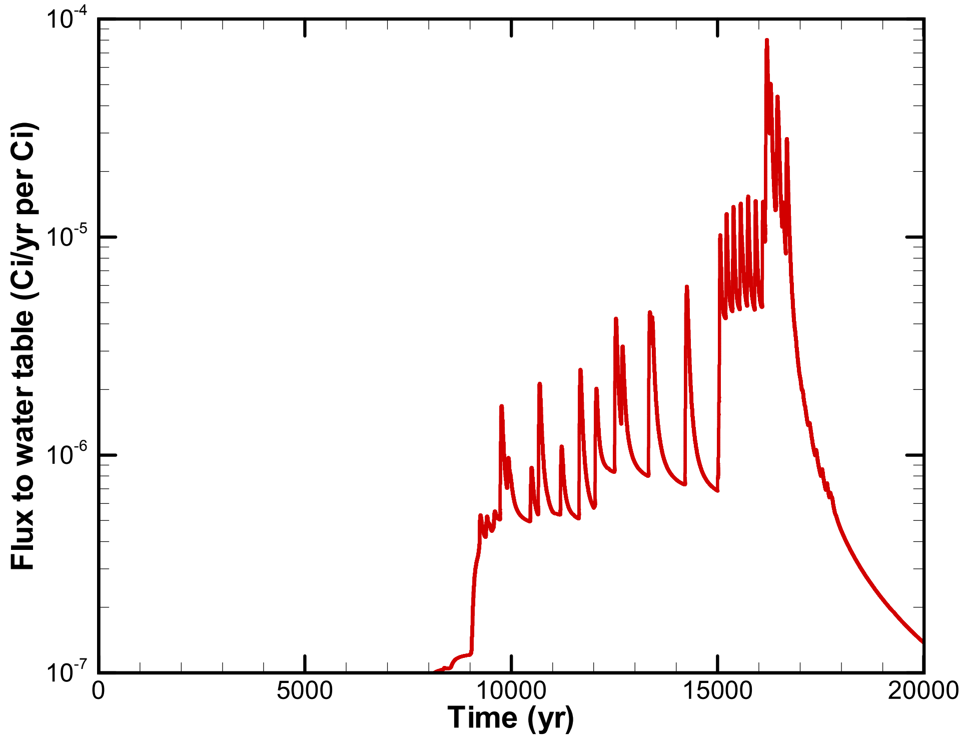


Figure 134. Tc-99 flux to water table for Vault 4 and Case A.

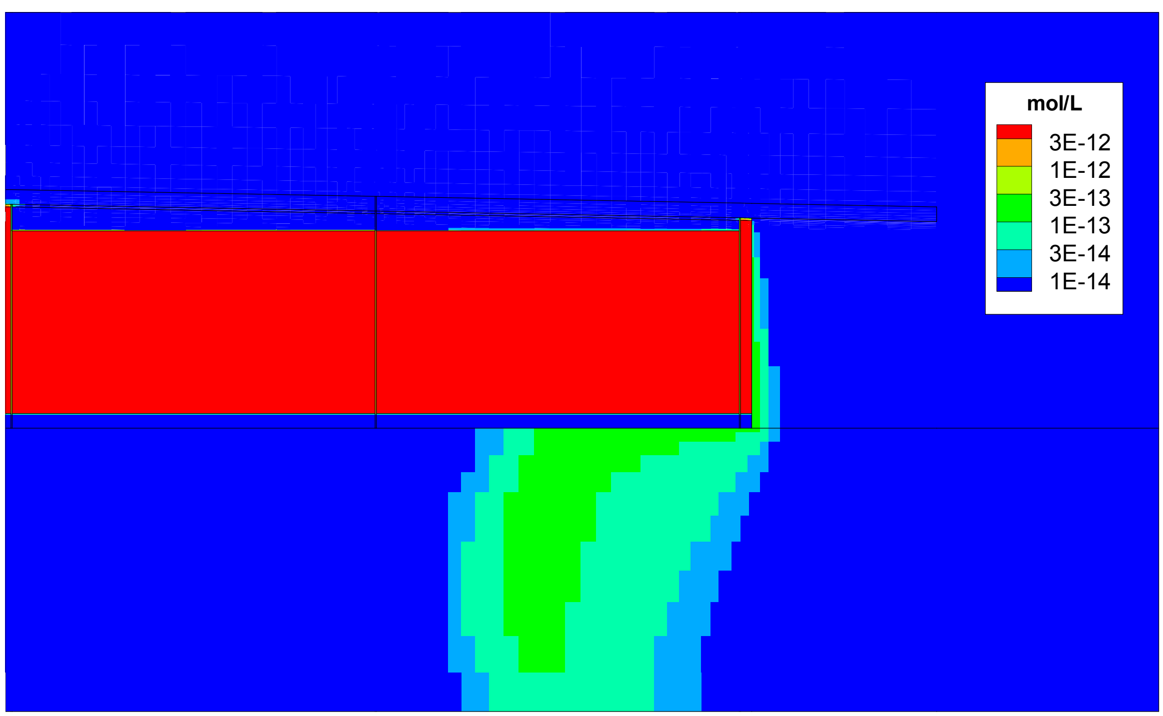


Figure 135. Tc-99 concentration at 1000 yrs for Vault 4 and Case A.

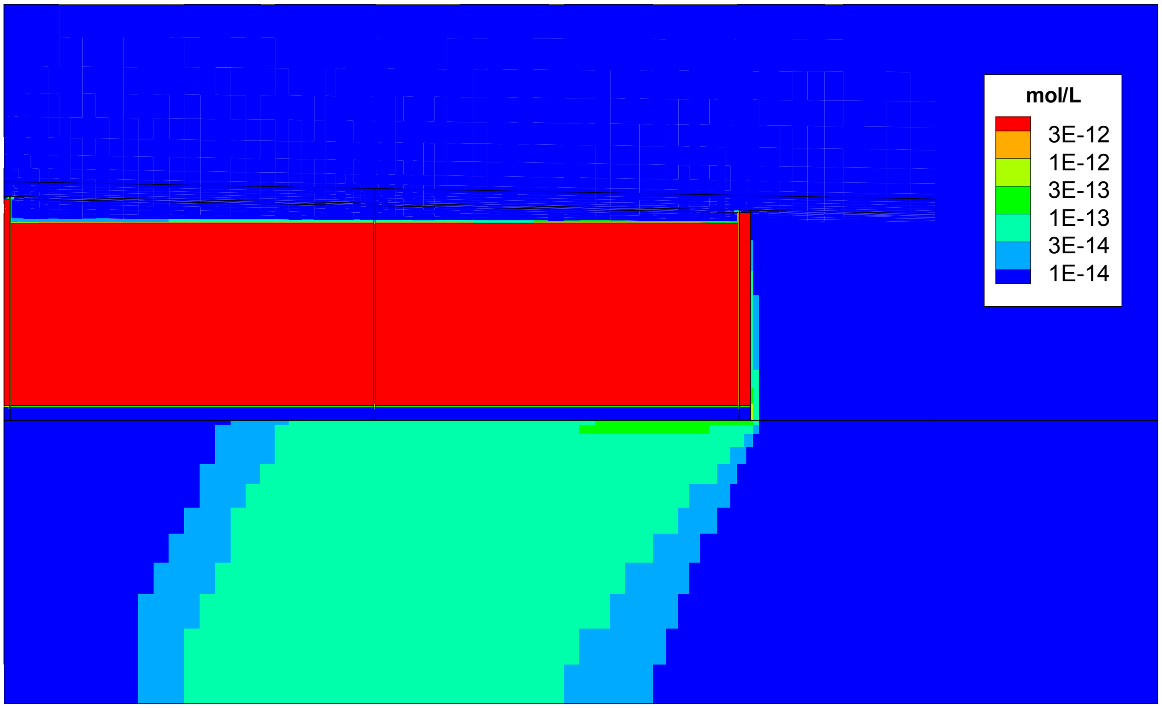


Figure 136. Tc-99 concentration at 3000 yrs for Vault 4 and Case A.

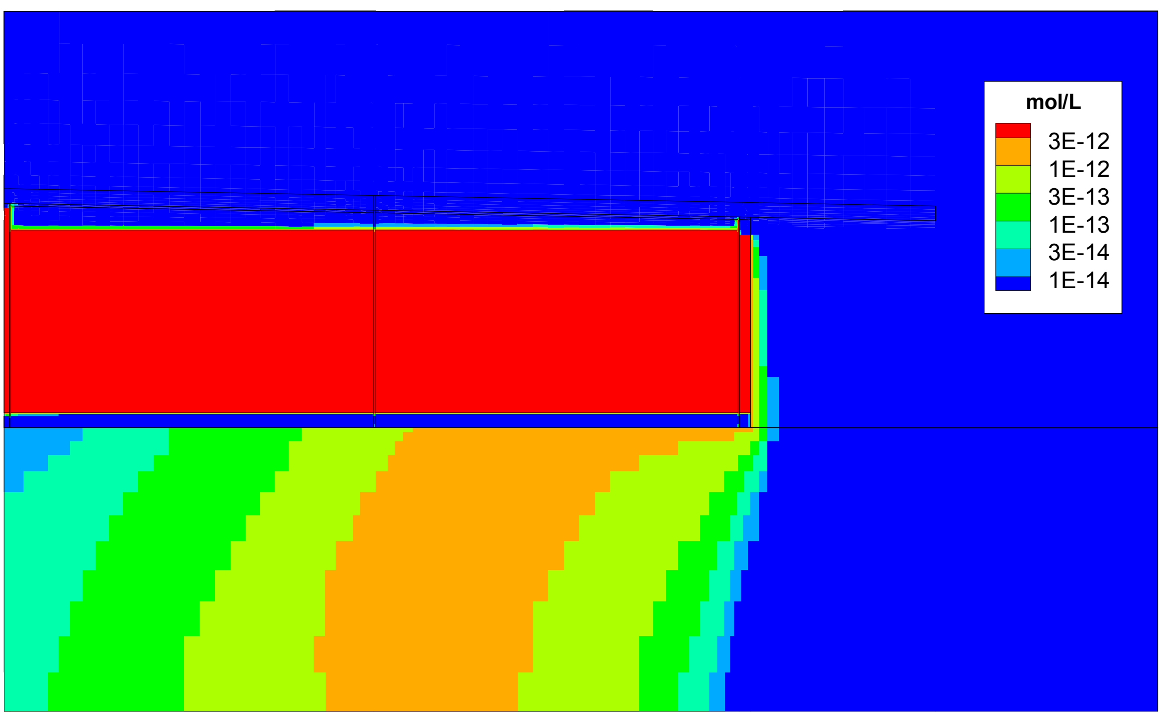


Figure 137. Tc-99 concentration at 10000 yrs for Vault 4 and Case A.

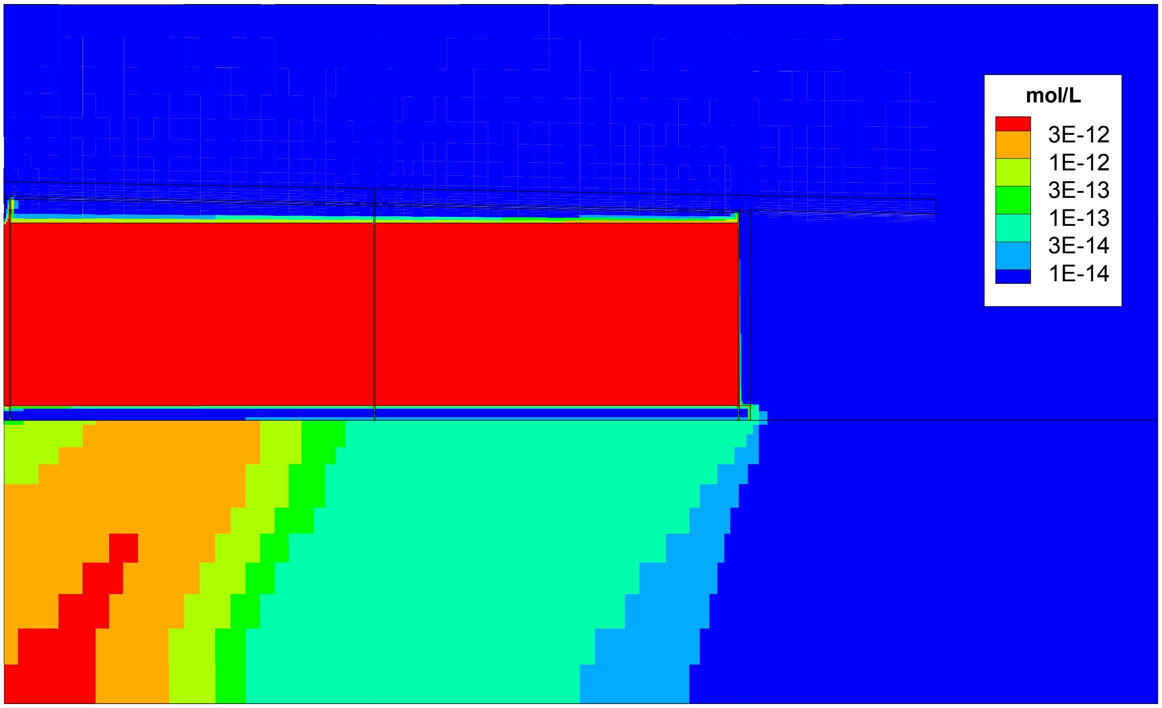


Figure 138. Tc-99 concentration at 20000 yrs for Vault 4 and Case A.

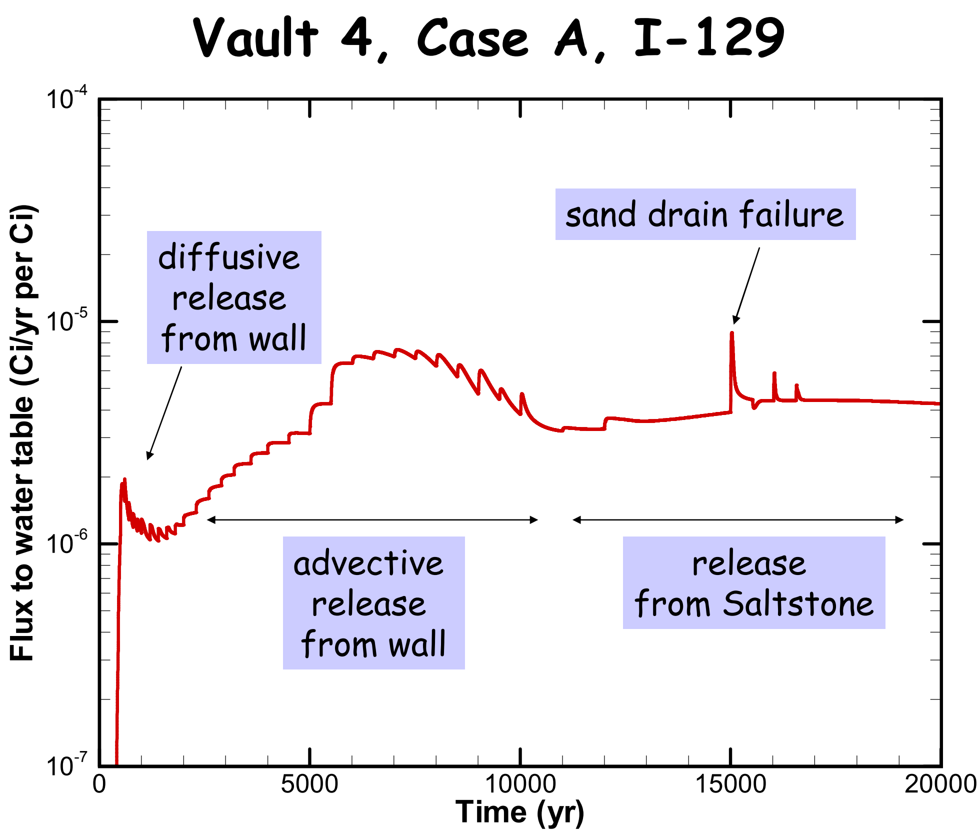


Figure 139. I-129 flux for Vault 4 and Case A with annotations.

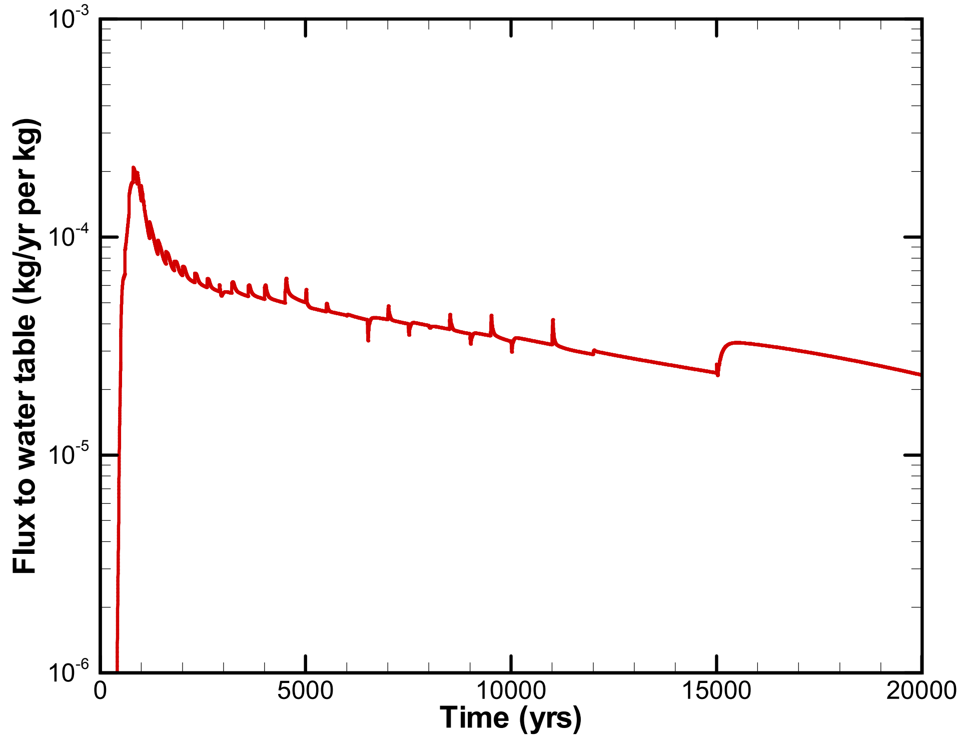


Figure 140. Nitrate flux to water table for Vault 1 and Case C.

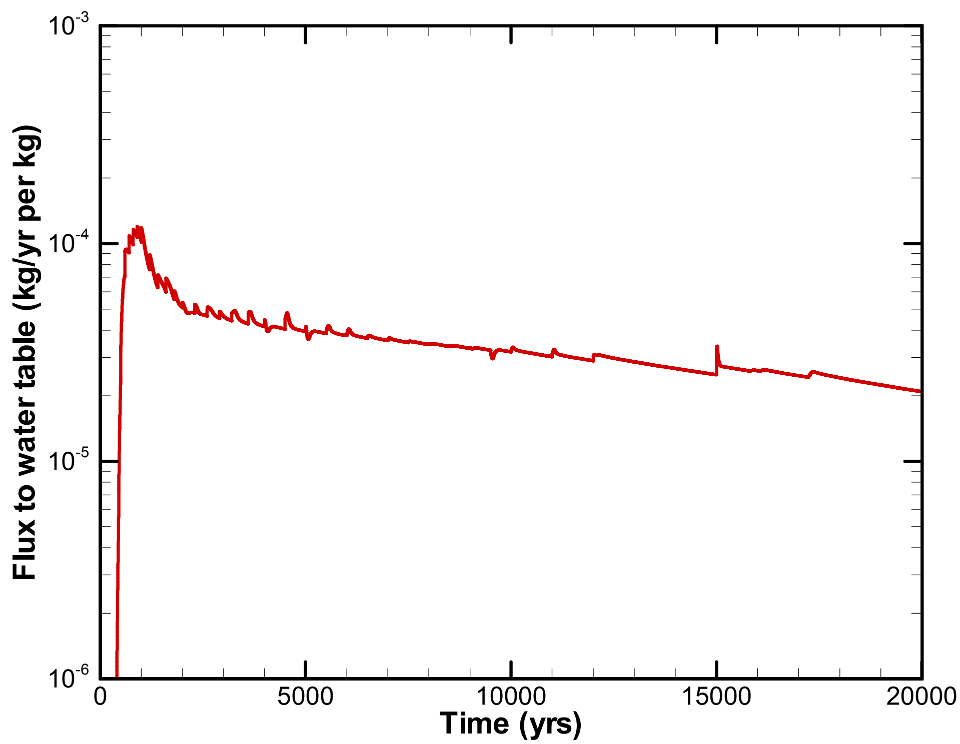


Figure 141. Nitrate flux to water table for Vault 2 and Case C.

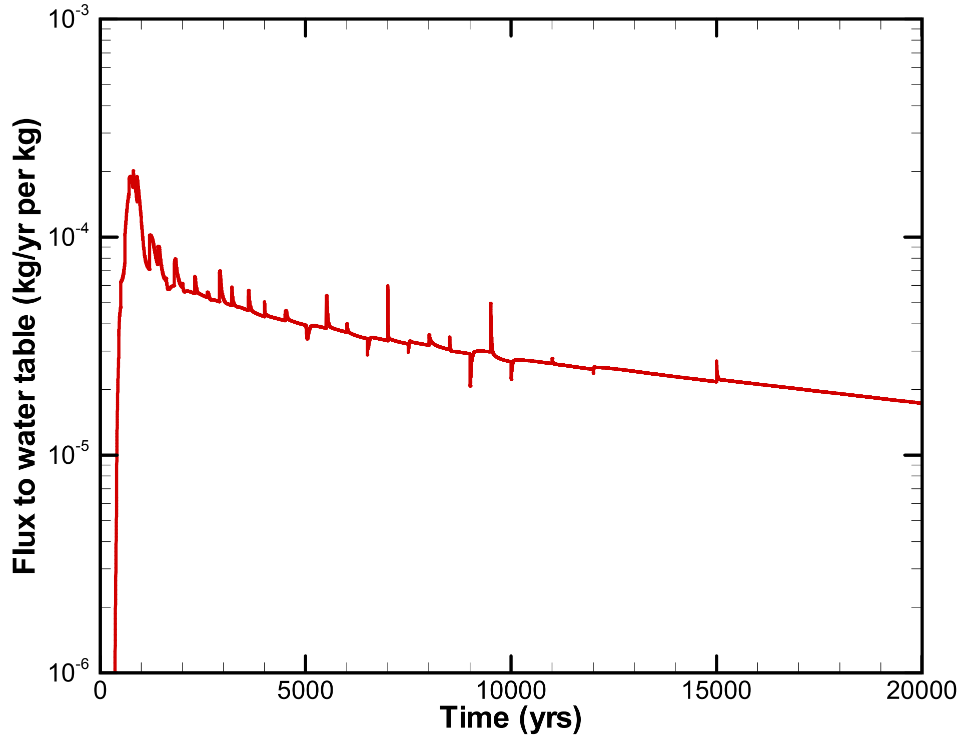


Figure 142. Nitrate flux to water table for Vault 4 and Case C.

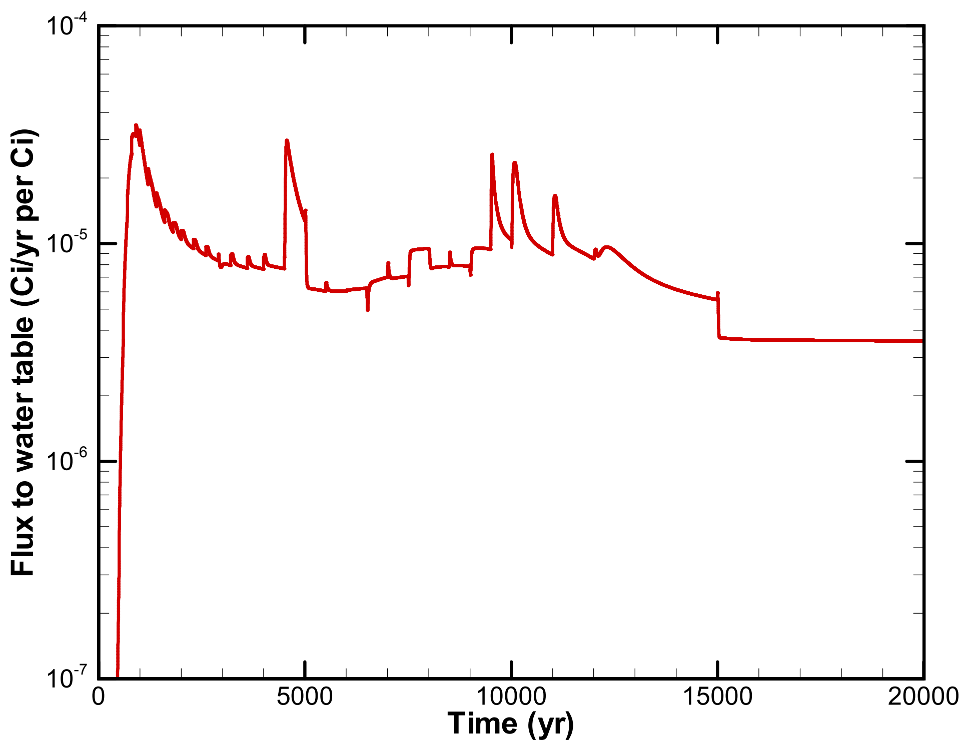


Figure 143. I-129 flux to water table for Vault 1 and Case C.

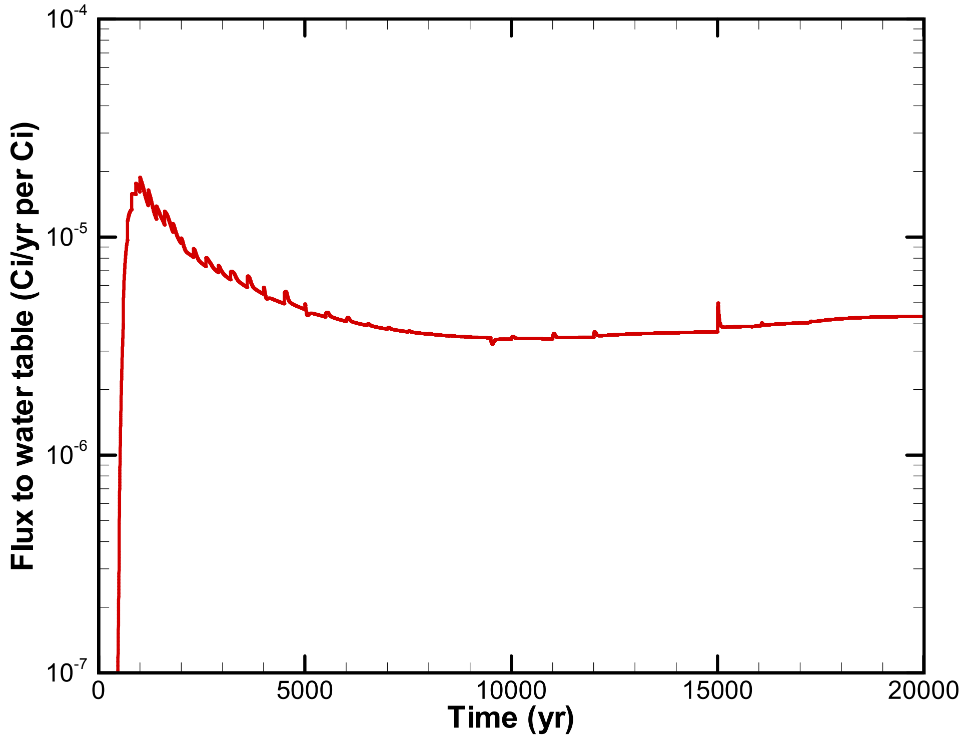


Figure 144. I-129 flux to water table for Vault 2 and Case C.

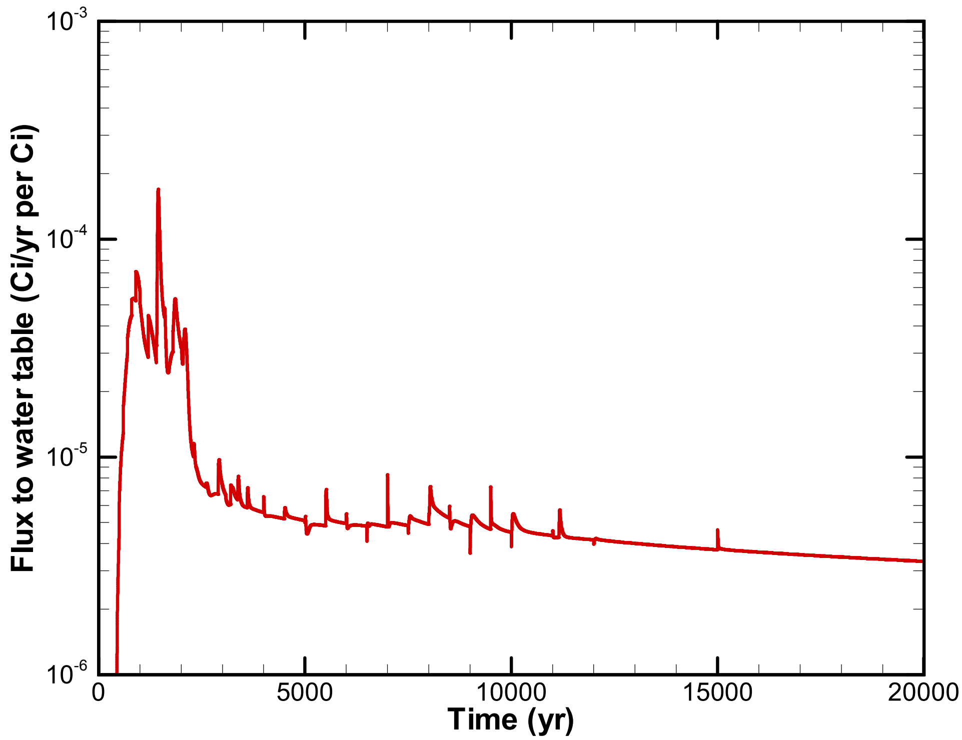


Figure 145. I-129 flux to water table for Vault 4 and Case C.

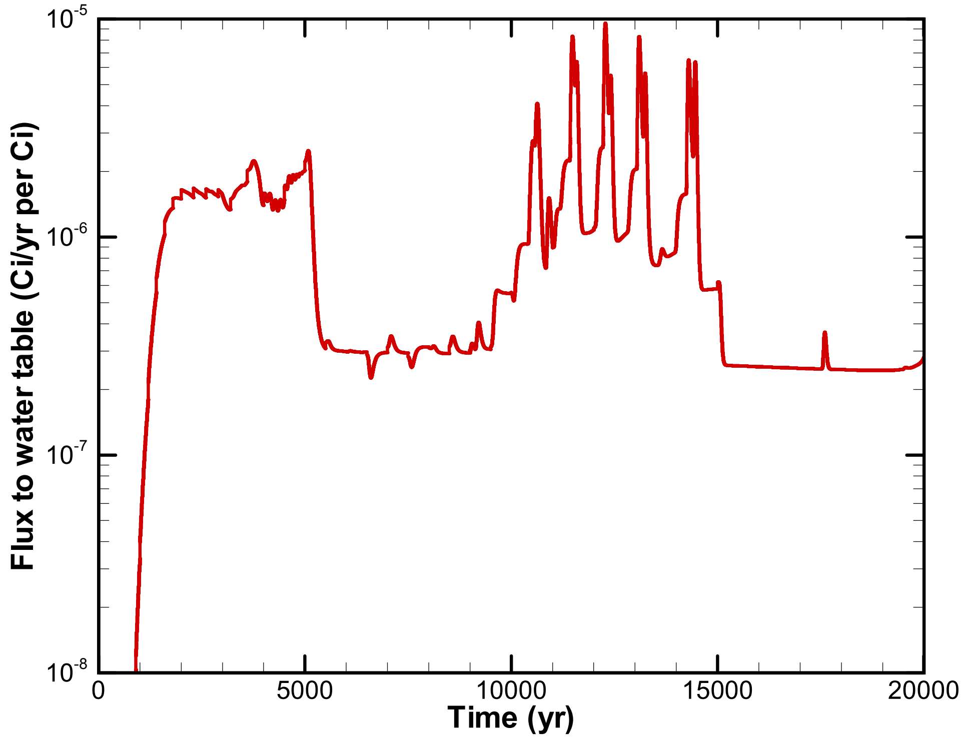


Figure 146. Tc-99 flux to water table for Vault 1 and Case C.

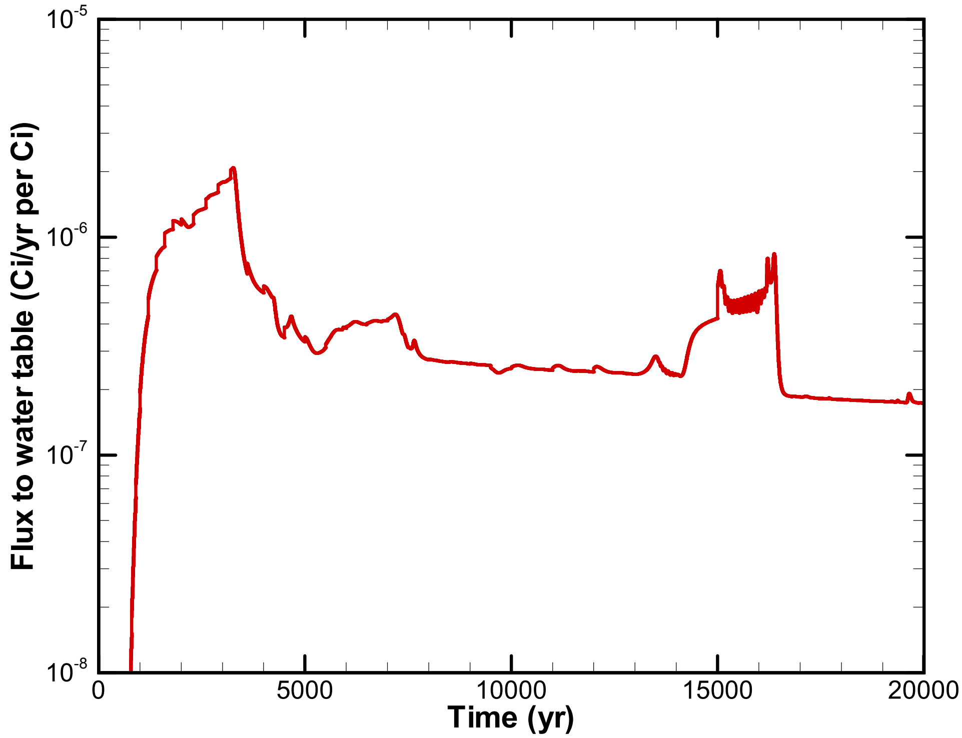


Figure 147. Tc-99 flux to water table for Vault 2 and Case C.

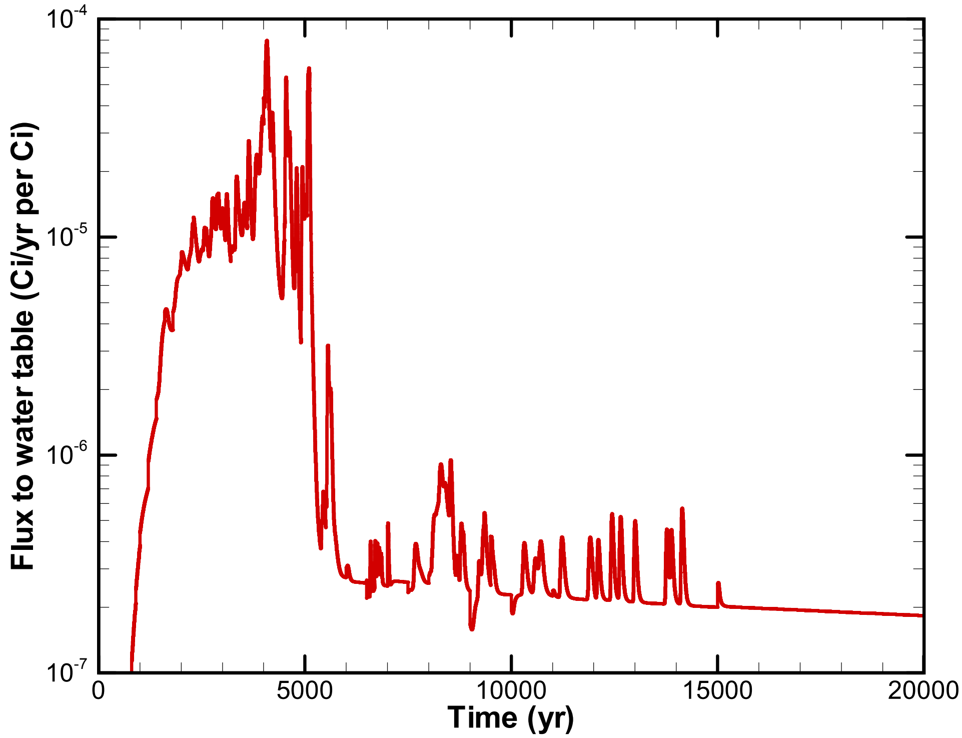


Figure 148. Tc-99 flux to water table for Vault 4 and Case C.

5.3 AQUIFER FLOW PARTICLE TRACKING

Streamtraces from the SDF vaults and disposal cells are shown in Figure 149 through Figure 151. Five year time markers (blue dots) indicate travel times in the saturated zone between vault sources and the 100m perimeter ranging from under 10 years to several decades depending on location within the SDF.

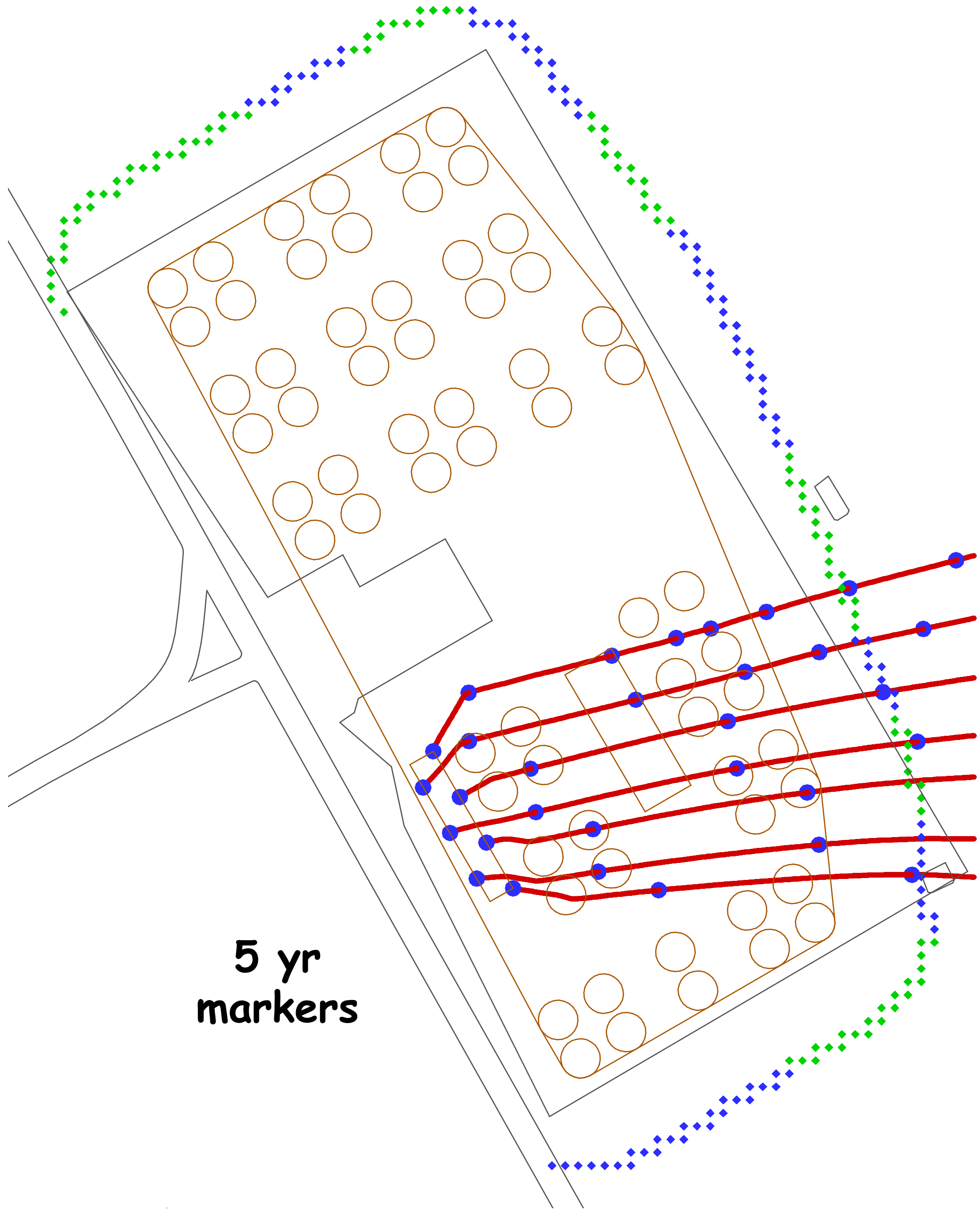


Figure 149. Simulated groundwater pathline emanating from Vault 1 with 5 year time markers.

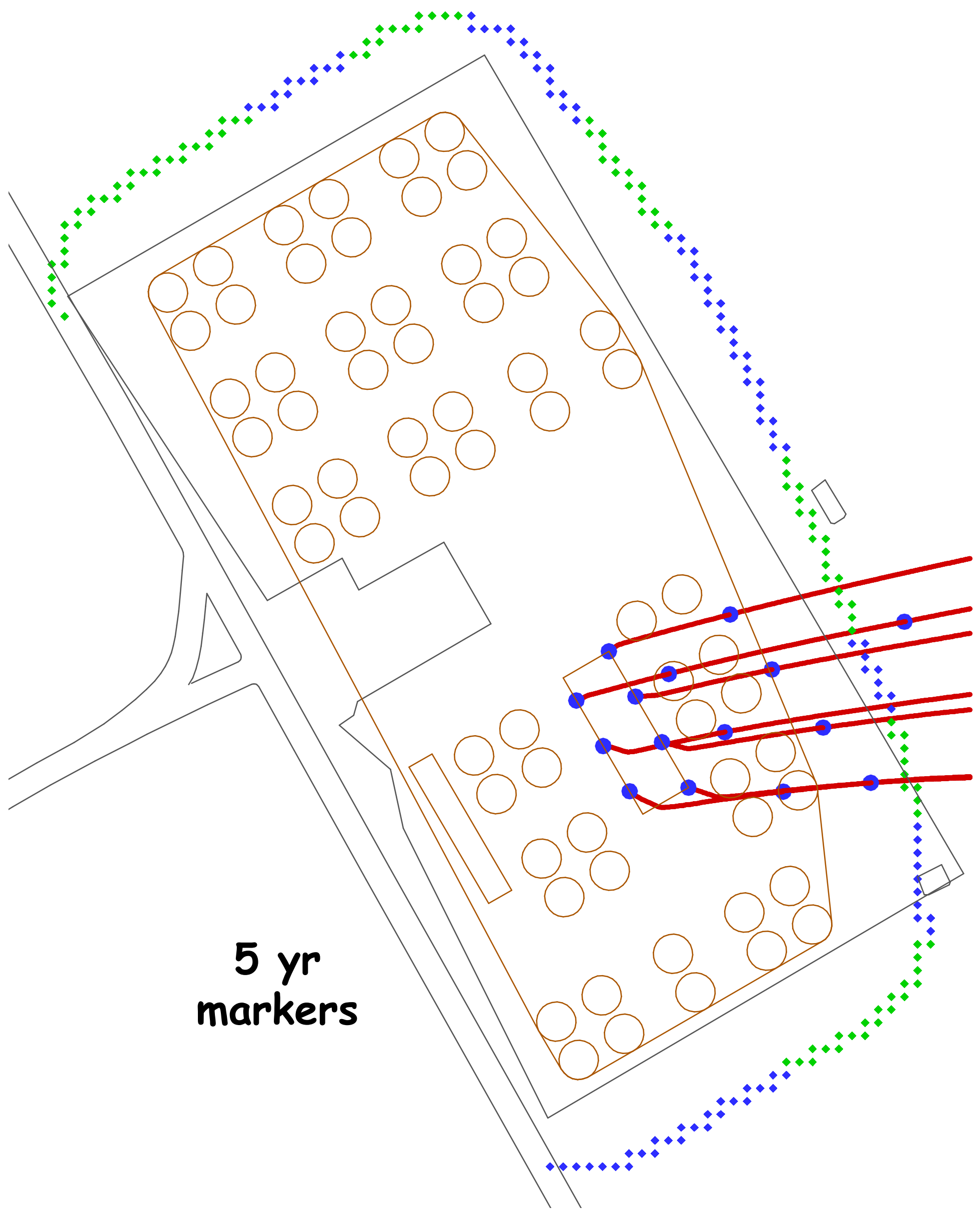


Figure 150. Simulated groundwater pathline emanating from Vault 4 with 5 year time markers.

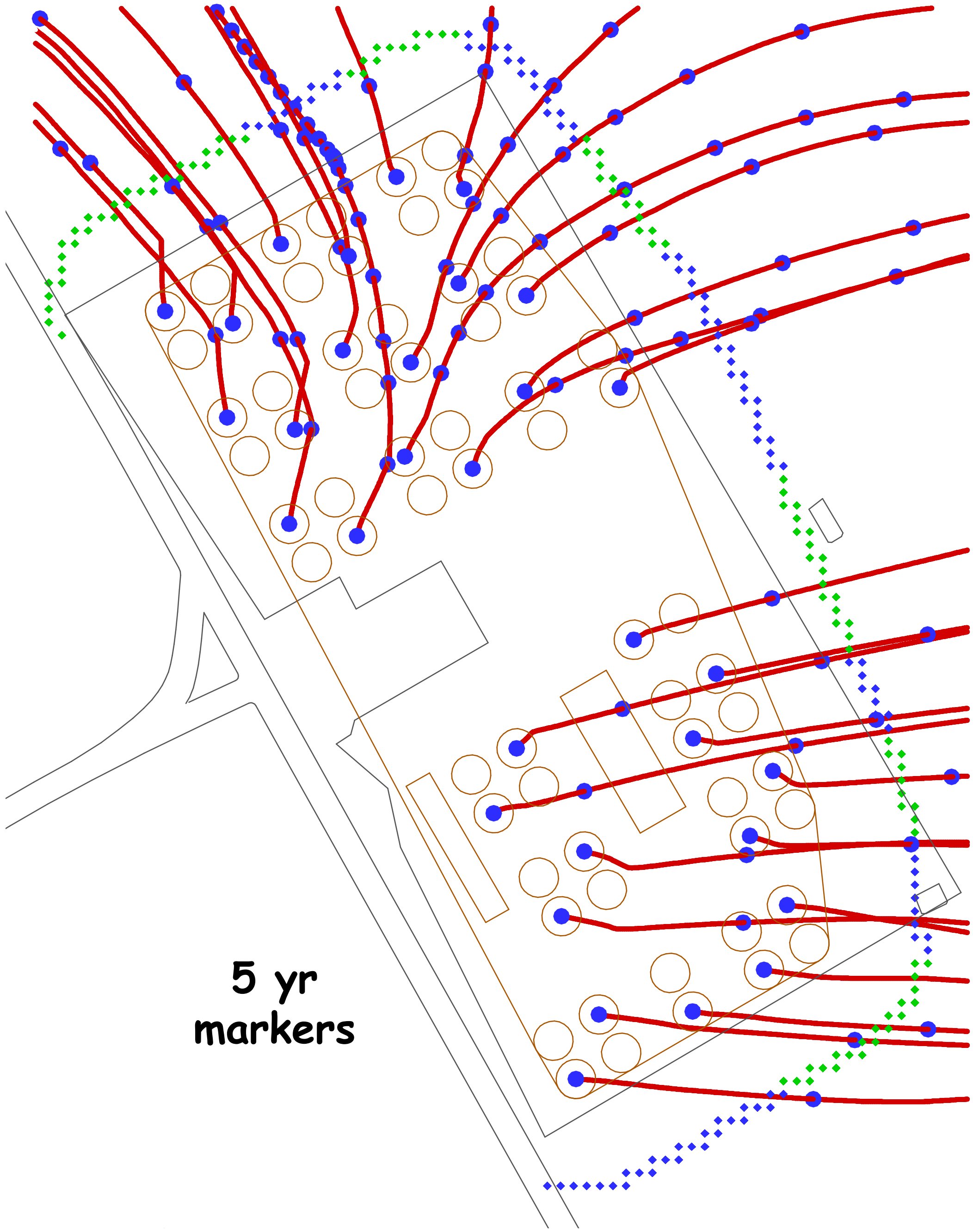


Figure 151. Simulated groundwater pathline emanating from Vault 2 disposal cells with 5 year time markers.

5.4 AQUIFER TRANSPORT

Figure 152 through Figure 157 show peak concentration at 100 meters through time and a plume snapshot at 20000 years for Case A when all vaults are active sources. Through 10000 years Vault 4 is the largest contributor to the peak Tc-99 concentration, while Vault 2 drives the I-129 and Nitrate peaks.

Concetration plots at 100 meters through time for each of the species that were modeled are presented in Appendix H.

The peak concentrations for several key nuclides for Case A and diagnostic CaseC are presented in Table 47 and Table 48, for time periods of 10000 and 20000 years, respectively. The key nuclides were determined to be the main contributors for dose for Case A, and include Nitrate, I-129, and Tc-99. The fraction is the fraction of the MCL, as discussed in Section 3.2, for each nuclide in the chain. The sum of fractions for each parent is used to assess the cumulative impact.

Table 47 Sum-of-fractions for key species and Cases A and C for 10000 years

Case	Vault	Parent	Chain	Peak (yr)	Conc (pCi|ug/L)	Fraction
CaseA	All	N	N	4040	1.16E+03	0.12
CaseA	All	N	SOF			0.12
CaseA	All	I-129	I-129	10000	2.87E-01	0.29
CaseA	All	I-129	SOF			0.29
CaseA	All	Np-237	Np-237	10000	1.54E-03	1.03E-04
CaseA	All	Np-237	U-233	10000	1.11E-07	7.42E-09
CaseA	All	Np-237	Th-229	10000	2.94E-09	1.96E-10
CaseA	All	Np-237	SOF			1.03E-04
CaseA	All	Tc-99	Tc-99	9820	1.58E+01	1.75E-02
CaseA	All	Tc-99	SOF			1.75E-02
CaseA	All	Pu-238	Pu-238	5500	1.48E-38	9.89E-40
CaseA	All	Pu-238	U-234	10000	1.21E-07	8.03E-09
CaseA	All	Pu-238	Th-230	10000	1.65E-10	1.10E-11
CaseA	All	Pu-238	Ra-226	10000	4.59E-02	3.06E-03
CaseA	All	Pu-238	Pb-210	10000	1.20E-04	7.99E-06
CaseA	All	Pu-238	SOF			3.07E-03
CaseA	All	Th-230	Th-230	10000	7.33E-21	4.89E-22
CaseA	All	Th-230	Ra-226	9920	1.47E+00	0.10
CaseA	All	Th-230	Pb-210	9960	3.86E-03	2.57E-04
CaseA	All	Th-230	SOF			0.10
CaseA	All	U-234	U-234	10000	9.85E-07	6.56E-08
CaseA	All	U-234	Th-230	10000	1.35E-09	8.99E-11
CaseA	All	U-234	Ra-226	10000	3.73E-01	2.48E-02
CaseA	All	U-234	Pb-210	10000	9.73E-04	6.48E-05
CaseA	All	U-234	SOF			2.49E-02
CaseA	All	U-235	U-235	10000	1.85E-08	1.23E-09
CaseA	All	U-235	Pa-231	10000	2.32E-04	1.54E-05
CaseA	All	U-235	Ac-227	10000	1.73E-07	1.15E-08
CaseA	All	U-235	SOF			1.55E-05
CaseC	All	N	N	820	4.27E+03	0.43
CaseC	All	N	SOF			0.43
CaseC	All	I-129	I-129	1040	2.79E+00	2.79
CaseC	All	I-129	SOF			2.79
CaseC	All	Np-237	Np-237	4420	4.08E-01	2.72E-02

Case	Vault	Parent	Chain	Peak (yr)	Conc (pCi|ug/L)	Fraction
CaseC	All	Np-237	U-233	10000	7.93E-05	5.29E-06
CaseC	All	Np-237	Th-229	10000	3.07E-06	2.05E-07
CaseC	All	Np-237	SOF			2.72E-02
CaseC	All	Tc-99	Tc-99	4120	8.57E+02	0.95
CaseC	All	Tc-99	SOF			0.95
CaseC	All	Pu-238	Pu-238	4220	9.66E-28	6.44E-29
CaseC	All	Pu-238	U-234	10000	4.66E-04	3.11E-05
CaseC	All	Pu-238	Th-230	10000	6.31E-07	4.21E-08
CaseC	All	Pu-238	Ra-226	10000	1.76E-01	1.17E-02
CaseC	All	Pu-238	Pb-210	10000	4.58E-04	3.05E-05
CaseC	All	Pu-238	SOF			1.18E-02
CaseC	All	Th-230	Th-230	10000	1.43E-14	9.52E-16
CaseC	All	Th-230	Ra-226	7360	5.68E+00	0.38
CaseC	All	Th-230	Pb-210	7400	1.47E-02	9.81E-04
CaseC	All	Th-230	SOF			0.38
CaseC	All	U-234	U-234	10000	3.72E-03	2.48E-04
CaseC	All	U-234	Th-230	10000	5.03E-06	3.36E-07
CaseC	All	U-234	Ra-226	9980	1.40E+00	9.30E-02
CaseC	All	U-234	Pb-210	10000	3.64E-03	2.43E-04
CaseC	All	U-234	SOF			9.35E-02
CaseC	All	U-235	U-235	10000	6.98E-05	4.65E-06
CaseC	All	U-235	Pa-231	4580	3.38E-02	2.25E-03
CaseC	All	U-235	Ac-227	4620	2.55E-05	1.70E-06
CaseC	All	U-235	SOF			2.26E-03

Table 48. Sum-of-fractions for key species and Cases A and C for 20000 years.

Case	Vault	Parent	Chain	Peak (yr)	Conc (pCi|ug/L)	Fraction
CaseA	All	N	N	15040	1.33E+03	0.13
CaseA	All	N	SOF			0.13
CaseA	All	I-129	I-129	15080	9.51E+00	9.51
CaseA	All	I-129	SOF			9.51
CaseA	All	Np-237	Np-237	16500	1.99E-01	1.33E-02
CaseA	All	Np-237	U-233	20000	3.07E-05	2.05E-06
CaseA	All	Np-237	Th-229	20000	7.26E-07	4.84E-08
CaseA	All	Np-237	SOF			1.33E-02
CaseA	All	Tc-99	Tc-99	16240	6.87E+02	0.76
CaseA	All	Tc-99	SOF			0.76
CaseA	All	Pu-238	Pu-238	5500	1.48E-38	9.89E-40
CaseA	All	Pu-238	U-234	20000	2.58E-04	1.72E-05
CaseA	All	Pu-238	Th-230	20000	1.26E-06	8.40E-08
CaseA	All	Pu-238	Ra-226	20000	1.25E-01	8.33E-03
CaseA	All	Pu-238	Pb-210	20000	3.27E-04	2.18E-05
CaseA	All	Pu-238	SOF			8.37E-03
CaseA	All	Th-230	Th-230	20000	5.36E-12	3.58E-13

Case	Vault	Parent	Chain	Peak (yr)	Conc (pCi|ug/L)	Fraction
CaseA	All	Th-230	Ra-226	15620	2.15E+00	0.14
CaseA	All	Th-230	Pb-210	15660	5.62E-03	3.75E-04
CaseA	All	Th-230	SOF			0.14
CaseA	All	U-234	U-234	20000	2.06E-03	1.38E-04
CaseA	All	U-234	Th-230	20000	1.01E-05	6.74E-07
CaseA	All	U-234	Ra-226	20000	9.71E-01	6.47E-02
CaseA	All	U-234	Pb-210	20000	2.54E-03	1.69E-04
CaseA	All	U-234	SOF			6.50E-02
CaseA	All	U-235	U-235	20000	3.98E-05	2.65E-06
CaseA	All	U-235	Pa-231	16540	5.03E-02	3.35E-03
CaseA	All	U-235	Ac-227	16580	3.83E-05	2.56E-06
CaseA	All	U-235	SOF			3.36E-03
CaseC	All	N	N	820	4.27E+03	0.43
CaseC	All	N	SOF			0.43
CaseC	All	I-129	I-129	1040	2.79E+00	2.79
CaseC	All	I-129	SOF			2.79
CaseC	All	Np-237	Np-237	4420	4.08E-01	2.72E-02
CaseC	All	Np-237	U-233	20000	4.67E-04	3.12E-05
CaseC	All	Np-237	Th-229	20000	3.91E-05	2.61E-06
CaseC	All	Np-237	SOF			2.72E-02
CaseC	All	Tc-99	Tc-99	4120	8.57E+02	0.95
CaseC	All	Tc-99	SOF			0.95
CaseC	All	Pu-238	Pu-238	4220	9.66E-28	6.44E-29
CaseC	All	Pu-238	U-234	20000	1.30E-01	8.69E-03
CaseC	All	Pu-238	Th-230	20000	1.38E-03	9.22E-05
CaseC	All	Pu-238	Ra-226	20000	3.33E-01	2.22E-02
CaseC	All	Pu-238	Pb-210	20000	8.72E-04	5.81E-05
CaseC	All	Pu-238	SOF			3.11E-02
CaseC	All	Th-230	Th-230	20000	6.41E-08	4.28E-09
CaseC	All	Th-230	Ra-226	7360	5.68E+00	0.38
CaseC	All	Th-230	Pb-210	7400	1.47E-02	9.81E-04
CaseC	All	Th-230	SOF			0.38
CaseC	All	U-234	U-234	20000	1.04E+00	6.93E-02
CaseC	All	U-234	Th-230	20000	1.10E-02	7.36E-04
CaseC	All	U-234	Ra-226	20000	2.60E+00	0.17
CaseC	All	U-234	Pb-210	20000	6.79E-03	4.53E-04
CaseC	All	U-234	SOF			0.24
CaseC	All	U-235	U-235	20000	2.01E-02	1.34E-03
CaseC	All	U-235	Pa-231	4580	3.38E-02	2.25E-03
CaseC	All	U-235	Ac-227	4620	2.55E-05	1.70E-06
CaseC	All	U-235	SOF			3.59E-03

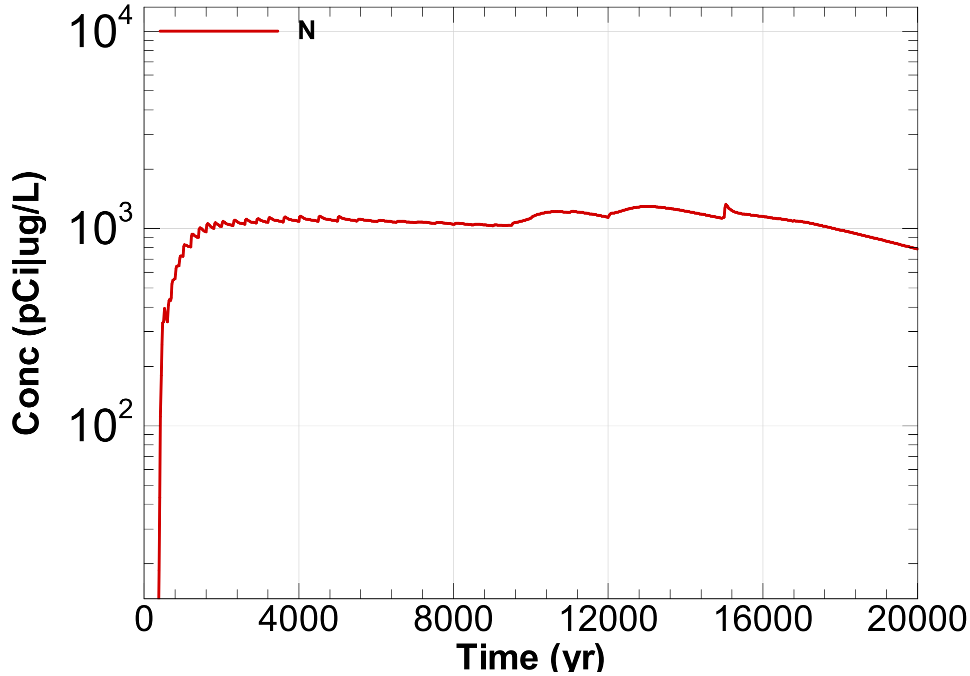


Figure 152. Peak Nitrate concentration at 100 meters for all sources and Case A.

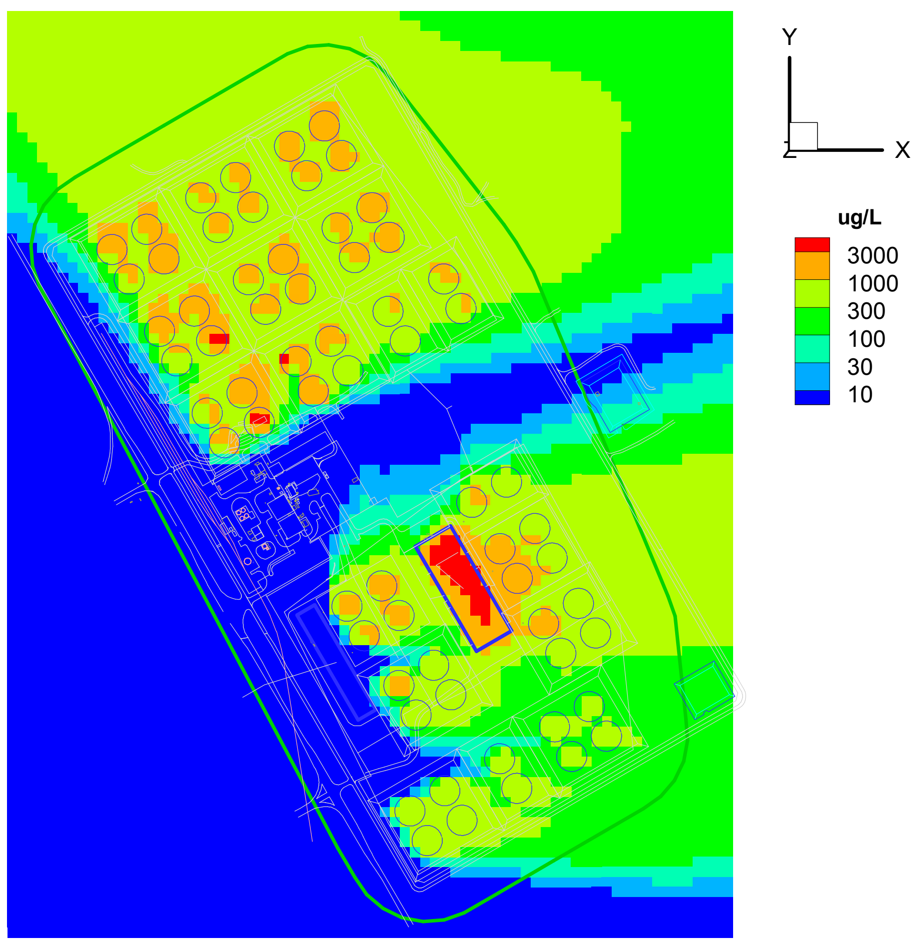


Figure 153. Nitrate concentration at 20000 yrs for all sources and Case A.

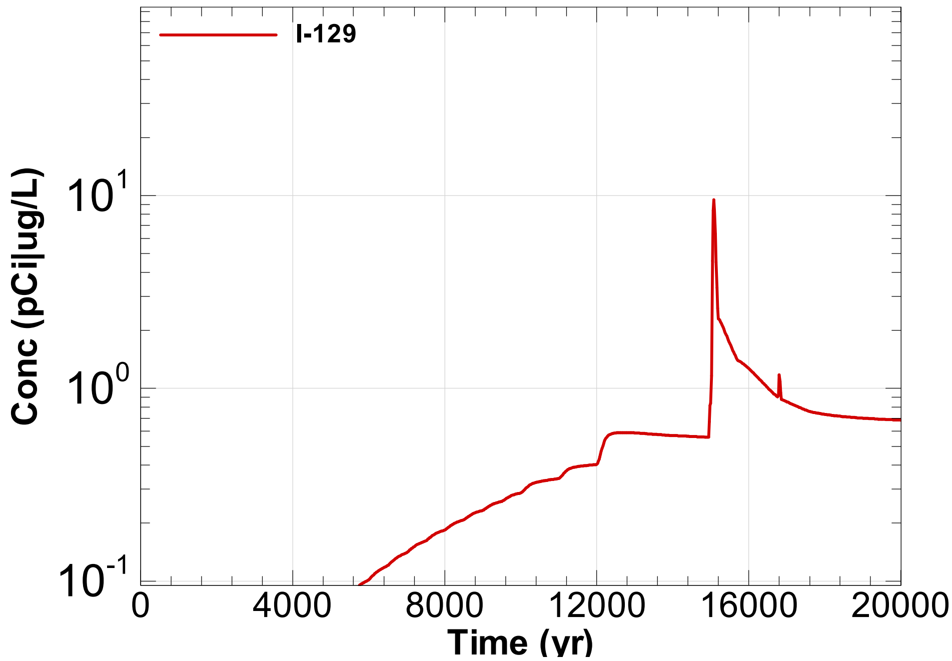


Figure 154. Peak I-129 concentration at 100 meters for all sources and Case A.

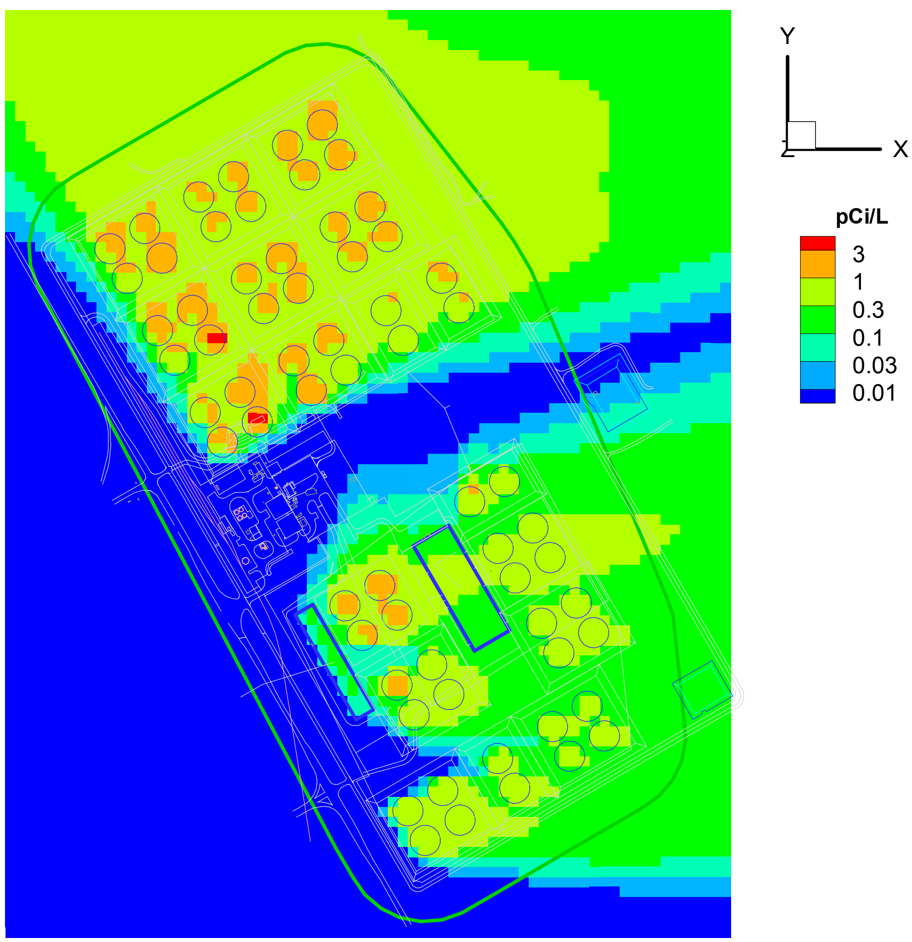


Figure 155. I-129 concentration at 20000 yrs for all sources and Case A.

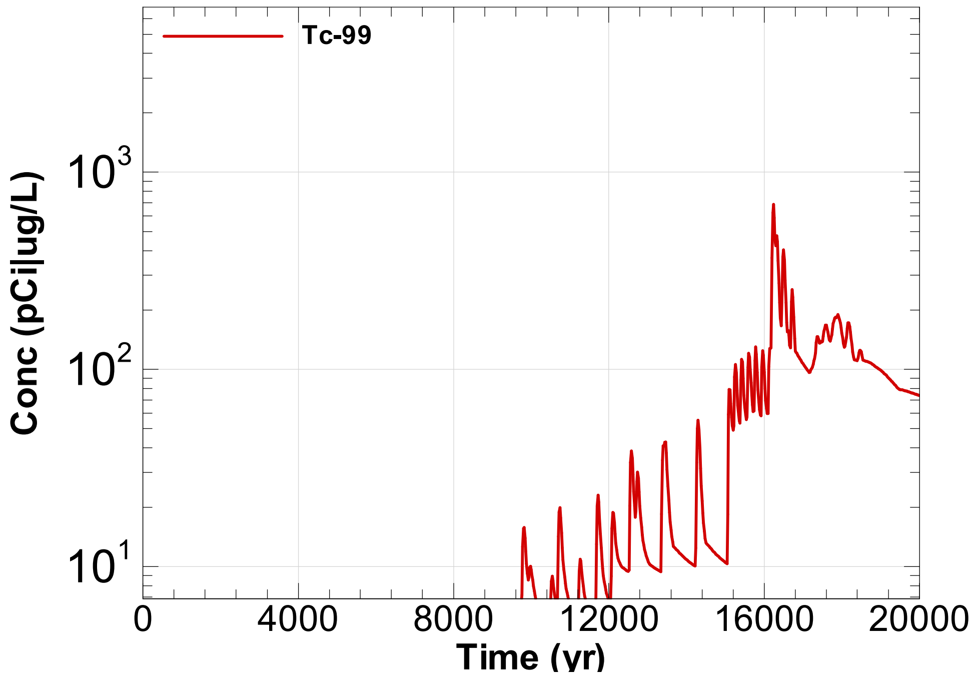


Figure 156. Peak Tc-99 concentration at 100 meters for all sources and Case A.

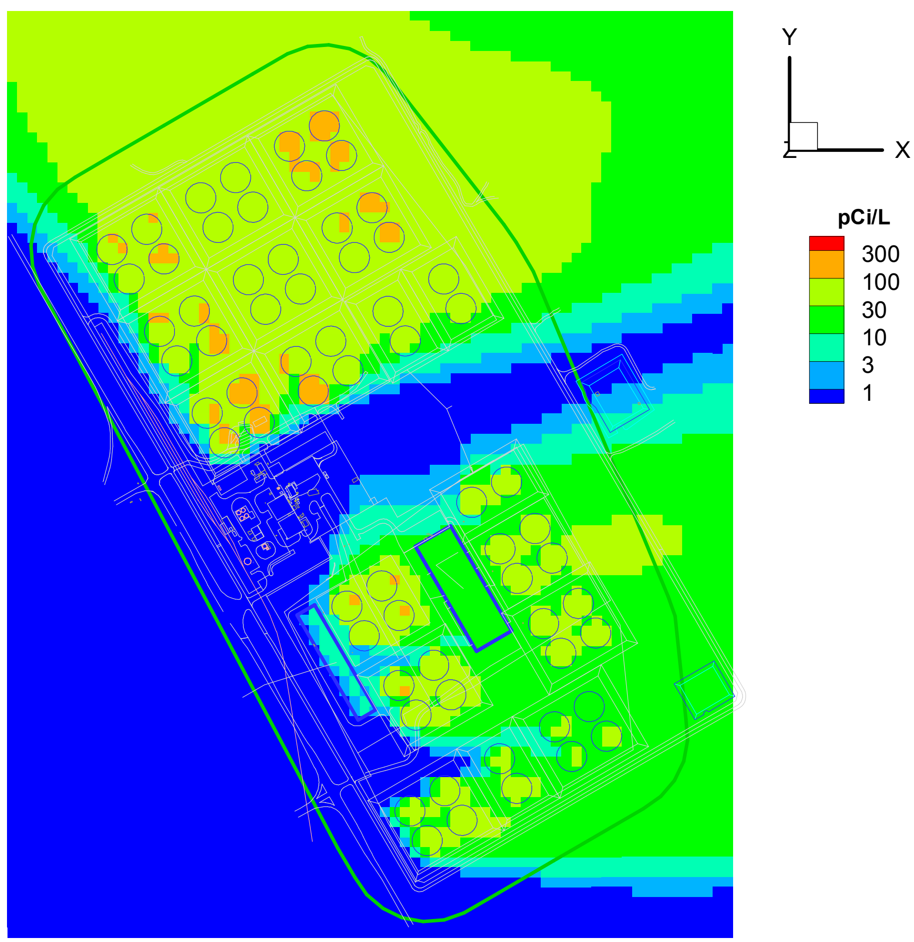


Figure 157. Tc-99 concentration at 20000 yrs for all sources and Case A.

6.0 SUMMARY

Immediately after closure of the Saltstone Disposal Facility, the newly installed cover system is expected to reduce infiltration to less than 0.01 in/yr, greatly retarding contaminant migration through the vadose zone. Similarly, the intact vault concrete and HDPE/GCL liners are predicted to form a highly competent barrier to contaminant release, such that diffusion controls leaching from Saltstone vaults. Corresponding PORFLOW simulations indicate very low contaminant releases early in the 10,000 year period of performance.

Over time, engineered materials and systems are expected to degrade. Engineering analyses described herein suggest that the cover system and HDPE/GCL liners will become significantly degraded within several hundred years, and essentially fully degraded after a few thousand years. The concrete barriers are predicted to degrade more slowly through sulfate attack lasting many thousands of years. The earliest failure is forecast at 10,000 years for the relatively thin Vault 4 roof. Chemical degradation from reducing moderate-aged concrete to oxidized and/or old-aged concrete is projected to occur well past the period of performance in general. Thus the overall vault containment system, although degraded, remains intact and effective through the period of performance. PORFLOW simulations indicate that peak contaminant levels for the baseline scenario will satisfy dose performance objectives of the Performance Assessment (PA) supported by this work.

Through 10,000 years Vault 4 is the largest contributor to the peak Tc-99 concentration, while Vault 2 future disposal cells drive the I-129 and Nitrate peaks. As a fraction of MCL, the peak 100 meter concentrations through 10,000 years in descending order are 0.29 for I-129, 0.12 for Nitrate, 0.10 for Ra-226 ingrowth from Th-230, 0.02 from Ra-226 ingrowth from U-234, and 0.02 for Tc-99. Other sensitivity cases were postulated for diagnostic purposes, to better understand the range of possible vault behavior. For the fast flow path Case C scenario, the peak fractions are 2.8 for I-129, 0.95 for Tc-99, 0.43 for Nitrate, and 0.38 from Ra-226 ingrowth from Th-230. Concentrations for some species peak after 10,000 years. Through 20,000 years, the Case A peak fractions are 9.5 for I-129, 0.76 for Tc-99, 0.14 for Ra-226 ingrowth from Th-230, and 0.13 for Nitrate. For the fast flow path Case C scenario, the peak fractions are 2.8 for I-129, 0.95 for Tc-99, 0.43 for Nitrate, and 0.38 from Ra-226 ingrowth from Th-230 through 20,000 years.

The present effort embodies a number of modeling advances in comparison to prior Special Analyses and Performance Assessment for the SDF. Degradation from sulfate attack is based on STADIUM simulations of the coupled transport and chemistry processes associated with ettringite formation in concrete. Although lacking explicit simulation of damage mechanics, STADIUM nonetheless represents the state-of-the-art in first-principles sulfate attack modeling. PORFLOW simulations for Tc-99 couple transport properties to local reduction capacity, which is depleted through exposure to dissolved oxygen. This approach represents an advance over earlier Saltstone modeling efforts that used spatial average reduction capacity to control Tc-99 release. The present simulations also incorporate the effects of cracking on cementitious material properties. The baseline scenario assumes cracks in the Vaults 1 and 4 walls, and Case E assumes that Saltstone is cracked for diagnostic purposes.

Cracks are predicted to become active when capillary suctions are less than approximately 100 cm, conditions that occur after the cover system degrades.

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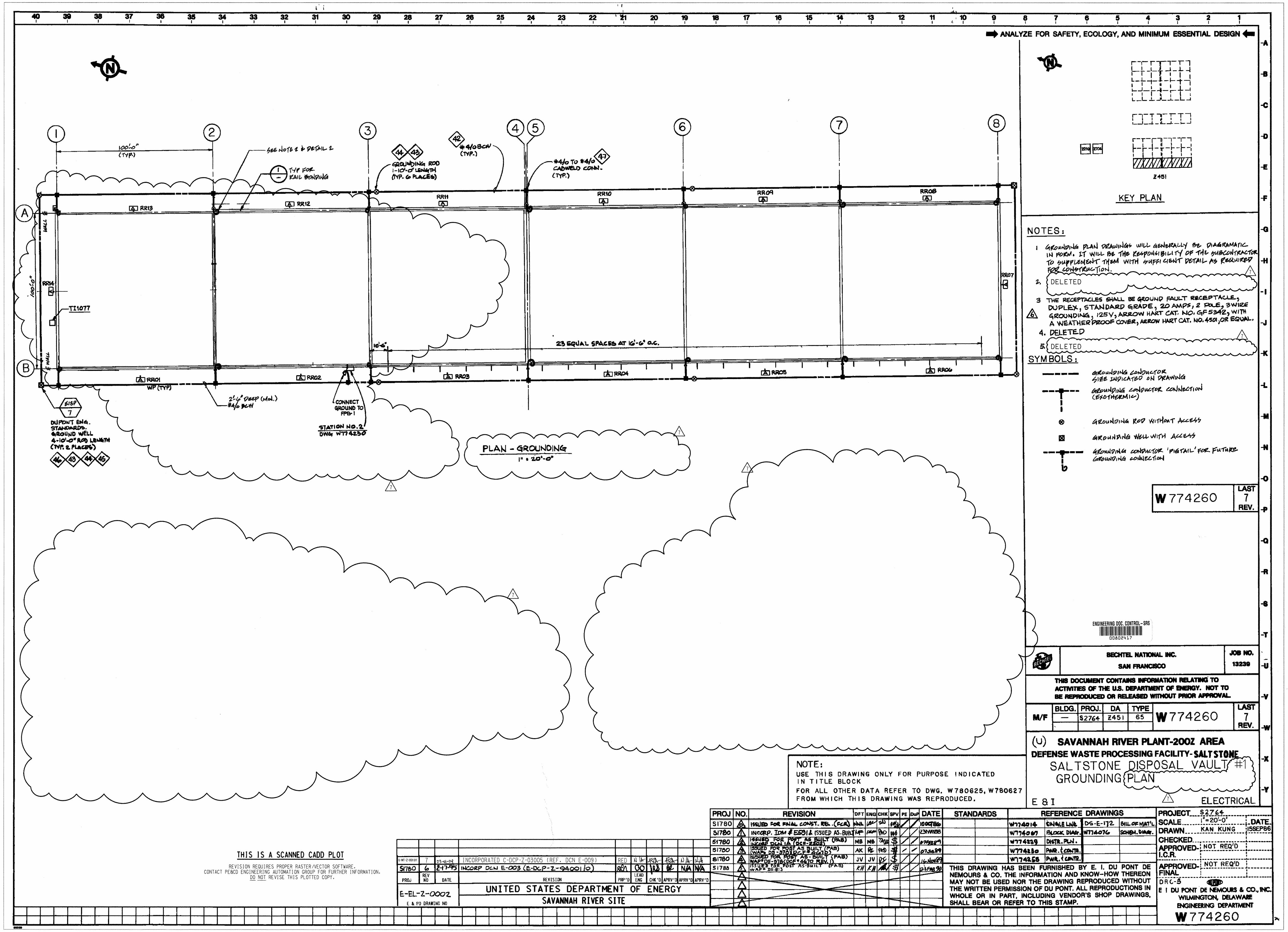
8.0 APPENDICES

Appendix A - Engineering Drawings


ANALYZE FOR SAFETY, ECOLOGY, AND MINIMUM ESSENTIAL DESIGN
KEY PLAN
NOTES:
1 GROUNDING PLAN DRAWINGS WILL GENERALLY BE DIAGRAMATIC IN FORM. IT WILL BE THE RESPONSIBILITY OF THE SUBCONTRACTOR TO SUPPLEMENT THEM WITH SUFFICIENT DETAIL AS REQUIRED FOR CONSTRUCTION.
2. DELETED
3 THE RECEPTACLES SHALL BE GROUND FAULT RECEPTACLE, DUPLEX, STANDARD GRADE, 20 AMPS, 2 POLE, 3 WIRE GROUNDING, 125V, ARROW HART CAT. NO. GF5342, WITH A WEATHERPROOF COVER, ARROW HART CAT. NO. 4501 OR EQUAL.
4. DELETED
5. DELETED
SYMBOLS:
GROUNDING CONDUCTOR SIZE INDICATED ON DRAWING
GROUNDING CONDUCTOR CONNECTION (EXOTHERMIC)
GROUNDING ROD WITHOUT ACCESS
GROUNDING WELL WITH ACCESS
GROUNDING CONDUCTOR 'PIGTAIL' FOR FUTURE GROUNDING CONNECTION
PLAN - GROUNDING
1" = 20'-0"
23 EQUAL SPACES AT 16'-6" O.C.
STATION NO. 2 DWG W774230
W774260
BECHTEL NATIONAL INC.
SAN FRANCISCO
JOB NO. 13239
THIS DOCUMENT CONTAINS INFORMATION RELATING TO ACTIVITIES OF THE U.S. DEPARTMENT OF ENERGY. NOT TO BE REPRODUCED OR RELEASED WITHOUT PRIOR APPROVAL.
(U) SAVANNAH RIVER PLANT-200Z AREA
DEFENSE WASTE PROCESSING FACILITY-SALTSTONE
SALTSTONE DISPOSAL VAULT #1
GROUNDING PLAN
ELECTRICAL
NOTE:
USE THIS DRAWING ONLY FOR PURPOSE INDICATED IN TITLE BLOCK
FOR ALL OTHER DATA REFER TO DWG. W780625, W780627 FROM WHICH THIS DRAWING WAS REPRODUCED.
THIS IS A SCANNED CADD PLOT
UNITED STATES DEPARTMENT OF ENERGY
SAVANNAH RIVER SITE
E-EL-Z-0002
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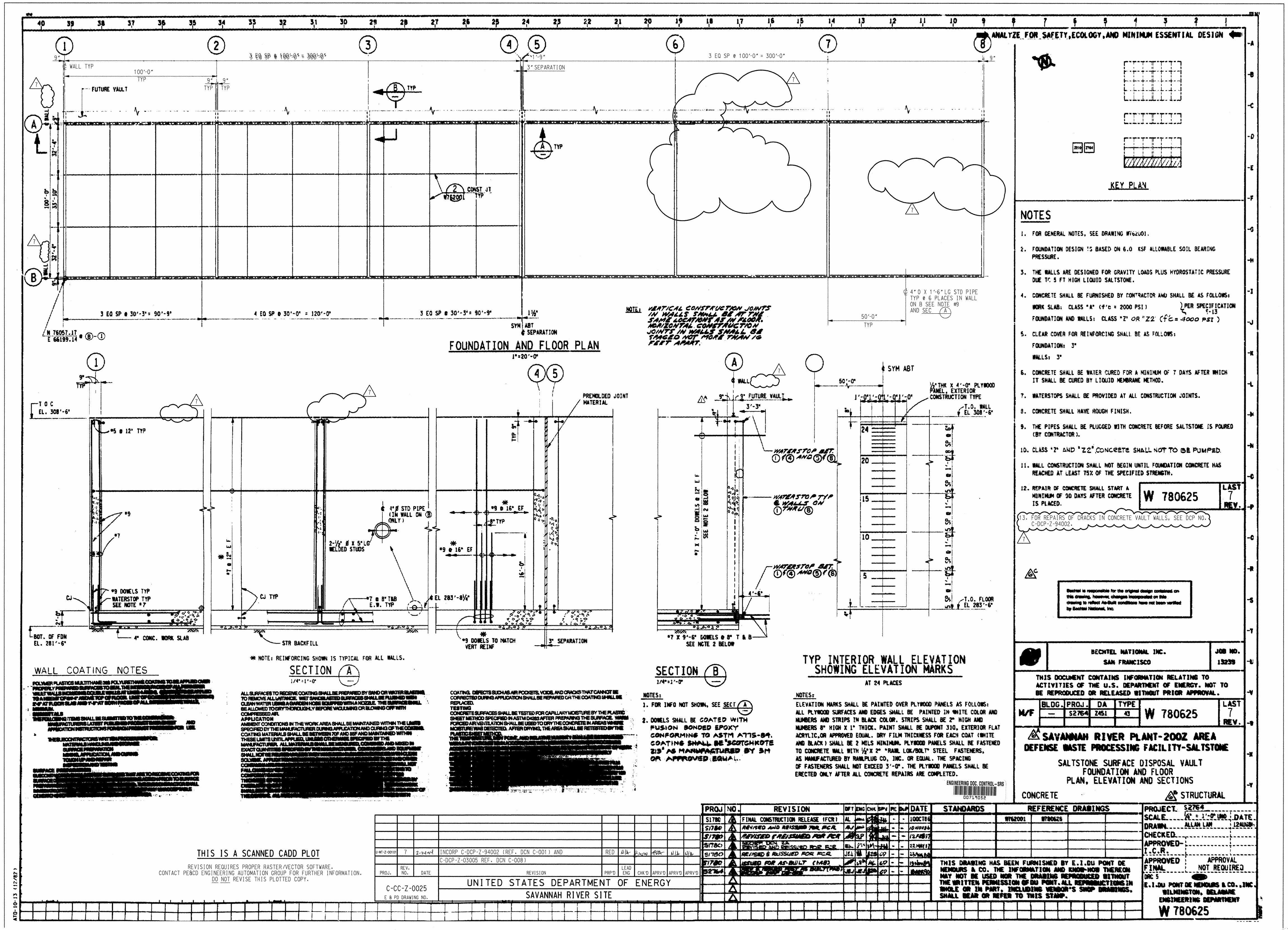
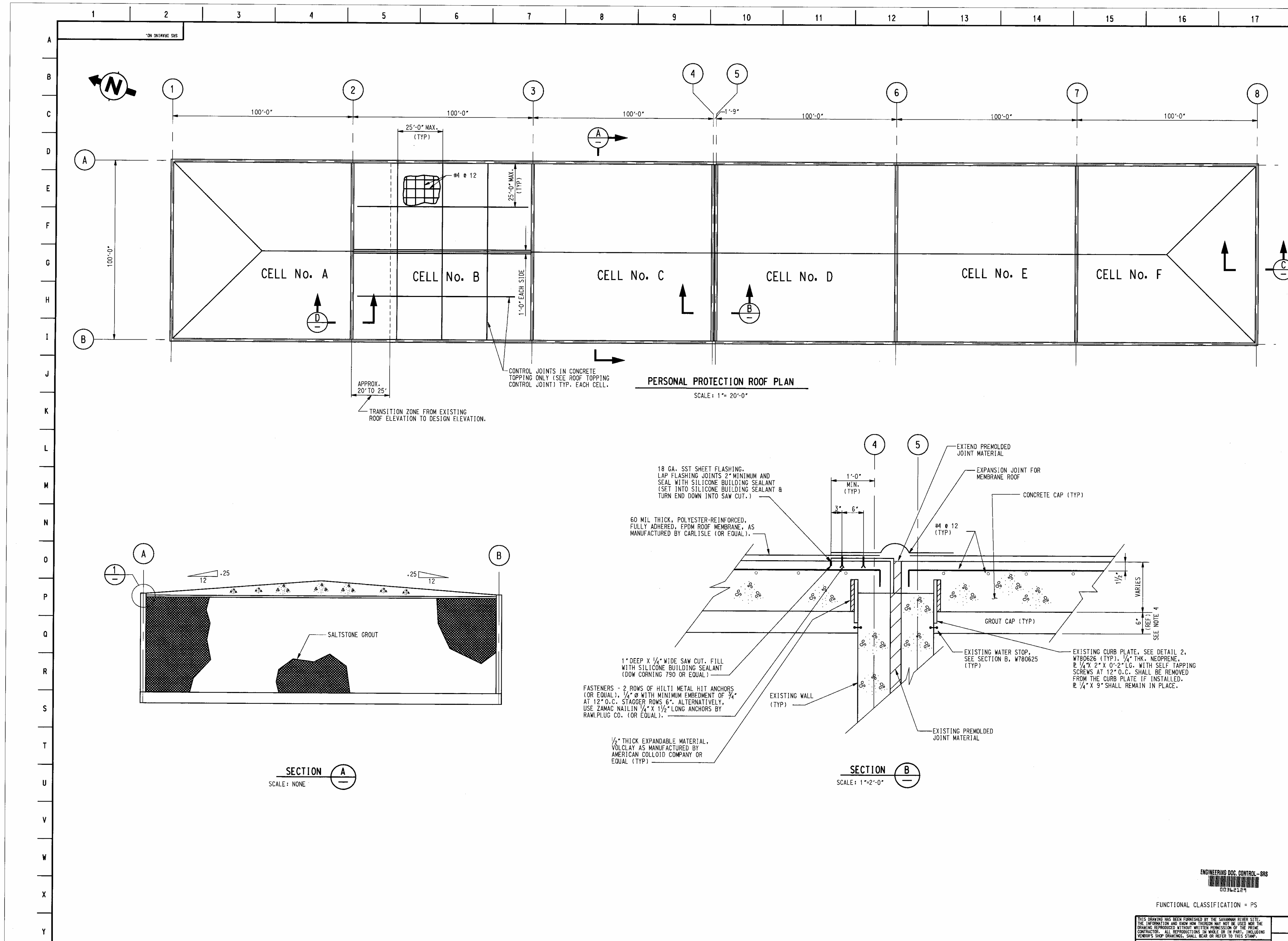
E I DU PONT DE NEMOURS & CO., INC.
WILMINGTON, DELAWARE
ENGINEERING DEPARTMENT


ANALYZE FOR SAFETY, ECOLOGY, AND MINIMUM ESSENTIAL DESIGN
FOUNDATION AND FLOOR PLAN
KEY PLAN
NOTES
SECTION A
SECTION B
TYP INTERIOR WALL ELEVATION SHOWING ELEVATION MARKS
WALL COATING NOTES
W 780625
BECHTEL NATIONAL INC. SAN FRANCISCO
SAVANNAH RIVER PLANT-200Z AREA
DEFENSE WASTE PROCESSING FACILITY-SALTSTONE
SALTSTONE SURFACE DISPOSAL VAULT FOUNDATION AND FLOOR PLAN, ELEVATION AND SECTIONS
CONCRETE
STRUCTURAL
THIS IS A SCANNED CADD PLOT
UNITED STATES DEPARTMENT OF ENERGY
SAVANNAH RIVER SITE
C-CC-Z-0025



NOTES

1. FURNISHING AND DELIVERY OF CONCRETE AND GROUT SHALL BE PER C-SPS-G-00085 REV. 2. CONCRETE MIX TO BE USED SHALL BE B3000-6-P-2-A. GROUT MIX TO BE USED SHALL BE OPBEXE-X-P-0-S.
2. FORMING, PLACING, FINISHING AND CURING OF CONCRETE AND GROUT SHALL BE PERFORMED AND INSPECTED IN ACCORDANCE WITH ACI 117-90, ACI 301-96, ACI 308-92, ACI 309R-96 AND ACI 318-95.
3. ALL REINFORCEMENT SHALL BE DEFORMED BAR PER ASTM A615-94, GRD. 60 AND FABRICATED, PLACED AND INSPECTED IN ACCORDANCE WITH ACI 117-90 AND ACI 318-95.
4. THE EXISTING SALTSTONE GROUT LEVEL IN EACH CELL MAY NOT BE LEVEL. ELEVATIONS OF THE EXISTING SALTSTONE GROUT SHALL BE DETERMINED BEFORE PLACEMENT OF THE GROUT CAP. THE GROUT CAP SHALL HAVE A MINIMUM THICKNESS OF 1" ABOVE THE EXISTING SALTSTONE GROUT ELEVATION BUT SHALL NOT BE HIGHER THAN 3" BELOW THE ELEVATION OF THE EXISTING WALL OF THE SALTSTONE VAULT.
5. GROUT SHALL BE PLACED, BEFORE MOVING THE WEATHER PROTECTION COVER, THROUGH THE HATCHES IN EACH OF THE FOUR QUADRANTS OF THE WEATHER PROTECTION COVER.
6. A TEMPORARY COVER OR TARP SHALL BE PLACED OVER THE GROUT CAP OF THE CELL AFTER THE WEATHER PROTECTION COVER HAS BEEN MOVED FROM THE CELL. THE TEMPORARY COVER OR TARP SHALL BE RESTRAINED TO RESIST HIGH WINDS. A METHOD FOR REMOVAL OF RAINWATER FROM THE TEMPORARY COVER OR TARP SHALL BE PROVIDED.
7. ½" THICK EXPANDABLE MATERIAL SHALL BE INSTALLED PER THE MANUFACTURER'S INSTRUCTIONS AND PLACED ON ALL SIDES OF EACH CELL.
8. FASTENERS/ANCHORS SHALL BE INSTALLED PER THE MANUFACTURER'S INSTRUCTIONS.
9. EPDM ROOF MEMBRANE SHALL BE INSTALLED PER THE MANUFACTURER'S INSTRUCTIONS.
10. SILICONE BUILDING SEALANT SHALL BE INSTALLED PER THE MANUFACTURER'S INSTRUCTIONS.
11. THE WEATHER PROTECTION COVER TIE-DOWNS AS SHOWN IN DETAIL 1, DWG. W780630 REV. 4 SHALL BE REMOVED PRIOR TO MOVEMENT OF THE WEATHER PROTECTION COVER. AFTER MOVEMENT OF THE WEATHER PROTECTION COVER, THE TIE-DOWNS SHALL BE RE-INSTALLED PER DETAIL 1 OF DWG. W780630 REV. 4. INSPECT PER AISC, NINTH EDITION.
12. A YELLOW AND BLACK SAFETY STRIPE SHALL BE PLACED 4'-0" FROM THE 25'-0" HIGH EDGE OF THE SALTSTONE VAULT. A WARNING SIGN SHALL BE PAINTED AT 20'-0" INTERVALS ALONG THE SAFETY STRIPE ON THE MEMBRANE ROOF. THE SIGN SHALL BE PAINTED IN YELLOW, 3" HIGH, BLOCK LETTERS AND READ "DO NOT GO PAST SAFETY STRIPE".
13. WEATHER PROTECTION COVER RAILS, RAIL BASE PLATES AND BASE PLATE ANCHORS ARE TO BE REMOVED. THE BASE PLATE ANCHORS SHALL BE CUT FLUSH WITH THE CONCRETE SURFACE. ANCHORS CAN BE CUT BY MECHANICAL MEANS OR FLAME CUT.
14. THIS DRAWING IS FOR CLOSURE OF CELL B THROUGH CELL F.
15. FOR PLACEMENT OF THE CONCRETE ROOF, BLEED WATER FROM PLACEMENT OF THE CONCRETE SHALL NOT BE ALLOWED TO MIGRATE TO THE SALTSTONE VAULT WALL AND INTO THE INTERFACE OF THE SALTSTONE GROUT / SALTSTONE VAULT WALL.

DOES NOT CONTAIN UNCLASSIFIED CONTROLLED NUCLEAR INFORMATION

Date: 2-3-98

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REFERENCE DRAWINGS	
W780625	FOUNDATION AND FLOOR PLAN
W780626	RAIL BASE PLATES AND DETAILS
W780627	WEATHER PROTECTION COVERS
W780628	WEATHER PROTECTION COVERS
W780629	WEATHER PROTECTION COVERS
W780630	WEATHER PROTECTION COVERS
W780631	WEATHER PROTECTION COVERS
W775949	EQUIPMENT LOCATIONS
W780622	WEATHER PROTECTION COVERS
W775546	WEATHER PROTECTION COVERS
W754534	WEATHER PROTECTION COVERS

REFERENCE STANDARDS

REV. NO.	DATE	REVISION
A	2-5-98	ISSUED FOR USE INTERIM DOCUMENT FOR C-DCP-Z-98001 (PE & CD)

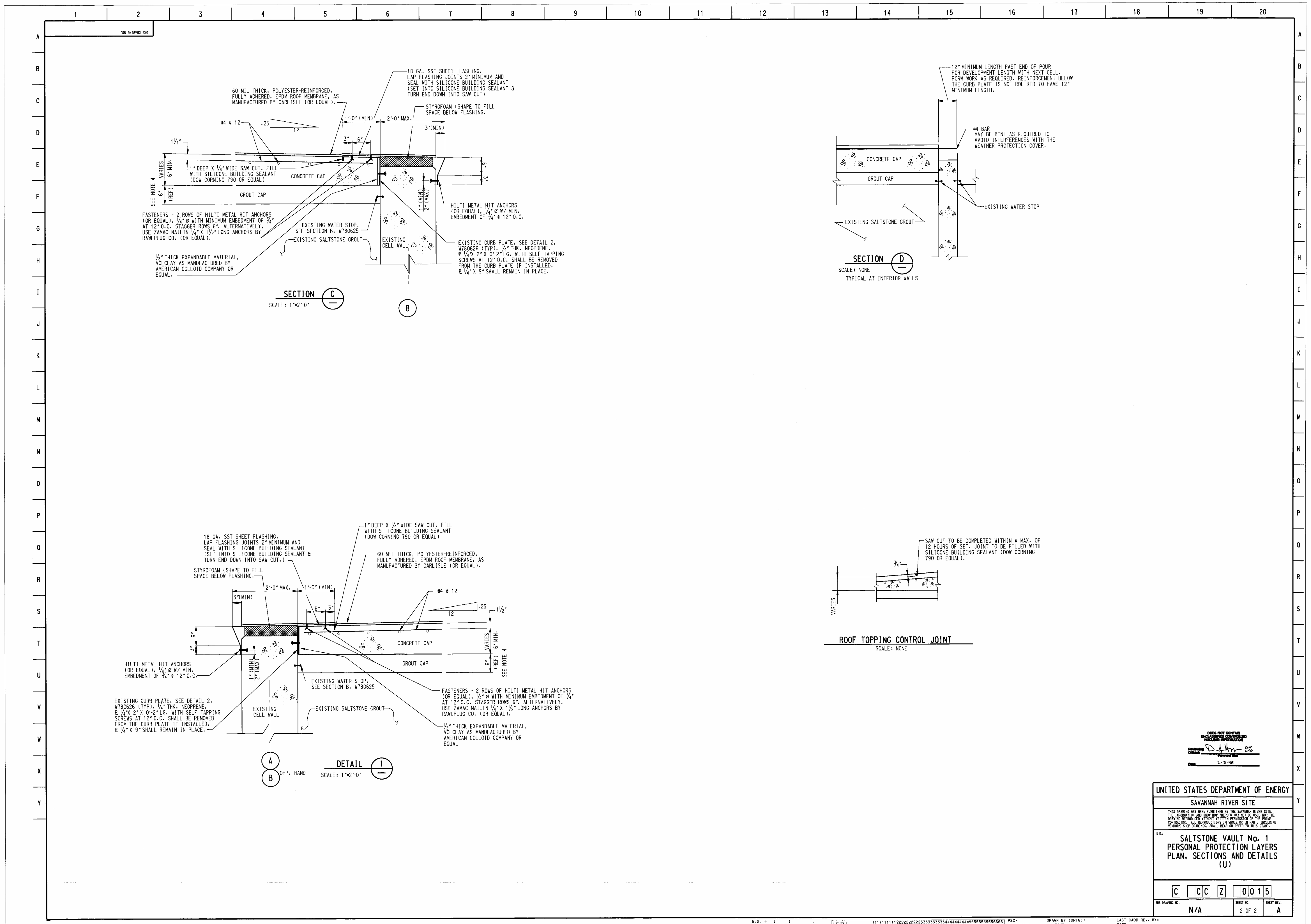
UNITED STATES DEPARTMENT OF ENERGY
SAVANNAH RIVER SITE

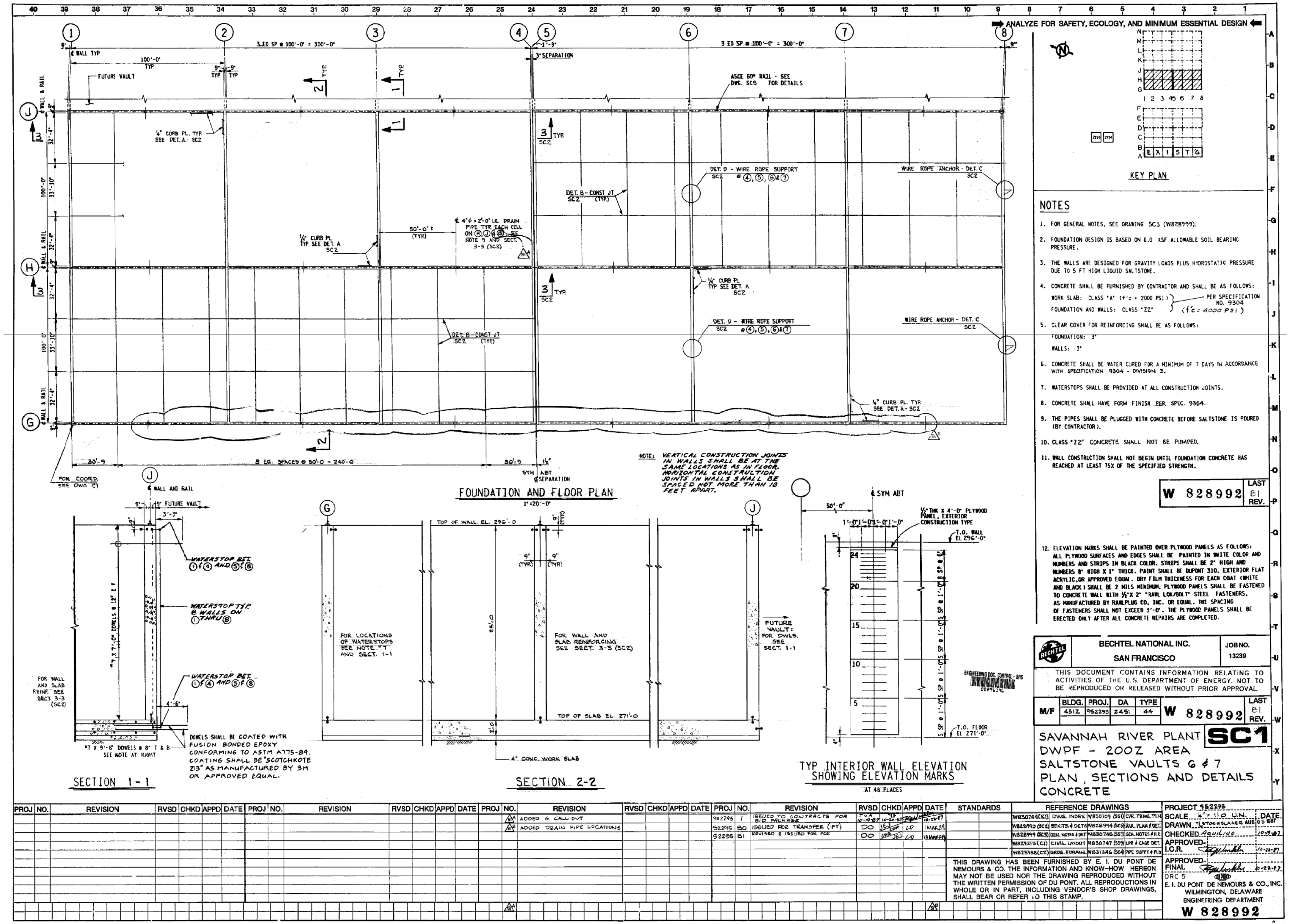
DESIGN GROUP: PE & CD

TITLE: DEFENSE WASTE PROCESSING FACILITY-SALTSTONE
SALTSTONE VAULT No. 1
PERSONAL PROTECTION LAYERS
PLAN, SECTIONS AND DETAILS
(U)

STRUCTURAL — CONCRETE

SCALE	SRS DRAWING NO.	SHEET NO.	LATEST REVISION
AS NOTED	N/A	1 OF 2	A


SECTION C
SCALE: 1"=2'-0"
SECTION D
SCALE: NONE
TYPICAL AT INTERIOR WALLS
DETAIL 1
SCALE: 1"=2'-0"
ROOF TOPPING CONTROL JOINT
SCALE: NONE
CONCRETE CAP
GROUT CAP
EXISTING SALTSTONE GROUT
EXISTING WATER STOP
UNITED STATES DEPARTMENT OF ENERGY
SAVANNAH RIVER SITE
SALTSTONE VAULT No. 1
PERSONAL PROTECTION LAYERS
PLAN, SECTIONS AND DETAILS
(U)
N/A
2 OF 2
A



ANALYZE FOR SAFETY, ECOLOGY, AND MINIMUM ESSENTIAL DESIGN
FOUNDATION AND FLOOR PLAN
SECTION 1-1
SECTION 2-2
TYP INTERIOR WALL ELEVATION SHOWING ELEVATION MARKS
KEY PLAN
NOTES
1. FOR GENERAL NOTES, SEE DRAWING SC3 (W828999).
2. FOUNDATION DESIGN IS BASED ON 6.0 KSF ALLOWABLE SOIL BEARING PRESSURE.
3. THE WALLS ARE DESIGNED FOR GRAVITY LOADS PLUS HYDROSTATIC PRESSURE DUE TO 5 FT HIGH LIQUID SALTSTONE.
4. CONCRETE SHALL BE FURNISHED BY CONTRACTOR AND SHALL BE AS FOLLOWS:
WORK SLAB: CLASS "A" (f'c = 2000 PSI)
FOUNDATION AND WALLS: CLASS "Z2" (f'c = 4000 PSI)
PER SPECIFICATION NO. 9304
5. CLEAR COVER FOR REINFORCING SHALL BE AS FOLLOWS:
FOUNDATION: 3"
WALLS: 3"
6. CONCRETE SHALL BE WATER CURED FOR A MINIMUM OF 7 DAYS IN ACCORDANCE WITH SPECIFICATION 9304 - DIVISION 3.
7. WATERSTOPS SHALL BE PROVIDED AT ALL CONSTRUCTION JOINTS.
8. CONCRETE SHALL HAVE FORM FINISH PER SPEC. 9304.
9. THE PIPES SHALL BE PLUGGED WITH CONCRETE BEFORE SALTSTONE IS POURED (BY CONTRACTOR).
10. CLASS "Z2" CONCRETE SHALL NOT BE PUMPED.
11. WALL CONSTRUCTION SHALL NOT BEGIN UNTIL FOUNDATION CONCRETE HAS REACHED AT LEAST 75% OF THE SPECIFIED STRENGTH.
12. ELEVATION MARKS SHALL BE PAINTED OVER PLYWOOD PANELS AS FOLLOWS: ALL PLYWOOD SURFACES AND EDGES SHALL BE PAINTED IN WHITE COLOR AND NUMBERS AND STRIPS IN BLACK COLOR. STRIPS SHALL BE 2" HIGH AND NUMBERS 8" HIGH X 1" THICK. PAINT SHALL BE DUPONT 310, EXTERIOR FLAT ACRYLIC, OR APPROVED EQUAL. DRY FILM THICKNESS FOR EACH COAT (WHITE AND BLACK) SHALL BE 2 MILS MINIMUM. PLYWOOD PANELS SHALL BE FASTENED TO CONCRETE WALL WITH ½" X 2" "RAWL LOK/BOLT" STEEL FASTENERS, AS MANUFACTURED BY RAWLPLUG CO, INC. OR EQUAL. THE SPACING OF FASTENERS SHALL NOT EXCEED 3'-0". THE PLYWOOD PANELS SHALL BE ERECTED ONLY AFTER ALL CONCRETE REPAIRS ARE COMPLETED.
W 828992 LAST B1 REV.
BECHTEL NATIONAL INC. SAN FRANCISCO JOB NO. 13239
THIS DOCUMENT CONTAINS INFORMATION RELATING TO ACTIVITIES OF THE U.S. DEPARTMENT OF ENERGY. NOT TO BE REPRODUCED OR RELEASED WITHOUT PRIOR APPROVAL.
M/F BLDG. 451Z PROJ. 952295 DA Z451 TYPE 44
SAVANNAH RIVER PLANT
DWPF - 200Z AREA
SALTSTONE VAULTS 6 & 7
PLAN, SECTIONS AND DETAILS
CONCRETE
SC1
STANDARDS
REFERENCE DRAWINGS
W830744(K1) DWG. INDEX
W830709 (SS1) CVR. FRMG. PLN
W828993 (SC2) SECTS. & DETS
W828994 (SC5) RAIL PLAN & DET.
W828999 (SC3) GEN. NOTES & DET
W830746 (SS7) GEN. NOTES & H.R.
W829213 (C1) CIVIL LAYOUT
W830747 (SS9) LDR & CAGE DET.
W828988 (C2) GRDG. & DRAIN.
W831346 (SC4) PIPE SUPPT & PL'S
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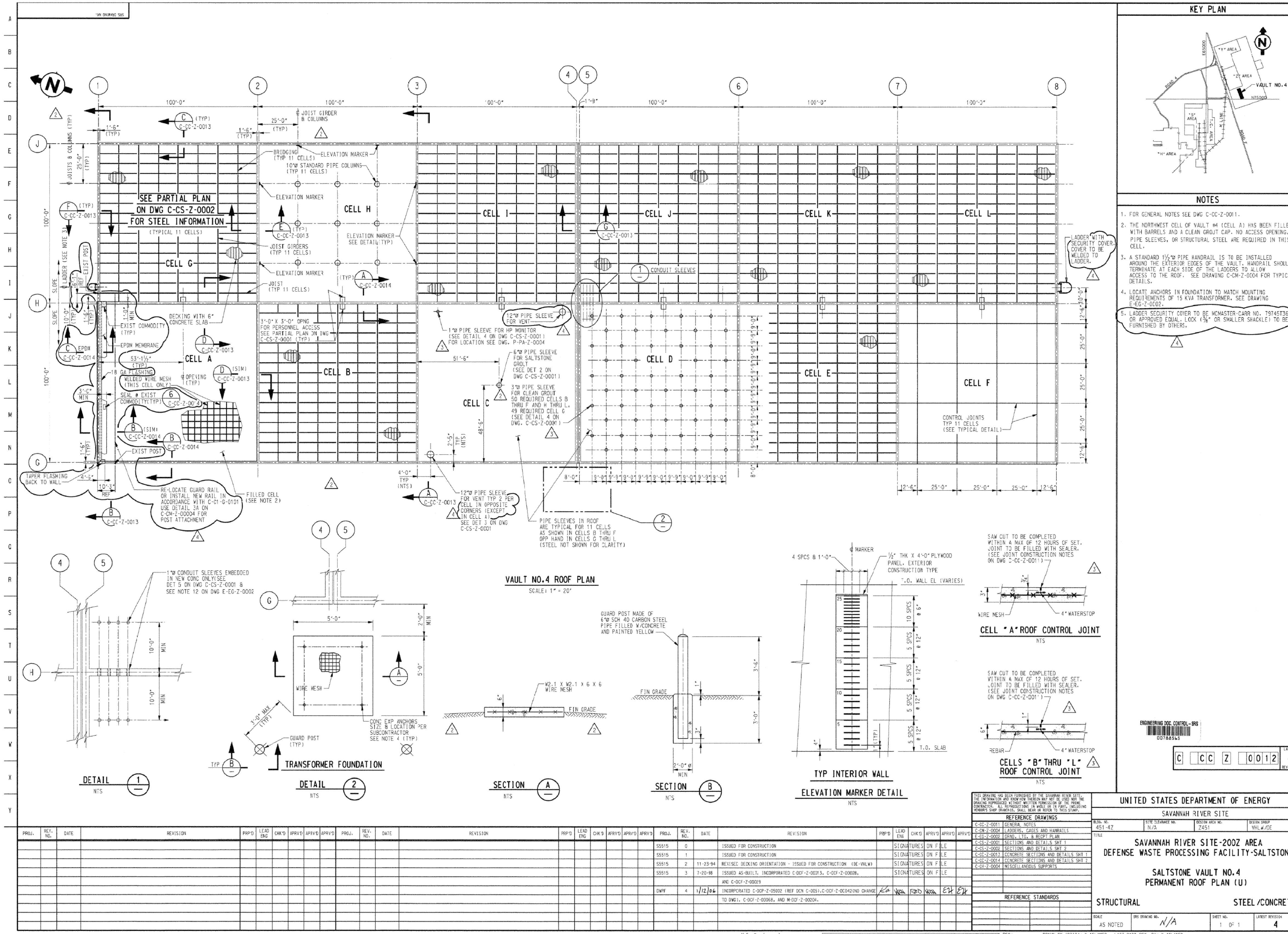
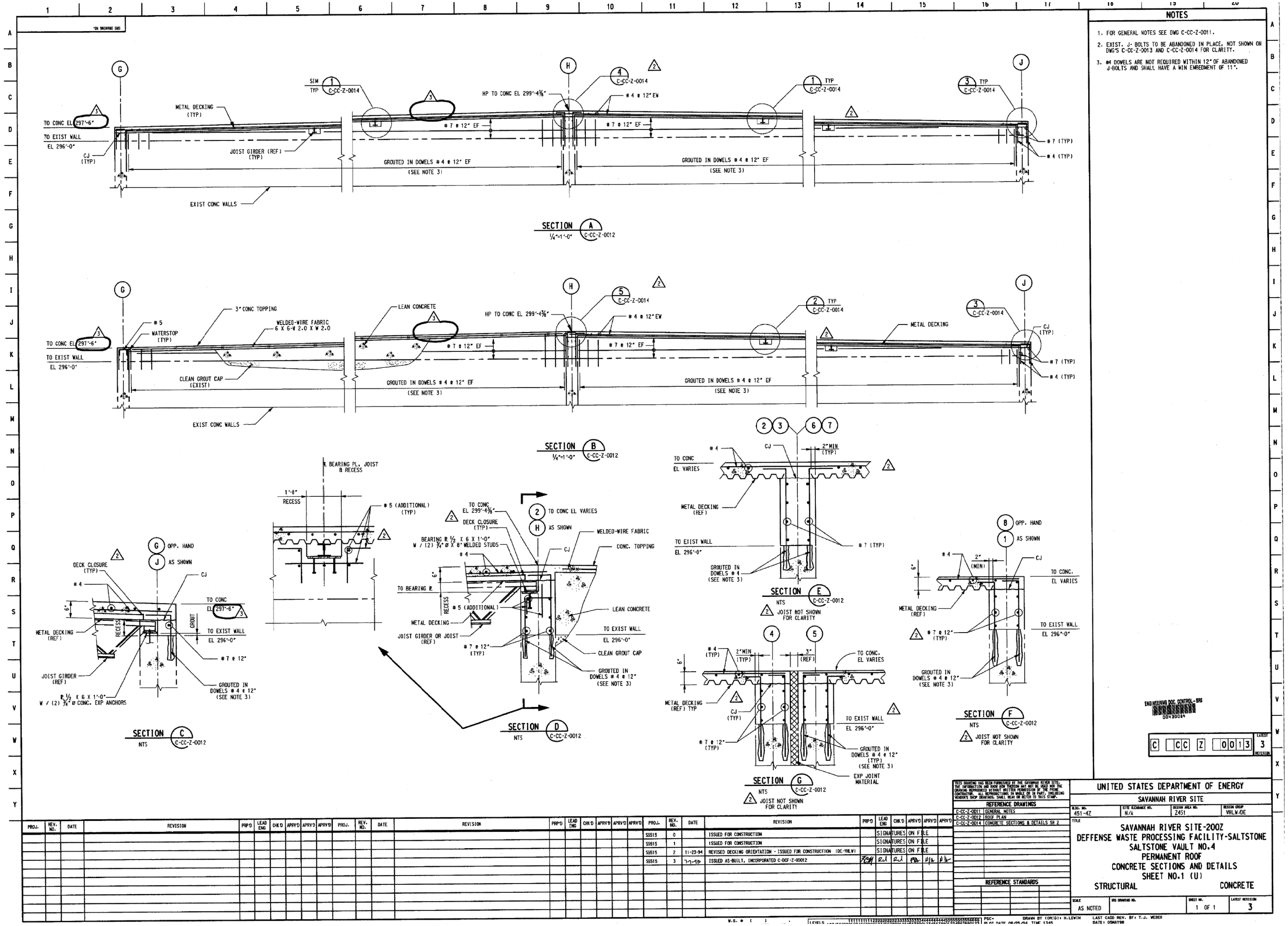
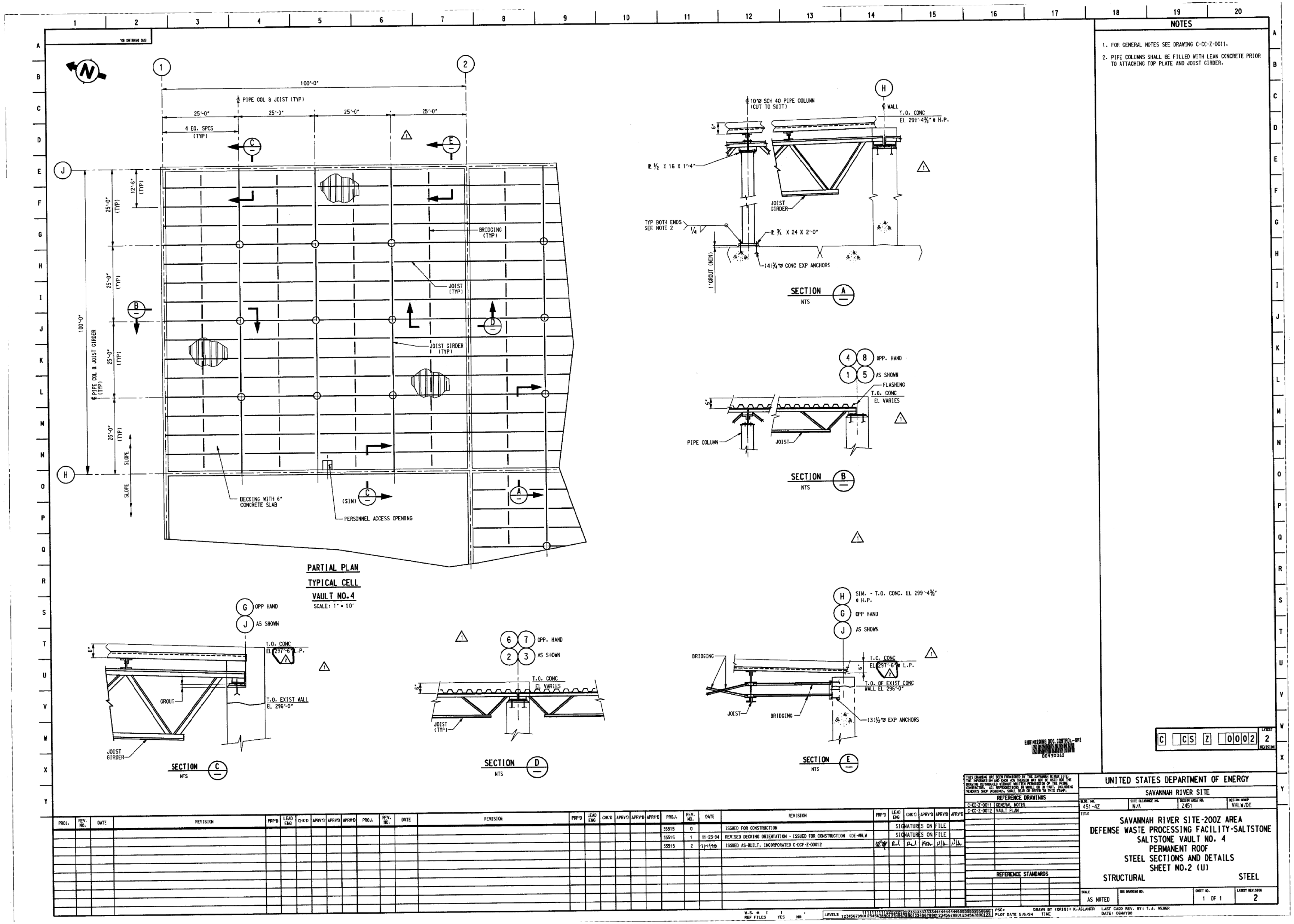
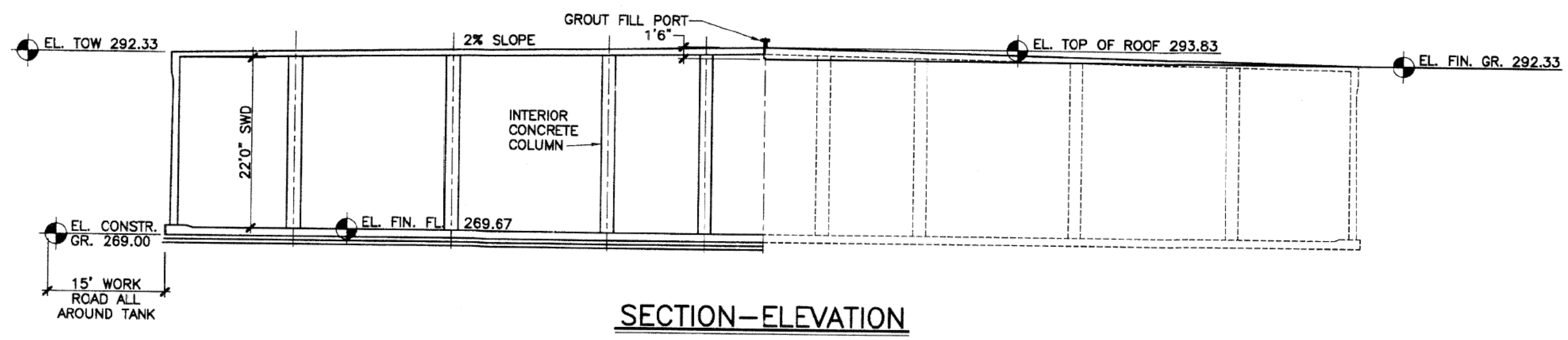
PROJECT 952295
SCALE ¼" = 1'-0 U.N.
DRAWN STOCKSLAGER AUG 05 1987
CHECKED AQUILINO 10-19-87
APPROVED-I.C.R. 10-22-87
APPROVED-FINAL 10-22-87
DRC 5
E. I. DU PONT DE NEMOURS & CO., INC.
WILMINGTON, DELAWARE
ENGINEERING DEPARTMENT
W 828992


KEY PLAN
NOTES
1. FOR GENERAL NOTES SEE DWG C-CC-Z-0011.
VAULT NO.4 ROOF PLAN
CELL A
CELL B
CELL C
CELL D
CELL E
CELL F
CELL G
CELL H
CELL I
CELL J
CELL K
CELL L
DETAIL 1
DETAIL 2
TRANSFORMER FOUNDATION
SECTION A
SECTION B
TYP INTERIOR WALL
ELEVATION MARKER DETAIL
CELL "A" ROOF CONTROL JOINT
CELLS "B" THRU "L" ROOF CONTROL JOINT
UNITED STATES DEPARTMENT OF ENERGY
SAVANNAH RIVER SITE
SAVANNAH RIVER SITE-200Z AREA
DEFENSE WASTE PROCESSING FACILITY-SALTSTONE
SALTSTONE VAULT NO.4
PERMANENT ROOF PLAN (U)
STRUCTURAL
STEEL/CONCRETE


NOTES
1. FOR GENERAL NOTES SEE DWG C-CC-Z-0011.
2. EXIST. J- BOLTS TO BE ABANDONED IN PLACE, NOT SHOWN ON DWG'S C-CC-Z-0013 AND C-CC-Z-0014 FOR CLARITY.
3. #4 DOWELS ARE NOT REQUIRED WITHIN 12" OF ABANDONED J-BOLTS AND SHALL HAVE A MIN EMBEDMENT OF 11".
SECTION A
SECTION B
SECTION C
SECTION D
SECTION E
SECTION F
SECTION G
EXIST CONC WALLS
METAL DECKING
GROUTED IN DOWELS # 4 @ 12" EF (SEE NOTE 3)
UNITED STATES DEPARTMENT OF ENERGY
SAVANNAH RIVER SITE
SAVANNAH RIVER SITE-200Z
DEFENSE WASTE PROCESSING FACILITY-SALTSTONE
SALTSTONE VAULT NO.4
PERMANENT ROOF
CONCRETE SECTIONS AND DETAILS
SHEET NO.1 (U)
STRUCTURAL
CONCRETE
AS NOTED
1 OF 1
3


NOTES
1. FOR GENERAL NOTES SEE DRAWING C-CC-Z-0011.
2. PIPE COLUMNS SHALL BE FILLED WITH LEAN CONCRETE PRIOR TO ATTACHING TOP PLATE AND JOIST GIRDER.
PARTIAL PLAN
TYPICAL CELL
VAULT NO. 4
SCALE: 1" = 10'
DECKING WITH 6" CONCRETE SLAB
PERSONNEL ACCESS OPENING
JOIST (TYP)
JOIST GIRDER (TYP)
BRIDGING (TYP)
SECTION A
SECTION B
SECTION C
SECTION D
SECTION E
NTS
UNITED STATES DEPARTMENT OF ENERGY
SAVANNAH RIVER SITE
SAVANNAH RIVER SITE-200Z AREA
DEFENSE WASTE PROCESSING FACILITY-SALTSTONE
SALTSTONE VAULT NO. 4
PERMANENT ROOF
STEEL SECTIONS AND DETAILS
SHEET NO.2 (U)
STRUCTURAL
STEEL
AS NOTED
1 OF 1
2
ISSUED FOR CONSTRUCTION
REVISED DECKING ORIENTATION - ISSUED FOR CONSTRUCTION
ISSUED AS-BUILT. INCORPORATED C-BCF-Z-00012
SIGNATURES ON FILE
REFERENCE DRAWINGS
REFERENCE STANDARDS



SECTION–ELEVATION

(1) DENOTES DETAIL NUMBER / DENOTES PAGE NUMBER WHERE DETAIL APPEARS

(A) DENOTES SECTION LETTER / DENOTES PAGE NUMBER WHERE SECTION APPEARS

NOTES

Materials & Services Furnished by SRS:

1. Concrete: Type V Cement
   A. 5000 psi pump mix with 3/4" aggregate for floor, roof, precast wall panels and floor wall joint curb.
2. Material Testing:
   A. Concrete:
      1. Slump: ASTM C 143/C 143M
      2. Air Content: C 231
      3. Density and Yield: ASTM C 138/C 138M
      4. Compression Tests: ASTM C 39/C 38M
         Four cylinders per set (for each set, test one at 7 days, two at 28 days, and hold one)
         i. 10 sets for floor
         ii. 10 sets for roof
         iii. 5 sets for corewall
         iv. 1 set for panel closure gaps

Materials & Services Furnished by MDM:

1. Clearing of the site, excavation, fill, and compaction to an elevation 8" below top of floor slab on a 186' diameter circle including two 4" thick concrete mud mats under the tank and a temporary 3"–thick stone, 15'–wide, work road all around the tank over plywood.
2. Dewatering of the 186' diameter work area if required.
3. Furnish adequate working and open storage space for construction equipment and materials.
4 Water and electricity for construction.
5. Final backfill and landscaping.
6. Concrete: Type II Cement
   A. 4000 psi pump mix with 3/4" aggregate for columns.
7. Material Testing:
   A. Concrete
      1. Slump: ASTM C 143/C 143M
      2. Air Content: C 231
      3. Density and Yield: ASTM C 138/C 138M
      4. Compression Tests: ASTM C 39/C 38M
         2 sets at 28 days

Materials & Services Furnished by CROM:

A. Shotcrete Mixes:
  1. Shotcrete Mixes: Use Type II Cement
     (a) 1st coat on steel shell & prestress wire: 1:3 mix
     (b) All other shotcrete: 1:4 mix
     (c) Strength: fg = 4000 psi, fgi = 2000 psi

B. Curing: (7 days minimum)
  1. Continuously water cure floor and wall during tank construction.
  2. Water cure roof 7 days.

C. Reinforcing Steel:
  1. ASTM A615 grade 60, lap splices 48 bar diameters

D. Prestressing Wire: Meets ASTM A821 05 Type B
  1. Diameter: 0.162 in (8 gauge)
  2. Area: 0.0206 sq–in.
  3. Ultimate Strength: 231,000 psi
  4. Initial Stress: 145,600 psi
  5. Working Stress: 115,000 psi

E. Steel Shell Diaphragm: Meets ASTM A1008–05b, 26 gauge

(b) F. Accessories (each tank except as noted):
  1. Floor embedments:
     (a) Thermowell floor embed plate (4 req.)
  2. Roof embedments (see schedule sheet 4 and 5):
     (a) 6" diameter thermowell roof penetrations (4 req.)
     (b) Thermowell junction box embed plate (4 req.)
     (c) 36" diameter camera port (3 req.)
     (d) Camera junction box embed plate (3 req.)
     (e) 3" diameter grout fill port
     (f) Grout fill support embed plates (8 req.)
     (g) Conduit support embed plates (38 req. for tank 2A, 36 req. for tank 2B))
     (h) 12" diameter ventilation port (3 req.)
     (i) 8" diameter sample port
     (j) 3" diameter inspection port (60 req.)
     (k) Temporary roof access opening
  3. Interior visual liquid level indicator using epoxy coating

G. Material Testing:
  1. Shotcrete:
     (a) Compression Tests: ASTM C 39/C 39M, C 109/C 109M
         Four cylinders (or cores) per set (for each set, test one at 7 days, two at 28 days, and hold one)
         i. 2 sets for outside core wall
         ii. 2 sets for cover coat

Savannah River Site – Supplier Document Status
Q B004 85K-011-D MDM
1/31/08

ENGINEERING DOC. CONTROL–SRS
00865803

CROM

SOUTH CAROLINA PROFESSIONAL ENGINEER – KETH R. HARVEY

TANK BUILDER: THE CROM CORPORATION GAINESVILLE, FLORIDA

OWNER: DEPT OF ENERGY SAVANNAH RIVER SITE AIKEN SOUTH CAROLINA

CONSULTING ENGINEER: BECHTEL SAVANNAH RIVER, INC. AIKEN SOUTH CAROLINA

TANK DESCRIPTION: 2.9–MG SALTSTONE STORAGE TANKS

TANK DIMENSIONS: 150'0" ID x 22'0" SWD

DATE: 8/14/06
DRAWN: MAL
CHECKED: SMC/MLM
APPROVED: LOB
DESIGNED: KRH

REV.	DESCRIPTION	DATE CK.BY
b	MODIFIED NOTES SECTION F ACCESSORIES PER ENGINEER.	12/20/07

WHERE STANDARD SPECIFICATIONS ARE IN CONFLICT WITH CROM CORPORATION SPECIFICATIONS OR WITH GOOD PRESTRESSING OR SHOTCRETE PRACTICES THE STANDARD SPECIFICATIONS SHALL BE SUBORDINATED.
THIS DESIGN AND DRAWING ORIGINATED BY AND THE EXCLUSIVE PROPERTY OF THE CROM CORPORATION.

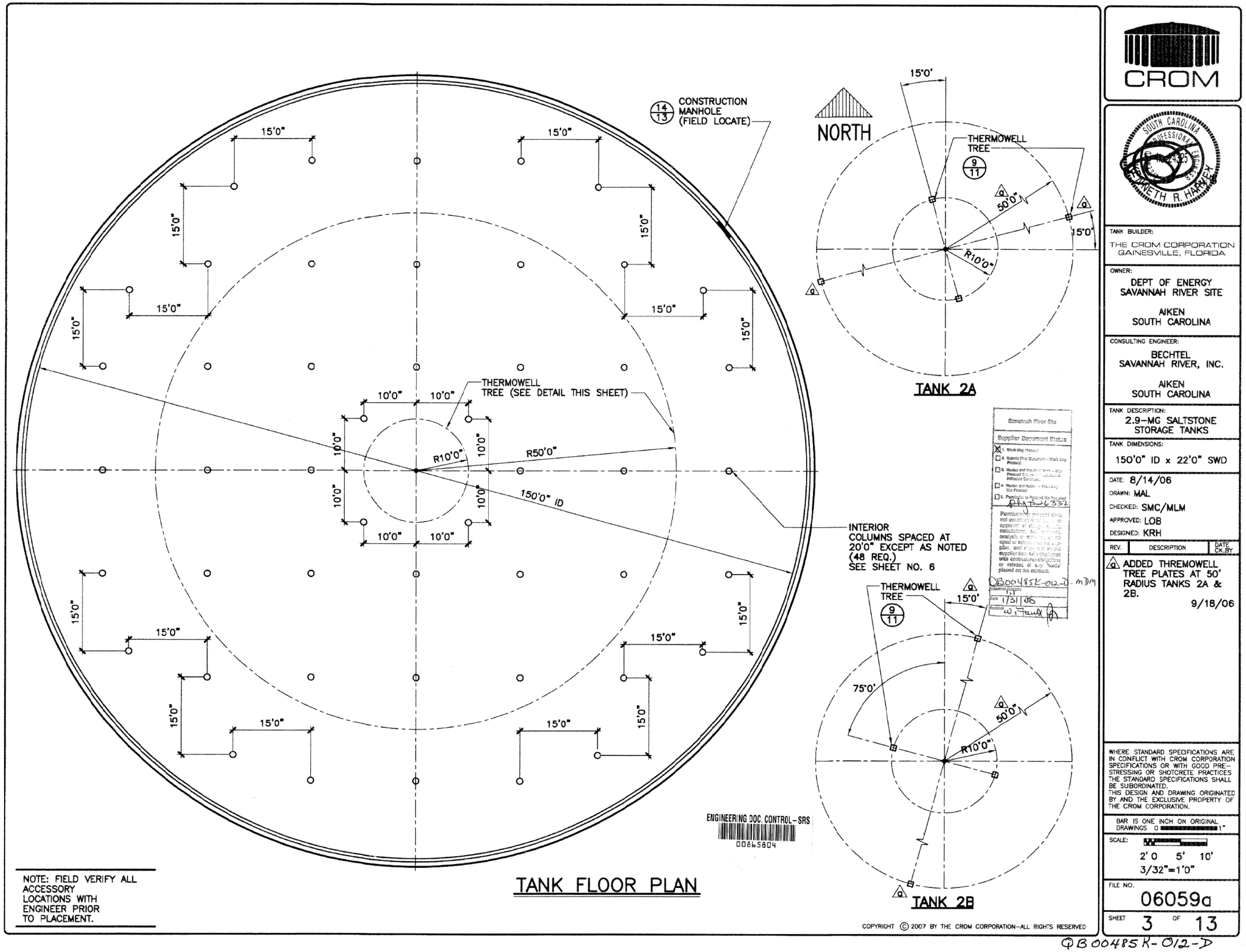
BAR IS ONE INCH ON ORIGINAL DRAWINGS 0 1"

SCALE: 2'0 5' 10'
3/32"=1'0"

FILE NO. 06059b

SHEET 2 OF 13

Q B004 85K-011-D



CONSTRUCTION MANHOLE (FIELD LOCATE)
NORTH
THERMOWELL TREE
THERMOWELL TREE (SEE DETAIL THIS SHEET)
R50'0"
R10'0"
150'0" ID
INTERIOR COLUMNS SPACED AT 20'0" EXCEPT AS NOTED (48 REQ.) SEE SHEET NO. 6
TANK 2A
TANK 2B
TANK FLOOR PLAN
NOTE: FIELD VERIFY ALL ACCESSORY LOCATIONS WITH ENGINEER PRIOR TO PLACEMENT.
ENGINEERING DOC. CONTROL-SRS
00865804
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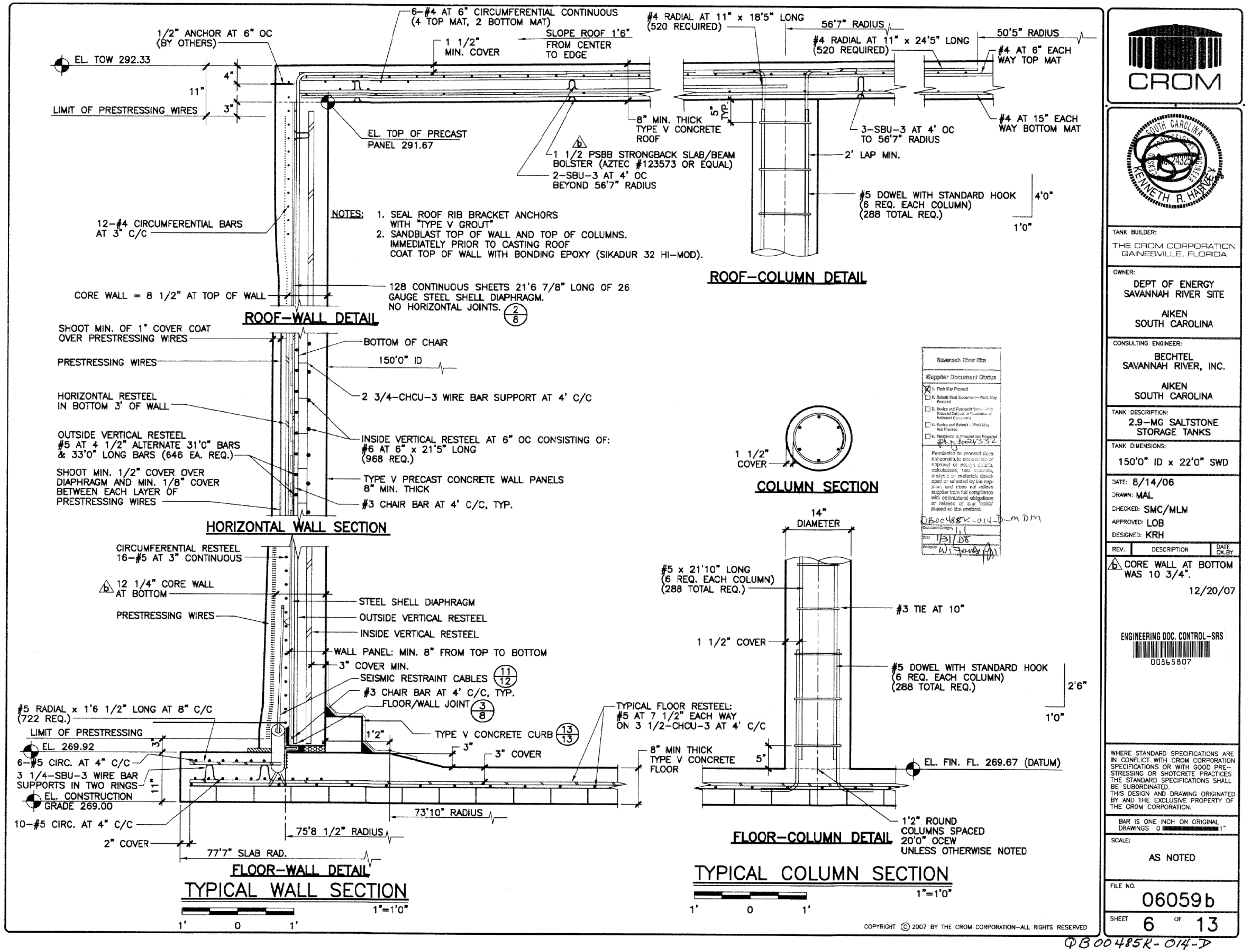
CROM
TANK BUILDER: THE CROM CORPORATION GAINESVILLE, FLORIDA
OWNER: DEPT OF ENERGY SAVANNAH RIVER SITE AIKEN SOUTH CAROLINA
CONSULTING ENGINEER: BECHTEL SAVANNAH RIVER, INC. AIKEN SOUTH CAROLINA
TANK DESCRIPTION: 2.9-MG SALTSTONE STORAGE TANKS
TANK DIMENSIONS: 150'0" ID x 22'0" SWD
DATE: 8/14/06
DRAWN: MAL
CHECKED: SMC/MLM
APPROVED: LOB
DESIGNED: KRH
ADDED THREMOWELL TREE PLATES AT 50' RADIUS TANKS 2A & 2B. 9/18/06
WHERE STANDARD SPECIFICATIONS ARE IN CONFLICT WITH CROM CORPORATION SPECIFICATIONS OR WITH GOOD PRESTRESSING OR SHOTCRETE PRACTICES THE STANDARD SPECIFICATIONS SHALL BE SUBORDINATED. THIS DESIGN AND DRAWING ORIGINATED BY AND THE EXCLUSIVE PROPERTY OF THE CROM CORPORATION.
SCALE: 3/32"=1'0"
FILE NO. 06059a
SHEET 3 OF 13
QB00485K-012-D


6-#4 AT 6" CIRCUMFERENTIAL CONTINUOUS (4 TOP MAT, 2 BOTTOM MAT)
1/2" ANCHOR AT 6" OC (BY OTHERS)
EL. TOW 292.33
1 1/2" MIN. COVER
SLOPE ROOF 1'6" FROM CENTER TO EDGE
LIMIT OF PRESTRESSING WIRES
EL. TOP OF PRECAST PANEL 291.67
8" MIN. THICK TYPE V CONCRETE ROOF
1 1/2 PSBB STRONGBACK SLAB/BEAM BOLSTER (AZTEC #123573 OR EQUAL)
2-SBU-3 AT 4' OC BEYOND 56'7" RADIUS
#4 RADIAL AT 11" x 18'5" LONG (520 REQUIRED)
56'7" RADIUS
#4 RADIAL AT 11" x 24'5" LONG (520 REQUIRED)
50'5" RADIUS
#4 AT 6" EACH WAY TOP MAT
#4 AT 15" EACH WAY BOTTOM MAT
3-SBU-3 AT 4' OC TO 56'7" RADIUS
2' LAP MIN.
#5 DOWEL WITH STANDARD HOOK (6 REQ. EACH COLUMN) (288 TOTAL REQ.)
4'0"
1'0"
ROOF-COLUMN DETAIL
12-#4 CIRCUMFERENTIAL BARS AT 3" C/C
NOTES: 1. SEAL ROOF RIB BRACKET ANCHORS WITH "TYPE V GROUT"
2. SANDBLAST TOP OF WALL AND TOP OF COLUMNS. IMMEDIATELY PRIOR TO CASTING ROOF COAT TOP OF WALL WITH BONDING EPOXY (SIKADUR 32 HI-MOD).
CORE WALL = 8 1/2" AT TOP OF WALL
128 CONTINUOUS SHEETS 21'6 7/8" LONG OF 26 GAUGE STEEL SHELL DIAPHRAGM. NO HORIZONTAL JOINTS.
ROOF-WALL DETAIL
SHOOT MIN. OF 1" COVER COAT OVER PRESTRESSING WIRES
BOTTOM OF CHAIR
PRESTRESSING WIRES
150'0" ID
HORIZONTAL RESTEEL IN BOTTOM 3' OF WALL
2 3/4-CHCU-3 WIRE BAR SUPPORT AT 4' C/C
OUTSIDE VERTICAL RESTEEL #5 AT 4 1/2" ALTERNATE 31'0" BARS & 33'0" LONG BARS (646 EA. REQ.)
INSIDE VERTICAL RESTEEL AT 6" OC CONSISTING OF: #6 AT 6" x 21'5" LONG (968 REQ.)
SHOOT MIN. 1/2" COVER OVER DIAPHRAGM AND MIN. 1/8" COVER BETWEEN EACH LAYER OF PRESTRESSING WIRES
TYPE V PRECAST CONCRETE WALL PANELS 8" MIN. THICK
#3 CHAIR BAR AT 4' C/C, TYP.
HORIZONTAL WALL SECTION
1 1/2" COVER
COLUMN SECTION
14" DIAMETER
CIRCUMFERENTIAL RESTEEL 16-#5 AT 3" CONTINUOUS
12 1/4" CORE WALL AT BOTTOM
STEEL SHELL DIAPHRAGM
PRESTRESSING WIRES
OUTSIDE VERTICAL RESTEEL
INSIDE VERTICAL RESTEEL
WALL PANEL: MIN. 8" FROM TOP TO BOTTOM
3" COVER MIN.
SEISMIC RESTRAINT CABLES
#3 CHAIR BAR AT 4' C/C, TYP.
FLOOR/WALL JOINT
#5 RADIAL x 1'6 1/2" LONG AT 8" C/C (722 REQ.)
LIMIT OF PRESTRESSING
EL. 269.92
6-#5 CIRC. AT 4" C/C
3 1/4-SBU-3 WIRE BAR SUPPORTS IN TWO RINGS
EL. CONSTRUCTION GRADE 269.00
10-#5 CIRC. AT 4" C/C
2" COVER
TYPE V CONCRETE CURB
3" COVER
TYPICAL FLOOR RESTEEL: #5 AT 7 1/2" EACH WAY ON 3 1/2-CHCU-3 AT 4' C/C
8" MIN THICK TYPE V CONCRETE FLOOR
73'10" RADIUS
75'8 1/2" RADIUS
77'7" SLAB RAD.
FLOOR-WALL DETAIL
TYPICAL WALL SECTION
1"=1'0"
#5 x 21'10" LONG (6 REQ. EACH COLUMN) (288 TOTAL REQ.)
#3 TIE AT 10"
1 1/2" COVER
#5 DOWEL WITH STANDARD HOOK (6 REQ. EACH COLUMN) (288 TOTAL REQ.)
2'6"
1'0"
EL. FIN. FL. 269.67 (DATUM)
1'2" ROUND COLUMNS SPACED 20'0" OCEW UNLESS OTHERWISE NOTED
FLOOR-COLUMN DETAIL
TYPICAL COLUMN SECTION
1"=1'0"
CROM
TANK BUILDER: THE CROM CORPORATION GAINESVILLE, FLORIDA
OWNER: DEPT OF ENERGY SAVANNAH RIVER SITE AIKEN SOUTH CAROLINA
CONSULTING ENGINEER: BECHTEL SAVANNAH RIVER, INC. AIKEN SOUTH CAROLINA
TANK DESCRIPTION: 2.9-MG SALTSTONE STORAGE TANKS
TANK DIMENSIONS: 150'0" ID x 22'0" SWD
DATE: 8/14/06
DRAWN: MAL
CHECKED: SMC/MLM
APPROVED: LOB
DESIGNED: KRH
CORE WALL AT BOTTOM WAS 10 3/4". 12/20/07
ENGINEERING DOC. CONTROL-SRS
00865807
WHERE STANDARD SPECIFICATIONS ARE IN CONFLICT WITH CROM CORPORATION SPECIFICATIONS OR WITH GOOD PRESTRESSING OR SHOTCRETE PRACTICES THE STANDARD SPECIFICATIONS SHALL BE SUBORDINATED. THIS DESIGN AND DRAWING ORIGINATED BY AND THE EXCLUSIVE PROPERTY OF THE CROM CORPORATION.
SCALE: AS NOTED
FILE NO. 06059b
SHEET 6 OF 13
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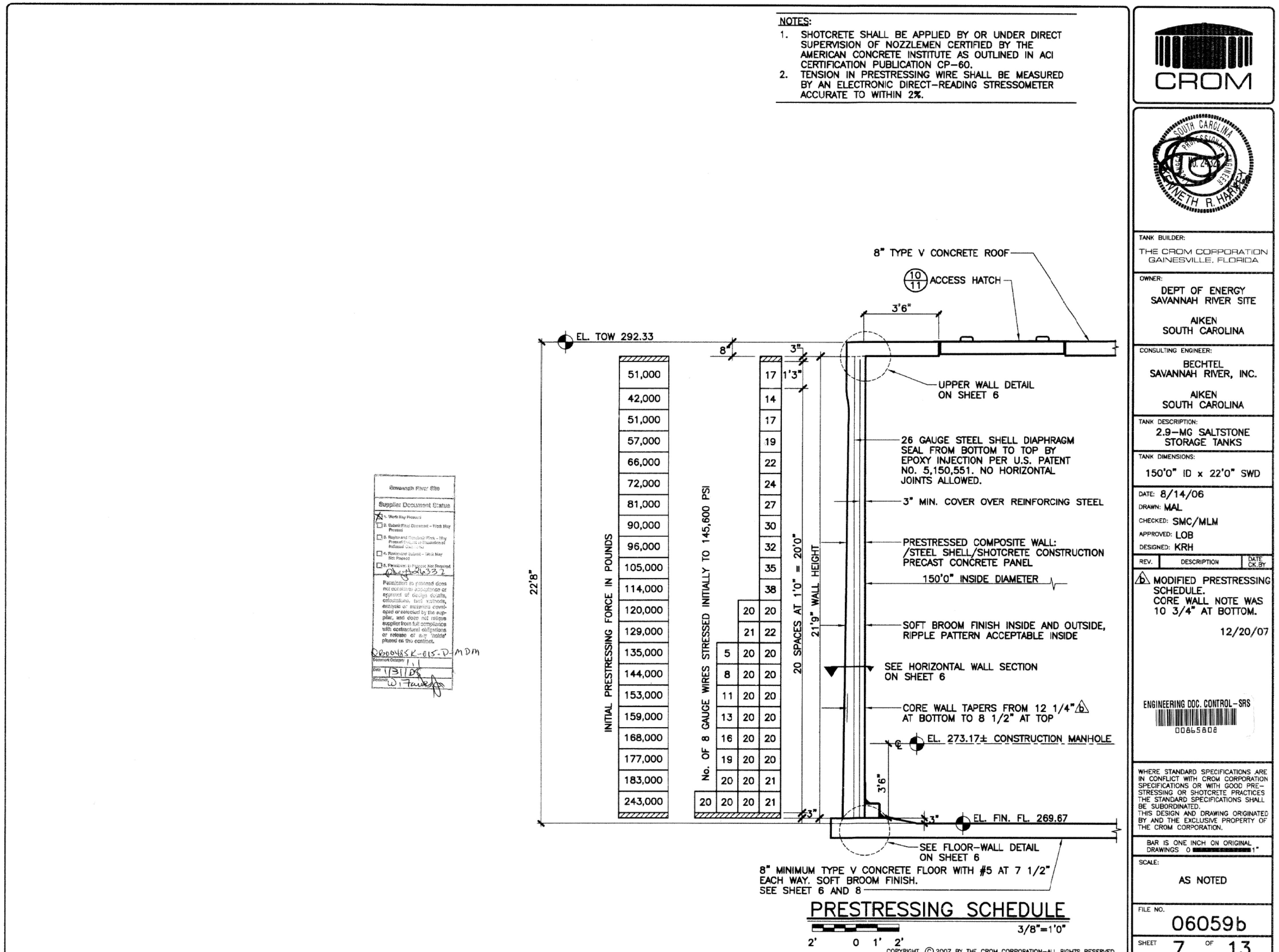
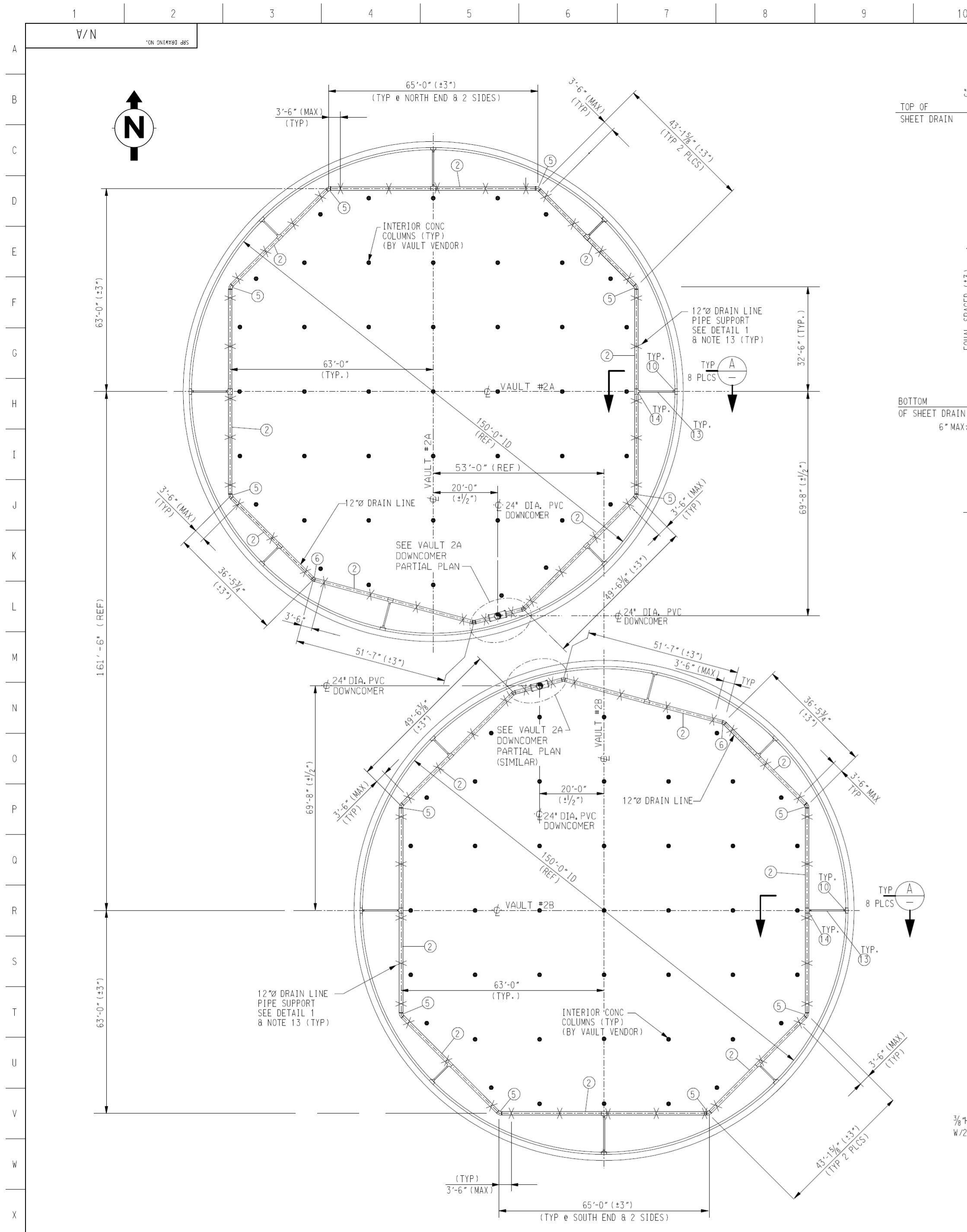
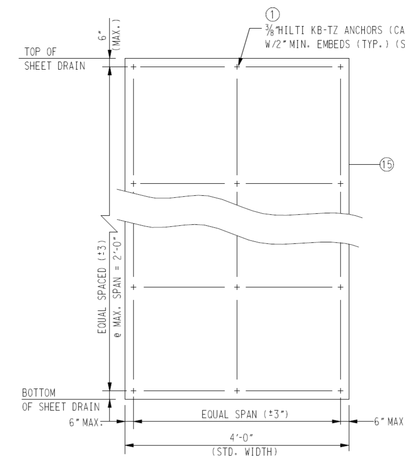
QB00485K-014-D



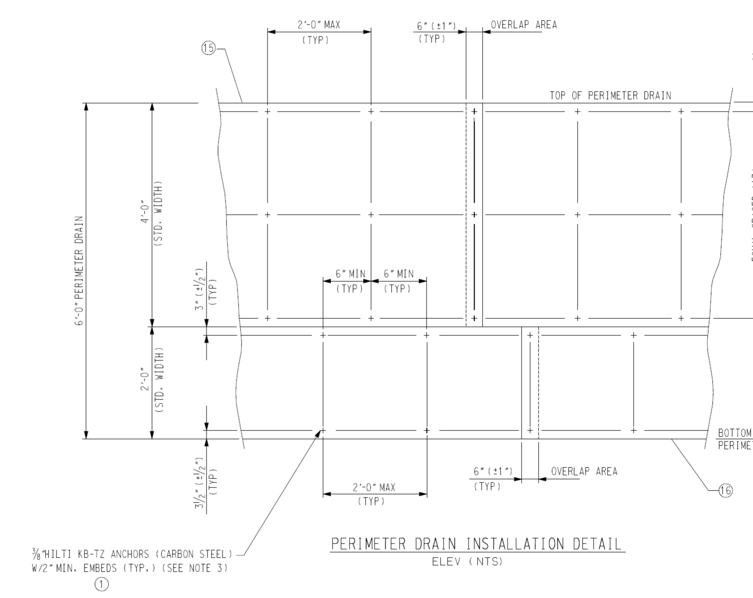
INITIAL PRESTRESSING FORCE IN POUNDS	No. OF 8 GAUGE WIRES STRESSED INITIALLY TO 145,600 PSI			
51,000				17
42,000				14
51,000				17
57,000				19
66,000				22
72,000				24
81,000				27
90,000				30
96,000				32
105,000				35
114,000				38
120,000			20	20
129,000			21	22
135,000		5	20	20
144,000		8	20	20
153,000		11	20	20
159,000		13	20	20
168,000		16	20	20
177,000		19	20	20
183,000		20	20	21
243,000	20	20	20	21



PLAN VIEW

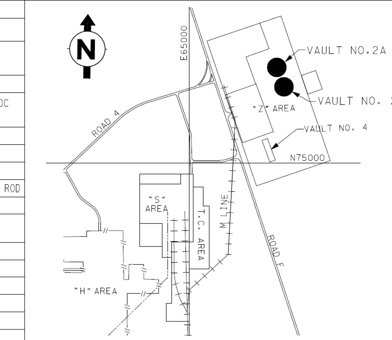


SHEET DRAIN INSTALLATION DETAIL
ELEV (NTS)



PERIMETER DRAIN INSTALLATION DETAIL
ELEV (NTS)

BILL OF MATERIAL		
ITEM	QTY PER VAULT	DESCRIPTION
1	AS REQ'D	3/8"HILTI KB-TZ ANCHORS (CARBON STEEL) WITH FENDER WASHER (SEE NOTE 3)
2	450'	12" DIA. PIPE, CPVC SCH 40, ASTM D1785
3	1	24" CPVC TEE MNFLD ASSY, SCH 40, #C-404-240C BY SPEARS MANUFACTURING CO.
4	NA	(NOT USED)
5	6	12"-45° SCH 40 ELBOW, SOCKET, ASTM F1866
6	3	12"-30° SCH 40 ELBOW, SOCKET, ASTM F1866
7	10	1 1/4" DIA. STUD, ASTM A193 B7 OR CONT. THRD'D ROD
8	20	1 1/4" NUT, ASTM A194-2H
9	1	24" CPVC FLANGE VAN STONE STYLE PART NO. 854-240FP BY SPEARS MANUF CO.
10	8	UNIVERSAL TEE FITTING (FOR SHEET DRAIN)
11	20	1 1/4"-7 JAM NUT McMASTER-CARR #91851A660
12	20	FULL FACE HARDEN WASHER, ASTM F436
13	AS REQ'D	4" SCH 40 CPVC PIPE, ASTM D1785
14	8	12"x4" SCH 40 TEE, SOCKET ASTM F1866
15	AS REQ'D	AMERDRAIN 500
16	AS REQ'D	AMERDRAIN TOTAL DRAIN
**	AS REQ'D	** SEE DET'L 1 & 3, SUPT H-1 FOR SUPT MAT'L



KEY PLAN

NOTES

1. DOWNCOMER SHALL BE ALIGNED WITH CENTERLINE OF DOWNCOMER ROOF PENETRATION (±1/2").
2. FIELD SHALL VERIFY ALL DIMENSIONS PRIOR TO COLLECTION DRAINAGE SYSTEM INSTALLATION.
3. INSTALL PERIMETER DRAIN AND SHEET DRAIN (BY AMERICAN WICK DRAIN CORPORATION, 1-800-242-WICK) IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS AND THESE NOTES. DRAIN SHEET SHALL BE ATTACHED TO CELL WALLS USING HILTI KB-TZ CARBON STEEL ANCHORS WITH 1/8" THICK FENDER WASHER (O.D.= 1 1/2"). SEE SHEET DRAIN AND PERIMETER DRAIN INSTALLATION DETAIL (PER THIS DWG) FOR ADDITIONAL DETAILS.
4. INSTALL ONE HORIZONTAL ROW OF AMERDRAIN TOTAL DRAIN AND ONE HORIZONTAL ROW OF AMERDRAIN 500 (BY AMERICAN WICK DRAIN CORP OR ENGINEERING APPROVED EQUAL) ALONG THE BOTTOM INSIDE PERIMETER OF THE TANK WALLS TO FORM A SIX FOOT HIGH PERIMETER DRAIN. SEE PERIMETER DRAIN INSTALLATION DETAIL (THIS DWG) FOR ADDITIONAL DETAILS. BOTTOM OF PERIMETER DRAIN SHALL BE FLUSH WITH CONCRETE FLOOR.
5. INSTALL (32) STANDARD 4 FT SHEET DRAINS (OR ENGINEERING APPROVED EQUAL) EQUALLY SPACED ALONG THE INSIDE TANK PERIMETER WALL FROM TOP OF 6 FT HIGH PERIMETER DRAIN TO TOP OF VAULT WALL. SEE SHEET DRAIN INSTALLATION DETAIL (PER THIS DWG) FOR ADDITIONAL DETAILS.
6. INSTALL 12"Ø CPVC PIPE (ASTM D1785) ALONG THE FLOOR OF VAULT 2A & 2B AS SHOWN ON SHEET 1 AND 2. JOIN DRAIN PIPE BY SOLVENT CEMENTING IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS (SPEAR MANUFACTURING CO. (1-818-364-1611) OR ENGINEERING APPROVED EQUAL).
7. INSTALLATION OF CONCRETE EXPANSION ANCHORS SHALL BE IN ACCORDANCE WITH DOCUMENT C-SPP-Z-00006. THE CUTTING OF REBAR IS PROHIBITED WITHOUT PRIOR WRITTEN ENGINEERING APPROVAL.
8. PLATES & BARS SHALL BE ASTM A36; W SHAPES SHALL BE ASTM A992. ALL STRUCTURAL STEEL SHALL BE GALVANIZED (UNO).
9. GROUT SHALL BE A NON SHRINK CEMENT BASED WITH A MINIMUM COMPRESSIVE STRENGTH OF 5000 PSI.
10. WELDING SHALL BE IN ACCORDANCE WITH AWS D1.1 FOR STATICALLY LOADED STRUCTURES.
11. BOLTS SHALL BE ASTM A307 GRADE A (UNO), THREADED ROD SHALL BE ASTM A36, NUTS SHALL BE ASTM A563 GRADE A (UNO), AND WASHERS SHALL BE ASTM F436 (UNO). BOLTING MATERIAL SHALL BE GALVANIZED.
12. U-BOLTS SHALL BE GALVANIZED STANDARD U-BOLTS, ANVIL 137 OR BERGEN POWER FIGURE 283 GALVANIZED. CLEARANCES BETWEEN PIPE AND U-BOLTS SHALL BE 1/16" UNO.
13. SUPPORT LOCATIONS SHALL BE BY FIELD. MAXIMUM SPAN BETWEEN SUPPORTS SHALL BE 15'-0" UNLESS NOTED OTHERWISE.
14. INSTALLATION OF FLANGES:
    a. LEVEL THE PLASTIC FLANGE BY ADJUSTING LEVELING NUTS.

C CH Z 00014 LATEST REVISION 0

0 15 30 45
1" = 15'

PROJ.	REV. NO.	REVISION	PRP'D	LEAD ENG	CHK'D/VERIF'D	APRV'D	APRV'D	APRV'D
N/A	0	ISSUED FOR CONSTRUCTION	APPROVALS MAINTAINED IN DCR/EDWS					3/10/08

REFERENCE DRAWINGS	
P-PA-Z-00017	3" GROUT FILL LINE
M-M6-Z-00100	VAULT #2 P&ID
QB00485K-013	2.9 MG STORAGE TANK
C-CG-Z-00030	VAULT#2 FINISH GRADING PLAN
C-CG-Z-00031	VAULT#2 GRADE SECTIONS & DETAILS
QB00485K-014	2.9 MG STOR. TANK SECTIONS & DET'L
C-CG-Z-00026	VAULT #2 OVERALL SITE PLAN

REFERENCE STANDARDS

UNITED STATES DEPARTMENT OF ENERGY
SAVANNAH RIVER SITE

BLDG. NO.	SITE CLEARANCE NO.	DESIGN AREA NO.	DESIGN GROUP
451-002Z	SC-5805	N/A	PD&CS

TITLE
CBU - SALTSTONE STORAGE VAULT NO. 2

DRAIN WATER COLLECTION SYSTEM
PIPING ARRANGEMENT AND
PIPE SUPPORT

SCALE	SRP DRAWING NO.	SHEET NO.	LATEST REVISION
1" = 15'	N/A	1 OF 2	0

PSC= PLOT DATE 01/17/08 TIME
DRAWN BY (ORIG): H. CRUZ
LAST CADD REV. BY: H. CRUZ DATE: 01/17/08
Scale shown on this drawing is only applicable when plotted at 30"x42" (actual drawing size)

Appendix B - Radiological and Chemical Properties

Decay rates (Tuli, 2005)

!nuclide	half_life	units
Ac-225	10	d
Ac-227	21.772	yr
Ac-228	6.15	hr
Ag-107	-1	yr
Ag-108	2.37	min
Ag-108m	438	yr
Al-26	717000	yr
Am-237	73	min
Am-241	432.2	yr
Am-242	16.02	hr
Am-242m	141	yr
Am-243	7370	yr
Am-245	2.05	hr
Am-246m	25	min
Ar-36	-1	yr
Ar-40	-1	yr
At-217	32.3	ms
At-218	1.5	s
Au-194	38.02	hr
B-10	-1	yr
Ba-134	-1	yr
Ba-135	-1	yr
Ba-137	-1	yr
Ba-137m	2.552	min
Ba-138	-1	yr
Be-10	1510000	yr
Bi-209	1.9E+19	yr
Bi-210	5.012	d
Bi-210m	3040000	yr
Bi-211	2.14	min
Bi-212	60.55	min
Bi-213	45.59	min
Bi-214	19.9	min
Bk-247	1380	yr
Bk-249	330	d

!nuclide	half_life	units
Bk-250	3.212	hr
Br-79	-1	yr
C-14	5700	yr
Ca-40	-1	yr
Ca-41	102000	yr
Ca-44	-1	yr
Cd-108	1E+18	yr
Cd-113	7.7E+15	yr
Ce-138	9E+13	yr
Ce-140	-1	yr
Ce-144	284.91	d
Cf-249	351	yr
Cf-250	13.08	yr
Cf-251	898	yr
Cf-252	2.645	yr
Cl-36	301000	yr
Cm-241	32.8	d
Cm-242	162.8	d
Cm-243	29.1	yr
Cm-244	18.1	yr
Cm-245	8500	yr
Cm-246	4760	yr
Cm-247	15600000	yr
Cm-248	348000	yr
Cm-250	8300	yr
Co-59	-1	yr
Co-60	1925.28	d
Co-60m	10.467	min
Cr-53	-1	yr
Cs-134	2.0652	yr
Cs-135	2300000	yr
Cs-137	30.03	yr
Cu-63	-1	yr
Er-166	-1	yr
Es-253	20.47	d

!nuclide	half_life	units
Eu-151	-1	yr
Eu-152	13.506	yr
Eu-154	8.59	yr
Eu-155	4.753	yr
Fe-60	1500000	yr
Fr-221	4.9	min
Fr-223	22	min
Ga-68	67.71	min
Gd-152	1.08E+14	yr
Gd-154	-1	yr
Gd-155	-1	yr
Ge-68	270.95	d
H-3	12.32	yr
He-3	-1	yr
Hf-176	-1	yr
Hf-180	-1	yr
Hf-182	8900000	yr
Hg-194	444	yr
Hg-198	-1	yr
Hg-202	-1	yr
Ho-166m	1200	yr
I-129	15700000	yr
In-113	-1	yr
In-115	4.41E+14	yr
Ir-192	73.827	d
Ir-192m	241	yr
Ir-193	-1	yr
K-40	1.25E+09	yr
K-41	-1	yr
La-137	60000	yr
La-138	1.02E+11	yr
Lu-176	3.76E+10	yr
Mg-26	-1	yr
Mn-53	3740000	yr
Mo-93	4000	yr
Mo-94	-1	yr
Mo-97	-1	yr
N-14	-1	yr
Na-22	2.6027	yr
Nb-93	-1	yr
Nb-93m	16.13	yr
Nb-94	20300	yr

!nuclide	half_life	units
Nd-142	-1	yr
Nd-143	-1	yr
Nd-144	2.29E+15	yr
Ne-22	-1	yr
Ni-59	76000	yr
Ni-60	-1	yr
Ni-63	100.1	yr
Np-233	36.2	min
Np-236a	154000	yr
Np-237	2144000	yr
Np-238	2.117	d
Np-239	2.356	d
Np-240	61.9	min
Np-240m	7.22	min
Os-186	2E+15	yr
Os-187	-1	yr
Os-192	-1	yr
P-32	14.262	d
Pa-230	17.4	d
Pa-231	32760	yr
Pa-232	1.31	d
Pa-233	26.975	d
Pa-234	6.7	hr
Pa-234m	1.17	min
Pb-202	52500	yr
Pb-205	17300000	yr
Pb-206	-1	yr
Pb-207	-1	yr
Pb-208	-1	yr
Pb-209	3.253	hr
Pb-210	22.2	yr
Pb-211	36.1	min
Pb-212	10.64	hr
Pb-214	26.8	min
Pd-106	-1	yr
Pd-107	6500000	yr
Pd-108	-1	yr
Pm-147	2.6234	yr
Po-210	138.376	d
Po-211	0.516	s
Po-212	9.48E-15	yr
Po-213	3.65	us
Po-214	164.3	us
Po-215	1.781	ms
Po-216	0.145	s
Po-218	3.1	min

!nuclide	half_life	units
Pr-144	17.28	min
Pt-192	-1	yr
Pt-193	50	yr
Pt-194	-1	yr
Pu-236	2.858	yr
Pu-237	45.2	d
Pu-238	87.7	yr
Pu-239	24110	yr
Pu-240	6561	yr
Pu-241	14.29	yr
Pu-242	375000	yr
Pu-243	4.956	hr
Pu-244	80000000	yr
Pu-246	10.84	d
Ra-221	28	s
Ra-222	38	s
Ra-223	11.43	d
Ra-224	3.6319	d
Ra-225	14.9	d
Ra-226	1600	yr
Ra-228	5.75	yr
Rb-87	4.97E+10	yr
Re-186	3.7186	d
Re-186m	200000	yr
Re-187	4.12E+10	yr
Rh-106	29.8	s
Rn-217	0.54	ms
Rn-218	35	ms
Rn-219	3.96	s
Rn-220	55.6	s
Rn-222	3.8235	d
Ru-106	373.59	d
Ru-97	2.791	d
Ru-98	-1	yr
Ru-99	-1	yr
S-32	-1	yr
S-36	-1	yr
Sb-123	-1	yr
Sb-125	2.7586	yr
Sb-126	12.35	d
Sb-126m	19.15	min
Sc-44	3.97	hr
Se-79	295000	yr
Si-32	132	yr
Sm-146	1.03E+08	yr
Sm-147	1.06E+11	yr

!nuclide	half_life	units
Sm-148	7E+15	yr
Sm-151	90	yr
Sm-152	-1	yr
Sm-154	-1	yr
Sn-115	-1	yr
Sn-126	230000	yr
Sr-87	-1	yr
Sr-90	28.9	yr
Ta-180	8.154	hr
Ta-180m	1.2E+15	yr
Ta-182	114.43	d
Tc-97	4210000	yr
Tc-97m	91.4	d
Tc-98	4200000	yr
Tc-99	211100	yr
Te-123	9.2E+16	yr
Te-125	-1	yr
Te-125m	57.4	d
Te-126	-1	yr
Th-226	30.57	min
Th-227	18.68	d
Th-228	1.9116	yr
Th-229	7340	yr
Th-230	75380	yr
Th-231	25.52	hr
Th-232	1.41E+10	yr
Th-234	24.1	d
Ti-44	60	yr
Ti-49	-1	yr
Tl-202	12.23	d
Tl-205	-1	yr
Tl-206	4.2	min
Tl-207	4.77	min
Tl-208	3.053	min
Tl-209	2.161	min
Tl-210	1.3	min
U-230	20.8	d
U-232	68.9	yr
U-233	159200	yr
U-234	245500	yr
U-235	7.04E+08	yr
U-236	23420000	yr
U-237	6.75	d
U-238	4.47E+09	yr

!nuclide	half_life	units
U-240	14.1	hr
V-49	329	d
W-180	1.8E+18	yr
W-182	8.3E+18	yr

!nuclide	half_life	units
W-186	2.7E+19	yr
Xe-129	-1	yr
Y-90	64.053	hr
Zn-68	-1	yr

!nuclide	half_life	units
Zr-90	-1	yr
Zr-93	1530000	yr

Progeny and branching fractions (Tuli, 2005)

!nuclide	progeny	fraction
Ac-225	Fr-221	1
Ac-227	Th-227	0.9862
Ac-227	Fr-223	0.0138
Ac-228	Th-228	1
Ag-108	Cd-108	0.9715
Ag-108	Pd-108	0.0285
Ag-108m	Ag-108	0.087
Ag-108m	Pd-108	0.913
Al-26	Mg-26	1
Am-237	Pu-237	0.9998
Am-237	Np-233	0.0003
Am-241	Np-237	1
Am-242	Cm-242	0.827
Am-242	Pu-242	0.173
Am-242m	Am-242	0.99541
Am-242m	Np-238	0.00459
Am-243	Np-239	1
Am-245	Cm-245	1
Am-246m	Cm-246	1
At-217	Bi-213	1
At-218	Bi-214	1
Au-194	Pt-194	1
Ba-137m	Ba-137	1
Be-10	B-10	1
Bi-209	Tl-205	1
Bi-210	Po-210	1
Bi-210m	Tl-206	1
Bi-211	Tl-207	0.9972
Bi-211	Po-211	0.0028
Bi-212	Po-212	0.6406
Bi-212	Tl-208	0.3594
Bi-213	Po-213	0.9791
Bi-213	Tl-209	0.0209
Bi-214	Po-214	0.9998
Bi-214	Tl-210	0.0002
Bk-247	Am-243	1
Bk-249	Cf-249	1
Bk-249	Am-245	0.000014
Bk-250	Cf-250	1
C-14	N-14	1
Ca-41	K-41	1

!nuclide	progeny	fraction
Cd-113	In-113	1
Ce-144	Pr-144	1
Cf-249	Cm-245	1
Cf-250	Cm-246	0.9992
Cf-251	Cm-247	1
Cf-252	Cm-248	0.9691
Cl-36	Ar-36	0.981
Cl-36	S-36	0.019
Cm-241	Am-241	0.99
Cm-241	Pu-237	0.01
Cm-242	Pu-238	1
Cm-243	Pu-239	0.9971
Cm-243	Am-243	0.0029
Cm-244	Pu-240	1
Cm-245	Pu-241	1
Cm-246	Pu-242	0.9997
Cm-247	Pu-243	1
Cm-248	Pu-244	0.9161
Cm-250	Pu-246	0.18
Cm-250	Bk-250	0.08
Co-60	Ni-60	1
Co-60m	Co-60	0.9976
Co-60m	Ni-60	0.0024
Cs-134	Ba-134	1
Cs-135	Ba-135	1
Cs-137	Ba-137	1
Es-253	Bk-249	1
Eu-152	Gd-152	0.279
Eu-152	Sm-152	0.721
Eu-154	Gd-154	0.9998
Eu-154	Sm-154	0.0002
Eu-155	Gd-155	1
Fe-60	Co-60m	1
Fr-221	At-217	1
Fr-221	Ra-221	0.001
Fr-223	Ra-223	1
Ga-68	Zn-68	1
Gd-152	Sm-148	1
Ge-68	Ga-68	1
H-3	He-3	1
Hf-182	Ta-182	1

!nuclide	progeny	fraction
Hg-194	Au-194	1
Ho-166m	Er-166	1
I-129	Xe-129	1
In-115	Sn-115	1
Ir-192	Pt-192	0.9513
Ir-192	Os-192	0.0487
Ir-192m	Ir-192	1
K-40	Ca-40	0.8928
K-40	Ar-40	0.1072
La-137	Ba-137	1
La-138	Ba-138	0.656
La-138	Ce-138	0.344
Lu-176	Hf-176	1
Mn-53	Cr-53	1
Mo-93	Nb-93m	1
Na-22	Ne-22	1
Nb-93m	Nb-93	1
Nb-94	Mo-94	1
Nd-144	Ce-140	1
Ni-59	Co-59	1
Ni-63	Cu-63	1
Np-233	U-233	1
Np-236	U-236	0.873
Np-236	Pu-236	0.125
Np-236	Pa-232	0.0016
Np-237	Pa-233	1
Np-238	Pu-238	1
Np-239	Pu-239	1
Np-240	Pu-240	1
Np-240m	Pu-240	0.9988
Np-240m	Np-240	0.0012
Os-186	W-182	1
P-32	S-32	1
Pa-230	Th-230	0.916
Pa-230	U-230	0.084
Pa-231	Ac-227	1
Pa-233	U-233	1
Pa-234	U-234	1
Pa-234m	U-234	0.9984
Pa-234m	Pa-234	0.0016
Pb-202	Tl-202	1
Pb-202	Hg-198	0.01
Pb-205	Tl-205	1
Pb-209	Bi-209	1
Pb-210	Bi-210	1
Pb-211	Bi-211	1
Pb-212	Bi-212	1
Pb-214	Bi-214	1
Pd-107	Ag-107	1

!nuclide	progeny	fraction
Pm-147	Sm-147	1
Po-210	Pb-206	1
Po-211	Pb-207	1
Po-212	Pb-208	1
Po-213	Pb-209	1
Po-214	Pb-210	1
Po-215	Pb-211	1
Po-216	Pb-212	1
Po-218	Pb-214	0.9998
Po-218	At-218	0.0002
Pr-144	Nd-144	1
Pt-193	Ir-193	1
Pu-236	U-232	1
Pu-237	Np-237	1
Pu-237	U-233	0.000042
Pu-238	U-234	1
Pu-239	U-235	1
Pu-240	U-236	1
Pu-241	Am-241	1
Pu-241	U-237	0.000025
Pu-242	U-238	1
Pu-243	Am-243	1
Pu-244	U-240	0.9988
Pu-246	Am-246m	1
Ra-221	Rn-217	1
Ra-222	Rn-218	1
Ra-223	Rn-219	1
Ra-224	Rn-220	1
Ra-225	Ac-225	1
Ra-226	Rn-222	1
Ra-228	Ac-228	1
Rb-87	Sr-87	1
Re-186	Os-186	0.9253
Re-186	W-186	0.0747
Re-186m	Re-186	1
Re-187	Os-187	1
Rh-106	Pd-106	1
Rn-217	Po-213	1
Rn-218	Po-214	1
Rn-219	Po-215	1
Rn-220	Po-216	1
Rn-222	Po-218	1
Ru-106	Rh-106	1
Ru-97	Tc-97	1
Sb-125	Te-125	1
Sb-126	Te-126	1
Sb-126m	Sb-126	0.14
Sb-126m	Te-126	0.86
Sc-44	Ca-44	1

!nuclide	progeny	fraction
Se-79	Br-79	1
Si-32	P-32	1
Sm-146	Nd-142	1
Sm-147	Nd-143	1
Sm-148	Nd-144	1
Sm-151	Eu-151	1
Sn-126	Sb-126m	1
Sr-90	Y-90	1
Ta-180	Hf-180	0.86
Ta-180	W-180	0.14
Ta-182	W-182	1
Tc-97	Mo-97	1
Tc-97m	Tc-97	1
Tc-98	Ru-98	1
Tc-99	Ru-99	1
Te-123	Sb-123	1
Te-125m	Te-125	1
Th-226	Ra-222	1
Th-227	Ra-223	1
Th-228	Ra-224	1
Th-229	Ra-225	1
Th-230	Ra-226	1

!nuclide	progeny	fraction
Th-231	Pa-231	1
Th-232	Ra-228	1
Th-234	Pa-234m	1
Ti-44	Sc-44	1
Tl-202	Hg-202	1
Tl-206	Pb-206	1
Tl-207	Pb-207	1
Tl-208	Pb-208	1
Tl-209	Pb-209	1
Tl-210	Pb-210	1
U-230	Th-226	1
U-232	Th-228	1
U-233	Th-229	1
U-234	Th-230	1
U-235	Th-231	1
U-236	Th-232	1
U-237	Np-237	1
U-238	Th-234	1
U-240	Np-240m	1
V-49	Ti-49	1
Y-90	Zr-90	1
Zr-93	Nb-93m	1

Atomic and molecular weights (Tuli 2005)

element	atomic_weight
Ag	107.8682
As	74.9216
Ba	137.327
Cd	112.411
Cr	51.9961
Cu	63.546
F	18.9984032
Fe	55.845
Hg	200.59
Mn	54.938049
N	14.00674
Ni	58.6934
NO2	46.0055
NO3	62.0049
Pb	207.2
Sb	121.76
Se	78.96
U	238.0289
V	50.9415
Zn	65.39

Appendix C - Summary of Or and Tuller (2000) analysis

The key equations and relationships needed to reproduce Figure 6a in Or and Tuller (2000) are summarized below:

Matric potential

$$\mu = \frac{P}{\rho} = gH \tag{C.1}$$

Film thickness adsorbed to surface under tension

$$h(\mu) = \left[\frac{A_{svl}}{6\pi\rho\mu}\right]^{1/3} \tag{C.2}$$

Corner radius under capillary retention

$$r(\mu) = -\frac{\sigma}{\rho\mu} \tag{C.3}$$

Critical matric potential

$$\mu_c = -\frac{\sigma \cos(\gamma/2)}{\rho L \tan(\gamma/2)} \tag{C.4}$$

Critical radius of curvature ($r < r_c$)

$$r_c = \frac{L \tan(\gamma/2)}{\cos(\gamma/2)} \tag{C.5}$$

Corner area for $\mu < \mu_c$

$$A_{C1}(\mu) = r(\mu)^2 \left[\frac{1}{\tan(\gamma/2)} - \frac{\pi(180-\gamma)}{360}\right] \tag{C.6}$$

Corner area for $\mu \geq \mu_c$

$$A_{C2} = L^2 \tan(\gamma/2) \tag{C.7}$$

Film area for $\mu < \mu_c$

$$A_{F1}(\mu) = h(\mu)\left\{\beta L + 2\left[\frac{L}{\cos(\gamma/2)} - \frac{r(\mu)}{\tan(\gamma/2)}\right]\right\} \tag{C.8}$$

Film area for $\mu \geq \mu_c$

$$A_{F2}(\mu) = h(\mu)\{\beta L + 2(1-\delta)L \tan(\gamma/2)\} \tag{C.9}$$

Smooth vertical surface film flow (Tokunaga and Wan 1997; Or and Tuller 2000)

$$\bar{v} = \frac{\rho g}{3\eta} h^2 \tag{C.10}$$

Corner vertical flow (Or and Tuller 2000)

$$\bar{v} = \frac{\rho g}{\varepsilon\eta} r^2 \tag{C.11}$$

where

$$\varepsilon = \exp\left[\frac{b + d\gamma}{1 + c\gamma}\right] \tag{C.12}$$

and $b = 2.124$, $c = -0.00415$ and $d = 0.00783$ for $10° < \gamma < 150°$.

Hydraulic conductivity

$$K \equiv \bar{v} \tag{C.13}$$

Average hydraulic conductivity (velocity) for $\mu < \mu_c$

$$K_{A1} = \frac{K_F A_{F1} + K_C A_{C1}\delta}{A_{F1} + A_{C1}} \tag{C.14}$$

Average hydraulic conductivity (velocity) for $\mu \geq \mu_c$

$$K_{A1} = \frac{K_F A_{F2} + K_C A_{C2}\delta}{A_{F2} + A_{C2}} \tag{C.15}$$

Width of representative surface element

$$W = \beta L + 2L\tan(\gamma/2) \tag{C.16}$$

Effective film thickness

$$D = \frac{A_F + A_C}{W} \tag{C.17}$$

Appendix D - Details of cracked cementitious material property calculations

Vault 1/4 Wall concrete with macrocracks

Description	Symbol	Value	Units	Aperture		following Or and Tuller 2000 WRR v36 n5																			
gravitational acceleration	g	9.81	m/s^2																						
liquid density	ρ	998	kg/m^3																						
Hamaker constant	A_{svl}	-1.9E-19	J																						
surface tension	σ	0.07275	N/m																						
viscosity	η	0.001002	kg/m-s																						
ratio of pit spacing to pit depth	β	1	unitless	1																					
pit connectivity factor	δ	1	unitless																						
pit angle	γ	60	deg																						
half angle	γ/2	30	deg																						
		0.5235988	rad																						
pit depth	L	5.0E-04	m	5.0E-04																					
		0.500	mm																						
		0.020	in	flat	groove																				
width of unit element	W	1.08E-03	m	5.0E-04	5.8E-04																				
actual aperture	b	1.27E-03	m																						
		0.05	in																						
		50	mil																						
		1.27	mm																						
		1270	micron																						
saturated conductivity	K_{sat}	1.3E+00	m/s																						
		1.3E+02	cm/s																						
critical radius of curvature	r_c	3.33E-04	m																						
critical matric potential for grooves	μ_c	-2.187E-01	J/kg	-2.229 cm																					
critical matric potential for aperture	2σ/ρb	-1.148E-01	J/kg	-1.170 cm					discontinuity in area																
prescribed/chosen matric potential	μ	-2.20E-01	J/kg		-1.0E-02	-1.14E-01	-1.16E-01	-1.67E-01	-2.18E-01	-2.19E-01	-5.00E-01	-1.1E+00	-2.3E+00	-5.0E+00	-1.1E+01	-2.3E+01	-5.0E+01	-1.1E+02	-2.3E+02	-5.0E+02	-1.1E+03	-2.3E+03	-5.0E+03	-1.1E+04	-2.3E+04
less than critical potential?	$\mu<\mu_c$?	yes			yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
more than critical potential?	$\mu>=\mu_c$?	yes			yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
pressure	P	-2.20E+02	Pa		-1.0E+01	-1.1E+02	-1.2E+02	-1.7E+02	-2.2E+02	-2.2E+02	-5.0E+02	-1.1E+03	-2.3E+03	-5.0E+03	-1.1E+04	-2.3E+04	-5.0E+04	-1.1E+05	-2.3E+05	-5.0E+05	-1.1E+06	-2.3E+06	-5.0E+06	-1.1E+07	-2.3E+07
head	H	-2.24E-02	m	1.0E-04	-1.0E-03	-1.2E-02	-1.2E-02	-1.7E-02	-2.2E-02	-2.2E-02	-5.1E-02	-1.1E-01	-2.4E-01	-5.1E-01	-1.1E+00	-2.4E+00	-5.1E+00	-1.1E+01	-2.4E+01	-5.1E+01	-1.1E+02	-2.4E+02	-5.1E+02	-1.1E+03	-2.4E+03
		-2.24	cm	1.0E-02	1.0E-01	1.2E+00	1.2E+00	1.70E+00	2.22E+00	2.23E+00	5.1E+00	1.1E+01	2.4E+01	5.1E+01	1.1E+02	2.4E+02	5.1E+02	1.1E+03	2.4E+03	5.1E+03	1.1E+04	2.4E+04	5.1E+04	1.1E+05	2.4E+05
		-0.07	ft	3.3E-04	3.3E-03	3.8E-02	3.9E-02	5.6E-02	7.3E-02	7.3E-02	1.7E-01	3.6E-01	7.8E-01	1.7E+00	3.6E+00	7.8E+00	1.7E+01	3.6E+01	7.8E+01	1.7E+02	3.6E+02	7.8E+02	1.7E+03	3.6E+03	7.8E+03
film thickness	h	3.58E-08	m		1.0E-07	4.5E-08	4.4E-08	3.9E-08	3.6E-08	3.6E-08	2.7E-08	2.1E-08	1.6E-08	1.3E-08	9.8E-09	7.6E-09	5.9E-09	4.5E-09	3.5E-09	2.7E-09	2.1E-09	1.6E-09	1.3E-09	9.8E-10	7.6E-10
corner radius	r	3.31E-04	m		3.3E-04	3.3E-04	3.3E-04	3.3E-04	3.3E-04	3.3E-04	1.5E-04	6.8E-05	3.1E-05	1.5E-05	6.8E-06	3.1E-06	1.5E-06	6.8E-07	3.1E-07	1.5E-07	6.8E-08	3.1E-08	1.5E-08	6.8E-09	3.1E-09
corner area	A_C	7.52E-08	m^2		1.4E-07	1.4E-07	1.4E-07	1.4E-07	1.4E-07	7.6E-08	1.5E-08	3.1E-09	6.8E-10	1.5E-10	3.1E-11	6.8E-12	1.5E-12	3.1E-13	6.8E-14	1.5E-14	3.1E-15	6.8E-16	1.5E-16	3.1E-17	6.8E-18
film area	A_F	1.82E-11	m^2		5.0E-11	2.2E-11	2.2E-11	2.0E-11	1.8E-11	1.8E-11	3.1E-11	3.0E-11	2.5E-11	2.0E-11	1.6E-11	1.2E-11	9.7E-12	7.5E-12	5.8E-12	4.5E-12	3.5E-12	2.7E-12	2.1E-12	1.6E-12	1.3E-12
corner flow "conductivity" (velocity)	K_C	3.39E-02	m/s		3.4E-02	3.4E-02	3.4E-02	3.4E-02	3.4E-02	3.4E-02	6.6E-03	1.4E-03	3.0E-04	6.6E-05	1.4E-05	3.0E-06	6.6E-07	1.4E-07	3.0E-08	6.6E-09	1.4E-09	3.0E-10	6.6E-11	1.4E-11	3.0E-12
film flow "conductivity" (velocity)	K_F	4.18E-09	m/s		3.3E-08	6.5E-09	6.4E-09	5.0E-09	4.2E-09	4.2E-09	2.4E-09	1.4E-09	8.7E-10	5.2E-10	3.1E-10	1.9E-10	1.1E-10	6.7E-11	4.0E-11	2.4E-11	1.4E-11	8.7E-12	5.2E-12	3.1E-12	1.9E-12
average "conductivity" (velocity)	K_A	3.39E-02	m/s		3.4E-02	3.4E-02	3.4E-02	3.4E-02	3.4E-02	3.4E-02	6.6E-03	1.4E-03	2.9E-04	5.8E-05	9.4E-06	1.1E-06	8.6E-08	5.7E-09	3.9E-10	4.5E-11	1.6E-11	8.8E-12	5.2E-12	3.1E-12	1.9E-12
effective film thickness	D	6.98E-05	m		1.3E-04	1.3E-04	1.3E-04	1.3E-04	1.3E-04	7.0E-05	1.4E-05	2.9E-06	6.5E-07	1.5E-07	4.4E-08	1.8E-08	1.0E-08	7.3E-09	5.5E-09	4.2E-09	3.2E-09	2.5E-09	1.9E-09	1.5E-09	1.2E-09
suction potential	−μ	2.20E-01	J/kg		1.0E-02	1.1E-01	1.2E-01	1.7E-01	2.2E-01	2.2E-01	5.0E-01	1.1E+00	2.3E+00	5.0E+00	1.1E+01	2.3E+01	5.0E+01	1.1E+02	2.3E+02	5.0E+02	1.1E+03	2.3E+03	5.0E+03	1.1E+04	2.3E+04
critical aperture for liquid-filled gap	b	6.63E-04	m		1.5E-02	1.3E-03	1.3E-03	8.7E-04	6.7E-04	6.7E-04	2.9E-04	1.4E-04	6.3E-05	2.9E-05	1.4E-05	6.3E-06	2.9E-06	1.4E-06	6.3E-07	2.9E-07	1.4E-07	6.3E-08	2.9E-08	1.4E-08	6.3E-09
		0.7	mm		1.5E+01	1.3E+00	1.3E+00	8.7E-01	6.7E-01	6.7E-01	2.9E-01	1.4E-01	6.3E-02	2.9E-02	1.4E-02	6.3E-03	2.9E-03	1.4E-03	6.3E-04	2.9E-04	1.4E-04	6.3E-05	2.9E-05	1.4E-05	6.3E-06
		0.03	in		5.7E-01	5.1E-02	5.0E-02	3.4E-02	2.6E-02	2.6E-02	1.1E-02	5.3E-03	2.5E-03	1.1E-03	5.3E-04	2.5E-04	1.1E-04	5.3E-05	2.5E-05	1.1E-05	5.3E-06	2.5E-06	1.1E-06	5.3E-07	2.5E-07
flowrate through crack	Q	2.55E-09	m^3/s		5.0E-09	5.0E-09	5.0E-09	5.0E-09	5.0E-09	2.6E-09	9.6E-11	4.4E-12	2.1E-13	9.6E-15	4.4E-16	2.1E-17	9.6E-19	4.5E-20	2.3E-21	2.0E-22	5.5E-23	2.4E-23	1.1E-23	5.1E-24	2.3E-24
sanity check	K_ADW	2.55E-09	m^3/s																						
porosity	n	1	for aperture																						
saturation	S		for apertu	1	1.0E+00	1.0E+00	2.1E-01	2.1E-01	2.1E-01	1.1E-01	2.1E-02	4.6E-03	1.0E-03	2.4E-04	6.9E-05	2.8E-05	1.6E-05	1.1E-05	8.6E-06	6.6E-06	5.1E-06	3.9E-06	3.1E-06	2.4E-06	1.8E-06
relative permeability	k_r		for apertu	1	1.0E+00	1.0E+00	5.5E-03	5.5E-03	5.5E-03	2.9E-03	1.1E-04	4.9E-06	2.3E-07	1.1E-08	4.9E-10	2.3E-11	1.1E-12	5.0E-14	2.6E-15	2.3E-16	6.1E-17	2.6E-17	1.2E-17	5.6E-18	2.6E-18
unsaturated conductivity	K_{unsat}		cm/s	1.3E+02	1.3E+02	1.3E+02	7.2E-01	7.2E-01	7.2E-01	3.8E-01	1.4E-02	6.5E-04	3.0E-05	1.4E-06	6.5E-08	3.0E-09	1.4E-10	6.6E-12	3.4E-13	3.0E-14	8.0E-15	3.5E-15	1.6E-15	7.4E-16	3.4E-16
Description	**Symbol**	**Value**	**Units**	**Matrix**				initial / intact / undegraded																	
spacing between fractures	B	1	m																						
		100	cm																						
saturated matrix conductivity	K_{matrix}	3.1E-12	m/s																						
		3.1E-10	cm/s																						
porosity	n	0.18																							
head	H	-2.24	cm	1.00E-02	1.02E-01	1.16E+00	1.18E+00	1.70E+00	2.22E+00	2.23E+00	5.10E+00	1.10E+01	2.37E+01	5.10E+01	1.10E+02	2.37E+02	5.10E+02	1.10E+03	2.37E+03	5.10E+03	1.10E+04	2.37E+04	5.10E+04	1.10E+05	2.37E+05
saturation	S			1	1	1	1	1	1	1	1	1	1	1	1	1	0.999999	0.999996	0.999984	0.999929	0.999685	0.998601	0.993831	0.973441	0.896172
relative permeability	k_r			1	0.999999	0.99999	0.999989	0.999985	0.999981	0.999981	0.999959	0.999915	0.999821	0.999641	0.999252	0.998427	0.996854	0.993541	0.9867	0.972651	0.943928	0.885927	0.772055	0.566345	0.27576
unsaturated conductivity	K_{unsat}		cm/s	3.1E-10	3.1E-10	3.1E-10	3.1E-10	3.1E-10	3.1E-10	3.1E-10	3.1E-10	3.1E-10	3.1E-10	3.1E-10	3.1E-10	3.1E-10	3.1E-10	3.1E-10	3.1E-10	3.0E-10	2.9E-10	2.7E-10	2.4E-10	1.8E-10	8.5E-11
Description	**Symbol**	**Value**	**Units**	**Fractured Porous Medium**				combining matrix and fracture																	
aperture+matrix thickness	b+B	1.00127	m																						
saturated conductivity	K_{sat}	1.67E-03	m/s																						
		1.67E-01	cm/s																						
porosity	n	0.1810401																							
head	H		cm	1.00E-02	1.02E-01	1.16E+00	1.18E+00	1.70E+00	2.22E+00	2.23E+00	5.10E+00	1.10E+01	2.37E+01	5.10E+01	1.10E+02	2.37E+02	5.10E+02	1.10E+03	2.37E+03	5.10E+03	1.10E+04	2.37E+04	5.10E+04	1.10E+05	2.37E+05
saturation	S			1.00E+00	1.00E+00	1.00E+00	9.94E-01	9.94E-01	9.94E-01	9.94E-01	9.93E-01	9.93E-01	9.93E-01	9.93E-01	9.93E-01	9.93E-01	9.93E-01	9.93E-01	9.93E-01	9.93E-01	9.93E-01	9.92E-01	9.87E-01	9.67E-01	8.90E-01
relative permeability	k_r			1.00E+00	1.00E+00	1.00E+00	5.52E-03	5.52E-03	5.52E-03	2.89E-03	1.06E-04	4.94E-06	2.31E-07	1.25E-08	2.35E-09	1.88E-09	1.85E-09	1.85E-09	1.83E-09	1.81E-09	1.75E-09	1.65E-09	1.43E-09	1.05E-09	5.13E-10
unsaturated conductivity	K_{unsat}		cm/s	1.7E-01	1.7E-01	1.7E-01	9.2E-04	9.2E-04	9.2E-04	4.8E-04	1.8E-05	8.2E-07	3.8E-08	2.1E-09	3.9E-10	3.1E-10	3.1E-10	3.1E-10	3.1E-10	3.0E-10	2.9E-10	2.7E-10	2.4E-10	1.8E-10	8.5E-11
head	H		cm					1.00E-02	1.02E-01	2.23E+00	5.10E+00	1.10E+01	2.37E+01	5.10E+01	1.10E+02	2.37E+02	5.10E+02	1.10E+03	2.37E+03	5.10E+03	1.10E+04	2.37E+04	5.10E+04	1.10E+05	2.37E+05
saturation	S							1.000E+00	1.000E+00	9.9377E-01	9.9314E-01	9.9303E-01	9.9300E-01	9.9300E-01	9.9299E-01	9.9299E-01	9.9299E-01	9.9299E-01	9.9298E-01	9.9292E-01	9.9268E-01	9.9161E-01	9.8687E-01	9.6662E-01	8.8989E-01
relative permeability	k_r							1.00E+00	1.00E+00	2.89E-03	1.06E-04	4.94E-06	2.31E-07	1.25E-08	2.35E-09	1.88E-09	1.85E-09	1.85E-09	1.83E-09	1.81E-09	1.75E-09	1.65E-09	1.43E-09	1.05E-09	5.13E-10
unsaturated conductivity	K_{unsat}		cm/s					1.7E-01	1.7E-01	4.8E-04	1.8E-05	8.2E-07	3.8E-08	2.1E-09	3.9E-10	3.1E-10	3.1E-10	3.1E-10	3.1E-10	3.0E-10	2.9E-10	2.7E-10	2.4E-10	1.8E-10	8.5E-11

Saltstone grout with microcracks

Description	Symbol	Value	Units	Aperture		following Or and Tuller 2000 WRR v36 n5																			
gravitational acceleration	g	9.81	m/s^2
liquid density	ρ	998	kg/m^3
Hamaker constant	A_{svl}	-1.9E-19	J
surface tension	σ	0.07275	N/m
viscosity	η	0.001002	kg/m-s
ratio of pit spacing to pit depth	β	1	unitless	1
pit connectivity factor	δ	1	unitless
pit angle	γ	60	deg
half angle	γ/2	30	deg
		0.5235988	rad
pit depth	L	5.0E-05	m	5.0E-04
		0.050	mm
		0.002	in	flat	groove
width of unit element	W	1.08E-04	m	5.0E-05	5.8E-05
actual aperture	b	1.27E-04	m
		0.005	in
		5	mil
		0.127	mm
		127	micron
saturated conductivity	K_{sat}	1.3E-02	m/s
		1.3E+00	cm/s
critical radius of curvature	r_c	3.33E-05	m
critical matric potential for grooves	μ_c	-2.187E+00	J/kg	-22.292 cm
critical matric potential for aperture	2σ/ρb	-1.148E+00	J/kg	-11.702 cm					discontinuity in area
prescribed/chosen matric potential	μ	-2.20E-01	J/kg		-1.0E-01	-1.14E+00	-1.16E+00	-1.67E+00	-2.18E+00	-2.19E+00	-5.00E+00	-1.1E+01	-2.3E+01	-5.0E+01	-1.1E+02	-2.3E+02	-5.0E+02	-1.1E+03	-2.3E+03	-5.0E+03	-1.1E+04	-2.3E+04	-5.0E+04	-1.1E+05	-2.3E+05
less than critical potential?	$\mu<\mu_c$?	yes			yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
more than critical potential?	$\mu>=\mu_c$?	yes			yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
pressure	P	-2.20E+02	Pa		-1.0E+02	-1.1E+03	-1.2E+03	-1.7E+03	-2.2E+03	-2.2E+03	-5.0E+03	-1.1E+04	-2.3E+04	-5.0E+04	-1.1E+05	-2.3E+05	-5.0E+05	-1.1E+06	-2.3E+06	-5.0E+06	-1.1E+07	-2.3E+07	-5.0E+07	-1.1E+08	-2.3E+08
head	H	-2.24E-02	m	1.0E-03	-1.0E-02	-1.2E-01	-1.2E-01	-1.7E-01	-2.2E-01	-2.2E-01	-5.1E-01	-1.1E+00	-2.4E+00	-5.1E+00	-1.1E+01	-2.4E+01	-5.1E+01	-1.1E+02	-2.4E+02	-5.1E+02	-1.1E+03	-2.4E+03	-5.1E+03	-1.1E+04	-2.4E+04
		-2.24	cm	1.0E-01	1.0E+00	1.2E+01	1.2E+01	1.70E+01	2.22E+01	2.23E+01	5.1E+01	1.1E+02	2.4E+02	5.1E+02	1.1E+03	2.4E+03	5.1E+03	1.1E+04	2.4E+04	5.1E+04	1.1E+05	2.4E+05	5.1E+05	1.1E+06	2.4E+06
		-0.07	ft	3.3E-03	3.3E-02	3.8E-01	3.9E-01	5.6E-01	7.3E-01	7.3E-01	1.7E+00	3.6E+00	7.8E+00	1.7E+01	3.6E+01	7.8E+01	1.7E+02	3.6E+02	7.8E+02	1.7E+03	3.6E+03	7.8E+03	1.7E+04	3.6E+04	7.8E+04
film thickness	h	3.58E-08	m		4.7E-08	2.1E-08	2.1E-08	1.8E-08	1.7E-08	1.7E-08	1.3E-08	9.8E-09	7.6E-09	5.9E-09	4.5E-09	3.5E-09	2.7E-09	2.1E-09	1.6E-09	1.3E-09	9.8E-10	7.6E-10	5.9E-10	4.5E-10	3.5E-10
corner radius	r	3.33E-05	m		3.3E-05	3.3E-05	3.3E-05	3.3E-05	3.3E-05	3.3E-05	1.5E-05	6.8E-06	3.1E-06	1.5E-06	6.8E-07	3.1E-07	1.5E-07	6.8E-08	3.1E-08	1.5E-08	6.8E-09	3.1E-09	1.5E-09	6.8E-10	3.1E-10
corner area	A_C	1.44E-09	m^2		1.4E-09	1.4E-09	1.4E-09	1.4E-09	1.4E-09	7.6E-10	1.5E-10	3.1E-11	6.8E-12	1.5E-12	3.1E-13	6.8E-14	1.5E-14	3.1E-15	6.8E-16	1.5E-16	3.1E-17	6.8E-18	1.5E-18	3.1E-19	6.8E-20
film area	A_F	1.79E-12	m^2		2.3E-12	1.0E-12	1.0E-12	9.1E-13	8.3E-13	8.4E-13	1.5E-12	1.4E-12	1.2E-12	9.4E-13	7.4E-13	5.8E-13	4.5E-13	3.5E-13	2.7E-13	2.1E-13	1.6E-13	1.3E-13	9.7E-14	7.5E-14	5.8E-14
corner flow "conductivity" (velocity)	K_C	3.43E-04	m/s		3.4E-04	3.4E-04	3.4E-04	3.4E-04	3.4E-04	3.4E-04	6.6E-05	1.4E-05	3.0E-06	6.6E-07	1.4E-07	3.0E-08	6.6E-09	1.4E-09	3.0E-10	6.6E-11	1.4E-11	3.0E-12	6.6E-13	1.4E-13	3.0E-14
film flow "conductivity" (velocity)	K_F	4.18E-09	m/s		7.1E-09	1.4E-09	1.4E-09	1.1E-09	9.1E-10	9.0E-10	5.2E-10	3.1E-10	1.9E-10	1.1E-10	6.7E-11	4.0E-11	2.4E-11	1.4E-11	8.7E-12	5.2E-12	3.1E-12	1.9E-12	1.1E-12	6.7E-13	4.0E-13
average "conductivity" (velocity)	K_A	3.43E-04	m/s		3.4E-04	3.4E-04	3.4E-04	3.4E-04	3.4E-04	3.4E-04	6.5E-05	1.4E-05	2.6E-06	4.0E-07	4.2E-08	3.2E-09	2.3E-10	2.7E-11	9.4E-12	5.2E-12	3.1E-12	1.9E-12	1.1E-12	6.7E-13	4.0E-13
effective film thickness	D	1.34E-05	m		1.3E-05	1.3E-05	1.3E-05	1.3E-05	1.3E-05	7.1E-06	1.4E-06	3.0E-07	7.4E-08	2.2E-08	9.8E-09	6.0E-09	4.3E-09	3.3E-09	2.5E-09	1.9E-09	1.5E-09	1.2E-09	9.0E-10	7.0E-10	5.4E-10
suction potential	−μ	2.20E-01	J/kg		1.0E-01	1.1E+00	1.2E+00	1.7E+00	2.2E+00	2.2E+00	5.0E+00	1.1E+01	2.3E+01	5.0E+01	1.1E+02	2.3E+02	5.0E+02	1.1E+03	2.3E+03	5.0E+03	1.1E+04	2.3E+04	5.0E+04	1.1E+05	2.3E+05
critical aperture for liquid-filled gap	b	6.63E-04	m		1.5E-03	1.3E-04	1.3E-04	8.7E-05	6.7E-05	6.7E-05	2.9E-05	1.4E-05	6.3E-06	2.9E-06	1.4E-06	6.3E-07	2.9E-07	1.4E-07	6.3E-08	2.9E-08	1.4E-08	6.3E-09	2.9E-09	1.4E-09	6.3E-10
		0.7	mm		1.5E+00	1.3E-01	1.3E-01	8.7E-02	6.7E-02	6.7E-02	2.9E-02	1.4E-02	6.3E-03	2.9E-03	1.4E-03	6.3E-04	2.9E-04	1.4E-04	6.3E-05	2.9E-05	1.4E-05	6.3E-06	2.9E-06	1.4E-06	6.3E-07
		0.03	in		5.7E-02	5.1E-03	5.0E-03	3.4E-03	2.6E-03	2.6E-03	1.1E-03	5.3E-04	2.5E-04	1.1E-04	5.3E-05	2.5E-05	1.1E-05	5.3E-06	2.5E-06	1.1E-06	5.3E-07	2.5E-07	1.1E-07	5.3E-08	2.5E-08
flowrate through crack	Q	4.96E-13	m^3/s		5.0E-13	5.0E-13	5.0E-13	5.0E-13	5.0E-13	2.6E-13	9.6E-15	4.4E-16	2.1E-17	9.6E-19	4.4E-20	2.1E-21	1.1E-22	9.5E-24	2.5E-24	1.1E-24	5.1E-25	2.3E-25	1.1E-25	5.1E-26	2.3E-26
sanity check	K_ADW	4.96E-13	m^3/s
porosity	n	1	for aperture
saturation	S		for apertu	1	1.0E+00	1.0E+00	2.1E-01	2.1E-01	2.1E-01	1.1E-01	2.1E-02	4.8E-03	1.2E-03	3.5E-04	1.5E-04	9.4E-05	6.8E-05	5.1E-05	4.0E-05	3.1E-05	2.4E-05	1.8E-05	1.4E-05	1.1E-05	8.5E-06
relative permeability	k_r		for apertu	1	1.0E+00	1.0E+00	5.5E-03	5.5E-03	5.5E-03	2.9E-03	1.1E-04	4.9E-06	2.3E-07	1.1E-08	4.9E-10	2.3E-11	1.2E-12	1.1E-13	2.8E-14	1.2E-14	5.6E-15	2.6E-15	1.2E-15	5.6E-16	2.6E-16
unsaturated conductivity	K_{unsat}		cm/s	1.3E+00	1.3E+00	1.3E+00	7.2E-03	7.2E-03	7.2E-03	3.8E-03	1.4E-04	6.5E-06	3.0E-07	1.4E-08	6.5E-10	3.0E-11	1.6E-12	1.4E-13	3.7E-14	1.6E-14	7.4E-15	3.4E-15	1.6E-15	7.4E-16	3.4E-16
Description	**Symbol**	**Value**	**Units**	**Matrix**				initial / intact / undegraded
spacing between fractures	B	0.1	m
		10	cm
saturated matrix conductivity	K_{matrix}	2.0E-11	m/s
		2.0E-09	cm/s
porosity	n	0.18	
head	H	-2.24	cm	1.00E-01	1.02E+00	1.16E+01	1.18E+01	1.70E+01	2.22E+01	2.23E+01	5.10E+01	1.10E+02	2.37E+02	5.10E+02	1.10E+03	2.37E+03	5.10E+03	1.10E+04	2.37E+04	5.10E+04	1.10E+05	2.37E+05	5.10E+05	1.10E+06	2.37E+06
saturation	S			0.999999	0.999993	0.999896	0.999894	0.99984	0.999784	0.999783	0.999458	0.998743	0.997145	0.993803	0.987583	0.977848	0.965296	0.951493	0.937739	0.924693	0.912594	0.90148	0.891314	0.88203	0.873558
relative permeability	k_r			0.466138	0.337118	0.191121	0.189781	0.169304	0.154625	0.154308	0.108558	0.071298	0.040819	0.019224	0.007016	0.00194	0.000427	8.19E-05	1.47E-05	2.56E-06	4.42E-07	7.6E-08	1.3E-08	2.23E-09	3.82E-10
unsaturated conductivity	K_{unsat}		cm/s	9.3E-10	6.7E-10	3.8E-10	3.8E-10	3.4E-10	3.1E-10	3.1E-10	2.2E-10	1.4E-10	8.2E-11	3.8E-11	1.4E-11	3.9E-12	8.5E-13	1.6E-13	2.9E-14	5.1E-15	8.8E-16	1.5E-16	2.6E-17	4.5E-18	7.6E-19
Description	**Symbol**	**Value**	**Units**	**Fractured Porous Medium**			combining matrix and fracture
aperture+matrix thickness	b+B	0.100127	m
saturated conductivity	K_{sat}	1.67E-05	m/s
		1.67E-03	cm/s
porosity	n	0.1810401	
head	H		cm	1.00E-01	1.02E+00	1.16E+01	1.18E+01	1.70E+01	2.22E+01	2.23E+01	5.10E+01	1.10E+02	2.37E+02	5.10E+02	1.10E+03	2.37E+03	5.10E+03	1.10E+04	2.37E+04	5.10E+04	1.10E+05	2.37E+05	5.10E+05	1.10E+06	2.37E+06
saturation	S			1.00E+00	1.00E+00	1.00E+00	9.94E-01	9.94E-01	9.94E-01	9.94E-01	9.93E-01	9.92E-01	9.90E-01	9.87E-01	9.81E-01	9.71E-01	9.59E-01	9.45E-01	9.31E-01	9.18E-01	9.06E-01	8.95E-01	8.85E-01	8.76E-01	8.67E-01
relative permeability	k_r			1.00E+00	1.00E+00	1.00E+00	5.52E-03	5.52E-03	5.52E-03	2.89E-03	1.07E-04	5.02E-06	2.78E-07	3.37E-08	8.91E-09	2.35E-09	5.13E-10	9.83E-11	1.76E-11	3.09E-12	5.36E-13	9.37E-14	1.68E-14	3.24E-15	7.19E-16
unsaturated conductivity	K_{unsat}		cm/s	1.7E-03	1.7E-03	1.7E-03	9.2E-06	9.2E-06	9.2E-06	4.8E-06	1.8E-07	8.4E-09	4.6E-10	5.6E-11	1.5E-11	3.9E-12	8.6E-13	1.6E-13	2.9E-14	5.1E-15	8.9E-16	1.6E-16	2.8E-17	5.4E-18	1.2E-18
head	H		cm					1.00E-01	1.02E+00	2.23E+01	5.10E+01	1.10E+02	2.37E+02	5.10E+02	1.10E+03	2.37E+03	5.10E+03	1.10E+04	2.37E+04	5.10E+04	1.10E+05	2.37E+05	5.10E+05	1.10E+06	2.37E+06
saturation	S							1.000E+00	1.000E+00	9.9356E-01	9.9261E-01	9.9178E-01	9.9017E-01	9.8684E-01	9.8066E-01	9.7100E-01	9.5853E-01	9.4483E-01	9.3117E-01	9.1822E-01	9.0620E-01	8.9516E-01	8.8507E-01	8.7585E-01	8.6744E-01
relative permeability	k_r							1.00E+00	1.00E+00	2.89E-03	1.07E-04	5.02E-06	2.78E-07	3.37E-08	8.91E-09	2.35E-09	5.13E-10	9.83E-11	1.76E-11	3.09E-12	5.36E-13	9.37E-14	1.68E-14	3.24E-15	7.19E-16
unsaturated conductivity	K_{unsat}		cm/s					1.7E-03	1.7E-03	4.8E-06	1.8E-07	8.4E-09	4.6E-10	5.6E-11	1.5E-11	3.9E-12	8.6E-13	1.6E-13	2.9E-14	5.1E-15	8.9E-16	1.6E-16	2.8E-17	5.4E-18	1.2E-18

Appendix E - Material property assignments for vadose zone flow simulations

Vault 1, Case A

Material zone	Time period(s)	Start time (yr)	End time (yr)	Horizontal conductivity (cm/s)	Vertical conductivity (cm/s)	Porosity	Solid density (g/mL)	Characteristic curves
BACKFILL	TI01-TI44	0	100000	7.60E-05	4.10E-05	0.35	2.631	CcBackfill
CLEAN_GROUT	TI01-TI44	0	100000	2.00E-09	2.00E-09	0.58	2.405	Saltstone
CRACK	TI01-TI44	0	100000	2.00E-09	5.00E-15	0.58	2.405	Saltstone
FLOOR	TI01	0	50	3.11E-10	3.11E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI02	50	100	3.13E-10	3.13E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI03	100	150	3.14E-10	3.14E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI04	150	200	3.15E-10	3.15E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI05	200	250	3.17E-10	3.17E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI06	250	300	3.17E-10	3.17E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI07	300	350	3.18E-10	3.18E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI08	350	400	3.19E-10	3.19E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI09	400	450	3.20E-10	3.20E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI10	450	500	3.21E-10	3.21E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI11	500	600	3.22E-10	3.22E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI12	600	700	3.24E-10	3.24E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI13	700	800	3.25E-10	3.25E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI14	800	900	3.26E-10	3.26E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI15	900	1000	3.28E-10	3.28E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI16	1000	1200	3.29E-10	3.29E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI17	1200	1400	3.31E-10	3.31E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI18	1400	1600	3.33E-10	3.33E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI19	1600	1800	3.34E-10	3.34E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI20	1800	2000	3.36E-10	3.36E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI21	2000	2300	3.38E-10	3.38E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI22	2300	2600	3.40E-10	3.40E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI23	2600	2900	3.43E-10	3.43E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI24	2900	3200	3.45E-10	3.45E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI25	3200	3600	3.47E-10	3.47E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI26	3600	4000	3.50E-10	3.50E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI27	4000	4500	3.53E-10	3.53E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI28	4500	5000	3.56E-10	3.56E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI29	5000	5500	3.59E-10	3.59E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI30	5500	6000	3.62E-10	3.62E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI31	6000	6500	3.65E-10	3.65E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI32	6500	7000	3.68E-10	3.68E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI33	7000	7500	3.71E-10	3.71E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI34	7500	8000	3.74E-10	3.74E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI35	8000	8500	3.76E-10	3.76E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI36	8500	9000	3.79E-10	3.79E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI37	9000	9500	3.82E-10	3.82E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI38	9500	10000	3.84E-10	3.84E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI39	10000	11000	3.88E-10	3.88E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI40	11000	12000	3.93E-10	3.93E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI41	12000	15000	4.02E-10	4.02E-10	0.12	2.546	Concrete_Qhigh

Material zone	Time period(s)	Start time (yr)	End time (yr)	Horizontal conductivity (cm/s)	Vertical conductivity (cm/s)	Porosity	Solid density (g/mL)	Characteristic curves
FLOOR	TI42	15000	20000	4.21E-10	4.21E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI43	20000	50000	5.01E-10	5.01E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI44	50000	100000	7.21E-10	7.21E-10	0.12	2.546	Concrete_Qhigh
NATIVE_SOIL	TI01-TI44	0	100000	0.0003301	9.11E-05	0.39	2.656	LowerVz
ROOF	TI01	0	50	5.03E-09	5.03E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI02	50	100	5.08E-09	5.08E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI03	100	150	5.12E-09	5.12E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI04	150	200	5.16E-09	5.16E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI05	200	250	5.20E-09	5.20E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI06	250	300	5.24E-09	5.24E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI07	300	350	5.27E-09	5.27E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI08	350	400	5.30E-09	5.30E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI09	400	450	5.33E-09	5.33E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI10	450	500	5.36E-09	5.36E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI11	500	600	5.40E-09	5.40E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI12	600	700	5.46E-09	5.46E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI13	700	800	5.51E-09	5.51E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI14	800	900	5.56E-09	5.56E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI15	900	1000	5.61E-09	5.61E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI16	1000	1200	5.67E-09	5.67E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI17	1200	1400	5.74E-09	5.74E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI18	1400	1600	5.81E-09	5.81E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI19	1600	1800	5.89E-09	5.89E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI20	1800	2000	5.96E-09	5.96E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI21	2000	2300	6.05E-09	6.05E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI22	2300	2600	6.15E-09	6.15E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI23	2600	2900	6.25E-09	6.25E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI24	2900	3200	6.35E-09	6.35E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI25	3200	3600	6.46E-09	6.46E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI26	3600	4000	6.60E-09	6.60E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI27	4000	4500	6.74E-09	6.74E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI28	4500	5000	6.90E-09	6.90E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI29	5000	5500	7.07E-09	7.07E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI30	5500	6000	7.23E-09	7.23E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI31	6000	6500	7.39E-09	7.39E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI32	6500	7000	7.55E-09	7.55E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI33	7000	7500	7.72E-09	7.72E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI34	7500	8000	7.89E-09	7.89E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI35	8000	8500	8.06E-09	8.06E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI36	8500	9000	8.23E-09	8.23E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI37	9000	9500	8.41E-09	8.41E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI38	9500	10000	8.59E-09	8.59E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI39	10000	11000	8.86E-09	8.86E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI40	11000	12000	9.23E-09	9.23E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI41	12000	15000	1.00E-08	1.00E-08	0.145	2.573	Concrete_Qmedium
ROOF	TI42	15000	20000	1.19E-08	1.19E-08	0.145	2.573	Concrete_Qmedium
ROOF	TI43	20000	50000	8.77E-07	8.77E-07	0.145	2.573	Concrete_Qmedium
ROOF	TI44	50000	100000	7.60E-05	4.10E-05	0.35	2.631	CcBackfill
SALTSTONE	TI01-TI44	0	100000	2.00E-09	2.00E-09	0.58	2.405	Saltstone

Material zone	Time period(s)	Start time (yr)	End time (yr)	Horizontal conductivity (cm/s)	Vertical conductivity (cm/s)	Porosity	Solid density (g/mL)	Characteristic curves
SAND_DRAIN	TI01-TI07	0	350	0.05001	0.05001	0.417	2.661	Sand
SAND_DRAIN	TI08-TI10	350	500	0.04997	0.04997	0.417	2.661	Sand
SAND_DRAIN	TI11	500	600	0.04994	0.04994	0.4169	2.661	Sand
SAND_DRAIN	TI12	600	700	0.04991	0.04991	0.4169	2.661	Sand
SAND_DRAIN	TI13	700	800	0.04985	0.04985	0.4168	2.661	Sand
SAND_DRAIN	TI14	800	900	0.04982	0.04982	0.4168	2.661	Sand
SAND_DRAIN	TI15	900	1000	0.04975	0.04975	0.4167	2.661	Sand
SAND_DRAIN	TI16	1000	1200	0.04966	0.04966	0.4165	2.661	Sand
SAND_DRAIN	TI17	1200	1400	0.04947	0.04947	0.4163	2.661	Sand
SAND_DRAIN	TI18	1400	1600	0.04928	0.04928	0.416	2.661	Sand
SAND_DRAIN	TI19	1600	1800	0.04909	0.04909	0.4158	2.661	Sand
SAND_DRAIN	TI20	1800	2000	0.04883	0.04883	0.4154	2.661	Sand
SAND_DRAIN	TI21	2000	2300	0.04842	0.04842	0.4149	2.661	Sand
SAND_DRAIN	TI22	2300	2600	0.04795	0.04795	0.4143	2.661	Sand
SAND_DRAIN	TI23	2600	2900	0.04747	0.04747	0.4136	2.661	Sand
SAND_DRAIN	TI24	2900	3200	0.04699	0.04699	0.413	2.661	Sand
SAND_DRAIN	TI25	3200	3600	0.04626	0.04626	0.412	2.661	Sand
SAND_DRAIN	TI26	3600	4000	0.04528	0.04528	0.4107	2.661	Sand
SAND_DRAIN	TI27	4000	4500	0.04414	0.04414	0.4092	2.661	Sand
SAND_DRAIN	TI28	4500	5000	0.0429	0.0429	0.4075	2.661	Sand
SAND_DRAIN	TI29	5000	5500	0.04167	0.04167	0.4058	2.661	Sand
SAND_DRAIN	TI30	5500	6000	0.04024	0.04024	0.4039	2.661	Sand
SAND_DRAIN	TI31	6000	6500	0.03872	0.03872	0.4019	2.661	Sand
SAND_DRAIN	TI32	6500	7000	0.0372	0.0372	0.3998	2.661	Sand
SAND_DRAIN	TI33	7000	7500	0.03571	0.03571	0.3978	2.661	Sand
SAND_DRAIN	TI34	7500	8000	0.03418	0.03418	0.3958	2.661	Sand
SAND_DRAIN	TI35	8000	8500	0.03266	0.03266	0.3937	2.661	Sand
SAND_DRAIN	TI36	8500	9000	0.03114	0.03114	0.3917	2.661	Sand
SAND_DRAIN	TI37	9000	9500	0.02963	0.02963	0.3897	2.661	Sand
SAND_DRAIN	TI38	9500	10000	0.02811	0.02811	0.3876	2.661	Sand
SAND_DRAIN	TI39	10000	11000	0.02584	0.02584	0.3846	2.661	Sand
SAND_DRAIN	TI40	11000	12000	0.02281	0.02281	0.3805	2.661	Sand
SAND_DRAIN	TI41	12000	15000	0.01675	0.01675	0.3724	2.661	Sand
SAND_DRAIN	TI42	15000	20000	0.004921	0.004921	0.3565	2.661	Sand
SAND_DRAIN	TI43-TI44	20000	100000	7.60E-05	4.10E-05	0.35	2.631	CcBackfill
WALL	TI01	0	50	0.1672	0.1672	0.12	2.546	FracturedConcrete
WALL	TI02	50	100	0.1684	0.1684	0.12	2.546	FracturedConcrete
WALL	TI03	100	150	0.1695	0.1695	0.12	2.546	FracturedConcrete
WALL	TI04	150	200	0.1704	0.1704	0.12	2.546	FracturedConcrete
WALL	TI05	200	250	0.1712	0.1712	0.12	2.546	FracturedConcrete
WALL	TI06	250	300	0.172	0.172	0.12	2.546	FracturedConcrete
WALL	TI07	300	350	0.1727	0.1727	0.12	2.546	FracturedConcrete
WALL	TI08	350	400	0.1734	0.1734	0.12	2.546	FracturedConcrete
WALL	TI09	400	450	0.174	0.174	0.12	2.546	FracturedConcrete
WALL	TI10	450	500	0.1746	0.1746	0.12	2.546	FracturedConcrete
WALL	TI11	500	600	0.1755	0.1755	0.12	2.546	FracturedConcrete
WALL	TI12	600	700	0.1765	0.1765	0.12	2.546	FracturedConcrete
WALL	TI13	700	800	0.1775	0.1775	0.12	2.546	FracturedConcrete

Material zone	Time period(s)	Start time (yr)	End time (yr)	Horizontal conductivity (cm/s)	Vertical conductivity (cm/s)	Porosity	Solid density (g/mL)	Characteristic curves
WALL	TI14	800	900	0.1785	0.1785	0.12	2.546	FracturedConcrete
WALL	TI15	900	1000	0.1794	0.1794	0.12	2.546	FracturedConcrete
WALL	TI16	1000	1200	0.1805	0.1805	0.12	2.546	FracturedConcrete
WALL	TI17	1200	1400	0.1819	0.1819	0.12	2.546	FracturedConcrete
WALL	TI18	1400	1600	0.1832	0.1832	0.12	2.546	FracturedConcrete
WALL	TI19	1600	1800	0.1845	0.1845	0.12	2.546	FracturedConcrete
WALL	TI20	1800	2000	0.1858	0.1858	0.12	2.546	FracturedConcrete
WALL	TI21	2000	2300	0.1873	0.1873	0.12	2.546	FracturedConcrete
WALL	TI22	2300	2600	0.1891	0.1891	0.12	2.546	FracturedConcrete
WALL	TI23	2600	2900	0.1908	0.1908	0.12	2.546	FracturedConcrete
WALL	TI24	2900	3200	0.1925	0.1925	0.12	2.546	FracturedConcrete
WALL	TI25	3200	3600	0.1944	0.1944	0.12	2.546	FracturedConcrete
WALL	TI26	3600	4000	0.1965	0.1965	0.12	2.546	FracturedConcrete
WALL	TI27	4000	4500	0.1988	0.1988	0.12	2.546	FracturedConcrete
WALL	TI28	4500	5000	0.2013	0.2013	0.12	2.546	FracturedConcrete
WALL	TI29	5000	5500	0.2038	0.2038	0.12	2.546	FracturedConcrete
WALL	TI30	5500	6000	0.2061	0.2061	0.12	2.546	FracturedConcrete
WALL	TI31	6000	6500	0.2085	0.2085	0.12	2.546	FracturedConcrete
WALL	TI32	6500	7000	0.2108	0.2108	0.12	2.546	FracturedConcrete
WALL	TI33	7000	7500	0.2131	0.2131	0.12	2.546	FracturedConcrete
WALL	TI34	7500	8000	0.2154	0.2154	0.12	2.546	FracturedConcrete
WALL	TI35	8000	8500	0.2176	0.2176	0.12	2.546	FracturedConcrete
WALL	TI36	8500	9000	0.2199	0.2199	0.12	2.546	FracturedConcrete
WALL	TI37	9000	9500	0.2221	0.2221	0.12	2.546	FracturedConcrete
WALL	TI38	9500	10000	0.2243	0.2243	0.12	2.546	FracturedConcrete
WALL	TI39	10000	11000	0.2275	0.2275	0.12	2.546	FracturedConcrete
WALL	TI40	11000	12000	0.2318	0.2318	0.12	2.546	FracturedConcrete
WALL	TI41	12000	15000	0.2402	0.2402	0.12	2.546	FracturedConcrete
WALL	TI42	15000	20000	0.2573	0.2573	0.12	2.546	FracturedConcrete
WALL	TI43	20000	50000	0.3415	0.3415	0.12	2.546	FracturedConcrete
WALL	TI44	50000	100000	0.7433	0.7433	0.12	2.546	FracturedConcrete

Vault 1, Case C

Material zone	Time period(s)	Start time (yr)	End time (yr)	Horizontal conductivity (cm/s)	Vertical conductivity (cm/s)	Porosity	Solid density (g/mL)	Characteristic curves
BACKFILL	TI01-TI44	0	100000	7.60E-05	4.10E-05	0.35	2.631	CcBackfill
CLEAN_GROUT	TI01-TI44	0	100000	2.00E-09	2.00E-09	0.58	2.405	Saltstone
CRACK	TI01-TI44	0	100000	0.15	0.15	0.3	2.6	Gravel
FLOOR	TI01	0	50	3.11E-10	3.11E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI02	50	100	3.13E-10	3.13E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI03	100	150	3.14E-10	3.14E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI04	150	200	3.15E-10	3.15E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI05	200	250	3.17E-10	3.17E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI06	250	300	3.17E-10	3.17E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI07	300	350	3.18E-10	3.18E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI08	350	400	3.19E-10	3.19E-10	0.12	2.546	Concrete_Qhigh

Material zone	Time period(s)	Start time (yr)	End time (yr)	Horizontal conductivity (cm/s)	Vertical conductivity (cm/s)	Porosity	Solid density (g/mL)	Characteristic curves
FLOOR	TI09	400	450	3.20E-10	3.20E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI10	450	500	3.21E-10	3.21E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI11	500	600	3.22E-10	3.22E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI12	600	700	3.24E-10	3.24E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI13	700	800	3.25E-10	3.25E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI14	800	900	3.26E-10	3.26E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI15	900	1000	3.28E-10	3.28E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI16	1000	1200	3.29E-10	3.29E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI17	1200	1400	3.31E-10	3.31E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI18	1400	1600	3.33E-10	3.33E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI19	1600	1800	3.34E-10	3.34E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI20	1800	2000	3.36E-10	3.36E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI21	2000	2300	3.38E-10	3.38E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI22	2300	2600	3.40E-10	3.40E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI23	2600	2900	3.43E-10	3.43E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI24	2900	3200	3.45E-10	3.45E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI25	3200	3600	3.47E-10	3.47E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI26	3600	4000	3.50E-10	3.50E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI27	4000	4500	3.53E-10	3.53E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI28	4500	5000	3.56E-10	3.56E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI29	5000	5500	3.59E-10	3.59E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI30	5500	6000	3.62E-10	3.62E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI31	6000	6500	3.65E-10	3.65E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI32	6500	7000	3.68E-10	3.68E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI33	7000	7500	3.71E-10	3.71E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI34	7500	8000	3.74E-10	3.74E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI35	8000	8500	3.76E-10	3.76E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI36	8500	9000	3.79E-10	3.79E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI37	9000	9500	3.82E-10	3.82E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI38	9500	10000	3.84E-10	3.84E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI39	10000	11000	3.88E-10	3.88E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI40	11000	12000	3.93E-10	3.93E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI41	12000	15000	4.02E-10	4.02E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI42	15000	20000	4.21E-10	4.21E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI43	20000	50000	5.01E-10	5.01E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI44	50000	100000	7.21E-10	7.21E-10	0.12	2.546	Concrete_Qhigh
NATIVE_SOIL	TI01-TI44	0	100000	0.0003301	9.11E-05	0.39	2.656	LowerVz
ROOF	TI01	0	50	5.03E-09	5.03E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI02	50	100	5.08E-09	5.08E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI03	100	150	5.12E-09	5.12E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI04	150	200	5.16E-09	5.16E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI05	200	250	5.20E-09	5.20E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI06	250	300	5.24E-09	5.24E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI07	300	350	5.27E-09	5.27E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI08	350	400	5.30E-09	5.30E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI09	400	450	5.33E-09	5.33E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI10	450	500	5.36E-09	5.36E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI11	500	600	5.40E-09	5.40E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI12	600	700	5.46E-09	5.46E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI13	700	800	5.51E-09	5.51E-09	0.145	2.573	Concrete_Qmedium

Material zone	Time period(s)	Start time (yr)	End time (yr)	Horizontal conductivity (cm/s)	Vertical conductivity (cm/s)	Porosity	Solid density (g/mL)	Characteristic curves
ROOF	TI14	800	900	5.56E-09	5.56E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI15	900	1000	5.61E-09	5.61E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI16	1000	1200	5.67E-09	5.67E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI17	1200	1400	5.74E-09	5.74E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI18	1400	1600	5.81E-09	5.81E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI19	1600	1800	5.89E-09	5.89E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI20	1800	2000	5.96E-09	5.96E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI21	2000	2300	6.05E-09	6.05E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI22	2300	2600	6.15E-09	6.15E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI23	2600	2900	6.25E-09	6.25E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI24	2900	3200	6.35E-09	6.35E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI25	3200	3600	6.46E-09	6.46E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI26	3600	4000	6.60E-09	6.60E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI27	4000	4500	6.74E-09	6.74E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI28	4500	5000	6.90E-09	6.90E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI29	5000	5500	7.07E-09	7.07E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI30	5500	6000	7.23E-09	7.23E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI31	6000	6500	7.39E-09	7.39E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI32	6500	7000	7.55E-09	7.55E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI33	7000	7500	7.72E-09	7.72E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI34	7500	8000	7.89E-09	7.89E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI35	8000	8500	8.06E-09	8.06E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI36	8500	9000	8.23E-09	8.23E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI37	9000	9500	8.41E-09	8.41E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI38	9500	10000	8.59E-09	8.59E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI39	10000	11000	8.86E-09	8.86E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI40	11000	12000	9.23E-09	9.23E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI41	12000	15000	1.00E-08	1.00E-08	0.145	2.573	Concrete_Qmedium
ROOF	TI42	15000	20000	1.19E-08	1.19E-08	0.145	2.573	Concrete_Qmedium
ROOF	TI43	20000	50000	8.77E-07	8.77E-07	0.145	2.573	Concrete_Qmedium
ROOF	TI44	50000	100000	7.60E-05	4.10E-05	0.35	2.631	CcBackfill
SALTSTONE	TI01-TI44	0	100000	2.00E-09	2.00E-09	0.58	2.405	Saltstone
SAND_DRAIN	TI01-TI07	0	350	0.05001	0.05001	0.417	2.661	Sand
SAND_DRAIN	TI08-TI10	350	500	0.04997	0.04997	0.417	2.661	Sand
SAND_DRAIN	TI11	500	600	0.04994	0.04994	0.4169	2.661	Sand
SAND_DRAIN	TI12	600	700	0.04991	0.04991	0.4169	2.661	Sand
SAND_DRAIN	TI13	700	800	0.04985	0.04985	0.4168	2.661	Sand
SAND_DRAIN	TI14	800	900	0.04982	0.04982	0.4168	2.661	Sand
SAND_DRAIN	TI15	900	1000	0.04975	0.04975	0.4167	2.661	Sand
SAND_DRAIN	TI16	1000	1200	0.04966	0.04966	0.4165	2.661	Sand
SAND_DRAIN	TI17	1200	1400	0.04947	0.04947	0.4163	2.661	Sand
SAND_DRAIN	TI18	1400	1600	0.04928	0.04928	0.416	2.661	Sand
SAND_DRAIN	TI19	1600	1800	0.04909	0.04909	0.4158	2.661	Sand
SAND_DRAIN	TI20	1800	2000	0.04883	0.04883	0.4154	2.661	Sand
SAND_DRAIN	TI21	2000	2300	0.04842	0.04842	0.4149	2.661	Sand
SAND_DRAIN	TI22	2300	2600	0.04795	0.04795	0.4143	2.661	Sand
SAND_DRAIN	TI23	2600	2900	0.04747	0.04747	0.4136	2.661	Sand
SAND_DRAIN	TI24	2900	3200	0.04699	0.04699	0.413	2.661	Sand

Material zone	Time period(s)	Start time (yr)	End time (yr)	Horizontal conductivity (cm/s)	Vertical conductivity (cm/s)	Porosity	Solid density (g/mL)	Characteristic curves
SAND_DRAIN	TI25	3200	3600	0.04626	0.04626	0.412	2.661	Sand
SAND_DRAIN	TI26	3600	4000	0.04528	0.04528	0.4107	2.661	Sand
SAND_DRAIN	TI27	4000	4500	0.04414	0.04414	0.4092	2.661	Sand
SAND_DRAIN	TI28	4500	5000	0.0429	0.0429	0.4075	2.661	Sand
SAND_DRAIN	TI29	5000	5500	0.04167	0.04167	0.4058	2.661	Sand
SAND_DRAIN	TI30	5500	6000	0.04024	0.04024	0.4039	2.661	Sand
SAND_DRAIN	TI31	6000	6500	0.03872	0.03872	0.4019	2.661	Sand
SAND_DRAIN	TI32	6500	7000	0.0372	0.0372	0.3998	2.661	Sand
SAND_DRAIN	TI33	7000	7500	0.03571	0.03571	0.3978	2.661	Sand
SAND_DRAIN	TI34	7500	8000	0.03418	0.03418	0.3958	2.661	Sand
SAND_DRAIN	TI35	8000	8500	0.03266	0.03266	0.3937	2.661	Sand
SAND_DRAIN	TI36	8500	9000	0.03114	0.03114	0.3917	2.661	Sand
SAND_DRAIN	TI37	9000	9500	0.02963	0.02963	0.3897	2.661	Sand
SAND_DRAIN	TI38	9500	10000	0.02811	0.02811	0.3876	2.661	Sand
SAND_DRAIN	TI39	10000	11000	0.02584	0.02584	0.3846	2.661	Sand
SAND_DRAIN	TI40	11000	12000	0.02281	0.02281	0.3805	2.661	Sand
SAND_DRAIN	TI41	12000	15000	0.01675	0.01675	0.3724	2.661	Sand
SAND_DRAIN	TI42	15000	20000	0.004921	0.004921	0.3565	2.661	Sand
SAND_DRAIN	TI43-TI44	20000	100000	7.60E-05	4.10E-05	0.35	2.631	CcBackfill
WALL	TI01	0	50	0.1672	0.1672	0.12	2.546	FracturedConcrete
WALL	TI02	50	100	0.1684	0.1684	0.12	2.546	FracturedConcrete
WALL	TI03	100	150	0.1695	0.1695	0.12	2.546	FracturedConcrete
WALL	TI04	150	200	0.1704	0.1704	0.12	2.546	FracturedConcrete
WALL	TI05	200	250	0.1712	0.1712	0.12	2.546	FracturedConcrete
WALL	TI06	250	300	0.172	0.172	0.12	2.546	FracturedConcrete
WALL	TI07	300	350	0.1727	0.1727	0.12	2.546	FracturedConcrete
WALL	TI08	350	400	0.1734	0.1734	0.12	2.546	FracturedConcrete
WALL	TI09	400	450	0.174	0.174	0.12	2.546	FracturedConcrete
WALL	TI10	450	500	0.1746	0.1746	0.12	2.546	FracturedConcrete
WALL	TI11	500	600	0.1755	0.1755	0.12	2.546	FracturedConcrete
WALL	TI12	600	700	0.1765	0.1765	0.12	2.546	FracturedConcrete
WALL	TI13	700	800	0.1775	0.1775	0.12	2.546	FracturedConcrete
WALL	TI14	800	900	0.1785	0.1785	0.12	2.546	FracturedConcrete
WALL	TI15	900	1000	0.1794	0.1794	0.12	2.546	FracturedConcrete
WALL	TI16	1000	1200	0.1805	0.1805	0.12	2.546	FracturedConcrete
WALL	TI17	1200	1400	0.1819	0.1819	0.12	2.546	FracturedConcrete
WALL	TI18	1400	1600	0.1832	0.1832	0.12	2.546	FracturedConcrete
WALL	TI19	1600	1800	0.1845	0.1845	0.12	2.546	FracturedConcrete
WALL	TI20	1800	2000	0.1858	0.1858	0.12	2.546	FracturedConcrete
WALL	TI21	2000	2300	0.1873	0.1873	0.12	2.546	FracturedConcrete
WALL	TI22	2300	2600	0.1891	0.1891	0.12	2.546	FracturedConcrete
WALL	TI23	2600	2900	0.1908	0.1908	0.12	2.546	FracturedConcrete
WALL	TI24	2900	3200	0.1925	0.1925	0.12	2.546	FracturedConcrete
WALL	TI25	3200	3600	0.1944	0.1944	0.12	2.546	FracturedConcrete
WALL	TI26	3600	4000	0.1965	0.1965	0.12	2.546	FracturedConcrete
WALL	TI27	4000	4500	0.1988	0.1988	0.12	2.546	FracturedConcrete
WALL	TI28	4500	5000	0.2013	0.2013	0.12	2.546	FracturedConcrete
WALL	TI29	5000	5500	0.2038	0.2038	0.12	2.546	FracturedConcrete
WALL	TI30	5500	6000	0.2061	0.2061	0.12	2.546	FracturedConcrete
WALL	TI31	6000	6500	0.2085	0.2085	0.12	2.546	FracturedConcrete

Material zone	Time period(s)	Start time (yr)	End time (yr)	Horizontal conductivity (cm/s)	Vertical conductivity (cm/s)	Porosity	Solid density (g/mL)	Characteristic curves
WALL	TI32	6500	7000	0.2108	0.2108	0.12	2.546	FracturedConcrete
WALL	TI33	7000	7500	0.2131	0.2131	0.12	2.546	FracturedConcrete
WALL	TI34	7500	8000	0.2154	0.2154	0.12	2.546	FracturedConcrete
WALL	TI35	8000	8500	0.2176	0.2176	0.12	2.546	FracturedConcrete
WALL	TI36	8500	9000	0.2199	0.2199	0.12	2.546	FracturedConcrete
WALL	TI37	9000	9500	0.2221	0.2221	0.12	2.546	FracturedConcrete
WALL	TI38	9500	10000	0.2243	0.2243	0.12	2.546	FracturedConcrete
WALL	TI39	10000	11000	0.2275	0.2275	0.12	2.546	FracturedConcrete
WALL	TI40	11000	12000	0.2318	0.2318	0.12	2.546	FracturedConcrete
WALL	TI41	12000	15000	0.2402	0.2402	0.12	2.546	FracturedConcrete
WALL	TI42	15000	20000	0.2573	0.2573	0.12	2.546	FracturedConcrete
WALL	TI43	20000	50000	0.3415	0.3415	0.12	2.546	FracturedConcrete
WALL	TI44	50000	100000	0.7433	0.7433	0.12	2.546	FracturedConcrete

Vault 1, Case E

Material zone	Time period(s)	Start time (yr)	End time (yr)	Horizontal conductivity (cm/s)	Vertical conductivity (cm/s)	Porosity	Solid density (g/mL)	Characteristic curves
BACKFILL	TI01-TI44	0	100000	7.60E-05	4.10E-05	0.35	2.631	CcBackfill
CLEAN_GROUT	TI01-TI44	0	100000	0.001666	0.001666	0.58	2.405	FracturedSaltstone
CRACK	TI01-TI44	0	100000	0.001666	5.00E-15	0.58	2.405	FracturedSaltstone
FLOOR	TI01	0	50	3.11E-10	3.11E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI02	50	100	3.13E-10	3.13E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI03	100	150	3.14E-10	3.14E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI04	150	200	3.15E-10	3.15E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI05	200	250	3.17E-10	3.17E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI06	250	300	3.17E-10	3.17E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI07	300	350	3.18E-10	3.18E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI08	350	400	3.19E-10	3.19E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI09	400	450	3.20E-10	3.20E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI10	450	500	3.21E-10	3.21E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI11	500	600	3.22E-10	3.22E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI12	600	700	3.24E-10	3.24E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI13	700	800	3.25E-10	3.25E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI14	800	900	3.26E-10	3.26E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI15	900	1000	3.28E-10	3.28E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI16	1000	1200	3.29E-10	3.29E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI17	1200	1400	3.31E-10	3.31E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI18	1400	1600	3.33E-10	3.33E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI19	1600	1800	3.34E-10	3.34E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI20	1800	2000	3.36E-10	3.36E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI21	2000	2300	3.38E-10	3.38E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI22	2300	2600	3.40E-10	3.40E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI23	2600	2900	3.43E-10	3.43E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI24	2900	3200	3.45E-10	3.45E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI25	3200	3600	3.47E-10	3.47E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI26	3600	4000	3.50E-10	3.50E-10	0.12	2.546	Concrete_Qhigh

Material zone	Time period(s)	Start time (yr)	End time (yr)	Horizontal conductivity (cm/s)	Vertical conductivity (cm/s)	Porosity	Solid density (g/mL)	Characteristic curves
FLOOR	TI27	4000	4500	3.53E-10	3.53E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI28	4500	5000	3.56E-10	3.56E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI29	5000	5500	3.59E-10	3.59E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI30	5500	6000	3.62E-10	3.62E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI31	6000	6500	3.65E-10	3.65E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI32	6500	7000	3.68E-10	3.68E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI33	7000	7500	3.71E-10	3.71E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI34	7500	8000	3.74E-10	3.74E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI35	8000	8500	3.76E-10	3.76E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI36	8500	9000	3.79E-10	3.79E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI37	9000	9500	3.82E-10	3.82E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI38	9500	10000	3.84E-10	3.84E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI39	10000	11000	3.88E-10	3.88E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI40	11000	12000	3.93E-10	3.93E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI41	12000	15000	4.02E-10	4.02E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI42	15000	20000	4.21E-10	4.21E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI43	20000	50000	5.01E-10	5.01E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI44	50000	100000	7.21E-10	7.21E-10	0.12	2.546	Concrete_Qhigh
NATIVE_SOIL	TI01-TI44	0	100000	0.0003301	9.11E-05	0.39	2.656	LowerVz
ROOF	TI01	0	50	5.03E-09	5.03E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI02	50	100	5.08E-09	5.08E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI03	100	150	5.12E-09	5.12E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI04	150	200	5.16E-09	5.16E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI05	200	250	5.20E-09	5.20E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI06	250	300	5.24E-09	5.24E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI07	300	350	5.27E-09	5.27E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI08	350	400	5.30E-09	5.30E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI09	400	450	5.33E-09	5.33E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI10	450	500	5.36E-09	5.36E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI11	500	600	5.40E-09	5.40E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI12	600	700	5.46E-09	5.46E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI13	700	800	5.51E-09	5.51E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI14	800	900	5.56E-09	5.56E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI15	900	1000	5.61E-09	5.61E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI16	1000	1200	5.67E-09	5.67E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI17	1200	1400	5.74E-09	5.74E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI18	1400	1600	5.81E-09	5.81E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI19	1600	1800	5.89E-09	5.89E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI20	1800	2000	5.96E-09	5.96E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI21	2000	2300	6.05E-09	6.05E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI22	2300	2600	6.15E-09	6.15E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI23	2600	2900	6.25E-09	6.25E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI24	2900	3200	6.35E-09	6.35E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI25	3200	3600	6.46E-09	6.46E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI26	3600	4000	6.60E-09	6.60E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI27	4000	4500	6.74E-09	6.74E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI28	4500	5000	6.90E-09	6.90E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI29	5000	5500	7.07E-09	7.07E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI30	5500	6000	7.23E-09	7.23E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI31	6000	6500	7.39E-09	7.39E-09	0.145	2.573	Concrete_Qmedium

Material zone	Time period(s)	Start time (yr)	End time (yr)	Horizontal conductivity (cm/s)	Vertical conductivity (cm/s)	Porosity	Solid density (g/mL)	Characteristic curves
ROOF	TI32	6500	7000	7.55E-09	7.55E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI33	7000	7500	7.72E-09	7.72E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI34	7500	8000	7.89E-09	7.89E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI35	8000	8500	8.06E-09	8.06E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI36	8500	9000	8.23E-09	8.23E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI37	9000	9500	8.41E-09	8.41E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI38	9500	10000	8.59E-09	8.59E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI39	10000	11000	8.86E-09	8.86E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI40	11000	12000	9.23E-09	9.23E-09	0.145	2.573	Concrete_Qmedium
ROOF	TI41	12000	15000	1.00E-08	1.00E-08	0.145	2.573	Concrete_Qmedium
ROOF	TI42	15000	20000	1.19E-08	1.19E-08	0.145	2.573	Concrete_Qmedium
ROOF	TI43	20000	50000	8.77E-07	8.77E-07	0.145	2.573	Concrete_Qmedium
ROOF	TI44	50000	100000	7.60E-05	4.10E-05	0.35	2.631	CcBackfill
SALTSTONE	TI01-TI44	0	100000	0.001666	0.001666	0.58	2.405	FracturedSaltstone
SAND_DRAIN	TI01-TI07	0	350	0.05001	0.05001	0.417	2.661	Sand
SAND_DRAIN	TI08-TI10	350	500	0.04997	0.04997	0.417	2.661	Sand
SAND_DRAIN	TI11	500	600	0.04994	0.04994	0.4169	2.661	Sand
SAND_DRAIN	TI12	600	700	0.04991	0.04991	0.4169	2.661	Sand
SAND_DRAIN	TI13	700	800	0.04985	0.04985	0.4168	2.661	Sand
SAND_DRAIN	TI14	800	900	0.04982	0.04982	0.4168	2.661	Sand
SAND_DRAIN	TI15	900	1000	0.04975	0.04975	0.4167	2.661	Sand
SAND_DRAIN	TI16	1000	1200	0.04966	0.04966	0.4165	2.661	Sand
SAND_DRAIN	TI17	1200	1400	0.04947	0.04947	0.4163	2.661	Sand
SAND_DRAIN	TI18	1400	1600	0.04928	0.04928	0.416	2.661	Sand
SAND_DRAIN	TI19	1600	1800	0.04909	0.04909	0.4158	2.661	Sand
SAND_DRAIN	TI20	1800	2000	0.04883	0.04883	0.4154	2.661	Sand
SAND_DRAIN	TI21	2000	2300	0.04842	0.04842	0.4149	2.661	Sand
SAND_DRAIN	TI22	2300	2600	0.04795	0.04795	0.4143	2.661	Sand
SAND_DRAIN	TI23	2600	2900	0.04747	0.04747	0.4136	2.661	Sand
SAND_DRAIN	TI24	2900	3200	0.04699	0.04699	0.413	2.661	Sand
SAND_DRAIN	TI25	3200	3600	0.04626	0.04626	0.412	2.661	Sand
SAND_DRAIN	TI26	3600	4000	0.04528	0.04528	0.4107	2.661	Sand
SAND_DRAIN	TI27	4000	4500	0.04414	0.04414	0.4092	2.661	Sand
SAND_DRAIN	TI28	4500	5000	0.0429	0.0429	0.4075	2.661	Sand
SAND_DRAIN	TI29	5000	5500	0.04167	0.04167	0.4058	2.661	Sand
SAND_DRAIN	TI30	5500	6000	0.04024	0.04024	0.4039	2.661	Sand
SAND_DRAIN	TI31	6000	6500	0.03872	0.03872	0.4019	2.661	Sand
SAND_DRAIN	TI32	6500	7000	0.0372	0.0372	0.3998	2.661	Sand
SAND_DRAIN	TI33	7000	7500	0.03571	0.03571	0.3978	2.661	Sand
SAND_DRAIN	TI34	7500	8000	0.03418	0.03418	0.3958	2.661	Sand
SAND_DRAIN	TI35	8000	8500	0.03266	0.03266	0.3937	2.661	Sand
SAND_DRAIN	TI36	8500	9000	0.03114	0.03114	0.3917	2.661	Sand
SAND_DRAIN	TI37	9000	9500	0.02963	0.02963	0.3897	2.661	Sand
SAND_DRAIN	TI38	9500	10000	0.02811	0.02811	0.3876	2.661	Sand
SAND_DRAIN	TI39	10000	11000	0.02584	0.02584	0.3846	2.661	Sand
SAND_DRAIN	TI40	11000	12000	0.02281	0.02281	0.3805	2.661	Sand
SAND_DRAIN	TI41	12000	15000	0.01675	0.01675	0.3724	2.661	Sand
SAND_DRAIN	TI42	15000	20000	0.004921	0.004921	0.3565	2.661	Sand

Material zone	Time period(s)	Start time (yr)	End time (yr)	Horizontal conductivity (cm/s)	Vertical conductivity (cm/s)	Porosity	Solid density (g/mL)	Characteristic curves
SAND_DRAIN	TI43-TI44	20000	100000	7.60E-05	4.10E-05	0.35	2.631	CcBackfill
WALL	TI01	0	50	0.1672	0.1672	0.12	2.546	FracturedConcrete
WALL	TI02	50	100	0.1684	0.1684	0.12	2.546	FracturedConcrete
WALL	TI03	100	150	0.1695	0.1695	0.12	2.546	FracturedConcrete
WALL	TI04	150	200	0.1704	0.1704	0.12	2.546	FracturedConcrete
WALL	TI05	200	250	0.1712	0.1712	0.12	2.546	FracturedConcrete
WALL	TI06	250	300	0.172	0.172	0.12	2.546	FracturedConcrete
WALL	TI07	300	350	0.1727	0.1727	0.12	2.546	FracturedConcrete
WALL	TI08	350	400	0.1734	0.1734	0.12	2.546	FracturedConcrete
WALL	TI09	400	450	0.174	0.174	0.12	2.546	FracturedConcrete
WALL	TI10	450	500	0.1746	0.1746	0.12	2.546	FracturedConcrete
WALL	TI11	500	600	0.1755	0.1755	0.12	2.546	FracturedConcrete
WALL	TI12	600	700	0.1765	0.1765	0.12	2.546	FracturedConcrete
WALL	TI13	700	800	0.1775	0.1775	0.12	2.546	FracturedConcrete
WALL	TI14	800	900	0.1785	0.1785	0.12	2.546	FracturedConcrete
WALL	TI15	900	1000	0.1794	0.1794	0.12	2.546	FracturedConcrete
WALL	TI16	1000	1200	0.1805	0.1805	0.12	2.546	FracturedConcrete
WALL	TI17	1200	1400	0.1819	0.1819	0.12	2.546	FracturedConcrete
WALL	TI18	1400	1600	0.1832	0.1832	0.12	2.546	FracturedConcrete
WALL	TI19	1600	1800	0.1845	0.1845	0.12	2.546	FracturedConcrete
WALL	TI20	1800	2000	0.1858	0.1858	0.12	2.546	FracturedConcrete
WALL	TI21	2000	2300	0.1873	0.1873	0.12	2.546	FracturedConcrete
WALL	TI22	2300	2600	0.1891	0.1891	0.12	2.546	FracturedConcrete
WALL	TI23	2600	2900	0.1908	0.1908	0.12	2.546	FracturedConcrete
WALL	TI24	2900	3200	0.1925	0.1925	0.12	2.546	FracturedConcrete
WALL	TI25	3200	3600	0.1944	0.1944	0.12	2.546	FracturedConcrete
WALL	TI26	3600	4000	0.1965	0.1965	0.12	2.546	FracturedConcrete
WALL	TI27	4000	4500	0.1988	0.1988	0.12	2.546	FracturedConcrete
WALL	TI28	4500	5000	0.2013	0.2013	0.12	2.546	FracturedConcrete
WALL	TI29	5000	5500	0.2038	0.2038	0.12	2.546	FracturedConcrete
WALL	TI30	5500	6000	0.2061	0.2061	0.12	2.546	FracturedConcrete
WALL	TI31	6000	6500	0.2085	0.2085	0.12	2.546	FracturedConcrete
WALL	TI32	6500	7000	0.2108	0.2108	0.12	2.546	FracturedConcrete
WALL	TI33	7000	7500	0.2131	0.2131	0.12	2.546	FracturedConcrete
WALL	TI34	7500	8000	0.2154	0.2154	0.12	2.546	FracturedConcrete
WALL	TI35	8000	8500	0.2176	0.2176	0.12	2.546	FracturedConcrete
WALL	TI36	8500	9000	0.2199	0.2199	0.12	2.546	FracturedConcrete
WALL	TI37	9000	9500	0.2221	0.2221	0.12	2.546	FracturedConcrete
WALL	TI38	9500	10000	0.2243	0.2243	0.12	2.546	FracturedConcrete
WALL	TI39	10000	11000	0.2275	0.2275	0.12	2.546	FracturedConcrete
WALL	TI40	11000	12000	0.2318	0.2318	0.12	2.546	FracturedConcrete
WALL	TI41	12000	15000	0.2402	0.2402	0.12	2.546	FracturedConcrete
WALL	TI42	15000	20000	0.2573	0.2573	0.12	2.546	FracturedConcrete
WALL	TI43	20000	50000	0.3415	0.3415	0.12	2.546	FracturedConcrete
WALL	TI44	50000	100000	0.7433	0.7433	0.12	2.546	FracturedConcrete

Vault 2, Case A

Material zone	Time period(s)	Start time (yr)	End time (yr)	Horizontal conductivity (cm/s)	Vertical conductivity (cm/s)	Porosity	Solid density (g/mL)	Characteristic curves
BACKFILL	TI01-TI44	0	100000	7.60E-05	4.10E-05	0.35	2.631	CcBackfill
CLEAN_GROUT	TI01-TI44	0	100000	2.00E-09	2.00E-09	0.58	2.405	Saltstone
COLUMN	TI01-TI44	0	100000	2.00E-09	5.00E-15	0.58	2.405	Saltstone
FLOOR	TI01	0	50	9.37E-11	9.37E-11	0.11	2.494	Concrete_Qhigh
FLOOR	TI02	50	100	9.50E-11	9.50E-11	0.11	2.494	Concrete_Qhigh
FLOOR	TI03	100	150	9.62E-11	9.62E-11	0.11	2.494	Concrete_Qhigh
FLOOR	TI04	150	200	9.72E-11	9.72E-11	0.11	2.494	Concrete_Qhigh
FLOOR	TI05	200	250	9.81E-11	9.81E-11	0.11	2.494	Concrete_Qhigh
FLOOR	TI06	250	300	9.90E-11	9.90E-11	0.11	2.494	Concrete_Qhigh
FLOOR	TI07	300	350	9.98E-11	9.98E-11	0.11	2.494	Concrete_Qhigh
FLOOR	TI08	350	400	1.01E-10	1.01E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI09	400	450	1.01E-10	1.01E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI10	450	500	1.02E-10	1.02E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI11	500	600	1.03E-10	1.03E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI12	600	700	1.04E-10	1.04E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI13	700	800	1.06E-10	1.06E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI14	800	900	1.07E-10	1.07E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI15	900	1000	1.08E-10	1.08E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI16	1000	1200	1.09E-10	1.09E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI17	1200	1400	1.11E-10	1.11E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI18	1400	1600	1.13E-10	1.13E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI19	1600	1800	1.14E-10	1.14E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI20	1800	2000	1.16E-10	1.16E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI21	2000	2300	1.18E-10	1.18E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI22	2300	2600	1.21E-10	1.21E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI23	2600	2900	1.23E-10	1.23E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI24	2900	3200	1.26E-10	1.26E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI25	3200	3600	1.28E-10	1.28E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI26	3600	4000	1.32E-10	1.32E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI27	4000	4500	1.35E-10	1.35E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI28	4500	5000	1.39E-10	1.39E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI29	5000	5500	1.43E-10	1.43E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI30	5500	6000	1.47E-10	1.47E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI31	6000	6500	1.52E-10	1.52E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI32	6500	7000	1.56E-10	1.56E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI33	7000	7500	1.60E-10	1.60E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI34	7500	8000	1.65E-10	1.65E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI35	8000	8500	1.69E-10	1.69E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI36	8500	9000	1.74E-10	1.74E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI37	9000	9500	1.79E-10	1.79E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI38	9500	10000	1.84E-10	1.84E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI39	10000	11000	1.92E-10	1.92E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI40	11000	12000	2.02E-10	2.02E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI41	12000	15000	2.27E-10	2.27E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI42	15000	20000	2.90E-10	2.90E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI43	20000	50000	4.17E-06	4.17E-06	0.11	2.494	Concrete_Qhigh
FLOOR	TI44	50000	100000	0.0003301	9.11E-05	0.39	2.656	LowerVz

Material zone	Time period(s)	Start time (yr)	End time (yr)	Horizontal conductivity (cm/s)	Vertical conductivity (cm/s)	Porosity	Solid density (g/mL)	Characteristic curves
FLOOR_HDPE_GCL	TI01	0	50	5.00E-15	2.19E-11	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI02	50	100	5.00E-15	6.22E-11	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI03	100	150	5.00E-15	1.64E-10	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI04	150	200	5.00E-15	2.63E-10	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI05	200	250	5.00E-15	3.47E-10	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI06	250	300	5.00E-15	4.30E-10	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI07	300	350	5.00E-15	5.13E-10	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI08	350	400	5.00E-15	5.95E-10	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI09	400	450	5.00E-15	6.76E-10	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI10	450	500	5.00E-15	7.56E-10	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI11	500	600	5.00E-15	8.76E-10	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI12	600	700	5.00E-15	1.04E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI13	700	800	5.00E-15	1.19E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI14	800	900	5.00E-15	1.35E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI15	900	1000	5.00E-15	1.50E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI16	1000	1200	5.00E-15	1.72E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI17	1200	1400	5.00E-15	2.02E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI18	1400	1600	5.00E-15	2.31E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI19	1600	1800	5.00E-15	2.59E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI20	1800	2000	5.00E-15	2.87E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI21	2000	2300	5.00E-15	3.21E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI22	2300	2600	5.00E-15	3.60E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI23	2600	2900	5.00E-15	3.99E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI24	2900	3200	5.00E-15	4.36E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI25	3200	3600	5.00E-15	4.79E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI26	3600	4000	5.00E-15	5.25E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI27	4000	4500	5.00E-15	5.77E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI28	4500	5000	5.00E-15	6.31E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI29	5000	5500	5.00E-15	6.84E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI30	5500	6000	5.00E-15	7.35E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI31	6000	6500	5.00E-15	7.85E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI32	6500	7000	5.00E-15	8.33E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI33	7000	7500	5.00E-15	8.79E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI34	7500	8000	5.00E-15	9.25E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI35	8000	8500	5.00E-15	9.69E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI36	8500	9000	5.00E-15	1.01E-08	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI37	9000	9500	5.00E-15	1.05E-08	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI38	9500	10000	5.00E-15	1.09E-08	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI39	10000	11000	5.00E-15	1.15E-08	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI40	11000	12000	5.00E-15	1.21E-08	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI41	12000	15000	5.00E-15	1.35E-08	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI42	15000	20000	5.00E-15	1.61E-08	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI43	20000	50000	5.00E-15	2.48E-08	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI44	50000	100000	5.00E-15	3.79E-08	0.3	2.143	CcBackfill
HDPE	TI01	0	50	5.87E-10	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI02	50	100	2.30E-09	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI03	100	150	5.46E-09	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI04	150	200	8.96E-09	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI05	200	250	1.23E-08	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI06	250	300	1.56E-08	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI07	300	350	1.89E-08	5.00E-15	0.3	2.143	CcBackfill

Material zone	Time period(s)	Start time (yr)	End time (yr)	Horizontal conductivity (cm/s)	Vertical conductivity (cm/s)	Porosity	Solid density (g/mL)	Characteristic curves
HDPE	TI08	350	400	2.22E-08	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI09	400	450	2.56E-08	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI10	450	500	2.89E-08	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI11	500	600	3.38E-08	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI12	600	700	4.05E-08	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI13	700	800	4.71E-08	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI14	800	900	5.38E-08	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI15	900	1000	6.04E-08	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI16	1000	1200	7.03E-08	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI17	1200	1400	8.36E-08	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI18	1400	1600	9.69E-08	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI19	1600	1800	1.10E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI20	1800	2000	1.23E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI21	2000	2300	1.40E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI22	2300	2600	1.60E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI23	2600	2900	1.80E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI24	2900	3200	2.00E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI25	3200	3600	2.23E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI26	3600	4000	2.50E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI27	4000	4500	2.79E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI28	4500	5000	3.13E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI29	5000	5500	3.46E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI30	5500	6000	3.79E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI31	6000	6500	4.12E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI32	6500	7000	4.45E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI33	7000	7500	4.79E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI34	7500	8000	5.12E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI35	8000	8500	5.45E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI36	8500	9000	5.78E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI37	9000	9500	6.11E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI38	9500	10000	6.44E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI39	10000	11000	6.94E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI40	11000	12000	7.60E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI41	12000	15000	8.93E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI42	15000	20000	1.16E-06	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI43	20000	50000	2.32E-06	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI44	50000	100000	4.97E-06	5.00E-15	0.3	2.143	CcBackfill
LOWER_MUD_MAT	TI01-TI43	0	50000	1.00E-08	1.00E-08	0.211	2.611	Concrete_Qlow
LOWER_MUD_MAT	TI44	50000	100000	0.0003301	9.11E-05	0.39	2.656	LowerVz
NATIVE_SOIL	TI01-TI44	0	100000	0.0003301	9.11E-05	0.39	2.656	LowerVz
ROOF	TI01	0	50	9.31E-11	9.31E-11	0.11	2.494	Concrete_Qhigh
ROOF	TI02	50	100	9.33E-11	9.33E-11	0.11	2.494	Concrete_Qhigh
ROOF	TI03	100	150	9.36E-11	9.36E-11	0.11	2.494	Concrete_Qhigh
ROOF	TI04	150	200	9.40E-11	9.40E-11	0.11	2.494	Concrete_Qhigh
ROOF	TI05	200	250	9.43E-11	9.43E-11	0.11	2.494	Concrete_Qhigh
ROOF	TI06	250	300	9.47E-11	9.47E-11	0.11	2.494	Concrete_Qhigh
ROOF	TI07	300	350	9.51E-11	9.51E-11	0.11	2.494	Concrete_Qhigh
ROOF	TI08	350	400	9.55E-11	9.55E-11	0.11	2.494	Concrete_Qhigh
ROOF	TI09	400	450	9.59E-11	9.59E-11	0.11	2.494	Concrete_Qhigh

Material zone	Time period(s)	Start time (yr)	End time (yr)	Horizontal conductivity (cm/s)	Vertical conductivity (cm/s)	Porosity	Solid density (g/mL)	Characteristic curves
ROOF	TI10	450	500	9.63E-11	9.63E-11	0.11	2.494	Concrete_Qhigh
ROOF	TI11	500	600	9.69E-11	9.69E-11	0.11	2.494	Concrete_Qhigh
ROOF	TI12	600	700	9.76E-11	9.76E-11	0.11	2.494	Concrete_Qhigh
ROOF	TI13	700	800	9.84E-11	9.84E-11	0.11	2.494	Concrete_Qhigh
ROOF	TI14	800	900	9.92E-11	9.92E-11	0.11	2.494	Concrete_Qhigh
ROOF	TI15	900	1000	1.00E-10	1.00E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI16	1000	1200	1.01E-10	1.01E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI17	1200	1400	1.02E-10	1.02E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI18	1400	1600	1.04E-10	1.04E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI19	1600	1800	1.05E-10	1.05E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI20	1800	2000	1.06E-10	1.06E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI21	2000	2300	1.08E-10	1.08E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI22	2300	2600	1.10E-10	1.10E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI23	2600	2900	1.12E-10	1.12E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI24	2900	3200	1.14E-10	1.14E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI25	3200	3600	1.16E-10	1.16E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI26	3600	4000	1.18E-10	1.18E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI27	4000	4500	1.21E-10	1.21E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI28	4500	5000	1.24E-10	1.24E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI29	5000	5500	1.28E-10	1.28E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI30	5500	6000	1.31E-10	1.31E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI31	6000	6500	1.34E-10	1.34E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI32	6500	7000	1.38E-10	1.38E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI33	7000	7500	1.41E-10	1.41E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI34	7500	8000	1.45E-10	1.45E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI35	8000	8500	1.48E-10	1.48E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI36	8500	9000	1.52E-10	1.52E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI37	9000	9500	1.56E-10	1.56E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI38	9500	10000	1.60E-10	1.60E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI39	10000	11000	1.66E-10	1.66E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI40	11000	12000	1.75E-10	1.75E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI41	12000	15000	1.94E-10	1.94E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI42	15000	20000	2.41E-10	2.41E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI43-TI44	20000	100000	7.60E-05	4.10E-05	0.35	2.631	CcBackfill
ROOF_HDPE_GCL	TI01	0	50	5.00E-15	2.19E-11	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI02	50	100	5.00E-15	6.22E-11	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI03	100	150	5.00E-15	1.64E-10	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI04	150	200	5.00E-15	2.63E-10	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI05	200	250	5.00E-15	3.47E-10	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI06	250	300	5.00E-15	4.30E-10	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI07	300	350	5.00E-15	5.13E-10	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI08	350	400	5.00E-15	5.95E-10	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI09	400	450	5.00E-15	6.76E-10	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI10	450	500	5.00E-15	7.56E-10	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI11	500	600	5.00E-15	8.76E-10	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI12	600	700	5.00E-15	1.04E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI13	700	800	5.00E-15	1.19E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI14	800	900	5.00E-15	1.35E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI15	900	1000	5.00E-15	1.50E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI16	1000	1200	5.00E-15	1.72E-09	0.3	2.143	CcBackfill

Material zone	Time period(s)	Start time (yr)	End time (yr)	Horizontal conductivity (cm/s)	Vertical conductivity (cm/s)	Porosity	Solid density (g/mL)	Characteristic curves
ROOF_HDPE_GCL	TI17	1200	1400	5.00E-15	2.02E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI18	1400	1600	5.00E-15	2.31E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI19	1600	1800	5.00E-15	2.59E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI20	1800	2000	5.00E-15	2.87E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI21	2000	2300	5.00E-15	3.21E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI22	2300	2600	5.00E-15	3.60E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI23	2600	2900	5.00E-15	3.99E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI24	2900	3200	5.00E-15	4.36E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI25	3200	3600	5.00E-15	4.79E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI26	3600	4000	5.00E-15	5.25E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI27	4000	4500	5.00E-15	5.77E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI28	4500	5000	5.00E-15	6.31E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI29	5000	5500	5.00E-15	6.84E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI30	5500	6000	5.00E-15	7.35E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI31	6000	6500	5.00E-15	7.85E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI32	6500	7000	5.00E-15	8.33E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI33	7000	7500	5.00E-15	8.79E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI34	7500	8000	5.00E-15	9.25E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI35	8000	8500	5.00E-15	9.69E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI36	8500	9000	5.00E-15	1.01E-08	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI37	9000	9500	5.00E-15	1.05E-08	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI38	9500	10000	5.00E-15	1.09E-08	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI39	10000	11000	5.00E-15	1.15E-08	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI40	11000	12000	5.00E-15	1.21E-08	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI41	12000	15000	5.00E-15	1.35E-08	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI42	15000	20000	5.00E-15	1.61E-08	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI43	20000	50000	5.00E-15	2.48E-08	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI44	50000	100000	5.00E-15	3.79E-08	0.3	2.143	CcBackfill
SALTSTONE	TI01-TI44	0	100000	2.00E-09	2.00E-09	0.58	2.405	Saltstone
SAND_DRAIN	TI01-TI07	0	350	0.05001	0.05001	0.417	2.661	Sand
SAND_DRAIN	TI08-TI10	350	500	0.04997	0.04997	0.417	2.661	Sand
SAND_DRAIN	TI11	500	600	0.04994	0.04994	0.4169	2.661	Sand
SAND_DRAIN	TI12	600	700	0.04991	0.04991	0.4169	2.661	Sand
SAND_DRAIN	TI13	700	800	0.04985	0.04985	0.4168	2.661	Sand
SAND_DRAIN	TI14	800	900	0.04982	0.04982	0.4168	2.661	Sand
SAND_DRAIN	TI15	900	1000	0.04975	0.04975	0.4167	2.661	Sand
SAND_DRAIN	TI16	1000	1200	0.04966	0.04966	0.4165	2.661	Sand
SAND_DRAIN	TI17	1200	1400	0.04947	0.04947	0.4163	2.661	Sand
SAND_DRAIN	TI18	1400	1600	0.04928	0.04928	0.416	2.661	Sand
SAND_DRAIN	TI19	1600	1800	0.04909	0.04909	0.4158	2.661	Sand
SAND_DRAIN	TI20	1800	2000	0.04883	0.04883	0.4154	2.661	Sand
SAND_DRAIN	TI21	2000	2300	0.04842	0.04842	0.4149	2.661	Sand
SAND_DRAIN	TI22	2300	2600	0.04795	0.04795	0.4143	2.661	Sand
SAND_DRAIN	TI23	2600	2900	0.04747	0.04747	0.4136	2.661	Sand
SAND_DRAIN	TI24	2900	3200	0.04699	0.04699	0.413	2.661	Sand
SAND_DRAIN	TI25	3200	3600	0.04626	0.04626	0.412	2.661	Sand
SAND_DRAIN	TI26	3600	4000	0.04528	0.04528	0.4107	2.661	Sand
SAND_DRAIN	TI27	4000	4500	0.04414	0.04414	0.4092	2.661	Sand

Material zone	Time period(s)	Start time (yr)	End time (yr)	Horizontal conductivity (cm/s)	Vertical conductivity (cm/s)	Porosity	Solid density (g/mL)	Characteristic curves
SAND_DRAIN	TI28	4500	5000	0.0429	0.0429	0.4075	2.661	Sand
SAND_DRAIN	TI29	5000	5500	0.04167	0.04167	0.4058	2.661	Sand
SAND_DRAIN	TI30	5500	6000	0.04024	0.04024	0.4039	2.661	Sand
SAND_DRAIN	TI31	6000	6500	0.03872	0.03872	0.4019	2.661	Sand
SAND_DRAIN	TI32	6500	7000	0.0372	0.0372	0.3998	2.661	Sand
SAND_DRAIN	TI33	7000	7500	0.03571	0.03571	0.3978	2.661	Sand
SAND_DRAIN	TI34	7500	8000	0.03418	0.03418	0.3958	2.661	Sand
SAND_DRAIN	TI35	8000	8500	0.03266	0.03266	0.3937	2.661	Sand
SAND_DRAIN	TI36	8500	9000	0.03114	0.03114	0.3917	2.661	Sand
SAND_DRAIN	TI37	9000	9500	0.02963	0.02963	0.3897	2.661	Sand
SAND_DRAIN	TI38	9500	10000	0.02811	0.02811	0.3876	2.661	Sand
SAND_DRAIN	TI39	10000	11000	0.02584	0.02584	0.3846	2.661	Sand
SAND_DRAIN	TI40	11000	12000	0.02281	0.02281	0.3805	2.661	Sand
SAND_DRAIN	TI41	12000	15000	0.01675	0.01675	0.3724	2.661	Sand
SAND_DRAIN	TI42	15000	20000	0.004921	0.004921	0.3565	2.661	Sand
SAND_DRAIN	TI43-TI44	20000	100000	7.60E-05	4.10E-05	0.35	2.631	CcBackfill
SHEET_DRAIN	TI01-TI44	0	100000	2.00E-09	5.00E-15	0.58	2.405	Saltstone
SHOT_CRETE	TI01-TI42	0	20000	7.60E-05	7.60E-05	0.35	2.631	CcBackfill
SHOT_CRETE	TI43-TI44	20000	100000	7.60E-05	4.10E-05	0.35	2.631	CcBackfill
UPPER_MUD_MAT	TI01	0	50	9.37E-11	9.37E-11	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI02	50	100	9.50E-11	9.50E-11	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI03	100	150	9.62E-11	9.62E-11	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI04	150	200	9.72E-11	9.72E-11	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI05	200	250	9.81E-11	9.81E-11	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI06	250	300	9.90E-11	9.90E-11	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI07	300	350	9.98E-11	9.98E-11	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI08	350	400	1.01E-10	1.01E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI09	400	450	1.01E-10	1.01E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI10	450	500	1.02E-10	1.02E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI11	500	600	1.03E-10	1.03E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI12	600	700	1.04E-10	1.04E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI13	700	800	1.06E-10	1.06E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI14	800	900	1.07E-10	1.07E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI15	900	1000	1.08E-10	1.08E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI16	1000	1200	1.09E-10	1.09E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI17	1200	1400	1.11E-10	1.11E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI18	1400	1600	1.13E-10	1.13E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI19	1600	1800	1.14E-10	1.14E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI20	1800	2000	1.16E-10	1.16E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI21	2000	2300	1.18E-10	1.18E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI22	2300	2600	1.21E-10	1.21E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI23	2600	2900	1.23E-10	1.23E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI24	2900	3200	1.26E-10	1.26E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI25	3200	3600	1.28E-10	1.28E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI26	3600	4000	1.32E-10	1.32E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI27	4000	4500	1.35E-10	1.35E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI28	4500	5000	1.39E-10	1.39E-10	0.11	2.494	Concrete_Qhigh

Material zone	Time period(s)	Start time (yr)	End time (yr)	Horizontal conductivity (cm/s)	Vertical conductivity (cm/s)	Porosity	Solid density (g/mL)	Characteristic curves
UPPER_MUD_MAT	TI29	5000	5500	1.43E-10	1.43E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI30	5500	6000	1.47E-10	1.47E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI31	6000	6500	1.52E-10	1.52E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI32	6500	7000	1.56E-10	1.56E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI33	7000	7500	1.60E-10	1.60E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI34	7500	8000	1.65E-10	1.65E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI35	8000	8500	1.69E-10	1.69E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI36	8500	9000	1.74E-10	1.74E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI37	9000	9500	1.79E-10	1.79E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI38	9500	10000	1.84E-10	1.84E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI39	10000	11000	1.92E-10	1.92E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI40	11000	12000	2.02E-10	2.02E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI41	12000	15000	2.27E-10	2.27E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI42	15000	20000	2.90E-10	2.90E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI43	20000	50000	4.17E-06	4.17E-06	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI44	50000	100000	0.0003301	9.11E-05	0.39	2.656	LowerVz
WALL	TI01	0	50	9.40E-11	9.40E-11	0.11	2.494	Concrete_Qhigh
WALL	TI02	50	100	9.61E-11	9.61E-11	0.11	2.494	Concrete_Qhigh
WALL	TI03	100	150	9.79E-11	9.79E-11	0.11	2.494	Concrete_Qhigh
WALL	TI04	150	200	9.95E-11	9.95E-11	0.11	2.494	Concrete_Qhigh
WALL	TI05	200	250	1.01E-10	1.01E-10	0.11	2.494	Concrete_Qhigh
WALL	TI06	250	300	1.02E-10	1.02E-10	0.11	2.494	Concrete_Qhigh
WALL	TI07	300	350	1.04E-10	1.04E-10	0.11	2.494	Concrete_Qhigh
WALL	TI08	350	400	1.05E-10	1.05E-10	0.11	2.494	Concrete_Qhigh
WALL	TI09	400	450	1.06E-10	1.06E-10	0.11	2.494	Concrete_Qhigh
WALL	TI10	450	500	1.07E-10	1.07E-10	0.11	2.494	Concrete_Qhigh
WALL	TI11	500	600	1.09E-10	1.09E-10	0.11	2.494	Concrete_Qhigh
WALL	TI12	600	700	1.11E-10	1.11E-10	0.11	2.494	Concrete_Qhigh
WALL	TI13	700	800	1.13E-10	1.13E-10	0.11	2.494	Concrete_Qhigh
WALL	TI14	800	900	1.15E-10	1.15E-10	0.11	2.494	Concrete_Qhigh
WALL	TI15	900	1000	1.17E-10	1.17E-10	0.11	2.494	Concrete_Qhigh
WALL	TI16	1000	1200	1.20E-10	1.20E-10	0.11	2.494	Concrete_Qhigh
WALL	TI17	1200	1400	1.23E-10	1.23E-10	0.11	2.494	Concrete_Qhigh
WALL	TI18	1400	1600	1.26E-10	1.26E-10	0.11	2.494	Concrete_Qhigh
WALL	TI19	1600	1800	1.29E-10	1.29E-10	0.11	2.494	Concrete_Qhigh
WALL	TI20	1800	2000	1.33E-10	1.33E-10	0.11	2.494	Concrete_Qhigh
WALL	TI21	2000	2300	1.37E-10	1.37E-10	0.11	2.494	Concrete_Qhigh
WALL	TI22	2300	2600	1.42E-10	1.42E-10	0.11	2.494	Concrete_Qhigh
WALL	TI23	2600	2900	1.47E-10	1.47E-10	0.11	2.494	Concrete_Qhigh
WALL	TI24	2900	3200	1.52E-10	1.52E-10	0.11	2.494	Concrete_Qhigh
WALL	TI25	3200	3600	1.59E-10	1.59E-10	0.11	2.494	Concrete_Qhigh
WALL	TI26	3600	4000	1.66E-10	1.66E-10	0.11	2.494	Concrete_Qhigh
WALL	TI27	4000	4500	1.75E-10	1.75E-10	0.11	2.494	Concrete_Qhigh
WALL	TI28	4500	5000	1.85E-10	1.85E-10	0.11	2.494	Concrete_Qhigh
WALL	TI29	5000	5500	1.96E-10	1.96E-10	0.11	2.494	Concrete_Qhigh
WALL	TI30	5500	6000	2.08E-10	2.08E-10	0.11	2.494	Concrete_Qhigh
WALL	TI31	6000	6500	2.21E-10	2.21E-10	0.11	2.494	Concrete_Qhigh
WALL	TI32	6500	7000	2.36E-10	2.36E-10	0.11	2.494	Concrete_Qhigh
WALL	TI33	7000	7500	2.51E-10	2.51E-10	0.11	2.494	Concrete_Qhigh
WALL	TI34	7500	8000	2.68E-10	2.68E-10	0.11	2.494	Concrete_Qhigh
WALL	TI35	8000	8500	2.88E-10	2.88E-10	0.11	2.494	Concrete_Qhigh

Material zone	Time period(s)	Start time (yr)	End time (yr)	Horizontal conductivity (cm/s)	Vertical conductivity (cm/s)	Porosity	Solid density (g/mL)	Characteristic curves
WALL	TI36	8500	9000	3.09E-10	3.09E-10	0.11	2.494	Concrete_Qhigh
WALL	TI37	9000	9500	3.33E-10	3.33E-10	0.11	2.494	Concrete_Qhigh
WALL	TI38	9500	10000	3.60E-10	3.60E-10	0.11	2.494	Concrete_Qhigh
WALL	TI39	10000	11000	4.16E-10	4.16E-10	0.11	2.494	Concrete_Qhigh
WALL	TI40	11000	12000	5.00E-10	5.00E-10	0.11	2.494	Concrete_Qhigh
WALL	TI41	12000	15000	9.57E-10	9.57E-10	0.11	2.494	Concrete_Qhigh
WALL	TI42	15000	20000	6.00E-06	6.00E-06	0.11	2.494	Concrete_Qhigh
WALL	TI43-TI44	20000	100000	7.60E-05	4.10E-05	0.35	2.631	CcBackfill

Vault 2, Case B

Material zone	Time period(s)	Start time (yr)	End time (yr)	Horizontal conductivity (cm/s)	Vertical conductivity (cm/s)	Porosity	Solid density (g/mL)	Characteristic curves
BACKFILL	TI01-TI44	0	100000	7.60E-05	4.10E-05	0.35	2.631	CcBackfill
CLEAN_GROUT	TI01-TI44	0	100000	2.00E-09	2.00E-09	0.58	2.405	Saltstone
COLUMN	TI01-TI44	0	100000	2.00E-09	5.00E-15	0.58	2.405	Saltstone
FLOOR	TI01	0	50	9.37E-11	9.37E-11	0.11	2.494	Concrete_Qhigh
FLOOR	TI02	50	100	9.50E-11	9.50E-11	0.11	2.494	Concrete_Qhigh
FLOOR	TI03	100	150	9.62E-11	9.62E-11	0.11	2.494	Concrete_Qhigh
FLOOR	TI04	150	200	9.72E-11	9.72E-11	0.11	2.494	Concrete_Qhigh
FLOOR	TI05	200	250	9.81E-11	9.81E-11	0.11	2.494	Concrete_Qhigh
FLOOR	TI06	250	300	9.90E-11	9.90E-11	0.11	2.494	Concrete_Qhigh
FLOOR	TI07	300	350	9.98E-11	9.98E-11	0.11	2.494	Concrete_Qhigh
FLOOR	TI08	350	400	1.01E-10	1.01E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI09	400	450	1.01E-10	1.01E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI10	450	500	1.02E-10	1.02E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI11	500	600	1.03E-10	1.03E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI12	600	700	1.04E-10	1.04E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI13	700	800	1.06E-10	1.06E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI14	800	900	1.07E-10	1.07E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI15	900	1000	1.08E-10	1.08E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI16	1000	1200	1.09E-10	1.09E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI17	1200	1400	1.11E-10	1.11E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI18	1400	1600	1.13E-10	1.13E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI19	1600	1800	1.14E-10	1.14E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI20	1800	2000	1.16E-10	1.16E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI21	2000	2300	1.18E-10	1.18E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI22	2300	2600	1.21E-10	1.21E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI23	2600	2900	1.23E-10	1.23E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI24	2900	3200	1.26E-10	1.26E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI25	3200	3600	1.28E-10	1.28E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI26	3600	4000	1.32E-10	1.32E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI27	4000	4500	1.35E-10	1.35E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI28	4500	5000	1.39E-10	1.39E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI29	5000	5500	1.43E-10	1.43E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI30	5500	6000	1.47E-10	1.47E-10	0.11	2.494	Concrete_Qhigh

Material zone	Time period(s)	Start time (yr)	End time (yr)	Horizontal conductivity (cm/s)	Vertical conductivity (cm/s)	Porosity	Solid density (g/mL)	Characteristic curves
FLOOR	TI31	6000	6500	1.52E-10	1.52E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI32	6500	7000	1.56E-10	1.56E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI33	7000	7500	1.60E-10	1.60E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI34	7500	8000	1.65E-10	1.65E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI35	8000	8500	1.69E-10	1.69E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI36	8500	9000	1.74E-10	1.74E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI37	9000	9500	1.79E-10	1.79E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI38	9500	10000	1.84E-10	1.84E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI39	10000	11000	1.92E-10	1.92E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI40	11000	12000	2.02E-10	2.02E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI41	12000	15000	2.27E-10	2.27E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI42	15000	20000	2.90E-10	2.90E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI43	20000	50000	4.17E-06	4.17E-06	0.11	2.494	Concrete_Qhigh
FLOOR	TI44	50000	100000	0.0003301	9.11E-05	0.39	2.656	LowerVz
FLOOR_HDPE_GCL	TI01	0	50	5.00E-15	2.19E-11	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI02	50	100	5.00E-15	6.22E-11	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI03	100	150	5.00E-15	1.64E-10	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI04	150	200	5.00E-15	2.63E-10	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI05	200	250	5.00E-15	3.47E-10	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI06	250	300	5.00E-15	4.30E-10	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI07	300	350	5.00E-15	5.13E-10	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI08	350	400	5.00E-15	5.95E-10	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI09	400	450	5.00E-15	6.76E-10	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI10	450	500	5.00E-15	7.56E-10	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI11	500	600	5.00E-15	8.76E-10	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI12	600	700	5.00E-15	1.04E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI13	700	800	5.00E-15	1.19E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI14	800	900	5.00E-15	1.35E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI15	900	1000	5.00E-15	1.50E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI16	1000	1200	5.00E-15	1.72E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI17	1200	1400	5.00E-15	2.02E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI18	1400	1600	5.00E-15	2.31E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI19	1600	1800	5.00E-15	2.59E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI20	1800	2000	5.00E-15	2.87E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI21	2000	2300	5.00E-15	3.21E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI22	2300	2600	5.00E-15	3.60E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI23	2600	2900	5.00E-15	3.99E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI24	2900	3200	5.00E-15	4.36E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI25	3200	3600	5.00E-15	4.79E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI26	3600	4000	5.00E-15	5.25E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI27	4000	4500	5.00E-15	5.77E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI28	4500	5000	5.00E-15	6.31E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI29	5000	5500	5.00E-15	6.84E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI30	5500	6000	5.00E-15	7.35E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI31	6000	6500	5.00E-15	7.85E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI32	6500	7000	5.00E-15	8.33E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI33	7000	7500	5.00E-15	8.79E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI34	7500	8000	5.00E-15	9.25E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI35	8000	8500	5.00E-15	9.69E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI36	8500	9000	5.00E-15	1.01E-08	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI37	9000	9500	5.00E-15	1.05E-08	0.3	2.143	CcBackfill

Material zone	Time period(s)	Start time (yr)	End time (yr)	Horizontal conductivity (cm/s)	Vertical conductivity (cm/s)	Porosity	Solid density (g/mL)	Characteristic curves
FLOOR_HDPE_GCL	TI38	9500	10000	5.00E-15	1.09E-08	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI39	10000	11000	5.00E-15	1.15E-08	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI40	11000	12000	5.00E-15	1.21E-08	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI41	12000	15000	5.00E-15	1.35E-08	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI42	15000	20000	5.00E-15	1.61E-08	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI43	20000	50000	5.00E-15	2.48E-08	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI44	50000	100000	5.00E-15	3.79E-08	0.3	2.143	CcBackfill
HDPE	TI01	0	50	5.87E-10	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI02	50	100	2.30E-09	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI03	100	150	5.46E-09	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI04	150	200	8.96E-09	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI05	200	250	1.23E-08	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI06	250	300	1.56E-08	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI07	300	350	1.89E-08	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI08	350	400	2.22E-08	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI09	400	450	2.56E-08	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI10	450	500	2.89E-08	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI11	500	600	3.38E-08	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI12	600	700	4.05E-08	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI13	700	800	4.71E-08	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI14	800	900	5.38E-08	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI15	900	1000	6.04E-08	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI16	1000	1200	7.03E-08	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI17	1200	1400	8.36E-08	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI18	1400	1600	9.69E-08	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI19	1600	1800	1.10E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI20	1800	2000	1.23E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI21	2000	2300	1.40E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI22	2300	2600	1.60E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI23	2600	2900	1.80E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI24	2900	3200	2.00E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI25	3200	3600	2.23E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI26	3600	4000	2.50E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI27	4000	4500	2.79E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI28	4500	5000	3.13E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI29	5000	5500	3.46E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI30	5500	6000	3.79E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI31	6000	6500	4.12E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI32	6500	7000	4.45E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI33	7000	7500	4.79E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI34	7500	8000	5.12E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI35	8000	8500	5.45E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI36	8500	9000	5.78E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI37	9000	9500	6.11E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI38	9500	10000	6.44E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI39	10000	11000	6.94E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI40	11000	12000	7.60E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI41	12000	15000	8.93E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI42	15000	20000	1.16E-06	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI43	20000	50000	2.32E-06	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI44	50000	100000	4.97E-06	5.00E-15	0.3	2.143	CcBackfill

Material zone	Time period(s)	Start time (yr)	End time (yr)	Horizontal conductivity (cm/s)	Vertical conductivity (cm/s)	Porosity	Solid density (g/mL)	Characteristic curves
LOWER_MUD_MAT	TI01-TI43	0	50000	1.00E-08	1.00E-08	0.211	2.611	Concrete_Qlow
LOWER_MUD_MAT	TI44	50000	100000	0.0003301	9.11E-05	0.39	2.656	LowerVz
NATIVE_SOIL	TI01-TI44	0	100000	0.0003301	9.11E-05	0.39	2.656	LowerVz
ROOF	TI01	0	50	9.31E-11	9.31E-11	0.11	2.494	Concrete_Qhigh
ROOF	TI02	50	100	9.33E-11	9.33E-11	0.11	2.494	Concrete_Qhigh
ROOF	TI03	100	150	9.36E-11	9.36E-11	0.11	2.494	Concrete_Qhigh
ROOF	TI04	150	200	9.40E-11	9.40E-11	0.11	2.494	Concrete_Qhigh
ROOF	TI05	200	250	9.43E-11	9.43E-11	0.11	2.494	Concrete_Qhigh
ROOF	TI06	250	300	9.47E-11	9.47E-11	0.11	2.494	Concrete_Qhigh
ROOF	TI07	300	350	9.51E-11	9.51E-11	0.11	2.494	Concrete_Qhigh
ROOF	TI08	350	400	9.55E-11	9.55E-11	0.11	2.494	Concrete_Qhigh
ROOF	TI09	400	450	9.59E-11	9.59E-11	0.11	2.494	Concrete_Qhigh
ROOF	TI10	450	500	9.63E-11	9.63E-11	0.11	2.494	Concrete_Qhigh
ROOF	TI11	500	600	9.69E-11	9.69E-11	0.11	2.494	Concrete_Qhigh
ROOF	TI12	600	700	9.76E-11	9.76E-11	0.11	2.494	Concrete_Qhigh
ROOF	TI13	700	800	9.84E-11	9.84E-11	0.11	2.494	Concrete_Qhigh
ROOF	TI14	800	900	9.92E-11	9.92E-11	0.11	2.494	Concrete_Qhigh
ROOF	TI15	900	1000	1.00E-10	1.00E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI16	1000	1200	1.01E-10	1.01E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI17	1200	1400	1.02E-10	1.02E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI18	1400	1600	1.04E-10	1.04E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI19	1600	1800	1.05E-10	1.05E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI20	1800	2000	1.06E-10	1.06E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI21	2000	2300	1.08E-10	1.08E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI22	2300	2600	1.10E-10	1.10E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI23	2600	2900	1.12E-10	1.12E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI24	2900	3200	1.14E-10	1.14E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI25	3200	3600	1.16E-10	1.16E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI26	3600	4000	1.18E-10	1.18E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI27	4000	4500	1.21E-10	1.21E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI28	4500	5000	1.24E-10	1.24E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI29	5000	5500	1.28E-10	1.28E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI30	5500	6000	1.31E-10	1.31E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI31	6000	6500	1.34E-10	1.34E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI32	6500	7000	1.38E-10	1.38E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI33	7000	7500	1.41E-10	1.41E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI34	7500	8000	1.45E-10	1.45E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI35	8000	8500	1.48E-10	1.48E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI36	8500	9000	1.52E-10	1.52E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI37	9000	9500	1.56E-10	1.56E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI38	9500	10000	1.60E-10	1.60E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI39	10000	11000	1.66E-10	1.66E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI40	11000	12000	1.75E-10	1.75E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI41	12000	15000	1.94E-10	1.94E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI42	15000	20000	2.41E-10	2.41E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI43-TI44	20000	100000	7.60E-05	4.10E-05	0.35	2.631	CcBackfill
ROOF_HDPE_GCL	TI01	0	50	5.00E-15	2.19E-11	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI02	50	100	5.00E-15	6.22E-11	0.3	2.143	CcBackfill

Material zone	Time period(s)	Start time (yr)	End time (yr)	Horizontal conductivity (cm/s)	Vertical conductivity (cm/s)	Porosity	Solid density (g/mL)	Characteristic curves
ROOF_HDPE_GCL	TI03	100	150	5.00E-15	1.64E-10	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI04	150	200	5.00E-15	2.63E-10	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI05	200	250	5.00E-15	3.47E-10	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI06	250	300	5.00E-15	4.30E-10	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI07	300	350	5.00E-15	5.13E-10	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI08	350	400	5.00E-15	5.95E-10	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI09	400	450	5.00E-15	6.76E-10	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI10	450	500	5.00E-15	7.56E-10	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI11	500	600	5.00E-15	8.76E-10	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI12	600	700	5.00E-15	1.04E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI13	700	800	5.00E-15	1.19E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI14	800	900	5.00E-15	1.35E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI15	900	1000	5.00E-15	1.50E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI16	1000	1200	5.00E-15	1.72E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI17	1200	1400	5.00E-15	2.02E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI18	1400	1600	5.00E-15	2.31E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI19	1600	1800	5.00E-15	2.59E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI20	1800	2000	5.00E-15	2.87E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI21	2000	2300	5.00E-15	3.21E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI22	2300	2600	5.00E-15	3.60E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI23	2600	2900	5.00E-15	3.99E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI24	2900	3200	5.00E-15	4.36E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI25	3200	3600	5.00E-15	4.79E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI26	3600	4000	5.00E-15	5.25E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI27	4000	4500	5.00E-15	5.77E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI28	4500	5000	5.00E-15	6.31E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI29	5000	5500	5.00E-15	6.84E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI30	5500	6000	5.00E-15	7.35E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI31	6000	6500	5.00E-15	7.85E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI32	6500	7000	5.00E-15	8.33E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI33	7000	7500	5.00E-15	8.79E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI34	7500	8000	5.00E-15	9.25E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI35	8000	8500	5.00E-15	9.69E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI36	8500	9000	5.00E-15	1.01E-08	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI37	9000	9500	5.00E-15	1.05E-08	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI38	9500	10000	5.00E-15	1.09E-08	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI39	10000	11000	5.00E-15	1.15E-08	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI40	11000	12000	5.00E-15	1.21E-08	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI41	12000	15000	5.00E-15	1.35E-08	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI42	15000	20000	5.00E-15	1.61E-08	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI43	20000	50000	5.00E-15	2.48E-08	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI44	50000	100000	5.00E-15	3.79E-08	0.3	2.143	CcBackfill
SALTSTONE	TI01-TI44	0	100000	2.00E-09	2.00E-09	0.58	2.405	Saltstone
SAND_DRAIN	TI01-TI07	0	350	0.05001	0.05001	0.417	2.661	Sand
SAND_DRAIN	TI08-TI10	350	500	0.04997	0.04997	0.417	2.661	Sand
SAND_DRAIN	TI11	500	600	0.04994	0.04994	0.4169	2.661	Sand
SAND_DRAIN	TI12	600	700	0.04991	0.04991	0.4169	2.661	Sand
SAND_DRAIN	TI13	700	800	0.04985	0.04985	0.4168	2.661	Sand

Material zone	Time period(s)	Start time (yr)	End time (yr)	Horizontal conductivity (cm/s)	Vertical conductivity (cm/s)	Porosity	Solid density (g/mL)	Characteristic curves
SAND_DRAIN	TI14	800	900	0.04982	0.04982	0.4168	2.661	Sand
SAND_DRAIN	TI15	900	1000	0.04975	0.04975	0.4167	2.661	Sand
SAND_DRAIN	TI16	1000	1200	0.04966	0.04966	0.4165	2.661	Sand
SAND_DRAIN	TI17	1200	1400	0.04947	0.04947	0.4163	2.661	Sand
SAND_DRAIN	TI18	1400	1600	0.04928	0.04928	0.416	2.661	Sand
SAND_DRAIN	TI19	1600	1800	0.04909	0.04909	0.4158	2.661	Sand
SAND_DRAIN	TI20	1800	2000	0.04883	0.04883	0.4154	2.661	Sand
SAND_DRAIN	TI21	2000	2300	0.04842	0.04842	0.4149	2.661	Sand
SAND_DRAIN	TI22	2300	2600	0.04795	0.04795	0.4143	2.661	Sand
SAND_DRAIN	TI23	2600	2900	0.04747	0.04747	0.4136	2.661	Sand
SAND_DRAIN	TI24	2900	3200	0.04699	0.04699	0.413	2.661	Sand
SAND_DRAIN	TI25	3200	3600	0.04626	0.04626	0.412	2.661	Sand
SAND_DRAIN	TI26	3600	4000	0.04528	0.04528	0.4107	2.661	Sand
SAND_DRAIN	TI27	4000	4500	0.04414	0.04414	0.4092	2.661	Sand
SAND_DRAIN	TI28	4500	5000	0.0429	0.0429	0.4075	2.661	Sand
SAND_DRAIN	TI29	5000	5500	0.04167	0.04167	0.4058	2.661	Sand
SAND_DRAIN	TI30	5500	6000	0.04024	0.04024	0.4039	2.661	Sand
SAND_DRAIN	TI31	6000	6500	0.03872	0.03872	0.4019	2.661	Sand
SAND_DRAIN	TI32	6500	7000	0.0372	0.0372	0.3998	2.661	Sand
SAND_DRAIN	TI33	7000	7500	0.03571	0.03571	0.3978	2.661	Sand
SAND_DRAIN	TI34	7500	8000	0.03418	0.03418	0.3958	2.661	Sand
SAND_DRAIN	TI35	8000	8500	0.03266	0.03266	0.3937	2.661	Sand
SAND_DRAIN	TI36	8500	9000	0.03114	0.03114	0.3917	2.661	Sand
SAND_DRAIN	TI37	9000	9500	0.02963	0.02963	0.3897	2.661	Sand
SAND_DRAIN	TI38	9500	10000	0.02811	0.02811	0.3876	2.661	Sand
SAND_DRAIN	TI39	10000	11000	0.02584	0.02584	0.3846	2.661	Sand
SAND_DRAIN	TI40	11000	12000	0.02281	0.02281	0.3805	2.661	Sand
SAND_DRAIN	TI41	12000	15000	0.01675	0.01675	0.3724	2.661	Sand
SAND_DRAIN	TI42	15000	20000	0.004921	0.004921	0.3565	2.661	Sand
SAND_DRAIN	TI43-TI44	20000	100000	7.60E-05	4.10E-05	0.35	2.631	CcBackfill
SHEET_DRAIN	TI01-TI44	0	100000	0.15	0.15	0.3	2.6	Gravel
SHOT_CRETE	TI01-TI42	0	20000	7.60E-05	7.60E-05	0.35	2.631	CcBackfill
SHOT_CRETE	TI43-TI44	20000	100000	7.60E-05	4.10E-05	0.35	2.631	CcBackfill
UPPER_MUD_MAT	TI01	0	50	9.37E-11	9.37E-11	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI02	50	100	9.50E-11	9.50E-11	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI03	100	150	9.62E-11	9.62E-11	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI04	150	200	9.72E-11	9.72E-11	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI05	200	250	9.81E-11	9.81E-11	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI06	250	300	9.90E-11	9.90E-11	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI07	300	350	9.98E-11	9.98E-11	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI08	350	400	1.01E-10	1.01E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI09	400	450	1.01E-10	1.01E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI10	450	500	1.02E-10	1.02E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI11	500	600	1.03E-10	1.03E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI12	600	700	1.04E-10	1.04E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI13	700	800	1.06E-10	1.06E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI14	800	900	1.07E-10	1.07E-10	0.11	2.494	Concrete_Qhigh

Material zone	Time period(s)	Start time (yr)	End time (yr)	Horizontal conductivity (cm/s)	Vertical conductivity (cm/s)	Porosity	Solid density (g/mL)	Characteristic curves
UPPER_MUD_MAT	TI15	900	1000	1.08E-10	1.08E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI16	1000	1200	1.09E-10	1.09E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI17	1200	1400	1.11E-10	1.11E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI18	1400	1600	1.13E-10	1.13E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI19	1600	1800	1.14E-10	1.14E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI20	1800	2000	1.16E-10	1.16E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI21	2000	2300	1.18E-10	1.18E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI22	2300	2600	1.21E-10	1.21E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI23	2600	2900	1.23E-10	1.23E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI24	2900	3200	1.26E-10	1.26E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI25	3200	3600	1.28E-10	1.28E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI26	3600	4000	1.32E-10	1.32E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI27	4000	4500	1.35E-10	1.35E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI28	4500	5000	1.39E-10	1.39E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI29	5000	5500	1.43E-10	1.43E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI30	5500	6000	1.47E-10	1.47E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI31	6000	6500	1.52E-10	1.52E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI32	6500	7000	1.56E-10	1.56E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI33	7000	7500	1.60E-10	1.60E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI34	7500	8000	1.65E-10	1.65E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI35	8000	8500	1.69E-10	1.69E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI36	8500	9000	1.74E-10	1.74E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI37	9000	9500	1.79E-10	1.79E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI38	9500	10000	1.84E-10	1.84E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI39	10000	11000	1.92E-10	1.92E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI40	11000	12000	2.02E-10	2.02E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI41	12000	15000	2.27E-10	2.27E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI42	15000	20000	2.90E-10	2.90E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI43	20000	50000	4.17E-06	4.17E-06	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI44	50000	100000	0.0003301	9.11E-05	0.39	2.656	LowerVz
WALL	TI01	0	50	9.40E-11	9.40E-11	0.11	2.494	Concrete_Qhigh
WALL	TI02	50	100	9.61E-11	9.61E-11	0.11	2.494	Concrete_Qhigh
WALL	TI03	100	150	9.79E-11	9.79E-11	0.11	2.494	Concrete_Qhigh
WALL	TI04	150	200	9.95E-11	9.95E-11	0.11	2.494	Concrete_Qhigh
WALL	TI05	200	250	1.01E-10	1.01E-10	0.11	2.494	Concrete_Qhigh
WALL	TI06	250	300	1.02E-10	1.02E-10	0.11	2.494	Concrete_Qhigh
WALL	TI07	300	350	1.04E-10	1.04E-10	0.11	2.494	Concrete_Qhigh
WALL	TI08	350	400	1.05E-10	1.05E-10	0.11	2.494	Concrete_Qhigh
WALL	TI09	400	450	1.06E-10	1.06E-10	0.11	2.494	Concrete_Qhigh
WALL	TI10	450	500	1.07E-10	1.07E-10	0.11	2.494	Concrete_Qhigh
WALL	TI11	500	600	1.09E-10	1.09E-10	0.11	2.494	Concrete_Qhigh
WALL	TI12	600	700	1.11E-10	1.11E-10	0.11	2.494	Concrete_Qhigh
WALL	TI13	700	800	1.13E-10	1.13E-10	0.11	2.494	Concrete_Qhigh
WALL	TI14	800	900	1.15E-10	1.15E-10	0.11	2.494	Concrete_Qhigh
WALL	TI15	900	1000	1.17E-10	1.17E-10	0.11	2.494	Concrete_Qhigh
WALL	TI16	1000	1200	1.20E-10	1.20E-10	0.11	2.494	Concrete_Qhigh
WALL	TI17	1200	1400	1.23E-10	1.23E-10	0.11	2.494	Concrete_Qhigh
WALL	TI18	1400	1600	1.26E-10	1.26E-10	0.11	2.494	Concrete_Qhigh
WALL	TI19	1600	1800	1.29E-10	1.29E-10	0.11	2.494	Concrete_Qhigh
WALL	TI20	1800	2000	1.33E-10	1.33E-10	0.11	2.494	Concrete_Qhigh
WALL	TI21	2000	2300	1.37E-10	1.37E-10	0.11	2.494	Concrete_Qhigh

Material zone	Time period(s)	Start time (yr)	End time (yr)	Horizontal conductivity (cm/s)	Vertical conductivity (cm/s)	Porosity	Solid density (g/mL)	Characteristic curves
WALL	TI22	2300	2600	1.42E-10	1.42E-10	0.11	2.494	Concrete_Qhigh
WALL	TI23	2600	2900	1.47E-10	1.47E-10	0.11	2.494	Concrete_Qhigh
WALL	TI24	2900	3200	1.52E-10	1.52E-10	0.11	2.494	Concrete_Qhigh
WALL	TI25	3200	3600	1.59E-10	1.59E-10	0.11	2.494	Concrete_Qhigh
WALL	TI26	3600	4000	1.66E-10	1.66E-10	0.11	2.494	Concrete_Qhigh
WALL	TI27	4000	4500	1.75E-10	1.75E-10	0.11	2.494	Concrete_Qhigh
WALL	TI28	4500	5000	1.85E-10	1.85E-10	0.11	2.494	Concrete_Qhigh
WALL	TI29	5000	5500	1.96E-10	1.96E-10	0.11	2.494	Concrete_Qhigh
WALL	TI30	5500	6000	2.08E-10	2.08E-10	0.11	2.494	Concrete_Qhigh
WALL	TI31	6000	6500	2.21E-10	2.21E-10	0.11	2.494	Concrete_Qhigh
WALL	TI32	6500	7000	2.36E-10	2.36E-10	0.11	2.494	Concrete_Qhigh
WALL	TI33	7000	7500	2.51E-10	2.51E-10	0.11	2.494	Concrete_Qhigh
WALL	TI34	7500	8000	2.68E-10	2.68E-10	0.11	2.494	Concrete_Qhigh
WALL	TI35	8000	8500	2.88E-10	2.88E-10	0.11	2.494	Concrete_Qhigh
WALL	TI36	8500	9000	3.09E-10	3.09E-10	0.11	2.494	Concrete_Qhigh
WALL	TI37	9000	9500	3.33E-10	3.33E-10	0.11	2.494	Concrete_Qhigh
WALL	TI38	9500	10000	3.60E-10	3.60E-10	0.11	2.494	Concrete_Qhigh
WALL	TI39	10000	11000	4.16E-10	4.16E-10	0.11	2.494	Concrete_Qhigh
WALL	TI40	11000	12000	5.00E-10	5.00E-10	0.11	2.494	Concrete_Qhigh
WALL	TI41	12000	15000	9.57E-10	9.57E-10	0.11	2.494	Concrete_Qhigh
WALL	TI42	15000	20000	6.00E-06	6.00E-06	0.11	2.494	Concrete_Qhigh
WALL	TI43-TI44	20000	100000	7.60E-05	4.10E-05	0.35	2.631	CcBackfill

Vault 2, Case C

Material zone	Time period(s)	Start time (yr)	End time (yr)	Horizontal conductivity (cm/s)	Vertical conductivity (cm/s)	Porosity	Solid density (g/mL)	Characteristic curves
BACKFILL	TI01-TI44	0	100000	7.60E-05	4.10E-05	0.35	2.631	CcBackfill
CLEAN_GROUT	TI01-TI44	0	100000	2.00E-09	2.00E-09	0.58	2.405	Saltstone
COLUMN	TI01-TI44	0	100000	0.0005001	0.00028	0.38	2.661	Sand
FLOOR	TI01	0	50	9.37E-11	9.37E-11	0.11	2.494	Concrete_Qhigh
FLOOR	TI02	50	100	9.50E-11	9.50E-11	0.11	2.494	Concrete_Qhigh
FLOOR	TI03	100	150	9.62E-11	9.62E-11	0.11	2.494	Concrete_Qhigh
FLOOR	TI04	150	200	9.72E-11	9.72E-11	0.11	2.494	Concrete_Qhigh
FLOOR	TI05	200	250	9.81E-11	9.81E-11	0.11	2.494	Concrete_Qhigh
FLOOR	TI06	250	300	9.90E-11	9.90E-11	0.11	2.494	Concrete_Qhigh
FLOOR	TI07	300	350	9.98E-11	9.98E-11	0.11	2.494	Concrete_Qhigh
FLOOR	TI08	350	400	1.01E-10	1.01E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI09	400	450	1.01E-10	1.01E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI10	450	500	1.02E-10	1.02E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI11	500	600	1.03E-10	1.03E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI12	600	700	1.04E-10	1.04E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI13	700	800	1.06E-10	1.06E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI14	800	900	1.07E-10	1.07E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI15	900	1000	1.08E-10	1.08E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI16	1000	1200	1.09E-10	1.09E-10	0.11	2.494	Concrete_Qhigh

Material zone	Time period(s)	Start time (yr)	End time (yr)	Horizontal conductivity (cm/s)	Vertical conductivity (cm/s)	Porosity	Solid density (g/mL)	Characteristic curves
FLOOR	TI17	1200	1400	1.11E-10	1.11E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI18	1400	1600	1.13E-10	1.13E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI19	1600	1800	1.14E-10	1.14E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI20	1800	2000	1.16E-10	1.16E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI21	2000	2300	1.18E-10	1.18E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI22	2300	2600	1.21E-10	1.21E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI23	2600	2900	1.23E-10	1.23E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI24	2900	3200	1.26E-10	1.26E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI25	3200	3600	1.28E-10	1.28E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI26	3600	4000	1.32E-10	1.32E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI27	4000	4500	1.35E-10	1.35E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI28	4500	5000	1.39E-10	1.39E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI29	5000	5500	1.43E-10	1.43E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI30	5500	6000	1.47E-10	1.47E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI31	6000	6500	1.52E-10	1.52E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI32	6500	7000	1.56E-10	1.56E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI33	7000	7500	1.60E-10	1.60E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI34	7500	8000	1.65E-10	1.65E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI35	8000	8500	1.69E-10	1.69E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI36	8500	9000	1.74E-10	1.74E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI37	9000	9500	1.79E-10	1.79E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI38	9500	10000	1.84E-10	1.84E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI39	10000	11000	1.92E-10	1.92E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI40	11000	12000	2.02E-10	2.02E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI41	12000	15000	2.27E-10	2.27E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI42	15000	20000	2.90E-10	2.90E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI43	20000	50000	4.17E-06	4.17E-06	0.11	2.494	Concrete_Qhigh
FLOOR	TI44	50000	100000	0.0003301	9.11E-05	0.39	2.656	LowerVz
FLOOR_HDPE_GCL	TI01	0	50	5.00E-15	2.19E-11	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI02	50	100	5.00E-15	6.22E-11	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI03	100	150	5.00E-15	1.64E-10	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI04	150	200	5.00E-15	2.63E-10	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI05	200	250	5.00E-15	3.47E-10	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI06	250	300	5.00E-15	4.30E-10	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI07	300	350	5.00E-15	5.13E-10	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI08	350	400	5.00E-15	5.95E-10	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI09	400	450	5.00E-15	6.76E-10	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI10	450	500	5.00E-15	7.56E-10	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI11	500	600	5.00E-15	8.76E-10	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI12	600	700	5.00E-15	1.04E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI13	700	800	5.00E-15	1.19E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI14	800	900	5.00E-15	1.35E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI15	900	1000	5.00E-15	1.50E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI16	1000	1200	5.00E-15	1.72E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI17	1200	1400	5.00E-15	2.02E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI18	1400	1600	5.00E-15	2.31E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI19	1600	1800	5.00E-15	2.59E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI20	1800	2000	5.00E-15	2.87E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI21	2000	2300	5.00E-15	3.21E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI22	2300	2600	5.00E-15	3.60E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI23	2600	2900	5.00E-15	3.99E-09	0.3	2.143	CcBackfill

Material zone	Time period(s)	Start time (yr)	End time (yr)	Horizontal conductivity (cm/s)	Vertical conductivity (cm/s)	Porosity	Solid density (g/mL)	Characteristic curves
FLOOR_HDPE_GCL	TI24	2900	3200	5.00E-15	4.36E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI25	3200	3600	5.00E-15	4.79E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI26	3600	4000	5.00E-15	5.25E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI27	4000	4500	5.00E-15	5.77E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI28	4500	5000	5.00E-15	6.31E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI29	5000	5500	5.00E-15	6.84E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI30	5500	6000	5.00E-15	7.35E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI31	6000	6500	5.00E-15	7.85E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI32	6500	7000	5.00E-15	8.33E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI33	7000	7500	5.00E-15	8.79E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI34	7500	8000	5.00E-15	9.25E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI35	8000	8500	5.00E-15	9.69E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI36	8500	9000	5.00E-15	1.01E-08	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI37	9000	9500	5.00E-15	1.05E-08	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI38	9500	10000	5.00E-15	1.09E-08	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI39	10000	11000	5.00E-15	1.15E-08	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI40	11000	12000	5.00E-15	1.21E-08	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI41	12000	15000	5.00E-15	1.35E-08	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI42	15000	20000	5.00E-15	1.61E-08	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI43	20000	50000	5.00E-15	2.48E-08	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI44	50000	100000	5.00E-15	3.79E-08	0.3	2.143	CcBackfill
HDPE	TI01	0	50	5.87E-10	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI02	50	100	2.30E-09	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI03	100	150	5.46E-09	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI04	150	200	8.96E-09	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI05	200	250	1.23E-08	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI06	250	300	1.56E-08	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI07	300	350	1.89E-08	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI08	350	400	2.22E-08	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI09	400	450	2.56E-08	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI10	450	500	2.89E-08	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI11	500	600	3.38E-08	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI12	600	700	4.05E-08	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI13	700	800	4.71E-08	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI14	800	900	5.38E-08	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI15	900	1000	6.04E-08	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI16	1000	1200	7.03E-08	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI17	1200	1400	8.36E-08	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI18	1400	1600	9.69E-08	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI19	1600	1800	1.10E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI20	1800	2000	1.23E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI21	2000	2300	1.40E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI22	2300	2600	1.60E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI23	2600	2900	1.80E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI24	2900	3200	2.00E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI25	3200	3600	2.23E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI26	3600	4000	2.50E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI27	4000	4500	2.79E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI28	4500	5000	3.13E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI29	5000	5500	3.46E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI30	5500	6000	3.79E-07	5.00E-15	0.3	2.143	CcBackfill

Material zone	Time period(s)	Start time (yr)	End time (yr)	Horizontal conductivity (cm/s)	Vertical conductivity (cm/s)	Porosity	Solid density (g/mL)	Characteristic curves
HDPE	TI31	6000	6500	4.12E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI32	6500	7000	4.45E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI33	7000	7500	4.79E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI34	7500	8000	5.12E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI35	8000	8500	5.45E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI36	8500	9000	5.78E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI37	9000	9500	6.11E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI38	9500	10000	6.44E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI39	10000	11000	6.94E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI40	11000	12000	7.60E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI41	12000	15000	8.93E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI42	15000	20000	1.16E-06	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI43	20000	50000	2.32E-06	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI44	50000	100000	4.97E-06	5.00E-15	0.3	2.143	CcBackfill
LOWER_MUD_MAT	TI01-TI43	0	50000	1.00E-08	1.00E-08	0.211	2.611	Concrete_Qlow
LOWER_MUD_MAT	TI44	50000	100000	0.0003301	9.11E-05	0.39	2.656	LowerVz
NATIVE_SOIL	TI01-TI44	0	100000	0.0003301	9.11E-05	0.39	2.656	LowerVz
ROOF	TI01	0	50	9.31E-11	9.31E-11	0.11	2.494	Concrete_Qhigh
ROOF	TI02	50	100	9.33E-11	9.33E-11	0.11	2.494	Concrete_Qhigh
ROOF	TI03	100	150	9.36E-11	9.36E-11	0.11	2.494	Concrete_Qhigh
ROOF	TI04	150	200	9.40E-11	9.40E-11	0.11	2.494	Concrete_Qhigh
ROOF	TI05	200	250	9.43E-11	9.43E-11	0.11	2.494	Concrete_Qhigh
ROOF	TI06	250	300	9.47E-11	9.47E-11	0.11	2.494	Concrete_Qhigh
ROOF	TI07	300	350	9.51E-11	9.51E-11	0.11	2.494	Concrete_Qhigh
ROOF	TI08	350	400	9.55E-11	9.55E-11	0.11	2.494	Concrete_Qhigh
ROOF	TI09	400	450	9.59E-11	9.59E-11	0.11	2.494	Concrete_Qhigh
ROOF	TI10	450	500	9.63E-11	9.63E-11	0.11	2.494	Concrete_Qhigh
ROOF	TI11	500	600	9.69E-11	9.69E-11	0.11	2.494	Concrete_Qhigh
ROOF	TI12	600	700	9.76E-11	9.76E-11	0.11	2.494	Concrete_Qhigh
ROOF	TI13	700	800	9.84E-11	9.84E-11	0.11	2.494	Concrete_Qhigh
ROOF	TI14	800	900	9.92E-11	9.92E-11	0.11	2.494	Concrete_Qhigh
ROOF	TI15	900	1000	1.00E-10	1.00E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI16	1000	1200	1.01E-10	1.01E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI17	1200	1400	1.02E-10	1.02E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI18	1400	1600	1.04E-10	1.04E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI19	1600	1800	1.05E-10	1.05E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI20	1800	2000	1.06E-10	1.06E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI21	2000	2300	1.08E-10	1.08E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI22	2300	2600	1.10E-10	1.10E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI23	2600	2900	1.12E-10	1.12E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI24	2900	3200	1.14E-10	1.14E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI25	3200	3600	1.16E-10	1.16E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI26	3600	4000	1.18E-10	1.18E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI27	4000	4500	1.21E-10	1.21E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI28	4500	5000	1.24E-10	1.24E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI29	5000	5500	1.28E-10	1.28E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI30	5500	6000	1.31E-10	1.31E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI31	6000	6500	1.34E-10	1.34E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI32	6500	7000	1.38E-10	1.38E-10	0.11	2.494	Concrete_Qhigh

Material zone	Time period(s)	Start time (yr)	End time (yr)	Horizontal conductivity (cm/s)	Vertical conductivity (cm/s)	Porosity	Solid density (g/mL)	Characteristic curves
ROOF	TI33	7000	7500	1.41E-10	1.41E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI34	7500	8000	1.45E-10	1.45E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI35	8000	8500	1.48E-10	1.48E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI36	8500	9000	1.52E-10	1.52E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI37	9000	9500	1.56E-10	1.56E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI38	9500	10000	1.60E-10	1.60E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI39	10000	11000	1.66E-10	1.66E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI40	11000	12000	1.75E-10	1.75E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI41	12000	15000	1.94E-10	1.94E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI42	15000	20000	2.41E-10	2.41E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI43-TI44	20000	100000	7.60E-05	4.10E-05	0.35	2.631	CcBackfill
ROOF_HDPE_GCL	TI01	0	50	5.00E-15	2.19E-11	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI02	50	100	5.00E-15	6.22E-11	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI03	100	150	5.00E-15	1.64E-10	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI04	150	200	5.00E-15	2.63E-10	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI05	200	250	5.00E-15	3.47E-10	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI06	250	300	5.00E-15	4.30E-10	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI07	300	350	5.00E-15	5.13E-10	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI08	350	400	5.00E-15	5.95E-10	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI09	400	450	5.00E-15	6.76E-10	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI10	450	500	5.00E-15	7.56E-10	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI11	500	600	5.00E-15	8.76E-10	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI12	600	700	5.00E-15	1.04E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI13	700	800	5.00E-15	1.19E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI14	800	900	5.00E-15	1.35E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI15	900	1000	5.00E-15	1.50E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI16	1000	1200	5.00E-15	1.72E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI17	1200	1400	5.00E-15	2.02E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI18	1400	1600	5.00E-15	2.31E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI19	1600	1800	5.00E-15	2.59E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI20	1800	2000	5.00E-15	2.87E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI21	2000	2300	5.00E-15	3.21E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI22	2300	2600	5.00E-15	3.60E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI23	2600	2900	5.00E-15	3.99E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI24	2900	3200	5.00E-15	4.36E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI25	3200	3600	5.00E-15	4.79E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI26	3600	4000	5.00E-15	5.25E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI27	4000	4500	5.00E-15	5.77E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI28	4500	5000	5.00E-15	6.31E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI29	5000	5500	5.00E-15	6.84E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI30	5500	6000	5.00E-15	7.35E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI31	6000	6500	5.00E-15	7.85E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI32	6500	7000	5.00E-15	8.33E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI33	7000	7500	5.00E-15	8.79E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI34	7500	8000	5.00E-15	9.25E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI35	8000	8500	5.00E-15	9.69E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI36	8500	9000	5.00E-15	1.01E-08	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI37	9000	9500	5.00E-15	1.05E-08	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI38	9500	10000	5.00E-15	1.09E-08	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI39	10000	11000	5.00E-15	1.15E-08	0.3	2.143	CcBackfill

Material zone	Time period(s)	Start time (yr)	End time (yr)	Horizontal conductivity (cm/s)	Vertical conductivity (cm/s)	Porosity	Solid density (g/mL)	Characteristic curves
ROOF_HDPE_GCL	TI40	11000	12000	5.00E-15	1.21E-08	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI41	12000	15000	5.00E-15	1.35E-08	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI42	15000	20000	5.00E-15	1.61E-08	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI43	20000	50000	5.00E-15	2.48E-08	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI44	50000	100000	5.00E-15	3.79E-08	0.3	2.143	CcBackfill
SALTSTONE	TI01-TI44	0	100000	2.00E-09	2.00E-09	0.58	2.405	Saltstone
SAND_DRAIN	TI01-TI07	0	350	0.05001	0.05001	0.417	2.661	Sand
SAND_DRAIN	TI08-TI10	350	500	0.04997	0.04997	0.417	2.661	Sand
SAND_DRAIN	TI11	500	600	0.04994	0.04994	0.4169	2.661	Sand
SAND_DRAIN	TI12	600	700	0.04991	0.04991	0.4169	2.661	Sand
SAND_DRAIN	TI13	700	800	0.04985	0.04985	0.4168	2.661	Sand
SAND_DRAIN	TI14	800	900	0.04982	0.04982	0.4168	2.661	Sand
SAND_DRAIN	TI15	900	1000	0.04975	0.04975	0.4167	2.661	Sand
SAND_DRAIN	TI16	1000	1200	0.04966	0.04966	0.4165	2.661	Sand
SAND_DRAIN	TI17	1200	1400	0.04947	0.04947	0.4163	2.661	Sand
SAND_DRAIN	TI18	1400	1600	0.04928	0.04928	0.416	2.661	Sand
SAND_DRAIN	TI19	1600	1800	0.04909	0.04909	0.4158	2.661	Sand
SAND_DRAIN	TI20	1800	2000	0.04883	0.04883	0.4154	2.661	Sand
SAND_DRAIN	TI21	2000	2300	0.04842	0.04842	0.4149	2.661	Sand
SAND_DRAIN	TI22	2300	2600	0.04795	0.04795	0.4143	2.661	Sand
SAND_DRAIN	TI23	2600	2900	0.04747	0.04747	0.4136	2.661	Sand
SAND_DRAIN	TI24	2900	3200	0.04699	0.04699	0.413	2.661	Sand
SAND_DRAIN	TI25	3200	3600	0.04626	0.04626	0.412	2.661	Sand
SAND_DRAIN	TI26	3600	4000	0.04528	0.04528	0.4107	2.661	Sand
SAND_DRAIN	TI27	4000	4500	0.04414	0.04414	0.4092	2.661	Sand
SAND_DRAIN	TI28	4500	5000	0.0429	0.0429	0.4075	2.661	Sand
SAND_DRAIN	TI29	5000	5500	0.04167	0.04167	0.4058	2.661	Sand
SAND_DRAIN	TI30	5500	6000	0.04024	0.04024	0.4039	2.661	Sand
SAND_DRAIN	TI31	6000	6500	0.03872	0.03872	0.4019	2.661	Sand
SAND_DRAIN	TI32	6500	7000	0.0372	0.0372	0.3998	2.661	Sand
SAND_DRAIN	TI33	7000	7500	0.03571	0.03571	0.3978	2.661	Sand
SAND_DRAIN	TI34	7500	8000	0.03418	0.03418	0.3958	2.661	Sand
SAND_DRAIN	TI35	8000	8500	0.03266	0.03266	0.3937	2.661	Sand
SAND_DRAIN	TI36	8500	9000	0.03114	0.03114	0.3917	2.661	Sand
SAND_DRAIN	TI37	9000	9500	0.02963	0.02963	0.3897	2.661	Sand
SAND_DRAIN	TI38	9500	10000	0.02811	0.02811	0.3876	2.661	Sand
SAND_DRAIN	TI39	10000	11000	0.02584	0.02584	0.3846	2.661	Sand
SAND_DRAIN	TI40	11000	12000	0.02281	0.02281	0.3805	2.661	Sand
SAND_DRAIN	TI41	12000	15000	0.01675	0.01675	0.3724	2.661	Sand
SAND_DRAIN	TI42	15000	20000	0.004921	0.004921	0.3565	2.661	Sand
SAND_DRAIN	TI43-TI44	20000	100000	7.60E-05	4.10E-05	0.35	2.631	CcBackfill
SHEET_DRAIN	TI01-TI44	0	100000	0.15	0.15	0.3	2.6	Gravel
SHOT_CRETE	TI01-TI42	0	20000	7.60E-05	7.60E-05	0.35	2.631	CcBackfill
SHOT_CRETE	TI43-TI44	20000	100000	7.60E-05	4.10E-05	0.35	2.631	CcBackfill

Material zone	Time period(s)	Start time (yr)	End time (yr)	Horizontal conductivity (cm/s)	Vertical conductivity (cm/s)	Porosity	Solid density (g/mL)	Characteristic curves
UPPER_MUD_MAT	TI01	0	50	9.37E-11	9.37E-11	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI02	50	100	9.50E-11	9.50E-11	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI03	100	150	9.62E-11	9.62E-11	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI04	150	200	9.72E-11	9.72E-11	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI05	200	250	9.81E-11	9.81E-11	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI06	250	300	9.90E-11	9.90E-11	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI07	300	350	9.98E-11	9.98E-11	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI08	350	400	1.01E-10	1.01E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI09	400	450	1.01E-10	1.01E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI10	450	500	1.02E-10	1.02E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI11	500	600	1.03E-10	1.03E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI12	600	700	1.04E-10	1.04E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI13	700	800	1.06E-10	1.06E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI14	800	900	1.07E-10	1.07E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI15	900	1000	1.08E-10	1.08E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI16	1000	1200	1.09E-10	1.09E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI17	1200	1400	1.11E-10	1.11E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI18	1400	1600	1.13E-10	1.13E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI19	1600	1800	1.14E-10	1.14E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI20	1800	2000	1.16E-10	1.16E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI21	2000	2300	1.18E-10	1.18E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI22	2300	2600	1.21E-10	1.21E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI23	2600	2900	1.23E-10	1.23E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI24	2900	3200	1.26E-10	1.26E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI25	3200	3600	1.28E-10	1.28E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI26	3600	4000	1.32E-10	1.32E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI27	4000	4500	1.35E-10	1.35E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI28	4500	5000	1.39E-10	1.39E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI29	5000	5500	1.43E-10	1.43E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI30	5500	6000	1.47E-10	1.47E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI31	6000	6500	1.52E-10	1.52E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI32	6500	7000	1.56E-10	1.56E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI33	7000	7500	1.60E-10	1.60E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI34	7500	8000	1.65E-10	1.65E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI35	8000	8500	1.69E-10	1.69E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI36	8500	9000	1.74E-10	1.74E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI37	9000	9500	1.79E-10	1.79E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI38	9500	10000	1.84E-10	1.84E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI39	10000	11000	1.92E-10	1.92E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI40	11000	12000	2.02E-10	2.02E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI41	12000	15000	2.27E-10	2.27E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI42	15000	20000	2.90E-10	2.90E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI43	20000	50000	4.17E-06	4.17E-06	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI44	50000	100000	0.0003301	9.11E-05	0.39	2.656	LowerVz
WALL	TI01	0	50	9.40E-11	9.40E-11	0.11	2.494	Concrete_Qhigh
WALL	TI02	50	100	9.61E-11	9.61E-11	0.11	2.494	Concrete_Qhigh
WALL	TI03	100	150	9.79E-11	9.79E-11	0.11	2.494	Concrete_Qhigh
WALL	TI04	150	200	9.95E-11	9.95E-11	0.11	2.494	Concrete_Qhigh
WALL	TI05	200	250	1.01E-10	1.01E-10	0.11	2.494	Concrete_Qhigh
WALL	TI06	250	300	1.02E-10	1.02E-10	0.11	2.494	Concrete_Qhigh
WALL	TI07	300	350	1.04E-10	1.04E-10	0.11	2.494	Concrete_Qhigh

Material zone	Time period(s)	Start time (yr)	End time (yr)	Horizontal conductivity (cm/s)	Vertical conductivity (cm/s)	Porosity	Solid density (g/mL)	Characteristic curves
WALL	TI08	350	400	1.05E-10	1.05E-10	0.11	2.494	Concrete_Qhigh
WALL	TI09	400	450	1.06E-10	1.06E-10	0.11	2.494	Concrete_Qhigh
WALL	TI10	450	500	1.07E-10	1.07E-10	0.11	2.494	Concrete_Qhigh
WALL	TI11	500	600	1.09E-10	1.09E-10	0.11	2.494	Concrete_Qhigh
WALL	TI12	600	700	1.11E-10	1.11E-10	0.11	2.494	Concrete_Qhigh
WALL	TI13	700	800	1.13E-10	1.13E-10	0.11	2.494	Concrete_Qhigh
WALL	TI14	800	900	1.15E-10	1.15E-10	0.11	2.494	Concrete_Qhigh
WALL	TI15	900	1000	1.17E-10	1.17E-10	0.11	2.494	Concrete_Qhigh
WALL	TI16	1000	1200	1.20E-10	1.20E-10	0.11	2.494	Concrete_Qhigh
WALL	TI17	1200	1400	1.23E-10	1.23E-10	0.11	2.494	Concrete_Qhigh
WALL	TI18	1400	1600	1.26E-10	1.26E-10	0.11	2.494	Concrete_Qhigh
WALL	TI19	1600	1800	1.29E-10	1.29E-10	0.11	2.494	Concrete_Qhigh
WALL	TI20	1800	2000	1.33E-10	1.33E-10	0.11	2.494	Concrete_Qhigh
WALL	TI21	2000	2300	1.37E-10	1.37E-10	0.11	2.494	Concrete_Qhigh
WALL	TI22	2300	2600	1.42E-10	1.42E-10	0.11	2.494	Concrete_Qhigh
WALL	TI23	2600	2900	1.47E-10	1.47E-10	0.11	2.494	Concrete_Qhigh
WALL	TI24	2900	3200	1.52E-10	1.52E-10	0.11	2.494	Concrete_Qhigh
WALL	TI25	3200	3600	1.59E-10	1.59E-10	0.11	2.494	Concrete_Qhigh
WALL	TI26	3600	4000	1.66E-10	1.66E-10	0.11	2.494	Concrete_Qhigh
WALL	TI27	4000	4500	1.75E-10	1.75E-10	0.11	2.494	Concrete_Qhigh
WALL	TI28	4500	5000	1.85E-10	1.85E-10	0.11	2.494	Concrete_Qhigh
WALL	TI29	5000	5500	1.96E-10	1.96E-10	0.11	2.494	Concrete_Qhigh
WALL	TI30	5500	6000	2.08E-10	2.08E-10	0.11	2.494	Concrete_Qhigh
WALL	TI31	6000	6500	2.21E-10	2.21E-10	0.11	2.494	Concrete_Qhigh
WALL	TI32	6500	7000	2.36E-10	2.36E-10	0.11	2.494	Concrete_Qhigh
WALL	TI33	7000	7500	2.51E-10	2.51E-10	0.11	2.494	Concrete_Qhigh
WALL	TI34	7500	8000	2.68E-10	2.68E-10	0.11	2.494	Concrete_Qhigh
WALL	TI35	8000	8500	2.88E-10	2.88E-10	0.11	2.494	Concrete_Qhigh
WALL	TI36	8500	9000	3.09E-10	3.09E-10	0.11	2.494	Concrete_Qhigh
WALL	TI37	9000	9500	3.33E-10	3.33E-10	0.11	2.494	Concrete_Qhigh
WALL	TI38	9500	10000	3.60E-10	3.60E-10	0.11	2.494	Concrete_Qhigh
WALL	TI39	10000	11000	4.16E-10	4.16E-10	0.11	2.494	Concrete_Qhigh
WALL	TI40	11000	12000	5.00E-10	5.00E-10	0.11	2.494	Concrete_Qhigh
WALL	TI41	12000	15000	9.57E-10	9.57E-10	0.11	2.494	Concrete_Qhigh
WALL	TI42	15000	20000	6.00E-06	6.00E-06	0.11	2.494	Concrete_Qhigh
WALL	TI43-TI44	20000	100000	7.60E-05	4.10E-05	0.35	2.631	CcBackfill

Vault 2, Case D

Material zone	Time period(s)	Start time (yr)	End time (yr)	Horizontal conductivity (cm/s)	Vertical conductivity (cm/s)	Porosity	Solid density (g/mL)	Characteristic curves
BACKFILL	TI01-TI44	0	100000	7.60E-05	4.10E-05	0.35	2.631	CcBackfill
CLEAN_GROUT	TI01-TI44	0	100000	2.00E-09	2.00E-09	0.58	2.405	Saltstone
COLUMN	TI01-TI44	0	100000	2.00E-09	5.00E-15	0.58	2.405	Saltstone
FLOOR	TI01	0	50	9.37E-11	9.37E-11	0.11	2.494	Concrete_Qhigh
FLOOR	TI02	50	100	9.50E-11	9.50E-11	0.11	2.494	Concrete_Qhigh

Material zone	Time period(s)	Start time (yr)	End time (yr)	Horizontal conductivity (cm/s)	Vertical conductivity (cm/s)	Porosity	Solid density (g/mL)	Characteristic curves
FLOOR	TI03	100	150	9.62E-11	9.62E-11	0.11	2.494	Concrete_Qhigh
FLOOR	TI04	150	200	9.72E-11	9.72E-11	0.11	2.494	Concrete_Qhigh
FLOOR	TI05	200	250	9.81E-11	9.81E-11	0.11	2.494	Concrete_Qhigh
FLOOR	TI06	250	300	9.90E-11	9.90E-11	0.11	2.494	Concrete_Qhigh
FLOOR	TI07	300	350	9.98E-11	9.98E-11	0.11	2.494	Concrete_Qhigh
FLOOR	TI08	350	400	1.01E-10	1.01E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI09	400	450	1.01E-10	1.01E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI10	450	500	1.02E-10	1.02E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI11	500	600	1.03E-10	1.03E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI12	600	700	1.04E-10	1.04E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI13	700	800	1.06E-10	1.06E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI14	800	900	1.07E-10	1.07E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI15	900	1000	1.08E-10	1.08E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI16	1000	1200	1.09E-10	1.09E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI17	1200	1400	1.11E-10	1.11E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI18	1400	1600	1.13E-10	1.13E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI19	1600	1800	1.14E-10	1.14E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI20	1800	2000	1.16E-10	1.16E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI21	2000	2300	1.18E-10	1.18E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI22	2300	2600	1.21E-10	1.21E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI23	2600	2900	1.23E-10	1.23E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI24	2900	3200	1.26E-10	1.26E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI25	3200	3600	1.28E-10	1.28E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI26	3600	4000	1.32E-10	1.32E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI27	4000	4500	1.35E-10	1.35E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI28	4500	5000	1.39E-10	1.39E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI29	5000	5500	1.43E-10	1.43E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI30	5500	6000	1.47E-10	1.47E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI31	6000	6500	1.52E-10	1.52E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI32	6500	7000	1.56E-10	1.56E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI33	7000	7500	1.60E-10	1.60E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI34	7500	8000	1.65E-10	1.65E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI35	8000	8500	1.69E-10	1.69E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI36	8500	9000	1.74E-10	1.74E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI37	9000	9500	1.79E-10	1.79E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI38	9500	10000	1.84E-10	1.84E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI39	10000	11000	1.92E-10	1.92E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI40	11000	12000	2.02E-10	2.02E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI41	12000	15000	2.27E-10	2.27E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI42	15000	20000	2.90E-10	2.90E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI43	20000	50000	4.17E-06	4.17E-06	0.11	2.494	Concrete_Qhigh
FLOOR	TI44	50000	100000	0.0003301	9.11E-05	0.39	2.656	LowerVz
FLOOR_HDPE_GCL	TI01	0	50	5.00E-15	2.19E-11	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI02	50	100	5.00E-15	6.22E-11	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI03	100	150	5.00E-15	1.64E-10	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI04	150	200	5.00E-15	2.63E-10	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI05	200	250	5.00E-15	3.47E-10	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI06	250	300	5.00E-15	4.30E-10	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI07	300	350	5.00E-15	5.13E-10	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI08	350	400	5.00E-15	5.95E-10	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI09	400	450	5.00E-15	6.76E-10	0.3	2.143	CcBackfill

Material zone	Time period(s)	Start time (yr)	End time (yr)	Horizontal conductivity (cm/s)	Vertical conductivity (cm/s)	Porosity	Solid density (g/mL)	Characteristic curves
FLOOR_HDPE_GCL	TI10	450	500	5.00E-15	7.56E-10	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI11	500	600	5.00E-15	8.76E-10	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI12	600	700	5.00E-15	1.04E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI13	700	800	5.00E-15	1.19E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI14	800	900	5.00E-15	1.35E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI15	900	1000	5.00E-15	1.50E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI16	1000	1200	5.00E-15	1.72E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI17	1200	1400	5.00E-15	2.02E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI18	1400	1600	5.00E-15	2.31E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI19	1600	1800	5.00E-15	2.59E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI20	1800	2000	5.00E-15	2.87E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI21	2000	2300	5.00E-15	3.21E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI22	2300	2600	5.00E-15	3.60E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI23	2600	2900	5.00E-15	3.99E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI24	2900	3200	5.00E-15	4.36E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI25	3200	3600	5.00E-15	4.79E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI26	3600	4000	5.00E-15	5.25E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI27	4000	4500	5.00E-15	5.77E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI28	4500	5000	5.00E-15	6.31E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI29	5000	5500	5.00E-15	6.84E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI30	5500	6000	5.00E-15	7.35E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI31	6000	6500	5.00E-15	7.85E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI32	6500	7000	5.00E-15	8.33E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI33	7000	7500	5.00E-15	8.79E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI34	7500	8000	5.00E-15	9.25E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI35	8000	8500	5.00E-15	9.69E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI36	8500	9000	5.00E-15	1.01E-08	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI37	9000	9500	5.00E-15	1.05E-08	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI38	9500	10000	5.00E-15	1.09E-08	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI39	10000	11000	5.00E-15	1.15E-08	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI40	11000	12000	5.00E-15	1.21E-08	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI41	12000	15000	5.00E-15	1.35E-08	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI42	15000	20000	5.00E-15	1.61E-08	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI43	20000	50000	5.00E-15	2.48E-08	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI44	50000	100000	5.00E-15	3.79E-08	0.3	2.143	CcBackfill
HDPE	TI01	0	50	5.87E-10	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI02	50	100	2.30E-09	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI03	100	150	5.46E-09	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI04	150	200	8.96E-09	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI05	200	250	1.23E-08	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI06	250	300	1.56E-08	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI07	300	350	1.89E-08	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI08	350	400	2.22E-08	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI09	400	450	2.56E-08	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI10	450	500	2.89E-08	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI11	500	600	3.38E-08	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI12	600	700	4.05E-08	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI13	700	800	4.71E-08	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI14	800	900	5.38E-08	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI15	900	1000	6.04E-08	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI16	1000	1200	7.03E-08	5.00E-15	0.3	2.143	CcBackfill

Material zone	Time period(s)	Start time (yr)	End time (yr)	Horizontal conductivity (cm/s)	Vertical conductivity (cm/s)	Porosity	Solid density (g/mL)	Characteristic curves
HDPE	TI17	1200	1400	8.36E-08	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI18	1400	1600	9.69E-08	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI19	1600	1800	1.10E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI20	1800	2000	1.23E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI21	2000	2300	1.40E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI22	2300	2600	1.60E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI23	2600	2900	1.80E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI24	2900	3200	2.00E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI25	3200	3600	2.23E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI26	3600	4000	2.50E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI27	4000	4500	2.79E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI28	4500	5000	3.13E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI29	5000	5500	3.46E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI30	5500	6000	3.79E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI31	6000	6500	4.12E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI32	6500	7000	4.45E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI33	7000	7500	4.79E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI34	7500	8000	5.12E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI35	8000	8500	5.45E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI36	8500	9000	5.78E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI37	9000	9500	6.11E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI38	9500	10000	6.44E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI39	10000	11000	6.94E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI40	11000	12000	7.60E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI41	12000	15000	8.93E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI42	15000	20000	1.16E-06	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI43	20000	50000	2.32E-06	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI44	50000	100000	4.97E-06	5.00E-15	0.3	2.143	CcBackfill
LOWER_MUD_MAT	TI01-TI43	0	50000	1.00E-08	1.00E-08	0.211	2.611	Concrete_Qlow
LOWER_MUD_MAT	TI44	50000	100000	0.0003301	9.11E-05	0.39	2.656	LowerVz
NATIVE_SOIL	TI01-TI44	0	100000	0.0003301	9.11E-05	0.39	2.656	LowerVz
ROOF	TI01	0	50	9.31E-11	9.31E-11	0.11	2.494	Concrete_Qhigh
ROOF	TI02	50	100	9.33E-11	9.33E-11	0.11	2.494	Concrete_Qhigh
ROOF	TI03	100	150	9.36E-11	9.36E-11	0.11	2.494	Concrete_Qhigh
ROOF	TI04	150	200	9.40E-11	9.40E-11	0.11	2.494	Concrete_Qhigh
ROOF	TI05	200	250	9.43E-11	9.43E-11	0.11	2.494	Concrete_Qhigh
ROOF	TI06	250	300	9.47E-11	9.47E-11	0.11	2.494	Concrete_Qhigh
ROOF	TI07	300	350	9.51E-11	9.51E-11	0.11	2.494	Concrete_Qhigh
ROOF	TI08	350	400	9.55E-11	9.55E-11	0.11	2.494	Concrete_Qhigh
ROOF	TI09	400	450	9.59E-11	9.59E-11	0.11	2.494	Concrete_Qhigh
ROOF	TI10	450	500	9.63E-11	9.63E-11	0.11	2.494	Concrete_Qhigh
ROOF	TI11	500	600	9.69E-11	9.69E-11	0.11	2.494	Concrete_Qhigh
ROOF	TI12	600	700	9.76E-11	9.76E-11	0.11	2.494	Concrete_Qhigh
ROOF	TI13	700	800	9.84E-11	9.84E-11	0.11	2.494	Concrete_Qhigh
ROOF	TI14	800	900	9.92E-11	9.92E-11	0.11	2.494	Concrete_Qhigh
ROOF	TI15	900	1000	1.00E-10	1.00E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI16	1000	1200	1.01E-10	1.01E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI17	1200	1400	1.02E-10	1.02E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI18	1400	1600	1.04E-10	1.04E-10	0.11	2.494	Concrete_Qhigh

Material zone	Time period(s)	Start time (yr)	End time (yr)	Horizontal conductivity (cm/s)	Vertical conductivity (cm/s)	Porosity	Solid density (g/mL)	Characteristic curves
ROOF	TI19	1600	1800	1.05E-10	1.05E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI20	1800	2000	1.06E-10	1.06E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI21	2000	2300	1.08E-10	1.08E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI22	2300	2600	1.10E-10	1.10E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI23	2600	2900	1.12E-10	1.12E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI24	2900	3200	1.14E-10	1.14E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI25	3200	3600	1.16E-10	1.16E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI26	3600	4000	1.18E-10	1.18E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI27	4000	4500	1.21E-10	1.21E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI28	4500	5000	1.24E-10	1.24E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI29	5000	5500	1.28E-10	1.28E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI30	5500	6000	1.31E-10	1.31E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI31	6000	6500	1.34E-10	1.34E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI32	6500	7000	1.38E-10	1.38E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI33	7000	7500	1.41E-10	1.41E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI34	7500	8000	1.45E-10	1.45E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI35	8000	8500	1.48E-10	1.48E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI36	8500	9000	1.52E-10	1.52E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI37	9000	9500	1.56E-10	1.56E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI38	9500	10000	1.60E-10	1.60E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI39	10000	11000	1.66E-10	1.66E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI40	11000	12000	1.75E-10	1.75E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI41	12000	15000	1.94E-10	1.94E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI42	15000	20000	2.41E-10	2.41E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI43-TI44	20000	100000	7.60E-05	4.10E-05	0.35	2.631	CcBackfill
ROOF_HDPE_GCL	TI01	0	50	5.00E-15	2.19E-11	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI02	50	100	5.00E-15	6.22E-11	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI03	100	150	5.00E-15	1.64E-10	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI04	150	200	5.00E-15	2.63E-10	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI05	200	250	5.00E-15	3.47E-10	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI06	250	300	5.00E-15	4.30E-10	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI07	300	350	5.00E-15	5.13E-10	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI08	350	400	5.00E-15	5.95E-10	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI09	400	450	5.00E-15	6.76E-10	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI10	450	500	5.00E-15	7.56E-10	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI11	500	600	5.00E-15	8.76E-10	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI12	600	700	5.00E-15	1.04E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI13	700	800	5.00E-15	1.19E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI14	800	900	5.00E-15	1.35E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI15	900	1000	5.00E-15	1.50E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI16	1000	1200	5.00E-15	1.72E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI17	1200	1400	5.00E-15	2.02E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI18	1400	1600	5.00E-15	2.31E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI19	1600	1800	5.00E-15	2.59E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI20	1800	2000	5.00E-15	2.87E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI21	2000	2300	5.00E-15	3.21E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI22	2300	2600	5.00E-15	3.60E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI23	2600	2900	5.00E-15	3.99E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI24	2900	3200	5.00E-15	4.36E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI25	3200	3600	5.00E-15	4.79E-09	0.3	2.143	CcBackfill

Material zone	Time period(s)	Start time (yr)	End time (yr)	Horizontal conductivity (cm/s)	Vertical conductivity (cm/s)	Porosity	Solid density (g/mL)	Characteristic curves
ROOF_HDPE_GCL	TI26	3600	4000	5.00E-15	5.25E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI27	4000	4500	5.00E-15	5.77E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI28	4500	5000	5.00E-15	6.31E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI29	5000	5500	5.00E-15	6.84E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI30	5500	6000	5.00E-15	7.35E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI31	6000	6500	5.00E-15	7.85E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI32	6500	7000	5.00E-15	8.33E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI33	7000	7500	5.00E-15	8.79E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI34	7500	8000	5.00E-15	9.25E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI35	8000	8500	5.00E-15	9.69E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI36	8500	9000	5.00E-15	1.01E-08	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI37	9000	9500	5.00E-15	1.05E-08	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI38	9500	10000	5.00E-15	1.09E-08	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI39	10000	11000	5.00E-15	1.15E-08	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI40	11000	12000	5.00E-15	1.21E-08	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI41	12000	15000	5.00E-15	1.35E-08	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI42	15000	20000	5.00E-15	1.61E-08	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI43	20000	50000	5.00E-15	2.48E-08	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI44	50000	100000	5.00E-15	3.79E-08	0.3	2.143	CcBackfill
SALTSTONE	TI01-TI44	0	100000	2.00E-09	2.00E-09	0.58	2.405	Saltstone
SAND_DRAIN	TI01-TI07	0	350	0.05001	0.05001	0.417	2.661	Sand
SAND_DRAIN	TI08-TI10	350	500	0.04997	0.04997	0.417	2.661	Sand
SAND_DRAIN	TI11	500	600	0.04994	0.04994	0.4169	2.661	Sand
SAND_DRAIN	TI12	600	700	0.04991	0.04991	0.4169	2.661	Sand
SAND_DRAIN	TI13	700	800	0.04985	0.04985	0.4168	2.661	Sand
SAND_DRAIN	TI14	800	900	0.04982	0.04982	0.4168	2.661	Sand
SAND_DRAIN	TI15	900	1000	0.04975	0.04975	0.4167	2.661	Sand
SAND_DRAIN	TI16	1000	1200	0.04966	0.04966	0.4165	2.661	Sand
SAND_DRAIN	TI17	1200	1400	0.04947	0.04947	0.4163	2.661	Sand
SAND_DRAIN	TI18	1400	1600	0.04928	0.04928	0.416	2.661	Sand
SAND_DRAIN	TI19	1600	1800	0.04909	0.04909	0.4158	2.661	Sand
SAND_DRAIN	TI20	1800	2000	0.04883	0.04883	0.4154	2.661	Sand
SAND_DRAIN	TI21	2000	2300	0.04842	0.04842	0.4149	2.661	Sand
SAND_DRAIN	TI22	2300	2600	0.04795	0.04795	0.4143	2.661	Sand
SAND_DRAIN	TI23	2600	2900	0.04747	0.04747	0.4136	2.661	Sand
SAND_DRAIN	TI24	2900	3200	0.04699	0.04699	0.413	2.661	Sand
SAND_DRAIN	TI25	3200	3600	0.04626	0.04626	0.412	2.661	Sand
SAND_DRAIN	TI26	3600	4000	0.04528	0.04528	0.4107	2.661	Sand
SAND_DRAIN	TI27	4000	4500	0.04414	0.04414	0.4092	2.661	Sand
SAND_DRAIN	TI28	4500	5000	0.0429	0.0429	0.4075	2.661	Sand
SAND_DRAIN	TI29	5000	5500	0.04167	0.04167	0.4058	2.661	Sand
SAND_DRAIN	TI30	5500	6000	0.04024	0.04024	0.4039	2.661	Sand
SAND_DRAIN	TI31	6000	6500	0.03872	0.03872	0.4019	2.661	Sand
SAND_DRAIN	TI32	6500	7000	0.0372	0.0372	0.3998	2.661	Sand
SAND_DRAIN	TI33	7000	7500	0.03571	0.03571	0.3978	2.661	Sand
SAND_DRAIN	TI34	7500	8000	0.03418	0.03418	0.3958	2.661	Sand
SAND_DRAIN	TI35	8000	8500	0.03266	0.03266	0.3937	2.661	Sand
SAND_DRAIN	TI36	8500	9000	0.03114	0.03114	0.3917	2.661	Sand

Material zone	Time period(s)	Start time (yr)	End time (yr)	Horizontal conductivity (cm/s)	Vertical conductivity (cm/s)	Porosity	Solid density (g/mL)	Characteristic curves
SAND_DRAIN	TI37	9000	9500	0.02963	0.02963	0.3897	2.661	Sand
SAND_DRAIN	TI38	9500	10000	0.02811	0.02811	0.3876	2.661	Sand
SAND_DRAIN	TI39	10000	11000	0.02584	0.02584	0.3846	2.661	Sand
SAND_DRAIN	TI40	11000	12000	0.02281	0.02281	0.3805	2.661	Sand
SAND_DRAIN	TI41	12000	15000	0.01675	0.01675	0.3724	2.661	Sand
SAND_DRAIN	TI42	15000	20000	0.004921	0.004921	0.3565	2.661	Sand
SAND_DRAIN	TI43-TI44	20000	100000	7.60E-05	4.10E-05	0.35	2.631	CcBackfill
SHEET_DRAIN	TI01-TI44	0	100000	5.00E-15	5.00E-15	0.3	2.143	Saltstone
SHOT_CRETE	TI01-TI42	0	20000	7.60E-05	7.60E-05	0.35	2.631	CcBackfill
SHOT_CRETE	TI43-TI44	20000	100000	7.60E-05	4.10E-05	0.35	2.631	CcBackfill
UPPER_MUD_MAT	TI01	0	50	9.37E-11	9.37E-11	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI02	50	100	9.50E-11	9.50E-11	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI03	100	150	9.62E-11	9.62E-11	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI04	150	200	9.72E-11	9.72E-11	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI05	200	250	9.81E-11	9.81E-11	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI06	250	300	9.90E-11	9.90E-11	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI07	300	350	9.98E-11	9.98E-11	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI08	350	400	1.01E-10	1.01E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI09	400	450	1.01E-10	1.01E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI10	450	500	1.02E-10	1.02E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI11	500	600	1.03E-10	1.03E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI12	600	700	1.04E-10	1.04E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI13	700	800	1.06E-10	1.06E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI14	800	900	1.07E-10	1.07E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI15	900	1000	1.08E-10	1.08E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI16	1000	1200	1.09E-10	1.09E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI17	1200	1400	1.11E-10	1.11E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI18	1400	1600	1.13E-10	1.13E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI19	1600	1800	1.14E-10	1.14E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI20	1800	2000	1.16E-10	1.16E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI21	2000	2300	1.18E-10	1.18E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI22	2300	2600	1.21E-10	1.21E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI23	2600	2900	1.23E-10	1.23E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI24	2900	3200	1.26E-10	1.26E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI25	3200	3600	1.28E-10	1.28E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI26	3600	4000	1.32E-10	1.32E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI27	4000	4500	1.35E-10	1.35E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI28	4500	5000	1.39E-10	1.39E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI29	5000	5500	1.43E-10	1.43E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI30	5500	6000	1.47E-10	1.47E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI31	6000	6500	1.52E-10	1.52E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI32	6500	7000	1.56E-10	1.56E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI33	7000	7500	1.60E-10	1.60E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI34	7500	8000	1.65E-10	1.65E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI35	8000	8500	1.69E-10	1.69E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI36	8500	9000	1.74E-10	1.74E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI37	9000	9500	1.79E-10	1.79E-10	0.11	2.494	Concrete_Qhigh

Material zone	Time period(s)	Start time (yr)	End time (yr)	Horizontal conductivity (cm/s)	Vertical conductivity (cm/s)	Porosity	Solid density (g/mL)	Characteristic curves
UPPER_MUD_MAT	TI38	9500	10000	1.84E-10	1.84E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI39	10000	11000	1.92E-10	1.92E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI40	11000	12000	2.02E-10	2.02E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI41	12000	15000	2.27E-10	2.27E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI42	15000	20000	2.90E-10	2.90E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI43	20000	50000	4.17E-06	4.17E-06	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI44	50000	100000	0.0003301	9.11E-05	0.39	2.656	LowerVz
WALL	TI01	0	50	9.40E-11	9.40E-11	0.11	2.494	Concrete_Qhigh
WALL	TI02	50	100	9.61E-11	9.61E-11	0.11	2.494	Concrete_Qhigh
WALL	TI03	100	150	9.79E-11	9.79E-11	0.11	2.494	Concrete_Qhigh
WALL	TI04	150	200	9.95E-11	9.95E-11	0.11	2.494	Concrete_Qhigh
WALL	TI05	200	250	1.01E-10	1.01E-10	0.11	2.494	Concrete_Qhigh
WALL	TI06	250	300	1.02E-10	1.02E-10	0.11	2.494	Concrete_Qhigh
WALL	TI07	300	350	1.04E-10	1.04E-10	0.11	2.494	Concrete_Qhigh
WALL	TI08	350	400	1.05E-10	1.05E-10	0.11	2.494	Concrete_Qhigh
WALL	TI09	400	450	1.06E-10	1.06E-10	0.11	2.494	Concrete_Qhigh
WALL	TI10	450	500	1.07E-10	1.07E-10	0.11	2.494	Concrete_Qhigh
WALL	TI11	500	600	1.09E-10	1.09E-10	0.11	2.494	Concrete_Qhigh
WALL	TI12	600	700	1.11E-10	1.11E-10	0.11	2.494	Concrete_Qhigh
WALL	TI13	700	800	1.13E-10	1.13E-10	0.11	2.494	Concrete_Qhigh
WALL	TI14	800	900	1.15E-10	1.15E-10	0.11	2.494	Concrete_Qhigh
WALL	TI15	900	1000	1.17E-10	1.17E-10	0.11	2.494	Concrete_Qhigh
WALL	TI16	1000	1200	1.20E-10	1.20E-10	0.11	2.494	Concrete_Qhigh
WALL	TI17	1200	1400	1.23E-10	1.23E-10	0.11	2.494	Concrete_Qhigh
WALL	TI18	1400	1600	1.26E-10	1.26E-10	0.11	2.494	Concrete_Qhigh
WALL	TI19	1600	1800	1.29E-10	1.29E-10	0.11	2.494	Concrete_Qhigh
WALL	TI20	1800	2000	1.33E-10	1.33E-10	0.11	2.494	Concrete_Qhigh
WALL	TI21	2000	2300	1.37E-10	1.37E-10	0.11	2.494	Concrete_Qhigh
WALL	TI22	2300	2600	1.42E-10	1.42E-10	0.11	2.494	Concrete_Qhigh
WALL	TI23	2600	2900	1.47E-10	1.47E-10	0.11	2.494	Concrete_Qhigh
WALL	TI24	2900	3200	1.52E-10	1.52E-10	0.11	2.494	Concrete_Qhigh
WALL	TI25	3200	3600	1.59E-10	1.59E-10	0.11	2.494	Concrete_Qhigh
WALL	TI26	3600	4000	1.66E-10	1.66E-10	0.11	2.494	Concrete_Qhigh
WALL	TI27	4000	4500	1.75E-10	1.75E-10	0.11	2.494	Concrete_Qhigh
WALL	TI28	4500	5000	1.85E-10	1.85E-10	0.11	2.494	Concrete_Qhigh
WALL	TI29	5000	5500	1.96E-10	1.96E-10	0.11	2.494	Concrete_Qhigh
WALL	TI30	5500	6000	2.08E-10	2.08E-10	0.11	2.494	Concrete_Qhigh
WALL	TI31	6000	6500	2.21E-10	2.21E-10	0.11	2.494	Concrete_Qhigh
WALL	TI32	6500	7000	2.36E-10	2.36E-10	0.11	2.494	Concrete_Qhigh
WALL	TI33	7000	7500	2.51E-10	2.51E-10	0.11	2.494	Concrete_Qhigh
WALL	TI34	7500	8000	2.68E-10	2.68E-10	0.11	2.494	Concrete_Qhigh
WALL	TI35	8000	8500	2.88E-10	2.88E-10	0.11	2.494	Concrete_Qhigh
WALL	TI36	8500	9000	3.09E-10	3.09E-10	0.11	2.494	Concrete_Qhigh
WALL	TI37	9000	9500	3.33E-10	3.33E-10	0.11	2.494	Concrete_Qhigh
WALL	TI38	9500	10000	3.60E-10	3.60E-10	0.11	2.494	Concrete_Qhigh
WALL	TI39	10000	11000	4.16E-10	4.16E-10	0.11	2.494	Concrete_Qhigh
WALL	TI40	11000	12000	5.00E-10	5.00E-10	0.11	2.494	Concrete_Qhigh
WALL	TI41	12000	15000	9.57E-10	9.57E-10	0.11	2.494	Concrete_Qhigh
WALL	TI42	15000	20000	6.00E-06	6.00E-06	0.11	2.494	Concrete_Qhigh
WALL	TI43-TI44	20000	100000	7.60E-05	4.10E-05	0.35	2.631	CcBackfill

Vault 2, Case E

Material zone	Time period(s)	Start time (yr)	End time (yr)	Horizontal conductivity (cm/s)	Vertical conductivity (cm/s)	Porosity	Solid density (g/mL)	Characteristic curves
BACKFILL	TI01-TI44	0	100000	7.60E-05	4.10E-05	0.35	2.631	CcBackfill
CLEAN_GROUT	TI01-TI44	0	100000	0.001666	0.001666	0.58	2.405	FracturedSaltstone
COLUMN	TI01-TI44	0	100000	0.001666	5.00E-15	0.58	2.405	FracturedSaltstone
FLOOR	TI01	0	50	9.37E-11	9.37E-11	0.11	2.494	Concrete_Qhigh
FLOOR	TI02	50	100	9.50E-11	9.50E-11	0.11	2.494	Concrete_Qhigh
FLOOR	TI03	100	150	9.62E-11	9.62E-11	0.11	2.494	Concrete_Qhigh
FLOOR	TI04	150	200	9.72E-11	9.72E-11	0.11	2.494	Concrete_Qhigh
FLOOR	TI05	200	250	9.81E-11	9.81E-11	0.11	2.494	Concrete_Qhigh
FLOOR	TI06	250	300	9.90E-11	9.90E-11	0.11	2.494	Concrete_Qhigh
FLOOR	TI07	300	350	9.98E-11	9.98E-11	0.11	2.494	Concrete_Qhigh
FLOOR	TI08	350	400	1.01E-10	1.01E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI09	400	450	1.01E-10	1.01E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI10	450	500	1.02E-10	1.02E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI11	500	600	1.03E-10	1.03E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI12	600	700	1.04E-10	1.04E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI13	700	800	1.06E-10	1.06E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI14	800	900	1.07E-10	1.07E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI15	900	1000	1.08E-10	1.08E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI16	1000	1200	1.09E-10	1.09E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI17	1200	1400	1.11E-10	1.11E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI18	1400	1600	1.13E-10	1.13E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI19	1600	1800	1.14E-10	1.14E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI20	1800	2000	1.16E-10	1.16E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI21	2000	2300	1.18E-10	1.18E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI22	2300	2600	1.21E-10	1.21E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI23	2600	2900	1.23E-10	1.23E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI24	2900	3200	1.26E-10	1.26E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI25	3200	3600	1.28E-10	1.28E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI26	3600	4000	1.32E-10	1.32E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI27	4000	4500	1.35E-10	1.35E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI28	4500	5000	1.39E-10	1.39E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI29	5000	5500	1.43E-10	1.43E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI30	5500	6000	1.47E-10	1.47E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI31	6000	6500	1.52E-10	1.52E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI32	6500	7000	1.56E-10	1.56E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI33	7000	7500	1.60E-10	1.60E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI34	7500	8000	1.65E-10	1.65E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI35	8000	8500	1.69E-10	1.69E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI36	8500	9000	1.74E-10	1.74E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI37	9000	9500	1.79E-10	1.79E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI38	9500	10000	1.84E-10	1.84E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI39	10000	11000	1.92E-10	1.92E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI40	11000	12000	2.02E-10	2.02E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI41	12000	15000	2.27E-10	2.27E-10	0.11	2.494	Concrete_Qhigh
FLOOR	TI42	15000	20000	2.90E-10	2.90E-10	0.11	2.494	Concrete_Qhigh

Material zone	Time period(s)	Start time (yr)	End time (yr)	Horizontal conductivity (cm/s)	Vertical conductivity (cm/s)	Porosity	Solid density (g/mL)	Characteristic curves
FLOOR	TI43	20000	50000	4.17E-06	4.17E-06	0.11	2.494	Concrete_Qhigh
FLOOR	TI44	50000	100000	0.0003301	9.11E-05	0.39	2.656	LowerVz
FLOOR_HDPE_GCL	TI01	0	50	5.00E-15	2.19E-11	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI02	50	100	5.00E-15	6.22E-11	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI03	100	150	5.00E-15	1.64E-10	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI04	150	200	5.00E-15	2.63E-10	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI05	200	250	5.00E-15	3.47E-10	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI06	250	300	5.00E-15	4.30E-10	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI07	300	350	5.00E-15	5.13E-10	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI08	350	400	5.00E-15	5.95E-10	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI09	400	450	5.00E-15	6.76E-10	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI10	450	500	5.00E-15	7.56E-10	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI11	500	600	5.00E-15	8.76E-10	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI12	600	700	5.00E-15	1.04E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI13	700	800	5.00E-15	1.19E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI14	800	900	5.00E-15	1.35E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI15	900	1000	5.00E-15	1.50E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI16	1000	1200	5.00E-15	1.72E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI17	1200	1400	5.00E-15	2.02E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI18	1400	1600	5.00E-15	2.31E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI19	1600	1800	5.00E-15	2.59E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI20	1800	2000	5.00E-15	2.87E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI21	2000	2300	5.00E-15	3.21E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI22	2300	2600	5.00E-15	3.60E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI23	2600	2900	5.00E-15	3.99E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI24	2900	3200	5.00E-15	4.36E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI25	3200	3600	5.00E-15	4.79E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI26	3600	4000	5.00E-15	5.25E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI27	4000	4500	5.00E-15	5.77E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI28	4500	5000	5.00E-15	6.31E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI29	5000	5500	5.00E-15	6.84E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI30	5500	6000	5.00E-15	7.35E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI31	6000	6500	5.00E-15	7.85E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI32	6500	7000	5.00E-15	8.33E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI33	7000	7500	5.00E-15	8.79E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI34	7500	8000	5.00E-15	9.25E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI35	8000	8500	5.00E-15	9.69E-09	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI36	8500	9000	5.00E-15	1.01E-08	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI37	9000	9500	5.00E-15	1.05E-08	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI38	9500	10000	5.00E-15	1.09E-08	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI39	10000	11000	5.00E-15	1.15E-08	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI40	11000	12000	5.00E-15	1.21E-08	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI41	12000	15000	5.00E-15	1.35E-08	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI42	15000	20000	5.00E-15	1.61E-08	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI43	20000	50000	5.00E-15	2.48E-08	0.3	2.143	CcBackfill
FLOOR_HDPE_GCL	TI44	50000	100000	5.00E-15	3.79E-08	0.3	2.143	CcBackfill
HDPE	TI01	0	50	5.87E-10	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI02	50	100	2.30E-09	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI03	100	150	5.46E-09	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI04	150	200	8.96E-09	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI05	200	250	1.23E-08	5.00E-15	0.3	2.143	CcBackfill

Material zone	Time period(s)	Start time (yr)	End time (yr)	Horizontal conductivity (cm/s)	Vertical conductivity (cm/s)	Porosity	Solid density (g/mL)	Characteristic curves
HDPE	TI06	250	300	1.56E-08	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI07	300	350	1.89E-08	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI08	350	400	2.22E-08	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI09	400	450	2.56E-08	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI10	450	500	2.89E-08	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI11	500	600	3.38E-08	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI12	600	700	4.05E-08	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI13	700	800	4.71E-08	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI14	800	900	5.38E-08	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI15	900	1000	6.04E-08	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI16	1000	1200	7.03E-08	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI17	1200	1400	8.36E-08	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI18	1400	1600	9.69E-08	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI19	1600	1800	1.10E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI20	1800	2000	1.23E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI21	2000	2300	1.40E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI22	2300	2600	1.60E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI23	2600	2900	1.80E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI24	2900	3200	2.00E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI25	3200	3600	2.23E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI26	3600	4000	2.50E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI27	4000	4500	2.79E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI28	4500	5000	3.13E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI29	5000	5500	3.46E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI30	5500	6000	3.79E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI31	6000	6500	4.12E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI32	6500	7000	4.45E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI33	7000	7500	4.79E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI34	7500	8000	5.12E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI35	8000	8500	5.45E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI36	8500	9000	5.78E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI37	9000	9500	6.11E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI38	9500	10000	6.44E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI39	10000	11000	6.94E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI40	11000	12000	7.60E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI41	12000	15000	8.93E-07	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI42	15000	20000	1.16E-06	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI43	20000	50000	2.32E-06	5.00E-15	0.3	2.143	CcBackfill
HDPE	TI44	50000	100000	4.97E-06	5.00E-15	0.3	2.143	CcBackfill
LOWER_MUD_MAT	TI01-TI43	0	50000	1.00E-08	1.00E-08	0.211	2.611	Concrete_Qlow
LOWER_MUD_MAT	TI44	50000	100000	0.0003301	9.11E-05	0.39	2.656	LowerVz
NATIVE_SOIL	TI01-TI44	0	100000	0.0003301	9.11E-05	0.39	2.656	LowerVz
ROOF	TI01	0	50	9.31E-11	9.31E-11	0.11	2.494	Concrete_Qhigh
ROOF	TI02	50	100	9.33E-11	9.33E-11	0.11	2.494	Concrete_Qhigh
ROOF	TI03	100	150	9.36E-11	9.36E-11	0.11	2.494	Concrete_Qhigh
ROOF	TI04	150	200	9.40E-11	9.40E-11	0.11	2.494	Concrete_Qhigh
ROOF	TI05	200	250	9.43E-11	9.43E-11	0.11	2.494	Concrete_Qhigh
ROOF	TI06	250	300	9.47E-11	9.47E-11	0.11	2.494	Concrete_Qhigh
ROOF	TI07	300	350	9.51E-11	9.51E-11	0.11	2.494	Concrete_Qhigh

Material zone	Time period(s)	Start time (yr)	End time (yr)	Horizontal conductivity (cm/s)	Vertical conductivity (cm/s)	Porosity	Solid density (g/mL)	Characteristic curves
ROOF	TI08	350	400	9.55E-11	9.55E-11	0.11	2.494	Concrete_Qhigh
ROOF	TI09	400	450	9.59E-11	9.59E-11	0.11	2.494	Concrete_Qhigh
ROOF	TI10	450	500	9.63E-11	9.63E-11	0.11	2.494	Concrete_Qhigh
ROOF	TI11	500	600	9.69E-11	9.69E-11	0.11	2.494	Concrete_Qhigh
ROOF	TI12	600	700	9.76E-11	9.76E-11	0.11	2.494	Concrete_Qhigh
ROOF	TI13	700	800	9.84E-11	9.84E-11	0.11	2.494	Concrete_Qhigh
ROOF	TI14	800	900	9.92E-11	9.92E-11	0.11	2.494	Concrete_Qhigh
ROOF	TI15	900	1000	1.00E-10	1.00E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI16	1000	1200	1.01E-10	1.01E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI17	1200	1400	1.02E-10	1.02E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI18	1400	1600	1.04E-10	1.04E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI19	1600	1800	1.05E-10	1.05E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI20	1800	2000	1.06E-10	1.06E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI21	2000	2300	1.08E-10	1.08E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI22	2300	2600	1.10E-10	1.10E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI23	2600	2900	1.12E-10	1.12E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI24	2900	3200	1.14E-10	1.14E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI25	3200	3600	1.16E-10	1.16E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI26	3600	4000	1.18E-10	1.18E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI27	4000	4500	1.21E-10	1.21E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI28	4500	5000	1.24E-10	1.24E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI29	5000	5500	1.28E-10	1.28E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI30	5500	6000	1.31E-10	1.31E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI31	6000	6500	1.34E-10	1.34E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI32	6500	7000	1.38E-10	1.38E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI33	7000	7500	1.41E-10	1.41E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI34	7500	8000	1.45E-10	1.45E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI35	8000	8500	1.48E-10	1.48E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI36	8500	9000	1.52E-10	1.52E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI37	9000	9500	1.56E-10	1.56E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI38	9500	10000	1.60E-10	1.60E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI39	10000	11000	1.66E-10	1.66E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI40	11000	12000	1.75E-10	1.75E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI41	12000	15000	1.94E-10	1.94E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI42	15000	20000	2.41E-10	2.41E-10	0.11	2.494	Concrete_Qhigh
ROOF	TI43-TI44	20000	100000	7.60E-05	4.10E-05	0.35	2.631	CcBackfill
ROOF_HDPE_GCL	TI01	0	50	5.00E-15	2.19E-11	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI02	50	100	5.00E-15	6.22E-11	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI03	100	150	5.00E-15	1.64E-10	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI04	150	200	5.00E-15	2.63E-10	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI05	200	250	5.00E-15	3.47E-10	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI06	250	300	5.00E-15	4.30E-10	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI07	300	350	5.00E-15	5.13E-10	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI08	350	400	5.00E-15	5.95E-10	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI09	400	450	5.00E-15	6.76E-10	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI10	450	500	5.00E-15	7.56E-10	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI11	500	600	5.00E-15	8.76E-10	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI12	600	700	5.00E-15	1.04E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI13	700	800	5.00E-15	1.19E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI14	800	900	5.00E-15	1.35E-09	0.3	2.143	CcBackfill

Material zone	Time period(s)	Start time (yr)	End time (yr)	Horizontal conductivity (cm/s)	Vertical conductivity (cm/s)	Porosity	Solid density (g/mL)	Characteristic curves
ROOF_HDPE_GCL	TI15	900	1000	5.00E-15	1.50E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI16	1000	1200	5.00E-15	1.72E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI17	1200	1400	5.00E-15	2.02E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI18	1400	1600	5.00E-15	2.31E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI19	1600	1800	5.00E-15	2.59E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI20	1800	2000	5.00E-15	2.87E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI21	2000	2300	5.00E-15	3.21E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI22	2300	2600	5.00E-15	3.60E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI23	2600	2900	5.00E-15	3.99E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI24	2900	3200	5.00E-15	4.36E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI25	3200	3600	5.00E-15	4.79E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI26	3600	4000	5.00E-15	5.25E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI27	4000	4500	5.00E-15	5.77E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI28	4500	5000	5.00E-15	6.31E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI29	5000	5500	5.00E-15	6.84E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI30	5500	6000	5.00E-15	7.35E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI31	6000	6500	5.00E-15	7.85E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI32	6500	7000	5.00E-15	8.33E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI33	7000	7500	5.00E-15	8.79E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI34	7500	8000	5.00E-15	9.25E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI35	8000	8500	5.00E-15	9.69E-09	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI36	8500	9000	5.00E-15	1.01E-08	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI37	9000	9500	5.00E-15	1.05E-08	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI38	9500	10000	5.00E-15	1.09E-08	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI39	10000	11000	5.00E-15	1.15E-08	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI40	11000	12000	5.00E-15	1.21E-08	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI41	12000	15000	5.00E-15	1.35E-08	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI42	15000	20000	5.00E-15	1.61E-08	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI43	20000	50000	5.00E-15	2.48E-08	0.3	2.143	CcBackfill
ROOF_HDPE_GCL	TI44	50000	100000	5.00E-15	3.79E-08	0.3	2.143	CcBackfill
SALTSTONE	TI01-TI44	0	100000	0.001666	0.001666	0.58	2.405	FracturedSaltstone
SAND_DRAIN	TI01-TI07	0	350	0.05001	0.05001	0.417	2.661	Sand
SAND_DRAIN	TI08-TI10	350	500	0.04997	0.04997	0.417	2.661	Sand
SAND_DRAIN	TI11	500	600	0.04994	0.04994	0.4169	2.661	Sand
SAND_DRAIN	TI12	600	700	0.04991	0.04991	0.4169	2.661	Sand
SAND_DRAIN	TI13	700	800	0.04985	0.04985	0.4168	2.661	Sand
SAND_DRAIN	TI14	800	900	0.04982	0.04982	0.4168	2.661	Sand
SAND_DRAIN	TI15	900	1000	0.04975	0.04975	0.4167	2.661	Sand
SAND_DRAIN	TI16	1000	1200	0.04966	0.04966	0.4165	2.661	Sand
SAND_DRAIN	TI17	1200	1400	0.04947	0.04947	0.4163	2.661	Sand
SAND_DRAIN	TI18	1400	1600	0.04928	0.04928	0.416	2.661	Sand
SAND_DRAIN	TI19	1600	1800	0.04909	0.04909	0.4158	2.661	Sand
SAND_DRAIN	TI20	1800	2000	0.04883	0.04883	0.4154	2.661	Sand
SAND_DRAIN	TI21	2000	2300	0.04842	0.04842	0.4149	2.661	Sand
SAND_DRAIN	TI22	2300	2600	0.04795	0.04795	0.4143	2.661	Sand
SAND_DRAIN	TI23	2600	2900	0.04747	0.04747	0.4136	2.661	Sand
SAND_DRAIN	TI24	2900	3200	0.04699	0.04699	0.413	2.661	Sand
SAND_DRAIN	TI25	3200	3600	0.04626	0.04626	0.412	2.661	Sand

Material zone	Time period(s)	Start time (yr)	End time (yr)	Horizontal conductivity (cm/s)	Vertical conductivity (cm/s)	Porosity	Solid density (g/mL)	Characteristic curves
SAND_DRAIN	TI26	3600	4000	0.04528	0.04528	0.4107	2.661	Sand
SAND_DRAIN	TI27	4000	4500	0.04414	0.04414	0.4092	2.661	Sand
SAND_DRAIN	TI28	4500	5000	0.0429	0.0429	0.4075	2.661	Sand
SAND_DRAIN	TI29	5000	5500	0.04167	0.04167	0.4058	2.661	Sand
SAND_DRAIN	TI30	5500	6000	0.04024	0.04024	0.4039	2.661	Sand
SAND_DRAIN	TI31	6000	6500	0.03872	0.03872	0.4019	2.661	Sand
SAND_DRAIN	TI32	6500	7000	0.0372	0.0372	0.3998	2.661	Sand
SAND_DRAIN	TI33	7000	7500	0.03571	0.03571	0.3978	2.661	Sand
SAND_DRAIN	TI34	7500	8000	0.03418	0.03418	0.3958	2.661	Sand
SAND_DRAIN	TI35	8000	8500	0.03266	0.03266	0.3937	2.661	Sand
SAND_DRAIN	TI36	8500	9000	0.03114	0.03114	0.3917	2.661	Sand
SAND_DRAIN	TI37	9000	9500	0.02963	0.02963	0.3897	2.661	Sand
SAND_DRAIN	TI38	9500	10000	0.02811	0.02811	0.3876	2.661	Sand
SAND_DRAIN	TI39	10000	11000	0.02584	0.02584	0.3846	2.661	Sand
SAND_DRAIN	TI40	11000	12000	0.02281	0.02281	0.3805	2.661	Sand
SAND_DRAIN	TI41	12000	15000	0.01675	0.01675	0.3724	2.661	Sand
SAND_DRAIN	TI42	15000	20000	0.004921	0.004921	0.3565	2.661	Sand
SAND_DRAIN	TI43-TI44	20000	100000	7.60E-05	4.10E-05	0.35	2.631	CcBackfill
SHEET_DRAIN	TI01-TI44	0	100000	0.001666	5.00E-15	0.58	2.405	FracturedSaltstone
SHOT_CRETE	TI01-TI42	0	20000	7.60E-05	7.60E-05	0.35	2.631	CcBackfill
SHOT_CRETE	TI43-TI44	20000	100000	7.60E-05	4.10E-05	0.35	2.631	CcBackfill
UPPER_MUD_MAT	TI01	0	50	9.37E-11	9.37E-11	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI02	50	100	9.50E-11	9.50E-11	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI03	100	150	9.62E-11	9.62E-11	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI04	150	200	9.72E-11	9.72E-11	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI05	200	250	9.81E-11	9.81E-11	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI06	250	300	9.90E-11	9.90E-11	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI07	300	350	9.98E-11	9.98E-11	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI08	350	400	1.01E-10	1.01E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI09	400	450	1.01E-10	1.01E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI10	450	500	1.02E-10	1.02E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI11	500	600	1.03E-10	1.03E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI12	600	700	1.04E-10	1.04E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI13	700	800	1.06E-10	1.06E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI14	800	900	1.07E-10	1.07E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI15	900	1000	1.08E-10	1.08E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI16	1000	1200	1.09E-10	1.09E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI17	1200	1400	1.11E-10	1.11E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI18	1400	1600	1.13E-10	1.13E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI19	1600	1800	1.14E-10	1.14E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI20	1800	2000	1.16E-10	1.16E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI21	2000	2300	1.18E-10	1.18E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI22	2300	2600	1.21E-10	1.21E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI23	2600	2900	1.23E-10	1.23E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI24	2900	3200	1.26E-10	1.26E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI25	3200	3600	1.28E-10	1.28E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI26	3600	4000	1.32E-10	1.32E-10	0.11	2.494	Concrete_Qhigh

Material zone	Time period(s)	Start time (yr)	End time (yr)	Horizontal conductivity (cm/s)	Vertical conductivity (cm/s)	Porosity	Solid density (g/mL)	Characteristic curves
UPPER_MUD_MAT	TI27	4000	4500	1.35E-10	1.35E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI28	4500	5000	1.39E-10	1.39E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI29	5000	5500	1.43E-10	1.43E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI30	5500	6000	1.47E-10	1.47E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI31	6000	6500	1.52E-10	1.52E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI32	6500	7000	1.56E-10	1.56E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI33	7000	7500	1.60E-10	1.60E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI34	7500	8000	1.65E-10	1.65E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI35	8000	8500	1.69E-10	1.69E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI36	8500	9000	1.74E-10	1.74E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI37	9000	9500	1.79E-10	1.79E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI38	9500	10000	1.84E-10	1.84E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI39	10000	11000	1.92E-10	1.92E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI40	11000	12000	2.02E-10	2.02E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI41	12000	15000	2.27E-10	2.27E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI42	15000	20000	2.90E-10	2.90E-10	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI43	20000	50000	4.17E-06	4.17E-06	0.11	2.494	Concrete_Qhigh
UPPER_MUD_MAT	TI44	50000	100000	0.0003301	9.11E-05	0.39	2.656	LowerVz
WALL	TI01	0	50	9.40E-11	9.40E-11	0.11	2.494	Concrete_Qhigh
WALL	TI02	50	100	9.61E-11	9.61E-11	0.11	2.494	Concrete_Qhigh
WALL	TI03	100	150	9.79E-11	9.79E-11	0.11	2.494	Concrete_Qhigh
WALL	TI04	150	200	9.95E-11	9.95E-11	0.11	2.494	Concrete_Qhigh
WALL	TI05	200	250	1.01E-10	1.01E-10	0.11	2.494	Concrete_Qhigh
WALL	TI06	250	300	1.02E-10	1.02E-10	0.11	2.494	Concrete_Qhigh
WALL	TI07	300	350	1.04E-10	1.04E-10	0.11	2.494	Concrete_Qhigh
WALL	TI08	350	400	1.05E-10	1.05E-10	0.11	2.494	Concrete_Qhigh
WALL	TI09	400	450	1.06E-10	1.06E-10	0.11	2.494	Concrete_Qhigh
WALL	TI10	450	500	1.07E-10	1.07E-10	0.11	2.494	Concrete_Qhigh
WALL	TI11	500	600	1.09E-10	1.09E-10	0.11	2.494	Concrete_Qhigh
WALL	TI12	600	700	1.11E-10	1.11E-10	0.11	2.494	Concrete_Qhigh
WALL	TI13	700	800	1.13E-10	1.13E-10	0.11	2.494	Concrete_Qhigh
WALL	TI14	800	900	1.15E-10	1.15E-10	0.11	2.494	Concrete_Qhigh
WALL	TI15	900	1000	1.17E-10	1.17E-10	0.11	2.494	Concrete_Qhigh
WALL	TI16	1000	1200	1.20E-10	1.20E-10	0.11	2.494	Concrete_Qhigh
WALL	TI17	1200	1400	1.23E-10	1.23E-10	0.11	2.494	Concrete_Qhigh
WALL	TI18	1400	1600	1.26E-10	1.26E-10	0.11	2.494	Concrete_Qhigh
WALL	TI19	1600	1800	1.29E-10	1.29E-10	0.11	2.494	Concrete_Qhigh
WALL	TI20	1800	2000	1.33E-10	1.33E-10	0.11	2.494	Concrete_Qhigh
WALL	TI21	2000	2300	1.37E-10	1.37E-10	0.11	2.494	Concrete_Qhigh
WALL	TI22	2300	2600	1.42E-10	1.42E-10	0.11	2.494	Concrete_Qhigh
WALL	TI23	2600	2900	1.47E-10	1.47E-10	0.11	2.494	Concrete_Qhigh
WALL	TI24	2900	3200	1.52E-10	1.52E-10	0.11	2.494	Concrete_Qhigh
WALL	TI25	3200	3600	1.59E-10	1.59E-10	0.11	2.494	Concrete_Qhigh
WALL	TI26	3600	4000	1.66E-10	1.66E-10	0.11	2.494	Concrete_Qhigh
WALL	TI27	4000	4500	1.75E-10	1.75E-10	0.11	2.494	Concrete_Qhigh
WALL	TI28	4500	5000	1.85E-10	1.85E-10	0.11	2.494	Concrete_Qhigh
WALL	TI29	5000	5500	1.96E-10	1.96E-10	0.11	2.494	Concrete_Qhigh
WALL	TI30	5500	6000	2.08E-10	2.08E-10	0.11	2.494	Concrete_Qhigh
WALL	TI31	6000	6500	2.21E-10	2.21E-10	0.11	2.494	Concrete_Qhigh
WALL	TI32	6500	7000	2.36E-10	2.36E-10	0.11	2.494	Concrete_Qhigh
WALL	TI33	7000	7500	2.51E-10	2.51E-10	0.11	2.494	Concrete_Qhigh

Material zone	Time period(s)	Start time (yr)	End time (yr)	Horizontal conductivity (cm/s)	Vertical conductivity (cm/s)	Porosity	Solid density (g/mL)	Characteristic curves
WALL	TI34	7500	8000	2.68E-10	2.68E-10	0.11	2.494	Concrete_Qhigh
WALL	TI35	8000	8500	2.88E-10	2.88E-10	0.11	2.494	Concrete_Qhigh
WALL	TI36	8500	9000	3.09E-10	3.09E-10	0.11	2.494	Concrete_Qhigh
WALL	TI37	9000	9500	3.33E-10	3.33E-10	0.11	2.494	Concrete_Qhigh
WALL	TI38	9500	10000	3.60E-10	3.60E-10	0.11	2.494	Concrete_Qhigh
WALL	TI39	10000	11000	4.16E-10	4.16E-10	0.11	2.494	Concrete_Qhigh
WALL	TI40	11000	12000	5.00E-10	5.00E-10	0.11	2.494	Concrete_Qhigh
WALL	TI41	12000	15000	9.57E-10	9.57E-10	0.11	2.494	Concrete_Qhigh
WALL	TI42	15000	20000	6.00E-06	6.00E-06	0.11	2.494	Concrete_Qhigh
WALL	TI43-TI44	20000	100000	7.60E-05	4.10E-05	0.35	2.631	CcBackfill

Vault 4, Case A

Material zone	Time period(s)	Start time (yr)	End time (yr)	Horizontal conductivity (cm/s)	Vertical conductivity (cm/s)	Porosity	Solid density (g/mL)	Characteristic curves
BACKFILL	TI01-TI44	0	100000	7.60E-05	4.10E-05	0.35	2.631	CcBackfill
CLEAN_GROUT	TI01-TI44	0	100000	2.00E-09	2.00E-09	0.58	2.405	Saltstone
CRACK	TI01-TI44	0	100000	2.00E-09	5.00E-15	0.58	2.405	Saltstone
FLOOR	TI01	0	50	3.11E-10	3.11E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI02	50	100	3.13E-10	3.13E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI03	100	150	3.14E-10	3.14E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI04	150	200	3.15E-10	3.15E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI05	200	250	3.17E-10	3.17E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI06	250	300	3.17E-10	3.17E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI07	300	350	3.18E-10	3.18E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI08	350	400	3.19E-10	3.19E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI09	400	450	3.20E-10	3.20E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI10	450	500	3.21E-10	3.21E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI11	500	600	3.22E-10	3.22E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI12	600	700	3.24E-10	3.24E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI13	700	800	3.25E-10	3.25E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI14	800	900	3.26E-10	3.26E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI15	900	1000	3.28E-10	3.28E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI16	1000	1200	3.29E-10	3.29E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI17	1200	1400	3.31E-10	3.31E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI18	1400	1600	3.33E-10	3.33E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI19	1600	1800	3.34E-10	3.34E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI20	1800	2000	3.36E-10	3.36E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI21	2000	2300	3.38E-10	3.38E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI22	2300	2600	3.40E-10	3.40E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI23	2600	2900	3.43E-10	3.43E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI24	2900	3200	3.45E-10	3.45E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI25	3200	3600	3.47E-10	3.47E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI26	3600	4000	3.50E-10	3.50E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI27	4000	4500	3.53E-10	3.53E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI28	4500	5000	3.56E-10	3.56E-10	0.12	2.546	Concrete_Qhigh

Material zone	Time period(s)	Start time (yr)	End time (yr)	Horizontal conductivity (cm/s)	Vertical conductivity (cm/s)	Porosity	Solid density (g/mL)	Characteristic curves
FLOOR	TI29	5000	5500	3.59E-10	3.59E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI30	5500	6000	3.62E-10	3.62E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI31	6000	6500	3.65E-10	3.65E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI32	6500	7000	3.68E-10	3.68E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI33	7000	7500	3.71E-10	3.71E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI34	7500	8000	3.74E-10	3.74E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI35	8000	8500	3.76E-10	3.76E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI36	8500	9000	3.79E-10	3.79E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI37	9000	9500	3.82E-10	3.82E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI38	9500	10000	3.84E-10	3.84E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI39	10000	11000	3.88E-10	3.88E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI40	11000	12000	3.93E-10	3.93E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI41	12000	15000	4.02E-10	4.02E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI42	15000	20000	4.21E-10	4.21E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI43	20000	50000	5.01E-10	5.01E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI44	50000	100000	7.21E-10	7.21E-10	0.12	2.546	Concrete_Qhigh
NATIVE_SOIL	TI01-TI44	0	100000	0.0003301	9.11E-05	0.39	2.656	LowerVz
ROOF	TI01	0	50	5.02E-09	5.02E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI02	50	100	5.06E-09	5.06E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI03	100	150	5.11E-09	5.11E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI04	150	200	5.16E-09	5.16E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI05	200	250	5.22E-09	5.22E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI06	250	300	5.28E-09	5.28E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI07	300	350	5.34E-09	5.34E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI08	350	400	5.40E-09	5.40E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI09	400	450	5.47E-09	5.47E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI10	450	500	5.53E-09	5.53E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI11	500	600	5.62E-09	5.62E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI12	600	700	5.75E-09	5.75E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI13	700	800	5.88E-09	5.88E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI14	800	900	6.01E-09	6.01E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI15	900	1000	6.14E-09	6.14E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI16	1000	1200	6.34E-09	6.34E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI17	1200	1400	6.60E-09	6.60E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI18	1400	1600	6.85E-09	6.85E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI19	1600	1800	7.11E-09	7.11E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI20	1800	2000	7.37E-09	7.37E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI21	2000	2300	7.74E-09	7.74E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI22	2300	2600	8.22E-09	8.22E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI23	2600	2900	8.70E-09	8.70E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI24	2900	3200	9.22E-09	9.22E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI25	3200	3600	9.96E-09	9.96E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI26	3600	4000	1.08E-08	1.08E-08	0.136	2.558	Concrete_Qmedium
ROOF	TI27	4000	4500	1.20E-08	1.20E-08	0.136	2.558	Concrete_Qmedium
ROOF	TI28	4500	5000	1.35E-08	1.35E-08	0.136	2.558	Concrete_Qmedium
ROOF	TI29	5000	5500	1.55E-08	1.55E-08	0.136	2.558	Concrete_Qmedium
ROOF	TI30	5500	6000	1.79E-08	1.79E-08	0.136	2.558	Concrete_Qmedium
ROOF	TI31	6000	6500	2.13E-08	2.13E-08	0.136	2.558	Concrete_Qmedium
ROOF	TI32	6500	7000	2.57E-08	2.57E-08	0.136	2.558	Concrete_Qmedium
ROOF	TI33	7000	7500	3.31E-08	3.31E-08	0.136	2.558	Concrete_Qmedium

Material zone	Time period(s)	Start time (yr)	End time (yr)	Horizontal conductivity (cm/s)	Vertical conductivity (cm/s)	Porosity	Solid density (g/mL)	Characteristic curves
ROOF	TI34	7500	8000	4.36E-08	4.36E-08	0.136	2.558	Concrete_Qmedium
ROOF	TI35	8000	8500	7.97E-08	7.97E-08	0.136	2.558	Concrete_Qmedium
ROOF	TI36	8500	9000	1.41E-07	1.41E-07	0.136	2.558	Concrete_Qmedium
ROOF	TI37	9000	9500	2.63E-06	2.63E-06	0.136	2.558	Concrete_Qmedium
ROOF	TI38	9500	10000	7.54E-06	7.54E-06	0.136	2.558	Concrete_Qmedium
ROOF	TI39-TI44	10000	100000	7.60E-05	4.10E-05	0.35	2.631	CcBackfill
SALTSTONE	TI01-TI44	0	100000	2.00E-09	2.00E-09	0.58	2.405	Saltstone
SAND_DRAIN	TI01-TI07	0	350	0.05001	0.05001	0.417	2.661	Sand
SAND_DRAIN	TI08-TI10	350	500	0.04997	0.04997	0.417	2.661	Sand
SAND_DRAIN	TI11	500	600	0.04994	0.04994	0.4169	2.661	Sand
SAND_DRAIN	TI12	600	700	0.04991	0.04991	0.4169	2.661	Sand
SAND_DRAIN	TI13	700	800	0.04985	0.04985	0.4168	2.661	Sand
SAND_DRAIN	TI14	800	900	0.04982	0.04982	0.4168	2.661	Sand
SAND_DRAIN	TI15	900	1000	0.04975	0.04975	0.4167	2.661	Sand
SAND_DRAIN	TI16	1000	1200	0.04966	0.04966	0.4165	2.661	Sand
SAND_DRAIN	TI17	1200	1400	0.04947	0.04947	0.4163	2.661	Sand
SAND_DRAIN	TI18	1400	1600	0.04928	0.04928	0.416	2.661	Sand
SAND_DRAIN	TI19	1600	1800	0.04909	0.04909	0.4158	2.661	Sand
SAND_DRAIN	TI20	1800	2000	0.04883	0.04883	0.4154	2.661	Sand
SAND_DRAIN	TI21	2000	2300	0.04842	0.04842	0.4149	2.661	Sand
SAND_DRAIN	TI22	2300	2600	0.04795	0.04795	0.4143	2.661	Sand
SAND_DRAIN	TI23	2600	2900	0.04747	0.04747	0.4136	2.661	Sand
SAND_DRAIN	TI24	2900	3200	0.04699	0.04699	0.413	2.661	Sand
SAND_DRAIN	TI25	3200	3600	0.04626	0.04626	0.412	2.661	Sand
SAND_DRAIN	TI26	3600	4000	0.04528	0.04528	0.4107	2.661	Sand
SAND_DRAIN	TI27	4000	4500	0.04414	0.04414	0.4092	2.661	Sand
SAND_DRAIN	TI28	4500	5000	0.0429	0.0429	0.4075	2.661	Sand
SAND_DRAIN	TI29	5000	5500	0.04167	0.04167	0.4058	2.661	Sand
SAND_DRAIN	TI30	5500	6000	0.04024	0.04024	0.4039	2.661	Sand
SAND_DRAIN	TI31	6000	6500	0.03872	0.03872	0.4019	2.661	Sand
SAND_DRAIN	TI32	6500	7000	0.0372	0.0372	0.3998	2.661	Sand
SAND_DRAIN	TI33	7000	7500	0.03571	0.03571	0.3978	2.661	Sand
SAND_DRAIN	TI34	7500	8000	0.03418	0.03418	0.3958	2.661	Sand
SAND_DRAIN	TI35	8000	8500	0.03266	0.03266	0.3937	2.661	Sand
SAND_DRAIN	TI36	8500	9000	0.03114	0.03114	0.3917	2.661	Sand
SAND_DRAIN	TI37	9000	9500	0.02963	0.02963	0.3897	2.661	Sand
SAND_DRAIN	TI38	9500	10000	0.02811	0.02811	0.3876	2.661	Sand
SAND_DRAIN	TI39	10000	11000	0.02584	0.02584	0.3846	2.661	Sand
SAND_DRAIN	TI40	11000	12000	0.02281	0.02281	0.3805	2.661	Sand
SAND_DRAIN	TI41	12000	15000	0.01675	0.01675	0.3724	2.661	Sand
SAND_DRAIN	TI42	15000	20000	0.004921	0.004921	0.3565	2.661	Sand
SAND_DRAIN	TI43-TI44	20000	100000	7.60E-05	4.10E-05	0.35	2.631	CcBackfill
SHEET_DRAIN	TI01-TI44	0	100000	2.00E-09	5.00E-15	0.58	2.405	Saltstone
WALL	TI01	0	50	0.1672	0.1672	0.12	2.546	FracturedConcrete
WALL	TI02	50	100	0.1684	0.1684	0.12	2.546	FracturedConcrete

Material zone	Time period(s)	Start time (yr)	End time (yr)	Horizontal conductivity (cm/s)	Vertical conductivity (cm/s)	Porosity	Solid density (g/mL)	Characteristic curves
WALL	TI03	100	150	0.1695	0.1695	0.12	2.546	FracturedConcrete
WALL	TI04	150	200	0.1704	0.1704	0.12	2.546	FracturedConcrete
WALL	TI05	200	250	0.1712	0.1712	0.12	2.546	FracturedConcrete
WALL	TI06	250	300	0.172	0.172	0.12	2.546	FracturedConcrete
WALL	TI07	300	350	0.1727	0.1727	0.12	2.546	FracturedConcrete
WALL	TI08	350	400	0.1734	0.1734	0.12	2.546	FracturedConcrete
WALL	TI09	400	450	0.174	0.174	0.12	2.546	FracturedConcrete
WALL	TI10	450	500	0.1746	0.1746	0.12	2.546	FracturedConcrete
WALL	TI11	500	600	0.1755	0.1755	0.12	2.546	FracturedConcrete
WALL	TI12	600	700	0.1765	0.1765	0.12	2.546	FracturedConcrete
WALL	TI13	700	800	0.1775	0.1775	0.12	2.546	FracturedConcrete
WALL	TI14	800	900	0.1785	0.1785	0.12	2.546	FracturedConcrete
WALL	TI15	900	1000	0.1794	0.1794	0.12	2.546	FracturedConcrete
WALL	TI16	1000	1200	0.1805	0.1805	0.12	2.546	FracturedConcrete
WALL	TI17	1200	1400	0.1819	0.1819	0.12	2.546	FracturedConcrete
WALL	TI18	1400	1600	0.1832	0.1832	0.12	2.546	FracturedConcrete
WALL	TI19	1600	1800	0.1845	0.1845	0.12	2.546	FracturedConcrete
WALL	TI20	1800	2000	0.1858	0.1858	0.12	2.546	FracturedConcrete
WALL	TI21	2000	2300	0.1873	0.1873	0.12	2.546	FracturedConcrete
WALL	TI22	2300	2600	0.1891	0.1891	0.12	2.546	FracturedConcrete
WALL	TI23	2600	2900	0.1908	0.1908	0.12	2.546	FracturedConcrete
WALL	TI24	2900	3200	0.1925	0.1925	0.12	2.546	FracturedConcrete
WALL	TI25	3200	3600	0.1944	0.1944	0.12	2.546	FracturedConcrete
WALL	TI26	3600	4000	0.1965	0.1965	0.12	2.546	FracturedConcrete
WALL	TI27	4000	4500	0.1988	0.1988	0.12	2.546	FracturedConcrete
WALL	TI28	4500	5000	0.2013	0.2013	0.12	2.546	FracturedConcrete
WALL	TI29	5000	5500	0.2038	0.2038	0.12	2.546	FracturedConcrete
WALL	TI30	5500	6000	0.2061	0.2061	0.12	2.546	FracturedConcrete
WALL	TI31	6000	6500	0.2085	0.2085	0.12	2.546	FracturedConcrete
WALL	TI32	6500	7000	0.2108	0.2108	0.12	2.546	FracturedConcrete
WALL	TI33	7000	7500	0.2131	0.2131	0.12	2.546	FracturedConcrete
WALL	TI34	7500	8000	0.2154	0.2154	0.12	2.546	FracturedConcrete
WALL	TI35	8000	8500	0.2176	0.2176	0.12	2.546	FracturedConcrete
WALL	TI36	8500	9000	0.2199	0.2199	0.12	2.546	FracturedConcrete
WALL	TI37	9000	9500	0.2221	0.2221	0.12	2.546	FracturedConcrete
WALL	TI38	9500	10000	0.2243	0.2243	0.12	2.546	FracturedConcrete
WALL	TI39	10000	11000	0.2275	0.2275	0.12	2.546	FracturedConcrete
WALL	TI40	11000	12000	0.2318	0.2318	0.12	2.546	FracturedConcrete
WALL	TI41	12000	15000	0.2402	0.2402	0.12	2.546	FracturedConcrete
WALL	TI42	15000	20000	0.2573	0.2573	0.12	2.546	FracturedConcrete
WALL	TI43	20000	50000	0.3415	0.3415	0.12	2.546	FracturedConcrete
WALL	TI44	50000	100000	0.7433	0.7433	0.12	2.546	FracturedConcrete

Vault 4, Case B

Material zone	Time period(s)	Start time (yr)	End time (yr)	Horizontal conductivity (cm/s)	Vertical conductivity (cm/s)	Porosity	Solid density (g/mL)	Characteristic curves
BACKFILL	TI01-TI44	0	100000	7.60E-05	4.10E-05	0.35	2.631	CcBackfill
CLEAN_GROUT	TI01-	0	100000	2.00E-09	2.00E-09	0.58	2.405	Saltstone

Material zone	Time period(s)	Start time (yr)	End time (yr)	Horizontal conductivity (cm/s)	Vertical conductivity (cm/s)	Porosity	Solid density (g/mL)	Characteristic curves
	TI44							
CRACK	TI01-TI44	0	100000	2.00E-09	5.00E-15	0.58	2.405	Saltstone
FLOOR	TI01	0	50	3.11E-10	3.11E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI02	50	100	3.13E-10	3.13E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI03	100	150	3.14E-10	3.14E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI04	150	200	3.15E-10	3.15E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI05	200	250	3.17E-10	3.17E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI06	250	300	3.17E-10	3.17E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI07	300	350	3.18E-10	3.18E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI08	350	400	3.19E-10	3.19E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI09	400	450	3.20E-10	3.20E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI10	450	500	3.21E-10	3.21E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI11	500	600	3.22E-10	3.22E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI12	600	700	3.24E-10	3.24E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI13	700	800	3.25E-10	3.25E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI14	800	900	3.26E-10	3.26E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI15	900	1000	3.28E-10	3.28E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI16	1000	1200	3.29E-10	3.29E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI17	1200	1400	3.31E-10	3.31E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI18	1400	1600	3.33E-10	3.33E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI19	1600	1800	3.34E-10	3.34E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI20	1800	2000	3.36E-10	3.36E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI21	2000	2300	3.38E-10	3.38E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI22	2300	2600	3.40E-10	3.40E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI23	2600	2900	3.43E-10	3.43E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI24	2900	3200	3.45E-10	3.45E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI25	3200	3600	3.47E-10	3.47E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI26	3600	4000	3.50E-10	3.50E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI27	4000	4500	3.53E-10	3.53E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI28	4500	5000	3.56E-10	3.56E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI29	5000	5500	3.59E-10	3.59E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI30	5500	6000	3.62E-10	3.62E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI31	6000	6500	3.65E-10	3.65E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI32	6500	7000	3.68E-10	3.68E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI33	7000	7500	3.71E-10	3.71E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI34	7500	8000	3.74E-10	3.74E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI35	8000	8500	3.76E-10	3.76E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI36	8500	9000	3.79E-10	3.79E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI37	9000	9500	3.82E-10	3.82E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI38	9500	10000	3.84E-10	3.84E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI39	10000	11000	3.88E-10	3.88E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI40	11000	12000	3.93E-10	3.93E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI41	12000	15000	4.02E-10	4.02E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI42	15000	20000	4.21E-10	4.21E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI43	20000	50000	5.01E-10	5.01E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI44	50000	100000	7.21E-10	7.21E-10	0.12	2.546	Concrete_Qhigh
NATIVE_SOIL	TI01-TI44	0	100000	0.0003301	9.11E-05	0.39	2.656	LowerVz
ROOF	TI01	0	50	5.02E-09	5.02E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI02	50	100	5.06E-09	5.06E-09	0.136	2.558	Concrete_Qmedium

Material zone	Time period(s)	Start time (yr)	End time (yr)	Horizontal conductivity (cm/s)	Vertical conductivity (cm/s)	Porosity	Solid density (g/mL)	Characteristic curves
ROOF	TI03	100	150	5.11E-09	5.11E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI04	150	200	5.16E-09	5.16E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI05	200	250	5.22E-09	5.22E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI06	250	300	5.28E-09	5.28E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI07	300	350	5.34E-09	5.34E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI08	350	400	5.40E-09	5.40E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI09	400	450	5.47E-09	5.47E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI10	450	500	5.53E-09	5.53E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI11	500	600	5.62E-09	5.62E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI12	600	700	5.75E-09	5.75E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI13	700	800	5.88E-09	5.88E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI14	800	900	6.01E-09	6.01E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI15	900	1000	6.14E-09	6.14E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI16	1000	1200	6.34E-09	6.34E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI17	1200	1400	6.60E-09	6.60E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI18	1400	1600	6.85E-09	6.85E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI19	1600	1800	7.11E-09	7.11E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI20	1800	2000	7.37E-09	7.37E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI21	2000	2300	7.74E-09	7.74E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI22	2300	2600	8.22E-09	8.22E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI23	2600	2900	8.70E-09	8.70E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI24	2900	3200	9.22E-09	9.22E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI25	3200	3600	9.96E-09	9.96E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI26	3600	4000	1.08E-08	1.08E-08	0.136	2.558	Concrete_Qmedium
ROOF	TI27	4000	4500	1.20E-08	1.20E-08	0.136	2.558	Concrete_Qmedium
ROOF	TI28	4500	5000	1.35E-08	1.35E-08	0.136	2.558	Concrete_Qmedium
ROOF	TI29	5000	5500	1.55E-08	1.55E-08	0.136	2.558	Concrete_Qmedium
ROOF	TI30	5500	6000	1.79E-08	1.79E-08	0.136	2.558	Concrete_Qmedium
ROOF	TI31	6000	6500	2.13E-08	2.13E-08	0.136	2.558	Concrete_Qmedium
ROOF	TI32	6500	7000	2.57E-08	2.57E-08	0.136	2.558	Concrete_Qmedium
ROOF	TI33	7000	7500	3.31E-08	3.31E-08	0.136	2.558	Concrete_Qmedium
ROOF	TI34	7500	8000	4.36E-08	4.36E-08	0.136	2.558	Concrete_Qmedium
ROOF	TI35	8000	8500	7.97E-08	7.97E-08	0.136	2.558	Concrete_Qmedium
ROOF	TI36	8500	9000	1.41E-07	1.41E-07	0.136	2.558	Concrete_Qmedium
ROOF	TI37	9000	9500	2.63E-06	2.63E-06	0.136	2.558	Concrete_Qmedium
ROOF	TI38	9500	10000	7.54E-06	7.54E-06	0.136	2.558	Concrete_Qmedium
ROOF	TI39-TI44	10000	100000	7.60E-05	4.10E-05	0.35	2.631	CcBackfill
SALTSTONE	TI01-TI44	0	100000	2.00E-09	2.00E-09	0.58	2.405	Saltstone
SAND_DRAIN	TI01-TI07	0	350	0.05001	0.05001	0.417	2.661	Sand
SAND_DRAIN	TI08-TI10	350	500	0.04997	0.04997	0.417	2.661	Sand
SAND_DRAIN	TI11	500	600	0.04994	0.04994	0.4169	2.661	Sand
SAND_DRAIN	TI12	600	700	0.04991	0.04991	0.4169	2.661	Sand
SAND_DRAIN	TI13	700	800	0.04985	0.04985	0.4168	2.661	Sand
SAND_DRAIN	TI14	800	900	0.04982	0.04982	0.4168	2.661	Sand
SAND_DRAIN	TI15	900	1000	0.04975	0.04975	0.4167	2.661	Sand
SAND_DRAIN	TI16	1000	1200	0.04966	0.04966	0.4165	2.661	Sand
SAND_DRAIN	TI17	1200	1400	0.04947	0.04947	0.4163	2.661	Sand

Material zone	Time period(s)	Start time (yr)	End time (yr)	Horizontal conductivity (cm/s)	Vertical conductivity (cm/s)	Porosity	Solid density (g/mL)	Characteristic curves
SAND_DRAIN	TI18	1400	1600	0.04928	0.04928	0.416	2.661	Sand
SAND_DRAIN	TI19	1600	1800	0.04909	0.04909	0.4158	2.661	Sand
SAND_DRAIN	TI20	1800	2000	0.04883	0.04883	0.4154	2.661	Sand
SAND_DRAIN	TI21	2000	2300	0.04842	0.04842	0.4149	2.661	Sand
SAND_DRAIN	TI22	2300	2600	0.04795	0.04795	0.4143	2.661	Sand
SAND_DRAIN	TI23	2600	2900	0.04747	0.04747	0.4136	2.661	Sand
SAND_DRAIN	TI24	2900	3200	0.04699	0.04699	0.413	2.661	Sand
SAND_DRAIN	TI25	3200	3600	0.04626	0.04626	0.412	2.661	Sand
SAND_DRAIN	TI26	3600	4000	0.04528	0.04528	0.4107	2.661	Sand
SAND_DRAIN	TI27	4000	4500	0.04414	0.04414	0.4092	2.661	Sand
SAND_DRAIN	TI28	4500	5000	0.0429	0.0429	0.4075	2.661	Sand
SAND_DRAIN	TI29	5000	5500	0.04167	0.04167	0.4058	2.661	Sand
SAND_DRAIN	TI30	5500	6000	0.04024	0.04024	0.4039	2.661	Sand
SAND_DRAIN	TI31	6000	6500	0.03872	0.03872	0.4019	2.661	Sand
SAND_DRAIN	TI32	6500	7000	0.0372	0.0372	0.3998	2.661	Sand
SAND_DRAIN	TI33	7000	7500	0.03571	0.03571	0.3978	2.661	Sand
SAND_DRAIN	TI34	7500	8000	0.03418	0.03418	0.3958	2.661	Sand
SAND_DRAIN	TI35	8000	8500	0.03266	0.03266	0.3937	2.661	Sand
SAND_DRAIN	TI36	8500	9000	0.03114	0.03114	0.3917	2.661	Sand
SAND_DRAIN	TI37	9000	9500	0.02963	0.02963	0.3897	2.661	Sand
SAND_DRAIN	TI38	9500	10000	0.02811	0.02811	0.3876	2.661	Sand
SAND_DRAIN	TI39	10000	11000	0.02584	0.02584	0.3846	2.661	Sand
SAND_DRAIN	TI40	11000	12000	0.02281	0.02281	0.3805	2.661	Sand
SAND_DRAIN	TI41	12000	15000	0.01675	0.01675	0.3724	2.661	Sand
SAND_DRAIN	TI42	15000	20000	0.004921	0.004921	0.3565	2.661	Sand
SAND_DRAIN	TI43-TI44	20000	100000	7.60E-05	4.10E-05	0.35	2.631	CcBackfill
SHEET_DRAIN	TI01-TI44	0	100000	0.15	0.15	0.3	2.6	Gravel
WALL	TI01	0	50	0.1672	0.1672	0.12	2.546	FracturedConcrete
WALL	TI02	50	100	0.1684	0.1684	0.12	2.546	FracturedConcrete
WALL	TI03	100	150	0.1695	0.1695	0.12	2.546	FracturedConcrete
WALL	TI04	150	200	0.1704	0.1704	0.12	2.546	FracturedConcrete
WALL	TI05	200	250	0.1712	0.1712	0.12	2.546	FracturedConcrete
WALL	TI06	250	300	0.172	0.172	0.12	2.546	FracturedConcrete
WALL	TI07	300	350	0.1727	0.1727	0.12	2.546	FracturedConcrete
WALL	TI08	350	400	0.1734	0.1734	0.12	2.546	FracturedConcrete
WALL	TI09	400	450	0.174	0.174	0.12	2.546	FracturedConcrete
WALL	TI10	450	500	0.1746	0.1746	0.12	2.546	FracturedConcrete
WALL	TI11	500	600	0.1755	0.1755	0.12	2.546	FracturedConcrete
WALL	TI12	600	700	0.1765	0.1765	0.12	2.546	FracturedConcrete
WALL	TI13	700	800	0.1775	0.1775	0.12	2.546	FracturedConcrete
WALL	TI14	800	900	0.1785	0.1785	0.12	2.546	FracturedConcrete
WALL	TI15	900	1000	0.1794	0.1794	0.12	2.546	FracturedConcrete
WALL	TI16	1000	1200	0.1805	0.1805	0.12	2.546	FracturedConcrete
WALL	TI17	1200	1400	0.1819	0.1819	0.12	2.546	FracturedConcrete
WALL	TI18	1400	1600	0.1832	0.1832	0.12	2.546	FracturedConcrete
WALL	TI19	1600	1800	0.1845	0.1845	0.12	2.546	FracturedConcrete
WALL	TI20	1800	2000	0.1858	0.1858	0.12	2.546	FracturedConcrete
WALL	TI21	2000	2300	0.1873	0.1873	0.12	2.546	FracturedConcrete
WALL	TI22	2300	2600	0.1891	0.1891	0.12	2.546	FracturedConcrete

Material zone	Time period(s)	Start time (yr)	End time (yr)	Horizontal conductivity (cm/s)	Vertical conductivity (cm/s)	Porosity	Solid density (g/mL)	Characteristic curves
WALL	TI23	2600	2900	0.1908	0.1908	0.12	2.546	FracturedConcrete
WALL	TI24	2900	3200	0.1925	0.1925	0.12	2.546	FracturedConcrete
WALL	TI25	3200	3600	0.1944	0.1944	0.12	2.546	FracturedConcrete
WALL	TI26	3600	4000	0.1965	0.1965	0.12	2.546	FracturedConcrete
WALL	TI27	4000	4500	0.1988	0.1988	0.12	2.546	FracturedConcrete
WALL	TI28	4500	5000	0.2013	0.2013	0.12	2.546	FracturedConcrete
WALL	TI29	5000	5500	0.2038	0.2038	0.12	2.546	FracturedConcrete
WALL	TI30	5500	6000	0.2061	0.2061	0.12	2.546	FracturedConcrete
WALL	TI31	6000	6500	0.2085	0.2085	0.12	2.546	FracturedConcrete
WALL	TI32	6500	7000	0.2108	0.2108	0.12	2.546	FracturedConcrete
WALL	TI33	7000	7500	0.2131	0.2131	0.12	2.546	FracturedConcrete
WALL	TI34	7500	8000	0.2154	0.2154	0.12	2.546	FracturedConcrete
WALL	TI35	8000	8500	0.2176	0.2176	0.12	2.546	FracturedConcrete
WALL	TI36	8500	9000	0.2199	0.2199	0.12	2.546	FracturedConcrete
WALL	TI37	9000	9500	0.2221	0.2221	0.12	2.546	FracturedConcrete
WALL	TI38	9500	10000	0.2243	0.2243	0.12	2.546	FracturedConcrete
WALL	TI39	10000	11000	0.2275	0.2275	0.12	2.546	FracturedConcrete
WALL	TI40	11000	12000	0.2318	0.2318	0.12	2.546	FracturedConcrete
WALL	TI41	12000	15000	0.2402	0.2402	0.12	2.546	FracturedConcrete
WALL	TI42	15000	20000	0.2573	0.2573	0.12	2.546	FracturedConcrete
WALL	TI43	20000	50000	0.3415	0.3415	0.12	2.546	FracturedConcrete
WALL	TI44	50000	100000	0.7433	0.7433	0.12	2.546	FracturedConcrete

Vault 4, Case C

Material zone	Time period(s)	Start time (yr)	End time (yr)	Horizontal conductivity (cm/s)	Vertical conductivity (cm/s)	Porosity	Solid density (g/mL)	Characteristic curves
BACKFILL	TI01-TI44	0	100000	7.60E-05	4.10E-05	0.35	2.631	CcBackfill
CLEAN_GROUT	TI01-TI44	0	100000	2.00E-09	2.00E-09	0.58	2.405	Saltstone
CRACK	TI01-TI44	0	100000	0.15	0.15	0.3	2.6	Gravel
FLOOR	TI01	0	50	3.11E-10	3.11E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI02	50	100	3.13E-10	3.13E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI03	100	150	3.14E-10	3.14E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI04	150	200	3.15E-10	3.15E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI05	200	250	3.17E-10	3.17E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI06	250	300	3.17E-10	3.17E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI07	300	350	3.18E-10	3.18E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI08	350	400	3.19E-10	3.19E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI09	400	450	3.20E-10	3.20E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI10	450	500	3.21E-10	3.21E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI11	500	600	3.22E-10	3.22E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI12	600	700	3.24E-10	3.24E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI13	700	800	3.25E-10	3.25E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI14	800	900	3.26E-10	3.26E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI15	900	1000	3.28E-10	3.28E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI16	1000	1200	3.29E-10	3.29E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI17	1200	1400	3.31E-10	3.31E-10	0.12	2.546	Concrete_Qhigh

Material zone	Time period(s)	Start time (yr)	End time (yr)	Horizontal conductivity (cm/s)	Vertical conductivity (cm/s)	Porosity	Solid density (g/mL)	Characteristic curves
FLOOR	TI18	1400	1600	3.33E-10	3.33E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI19	1600	1800	3.34E-10	3.34E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI20	1800	2000	3.36E-10	3.36E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI21	2000	2300	3.38E-10	3.38E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI22	2300	2600	3.40E-10	3.40E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI23	2600	2900	3.43E-10	3.43E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI24	2900	3200	3.45E-10	3.45E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI25	3200	3600	3.47E-10	3.47E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI26	3600	4000	3.50E-10	3.50E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI27	4000	4500	3.53E-10	3.53E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI28	4500	5000	3.56E-10	3.56E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI29	5000	5500	3.59E-10	3.59E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI30	5500	6000	3.62E-10	3.62E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI31	6000	6500	3.65E-10	3.65E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI32	6500	7000	3.68E-10	3.68E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI33	7000	7500	3.71E-10	3.71E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI34	7500	8000	3.74E-10	3.74E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI35	8000	8500	3.76E-10	3.76E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI36	8500	9000	3.79E-10	3.79E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI37	9000	9500	3.82E-10	3.82E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI38	9500	10000	3.84E-10	3.84E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI39	10000	11000	3.88E-10	3.88E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI40	11000	12000	3.93E-10	3.93E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI41	12000	15000	4.02E-10	4.02E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI42	15000	20000	4.21E-10	4.21E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI43	20000	50000	5.01E-10	5.01E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI44	50000	100000	7.21E-10	7.21E-10	0.12	2.546	Concrete_Qhigh
NATIVE_SOIL	TI01-TI44	0	100000	0.0003301	9.11E-05	0.39	2.656	LowerVz
ROOF	TI01	0	50	5.02E-09	5.02E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI02	50	100	5.06E-09	5.06E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI03	100	150	5.11E-09	5.11E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI04	150	200	5.16E-09	5.16E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI05	200	250	5.22E-09	5.22E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI06	250	300	5.28E-09	5.28E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI07	300	350	5.34E-09	5.34E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI08	350	400	5.40E-09	5.40E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI09	400	450	5.47E-09	5.47E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI10	450	500	5.53E-09	5.53E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI11	500	600	5.62E-09	5.62E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI12	600	700	5.75E-09	5.75E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI13	700	800	5.88E-09	5.88E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI14	800	900	6.01E-09	6.01E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI15	900	1000	6.14E-09	6.14E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI16	1000	1200	6.34E-09	6.34E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI17	1200	1400	6.60E-09	6.60E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI18	1400	1600	6.85E-09	6.85E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI19	1600	1800	7.11E-09	7.11E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI20	1800	2000	7.37E-09	7.37E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI21	2000	2300	7.74E-09	7.74E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI22	2300	2600	8.22E-09	8.22E-09	0.136	2.558	Concrete_Qmedium

Material zone	Time period(s)	Start time (yr)	End time (yr)	Horizontal conductivity (cm/s)	Vertical conductivity (cm/s)	Porosity	Solid density (g/mL)	Characteristic curves
ROOF	TI23	2600	2900	8.70E-09	8.70E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI24	2900	3200	9.22E-09	9.22E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI25	3200	3600	9.96E-09	9.96E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI26	3600	4000	1.08E-08	1.08E-08	0.136	2.558	Concrete_Qmedium
ROOF	TI27	4000	4500	1.20E-08	1.20E-08	0.136	2.558	Concrete_Qmedium
ROOF	TI28	4500	5000	1.35E-08	1.35E-08	0.136	2.558	Concrete_Qmedium
ROOF	TI29	5000	5500	1.55E-08	1.55E-08	0.136	2.558	Concrete_Qmedium
ROOF	TI30	5500	6000	1.79E-08	1.79E-08	0.136	2.558	Concrete_Qmedium
ROOF	TI31	6000	6500	2.13E-08	2.13E-08	0.136	2.558	Concrete_Qmedium
ROOF	TI32	6500	7000	2.57E-08	2.57E-08	0.136	2.558	Concrete_Qmedium
ROOF	TI33	7000	7500	3.31E-08	3.31E-08	0.136	2.558	Concrete_Qmedium
ROOF	TI34	7500	8000	4.36E-08	4.36E-08	0.136	2.558	Concrete_Qmedium
ROOF	TI35	8000	8500	7.97E-08	7.97E-08	0.136	2.558	Concrete_Qmedium
ROOF	TI36	8500	9000	1.41E-07	1.41E-07	0.136	2.558	Concrete_Qmedium
ROOF	TI37	9000	9500	2.63E-06	2.63E-06	0.136	2.558	Concrete_Qmedium
ROOF	TI38	9500	10000	7.54E-06	7.54E-06	0.136	2.558	Concrete_Qmedium
ROOF	TI39-TI44	10000	100000	7.60E-05	4.10E-05	0.35	2.631	CcBackfill
SALTSTONE	TI01-TI44	0	100000	2.00E-09	2.00E-09	0.58	2.405	Saltstone
SAND_DRAIN	TI01-TI07	0	350	0.05001	0.05001	0.417	2.661	Sand
SAND_DRAIN	TI08-TI10	350	500	0.04997	0.04997	0.417	2.661	Sand
SAND_DRAIN	TI11	500	600	0.04994	0.04994	0.4169	2.661	Sand
SAND_DRAIN	TI12	600	700	0.04991	0.04991	0.4169	2.661	Sand
SAND_DRAIN	TI13	700	800	0.04985	0.04985	0.4168	2.661	Sand
SAND_DRAIN	TI14	800	900	0.04982	0.04982	0.4168	2.661	Sand
SAND_DRAIN	TI15	900	1000	0.04975	0.04975	0.4167	2.661	Sand
SAND_DRAIN	TI16	1000	1200	0.04966	0.04966	0.4165	2.661	Sand
SAND_DRAIN	TI17	1200	1400	0.04947	0.04947	0.4163	2.661	Sand
SAND_DRAIN	TI18	1400	1600	0.04928	0.04928	0.416	2.661	Sand
SAND_DRAIN	TI19	1600	1800	0.04909	0.04909	0.4158	2.661	Sand
SAND_DRAIN	TI20	1800	2000	0.04883	0.04883	0.4154	2.661	Sand
SAND_DRAIN	TI21	2000	2300	0.04842	0.04842	0.4149	2.661	Sand
SAND_DRAIN	TI22	2300	2600	0.04795	0.04795	0.4143	2.661	Sand
SAND_DRAIN	TI23	2600	2900	0.04747	0.04747	0.4136	2.661	Sand
SAND_DRAIN	TI24	2900	3200	0.04699	0.04699	0.413	2.661	Sand
SAND_DRAIN	TI25	3200	3600	0.04626	0.04626	0.412	2.661	Sand
SAND_DRAIN	TI26	3600	4000	0.04528	0.04528	0.4107	2.661	Sand
SAND_DRAIN	TI27	4000	4500	0.04414	0.04414	0.4092	2.661	Sand
SAND_DRAIN	TI28	4500	5000	0.0429	0.0429	0.4075	2.661	Sand
SAND_DRAIN	TI29	5000	5500	0.04167	0.04167	0.4058	2.661	Sand
SAND_DRAIN	TI30	5500	6000	0.04024	0.04024	0.4039	2.661	Sand
SAND_DRAIN	TI31	6000	6500	0.03872	0.03872	0.4019	2.661	Sand
SAND_DRAIN	TI32	6500	7000	0.0372	0.0372	0.3998	2.661	Sand
SAND_DRAIN	TI33	7000	7500	0.03571	0.03571	0.3978	2.661	Sand
SAND_DRAIN	TI34	7500	8000	0.03418	0.03418	0.3958	2.661	Sand
SAND_DRAIN	TI35	8000	8500	0.03266	0.03266	0.3937	2.661	Sand
SAND_DRAIN	TI36	8500	9000	0.03114	0.03114	0.3917	2.661	Sand
SAND_DRAIN	TI37	9000	9500	0.02963	0.02963	0.3897	2.661	Sand

Material zone	Time period(s)	Start time (yr)	End time (yr)	Horizontal conductivity (cm/s)	Vertical conductivity (cm/s)	Porosity	Solid density (g/mL)	Characteristic curves
SAND_DRAIN	TI38	9500	10000	0.02811	0.02811	0.3876	2.661	Sand
SAND_DRAIN	TI39	10000	11000	0.02584	0.02584	0.3846	2.661	Sand
SAND_DRAIN	TI40	11000	12000	0.02281	0.02281	0.3805	2.661	Sand
SAND_DRAIN	TI41	12000	15000	0.01675	0.01675	0.3724	2.661	Sand
SAND_DRAIN	TI42	15000	20000	0.004921	0.004921	0.3565	2.661	Sand
SAND_DRAIN	TI43-TI44	20000	100000	7.60E-05	4.10E-05	0.35	2.631	CcBackfill
SHEET_DRAIN	TI01-TI44	0	100000	0.15	0.15	0.3	2.6	Gravel
WALL	TI01	0	50	0.1672	0.1672	0.12	2.546	FracturedConcrete
WALL	TI02	50	100	0.1684	0.1684	0.12	2.546	FracturedConcrete
WALL	TI03	100	150	0.1695	0.1695	0.12	2.546	FracturedConcrete
WALL	TI04	150	200	0.1704	0.1704	0.12	2.546	FracturedConcrete
WALL	TI05	200	250	0.1712	0.1712	0.12	2.546	FracturedConcrete
WALL	TI06	250	300	0.172	0.172	0.12	2.546	FracturedConcrete
WALL	TI07	300	350	0.1727	0.1727	0.12	2.546	FracturedConcrete
WALL	TI08	350	400	0.1734	0.1734	0.12	2.546	FracturedConcrete
WALL	TI09	400	450	0.174	0.174	0.12	2.546	FracturedConcrete
WALL	TI10	450	500	0.1746	0.1746	0.12	2.546	FracturedConcrete
WALL	TI11	500	600	0.1755	0.1755	0.12	2.546	FracturedConcrete
WALL	TI12	600	700	0.1765	0.1765	0.12	2.546	FracturedConcrete
WALL	TI13	700	800	0.1775	0.1775	0.12	2.546	FracturedConcrete
WALL	TI14	800	900	0.1785	0.1785	0.12	2.546	FracturedConcrete
WALL	TI15	900	1000	0.1794	0.1794	0.12	2.546	FracturedConcrete
WALL	TI16	1000	1200	0.1805	0.1805	0.12	2.546	FracturedConcrete
WALL	TI17	1200	1400	0.1819	0.1819	0.12	2.546	FracturedConcrete
WALL	TI18	1400	1600	0.1832	0.1832	0.12	2.546	FracturedConcrete
WALL	TI19	1600	1800	0.1845	0.1845	0.12	2.546	FracturedConcrete
WALL	TI20	1800	2000	0.1858	0.1858	0.12	2.546	FracturedConcrete
WALL	TI21	2000	2300	0.1873	0.1873	0.12	2.546	FracturedConcrete
WALL	TI22	2300	2600	0.1891	0.1891	0.12	2.546	FracturedConcrete
WALL	TI23	2600	2900	0.1908	0.1908	0.12	2.546	FracturedConcrete
WALL	TI24	2900	3200	0.1925	0.1925	0.12	2.546	FracturedConcrete
WALL	TI25	3200	3600	0.1944	0.1944	0.12	2.546	FracturedConcrete
WALL	TI26	3600	4000	0.1965	0.1965	0.12	2.546	FracturedConcrete
WALL	TI27	4000	4500	0.1988	0.1988	0.12	2.546	FracturedConcrete
WALL	TI28	4500	5000	0.2013	0.2013	0.12	2.546	FracturedConcrete
WALL	TI29	5000	5500	0.2038	0.2038	0.12	2.546	FracturedConcrete
WALL	TI30	5500	6000	0.2061	0.2061	0.12	2.546	FracturedConcrete
WALL	TI31	6000	6500	0.2085	0.2085	0.12	2.546	FracturedConcrete
WALL	TI32	6500	7000	0.2108	0.2108	0.12	2.546	FracturedConcrete
WALL	TI33	7000	7500	0.2131	0.2131	0.12	2.546	FracturedConcrete
WALL	TI34	7500	8000	0.2154	0.2154	0.12	2.546	FracturedConcrete
WALL	TI35	8000	8500	0.2176	0.2176	0.12	2.546	FracturedConcrete
WALL	TI36	8500	9000	0.2199	0.2199	0.12	2.546	FracturedConcrete
WALL	TI37	9000	9500	0.2221	0.2221	0.12	2.546	FracturedConcrete
WALL	TI38	9500	10000	0.2243	0.2243	0.12	2.546	FracturedConcrete
WALL	TI39	10000	11000	0.2275	0.2275	0.12	2.546	FracturedConcrete
WALL	TI40	11000	12000	0.2318	0.2318	0.12	2.546	FracturedConcrete
WALL	TI41	12000	15000	0.2402	0.2402	0.12	2.546	FracturedConcrete
WALL	TI42	15000	20000	0.2573	0.2573	0.12	2.546	FracturedConcrete

Material zone	Time period(s)	Start time (yr)	End time (yr)	Horizontal conductivity (cm/s)	Vertical conductivity (cm/s)	Porosity	Solid density (g/mL)	Characteristic curves
WALL	TI43	20000	50000	0.3415	0.3415	0.12	2.546	FracturedConcrete
WALL	TI44	50000	100000	0.7433	0.7433	0.12	2.546	FracturedConcrete

Vault 4, Case D

Material zone	Time period(s)	Start time (yr)	End time (yr)	Horizontal conductivity (cm/s)	Vertical conductivity (cm/s)	Porosity	Solid density (g/mL)	Characteristic curves
BACKFILL	TI01-TI44	0	100000	7.60E-05	4.10E-05	0.35	2.631	CcBackfill
CLEAN_GROUT	TI01-TI44	0	100000	2.00E-09	2.00E-09	0.58	2.405	Saltstone
CRACK	TI01-TI44	0	100000	2.00E-09	5.00E-15	0.58	2.405	Saltstone
FLOOR	TI01	0	50	3.11E-10	3.11E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI02	50	100	3.13E-10	3.13E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI03	100	150	3.14E-10	3.14E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI04	150	200	3.15E-10	3.15E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI05	200	250	3.17E-10	3.17E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI06	250	300	3.17E-10	3.17E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI07	300	350	3.18E-10	3.18E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI08	350	400	3.19E-10	3.19E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI09	400	450	3.20E-10	3.20E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI10	450	500	3.21E-10	3.21E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI11	500	600	3.22E-10	3.22E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI12	600	700	3.24E-10	3.24E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI13	700	800	3.25E-10	3.25E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI14	800	900	3.26E-10	3.26E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI15	900	1000	3.28E-10	3.28E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI16	1000	1200	3.29E-10	3.29E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI17	1200	1400	3.31E-10	3.31E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI18	1400	1600	3.33E-10	3.33E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI19	1600	1800	3.34E-10	3.34E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI20	1800	2000	3.36E-10	3.36E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI21	2000	2300	3.38E-10	3.38E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI22	2300	2600	3.40E-10	3.40E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI23	2600	2900	3.43E-10	3.43E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI24	2900	3200	3.45E-10	3.45E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI25	3200	3600	3.47E-10	3.47E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI26	3600	4000	3.50E-10	3.50E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI27	4000	4500	3.53E-10	3.53E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI28	4500	5000	3.56E-10	3.56E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI29	5000	5500	3.59E-10	3.59E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI30	5500	6000	3.62E-10	3.62E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI31	6000	6500	3.65E-10	3.65E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI32	6500	7000	3.68E-10	3.68E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI33	7000	7500	3.71E-10	3.71E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI34	7500	8000	3.74E-10	3.74E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI35	8000	8500	3.76E-10	3.76E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI36	8500	9000	3.79E-10	3.79E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI37	9000	9500	3.82E-10	3.82E-10	0.12	2.546	Concrete_Qhigh

Material zone	Time period(s)	Start time (yr)	End time (yr)	Horizontal conductivity (cm/s)	Vertical conductivity (cm/s)	Porosity	Solid density (g/mL)	Characteristic curves
FLOOR	TI38	9500	10000	3.84E-10	3.84E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI39	10000	11000	3.88E-10	3.88E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI40	11000	12000	3.93E-10	3.93E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI41	12000	15000	4.02E-10	4.02E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI42	15000	20000	4.21E-10	4.21E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI43	20000	50000	5.01E-10	5.01E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI44	50000	100000	7.21E-10	7.21E-10	0.12	2.546	Concrete_Qhigh
NATIVE_SOIL	TI01-TI44	0	100000	0.0003301	9.11E-05	0.39	2.656	LowerVz
ROOF	TI01	0	50	5.02E-09	5.02E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI02	50	100	5.06E-09	5.06E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI03	100	150	5.11E-09	5.11E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI04	150	200	5.16E-09	5.16E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI05	200	250	5.22E-09	5.22E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI06	250	300	5.28E-09	5.28E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI07	300	350	5.34E-09	5.34E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI08	350	400	5.40E-09	5.40E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI09	400	450	5.47E-09	5.47E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI10	450	500	5.53E-09	5.53E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI11	500	600	5.62E-09	5.62E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI12	600	700	5.75E-09	5.75E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI13	700	800	5.88E-09	5.88E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI14	800	900	6.01E-09	6.01E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI15	900	1000	6.14E-09	6.14E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI16	1000	1200	6.34E-09	6.34E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI17	1200	1400	6.60E-09	6.60E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI18	1400	1600	6.85E-09	6.85E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI19	1600	1800	7.11E-09	7.11E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI20	1800	2000	7.37E-09	7.37E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI21	2000	2300	7.74E-09	7.74E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI22	2300	2600	8.22E-09	8.22E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI23	2600	2900	8.70E-09	8.70E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI24	2900	3200	9.22E-09	9.22E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI25	3200	3600	9.96E-09	9.96E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI26	3600	4000	1.08E-08	1.08E-08	0.136	2.558	Concrete_Qmedium
ROOF	TI27	4000	4500	1.20E-08	1.20E-08	0.136	2.558	Concrete_Qmedium
ROOF	TI28	4500	5000	1.35E-08	1.35E-08	0.136	2.558	Concrete_Qmedium
ROOF	TI29	5000	5500	1.55E-08	1.55E-08	0.136	2.558	Concrete_Qmedium
ROOF	TI30	5500	6000	1.79E-08	1.79E-08	0.136	2.558	Concrete_Qmedium
ROOF	TI31	6000	6500	2.13E-08	2.13E-08	0.136	2.558	Concrete_Qmedium
ROOF	TI32	6500	7000	2.57E-08	2.57E-08	0.136	2.558	Concrete_Qmedium
ROOF	TI33	7000	7500	3.31E-08	3.31E-08	0.136	2.558	Concrete_Qmedium
ROOF	TI34	7500	8000	4.36E-08	4.36E-08	0.136	2.558	Concrete_Qmedium
ROOF	TI35	8000	8500	7.97E-08	7.97E-08	0.136	2.558	Concrete_Qmedium
ROOF	TI36	8500	9000	1.41E-07	1.41E-07	0.136	2.558	Concrete_Qmedium
ROOF	TI37	9000	9500	2.63E-06	2.63E-06	0.136	2.558	Concrete_Qmedium
ROOF	TI38	9500	10000	7.54E-06	7.54E-06	0.136	2.558	Concrete_Qmedium
ROOF	TI39-TI44	10000	100000	7.60E-05	4.10E-05	0.35	2.631	CcBackfill
SALTSTONE	TI01-TI44	0	100000	2.00E-09	2.00E-09	0.58	2.405	Saltstone

Material zone	Time period(s)	Start time (yr)	End time (yr)	Horizontal conductivity (cm/s)	Vertical conductivity (cm/s)	Porosity	Solid density (g/mL)	Characteristic curves
SAND_DRAIN	TI01-TI07	0	350	0.05001	0.05001	0.417	2.661	Sand
SAND_DRAIN	TI08-TI10	350	500	0.04997	0.04997	0.417	2.661	Sand
SAND_DRAIN	TI11	500	600	0.04994	0.04994	0.4169	2.661	Sand
SAND_DRAIN	TI12	600	700	0.04991	0.04991	0.4169	2.661	Sand
SAND_DRAIN	TI13	700	800	0.04985	0.04985	0.4168	2.661	Sand
SAND_DRAIN	TI14	800	900	0.04982	0.04982	0.4168	2.661	Sand
SAND_DRAIN	TI15	900	1000	0.04975	0.04975	0.4167	2.661	Sand
SAND_DRAIN	TI16	1000	1200	0.04966	0.04966	0.4165	2.661	Sand
SAND_DRAIN	TI17	1200	1400	0.04947	0.04947	0.4163	2.661	Sand
SAND_DRAIN	TI18	1400	1600	0.04928	0.04928	0.416	2.661	Sand
SAND_DRAIN	TI19	1600	1800	0.04909	0.04909	0.4158	2.661	Sand
SAND_DRAIN	TI20	1800	2000	0.04883	0.04883	0.4154	2.661	Sand
SAND_DRAIN	TI21	2000	2300	0.04842	0.04842	0.4149	2.661	Sand
SAND_DRAIN	TI22	2300	2600	0.04795	0.04795	0.4143	2.661	Sand
SAND_DRAIN	TI23	2600	2900	0.04747	0.04747	0.4136	2.661	Sand
SAND_DRAIN	TI24	2900	3200	0.04699	0.04699	0.413	2.661	Sand
SAND_DRAIN	TI25	3200	3600	0.04626	0.04626	0.412	2.661	Sand
SAND_DRAIN	TI26	3600	4000	0.04528	0.04528	0.4107	2.661	Sand
SAND_DRAIN	TI27	4000	4500	0.04414	0.04414	0.4092	2.661	Sand
SAND_DRAIN	TI28	4500	5000	0.0429	0.0429	0.4075	2.661	Sand
SAND_DRAIN	TI29	5000	5500	0.04167	0.04167	0.4058	2.661	Sand
SAND_DRAIN	TI30	5500	6000	0.04024	0.04024	0.4039	2.661	Sand
SAND_DRAIN	TI31	6000	6500	0.03872	0.03872	0.4019	2.661	Sand
SAND_DRAIN	TI32	6500	7000	0.0372	0.0372	0.3998	2.661	Sand
SAND_DRAIN	TI33	7000	7500	0.03571	0.03571	0.3978	2.661	Sand
SAND_DRAIN	TI34	7500	8000	0.03418	0.03418	0.3958	2.661	Sand
SAND_DRAIN	TI35	8000	8500	0.03266	0.03266	0.3937	2.661	Sand
SAND_DRAIN	TI36	8500	9000	0.03114	0.03114	0.3917	2.661	Sand
SAND_DRAIN	TI37	9000	9500	0.02963	0.02963	0.3897	2.661	Sand
SAND_DRAIN	TI38	9500	10000	0.02811	0.02811	0.3876	2.661	Sand
SAND_DRAIN	TI39	10000	11000	0.02584	0.02584	0.3846	2.661	Sand
SAND_DRAIN	TI40	11000	12000	0.02281	0.02281	0.3805	2.661	Sand
SAND_DRAIN	TI41	12000	15000	0.01675	0.01675	0.3724	2.661	Sand
SAND_DRAIN	TI42	15000	20000	0.004921	0.004921	0.3565	2.661	Sand
SAND_DRAIN	TI43-TI44	20000	100000	7.60E-05	4.10E-05	0.35	2.631	CcBackfill
SHEET_DRAIN	TI01-TI44	0	100000	5.00E-15	5.00E-15	0.3	2.143	Saltstone
WALL	TI01	0	50	0.1672	0.1672	0.12	2.546	FracturedConcrete
WALL	TI02	50	100	0.1684	0.1684	0.12	2.546	FracturedConcrete
WALL	TI03	100	150	0.1695	0.1695	0.12	2.546	FracturedConcrete
WALL	TI04	150	200	0.1704	0.1704	0.12	2.546	FracturedConcrete
WALL	TI05	200	250	0.1712	0.1712	0.12	2.546	FracturedConcrete
WALL	TI06	250	300	0.172	0.172	0.12	2.546	FracturedConcrete
WALL	TI07	300	350	0.1727	0.1727	0.12	2.546	FracturedConcrete
WALL	TI08	350	400	0.1734	0.1734	0.12	2.546	FracturedConcrete
WALL	TI09	400	450	0.174	0.174	0.12	2.546	FracturedConcrete
WALL	TI10	450	500	0.1746	0.1746	0.12	2.546	FracturedConcrete
WALL	TI11	500	600	0.1755	0.1755	0.12	2.546	FracturedConcrete

Material zone	Time period(s)	Start time (yr)	End time (yr)	Horizontal conductivity (cm/s)	Vertical conductivity (cm/s)	Porosity	Solid density (g/mL)	Characteristic curves
WALL	TI12	600	700	0.1765	0.1765	0.12	2.546	FracturedConcrete
WALL	TI13	700	800	0.1775	0.1775	0.12	2.546	FracturedConcrete
WALL	TI14	800	900	0.1785	0.1785	0.12	2.546	FracturedConcrete
WALL	TI15	900	1000	0.1794	0.1794	0.12	2.546	FracturedConcrete
WALL	TI16	1000	1200	0.1805	0.1805	0.12	2.546	FracturedConcrete
WALL	TI17	1200	1400	0.1819	0.1819	0.12	2.546	FracturedConcrete
WALL	TI18	1400	1600	0.1832	0.1832	0.12	2.546	FracturedConcrete
WALL	TI19	1600	1800	0.1845	0.1845	0.12	2.546	FracturedConcrete
WALL	TI20	1800	2000	0.1858	0.1858	0.12	2.546	FracturedConcrete
WALL	TI21	2000	2300	0.1873	0.1873	0.12	2.546	FracturedConcrete
WALL	TI22	2300	2600	0.1891	0.1891	0.12	2.546	FracturedConcrete
WALL	TI23	2600	2900	0.1908	0.1908	0.12	2.546	FracturedConcrete
WALL	TI24	2900	3200	0.1925	0.1925	0.12	2.546	FracturedConcrete
WALL	TI25	3200	3600	0.1944	0.1944	0.12	2.546	FracturedConcrete
WALL	TI26	3600	4000	0.1965	0.1965	0.12	2.546	FracturedConcrete
WALL	TI27	4000	4500	0.1988	0.1988	0.12	2.546	FracturedConcrete
WALL	TI28	4500	5000	0.2013	0.2013	0.12	2.546	FracturedConcrete
WALL	TI29	5000	5500	0.2038	0.2038	0.12	2.546	FracturedConcrete
WALL	TI30	5500	6000	0.2061	0.2061	0.12	2.546	FracturedConcrete
WALL	TI31	6000	6500	0.2085	0.2085	0.12	2.546	FracturedConcrete
WALL	TI32	6500	7000	0.2108	0.2108	0.12	2.546	FracturedConcrete
WALL	TI33	7000	7500	0.2131	0.2131	0.12	2.546	FracturedConcrete
WALL	TI34	7500	8000	0.2154	0.2154	0.12	2.546	FracturedConcrete
WALL	TI35	8000	8500	0.2176	0.2176	0.12	2.546	FracturedConcrete
WALL	TI36	8500	9000	0.2199	0.2199	0.12	2.546	FracturedConcrete
WALL	TI37	9000	9500	0.2221	0.2221	0.12	2.546	FracturedConcrete
WALL	TI38	9500	10000	0.2243	0.2243	0.12	2.546	FracturedConcrete
WALL	TI39	10000	11000	0.2275	0.2275	0.12	2.546	FracturedConcrete
WALL	TI40	11000	12000	0.2318	0.2318	0.12	2.546	FracturedConcrete
WALL	TI41	12000	15000	0.2402	0.2402	0.12	2.546	FracturedConcrete
WALL	TI42	15000	20000	0.2573	0.2573	0.12	2.546	FracturedConcrete
WALL	TI43	20000	50000	0.3415	0.3415	0.12	2.546	FracturedConcrete
WALL	TI44	50000	100000	0.7433	0.7433	0.12	2.546	FracturedConcrete

Vault 4, Case E

Material zone	Time period(s)	Start time (yr)	End time (yr)	Horizontal conductivity (cm/s)	Vertical conductivity (cm/s)	Porosity	Solid density (g/mL)	Characteristic curves
BACKFILL	TI01-TI44	0	100000	7.60E-05	4.10E-05	0.35	2.631	CcBackfill
CLEAN_GROUT	TI01-TI44	0	100000	0.001666	0.001666	0.58	2.405	FracturedSaltstone
CRACK	TI01-TI44	0	100000	0.001666	5.00E-15	0.58	2.405	FracturedSaltstone
FLOOR	TI01	0	50	3.11E-10	3.11E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI02	50	100	3.13E-10	3.13E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI03	100	150	3.14E-10	3.14E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI04	150	200	3.15E-10	3.15E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI05	200	250	3.17E-10	3.17E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI06	250	300	3.17E-10	3.17E-10	0.12	2.546	Concrete_Qhigh

Material zone	Time period(s)	Start time (yr)	End time (yr)	Horizontal conductivity (cm/s)	Vertical conductivity (cm/s)	Porosity	Solid density (g/mL)	Characteristic curves
FLOOR	TI07	300	350	3.18E-10	3.18E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI08	350	400	3.19E-10	3.19E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI09	400	450	3.20E-10	3.20E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI10	450	500	3.21E-10	3.21E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI11	500	600	3.22E-10	3.22E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI12	600	700	3.24E-10	3.24E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI13	700	800	3.25E-10	3.25E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI14	800	900	3.26E-10	3.26E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI15	900	1000	3.28E-10	3.28E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI16	1000	1200	3.29E-10	3.29E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI17	1200	1400	3.31E-10	3.31E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI18	1400	1600	3.33E-10	3.33E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI19	1600	1800	3.34E-10	3.34E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI20	1800	2000	3.36E-10	3.36E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI21	2000	2300	3.38E-10	3.38E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI22	2300	2600	3.40E-10	3.40E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI23	2600	2900	3.43E-10	3.43E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI24	2900	3200	3.45E-10	3.45E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI25	3200	3600	3.47E-10	3.47E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI26	3600	4000	3.50E-10	3.50E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI27	4000	4500	3.53E-10	3.53E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI28	4500	5000	3.56E-10	3.56E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI29	5000	5500	3.59E-10	3.59E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI30	5500	6000	3.62E-10	3.62E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI31	6000	6500	3.65E-10	3.65E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI32	6500	7000	3.68E-10	3.68E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI33	7000	7500	3.71E-10	3.71E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI34	7500	8000	3.74E-10	3.74E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI35	8000	8500	3.76E-10	3.76E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI36	8500	9000	3.79E-10	3.79E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI37	9000	9500	3.82E-10	3.82E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI38	9500	10000	3.84E-10	3.84E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI39	10000	11000	3.88E-10	3.88E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI40	11000	12000	3.93E-10	3.93E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI41	12000	15000	4.02E-10	4.02E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI42	15000	20000	4.21E-10	4.21E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI43	20000	50000	5.01E-10	5.01E-10	0.12	2.546	Concrete_Qhigh
FLOOR	TI44	50000	100000	7.21E-10	7.21E-10	0.12	2.546	Concrete_Qhigh
NATIVE_SOIL	TI01-TI44	0	100000	0.0003301	9.11E-05	0.39	2.656	LowerVz
ROOF	TI01	0	50	5.02E-09	5.02E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI02	50	100	5.06E-09	5.06E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI03	100	150	5.11E-09	5.11E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI04	150	200	5.16E-09	5.16E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI05	200	250	5.22E-09	5.22E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI06	250	300	5.28E-09	5.28E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI07	300	350	5.34E-09	5.34E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI08	350	400	5.40E-09	5.40E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI09	400	450	5.47E-09	5.47E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI10	450	500	5.53E-09	5.53E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI11	500	600	5.62E-09	5.62E-09	0.136	2.558	Concrete_Qmedium

Material zone	Time period(s)	Start time (yr)	End time (yr)	Horizontal conductivity (cm/s)	Vertical conductivity (cm/s)	Porosity	Solid density (g/mL)	Characteristic curves
ROOF	TI12	600	700	5.75E-09	5.75E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI13	700	800	5.88E-09	5.88E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI14	800	900	6.01E-09	6.01E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI15	900	1000	6.14E-09	6.14E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI16	1000	1200	6.34E-09	6.34E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI17	1200	1400	6.60E-09	6.60E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI18	1400	1600	6.85E-09	6.85E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI19	1600	1800	7.11E-09	7.11E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI20	1800	2000	7.37E-09	7.37E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI21	2000	2300	7.74E-09	7.74E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI22	2300	2600	8.22E-09	8.22E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI23	2600	2900	8.70E-09	8.70E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI24	2900	3200	9.22E-09	9.22E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI25	3200	3600	9.96E-09	9.96E-09	0.136	2.558	Concrete_Qmedium
ROOF	TI26	3600	4000	1.08E-08	1.08E-08	0.136	2.558	Concrete_Qmedium
ROOF	TI27	4000	4500	1.20E-08	1.20E-08	0.136	2.558	Concrete_Qmedium
ROOF	TI28	4500	5000	1.35E-08	1.35E-08	0.136	2.558	Concrete_Qmedium
ROOF	TI29	5000	5500	1.55E-08	1.55E-08	0.136	2.558	Concrete_Qmedium
ROOF	TI30	5500	6000	1.79E-08	1.79E-08	0.136	2.558	Concrete_Qmedium
ROOF	TI31	6000	6500	2.13E-08	2.13E-08	0.136	2.558	Concrete_Qmedium
ROOF	TI32	6500	7000	2.57E-08	2.57E-08	0.136	2.558	Concrete_Qmedium
ROOF	TI33	7000	7500	3.31E-08	3.31E-08	0.136	2.558	Concrete_Qmedium
ROOF	TI34	7500	8000	4.36E-08	4.36E-08	0.136	2.558	Concrete_Qmedium
ROOF	TI35	8000	8500	7.97E-08	7.97E-08	0.136	2.558	Concrete_Qmedium
ROOF	TI36	8500	9000	1.41E-07	1.41E-07	0.136	2.558	Concrete_Qmedium
ROOF	TI37	9000	9500	2.63E-06	2.63E-06	0.136	2.558	Concrete_Qmedium
ROOF	TI38	9500	10000	7.54E-06	7.54E-06	0.136	2.558	Concrete_Qmedium
ROOF	TI39-TI44	10000	100000	7.60E-05	4.10E-05	0.35	2.631	CcBackfill
SALTSTONE	TI01-TI44	0	100000	0.001666	0.001666	0.58	2.405	FracturedSaltstone
SAND_DRAIN	TI01-TI07	0	350	0.05001	0.05001	0.417	2.661	Sand
SAND_DRAIN	TI08-TI10	350	500	0.04997	0.04997	0.417	2.661	Sand
SAND_DRAIN	TI11	500	600	0.04994	0.04994	0.4169	2.661	Sand
SAND_DRAIN	TI12	600	700	0.04991	0.04991	0.4169	2.661	Sand
SAND_DRAIN	TI13	700	800	0.04985	0.04985	0.4168	2.661	Sand
SAND_DRAIN	TI14	800	900	0.04982	0.04982	0.4168	2.661	Sand
SAND_DRAIN	TI15	900	1000	0.04975	0.04975	0.4167	2.661	Sand
SAND_DRAIN	TI16	1000	1200	0.04966	0.04966	0.4165	2.661	Sand
SAND_DRAIN	TI17	1200	1400	0.04947	0.04947	0.4163	2.661	Sand
SAND_DRAIN	TI18	1400	1600	0.04928	0.04928	0.416	2.661	Sand
SAND_DRAIN	TI19	1600	1800	0.04909	0.04909	0.4158	2.661	Sand
SAND_DRAIN	TI20	1800	2000	0.04883	0.04883	0.4154	2.661	Sand
SAND_DRAIN	TI21	2000	2300	0.04842	0.04842	0.4149	2.661	Sand
SAND_DRAIN	TI22	2300	2600	0.04795	0.04795	0.4143	2.661	Sand
SAND_DRAIN	TI23	2600	2900	0.04747	0.04747	0.4136	2.661	Sand
SAND_DRAIN	TI24	2900	3200	0.04699	0.04699	0.413	2.661	Sand
SAND_DRAIN	TI25	3200	3600	0.04626	0.04626	0.412	2.661	Sand
SAND_DRAIN	TI26	3600	4000	0.04528	0.04528	0.4107	2.661	Sand

Material zone	Time period(s)	Start time (yr)	End time (yr)	Horizontal conductivity (cm/s)	Vertical conductivity (cm/s)	Porosity	Solid density (g/mL)	Characteristic curves
SAND_DRAIN	TI27	4000	4500	0.04414	0.04414	0.4092	2.661	Sand
SAND_DRAIN	TI28	4500	5000	0.0429	0.0429	0.4075	2.661	Sand
SAND_DRAIN	TI29	5000	5500	0.04167	0.04167	0.4058	2.661	Sand
SAND_DRAIN	TI30	5500	6000	0.04024	0.04024	0.4039	2.661	Sand
SAND_DRAIN	TI31	6000	6500	0.03872	0.03872	0.4019	2.661	Sand
SAND_DRAIN	TI32	6500	7000	0.0372	0.0372	0.3998	2.661	Sand
SAND_DRAIN	TI33	7000	7500	0.03571	0.03571	0.3978	2.661	Sand
SAND_DRAIN	TI34	7500	8000	0.03418	0.03418	0.3958	2.661	Sand
SAND_DRAIN	TI35	8000	8500	0.03266	0.03266	0.3937	2.661	Sand
SAND_DRAIN	TI36	8500	9000	0.03114	0.03114	0.3917	2.661	Sand
SAND_DRAIN	TI37	9000	9500	0.02963	0.02963	0.3897	2.661	Sand
SAND_DRAIN	TI38	9500	10000	0.02811	0.02811	0.3876	2.661	Sand
SAND_DRAIN	TI39	10000	11000	0.02584	0.02584	0.3846	2.661	Sand
SAND_DRAIN	TI40	11000	12000	0.02281	0.02281	0.3805	2.661	Sand
SAND_DRAIN	TI41	12000	15000	0.01675	0.01675	0.3724	2.661	Sand
SAND_DRAIN	TI42	15000	20000	0.004921	0.004921	0.3565	2.661	Sand
SAND_DRAIN	TI43-TI44	20000	100000	7.60E-05	4.10E-05	0.35	2.631	CcBackfill
SHEET_DRAIN	TI01-TI44	0	100000	0.001666	5.00E-15	0.58	2.405	FracturedSaltstone
WALL	TI01	0	50	0.1672	0.1672	0.12	2.546	FracturedConcrete
WALL	TI02	50	100	0.1684	0.1684	0.12	2.546	FracturedConcrete
WALL	TI03	100	150	0.1695	0.1695	0.12	2.546	FracturedConcrete
WALL	TI04	150	200	0.1704	0.1704	0.12	2.546	FracturedConcrete
WALL	TI05	200	250	0.1712	0.1712	0.12	2.546	FracturedConcrete
WALL	TI06	250	300	0.172	0.172	0.12	2.546	FracturedConcrete
WALL	TI07	300	350	0.1727	0.1727	0.12	2.546	FracturedConcrete
WALL	TI08	350	400	0.1734	0.1734	0.12	2.546	FracturedConcrete
WALL	TI09	400	450	0.174	0.174	0.12	2.546	FracturedConcrete
WALL	TI10	450	500	0.1746	0.1746	0.12	2.546	FracturedConcrete
WALL	TI11	500	600	0.1755	0.1755	0.12	2.546	FracturedConcrete
WALL	TI12	600	700	0.1765	0.1765	0.12	2.546	FracturedConcrete
WALL	TI13	700	800	0.1775	0.1775	0.12	2.546	FracturedConcrete
WALL	TI14	800	900	0.1785	0.1785	0.12	2.546	FracturedConcrete
WALL	TI15	900	1000	0.1794	0.1794	0.12	2.546	FracturedConcrete
WALL	TI16	1000	1200	0.1805	0.1805	0.12	2.546	FracturedConcrete
WALL	TI17	1200	1400	0.1819	0.1819	0.12	2.546	FracturedConcrete
WALL	TI18	1400	1600	0.1832	0.1832	0.12	2.546	FracturedConcrete
WALL	TI19	1600	1800	0.1845	0.1845	0.12	2.546	FracturedConcrete
WALL	TI20	1800	2000	0.1858	0.1858	0.12	2.546	FracturedConcrete
WALL	TI21	2000	2300	0.1873	0.1873	0.12	2.546	FracturedConcrete
WALL	TI22	2300	2600	0.1891	0.1891	0.12	2.546	FracturedConcrete
WALL	TI23	2600	2900	0.1908	0.1908	0.12	2.546	FracturedConcrete
WALL	TI24	2900	3200	0.1925	0.1925	0.12	2.546	FracturedConcrete
WALL	TI25	3200	3600	0.1944	0.1944	0.12	2.546	FracturedConcrete
WALL	TI26	3600	4000	0.1965	0.1965	0.12	2.546	FracturedConcrete
WALL	TI27	4000	4500	0.1988	0.1988	0.12	2.546	FracturedConcrete
WALL	TI28	4500	5000	0.2013	0.2013	0.12	2.546	FracturedConcrete
WALL	TI29	5000	5500	0.2038	0.2038	0.12	2.546	FracturedConcrete
WALL	TI30	5500	6000	0.2061	0.2061	0.12	2.546	FracturedConcrete
WALL	TI31	6000	6500	0.2085	0.2085	0.12	2.546	FracturedConcrete

Material zone	Time period(s)	Start time (yr)	End time (yr)	Horizontal conductivity (cm/s)	Vertical conductivity (cm/s)	Porosity	Solid density (g/mL)	Characteristic curves
WALL	TI32	6500	7000	0.2108	0.2108	0.12	2.546	FracturedConcrete
WALL	TI33	7000	7500	0.2131	0.2131	0.12	2.546	FracturedConcrete
WALL	TI34	7500	8000	0.2154	0.2154	0.12	2.546	FracturedConcrete
WALL	TI35	8000	8500	0.2176	0.2176	0.12	2.546	FracturedConcrete
WALL	TI36	8500	9000	0.2199	0.2199	0.12	2.546	FracturedConcrete
WALL	TI37	9000	9500	0.2221	0.2221	0.12	2.546	FracturedConcrete
WALL	TI38	9500	10000	0.2243	0.2243	0.12	2.546	FracturedConcrete
WALL	TI39	10000	11000	0.2275	0.2275	0.12	2.546	FracturedConcrete
WALL	TI40	11000	12000	0.2318	0.2318	0.12	2.546	FracturedConcrete
WALL	TI41	12000	15000	0.2402	0.2402	0.12	2.546	FracturedConcrete
WALL	TI42	15000	20000	0.2573	0.2573	0.12	2.546	FracturedConcrete
WALL	TI43	20000	50000	0.3415	0.3415	0.12	2.546	FracturedConcrete
WALL	TI44	50000	100000	0.7433	0.7433	0.12	2.546	FracturedConcrete

Appendix F - Material property assignments for vadose zone transport simulations

Vault 1, Case A, I-129

Material zone	Time period(s)	Start time (yr)	End time (yr)	Effective diffusion coefficient (cm^2/s)	Porosity	Solid density (g/mL)	Sorption material	Sorption coefficient, Kd (mL/g)	Species
BACKFILL	TI01-TI42	0	20000	5.30E-06	0.35	2.63	Clayey	0.6	I-129
CLEAN_GROUT	TI01-TI42	0	20000	1.00E-07	0.58	2.4	ReModerate	9	I-129
CRACK	TI01-TI42	0	20000	1.00E-07	0.58	2.4	ReModerate	9	I-129
FLOOR	TI01	0	50	5.01E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI02	50	100	5.04E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI03	100	150	5.07E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI04	150	200	5.09E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI05	200	250	5.10E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI06	250	300	5.12E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI07	300	350	5.14E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI08	350	400	5.15E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI09	400	450	5.16E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI10	450	500	5.18E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI11	500	600	5.20E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI12	600	700	5.22E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI13	700	800	5.24E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI14	800	900	5.26E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI15	900	1000	5.28E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI16	1000	1200	5.30E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI17	1200	1400	5.33E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI18	1400	1600	5.36E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI19	1600	1800	5.39E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI20	1800	2000	5.42E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI21	2000	2300	5.45E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI22	2300	2600	5.49E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI23	2600	2900	5.52E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI24	2900	3200	5.56E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI25	3200	3600	5.59E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI26	3600	4000	5.64E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI27	4000	4500	5.68E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI28	4500	5000	5.74E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI29	5000	5500	5.78E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI30	5500	6000	5.83E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI31	6000	6500	5.88E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI32	6500	7000	5.92E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI33	7000	7500	5.97E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI34	7500	8000	6.01E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI35	8000	8500	6.06E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI36	8500	9000	6.10E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI37	9000	9500	6.14E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI38	9500	10000	6.18E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI39	10000	11000	6.24E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI40	11000	12000	6.32E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI41	12000	15000	6.47E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI42	15000	20000	6.77E-08	0.12	2.55	ReModerate	9	I-129
NATIVE_SOIL	TI01-TI42	0	20000	5.30E-06	0.39	2.66	Sandy	0	I-129
ROOF	TI01	0	50	1.01E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI02	50	100	1.02E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI03	100	150	1.02E-07	0.145	2.57	OxModerate	15	I-129

Material zone	Time period(s)	Start time (yr)	End time (yr)	Effective diffusion coefficient (cm^2/s)	Porosity	Solid density (g/mL)	Sorption material	Sorption coefficient, Kd (mL/g)	Species
ROOF	TI04	150	200	1.03E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI05	200	250	1.04E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI06	250	300	1.05E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI07	300	350	1.05E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI08	350	400	1.06E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI09	400	450	1.07E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI10	450	500	1.07E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI11	500	600	1.08E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI12	600	700	1.09E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI13	700	800	1.10E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI14	800	900	1.11E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI15	900	1000	1.12E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI16	1000	1200	1.13E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI17	1200	1400	1.15E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI18	1400	1600	1.16E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI19	1600	1800	1.17E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI20	1800	2000	1.19E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI21	2000	2300	1.20E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI22	2300	2600	1.22E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI23	2600	2900	1.24E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI24	2900	3200	1.26E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI25	3200	3600	1.29E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI26	3600	4000	1.31E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI27	4000	4500	1.34E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI28	4500	5000	1.37E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI29	5000	5500	1.40E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI30	5500	6000	1.43E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI31	6000	6500	1.46E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI32	6500	7000	1.50E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI33	7000	7500	1.53E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI34	7500	8000	1.56E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI35	8000	8500	1.59E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI36	8500	9000	1.63E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI37	9000	9500	1.66E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI38	9500	10000	1.69E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI39	10000	11000	1.75E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI40	11000	12000	1.82E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI41	12000	15000	1.97E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI42	15000	20000	2.32E-07	0.145	2.57	OxModerate	15	I-129
SALTSTONE	TI01-TI42	0	20000	1.00E-07	0.58	2.4	ReModerate	9	I-129
SAND_DRAIN	TI01-TI16	0	1200	8.00E-06	0.417	2.66	Sandy	0	I-129
SAND_DRAIN	TI17-TI19	1200	1800	8.00E-06	0.416	2.66	Sandy	0	I-129
SAND_DRAIN	TI20-TI21	1800	2300	8.00E-06	0.415	2.66	Sandy	0	I-129
SAND_DRAIN	TI22-TI23	2300	2900	8.00E-06	0.414	2.66	Sandy	0	I-129
SAND_DRAIN	TI24	2900	3200	8.00E-06	0.413	2.66	Sandy	0	I-129
SAND_DRAIN	TI25	3200	3600	8.00E-06	0.412	2.66	Sandy	0	I-129
SAND_DRAIN	TI26	3600	4000	8.00E-06	0.411	2.66	Sandy	0	I-129
SAND_DRAIN	TI27	4000	4500	8.00E-06	0.409	2.66	Sandy	0	I-129
SAND_DRAIN	TI28	4500	5000	8.00E-06	0.407	2.66	Sandy	0	I-129
SAND_DRAIN	TI29	5000	5500	8.00E-06	0.406	2.66	Sandy	0	I-129
SAND_DRAIN	TI30	5500	6000	8.00E-06	0.404	2.66	Sandy	0	I-129
SAND_DRAIN	TI31	6000	6500	8.00E-06	0.402	2.66	Sandy	0	I-129
SAND_DRAIN	TI32	6500	7000	8.00E-06	0.4	2.66	Sandy	0	I-129
SAND_DRAIN	TI33	7000	7500	8.00E-06	0.398	2.66	Sandy	0	I-129
SAND_DRAIN	TI34	7500	8000	8.00E-06	0.396	2.66	Sandy	0	I-129

Material zone	Time period(s)	Start time (yr)	End time (yr)	Effective diffusion coefficient (cm²/s)	Porosity	Solid density (g/mL)	Sorption material	Sorption coefficient, Kd (mL/g)	Species
SAND_DRAIN	TI35	8000	8500	8.00E-06	0.394	2.66	Sandy	0	I-129
SAND_DRAIN	TI36	8500	9000	8.00E-06	0.392	2.66	Sandy	0	I-129
SAND_DRAIN	TI37	9000	9500	8.00E-06	0.39	2.66	Sandy	0	I-129
SAND_DRAIN	TI38	9500	10000	8.00E-06	0.388	2.66	Sandy	0	I-129
SAND_DRAIN	TI39	10000	11000	8.00E-06	0.385	2.66	Sandy	0	I-129
SAND_DRAIN	TI40	11000	12000	8.00E-06	0.381	2.66	Sandy	0	I-129
SAND_DRAIN	TI41	12000	15000	8.00E-06	0.372	2.66	Sandy	0	I-129
SAND_DRAIN	TI42	15000	20000	8.00E-06	0.357	2.66	Sandy	0	I-129
WALL	TI01	0	50	5.02E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI02	50	100	5.06E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI03	100	150	5.09E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI04	150	200	5.11E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI05	200	250	5.14E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI06	250	300	5.16E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI07	300	350	5.18E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI08	350	400	5.20E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI09	400	450	5.22E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI10	450	500	5.24E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI11	500	600	5.26E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI12	600	700	5.30E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI13	700	800	5.33E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI14	800	900	5.35E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI15	900	1000	5.38E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI16	1000	1200	5.41E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI17	1200	1400	5.45E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI18	1400	1600	5.49E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI19	1600	1800	5.53E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI20	1800	2000	5.57E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI21	2000	2300	5.62E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI22	2300	2600	5.67E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI23	2600	2900	5.72E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI24	2900	3200	5.77E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI25	3200	3600	5.83E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI26	3600	4000	5.89E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI27	4000	4500	5.96E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI28	4500	5000	6.03E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI29	5000	5500	6.10E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI30	5500	6000	6.17E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI31	6000	6500	6.24E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI32	6500	7000	6.31E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI33	7000	7500	6.38E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI34	7500	8000	6.45E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI35	8000	8500	6.51E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI36	8500	9000	6.58E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI37	9000	9500	6.64E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI38	9500	10000	6.71E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI39	10000	11000	6.80E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI40	11000	12000	6.93E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI41	12000	15000	7.18E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI42	15000	20000	7.68E-08	0.12	2.55	ReModerate	9	I-129

Vault 1, Case C, I-129

Material zone	Time period(s)	Start time (yr)	End time (yr)	Effective diffusion coefficient (cm^2/s)	Porosity	Solid density (g/mL)	Sorption material	Sorption coefficient, Kd (mL/g)	Species
BACKFILL	TI01-TI42	0	20000	5.30E-06	0.35	2.63	Clayey	0.6	I-129
CLEAN_GROUT	TI01-TI42	0	20000	1.00E-07	0.58	2.4	ReModerate	9	I-129
CRACK	TI01-TI42	0	20000	9.40E-06	0.3	2.6	Zero	0	I-129
FLOOR	TI01	0	50	5.01E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI02	50	100	5.04E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI03	100	150	5.07E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI04	150	200	5.09E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI05	200	250	5.10E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI06	250	300	5.12E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI07	300	350	5.14E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI08	350	400	5.15E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI09	400	450	5.16E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI10	450	500	5.18E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI11	500	600	5.20E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI12	600	700	5.22E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI13	700	800	5.24E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI14	800	900	5.26E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI15	900	1000	5.28E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI16	1000	1200	5.30E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI17	1200	1400	5.33E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI18	1400	1600	5.36E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI19	1600	1800	5.39E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI20	1800	2000	5.42E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI21	2000	2300	5.45E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI22	2300	2600	5.49E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI23	2600	2900	5.52E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI24	2900	3200	5.56E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI25	3200	3600	5.59E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI26	3600	4000	5.64E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI27	4000	4500	5.68E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI28	4500	5000	5.74E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI29	5000	5500	5.78E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI30	5500	6000	5.83E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI31	6000	6500	5.88E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI32	6500	7000	5.92E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI33	7000	7500	5.97E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI34	7500	8000	6.01E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI35	8000	8500	6.06E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI36	8500	9000	6.10E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI37	9000	9500	6.14E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI38	9500	10000	6.18E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI39	10000	11000	6.24E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI40	11000	12000	6.32E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI41	12000	15000	6.47E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI42	15000	20000	6.77E-08	0.12	2.55	ReModerate	9	I-129
NATIVE_SOIL	TI01-TI42	0	20000	5.30E-06	0.39	2.66	Sandy	0	I-129
ROOF	TI01	0	50	1.01E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI02	50	100	1.02E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI03	100	150	1.02E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI04	150	200	1.03E-07	0.145	2.57	OxModerate	15	I-129

Material zone	Time period(s)	Start time (yr)	End time (yr)	Effective diffusion coefficient (cm^2/s)	Porosity	Solid density (g/mL)	Sorption material	Sorption coefficient, Kd (mL/g)	Species
ROOF	TI05	200	250	1.04E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI06	250	300	1.05E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI07	300	350	1.05E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI08	350	400	1.06E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI09	400	450	1.07E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI10	450	500	1.07E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI11	500	600	1.08E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI12	600	700	1.09E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI13	700	800	1.10E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI14	800	900	1.11E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI15	900	1000	1.12E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI16	1000	1200	1.13E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI17	1200	1400	1.15E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI18	1400	1600	1.16E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI19	1600	1800	1.17E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI20	1800	2000	1.19E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI21	2000	2300	1.20E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI22	2300	2600	1.22E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI23	2600	2900	1.24E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI24	2900	3200	1.26E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI25	3200	3600	1.29E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI26	3600	4000	1.31E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI27	4000	4500	1.34E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI28	4500	5000	1.37E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI29	5000	5500	1.40E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI30	5500	6000	1.43E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI31	6000	6500	1.46E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI32	6500	7000	1.50E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI33	7000	7500	1.53E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI34	7500	8000	1.56E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI35	8000	8500	1.59E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI36	8500	9000	1.63E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI37	9000	9500	1.66E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI38	9500	10000	1.69E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI39	10000	11000	1.75E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI40	11000	12000	1.82E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI41	12000	15000	1.97E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI42	15000	20000	2.32E-07	0.145	2.57	OxModerate	15	I-129
SALTSTONE	TI01-TI42	0	20000	1.00E-07	0.58	2.4	ReModerate	9	I-129
SAND_DRAIN	TI01-TI16	0	1200	8.00E-06	0.417	2.66	Sandy	0	I-129
SAND_DRAIN	TI17-TI19	1200	1800	8.00E-06	0.416	2.66	Sandy	0	I-129
SAND_DRAIN	TI20-TI21	1800	2300	8.00E-06	0.415	2.66	Sandy	0	I-129
SAND_DRAIN	TI22-TI23	2300	2900	8.00E-06	0.414	2.66	Sandy	0	I-129
SAND_DRAIN	TI24	2900	3200	8.00E-06	0.413	2.66	Sandy	0	I-129
SAND_DRAIN	TI25	3200	3600	8.00E-06	0.412	2.66	Sandy	0	I-129
SAND_DRAIN	TI26	3600	4000	8.00E-06	0.411	2.66	Sandy	0	I-129
SAND_DRAIN	TI27	4000	4500	8.00E-06	0.409	2.66	Sandy	0	I-129
SAND_DRAIN	TI28	4500	5000	8.00E-06	0.407	2.66	Sandy	0	I-129
SAND_DRAIN	TI29	5000	5500	8.00E-06	0.406	2.66	Sandy	0	I-129
SAND_DRAIN	TI30	5500	6000	8.00E-06	0.404	2.66	Sandy	0	I-129
SAND_DRAIN	TI31	6000	6500	8.00E-06	0.402	2.66	Sandy	0	I-129

Material zone	Time period(s)	Start time (yr)	End time (yr)	Effective diffusion coefficient (cm^2/s)	Porosity	Solid density (g/mL)	Sorption material	Sorption coefficient, Kd (mL/g)	Species
SAND_DRAIN	TI32	6500	7000	8.00E-06	0.4	2.66	Sandy	0	I-129
SAND_DRAIN	TI33	7000	7500	8.00E-06	0.398	2.66	Sandy	0	I-129
SAND_DRAIN	TI34	7500	8000	8.00E-06	0.396	2.66	Sandy	0	I-129
SAND_DRAIN	TI35	8000	8500	8.00E-06	0.394	2.66	Sandy	0	I-129
SAND_DRAIN	TI36	8500	9000	8.00E-06	0.392	2.66	Sandy	0	I-129
SAND_DRAIN	TI37	9000	9500	8.00E-06	0.39	2.66	Sandy	0	I-129
SAND_DRAIN	TI38	9500	10000	8.00E-06	0.388	2.66	Sandy	0	I-129
SAND_DRAIN	TI39	10000	11000	8.00E-06	0.385	2.66	Sandy	0	I-129
SAND_DRAIN	TI40	11000	12000	8.00E-06	0.381	2.66	Sandy	0	I-129
SAND_DRAIN	TI41	12000	15000	8.00E-06	0.372	2.66	Sandy	0	I-129
SAND_DRAIN	TI42	15000	20000	8.00E-06	0.357	2.66	Sandy	0	I-129
WALL	TI01	0	50	5.02E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI02	50	100	5.06E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI03	100	150	5.09E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI04	150	200	5.11E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI05	200	250	5.14E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI06	250	300	5.16E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI07	300	350	5.18E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI08	350	400	5.20E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI09	400	450	5.22E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI10	450	500	5.24E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI11	500	600	5.26E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI12	600	700	5.30E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI13	700	800	5.33E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI14	800	900	5.35E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI15	900	1000	5.38E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI16	1000	1200	5.41E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI17	1200	1400	5.45E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI18	1400	1600	5.49E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI19	1600	1800	5.53E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI20	1800	2000	5.57E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI21	2000	2300	5.62E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI22	2300	2600	5.67E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI23	2600	2900	5.72E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI24	2900	3200	5.77E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI25	3200	3600	5.83E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI26	3600	4000	5.89E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI27	4000	4500	5.96E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI28	4500	5000	6.03E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI29	5000	5500	6.10E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI30	5500	6000	6.17E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI31	6000	6500	6.24E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI32	6500	7000	6.31E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI33	7000	7500	6.38E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI34	7500	8000	6.45E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI35	8000	8500	6.51E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI36	8500	9000	6.58E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI37	9000	9500	6.64E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI38	9500	10000	6.71E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI39	10000	11000	6.80E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI40	11000	12000	6.93E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI41	12000	15000	7.18E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI42	15000	20000	7.68E-08	0.12	2.55	ReModerate	9	I-129

Vault 1, Case E, I-129

Material zone	Time period(s)	Start time (yr)	End time (yr)	Effective diffusion coefficient (cm^2/s)	Porosity	Solid density (g/mL)	Sorption material	Sorption coefficient, Kd (mL/g)	Species
BACKFILL	TI01-TI43d	0	40000	5.30E-06	0.35	2.63	Clayey	0.6	I-129
CLEAN_GROUT	TI01-TI43b	0	20205	1.00E-07	0.58	2.4	ReModerate	9	I-129
CLEAN_GROUT	TI43c	20205	22690	1.00E-07	0.58	2.4	OxModerate	15	I-129
CLEAN_GROUT	TI43d	22690	40000	1.00E-07	0.58	2.4	OxAged	4	I-129
CRACK	TI01-TI43d	0	40000	1.00E-07	0.58	2.4	ReModerate	9	I-129
FLOOR	TI01	0	50	5.01E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI02	50	100	5.04E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI03	100	150	5.07E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI04	150	200	5.09E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI05	200	250	5.10E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI06	250	300	5.12E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI07	300	350	5.14E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI08	350	400	5.15E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI09	400	450	5.16E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI10	450	500	5.18E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI11	500	600	5.20E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI12	600	700	5.22E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI13	700	800	5.24E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI14	800	900	5.26E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI15	900	1000	5.28E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI16	1000	1200	5.30E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI17	1200	1400	5.33E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI18	1400	1600	5.36E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI19	1600	1800	5.39E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI20	1800	2000	5.42E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI21	2000	2300	5.45E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI22	2300	2600	5.49E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI23	2600	2900	5.52E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI24	2900	3200	5.56E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI25	3200	3600	5.59E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI26	3600	4000	5.64E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI27	4000	4500	5.68E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI28	4500	5000	5.74E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI29	5000	5500	5.78E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI30	5500	6000	5.83E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI31	6000	6500	5.88E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI32	6500	7000	5.92E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI33	7000	7500	5.97E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI34	7500	8000	6.01E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI35	8000	8500	6.06E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI36	8500	9000	6.10E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI37	9000	9500	6.14E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI38	9500	10000	6.18E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI39	10000	11000	6.24E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI40a	11000	11626	6.31E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI40b	11626	12000	6.34E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI41a	12000	13669	6.42E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI41b	13669	15000	6.54E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI42	15000	20000	6.77E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI43a	20000	20012	6.96E-08	0.12	2.55	ReModerate	9	I-129

Material zone	Time period(s)	Start time (yr)	End time (yr)	Effective diffusion coefficient (cm^2/s)	Porosity	Solid density (g/mL)	Sorption material	Sorption coefficient, Kd (mL/g)	Species
FLOOR	TI43b	20012	20205	6.96E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI43c	20205	22690	7.06E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI43d	22690	40000	8.08E-08	0.12	2.55	ReModerate	9	I-129
NATIVE_SOIL	TI01-TI43d	0	40000	5.30E-06	0.39	2.66	Sandy	0	I-129
ROOF	TI01	0	50	1.01E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI02	50	100	1.02E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI03	100	150	1.02E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI04	150	200	1.03E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI05	200	250	1.04E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI06	250	300	1.05E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI07	300	350	1.05E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI08	350	400	1.06E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI09	400	450	1.07E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI10	450	500	1.07E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI11	500	600	1.08E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI12	600	700	1.09E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI13	700	800	1.10E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI14	800	900	1.11E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI15	900	1000	1.12E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI16	1000	1200	1.13E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI17	1200	1400	1.15E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI18	1400	1600	1.16E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI19	1600	1800	1.17E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI20	1800	2000	1.19E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI21	2000	2300	1.20E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI22	2300	2600	1.22E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI23	2600	2900	1.24E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI24	2900	3200	1.26E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI25	3200	3600	1.29E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI26	3600	4000	1.31E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI27	4000	4500	1.34E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI28	4500	5000	1.37E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI29	5000	5500	1.40E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI30	5500	6000	1.43E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI31	6000	6500	1.46E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI32	6500	7000	1.50E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI33	7000	7500	1.53E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI34	7500	8000	1.56E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI35	8000	8500	1.59E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI36	8500	9000	1.63E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI37	9000	9500	1.66E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI38	9500	10000	1.69E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI39	10000	11000	1.75E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI40a	11000	11626	1.80E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI40b	11626	12000	1.84E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI41a	12000	13669	1.92E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI41b	13669	15000	2.03E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI42	15000	20000	2.32E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI43a	20000	20012	2.57E-07	0.145	2.57	OxModerate	15	I-129
ROOF	TI43b	20012	20205	2.58E-07	0.145	2.57	OxAged	4	I-129
ROOF	TI43c	20205	22690	2.75E-07	0.145	2.57	OxAged	4	I-129
ROOF	TI43d	22690	40000	1.01E-06	0.145	2.57	OxAged	4	I-129
SALTSTONE	TI01-TI43d	0	40000	1.00E-07	0.58	2.4	ReModerate	9	I-129
SAND_DRAIN	TI01-TI16	0	1200	8.00E-06	0.417	2.66	Sandy	0	I-129

Material zone	Time period(s)	Start time (yr)	End time (yr)	Effective diffusion coefficient (cm^2/s)	Porosity	Solid density (g/mL)	Sorption material	Sorption coefficient, Kd (mL/g)	Species
SAND_DRAIN	TI17-TI19	1200	1800	8.00E-06	0.416	2.66	Sandy	0	I-129
SAND_DRAIN	TI20-TI21	1800	2300	8.00E-06	0.415	2.66	Sandy	0	I-129
SAND_DRAIN	TI22-TI23	2300	2900	8.00E-06	0.414	2.66	Sandy	0	I-129
SAND_DRAIN	TI24	2900	3200	8.00E-06	0.413	2.66	Sandy	0	I-129
SAND_DRAIN	TI25	3200	3600	8.00E-06	0.412	2.66	Sandy	0	I-129
SAND_DRAIN	TI26	3600	4000	8.00E-06	0.411	2.66	Sandy	0	I-129
SAND_DRAIN	TI27	4000	4500	8.00E-06	0.409	2.66	Sandy	0	I-129
SAND_DRAIN	TI28	4500	5000	8.00E-06	0.407	2.66	Sandy	0	I-129
SAND_DRAIN	TI29	5000	5500	8.00E-06	0.406	2.66	Sandy	0	I-129
SAND_DRAIN	TI30	5500	6000	8.00E-06	0.404	2.66	Sandy	0	I-129
SAND_DRAIN	TI31	6000	6500	8.00E-06	0.402	2.66	Sandy	0	I-129
SAND_DRAIN	TI32	6500	7000	8.00E-06	0.4	2.66	Sandy	0	I-129
SAND_DRAIN	TI33	7000	7500	8.00E-06	0.398	2.66	Sandy	0	I-129
SAND_DRAIN	TI34	7500	8000	8.00E-06	0.396	2.66	Sandy	0	I-129
SAND_DRAIN	TI35	8000	8500	8.00E-06	0.394	2.66	Sandy	0	I-129
SAND_DRAIN	TI36	8500	9000	8.00E-06	0.392	2.66	Sandy	0	I-129
SAND_DRAIN	TI37	9000	9500	8.00E-06	0.39	2.66	Sandy	0	I-129
SAND_DRAIN	TI38	9500	10000	8.00E-06	0.388	2.66	Sandy	0	I-129
SAND_DRAIN	TI39	10000	11000	8.00E-06	0.385	2.66	Sandy	0	I-129
SAND_DRAIN	TI40a	11000	11626	8.00E-06	0.381	2.66	Sandy	0	I-129
SAND_DRAIN	TI40b	11626	12000	8.00E-06	0.379	2.66	Sandy	0	I-129
SAND_DRAIN	TI41a	12000	13669	8.00E-06	0.375	2.66	Sandy	0	I-129
SAND_DRAIN	TI41b	13669	15000	8.00E-06	0.369	2.66	Sandy	0	I-129
SAND_DRAIN	TI42	15000	20000	8.00E-06	0.357	2.66	Sandy	0	I-129
SAND_DRAIN	TI43a-TI43d	20000	40000	5.30E-06	0.35	2.63	Clayey	0.6	I-129
WALL	TI01	0	50	5.02E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI02	50	100	5.06E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI03	100	150	5.09E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI04	150	200	5.11E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI05	200	250	5.14E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI06	250	300	5.16E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI07	300	350	5.18E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI08	350	400	5.20E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI09	400	450	5.22E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI10	450	500	5.24E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI11	500	600	5.26E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI12	600	700	5.30E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI13	700	800	5.33E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI14	800	900	5.35E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI15	900	1000	5.38E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI16	1000	1200	5.41E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI17	1200	1400	5.45E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI18	1400	1600	5.49E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI19	1600	1800	5.53E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI20	1800	2000	5.57E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI21	2000	2300	5.62E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI22	2300	2600	5.67E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI23	2600	2900	5.72E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI24	2900	3200	5.77E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI25	3200	3600	5.83E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI26	3600	4000	5.89E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI27	4000	4500	5.96E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI28	4500	5000	6.03E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI29	5000	5500	6.10E-08	0.12	2.55	ReModerate	9	I-129

Material zone	Time period(s)	Start time (yr)	End time (yr)	Effective diffusion coefficient (cm^2/s)	Porosity	Solid density (g/mL)	Sorption material	Sorption coefficient, Kd (mL/g)	Species
WALL	TI30	5500	6000	6.17E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI31	6000	6500	6.24E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI32	6500	7000	6.31E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI33	7000	7500	6.38E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI34	7500	8000	6.45E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI35	8000	8500	6.51E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI36	8500	9000	6.58E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI37	9000	9500	6.64E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI38	9500	10000	6.71E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI39	10000	11000	6.80E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI40a	11000	11626	6.91E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI40b	11626	12000	6.97E-08	0.12	2.55	OxModerate	15	I-129
WALL	TI41a	12000	13669	7.10E-08	0.12	2.55	OxModerate	15	I-129
WALL	TI41b	13669	15000	7.28E-08	0.12	2.55	OxAged	4	I-129
WALL	TI42	15000	20000	7.68E-08	0.12	2.55	OxAged	4	I-129
WALL	TI43a	20000	20012	8.00E-08	0.12	2.55	OxAged	4	I-129
WALL	TI43b	20012	20205	8.01E-08	0.12	2.55	OxAged	4	I-129
WALL	TI43c	20205	22690	8.18E-08	0.12	2.55	OxAged	4	I-129
WALL	TI43d	22690	40000	1.02E-07	0.12	2.55	OxAged	4	I-129

Vault 2, Case A, I-129

Material zone	Time period(s)	Start time (yr)	End time (yr)	Effective diffusion coefficient (cm^2/s)	Porosity	Solid density (g/mL)	Sorption material	Sorption coefficient, Kd (mL/g)	Species
BACKFILL	TI01-TI42c	0	20000	5.30E-06	0.35	2.63	Clayey	0.6	I-129
CLEAN_GROUT	TI01-TI42c	0	20000	1.00E-07	0.58	2.4	ReModerate	9	I-129
COLUMN	TI01-TI42c	0	20000	1.00E-07	0.58	2.4	ReModerate	9	I-129
FLOOR	TI01	0	50	5.04E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI02	50	100	5.11E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI03	100	150	5.17E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI04	150	200	5.22E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI05	200	250	5.27E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI06	250	300	5.32E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI07	300	350	5.36E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI08	350	400	5.40E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI09	400	450	5.44E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI10	450	500	5.48E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI11	500	600	5.53E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI12	600	700	5.60E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI13	700	800	5.66E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI14	800	900	5.73E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI15	900	1000	5.79E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI16	1000	1200	5.86E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI17	1200	1400	5.95E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI18	1400	1600	6.04E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI19	1600	1800	6.14E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI20	1800	2000	6.23E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI21	2000	2300	6.34E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI22	2300	2600	6.47E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI23	2600	2900	6.59E-08	0.11	2.49	ReModerate	9	I-129

Material zone	Time period(s)	Start time (yr)	End time (yr)	Effective diffusion coefficient (cm²/s)	Porosity	Solid density (g/mL)	Sorption material	Sorption coefficient, Kd (mL/g)	Species
FLOOR	TI24	2900	3200	6.72E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI25	3200	3600	6.87E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI26	3600	4000	7.04E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI27	4000	4500	7.23E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI28	4500	5000	7.44E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI29	5000	5500	7.66E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI30	5500	6000	7.87E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI31	6000	6500	8.10E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI32	6500	7000	8.32E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI33	7000	7500	8.55E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI34	7500	8000	8.78E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI35	8000	8500	9.03E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI36	8500	9000	9.27E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI37	9000	9500	9.52E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI38	9500	10000	9.79E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI39	10000	11000	1.02E-07	0.11	2.49	ReModerate	9	I-129
FLOOR	TI40	11000	12000	1.08E-07	0.11	2.49	ReModerate	9	I-129
FLOOR	TI41a	12000	14928	1.20E-07	0.11	2.49	ReModerate	9	I-129
FLOOR	TI41b	14928	15000	1.30E-07	0.11	2.49	ReModerate	9	I-129
FLOOR	TI42a	15000	16344	1.36E-07	0.11	2.49	ReModerate	9	I-129
FLOOR	TI42b	16344	16753	1.43E-07	0.11	2.49	ReModerate	9	I-129
FLOOR	TI42c	16753	20000	1.61E-07	0.11	2.49	ReModerate	9	I-129
FLOOR_HDPE_GCL	TI01	0	50	4.39E-10	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI02	50	100	5.62E-10	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI03	100	150	7.72E-10	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI04	150	200	9.93E-10	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI05	200	250	1.20E-09	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI06	250	300	1.40E-09	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI07	300	350	1.60E-09	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI08	350	400	1.79E-09	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI09	400	450	1.99E-09	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI10	450	500	2.19E-09	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI11	500	600	2.48E-09	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI12	600	700	2.87E-09	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI13	700	800	3.26E-09	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI14	800	900	3.65E-09	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI15	900	1000	4.04E-09	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI16	1000	1200	4.62E-09	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI17	1200	1400	5.40E-09	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI18	1400	1600	6.17E-09	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI19	1600	1800	6.95E-09	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI20	1800	2000	7.72E-09	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI21	2000	2300	8.69E-09	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI22	2300	2600	9.85E-09	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI23	2600	2900	1.10E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI24	2900	3200	1.22E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI25	3200	3600	1.35E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI26	3600	4000	1.51E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI27	4000	4500	1.68E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI28	4500	5000	1.88E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI29	5000	5500	2.07E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI30	5500	6000	2.26E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI31	6000	6500	2.46E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI32	6500	7000	2.65E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI33	7000	7500	2.84E-08	0.3	2.14	Zero	0	I-129

Material zone	Time period(s)	Start time (yr)	End time (yr)	Effective diffusion coefficient (cm^2/s)	Porosity	Solid density (g/mL)	Sorption material	Sorption coefficient, Kd (mL/g)	Species
FLOOR_HDPE_GCL	TI34	7500	8000	3.03E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI35	8000	8500	3.23E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI36	8500	9000	3.42E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI37	9000	9500	3.61E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI38	9500	10000	3.81E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI39	10000	11000	4.10E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI40	11000	12000	4.48E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI41a	12000	14928	5.24E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI41b	14928	15000	5.82E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI42a	15000	16344	6.09E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI42b	16344	16753	6.43E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI42c	16753	20000	7.13E-08	0.3	2.14	Zero	0	I-129
HDPE	TI01	0	50	4.77E-10	0.3	2.14	Zero	0	I-129
HDPE	TI02	50	100	7.02E-10	0.3	2.14	Zero	0	I-129
HDPE	TI03	100	150	1.12E-09	0.3	2.14	Zero	0	I-129
HDPE	TI04	150	200	1.58E-09	0.3	2.14	Zero	0	I-129
HDPE	TI05	200	250	2.02E-09	0.3	2.14	Zero	0	I-129
HDPE	TI06	250	300	2.45E-09	0.3	2.14	Zero	0	I-129
HDPE	TI07	300	350	2.89E-09	0.3	2.14	Zero	0	I-129
HDPE	TI08	350	400	3.32E-09	0.3	2.14	Zero	0	I-129
HDPE	TI09	400	450	3.76E-09	0.3	2.14	Zero	0	I-129
HDPE	TI10	450	500	4.20E-09	0.3	2.14	Zero	0	I-129
HDPE	TI11	500	600	4.85E-09	0.3	2.14	Zero	0	I-129
HDPE	TI12	600	700	5.73E-09	0.3	2.14	Zero	0	I-129
HDPE	TI13	700	800	6.60E-09	0.3	2.14	Zero	0	I-129
HDPE	TI14	800	900	7.47E-09	0.3	2.14	Zero	0	I-129
HDPE	TI15	900	1000	8.34E-09	0.3	2.14	Zero	0	I-129
HDPE	TI16	1000	1200	9.65E-09	0.3	2.14	Zero	0	I-129
HDPE	TI17	1200	1400	1.14E-08	0.3	2.14	Zero	0	I-129
HDPE	TI18	1400	1600	1.32E-08	0.3	2.14	Zero	0	I-129
HDPE	TI19	1600	1800	1.49E-08	0.3	2.14	Zero	0	I-129
HDPE	TI20	1800	2000	1.66E-08	0.3	2.14	Zero	0	I-129
HDPE	TI21	2000	2300	1.88E-08	0.3	2.14	Zero	0	I-129
HDPE	TI22	2300	2600	2.14E-08	0.3	2.14	Zero	0	I-129
HDPE	TI23	2600	2900	2.41E-08	0.3	2.14	Zero	0	I-129
HDPE	TI24	2900	3200	2.67E-08	0.3	2.14	Zero	0	I-129
HDPE	TI25	3200	3600	2.97E-08	0.3	2.14	Zero	0	I-129
HDPE	TI26	3600	4000	3.32E-08	0.3	2.14	Zero	0	I-129
HDPE	TI27	4000	4500	3.72E-08	0.3	2.14	Zero	0	I-129
HDPE	TI28	4500	5000	4.15E-08	0.3	2.14	Zero	0	I-129
HDPE	TI29	5000	5500	4.59E-08	0.3	2.14	Zero	0	I-129
HDPE	TI30	5500	6000	5.03E-08	0.3	2.14	Zero	0	I-129
HDPE	TI31	6000	6500	5.46E-08	0.3	2.14	Zero	0	I-129
HDPE	TI32	6500	7000	5.90E-08	0.3	2.14	Zero	0	I-129
HDPE	TI33	7000	7500	6.33E-08	0.3	2.14	Zero	0	I-129
HDPE	TI34	7500	8000	6.77E-08	0.3	2.14	Zero	0	I-129
HDPE	TI35	8000	8500	7.21E-08	0.3	2.14	Zero	0	I-129
HDPE	TI36	8500	9000	7.64E-08	0.3	2.14	Zero	0	I-129
HDPE	TI37	9000	9500	8.08E-08	0.3	2.14	Zero	0	I-129
HDPE	TI38	9500	10000	8.52E-08	0.3	2.14	Zero	0	I-129
HDPE	TI39	10000	11000	9.17E-08	0.3	2.14	Zero	0	I-129
HDPE	TI40	11000	12000	1.00E-07	0.3	2.14	Zero	0	I-129
HDPE	TI41a	12000	14928	1.18E-07	0.3	2.14	Zero	0	I-129
HDPE	TI41b	14928	15000	1.31E-07	0.3	2.14	Zero	0	I-129
HDPE	TI42a	15000	16344	1.37E-07	0.3	2.14	Zero	0	I-129

Material zone	Time period(s)	Start time (yr)	End time (yr)	Effective diffusion coefficient (cm^2/s)	Porosity	Solid density (g/mL)	Sorption material	Sorption coefficient, Kd (mL/g)	Species
HDPE	TI42b	16344	16753	1.45E-07	0.3	2.14	Zero	0	I-129
HDPE	TI42c	16753	20000	1.61E-07	0.3	2.14	Zero	0	I-129
LOWER_MUD_MAT	TI01-TI42c	0	20000	8.00E-07	0.211	2.61	OxModerate	15	I-129
NATIVE_SOIL	TI01-TI42c	0	20000	5.30E-06	0.39	2.66	Sandy	0	I-129
ROOF	TI01	0	50	5.01E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI02	50	100	5.02E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI03	100	150	5.03E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI04	150	200	5.05E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI05	200	250	5.07E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI06	250	300	5.09E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI07	300	350	5.11E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI08	350	400	5.13E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI09	400	450	5.15E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI10	450	500	5.17E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI11	500	600	5.21E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI12	600	700	5.25E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI13	700	800	5.29E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI14	800	900	5.33E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI15	900	1000	5.37E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI16	1000	1200	5.43E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI17	1200	1400	5.49E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI18	1400	1600	5.56E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI19	1600	1800	5.63E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI20	1800	2000	5.70E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI21	2000	2300	5.79E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI22	2300	2600	5.89E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI23	2600	2900	5.99E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI24	2900	3200	6.09E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI25	3200	3600	6.21E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI26	3600	4000	6.34E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI27	4000	4500	6.49E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI28	4500	5000	6.66E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI29	5000	5500	6.84E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI30	5500	6000	7.01E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI31	6000	6500	7.19E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI32	6500	7000	7.37E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI33	7000	7500	7.55E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI34	7500	8000	7.74E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI35	8000	8500	7.93E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI36	8500	9000	8.13E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI37	9000	9500	8.33E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI38	9500	10000	8.54E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI39	10000	11000	8.86E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI40	11000	12000	9.30E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI41a	12000	14928	1.03E-07	0.11	2.49	ReModerate	9	I-129
ROOF	TI41b	14928	15000	1.11E-07	0.11	2.49	ReModerate	9	I-129
ROOF	TI42a	15000	16344	1.15E-07	0.11	2.49	ReModerate	9	I-129
ROOF	TI42b	16344	16753	1.21E-07	0.11	2.49	ReModerate	9	I-129
ROOF	TI42c	16753	20000	1.34E-07	0.11	2.49	ReModerate	9	I-129
ROOF_HDPE_GCL	TI01	0	50	4.39E-10	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI02	50	100	5.62E-10	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI03	100	150	7.72E-10	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI04	150	200	9.93E-10	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI05	200	250	1.20E-09	0.3	2.14	Zero	0	I-129

Material zone	Time period(s)	Start time (yr)	End time (yr)	Effective diffusion coefficient (cm^2/s)	Porosity	Solid density (g/mL)	Sorption material	Sorption coefficient, Kd (mL/g)	Species
ROOF_HDPE_GCL	TI06	250	300	1.40E-09	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI07	300	350	1.60E-09	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI08	350	400	1.79E-09	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI09	400	450	1.99E-09	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI10	450	500	2.19E-09	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI11	500	600	2.48E-09	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI12	600	700	2.87E-09	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI13	700	800	3.26E-09	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI14	800	900	3.65E-09	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI15	900	1000	4.04E-09	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI16	1000	1200	4.62E-09	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI17	1200	1400	5.40E-09	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI18	1400	1600	6.17E-09	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI19	1600	1800	6.95E-09	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI20	1800	2000	7.72E-09	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI21	2000	2300	8.69E-09	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI22	2300	2600	9.85E-09	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI23	2600	2900	1.10E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI24	2900	3200	1.22E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI25	3200	3600	1.35E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI26	3600	4000	1.51E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI27	4000	4500	1.68E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI28	4500	5000	1.88E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI29	5000	5500	2.07E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI30	5500	6000	2.26E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI31	6000	6500	2.46E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI32	6500	7000	2.65E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI33	7000	7500	2.84E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI34	7500	8000	3.03E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI35	8000	8500	3.23E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI36	8500	9000	3.42E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI37	9000	9500	3.61E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI38	9500	10000	3.81E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI39	10000	11000	4.10E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI40	11000	12000	4.48E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI41a	12000	14928	5.24E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI41b	14928	15000	5.82E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI42a	15000	16344	6.09E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI42b	16344	16753	6.43E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI42c	16753	20000	7.13E-08	0.3	2.14	Zero	0	I-129
SALTSTONE	TI01-TI42c	0	20000	1.00E-07	0.58	2.4	ReModerate	9	I-129
SAND_DRAIN	TI01-TI16	0	1200	8.00E-06	0.417	2.66	Sandy	0	I-129
SAND_DRAIN	TI17-TI19	1200	1800	8.00E-06	0.416	2.66	Sandy	0	I-129
SAND_DRAIN	TI20-TI21	1800	2300	8.00E-06	0.415	2.66	Sandy	0	I-129
SAND_DRAIN	TI22-TI23	2300	2900	8.00E-06	0.414	2.66	Sandy	0	I-129
SAND_DRAIN	TI24	2900	3200	8.00E-06	0.413	2.66	Sandy	0	I-129
SAND_DRAIN	TI25	3200	3600	8.00E-06	0.412	2.66	Sandy	0	I-129
SAND_DRAIN	TI26	3600	4000	8.00E-06	0.411	2.66	Sandy	0	I-129
SAND_DRAIN	TI27	4000	4500	8.00E-06	0.409	2.66	Sandy	0	I-129
SAND_DRAIN	TI28	4500	5000	8.00E-06	0.407	2.66	Sandy	0	I-129
SAND_DRAIN	TI29	5000	5500	8.00E-06	0.406	2.66	Sandy	0	I-129

Material zone	Time period(s)	Start time (yr)	End time (yr)	Effective diffusion coefficient (cm²/s)	Porosity	Solid density (g/mL)	Sorption material	Sorption coefficient, Kd (mL/g)	Species
SAND_DRAIN	TI30	5500	6000	8.00E-06	0.404	2.66	Sandy	0	I-129
SAND_DRAIN	TI31	6000	6500	8.00E-06	0.402	2.66	Sandy	0	I-129
SAND_DRAIN	TI32	6500	7000	8.00E-06	0.4	2.66	Sandy	0	I-129
SAND_DRAIN	TI33	7000	7500	8.00E-06	0.398	2.66	Sandy	0	I-129
SAND_DRAIN	TI34	7500	8000	8.00E-06	0.396	2.66	Sandy	0	I-129
SAND_DRAIN	TI35	8000	8500	8.00E-06	0.394	2.66	Sandy	0	I-129
SAND_DRAIN	TI36	8500	9000	8.00E-06	0.392	2.66	Sandy	0	I-129
SAND_DRAIN	TI37	9000	9500	8.00E-06	0.39	2.66	Sandy	0	I-129
SAND_DRAIN	TI38	9500	10000	8.00E-06	0.388	2.66	Sandy	0	I-129
SAND_DRAIN	TI39	10000	11000	8.00E-06	0.385	2.66	Sandy	0	I-129
SAND_DRAIN	TI40	11000	12000	8.00E-06	0.381	2.66	Sandy	0	I-129
SAND_DRAIN	TI41a	12000	14928	8.00E-06	0.373	2.66	Sandy	0	I-129
SAND_DRAIN	TI41b	14928	15000	8.00E-06	0.366	2.66	Sandy	0	I-129
SAND_DRAIN	TI42a	15000	16344	8.00E-06	0.364	2.66	Sandy	0	I-129
SAND_DRAIN	TI42b	16344	16753	8.00E-06	0.36	2.66	Sandy	0	I-129
SAND_DRAIN	TI42c	16753	20000	8.00E-06	0.353	2.66	Sandy	0	I-129
SHEET_DRAIN	TI01-TI42c	0	20000	1.00E-07	0.58	2.4	ReModerate	9	I-129
SHOT_CRETE	TI01-TI41a	0	14928	5.30E-06	0.35	2.63	OxModerate	15	I-129
SHOT_CRETE	TI41b-TI42c	14928	20000	5.30E-06	0.35	2.63	OxAged	4	I-129
UPPER_MUD_MAT	TI01	0	50	5.04E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI02	50	100	5.11E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI03	100	150	5.17E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI04	150	200	5.22E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI05	200	250	5.27E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI06	250	300	5.32E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI07	300	350	5.36E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI08	350	400	5.40E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI09	400	450	5.44E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI10	450	500	5.48E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI11	500	600	5.53E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI12	600	700	5.60E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI13	700	800	5.66E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI14	800	900	5.73E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI15	900	1000	5.79E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI16	1000	1200	5.86E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI17	1200	1400	5.95E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI18	1400	1600	6.04E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI19	1600	1800	6.14E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI20	1800	2000	6.23E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI21	2000	2300	6.34E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI22	2300	2600	6.47E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI23	2600	2900	6.59E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI24	2900	3200	6.72E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI25	3200	3600	6.87E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI26	3600	4000	7.04E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI27	4000	4500	7.23E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI28	4500	5000	7.44E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI29	5000	5500	7.66E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI30	5500	6000	7.87E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI31	6000	6500	8.10E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI32	6500	7000	8.32E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI33	7000	7500	8.55E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI34	7500	8000	8.78E-08	0.11	2.49	ReModerate	9	I-129

Material zone	Time period(s)	Start time (yr)	End time (yr)	Effective diffusion coefficient (cm^2/s)	Porosity	Solid density (g/mL)	Sorption material	Sorption coefficient, Kd (mL/g)	Species
UPPER_MUD_MAT	TI35	8000	8500	9.03E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI36	8500	9000	9.27E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI37	9000	9500	9.52E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI38	9500	10000	9.79E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI39	10000	11000	1.02E-07	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI40	11000	12000	1.08E-07	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI41a	12000	14928	1.20E-07	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI41b	14928	15000	1.30E-07	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI42a	15000	16344	1.36E-07	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI42b	16344	16753	1.43E-07	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI42c	16753	20000	1.61E-07	0.11	2.49	ReModerate	9	I-129
WALL	TI01	0	50	5.06E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI02	50	100	5.16E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI03	100	150	5.26E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI04	150	200	5.34E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI05	200	250	5.42E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI06	250	300	5.49E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI07	300	350	5.56E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI08	350	400	5.63E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI09	400	450	5.69E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI10	450	500	5.75E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI11	500	600	5.84E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI12	600	700	5.96E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI13	700	800	6.07E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI14	800	900	6.18E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI15	900	1000	6.28E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI16	1000	1200	6.42E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI17	1200	1400	6.59E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI18	1400	1600	6.76E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI19	1600	1800	6.93E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI20	1800	2000	7.10E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI21	2000	2300	7.32E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI22	2300	2600	7.59E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI23	2600	2900	7.85E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI24	2900	3200	8.12E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI25	3200	3600	8.46E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI26	3600	4000	8.85E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI27	4000	4500	9.31E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI28	4500	5000	9.86E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI29	5000	5500	1.04E-07	0.11	2.49	ReModerate	9	I-129
WALL	TI30	5500	6000	1.11E-07	0.11	2.49	ReModerate	9	I-129
WALL	TI31	6000	6500	1.17E-07	0.11	2.49	ReModerate	9	I-129
WALL	TI32	6500	7000	1.25E-07	0.11	2.49	ReModerate	9	I-129
WALL	TI33	7000	7500	1.33E-07	0.11	2.49	ReModerate	9	I-129
WALL	TI34	7500	8000	1.42E-07	0.11	2.49	ReModerate	9	I-129
WALL	TI35	8000	8500	1.51E-07	0.11	2.49	ReModerate	9	I-129
WALL	TI36	8500	9000	1.62E-07	0.11	2.49	ReModerate	9	I-129
WALL	TI37	9000	9500	1.74E-07	0.11	2.49	ReModerate	9	I-129
WALL	TI38	9500	10000	1.88E-07	0.11	2.49	ReModerate	9	I-129
WALL	TI39	10000	11000	2.16E-07	0.11	2.49	ReModerate	9	I-129
WALL	TI40	11000	12000	2.57E-07	0.11	2.49	ReModerate	9	I-129
WALL	TI41a	12000	14928	4.49E-07	0.11	2.49	ReModerate	9	I-129
WALL	TI41b	14928	15000	8.01E-07	0.11	2.49	ReModerate	9	I-129
WALL	TI42a	15000	16344	1.12E-06	0.11	2.49	ReModerate	9	I-129
WALL	TI42b	16344	16753	2.22E-06	0.11	2.49	OxModerate	15	I-129

Material zone	Time period(s)	Start time (yr)	End time (yr)	Effective diffusion coefficient (cm^2/s)	Porosity	Solid density (g/mL)	Sorption material	Sorption coefficient, Kd (mL/g)	Species
WALL	TI42c	16753	20000	4.54E-06	0.11	2.49	OxAged	4	I-129

Vault 2, Case B, I-129

Material zone	Time period(s)	Start time (yr)	End time (yr)	Effective diffusion coefficient (cm^2/s)	Porosity	Solid density (g/mL)	Sorption material	Sorption coefficient, Kd (mL/g)	Species
BACKFILL	TI01-TI42d	0	20000	5.30E-06	0.35	2.63	Clayey	0.6	I-129
CLEAN_GROUT	TI01-TI42d	0	20000	1.00E-07	0.58	2.4	ReModerate	9	I-129
COLUMN	TI01-TI42d	0	20000	1.00E-07	0.58	2.4	ReModerate	9	I-129
FLOOR	TI01	0	50	5.04E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI02	50	100	5.11E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI03	100	150	5.17E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI04	150	200	5.22E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI05	200	250	5.27E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI06	250	300	5.32E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI07	300	350	5.36E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI08	350	400	5.40E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI09	400	450	5.44E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI10	450	500	5.48E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI11	500	600	5.53E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI12	600	700	5.60E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI13	700	800	5.66E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI14	800	900	5.73E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI15	900	1000	5.79E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI16	1000	1200	5.86E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI17	1200	1400	5.95E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI18	1400	1600	6.04E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI19	1600	1800	6.14E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI20	1800	2000	6.23E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI21	2000	2300	6.34E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI22	2300	2600	6.47E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI23	2600	2900	6.59E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI24	2900	3200	6.72E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI25	3200	3600	6.87E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI26	3600	4000	7.04E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI27	4000	4500	7.23E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI28	4500	5000	7.44E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI29	5000	5500	7.66E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI30	5500	6000	7.87E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI31	6000	6500	8.10E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI32	6500	7000	8.32E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI33	7000	7500	8.55E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI34	7500	8000	8.78E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI35	8000	8500	9.03E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI36	8500	9000	9.27E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI37	9000	9500	9.52E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI38	9500	10000	9.79E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI39	10000	11000	1.02E-07	0.11	2.49	ReModerate	9	I-129
FLOOR	TI40	11000	12000	1.08E-07	0.11	2.49	ReModerate	9	I-129
FLOOR	TI41	12000	15000	1.20E-07	0.11	2.49	ReModerate	9	I-129
FLOOR	TI42a	15000	15784	1.34E-07	0.11	2.49	ReModerate	9	I-129

Material zone	Time period(s)	Start time (yr)	End time (yr)	Effective diffusion coefficient (cm²/s)	Porosity	Solid density (g/mL)	Sorption material	Sorption coefficient, Kd (mL/g)	Species
FLOOR	TI42b	15784	16027	1.38E-07	0.11	2.49	ReModerate	9	I-129
FLOOR	TI42c	16027	16985	1.43E-07	0.11	2.49	ReModerate	9	I-129
FLOOR	TI42d	16985	20000	1.62E-07	0.11	2.49	ReModerate	9	I-129
FLOOR_HDPE_GCL	TI01	0	50	4.39E-10	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI02	50	100	5.62E-10	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI03	100	150	7.72E-10	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI04	150	200	9.93E-10	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI05	200	250	1.20E-09	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI06	250	300	1.40E-09	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI07	300	350	1.60E-09	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI08	350	400	1.79E-09	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI09	400	450	1.99E-09	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI10	450	500	2.19E-09	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI11	500	600	2.48E-09	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI12	600	700	2.87E-09	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI13	700	800	3.26E-09	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI14	800	900	3.65E-09	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI15	900	1000	4.04E-09	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI16	1000	1200	4.62E-09	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI17	1200	1400	5.40E-09	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI18	1400	1600	6.17E-09	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI19	1600	1800	6.95E-09	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI20	1800	2000	7.72E-09	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI21	2000	2300	8.69E-09	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI22	2300	2600	9.85E-09	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI23	2600	2900	1.10E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI24	2900	3200	1.22E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI25	3200	3600	1.35E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI26	3600	4000	1.51E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI27	4000	4500	1.68E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI28	4500	5000	1.88E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI29	5000	5500	2.07E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI30	5500	6000	2.26E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI31	6000	6500	2.46E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI32	6500	7000	2.65E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI33	7000	7500	2.84E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI34	7500	8000	3.03E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI35	8000	8500	3.23E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI36	8500	9000	3.42E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI37	9000	9500	3.61E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI38	9500	10000	3.81E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI39	10000	11000	4.10E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI40	11000	12000	4.48E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI41	12000	15000	5.25E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI42a	15000	15784	5.98E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI42b	15784	16027	6.18E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI42c	16027	16985	6.41E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI42d	16985	20000	7.17E-08	0.3	2.14	Zero	0	I-129
HDPE	TI01	0	50	4.77E-10	0.3	2.14	Zero	0	I-129
HDPE	TI02	50	100	7.02E-10	0.3	2.14	Zero	0	I-129
HDPE	TI03	100	150	1.12E-09	0.3	2.14	Zero	0	I-129
HDPE	TI04	150	200	1.58E-09	0.3	2.14	Zero	0	I-129
HDPE	TI05	200	250	2.02E-09	0.3	2.14	Zero	0	I-129
HDPE	TI06	250	300	2.45E-09	0.3	2.14	Zero	0	I-129
HDPE	TI07	300	350	2.89E-09	0.3	2.14	Zero	0	I-129

Material zone	Time period(s)	Start time (yr)	End time (yr)	Effective diffusion coefficient (cm^2/s)	Porosity	Solid density (g/mL)	Sorption material	Sorption coefficient, Kd (mL/g)	Species
HDPE	TI08	350	400	3.32E-09	0.3	2.14	Zero	0	I-129
HDPE	TI09	400	450	3.76E-09	0.3	2.14	Zero	0	I-129
HDPE	TI10	450	500	4.20E-09	0.3	2.14	Zero	0	I-129
HDPE	TI11	500	600	4.85E-09	0.3	2.14	Zero	0	I-129
HDPE	TI12	600	700	5.73E-09	0.3	2.14	Zero	0	I-129
HDPE	TI13	700	800	6.60E-09	0.3	2.14	Zero	0	I-129
HDPE	TI14	800	900	7.47E-09	0.3	2.14	Zero	0	I-129
HDPE	TI15	900	1000	8.34E-09	0.3	2.14	Zero	0	I-129
HDPE	TI16	1000	1200	9.65E-09	0.3	2.14	Zero	0	I-129
HDPE	TI17	1200	1400	1.14E-08	0.3	2.14	Zero	0	I-129
HDPE	TI18	1400	1600	1.32E-08	0.3	2.14	Zero	0	I-129
HDPE	TI19	1600	1800	1.49E-08	0.3	2.14	Zero	0	I-129
HDPE	TI20	1800	2000	1.66E-08	0.3	2.14	Zero	0	I-129
HDPE	TI21	2000	2300	1.88E-08	0.3	2.14	Zero	0	I-129
HDPE	TI22	2300	2600	2.14E-08	0.3	2.14	Zero	0	I-129
HDPE	TI23	2600	2900	2.41E-08	0.3	2.14	Zero	0	I-129
HDPE	TI24	2900	3200	2.67E-08	0.3	2.14	Zero	0	I-129
HDPE	TI25	3200	3600	2.97E-08	0.3	2.14	Zero	0	I-129
HDPE	TI26	3600	4000	3.32E-08	0.3	2.14	Zero	0	I-129
HDPE	TI27	4000	4500	3.72E-08	0.3	2.14	Zero	0	I-129
HDPE	TI28	4500	5000	4.15E-08	0.3	2.14	Zero	0	I-129
HDPE	TI29	5000	5500	4.59E-08	0.3	2.14	Zero	0	I-129
HDPE	TI30	5500	6000	5.03E-08	0.3	2.14	Zero	0	I-129
HDPE	TI31	6000	6500	5.46E-08	0.3	2.14	Zero	0	I-129
HDPE	TI32	6500	7000	5.90E-08	0.3	2.14	Zero	0	I-129
HDPE	TI33	7000	7500	6.33E-08	0.3	2.14	Zero	0	I-129
HDPE	TI34	7500	8000	6.77E-08	0.3	2.14	Zero	0	I-129
HDPE	TI35	8000	8500	7.21E-08	0.3	2.14	Zero	0	I-129
HDPE	TI36	8500	9000	7.64E-08	0.3	2.14	Zero	0	I-129
HDPE	TI37	9000	9500	8.08E-08	0.3	2.14	Zero	0	I-129
HDPE	TI38	9500	10000	8.52E-08	0.3	2.14	Zero	0	I-129
HDPE	TI39	10000	11000	9.17E-08	0.3	2.14	Zero	0	I-129
HDPE	TI40	11000	12000	1.00E-07	0.3	2.14	Zero	0	I-129
HDPE	TI41	12000	15000	1.18E-07	0.3	2.14	Zero	0	I-129
HDPE	TI42a	15000	15784	1.34E-07	0.3	2.14	Zero	0	I-129
HDPE	TI42b	15784	16027	1.39E-07	0.3	2.14	Zero	0	I-129
HDPE	TI42c	16027	16985	1.44E-07	0.3	2.14	Zero	0	I-129
HDPE	TI42d	16985	20000	1.62E-07	0.3	2.14	Zero	0	I-129
LOWER_MUD_MAT	TI01-TI42d	0	20000	8.00E-07	0.211	2.61	OxModerate	15	I-129
NATIVE_SOIL	TI01-TI42d	0	20000	5.30E-06	0.39	2.66	Sandy	0	I-129
ROOF	TI01	0	50	5.01E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI02	50	100	5.02E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI03	100	150	5.03E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI04	150	200	5.05E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI05	200	250	5.07E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI06	250	300	5.09E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI07	300	350	5.11E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI08	350	400	5.13E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI09	400	450	5.15E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI10	450	500	5.17E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI11	500	600	5.21E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI12	600	700	5.25E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI13	700	800	5.29E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI14	800	900	5.33E-08	0.11	2.49	ReModerate	9	I-129

Material zone	Time period(s)	Start time (yr)	End time (yr)	Effective diffusion coefficient (cm^2/s)	Porosity	Solid density (g/mL)	Sorption material	Sorption coefficient, Kd (mL/g)	Species
ROOF	TI15	900	1000	5.37E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI16	1000	1200	5.43E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI17	1200	1400	5.49E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI18	1400	1600	5.56E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI19	1600	1800	5.63E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI20	1800	2000	5.70E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI21	2000	2300	5.79E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI22	2300	2600	5.89E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI23	2600	2900	5.99E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI24	2900	3200	6.09E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI25	3200	3600	6.21E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI26	3600	4000	6.34E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI27	4000	4500	6.49E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI28	4500	5000	6.66E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI29	5000	5500	6.84E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI30	5500	6000	7.01E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI31	6000	6500	7.19E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI32	6500	7000	7.37E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI33	7000	7500	7.55E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI34	7500	8000	7.74E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI35	8000	8500	7.93E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI36	8500	9000	8.13E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI37	9000	9500	8.33E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI38	9500	10000	8.54E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI39	10000	11000	8.86E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI40	11000	12000	9.30E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI41	12000	15000	1.03E-07	0.11	2.49	ReModerate	9	I-129
ROOF	TI42a	15000	15784	1.13E-07	0.11	2.49	ReModerate	9	I-129
ROOF	TI42b	15784	16027	1.16E-07	0.11	2.49	ReModerate	9	I-129
ROOF	TI42c	16027	16985	1.20E-07	0.11	2.49	ReModerate	9	I-129
ROOF	TI42d	16985	20000	1.35E-07	0.11	2.49	ReModerate	9	I-129
ROOF_HDPE_GCL	TI01	0	50	4.39E-10	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI02	50	100	5.62E-10	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI03	100	150	7.72E-10	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI04	150	200	9.93E-10	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI05	200	250	1.20E-09	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI06	250	300	1.40E-09	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI07	300	350	1.60E-09	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI08	350	400	1.79E-09	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI09	400	450	1.99E-09	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI10	450	500	2.19E-09	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI11	500	600	2.48E-09	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI12	600	700	2.87E-09	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI13	700	800	3.26E-09	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI14	800	900	3.65E-09	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI15	900	1000	4.04E-09	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI16	1000	1200	4.62E-09	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI17	1200	1400	5.40E-09	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI18	1400	1600	6.17E-09	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI19	1600	1800	6.95E-09	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI20	1800	2000	7.72E-09	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI21	2000	2300	8.69E-09	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI22	2300	2600	9.85E-09	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI23	2600	2900	1.10E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI24	2900	3200	1.22E-08	0.3	2.14	Zero	0	I-129

Material zone	Time period(s)	Start time (yr)	End time (yr)	Effective diffusion coefficient (cm^2/s)	Porosity	Solid density (g/mL)	Sorption material	Sorption coefficient, Kd (mL/g)	Species
ROOF_HDPE_GCL	TI25	3200	3600	1.35E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI26	3600	4000	1.51E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI27	4000	4500	1.68E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI28	4500	5000	1.88E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI29	5000	5500	2.07E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI30	5500	6000	2.26E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI31	6000	6500	2.46E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI32	6500	7000	2.65E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI33	7000	7500	2.84E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI34	7500	8000	3.03E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI35	8000	8500	3.23E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI36	8500	9000	3.42E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI37	9000	9500	3.61E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI38	9500	10000	3.81E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI39	10000	11000	4.10E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI40	11000	12000	4.48E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI41	12000	15000	5.25E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI42a	15000	15784	5.98E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI42b	15784	16027	6.18E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI42c	16027	16985	6.41E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI42d	16985	20000	7.17E-08	0.3	2.14	Zero	0	I-129
SALTSTONE	TI01-TI42d	0	20000	1.00E-07	0.58	2.4	ReModerate	9	I-129
SAND_DRAIN	TI01-TI16	0	1200	8.00E-06	0.417	2.66	Sandy	0	I-129
SAND_DRAIN	TI17-TI19	1200	1800	8.00E-06	0.416	2.66	Sandy	0	I-129
SAND_DRAIN	TI20-TI21	1800	2300	8.00E-06	0.415	2.66	Sandy	0	I-129
SAND_DRAIN	TI22-TI23	2300	2900	8.00E-06	0.414	2.66	Sandy	0	I-129
SAND_DRAIN	TI24	2900	3200	8.00E-06	0.413	2.66	Sandy	0	I-129
SAND_DRAIN	TI25	3200	3600	8.00E-06	0.412	2.66	Sandy	0	I-129
SAND_DRAIN	TI26	3600	4000	8.00E-06	0.411	2.66	Sandy	0	I-129
SAND_DRAIN	TI27	4000	4500	8.00E-06	0.409	2.66	Sandy	0	I-129
SAND_DRAIN	TI28	4500	5000	8.00E-06	0.407	2.66	Sandy	0	I-129
SAND_DRAIN	TI29	5000	5500	8.00E-06	0.406	2.66	Sandy	0	I-129
SAND_DRAIN	TI30	5500	6000	8.00E-06	0.404	2.66	Sandy	0	I-129
SAND_DRAIN	TI31	6000	6500	8.00E-06	0.402	2.66	Sandy	0	I-129
SAND_DRAIN	TI32	6500	7000	8.00E-06	0.4	2.66	Sandy	0	I-129
SAND_DRAIN	TI33	7000	7500	8.00E-06	0.398	2.66	Sandy	0	I-129
SAND_DRAIN	TI34	7500	8000	8.00E-06	0.396	2.66	Sandy	0	I-129
SAND_DRAIN	TI35	8000	8500	8.00E-06	0.394	2.66	Sandy	0	I-129
SAND_DRAIN	TI36	8500	9000	8.00E-06	0.392	2.66	Sandy	0	I-129
SAND_DRAIN	TI37	9000	9500	8.00E-06	0.39	2.66	Sandy	0	I-129
SAND_DRAIN	TI38	9500	10000	8.00E-06	0.388	2.66	Sandy	0	I-129
SAND_DRAIN	TI39	10000	11000	8.00E-06	0.385	2.66	Sandy	0	I-129
SAND_DRAIN	TI40	11000	12000	8.00E-06	0.381	2.66	Sandy	0	I-129
SAND_DRAIN	TI41	12000	15000	8.00E-06	0.372	2.66	Sandy	0	I-129
SAND_DRAIN	TI42a	15000	15784	8.00E-06	0.365	2.66	Sandy	0	I-129
SAND_DRAIN	TI42b	15784	16027	8.00E-06	0.363	2.66	Sandy	0	I-129
SAND_DRAIN	TI42c	16027	16985	8.00E-06	0.36	2.66	Sandy	0	I-129
SAND_DRAIN	TI42d	16985	20000	8.00E-06	0.353	2.66	Sandy	0	I-129
SHEET_DRAIN	TI01-TI42d	0	20000	9.40E-06	0.3	2.6	Zero	0	I-129
SHOT_CRETE	TI01-	0	16985	5.30E-06	0.35	2.63	OxModerate	15	I-129

Material zone	Time period(s)	Start time (yr)	End time (yr)	Effective diffusion coefficient (cm^2/s)	Porosity	Solid density (g/mL)	Sorption material	Sorption coefficient, Kd (mL/g)	Species
	TI42c								
SHOT_CRETE	TI42d	16985	20000	5.30E-06	0.35	2.63	OxAged	4	I-129
UPPER_MUD_MAT	TI01	0	50	5.04E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI02	50	100	5.11E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI03	100	150	5.17E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI04	150	200	5.22E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI05	200	250	5.27E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI06	250	300	5.32E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI07	300	350	5.36E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI08	350	400	5.40E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI09	400	450	5.44E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI10	450	500	5.48E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI11	500	600	5.53E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI12	600	700	5.60E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI13	700	800	5.66E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI14	800	900	5.73E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI15	900	1000	5.79E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI16	1000	1200	5.86E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI17	1200	1400	5.95E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI18	1400	1600	6.04E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI19	1600	1800	6.14E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI20	1800	2000	6.23E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI21	2000	2300	6.34E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI22	2300	2600	6.47E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI23	2600	2900	6.59E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI24	2900	3200	6.72E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI25	3200	3600	6.87E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI26	3600	4000	7.04E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI27	4000	4500	7.23E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI28	4500	5000	7.44E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI29	5000	5500	7.66E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI30	5500	6000	7.87E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI31	6000	6500	8.10E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI32	6500	7000	8.32E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI33	7000	7500	8.55E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI34	7500	8000	8.78E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI35	8000	8500	9.03E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI36	8500	9000	9.27E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI37	9000	9500	9.52E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI38	9500	10000	9.79E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI39	10000	11000	1.02E-07	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI40	11000	12000	1.08E-07	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI41	12000	15000	1.20E-07	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI42a	15000	15784	1.34E-07	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI42b	15784	16027	1.38E-07	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI42c	16027	16985	1.43E-07	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI42d	16985	20000	1.62E-07	0.11	2.49	ReModerate	9	I-129
WALL	TI01	0	50	5.06E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI02	50	100	5.16E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI03	100	150	5.26E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI04	150	200	5.34E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI05	200	250	5.42E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI06	250	300	5.49E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI07	300	350	5.56E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI08	350	400	5.63E-08	0.11	2.49	ReModerate	9	I-129

Material zone	Time period(s)	Start time (yr)	End time (yr)	Effective diffusion coefficient (cm^2/s)	Porosity	Solid density (g/mL)	Sorption material	Sorption coefficient, Kd (mL/g)	Species
WALL	TI09	400	450	5.69E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI10	450	500	5.75E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI11	500	600	5.84E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI12	600	700	5.96E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI13	700	800	6.07E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI14	800	900	6.18E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI15	900	1000	6.28E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI16	1000	1200	6.42E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI17	1200	1400	6.59E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI18	1400	1600	6.76E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI19	1600	1800	6.93E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI20	1800	2000	7.10E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI21	2000	2300	7.32E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI22	2300	2600	7.59E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI23	2600	2900	7.85E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI24	2900	3200	8.12E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI25	3200	3600	8.46E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI26	3600	4000	8.85E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI27	4000	4500	9.31E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI28	4500	5000	9.86E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI29	5000	5500	1.04E-07	0.11	2.49	ReModerate	9	I-129
WALL	TI30	5500	6000	1.11E-07	0.11	2.49	ReModerate	9	I-129
WALL	TI31	6000	6500	1.17E-07	0.11	2.49	ReModerate	9	I-129
WALL	TI32	6500	7000	1.25E-07	0.11	2.49	ReModerate	9	I-129
WALL	TI33	7000	7500	1.33E-07	0.11	2.49	ReModerate	9	I-129
WALL	TI34	7500	8000	1.42E-07	0.11	2.49	ReModerate	9	I-129
WALL	TI35	8000	8500	1.51E-07	0.11	2.49	ReModerate	9	I-129
WALL	TI36	8500	9000	1.62E-07	0.11	2.49	ReModerate	9	I-129
WALL	TI37	9000	9500	1.74E-07	0.11	2.49	ReModerate	9	I-129
WALL	TI38	9500	10000	1.88E-07	0.11	2.49	ReModerate	9	I-129
WALL	TI39	10000	11000	2.16E-07	0.11	2.49	ReModerate	9	I-129
WALL	TI40	11000	12000	2.57E-07	0.11	2.49	ReModerate	9	I-129
WALL	TI41	12000	15000	4.58E-07	0.11	2.49	ReModerate	9	I-129
WALL	TI42a	15000	15784	9.54E-07	0.11	2.49	ReModerate	9	I-129
WALL	TI42b	15784	16027	1.14E-06	0.11	2.49	OxModerate	15	I-129
WALL	TI42c	16027	16985	2.14E-06	0.11	2.49	OxAged	4	I-129
WALL	TI42d	16985	20000	4.67E-06	0.11	2.49	OxAged	4	I-129

Vault 2, Case C, I-129

Material zone	Time period(s)	Start time (yr)	End time (yr)	Effective diffusion coefficient (cm^2/s)	Porosity	Solid density (g/mL)	Sorption material	Sorption coefficient, Kd (mL/g)	Species
BACKFILL	TI01-TI42d	0	20000	5.30E-06	0.35	2.63	Clayey	0.6	I-129
CLEAN_GROUT	TI01-TI42d	0	20000	1.00E-07	0.58	2.4	ReModerate	9	I-129
COLUMN	TI01-TI42d	0	20000	8.00E-06	0.38	2.66	Zero	0	I-129
FLOOR	TI01	0	50	5.04E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI02	50	100	5.11E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI03	100	150	5.17E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI04	150	200	5.22E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI05	200	250	5.27E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI06	250	300	5.32E-08	0.11	2.49	ReModerate	9	I-129

Material zone	Time period(s)	Start time (yr)	End time (yr)	Effective diffusion coefficient (cm²/s)	Porosity	Solid density (g/mL)	Sorption material	Sorption coefficient, Kd (mL/g)	Species
FLOOR	TI07	300	350	5.36E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI08	350	400	5.40E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI09	400	450	5.44E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI10	450	500	5.48E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI11	500	600	5.53E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI12	600	700	5.60E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI13	700	800	5.66E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI14	800	900	5.73E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI15	900	1000	5.79E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI16	1000	1200	5.86E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI17	1200	1400	5.95E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI18	1400	1600	6.04E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI19	1600	1800	6.14E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI20	1800	2000	6.23E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI21	2000	2300	6.34E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI22	2300	2600	6.47E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI23	2600	2900	6.59E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI24	2900	3200	6.72E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI25	3200	3600	6.87E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI26	3600	4000	7.04E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI27	4000	4500	7.23E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI28	4500	5000	7.44E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI29	5000	5500	7.66E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI30	5500	6000	7.87E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI31	6000	6500	8.10E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI32	6500	7000	8.32E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI33	7000	7500	8.55E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI34	7500	8000	8.78E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI35	8000	8500	9.03E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI36	8500	9000	9.27E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI37	9000	9500	9.52E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI38	9500	10000	9.79E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI39	10000	11000	1.02E-07	0.11	2.49	ReModerate	9	I-129
FLOOR	TI40	11000	12000	1.08E-07	0.11	2.49	ReModerate	9	I-129
FLOOR	TI41	12000	15000	1.20E-07	0.11	2.49	ReModerate	9	I-129
FLOOR	TI42a	15000	15803	1.34E-07	0.11	2.49	ReModerate	9	I-129
FLOOR	TI42b	15803	16052	1.38E-07	0.11	2.49	ReModerate	9	I-129
FLOOR	TI42c	16052	17224	1.44E-07	0.11	2.49	ReModerate	9	I-129
FLOOR	TI42d	17224	20000	1.63E-07	0.11	2.49	ReModerate	9	I-129
FLOOR_HDPE_GCL	TI01	0	50	4.39E-10	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI02	50	100	5.62E-10	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI03	100	150	7.72E-10	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI04	150	200	9.93E-10	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI05	200	250	1.20E-09	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI06	250	300	1.40E-09	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI07	300	350	1.60E-09	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI08	350	400	1.79E-09	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI09	400	450	1.99E-09	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI10	450	500	2.19E-09	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI11	500	600	2.48E-09	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI12	600	700	2.87E-09	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI13	700	800	3.26E-09	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI14	800	900	3.65E-09	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI15	900	1000	4.04E-09	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI16	1000	1200	4.62E-09	0.3	2.14	Zero	0	I-129

Material zone	Time period(s)	Start time (yr)	End time (yr)	Effective diffusion coefficient (cm^2/s)	Porosity	Solid density (g/mL)	Sorption material	Sorption coefficient, Kd (mL/g)	Species
FLOOR_HDPE_GCL	TI17	1200	1400	5.40E-09	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI18	1400	1600	6.17E-09	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI19	1600	1800	6.95E-09	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI20	1800	2000	7.72E-09	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI21	2000	2300	8.69E-09	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI22	2300	2600	9.85E-09	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI23	2600	2900	1.10E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI24	2900	3200	1.22E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI25	3200	3600	1.35E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI26	3600	4000	1.51E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI27	4000	4500	1.68E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI28	4500	5000	1.88E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI29	5000	5500	2.07E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI30	5500	6000	2.26E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI31	6000	6500	2.46E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI32	6500	7000	2.65E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI33	7000	7500	2.84E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI34	7500	8000	3.03E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI35	8000	8500	3.23E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI36	8500	9000	3.42E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI37	9000	9500	3.61E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI38	9500	10000	3.81E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI39	10000	11000	4.10E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI40	11000	12000	4.48E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI41	12000	15000	5.25E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI42a	15000	15803	5.98E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI42b	15803	16052	6.19E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI42c	16052	17224	6.46E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI42d	17224	20000	7.22E-08	0.3	2.14	Zero	0	I-129
HDPE	TI01	0	50	4.77E-10	0.3	2.14	Zero	0	I-129
HDPE	TI02	50	100	7.02E-10	0.3	2.14	Zero	0	I-129
HDPE	TI03	100	150	1.12E-09	0.3	2.14	Zero	0	I-129
HDPE	TI04	150	200	1.58E-09	0.3	2.14	Zero	0	I-129
HDPE	TI05	200	250	2.02E-09	0.3	2.14	Zero	0	I-129
HDPE	TI06	250	300	2.45E-09	0.3	2.14	Zero	0	I-129
HDPE	TI07	300	350	2.89E-09	0.3	2.14	Zero	0	I-129
HDPE	TI08	350	400	3.32E-09	0.3	2.14	Zero	0	I-129
HDPE	TI09	400	450	3.76E-09	0.3	2.14	Zero	0	I-129
HDPE	TI10	450	500	4.20E-09	0.3	2.14	Zero	0	I-129
HDPE	TI11	500	600	4.85E-09	0.3	2.14	Zero	0	I-129
HDPE	TI12	600	700	5.73E-09	0.3	2.14	Zero	0	I-129
HDPE	TI13	700	800	6.60E-09	0.3	2.14	Zero	0	I-129
HDPE	TI14	800	900	7.47E-09	0.3	2.14	Zero	0	I-129
HDPE	TI15	900	1000	8.34E-09	0.3	2.14	Zero	0	I-129
HDPE	TI16	1000	1200	9.65E-09	0.3	2.14	Zero	0	I-129
HDPE	TI17	1200	1400	1.14E-08	0.3	2.14	Zero	0	I-129
HDPE	TI18	1400	1600	1.32E-08	0.3	2.14	Zero	0	I-129
HDPE	TI19	1600	1800	1.49E-08	0.3	2.14	Zero	0	I-129
HDPE	TI20	1800	2000	1.66E-08	0.3	2.14	Zero	0	I-129
HDPE	TI21	2000	2300	1.88E-08	0.3	2.14	Zero	0	I-129
HDPE	TI22	2300	2600	2.14E-08	0.3	2.14	Zero	0	I-129
HDPE	TI23	2600	2900	2.41E-08	0.3	2.14	Zero	0	I-129
HDPE	TI24	2900	3200	2.67E-08	0.3	2.14	Zero	0	I-129
HDPE	TI25	3200	3600	2.97E-08	0.3	2.14	Zero	0	I-129
HDPE	TI26	3600	4000	3.32E-08	0.3	2.14	Zero	0	I-129

Material zone	Time period(s)	Start time (yr)	End time (yr)	Effective diffusion coefficient (cm^2/s)	Porosity	Solid density (g/mL)	Sorption material	Sorption coefficient, Kd (mL/g)	Species
HDPE	TI27	4000	4500	3.72E-08	0.3	2.14	Zero	0	I-129
HDPE	TI28	4500	5000	4.15E-08	0.3	2.14	Zero	0	I-129
HDPE	TI29	5000	5500	4.59E-08	0.3	2.14	Zero	0	I-129
HDPE	TI30	5500	6000	5.03E-08	0.3	2.14	Zero	0	I-129
HDPE	TI31	6000	6500	5.46E-08	0.3	2.14	Zero	0	I-129
HDPE	TI32	6500	7000	5.90E-08	0.3	2.14	Zero	0	I-129
HDPE	TI33	7000	7500	6.33E-08	0.3	2.14	Zero	0	I-129
HDPE	TI34	7500	8000	6.77E-08	0.3	2.14	Zero	0	I-129
HDPE	TI35	8000	8500	7.21E-08	0.3	2.14	Zero	0	I-129
HDPE	TI36	8500	9000	7.64E-08	0.3	2.14	Zero	0	I-129
HDPE	TI37	9000	9500	8.08E-08	0.3	2.14	Zero	0	I-129
HDPE	TI38	9500	10000	8.52E-08	0.3	2.14	Zero	0	I-129
HDPE	TI39	10000	11000	9.17E-08	0.3	2.14	Zero	0	I-129
HDPE	TI40	11000	12000	1.00E-07	0.3	2.14	Zero	0	I-129
HDPE	TI41	12000	15000	1.18E-07	0.3	2.14	Zero	0	I-129
HDPE	TI42a	15000	15803	1.35E-07	0.3	2.14	Zero	0	I-129
HDPE	TI42b	15803	16052	1.39E-07	0.3	2.14	Zero	0	I-129
HDPE	TI42c	16052	17224	1.45E-07	0.3	2.14	Zero	0	I-129
HDPE	TI42d	17224	20000	1.63E-07	0.3	2.14	Zero	0	I-129
LOWER_MUD_MAT	TI01-TI42d	0	20000	8.00E-07	0.211	2.61	OxModerate	15	I-129
NATIVE_SOIL	TI01-TI42d	0	20000	5.30E-06	0.39	2.66	Sandy	0	I-129
ROOF	TI01	0	50	5.01E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI02	50	100	5.02E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI03	100	150	5.03E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI04	150	200	5.05E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI05	200	250	5.07E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI06	250	300	5.09E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI07	300	350	5.11E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI08	350	400	5.13E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI09	400	450	5.15E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI10	450	500	5.17E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI11	500	600	5.21E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI12	600	700	5.25E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI13	700	800	5.29E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI14	800	900	5.33E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI15	900	1000	5.37E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI16	1000	1200	5.43E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI17	1200	1400	5.49E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI18	1400	1600	5.56E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI19	1600	1800	5.63E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI20	1800	2000	5.70E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI21	2000	2300	5.79E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI22	2300	2600	5.89E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI23	2600	2900	5.99E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI24	2900	3200	6.09E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI25	3200	3600	6.21E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI26	3600	4000	6.34E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI27	4000	4500	6.49E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI28	4500	5000	6.66E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI29	5000	5500	6.84E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI30	5500	6000	7.01E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI31	6000	6500	7.19E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI32	6500	7000	7.37E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI33	7000	7500	7.55E-08	0.11	2.49	ReModerate	9	I-129

Material zone	Time period(s)	Start time (yr)	End time (yr)	Effective diffusion coefficient (cm^2/s)	Porosity	Solid density (g/mL)	Sorption material	Sorption coefficient, Kd (mL/g)	Species
ROOF	TI34	7500	8000	7.74E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI35	8000	8500	7.93E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI36	8500	9000	8.13E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI37	9000	9500	8.33E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI38	9500	10000	8.54E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI39	10000	11000	8.86E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI40	11000	12000	9.30E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI41	12000	15000	1.03E-07	0.11	2.49	ReModerate	9	I-129
ROOF	TI42a	15000	15803	1.13E-07	0.11	2.49	ReModerate	9	I-129
ROOF	TI42b	15803	16052	1.16E-07	0.11	2.49	ReModerate	9	I-129
ROOF	TI42c	16052	17224	1.21E-07	0.11	2.49	ReModerate	9	I-129
ROOF	TI42d	17224	20000	1.36E-07	0.11	2.49	ReModerate	9	I-129
ROOF_HDPE_GCL	TI01	0	50	4.39E-10	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI02	50	100	5.62E-10	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI03	100	150	7.72E-10	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI04	150	200	9.93E-10	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI05	200	250	1.20E-09	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI06	250	300	1.40E-09	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI07	300	350	1.60E-09	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI08	350	400	1.79E-09	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI09	400	450	1.99E-09	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI10	450	500	2.19E-09	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI11	500	600	2.48E-09	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI12	600	700	2.87E-09	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI13	700	800	3.26E-09	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI14	800	900	3.65E-09	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI15	900	1000	4.04E-09	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI16	1000	1200	4.62E-09	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI17	1200	1400	5.40E-09	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI18	1400	1600	6.17E-09	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI19	1600	1800	6.95E-09	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI20	1800	2000	7.72E-09	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI21	2000	2300	8.69E-09	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI22	2300	2600	9.85E-09	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI23	2600	2900	1.10E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI24	2900	3200	1.22E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI25	3200	3600	1.35E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI26	3600	4000	1.51E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI27	4000	4500	1.68E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI28	4500	5000	1.88E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI29	5000	5500	2.07E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI30	5500	6000	2.26E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI31	6000	6500	2.46E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI32	6500	7000	2.65E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI33	7000	7500	2.84E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI34	7500	8000	3.03E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI35	8000	8500	3.23E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI36	8500	9000	3.42E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI37	9000	9500	3.61E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI38	9500	10000	3.81E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI39	10000	11000	4.10E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI40	11000	12000	4.48E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI41	12000	15000	5.25E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI42a	15000	15803	5.98E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI42b	15803	16052	6.19E-08	0.3	2.14	Zero	0	I-129

Material zone	Time period(s)	Start time (yr)	End time (yr)	Effective diffusion coefficient (cm²/s)	Porosity	Solid density (g/mL)	Sorption material	Sorption coefficient, Kd (mL/g)	Species
ROOF_HDPE_GCL	TI42c	16052	17224	6.46E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI42d	17224	20000	7.22E-08	0.3	2.14	Zero	0	I-129
SALTSTONE	TI01-TI42d	0	20000	1.00E-07	0.58	2.4	ReModerate	9	I-129
SAND_DRAIN	TI01-TI16	0	1200	8.00E-06	0.417	2.66	Sandy	0	I-129
SAND_DRAIN	TI17-TI19	1200	1800	8.00E-06	0.416	2.66	Sandy	0	I-129
SAND_DRAIN	TI20-TI21	1800	2300	8.00E-06	0.415	2.66	Sandy	0	I-129
SAND_DRAIN	TI22-TI23	2300	2900	8.00E-06	0.414	2.66	Sandy	0	I-129
SAND_DRAIN	TI24	2900	3200	8.00E-06	0.413	2.66	Sandy	0	I-129
SAND_DRAIN	TI25	3200	3600	8.00E-06	0.412	2.66	Sandy	0	I-129
SAND_DRAIN	TI26	3600	4000	8.00E-06	0.411	2.66	Sandy	0	I-129
SAND_DRAIN	TI27	4000	4500	8.00E-06	0.409	2.66	Sandy	0	I-129
SAND_DRAIN	TI28	4500	5000	8.00E-06	0.407	2.66	Sandy	0	I-129
SAND_DRAIN	TI29	5000	5500	8.00E-06	0.406	2.66	Sandy	0	I-129
SAND_DRAIN	TI30	5500	6000	8.00E-06	0.404	2.66	Sandy	0	I-129
SAND_DRAIN	TI31	6000	6500	8.00E-06	0.402	2.66	Sandy	0	I-129
SAND_DRAIN	TI32	6500	7000	8.00E-06	0.4	2.66	Sandy	0	I-129
SAND_DRAIN	TI33	7000	7500	8.00E-06	0.398	2.66	Sandy	0	I-129
SAND_DRAIN	TI34	7500	8000	8.00E-06	0.396	2.66	Sandy	0	I-129
SAND_DRAIN	TI35	8000	8500	8.00E-06	0.394	2.66	Sandy	0	I-129
SAND_DRAIN	TI36	8500	9000	8.00E-06	0.392	2.66	Sandy	0	I-129
SAND_DRAIN	TI37	9000	9500	8.00E-06	0.39	2.66	Sandy	0	I-129
SAND_DRAIN	TI38	9500	10000	8.00E-06	0.388	2.66	Sandy	0	I-129
SAND_DRAIN	TI39	10000	11000	8.00E-06	0.385	2.66	Sandy	0	I-129
SAND_DRAIN	TI40	11000	12000	8.00E-06	0.381	2.66	Sandy	0	I-129
SAND_DRAIN	TI41	12000	15000	8.00E-06	0.372	2.66	Sandy	0	I-129
SAND_DRAIN	TI42a	15000	15803	8.00E-06	0.365	2.66	Sandy	0	I-129
SAND_DRAIN	TI42b	15803	16052	8.00E-06	0.363	2.66	Sandy	0	I-129
SAND_DRAIN	TI42c	16052	17224	8.00E-06	0.36	2.66	Sandy	0	I-129
SAND_DRAIN	TI42d	17224	20000	8.00E-06	0.352	2.66	Sandy	0	I-129
SHEET_DRAIN	TI01-TI42d	0	20000	9.40E-06	0.3	2.6	Zero	0	I-129
SHOT_CRETE	TI01-TI42c	0	17224	5.30E-06	0.35	2.63	OxModerate	15	I-129
SHOT_CRETE	TI42d	17224	20000	5.30E-06	0.35	2.63	OxAged	4	I-129
UPPER_MUD_MAT	TI01	0	50	5.04E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI02	50	100	5.11E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI03	100	150	5.17E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI04	150	200	5.22E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI05	200	250	5.27E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI06	250	300	5.32E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI07	300	350	5.36E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI08	350	400	5.40E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI09	400	450	5.44E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI10	450	500	5.48E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI11	500	600	5.53E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI12	600	700	5.60E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI13	700	800	5.66E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI14	800	900	5.73E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI15	900	1000	5.79E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI16	1000	1200	5.86E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI17	1200	1400	5.95E-08	0.11	2.49	ReModerate	9	I-129

Material zone	Time period(s)	Start time (yr)	End time (yr)	Effective diffusion coefficient (cm²/s)	Porosity	Solid density (g/mL)	Sorption material	Sorption coefficient, Kd (mL/g)	Species
UPPER_MUD_MAT	TI18	1400	1600	6.04E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI19	1600	1800	6.14E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI20	1800	2000	6.23E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI21	2000	2300	6.34E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI22	2300	2600	6.47E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI23	2600	2900	6.59E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI24	2900	3200	6.72E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI25	3200	3600	6.87E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI26	3600	4000	7.04E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI27	4000	4500	7.23E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI28	4500	5000	7.44E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI29	5000	5500	7.66E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI30	5500	6000	7.87E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI31	6000	6500	8.10E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI32	6500	7000	8.32E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI33	7000	7500	8.55E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI34	7500	8000	8.78E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI35	8000	8500	9.03E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI36	8500	9000	9.27E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI37	9000	9500	9.52E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI38	9500	10000	9.79E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI39	10000	11000	1.02E-07	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI40	11000	12000	1.08E-07	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI41	12000	15000	1.20E-07	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI42a	15000	15803	1.34E-07	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI42b	15803	16052	1.38E-07	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI42c	16052	17224	1.44E-07	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI42d	17224	20000	1.63E-07	0.11	2.49	ReModerate	9	I-129
WALL	TI01	0	50	5.06E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI02	50	100	5.16E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI03	100	150	5.26E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI04	150	200	5.34E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI05	200	250	5.42E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI06	250	300	5.49E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI07	300	350	5.56E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI08	350	400	5.63E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI09	400	450	5.69E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI10	450	500	5.75E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI11	500	600	5.84E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI12	600	700	5.96E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI13	700	800	6.07E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI14	800	900	6.18E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI15	900	1000	6.28E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI16	1000	1200	6.42E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI17	1200	1400	6.59E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI18	1400	1600	6.76E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI19	1600	1800	6.93E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI20	1800	2000	7.10E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI21	2000	2300	7.32E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI22	2300	2600	7.59E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI23	2600	2900	7.85E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI24	2900	3200	8.12E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI25	3200	3600	8.46E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI26	3600	4000	8.85E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI27	4000	4500	9.31E-08	0.11	2.49	ReModerate	9	I-129

Material zone	Time period(s)	Start time (yr)	End time (yr)	Effective diffusion coefficient (cm^2/s)	Porosity	Solid density (g/mL)	Sorption material	Sorption coefficient, Kd (mL/g)	Species
WALL	TI28	4500	5000	9.86E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI29	5000	5500	1.04E-07	0.11	2.49	ReModerate	9	I-129
WALL	TI30	5500	6000	1.11E-07	0.11	2.49	ReModerate	9	I-129
WALL	TI31	6000	6500	1.17E-07	0.11	2.49	ReModerate	9	I-129
WALL	TI32	6500	7000	1.25E-07	0.11	2.49	ReModerate	9	I-129
WALL	TI33	7000	7500	1.33E-07	0.11	2.49	ReModerate	9	I-129
WALL	TI34	7500	8000	1.42E-07	0.11	2.49	ReModerate	9	I-129
WALL	TI35	8000	8500	1.51E-07	0.11	2.49	ReModerate	9	I-129
WALL	TI36	8500	9000	1.62E-07	0.11	2.49	ReModerate	9	I-129
WALL	TI37	9000	9500	1.74E-07	0.11	2.49	ReModerate	9	I-129
WALL	TI38	9500	10000	1.88E-07	0.11	2.49	ReModerate	9	I-129
WALL	TI39	10000	11000	2.16E-07	0.11	2.49	ReModerate	9	I-129
WALL	TI40	11000	12000	2.57E-07	0.11	2.49	ReModerate	9	I-129
WALL	TI41	12000	15000	4.58E-07	0.11	2.49	ReModerate	9	I-129
WALL	TI42a	15000	15803	9.57E-07	0.11	2.49	ReModerate	9	I-129
WALL	TI42b	15803	16052	1.15E-06	0.11	2.49	OxModerate	15	I-129
WALL	TI42c	16052	17224	2.39E-06	0.11	2.49	OxAged	4	I-129
WALL	TI42d	17224	20000	4.79E-06	0.11	2.49	OxAged	4	I-129

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Material zone	Time period(s)	Start time (yr)	End time (yr)	Effective diffusion coefficient (cm^2/s)	Porosity	Solid density (g/mL)	Sorption material	Sorption coefficient, Kd (mL/g)	Species
BACKFILL	TI01-TI42c	0	20000	5.30E-06	0.35	2.63	Clayey	0.6	I-129
CLEAN_GROUT	TI01-TI42c	0	20000	1.00E-07	0.58	2.4	ReModerate	9	I-129
COLUMN	TI01-TI42c	0	20000	1.00E-07	0.58	2.4	ReModerate	9	I-129
FLOOR	TI01	0	50	5.04E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI02	50	100	5.11E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI03	100	150	5.17E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI04	150	200	5.22E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI05	200	250	5.27E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI06	250	300	5.32E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI07	300	350	5.36E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI08	350	400	5.40E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI09	400	450	5.44E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI10	450	500	5.48E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI11	500	600	5.53E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI12	600	700	5.60E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI13	700	800	5.66E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI14	800	900	5.73E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI15	900	1000	5.79E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI16	1000	1200	5.86E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI17	1200	1400	5.95E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI18	1400	1600	6.04E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI19	1600	1800	6.14E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI20	1800	2000	6.23E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI21	2000	2300	6.34E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI22	2300	2600	6.47E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI23	2600	2900	6.59E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI24	2900	3200	6.72E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI25	3200	3600	6.87E-08	0.11	2.49	ReModerate	9	I-129

Material zone	Time period(s)	Start time (yr)	End time (yr)	Effective diffusion coefficient (cm^2/s)	Porosity	Solid density (g/mL)	Sorption material	Sorption coefficient, Kd (mL/g)	Species
FLOOR	TI26	3600	4000	7.04E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI27	4000	4500	7.23E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI28	4500	5000	7.44E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI29	5000	5500	7.66E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI30	5500	6000	7.87E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI31	6000	6500	8.10E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI32	6500	7000	8.32E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI33	7000	7500	8.55E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI34	7500	8000	8.78E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI35	8000	8500	9.03E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI36	8500	9000	9.27E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI37	9000	9500	9.52E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI38	9500	10000	9.79E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI39	10000	11000	1.02E-07	0.11	2.49	ReModerate	9	I-129
FLOOR	TI40	11000	12000	1.08E-07	0.11	2.49	ReModerate	9	I-129
FLOOR	TI41a	12000	14928	1.20E-07	0.11	2.49	ReModerate	9	I-129
FLOOR	TI41b	14928	15000	1.30E-07	0.11	2.49	ReModerate	9	I-129
FLOOR	TI42a	15000	16349	1.36E-07	0.11	2.49	ReModerate	9	I-129
FLOOR	TI42b	16349	16757	1.43E-07	0.11	2.49	ReModerate	9	I-129
FLOOR	TI42c	16757	20000	1.61E-07	0.11	2.49	ReModerate	9	I-129
FLOOR_HDPE_GCL	TI01	0	50	4.39E-10	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI02	50	100	5.62E-10	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI03	100	150	7.72E-10	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI04	150	200	9.93E-10	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI05	200	250	1.20E-09	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI06	250	300	1.40E-09	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI07	300	350	1.60E-09	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI08	350	400	1.79E-09	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI09	400	450	1.99E-09	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI10	450	500	2.19E-09	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI11	500	600	2.48E-09	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI12	600	700	2.87E-09	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI13	700	800	3.26E-09	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI14	800	900	3.65E-09	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI15	900	1000	4.04E-09	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI16	1000	1200	4.62E-09	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI17	1200	1400	5.40E-09	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI18	1400	1600	6.17E-09	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI19	1600	1800	6.95E-09	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI20	1800	2000	7.72E-09	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI21	2000	2300	8.69E-09	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI22	2300	2600	9.85E-09	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI23	2600	2900	1.10E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI24	2900	3200	1.22E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI25	3200	3600	1.35E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI26	3600	4000	1.51E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI27	4000	4500	1.68E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI28	4500	5000	1.88E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI29	5000	5500	2.07E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI30	5500	6000	2.26E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI31	6000	6500	2.46E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI32	6500	7000	2.65E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI33	7000	7500	2.84E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI34	7500	8000	3.03E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI35	8000	8500	3.23E-08	0.3	2.14	Zero	0	I-129

Material zone	Time period(s)	Start time (yr)	End time (yr)	Effective diffusion coefficient (cm^2/s)	Porosity	Solid density (g/mL)	Sorption material	Sorption coefficient, Kd (mL/g)	Species
FLOOR_HDPE_GCL	TI36	8500	9000	3.42E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI37	9000	9500	3.61E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI38	9500	10000	3.81E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI39	10000	11000	4.10E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI40	11000	12000	4.48E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI41a	12000	14928	5.24E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI41b	14928	15000	5.82E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI42a	15000	16349	6.09E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI42b	16349	16757	6.43E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI42c	16757	20000	7.13E-08	0.3	2.14	Zero	0	I-129
HDPE	TI01	0	50	4.77E-10	0.3	2.14	Zero	0	I-129
HDPE	TI02	50	100	7.02E-10	0.3	2.14	Zero	0	I-129
HDPE	TI03	100	150	1.12E-09	0.3	2.14	Zero	0	I-129
HDPE	TI04	150	200	1.58E-09	0.3	2.14	Zero	0	I-129
HDPE	TI05	200	250	2.02E-09	0.3	2.14	Zero	0	I-129
HDPE	TI06	250	300	2.45E-09	0.3	2.14	Zero	0	I-129
HDPE	TI07	300	350	2.89E-09	0.3	2.14	Zero	0	I-129
HDPE	TI08	350	400	3.32E-09	0.3	2.14	Zero	0	I-129
HDPE	TI09	400	450	3.76E-09	0.3	2.14	Zero	0	I-129
HDPE	TI10	450	500	4.20E-09	0.3	2.14	Zero	0	I-129
HDPE	TI11	500	600	4.85E-09	0.3	2.14	Zero	0	I-129
HDPE	TI12	600	700	5.73E-09	0.3	2.14	Zero	0	I-129
HDPE	TI13	700	800	6.60E-09	0.3	2.14	Zero	0	I-129
HDPE	TI14	800	900	7.47E-09	0.3	2.14	Zero	0	I-129
HDPE	TI15	900	1000	8.34E-09	0.3	2.14	Zero	0	I-129
HDPE	TI16	1000	1200	9.65E-09	0.3	2.14	Zero	0	I-129
HDPE	TI17	1200	1400	1.14E-08	0.3	2.14	Zero	0	I-129
HDPE	TI18	1400	1600	1.32E-08	0.3	2.14	Zero	0	I-129
HDPE	TI19	1600	1800	1.49E-08	0.3	2.14	Zero	0	I-129
HDPE	TI20	1800	2000	1.66E-08	0.3	2.14	Zero	0	I-129
HDPE	TI21	2000	2300	1.88E-08	0.3	2.14	Zero	0	I-129
HDPE	TI22	2300	2600	2.14E-08	0.3	2.14	Zero	0	I-129
HDPE	TI23	2600	2900	2.41E-08	0.3	2.14	Zero	0	I-129
HDPE	TI24	2900	3200	2.67E-08	0.3	2.14	Zero	0	I-129
HDPE	TI25	3200	3600	2.97E-08	0.3	2.14	Zero	0	I-129
HDPE	TI26	3600	4000	3.32E-08	0.3	2.14	Zero	0	I-129
HDPE	TI27	4000	4500	3.72E-08	0.3	2.14	Zero	0	I-129
HDPE	TI28	4500	5000	4.15E-08	0.3	2.14	Zero	0	I-129
HDPE	TI29	5000	5500	4.59E-08	0.3	2.14	Zero	0	I-129
HDPE	TI30	5500	6000	5.03E-08	0.3	2.14	Zero	0	I-129
HDPE	TI31	6000	6500	5.46E-08	0.3	2.14	Zero	0	I-129
HDPE	TI32	6500	7000	5.90E-08	0.3	2.14	Zero	0	I-129
HDPE	TI33	7000	7500	6.33E-08	0.3	2.14	Zero	0	I-129
HDPE	TI34	7500	8000	6.77E-08	0.3	2.14	Zero	0	I-129
HDPE	TI35	8000	8500	7.21E-08	0.3	2.14	Zero	0	I-129
HDPE	TI36	8500	9000	7.64E-08	0.3	2.14	Zero	0	I-129
HDPE	TI37	9000	9500	8.08E-08	0.3	2.14	Zero	0	I-129
HDPE	TI38	9500	10000	8.52E-08	0.3	2.14	Zero	0	I-129
HDPE	TI39	10000	11000	9.17E-08	0.3	2.14	Zero	0	I-129
HDPE	TI40	11000	12000	1.00E-07	0.3	2.14	Zero	0	I-129
HDPE	TI41a	12000	14928	1.18E-07	0.3	2.14	Zero	0	I-129
HDPE	TI41b	14928	15000	1.31E-07	0.3	2.14	Zero	0	I-129
HDPE	TI42a	15000	16349	1.37E-07	0.3	2.14	Zero	0	I-129
HDPE	TI42b	16349	16757	1.45E-07	0.3	2.14	Zero	0	I-129
HDPE	TI42c	16757	20000	1.61E-07	0.3	2.14	Zero	0	I-129

Material zone	Time period(s)	Start time (yr)	End time (yr)	Effective diffusion coefficient (cm^2/s)	Porosity	Solid density (g/mL)	Sorption material	Sorption coefficient, Kd (mL/g)	Species
LOWER_MUD_MAT	TI01-TI42c	0	20000	8.00E-07	0.211	2.61	OxModerate	15	I-129
NATIVE_SOIL	TI01-TI42c	0	20000	5.30E-06	0.39	2.66	Sandy	0	I-129
ROOF	TI01	0	50	5.01E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI02	50	100	5.02E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI03	100	150	5.03E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI04	150	200	5.05E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI05	200	250	5.07E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI06	250	300	5.09E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI07	300	350	5.11E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI08	350	400	5.13E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI09	400	450	5.15E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI10	450	500	5.17E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI11	500	600	5.21E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI12	600	700	5.25E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI13	700	800	5.29E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI14	800	900	5.33E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI15	900	1000	5.37E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI16	1000	1200	5.43E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI17	1200	1400	5.49E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI18	1400	1600	5.56E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI19	1600	1800	5.63E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI20	1800	2000	5.70E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI21	2000	2300	5.79E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI22	2300	2600	5.89E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI23	2600	2900	5.99E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI24	2900	3200	6.09E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI25	3200	3600	6.21E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI26	3600	4000	6.34E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI27	4000	4500	6.49E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI28	4500	5000	6.66E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI29	5000	5500	6.84E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI30	5500	6000	7.01E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI31	6000	6500	7.19E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI32	6500	7000	7.37E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI33	7000	7500	7.55E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI34	7500	8000	7.74E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI35	8000	8500	7.93E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI36	8500	9000	8.13E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI37	9000	9500	8.33E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI38	9500	10000	8.54E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI39	10000	11000	8.86E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI40	11000	12000	9.30E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI41a	12000	14928	1.03E-07	0.11	2.49	ReModerate	9	I-129
ROOF	TI41b	14928	15000	1.11E-07	0.11	2.49	ReModerate	9	I-129
ROOF	TI42a	15000	16349	1.15E-07	0.11	2.49	ReModerate	9	I-129
ROOF	TI42b	16349	16757	1.21E-07	0.11	2.49	ReModerate	9	I-129
ROOF	TI42c	16757	20000	1.34E-07	0.11	2.49	ReModerate	9	I-129
ROOF_HDPE_GCL	TI01	0	50	4.39E-10	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI02	50	100	5.62E-10	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI03	100	150	7.72E-10	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI04	150	200	9.93E-10	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI05	200	250	1.20E-09	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI06	250	300	1.40E-09	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI07	300	350	1.60E-09	0.3	2.14	Zero	0	I-129

Material zone	Time period(s)	Start time (yr)	End time (yr)	Effective diffusion coefficient (cm²/s)	Porosity	Solid density (g/mL)	Sorption material	Sorption coefficient, Kd (mL/g)	Species
ROOF_HDPE_GCL	TI08	350	400	1.79E-09	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI09	400	450	1.99E-09	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI10	450	500	2.19E-09	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI11	500	600	2.48E-09	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI12	600	700	2.87E-09	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI13	700	800	3.26E-09	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI14	800	900	3.65E-09	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI15	900	1000	4.04E-09	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI16	1000	1200	4.62E-09	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI17	1200	1400	5.40E-09	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI18	1400	1600	6.17E-09	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI19	1600	1800	6.95E-09	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI20	1800	2000	7.72E-09	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI21	2000	2300	8.69E-09	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI22	2300	2600	9.85E-09	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI23	2600	2900	1.10E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI24	2900	3200	1.22E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI25	3200	3600	1.35E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI26	3600	4000	1.51E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI27	4000	4500	1.68E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI28	4500	5000	1.88E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI29	5000	5500	2.07E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI30	5500	6000	2.26E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI31	6000	6500	2.46E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI32	6500	7000	2.65E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI33	7000	7500	2.84E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI34	7500	8000	3.03E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI35	8000	8500	3.23E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI36	8500	9000	3.42E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI37	9000	9500	3.61E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI38	9500	10000	3.81E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI39	10000	11000	4.10E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI40	11000	12000	4.48E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI41a	12000	14928	5.24E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI41b	14928	15000	5.82E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI42a	15000	16349	6.09E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI42b	16349	16757	6.43E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI42c	16757	20000	7.13E-08	0.3	2.14	Zero	0	I-129
SALTSTONE	TI01-TI42c	0	20000	1.00E-07	0.58	2.4	ReModerate	9	I-129
SAND_DRAIN	TI01-TI16	0	1200	8.00E-06	0.417	2.66	Sandy	0	I-129
SAND_DRAIN	TI17-TI19	1200	1800	8.00E-06	0.416	2.66	Sandy	0	I-129
SAND_DRAIN	TI20-TI21	1800	2300	8.00E-06	0.415	2.66	Sandy	0	I-129
SAND_DRAIN	TI22-TI23	2300	2900	8.00E-06	0.414	2.66	Sandy	0	I-129
SAND_DRAIN	TI24	2900	3200	8.00E-06	0.413	2.66	Sandy	0	I-129
SAND_DRAIN	TI25	3200	3600	8.00E-06	0.412	2.66	Sandy	0	I-129
SAND_DRAIN	TI26	3600	4000	8.00E-06	0.411	2.66	Sandy	0	I-129
SAND_DRAIN	TI27	4000	4500	8.00E-06	0.409	2.66	Sandy	0	I-129
SAND_DRAIN	TI28	4500	5000	8.00E-06	0.407	2.66	Sandy	0	I-129
SAND_DRAIN	TI29	5000	5500	8.00E-06	0.406	2.66	Sandy	0	I-129
SAND_DRAIN	TI30	5500	6000	8.00E-06	0.404	2.66	Sandy	0	I-129
SAND_DRAIN	TI31	6000	6500	8.00E-06	0.402	2.66	Sandy	0	I-129

Material zone	Time period(s)	Start time (yr)	End time (yr)	Effective diffusion coefficient (cm²/s)	Porosity	Solid density (g/mL)	Sorption material	Sorption coefficient, Kd (mL/g)	Species
SAND_DRAIN	TI32	6500	7000	8.00E-06	0.4	2.66	Sandy	0	I-129
SAND_DRAIN	TI33	7000	7500	8.00E-06	0.398	2.66	Sandy	0	I-129
SAND_DRAIN	TI34	7500	8000	8.00E-06	0.396	2.66	Sandy	0	I-129
SAND_DRAIN	TI35	8000	8500	8.00E-06	0.394	2.66	Sandy	0	I-129
SAND_DRAIN	TI36	8500	9000	8.00E-06	0.392	2.66	Sandy	0	I-129
SAND_DRAIN	TI37	9000	9500	8.00E-06	0.39	2.66	Sandy	0	I-129
SAND_DRAIN	TI38	9500	10000	8.00E-06	0.388	2.66	Sandy	0	I-129
SAND_DRAIN	TI39	10000	11000	8.00E-06	0.385	2.66	Sandy	0	I-129
SAND_DRAIN	TI40	11000	12000	8.00E-06	0.381	2.66	Sandy	0	I-129
SAND_DRAIN	TI41a	12000	14928	8.00E-06	0.373	2.66	Sandy	0	I-129
SAND_DRAIN	TI41b	14928	15000	8.00E-06	0.366	2.66	Sandy	0	I-129
SAND_DRAIN	TI42a	15000	16349	8.00E-06	0.364	2.66	Sandy	0	I-129
SAND_DRAIN	TI42b	16349	16757	8.00E-06	0.36	2.66	Sandy	0	I-129
SAND_DRAIN	TI42c	16757	20000	8.00E-06	0.353	2.66	Sandy	0	I-129
SHEET_DRAIN	TI01-TI42c	0	20000	1.00E-13	0.3	2.14	Zero	0	I-129
SHOT_CRETE	TI01-TI41a	0	14928	5.30E-06	0.35	2.63	OxModerate	15	I-129
SHOT_CRETE	TI41b-TI42c	14928	20000	5.30E-06	0.35	2.63	OxAged	4	I-129
UPPER_MUD_MAT	TI01	0	50	5.04E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI02	50	100	5.11E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI03	100	150	5.17E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI04	150	200	5.22E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI05	200	250	5.27E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI06	250	300	5.32E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI07	300	350	5.36E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI08	350	400	5.40E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI09	400	450	5.44E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI10	450	500	5.48E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI11	500	600	5.53E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI12	600	700	5.60E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI13	700	800	5.66E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI14	800	900	5.73E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI15	900	1000	5.79E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI16	1000	1200	5.86E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI17	1200	1400	5.95E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI18	1400	1600	6.04E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI19	1600	1800	6.14E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI20	1800	2000	6.23E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI21	2000	2300	6.34E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI22	2300	2600	6.47E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI23	2600	2900	6.59E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI24	2900	3200	6.72E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI25	3200	3600	6.87E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI26	3600	4000	7.04E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI27	4000	4500	7.23E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI28	4500	5000	7.44E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI29	5000	5500	7.66E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI30	5500	6000	7.87E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI31	6000	6500	8.10E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI32	6500	7000	8.32E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI33	7000	7500	8.55E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI34	7500	8000	8.78E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI35	8000	8500	9.03E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI36	8500	9000	9.27E-08	0.11	2.49	ReModerate	9	I-129

Material zone	Time period(s)	Start time (yr)	End time (yr)	Effective diffusion coefficient (cm^2/s)	Porosity	Solid density (g/mL)	Sorption material	Sorption coefficient, Kd (mL/g)	Species
UPPER_MUD_MAT	TI37	9000	9500	9.52E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI38	9500	10000	9.79E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI39	10000	11000	1.02E-07	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI40	11000	12000	1.08E-07	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI41a	12000	14928	1.20E-07	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI41b	14928	15000	1.30E-07	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI42a	15000	16349	1.36E-07	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI42b	16349	16757	1.43E-07	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI42c	16757	20000	1.61E-07	0.11	2.49	ReModerate	9	I-129
WALL	TI01	0	50	5.06E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI02	50	100	5.16E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI03	100	150	5.26E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI04	150	200	5.34E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI05	200	250	5.42E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI06	250	300	5.49E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI07	300	350	5.56E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI08	350	400	5.63E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI09	400	450	5.69E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI10	450	500	5.75E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI11	500	600	5.84E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI12	600	700	5.96E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI13	700	800	6.07E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI14	800	900	6.18E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI15	900	1000	6.28E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI16	1000	1200	6.42E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI17	1200	1400	6.59E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI18	1400	1600	6.76E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI19	1600	1800	6.93E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI20	1800	2000	7.10E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI21	2000	2300	7.32E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI22	2300	2600	7.59E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI23	2600	2900	7.85E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI24	2900	3200	8.12E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI25	3200	3600	8.46E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI26	3600	4000	8.85E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI27	4000	4500	9.31E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI28	4500	5000	9.86E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI29	5000	5500	1.04E-07	0.11	2.49	ReModerate	9	I-129
WALL	TI30	5500	6000	1.11E-07	0.11	2.49	ReModerate	9	I-129
WALL	TI31	6000	6500	1.17E-07	0.11	2.49	ReModerate	9	I-129
WALL	TI32	6500	7000	1.25E-07	0.11	2.49	ReModerate	9	I-129
WALL	TI33	7000	7500	1.33E-07	0.11	2.49	ReModerate	9	I-129
WALL	TI34	7500	8000	1.42E-07	0.11	2.49	ReModerate	9	I-129
WALL	TI35	8000	8500	1.51E-07	0.11	2.49	ReModerate	9	I-129
WALL	TI36	8500	9000	1.62E-07	0.11	2.49	ReModerate	9	I-129
WALL	TI37	9000	9500	1.74E-07	0.11	2.49	ReModerate	9	I-129
WALL	TI38	9500	10000	1.88E-07	0.11	2.49	ReModerate	9	I-129
WALL	TI39	10000	11000	2.16E-07	0.11	2.49	ReModerate	9	I-129
WALL	TI40	11000	12000	2.57E-07	0.11	2.49	ReModerate	9	I-129
WALL	TI41a	12000	14928	4.49E-07	0.11	2.49	ReModerate	9	I-129
WALL	TI41b	14928	15000	8.01E-07	0.11	2.49	ReModerate	9	I-129
WALL	TI42a	15000	16349	1.12E-06	0.11	2.49	ReModerate	9	I-129
WALL	TI42b	16349	16757	2.23E-06	0.11	2.49	OxModerate	15	I-129
WALL	TI42c	16757	20000	4.54E-06	0.11	2.49	OxAged	4	I-129

Vault 2, Case E, I-129

Material zone	Time period(s)	Start time (yr)	End time (yr)	Effective diffusion coefficient (cm²/s)	Porosity	Solid density (g/mL)	Sorption material	Sorption coefficient, Kd (mL/g)	Species
BACKFILL	TI01-TI42c	0	20000	5.30E-06	0.35	2.63	Clayey	0.6	I-129
CLEAN_GROUT	TI01-TI42c	0	20000	1.00E-07	0.58	2.4	ReModerate	9	I-129
COLUMN	TI01-TI42c	0	20000	1.00E-07	0.58	2.4	ReModerate	9	I-129
FLOOR	TI01	0	50	5.04E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI02	50	100	5.11E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI03	100	150	5.17E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI04	150	200	5.22E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI05	200	250	5.27E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI06	250	300	5.32E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI07	300	350	5.36E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI08	350	400	5.40E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI09	400	450	5.44E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI10	450	500	5.48E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI11	500	600	5.53E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI12	600	700	5.60E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI13	700	800	5.66E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI14	800	900	5.73E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI15	900	1000	5.79E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI16	1000	1200	5.86E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI17	1200	1400	5.95E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI18	1400	1600	6.04E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI19	1600	1800	6.14E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI20	1800	2000	6.23E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI21	2000	2300	6.34E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI22	2300	2600	6.47E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI23	2600	2900	6.59E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI24	2900	3200	6.72E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI25	3200	3600	6.87E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI26	3600	4000	7.04E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI27	4000	4500	7.23E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI28	4500	5000	7.44E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI29	5000	5500	7.66E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI30	5500	6000	7.87E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI31	6000	6500	8.10E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI32	6500	7000	8.32E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI33	7000	7500	8.55E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI34	7500	8000	8.78E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI35	8000	8500	9.03E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI36	8500	9000	9.27E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI37	9000	9500	9.52E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI38	9500	10000	9.79E-08	0.11	2.49	ReModerate	9	I-129
FLOOR	TI39	10000	11000	1.02E-07	0.11	2.49	ReModerate	9	I-129
FLOOR	TI40	11000	12000	1.08E-07	0.11	2.49	ReModerate	9	I-129
FLOOR	TI41a	12000	14716	1.19E-07	0.11	2.49	ReModerate	9	I-129
FLOOR	TI41b	14716	15000	1.30E-07	0.11	2.49	ReModerate	9	I-129
FLOOR	TI42a	15000	15631	1.33E-07	0.11	2.49	ReModerate	9	I-129
FLOOR	TI42b	15631	15841	1.36E-07	0.11	2.49	ReModerate	9	I-129
FLOOR	TI42c	15841	20000	1.56E-07	0.11	2.49	ReModerate	9	I-129
FLOOR_HDPE_GCL	TI01	0	50	4.39E-10	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI02	50	100	5.62E-10	0.3	2.14	Zero	0	I-129

Material zone	Time period(s)	Start time (yr)	End time (yr)	Effective diffusion coefficient (cm^2/s)	Porosity	Solid density (g/mL)	Sorption material	Sorption coefficient, Kd (mL/g)	Species
FLOOR_HDPE_GCL	TI03	100	150	7.72E-10	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI04	150	200	9.93E-10	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI05	200	250	1.20E-09	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI06	250	300	1.40E-09	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI07	300	350	1.60E-09	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI08	350	400	1.79E-09	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI09	400	450	1.99E-09	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI10	450	500	2.19E-09	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI11	500	600	2.48E-09	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI12	600	700	2.87E-09	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI13	700	800	3.26E-09	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI14	800	900	3.65E-09	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI15	900	1000	4.04E-09	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI16	1000	1200	4.62E-09	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI17	1200	1400	5.40E-09	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI18	1400	1600	6.17E-09	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI19	1600	1800	6.95E-09	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI20	1800	2000	7.72E-09	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI21	2000	2300	8.69E-09	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI22	2300	2600	9.85E-09	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI23	2600	2900	1.10E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI24	2900	3200	1.22E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI25	3200	3600	1.35E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI26	3600	4000	1.51E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI27	4000	4500	1.68E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI28	4500	5000	1.88E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI29	5000	5500	2.07E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI30	5500	6000	2.26E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI31	6000	6500	2.46E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI32	6500	7000	2.65E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI33	7000	7500	2.84E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI34	7500	8000	3.03E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI35	8000	8500	3.23E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI36	8500	9000	3.42E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI37	9000	9500	3.61E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI38	9500	10000	3.81E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI39	10000	11000	4.10E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI40	11000	12000	4.48E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI41a	12000	14716	5.20E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI41b	14716	15000	5.77E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI42a	15000	15631	5.95E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI42b	15631	15841	6.11E-08	0.3	2.14	Zero	0	I-129
FLOOR_HDPE_GCL	TI42c	15841	20000	6.95E-08	0.3	2.14	Zero	0	I-129
HDPE	TI01	0	50	4.77E-10	0.3	2.14	Zero	0	I-129
HDPE	TI02	50	100	7.02E-10	0.3	2.14	Zero	0	I-129
HDPE	TI03	100	150	1.12E-09	0.3	2.14	Zero	0	I-129
HDPE	TI04	150	200	1.58E-09	0.3	2.14	Zero	0	I-129
HDPE	TI05	200	250	2.02E-09	0.3	2.14	Zero	0	I-129
HDPE	TI06	250	300	2.45E-09	0.3	2.14	Zero	0	I-129
HDPE	TI07	300	350	2.89E-09	0.3	2.14	Zero	0	I-129
HDPE	TI08	350	400	3.32E-09	0.3	2.14	Zero	0	I-129
HDPE	TI09	400	450	3.76E-09	0.3	2.14	Zero	0	I-129
HDPE	TI10	450	500	4.20E-09	0.3	2.14	Zero	0	I-129
HDPE	TI11	500	600	4.85E-09	0.3	2.14	Zero	0	I-129
HDPE	TI12	600	700	5.73E-09	0.3	2.14	Zero	0	I-129

Material zone	Time period(s)	Start time (yr)	End time (yr)	Effective diffusion coefficient (cm²/s)	Porosity	Solid density (g/mL)	Sorption material	Sorption coefficient, Kd (mL/g)	Species
HDPE	TI13	700	800	6.60E-09	0.3	2.14	Zero	0	I-129
HDPE	TI14	800	900	7.47E-09	0.3	2.14	Zero	0	I-129
HDPE	TI15	900	1000	8.34E-09	0.3	2.14	Zero	0	I-129
HDPE	TI16	1000	1200	9.65E-09	0.3	2.14	Zero	0	I-129
HDPE	TI17	1200	1400	1.14E-08	0.3	2.14	Zero	0	I-129
HDPE	TI18	1400	1600	1.32E-08	0.3	2.14	Zero	0	I-129
HDPE	TI19	1600	1800	1.49E-08	0.3	2.14	Zero	0	I-129
HDPE	TI20	1800	2000	1.66E-08	0.3	2.14	Zero	0	I-129
HDPE	TI21	2000	2300	1.88E-08	0.3	2.14	Zero	0	I-129
HDPE	TI22	2300	2600	2.14E-08	0.3	2.14	Zero	0	I-129
HDPE	TI23	2600	2900	2.41E-08	0.3	2.14	Zero	0	I-129
HDPE	TI24	2900	3200	2.67E-08	0.3	2.14	Zero	0	I-129
HDPE	TI25	3200	3600	2.97E-08	0.3	2.14	Zero	0	I-129
HDPE	TI26	3600	4000	3.32E-08	0.3	2.14	Zero	0	I-129
HDPE	TI27	4000	4500	3.72E-08	0.3	2.14	Zero	0	I-129
HDPE	TI28	4500	5000	4.15E-08	0.3	2.14	Zero	0	I-129
HDPE	TI29	5000	5500	4.59E-08	0.3	2.14	Zero	0	I-129
HDPE	TI30	5500	6000	5.03E-08	0.3	2.14	Zero	0	I-129
HDPE	TI31	6000	6500	5.46E-08	0.3	2.14	Zero	0	I-129
HDPE	TI32	6500	7000	5.90E-08	0.3	2.14	Zero	0	I-129
HDPE	TI33	7000	7500	6.33E-08	0.3	2.14	Zero	0	I-129
HDPE	TI34	7500	8000	6.77E-08	0.3	2.14	Zero	0	I-129
HDPE	TI35	8000	8500	7.21E-08	0.3	2.14	Zero	0	I-129
HDPE	TI36	8500	9000	7.64E-08	0.3	2.14	Zero	0	I-129
HDPE	TI37	9000	9500	8.08E-08	0.3	2.14	Zero	0	I-129
HDPE	TI38	9500	10000	8.52E-08	0.3	2.14	Zero	0	I-129
HDPE	TI39	10000	11000	9.17E-08	0.3	2.14	Zero	0	I-129
HDPE	TI40	11000	12000	1.00E-07	0.3	2.14	Zero	0	I-129
HDPE	TI41a	12000	14716	1.17E-07	0.3	2.14	Zero	0	I-129
HDPE	TI41b	14716	15000	1.30E-07	0.3	2.14	Zero	0	I-129
HDPE	TI42a	15000	15631	1.34E-07	0.3	2.14	Zero	0	I-129
HDPE	TI42b	15631	15841	1.37E-07	0.3	2.14	Zero	0	I-129
HDPE	TI42c	15841	20000	1.57E-07	0.3	2.14	Zero	0	I-129
LOWER_MUD_MAT	TI01-TI42c	0	20000	8.00E-07	0.211	2.61	OxModerate	15	I-129
NATIVE_SOIL	TI01-TI42c	0	20000	5.30E-06	0.39	2.66	Sandy	0	I-129
ROOF	TI01	0	50	5.01E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI02	50	100	5.02E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI03	100	150	5.03E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI04	150	200	5.05E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI05	200	250	5.07E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI06	250	300	5.09E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI07	300	350	5.11E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI08	350	400	5.13E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI09	400	450	5.15E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI10	450	500	5.17E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI11	500	600	5.21E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI12	600	700	5.25E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI13	700	800	5.29E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI14	800	900	5.33E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI15	900	1000	5.37E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI16	1000	1200	5.43E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI17	1200	1400	5.49E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI18	1400	1600	5.56E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI19	1600	1800	5.63E-08	0.11	2.49	ReModerate	9	I-129

Material zone	Time period(s)	Start time (yr)	End time (yr)	Effective diffusion coefficient (cm^2/s)	Porosity	Solid density (g/mL)	Sorption material	Sorption coefficient, Kd (mL/g)	Species
ROOF	TI20	1800	2000	5.70E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI21	2000	2300	5.79E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI22	2300	2600	5.89E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI23	2600	2900	5.99E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI24	2900	3200	6.09E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI25	3200	3600	6.21E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI26	3600	4000	6.34E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI27	4000	4500	6.49E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI28	4500	5000	6.66E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI29	5000	5500	6.84E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI30	5500	6000	7.01E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI31	6000	6500	7.19E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI32	6500	7000	7.37E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI33	7000	7500	7.55E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI34	7500	8000	7.74E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI35	8000	8500	7.93E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI36	8500	9000	8.13E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI37	9000	9500	8.33E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI38	9500	10000	8.54E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI39	10000	11000	8.86E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI40	11000	12000	9.30E-08	0.11	2.49	ReModerate	9	I-129
ROOF	TI41a	12000	14716	1.02E-07	0.11	2.49	ReModerate	9	I-129
ROOF	TI41b	14716	15000	1.10E-07	0.11	2.49	ReModerate	9	I-129
ROOF	TI42a	15000	15631	1.13E-07	0.11	2.49	ReModerate	9	I-129
ROOF	TI42b	15631	15841	1.15E-07	0.11	2.49	ReModerate	9	I-129
ROOF	TI42c	15841	20000	1.31E-07	0.11	2.49	ReModerate	9	I-129
ROOF_HDPE_GCL	TI01	0	50	4.39E-10	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI02	50	100	5.62E-10	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI03	100	150	7.72E-10	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI04	150	200	9.93E-10	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI05	200	250	1.20E-09	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI06	250	300	1.40E-09	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI07	300	350	1.60E-09	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI08	350	400	1.79E-09	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI09	400	450	1.99E-09	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI10	450	500	2.19E-09	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI11	500	600	2.48E-09	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI12	600	700	2.87E-09	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI13	700	800	3.26E-09	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI14	800	900	3.65E-09	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI15	900	1000	4.04E-09	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI16	1000	1200	4.62E-09	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI17	1200	1400	5.40E-09	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI18	1400	1600	6.17E-09	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI19	1600	1800	6.95E-09	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI20	1800	2000	7.72E-09	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI21	2000	2300	8.69E-09	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI22	2300	2600	9.85E-09	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI23	2600	2900	1.10E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI24	2900	3200	1.22E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI25	3200	3600	1.35E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI26	3600	4000	1.51E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI27	4000	4500	1.68E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI28	4500	5000	1.88E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI29	5000	5500	2.07E-08	0.3	2.14	Zero	0	I-129

Material zone	Time period(s)	Start time (yr)	End time (yr)	Effective diffusion coefficient (cm^2/s)	Porosity	Solid density (g/mL)	Sorption material	Sorption coefficient, Kd (mL/g)	Species
ROOF_HDPE_GCL	TI30	5500	6000	2.26E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI31	6000	6500	2.46E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI32	6500	7000	2.65E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI33	7000	7500	2.84E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI34	7500	8000	3.03E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI35	8000	8500	3.23E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI36	8500	9000	3.42E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI37	9000	9500	3.61E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI38	9500	10000	3.81E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI39	10000	11000	4.10E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI40	11000	12000	4.48E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI41a	12000	14716	5.20E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI41b	14716	15000	5.77E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI42a	15000	15631	5.95E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI42b	15631	15841	6.11E-08	0.3	2.14	Zero	0	I-129
ROOF_HDPE_GCL	TI42c	15841	20000	6.95E-08	0.3	2.14	Zero	0	I-129
SALTSTONE	TI01-TI42c	0	20000	1.00E-07	0.58	2.4	ReModerate	9	I-129
SAND_DRAIN	TI01-TI16	0	1200	8.00E-06	0.417	2.66	Sandy	0	I-129
SAND_DRAIN	TI17-TI19	1200	1800	8.00E-06	0.416	2.66	Sandy	0	I-129
SAND_DRAIN	TI20-TI21	1800	2300	8.00E-06	0.415	2.66	Sandy	0	I-129
SAND_DRAIN	TI22-TI23	2300	2900	8.00E-06	0.414	2.66	Sandy	0	I-129
SAND_DRAIN	TI24	2900	3200	8.00E-06	0.413	2.66	Sandy	0	I-129
SAND_DRAIN	TI25	3200	3600	8.00E-06	0.412	2.66	Sandy	0	I-129
SAND_DRAIN	TI26	3600	4000	8.00E-06	0.411	2.66	Sandy	0	I-129
SAND_DRAIN	TI27	4000	4500	8.00E-06	0.409	2.66	Sandy	0	I-129
SAND_DRAIN	TI28	4500	5000	8.00E-06	0.407	2.66	Sandy	0	I-129
SAND_DRAIN	TI29	5000	5500	8.00E-06	0.406	2.66	Sandy	0	I-129
SAND_DRAIN	TI30	5500	6000	8.00E-06	0.404	2.66	Sandy	0	I-129
SAND_DRAIN	TI31	6000	6500	8.00E-06	0.402	2.66	Sandy	0	I-129
SAND_DRAIN	TI32	6500	7000	8.00E-06	0.4	2.66	Sandy	0	I-129
SAND_DRAIN	TI33	7000	7500	8.00E-06	0.398	2.66	Sandy	0	I-129
SAND_DRAIN	TI34	7500	8000	8.00E-06	0.396	2.66	Sandy	0	I-129
SAND_DRAIN	TI35	8000	8500	8.00E-06	0.394	2.66	Sandy	0	I-129
SAND_DRAIN	TI36	8500	9000	8.00E-06	0.392	2.66	Sandy	0	I-129
SAND_DRAIN	TI37	9000	9500	8.00E-06	0.39	2.66	Sandy	0	I-129
SAND_DRAIN	TI38	9500	10000	8.00E-06	0.388	2.66	Sandy	0	I-129
SAND_DRAIN	TI39	10000	11000	8.00E-06	0.385	2.66	Sandy	0	I-129
SAND_DRAIN	TI40	11000	12000	8.00E-06	0.381	2.66	Sandy	0	I-129
SAND_DRAIN	TI41a	12000	14716	8.00E-06	0.373	2.66	Sandy	0	I-129
SAND_DRAIN	TI41b	14716	15000	8.00E-06	0.367	2.66	Sandy	0	I-129
SAND_DRAIN	TI42a	15000	15631	8.00E-06	0.365	2.66	Sandy	0	I-129
SAND_DRAIN	TI42b	15631	15841	8.00E-06	0.363	2.66	Sandy	0	I-129
SAND_DRAIN	TI42c	15841	20000	8.00E-06	0.355	2.66	Sandy	0	I-129
SHEET_DRAIN	TI01-TI42c	0	20000	1.00E-07	0.58	2.4	ReModerate	9	I-129
SHOT_CRETE	TI01-TI41a	0	14716	5.30E-06	0.35	2.63	OxModerate	15	I-129
SHOT_CRETE	TI41b-TI42c	14716	20000	5.30E-06	0.35	2.63	OxAged	4	I-129
UPPER_MUD_MAT	TI01	0	50	5.04E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI02	50	100	5.11E-08	0.11	2.49	ReModerate	9	I-129

Material zone	Time period(s)	Start time (yr)	End time (yr)	Effective diffusion coefficient (cm^2/s)	Porosity	Solid density (g/mL)	Sorption material	Sorption coefficient, Kd (mL/g)	Species
UPPER_MUD_MAT	TI03	100	150	5.17E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI04	150	200	5.22E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI05	200	250	5.27E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI06	250	300	5.32E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI07	300	350	5.36E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI08	350	400	5.40E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI09	400	450	5.44E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI10	450	500	5.48E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI11	500	600	5.53E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI12	600	700	5.60E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI13	700	800	5.66E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI14	800	900	5.73E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI15	900	1000	5.79E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI16	1000	1200	5.86E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI17	1200	1400	5.95E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI18	1400	1600	6.04E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI19	1600	1800	6.14E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI20	1800	2000	6.23E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI21	2000	2300	6.34E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI22	2300	2600	6.47E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI23	2600	2900	6.59E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI24	2900	3200	6.72E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI25	3200	3600	6.87E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI26	3600	4000	7.04E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI27	4000	4500	7.23E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI28	4500	5000	7.44E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI29	5000	5500	7.66E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI30	5500	6000	7.87E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI31	6000	6500	8.10E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI32	6500	7000	8.32E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI33	7000	7500	8.55E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI34	7500	8000	8.78E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI35	8000	8500	9.03E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI36	8500	9000	9.27E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI37	9000	9500	9.52E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI38	9500	10000	9.79E-08	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI39	10000	11000	1.02E-07	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI40	11000	12000	1.08E-07	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI41a	12000	14716	1.19E-07	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI41b	14716	15000	1.30E-07	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI42a	15000	15631	1.33E-07	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI42b	15631	15841	1.36E-07	0.11	2.49	ReModerate	9	I-129
UPPER_MUD_MAT	TI42c	15841	20000	1.56E-07	0.11	2.49	ReModerate	9	I-129
WALL	TI01	0	50	5.06E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI02	50	100	5.16E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI03	100	150	5.26E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI04	150	200	5.34E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI05	200	250	5.42E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI06	250	300	5.49E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI07	300	350	5.56E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI08	350	400	5.63E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI09	400	450	5.69E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI10	450	500	5.75E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI11	500	600	5.84E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI12	600	700	5.96E-08	0.11	2.49	ReModerate	9	I-129

Material zone	Time period(s)	Start time (yr)	End time (yr)	Effective diffusion coefficient (cm^2/s)	Porosity	Solid density (g/mL)	Sorption material	Sorption coefficient, Kd (mL/g)	Species
WALL	TI13	700	800	6.07E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI14	800	900	6.18E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI15	900	1000	6.28E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI16	1000	1200	6.42E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI17	1200	1400	6.59E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI18	1400	1600	6.76E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI19	1600	1800	6.93E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI20	1800	2000	7.10E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI21	2000	2300	7.32E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI22	2300	2600	7.59E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI23	2600	2900	7.85E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI24	2900	3200	8.12E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI25	3200	3600	8.46E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI26	3600	4000	8.85E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI27	4000	4500	9.31E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI28	4500	5000	9.86E-08	0.11	2.49	ReModerate	9	I-129
WALL	TI29	5000	5500	1.04E-07	0.11	2.49	ReModerate	9	I-129
WALL	TI30	5500	6000	1.11E-07	0.11	2.49	ReModerate	9	I-129
WALL	TI31	6000	6500	1.17E-07	0.11	2.49	ReModerate	9	I-129
WALL	TI32	6500	7000	1.25E-07	0.11	2.49	ReModerate	9	I-129
WALL	TI33	7000	7500	1.33E-07	0.11	2.49	ReModerate	9	I-129
WALL	TI34	7500	8000	1.42E-07	0.11	2.49	ReModerate	9	I-129
WALL	TI35	8000	8500	1.51E-07	0.11	2.49	ReModerate	9	I-129
WALL	TI36	8500	9000	1.62E-07	0.11	2.49	ReModerate	9	I-129
WALL	TI37	9000	9500	1.74E-07	0.11	2.49	ReModerate	9	I-129
WALL	TI38	9500	10000	1.88E-07	0.11	2.49	ReModerate	9	I-129
WALL	TI39	10000	11000	2.16E-07	0.11	2.49	ReModerate	9	I-129
WALL	TI40	11000	12000	2.57E-07	0.11	2.49	ReModerate	9	I-129
WALL	TI41a	12000	14716	4.26E-07	0.11	2.49	ReModerate	9	I-129
WALL	TI41b	14716	15000	7.64E-07	0.11	2.49	ReModerate	9	I-129
WALL	TI42a	15000	15631	9.26E-07	0.11	2.49	ReModerate	9	I-129
WALL	TI42b	15631	15841	1.08E-06	0.11	2.49	OxModerate	15	I-129
WALL	TI42c	15841	20000	3.93E-06	0.11	2.49	OxAged	4	I-129

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Material zone	Time period(s)	Start time (yr)	End time (yr)	Effective diffusion coefficient (cm^2/s)	Porosity	Solid density (g/mL)	Sorption material	Sorption coefficient, Kd (mL/g)	Species
BACKFILL	TI01-TI42d	0	20000	5.30E-06	0.35	2.63	Clayey	0.6	I-129
CLEAN_GROUT	TI01-TI42d	0	20000	1.00E-07	0.58	2.4	ReModerate	9	I-129
CRACK	TI01-TI42d	0	20000	1.00E-07	0.58	2.4	ReModerate	9	I-129
FLOOR	TI01	0	50	5.01E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI02	50	100	5.04E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI03	100	150	5.07E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI04	150	200	5.09E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI05	200	250	5.10E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI06	250	300	5.12E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI07	300	350	5.14E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI08	350	400	5.15E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI09	400	450	5.16E-08	0.12	2.55	ReModerate	9	I-129

Material zone	Time period(s)	Start time (yr)	End time (yr)	Effective diffusion coefficient (cm^2/s)	Porosity	Solid density (g/mL)	Sorption material	Sorption coefficient, Kd (mL/g)	Species
FLOOR	TI10	450	500	5.18E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI11	500	600	5.20E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI12	600	700	5.22E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI13	700	800	5.24E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI14	800	900	5.26E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI15	900	1000	5.28E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI16	1000	1200	5.30E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI17	1200	1400	5.33E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI18	1400	1600	5.36E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI19	1600	1800	5.39E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI20	1800	2000	5.42E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI21	2000	2300	5.45E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI22	2300	2600	5.49E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI23	2600	2900	5.52E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI24	2900	3200	5.56E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI25	3200	3600	5.59E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI26	3600	4000	5.64E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI27	4000	4500	5.68E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI28	4500	5000	5.74E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI29	5000	5500	5.78E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI30	5500	6000	5.83E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI31	6000	6500	5.88E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI32	6500	7000	5.92E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI33	7000	7500	5.97E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI34	7500	8000	6.01E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI35	8000	8500	6.06E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI36	8500	9000	6.10E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI37	9000	9500	6.14E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI38	9500	10000	6.18E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI39	10000	11000	6.24E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI40	11000	12000	6.32E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI41	12000	15000	6.47E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI42a	15000	15519	6.61E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI42b	15519	16018	6.64E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI42c	16018	16547	6.68E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI42d	16547	20000	6.83E-08	0.12	2.55	ReModerate	9	I-129
NATIVE_SOIL	TI01-TI42d	0	20000	5.30E-06	0.39	2.66	Sandy	0	I-129
ROOF	TI01	0	50	1.00E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI02	50	100	1.01E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI03	100	150	1.02E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI04	150	200	1.03E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI05	200	250	1.04E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI06	250	300	1.06E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI07	300	350	1.07E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI08	350	400	1.08E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI09	400	450	1.09E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI10	450	500	1.10E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI11	500	600	1.12E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI12	600	700	1.15E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI13	700	800	1.17E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI14	800	900	1.20E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI15	900	1000	1.22E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI16	1000	1200	1.26E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI17	1200	1400	1.31E-07	0.136	2.56	OxModerate	15	I-129

Material zone	Time period(s)	Start time (yr)	End time (yr)	Effective diffusion coefficient (cm^2/s)	Porosity	Solid density (g/mL)	Sorption material	Sorption coefficient, Kd (mL/g)	Species
ROOF	TI18	1400	1600	1.36E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI19	1600	1800	1.41E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI20	1800	2000	1.46E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI21	2000	2300	1.53E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI22	2300	2600	1.62E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI23	2600	2900	1.72E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI24	2900	3200	1.81E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI25	3200	3600	1.95E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI26	3600	4000	2.12E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI27	4000	4500	2.34E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI28	4500	5000	2.62E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI29	5000	5500	2.98E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI30	5500	6000	3.41E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI31	6000	6500	4.00E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI32	6500	7000	4.74E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI33	7000	7500	5.92E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI34	7500	8000	7.54E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI35	8000	8500	1.15E-06	0.136	2.56	OxModerate	15	I-129
ROOF	TI36	8500	9000	1.77E-06	0.136	2.56	OxModerate	15	I-129
ROOF	TI37	9000	9500	2.81E-06	0.136	2.56	OxModerate	15	I-129
ROOF	TI38	9500	10000	4.27E-06	0.136	2.56	OxModerate	15	I-129
ROOF	TI39-TI42c	10000	16547	5.30E-06	0.35	2.63	OxModerate	15	I-129
ROOF	TI42d	16547	20000	5.30E-06	0.35	2.63	OxAged	4	I-129
SALTSTONE	TI01-TI42d	0	20000	1.00E-07	0.58	2.4	ReModerate	9	I-129
SAND_DRAIN	TI01-TI16	0	1200	8.00E-06	0.417	2.66	Sandy	0	I-129
SAND_DRAIN	TI17-TI19	1200	1800	8.00E-06	0.416	2.66	Sandy	0	I-129
SAND_DRAIN	TI20-TI21	1800	2300	8.00E-06	0.415	2.66	Sandy	0	I-129
SAND_DRAIN	TI22-TI23	2300	2900	8.00E-06	0.414	2.66	Sandy	0	I-129
SAND_DRAIN	TI24	2900	3200	8.00E-06	0.413	2.66	Sandy	0	I-129
SAND_DRAIN	TI25	3200	3600	8.00E-06	0.412	2.66	Sandy	0	I-129
SAND_DRAIN	TI26	3600	4000	8.00E-06	0.411	2.66	Sandy	0	I-129
SAND_DRAIN	TI27	4000	4500	8.00E-06	0.409	2.66	Sandy	0	I-129
SAND_DRAIN	TI28	4500	5000	8.00E-06	0.407	2.66	Sandy	0	I-129
SAND_DRAIN	TI29	5000	5500	8.00E-06	0.406	2.66	Sandy	0	I-129
SAND_DRAIN	TI30	5500	6000	8.00E-06	0.404	2.66	Sandy	0	I-129
SAND_DRAIN	TI31	6000	6500	8.00E-06	0.402	2.66	Sandy	0	I-129
SAND_DRAIN	TI32	6500	7000	8.00E-06	0.4	2.66	Sandy	0	I-129
SAND_DRAIN	TI33	7000	7500	8.00E-06	0.398	2.66	Sandy	0	I-129
SAND_DRAIN	TI34	7500	8000	8.00E-06	0.396	2.66	Sandy	0	I-129
SAND_DRAIN	TI35	8000	8500	8.00E-06	0.394	2.66	Sandy	0	I-129
SAND_DRAIN	TI36	8500	9000	8.00E-06	0.392	2.66	Sandy	0	I-129
SAND_DRAIN	TI37	9000	9500	8.00E-06	0.39	2.66	Sandy	0	I-129
SAND_DRAIN	TI38	9500	10000	8.00E-06	0.388	2.66	Sandy	0	I-129
SAND_DRAIN	TI39	10000	11000	8.00E-06	0.385	2.66	Sandy	0	I-129
SAND_DRAIN	TI40	11000	12000	8.00E-06	0.381	2.66	Sandy	0	I-129
SAND_DRAIN	TI41	12000	15000	8.00E-06	0.372	2.66	Sandy	0	I-129
SAND_DRAIN	TI42a	15000	15519	8.00E-06	0.365	2.66	Sandy	0	I-129
SAND_DRAIN	TI42b	15519	16018	8.00E-06	0.363	2.66	Sandy	0	I-129
SAND_DRAIN	TI42c	16018	16547	8.00E-06	0.361	2.66	Sandy	0	I-129
SAND_DRAIN	TI42d	16547	20000	8.00E-06	0.354	2.66	Sandy	0	I-129
SHEET_DRAIN	TI01-TI42d	0	20000	1.00E-07	0.58	2.4	ReModerate	9	I-129
WALL	TI01	0	50	5.02E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI02	50	100	5.06E-08	0.12	2.55	ReModerate	9	I-129

Material zone	Time period(s)	Start time (yr)	End time (yr)	Effective diffusion coefficient (cm²/s)	Porosity	Solid density (g/mL)	Sorption material	Sorption coefficient, Kd (mL/g)	Species
WALL	TI03	100	150	5.09E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI04	150	200	5.11E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI05	200	250	5.14E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI06	250	300	5.16E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI07	300	350	5.18E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI08	350	400	5.20E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI09	400	450	5.22E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI10	450	500	5.24E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI11	500	600	5.26E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI12	600	700	5.30E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI13	700	800	5.33E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI14	800	900	5.35E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI15	900	1000	5.38E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI16	1000	1200	5.41E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI17	1200	1400	5.45E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI18	1400	1600	5.49E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI19	1600	1800	5.53E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI20	1800	2000	5.57E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI21	2000	2300	5.62E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI22	2300	2600	5.67E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI23	2600	2900	5.72E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI24	2900	3200	5.77E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI25	3200	3600	5.83E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI26	3600	4000	5.89E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI27	4000	4500	5.96E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI28	4500	5000	6.03E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI29	5000	5500	6.10E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI30	5500	6000	6.17E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI31	6000	6500	6.24E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI32	6500	7000	6.31E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI33	7000	7500	6.38E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI34	7500	8000	6.45E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI35	8000	8500	6.51E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI36	8500	9000	6.58E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI37	9000	9500	6.64E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI38	9500	10000	6.71E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI39	10000	11000	6.80E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI40	11000	12000	6.93E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI41	12000	15000	7.18E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI42a	15000	15519	7.40E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI42b	15519	16018	7.46E-08	0.12	2.55	OxModerate	15	I-129
WALL	TI42c	16018	16547	7.53E-08	0.12	2.55	OxAged	4	I-129
WALL	TI42d	16547	20000	7.78E-08	0.12	2.55	OxAged	4	I-129

Vault 4, Case B, I-129

Material zone	Time period(s)	Start time (yr)	End time (yr)	Effective diffusion coefficient (cm²/s)	Porosity	Solid density (g/mL)	Sorption material	Sorption coefficient, Kd (mL/g)	Species
BACKFILL	TI01-TI42b	0	20000	5.30E-06	0.35	2.63	Clayey	0.6	I-129
CLEAN_GROUT	TI01-TI42b	0	20000	1.00E-07	0.58	2.4	ReModerate	9	I-129
CRACK	TI01-TI42b	0	20000	1.00E-07	0.58	2.4	ReModerate	9	I-129

Material zone	Time period(s)	Start time (yr)	End time (yr)	Effective diffusion coefficient (cm^2/s)	Porosity	Solid density (g/mL)	Sorption material	Sorption coefficient, Kd (mL/g)	Species
FLOOR	TI01	0	50	5.01E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI02	50	100	5.04E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI03	100	150	5.07E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI04	150	200	5.09E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI05	200	250	5.10E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI06	250	300	5.12E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI07	300	350	5.14E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI08	350	400	5.15E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI09	400	450	5.16E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI10	450	500	5.18E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI11	500	600	5.20E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI12	600	700	5.22E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI13	700	800	5.24E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI14	800	900	5.26E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI15	900	1000	5.28E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI16	1000	1200	5.30E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI17	1200	1400	5.33E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI18	1400	1600	5.36E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI19	1600	1800	5.39E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI20	1800	2000	5.42E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI21	2000	2300	5.45E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI22	2300	2600	5.49E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI23	2600	2900	5.52E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI24	2900	3200	5.56E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI25	3200	3600	5.59E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI26a	3600	3987	5.64E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI26b	3987	4000	5.66E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI27	4000	4500	5.68E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI28	4500	5000	5.74E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI29a	5000	5016	5.76E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI29b	5016	5500	5.79E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI30	5500	6000	5.83E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI31	6000	6500	5.88E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI32	6500	7000	5.92E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI33	7000	7500	5.97E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI34	7500	8000	6.01E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI35	8000	8500	6.06E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI36	8500	9000	6.10E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI37	9000	9500	6.14E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI38	9500	10000	6.18E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI39	10000	11000	6.24E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI40	11000	12000	6.32E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI41	12000	15000	6.47E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI42a	15000	16507	6.64E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI42b	16507	20000	6.83E-08	0.12	2.55	ReModerate	9	I-129
NATIVE_SOIL	TI01-TI42b	0	20000	5.30E-06	0.39	2.66	Sandy	0	I-129
ROOF	TI01	0	50	1.00E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI02	50	100	1.01E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI03	100	150	1.02E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI04	150	200	1.03E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI05	200	250	1.04E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI06	250	300	1.06E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI07	300	350	1.07E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI08	350	400	1.08E-07	0.136	2.56	OxModerate	15	I-129

Material zone	Time period(s)	Start time (yr)	End time (yr)	Effective diffusion coefficient (cm^2/s)	Porosity	Solid density (g/mL)	Sorption material	Sorption coefficient, Kd (mL/g)	Species
ROOF	TI09	400	450	1.09E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI10	450	500	1.10E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI11	500	600	1.12E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI12	600	700	1.15E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI13	700	800	1.17E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI14	800	900	1.20E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI15	900	1000	1.22E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI16	1000	1200	1.26E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI17	1200	1400	1.31E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI18	1400	1600	1.36E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI19	1600	1800	1.41E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI20	1800	2000	1.46E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI21	2000	2300	1.53E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI22	2300	2600	1.62E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI23	2600	2900	1.72E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI24	2900	3200	1.81E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI25	3200	3600	1.95E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI26a	3600	3987	2.11E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI26b	3987	4000	2.19E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI27	4000	4500	2.34E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI28	4500	5000	2.62E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI29a	5000	5016	2.77E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI29b	5016	5500	2.98E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI30	5500	6000	3.41E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI31	6000	6500	4.00E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI32	6500	7000	4.74E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI33	7000	7500	5.92E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI34	7500	8000	7.54E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI35	8000	8500	1.15E-06	0.136	2.56	OxModerate	15	I-129
ROOF	TI36	8500	9000	1.77E-06	0.136	2.56	OxModerate	15	I-129
ROOF	TI37	9000	9500	2.81E-06	0.136	2.56	OxModerate	15	I-129
ROOF	TI38	9500	10000	4.27E-06	0.136	2.56	OxModerate	15	I-129
ROOF	TI39-TI42a	10000	16507	5.30E-06	0.35	2.63	OxModerate	15	I-129
ROOF	TI42b	16507	20000	5.30E-06	0.35	2.63	OxAged	4	I-129
SALTSTONE	TI01-TI42b	0	20000	1.00E-07	0.58	2.4	ReModerate	9	I-129
SAND_DRAIN	TI01-TI16	0	1200	8.00E-06	0.417	2.66	Sandy	0	I-129
SAND_DRAIN	TI17-TI19	1200	1800	8.00E-06	0.416	2.66	Sandy	0	I-129
SAND_DRAIN	TI20-TI21	1800	2300	8.00E-06	0.415	2.66	Sandy	0	I-129
SAND_DRAIN	TI22-TI23	2300	2900	8.00E-06	0.414	2.66	Sandy	0	I-129
SAND_DRAIN	TI24	2900	3200	8.00E-06	0.413	2.66	Sandy	0	I-129
SAND_DRAIN	TI25	3200	3600	8.00E-06	0.412	2.66	Sandy	0	I-129
SAND_DRAIN	TI26a	3600	3987	8.00E-06	0.411	2.66	Sandy	0	I-129
SAND_DRAIN	TI26b	3987	4000	8.00E-06	0.41	2.66	Sandy	0	I-129
SAND_DRAIN	TI27	4000	4500	8.00E-06	0.409	2.66	Sandy	0	I-129
SAND_DRAIN	TI28-TI29a	4500	5016	8.00E-06	0.407	2.66	Sandy	0	I-129
SAND_DRAIN	TI29b	5016	5500	8.00E-06	0.406	2.66	Sandy	0	I-129
SAND_DRAIN	TI30	5500	6000	8.00E-06	0.404	2.66	Sandy	0	I-129
SAND_DRAIN	TI31	6000	6500	8.00E-06	0.402	2.66	Sandy	0	I-129
SAND_DRAIN	TI32	6500	7000	8.00E-06	0.4	2.66	Sandy	0	I-129
SAND_DRAIN	TI33	7000	7500	8.00E-06	0.398	2.66	Sandy	0	I-129
SAND_DRAIN	TI34	7500	8000	8.00E-06	0.396	2.66	Sandy	0	I-129
SAND_DRAIN	TI35	8000	8500	8.00E-06	0.394	2.66	Sandy	0	I-129
SAND_DRAIN	TI36	8500	9000	8.00E-06	0.392	2.66	Sandy	0	I-129

Material zone	Time period(s)	Start time (yr)	End time (yr)	Effective diffusion coefficient (cm^2/s)	Porosity	Solid density (g/mL)	Sorption material	Sorption coefficient, Kd (mL/g)	Species
SAND_DRAIN	TI37	9000	9500	8.00E-06	0.39	2.66	Sandy	0	I-129
SAND_DRAIN	TI38	9500	10000	8.00E-06	0.388	2.66	Sandy	0	I-129
SAND_DRAIN	TI39	10000	11000	8.00E-06	0.385	2.66	Sandy	0	I-129
SAND_DRAIN	TI40	11000	12000	8.00E-06	0.381	2.66	Sandy	0	I-129
SAND_DRAIN	TI41	12000	15000	8.00E-06	0.372	2.66	Sandy	0	I-129
SAND_DRAIN	TI42a	15000	16507	8.00E-06	0.363	2.66	Sandy	0	I-129
SAND_DRAIN	TI42b	16507	20000	8.00E-06	0.354	2.66	Sandy	0	I-129
SHEET_DRAIN	TI01-TI42b	0	20000	9.40E-06	0.3	2.6	Zero	0	I-129
WALL	TI01	0	50	5.02E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI02	50	100	5.06E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI03	100	150	5.09E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI04	150	200	5.11E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI05	200	250	5.14E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI06	250	300	5.16E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI07	300	350	5.18E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI08	350	400	5.20E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI09	400	450	5.22E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI10	450	500	5.24E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI11	500	600	5.26E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI12	600	700	5.30E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI13	700	800	5.33E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI14	800	900	5.35E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI15	900	1000	5.38E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI16	1000	1200	5.41E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI17	1200	1400	5.45E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI18	1400	1600	5.49E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI19	1600	1800	5.53E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI20	1800	2000	5.57E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI21	2000	2300	5.62E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI22	2300	2600	5.67E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI23	2600	2900	5.72E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI24	2900	3200	5.77E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI25	3200	3600	5.83E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI26a	3600	3987	5.89E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI26b	3987	4000	5.92E-08	0.12	2.55	OxModerate	15	I-129
WALL	TI27	4000	4500	5.96E-08	0.12	2.55	OxModerate	15	I-129
WALL	TI28	4500	5000	6.03E-08	0.12	2.55	OxModerate	15	I-129
WALL	TI29a	5000	5016	6.07E-08	0.12	2.55	OxModerate	15	I-129
WALL	TI29b	5016	5500	6.10E-08	0.12	2.55	OxAged	4	I-129
WALL	TI30	5500	6000	6.17E-08	0.12	2.55	OxAged	4	I-129
WALL	TI31	6000	6500	6.24E-08	0.12	2.55	OxAged	4	I-129
WALL	TI32	6500	7000	6.31E-08	0.12	2.55	OxAged	4	I-129
WALL	TI33	7000	7500	6.38E-08	0.12	2.55	OxAged	4	I-129
WALL	TI34	7500	8000	6.45E-08	0.12	2.55	OxAged	4	I-129
WALL	TI35	8000	8500	6.51E-08	0.12	2.55	OxAged	4	I-129
WALL	TI36	8500	9000	6.58E-08	0.12	2.55	OxAged	4	I-129
WALL	TI37	9000	9500	6.64E-08	0.12	2.55	OxAged	4	I-129
WALL	TI38	9500	10000	6.71E-08	0.12	2.55	OxAged	4	I-129
WALL	TI39	10000	11000	6.80E-08	0.12	2.55	OxAged	4	I-129
WALL	TI40	11000	12000	6.93E-08	0.12	2.55	OxAged	4	I-129
WALL	TI41	12000	15000	7.18E-08	0.12	2.55	OxAged	4	I-129
WALL	TI42a	15000	16507	7.46E-08	0.12	2.55	OxAged	4	I-129
WALL	TI42b	16507	20000	7.78E-08	0.12	2.55	OxAged	4	I-129

Vault 4, Case C, I-129

Material zone	Time period(s)	Start time (yr)	End time (yr)	Effective diffusion coefficient (cm^2/s)	Porosity	Solid density (g/mL)	Sorption material	Sorption coefficient, Kd (mL/g)	Species
BACKFILL	TI01-TI42	0	20000	5.30E-06	0.35	2.63	Clayey	0.6	I-129
CLEAN_GROUT	TI01-TI42	0	20000	1.00E-07	0.58	2.4	ReModerate	9	I-129
CRACK	TI01-TI42	0	20000	9.40E-06	0.3	2.6	Zero	0	I-129
FLOOR	TI01	0	50	5.01E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI02	50	100	5.04E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI03	100	150	5.07E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI04	150	200	5.09E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI05	200	250	5.10E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI06	250	300	5.12E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI07	300	350	5.14E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI08	350	400	5.15E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI09	400	450	5.16E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI10	450	500	5.18E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI11	500	600	5.20E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI12	600	700	5.22E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI13	700	800	5.24E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI14	800	900	5.26E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI15	900	1000	5.28E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI16	1000	1200	5.30E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI17	1200	1400	5.33E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI18	1400	1600	5.36E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI19	1600	1800	5.39E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI20	1800	2000	5.42E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI21	2000	2300	5.45E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI22	2300	2600	5.49E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI23	2600	2900	5.52E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI24a	2900	3069	5.55E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI24b	3069	3200	5.57E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI25a	3200	3363	5.58E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI25b	3363	3600	5.60E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI26	3600	4000	5.64E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI27	4000	4500	5.68E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI28	4500	5000	5.74E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI29	5000	5500	5.78E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI30	5500	6000	5.83E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI31	6000	6500	5.88E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI32	6500	7000	5.92E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI33	7000	7500	5.97E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI34	7500	8000	6.01E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI35	8000	8500	6.06E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI36	8500	9000	6.10E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI37	9000	9500	6.14E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI38	9500	10000	6.18E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI39	10000	11000	6.24E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI40a	11000	11151	6.29E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI40b	11151	12000	6.33E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI41	12000	15000	6.47E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI42	15000	20000	6.77E-08	0.12	2.55	ReModerate	9	I-129
NATIVE_SOIL	TI01-TI42	0	20000	5.30E-06	0.39	2.66	Sandy	0	I-129
ROOF	TI01	0	50	1.00E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI02	50	100	1.01E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI03	100	150	1.02E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI04	150	200	1.03E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI05	200	250	1.04E-07	0.136	2.56	OxModerate	15	I-129

Material zone	Time period(s)	Start time (yr)	End time (yr)	Effective diffusion coefficient (cm^2/s)	Porosity	Solid density (g/mL)	Sorption material	Sorption coefficient, Kd (mL/g)	Species
ROOF	TI06	250	300	1.06E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI07	300	350	1.07E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI08	350	400	1.08E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI09	400	450	1.09E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI10	450	500	1.10E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI11	500	600	1.12E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI12	600	700	1.15E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI13	700	800	1.17E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI14	800	900	1.20E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI15	900	1000	1.22E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI16	1000	1200	1.26E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI17	1200	1400	1.31E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI18	1400	1600	1.36E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI19	1600	1800	1.41E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI20	1800	2000	1.46E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI21	2000	2300	1.53E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI22	2300	2600	1.62E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI23	2600	2900	1.72E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI24a	2900	3069	1.79E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI24b	3069	3200	1.85E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI25a	3200	3363	1.91E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI25b	3363	3600	1.99E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI26	3600	4000	2.12E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI27	4000	4500	2.34E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI28	4500	5000	2.62E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI29	5000	5500	2.98E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI30	5500	6000	3.41E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI31	6000	6500	4.00E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI32	6500	7000	4.74E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI33	7000	7500	5.92E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI34	7500	8000	7.54E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI35	8000	8500	1.15E-06	0.136	2.56	OxModerate	15	I-129
ROOF	TI36	8500	9000	1.77E-06	0.136	2.56	OxModerate	15	I-129
ROOF	TI37	9000	9500	2.81E-06	0.136	2.56	OxModerate	15	I-129
ROOF	TI38	9500	10000	4.27E-06	0.136	2.56	OxModerate	15	I-129
ROOF	TI39-TI40a	10000	11151	5.30E-06	0.35	2.63	OxModerate	15	I-129
ROOF	TI40b-TI42	11151	20000	5.30E-06	0.35	2.63	OxAged	4	I-129
SALTSTONE	TI01-TI42	0	20000	1.00E-07	0.58	2.4	ReModerate	9	I-129
SAND_DRAIN	TI01-TI16	0	1200	8.00E-06	0.417	2.66	Sandy	0	I-129
SAND_DRAIN	TI17-TI19	1200	1800	8.00E-06	0.416	2.66	Sandy	0	I-129
SAND_DRAIN	TI20-TI21	1800	2300	8.00E-06	0.415	2.66	Sandy	0	I-129
SAND_DRAIN	TI22-TI23	2300	2900	8.00E-06	0.414	2.66	Sandy	0	I-129
SAND_DRAIN	TI24a-TI24b	2900	3200	8.00E-06	0.413	2.66	Sandy	0	I-129
SAND_DRAIN	TI25a-TI25b	3200	3600	8.00E-06	0.412	2.66	Sandy	0	I-129
SAND_DRAIN	TI26	3600	4000	8.00E-06	0.411	2.66	Sandy	0	I-129
SAND_DRAIN	TI27	4000	4500	8.00E-06	0.409	2.66	Sandy	0	I-129
SAND_DRAIN	TI28	4500	5000	8.00E-06	0.407	2.66	Sandy	0	I-129
SAND_DRAIN	TI29	5000	5500	8.00E-06	0.406	2.66	Sandy	0	I-129
SAND_DRAIN	TI30	5500	6000	8.00E-06	0.404	2.66	Sandy	0	I-129
SAND_DRAIN	TI31	6000	6500	8.00E-06	0.402	2.66	Sandy	0	I-129
SAND_DRAIN	TI32	6500	7000	8.00E-06	0.4	2.66	Sandy	0	I-129
SAND_DRAIN	TI33	7000	7500	8.00E-06	0.398	2.66	Sandy	0	I-129

Material zone	Time period(s)	Start time (yr)	End time (yr)	Effective diffusion coefficient (cm^2/s)	Porosity	Solid density (g/mL)	Sorption material	Sorption coefficient, Kd (mL/g)	Species
SAND_DRAIN	TI34	7500	8000	8.00E-06	0.396	2.66	Sandy	0	I-129
SAND_DRAIN	TI35	8000	8500	8.00E-06	0.394	2.66	Sandy	0	I-129
SAND_DRAIN	TI36	8500	9000	8.00E-06	0.392	2.66	Sandy	0	I-129
SAND_DRAIN	TI37	9000	9500	8.00E-06	0.39	2.66	Sandy	0	I-129
SAND_DRAIN	TI38	9500	10000	8.00E-06	0.388	2.66	Sandy	0	I-129
SAND_DRAIN	TI39	10000	11000	8.00E-06	0.385	2.66	Sandy	0	I-129
SAND_DRAIN	TI40a	11000	11151	8.00E-06	0.382	2.66	Sandy	0	I-129
SAND_DRAIN	TI40b	11151	12000	8.00E-06	0.38	2.66	Sandy	0	I-129
SAND_DRAIN	TI41	12000	15000	8.00E-06	0.372	2.66	Sandy	0	I-129
SAND_DRAIN	TI42	15000	20000	8.00E-06	0.357	2.66	Sandy	0	I-129
SHEET_DRAIN	TI01-TI42	0	20000	9.40E-06	0.3	2.6	Zero	0	I-129
WALL	TI01	0	50	5.02E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI02	50	100	5.06E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI03	100	150	5.09E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI04	150	200	5.11E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI05	200	250	5.14E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI06	250	300	5.16E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI07	300	350	5.18E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI08	350	400	5.20E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI09	400	450	5.22E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI10	450	500	5.24E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI11	500	600	5.26E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI12	600	700	5.30E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI13	700	800	5.33E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI14	800	900	5.35E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI15	900	1000	5.38E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI16	1000	1200	5.41E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI17	1200	1400	5.45E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI18	1400	1600	5.49E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI19	1600	1800	5.53E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI20	1800	2000	5.57E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI21	2000	2300	5.62E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI22	2300	2600	5.67E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI23	2600	2900	5.72E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI24a	2900	3069	5.76E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI24b	3069	3200	5.78E-08	0.12	2.55	OxModerate	15	I-129
WALL	TI25a	3200	3363	5.81E-08	0.12	2.55	OxModerate	15	I-129
WALL	TI25b	3363	3600	5.84E-08	0.12	2.55	OxAged	4	I-129
WALL	TI26	3600	4000	5.89E-08	0.12	2.55	OxAged	4	I-129
WALL	TI27	4000	4500	5.96E-08	0.12	2.55	OxAged	4	I-129
WALL	TI28	4500	5000	6.03E-08	0.12	2.55	OxAged	4	I-129
WALL	TI29	5000	5500	6.10E-08	0.12	2.55	OxAged	4	I-129
WALL	TI30	5500	6000	6.17E-08	0.12	2.55	OxAged	4	I-129
WALL	TI31	6000	6500	6.24E-08	0.12	2.55	OxAged	4	I-129
WALL	TI32	6500	7000	6.31E-08	0.12	2.55	OxAged	4	I-129
WALL	TI33	7000	7500	6.38E-08	0.12	2.55	OxAged	4	I-129
WALL	TI34	7500	8000	6.45E-08	0.12	2.55	OxAged	4	I-129
WALL	TI35	8000	8500	6.51E-08	0.12	2.55	OxAged	4	I-129
WALL	TI36	8500	9000	6.58E-08	0.12	2.55	OxAged	4	I-129
WALL	TI37	9000	9500	6.64E-08	0.12	2.55	OxAged	4	I-129
WALL	TI38	9500	10000	6.71E-08	0.12	2.55	OxAged	4	I-129
WALL	TI39	10000	11000	6.80E-08	0.12	2.55	OxAged	4	I-129
WALL	TI40a	11000	11151	6.88E-08	0.12	2.55	OxAged	4	I-129
WALL	TI40b	11151	12000	6.94E-08	0.12	2.55	OxAged	4	I-129
WALL	TI41	12000	15000	7.18E-08	0.12	2.55	OxAged	4	I-129

Material zone	Time period(s)	Start time (yr)	End time (yr)	Effective diffusion coefficient (cm^2/s)	Porosity	Solid density (g/mL)	Sorption material	Sorption coefficient, Kd (mL/g)	Species
WALL	TI42	15000	20000	7.68E-08	0.12	2.55	OxAged	4	I-129

Vault 4, Case D, I-129

Material zone	Time period(s)	Start time (yr)	End time (yr)	Effective diffusion coefficient (cm^2/s)	Porosity	Solid density (g/mL)	Sorption material	Sorption coefficient, Kd (mL/g)	Species
BACKFILL	TI01-TI42d	0	20000	5.30E-06	0.35	2.63	Clayey	0.6	I-129
CLEAN_GROUT	TI01-TI42d	0	20000	1.00E-07	0.58	2.4	ReModerate	9	I-129
CRACK	TI01-TI42d	0	20000	1.00E-07	0.58	2.4	ReModerate	9	I-129
FLOOR	TI01	0	50	5.01E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI02	50	100	5.04E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI03	100	150	5.07E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI04	150	200	5.09E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI05	200	250	5.10E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI06	250	300	5.12E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI07	300	350	5.14E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI08	350	400	5.15E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI09	400	450	5.16E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI10	450	500	5.18E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI11	500	600	5.20E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI12	600	700	5.22E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI13	700	800	5.24E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI14	800	900	5.26E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI15	900	1000	5.28E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI16	1000	1200	5.30E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI17	1200	1400	5.33E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI18	1400	1600	5.36E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI19	1600	1800	5.39E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI20	1800	2000	5.42E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI21	2000	2300	5.45E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI22	2300	2600	5.49E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI23	2600	2900	5.52E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI24	2900	3200	5.56E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI25	3200	3600	5.59E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI26	3600	4000	5.64E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI27	4000	4500	5.68E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI28	4500	5000	5.74E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI29	5000	5500	5.78E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI30	5500	6000	5.83E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI31	6000	6500	5.88E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI32	6500	7000	5.92E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI33	7000	7500	5.97E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI34	7500	8000	6.01E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI35	8000	8500	6.06E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI36	8500	9000	6.10E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI37	9000	9500	6.14E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI38	9500	10000	6.18E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI39	10000	11000	6.24E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI40	11000	12000	6.32E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI41	12000	15000	6.47E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI42a	15000	15555	6.61E-08	0.12	2.55	ReModerate	9	I-129

Material zone	Time period(s)	Start time (yr)	End time (yr)	Effective diffusion coefficient (cm²/s)	Porosity	Solid density (g/mL)	Sorption material	Sorption coefficient, Kd (mL/g)	Species
FLOOR	TI42b	15555	16052	6.65E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI42c	16052	16606	6.69E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI42d	16606	20000	6.83E-08	0.12	2.55	ReModerate	9	I-129
NATIVE_SOIL	TI01-TI42d	0	20000	5.30E-06	0.39	2.66	Sandy	0	I-129
ROOF	TI01	0	50	1.00E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI02	50	100	1.01E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI03	100	150	1.02E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI04	150	200	1.03E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI05	200	250	1.04E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI06	250	300	1.06E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI07	300	350	1.07E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI08	350	400	1.08E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI09	400	450	1.09E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI10	450	500	1.10E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI11	500	600	1.12E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI12	600	700	1.15E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI13	700	800	1.17E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI14	800	900	1.20E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI15	900	1000	1.22E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI16	1000	1200	1.26E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI17	1200	1400	1.31E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI18	1400	1600	1.36E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI19	1600	1800	1.41E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI20	1800	2000	1.46E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI21	2000	2300	1.53E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI22	2300	2600	1.62E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI23	2600	2900	1.72E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI24	2900	3200	1.81E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI25	3200	3600	1.95E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI26	3600	4000	2.12E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI27	4000	4500	2.34E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI28	4500	5000	2.62E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI29	5000	5500	2.98E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI30	5500	6000	3.41E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI31	6000	6500	4.00E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI32	6500	7000	4.74E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI33	7000	7500	5.92E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI34	7500	8000	7.54E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI35	8000	8500	1.15E-06	0.136	2.56	OxModerate	15	I-129
ROOF	TI36	8500	9000	1.77E-06	0.136	2.56	OxModerate	15	I-129
ROOF	TI37	9000	9500	2.81E-06	0.136	2.56	OxModerate	15	I-129
ROOF	TI38	9500	10000	4.27E-06	0.136	2.56	OxModerate	15	I-129
ROOF	TI39-TI42c	10000	16606	5.30E-06	0.35	2.63	OxModerate	15	I-129
ROOF	TI42d	16606	20000	5.30E-06	0.35	2.63	OxAged	4	I-129
SALTSTONE	TI01-TI42d	0	20000	1.00E-07	0.58	2.4	ReModerate	9	I-129
SAND_DRAIN	TI01-TI16	0	1200	8.00E-06	0.417	2.66	Sandy	0	I-129
SAND_DRAIN	TI17-TI19	1200	1800	8.00E-06	0.416	2.66	Sandy	0	I-129
SAND_DRAIN	TI20-TI21	1800	2300	8.00E-06	0.415	2.66	Sandy	0	I-129
SAND_DRAIN	TI22-TI23	2300	2900	8.00E-06	0.414	2.66	Sandy	0	I-129
SAND_DRAIN	TI24	2900	3200	8.00E-06	0.413	2.66	Sandy	0	I-129
SAND_DRAIN	TI25	3200	3600	8.00E-06	0.412	2.66	Sandy	0	I-129
SAND_DRAIN	TI26	3600	4000	8.00E-06	0.411	2.66	Sandy	0	I-129
SAND_DRAIN	TI27	4000	4500	8.00E-06	0.409	2.66	Sandy	0	I-129

Material zone	Time period(s)	Start time (yr)	End time (yr)	Effective diffusion coefficient (cm^2/s)	Porosity	Solid density (g/mL)	Sorption material	Sorption coefficient, Kd (mL/g)	Species
SAND_DRAIN	TI28	4500	5000	8.00E-06	0.407	2.66	Sandy	0	I-129
SAND_DRAIN	TI29	5000	5500	8.00E-06	0.406	2.66	Sandy	0	I-129
SAND_DRAIN	TI30	5500	6000	8.00E-06	0.404	2.66	Sandy	0	I-129
SAND_DRAIN	TI31	6000	6500	8.00E-06	0.402	2.66	Sandy	0	I-129
SAND_DRAIN	TI32	6500	7000	8.00E-06	0.4	2.66	Sandy	0	I-129
SAND_DRAIN	TI33	7000	7500	8.00E-06	0.398	2.66	Sandy	0	I-129
SAND_DRAIN	TI34	7500	8000	8.00E-06	0.396	2.66	Sandy	0	I-129
SAND_DRAIN	TI35	8000	8500	8.00E-06	0.394	2.66	Sandy	0	I-129
SAND_DRAIN	TI36	8500	9000	8.00E-06	0.392	2.66	Sandy	0	I-129
SAND_DRAIN	TI37	9000	9500	8.00E-06	0.39	2.66	Sandy	0	I-129
SAND_DRAIN	TI38	9500	10000	8.00E-06	0.388	2.66	Sandy	0	I-129
SAND_DRAIN	TI39	10000	11000	8.00E-06	0.385	2.66	Sandy	0	I-129
SAND_DRAIN	TI40	11000	12000	8.00E-06	0.381	2.66	Sandy	0	I-129
SAND_DRAIN	TI41	12000	15000	8.00E-06	0.372	2.66	Sandy	0	I-129
SAND_DRAIN	TI42a	15000	15555	8.00E-06	0.365	2.66	Sandy	0	I-129
SAND_DRAIN	TI42b	15555	16052	8.00E-06	0.363	2.66	Sandy	0	I-129
SAND_DRAIN	TI42c	16052	16606	8.00E-06	0.361	2.66	Sandy	0	I-129
SAND_DRAIN	TI42d	16606	20000	8.00E-06	0.353	2.66	Sandy	0	I-129
SHEET_DRAIN	TI01-TI42d	0	20000	1.00E-13	0.3	2.14	Zero	0	I-129
WALL	TI01	0	50	5.02E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI02	50	100	5.06E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI03	100	150	5.09E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI04	150	200	5.11E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI05	200	250	5.14E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI06	250	300	5.16E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI07	300	350	5.18E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI08	350	400	5.20E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI09	400	450	5.22E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI10	450	500	5.24E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI11	500	600	5.26E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI12	600	700	5.30E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI13	700	800	5.33E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI14	800	900	5.35E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI15	900	1000	5.38E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI16	1000	1200	5.41E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI17	1200	1400	5.45E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI18	1400	1600	5.49E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI19	1600	1800	5.53E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI20	1800	2000	5.57E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI21	2000	2300	5.62E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI22	2300	2600	5.67E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI23	2600	2900	5.72E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI24	2900	3200	5.77E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI25	3200	3600	5.83E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI26	3600	4000	5.89E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI27	4000	4500	5.96E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI28	4500	5000	6.03E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI29	5000	5500	6.10E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI30	5500	6000	6.17E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI31	6000	6500	6.24E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI32	6500	7000	6.31E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI33	7000	7500	6.38E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI34	7500	8000	6.45E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI35	8000	8500	6.51E-08	0.12	2.55	ReModerate	9	I-129

Material zone	Time period(s)	Start time (yr)	End time (yr)	Effective diffusion coefficient (cm²/s)	Porosity	Solid density (g/mL)	Sorption material	Sorption coefficient, Kd (mL/g)	Species
WALL	TI36	8500	9000	6.58E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI37	9000	9500	6.64E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI38	9500	10000	6.71E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI39	10000	11000	6.80E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI40	11000	12000	6.93E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI41	12000	15000	7.18E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI42a	15000	15555	7.40E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI42b	15555	16052	7.47E-08	0.12	2.55	OxModerate	15	I-129
WALL	TI42c	16052	16606	7.53E-08	0.12	2.55	OxAged	4	I-129
WALL	TI42d	16606	20000	7.78E-08	0.12	2.55	OxAged	4	I-129

Vault 4, Case E, I-129

Material zone	Time period(s)	Start time (yr)	End time (yr)	Effective diffusion coefficient (cm²/s)	Porosity	Solid density (g/mL)	Sorption material	Sorption coefficient, Kd (mL/g)	Species
BACKFILL	TI01-TI43c	0	40000	5.30E-06	0.35	2.63	Clayey	0.6	I-129
CLEAN_GROUT	TI01-TI41a	0	12839	1.00E-07	0.58	2.4	ReModerate	9	I-129
CLEAN_GROUT	TI41b-TI43a	12839	25004	1.00E-07	0.58	2.4	OxModerate	15	I-129
CLEAN_GROUT	TI43b-TI43c	25004	40000	1.00E-07	0.58	2.4	OxAged	4	I-129
CRACK	TI01-TI43b	0	39421	1.00E-07	0.58	2.4	ReModerate	9	I-129
CRACK	TI43c	39421	40000	1.00E-07	0.58	2.4	OxModerate	15	I-129
FLOOR	TI01	0	50	5.01E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI02	50	100	5.04E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI03	100	150	5.07E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI04	150	200	5.09E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI05	200	250	5.10E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI06	250	300	5.12E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI07	300	350	5.14E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI08	350	400	5.15E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI09	400	450	5.16E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI10	450	500	5.18E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI11	500	600	5.20E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI12	600	700	5.22E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI13	700	800	5.24E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI14	800	900	5.26E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI15	900	1000	5.28E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI16	1000	1200	5.30E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI17	1200	1400	5.33E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI18	1400	1600	5.36E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI19	1600	1800	5.39E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI20	1800	2000	5.42E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI21	2000	2300	5.45E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI22	2300	2600	5.49E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI23	2600	2900	5.52E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI24	2900	3200	5.56E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI25	3200	3600	5.59E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI26	3600	4000	5.64E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI27	4000	4500	5.68E-08	0.12	2.55	ReModerate	9	I-129

Material zone	Time period(s)	Start time (yr)	End time (yr)	Effective diffusion coefficient (cm^2/s)	Porosity	Solid density (g/mL)	Sorption material	Sorption coefficient, Kd (mL/g)	Species
FLOOR	TI28a	4500	4594	5.71E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI28b	4594	5000	5.74E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI29a	5000	5134	5.77E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI29b	5134	5500	5.79E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI30a	5500	5836	5.82E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI30b	5836	6000	5.85E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI31	6000	6500	5.88E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI32	6500	7000	5.92E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI33	7000	7500	5.97E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI34	7500	8000	6.01E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI35	8000	8500	6.06E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI36	8500	9000	6.10E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI37	9000	9500	6.14E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI38	9500	10000	6.18E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI39	10000	11000	6.24E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI40	11000	12000	6.32E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI41a	12000	12839	6.39E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI41b	12839	15000	6.51E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI42	15000	20000	6.77E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI43a	20000	25004	7.13E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI43b	25004	39421	7.82E-08	0.12	2.55	ReModerate	9	I-129
FLOOR	TI43c	39421	40000	8.75E-08	0.12	2.55	ReModerate	9	I-129
NATIVE_SOIL	TI01-TI43c	0	40000	5.30E-06	0.39	2.66	Sandy	0	I-129
ROOF	TI01	0	50	1.00E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI02	50	100	1.01E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI03	100	150	1.02E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI04	150	200	1.03E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI05	200	250	1.04E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI06	250	300	1.06E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI07	300	350	1.07E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI08	350	400	1.08E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI09	400	450	1.09E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI10	450	500	1.10E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI11	500	600	1.12E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI12	600	700	1.15E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI13	700	800	1.17E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI14	800	900	1.20E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI15	900	1000	1.22E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI16	1000	1200	1.26E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI17	1200	1400	1.31E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI18	1400	1600	1.36E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI19	1600	1800	1.41E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI20	1800	2000	1.46E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI21	2000	2300	1.53E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI22	2300	2600	1.62E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI23	2600	2900	1.72E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI24	2900	3200	1.81E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI25	3200	3600	1.95E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI26	3600	4000	2.12E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI27	4000	4500	2.34E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI28a	4500	4594	2.51E-07	0.136	2.56	OxModerate	15	I-129
ROOF	TI28b	4594	5000	2.65E-07	0.136	2.56	OxAged	4	I-129
ROOF	TI29a	5000	5134	2.82E-07	0.136	2.56	OxAged	4	I-129
ROOF	TI29b	5134	5500	3.03E-07	0.136	2.56	OxAged	4	I-129

Material zone	Time period(s)	Start time (yr)	End time (yr)	Effective diffusion coefficient (cm^2/s)	Porosity	Solid density (g/mL)	Sorption material	Sorption coefficient, Kd (mL/g)	Species
ROOF	TI30a	5500	5836	3.34E-07	0.136	2.56	OxAged	4	I-129
ROOF	TI30b	5836	6000	3.55E-07	0.136	2.56	OxAged	4	I-129
ROOF	TI31	6000	6500	4.00E-07	0.136	2.56	OxAged	4	I-129
ROOF	TI32	6500	7000	4.74E-07	0.136	2.56	OxAged	4	I-129
ROOF	TI33	7000	7500	5.92E-07	0.136	2.56	OxAged	4	I-129
ROOF	TI34	7500	8000	7.54E-07	0.136	2.56	OxAged	4	I-129
ROOF	TI35	8000	8500	1.15E-06	0.136	2.56	OxAged	4	I-129
ROOF	TI36	8500	9000	1.77E-06	0.136	2.56	OxAged	4	I-129
ROOF	TI37	9000	9500	2.81E-06	0.136	2.56	OxAged	4	I-129
ROOF	TI38	9500	10000	4.27E-06	0.136	2.56	OxAged	4	I-129
ROOF	TI39-TI43c	10000	40000	5.30E-06	0.35	2.63	OxAged	4	I-129
SALTSTONE	TI01-TI43b	0	39421	1.00E-07	0.58	2.4	ReModerate	9	I-129
SALTSTONE	TI43c	39421	40000	1.00E-07	0.58	2.4	OxModerate	15	I-129
SAND_DRAIN	TI01-TI16	0	1200	8.00E-06	0.417	2.66	Sandy	0	I-129
SAND_DRAIN	TI17-TI19	1200	1800	8.00E-06	0.416	2.66	Sandy	0	I-129
SAND_DRAIN	TI20-TI21	1800	2300	8.00E-06	0.415	2.66	Sandy	0	I-129
SAND_DRAIN	TI22-TI23	2300	2900	8.00E-06	0.414	2.66	Sandy	0	I-129
SAND_DRAIN	TI24	2900	3200	8.00E-06	0.413	2.66	Sandy	0	I-129
SAND_DRAIN	TI25	3200	3600	8.00E-06	0.412	2.66	Sandy	0	I-129
SAND_DRAIN	TI26	3600	4000	8.00E-06	0.411	2.66	Sandy	0	I-129
SAND_DRAIN	TI27	4000	4500	8.00E-06	0.409	2.66	Sandy	0	I-129
SAND_DRAIN	TI28a	4500	4594	8.00E-06	0.408	2.66	Sandy	0	I-129
SAND_DRAIN	TI28b	4594	5000	8.00E-06	0.407	2.66	Sandy	0	I-129
SAND_DRAIN	TI29a-TI29b	5000	5500	8.00E-06	0.406	2.66	Sandy	0	I-129
SAND_DRAIN	TI30a	5500	5836	8.00E-06	0.404	2.66	Sandy	0	I-129
SAND_DRAIN	TI30b	5836	6000	8.00E-06	0.403	2.66	Sandy	0	I-129
SAND_DRAIN	TI31	6000	6500	8.00E-06	0.402	2.66	Sandy	0	I-129
SAND_DRAIN	TI32	6500	7000	8.00E-06	0.4	2.66	Sandy	0	I-129
SAND_DRAIN	TI33	7000	7500	8.00E-06	0.398	2.66	Sandy	0	I-129
SAND_DRAIN	TI34	7500	8000	8.00E-06	0.396	2.66	Sandy	0	I-129
SAND_DRAIN	TI35	8000	8500	8.00E-06	0.394	2.66	Sandy	0	I-129
SAND_DRAIN	TI36	8500	9000	8.00E-06	0.392	2.66	Sandy	0	I-129
SAND_DRAIN	TI37	9000	9500	8.00E-06	0.39	2.66	Sandy	0	I-129
SAND_DRAIN	TI38	9500	10000	8.00E-06	0.388	2.66	Sandy	0	I-129
SAND_DRAIN	TI39	10000	11000	8.00E-06	0.385	2.66	Sandy	0	I-129
SAND_DRAIN	TI40	11000	12000	8.00E-06	0.381	2.66	Sandy	0	I-129
SAND_DRAIN	TI41a	12000	12839	8.00E-06	0.377	2.66	Sandy	0	I-129
SAND_DRAIN	TI41b	12839	15000	8.00E-06	0.371	2.66	Sandy	0	I-129
SAND_DRAIN	TI42	15000	20000	8.00E-06	0.357	2.66	Sandy	0	I-129
SAND_DRAIN	TI43a-TI43c	20000	40000	5.30E-06	0.35	2.63	Clayey	0.6	I-129
SHEET_DRAIN	TI01-TI43b	0	39421	1.00E-07	0.58	2.4	ReModerate	9	I-129
SHEET_DRAIN	TI43c	39421	40000	1.00E-07	0.58	2.4	OxModerate	15	I-129
WALL	TI01	0	50	5.02E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI02	50	100	5.06E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI03	100	150	5.09E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI04	150	200	5.11E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI05	200	250	5.14E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI06	250	300	5.16E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI07	300	350	5.18E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI08	350	400	5.20E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI09	400	450	5.22E-08	0.12	2.55	ReModerate	9	I-129

Material zone	Time period(s)	Start time (yr)	End time (yr)	Effective diffusion coefficient (cm^2/s)	Porosity	Solid density (g/mL)	Sorption material	Sorption coefficient, Kd (mL/g)	Species
WALL	TI10	450	500	5.24E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI11	500	600	5.26E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI12	600	700	5.30E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI13	700	800	5.33E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI14	800	900	5.35E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI15	900	1000	5.38E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI16	1000	1200	5.41E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI17	1200	1400	5.45E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI18	1400	1600	5.49E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI19	1600	1800	5.53E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI20	1800	2000	5.57E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI21	2000	2300	5.62E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI22	2300	2600	5.67E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI23	2600	2900	5.72E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI24	2900	3200	5.77E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI25	3200	3600	5.83E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI26	3600	4000	5.89E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI27	4000	4500	5.96E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI28a	4500	4594	6.00E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI28b	4594	5000	6.04E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI29a	5000	5134	6.08E-08	0.12	2.55	ReModerate	9	I-129
WALL	TI29b	5134	5500	6.11E-08	0.12	2.55	OxModerate	15	I-129
WALL	TI30a	5500	5836	6.16E-08	0.12	2.55	OxModerate	15	I-129
WALL	TI30b	5836	6000	6.20E-08	0.12	2.55	OxAged	4	I-129
WALL	TI31	6000	6500	6.24E-08	0.12	2.55	OxAged	4	I-129
WALL	TI32	6500	7000	6.31E-08	0.12	2.55	OxAged	4	I-129
WALL	TI33	7000	7500	6.38E-08	0.12	2.55	OxAged	4	I-129
WALL	TI34	7500	8000	6.45E-08	0.12	2.55	OxAged	4	I-129
WALL	TI35	8000	8500	6.51E-08	0.12	2.55	OxAged	4	I-129
WALL	TI36	8500	9000	6.58E-08	0.12	2.55	OxAged	4	I-129
WALL	TI37	9000	9500	6.64E-08	0.12	2.55	OxAged	4	I-129
WALL	TI38	9500	10000	6.71E-08	0.12	2.55	OxAged	4	I-129
WALL	TI39	10000	11000	6.80E-08	0.12	2.55	OxAged	4	I-129
WALL	TI40	11000	12000	6.93E-08	0.12	2.55	OxAged	4	I-129
WALL	TI41a	12000	12839	7.04E-08	0.12	2.55	OxAged	4	I-129
WALL	TI41b	12839	15000	7.23E-08	0.12	2.55	OxAged	4	I-129
WALL	TI42	15000	20000	7.68E-08	0.12	2.55	OxAged	4	I-129
WALL	TI43a	20000	25004	8.32E-08	0.12	2.55	OxAged	4	I-129
WALL	TI43b	25004	39421	9.65E-08	0.12	2.55	OxAged	4	I-129
WALL	TI43c	39421	40000	1.17E-07	0.12	2.55	OxAged	4	I-129

Appendix G - Flux to the water table for CaseA

G.1 – Vault 1 Flux to the Water Table

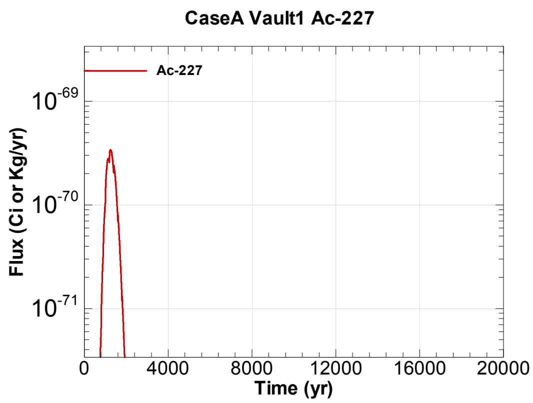

Figure G.1-1 - Flux to the Water Table for CaseA Vault1 Ac-227

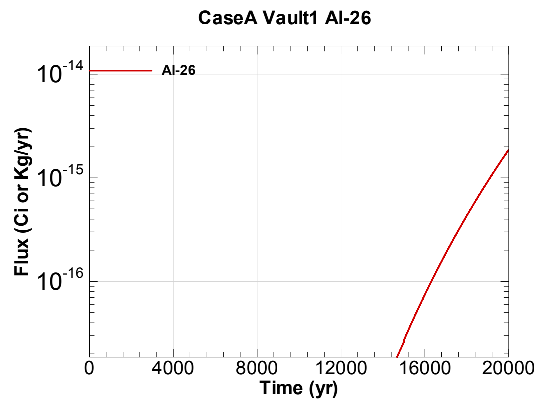

Figure G.1-2 - Flux to the Water Table for CaseA Vault1 Al-26

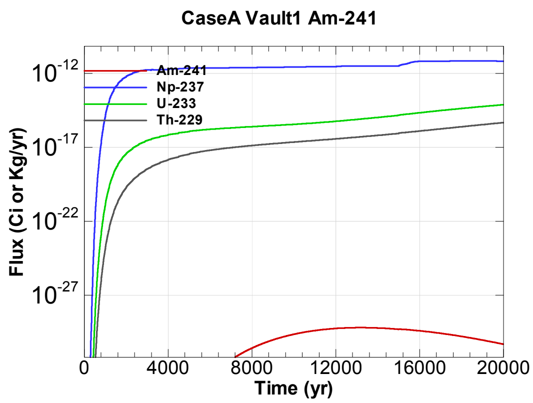

Figure G.1-3 - Flux to the Water Table for CaseA Vault1 Am-241

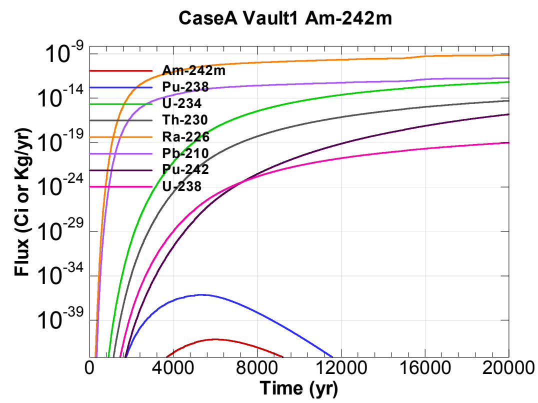

Figure G.1-4 - Flux to the Water Table for CaseA Vault1 Am-242m

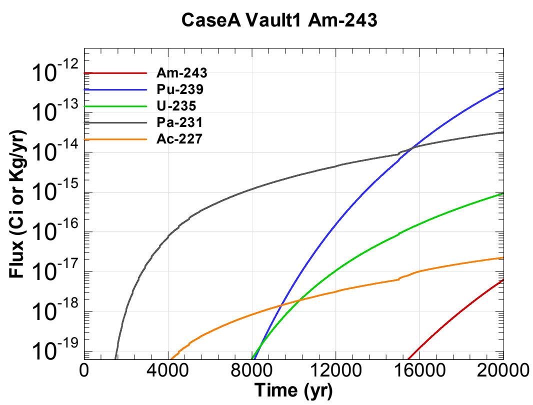

Figure G.1-5 - Flux to the Water Table for CaseA Vault1 Am-243

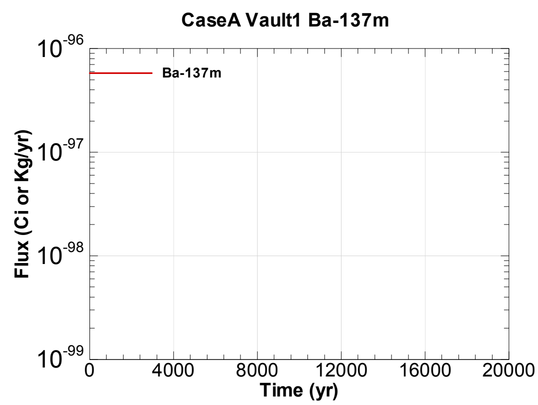

Figure G.1-6 - Flux to the Water Table for CaseA Vault1 Ba-137m

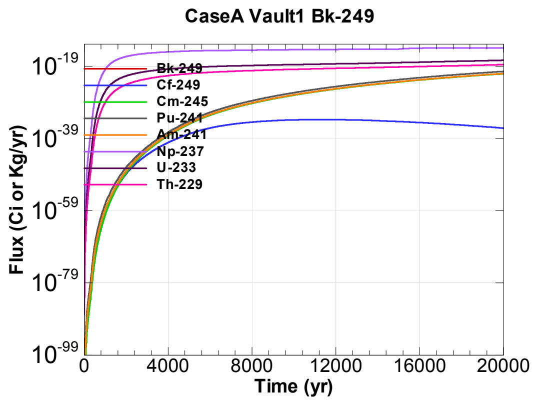

Figure G.1-7 - Flux to the Water Table for CaseA Vault1 Bk-249

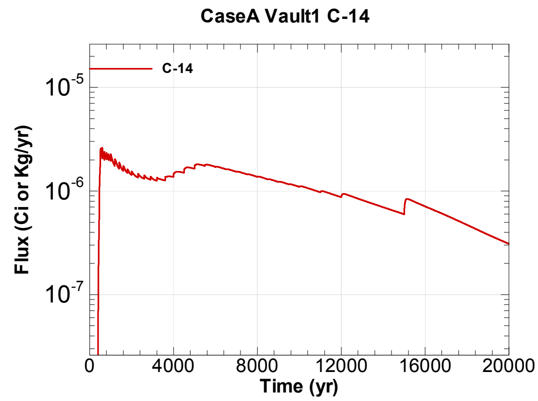

Figure G.1-8 - Flux to the Water Table for CaseA Vault1 C-14

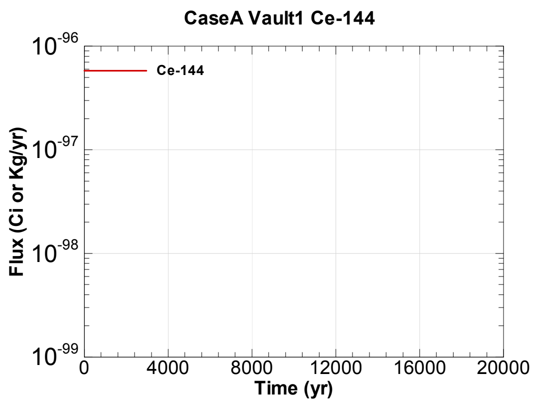

Figure G.1-9 - Flux to the Water Table for CaseA Vault1 Ce-144

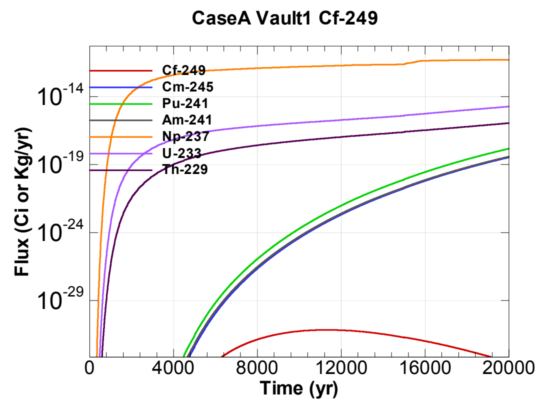

Figure G.1-10 - Flux to the Water Table for CaseA Vault1 Cf-249

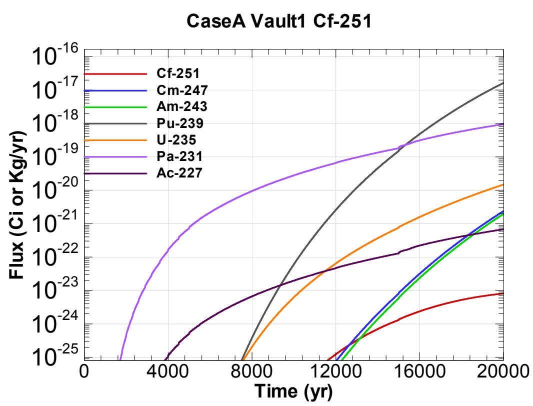

Figure G.1-11 - Flux to the Water Table for CaseA Vault1 Cf-251

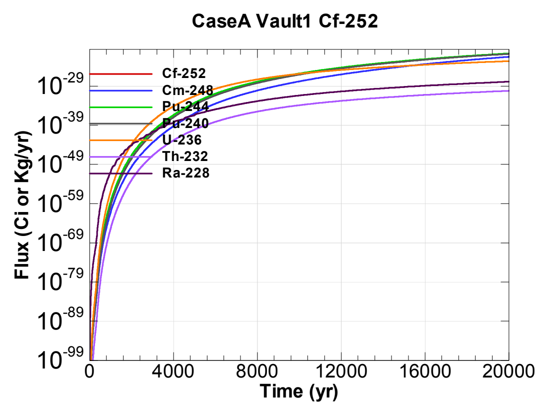

Figure G.1-12 - Flux to the Water Table for CaseA Vault1 Cf-252

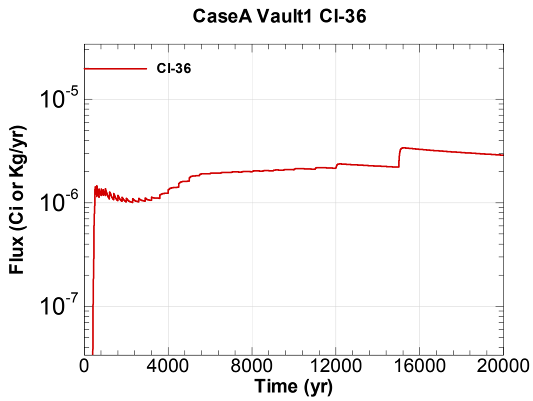

Figure G.1-13 - Flux to the Water Table for CaseA Vault1 Cl-36

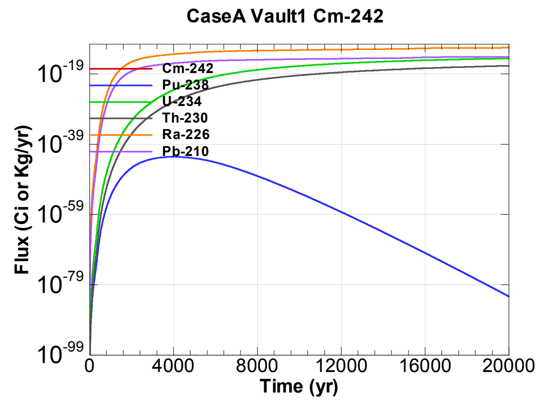

Figure G.1-14 - Flux to the Water Table for CaseA Vault1 Cm-242

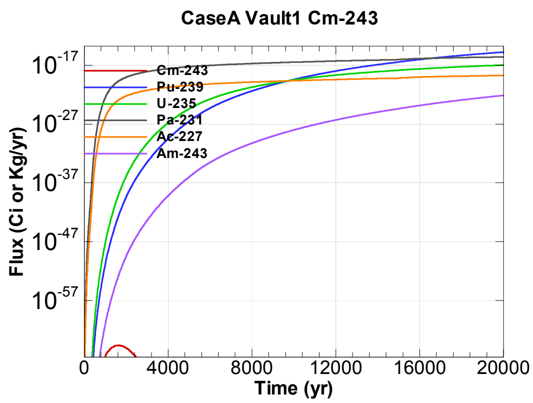

Figure G.1-15 - Flux to the Water Table for CaseA Vault1 Cm-243

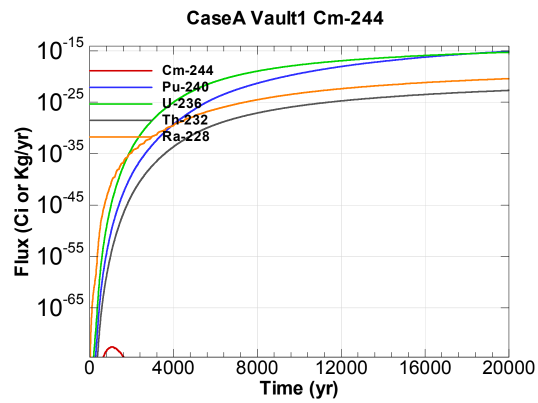

Figure G.1-16 - Flux to the Water Table for CaseA Vault1 Cm-244

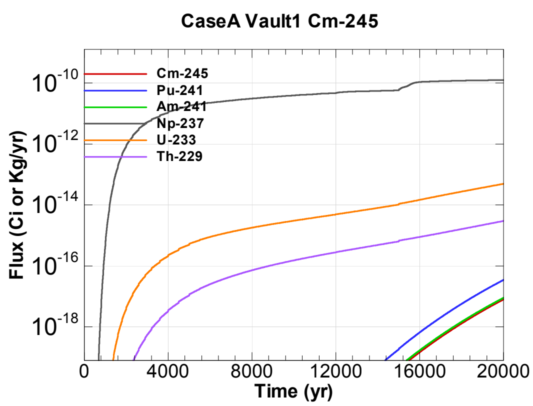

Figure G.1-17 - Flux to the Water Table for CaseA Vault1 Cm-245

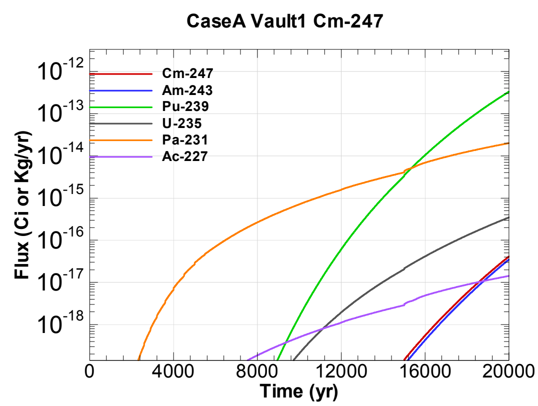

Figure G.1-18 - Flux to the Water Table for CaseA Vault1 Cm-247

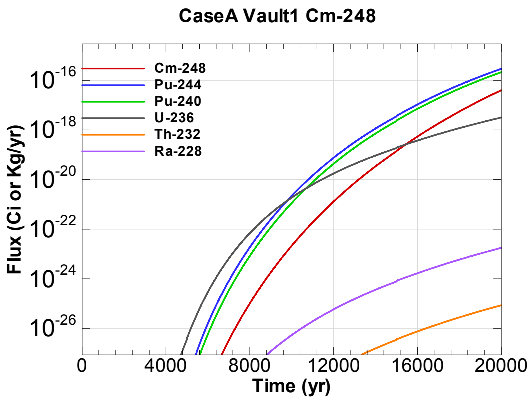

Figure G.1-19 - Flux to the Water Table for CaseA Vault1 Cm-248

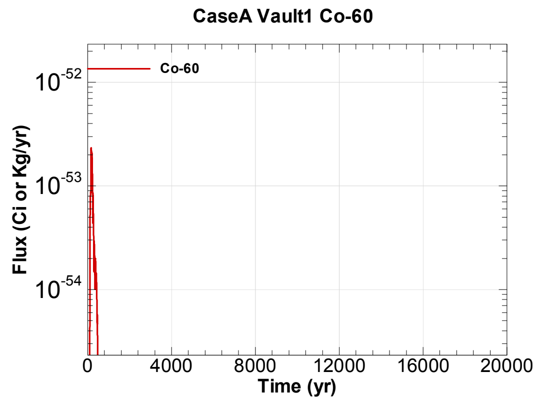

Figure G.1-20 - Flux to the Water Table for CaseA Vault1 Co-60

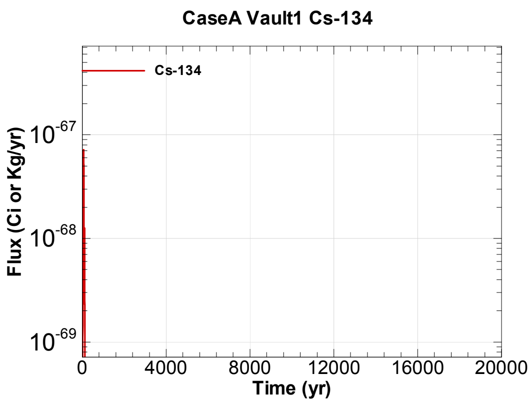

Figure G.1-21 - Flux to the Water Table for CaseA Vault1 Cs-134

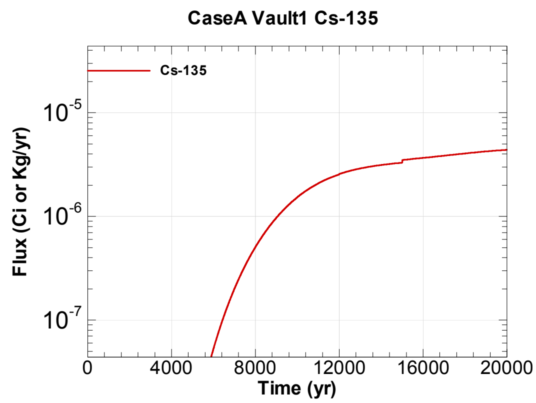

Figure G.1-22 - Flux to the Water Table for CaseA Vault1 Cs-135

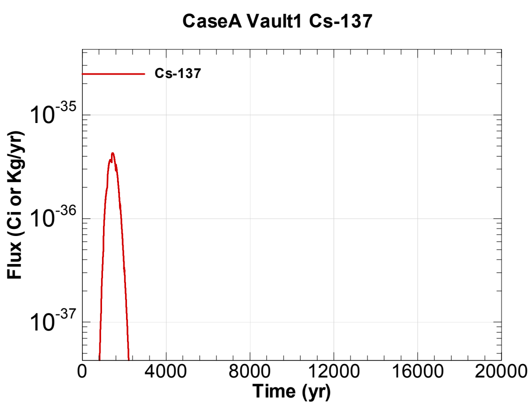

Figure G.1-23 - Flux to the Water Table for CaseA Vault1 Cs-137

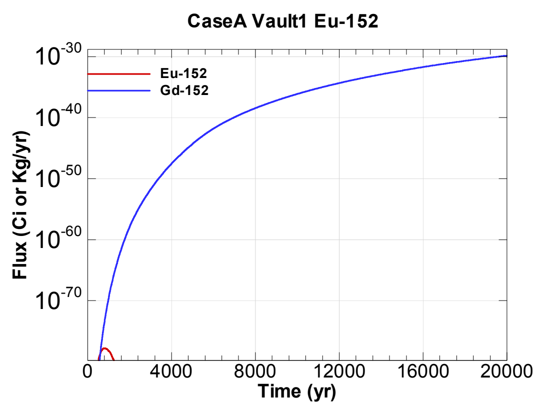

Figure G.1-24 - Flux to the Water Table for CaseA Vault1 Eu-152

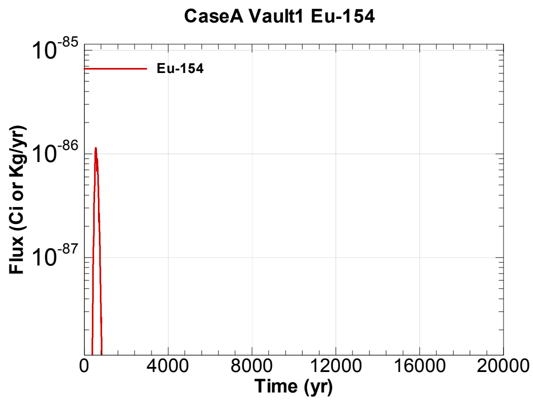

Figure G.1-25 - Flux to the Water Table for CaseA Vault1 Eu-154

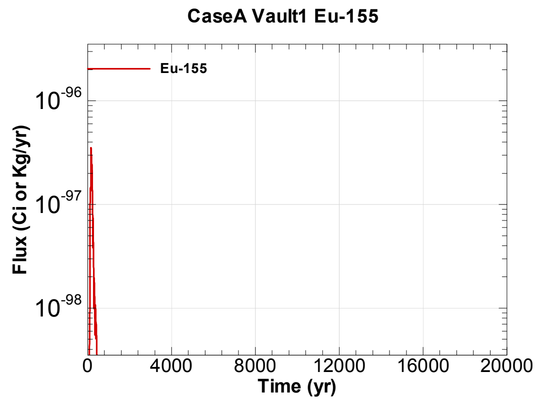

Figure G.1-26 - Flux to the Water Table for CaseA Vault1 Eu-155

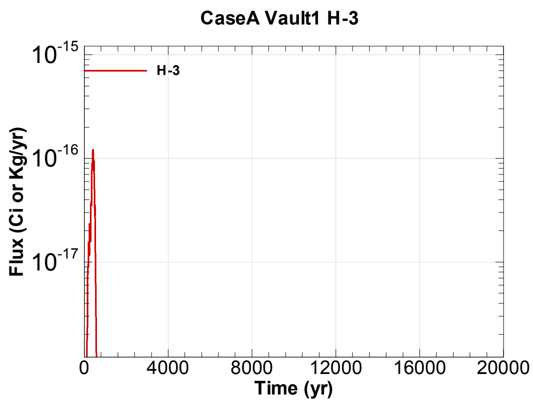

Figure G.1-27 - Flux to the Water Table for CaseA Vault1 H-3

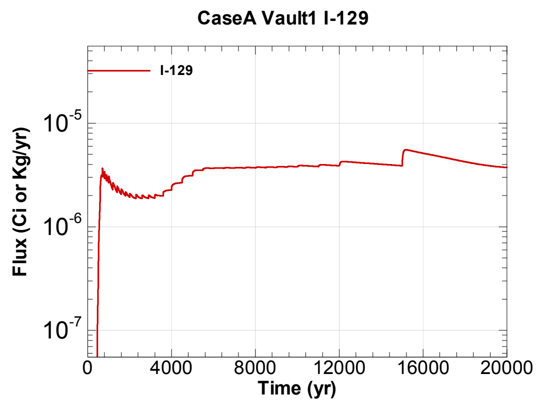

Figure G.1-28 - Flux to the Water Table for CaseA Vault1 I-129

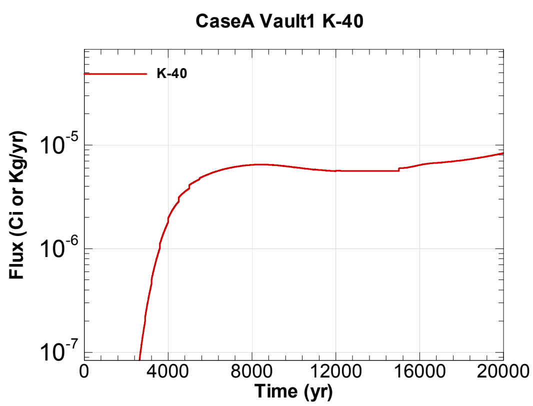

Figure G.1-29 - Flux to the Water Table for CaseA Vault1 K-40

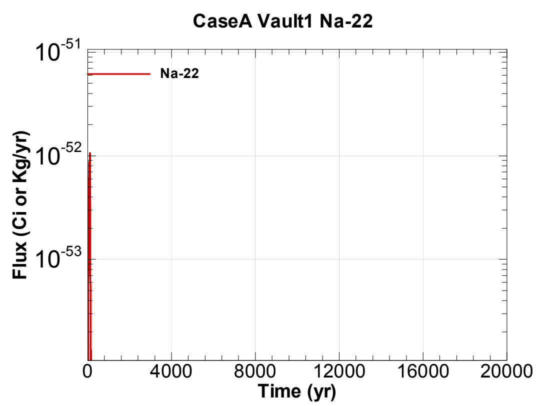

Figure G.1-30 - Flux to the Water Table for CaseA Vault1 Na-22

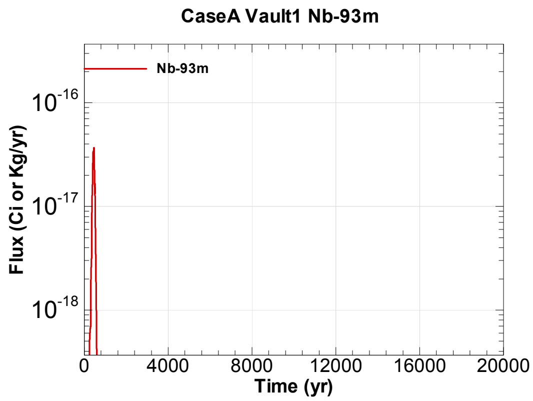

Figure G.1-31 - Flux to the Water Table for CaseA Vault1 Nb-93m

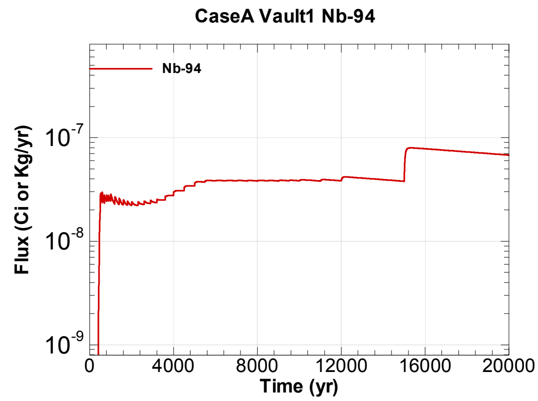

Figure G.1-32 - Flux to the Water Table for CaseA Vault1 Nb-94

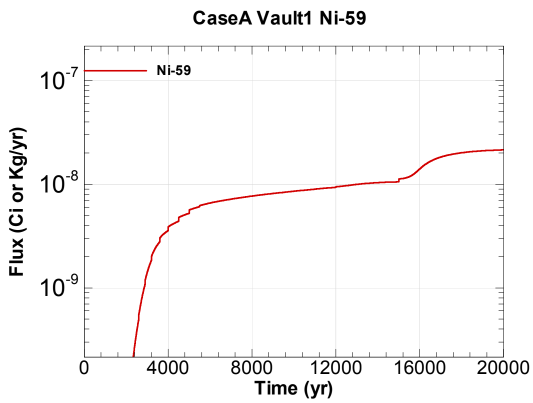

Figure G.1-33 - Flux to the Water Table for CaseA Vault1 Ni-59

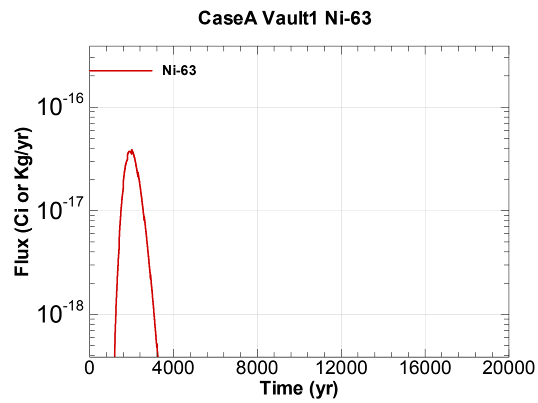

Figure G.1-34 - Flux to the Water Table for CaseA Vault1 Ni-63

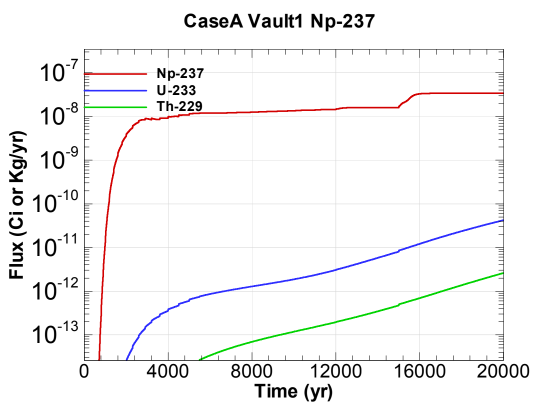

Figure G.1-35 - Flux to the Water Table for CaseA Vault1 Np-237

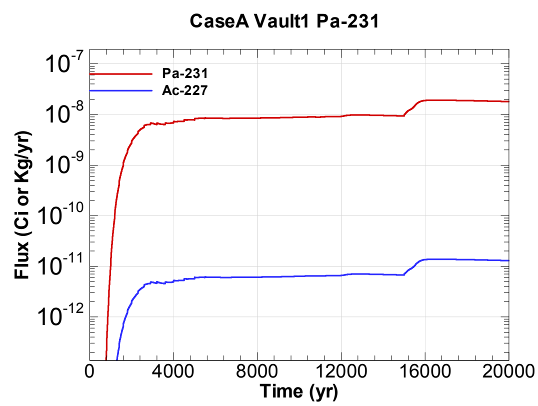

Figure G.1-36 - Flux to the Water Table for CaseA Vault1 Pa-231

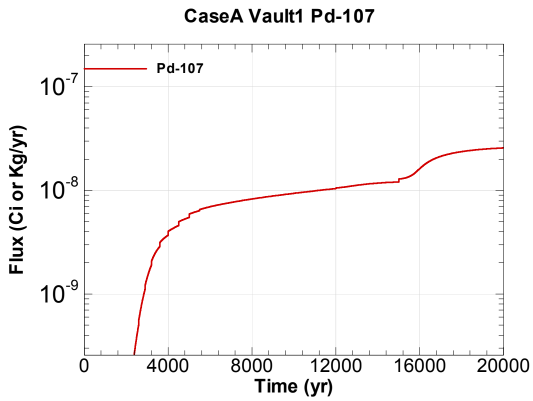

Figure G.1-37 - Flux to the Water Table for CaseA Vault1 Pd-107

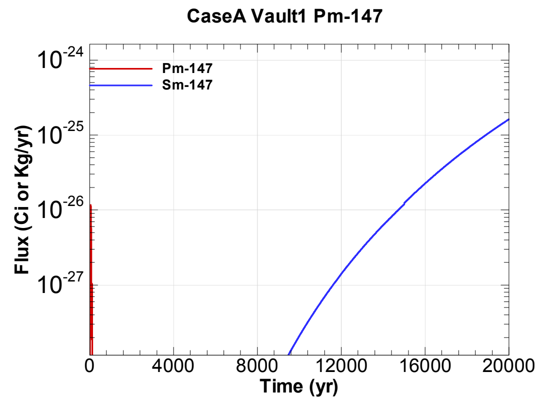

Figure G.1-38 - Flux to the Water Table for CaseA Vault1 Pm-147

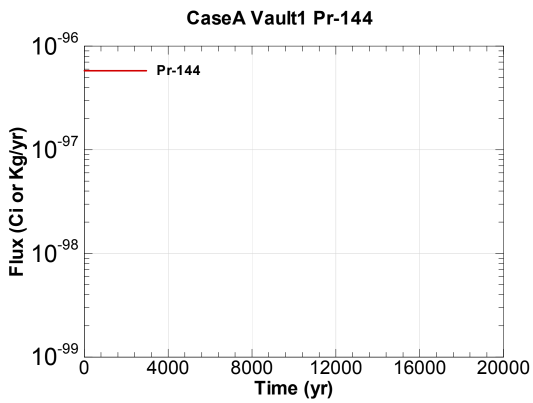

Figure G.1-39 - Flux to the Water Table for CaseA Vault1 Pr-144

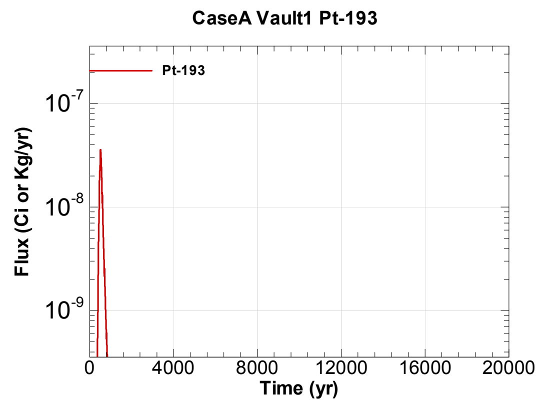

Figure G.1-40 - Flux to the Water Table for CaseA Vault1 Pt-193

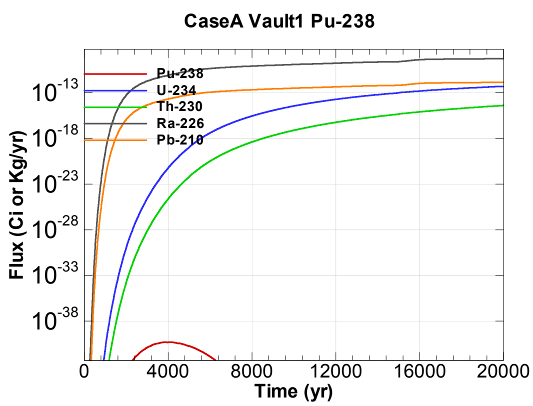

Figure G.1-41 - Flux to the Water Table for CaseA Vault1 Pu-238

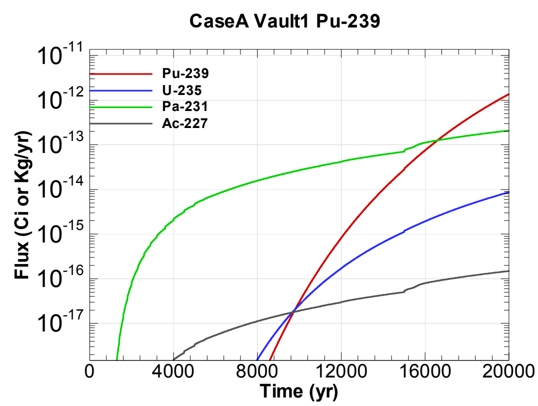

Figure G.1-42 - Flux to the Water Table for CaseA Vault1 Pu-239

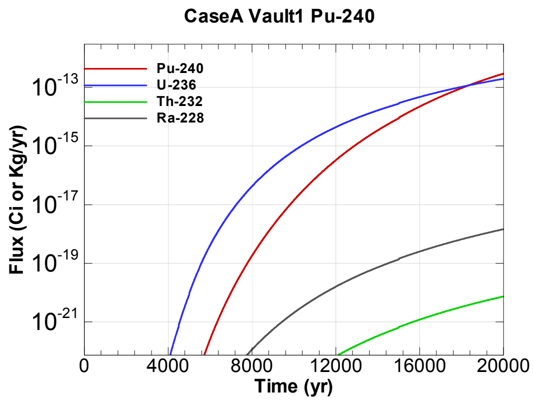

Figure G.1-43 - Flux to the Water Table for CaseA Vault1 Pu-240

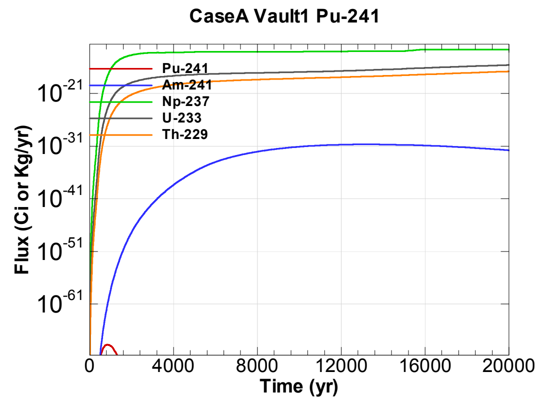

Figure G.1-44 - Flux to the Water Table for CaseA Vault1 Pu-241

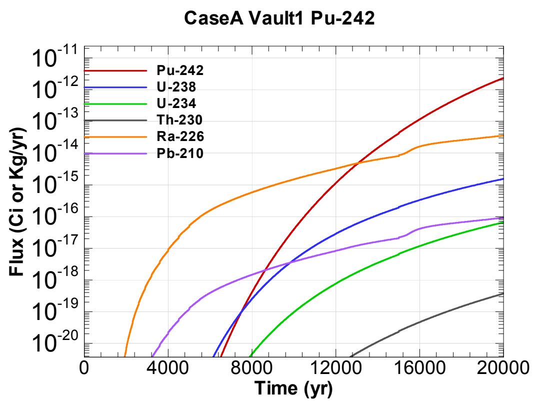

Figure G.1-45 - Flux to the Water Table for CaseA Vault1 Pu-242

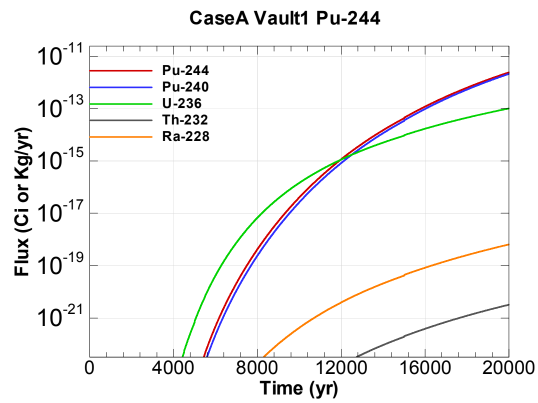

Figure G.1-46 - Flux to the Water Table for CaseA Vault1 Pu-244

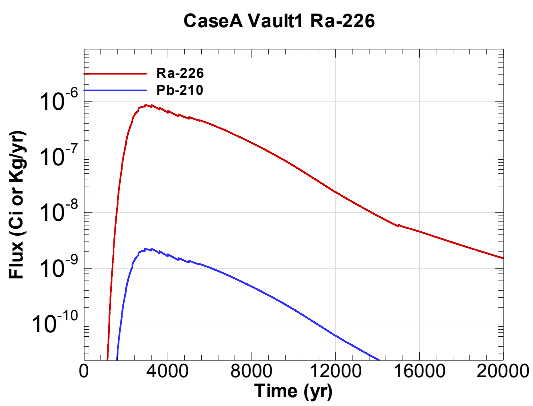

Figure G.1-47 - Flux to the Water Table for CaseA Vault1 Ra-226

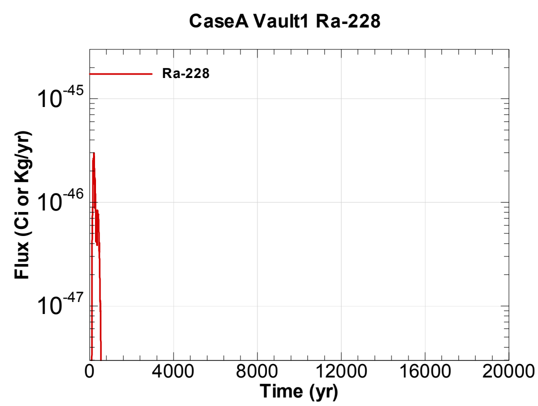

Figure G.1-48 - Flux to the Water Table for CaseA Vault1 Ra-228

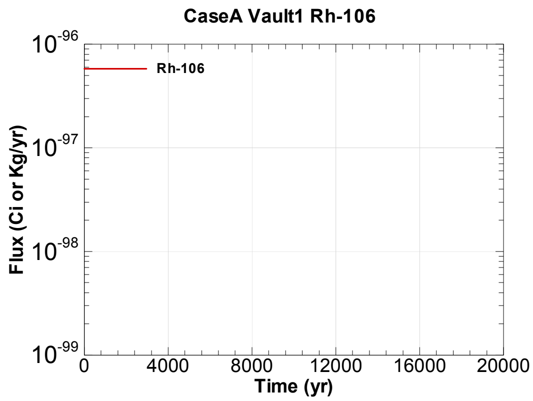

Figure G.1-49 - Flux to the Water Table for CaseA Vault1 Rh-106

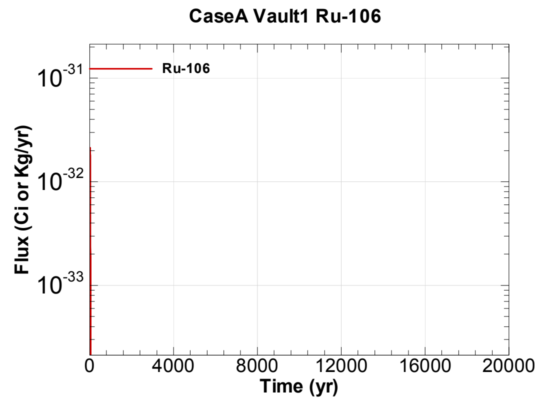

Figure G.1-50 - Flux to the Water Table for CaseA Vault1 Ru-106

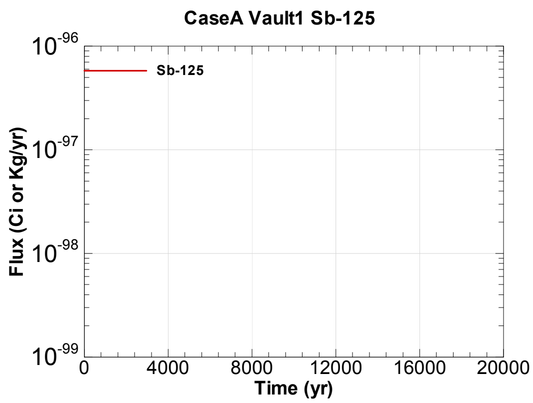

Figure G.1-51 - Flux to the Water Table for CaseA Vault1 Sb-125

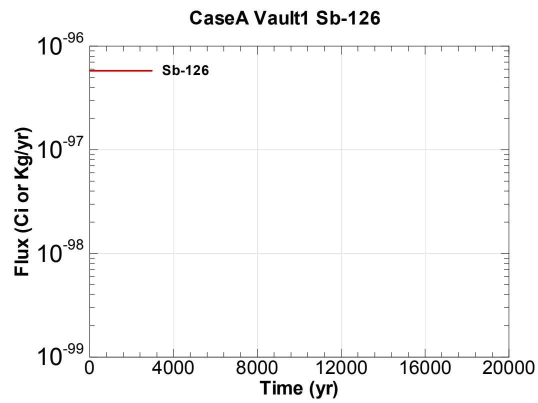

Figure G.1-52 - Flux to the Water Table for CaseA Vault1 Sb-126

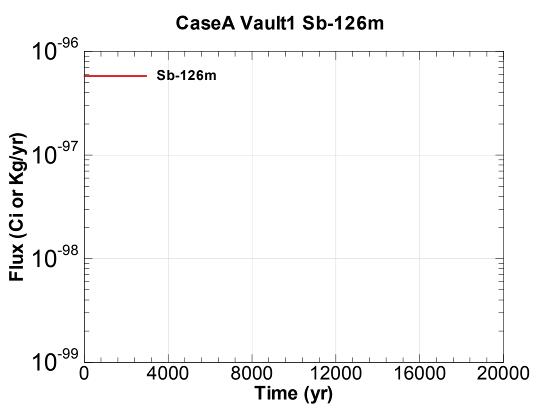

Figure G.1-53 - Flux to the Water Table for CaseA Vault1 Sb-126m

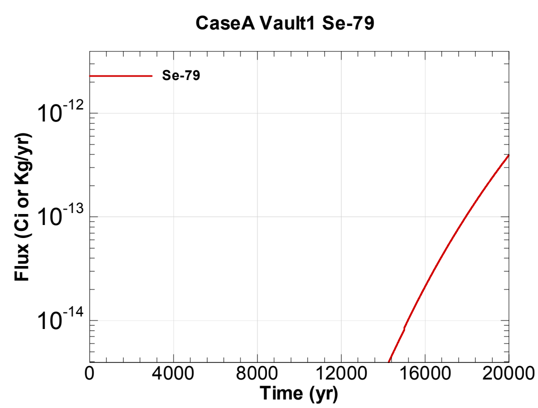

Figure G.1-54 - Flux to the Water Table for CaseA Vault1 Se-79

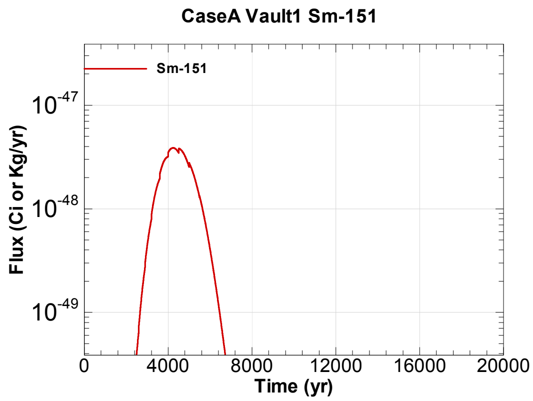

Figure G.1-55 - Flux to the Water Table for CaseA Vault1 Sm-151

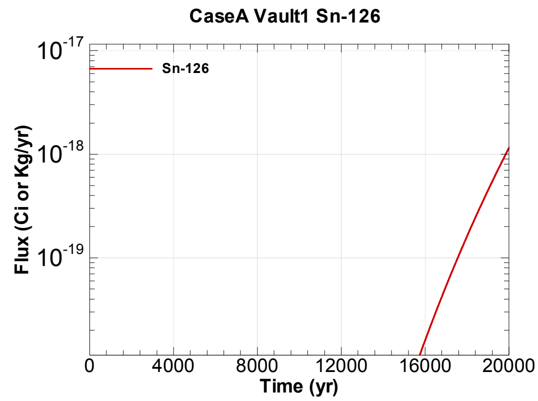

Figure G.1-56 - Flux to the Water Table for CaseA Vault1 Sn-126

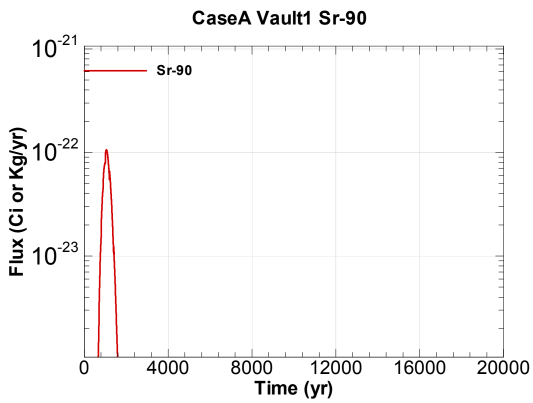

Figure G.1-57 - Flux to the Water Table for CaseA Vault1 Sr-90

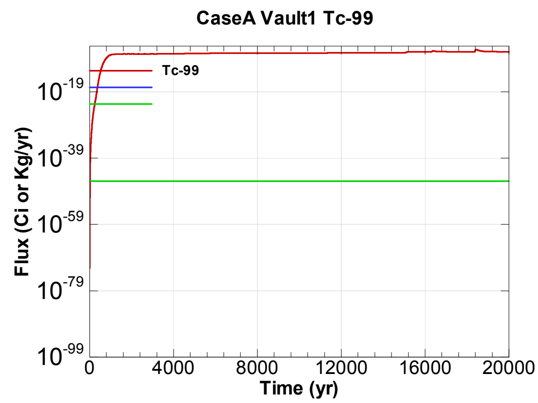

Figure G.1-58 - Flux to the Water Table for CaseA Vault1 Tc-99

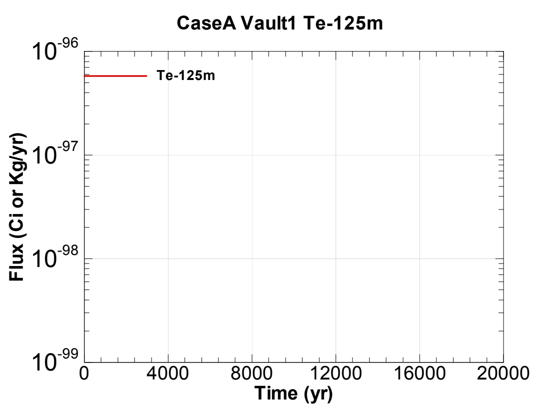

Figure G.1-59 - Flux to the Water Table for CaseA Vault1 Te-125m

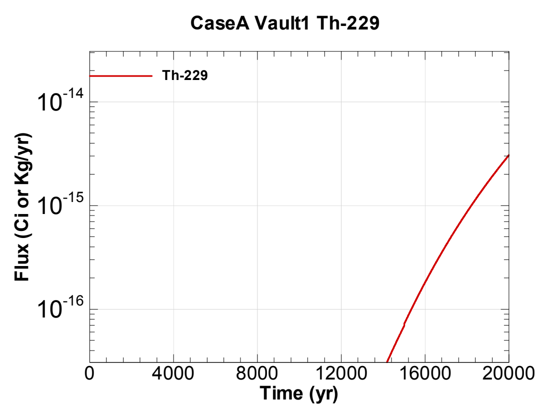

Figure G.1-60 - Flux to the Water Table for CaseA Vault1 Th-229

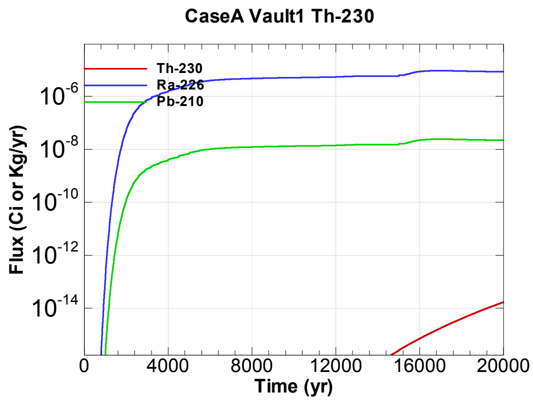

Figure G.1-61 - Flux to the Water Table for CaseA Vault1 Th-230

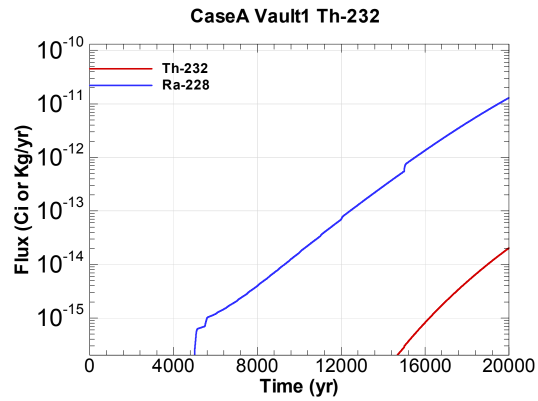

Figure G.1-62 - Flux to the Water Table for CaseA Vault1 Th-232

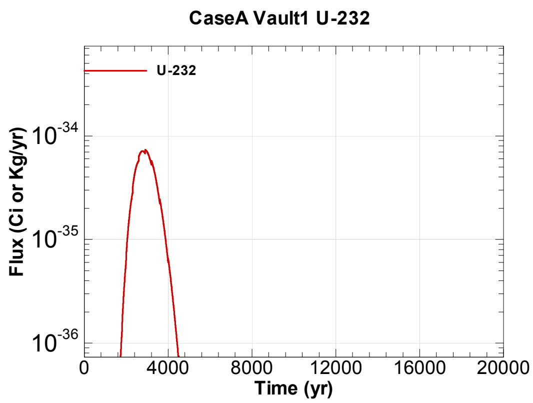

Figure G.1-63 - Flux to the Water Table for CaseA Vault1 U-232

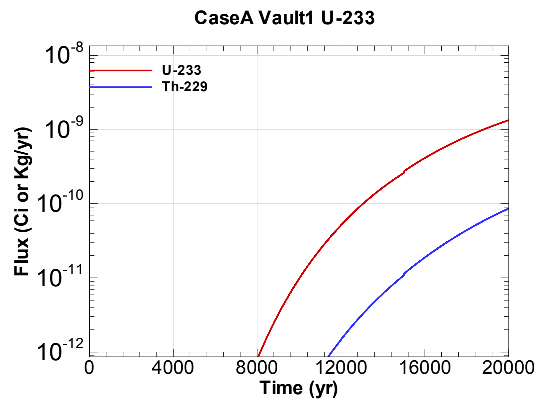

Figure G.1-64 - Flux to the Water Table for CaseA Vault1 U-233

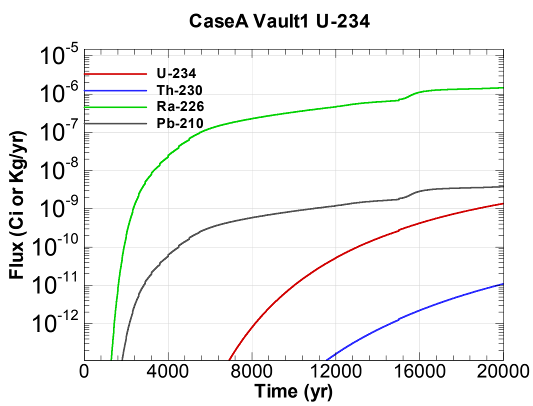

Figure G.1-65 - Flux to the Water Table for CaseA Vault1 U-234

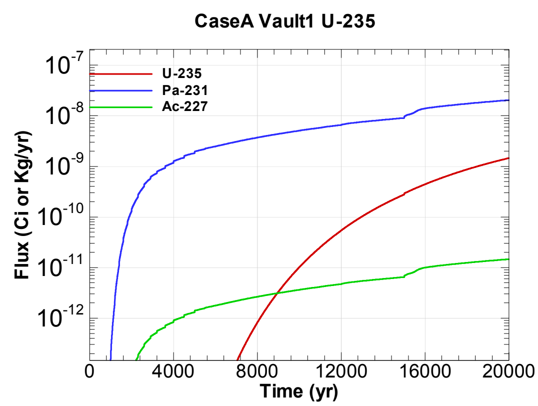

Figure G.1-66 - Flux to the Water Table for CaseA Vault1 U-235

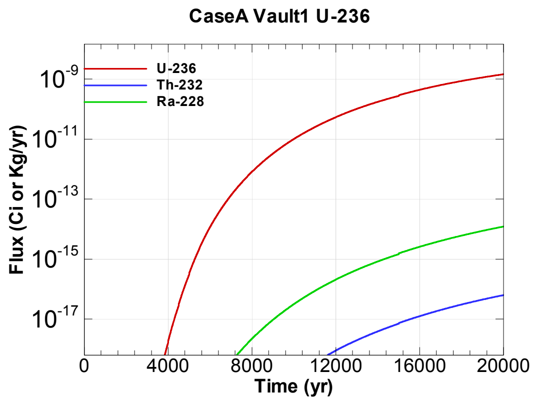

Figure G.1-67 - Flux to the Water Table for CaseA Vault1 U-236

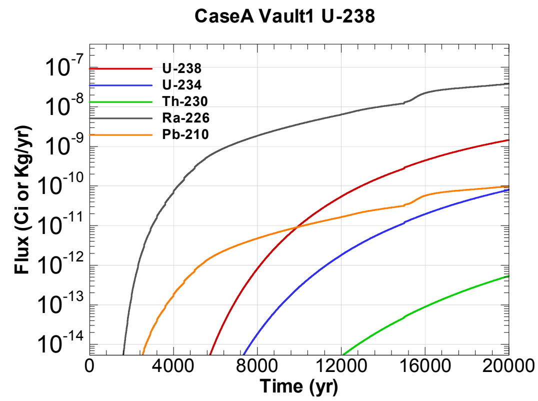

Figure G.1-68 - Flux to the Water Table for CaseA Vault1 U-238

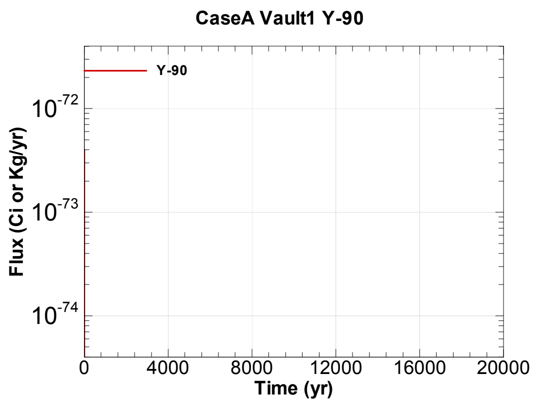

Figure G.1-69 - Flux to the Water Table for CaseA Vault1 Y-90

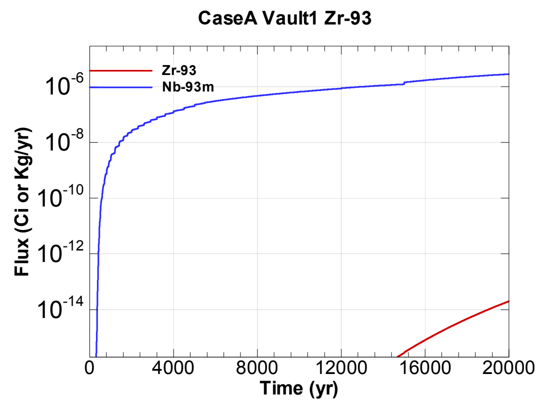

Figure G.1-70 - Flux to the Water Table for CaseA Vault1 Zr-93

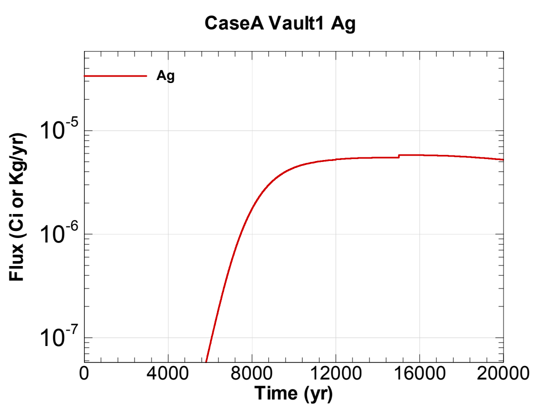

Figure G.1-71 - Flux to the Water Table for CaseA Vault1 Ag

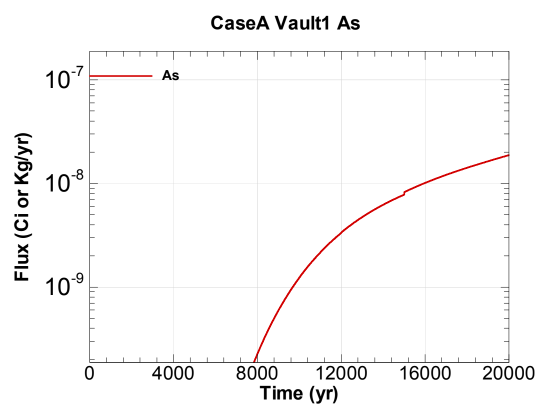

Figure G.1-72 - Flux to the Water Table for CaseA Vault1 As

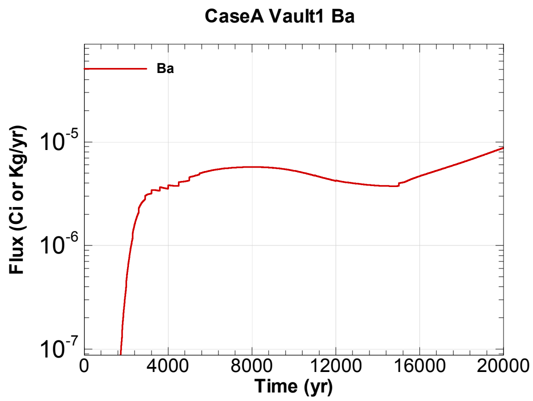

Figure G.1-73 - Flux to the Water Table for CaseA Vault1 Ba

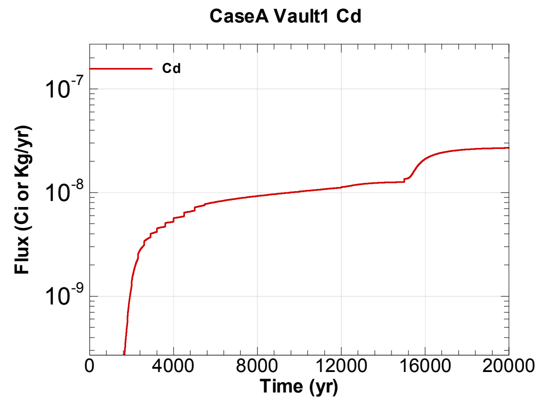

Figure G.1-74 - Flux to the Water Table for CaseA Vault1 Cd

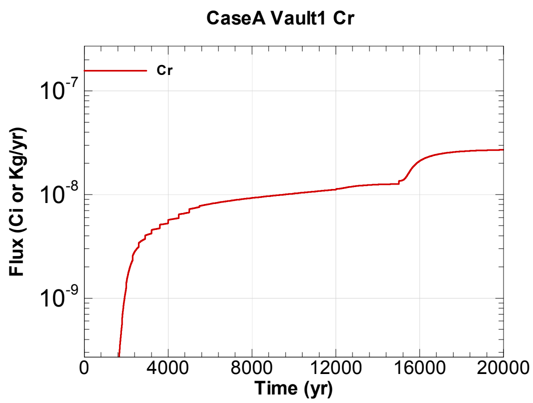

Figure G.1-75 - Flux to the Water Table for CaseA Vault1 Cr

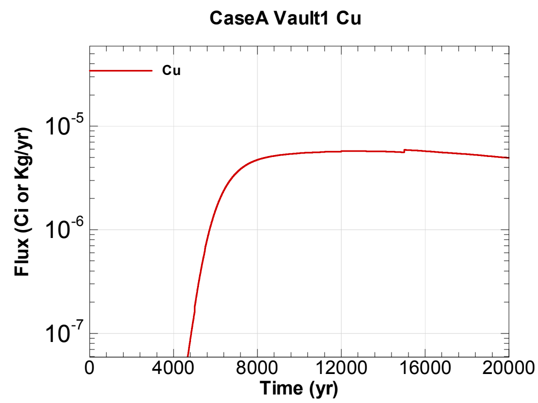

Figure G.1-76 - Flux to the Water Table for CaseA Vault1 Cu

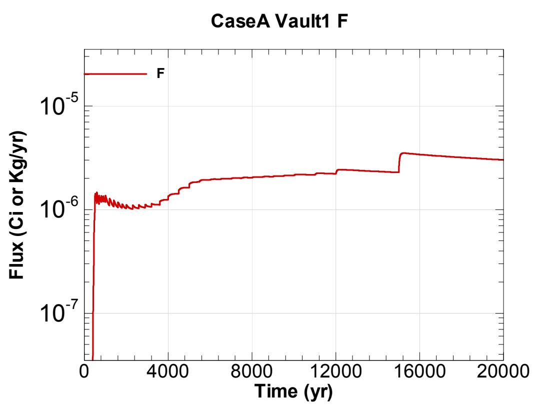

Figure G.1-77 - Flux to the Water Table for CaseA Vault1 F

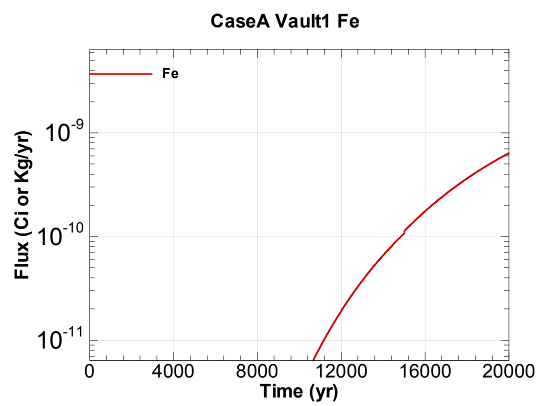

Figure G.1-78 - Flux to the Water Table for CaseA Vault1 Fe

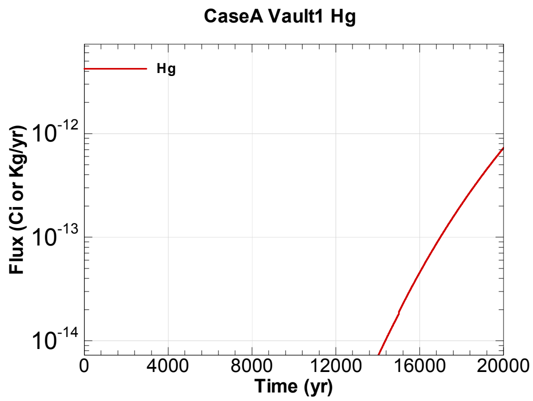

Figure G.1-79 - Flux to the Water Table for CaseA Vault1 Hg

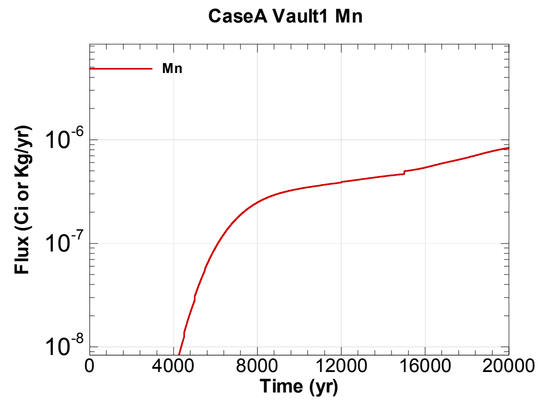

Figure G.1-80 - Flux to the Water Table for CaseA Vault1 Mn

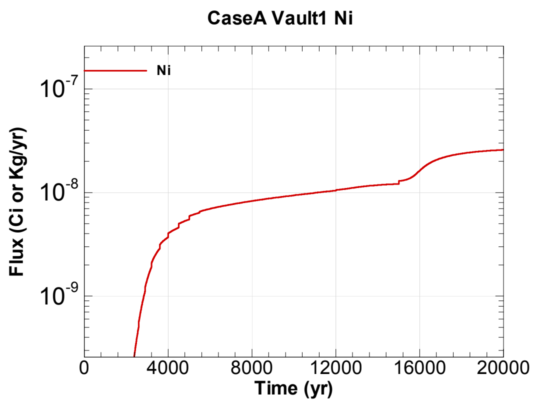

Figure G.1-81 - Flux to the Water Table for CaseA Vault1 Ni

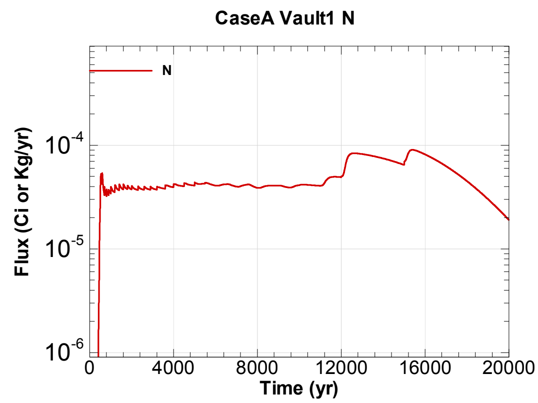

Figure G.1-82 - Flux to the Water Table for CaseA Vault1 N

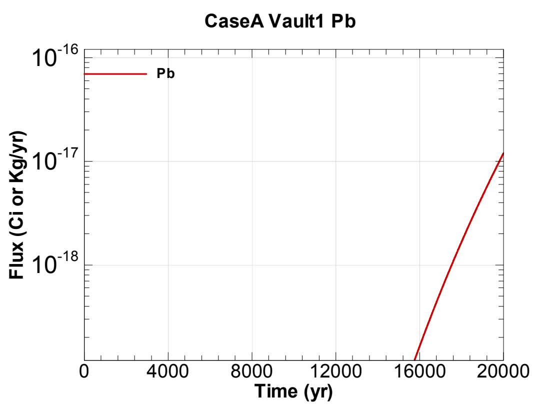

Figure G.1-83 - Flux to the Water Table for CaseA Vault1 Pb

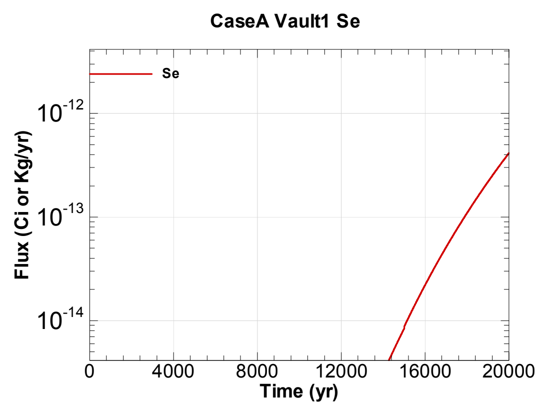

Figure G.1-84 - Flux to the Water Table for CaseA Vault1 Se

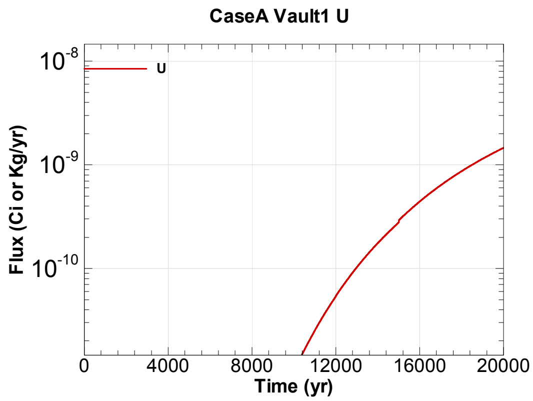

Figure G.1-85 - Flux to the Water Table for CaseA Vault1 U

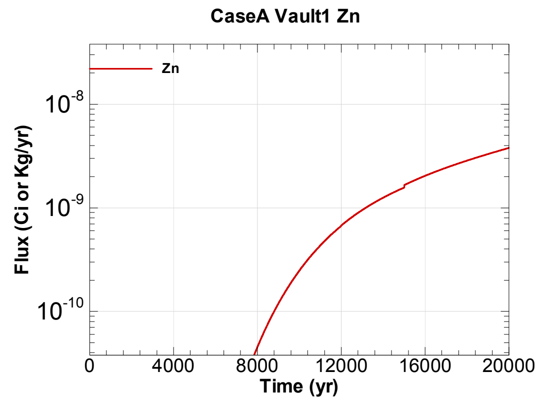

Figure G.1-86 - Flux to the Water Table for CaseA Vault1 Zn

G.2 – Vault 2 Flux to the Water Table

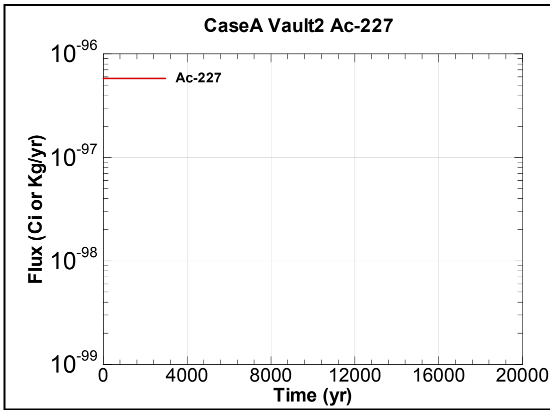

Figure G.2-1 - Flux to the Water Table for CaseF Vault2 Ac-227

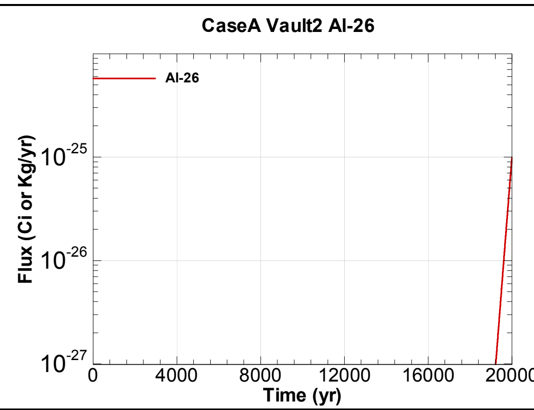

Figure G.2-2 - Flux to the Water Table for CaseF Vault2 Al-26

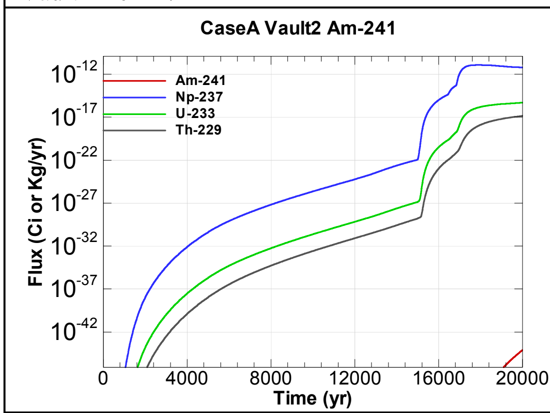

Figure G.2-3 - Flux to the Water Table for CaseF Vault2 Am-241

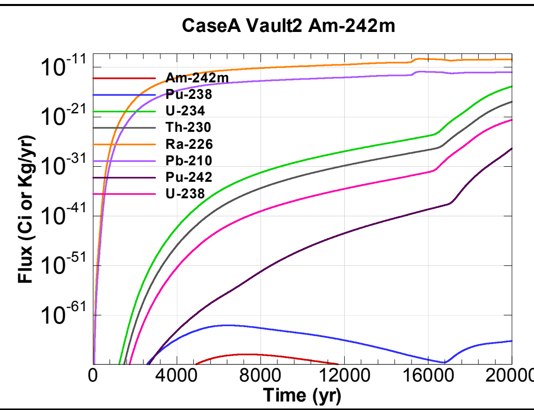

Figure G.2-4 - Flux to the Water Table for CaseF Vault2 Am-242m

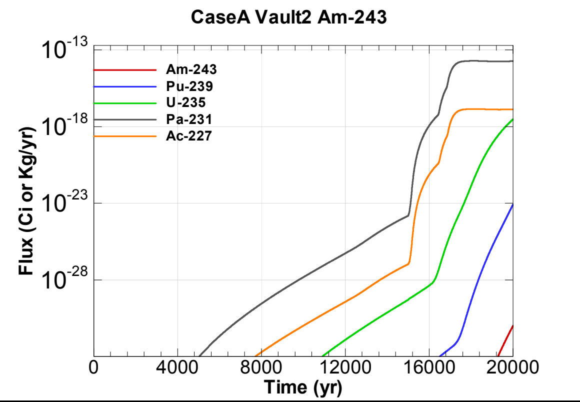

Figure G.2-5 - Flux to the Water Table for CaseF Vault2 Am-243

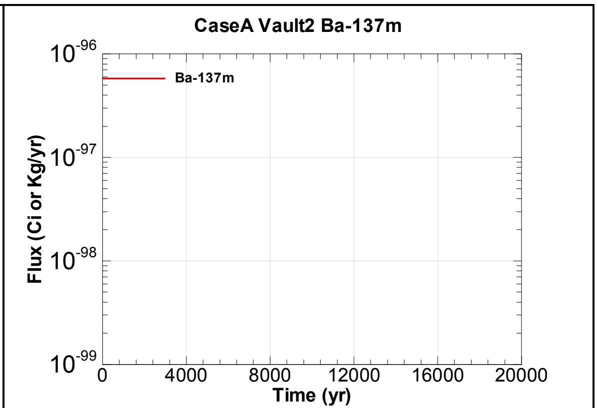

Figure G.2-6 - Flux to the Water Table for CaseF Vault2 Ba-137m

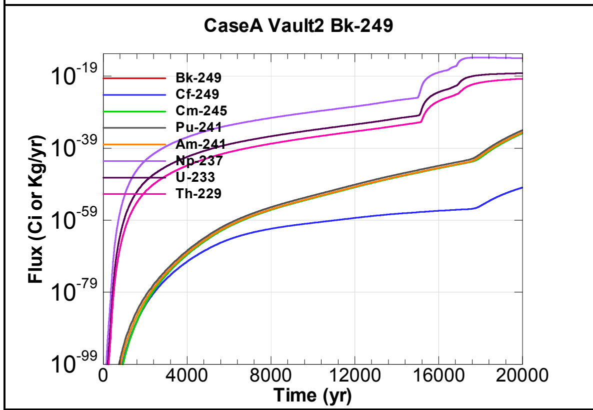

Figure G.2-7 - Flux to the Water Table for CaseF Vault2 Bk-249

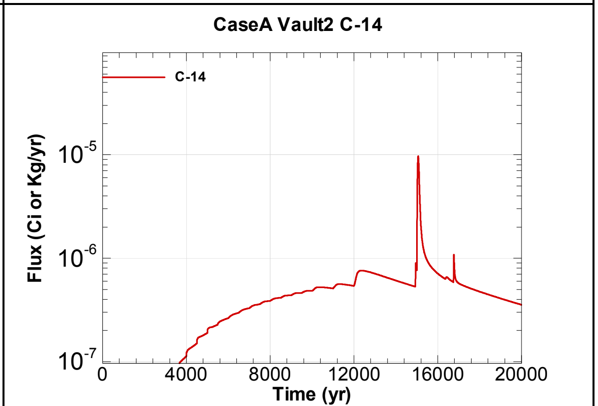

Figure G.2-8 - Flux to the Water Table for CaseF Vault2 C-14

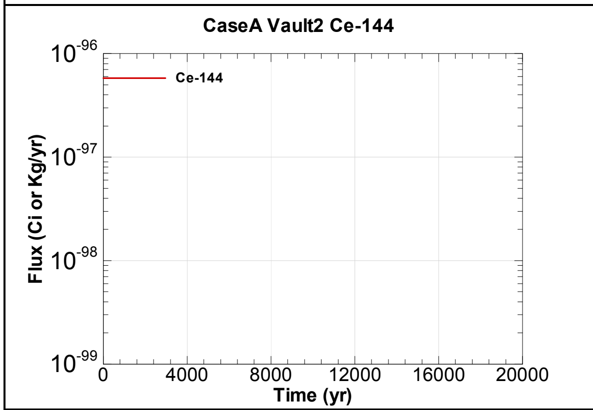

Figure G.2-9 - Flux to the Water Table for CaseF Vault2 Ce-144

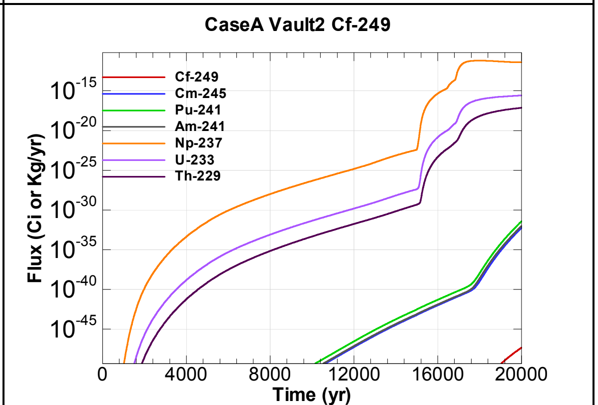

Figure G.2-10 - Flux to the Water Table for CaseF Vault2 Cf-249

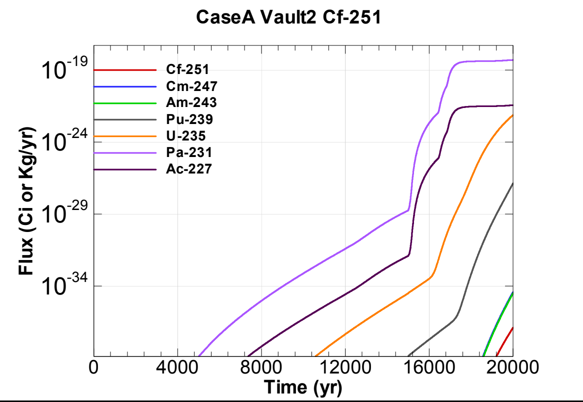

Figure G.2-11 - Flux to the Water Table for CaseF Vault2 Cf-251

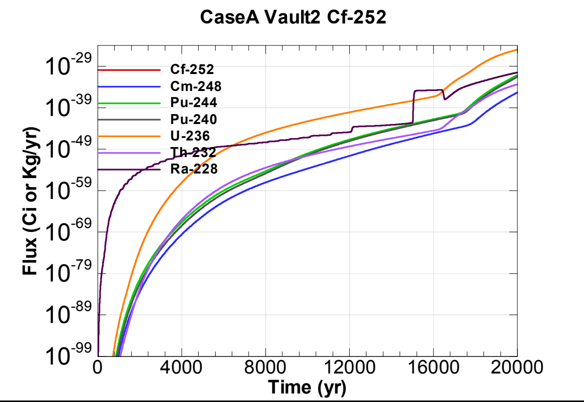

Figure G.2-12 - Flux to the Water Table for CaseF Vault2 Cf-252

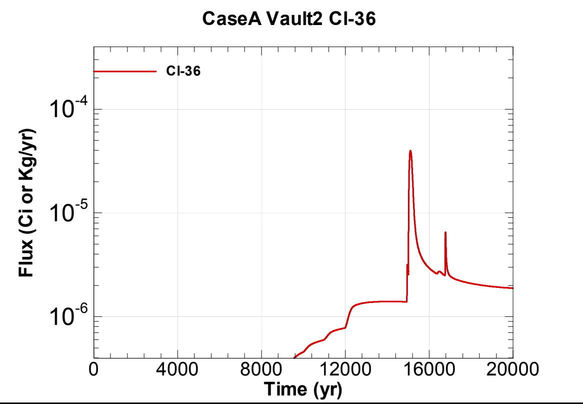

Figure G.2-13 - Flux to the Water Table for CaseF Vault2 Cl-36

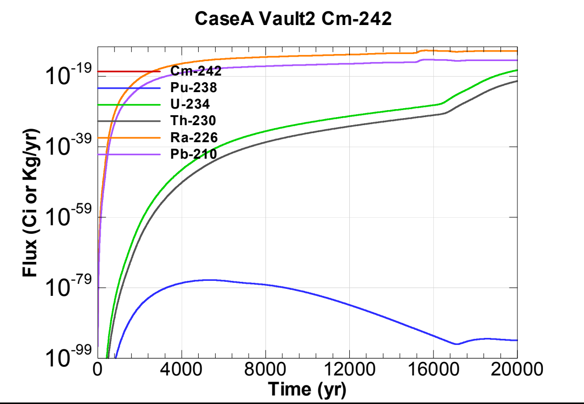

Figure G.2-14 - Flux to the Water Table for CaseF Vault2 Cm-242

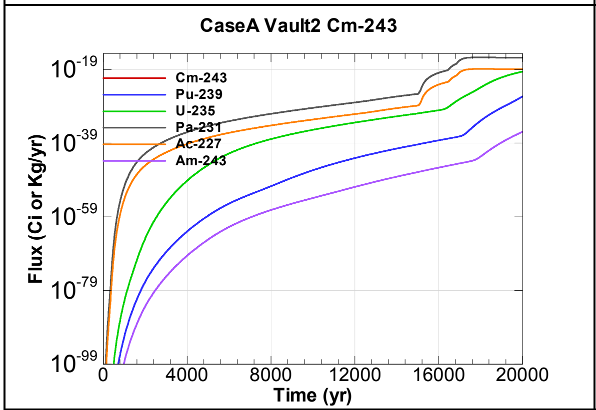

Figure G.2-15 - Flux to the Water Table for CaseF Vault2 Cm-243

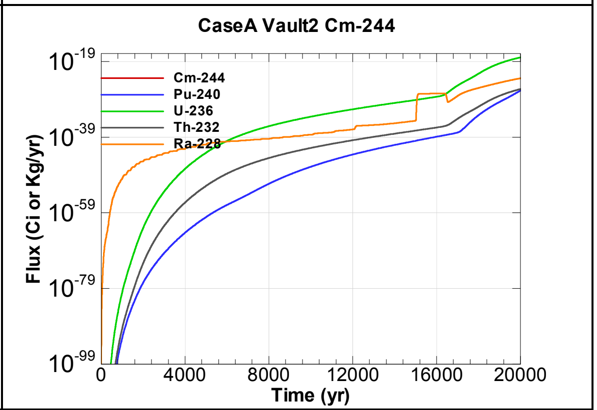

Figure G.2-16 - Flux to the Water Table for CaseF Vault2 Cm-244

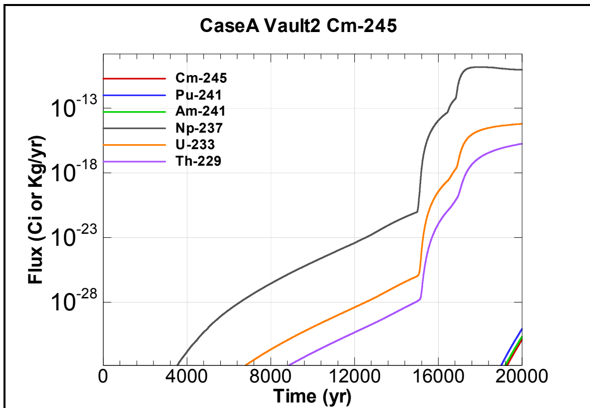

Figure G.2-17 - Flux to the Water Table for CaseF Vault2 Cm-245

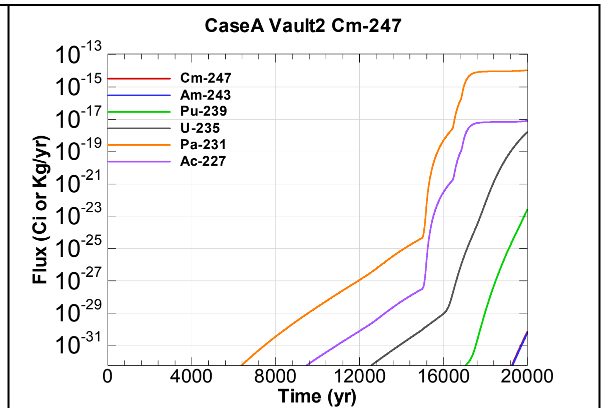

Figure G.2-18 - Flux to the Water Table for CaseF Vault2 Cm-247

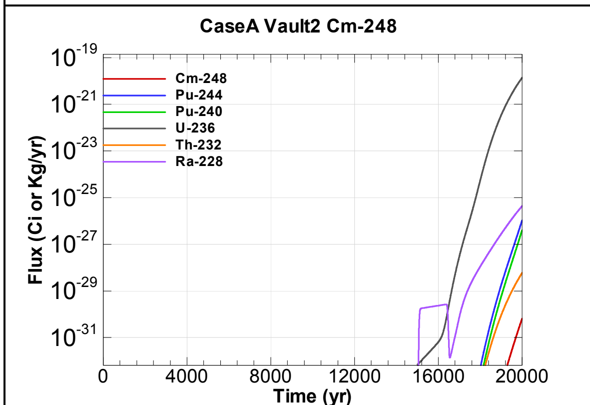

Figure G.2-19 - Flux to the Water Table for CaseF Vault2 Cm-248

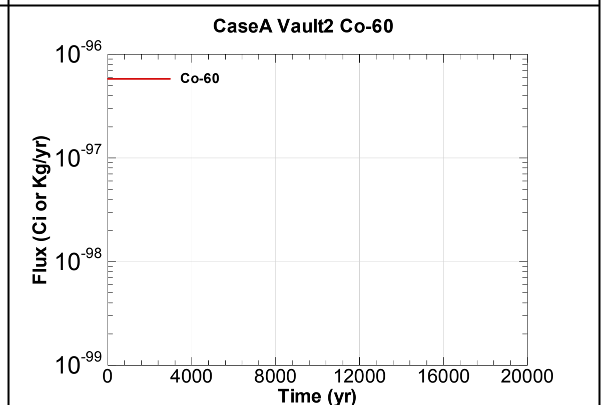

Figure G.2-20 - Flux to the Water Table for CaseF Vault2 Co-60

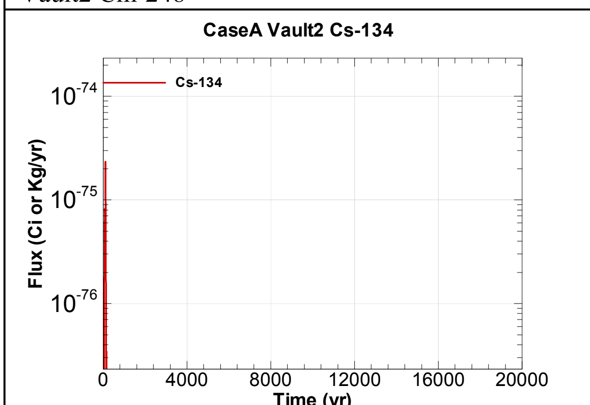

Figure G.2-21 - Flux to the Water Table for CaseF Vault2 Cs-134

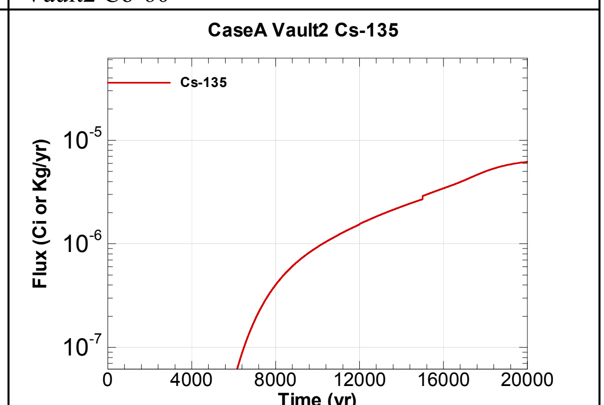

Figure G.2-22 - Flux to the Water Table for CaseF Vault2 Cs-135

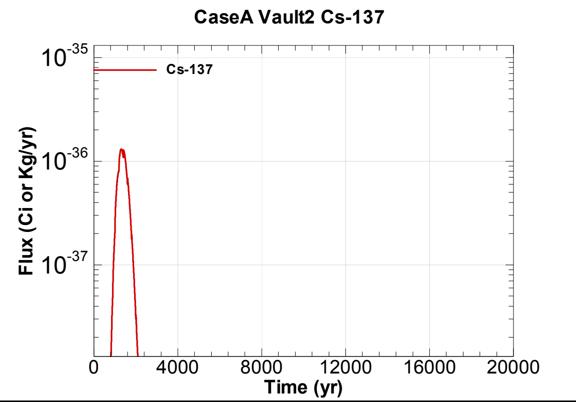

Figure G.2-23 - Flux to the Water Table for CaseF Vault2 Cs-137

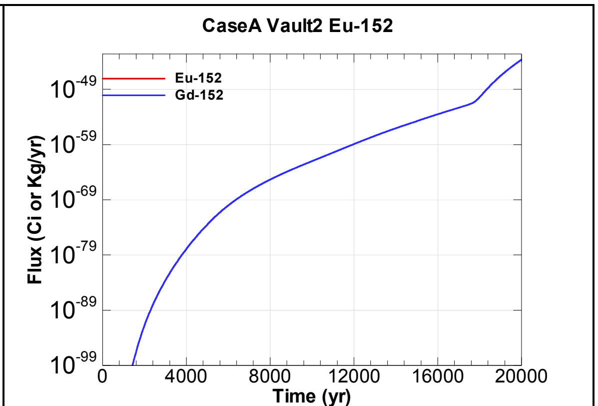

Figure G.2-24 - Flux to the Water Table for CaseF Vault2 Eu-152

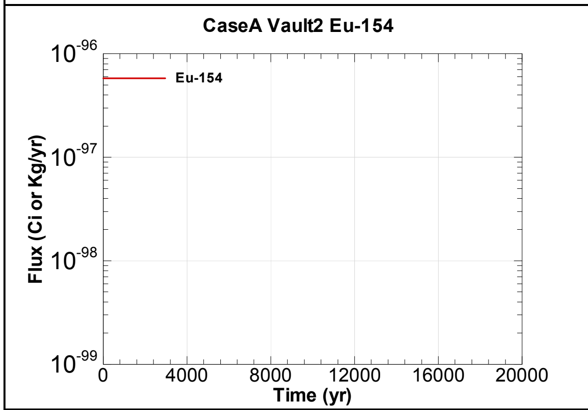

Figure G.2-25 - Flux to the Water Table for CaseF Vault2 Eu-154

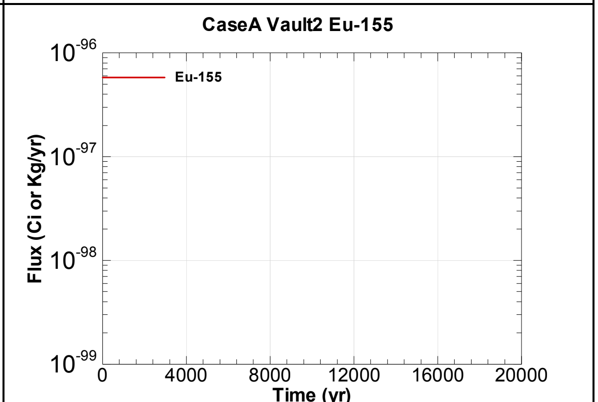

Figure G.2-26 - Flux to the Water Table for CaseF Vault2 Eu-155

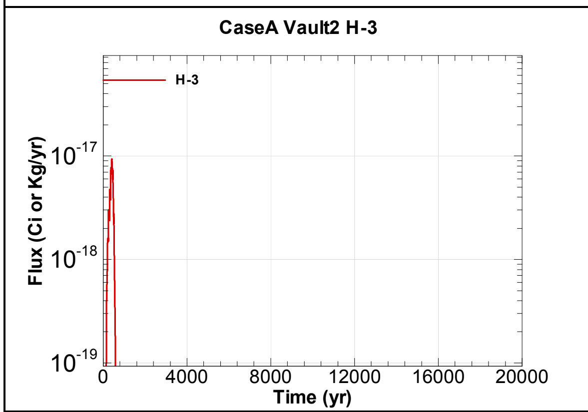

Figure G.2-27 - Flux to the Water Table for CaseF Vault2 H-3

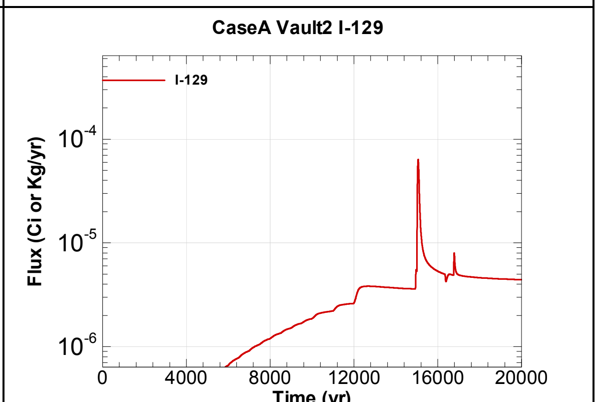

Figure G.2-28 - Flux to the Water Table for CaseF Vault2 I-129

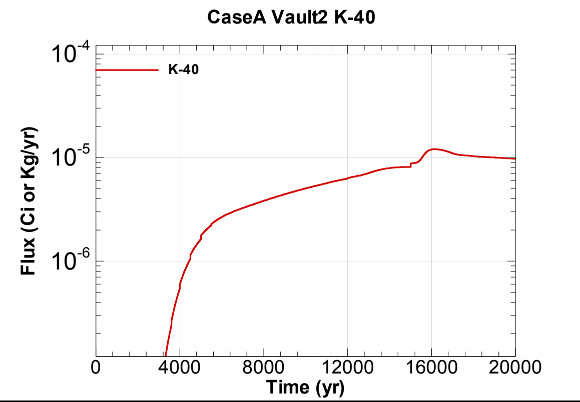

Figure G.2-29 - Flux to the Water Table for CaseF Vault2 K-40

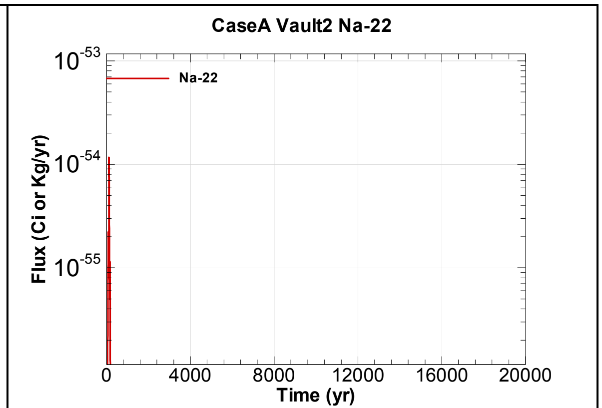

Figure G.2-30 - Flux to the Water Table for CaseF Vault2 Na-22

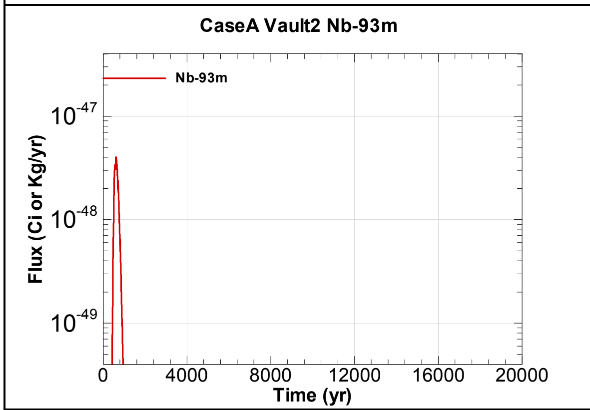

Figure G.2-31 - Flux to the Water Table for CaseF Vault2 Nb-93m

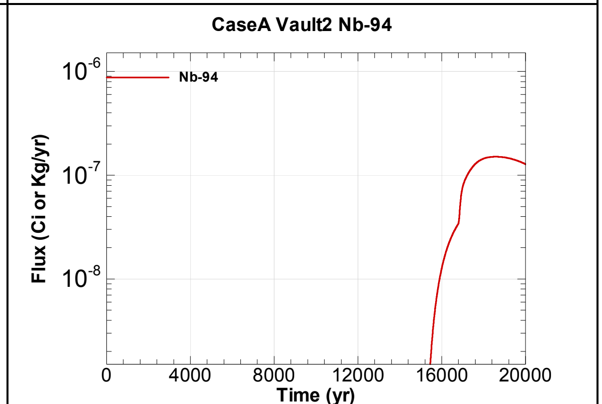

Figure G.2-32 - Flux to the Water Table for CaseF Vault2 Nb-94

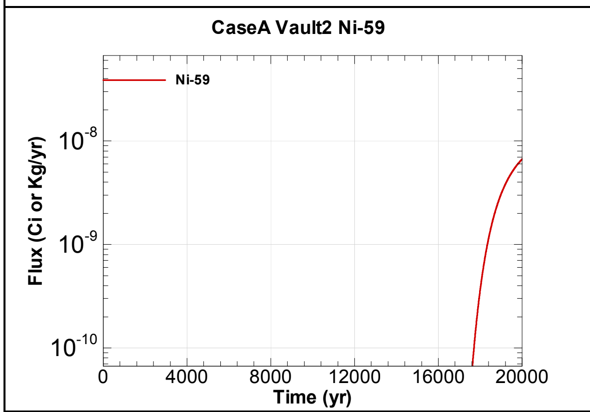

Figure G.2-33 - Flux to the Water Table for CaseF Vault2 Ni-59

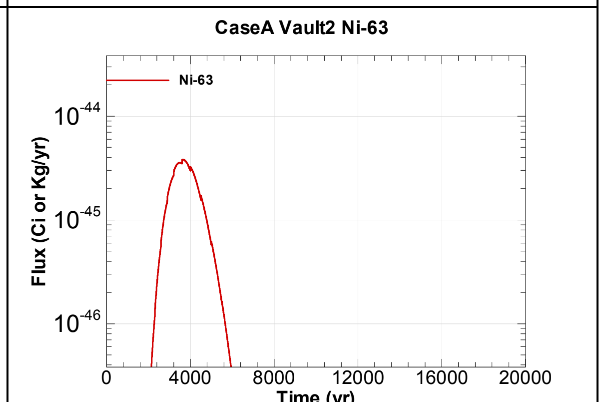

Figure G.2-34 - Flux to the Water Table for CaseF Vault2 Ni-63

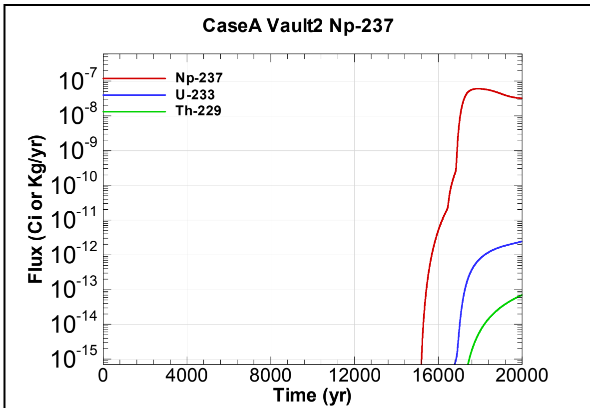

Figure G.2-35 - Flux to the Water Table for CaseF Vault2 Np-237

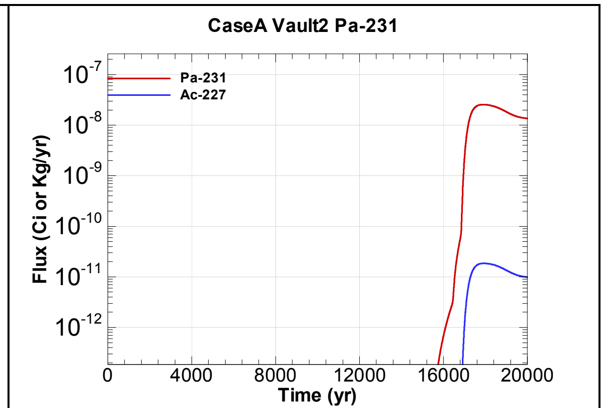

Figure G.2-36 - Flux to the Water Table for CaseF Vault2 Pa-231

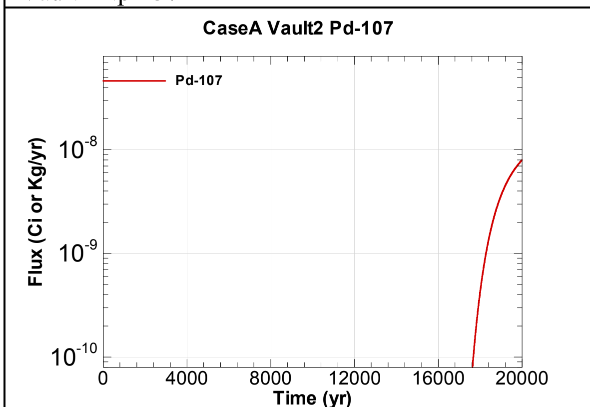

Figure G.2-37 - Flux to the Water Table for CaseF Vault2 Pd-107

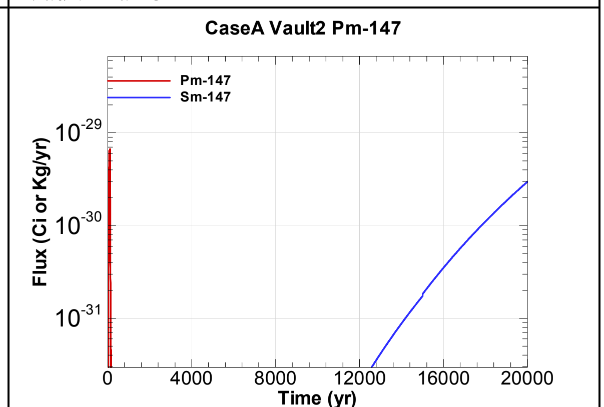

Figure G.2-38 - Flux to the Water Table for CaseF Vault2 Pm-147

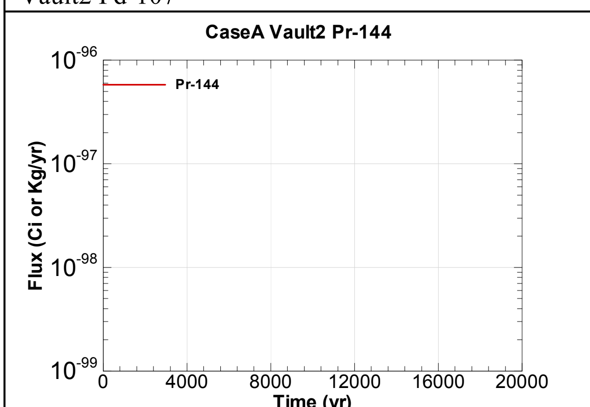

Figure G.2-39 - Flux to the Water Table for CaseF Vault2 Pr-144

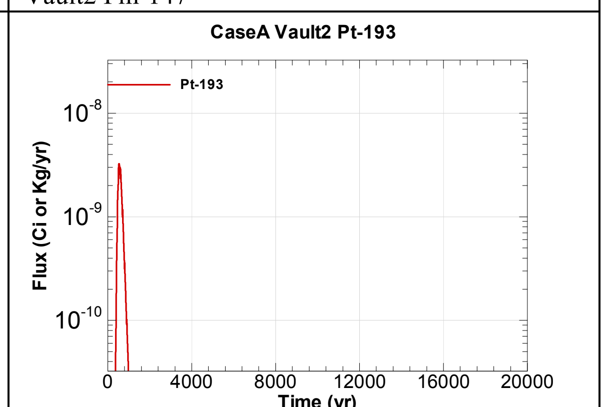

Figure G.2-40 - Flux to the Water Table for CaseF Vault2 Pt-193

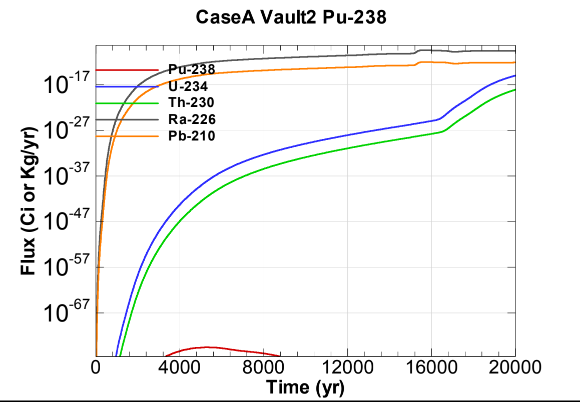

Figure G.2-41 - Flux to the Water Table for CaseF Vault2 Pu-238

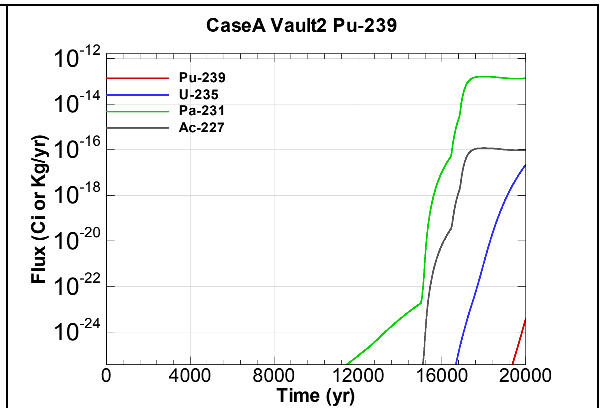

Figure G.2-42 - Flux to the Water Table for CaseF Vault2 Pu-239

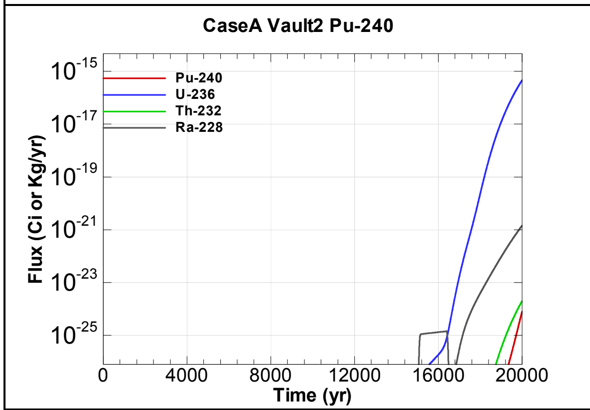

Figure G.2-43 - Flux to the Water Table for CaseF Vault2 Pu-240

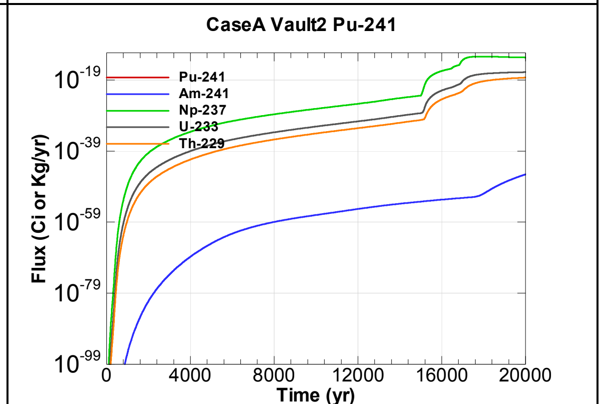

Figure G.2-44 - Flux to the Water Table for CaseF Vault2 Pu-241

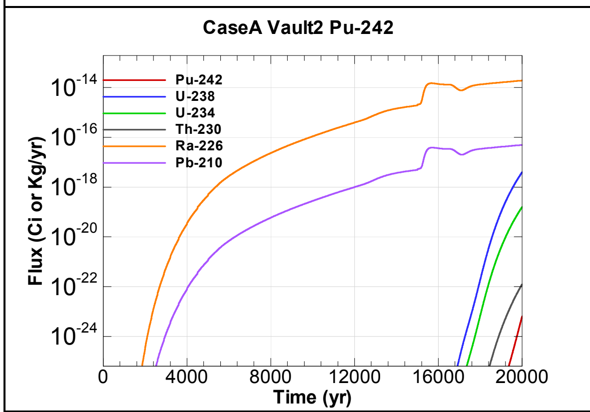

Figure G.2-45 - Flux to the Water Table for CaseF Vault2 Pu-242

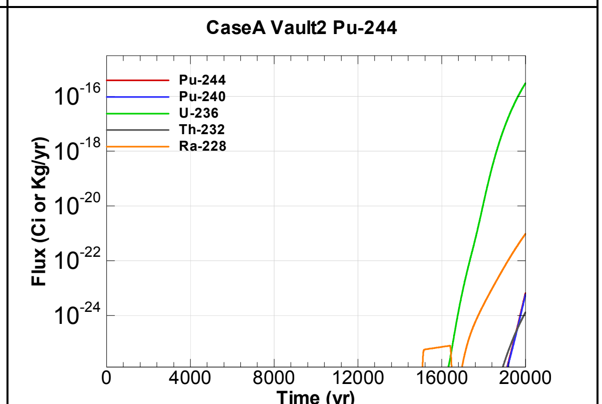

Figure G.2-46 - Flux to the Water Table for CaseF Vault2 Pu-244

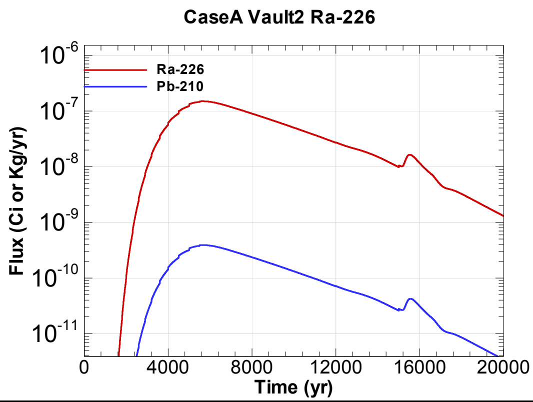

Figure G.2-47 - Flux to the Water Table for CaseF Vault2 Ra-226

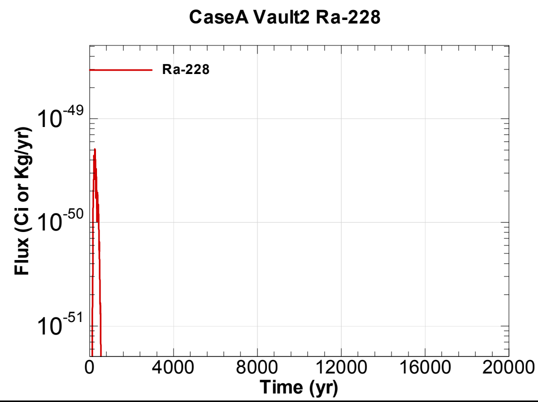

Figure G.2-48 - Flux to the Water Table for CaseF Vault2 Ra-228

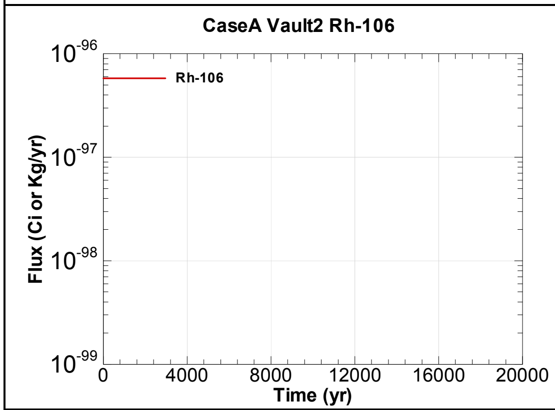

Figure G.2-49 - Flux to the Water Table for CaseF Vault2 Rh-106

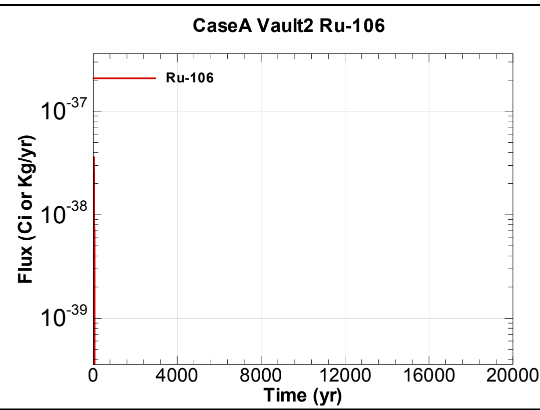

Figure G.2-50 - Flux to the Water Table for CaseF Vault2 Ru-106

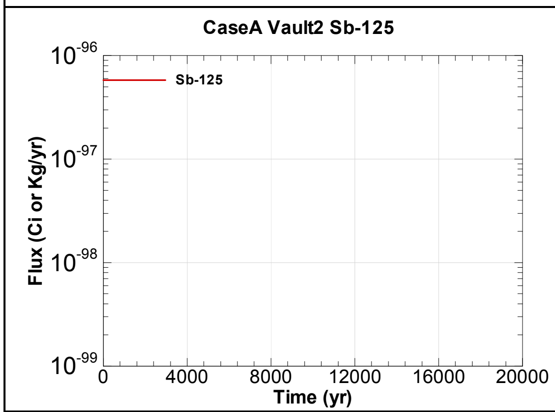

Figure G.2-51 - Flux to the Water Table for CaseF Vault2 Sb-125

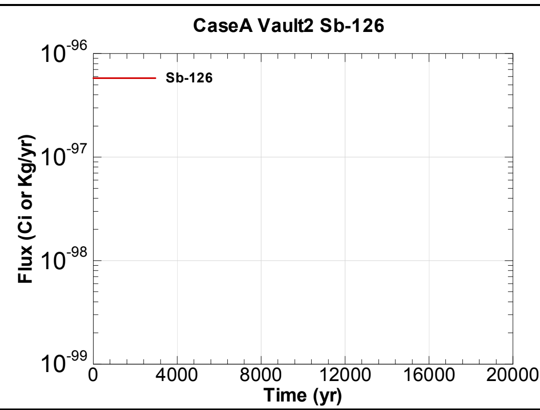

Figure G.2-52 - Flux to the Water Table for CaseF Vault2 Sb-126

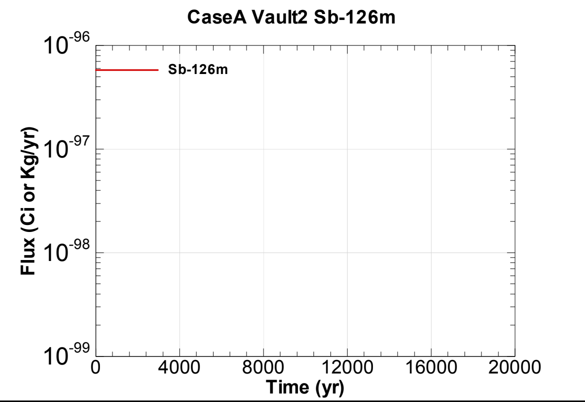

Figure G.2-53 - Flux to the Water Table for CaseF Vault2 Sb-126m

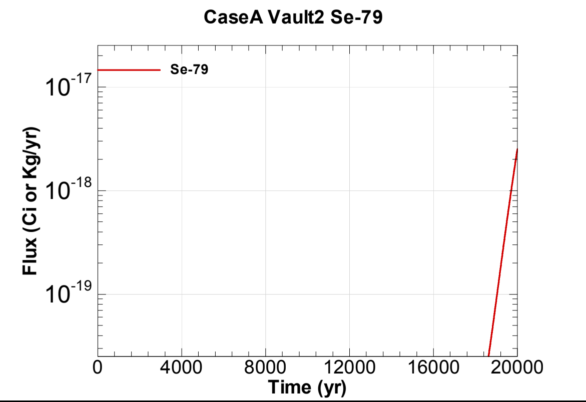

Figure G.2-54 - Flux to the Water Table for CaseF Vault2 Se-79

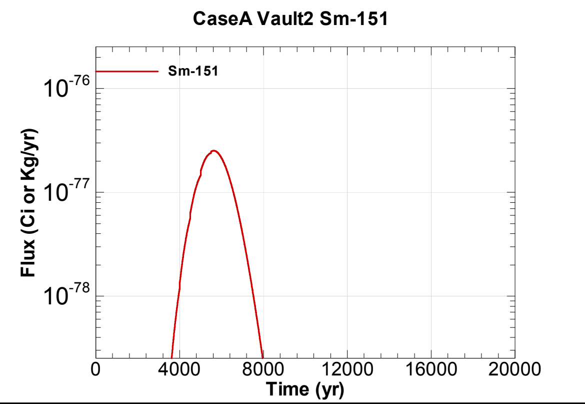

Figure G.2-55 - Flux to the Water Table for CaseF Vault2 Sm-151

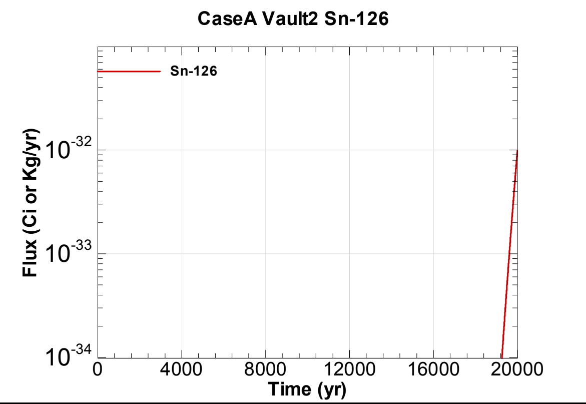

Figure G.2-56 - Flux to the Water Table for CaseF Vault2 Sn-126

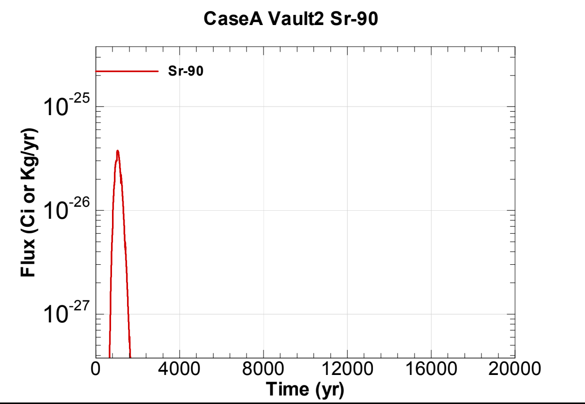

Figure G.2-57 - Flux to the Water Table for CaseF Vault2 Sr-90

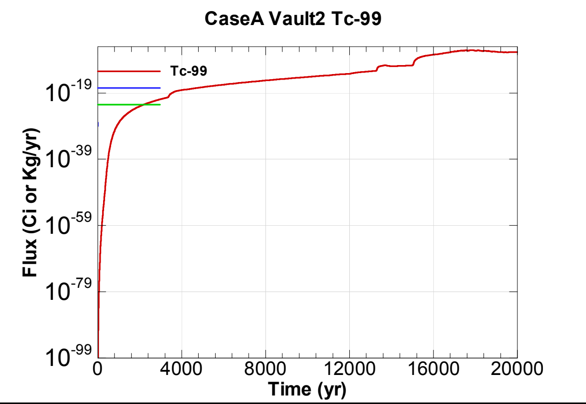

Figure G.2-58 - Flux to the Water Table for CaseF Vault2 Tc-99

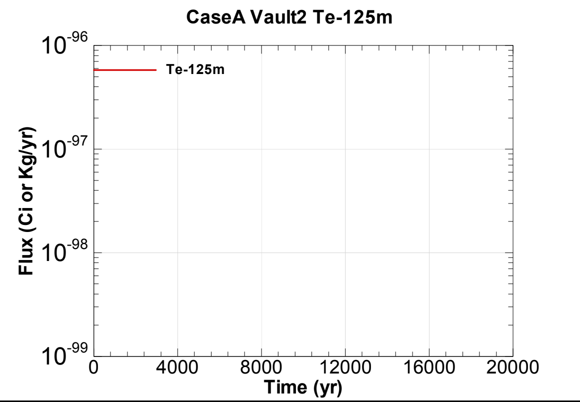

Figure G.2-59 - Flux to the Water Table for CaseF Vault2 Te-125m

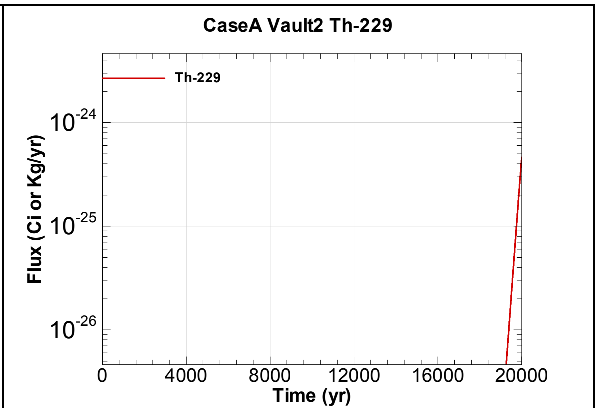

Figure G.2-60 - Flux to the Water Table for CaseF Vault2 Th-229

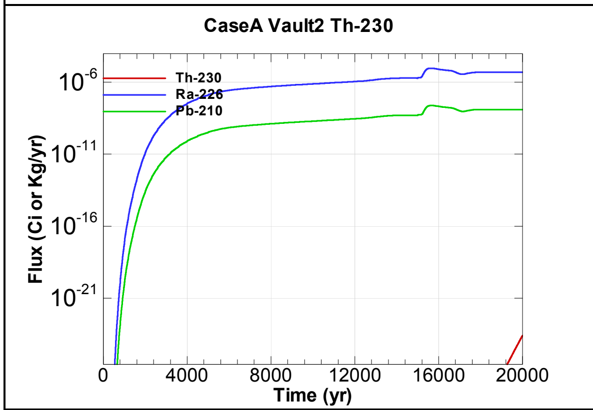

Figure G.2-61 - Flux to the Water Table for CaseF Vault2 Th-230

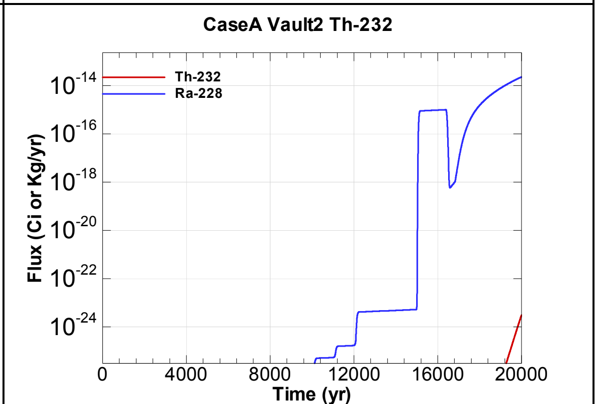

Figure G.2-62 - Flux to the Water Table for CaseF Vault2 Th-232

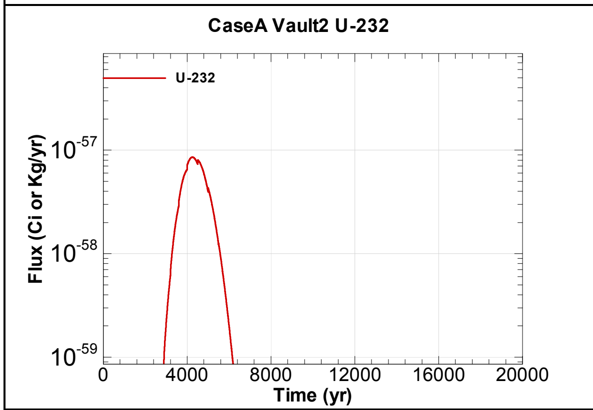

Figure G.2-63 - Flux to the Water Table for CaseF Vault2 U-232

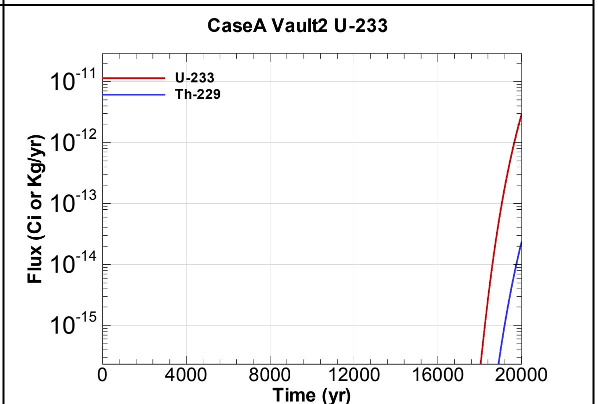

Figure G.2-64 - Flux to the Water Table for CaseF Vault2 U-233

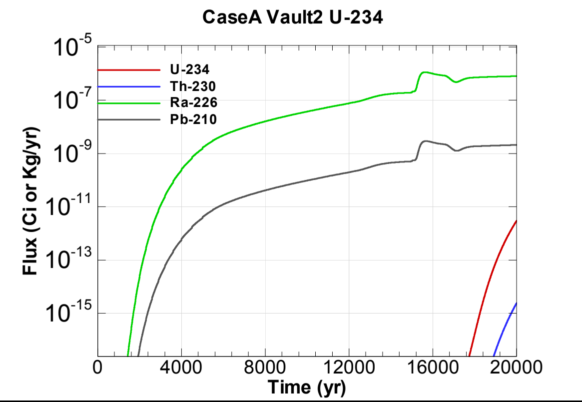

Figure G.2-65 - Flux to the Water Table for CaseF Vault2 U-234

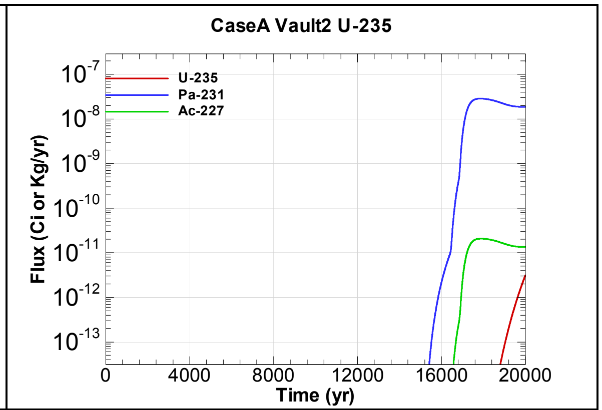

Figure G.2-66 - Flux to the Water Table for CaseF Vault2 U-235

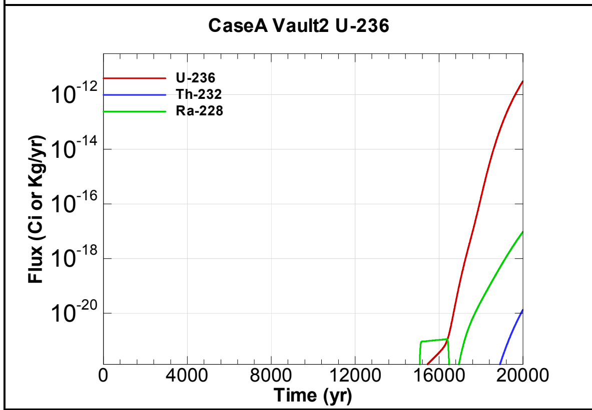

Figure G.2-67 - Flux to the Water Table for CaseF Vault2 U-236

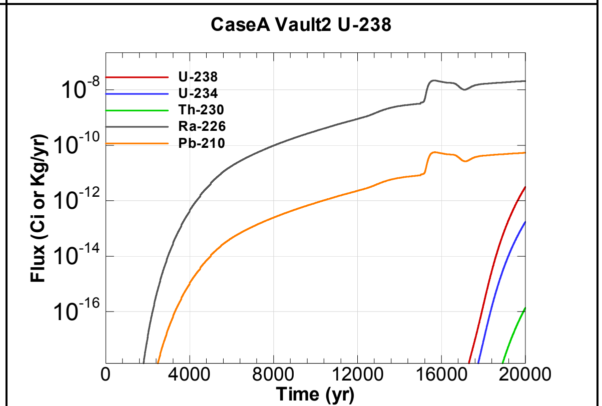

Figure G.2-68 - Flux to the Water Table for CaseF Vault2 U-238

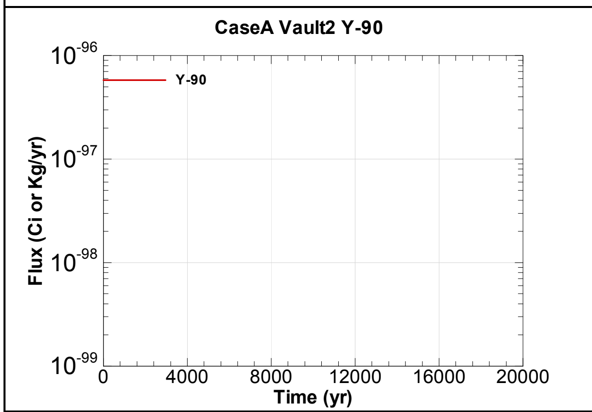

Figure G.2-69 - Flux to the Water Table for CaseF Vault2 Y-90

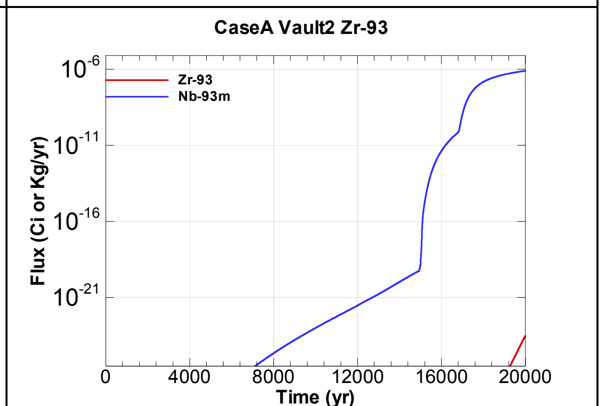

Figure G.2-70 - Flux to the Water Table for CaseF Vault2 Zr-93

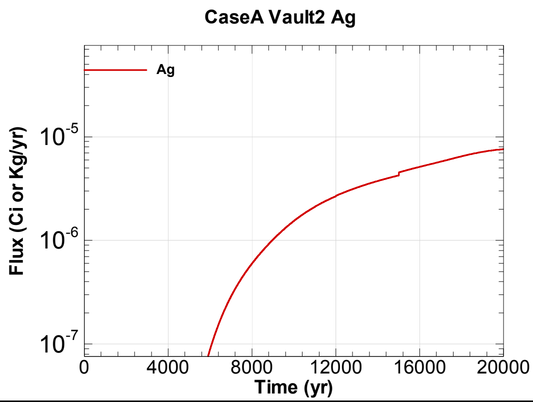

Figure G.2-71 - Flux to the Water Table for CaseF Vault2 Ag

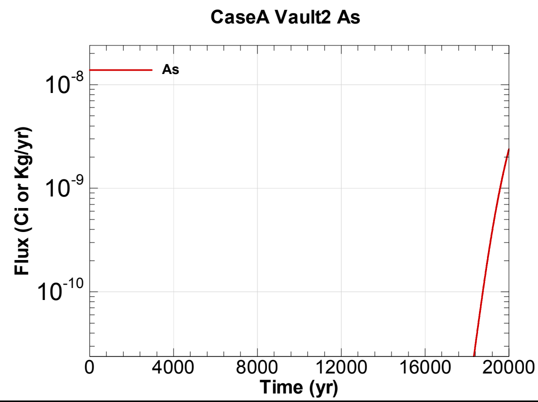

Figure G.2-72 - Flux to the Water Table for CaseF Vault2 As

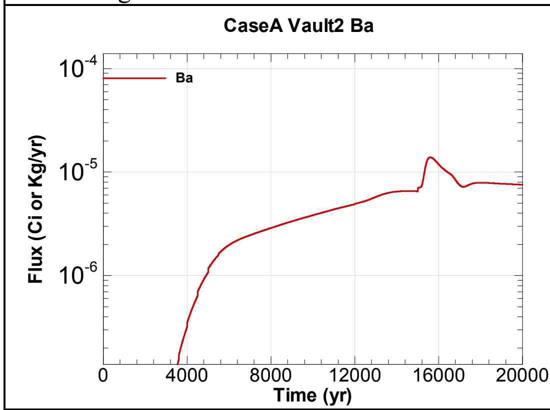

Figure G.2-73 - Flux to the Water Table for CaseF Vault2 Ba

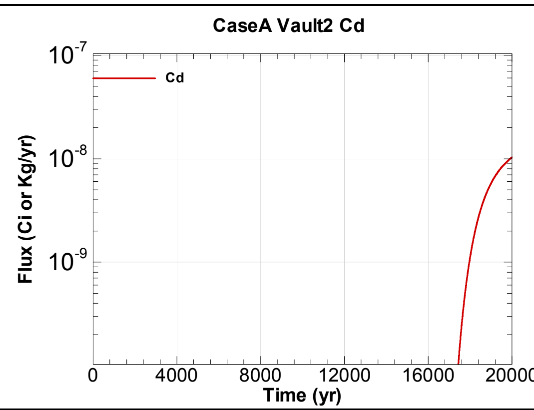

Figure G.2-74 - Flux to the Water Table for CaseF Vault2 Cd

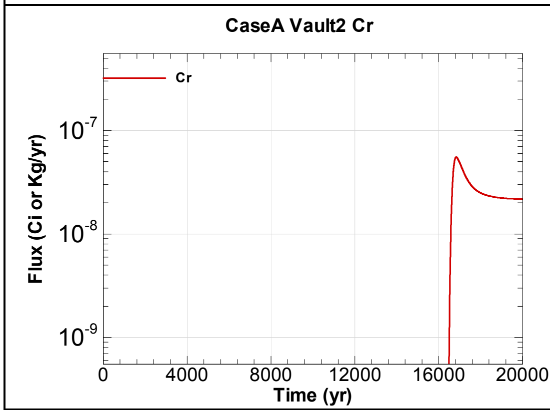

Figure G.2-75 - Flux to the Water Table for CaseF Vault2 Cr

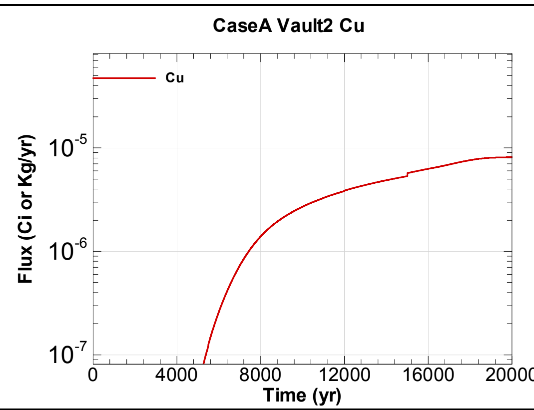

Figure G.2-76 - Flux to the Water Table for CaseF Vault2 Cu

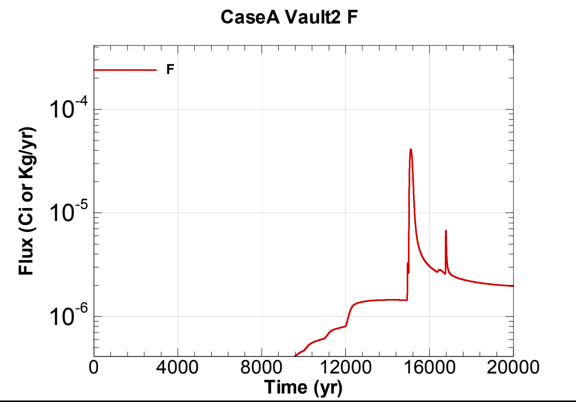

Figure G.2-77 - Flux to the Water Table for CaseF Vault2 F

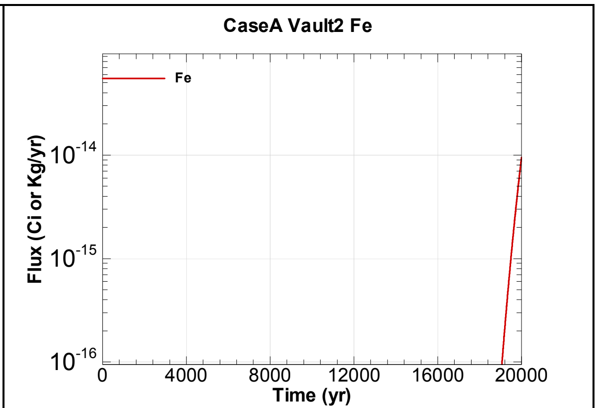

Figure G.2-78 - Flux to the Water Table for CaseF Vault2 Fe

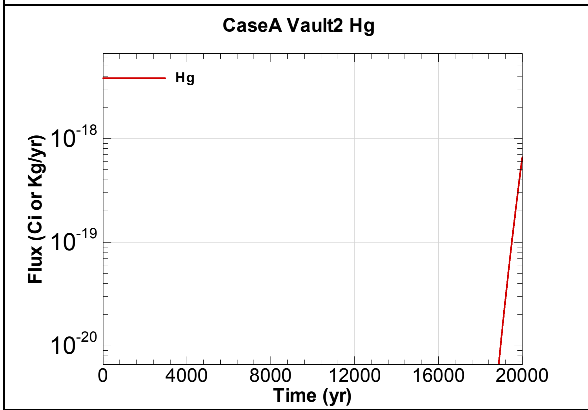

Figure G.2-79 - Flux to the Water Table for CaseF Vault2 Hg

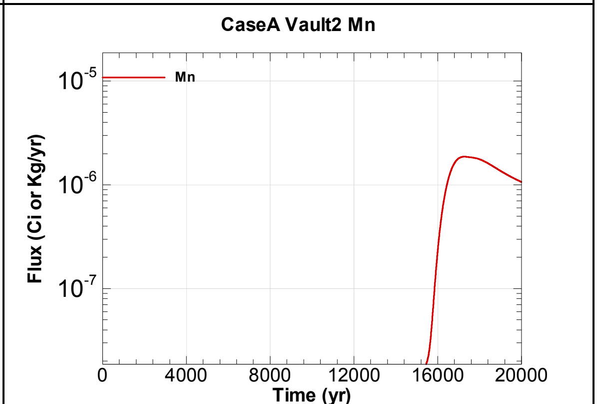

Figure G.2-80 - Flux to the Water Table for CaseF Vault2 Mn

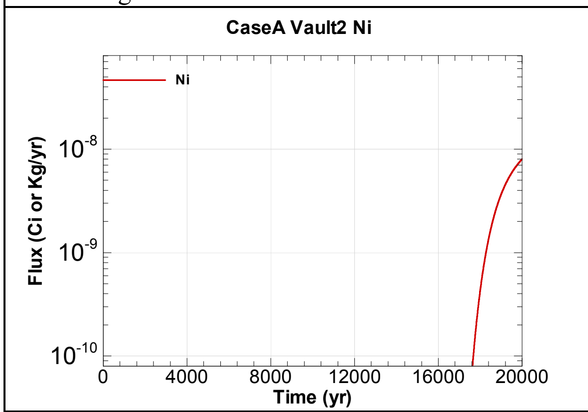

Figure G.2-81 - Flux to the Water Table for CaseF Vault2 Ni

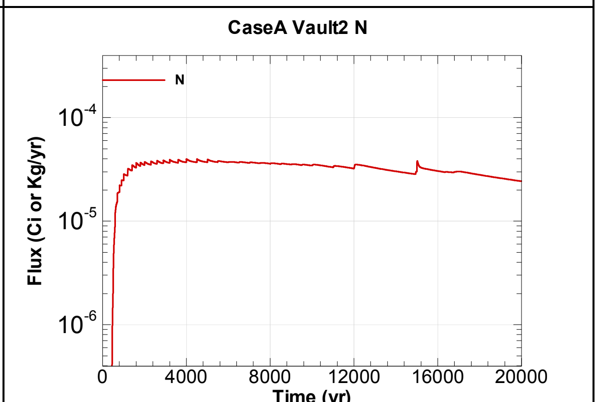

Figure G.2-82 - Flux to the Water Table for CaseF Vault2 N

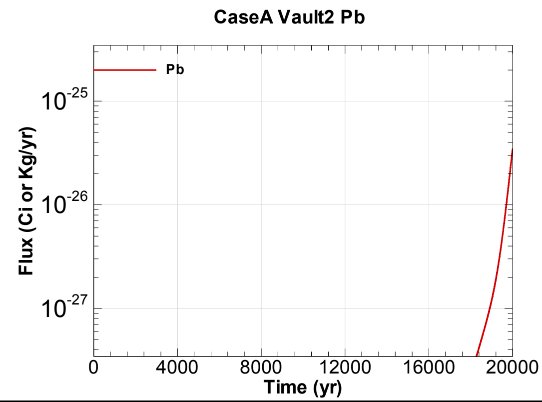

Figure G.2-83 - Flux to the Water Table for CaseF Vault2 Pb

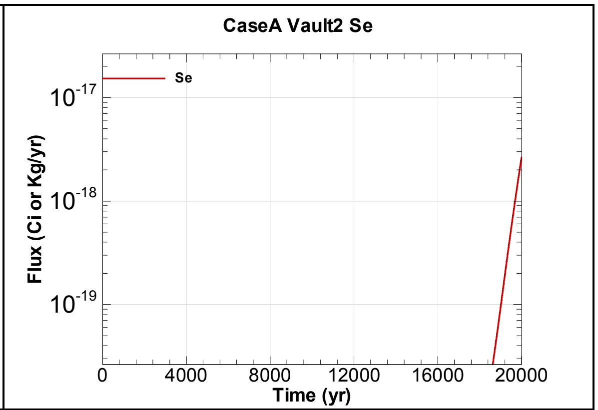

Figure G.2-84 - Flux to the Water Table for CaseF Vault2 Se

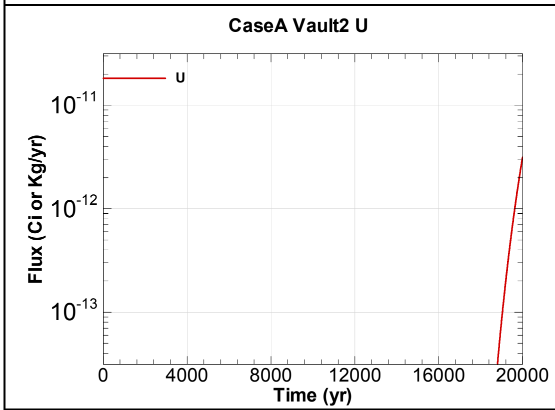

Figure G.2-85 - Flux to the Water Table for CaseF Vault2 U

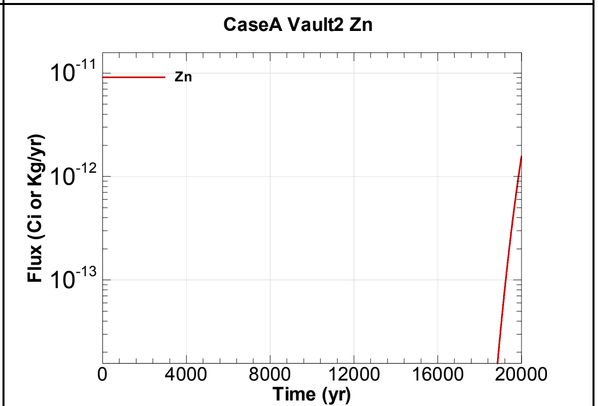

Figure G.2-86 - Flux to the Water Table for CaseF Vault2 Zn

G.3 – Vault 4 Flux to the Water Table

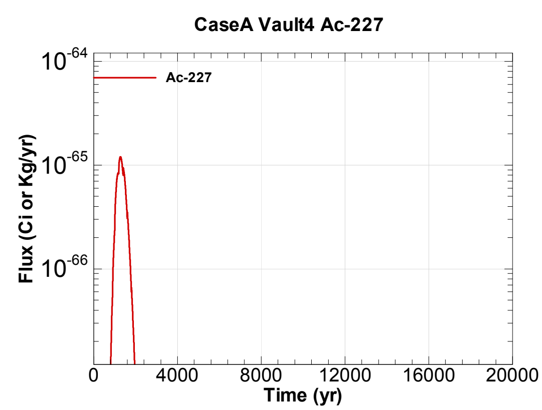

Figure G.3-1 - Flux to the Water Table for CaseA Vault4 Ac-227

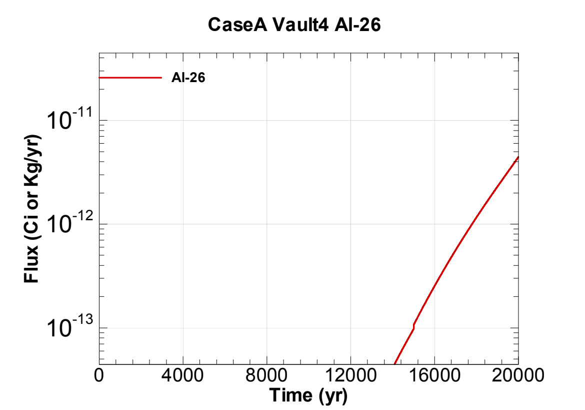

Figure G.3-2 - Flux to the Water Table for CaseA Vault4 Al-26

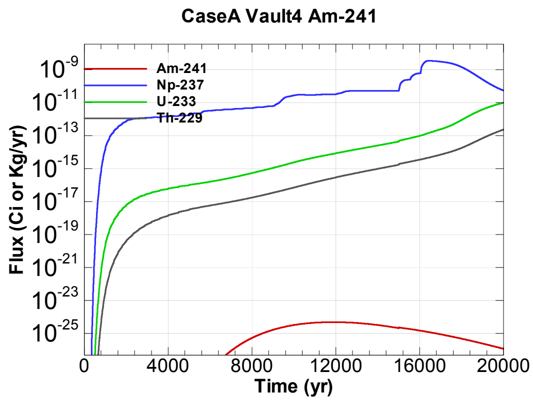

Figure G.3-3 - Flux to the Water Table for CaseA Vault4 Am-241

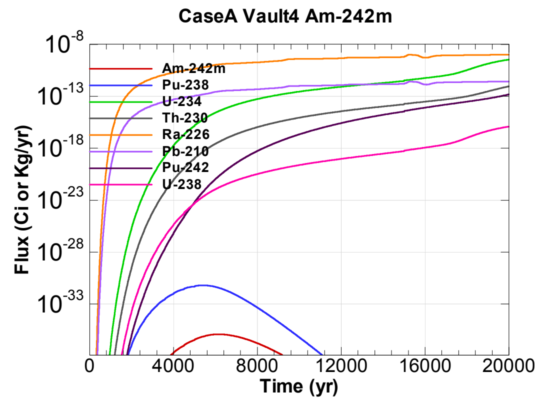

Figure G.3-4 - Flux to the Water Table for CaseA Vault4 Am-242m

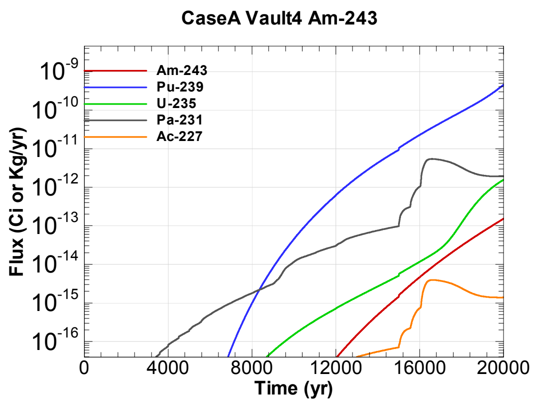

Figure G.3-5 - Flux to the Water Table for CaseA Vault4 Am-243

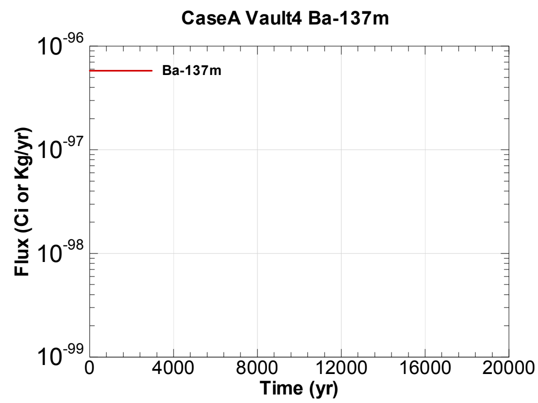

Figure G.3-6 - Flux to the Water Table for CaseA Vault4 Ba-137m

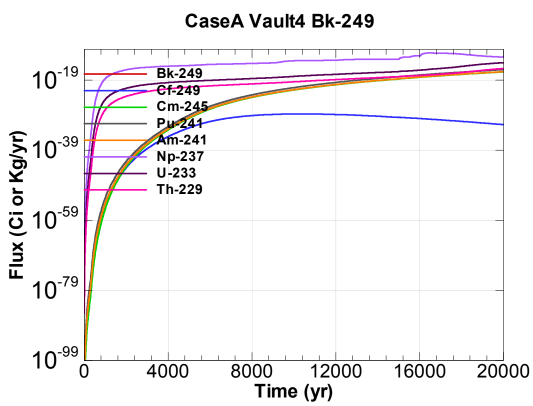

Figure G.3-7 - Flux to the Water Table for CaseA Vault4 Bk-249

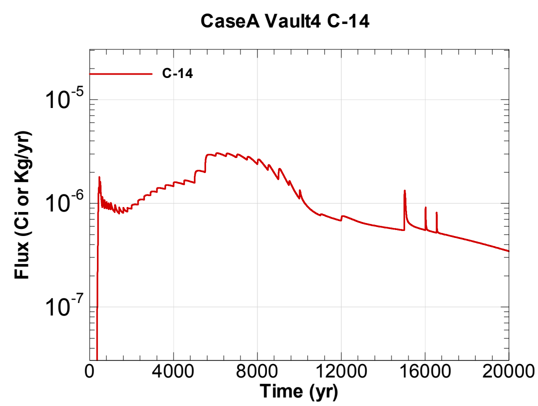

Figure G.3-8 - Flux to the Water Table for CaseA Vault4 C-14

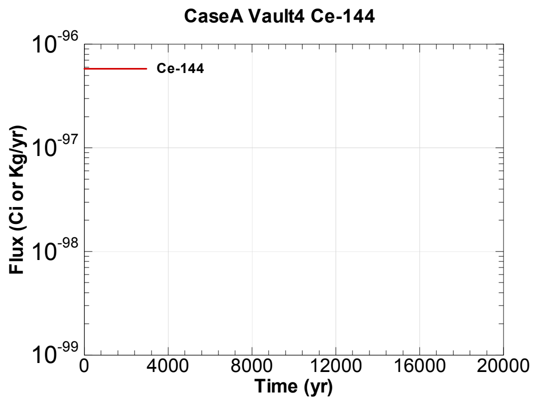

Figure G.3-9 - Flux to the Water Table for CaseA Vault4 Ce-144

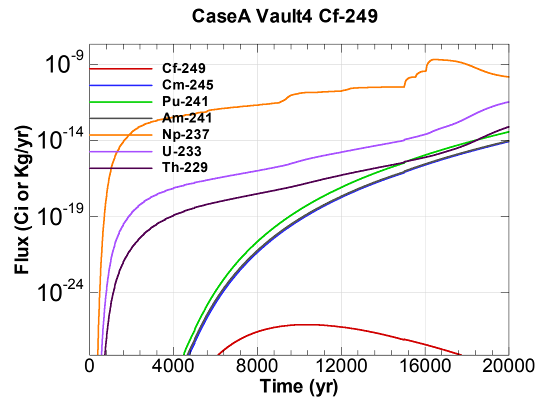

Figure G.3-10 - Flux to the Water Table for CaseA Vault4 Cf-249

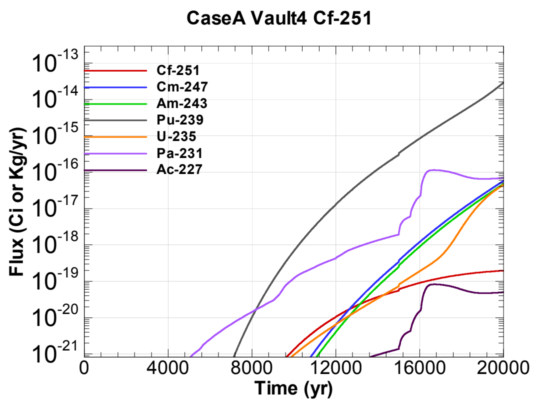

Figure G.3-11 - Flux to the Water Table for CaseA Vault4 Cf-251

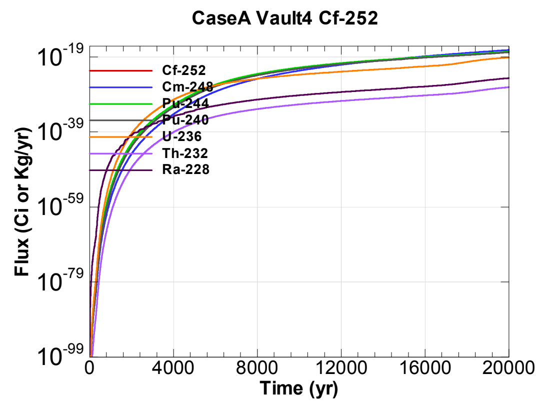

Figure G.3-12 - Flux to the Water Table for CaseA Vault4 Cf-252

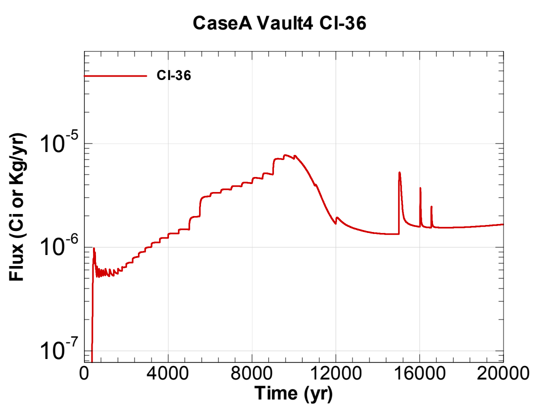

Figure G.3-13 - Flux to the Water Table for CaseA Vault4 Cl-36

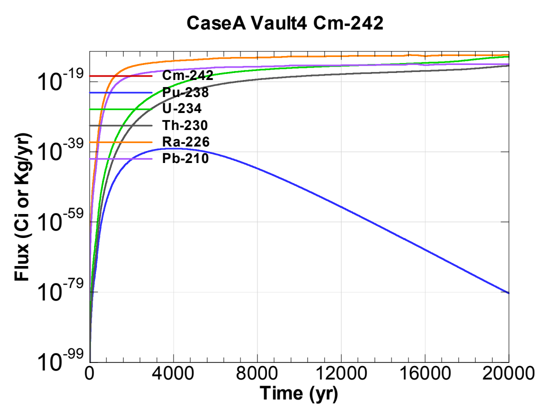

Figure G.3-14 - Flux to the Water Table for CaseA Vault4 Cm-242

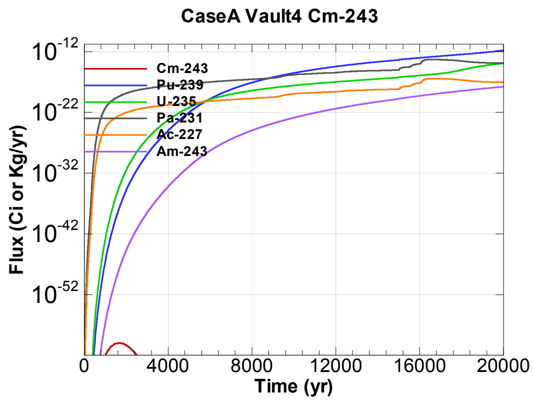

Figure G.3-15 - Flux to the Water Table for CaseA Vault4 Cm-243

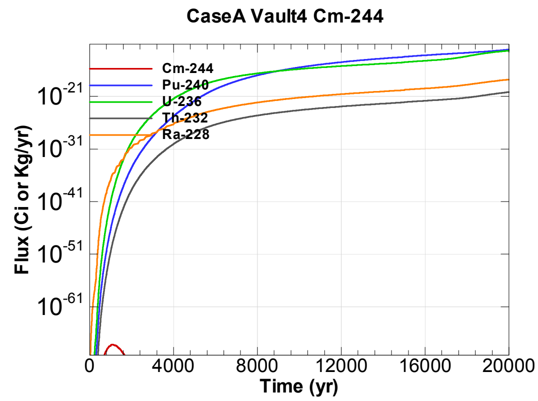

Figure G.3-16 - Flux to the Water Table for CaseA Vault4 Cm-244

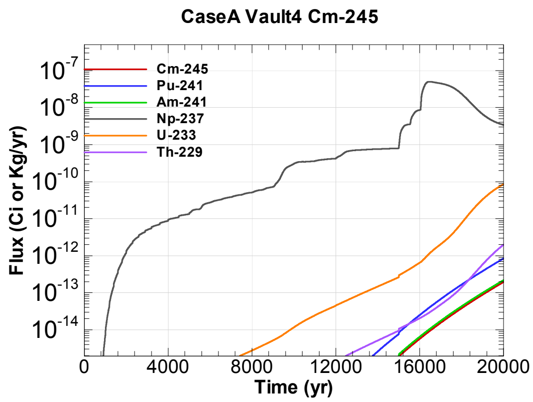

Figure G.3-17 - Flux to the Water Table for CaseA Vault4 Cm-245

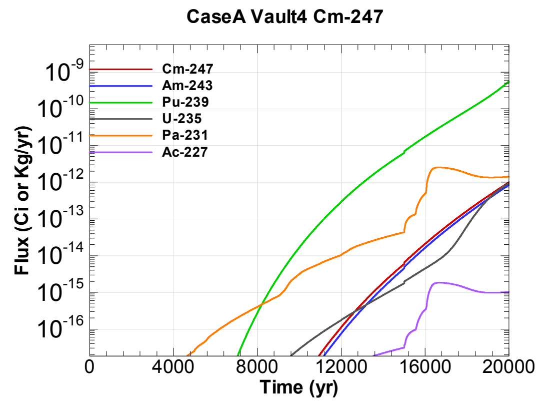

Figure G.3-18 - Flux to the Water Table for CaseA Vault4 Cm-247

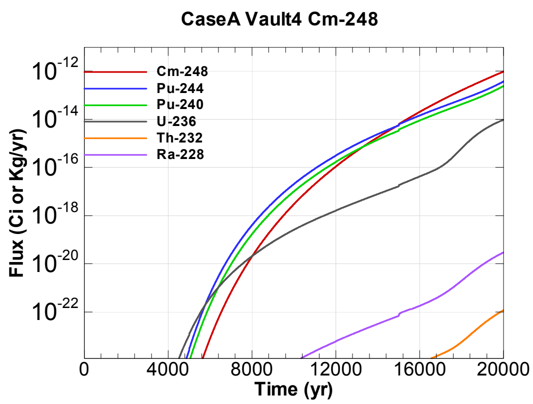

Figure G.3-19 - Flux to the Water Table for CaseA Vault4 Cm-248

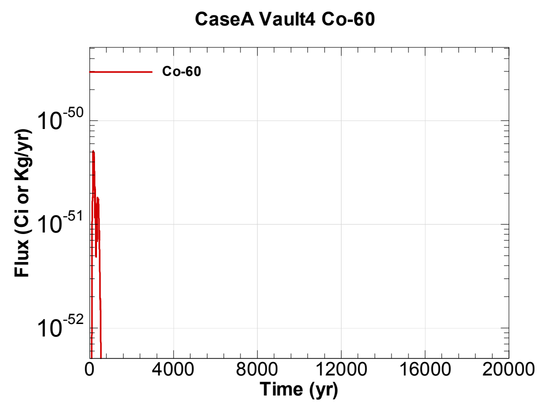

Figure G.3-20 - Flux to the Water Table for CaseA Vault4 Co-60

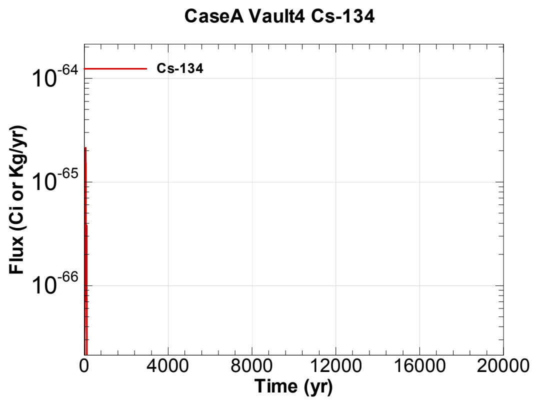

Figure G.3-21 - Flux to the Water Table for CaseA Vault4 Cs-134

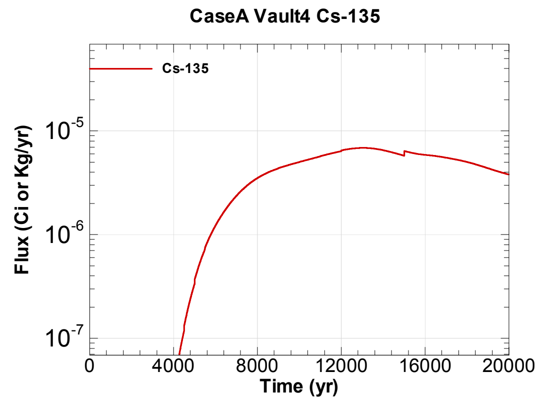

Figure G.3-22 - Flux to the Water Table for CaseA Vault4 Cs-135

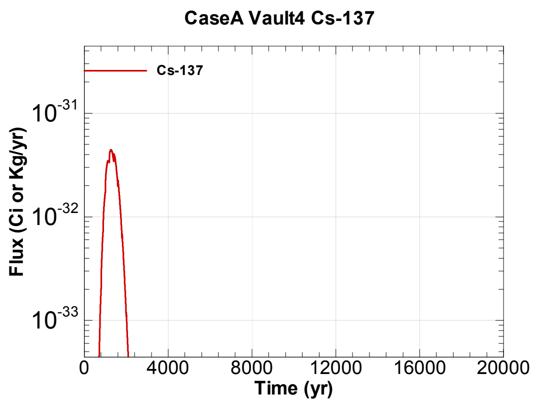

Figure G.3-23 - Flux to the Water Table for CaseA Vault4 Cs-137

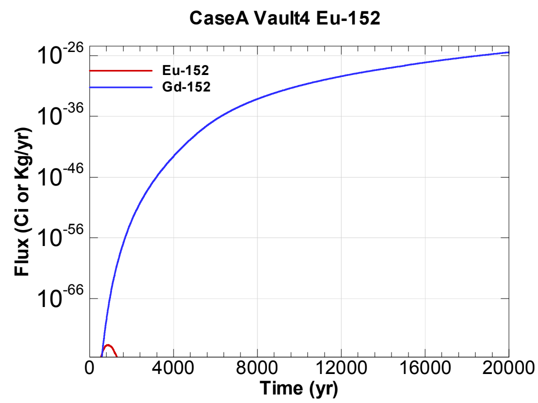

Figure G.3-24 - Flux to the Water Table for CaseA Vault4 Eu-152

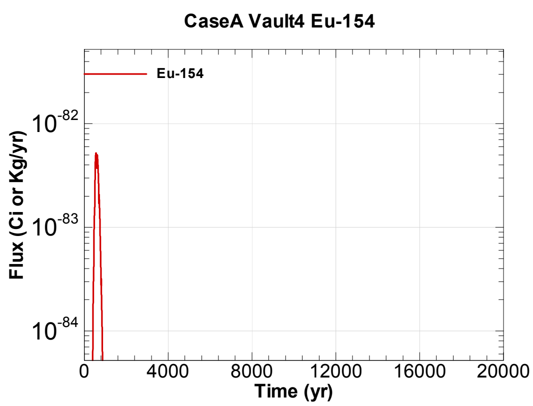

Figure G.3-25 - Flux to the Water Table for CaseA Vault4 Eu-154

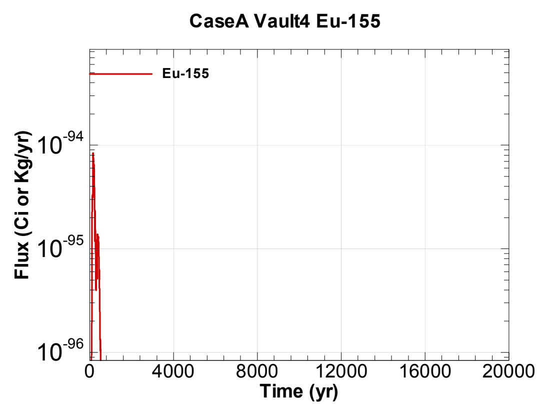

Figure G.3-26 - Flux to the Water Table for CaseA Vault4 Eu-155

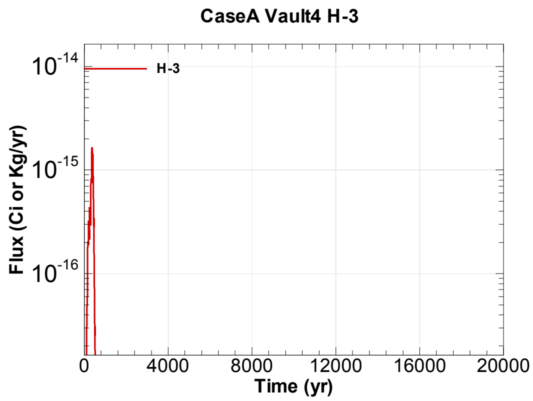

Figure G.3-27 - Flux to the Water Table for CaseA Vault4 H-3

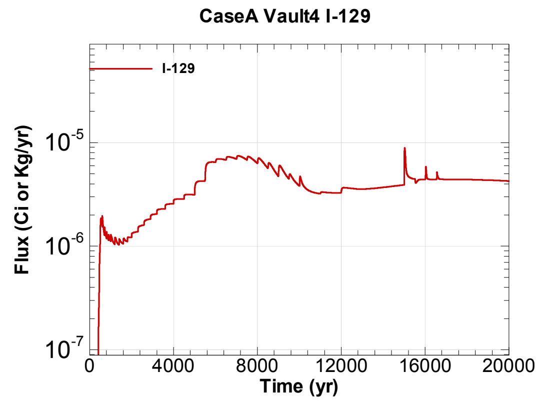

Figure G.3-28 - Flux to the Water Table for CaseA Vault4 I-129

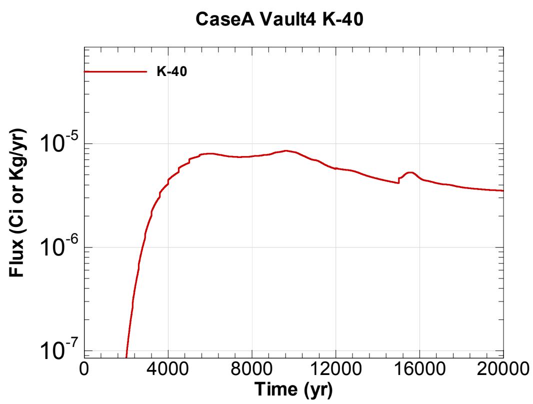

Figure G.3-29 - Flux to the Water Table for CaseA Vault4 K-40

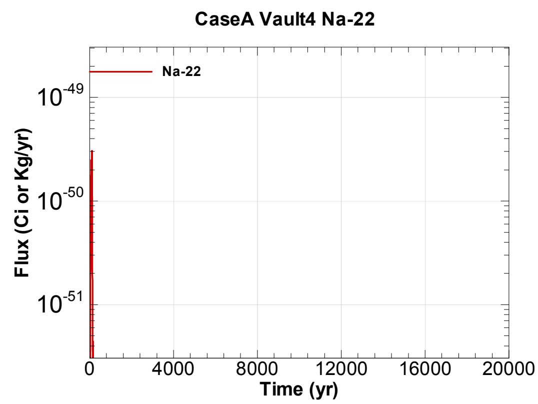

Figure G.3-30 - Flux to the Water Table for CaseA Vault4 Na-22

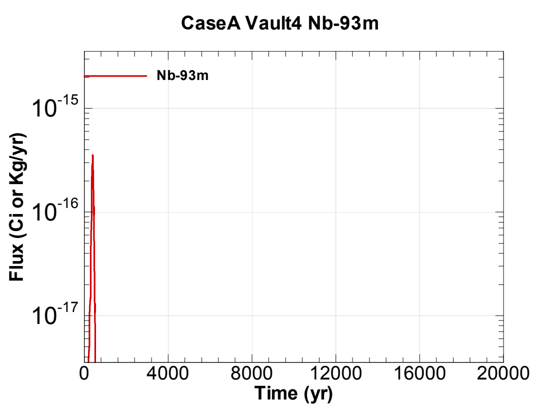

Figure G.3-31 - Flux to the Water Table for CaseA Vault4 Nb-93m

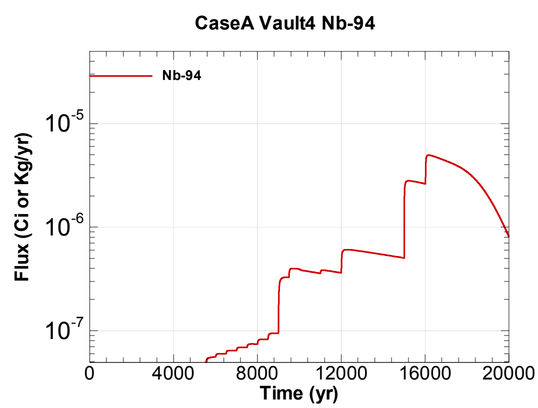

Figure G.3-32 - Flux to the Water Table for CaseA Vault4 Nb-94

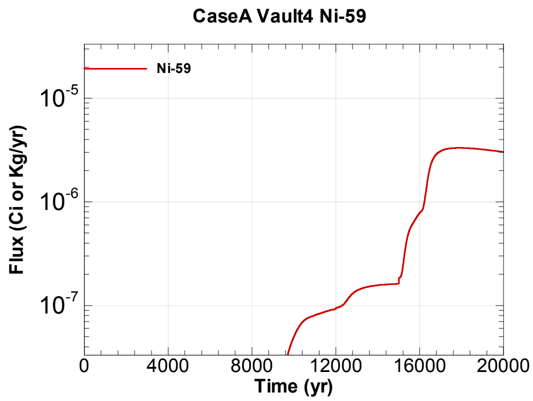

Figure G.3-33 - Flux to the Water Table for CaseA Vault4 Ni-59

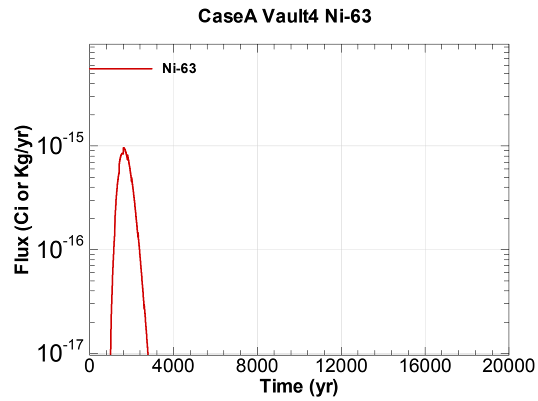

Figure G.3-34 - Flux to the Water Table for CaseA Vault4 Ni-63

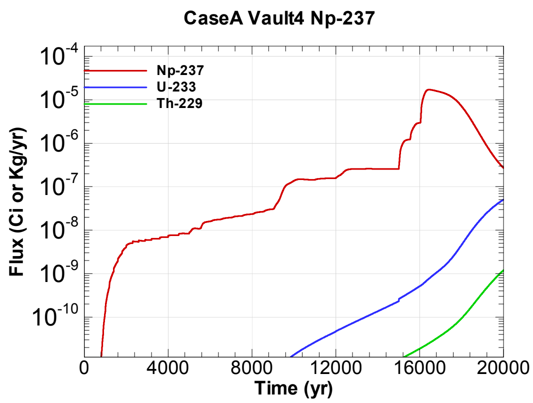

Figure G.3-35 - Flux to the Water Table for CaseA Vault4 Np-237

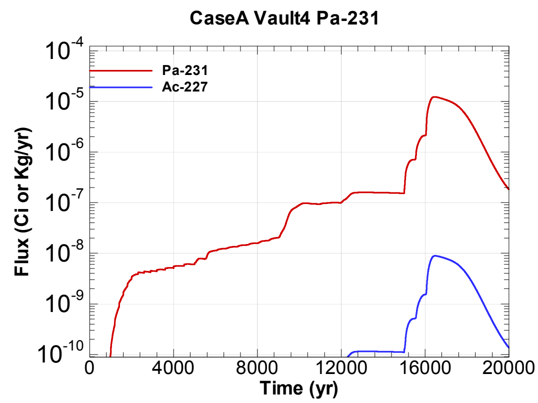

Figure G.3-36 - Flux to the Water Table for CaseA Vault4 Pa-231

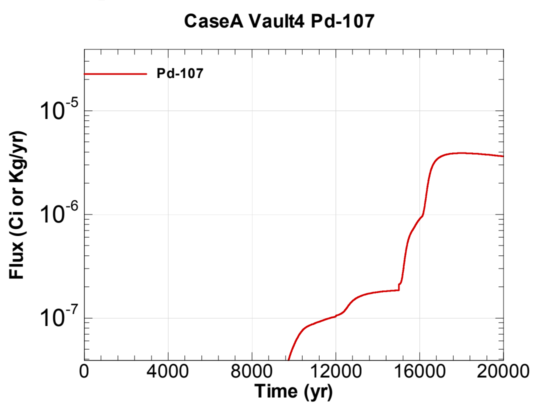

Figure G.3-37 - Flux to the Water Table for CaseA Vault4 Pd-107

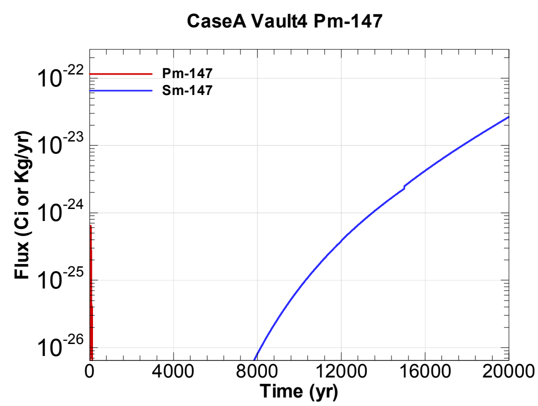

Figure G.3-38 - Flux to the Water Table for CaseA Vault4 Pm-147

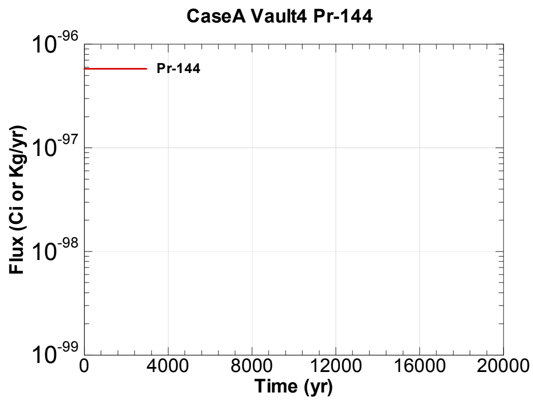

Figure G.3-39 - Flux to the Water Table for CaseA Vault4 Pr-144

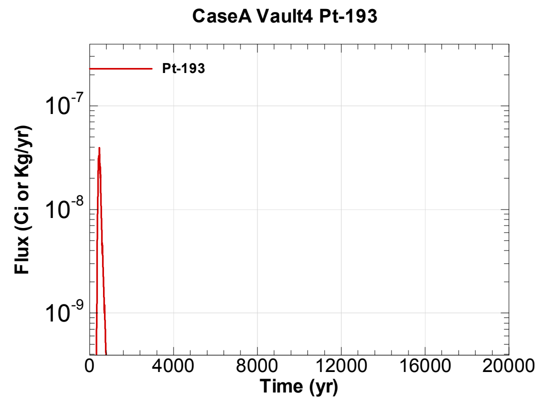

Figure G.3-40 - Flux to the Water Table for CaseA Vault4 Pt-193

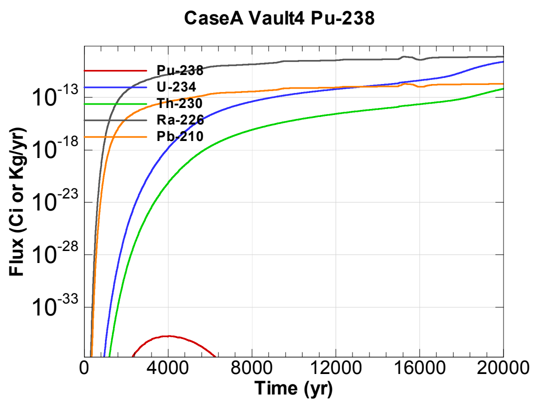

Figure G.3-41 - Flux to the Water Table for CaseA Vault4 Pu-238

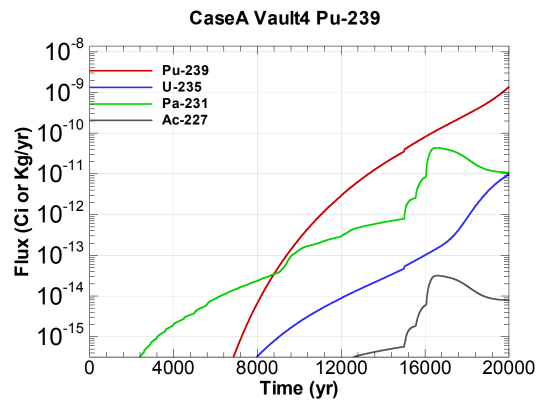

Figure G.3-42 - Flux to the Water Table for CaseA Vault4 Pu-239

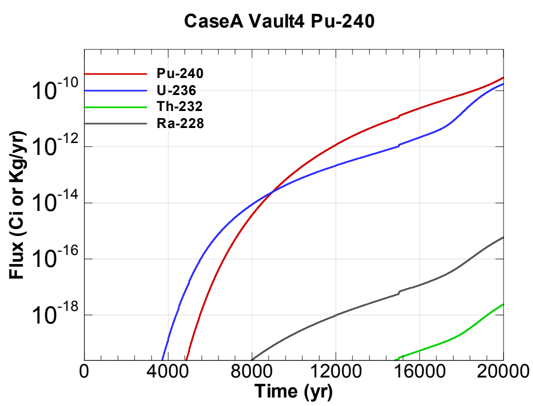

Figure G.3-43 - Flux to the Water Table for CaseA Vault4 Pu-240

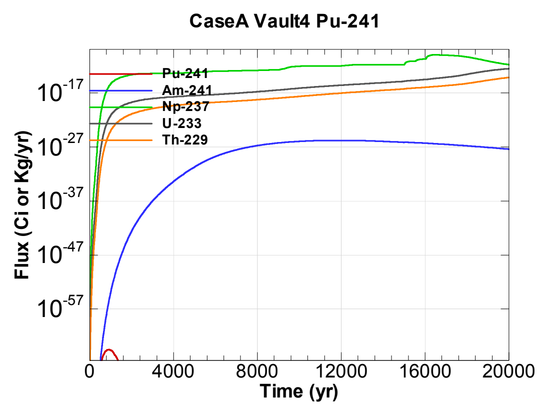

Figure G.3-44 - Flux to the Water Table for CaseA Vault4 Pu-241

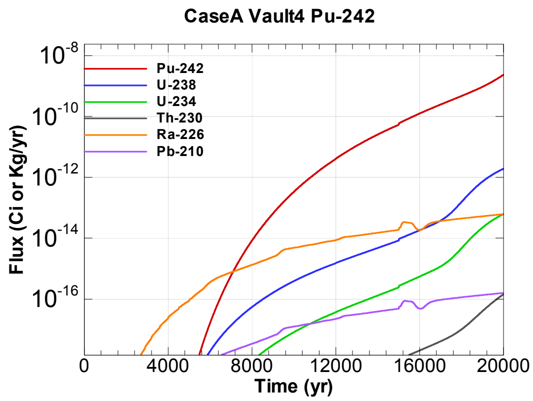

Figure G.3-45 - Flux to the Water Table for CaseA Vault4 Pu-242

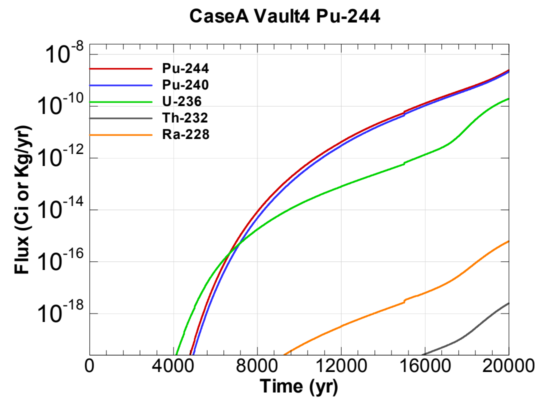

Figure G.3-46 - Flux to the Water Table for CaseA Vault4 Pu-244

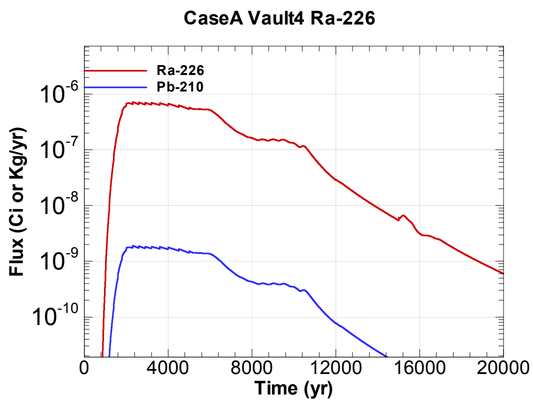

Figure G.3-47 - Flux to the Water Table for CaseA Vault4 Ra-226

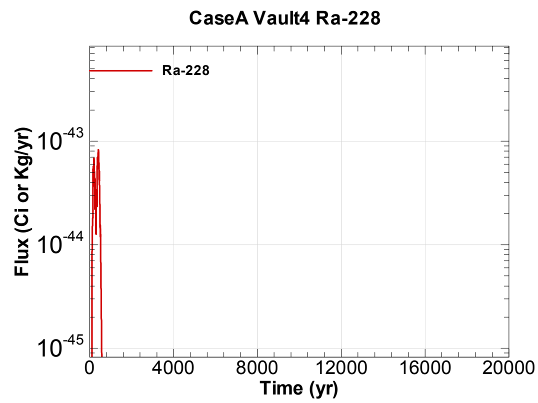

Figure G.3-48 - Flux to the Water Table for CaseA Vault4 Ra-228

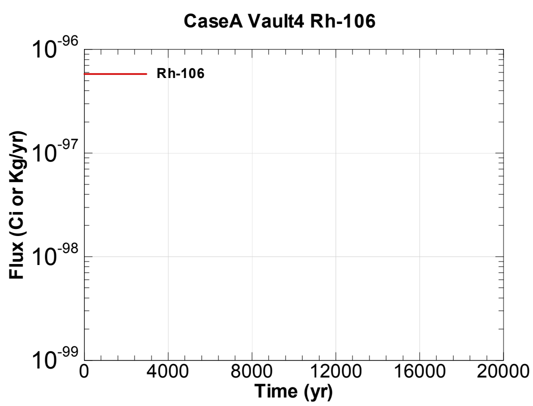

Figure G.3-49 - Flux to the Water Table for CaseA Vault4 Rh-106

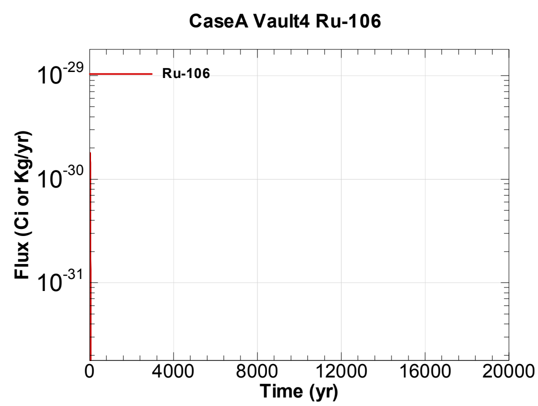

Figure G.3-50 - Flux to the Water Table for CaseA Vault4 Ru-106

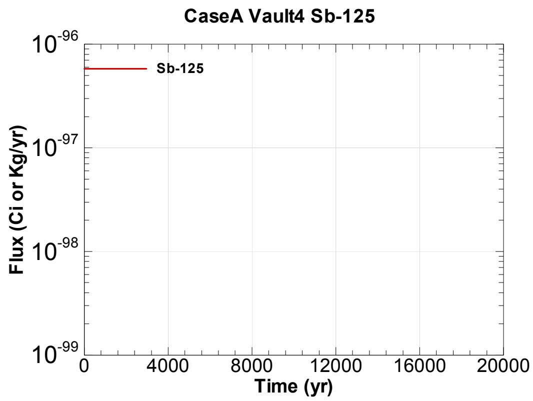

Figure G.3-51 - Flux to the Water Table for CaseA Vault4 Sb-125

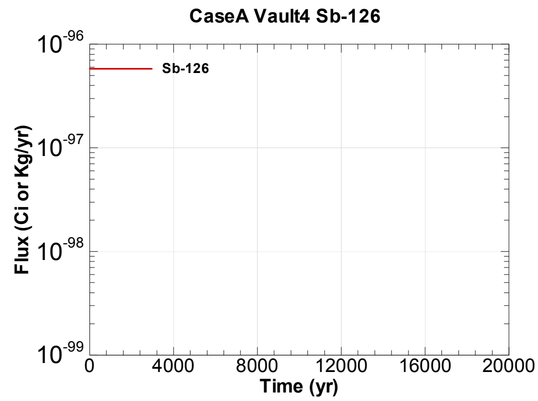

Figure G.3-52 - Flux to the Water Table for CaseA Vault4 Sb-126

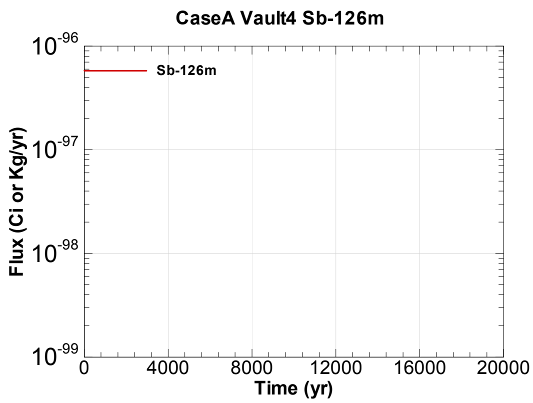

Figure G.3-53 - Flux to the Water Table for CaseA Vault4 Sb-126m

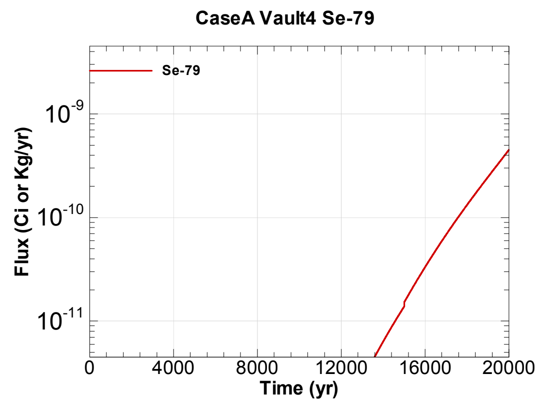

Figure G.3-54 - Flux to the Water Table for CaseA Vault4 Se-79

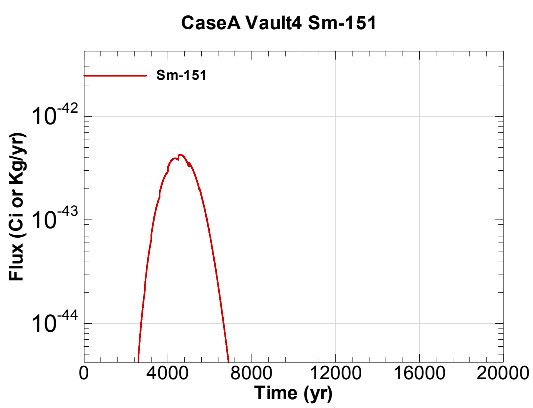

Figure G.3-55 - Flux to the Water Table for CaseA Vault4 Sm-151

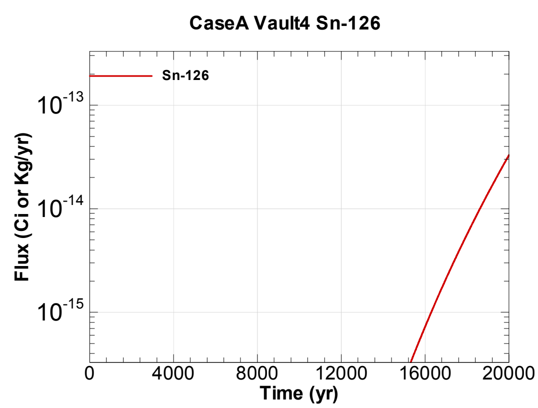

Figure G.3-56 - Flux to the Water Table for CaseA Vault4 Sn-126

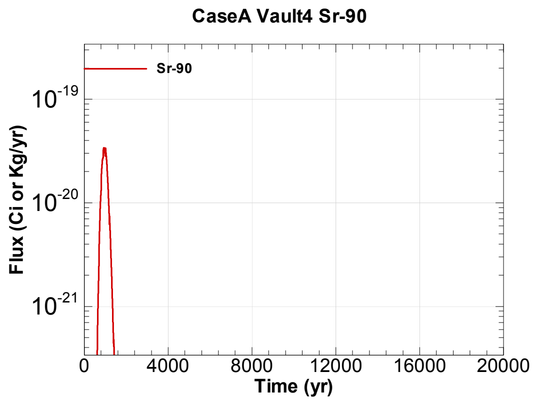

Figure G.3-57 - Flux to the Water Table for CaseA Vault4 Sr-90

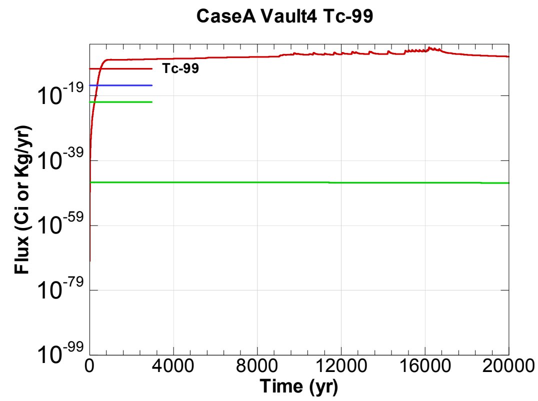

Figure G.3-58 - Flux to the Water Table for CaseA Vault4 Tc-99

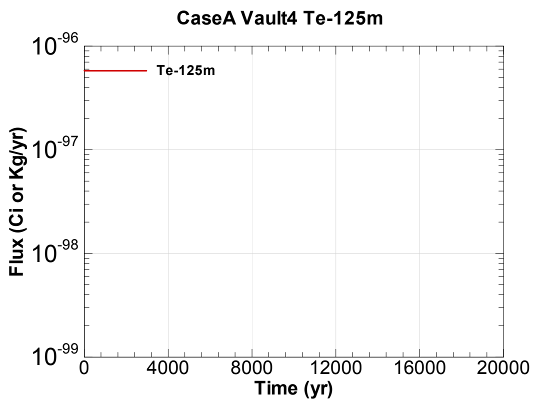

Figure G.3-59 - Flux to the Water Table for CaseA Vault4 Te-125m

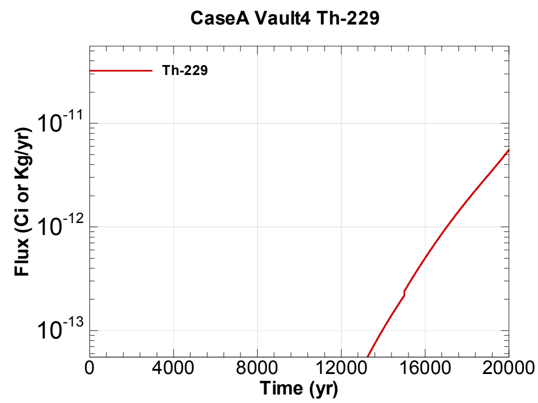

Figure G.3-60 - Flux to the Water Table for CaseA Vault4 Th-229

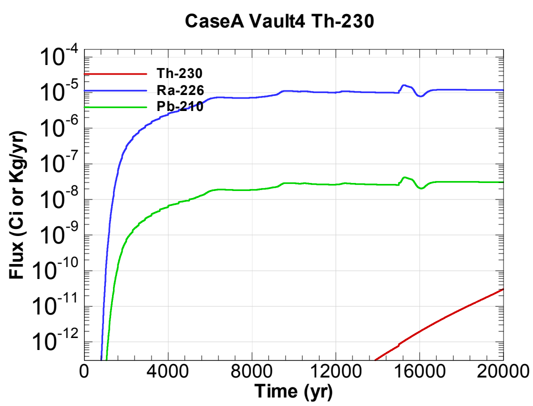

Figure G.3-61 - Flux to the Water Table for CaseA Vault4 Th-230

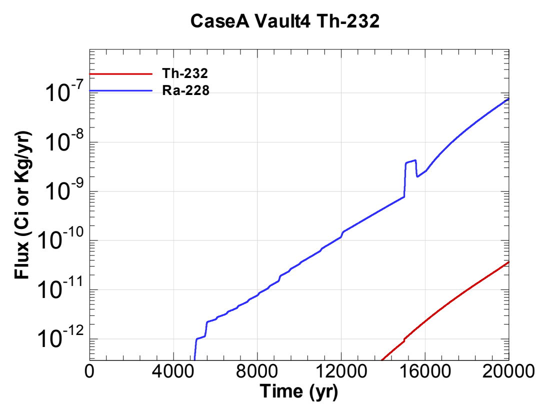

Figure G.3-62 - Flux to the Water Table for CaseA Vault4 Th-232

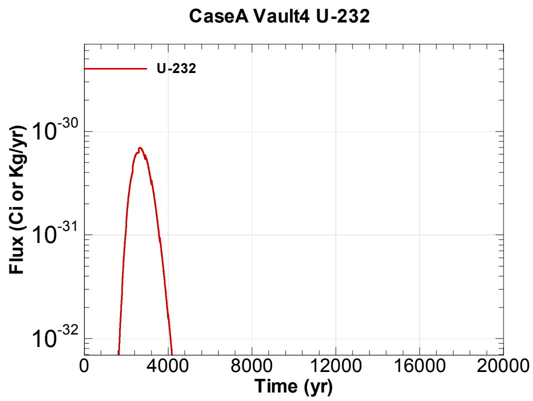

Figure G.3-63 - Flux to the Water Table for CaseA Vault4 U-232

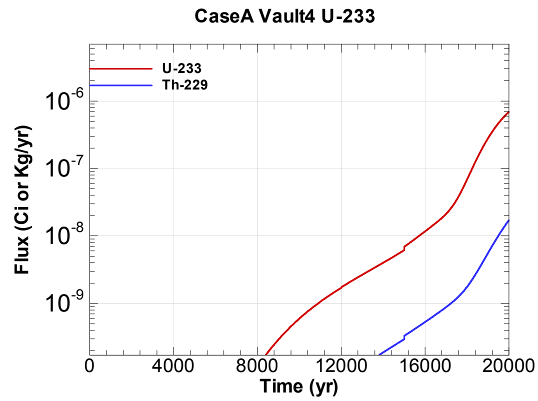

Figure G.3-64 - Flux to the Water Table for CaseA Vault4 U-233

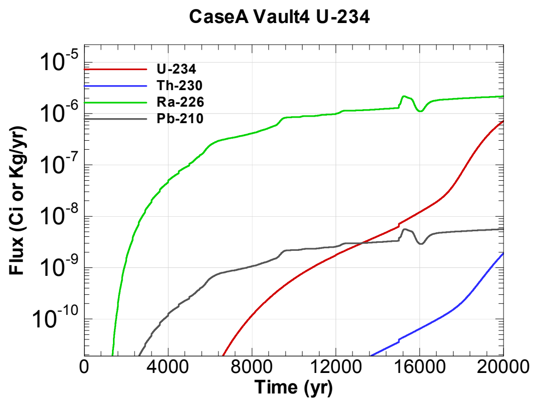

Figure G.3-65 - Flux to the Water Table for CaseA Vault4 U-234

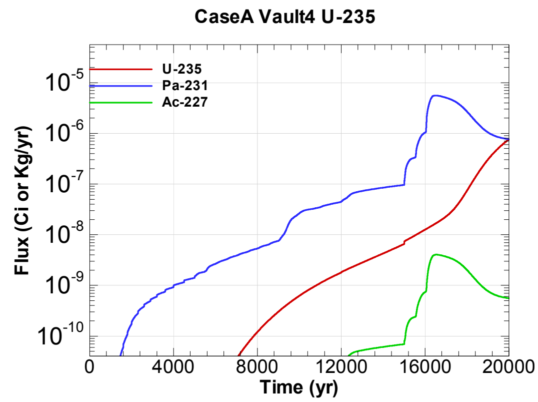

Figure G.3-66 - Flux to the Water Table for CaseA Vault4 U-235

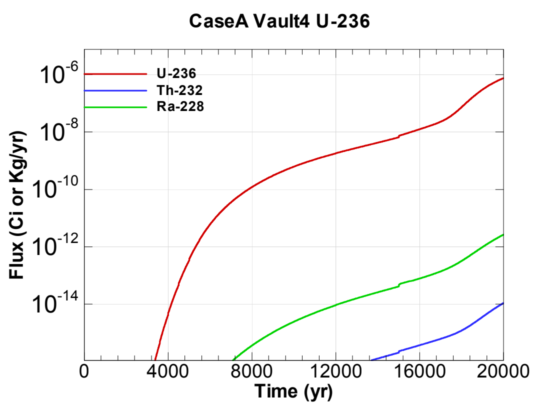

Figure G.3-67 - Flux to the Water Table for CaseA Vault4 U-236

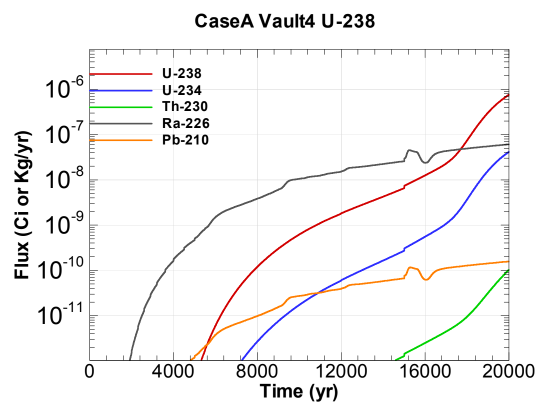

Figure G.3-68 - Flux to the Water Table for CaseA Vault4 U-238

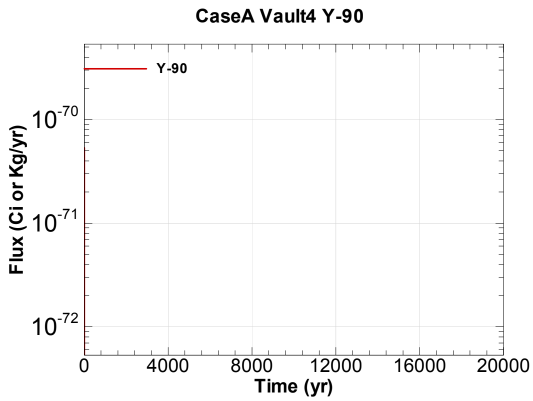

Figure G.3-69 - Flux to the Water Table for CaseA Vault4 Y-90

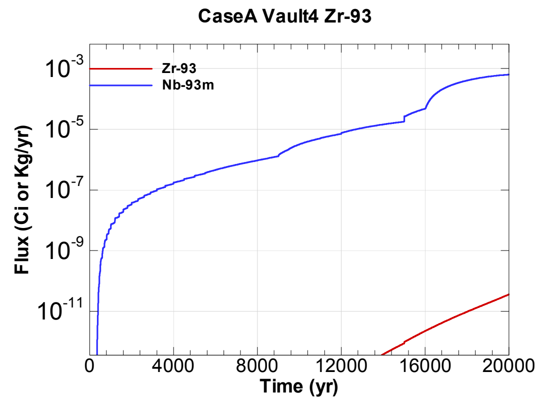

Figure G.3-70 - Flux to the Water Table for CaseA Vault4 Zr-93

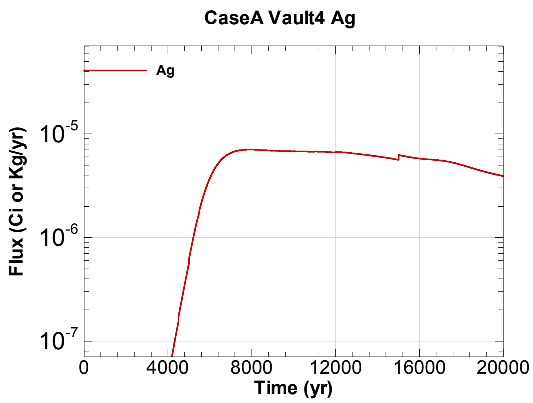

Figure G.3-71 - Flux to the Water Table for CaseA Vault4 Ag

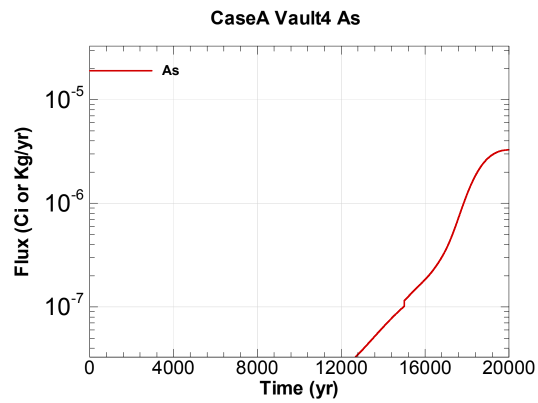

Figure G.3-72 - Flux to the Water Table for CaseA Vault4 As

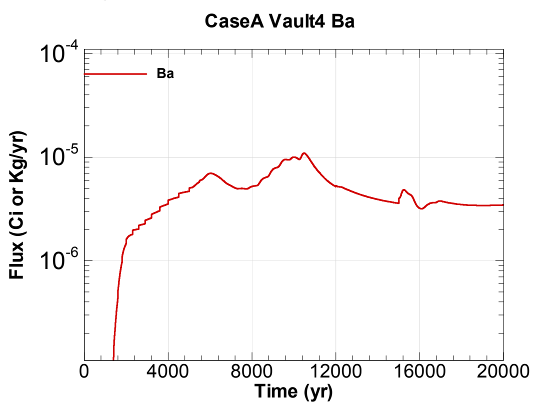

Figure G.3-73 - Flux to the Water Table for CaseA Vault4 Ba

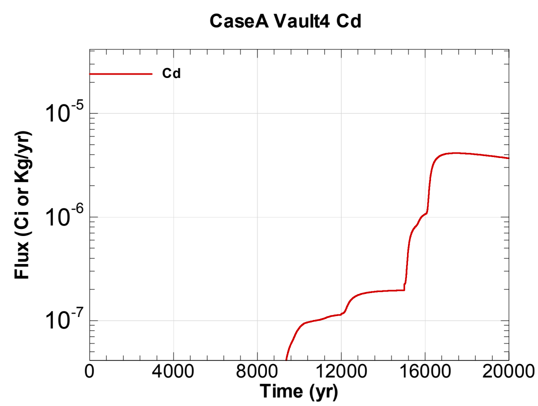

Figure G.3-74 - Flux to the Water Table for CaseA Vault4 Cd

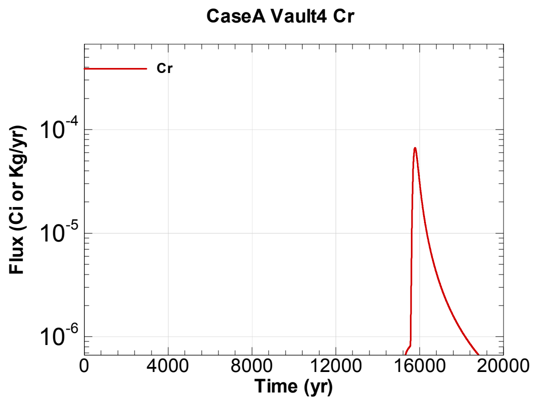

Figure G.3-75 - Flux to the Water Table for CaseA Vault4 Cr

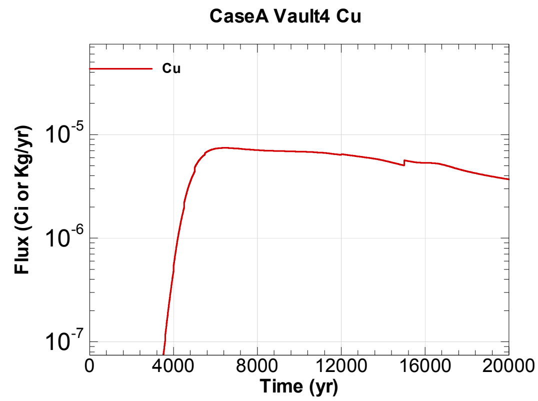

Figure G.3-76 - Flux to the Water Table for CaseA Vault4 Cu

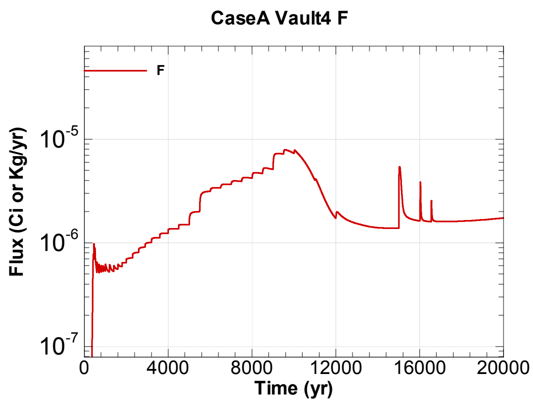

Figure G.3-77 - Flux to the Water Table for CaseA Vault4 F

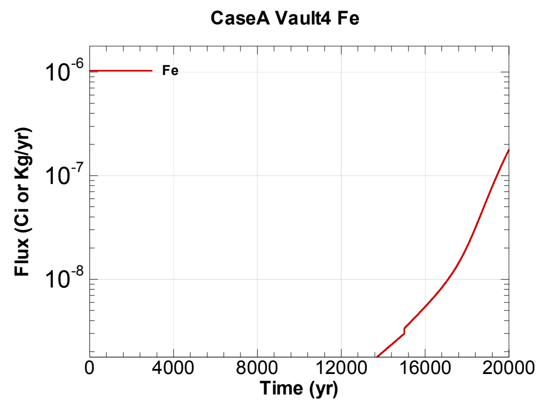

Figure G.3-78 - Flux to the Water Table for CaseA Vault4 Fe

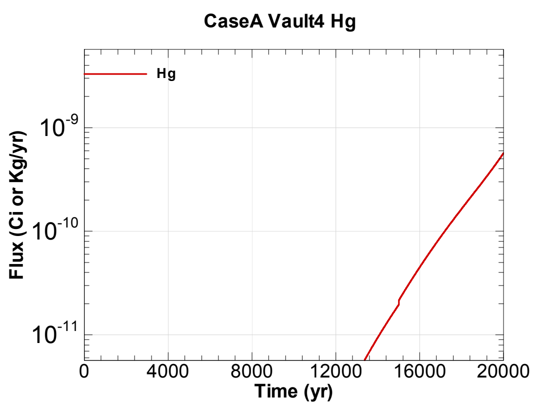

Figure G.3-79 - Flux to the Water Table for CaseA Vault4 Hg

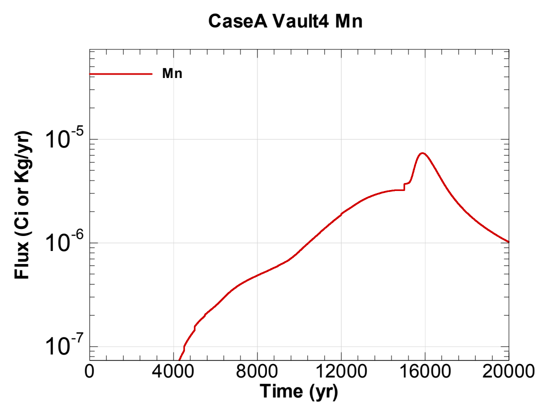

Figure G.3-80 - Flux to the Water Table for CaseA Vault4 Mn

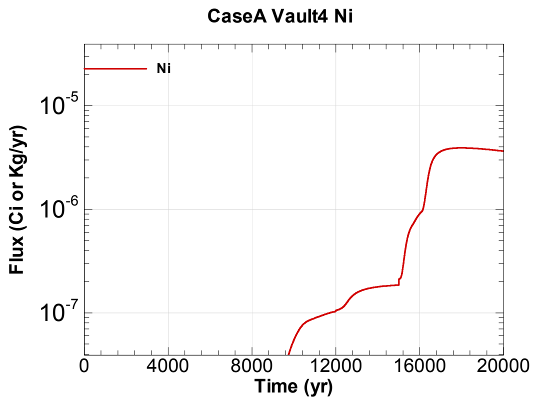

Figure G.3-81 - Flux to the Water Table for CaseA Vault4 Ni

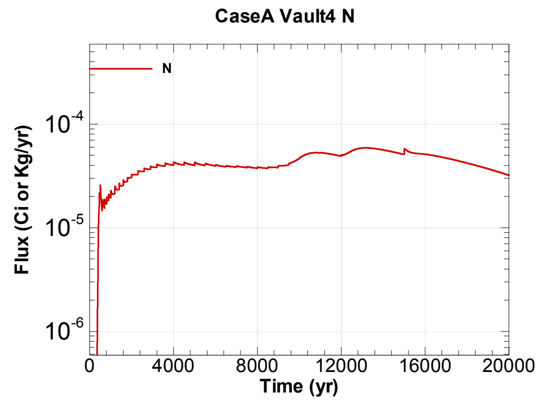

Figure G.3-82 - Flux to the Water Table for CaseA Vault4 N

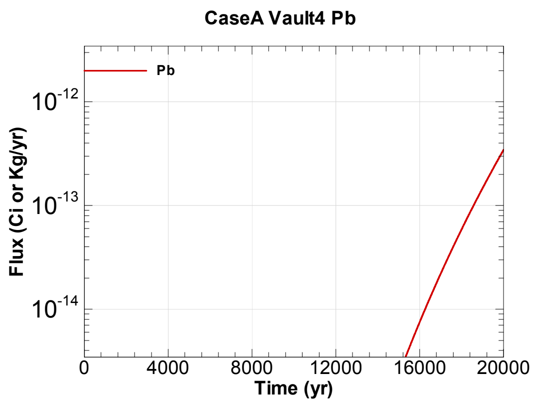

Figure G.3-83 - Flux to the Water Table for CaseA Vault4 Pb

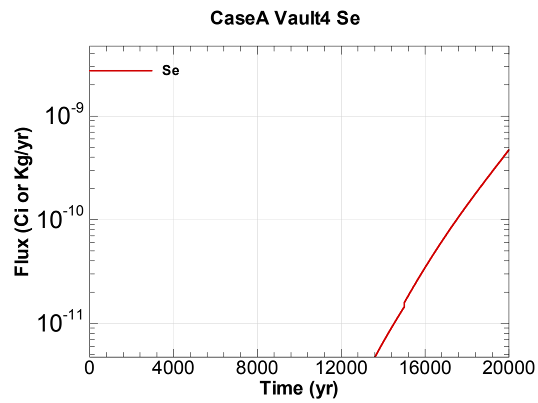

Figure G.3-84 - Flux to the Water Table for CaseA Vault4 Se

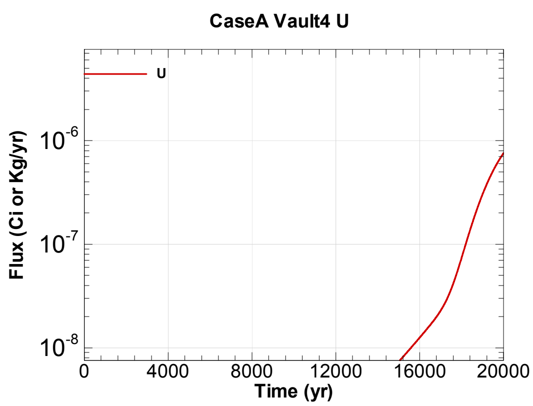

Figure G.3-85 - Flux to the Water Table for CaseA Vault4 U

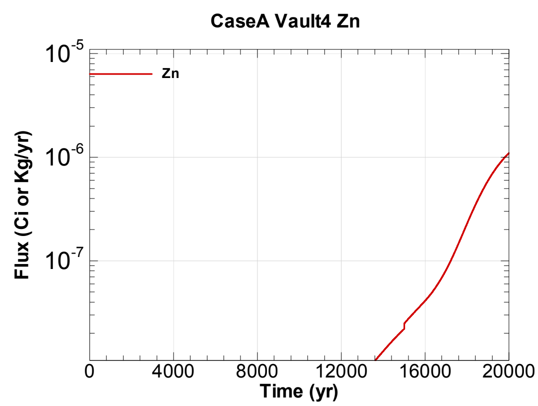

Figure G.3-86 - Flux to the Water Table for CaseA Vault4 Zn

Appendix H - Peak concentration at 100 meters for CaseA

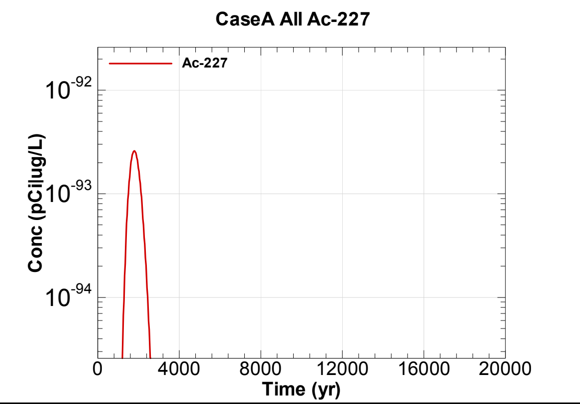

Figure H-1 - 100m Aquifer Concentration for CaseF All Ac-227

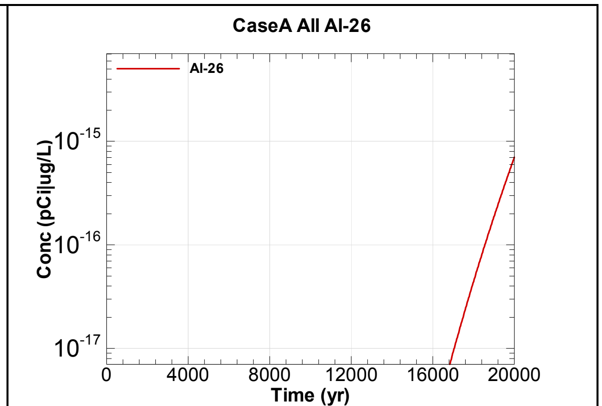

Figure H-2 - 100m Aquifer Concentration for CaseF All Al-26

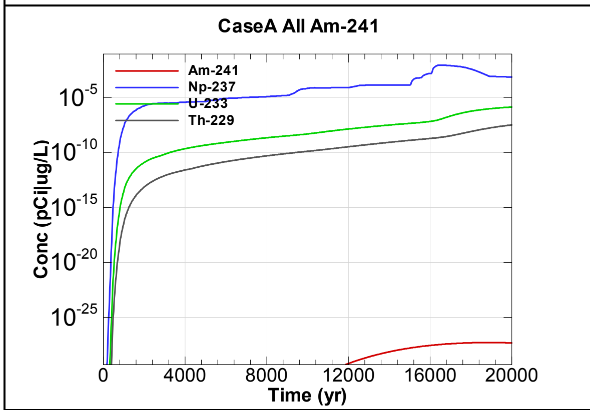

Figure H-3 - 100m Aquifer Concentration for CaseF All Am-241

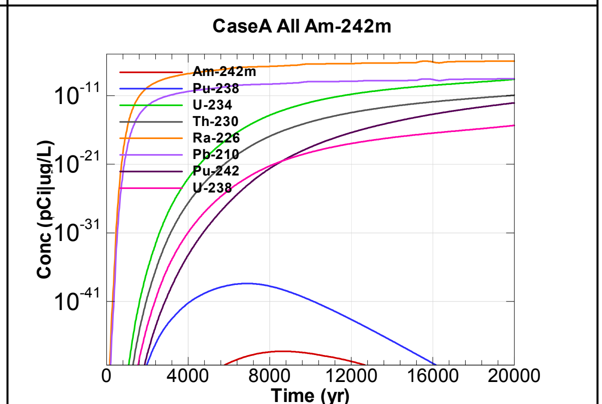

Figure H-4 - 100m Aquifer Concentration for CaseF All Am-242m

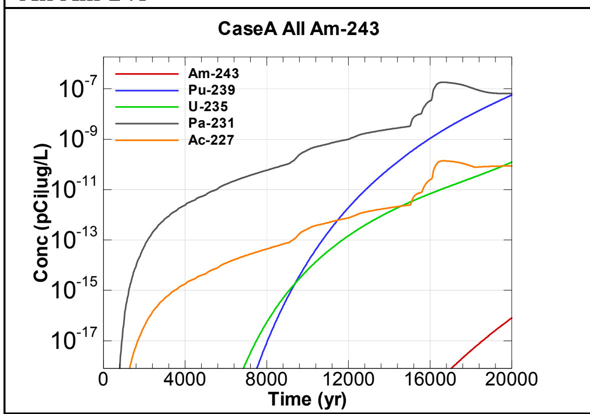

Figure H-5 - 100m Aquifer Concentration for CaseF All Am-243

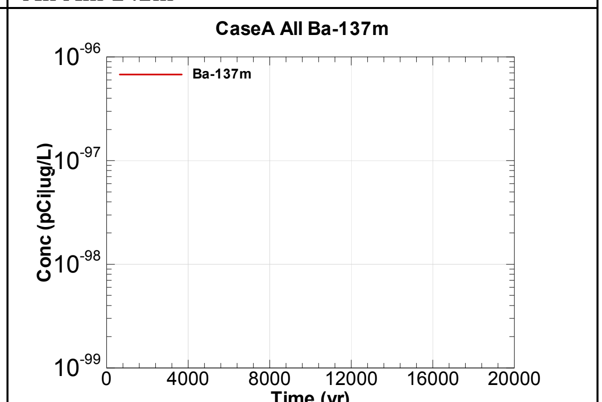

Figure H-6 - 100m Aquifer Concentration for CaseF All Ba-137m

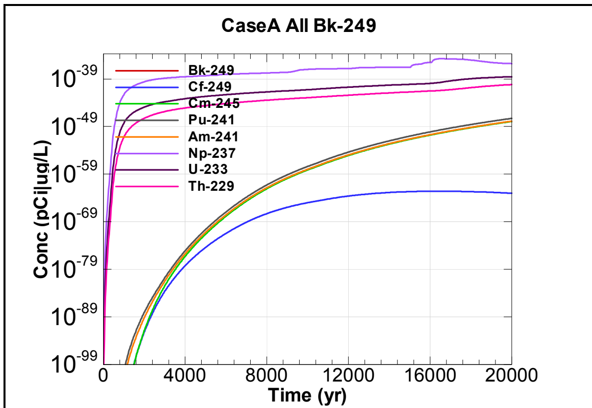

Figure H-7 - 100m Aquifer Concentration for CaseF All Bk-249

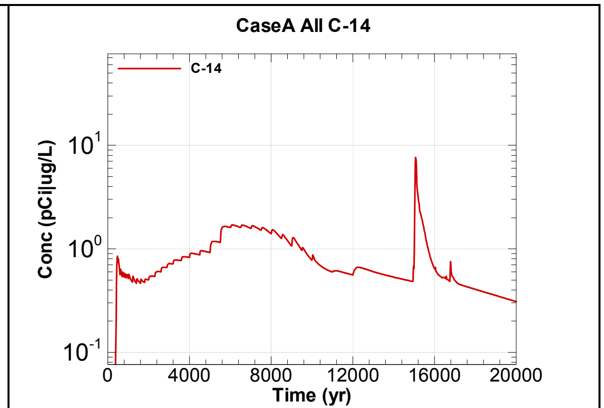

Figure H-8 - 100m Aquifer Concentration for CaseF All C-14

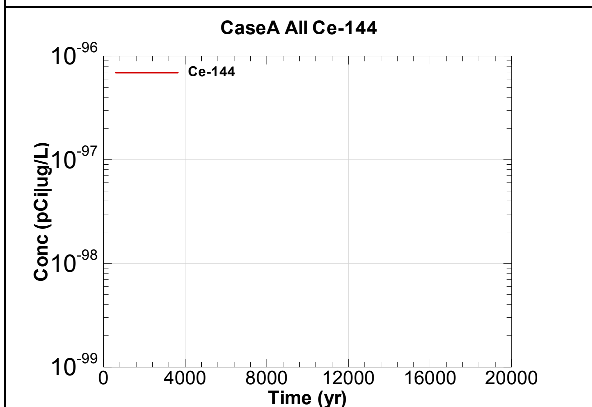

Figure H-9 - 100m Aquifer Concentration for CaseF All Ce-144

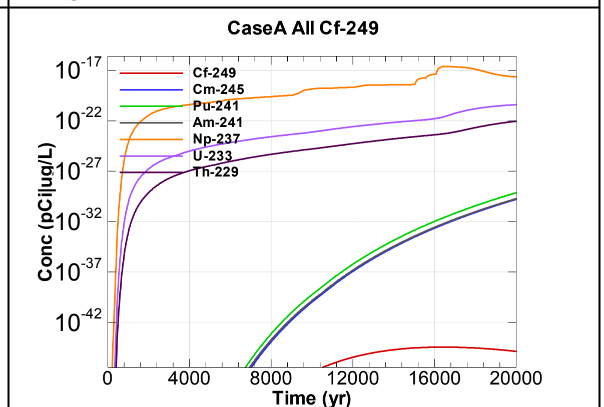

Figure H-10 - 100m Aquifer Concentration for CaseF All Cf-249

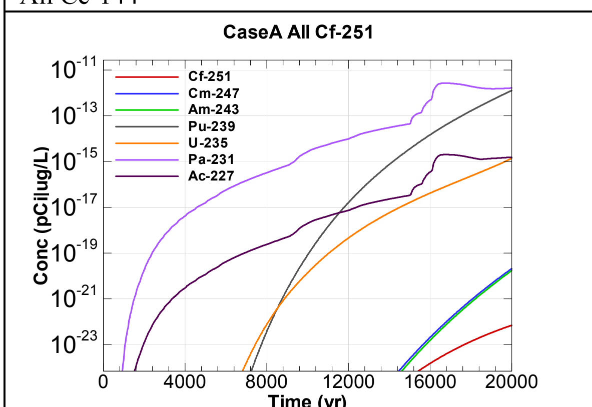

Figure H-11 - 100m Aquifer Concentration for CaseF All Cf-251

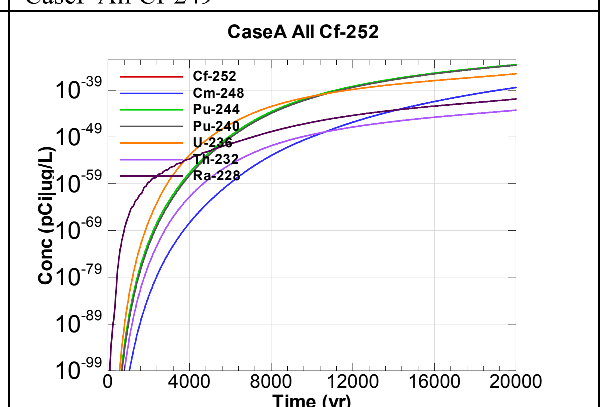

Figure H-12 - 100m Aquifer Concentration for CaseF All Cf-252

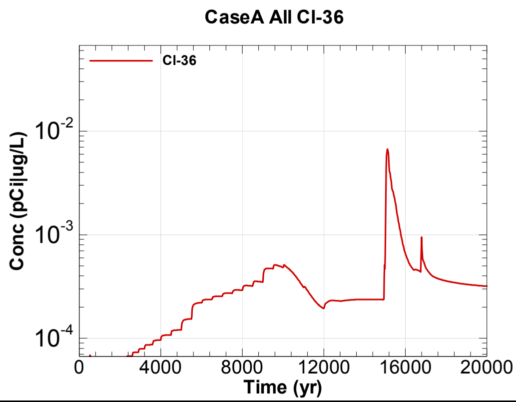

Figure H-13 - 100m Aquifer Concentration for CaseF All Cl-36

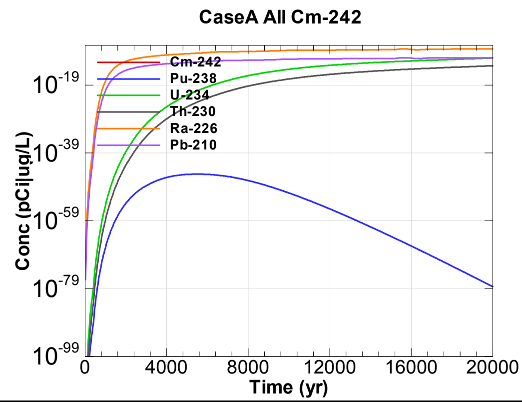

Figure H-14 - 100m Aquifer Concentration for CaseF All Cm-242

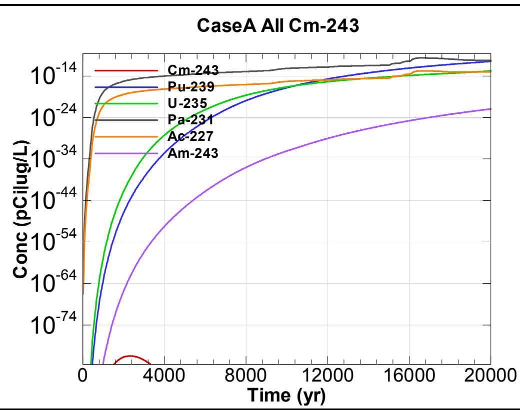

Figure H-15 - 100m Aquifer Concentration for CaseF All Cm-243

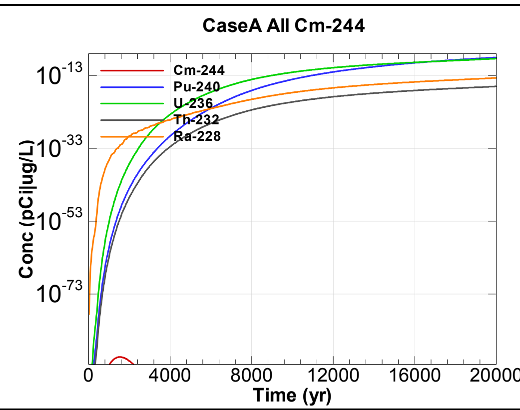

Figure H-16 - 100m Aquifer Concentration for CaseF All Cm-244

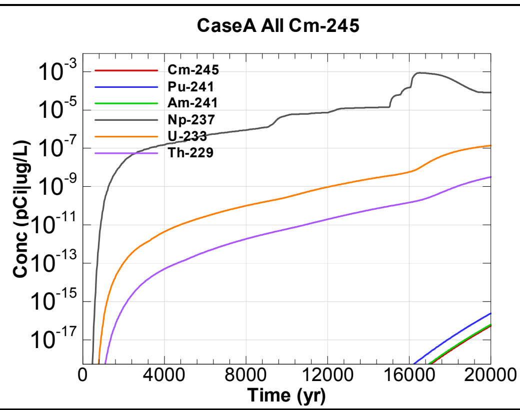

Figure H-17 - 100m Aquifer Concentration for CaseF All Cm-245

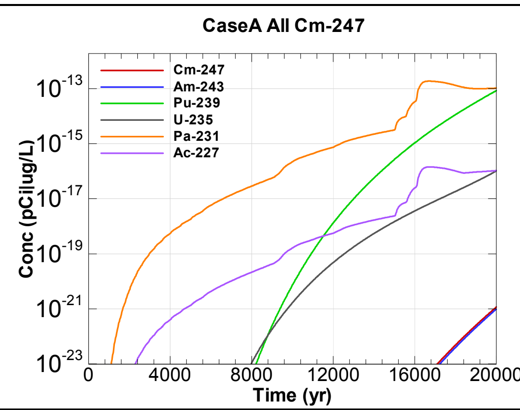

Figure H-18 - 100m Aquifer Concentration for CaseF All Cm-247

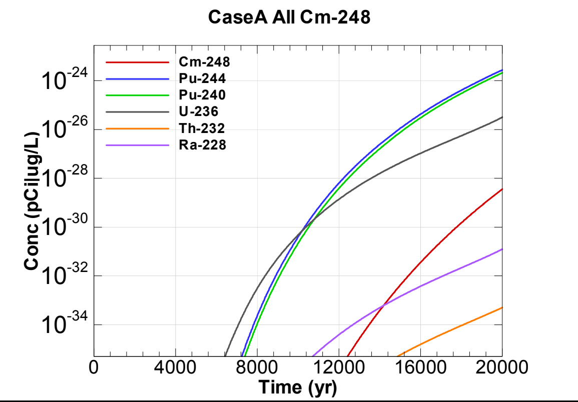

Figure H-19 - 100m Aquifer Concentration for CaseF All Cm-248

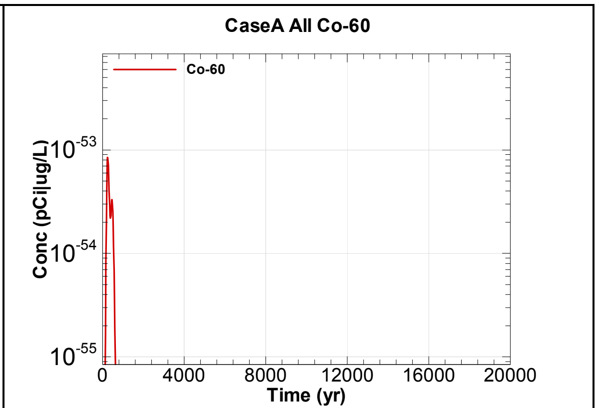

Figure H-20 - 100m Aquifer Concentration for CaseF All Co-60

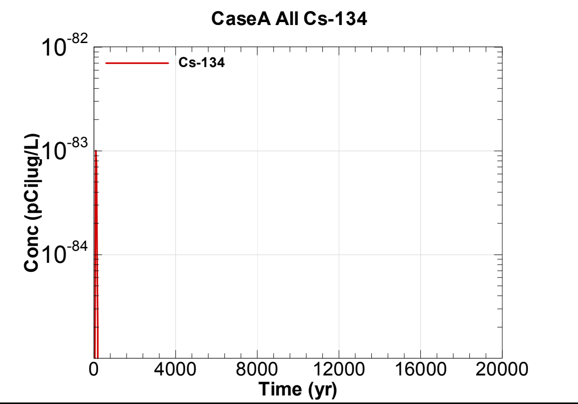

Figure H-21 - 100m Aquifer Concentration for CaseF All Cs-134

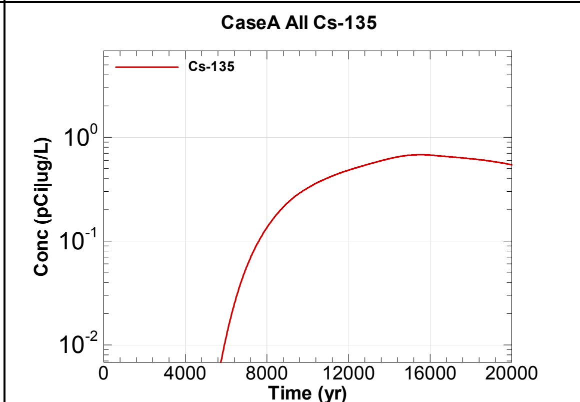

Figure H-22 - 100m Aquifer Concentration for CaseF All Cs-135

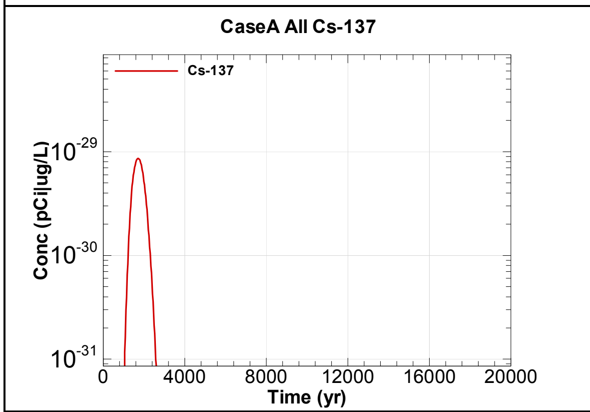

Figure H-23 - 100m Aquifer Concentration for CaseF All Cs-137

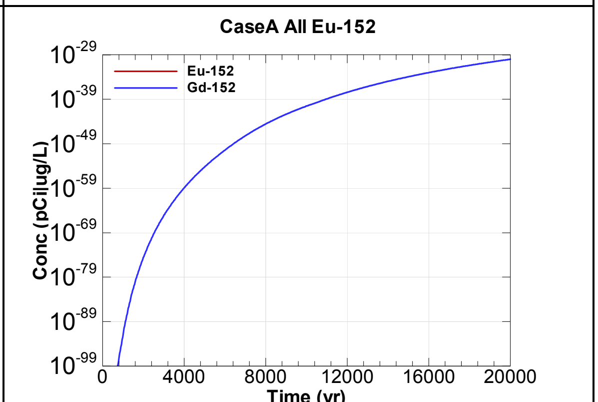

Figure H-24 - 100m Aquifer Concentration for CaseF All Eu-152

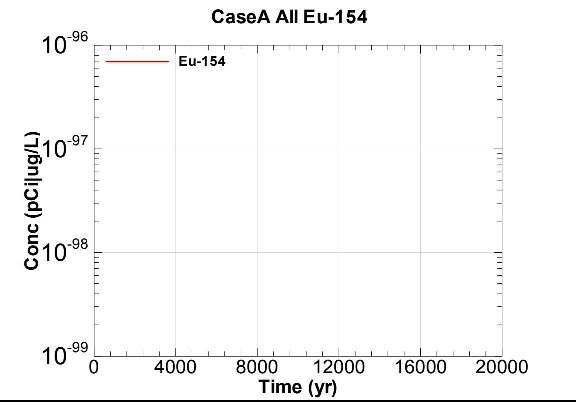	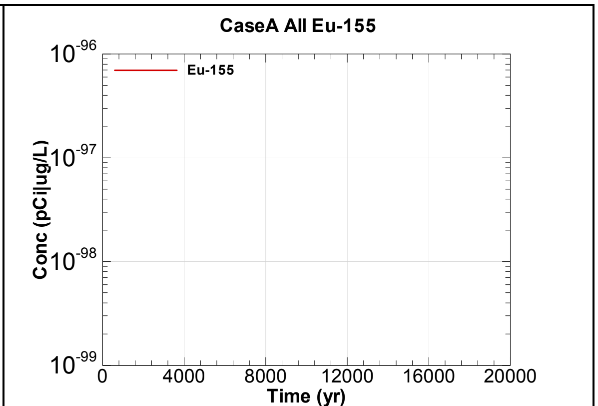
Figure H-25 - 100m Aquifer Concentration for CaseF All Eu-154	Figure H-26 - 100m Aquifer Concentration for CaseF All Eu-155
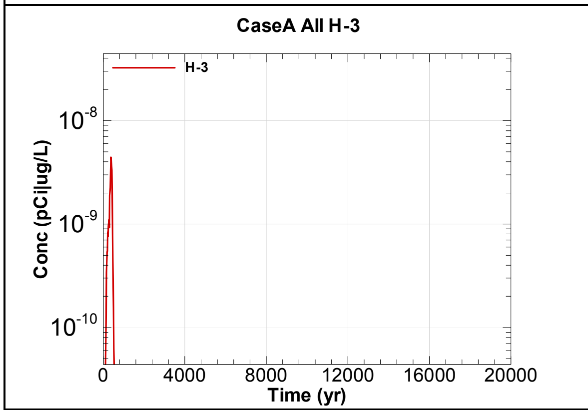	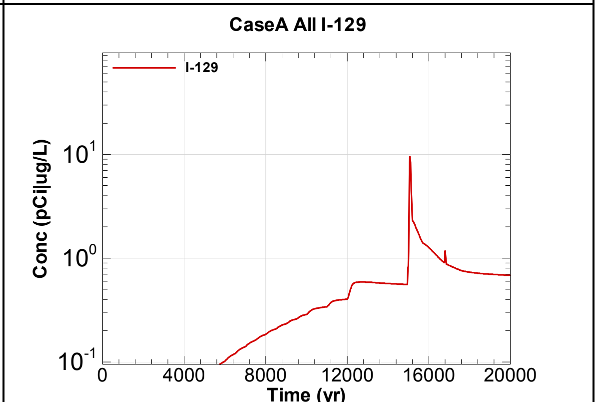
Figure H-27 - 100m Aquifer Concentration for CaseF All H-3	Figure H-28 - 100m Aquifer Concentration for CaseF All I-129
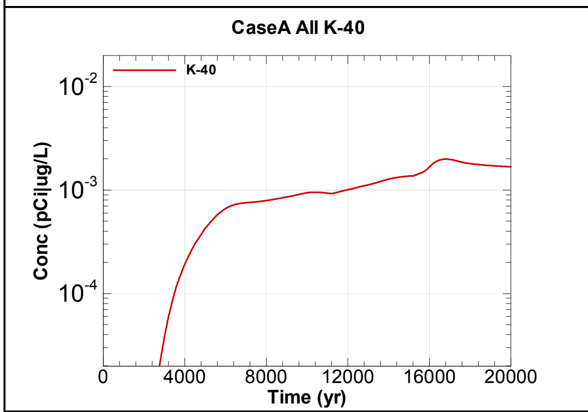	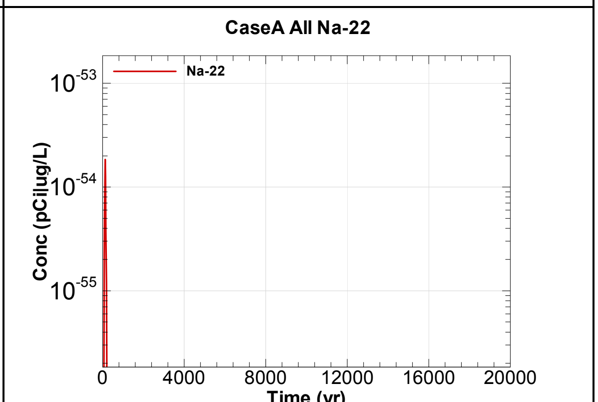
Figure H-29 - 100m Aquifer Concentration for CaseF All K-40	Figure H-30 - 100m Aquifer Concentration for CaseF All Na-22

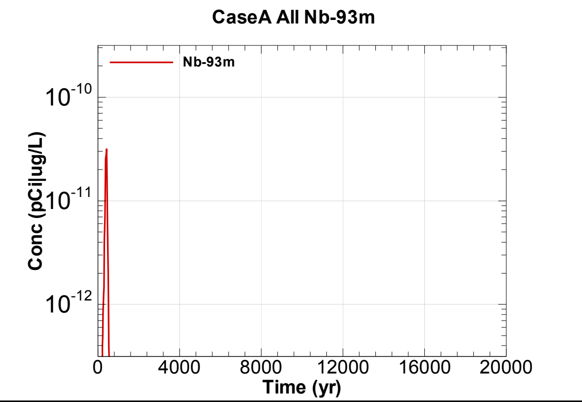

Figure H-31 - 100m Aquifer Concentration for CaseF All Nb-93m

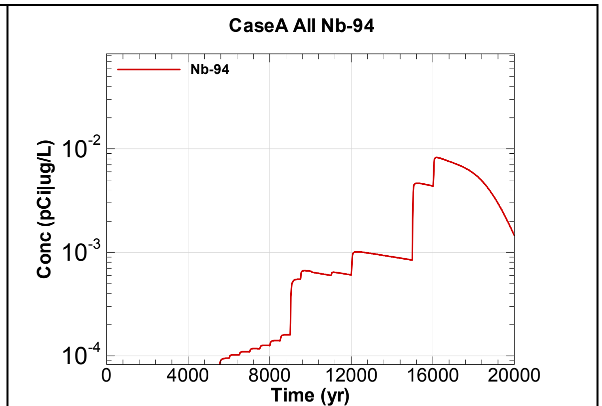

Figure H-32 - 100m Aquifer Concentration for CaseF All Nb-94

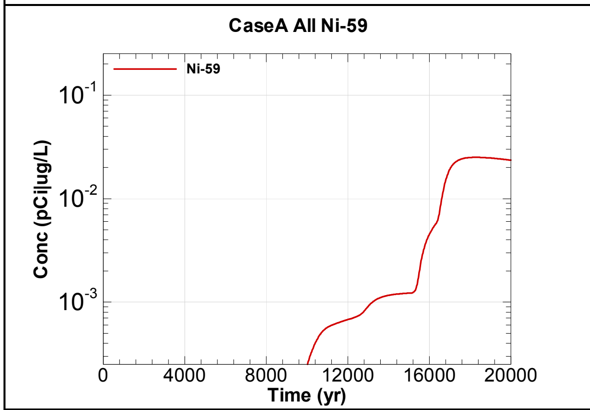

Figure H-33 - 100m Aquifer Concentration for CaseF All Ni-59

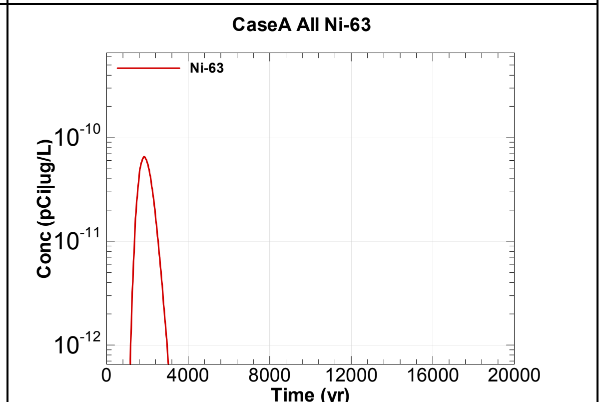

Figure H-34 - 100m Aquifer Concentration for CaseF All Ni-63

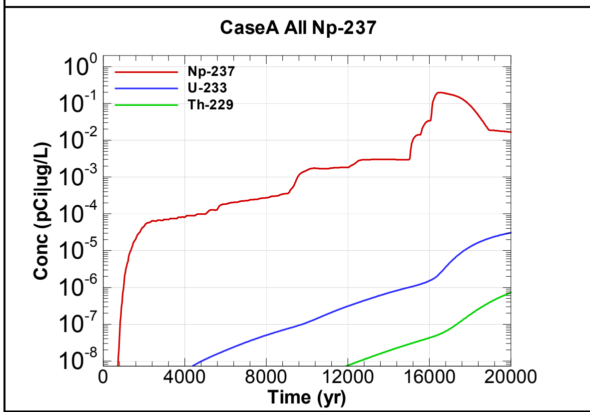

Figure H-35 - 100m Aquifer Concentration for CaseF All Np-237

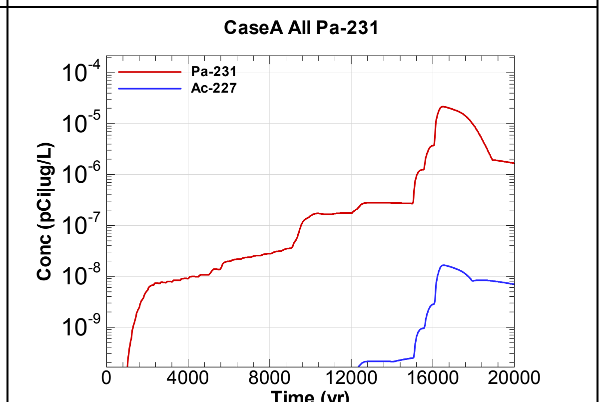

Figure H-36 - 100m Aquifer Concentration for CaseF All Pa-231

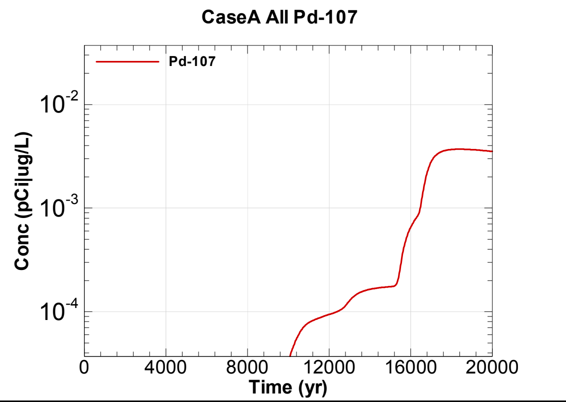

Figure H-37 - 100m Aquifer Concentration for CaseF All Pd-107

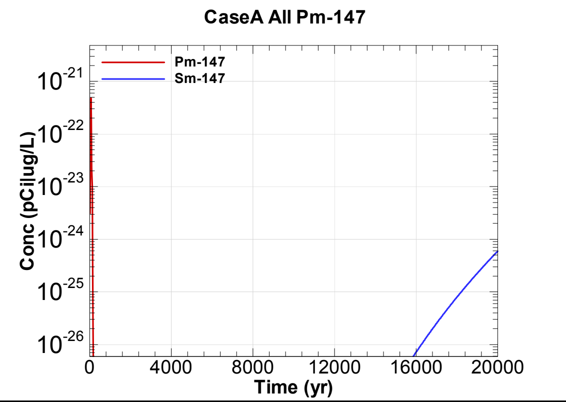

Figure H-38 - 100m Aquifer Concentration for CaseF All Pm-147

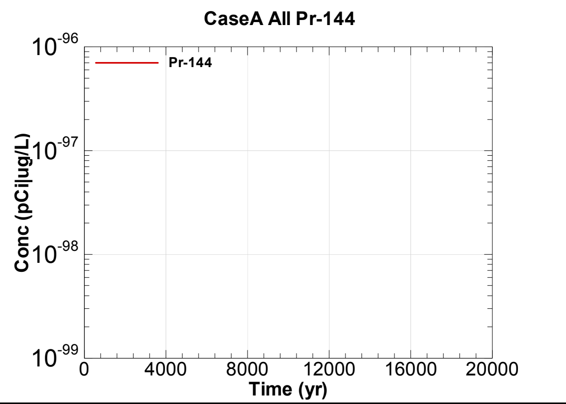

Figure H-39 - 100m Aquifer Concentration for CaseF All Pr-144

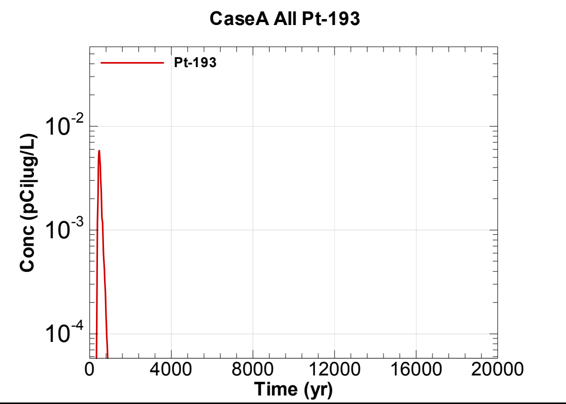

Figure H-40 - 100m Aquifer Concentration for CaseF All Pt-193

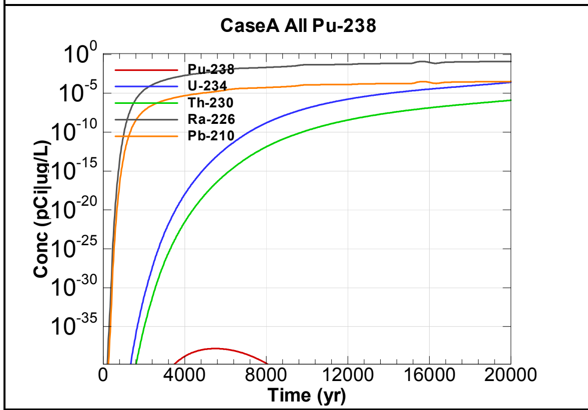

Figure H-41 - 100m Aquifer Concentration for CaseF All Pu-238

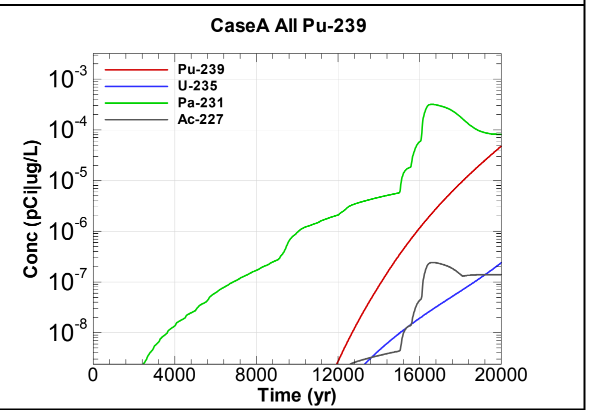

Figure H-42 - 100m Aquifer Concentration for CaseF All Pu-239

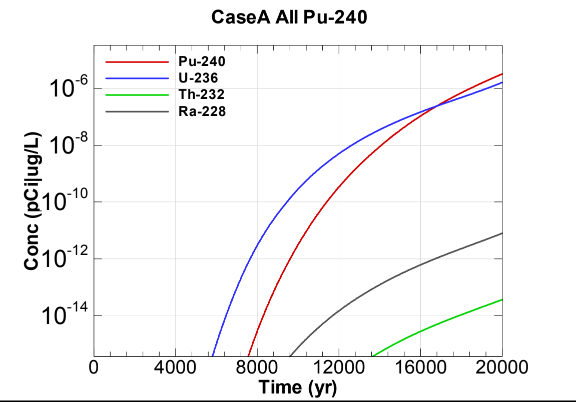

Figure H-43 - 100m Aquifer Concentration for CaseF All Pu-240

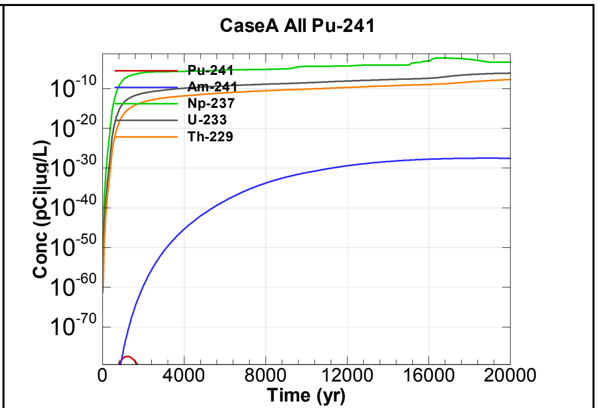

Figure H-44 - 100m Aquifer Concentration for CaseF All Pu-241

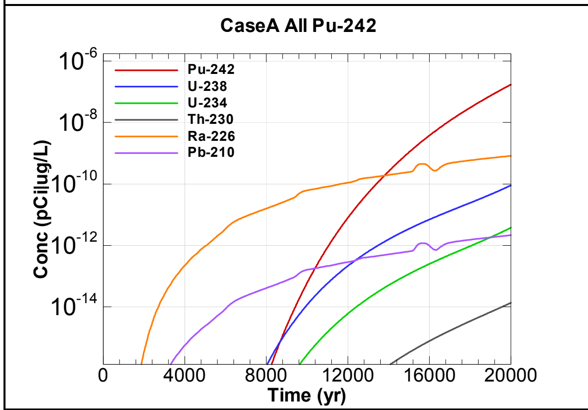

Figure H-45 - 100m Aquifer Concentration for CaseF All Pu-242

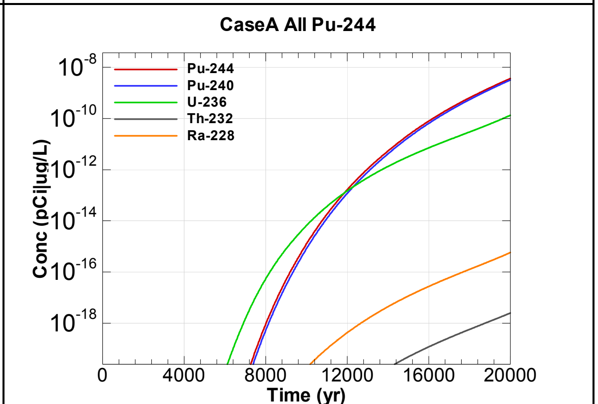

Figure H-46 - 100m Aquifer Concentration for CaseF All Pu-244

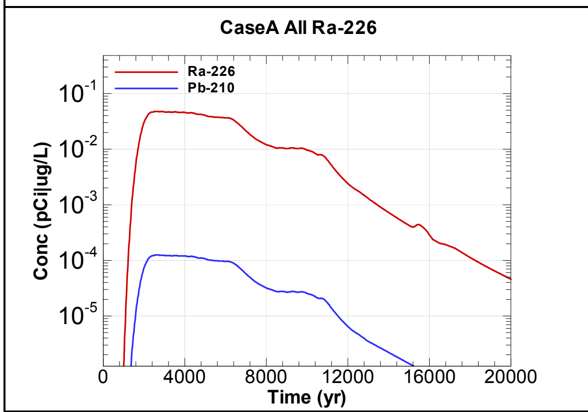

Figure H-47 - 100m Aquifer Concentration for CaseF All Ra-226

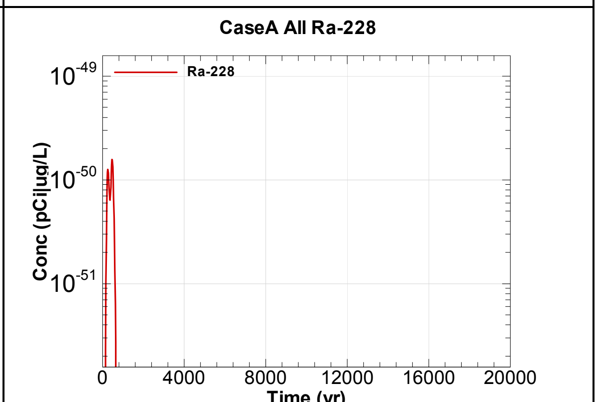

Figure H-48 - 100m Aquifer Concentration for CaseF All Ra-228

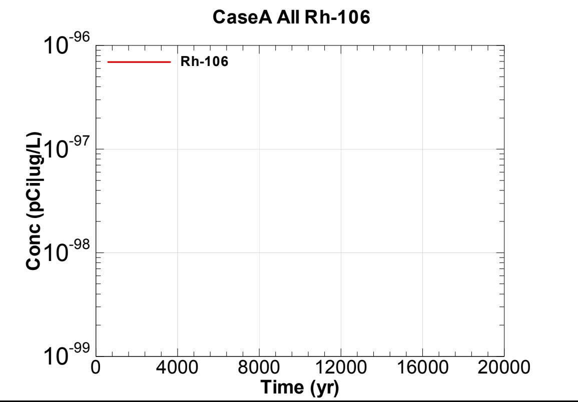

Figure H-49 - 100m Aquifer Concentration for CaseF All Rh-106

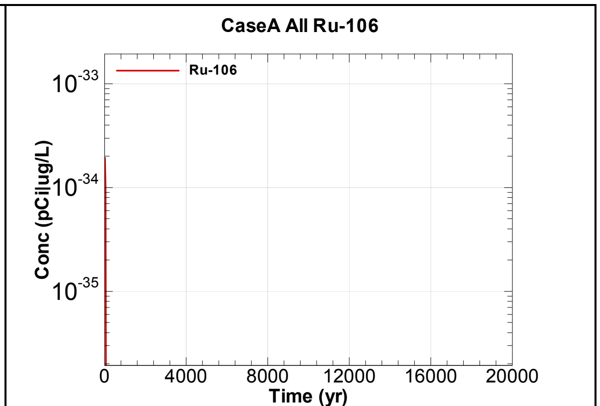

Figure H-50 - 100m Aquifer Concentration for CaseF All Ru-106

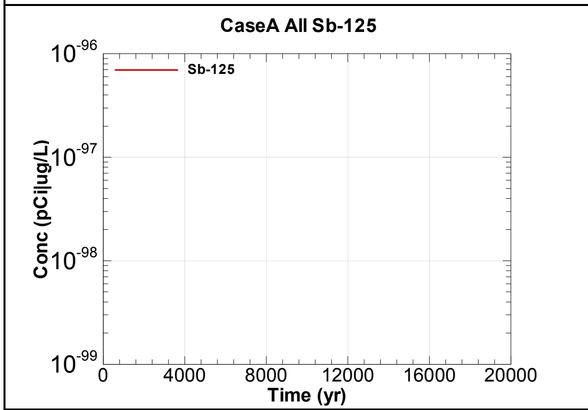

Figure H-51 - 100m Aquifer Concentration for CaseF All Sb-125

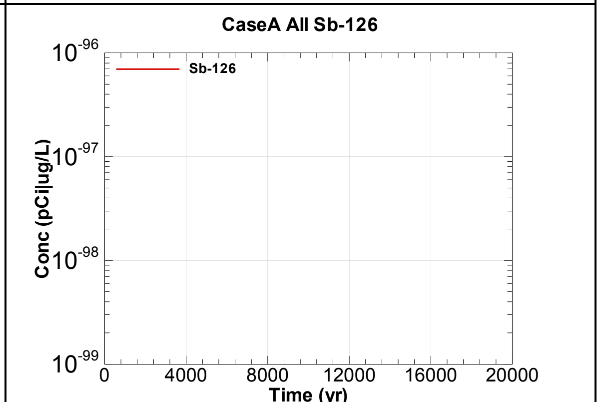

Figure H-52 - 100m Aquifer Concentration for CaseF All Sb-126

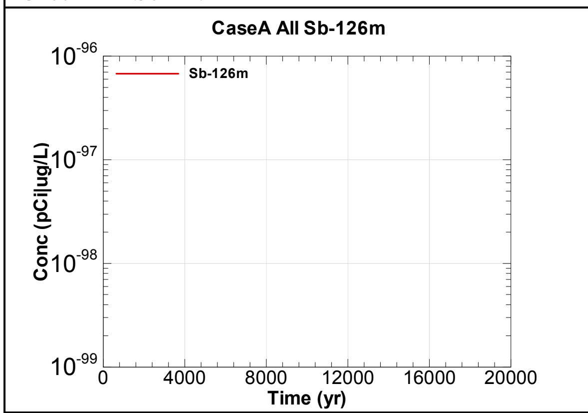

Figure H-53 - 100m Aquifer Concentration for CaseF All Sb-126m

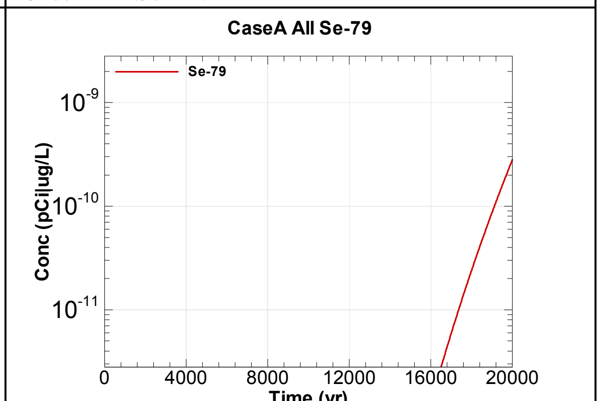

Figure H-54 - 100m Aquifer Concentration for CaseF All Se-79

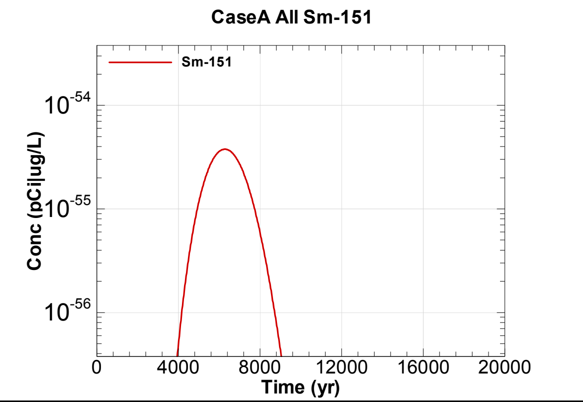

Figure H-55 - 100m Aquifer Concentration for CaseF All Sm-151

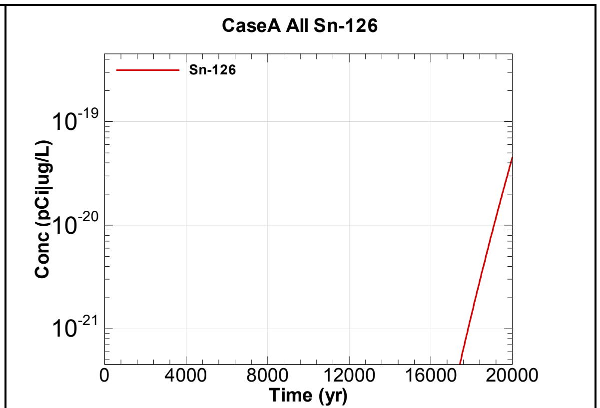

Figure H-56 - 100m Aquifer Concentration for CaseF All Sn-126

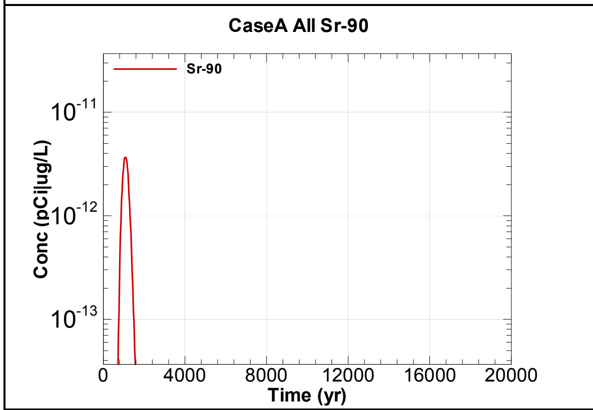

Figure H-57 - 100m Aquifer Concentration for CaseF All Sr-90

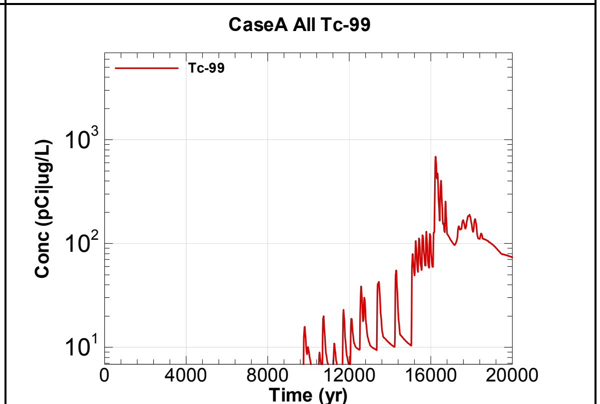

Figure H-58 - 100m Aquifer Concentration for CaseF All Tc-99

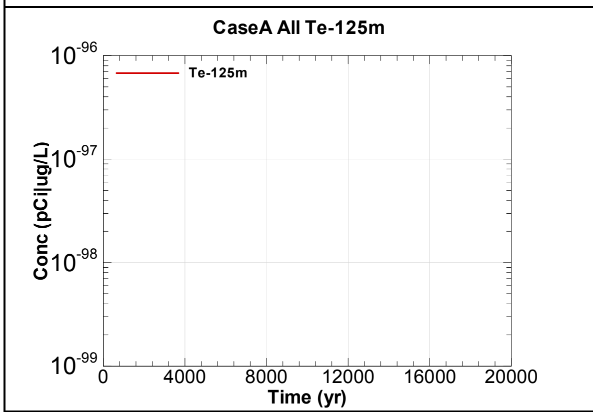

Figure H-59 - 100m Aquifer Concentration for CaseF All Te-125m

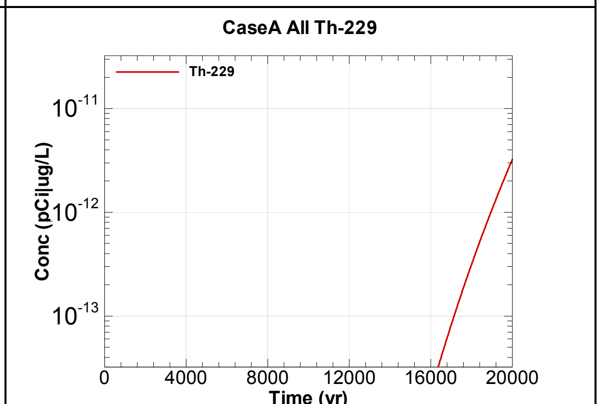

Figure H-60 - 100m Aquifer Concentration for CaseF All Th-229

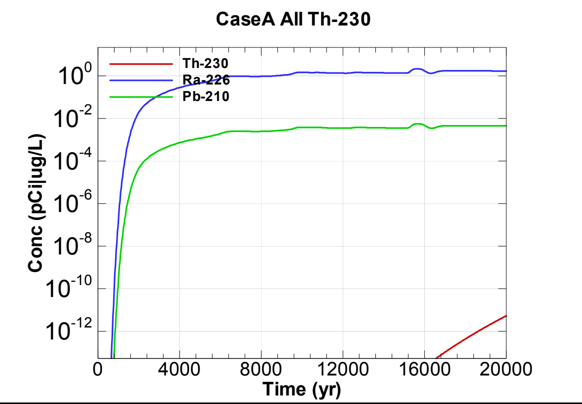

Figure H-61 - 100m Aquifer Concentration for CaseF All Th-230

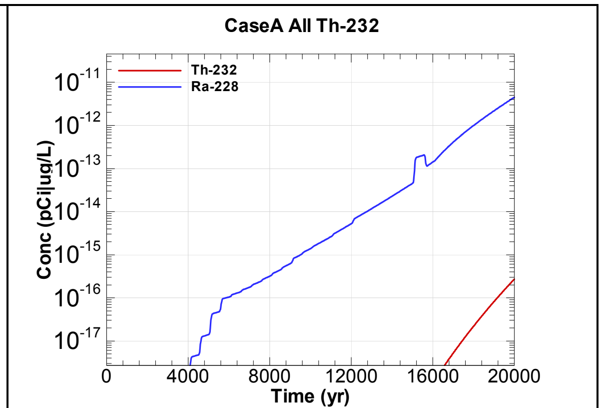

Figure H-62 - 100m Aquifer Concentration for CaseF All Th-232

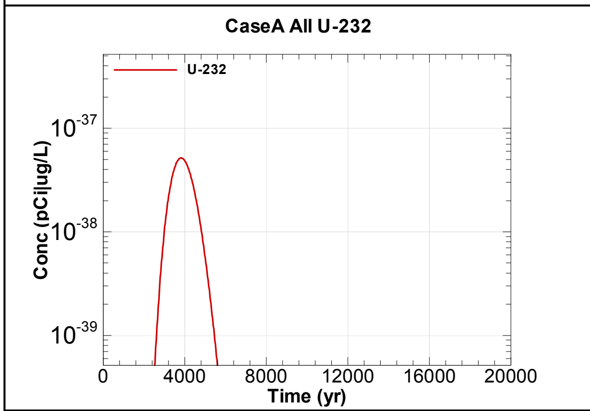

Figure H-63 - 100m Aquifer Concentration for CaseF All U-232

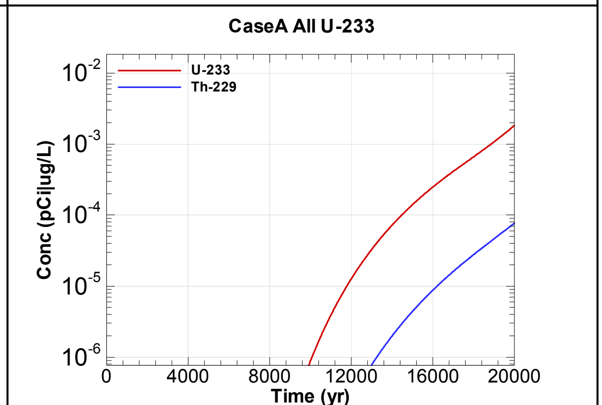

Figure H-64 - 100m Aquifer Concentration for CaseF All U-233

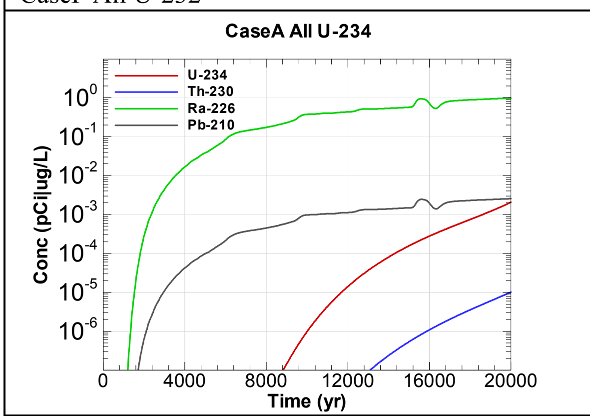

Figure H-65 - 100m Aquifer Concentration for CaseF All U-234

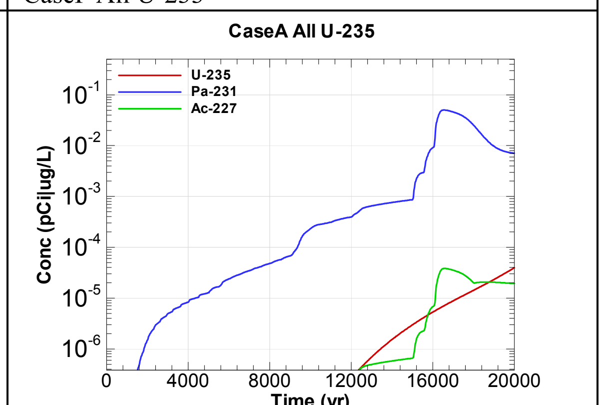

Figure H-66 - 100m Aquifer Concentration for CaseF All U-235

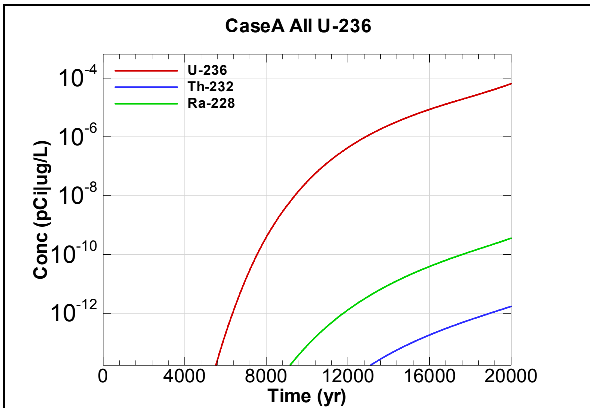

Figure H-67 - 100m Aquifer Concentration for CaseF All U-236

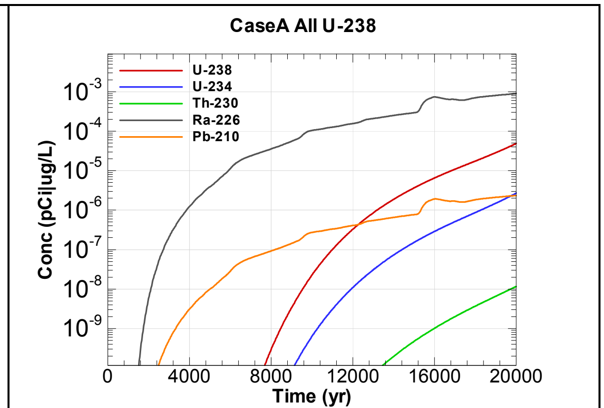

Figure H-68 - 100m Aquifer Concentration for CaseF All U-238

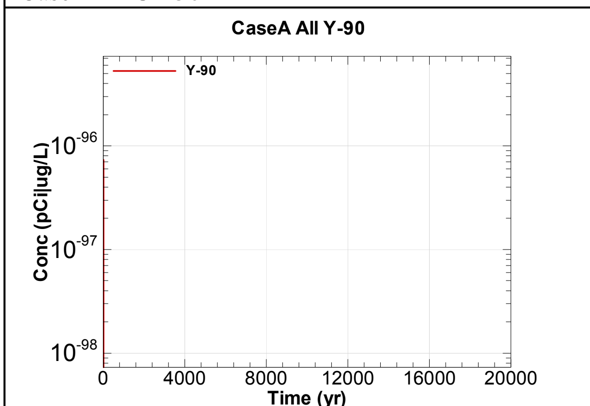

Figure H-69 - 100m Aquifer Concentration for CaseF All Y-90

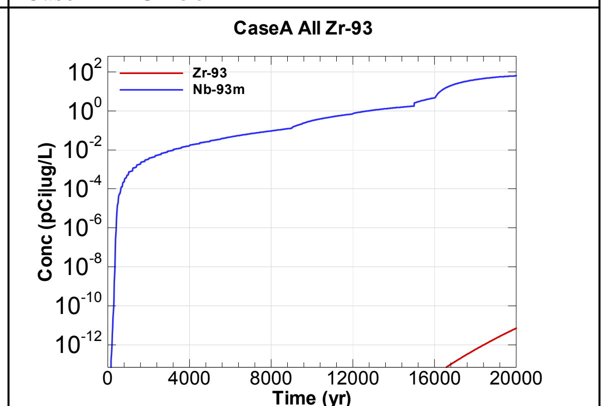

Figure H-70 - 100m Aquifer Concentration for CaseF All Zr-93

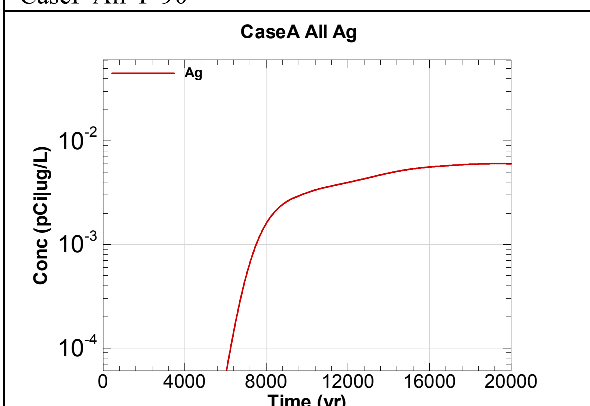

Figure H-71 - 100m Aquifer Concentration for CaseF All Ag

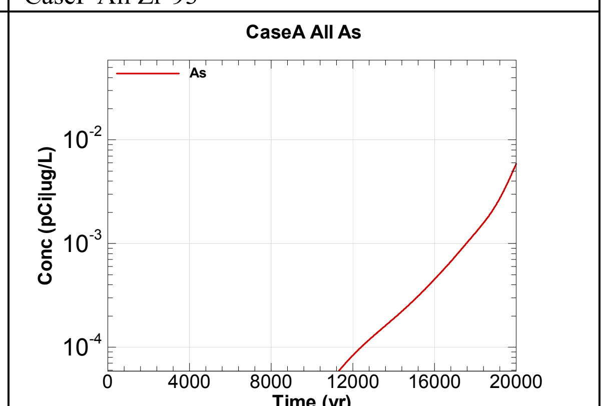

Figure H-72 - 100m Aquifer Concentration for CaseF All As

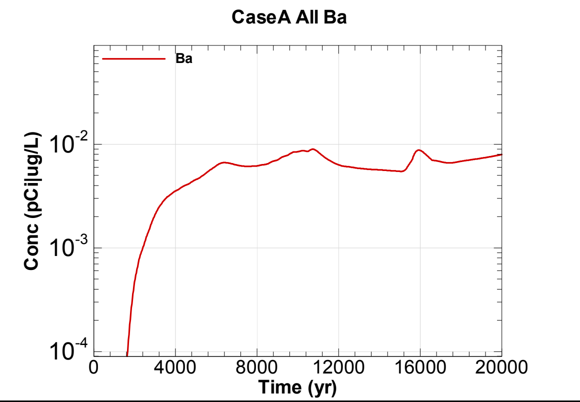

Figure H-73 - 100m Aquifer Concentration for CaseF All Ba

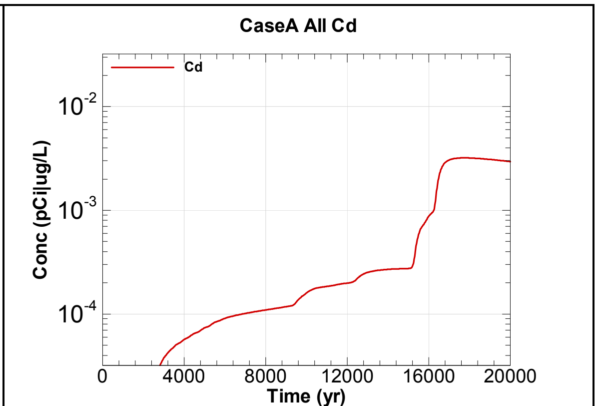

Figure H-74 - 100m Aquifer Concentration for CaseF All Cd

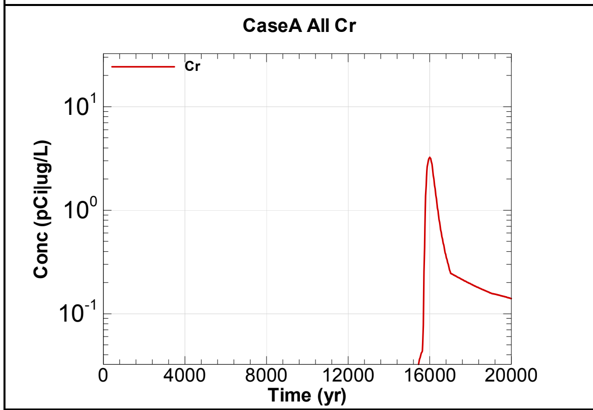

Figure H-75 - 100m Aquifer Concentration for CaseF All Cr

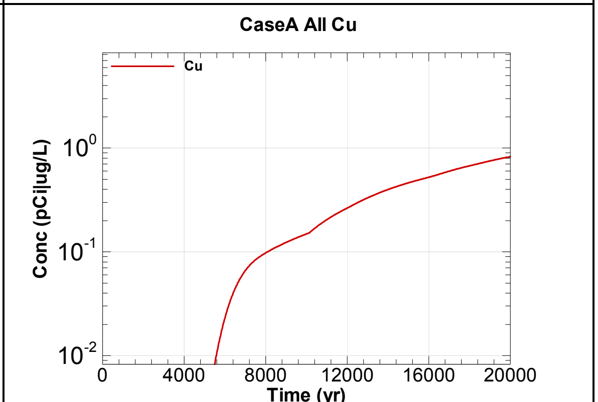

Figure H-76 - 100m Aquifer Concentration for CaseF All Cu

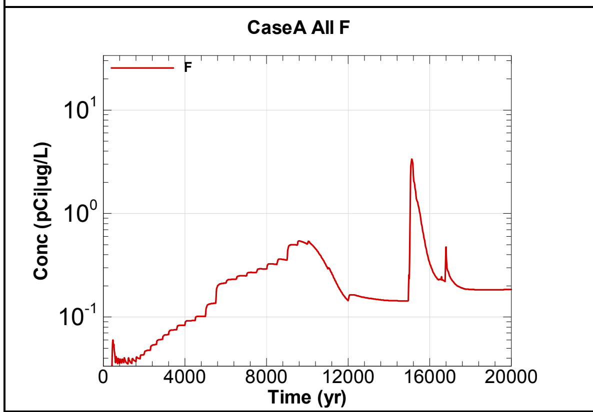

Figure H-77 - 100m Aquifer Concentration for CaseF All F

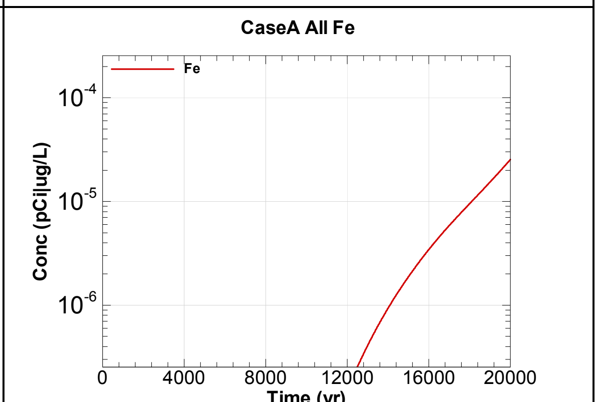

Figure H-78 - 100m Aquifer Concentration for CaseF All Fe

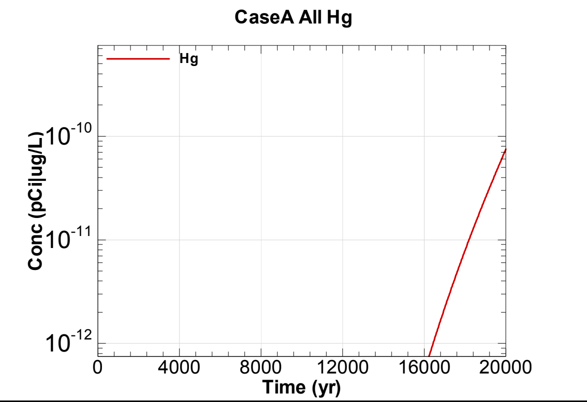

Figure H-79 - 100m Aquifer Concentration for CaseF All Hg

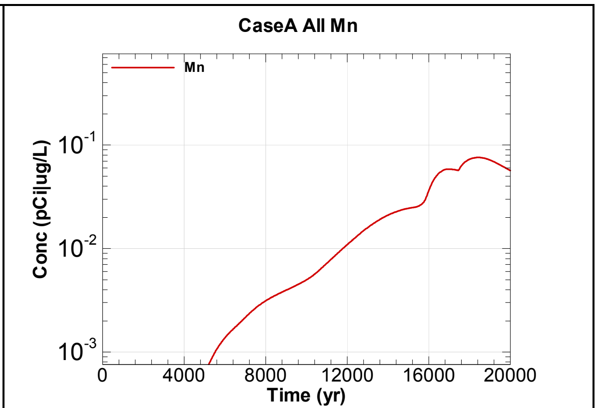

Figure H-80 - 100m Aquifer Concentration for CaseF All Mn

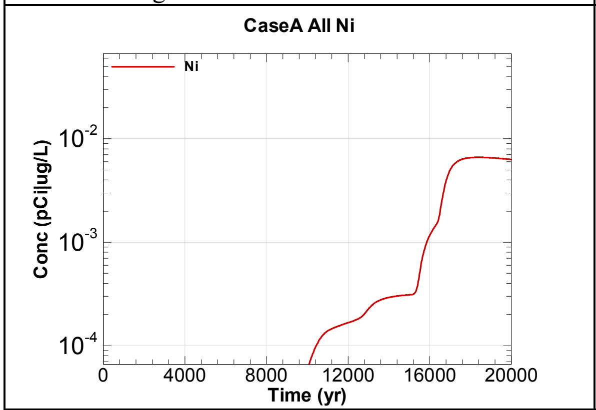

Figure H-81 - 100m Aquifer Concentration for CaseF All Ni

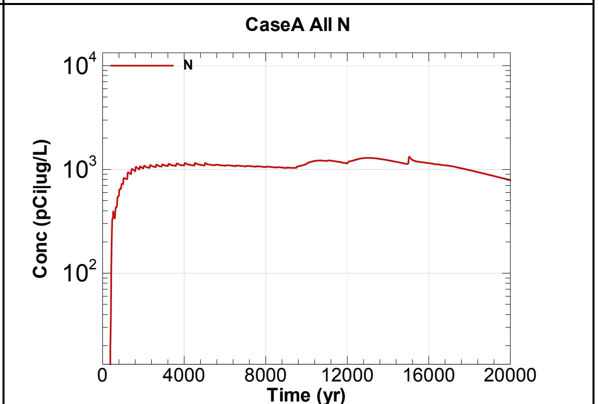

Figure H-82 - 100m Aquifer Concentration for CaseF All N

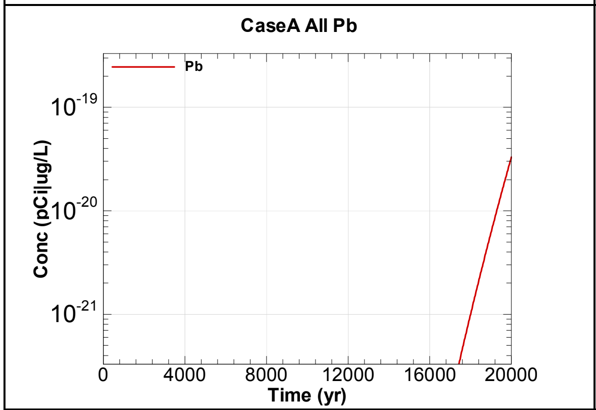

Figure H-83 - 100m Aquifer Concentration for CaseF All Pb

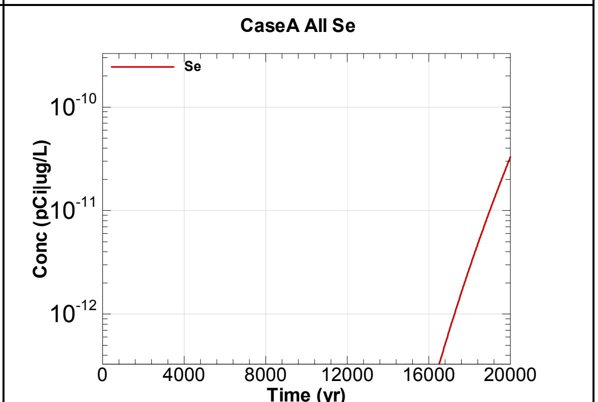

Figure H-84 - 100m Aquifer Concentration for CaseF All Se

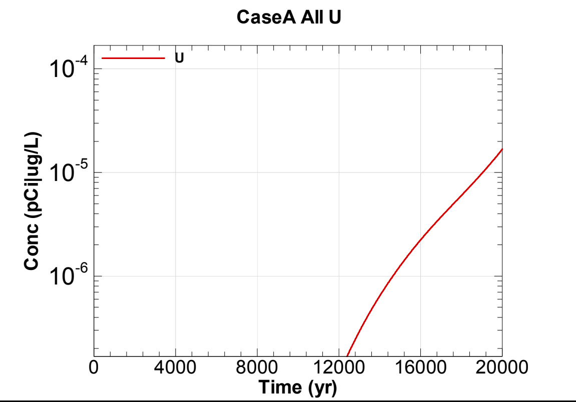	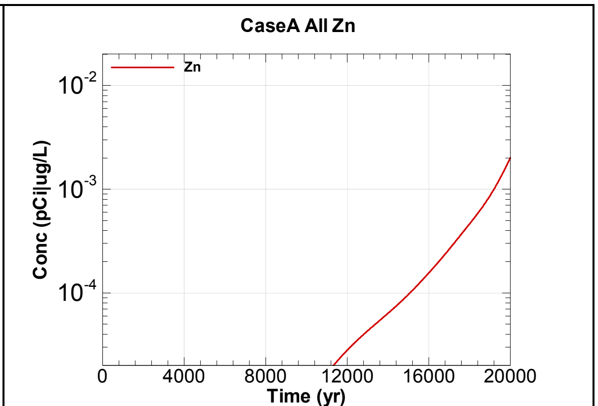
Figure H-85 - 100m Aquifer Concentration for CaseF All U	Figure H-86 - 100m Aquifer Concentration for CaseF All Zn