

TABLE 0  
 SITE RISK ASSESSMENT IDENTIFICATION INFORMATION  
 UNC Church Rock Mill and Tailings Site

Site Name/OU:	UNC CHURCH ROCK MILL AND TAILINGS SITE
Region:	6
EPA ID Number:	NMD030443303
State:	New Mexico
Status:	RP Sitewide Supplemental Feasibility Study (ongoing)
Federal Facility (Y/N):	N
EPA Project Manager	Katrina Coltrain
EPA Risk Assessor:	Anna Milburn
Prepared by (Organization):	Chester Engineers
Prepared for (Organization):	United Nuclear Corporation
Document Title:	Human Health Risk Assessment for the UNC Church Rock Site
Document Date:	February 2011
Probabilistic Risk Assessment (Y/N):	N
Comments:	Groundwater at this site is impacted by seepage from uranium mill tailings disposal

TABLE 1  
 SELECTION OF EXPOSURE PATHWAYS  
 UNC Church Rock Mill and Tailings Site

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway <sup>(1)</sup>
Future	Groundwater - Southwest Alluvium	Groundwater	SW Alluvium Tapwater	Resident	Adult	Dermal	Quant	Future resident using domestic well in SW Alluvium
						Ingestion	Quant	Future resident using domestic well in SW Alluvium
					Child	Dermal	Quant	Future resident using domestic well in SW Alluvium
						Ingestion	Quant	Future resident using domestic well in SW Alluvium
					Adult/Child	Dermal	Quant	Future resident using domestic well in SW Alluvium
						Ingestion	Quant	Future resident using domestic well in SW Alluvium
		Air	Water Vapors from Showerhead / Domestic Uses	Resident	Adult	Inhalation	Quant	Future resident using domestic well in SW Alluvium
					Child	Inhalation	Quant	Future resident using domestic well in SW Alluvium
					Adult/Child	Inhalation	Quant	Future resident using domestic well in SW Alluvium
	Groundwater - Zone 1 Upper Gallup Fm	Groundwater	Zone 1 Tapwater	Resident	Adult	Dermal	Quant	Future resident using domestic well in Zone 1
						Ingestion	Quant	Future resident using domestic well in Zone 1
					Child	Dermal	Quant	Future resident using domestic well in Zone 1
						Ingestion	Quant	Future resident using domestic well in Zone 1
					Adult/Child	Dermal	Quant	Future resident using domestic well in Zone 1
						Ingestion	Quant	Future resident using domestic well in Zone 1
		Air	Water Vapors from Showerhead / Domestic Uses	Resident	Adult	Inhalation	Quant	Future resident using domestic well in Zone 1
					Child	Inhalation	Quant	Future resident using domestic well in Zone 1
					Adult/Child	Inhalation	Quant	Future resident using domestic well in Zone 1
	Groundwater - Zone 3 Upper Gallup Fm	Groundwater	Zone 3 Tapwater	Resident	Adult	Dermal	Quant	Future resident using domestic well in Zone 3
						Ingestion	Quant	Future resident using domestic well in Zone 3
					Child	Dermal	Quant	Future resident using domestic well in Zone 3
					Ingestion	Quant	Future resident using domestic well in Zone 3	
Adult/Child					Dermal	Quant	Future resident using domestic well in Zone 3	
					Ingestion	Quant	Future resident using domestic well in Zone 3	
Air		Water Vapors from Showerhead / Domestic Uses	Resident	Adult	Inhalation	Quant	Future resident using domestic well in Zone 3	
				Child	Inhalation	Quant	Future resident using domestic well in Zone 3	
				Adult/Child	Inhalation	Quant	Future resident using domestic well in Zone 3	

TABLE 2.1  
 OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 UNC Church Rock Mill and Tailings Site

Scenario Timeframe: Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier) (1)	Maximum Concentration (Qualifier) (1)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (4)	Background Value (5)	Screening Toxicity Value (N/C) (6)	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (7)
SW Alluvium Tapwater	7429-90-5	Aluminum	0.1	0.3	mg/L	808	6 / 96	0.1 - 0.1	0.3	0.107	1.6 (N)	5	NMWQCC-I	N	BSL
	7440-38-2	Arsenic	0.001	0.01	mg/L	632, 801, 803, 808, EPA23, EPA25, GW1, GW3	13 / 96	0.001 - 0.001	0.01	0.00116	0.000045 (C)	0.01	MCL	Y	ASL
	7440-48-4	Cobalt	0.01	0.01	mg/L	GW 3	1 / 96	0.01 - 0.01	0.01	0.0121	0.00047 (N)	0.05	NMWQCC-I	Y	ASL
	7439-96-5	Manganese	0.03	5.4	mg/L	EPA23	96 / 96	0.01 - 0.01	5.4	0.414	0.032 (N)	0.2	NMWQCC-O	Y	ASL
	7782-49-2	Selenium	0.001	0.001	mg/L	EPA 23	1 / 96	0.001 - 0.001	0.001	0.00516	0.0078 (N)	0.05	MCL	N	BSL
	7440-61-1	Uranium	0.0229	0.2460	mg/L	509D	96 / 96	0.0003 - 0.0004	0.246	0.0459	0.0047 (N)	0.03	MCL	Y	ASL
	13966-29-5	Uranium-234	NA (2)	NA (2)	pCi/L	NA (2)	NA (2)	NA (2)	NA	NA	NA (C)	NA	NA	Y	DET
	15117-96-1	Uranium-235	NA (2)	NA (2)	pCi/L	NA (2)	NA (2)	NA (2)	NA	NA	NA (C)	NA	NA	Y	DET
	7440-61-1	Uranium-238	NA (2)	NA (2)	pCi/L	NA (2)	NA (2)	NA (2)	NA	NA	NA (C)	NA	NA	Y	DET
	67-66-3	Chloroform	0.00061	0.0155	mg/L	802	49 / 96	0.0005 - 0.001	0.0155	ND	0.00019 (C)	0.08	MCL (TTHM)	Y	ASL
	13982-63-3	Radium-226 (3)	0.1	1	pCi/L	632	37 / 96	0.001 - 0.2	1	0.798	NA (C)	5	MCL (combined radium)	Y	DET
15262-20-1	Radium-228 (3)	0.3	4.3	pCi/L	632	22 / 96	0.04 - 1	4.3	1.611	NA (C)	5	MCL (combined radium)	Y	DET	
14269-63-7	Thorium-230	0.2	1.6	pCi/L	632	10 / 96	0.2 - 0.2	1.6	0.509	NA (C)	5	NRC GPS	Y	DET	
Zone 1 Tapwater	7429-90-5	Aluminum	0.2	1.3	mg/L	EPA07	7 / 16	0.1 - 0.1	1.3	0.117	1.6 (N)	5	NMWQCC-I	N	BSL
	7440-38-2	Arsenic	0.001	0.003	mg/L	EPA07	4 / 16	0.001 - 0.001	0.003	0.00117	0.000045 (C)	0.01	MCL	Y	ASL
	7440-48-4	Cobalt	0.02	0.06	mg/L	EPA05	16 / 16	0.01 - 0.01	0.06	0.0112	0.00047 (N)	0.05	NMWQCC-I	Y	ASL
	7439-96-5	Manganese	0.95	2.96	mg/L	EPA07	16 / 16	0.01 - 0.01	2.96	2.519	0.032 (N)	0.2	NMWQCC-O	Y	ASL
	7440-02-0	Nickel	0.05	0.06	mg/L	EPA05	3 / 16	0.05 - 0.05	0.06	0.0602	0.030 (N)	0.2	NMWQCC-I	N	ASL
	7782-49-2	Selenium	0.001	0.001	mg/L	EPA05	1 / 16	0.001 - 0.001	0.001	0.00107	0.0078 (N)	0.05	MCL	N	BSL
	7440-62-2	Vanadium	0.2	0.2	mg/L	EPA07	1 / 16	0.1 - 0.1	0.2	ND	0.0078 (N)	0.1	NRC GPS	Y	ASL
	7440-61-1	Uranium	0.0012	0.0022	mg/L	EPA07	16 / 16	0.0003 - 0.0004	0.0022	0.0255	0.0047 (N)	0.03	MCL	N	BSL
	13966-29-5	Uranium-234	NA (2)	NA (2)	pCi/L	NA (2)	NA (2)	NA (2)	NA	NA	NA (C)	NA	NA	Y	DET
	15117-96-1	Uranium-235	NA (2)	NA (2)	pCi/L	NA (2)	NA (2)	NA (2)	NA	NA	NA (C)	NA	NA	Y	DET
	7440-61-1	Uranium-238	NA (2)	NA (2)	pCi/L	NA (2)	NA (2)	NA (2)	NA	NA	NA (C)	NA	NA	Y	DET
67-66-3	Chloroform	0.0006	0.00076	mg/L	EPA07	2 / 16	0.0005 - 0.001	0.00076	NBC	0.00019 (C)	0.08	MCL (TTHM)	Y	ASL	
13982-63-3	Radium-226 (3)	0.4	1.8	pCi/L	EPA05	13 / 16	0.2 - 0.2	1.8	1.314	NA (C)	5	MCL (combined radium)	Y	DET	
15262-20-1	Radium-228 (3)	1	4	pCi/L	EPA05	8 / 16	1.0 - 1.0	4	2.946	NA (C)	5	MCL (combined radium)	Y	DET	
14269-63-7	Thorium-230	0.6	0.7	pCi/L	EPA05	2 / 16	0.2 - 0.2	0.7	0.403	NA (C)	5	NRC GPS	Y	DET	
Zone 3 Tapwater	7429-90-5	Aluminum	0.1	163	mg/L	EPA14	58 / 70	0.1 - 0.1	163	0.231	1.6 (N)	5	NMWQCC-I	Y	ASL
	7440-38-2	Arsenic	0.001	2.5 D	mg/L	NBL-01	48 / 70	0.001 - 0.03	2.5	0.175	0.000045 (C)	0.01	MCL	Y	ASL
	7440-41-7	Beryllium	0.01	0.09	mg/L	EPA14	9 / 70	0.01 - 0.01	0.09	ND	0.0016 (N)	0.004	MCL	Y	ASL
	7440-43-9	Cadmium	0.005	0.015	mg/L	EPA14	16 / 70	0.005 - 0.005	0.015	0.0113	0.00069 (N)	0.005	MCL	Y	ASL
	7440-48-4	Cobalt	0.05	0.95 D	mg/L	EPA14	70 / 70	0.01 - 0.02	0.95	0.0877	0.00047 (N)	0.05	NMWQCC-I	Y	ASL
	7439-96-5	Manganese	3.33	23.7	mg/L	717	70 / 70	0.01 - 0.01	23.7	3.436	0.032 (N)	0.2	NMWQCC-O	Y	ASL
	7439-98-7	Molybdenum	0.1	5	mg/L	NBL-01	32 / 70	0.1 - 0.1	5	17.43	0.0078 (N)	1	NMWQCC-I	Y	ASL
	7440-02-0	Nickel	0.11	0.89	mg/L	EPA14	70 / 70	0.05 - 0.05	0.89	0.14	0.030 (N)	0.2	NMWQCC-I	Y	ASL
	7782-49-2	Selenium	0.001	0.01	mg/L	NBL-01	3 / 70	0.001 - 0.001	0.01	0.00159	0.0078 (N)	0.05	MCL	N	ASL
	7440-62-2	Vanadium	0.1	0.2	mg/L	517, 708, EPA13, EPA14, NBL-01	5 / 70	0.1 - 0.1	0.2	ND	0.0078 (N)	0.1	NRC GPS	Y	ASL
	7440-61-1	Uranium	0.0011	0.138	mg/L	NBL-01	70 / 70	0.0003 - 0.002	0.138	0.107	0.0047 (N)	0.03	MCL	Y	ASL
	13966-29-5	Uranium-234	NA (2)	NA (2)	pCi/L	NA (2)	NA (2)	NA (2)	NA	NA	NA (C)	NA	NA	Y	DET
	15117-96-1	Uranium-235	NA (2)	NA (2)	pCi/L	NA (2)	NA (2)	NA (2)	NA	NA	NA (C)	NA	NA	Y	DET
	7440-61-1	Uranium-238	NA (2)	NA (2)	pCi/L	NA (2)	NA (2)	NA (2)	NA	NA	NA (C)	NA	NA	Y	DET
	67-66-3	Chloroform	0.00093	0.00676	mg/L	517	13 / 70	0.0005 - 0.001	0.00676	NBC	0.00019 (C)	0.08	MCL (TTHM)	Y	ASL
	13982-63-3	Radium-226	2	27.6	pCi/L	EPA14	70 / 70	0.1 - 0.2	27.6	4.996	NA (C)	5	MCL (combined radium)	Y	DET
15262-20-1	Radium-228	3.8	56.1	pCi/L	EPA14	70 / 70	1 - 1.4	56.1	4.509	NA (C)	5	MCL (combined radium)	Y	DET	
14269-63-7	Thorium-230	0.2	1.3	pCi/L	517	6 / 70	0.2 - 0.2	1.3	1.426	NA (C)	5	NRC GPS	Y	DET	
14255-04-0	Lead-210	1.8	8.1	pCi/L	719	6 / 70	1.0 - 1.0	8.1	1.618	NA (C)	1	NRC GPS	Y	DET	

Notes:

- Qualifier codes used for the "Minimum Concentration" and "Maximum Concentration":  
 D = the sample was diluted to facilitate analysis.
- Uranium isotopes not analyzed. Isotope concentrations estimated from total uranium mass concentration (see Table 3.A.RME).
- The summary statistics for Radium-226 and Radium-228 count the raw below-detection-limit values from the 2nd Quarter 2008 as detections, because they were treated as such in the calculation of EPC statistics using ProUCL.
- Maximum concentration used for screening chemicals. No screening was conducted for radionuclides. All radionuclides detected are selected as COPCs.
- Background values are mean (UCL95) calculated in N.A. Water Systems (2008b).
- All compounds were screened against the November 2010 USEPA Risk Screening Level Table (<http://www.epa.gov/region9/superfund/prg/>).  
 - For non-carcinogens: screening value = 0.1 x RSL tapwater value  
 - For carcinogens: screening value = RSL tapwater value
- Rationale Codes:  
 Selection Reason Above Screening Level (ASL)  
 Detected in seepage-impacted groundwater at Site (DET)  
 Deletion Reason Below Screening Level (BSL)

Definitions:

- NA = Not Applicable
- ND = Not Detected
- MCL = Maximum Contaminant level
- NRC GPS = NRC Groundwater Protection Standard
- NMWQCC = New Mexico Water Quality Control Commission Groundwater Standard
- NMWQCC-I = New Mexico Water Quality Control Commission Irrigation Standard
- NMWQCC-O = New Mexico Water Quality Control Commission Other Standard
- C = Carcinogen
- N = Noncarcinogen
- TTHM = 0.080 mg/l is the MCL for total trihalomethanes, of which chloroform is a single compound.
- NBC = No background concentration - chloroform was not detected frequently enough in Zone 1 and Zone 3 background samples (less than 1%) to calculate background concentration

TABLE 2.2  
 OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 UNC Church Rock Mill and Tailings Site

Scenario Timeframe: Future  
 Medium: Groundwater  
 Exposure Medium: Air

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier) (1)	Maximum Concentration (Qualifier) (1)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (4)	Background Value (5)	Screening Toxicity Value (N/C) (6)	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (7)
SW Alluvium	7429-90-5	Aluminum	0.1	0.3	mg/L	808	6 / 96	0.1 - 0.1	0.3	0.107	1.6 (N)	5	NMWQCC-I	N	BSL
Water Vapors from Showerhead / Domestic Use	7440-38-2	Arsenic	0.001	0.01	mg/L	032, 007, 003, 000, EPA23, EPA25, GW1, GW3	13 / 96	0.001 - 0.001	0.01	0.00116	0.000045 (C)	0.01	MCL	N	NV
	7440-48-4	Cobalt	0.01	0.01	mg/L	GW 3	1 / 96	0.01 - 0.01	0.01	0.0121	0.00047 (N)	0.05	NMWQCC-I	N	NV
	7439-96-5	Manganese	0.03	5.4	mg/L	EPA23	96 / 96	0.01 - 0.01	5.4	0.414	0.032 (N)	0.2	NMWQCC-O	N	NV
	7782-49-2	Selenium	0.001	0.001	mg/L	EPA 23	1 / 96	0.001 - 0.001	0.001	0.00516	0.0078 (N)	0.05	MCL	N	BSL
	7440-61-1	Uranium	0.0229	0.2460	mg/L	509D	96 / 96	0.0003 - 0.0004	0.246	0.0459	0.0047 (N)	0.03	MCL	N	NV
	13966-29-5	Uranium-234	NA (2)	NA (2)	pCi/L	NA (2)	NA (C)	NA (2)	NA	NA	NA (C)	NA	NA	N	NV
	15117-96-1	Uranium-235	NA (2)	NA (2)	pCi/L	NA (2)	NA (C)	NA (2)	NA	NA	NA (C)	NA	NA	N	NV
	7440-61-1	Uranium-238	NA (2)	NA (2)	pCi/L	NA (2)	NA (C)	NA (2)	NA	NA	NA (C)	NA	NA	N	NV
	67-66-3	Chloroform	0.00061	0.0155	mg/L	802	49 / 96	0.0005 - 0.001	0.0155	ND	0.00019 (C)	0.08	MCL (TTHM)	Y	ASL
	13982-63-3	Radium-226 (3)	0.1	1	pCi/L	632	37 / 96	0.001 - 0.2	1	0.798	NA (C)	5	MCL (combined radium)	Y	DET
15262-20-1	Radium-228 (3)	0.3	4.3	pCi/L	632	22 / 96	0.04 - 1	4.3	1.611	NA (C)	5	MCL (combined radium)	N	NV	
14269-63-7	Thorium-230	0.2	1.6	pCi/L	632	10 / 96	0.2 - 0.2	1.6	0.509	NA (C)	5	NRC GPS	N	NV	
Zone 1 Water Vapors from Showerhead / Domestic Use	7429-90-5	Aluminum	0.2	1.3	mg/L	EPA07	7 / 16	0.1 - 0.1	1.3	0.117	1.6 (N)	5	NMWQCC-I	N	BSL
	7440-38-2	Arsenic	0.001	0.003	mg/L	EPA07	4 / 16	0.001 - 0.001	0.003	0.00117	0.000045 (C)	0.01	MCL	N	NV
	7440-48-4	Cobalt	0.02	0.06	mg/L	EPA05	16 / 16	0.01 - 0.01	0.06	0.0112	0.00047 (N)	0.05	NMWQCC-I	N	NV
	7439-96-5	Manganese	0.95	2.96	mg/L	EPA07	16 / 16	0.01 - 0.01	2.96	2.519	0.032 (N)	0.2	NMWQCC-O	N	NV
	7440-02-0	Nickel	0.05	0.06	mg/L	EPA05	3 / 16	0.05 - 0.05	0.06	0.0602	0.030 (N)	0.2	NMWQCC-I	N	NV
	7782-49-2	Selenium	0.001	0.001	mg/L	EPA05	1 / 16	0.001 - 0.001	0.001	0.00107	0.0078 (N)	0.05	MCL	N	BSL
	7440-62-2	Vanadium	0.2	0.2	mg/L	EPA07	1 / 16	0.1 - 0.1	0.2	ND	0.0078 (N)	0.1	NRC GPS	N	NV
	7440-61-1	Uranium	0.0012	0.0022	mg/L	EPA07	16 / 16	0.0003 - 0.0004	0.0022	0.0255	0.0047 (N)	0.03	MCL	N	BSL
	13966-29-5	Uranium-234	NA (2)	NA (2)	pCi/L	NA (2)	NA (C)	NA (2)	NA	NA	NA (C)	NA	NA	N	NV
	15117-96-1	Uranium-235	NA (2)	NA (2)	pCi/L	NA (2)	NA (C)	NA (2)	NA	NA	NA (C)	NA	NA	N	NV
7440-61-1	Uranium-238	NA (2)	NA (2)	pCi/L	NA (2)	NA (C)	NA (2)	NA	NA	NA (C)	NA	NA	N	NV	
67-66-3	Chloroform	0.0006	0.00076	mg/L	EPA07	2 / 16	0.0005 - 0.001	0.00076	NBC	0.00019 (C)	0.08	MCL (TTHM)	Y	ASL	
13982-63-3	Radium-226 (3)	0.4	1.8	pCi/L	EPA05	13 / 16	0.2 - 0.2	1.8	1.314	NA (C)	5	MCL (combined radium)	Y	DET	
15262-20-1	Radium-228 (3)	1	4	pCi/L	EPA05	8 / 16	1.0 - 1.0	4	2.946	NA (C)	5	MCL (combined radium)	N	NV	
14269-63-7	Thorium-230	0.6	0.7	pCi/L	EPA05	2 / 16	0.2 - 0.2	0.7	0.403	NA (C)	5	NRC GPS	N	NV	
Zone 3 Water Vapors from Showerhead / Domestic Use	7429-90-5	Aluminum	0.1	163	mg/L	EPA14	58 / 70	0.1 - 0.1	163	0.231	1.6 (N)	5	NMWQCC-I	N	NV
	7440-38-2	Arsenic	0.001	2.5 D	mg/L	NBL-01	48 / 70	0.001 - 0.03	2.5	0.175	0.000045 (C)	0.01	MCL	N	NV
	7440-41-7	Beryllium	0.01	0.09	mg/L	EPA14	9 / 70	0.01 - 0.01	0.09	ND	0.0016 (N)	0.004	MCL	N	NV
	7440-43-9	Cadmium	0.005	0.015	mg/L	EPA14	16 / 70	0.005 - 0.005	0.015	0.0113	0.00069 (N)	0.005	MCL	N	NV
	7440-48-4	Cobalt	0.05	0.95 D	mg/L	EPA14	70 / 70	0.01 - 0.02	0.95	0.0877	0.00047 (N)	0.05	NMWQCC-I	N	NV
	7439-96-5	Manganese	3.33	23.7	mg/L	717	70 / 70	0.01 - 0.01	23.7	3.436	0.032 (N)	0.2	NMWQCC-O	N	NV
	7439-98-7	Molybdenum	0.1	5	mg/L	NBL-01	32 / 70	0.1 - 0.1	5	17.43	0.0078 (N)	1	NMWQCC-I	N	NV
	7440-02-0	Nickel	0.11	0.89	mg/L	EPA14	70 / 70	0.05 - 0.05	0.89	0.14	0.030 (N)	0.2	NMWQCC-I	N	NV
	7782-49-2	Selenium	0.001	0.01	mg/L	NBL-01	3 / 70	0.001 - 0.001	0.01	0.00159	0.0078 (N)	0.05	MCL	N	NV
	7440-62-2	Vanadium	0.1	0.2	mg/L	517, 708, EPA13, EPA14, NBL-01	5 / 70	0.1 - 0.1	0.2	ND	0.0078 (N)	0.1	NRC GPS	N	NV
	7440-61-1	Uranium	0.0011	0.138	mg/L	NBL-01	70 / 70	0.0003 - 0.002	0.138	0.107	0.0047 (N)	0.03	MCL	N	NV
	13966-29-5	Uranium-234	NA (2)	NA (2)	pCi/L	NA (2)	NA (2)	NA (2)	NA	NA	NA (C)	NA	NA	N	NV
	15117-96-1	Uranium-235	NA (2)	NA (2)	pCi/L	NA (2)	NA (2)	NA (2)	NA	NA	NA (C)	NA	NA	N	NV
	7440-61-1	Uranium-238	NA (2)	NA (2)	pCi/L	NA (2)	NA (2)	NA (2)	NA	NA	NA (C)	NA	NA	N	NV
67-66-3	Chloroform	0.00093	0.00676	mg/L	517	13 / 70	0.0005 - 0.001	0.00676	NBC	0.00019 (C)	0.08	MCL (TTHM)	Y	ASL	
13982-63-3	Radium-226	2	27.6	pCi/L	EPA14	70 / 70	0.1 - 0.2	27.6	4.996	NA (C)	5	MCL (combined radium)	Y	DET	
15262-20-1	Radium-228	3.8	56.1	pCi/L	EPA14	70 / 70	1 - 1.4	56.1	4.509	NA (C)	5	MCL (combined radium)	N	NV	
14269-63-7	Thorium-230	0.2	1.3	pCi/L	517	6 / 70	0.2 - 0.2	1.3	1.426	NA (C)	5	NRC GPS	N	NV	
14255-04-0	Lead-210	1.8	8.1	pCi/L	719	6 / 70	1.0 - 1.0	8.1	1.618	NA (C)	1	NRC GPS	N	NV	

Notes:

- Qualifier codes used for the "Minimum Concentration" and "Maximum Concentration".  
D = the sample was diluted to facilitate analysis.
- Uranium isotopes not analyzed. Isotope concentrations estimated from total uranium mass concentration (see Table 3.A.RME).
- The summary statistics for Radium-226 and Radium-228 count the raw below-detection-limit values from the 2nd Quarter 2008 as detections, because they were treated as such in the calculation of EPC statistics using ProUCL.
- Maximum concentration used for screening chemicals. No screening was conducted for radionuclides. All detected radionuclides considered volatile, or with volatile decay products, are selected as COPCs (i.e., only Ra-226).
- Background value calculated in N.A. Water Systems (2008b).
- All compounds were screened against the November 2010 USEPA Risk Screening Level Table (<http://www.epa.gov/region9/superfund/prg/>).  
- For non-carcinogens: screening value = 0.1 x RSL tapwater value

Definitions:

- NA = Not Applicable
- ND = Not Detected
- MCL = Maximum Contaminant level
- NRC GPS = NRC Groundwater Protection Standard
- NMWQCC = New Mexico Water Quality Control Commission Groundwater Standard
- NMWQCC-I = New Mexico Water Quality Control Commission Irrigation Standard
- NMWQCC-O = New Mexico Water Quality Control Commission Other Standard
- C = Carcinogen
- N = Noncarcinogen
- TTHM = 0.080 mg/l is the MCL for total trihalomethanes, of which chloroform is a single compound.
- NBC = No background concentration - chloroform was not detected frequently enough in Zone 1 and Zone 3 background samples (less than 1%) to calculate background concentration

TABLE 3.1.RME  
EXPOSURE POINT CONCENTRATION SUMMARY  
REASONABLE MAXIMUM EXPOSURE  
UNC Church Rock Mill and Tailings Site

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean (of Detected)	95% UCL (Distribution) (1)	Maximum Concentration (Qualifier) (3)	Exposure Point Concentration			
						Value	Units	Statistic (4)	Rationale (5)
SW Alluvium Tapwater	Arsenic	mg/L	0.00885	0.00256 (NP)	0.01	0.00256	mg/l	95% UCL	KM (t)
	Cobalt	mg/L	NA	NA	0.01	0.01	mg/l	Max	(a)
	Manganese	mg/L	1.865	2.8 (O)	5.4	2.8	mg/l	97.5% UCL	Chebyshev, (b)
	Uranium	mg/L	0.104	0.128 (NP)	0.246	0.128	mg/l	95% UCL	Chebyshev
	Uranium-234 (2)	pCi/L	NA	NA	NA	4.37E+01	pCi/L	NA	(f)
	Uranium-235 (2)	pCi/L	NA	NA	NA	1.99E+00	pCi/L	NA	(f)
	Uranium-238 (2)	pCi/L	NA	NA	NA	4.27E+01	pCi/L	NA	(f)
	Chloroform	mg/L	0.00479	0.00338 (NP)	0.0155	0.00338	mg/l	95% UCL	KM (%)
	Radium-226	pCi/L	0.435	0.267 (N)	1	0.267	pCi/L	95% UCL	KM (%)
	Radium-228	pCi/L	1.786	0.86 (N)	4.3	0.86	pCi/L	95% UCL	KM (%)
Thorium-230	pCi/L	0.69	0.29 (O)	1.6	0.29	pCi/L	95% UCL	KM (t)	
Zone 1 Tapwater	Arsenic	mg/L	0.00175	0.00145 (N)	0.003	0.00145	mg/l	95% UCL	KM (t)
	Cobalt	mg/L	0.0363	0.0557 (NP)	0.06	0.0557	mg/l	95% UCL	Chebyshev
	Manganese	mg/L	1.656	1.95 (T)	2.96	1.95	mg/l	95% UCL	Modified t
	Nickel	mg/L	0.0533	0.0519 (NP)	0.06	0.0533	mg/l	Mean	(e)
	Vanadium	mg/L	NA	NA	0.2	0.2	mg/l	Max	(a)
	Uranium (g)	mg/L	0.00161	0.00174 (N)	0.0022	0.00174	mg/l	95% UCL	Modified t
	Uranium-234 (2)	pCi/L	NA	NA	NA	5.94E-01	pCi/L	NA	(f)
	Uranium-235 (2)	pCi/L	NA	NA	NA	2.71E-02	pCi/L	NA	(f)
	Uranium-238 (2)	pCi/L	NA	NA	NA	5.80E-01	pCi/L	NA	(f)
	Chloroform	mg/L	0.00068	0.000639 (NP)	0.00076	0.00068	mg/l	Mean	(c)
	Radium-226	pCi/L	1.138	1.213 (N)	1.8	1.213	pCi/L	95% UCL	KM (%)
	Radium-228	pCi/L	2.286	2.087 (N)	4	2.087	pCi/L	95% UCL	KM (t)
	Thorium-230	pCi/L	0.65	0.621 (NP)	0.7	0.65	pCi/L	Mean	(c)
Zone 3 Tapwater	Aluminum	mg/L	16.14	39.15 (NP)	163	39.15	mg/l	97.5% UCL	KM (Chebyshev), (b)
	Arsenic	mg/L	0.206	0.412 (NP)	2.5 (D)	0.412	mg/l	95% UCL	KM (Chebyshev), (b)
	Beryllium	mg/L	0.0589	0.0202 (N)	0.09	0.0202	mg/l	95% UCL	KM (t)
	Cadmium	mg/L	0.00956	0.0075 (NP)	0.015	0.0075	mg/l	95% UCL	KM (%)
	Cobalt	mg/L	0.381	0.439 (O)	0.95 (D)	0.439	mg/l	95% UCL	Gamma
	Manganese	mg/L	9.836	10.89 (NP)	23.7	10.89	mg/l	95% UCL	Modified t
	Molybdenum	mg/L	1.084	0.739 (NP)	5	0.739	mg/l	95% UCL	KM (BCA)
	Nickel	mg/L	0.377	0.489 (NP)	0.89	0.489	mg/l	95% UCL	Chebyshev
	Selenium	mg/L	0.00433	0.0014 (N)	0.01	0.00433	mg/l	Mean	(e)
	Vanadium	mg/L	0.18	0.111 (NP)	0.2	0.18	mg/l	Mean	(d)
	Uranium	mg/L	0.0287	0.0431 (NP)	0.138	0.0431	mg/l	95% UCL	Chebyshev
	Uranium-234 (2)	pCi/L	NA	NA	NA	1.47E+01	pCi/L	NA	(f)
	Uranium-235 (2)	pCi/L	NA	NA	NA	6.71E-01	pCi/L	NA	(f)
	Uranium-238 (2)	pCi/L	NA	NA	NA	1.44E+01	pCi/L	NA	(f)
	Chloroform	mg/L	0.00441	0.00326 (N)	0.00676	0.00326	mg/l	95% UCL	KM (%)
	Radium-226	pCi/L	9.823	11.14 (O)	27.6	11.14	pCi/L	95% UCL	Gamma
	Radium-228	pCi/L	15.73	17.84 (O)	56.1	17.84	pCi/L	95% UCL	Gamma
	Thorium-230	pCi/L	0.533	0.259 (N)	1.3	0.259	pCi/L	95% UCL	KM (t)
Lead-210	pCi/L	4.883	2.287 (N)	8.1	2.287	pCi/L	95% UCL	KM (t)	

- Notes:
- (1) "95% UCL" term calculated using ProUCL ver 4.00.02 as described in N.A. Water Systems (2008c)  
Codes describing the type of distribution for the "95% UCL" term.  
N = Normal  
T = Transformed (lognormal)  
NP = Nonparametric  
O = Other
- (2) Uranium isotopes not analyzed. Isotope concentrations estimated from total uranium mass concentration (see Table 3.A.RME).
- (3) Qualifier codes used for the "Maximum Concentration".  
D = the sample was diluted to facilitate analysis.
- (4) Codes describing the "EPC Statistic".  
95% UCL = 95% UCL Statistic  
97.5% UCL = 97.5% UCL Statistic  
Max = Maximum Detected Concentration  
Mean = Arithmetic Mean of Detected Concentrations
- Definitions:  
NA = Not Applicable
- (5) Codes describing the rationale the statistic is used to represent the EPC  
KM (t) = UCL based upon Kaplan-Meier estimates using the Student's t-distribution cutoff value  
KM (%) = UCL based upon Kaplan-Meier estimates using the percentile bootstrap method  
Chebyshev = Chebyshev inequality-based UCL  
Modified t = UCL based on the modified t statistic  
KM (Chebyshev) = UCL based upon Kaplan-Meier estimates using the Chebyshev inequality  
KM (BCA) = UCL based upon Kaplan-Meier estimates using bias-corrected accelerated bootstrap method  
Gamma = 95% Approximate Gamma UCL
- (a) Only one detection, 95% UCL not calculated, used maximum detected concentration.  
(b) UCL calculated at 97.5% confidence level.  
(c) Only two detections. 95% UCL of questionable reliability; used arithmetic mean of detected values.  
(d) 95% UCL of questionable reliability; used arithmetic mean of detected values.  
(e) Only three detections. 95% UCL of questionable reliability; used arithmetic mean of detected values.  
(f) Uranium isotopes not analyzed. Isotope concentrations estimated from total uranium mass concentration (see Table 3.A.RME)  
(g) The total uranium mass concentration was screened out of the Zone 1 risk evaluation but appears in this table because it is the basis of the uranium isotope activities shown.

TABLE 3.2.RME  
EXPOSURE POINT CONCENTRATION SUMMARY  
REASONABLE MAXIMUM EXPOSURE  
UNC Church Rock Mill and Tailings Site

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution) (1)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic (2)	Rationale (3)
SW Alluvium Water Vapors from Showerhead / Domestic Use	Chloroform	mg/L	0.00479	0.00338 (NP)	0.0155	0.00338	mg/l	95% UCL	KM (%)
	Radium-226	pCi/L	0.435	0.267 (N)	1	0.267	pCi/L	95% UCL	KM (%)
Zone 1 Water Vapors from Showerhead / Domestic Use	Chloroform	mg/L	0.00068	0.000639 (NP)	0.00076	0.00068	mg/l	Mean	(a)
	Radium-226	pCi/L	1.138	1.213 (N)	1.8	1.213	pCi/L	95% UCL	KM (%)
Zone 3 Water Vapors from Showerhead / Domestic Use	Chloroform	mg/L	0.00441	0.00326 (N)	0.00676	0.00326	mg/l	95% UCL	KM (%)
	Radium-226	pCi/L	9.823	11.14 (O)	27.6	11.14	pCi/L	95% UCL	Gamma

Notes:

- (1) "95% UCL" term calculated using ProUCL ver 4.00.02 as described in N.A. Water Systems (2008c).  
Codes describing the type of distribution for the "95% UCL" term:  
N = Normal  
NP = Nonparametric  
O = Other

- (2) Codes describing the "EPC Statistic":  
95% UCL = 95% UCL Statistic  
97.5% UCL = 97.5% UCL Statistic  
Max = Maximum Detected Concentration  
Mean = Arithmetic Mean of Detected Concentrations

- (3) Codes describing the rationale the statistic is used to represent the EPC:  
KM (%) = UCL based upon Kaplan-Meier estimates using the percentile bootstrap method  
Gamma = 95% Approximate Gamma UCL  
(a) Only two detections. 95% UCL lower than arithmetic mean of detected and of questionable reliability; used arithmetic mean.

Table 3.A.RME (SUPPLEMENTAL)  
 ESTIMATION OF URANIUM ISOTOPE CONCENTRATIONS  
 REASONABLE MAXIMUM EXPOSURE  
 UNC Church Rock Mill and Tailings Site

Hydrostratigraphic Unit	Uranium Isotopes		Mass-Based Uranium EPC Concentration (mg/l)	Uranium Isotope Natural Abundance (%) (1)	Isotope Mass Concentration at EPC Concentration (mg/l)	Isotope Specific Activity (pCi/μg)	Isotope Activity (pCi/L) at Uranium EPC Concentration (2)
SWA	U-234	mg/L	0.128	0.000055	0.000007	6209	4.37E+01
SWA	U-235	mg/L	0.128	0.00720	0.00092	2.161	1.99E+00
SWA	U-238	mg/L	0.128	0.99270	0.12707	0.336	4.27E+01
Zone 1	U-234	mg/L	0.00174	0.000055	0.0000001	6209	5.94E-01
Zone 1	U-235	mg/L	0.00174	0.00720	0.00001	2.161	2.71E-02
Zone 1	U-238	mg/L	0.00174	0.99270	0.00173	0.336	5.80E-01
Zone 3	U-234	mg/L	0.0431	0.000055	0.0000024	6209	1.47E+01
Zone 3	U-235	mg/L	0.0431	0.00720	0.00031	2.161	6.71E-01
Zone 3	U-238	mg/L	0.0431	0.99270	0.04279	0.336	1.44E+01
Zone 3 (Background)	U-234	mg/L	0.107	0.000055	0.0000059	6209	3.65E+01
Zone 3 (Background)	U-235	mg/L	0.107	0.00720	0.00077	2.161	1.67E+00
Zone 3 (Background)	U-238	mg/L	0.107	0.99270	0.10622	0.336	3.57E+01

Notes:

(1) Source of natural abundance percentages: <http://www.epa.gov/radiation/radionuclides/uranium.html>

(2) Isotope activity (pCi/L) = Isotope Mass Concentration at EPC concentration (mg/L) x Isotope Specific Activity (pCi/μg) x Conversion Factor (1000 μg/mg)

TABLE 4.1.RME  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
REASONABLE MAXIMUM EXPOSURE  
UNC Church Rock Mill and Tailings Site

Scenario Timeframe: Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/Reference (1)	Intake Equation/Model Name (2)	
Ingestion	Resident	Adult	SW Alluvium Zone 1 and Zone 3 Tapwater	CW	Chemical Concentration in Water	See Table 3.1	mg/l	See Table 3.1	Chronic Daily Intake (CDI) (mg/kg/day) = CW x IRw x EF x ED x 1/BW x 1/(ATn)	
				IRw	Ingestion Rate of Water	2	l/day	EPA, 1991		
				EF	Exposure Frequency	350	days/year	EPA, 1991		
		ED		Exposure Duration	24	years	EPA, 1991			
		BW		Body Weight	70	kg	EPA, 1991			
		ATn		Averaging Time - Non-Cancer	8,760	days	EPA, 1989			
		Child		IRw	Chemical Concentration in Water	See Table 3.1	mg/l	See Table 3.1		CDI (mg/kg/day) = CW x IRw x EF x ED x 1/BW x 1/(ATn)
				IRw	Ingestion Rate of Water	1	l/day	CalEPA, 1994		
				EF	Exposure Frequency	350	days/year	EPA, 1991		
	Adult/Child	SW Alluvium Zone 1 and Zone 3 Tapwater	Adult/Child	IRw	Ingestion Rate of Water	1	l/day	CalEPA, 1994	CDI (mg/kg/day) = CW x IRwadj x EF x 1/(ATc)	
				IRwadj	Ingestion Rate of Water - Age-Adjusted	1.09	[L <sup>3</sup> /yr]/[kg*d]	Calculated		
				EF	Exposure Frequency	350	days/year	EPA, 1991		
				EDc	Exposure Duration - Child	6	years	EPA, 1991		
				EDa	Exposure Duration - Adult	24	years	EPA, 1991		
				BW	Body Weight - Child	15	kg	EPA, 1991		
Dermal	Resident	Adult	SW Alluvium Zone 1 and Zone 3 Tapwater	CW	Chemical Concentration in Water	See Table 3.1	mg/l	See Table 3.1	Dermally Absorbed Dose (DAD) (mg/kg-day) = DA-event x EV x ED x EF x SA x 1/BW x 1/(ATn) where, for organic compounds with t-event <= t*: Absorbed Dose per Event (DA-event) (mg/cm2-event) = 2 FA x Kp x CW x CF x SQRT((6 x tau-event x t-event)/pi) or where, for organic compounds with t-event > t*: DA-event = FA x Kp x CW x ((t-event)/(1 + B)) + 2 x tau-event x ((1 + (3 x B) + (3 x B x B))/(1 + B)2)) and where, for inorganic compounds, DA-event = Kp x CW x CF x t-event (see Tables 7.A.RME and 7.B.RME)	
				DA-event	Absorbed Dose per Event	Chemical Specific	mg/cm2-event	Calculated		
				FA	Fraction Absorbed Water	Chemical Specific	--	EPA, 2004		
				Kp	Permeability Constant	Chemical Specific	cm/hr	EPA, 2004		
				SA	Skin Surface Area	Chemical Specific	cm2	EPA, 2004		
				tau-event	Lag time per event	Chemical Specific	hr/event	EPA, 2004		
				t-event	Event Duration	Chemical Specific	hr/event	EPA, 2004		
				t*	Time to reach steady-state (hr)	Chemical Specific	hrs	EPA, 2004		
				B	Ratio of permeability coefficient of a compound through the stratum corneum relative to its permeability coefficient across the viable epidermis	Chemical Specific	--	EPA, 2004		
EV	Event Frequency	1	events/day	EPA, 2004						
EF	Exposure Frequency	350	days/year	EPA, 2004						
ED	Exposure Duration	24	years	EPA, 1991						
CF	Volumetric Conversion Factor for Water	0.001	l/cm3	--						
BW	Body Weight	70	kg	EPA, 2004						
ATn	Averaging Time - Non-Cancer	8,760	days	EPA, 2004						
Dermal	Resident	Child	SW Alluvium Zone 1 and Zone 3 Tapwater	CW	Chemical Concentration in Water	See Table 3.1	mg/l	See Table 3.1	Dermally Absorbed Dose (DAD) (mg/kg-day) = DA-event x EV x ED x EF x SA x 1/BW x 1/(ATn) where, for organic compounds with t-event <= t*: Absorbed Dose per Event (DA-event) (mg/cm2-event) = 2 FA x Kp x CW x CF x SQRT((6 x tau-event x t-event)/pi) or where, for organic compounds with t-event > t*: DA-event = FA x Kp x CW x ((t-event)/(1 + B)) + 2 x tau-event x ((1 + (3 x B) + (3 x B x B))/(1 + B)2)) and where, for inorganic compounds, DA-event = Kp x CW x CF x t-event (see Tables 7.A.RME and 7.B.RME)	
				DA-event	Absorbed Dose per Event	Chemical Specific	mg/cm2-event	Calculated		
				FA	Fraction Absorbed Water	Chemical Specific	--	EPA, 2004		
				Kp	Permeability Constant	Chemical Specific	cm/hr	EPA, 2004		
				SA	Skin Surface Area	Chemical Specific	cm2	EPA, 2004		
				tau-event	Lag time per event	Chemical Specific	hr/event	EPA, 2004		
				t-event	Event Duration	Chemical Specific	hr/event	EPA, 2004		
				t*	Time to reach steady-state (hr)	Chemical Specific	hr	EPA, 2004		
				B	Ratio of permeability coefficient of a compound through the stratum corneum relative to its permeability coefficient across the viable epidermis	Chemical Specific	--	EPA, 2004		
	EV	Event Frequency	1	events/day	EPA, 2004					
	EF	Exposure Frequency	350	days/year	EPA, 2004					
	ED	Exposure Duration	6	years	EPA, 2004					
	CF	Volumetric Conversion Factor for Water	0.001	l/cm3	--					
	BW	Body Weight	15	kg	EPA, 2004					
	ATn	Averaging Time - Non-Cancer	2,190	days	EPA, 2004					
Dermal	Resident	Adult/Child	SW Alluvium Zone 1 and Zone 3 Tapwater	DA-event-a	Absorbed Dose per Event - Adult	See Table 3.1	mg/cm2-event	See Table 3.1	Dermally Absorbed Dose (DAD) (mg/kg-day) = [(DA-event-a x EV x EDa x EF x SAa x 1/Bwa) + [(DA-event-c x EV x EDc x EF x Sac x 1/Bwc)] x 1/(ATc) where, for organic compounds with t-event <= t*: Absorbed Dose per Event (DA-event) (mg/cm2-event) = 2 FA x Kp x CW x CF x SQRT((6 x tau-event x t-event)/pi) or where, for organic compounds with t-event > t*: DA-event = FA x Kp x CW x ((t-event)/(1 + B)) + 2 x tau-event x ((1 + (3 x B) + (3 x B x B))/(1 + B)2)) and where, for inorganic compounds, DA-event = Kp x CW x CF x t-event (see Tables 7.A.RME and 7.B.RME)  Note: Adult and Child DA-event values are calculated using corresponding Adult or Child t-event value	
				DA-event-c	Absorbed Dose per Event - Child	Chemical Specific	mg/cm2-event	Calculated		
				FA	Fraction Absorbed Water	Chemical Specific	--	EPA, 2004		
				Kp	Permeability Constant	Chemical Specific	cm/hr	EPA, 2004		
				SAC	Skin Surface Area - Child	Chemical Specific	cm2	EPA, 2004		
				SAa	Skin Surface Area - Adult	Chemical Specific	cm2	EPA, 2004		
				tau-event	Lag time per event	Chemical Specific	hrs/event	EPA, 2004		
				t-event-a	Event Duration - Adult	Chemical Specific	hrs/event	EPA, 2004		
				t-event-c	Event Duration - Child	Chemical Specific	hrs/event	EPA, 2004		
				t*	Time to reach steady-state (hr)	Chemical Specific	hr	EPA, 2004		
				B	Ratio of permeability coefficient of a compound through the stratum corneum relative to its permeability coefficient across the viable epidermis	Chemical Specific	--	EPA, 2004		
				EV	Event Frequency	1	events/day	EPA, 2004		
				EF	Exposure Frequency	350	days/year	EPA, 2004		
				EDa	Exposure Duration - Adult	24	years	EPA, 2004		
				EDc	Exposure Duration - Child	6	years	EPA, 2004		
CF	Volumetric Conversion Factor for Water	0.001	l/cm3	--						
Bwa	Body Weight - Adult	70	kg	EPA, 2004						
Bwc	Body Weight - Child	15	kg	EPA, 2004						
ATc	Averaging Time - Cancer	25,550	days	EPA, 2004						

Notes:

Dermal uptake is generally not an important route of uptake for radionuclides, which have small permeability constants (EPA, 1989a). Dermal uptake of radionuclides is not evaluated in this risk assessment.

(1) References:

- California EPA (CalEPA). 1994. Preliminary Endangerment Assessment Guidance Manual. (PEA) Department of Toxic Substances Control, Sacramento, California.
- EPA 1989: Risk Assessment Guidance for Superfund. Volume 1: Human Health Evaluation Manual, Part A. OERR EPA/540/1-89/002.
- EPA 1991: Risk Assessment Guidance for Superfund. Volume 1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER 9285.6-03.
- EPA 2004: Risk Assessment Guidance for Superfund. Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final.

(2) Intake for adults and children combined/adjusted for cancer risk calculations based on exposure duration.



TABLE 4.2.RME  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
REASONABLE MAXIMUM EXPOSURE  
UNC Church Rock Mill and Tailings Site

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation (1)	Resident	Adult	Water Vapors From Showerhead	(1)	(1)	(1)	(1)	(1)	Foster and Chrostowski Model
Inhalation (1)	Resident	Child	Water Vapors From Showerhead	(1)	(1)	(1)	(1)	(1)	Foster and Chrostowski Model
Inhalation (1)	Resident	Child/Adult	Water Vapors From Showerhead	(1)	(1)	(1)	(1)	(1)	Foster and Chrostowski Model
Inhalation (2)	Resident	Child/Adult	Water Vapors From Showerhead and Other Domestic Uses	(2)	(2)	(2)	(2)	(2)	Andelman Volatilization Factor

Footnote Instructions:

- (1) Refer to Tables 7.C.RME and 7.D.RME and the Risk Assessment text for details on the modeled intake methodology and parameters used to calculate modeled intake values for the Foster and Chrostowski Shower Model.
- (2) Refer to the Table 7.E.RME and the Risk Assessment text for details on the modeled intake methodology and parameters used to calculate modeled intake values for the Andelman Volatilization Factor.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
UNC Church Rock Mill and Tailings Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD		Oral Absorption Efficiency for Dermal  (1)	Absorbed RfD for Dermal (2)		Primary Target Organ(s) Or Effects	Combined Uncertainty/Modifying Factors	RfD:Target Organ(s) (3)	
		Value	Units		Value	Units			Source(s)	Date(s) (MM/DD/YYYY)
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Central nervous system	100	PPRTV	12/13/2010
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin	3	IRIS	12/13/2010
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Gastrointestinal	300	IRIS	12/13/2010
Cadmium	Chronic	5.0E-04	mg/kg-day	0.05	2.5E-05	mg/kg-day	Kidney	10	IRIS	12/13/2010
Chloroform	Chronic	1.0E-02	mg/kg-day	1	1.0E-02	mg/kg-day	Liver	100	IRIS	12/13/2010
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Thyroid	1000	PPRTV	08/25/2008
Lead-210	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	Chronic	2.4E-02	mg/kg-day	0.04	9.6E-04	mg/kg-day	Central nervous system	3	RSL (4)	11/2010
Molybdenum	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Increased uric acid (kidney)	30	IRIS	12/13/2010
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Reduced organ and body weights	300	IRIS	12/13/2010
Radium-226	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Radium-228	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	Chronic	5.0E-03	NA	1	5.0E-03	mg/kg-day	Skin	3	IRIS	1/31/2012
Thorium-230	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Uranium	Chronic	3.0E-03	mg/kg-day	1	3.0E-03	mg/kg-day	Kidney	1000	IRIS	12/13/2010
Uranium-234	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Uranium-235	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Uranium-238	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Decreased hair cystine	100	RSL (5) (6)	12/13/2010

Notes:

- (1) EPA 2004: Risk Assessment Guidance for Superfund. Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, Section 4.2 and Exhibit 4-1, except for selenium and vanadium, which were based on the GIABS value listed in the EPA RSL Table for selenium and vanadium (i.e., as listed for Vanadium and Compounds).
- (2) Absorbed RfD for Dermal calculated by multiplying Oral RfD by Oral Absorption Efficiency for Dermal.
- (3) RfD Date: The date shown for IRIS values is the date IRIS was searched; for PPRTV values, the date of the PPRTV report; for RSL values, the date of the RSL Table.
- (4) Manganese RfD obtained from November 2010 EPA RSL Table; based on IRIS assessment recommendation to subtract dietary contribution from IRIS RfD when evaluating non-food exposures (e.g., drinking water or soil).
- (5) Vanadium oral RfD obtained from November 2010 EPA RSL Table for "Vanadium and Compounds"; derived from IRIS oral RfD for vanadium pentoxide by factoring out the molecular wt of the oxide ion.
- (6) Vanadium oral RfD for decreased hair cystine interpreted to have a metabolic system endpoint.

Definitions:

- NA = Not Applicable  
 IRIS = Integrated Risk Information System  
 RSL = Regional Screening Level Table  
 PPRTV = Provisional Peer Reviewed Toxicity Value, Superfund Health Technical Support Center

TABLE 5.2  
NON-CANCER TOXICITY DATA -- INHALATION  
UNC Church Rock Mill and Tailings Site

Chemical of Potential Concern	Chronic/ Subchronic	Inhalation RfC		Primary Target Organ(s)	Combined Uncertainty/Modifying Factors	RfC : Target Organ(s) (1)	
		Value	Units			Source(s)	Date(s) (MM/DD/YYYY)
Chloroform	Chronic	9.80E-02	mg/m3	Liver	100	RSL/ATSDR	12-2010 / 09-1997
Radium-226	NA	NA	NA	NA	NA	NA	NA

Notes:

(1) RfC Date: The date shown for RSL values, the date of the RSL Table; for ATSDR values (MRLs), the date of the ATSDR report.

Definitions:

NA = Not Applicable

RSL = Regional Screening Level Table

ATSDR = Agency for Toxic Substances and Disease Registry

TABLE 5.3  
 NON-CANCER TOXICITY DATA -- SPECIAL CASE CHEMICALS  
 UNC Church Rock Mill and Tailings Site

Chemical of Potential Concern	Chronic/ Subchronic	Parameter			Primary Target Organ(s)	Combined Uncertainty/Modifying Factors	Parameter:Target Organ(s)	
		Name	Value	Units			Source(s)	Date(s) (MM/DD/YYYY)
<b>NOT APPLICABLE</b>								

TABLE 6.1  
 CANCER TOXICITY DATA - ORAL/DERMAL  
 UNC Church Rock Mill and Tailings Site

Chemical of Potential Concern	Oral Cancer Slope Factor		Oral Absorption Efficiency for Dermal (1)	Absorbed Cancer Slope Factor for Dermal (2)		Weight of Evidence/ Cancer Guideline Description	Oral CSF	
	Value	Units		Value	Units		Source(s)	Date(s) (MM/DD/YYYY)
Aluminum	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	1.50E+00	(mg/kg-day) <sup>-1</sup>	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	12/12/2010
Beryllium	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	NA	NA	NA	NA	NA	NA	NA	NA
Chloroform	3.10E-02	(mg/kg-day) <sup>-1</sup>	1	3.1E-02	(mg/kg-day) <sup>-1</sup>	B2	CalEPA	09/01/1990
Cobalt	NA	NA	NA	NA	NA	NA	NA	NA
Lead-210+D (Water Ingestion)	1.27E-09	Risk/pCi	NA	NA	NA	A	HEAST	04/16/2001
Manganese	NA	NA	NA	NA	NA	NA	NA	NA
Molybdenum	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	NA	NA	NA	NA	NA	NA	NA	NA
Radium-226+D (Water Ingestion)	3.86E-10	Risk/pCi	NA	NA	NA	A	HEAST	04/16/2001
Radium-228+D (Water Ingestion)	1.04E-09	Risk/pCi	NA	NA	NA	A	HEAST	04/16/2001
Selenium	NA	NA	NA	NA	NA	NA	NA	NA
Thorium-230 (Water Ingestion)	9.10E-11	Risk/pCi	NA	NA	NA	A	HEAST	04/16/2001
Uranium	NA	NA	NA	NA	NA	NA	NA	NA
Uranium-234 (Water Ingestion)	7.07E-11	Risk/pCi	NA	NA	NA	A	HEAST	04/16/2001
Uranium-235+D (Water Ingestion)	7.18E-11	Risk/pCi	NA	NA	NA	A	HEAST	04/16/2001
Uranium-238+D (Water Ingestion)	8.71E-11	Risk/pCi	NA	NA	NA	A	HEAST	04/16/2001
Vanadium	NA	NA	NA	NA	NA	NA	NA	NA

Notes:

- (1) EPA 2004: Risk Assessment Guidance for Superfund. Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, Section 4.2 and Exhibit
- (2) Absorbed Cancer Slope Factor for Dermal calculated by multiplying Oral Cancer Slope Factor by Oral Absorption Efficiency for Dermal.
- (3) Oral CSF Date: The date shown for IRIS values is the date IRIS was searched; for CalEPA values, date of CalEPA document; for HEAST values, date of HEAST document.

Definitions:

NA = Not Applicable

CalEPA = California EPA (identified on EPA RSL Table)

HEAST = Health Effects Summary Tables

IRIS = Integrated Risk Information System

RSL = Regional Screening Level Table

A = Known human carcinogen

B2 = Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

TABLE 6.2  
 CANCER TOXICITY DATA - INHALATION  
 UNC Church Rock Mill and Tailings Site

Chemical of Potential Concern	Unit Risk (1)		Inhalation Cancer Slope Factor (2)		Weight of Evidence/ Cancer Guideline Description	Unit Risk : Inhalation CSF	
	Value	Units	Value	Units		Source(s)	Date(s) (MM/DD/YYYY)
Chloroform	2.3E-05	( $\mu\text{g}/\text{m}^3$ ) <sup>-1</sup>	8.1E-02	( $\text{mg}/\text{kg}\cdot\text{day}$ ) <sup>-1</sup>	B2	IRIS	12/13/2010
Radium-226+D	NA	NA	1.16E-08	risk/pCi	A	HEAST	04/16/2001

(1) Inhalation Unit Risk (IUR) values used in risk calculations for chloroform

(2) Inhalation cancer slope factor used in risk calculations for radium-226+D

Definitions:

NA = Not Applicable

HEAST = Health Effects Summary Tables

IRIS = Integrated Risk Information System

A = Known human carcinogen

B2 = Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

TABLE 6.3  
 CANCER TOXICITY DATA - SPECIAL CASE CHEMICALS  
 UNC Church Rock Mill and Tailings Site

Chemical of Potential Concern	Parameters			Source(s)	Date(s) (MM/DD/YYYY)
	Name	Value	Units		
<b>NOT APPLICABLE</b>					

TABLE 6.4  
 CANCER TOXICITY DATA - EXTERNAL (RADIATION)  
 UNC Church Rock Mill and Tailings Site

Chemical of Potential Concern	Cancer Slope Factor		Source(s)	Date(s) (MM/DD/YYYY)
	Value	Units		
<b>NOT APPLICABLE</b>				



TABLE 7.1.RME  
 CALCULATION OF CHEMICAL NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 UNC Church Rock Mill and Tailings Site

Scenario Timeframe: Future  
 Receptor Population: Resident  
 Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value (1)	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater SW Alluvium	Groundwater	Tapwater	Ingestion	Arsenic	0.00256	mg/l	NA	NA	NA	NA	NA	7.01E-05	mg/kg/d	3.0E-04	mg/kg/d	0.23
				Cobalt	0.01	mg/l	NA	NA	NA	NA	NA	2.74E-04	mg/kg/d	3.0E-04	mg/kg/d	0.91
				Manganese	2.8	mg/l	NA	NA	NA	NA	NA	7.67E-02	mg/kg/d	2.4E-02	mg/kg/d	3.2
				Uranium	0.128	mg/l	NA	NA	NA	NA	NA	3.51E-03	mg/kg/d	3.0E-03	mg/kg/d	1.2
				Chloroform	0.00338	mg/l	NA	NA	NA	NA	NA	9.26E-05	mg/kg/d	1.0E-02	mg/kg/d	0.0091
			Exp. Route Total					NA							5.5	
			Dermal	Arsenic	0.00256	mg/l	NA	NA	NA	NA	NA	3.7E-07	mg/kg/d	3.0E-04	mg/kg/d	0.0012
				Cobalt	0.01	mg/l	NA	NA	NA	NA	NA	1.4E-06	mg/kg/d	3.0E-04	mg/kg/d	0.0048
				Manganese	2.8	mg/l	NA	NA	NA	NA	NA	4.0E-04	mg/kg/d	9.6E-04	mg/kg/d	0.42
				Uranium	0.128	mg/l	NA	NA	NA	NA	NA	1.8E-05	mg/kg/d	3.0E-03	mg/kg/d	0.0061
		Chloroform		0.00338	mg/l	NA	NA	NA	NA	NA	8.4E-06	mg/kg/d	1.02E-02	mg/kg/d	0.0008	
		Exp. Route Total					NA							0.43		
		Exposure Point Total						NA							6.0	
		Exposure Medium Total						NA							6.0	
		Air	Water Vapors from Showerhead	Inhalation (1)	Chloroform	0.0070	mg/m3	NA	NA	NA	NA	NA	1.6E-04	mg/m3	9.8E-02	mg/m3
Exp. Route Total								NA						0.0017		
Exposure Point Total							NA							0.0017		
Exposure Medium Total						NA							0.0017			
Groundwater Total - SW Alluvium														6.0		
Total of Receptor Risks Across All Media										NA	Total of Receptor Hazards Across All Media				6.0	

Notes:  
 (1) Inhalation EPC represents chemical air concentration (mg/m3) calculated from shower exposure model in Table 7.C.RME (Supplemental)  
 Definitions:  
 NA = Not Applicable

TABLE 7.2.RME  
 CALCULATION OF CHEMICAL NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 UNC Church Rock Mill and Tailings Site

Scenario Timeframe: Future  
 Receptor Population: Resident  
 Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations							
					Value (1)	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient			
							Value	Units	Value	Units		Value	Units						
Groundwater SW Alluvium	Groundwater	Tapwater	Ingestion	Arsenic	0.00256	mg/l	NA	NA	NA	NA	NA	1.64E-04	mg/kg/d	3.0E-04	mg/kg/d	0.55			
				Cobalt	0.01	mg/l	NA	NA	NA	NA	NA	6.39E-04	mg/kg/d	3.0E-04	mg/kg/d	2.1			
				Manganese	2.8	mg/l	NA	NA	NA	NA	NA	1.79E-01	mg/kg/d	2.4E-02	mg/kg/d	7.5			
				Uranium	0.128	mg/l	NA	NA	NA	NA	NA	8.18E-03	mg/kg/d	3.0E-03	mg/kg/d	2.7			
				Chloroform	0.00338	mg/l	NA	NA	NA	NA	NA	2.16E-04	mg/kg/d	1.0E-02	mg/kg/d	0.021			
				Exp. Route Total															
				Dermal	Arsenic	0.00256	mg/l	NA	NA	NA	NA	NA	1.1E-06	mg/kg/d	3.0E-04	mg/kg/d	0.0036		
			Cobalt		0.01	mg/l	NA	NA	NA	NA	NA	4.2E-06	mg/kg/d	3.0E-04	mg/kg/d	0.014			
			Manganese		2.8	mg/l	NA	NA	NA	NA	NA	1.2E-03	mg/kg/d	9.6E-04	mg/kg/d	1.2			
			Uranium		0.128	mg/l	NA	NA	NA	NA	NA	5.4E-05	mg/kg/d	3.0E-03	mg/kg/d	0.018			
			Chloroform		0.00338	mg/l	NA	NA	NA	NA	NA	1.9E-05	mg/kg/d	1.02E-02	mg/kg/d	0.0019			
				Exp. Route Total															
				Exposure Point Total															1.3
				Exposure Medium Total															14.2
				Air	Water Vapors from Showerhead	Inhalation	Chloroform	0.010	mg/m3	NA	NA	NA	NA	NA	4.1E-04	mg/m3	9.8E-02	mg/m3	0.0041
	Exp. Route Total																	0.0041	
	Exposure Point Total															0.0041			
	Exposure Medium Total															0.0041			
Groundwater Total - SW Alluvium																14.2			
										Total of Receptor Risks Across All Media		NA	Total of Receptor Hazards Across All Media			14.2			

Notes:  
 (1) Inhalation EPC represents chemical air concentration (mg/m3) calculated from shower exposure model in Table 7.D.RME (Supplemental)  
 Definitions:  
 NA = Not Applicable

TABLE 7.3.RME  
 CALCULATION OF CHEMICAL CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 UNC Church Rock Mill and Tailings Site

Scenario Timeframe: Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations																
					Value (1)	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient												
							Value	Units	Value	Units		Value	Units															
Groundwater SW Alluvium	Groundwater	Tapwater	Ingestion	Arsenic	0.00256	mg/l	3.82E-05	mg/kg/d	1.5E+00	(mg/kg-day) <sup>-1</sup>	5.7E-05	NA	NA	NA	NA	NA												
				Cobalt	0.01	mg/l	1.49E-04	mg/kg/d	NA	NA	NA	NA	NA	NA	NA	NA	NA											
				Manganese	2.8	mg/l	4.18E-02	mg/kg/d	NA	NA	NA	NA	NA	NA	NA	NA	NA											
				Uranium	0.128	mg/l	1.91E-03	mg/kg/d	NA	NA	NA	NA	NA	NA	NA	NA	NA											
				Chloroform	0.00338	mg/l	5.05E-05	mg/kg/d	3.1E-02	(mg/kg-day) <sup>-1</sup>	1.6E-06	NA	NA	NA	NA	NA	NA											
			Exp. Route Total									5.9E-05					NA											
			Dermal	Arsenic	0.00256	mg/l	2.2E-07	mg/kg/d	1.5E+00	(mg/kg-day) <sup>-1</sup>	3.3E-07	NA	NA	NA	NA	NA	NA											
				Cobalt	0.01	mg/l	8.5E-07	mg/kg/d	NA	NA	NA	NA	NA	NA	NA	NA	NA											
				Manganese	2.8	mg/l	2.4E-04	mg/kg/d	NA	NA	NA	NA	NA	NA	NA	NA	NA											
				Uranium	0.128	mg/l	1.1E-05	mg/kg/d	NA	NA	NA	NA	NA	NA	NA	NA	NA											
				Chloroform	0.00338	mg/l	4.5E-06	mg/kg/d	3.1E-02	(mg/kg-day) <sup>-1</sup>	1.4E-07	NA	NA	NA	NA	NA	NA											
			Exp. Route Total									4.7E-07					NA											
			Exposure Point Total										5.9E-05	NA	NA	NA	NA	NA										
			Exposure Medium Total										5.9E-05					NA										
			Air	Water Vapors from Showerhead	Inhalation	Chloroform	0.0076	mg/m3	9.1E-05	mg/m3	2.3E-05	(µg/m3) <sup>-1</sup>	2.1E-06	NA	NA	NA	NA	NA										
Exp. Route Total																												
Exposure Point Total																												
Exposure Medium Total										2.1E-06					NA													
Groundwater Total - SW Alluvium										6.1E-05					NA													
Total of Receptor Risks Across All Media										6.1E-05	Total of Receptor Hazards Across All Media				NA													

Notes:

(1) Inhalation EPC represents time weighted chemical air concentration (mg/m3) calculated from shower exposure model in Tables 7.C.RME Supplement C and 7.D.RME Supplement D (note that "Exposure Concentration" is calculated independently).

Definitions:

NA = Not Applicable

TABLE 7.4.RME  
 CALCULATION OF CHEMICAL NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 UNC Church Rock Mill and Tailings Site

Scenario Timeframe: Future  
 Receptor Population: Resident  
 Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value (1)	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater Zone 1	Groundwater	Tapwater	Ingestion	Arsenic	0.00145	mg/l	NA	NA	NA	NA	NA	3.97E-05	mg/kg/d	3.0E-04	mg/kg/d	0.13
				Cobalt	0.0557	mg/l	NA	NA	NA	NA	NA	1.53E-03	mg/kg/d	3.0E-04	mg/kg/d	5.1
				Manganese	1.95	mg/l	NA	NA	NA	NA	NA	5.34E-02	mg/kg/d	2.4E-02	mg/kg/d	2.2
				Nickel	0.0533	mg/l	NA	NA	NA	NA	NA	1.46E-03	mg/kg/d	2.0E-02	mg/kg/d	0.073
				Vanadium	0.2	mg/l	NA	NA	NA	NA	NA	5.48E-03	mg/kg/d	5.0E-03	mg/kg/d	1.1
				Chloroform	0.00068	mg/l	NA	NA	NA	NA	NA	1.86E-05	mg/kg/d	1.0E-02	mg/kg/d	0.0018
			Exp. Route Total					NA							8.6	
			Dermal	Arsenic	0.00145	mg/l	NA	NA	NA	NA	NA	2.1E-07	mg/kg/d	3.0E-04	mg/kg/d	0.0007
				Cobalt	0.0557	mg/l	NA	NA	NA	NA	NA	8.0E-06	mg/kg/d	3.0E-04	mg/kg/d	0.027
				Manganese	1.95	mg/l	NA	NA	NA	NA	NA	2.8E-04	mg/kg/d	9.6E-04	mg/kg/d	0.29
	Nickel	0.0533		mg/l	NA	NA	NA	NA	NA	1.5E-06	mg/kg/d	8.0E-04	mg/kg/d	0.0019		
	Vanadium	0.2	mg/l	NA	NA	NA	NA	NA	2.9E-05	mg/kg/d	5.0E-03	mg/kg/d	0.0057			
	Chloroform	0.00068	mg/l	NA	NA	NA	NA	NA	1.7E-06	mg/kg/d	1.02E-02	mg/kg/d	0.0002			
	Exp. Route Total													0.33		
	Exposure Point Total															8.9
	Exposure Medium Total															8.9
	Air	Water Vapors from Showerhead	Inhalation	Chloroform	0.0014	mg/m3	NA	NA	NA	NA	NA	3.3E-05	mg/m3	9.8E-02	mg/m3	0.0003
							Exp. Route Total									
		Exposure Point Total														
	Exposure Medium Total															0.0003
Groundwater Total - Zone 1															8.9	
Total of Receptor Risks Across All Media										NA	Total of Receptor Hazards Across All Media					8.9

Notes:  
 (1) Inhalation EPC represents chemical air concentration (mg/m3) calculated from shower exposure model in Table 7.D.RME (Supplemental)  
 Definitions:  
 NA = Not Applicable

TABLE 7.5.RME  
 CALCULATION OF CHEMICAL NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 UNC Church Rock Mill and Tailings Site

Scenario Timeframe: Future  
 Receptor Population: Resident  
 Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations					
					Value (1)	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient	
							Value	Units	Value	Units		Value	Units	Value	Units		
Groundwater Zone 1	Groundwater	Tapwater	Ingestion	Arsenic	0.00145	mg/l	NA	NA	NA	NA	NA	9.27E-05	mg/kg/d	3.0E-04	mg/kg/d	0.31	
				Cobalt	0.0557	mg/l	NA	NA	NA	NA	NA	3.56E-03	mg/kg/d	3.0E-04	mg/kg/d	11.9	
				Manganese	1.95	mg/l	NA	NA	NA	NA	NA	1.25E-01	mg/kg/d	2.4E-02	mg/kg/d	5.2	
				Nickel	0.0533	mg/l	NA	NA	NA	NA	NA	3.41E-03	mg/kg/d	2.0E-02	mg/kg/d	0.17	
				Vanadium	0.2	mg/l	NA	NA	NA	NA	NA	1.28E-02	mg/kg/d	5.0E-03	mg/kg/d	2.6	
				Chloroform	0.00068	mg/l	NA	NA	NA	NA	NA	4.35E-05	mg/kg/d	1.0E-02	mg/kg/d	0.0043	
			Exp. Route Total					NA							20.1		
			Dermal	Arsenic	0.00145	mg/l	NA	NA	NA	NA	NA	6.1E-07	mg/kg/d	3.0E-04	mg/kg/d	0.0020	
				Cobalt	0.0557	mg/l	NA	NA	NA	NA	NA	2.4E-05	mg/kg/d	3.0E-04	mg/kg/d	0.078	
				Manganese	1.95	mg/l	NA	NA	NA	NA	NA	8.2E-04	mg/kg/d	9.6E-04	mg/kg/d	0.86	
				Nickel	0.0533	mg/l	NA	NA	NA	NA	NA	4.5E-06	mg/kg/d	8.0E-04	mg/kg/d	0.0056	
				Vanadium	0.2	mg/l	NA	NA	NA	NA	NA	8.4E-05	mg/kg/d	5.0E-03	mg/kg/d	0.017	
	Chloroform	0.00068		mg/l	NA	NA	NA	NA	NA	3.8E-06	mg/kg/d	1.02E-02	mg/kg/d	0.0004			
	Exp. Route Total												0.96				
	Exposure Point Total															21.1	
	Exposure Medium Total															21.1	
	Air	Water Vapors from Showerhead		Inhalation	Chloroform	0.0020	mg/m3	NA	NA	NA	NA	NA	8.2E-05	mg/m3	9.8E-02	mg/m3	0.0008
				Exp. Route Total												0.0008	
		Exposure Point Total															0.0008
	Exposure Medium Total															0.0008	
	Groundwater Total - Zone 1															21.1	
Total of Receptor Risks Across All Media										NA	Total of Receptor Hazards Across All Media					21.1	

Notes:  
 (1) Inhalation EPC represents chemical air concentration (mg/m3) calculated from shower exposure model in Table 7.D.RME (Supplemental)  
 Definitions:  
 NA = Not Applicable

TABLE 7.6.RME  
 CALCULATION OF CHEMICAL CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 UNC Church Rock Mill and Tailings Site

Scenario Timeframe: Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations					
					Value (1)	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient	
							Value	Units	Value	Units		Value	Units				
Groundwater Zone 1	Groundwater	Tapwater	Ingestion	Arsenic	0.00145	mg/l	2.17E-05	mg/kg/d	1.5E+00	(mg/kg-day) <sup>-1</sup>	3.2E-05	NA	NA	NA	NA	NA	
				Cobalt	0.0557	mg/l	8.32E-04	mg/kg/d	NA	NA	NA	NA	NA	NA	NA	NA	NA
				Manganese	1.95	mg/l	2.91E-02	mg/kg/d	NA	NA	NA	NA	NA	NA	NA	NA	NA
				Nickel	0.0533	mg/l	7.96E-04	mg/kg/d	NA	NA	NA	NA	NA	NA	NA	NA	NA
				Vanadium	0.2	mg/l	2.99E-03	mg/kg/d	NA	NA	NA	NA	NA	NA	NA	NA	NA
				Chloroform	0.00068	mg/l	1.02E-05	mg/kg/d	3.1E-02	(mg/kg-day) <sup>-1</sup>	3.1E-07	NA	NA	NA	NA	NA	NA
			Exp. Route Total									3.3E-05					NA
			Dermal	Arsenic	0.00145	mg/l	1.24E-07	mg/kg/d	1.5E+00	(mg/kg-day) <sup>-1</sup>	1.9E-07	NA	NA	NA	NA	NA	NA
				Cobalt	0.0557	mg/l	4.7E-06	mg/kg/d	NA	NA	NA	NA	NA	NA	NA	NA	NA
				Manganese	1.95	mg/l	1.7E-04	mg/kg/d	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Nickel	0.0533		mg/l	9.1E-07	mg/kg/d	NA	NA	NA	NA	NA	NA	NA	NA	NA		
	Vanadium	0.2	mg/l	1.7E-05	mg/kg/d	NA	NA	NA	NA	NA	NA	NA	NA	NA			
	Chloroform	0.00068	mg/l	9.1E-07	mg/kg/d	3.1E-02	(mg/kg-day) <sup>-1</sup>	2.8E-08	NA	NA	NA	NA	NA	NA			
	Exp. Route Total										2.1E-07				NA		
	Exposure Point Total											3.3E-05				NA	
	Exposure Medium Total											3.3E-05				NA	
	Air	Water Vapors from Showerhead		Inhalation	Chloroform	0.0015	mg/m3	1.8E-05	mg/m3	2.3E-05	(µg/m3) <sup>-1</sup>	4.2E-07	NA	NA	NA	NA	
				Exp. Route Total									4.2E-07				NA
		Exposure Point Total											4.2E-07				NA
		Exposure Medium Total											4.2E-07				NA
Groundwater Total - Zone 1											3.3E-05				NA		
Total of Receptor Risks Across All Media										3.3E-05	Total of Receptor Hazards Across All Media					NA	

Notes:  
 (1) Inhalation EPC represents time weighted chemical air concentration (mg/m3) calculated from shower exposure model in Tables 7.C.RME Supplement C and 7.D.RME Supplement D (note that "Exposure Concentration" is calculated independently).  
 Definitions:  
 NA = Not Applicable

TABLE 7.7.RME  
 CALCULATION OF CHEMICAL NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 UNC Church Rock Mill and Tailings Site

Scenario Timeframe: Future  
 Receptor Population: Resident  
 Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations					
					Value (1)	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient	
							Value	Units	Value	Units		Value	Units				
Groundwater Zone 3	Groundwater	Tapwater	Ingestion	Aluminum	39.15	mg/l	NA	NA	NA	NA	NA	1.07E+00	mg/kg/d	1.0E+00	mg/kg/d	1.1	
				Arsenic	0.412	mg/l	NA	NA	NA	NA	NA	1.13E-02	mg/kg/d	3.0E-04	mg/kg/d	37.6	
				Beryllium	0.0202	mg/l	NA	NA	NA	NA	NA	5.53E-04	mg/kg/d	2.0E-03	mg/kg/d	0.28	
				Cadmium	0.0075	mg/l	NA	NA	NA	NA	NA	2.05E-04	mg/kg/d	5.0E-04	mg/kg/d	0.41	
				Cobalt	0.439	mg/l	NA	NA	NA	NA	NA	1.20E-02	mg/kg/d	3.0E-04	mg/kg/d	40.1	
				Manganese	10.89	mg/l	NA	NA	NA	NA	NA	2.98E-01	mg/kg/d	2.4E-02	mg/kg/d	12.4	
				Molybdenum	0.739	mg/l	NA	NA	NA	NA	NA	2.02E-02	mg/kg/d	5.0E-03	mg/kg/d	4.0	
				Nickel	0.489	mg/l	NA	NA	NA	NA	NA	1.34E-02	mg/kg/d	2.0E-02	mg/kg/d	0.67	
				Selenium	0.00433	mg/l	NA	NA	NA	NA	NA	1.19E-04	mg/kg/d	5.0E-03	mg/kg/d	0.024	
				Vanadium	0.18	mg/l	NA	NA	NA	NA	NA	4.93E-03	mg/kg/d	5.0E-03	mg/kg/d	1.0	
				Uranium	0.0431	mg/l	NA	NA	NA	NA	NA	1.18E-03	mg/kg/d	3.0E-03	mg/kg/d	0.39	
				Chloroform	0.00326	mg/l	NA	NA	NA	NA	NA	8.93E-05	mg/kg/d	1.0E-02	mg/kg/d	0.0088	
				Exp. Route Total								NA					
			Dermal	Aluminum	39.15	mg/l	NA	NA	NA	NA	NA	5.6E-03	mg/kg/d	1.0E+00	mg/kg/d	0.0056	
				Arsenic	0.412	mg/l	NA	NA	NA	NA	NA	5.9E-05	mg/kg/d	3.0E-04	mg/kg/d	0.20	
				Beryllium	0.0202	mg/l	NA	NA	NA	NA	NA	2.9E-06	mg/kg/d	1.4E-05	mg/kg/d	0.21	
				Cadmium	0.0075	mg/l	NA	NA	NA	NA	NA	1.1E-06	mg/kg/d	2.5E-05	mg/kg/d	0.043	
				Cobalt	0.439	mg/l	NA	NA	NA	NA	NA	6.3E-05	mg/kg/d	3.0E-04	mg/kg/d	0.21	
				Manganese	10.89	mg/l	NA	NA	NA	NA	NA	1.6E-03	mg/kg/d	9.6E-04	mg/kg/d	1.6	
				Molybdenum	0.739	mg/l	NA	NA	NA	NA	NA	1.1E-04	mg/kg/d	5.0E-03	mg/kg/d	0.021	
				Nickel	0.489	mg/l	NA	NA	NA	NA	NA	1.4E-05	mg/kg/d	8.0E-04	mg/kg/d	0.017	
				Selenium	0.00433	mg/l	NA	NA	NA	NA	NA	6.2E-07	mg/kg/d	5.0E-03	mg/kg/d	0.0001	
				Vanadium	0.18	mg/l	NA	NA	NA	NA	NA	2.6E-05	mg/kg/d	5.0E-03	mg/kg/d	0.0051	
				Uranium	0.0431	mg/l	NA	NA	NA	NA	NA	6.2E-06	mg/kg/d	3.0E-03	mg/kg/d	0.0021	
				Chloroform	0.00326	mg/l	NA	NA	NA	NA	NA	8.1E-06	mg/kg/d	1.0E-02	mg/kg/d	0.0008	
				Exp. Route Total								NA					2.3
			Exposure Point Total								NA						100
Exposure Medium Total								NA						100			
Air	Water Vapors from Showerhead		Inhalation	Chloroform	0.0068	mg/m3	NA	NA	NA	NA	1.6E-04	mg/m3	9.8E-02	mg/m3	0.0016		
																Exp. Route Total	
			Exposure Point Total														
Exposure Medium Total															0.0016		
Groundwater Total - Zone 3															100		
Total of Receptor Risks Across All Media										NA	Total of Receptor Hazards Across All Media				100		

Notes:  
 (1) Inhalation EPC represents chemical air concentration (mg/m3) calculated from shower exposure model in Table 7.D.RME (Supplemental)  
 Definitions:  
 NA = Not Applicable

TABLE 7.8.RME  
 CALCULATION OF CHEMICAL NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 UNC Church Rock Mill and Tailings Site

Scenario Timeframe: Future  
 Receptor Population: Resident  
 Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations							
					Value (1)	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient			
							Value	Units	Value	Units		Value	Units	Value	Units				
Groundwater Zone 3	Groundwater	Tapwater	Ingestion	Aluminum	39.15	mg/l	NA	NA	NA	NA	NA	2.50E+00	mg/kg/d	1.0E+00	mg/kg/d	2.5			
				Arsenic	0.412	mg/l	NA	NA	NA	NA	NA	2.63E-02	mg/kg/d	3.0E-04	mg/kg/d	87.8			
				Beryllium	0.0202	mg/l	NA	NA	NA	NA	NA	1.29E-03	mg/kg/d	2.0E-03	mg/kg/d	0.65			
				Cadmium	0.0075	mg/l	NA	NA	NA	NA	NA	4.79E-04	mg/kg/d	5.0E-04	mg/kg/d	1.0			
				Cobalt	0.439	mg/l	NA	NA	NA	NA	NA	2.81E-02	mg/kg/d	3.0E-04	mg/kg/d	93.5			
				Manganese	10.89	mg/l	NA	NA	NA	NA	NA	6.96E-01	mg/kg/d	2.4E-02	mg/kg/d	29.0			
				Molybdenum	0.739	mg/l	NA	NA	NA	NA	NA	4.72E-02	mg/kg/d	5.0E-03	mg/kg/d	9.4			
				Nickel	0.489	mg/l	NA	NA	NA	NA	NA	3.13E-02	mg/kg/d	2.0E-02	mg/kg/d	1.6			
				Selenium	0.00433	mg/l	NA	NA	NA	NA	NA	2.77E-04	mg/kg/d	5.0E-03	mg/kg/d	0.055			
				Vanadium	0.18	mg/l	NA	NA	NA	NA	NA	1.15E-02	mg/kg/d	5.0E-03	mg/kg/d	2.3			
				Uranium	0.0431	mg/l	NA	NA	NA	NA	NA	2.76E-03	mg/kg/d	3.0E-03	mg/kg/d	0.92			
				Chloroform	0.00326	mg/l	NA	NA	NA	NA	NA	2.08E-04	mg/kg/d	1.0E-02	mg/kg/d	0.020			
				Exp. Route Total															229
			Dermal																
			Aluminum	39.15	mg/l	NA	NA	NA	NA	NA	NA	1.7E-02	mg/kg/d	1.0E+00	mg/kg/d				0.017
			Arsenic	0.412	mg/l	NA	NA	NA	NA	NA	NA	1.7E-04	mg/kg/d	3.0E-04	mg/kg/d				0.58
			Beryllium	0.0202	mg/l	NA	NA	NA	NA	NA	NA	8.5E-06	mg/kg/d	1.4E-05	mg/kg/d				0.61
			Cadmium	0.0075	mg/l	NA	NA	NA	NA	NA	NA	3.2E-06	mg/kg/d	2.5E-05	mg/kg/d				0.13
			Cobalt	0.439	mg/l	NA	NA	NA	NA	NA	NA	1.9E-04	mg/kg/d	3.0E-04	mg/kg/d				0.62
			Manganese	10.89	mg/l	NA	NA	NA	NA	NA	NA	4.6E-03	mg/kg/d	9.6E-04	mg/kg/d				4.8
			Molybdenum	0.739	mg/l	NA	NA	NA	NA	NA	NA	3.1E-04	mg/kg/d	5.0E-03	mg/kg/d				0.062
			Nickel	0.489	mg/l	NA	NA	NA	NA	NA	NA	4.1E-05	mg/kg/d	8.0E-04	mg/kg/d				0.052
			Selenium	0.00433	mg/l	NA	NA	NA	NA	NA	NA	1.8E-06	mg/kg/d	5.0E-03	mg/kg/d				0.0004
			Vanadium	0.18	mg/l	NA	NA	NA	NA	NA	NA	7.6E-05	mg/kg/d	5.0E-03	mg/kg/d				0.015
			Uranium	0.0431	mg/l	NA	NA	NA	NA	NA	NA	1.8E-05	mg/kg/d	3.0E-03	mg/kg/d				0.0061
			Chloroform	0.00326	mg/l	NA	NA	NA	NA	NA	NA	1.8E-05	mg/kg/d	1.0E-02	mg/kg/d				0.0018
			Exp. Route Total																6.9
Exposure Point Total																236			
Exposure Medium Total																236			
Air	Water Vapors from Showerhead	Inhalation	Chloroform	0.0098	mg/m3						NA	3.9E-04	mg/m3	9.8E-02	mg/m3	0.0040			
		Exp. Route Total														0.0040			
		Exposure Point Total														0.0040			
	Exposure Medium Total															0.0040			
Groundwater Total - Zone 3																236			
Total of Receptor Risks Across All Media										NA	Total of Receptor Hazards Across All Media					236			

Notes:  
 (1) Inhalation EPC represents chemical air concentration (mg/m3) calculated from shower exposure model in Table 7.D.RME (Supplemental)  
 Definitions:  
 NA = Not Applicable



TABLE 7.9.RME  
 CALCULATION OF CHEMICAL CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 UNC Church Rock Mill and Tailings Site

Scenario Timeframe: Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations													
					Value (1)	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient									
							Value	Units	Value	Units		Value	Units	Value	Units										
Groundwater Zone 3	Groundwater	Tapwater	Ingestion	Aluminum	39.15	mg/l	5.8E-01	mg/kg/d	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA							
				Arsenic	0.412	mg/l	6.2E-03	mg/kg/d	1.5E+00	(mg/kg-day) <sup>-1</sup>	9.2E-03	NA	NA	NA	NA	NA	NA	NA	NA						
				Beryllium	0.0202	mg/l	3.0E-04	mg/kg/d	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA					
				Cadmium	0.0075	mg/l	1.1E-04	mg/kg/d	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA					
				Cobalt	0.439	mg/l	6.6E-03	mg/kg/d	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA					
				Manganese	10.89	mg/l	1.6E-01	mg/kg/d	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA					
				Molybdenum	0.739	mg/l	1.1E-02	mg/kg/d	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA					
				Nickel	0.489	mg/l	7.3E-03	mg/kg/d	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA					
				Selenium	0.00433	mg/l	6.5E-05	mg/kg/d	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA					
				Vanadium	0.18	mg/l	2.7E-03	mg/kg/d	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA					
				Uranium	0.0431	mg/l	6.4E-04	mg/kg/d	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA					
				Chloroform	0.00326	mg/l	4.9E-05	mg/kg/d	3.1E-02	(mg/kg-day) <sup>-1</sup>	1.5E-06	NA	NA	NA	NA	NA	NA	NA	NA	NA					
				Exp. Route Total																	9.2E-03	NA			
			Exposure Point Total																		9.2E-03	NA			
			Exposure Medium Total																		9.3E-03	NA			
			Air	Water Vapors from Showerhead		Inhalation	Chloroform	0.0074	mg/m3	8.7E-05	mg/m3	2.3E-05	(µg/m3) <sup>-1</sup>	2.0E-06	NA	NA	NA	NA	NA	NA	NA				
							Exp. Route Total																2.0E-06	NA	
							Exposure Point Total																	2.0E-06	NA
							Exposure Medium Total																	2.0E-06	NA
							Groundwater Total - Zone 3										9.3E-03							9.3E-03	NA
							Air										2.0E-06							2.0E-06	NA
							Total of Receptor Risks Across All Media										9.3E-03							Total of Receptor Hazards Across All Media	NA

Notes:  
 (1) Inhalation EPC represents time weighted chemical air concentration (mg/m3) calculated from shower exposure model in Tables 7.C.RME Supplement C and 7.D.RME Supplement D (note that "Exposure Concentration" is calculated independently).  
 Definitions:  
 NA = Not Applicable

TABLE 7.A.RME (SUPPLEMENTAL)  
 CALCULATION OF DAevent  
 FUTURE RESIDENT ADULT  
 UNC Church Rock Mill and Tailings Site

Hydrostratigraphic Unit	Chemical of Potential Concern (1)	Groundwater Concentration (CW) mg/L	Permeability Coefficient <sup>(2)</sup> (Kp) (cm/hr)	B <sup>(2)</sup> (dimensionless)	Lag Time <sup>(2)</sup> ( $\tau_{event}$ ) (hr)	t <sup>+(2)</sup> (hr)	Fraction Absorbed Water <sup>(2)</sup> (FA) (dimensionless)	Duration of Event <sup>(2)</sup> (tevent) (hr)	DAevent (mg/cm <sup>2</sup> -event)
SW Alluvium	Arsenic (arsenite)	2.56E-03	1.0E-03	NA	NA	NA	NA	0.58	1.5E-09
SW Alluvium	Cobalt	1.00E-02	1.0E-03	NA	NA	NA	NA	0.58	5.8E-09
SW Alluvium	Manganese	2.80E+00	1.0E-03	NA	NA	NA	NA	0.58	1.6E-06
SW Alluvium	Uranium	1.28E-01	1.0E-03	NA	NA	NA	NA	0.58	7.4E-08
SW Alluvium	Chloroform	3.38E-03	6.8E-03	2.9E-02	5.0E-01	1.2E+00	1.0E+00	0.58	3.4E-08
Zone 1	Arsenic (arsenite)	1.45E-03	1.0E-03	NA	NA	NA	NA	0.58	8.4E-10
Zone 1	Cobalt	5.57E-02	1.0E-03	NA	NA	NA	NA	0.58	3.2E-08
Zone 1	Manganese	1.95E+00	1.0E-03	NA	NA	NA	NA	0.58	1.1E-06
Zone 1	Nickel	5.33E-02	2.0E-04	NA	NA	NA	NA	0.58	6.2E-09
Zone 1	Vanadium	2.00E-01	1.0E-03	NA	NA	NA	NA	0.58	1.2E-07
Zone 1	Uranium	1.74E-03	1.0E-03	NA	NA	NA	NA	0.58	1.0E-09
Zone 1	Chloroform	6.80E-04	6.8E-03	2.9E-02	5.0E-01	1.2E+00	1.0E+00	0.58	6.9E-09
Zone 3	Aluminum	3.92E+01	1.0E-03	NA	NA	NA	NA	0.58	2.3E-05
Zone 3	Arsenic (arsenite)	4.12E-01	1.0E-03	NA	NA	NA	NA	0.58	2.4E-07
Zone 3	Beryllium	2.02E-02	1.0E-03	NA	NA	NA	NA	0.58	1.2E-08
Zone 3	Cadmium (water)	7.50E-03	1.0E-03	NA	NA	NA	NA	0.58	4.4E-09
Zone 3	Cobalt	4.39E-01	1.0E-03	NA	NA	NA	NA	0.58	2.5E-07
Zone 3	Manganese	1.09E+01	1.0E-03	NA	NA	NA	NA	0.58	6.3E-06
Zone 3	Molybdenum	7.39E-01	1.0E-03	NA	NA	NA	NA	0.58	4.3E-07
Zone 3	Nickel	4.89E-01	2.0E-04	NA	NA	NA	NA	0.58	5.7E-08
Zone 3	Selenium	4.33E-03	1.0E-03	NA	NA	NA	NA	0.58	2.5E-09
Zone 3	Vanadium	1.80E-01	1.0E-03	NA	NA	NA	NA	0.58	1.0E-07
Zone 3	Uranium	4.31E-02	1.0E-03	NA	NA	NA	NA	0.58	2.5E-08
Zone 3	Chloroform	3.26E-03	6.8E-03	2.9E-02	5.0E-01	1.2E+00	1.0E+00	0.58	3.3E-08

Notes:

(1) Radionuclide COPCs not included in dermal evaluation because the ingested dose significantly outweighs the dermally absorbed dose.

(2) Values from EPA 2004, Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment - Final). EPA/540/R/99/005.

Per the guidance, the default Kp value of 1E-06 was assigned to inorganics without designated Kp values.

Definitions:

NA = Not Applicable

TABLE 7.B.RME (SUPPLEMENTAL)  
 CALCULATION OF DA<sub>event</sub>  
 FUTURE RESIDENT CHILD  
 UNC Church Rock Mill and Tailings Site

Hydrostratigraphic Unit	Chemical of Potential Concern (1)	Groundwater Concentration (CW) mg/L	Permeability Coefficient <sup>(2)</sup> (Kp) (cm/hr)	B <sup>(2)</sup> (dimensionless)	Lag Time <sup>(2)</sup> (τ <sub>event</sub> ) (hr)	t* <sup>(2)</sup> (hr)	Fraction Absorbed Water <sup>(2)</sup> (FA) (dimensionless)	Duration of Event <sup>(2)</sup> (tevent) (hr)	DA <sub>event</sub> (mg/cm <sup>2</sup> -event)
SW Alluvium	Arsenic (arsenite)	2.56E-03	1.0E-03	NA	NA	NA	NA	1	2.6E-09
SW Alluvium	Cobalt	1.00E-02	1.0E-03	NA	NA	NA	NA	1	1.0E-08
SW Alluvium	Manganese	2.80E+00	1.0E-03	NA	NA	NA	NA	1	2.8E-06
SW Alluvium	Uranium	1.28E-01	1.0E-03	NA	NA	NA	NA	1	1.3E-07
SW Alluvium	Chloroform	3.38E-03	6.8E-03	2.9E-02	5.0E-01	1.2E+00	1.0E+00	1	4.5E-08
Zone 1	Arsenic (arsenite)	1.45E-03	1.0E-03	NA	NA	NA	NA	1	1.5E-09
Zone 1	Cobalt	5.57E-02	1.0E-03	NA	NA	NA	NA	1	5.6E-08
Zone 1	Manganese	1.95E+00	1.0E-03	NA	NA	NA	NA	1	2.0E-06
Zone 1	Nickel	5.33E-02	2.0E-04	NA	NA	NA	NA	1	1.1E-08
Zone 1	Vanadium	2.00E-01	1.0E-03	NA	NA	NA	NA	1	2.0E-07
Zone 1	Uranium	1.74E-03	1.0E-03	NA	NA	NA	NA	1	1.7E-09
Zone 1	Chloroform	6.80E-04	6.8E-03	2.9E-02	5.0E-01	1.2E+00	1.0E+00	1	9.0E-09
Zone 3	Aluminum	3.92E+01	1.0E-03	NA	NA	NA	NA	1	3.9E-05
Zone 3	Arsenic (arsenite)	4.12E-01	1.0E-03	NA	NA	NA	NA	1	4.1E-07
Zone 3	Beryllium	2.02E-02	1.0E-03	NA	NA	NA	NA	1	2.0E-08
Zone 3	Cadmium (water)	7.50E-03	1.0E-03	NA	NA	NA	NA	1	7.5E-09
Zone 3	Cobalt	4.39E-01	1.0E-03	NA	NA	NA	NA	1	4.4E-07
Zone 3	Manganese	1.09E+01	1.0E-03	NA	NA	NA	NA	1	1.1E-05
Zone 3	Molybdenum	7.39E-01	1.0E-03	NA	NA	NA	NA	1	7.4E-07
Zone 3	Nickel	4.89E-01	2.0E-04	NA	NA	NA	NA	1	9.8E-08
Zone 3	Selenium	4.33E-03	1.0E-03	NA	NA	NA	NA	1	4.3E-09
Zone 3	Vanadium	1.80E-01	1.0E-03	NA	NA	NA	NA	1	1.8E-07
Zone 3	Uranium	4.31E-02	1.0E-03	NA	NA	NA	NA	1	4.3E-08
Zone 3	Chloroform	3.26E-03	6.8E-03	2.9E-02	5.0E-01	1.2E+00	1.0E+00	1	4.3E-08

Notes:

(1) Radionuclide COPCs not included in dermal evaluation because the ingested dose significantly outweighs the dermally absorbed dose.

(2) Values from EPA 2004, Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment - Final). EPA/540/R/99/005.

Per the guidance, the default Kp value of 1E-06 was assigned to inorganics without designated Kp values.

Definitions:

NA = Not Applicable

TABLE 7.C.RME (SUPPLEMENTAL)  
 INHALATION EXPOSURE CONCENTRATIONS FROM FOSTER AND CHROSTOWSKI SHOWER MODEL  
 FUTURE RESIDENT ADULT  
 UNC Church Rock Mill and Tailings Site

Hydrostratigraphic Unit	Chemical of Potential Concern	Exposure Point Concentration Cwo (µg/L)	Molecular weight (MW) (g/mole)	Henry's Law Constant (H) (atm·m <sup>3</sup> /mole)	Kg (VOC) (cm/hr)	KI (VOC) (cm/hr)	KL (cm/hr)	Kal (cm/hr)	Cwd (µg/L)	S (µg/m <sup>3</sup> ·min)	Ca (mg/m <sup>3</sup> )
SW Alluvium	Chloroform	3.4E+00	119.38	3.67E-03	1.2E+03	1.2E+01	1.1E+01	1.5E+01	4.1E-01	3.4E-01	7.0E-03
Zone 1	Chloroform	6.8E-01	119.38	3.67E-03	1.2E+03	1.2E+01	1.1E+01	1.5E+01	8.2E-02	6.8E-02	1.4E-03
Zone 3	Chloroform	3.3E+00	119.38	3.67E-03	1.2E+03	1.2E+01	1.1E+01	1.5E+01	3.9E-01	3.3E-01	6.8E-03

Variables	Units	Exposure Assumptions
Kg(VOC) = gas-film mass transfer coefficient	cm/hr	Solved by Eq 1
KI(VOC) = liquid-film mass transfer coefficient	cm/hr	Solved by Eq 2
KL = overall mass transfer coefficient	cm/hr	Solved by Eq 3
Kal = adjusted overall mass transfer coeff.	cm/hr	Solved by Eq 4
TI = Calibration temp. of water	K (20C +273)	293
Ts = Shower water temperature	k (45C)	318
Us = water viscosity at Ts	centipoise	0.596
UI = water viscosity at TI	cp	1.002
Cwd = conc. leaving droplets after time sdt	µg/l	Solved by Eq 5
sdt = shower droplet drop time	sec	0.5
d = shower droplet diameter	mm	1
FR = shower water flow rate	l/min	10
SV = shower room air volume	m <sup>3</sup>	12
S = indoor VOC generation rate	µg/m <sup>3</sup> ·min	Solved by Eq 6
VR = ventilation rate	l/min	13.8
BW = body weight	kg	70
Ds = duration of shower	min	35
Dt = total duration in shower room	min	60
R = Universal gas constant	atm·m <sup>3</sup> /mol·°K	8.20E-05
Rae = air exchange rate	min <sup>-1</sup>	0.0083
Ca = indoor air concentration of VOCs	µg/m <sup>3</sup>	Solved by Eq 7

Equation 1:	Kg(VOC) =	3000 * (18 / MW) <sup>0.5</sup>
Equation 2:	KI(VOC) =	20 * (44 / MW) <sup>0.5</sup>
Equation 3:	KL =	((1 / KI(VOC)) + (0.024 / ((Kg (VOC) * H))) <sup>-1</sup>
Equation 4:	Kal =	(KL * (((TI * Us) / (Ts * UI)) <sup>0.75</sup> ))
Equation 5:	Cwd =	(Cwo * (1-EXP((-1 * Kal * sdt)/(60 * d))))
Equation 6:	S =	(Cwd * FR / SV)
Equation 7:	Ca =	If t>Ds [(S / Rae) * (Ds + (EXP(-Rae * Dt) / Rae) - (EXP(Rae * (Ds - Dt)) / Rae))] / Dt * 1/1000

Notes:

Inhalation Exposure Concentrations calculated based on Foster, Sarah A., and Paul C. Chrostowski. 1987. Inhalation Exposures to Volatile Organic Contaminants in the Shower.

In The Proceedings of the 80th Annual Meeting of the Air Pollution Control Association (APCA), June 21-26, New York. Air Pollution Control Association.

TABLE 7.D.RME (SUPPLEMENTAL)  
 INHALATION EXPOSURE CONCENTRATIONS FROM FOSTER AND CHROSTOWSKI SHOWER MODEL  
 FUTURE RESIDENT CHILD  
 UNC Church Rock Mill and Tailings Site

Hydrostratigraphic Unit	Chemical of Potential Concern	Exposure Point Concentration Cwo (µg/L)	Molecular weight (MW) (g/mole)	Henry's Law Constant (H) (atm-m <sup>3</sup> /mole)	Kg (VOC) (cm/hr)	KI (VOC) (cm/hr)	KL (cm/hr)	Kal (cm/hr)	Cwd (µg/L)	S (µg/m <sup>3</sup> -min)	Ca (mg/m <sup>3</sup> )
SW Alluvium	Chloroform	3.4E+00	119.38	3.7E-03	1.2E+03	1.2E+01	1.1E+01	1.5E+01	4.1E-01	3.4E-01	1.0E-02
Zone 1	Chloroform	6.8E-01	119.38	3.7E-03	1.2E+03	1.2E+01	1.1E+01	1.5E+01	8.2E-02	6.8E-02	2.0E-03
Zone 3	Chloroform	3.3E+00	119.38	3.7E-03	1.2E+03	1.2E+01	1.1E+01	1.5E+01	3.9E-01	3.3E-01	9.8E-03

Variables	Units	Exposure Assumptions
Kg(VOC) = gas-film mass transfer coefficient	cm/hr	Calculated using Eq 1
KI(VOC) = liquid-film mass transfer coefficient	cm/hr	Calculated using Eq 2
KL = overall mass transfer coefficient	cm/hr	Calculated using Eq 3
Kal = adjusted overall mass transfer coeff.	cm/hr	Calculated using Eq 4
TI = Calibration temp. of water	K (20C +273)	293
Ts = Shower water temperature	k (45C)	318
Us = water viscosity at Ts	cp	0.596
UI = water viscosity at TI	cp	1.002
Cwd = conc. leaving droplets after time sdt	µg/l	Calculated using Eq 5
sdt = shower droplet drop time	sec	0.5
d = shower droplet diameter	mm	1
FR = shower water flow rate	l/min	10
SV = shower room air volume	m <sup>3</sup>	12
S = indoor VOC generation rate	µg/m <sup>3</sup> -min	Calculated using Eq 6
Ds = duration of shower	min	60
Dt = total duration in shower room	min	80
R = Universal gas constant	atm-m <sup>3</sup> /mol-°K	8.20E-05
Rae = air exchange rate	min <sup>-1</sup>	0.0083
Ca = indoor air concentration of VOCs	µg/m <sup>3</sup>	Calculated using Eq 7

Equation 1:	Kg(VOC) =	$3000 * (18 / MW)^{0.5}$
Equation 2:	KI(VOC) =	$20 * (44 / MW)^{0.5}$
Equation 3:	KL =	$((1 / KI(VOC)) + (R * TI / (Kg (VOC) * H)))^{-1}$
Equation 4:	Kal =	$(KL * (((TI * Us) / (Ts * UI))^{0.5}))$
Equation 5:	Cwd =	$(Cwo * (1 - EXP(-1 * Kal * sdt) / (60 * d)))$
Equation 6:	S =	$(Cwd * FR / SV)$
Equation 7:	Ca =	$If t > Ds \quad [(S / Rae) * (Ds + (EXP(-Rae * Dt) / Rae) - (EXP(Rae * (Ds - Dt)) / Rae))] / Dt * 1/1000$

Notes:

Inhalation Exposure Concentrations calculated based on Foster, Sarah A., and Paul C. Chrostowski. 1987. Inhalation Exposures to Volatile Organic Contaminants in the Shower. In The Proceedings of the 80th Annual Meeting of the Air Pollution Control Association (APCA), June 21-26, New York. Air Pollution Control Association.

TABLE 7.E.RME (SUPPLEMENTAL)  
 CALCULATION OF INHALATION INTAKE USING ANDELMAN VOLATILIZATION FACTOR  
 FUTURE RESIDENT CHILD/ADULT  
 UNC Church Rock Mill and Tailings Site

Compound	Hydrostratigraphic Unit	EPC Activity pCi/L	Intake Through Vapor Inhalation pCi
Radium 226+D	SWA	0.267	2.52E+04
Radium 226+D	Zone 1	1.213	1.15E+05
Radium 226+D	Zone 3	11.14	1.05E+06

$$Intake(pCi) = CW_R \left( \frac{pCi}{L} \right) \times EF \left( \frac{350d}{y} \right) \times ED(30yr) \times IRAadj \left( \frac{18m^3}{d} \right) \times ETr \left( \frac{24hr}{d} \right) \times \left( \frac{1d}{24h} \right) \times K \left( \frac{0.5L}{m^3} \right)$$

Name	Abbr	Value	Units
Radionuclide concentration (activity) in water	CW <sub>R</sub>	Chem. specific	pCi/L
Exposure Frequency	EF	350	day/year
Exposure Duration	ED	30	year
Age-adjusted inhalation rate	IRAadj	18	m <sup>3</sup> /day
Andelman volatilization factor	K	0.5	L/day
Exposure Time-residential	ETr	24	hrs/day
Conversion	Constant (1 day/24 hours)	0.041666667	day/hours

Notes:

The inhalation exposure route is only calculated for Ra-226+D. Volatilization in the equation comes from household uses of water (e.g., showering, laundering, dishwashing)

TABLE 7.F.RME (SUPPLEMENTAL)  
 CALCULATION OF CHEMICAL NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 UNC Church Rock Mill and Tailings Site

Scenario Timeframe: Future  
 Receptor Population: Resident  
 Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC (1)		Cancer Risk Calculations					Non-Cancer Hazard Calculations								
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient				
							Value	Units	Value	Units		Value	Units							
Background Groundwater Zone 3	Groundwater	Tapwater	Ingestion	Aluminum	0.231	mg/l	NA	NA	NA	NA	NA	6.33E-03	mg/kg/d	1.0E+00	mg/kg/d	0.0063				
				Arsenic	0.175	mg/l	NA	NA	NA	NA	NA	4.79E-03	mg/kg/d	3.0E-04	mg/kg/d	16.0				
				Beryllium	ND	mg/l	NA	NA	NA	NA	NA	NC	mg/kg/d	2.0E-03	mg/kg/d	NC				
				Cadmium	0.0113	mg/l	NA	NA	NA	NA	NA	3.10E-04	mg/kg/d	5.0E-04	mg/kg/d	0.62				
				Cobalt	0.0877	mg/l	NA	NA	NA	NA	NA	2.40E-03	mg/kg/d	3.0E-04	mg/kg/d	8.0				
				Manganese	3.436	mg/l	NA	NA	NA	NA	NA	9.41E-02	mg/kg/d	2.4E-02	mg/kg/d	3.9				
				Molybdenum	17.43	mg/l	NA	NA	NA	NA	NA	4.78E-01	mg/kg/d	5.0E-03	mg/kg/d	95.5				
				Nickel	0.14	mg/l	NA	NA	NA	NA	NA	3.84E-03	mg/kg/d	2.0E-02	mg/kg/d	0.19				
				Selenium	0.00159	mg/l	NA	NA	NA	NA	NA	4.36E-05	mg/kg/d	5.0E-03	mg/kg/d	0.0087				
				Vanadium	ND	mg/l	NA	NA	NA	NA	NA	NC	mg/kg/d	5.0E-03	mg/kg/d	NC				
				Uranium	0.107	mg/l	NA	NA	NA	NA	NA	2.93E-03	mg/kg/d	3.0E-03	mg/kg/d	0.98				
				Chloroform	ND	mg/l	NA	NA	NA	NA	NA	NC	mg/kg/d	1.0E-02	mg/kg/d	NC				
				Exp. Route Total															125	
				Dermal	Aluminum	0.231	mg/l	NA	NA	NA	NA	NA	3.3E-05	mg/kg/d	1.0E+00	mg/kg/d	0.00003			
			Arsenic	0.175	mg/l	NA	NA	NA	NA	NA	2.5E-05	mg/kg/d	3.0E-04	mg/kg/d	0.083					
			Beryllium	ND	mg/l	NA	NA	NA	NA	NA	NC	mg/kg/d	1.4E-05	mg/kg/d	NC					
			Cadmium	0.0113	mg/l	NA	NA	NA	NA	NA	1.6E-06	mg/kg/d	2.5E-05	mg/kg/d	0.065					
			Cobalt	0.0877	mg/l	NA	NA	NA	NA	NA	1.3E-05	mg/kg/d	3.0E-04	mg/kg/d	0.042					
			Manganese	3.436	mg/l	NA	NA	NA	NA	NA	4.9E-04	mg/kg/d	9.6E-04	mg/kg/d	0.51					
			Molybdenum	17.43	mg/l	NA	NA	NA	NA	NA	2.5E-03	mg/kg/d	5.0E-03	mg/kg/d	0.50					
			Nickel	0.14	mg/l	NA	NA	NA	NA	NA	4.0E-06	mg/kg/d	8.0E-04	mg/kg/d	0.0050					
			Selenium	0.00159	mg/l	NA	NA	NA	NA	NA	2.3E-07	mg/kg/d	5.0E-03	mg/kg/d	0.00005					
			Vanadium	ND	mg/l	NA	NA	NA	NA	NA	NC	mg/kg/d	5.0E-03	mg/kg/d	NC					
			Uranium	0.107	mg/l	NA	NA	NA	NA	NA	1.5E-05	mg/kg/d	3.0E-03	mg/kg/d	0.0051					
			Chloroform	ND	mg/l	NA	NA	NA	NA	NA	NC	mg/kg/d	1.0E-02	mg/kg/d	NC					
			Exp. Route Total															1.2		
			Exposure Point Total																126	
Exposure Medium Total																126				
Air	Water Vapors from Showerhead		Inhalation	Chloroform	ND	mg/m3	NA	NA	NA	NA	NA	NC	mg/m3	9.8E-02	mg/m3	NC				
							Exp. Route Total													NC
							Exposure Point Total													
Exposure Medium Total																NC				
Groundwater Total - Zone 3																126				
Total of Receptor Risks Across All Media										NA	Total of Receptor Hazards Across All Media					126				

Notes:  
 (1) EPC concentration shown is "95% UCL" term for background groundwater calculated using ProUCL ver 4.00.02 as described in N.A. Water Systems (2008b). Chloroform is shown as not detected because it was detected in only one of 186 Zone 3 background samples. Calculations do not include chemicals detected in background that are not COPCs in impacted water

Definitions:  
 NA = Not Applicable  
 NC = Not calculated, COPC was not detected in background water  
 ND = Not Detected; Shown where COPCs (for seepage-impacted water) were not detected in background water. HQs not calculated for these COPCs

TABLE 7.G.RME (SUPPLEMENTAL)  
 CALCULATION OF CHEMICAL NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 UNC Church Rock Mill and Tailings Site

Scenario Timeframe: Future  
 Receptor Population: Resident  
 Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC (1)		Cancer Risk Calculations					Non-Cancer Hazard Calculations					
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient	
							Value	Units	Value	Units		Value	Units	Value	Units		
Background Groundwater Zone 3	Groundwater	Tapwater	Ingestion	Aluminum	0.231	mg/l	NA	NA	NA	NA	NA	1.48E-02	mg/kg/d	1.0E+00	mg/kg/d	0.015	
				Arsenic	0.175	mg/l	NA	NA	NA	NA	NA	1.12E-02	mg/kg/d	3.0E-04	mg/kg/d	37.3	
				Beryllium	ND	mg/l	NA	NA	NA	NA	NA	NC	mg/kg/d	2.0E-03	mg/kg/d	NC	
				Cadmium	0.0113	mg/l	NA	NA	NA	NA	NA	7.22E-04	mg/kg/d	5.0E-04	mg/kg/d	1.4	
				Cobalt	0.0877	mg/l	NA	NA	NA	NA	NA	5.61E-03	mg/kg/d	3.0E-04	mg/kg/d	18.7	
				Manganese	3.436	mg/l	NA	NA	NA	NA	NA	2.20E-01	mg/kg/d	2.4E-02	mg/kg/d	9.2	
				Molybdenum	17.43	mg/l	NA	NA	NA	NA	NA	1.11E+00	mg/kg/d	5.0E-03	mg/kg/d	223	
				Nickel	0.14	mg/l	NA	NA	NA	NA	NA	8.95E-03	mg/kg/d	2.0E-02	mg/kg/d	0.45	
				Selenium	0.00159	mg/l	NA	NA	NA	NA	NA	1.02E-04	mg/kg/d	5.0E-03	mg/kg/d	0.020	
				Vanadium	ND	mg/l	NA	NA	NA	NA	NA	NC	mg/kg/d	5.0E-03	mg/kg/d	NC	
				Uranium	0.107	mg/l	NA	NA	NA	NA	NA	6.84E-03	mg/kg/d	3.0E-03	mg/kg/d	2.3	
				Chloroform	ND	mg/l	NA	NA	NA	NA	NA	NC	mg/kg/d	1.0E-02	mg/kg/d	NC	
				Exp. Route Total													
			Dermal	Aluminum	0.231	mg/l	NA	NA	NA	NA	NA	9.7E-05	mg/kg/d	1.0E+00	mg/kg/d	0.0001	
				Arsenic	0.175	mg/l	NA	NA	NA	NA	NA	7.4E-05	mg/kg/d	3.0E-04	mg/kg/d	0.25	
				Beryllium	ND	mg/l	NA	NA	NA	NA	NA	NC	mg/kg/d	1.4E-05	mg/kg/d	NC	
				Cadmium	0.0113	mg/l	NA	NA	NA	NA	NA	4.8E-06	mg/kg/d	2.5E-05	mg/kg/d	0.19	
				Cobalt	0.0877	mg/l	NA	NA	NA	NA	NA	3.7E-05	mg/kg/d	3.0E-04	mg/kg/d	0.12	
				Manganese	3.436	mg/l	NA	NA	NA	NA	NA	1.4E-03	mg/kg/d	9.6E-04	mg/kg/d	1.5	
				Molybdenum	17.43	mg/l	NA	NA	NA	NA	NA	7.4E-03	mg/kg/d	5.0E-03	mg/kg/d	1.5	
				Nickel	0.14	mg/l	NA	NA	NA	NA	NA	1.2E-05	mg/kg/d	8.0E-04	mg/kg/d	0.015	
				Selenium	0.00159	mg/l	NA	NA	NA	NA	NA	6.7E-07	mg/kg/d	5.0E-03	mg/kg/d	0.0001	
				Vanadium	ND	mg/l	NA	NA	NA	NA	NA	NC	mg/kg/d	5.0E-03	mg/kg/d	NC	
				Uranium	0.107	mg/l	NA	NA	NA	NA	NA	4.5E-05	mg/kg/d	3.0E-03	mg/kg/d	0.015	
				Chloroform	ND	mg/l	NA	NA	NA	NA	NA	NC	mg/kg/d	1.0E-02	mg/kg/d	NC	
				Exp. Route Total													3.6
			Exposure Point Total														296
Exposure Medium Total														296			
Air	Water Vapors from Showerhead		Inhalation	Chloroform	ND	mg/m3						NC	mg/m3	9.8E-02	mg/m3	NC	
							Exp. Route Total										NC
							Exposure Point Total										
Exposure Medium Total													NC				
Groundwater Total - Zone 3														296			
Total of Receptor Risks Across All Media										NA	Total of Receptor Hazards Across All Media					296	

Notes:  
 (1) EPC concentration shown is "95% UCL" term for background groundwater calculated using ProUCL ver 4.00.02 as described in N.A. Water Systems (2008b). Chloroform is shown as not detected because it was detected in only one of 186 Zone 3 background samples. Calculations do not include chemicals detected in background that are not COPCs in impacted water

Definitions:  
 NA = Not Applicable  
 NC = Not calculated, COPC was not detected in background water  
 ND = Not Detected; Shown where COPCs (for seepage-impacted water) were not detected in background water. HQs not calculated for these COPCs



TABLE 7.H.RME (SUPPLEMENTAL)  
 CALCULATION OF CHEMICAL CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 UNC Church Rock Mill and Tailings Site

Scenario Timeframe: Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC (1)		Cancer Risk Calculations					Non-Cancer Hazard Calculations										
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient						
							Value	Units	Value	Units		Value	Units									
<b>Background</b> Groundwater Zone 3	Groundwater	Tapwater	Ingestion	Aluminum	0.231	mg/l	NA	mg/kg/d	NA	NA	NA	NA	NA	NA	NA	NA	NA					
				Arsenic	0.175	mg/l	2.6E-03	mg/kg/d	1.5E+00	(mg/kg-day) <sup>-1</sup>	3.9E-03	NA	NA	NA	NA	NA	NA	NA				
				Beryllium	ND	mg/l	NA	mg/kg/d	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA			
				Cadmium	0.0113	mg/l	NA	mg/kg/d	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA			
				Cobalt	0.0877	mg/l	NA	mg/kg/d	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA			
				Manganese	3.436	mg/l	NA	mg/kg/d	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA			
				Molybdenum	17.43	mg/l	NA	mg/kg/d	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA			
				Nickel	0.14	mg/l	NA	mg/kg/d	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA			
				Selenium	0.00159	mg/l	NA	mg/kg/d	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA			
				Vanadium	ND	mg/l	NA	mg/kg/d	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA			
				Uranium	0.107	mg/l	NA	mg/kg/d	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA			
				Chloroform	ND	mg/l	NC	mg/kg/d	3.1E-02	(mg/kg-day) <sup>-1</sup>	NC	NA	NA	NA	NA	NA	NA	NA	NA			
				Exp. Route Total										3.9E-03					NA			
							Dermal	Aluminum	0.231	mg/l	NA	mg/kg/d	NA	NA	NA	NA	NA	NA	NA	NA		
								Arsenic	0.175	mg/l	1.49E-05	mg/kg/d	1.5E+00	(mg/kg-day) <sup>-1</sup>	2.2E-05	NA	NA	NA	NA			
					Beryllium	ND		mg/l	NA	mg/kg/d	NA	NA	NA	NA	NA	NA	NA					
					Cadmium	0.0113		mg/l	NA	mg/kg/d	NA	NA	NA	NA	NA	NA	NA					
					Cobalt	0.0877		mg/l	NA	mg/kg/d	NA	NA	NA	NA	NA	NA	NA					
					Manganese	3.436		mg/l	NA	mg/kg/d	NA	NA	NA	NA	NA	NA	NA					
					Molybdenum	17.43		mg/l	NA	mg/kg/d	NA	NA	NA	NA	NA	NA	NA					
					Nickel	0.14		mg/l	NA	mg/kg/d	NA	NA	NA	NA	NA	NA	NA					
					Selenium	0.00159		mg/l	NA	mg/kg/d	NA	NA	NA	NA	NA	NA	NA					
					Vanadium	ND		mg/l	NA	mg/kg/d	NA	NA	NA	NA	NA	NA	NA					
					Uranium	0.107	mg/l	NA	mg/kg/d	NA	NA	NA	NA	NA	NA	NA						
					Chloroform	ND	mg/l	NC	mg/kg/d	3.1E-02	(mg/kg-day) <sup>-1</sup>	NC	NA	NA	NA	NA						
	Exp. Route Total										2.2E-05					NA						
	Exposure Point Total											3.9E-03					NA					
Exposure Medium Total											3.9E-03					NA						
Air	Water Vapors from Showerhead		Inhalation	Chloroform	ND	mg/m3	NC	mg/m3	2.3E-05	(µg/m3) <sup>-1</sup>	NC					NA						
												Exp. Route Total										NC
												Exposure Point Total										
Exposure Medium Total															NC							
Groundwater Total - Zone 3															3.9E-03							
Total of Receptor Risks Across All Media										3.9E-03		Total of Receptor Hazards Across All Media				NA						

Notes:  
 (1) EPC concentration shown is "95% UCL" term for background groundwater calculated using ProUCL ver 4.00.02 as described in N.A. Water Systems (2008b). Chloroform is shown as not detected because it was detected in only one of 186 Zone 3 background samples. Calculations do not include chemicals detected in background that are not COPCs in impacted water  
 Definitions:  
 NA = Not Applicable  
 NC = Not calculated, COPC was not detected in background water  
 ND = Not Detected; Shown where COPCs (for seepage-impacted water) were not detected in background water. HQs not calculated for these COPCs

TABLE 7.I.RME (SUPPLEMENTAL)  
 CALCULATION OF DAevent  
 Future Resident Adult  
 UNC Church Rock Mill and Tailings Site

Hydrostratigraphic Unit	Chemical of Potential Concern (1)	Groundwater Concentration (CW) mg/L	Permeability Coefficient <sup>(2)</sup> (Kp) (cm/hr)	B <sup>(2)</sup> (dimensionless)	Lag Time <sup>(2)</sup> ( $\tau_{event}$ ) (hr)	t <sup>*(2)</sup> (hr)	Fraction Absorbed Water <sup>(2)</sup> (FA) (dimensionless)	Duration of Event <sup>(2)</sup> (tevent) (hr)	DAevent (mg/cm <sup>2</sup> -event)
Zone 3 - Background	Aluminum	2.31E-01	1.0E-03	NA	NA	NA	NA	0.58	1.3E-07
Zone 3 - Background	Arsenic (arsenite)	1.75E-01	1.0E-03	NA	NA	NA	NA	0.58	1.0E-07
Zone 3 - Background	Beryllium	ND	1.0E-03	NA	NA	NA	NA	0.58	NC
Zone 3 - Background	Cadmium (water)	1.13E-02	1.0E-03	NA	NA	NA	NA	0.58	6.6E-09
Zone 3 - Background	Cobalt	8.77E-02	1.0E-03	NA	NA	NA	NA	0.58	5.1E-08
Zone 3 - Background	Manganese	3.44E+00	1.0E-03	NA	NA	NA	NA	0.58	2.0E-06
Zone 3 - Background	Molybdenum	1.74E+01	1.0E-03	NA	NA	NA	NA	0.58	1.0E-05
Zone 3 - Background	Nickel	1.40E-01	2.0E-04	NA	NA	NA	NA	0.58	1.6E-08
Zone 3 - Background	Selenium	1.59E-03	1.0E-03	NA	NA	NA	NA	0.58	9.2E-10
Zone 3 - Background	Vanadium	ND	1.0E-03	NA	NA	NA	NA	0.58	NC
Zone 3 - Background	Uranium	1.07E-01	1.0E-03	NA	NA	NA	NA	0.58	6.2E-08
Zone 3 - Background	Chloroform	ND	6.8E-03	2.9E-02	5.0E-01	1.2E+00	1.0E+00	0.58	NC

Notes:

- (1) Radionuclide COPCs not included in dermal evaluation because the ingested dose significantly outweighs the dermally absorbed dose.
- (2) Groundwater concentration shown is "95% UCL" term for background groundwater calculated using ProUCL ver 4.00.02 as described in N.A. Water Systems (2008b). Chloroform is shown as not detected because it was detected in only one of 186 Zone 3 background samples.
- (3) Values from EPA 2004, Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment - Final). EPA/540/R/99/005. Per the guidance, the default Kp value of 1E-06 was assigned to inorganics without designated Kp values.

TABLE 7.J.RME (SUPPLEMENTAL)  
 CALCULATION OF DAevent  
 Future Resident Child  
 UNC Church Rock Mill and Tailings Site

Hydrostratigraphic Unit	Chemical of Potential Concern (1)	Groundwater Concentration (CW) (mg/L)	Permeability Coefficient <sup>(3)</sup> (Kp) (cm/hr)	B <sup>(3)</sup> (dimensionless)	Lag Time <sup>(3)</sup> ( $\tau_{event}$ ) (hr)	t <sup>*(3)</sup> (hr)	Fraction Absorbed Water <sup>(3)</sup> (FA) (dimensionless)	Duration of Event <sup>(3)</sup> (tevent) (hr)	DAevent (mg/cm <sup>2</sup> -event)
Zone 3 - Background	Aluminum	2.31E-01	1.0E-03	NA	NA	NA	NA	1	2.3E-07
Zone 3 - Background	Arsenic (arsenite)	1.75E-01	1.0E-03	NA	NA	NA	NA	1	1.8E-07
Zone 3 - Background	Beryllium	ND	1.0E-03	NA	NA	NA	NA	1	NC
Zone 3 - Background	Cadmium (water)	1.13E-02	1.0E-03	NA	NA	NA	NA	1	1.1E-08
Zone 3 - Background	Cobalt	8.77E-02	1.0E-03	NA	NA	NA	NA	1	8.8E-08
Zone 3 - Background	Manganese	3.44E+00	1.0E-03	NA	NA	NA	NA	1	3.4E-06
Zone 3 - Background	Molybdenum	1.74E+01	1.0E-03	NA	NA	NA	NA	1	1.7E-05
Zone 3 - Background	Nickel	1.40E-01	2.0E-04	NA	NA	NA	NA	1	2.8E-08
Zone 3 - Background	Selenium	1.59E-03	1.0E-03	NA	NA	NA	NA	1	1.6E-09
Zone 3 - Background	Vanadium	ND	1.0E-03	NA	NA	NA	NA	1	NC
Zone 3 - Background	Uranium	1.07E-01	1.0E-03	NA	NA	NA	NA	1	1.1E-07
Zone 3 - Background	Chloroform	ND	6.8E-03	2.9E-02	5.0E-01	1.2E+00	1.0E+00	1	NC

Notes:

- (1) Radionuclide COPCs not included in dermal evaluation because the ingested dose significantly outweighs the dermally absorbed dose.
- (2) Groundwater concentration shown is "95% UCL" term for background groundwater calculated using ProUCL ver 4.00.02 as described in N.A.Water Systems (2008b). Chloroform is shown as not detected because it was detected in only one of 186 Zone 3 background samples.
- (3) Values from EPA 2004, Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment - Final). EPA/540/R/99/005. Per the guidance, the default Kp value of 1E-06 was assigned to inorganics without designated Kp values.

TABLE 8.1.RME  
 CALCULATION OF RADIATION CANCER RISKS  
 Reasonable Maximum Exposure  
 UNC Church Rock Mill and Tailings Site

Scenario Timeframe:	Future
Receptor Population:	Resident
Receptor Age:	Child/Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Radionuclide of Potential Concern	EPC		Risk Calculation Approach	Cancer Risk Calculations				Cancer Risk										
					Value	Units		Intake/Activity		CSF												
					(1)			Value	Units	Value	Units											
Groundwater SW Alluvium	Groundwater	Tapwater	Ingestion	Uranium-234	4.4E+01	pCi/l	USEPA RAGS	8.3E+05	pCi	7.1E-11	Risk/pCi	5.8E-05										
				Uranium-235+D	2.0E+00	pCi/l	USEPA RAGS	3.8E+04	pCi	7.2E-11	Risk/pCi	2.7E-06										
				Uranium-238+D	4.3E+01	pCi/l	USEPA RAGS	8.1E+05	pCi	8.7E-11	Risk/pCi	7.0E-05										
				Radium-226+D	2.7E-01	pCi/l	USEPA RAGS	5.0E+03	pCi	3.9E-10	Risk/pCi	1.9E-06										
				Radium-228+D	8.6E-01	pCi/l	USEPA RAGS	1.6E+04	pCi	1.0E-09	Risk/pCi	1.7E-05										
				Thorium-230	2.9E-01	pCi/l	USEPA RAGS	5.5E+03	pCi	9.1E-11	Risk/pCi	5.0E-07										
			Exp. Route Total									1.5E-04										
			Exposure Point Total									1.5E-04										
			Exposure Medium Total									1.5E-04										
		Air	Water Vapors from Domestic Use	Inhalation	Radium-226+D	1.3E-01	pCi/m3	USEPA RAGS	2.5E+04	pCi	1.2E-08	Risk/pCi	2.9E-04									
															Exp. Route Total							2.9E-04
															Exposure Point Total							
		Exposure Medium Total									2.9E-04											
Medium Total												4.4E-04										

Notes:

(1) Inhalation EPC represents the air concentration (pCi/m3) calculated using the Andelman volatilization factor K (0.5 L/m3)

Total of Receptor Risks Across All Media

4.4E-04

TABLE 8.2.RME  
 CALCULATION OF RADIATION CANCER RISKS  
 Reasonable Maximum Exposure  
 UNC Church Rock Mill and Tailings Site

Scenario Timeframe:	Future
Receptor Population:	Resident
Receptor Age:	Child/Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Radionuclide of Potential Concern	EPC		Risk Calculation Approach	Cancer Risk Calculations												
					Value	Units		Intake/Activity		CSF		Cancer Risk								
					(1)			Value	Units	Value	Units									
Groundwater Zone 1	Groundwater	Tapwater	Ingestion	Uranium-234	5.9E-01	pCi/l	USEPA RAGS	1.1E+04	pCi	7.1E-11	Risk/pCi	7.9E-07								
				Uranium-235+D	2.7E-02	pCi/l	USEPA RAGS	5.1E+02	pCi	7.2E-11	Risk/pCi	3.7E-08								
				Uranium-238+D	5.8E-01	pCi/l	USEPA RAGS	1.1E+04	pCi	8.7E-11	Risk/pCi	9.6E-07								
				Radium-226+D	1.2E+00	pCi/l	USEPA RAGS	2.3E+04	pCi	3.9E-10	Risk/pCi	8.8E-06								
				Radium-228+D	2.1E+00	pCi/l	USEPA RAGS	3.9E+04	pCi	1.0E-09	Risk/pCi	4.1E-05								
				Thorium-230	6.5E-01	pCi/l	USEPA RAGS	1.2E+04	pCi	9.1E-11	Risk/pCi	1.1E-06								
			Exp. Route Total									5.3E-05								
			Exposure Point Total									5.3E-05								
			Exposure Medium Total									5.3E-05								
		Air	Water Vapors from Domestic Use	Inhalation	Radium-226+D	6.1E-01	pCi/m3	USEPA RAGS	1.1E+05	pCi	1.2E-08	Risk/pCi	1.3E-03							
														Exp. Route Total						1.3E-03
														Exposure Point Total						
		Exposure Medium Total										1.3E-03								
Medium Total												1.4E-03								

Notes:

(1) Inhalation EPC represents the air concentration (pCi/m3) calculated using the Andelman volatilization factor K (0.5 L/m3)

Total of Receptor Risks Across All Media

1.4E-03

TABLE 8.3.RME  
 CALCULATION OF RADIATION CANCER RISKS  
 Reasonable Maximum Exposure  
 UNC Church Rock Mill and Tailings Site

Scenario Timeframe:	Future
Receptor Population:	Resident
Receptor Age:	Child/Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Radionuclide of Potential Concern	EPC		Risk Calculation Approach	Cancer Risk Calculations					
					Value	Units		Intake/Activity		CSF		Cancer Risk	
					(1)			Value	Units	Value	Units		
Groundwater Zone 3	Groundwater	Tapwater	Ingestion	Uranium-234	1.5E+01	pCi/l	USEPA RAGS	2.8E+05	pCi	7.1E-11	Risk/pCi	2.0E-05	
				Uranium-235+D	6.7E-01	pCi/l	USEPA RAGS	1.3E+04	pCi	7.2E-11	Risk/pCi	9.1E-07	
				Uranium-238+D	1.4E+01	pCi/l	USEPA RAGS	2.7E+05	pCi	8.7E-11	Risk/pCi	2.4E-05	
				Radium-226+D	1.1E+01	pCi/l	USEPA RAGS	2.1E+05	pCi	3.9E-10	Risk/pCi	8.1E-05	
				Radium-228+D	1.8E+01	pCi/l	USEPA RAGS	3.4E+05	pCi	1.0E-09	Risk/pCi	3.5E-04	
				Thorium-230	2.6E-01	pCi/l	USEPA RAGS	4.9E+03	pCi	9.1E-11	Risk/pCi	4.5E-07	
				Lead-210+D	2.3E+00	pCi/l	USEPA RAGS	4.3E+04	pCi	1.3E-09	Risk/pCi	5.5E-05	
			Exp. Route Total									5.3E-04	
			Exposure Point Total									5.3E-04	
			Exposure Medium Total									5.3E-04	
		Air	Water Vapors from Domestic Use	Inhalation	Radium-226+D	6E+00	pCi/m3	USEPA RAGS	1.1E+06	pCi	1.2E-08	Risk/pCi	1.2E-02
				Exp. Route Total									1.2E-02
		Exposure Point Total										1.2E-02	
		Exposure Medium Total										1.2E-02	
Medium Total												1.3E-02	

Notes:

(1) Inhalation EPC represents the air concentration (pCi/m3) calculated using the Andelman volatilization factor K (0.5 L/m3)

Total of Receptor Risks Across All Media

1.3E-02
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TABLE 8.A.RME (SUPPLEMENTAL)  
 CALCULATION OF RADIATION CANCER RISKS  
 Reasonable Maximum Exposure  
 UNC Church Rock Mill and Tailings Site

Scenario Timeframe:	Future
Receptor Population:	Resident
Receptor Age:	Child/Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Radionuclide of Potential Concern	EPC (1)		Risk Calculation Approach	Cancer Risk Calculations					
					Value	Units		Intake/Activity		CSF		Cancer Risk	
					(2)			Value	Units	Value	Units		
Background Groundwater Zone 3	Groundwater	Tapwater	Ingestion	Uranium-234	3.7E+01	pCi/l	USEPA RAGS	6.9E+05	pCi	7.1E-11	Risk/pCi	4.9E-05	
				Uranium-235+D	1.7E+00	pCi/l	USEPA RAGS	3.1E+04	pCi	7.2E-11	Risk/pCi	2.3E-06	
				Uranium-238+D	3.6E+01	pCi/l	USEPA RAGS	6.7E+05	pCi	8.7E-11	Risk/pCi	5.9E-05	
				Radium-226+D	5.0E+00	pCi/l	USEPA RAGS	9.4E+04	pCi	3.9E-10	Risk/pCi	3.6E-05	
				Radium-228+D	4.5E+00	pCi/l	USEPA RAGS	8.5E+04	pCi	1.0E-09	Risk/pCi	8.9E-05	
				Thorium-230	1.4E+00	pCi/l	USEPA RAGS	2.7E+04	pCi	9.1E-11	Risk/pCi	2.5E-06	
				Lead-210+D	1.6E+00	pCi/l	USEPA RAGS	3.1E+04	pCi	1.3E-09	Risk/pCi	3.9E-05	
			Exp. Route Total									2.8E-04	
			Exposure Point Total									2.8E-04	
			Exposure Medium Total									2.8E-04	
		Air	Water Vapors from Showerhead	Inhalation	Radium-226+D	2.5E+00	pCi/m3	USEPA RAGS	4.7E+05	pCi	1.2E-08	Risk/pCi	5.5E-03
					Exp. Route Total								5.5E-03
				Exposure Point Total									5.5E-03
		Exposure Medium Total									5.5E-03		
Medium Total												5.8E-03	

Notes:

(1) Groundwater EPC represents UCL95 background water concentration per N.A. Water System (2008b)

(2) Inhalation EPC represents the air concentration (pCi/m3) calculated using the Andelman volatilization factor K (0.5 L/m3)

Total of Receptor Risks Across All Media

5.8E-03

TABLE 9.1.RME  
SUMMARY OF RECEPTOR HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
UNC Church Rock Mill and Tailings Site

Scenario Timeframe: Future  
Receptor Population: Resident  
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient					
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total	
Groundwater SW Alluvium	Groundwater	Tapwater	Arsenic	--	--	--	--	--	Skin	0.23	--	0.0012	0.24	
			Cobalt	--	--	--	--	--	Thyroid	0.91	--	0.0048	0.92	
			Manganese	--	--	--	--	--	Central nervous system	3.2	--	0.42	3.6	
			Uranium	--	--	--	--	--	Kidney	1.2	--	0.0061	1.2	
			Chloroform	--	--	--	--	--	Liver	0.0091	--	0.0008	0.010	
			Chemical Total	--	--	--	--	--		5.5	--	0.43	6.0	
			Uranium-234	--	--	--	--	--	--	--	--	--	--	--
			Uranium-235+D	--	--	--	--	--	--	--	--	--	--	--
			Uranium-238+D	--	--	--	--	--	--	--	--	--	--	--
			Radium-226+D	--	--	--	--	--	--	--	--	--	--	--
	Radium-228+D	--	--	--	--	--	--	--	--	--	--	--		
	Thorium-230	--	--	--	--	--	--	--	--	--	--	--		
	Radionuclide Total	--	--	--	--	--	--	--	--	--	--	--		
	Exposure Point Total												6.0	
	Exposure Medium Total												6.0	
	Air	Water Vapors from Showerhead	Arsenic	--	--	--	--	--	--	--	--	--	--	--
			Cobalt	--	--	--	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	--	--	--	--	--	--	--
			Uranium	--	--	--	--	--	--	--	--	--	--	--
			Chloroform	--	--	--	--	--	--	Liver	--	0.0017	--	0.0017
Chemical Total										0.0017			0.0017	
Uranium-234			--	--	--	--	--	--	--	--	--	--	--	--
Uranium-235+D			--	--	--	--	--	--	--	--	--	--	--	--
Uranium-238+D			--	--	--	--	--	--	--	--	--	--	--	--
Radium-226+D			--	--	--	--	--	--	--	--	--	--	--	--
Radium-228+D	--	--	--	--	--	--	--	--	--	--	--	--		
Thorium-230	--	--	--	--	--	--	--	--	--	--	--	--		
Radionuclide Total	--	--	--	--	--	--	--	--	--	--	--	--		
Exposure Point Total												0.0017		
Exposure Medium Total												0.0017		
Medium Total												6.0		
Receptor Total				Receptor Risk Total				--	Receptor HI Total				6.0	

Total Skin HI Across All Media = 0.24  
Total Thyroid HI Across All Media = 0.92  
Total Central Nervous System HI Across All Media = 3.6  
Total Kidney HI Across All Media = 1.2  
Total Liver HI Across All Media = 0.012



TABLE 9.2.RME  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
UNC Church Rock Mill and Tailings Site

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient					
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total	
Groundwater SW Alluvium	Groundwater	Tapwater	Arsenic	--	--	--	--	--	Skin	0.55	--	0.0036	0.55	
			Cobalt	--	--	--	--	--	Thyroid	2.1	--	0.014	2.1	
			Manganese	--	--	--	--	--	Central nervous system	7.5	--	1.2	8.7	
			Uranium	--	--	--	--	--	Kidney	2.7	--	0.018	2.7	
			Chloroform	--	--	--	--	--	Liver	0.021	--	0.0019	0.023	
			Chemical Total	--	--	--	--	--		12.9	--	1.3	14.2	
			Uranium-234	--	--	--	--	--	--	--	--	--	--	--
			Uranium-235+D	--	--	--	--	--	--	--	--	--	--	--
			Uranium-238+D	--	--	--	--	--	--	--	--	--	--	--
			Radium-226+D	--	--	--	--	--	--	--	--	--	--	--
	Radium-228+D	--	--	--	--	--	--	--	--	--	--	--		
	Thorium-230	--	--	--	--	--	--	--	--	--	--	--		
	Radionuclide Total	--	--	--	--	--	--	--	--	--	--	--		
	Exposure Point Total						--						14.2	
	Exposure Medium Total						--						14.2	
	Air	Water Vapors from Showerhead	Arsenic	--	--	--	--	--	--	--	--	--	--	
			Cobalt	--	--	--	--	--	--	--	--	--	--	
			Manganese	--	--	--	--	--	--	--	--	--	--	
			Uranium	--	--	--	--	--	--	--	--	--	--	
			Chloroform	--	--	--	--	--	Liver	--	0.0041	--	0.0041	
Chemical Total							--			0.0041		0.0041		
Uranium-234			--	--	--	--	--	--	--	--	--	--	--	
Uranium-235+D			--	--	--	--	--	--	--	--	--	--	--	
Uranium-238+D			--	--	--	--	--	--	--	--	--	--	--	
Radium-226+D			--	--	--	--	--	--	--	--	--	--	--	
Radium-228+D	--	--	--	--	--	--	--	--	--	--	--			
Thorium-230	--	--	--	--	--	--	--	--	--	--	--			
Radionuclide Total	--	--	--	--	--	--	--	--	--	--	--			
Exposure Point Total												0.0041		
Exposure Medium Total												0.0041		
Medium Total												14.2		
Receptor Total				Receptor Risk Total				--	Receptor HI Total				14.2	

Total Skin HI Across All Media =	0.55
Total Thyroid HI Across All Media =	2.1
Total Central Nervous System HI Across All Media =	8.7
Total Kidney HI Across All Media =	2.7
Total Liver HI Across All Media =	0.027

TABLE 9.3.RME  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
UNC Church Rock Mill and Tailings Site

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater SW Alluvium	Groundwater	Tapwater	Arsenic	5.7E-05	--	3.3E-07	--	5.8E-05	--	--	--	--	--
			Cobalt	--	--	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	--	--	--	--	--	--
			Uranium	--	--	--	--	--	--	--	--	--	--
			Chloroform	1.6E-06	--	1.4E-07	--	1.7E-06	--	--	--	--	--
			<b>Chemical Total</b>	5.9E-05	--	4.7E-07	--	5.9E-05	--	--	--	--	--
			Uranium-234	5.8E-05	--	--	--	5.8E-05	--	--	--	--	--
			Uranium-235+D	2.7E-06	--	--	--	2.7E-06	--	--	--	--	--
			Uranium-238+D	7.0E-05	--	--	--	7.0E-05	--	--	--	--	--
			Radium-226+D	1.9E-06	--	--	--	1.9E-06	--	--	--	--	--
			Radium-228+D	1.7E-05	--	--	--	1.7E-05	--	--	--	--	--
			Thorium-230	5.0E-07	--	--	--	5.0E-07	--	--	--	--	--
	<b>Radionuclide Total</b>	1.5E-04	--	--	--	1.5E-04	--	--	--	--	--		
	<b>Exposure Point Total</b>									2.1E-04			
	<b>Exposure Medium Total</b>									2.1E-04			
	Air	Water Vapors from Showerhead	Arsenic	--	--	--	--	--	--	--	--	--	--
			Cobalt	--	--	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	--	--	--	--	--	--
			Uranium	--	--	--	--	--	--	--	--	--	--
			Chloroform	--	2.1E-06	--	--	2.1E-06	--	--	--	--	--
			<b>Chemical Total</b>	--	2.1E-06	--	--	2.1E-06	--	--	--	--	--
			Uranium-234	--	--	--	--	--	--	--	--	--	--
			Uranium-235+D	--	--	--	--	--	--	--	--	--	--
Uranium-238+D			--	--	--	--	--	--	--	--	--	--	
Radium-226+D			--	2.9E-04	--	--	2.9E-04	--	--	--	--	--	
Radium-228+D			--	--	--	--	--	--	--	--	--	--	
Thorium-230	--	--	--	--	--	--	--	--	--	--			
<b>Radionuclide Total</b>	--	2.9E-04	--	--	2.9E-04	--	--	--	--	--			
<b>Exposure Point Total</b>									2.9E-04				
<b>Exposure Medium Total</b>									2.9E-04				
<b>Medium Total</b>									5.0E-04				
<b>Receptor Total</b>				<b>Receptor Risk Total</b>					5.0E-04	<b>Receptor HI Total</b>			

TABLE 9.4.RME  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
UNC Church Rock Mill and Tailings Site

Scenario Timeframe: Future  
Receptor Population: Resident  
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient					
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total	
Groundwater Zone 1	Groundwater	Tapwater	Arsenic	--	--	--	--	--	Skin	0.13	--	0.0007	0.13	
			Cobalt	--	--	--	--	--	Thyroid	5.1	--	0.027	5.1	
			Manganese	--	--	--	--	--	Central nervous system	2.2	--	0.29	2.5	
			Nickel	--	--	--	--	--	Reduced organ and body weights	0.073	--	0.0019	0.075	
			Vanadium	--	--	--	--	--	Decreased hair cystine	1.1	--	0.0057	1.1	
			Chloroform	--	--	--	--	--	Liver	0.0018	--	0.0002	0.0020	
			Chemical Total	--	--	--	--	--		8.6	--	0.33	8.9	
			Uranium-234	--	--	--	--	--	--	--	--	--	--	--
			Uranium-235+D	--	--	--	--	--	--	--	--	--	--	--
			Uranium-238+D	--	--	--	--	--	--	--	--	--	--	--
			Radium-226+D	--	--	--	--	--	--	--	--	--	--	--
	Radium-228+D	--	--	--	--	--	--	--	--	--	--	--		
	Thorium-230	--	--	--	--	--	--	--	--	--	--	--		
	Radionuclide Total	--	--	--	--	--	--	--	--	--	--	--		
	Exposure Point Total						--						8.9	
	Exposure Medium Total						--						8.9	
	Air	Water Vapors from Showerhead	Arsenic	--	--	--	--	--	--	--	--	--	--	
			Cobalt	--	--	--	--	--	--	--	--	--	--	
			Manganese	--	--	--	--	--	--	--	--	--	--	
			Nickel	--	--	--	--	--	--	--	--	--	--	
			Vanadium	--	--	--	--	--	--	--	--	--	--	
			Chloroform	--	--	--	--	--	--	Liver	--	0.0003	--	0.0003
			Chemical Total					--			0.0003			0.0003
Uranium-234			--	--	--	--	--	--	--	--	--	--	--	
Uranium-235+D			--	--	--	--	--	--	--	--	--	--	--	
Uranium-238+D			--	--	--	--	--	--	--	--	--	--	--	
Radium-226+D			--	--	--	--	--	--	--	--	--	--	--	
Radium-228+D			--	--	--	--	--	--	--	--	--	--	--	
Thorium-230	--	--	--	--	--	--	--	--	--	--	--			
Radionuclide Total	--	--	--	--	--	--	--	--	--	--	--			
Exposure Point Total												0.0003		
Exposure Medium Total												0.0003		
Medium Total												8.9		
Receptor Total							Receptor Risk Total	--				Receptor HI Total	8.9	

Total Skin HI Across All Media =	0.13
Total Thyroid HI Across All Media =	5.1
Total Central Nervous System HI Across All Media =	2.5
Total Reduced Organ and Body Weights =	0.075
Total Hair Cystine (Metabolic System) HI Across All Media =	1.1
Total Liver HI Across All Media =	0.0023

TABLE 9.5.RME  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
UNC Church Rock Mill and Tailings Site

Scenario Timeframe: Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater Zone 1	Groundwater	Tapwater	Arsenic	--	--	--	--	--	Skin	0.31	--	0.0020	0.31
			Cobalt	--	--	--	--	--	Thyroid	11.9	--	0.078	11.9
			Manganese	--	--	--	--	--	Central nervous system	5.2	--	0.86	6.1
			Nickel	--	--	--	--	--	Reduced organ and body weights	0.17	--	0.0056	0.18
			Vanadium	--	--	--	--	--	Decreased hair cystine	2.6	--	0.017	2.6
			Chloroform	--	--	--	--	--	Liver	0.0043	--	0.0004	0.0046
			Chemical Total	--	--	--	--	--		20.1	--	0.96	21.1
			Uranium-234	--	--	--	--	--	--	--	--	--	--
			Uranium-235+D	--	--	--	--	--	--	--	--	--	--
			Uranium-238+D	--	--	--	--	--	--	--	--	--	--
	Radium-226+D	--	--	--	--	--	--	--	--	--	--		
	Radium-228+D	--	--	--	--	--	--	--	--	--	--		
	Thorium-230	--	--	--	--	--	--	--	--	--	--		
	Radionuclide Total	--	--	--	--	--	--	--	--	--	--		
	Exposure Point Total						--					21.1	
	Exposure Medium Total						--					21.1	
	Air	Water Vapors from Showerhead	Arsenic	--	--	--	--	--	--	--	--	--	--
			Cobalt	--	--	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	--	--	--	--	--	--
			Nickel	--	--	--	--	--	--	--	--	--	--
			Vanadium	--	--	--	--	--	--	--	--	--	--
Chloroform			--	--	--	--	--	--	Liver	--	0.0008	0.0008	
Chemical Total			--	--	--	--	--	--			0.0008	0.0008	
Uranium-234			--	--	--	--	--	--	--	--	--	--	
Uranium-235+D			--	--	--	--	--	--	--	--	--	--	
Uranium-238+D			--	--	--	--	--	--	--	--	--	--	
Radium-226+D	--	--	--	--	--	--	--	--	--	--			
Radium-228+D	--	--	--	--	--	--	--	--	--	--			
Thorium-230	--	--	--	--	--	--	--	--	--	--			
Radionuclide Total	--	--	--	--	--	--	--	--	--	--			
Exposure Point Total											0.0008		
Exposure Medium Total											0.0008		
Medium Total											21.1		
Receptor Total				Receptor Risk Total				--	Receptor HI Total				21.1

Total Skin HI Across All Media =	0.31
Total Thyroid HI Across All Media =	11.9
Total Central Nervous System HI Across All Media =	6.1
Total Reduced Organ and Body Weights =	0.18
Total Hair Cystine (Metabolic System) HI Across All Media =	2.6
Total Liver HI Across All Media =	0.0055

TABLE 9.6.RME  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
UNC Church Rock Mill and Tailings Site

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient					
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total	
Groundwater Zone 1	Groundwater	Tapwater	Arsenic	3.2E-05	--	1.9E-07	--	3.3E-05	--	--	--	--	--	
			Cobalt	--	--	--	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	--	--	--	--	--	--	--
			Nickel	--	--	--	--	--	--	--	--	--	--	--
			Vanadium	--	--	--	--	--	--	--	--	--	--	--
			Chloroform	3.1E-07	--	2.8E-08	--	3.4E-07	--	--	--	--	--	--
			Chemical Total	3.3E-05	--	2.1E-07	--	3.3E-05	--	--	--	--	--	--
			Uranium-234	7.9E-07	--	--	--	7.9E-07	--	--	--	--	--	--
			Uranium-235+D	3.7E-08	--	--	--	3.7E-08	--	--	--	--	--	--
			Uranium-238+D	9.6E-07	--	--	--	9.6E-07	--	--	--	--	--	--
			Radium-226+D	8.8E-06	--	--	--	8.8E-06	--	--	--	--	--	--
			Radium-228+D	4.1E-05	--	--	--	4.1E-05	--	--	--	--	--	--
			Thorium-230	1.1E-06	--	--	--	1.1E-06	--	--	--	--	--	--
			Radionuclide Total	5.3E-05	--	--	--	5.3E-05	--	--	--	--	--	--
	Exposure Point Total							8.6E-05					--	
	Exposure Medium Total							8.6E-05					--	
	Air	Water Vapors from Showerhead	Arsenic	--	--	--	--	--	--	--	--	--	--	
			Cobalt	--	--	--	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	--	--	--	--	--	--	--
			Nickel	--	--	--	--	--	--	--	--	--	--	--
Vanadium			--	--	--	--	--	--	--	--	--	--	--	
Chloroform			--	4.2E-07	--	--	4.2E-07	--	--	--	--	--	--	
Chemical Total			--	4.2E-07	--	--	4.2E-07	--	--	--	--	--	--	
Uranium-234			--	--	--	--	--	--	--	--	--	--	--	
Uranium-235+D			--	--	--	--	--	--	--	--	--	--	--	
Uranium-238+D			--	--	--	--	--	--	--	--	--	--	--	
Radium-226+D			--	1.3E-03	--	--	1.3E-03	--	--	--	--	--	--	
Radium-228+D			--	--	--	--	--	--	--	--	--	--	--	
Thorium-230			--	--	--	--	--	--	--	--	--	--	--	
Radionuclide Total			--	1.3E-03	--	--	1.3E-03	--	--	--	--	--	--	
Exposure Point Total							1.3E-03					--		
Exposure Medium Total							1.3E-03					--		
Medium Total							1.4E-03					--		
Receptor Total							Receptor Risk Total	1.4E-03				Receptor HI Total	--	

TABLE 9.7.RME  
 SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
 REASONABLE MAXIMUM EXPOSURE  
 UNC Church Rock Mill and Tailings Site

Scenario Timeframe: Future  
 Receptor Population: Resident  
 Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient						
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total		
Groundwater Zone 3	Groundwater	Tapwater	Aluminum	--	--	--	--	--	Central nervous system	1.1	--	0.0056	1.1		
			Arsenic	--	--	--	--	--	Skin	37.6	--	0.20	37.8		
			Beryllium	--	--	--	--	--	Gastrointestinal	0.28	--	0.21	0.48		
			Cadmium	--	--	--	--	--	Kidney	0.41	--	0.04	0.45		
			Cobalt	--	--	--	--	--	Thyroid	40.1	--	0.21	40.3		
			Manganese	--	--	--	--	--	Central nervous system	12.4	--	1.6	14.1		
			Molybdenum	--	--	--	--	--	Increased uric acid (kidney)	4.0	--	0.021	4.1		
			Nickel	--	--	--	--	--	Reduced organ and body weights	0.67	--	0.017	0.69		
			Selenium	--	--	--	--	--	Skin	0.024	--	0.0001	0.024		
			Vanadium	--	--	--	--	--	Decreased hair cystine	1.0	--	0.0051	1.0		
			Uranium	--	--	--	--	--	Kidney	0.39	--	0.0021	0.40		
			Chloroform	--	--	--	--	--	Liver	0.0088	--	0.0008	0.01		
			<b>Chemical Total</b>	--	--	--	--	--		98	--	2.3	100		
			Uranium-234	--	--	--	--	--		--	--	--	--		
			Uranium-235+D	--	--	--	--	--		--	--	--	--		
			Uranium-238+D	--	--	--	--	--		--	--	--	--		
			Radium-226+D	--	--	--	--	--		--	--	--	--		
			Radium-228+D	--	--	--	--	--		--	--	--	--		
			Thorium-230	--	--	--	--	--		--	--	--	--		
			Lead-210+D	--	--	--	--	--		--	--	--	--		
			<b>Radionuclide Total</b>	--	--	--	--	--		--	--	--	--		
			<b>Exposure Point Total</b>												100
			<b>Exposure Medium Total</b>												100
			Air	Water Vapors from Showerhead	Aluminum	--	--	--	--	--	--	--	--	--	--
					Arsenic	--	--	--	--	--	--	--	--	--	--
					Beryllium	--	--	--	--	--	--	--	--	--	--
					Cadmium	--	--	--	--	--	--	--	--	--	--
Cobalt	--	--			--	--	--	--	--	--	--	--			
Manganese	--	--			--	--	--	--	--	--	--	--			
Molybdenum	--	--			--	--	--	--	--	--	--	--			
Nickel	--	--			--	--	--	--	--	--	--	--			
Selenium	--	--			--	--	--	--	--	--	--	--			
Vanadium	--	--			--	--	--	--	--	--	--	--			
Uranium	--	--			--	--	--	--	--	--	--	--			
Chloroform	--	--			--	--	--	--	--	--	0.0016	0.0016			
<b>Chemical Total</b>													0.002		
Uranium-234	--	--			--	--	--	--	--	--	--	--	--		
Uranium-235+D	--	--			--	--	--	--	--	--	--	--	--		
Uranium-238+D	--	--			--	--	--	--	--	--	--	--	--		
Radium-226+D	--	--			--	--	--	--	--	--	--	--	--		
Radium-228+D	--	--			--	--	--	--	--	--	--	--	--		
Thorium-230	--	--			--	--	--	--	--	--	--	--	--		
Lead-210+D	--	--			--	--	--	--	--	--	--	--	--		
<b>Radionuclide Total</b>	--	--	--	--	--	--	--	--	--	--	--				
<b>Exposure Point Total</b>												0.0016			
<b>Exposure Medium Total</b>												0.0016			
<b>Medium Total</b>												100			
<b>Receptor Total</b>				<b>Receptor Risk Total</b>				--	<b>Receptor HI Total</b>				100		

Total Skin HI Across All Media =	37.8
Total Thyroid HI Across All Media =	40.3
Total Central Nervous System HI Across All Media =	15.1
Total Kidney HI Across All Media =	4.9
Total Liver HI Across All Media =	0.011
Total Gastrointestinal HI Across All Media =	0.48
Total Reduced Body and Organ Weights HI Across All Media =	0.69
Total Hair Cystine (Metabolic System) HI Across All Media =	1.0

TABLE 9.8.RME  
 SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
 REASONABLE MAXIMUM EXPOSURE  
 UNC Church Rock Mill and Tailings Site

Scenario Timeframe: Future  
 Receptor Population: Resident  
 Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient						
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total		
Groundwater Zone 3	Groundwater	Tapwater	Aluminum	--	--	--	--	--	Central nervous system	2.5	--	0.017	2.5		
			Arsenic	--	--	--	--	--	Skin	87.8	--	0.58	88.4		
			Beryllium	--	--	--	--	--	Gastrointestinal	0.65	--	0.61	1.3		
			Cadmium	--	--	--	--	--	Kidney	1.0	--	0.13	1.1		
			Cobalt	--	--	--	--	--	Thyroid	93.5	--	0.62	94.2		
			Manganese	--	--	--	--	--	Central nervous system	29.0	--	4.8	33.8		
			Molybdenum	--	--	--	--	--	Increased uric acid (kidney)	9.4	--	0.062	9.5		
			Nickel	--	--	--	--	--	Reduced organ and body weights	1.6	--	0.052	1.6		
			Selenium	--	--	--	--	--	Skin	0.055	--	0.0004	0.056		
			Vanadium	--	--	--	--	--	Decreased hair cystine	2.3	--	0.015	2.3		
			Uranium	--	--	--	--	--	Kidney	0.92	--	0.0061	0.92		
			Chloroform	--	--	--	--	--	Liver	0.020	--	0.0018	0.022		
			Chemical Total	--	--	--	--	--		229	--	6.9	236		
			Uranium-234	--	--	--	--	--		--	--	--	--		
			Uranium-235+D	--	--	--	--	--		--	--	--	--		
			Uranium-238+D	--	--	--	--	--		--	--	--	--		
			Radium-226+D	--	--	--	--	--		--	--	--	--		
			Radium-228+D	--	--	--	--	--		--	--	--	--		
			Thorium-230	--	--	--	--	--		--	--	--	--		
			Lead-210+D	--	--	--	--	--		--	--	--	--		
			Radionuclide Total	--	--	--	--	--		--	--	--	--		
			Exposure Point Total												236
			Exposure Medium Total												236
Air	Water Vapors from Showerhead	Aluminum	--	--	--	--	--	--	--	--	--	--			
		Arsenic	--	--	--	--	--	--	--	--	--	--			
		Beryllium	--	--	--	--	--	--	--	--	--				
		Cadmium	--	--	--	--	--	--	--	--	--				
		Cobalt	--	--	--	--	--	--	--	--	--				
		Manganese	--	--	--	--	--	--	--	--	--				
		Molybdenum	--	--	--	--	--	--	--	--	--				
		Nickel	--	--	--	--	--	--	--	--	--				
		Selenium	--	--	--	--	--	--	--	--	--				
		Vanadium	--	--	--	--	--	--	--	--	--				
		Uranium	--	--	--	--	--	--	--	--	--				
		Chloroform	--	--	--	--	--	--	--	--	0.0040	0.0040			
		Chemical Total										0.0040			
		Uranium-234	--	--	--	--	--	--	--	--	--	--			
		Uranium-235+D	--	--	--	--	--	--	--	--	--	--			
		Uranium-238+D	--	--	--	--	--	--	--	--	--	--			
		Radium-226+D	--	--	--	--	--	--	--	--	--	--			
Radium-228+D	--	--	--	--	--	--	--	--	--	--					
Thorium-230	--	--	--	--	--	--	--	--	--	--					
Lead-210+D	--	--	--	--	--	--	--	--	--	--					
Radionuclide Total	--	--	--	--	--	--	--	--	--	--					
Exposure Point Total												0.0040			
Exposure Medium Total												0.0040			
Medium Total												236			
Receptor Total				Receptor Risk Total				--	Receptor HI Total				236		

Total Skin HI Across All Media =	88.4
Total Thyroid HI Across All Media =	94.2
Total Central Nervous System HI Across All Media =	36.3
Total Kidney HI Across All Media =	11.5
Total Liver HI Across All Media =	0.026
Total Gastrointestinal HI Across All Media =	1.3
Total Reduced Body and Organ Weights HI Across All Media =	1.6
Total Hair Cystine (Metabolic System) HI Across All Media =	2.3

TABLE 9.9.RME  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
UNC Church Rock Mill and Tailings Site

Scenario Timeframe: Future  
Receptor Population: Resident  
Receptor Age: Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient						
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total		
Groundwater Zone 3	Groundwater	Tapwater	Aluminum	--	--	--	--	--	--	--	--	--	--	--	
			Arsenic	9.2E-03	--	5.3E-05	--	9.3E-03	--	--	--	--	--	--	--
			Beryllium	--	--	--	--	--	--	--	--	--	--	--	--
			Cadmium	--	--	--	--	--	--	--	--	--	--	--	--
			Cobalt	--	--	--	--	--	--	--	--	--	--	--	--
			Manganese	--	--	--	--	--	--	--	--	--	--	--	--
			Molybdenum	--	--	--	--	--	--	--	--	--	--	--	--
			Nickel	--	--	--	--	--	--	--	--	--	--	--	--
			Selenium	--	--	--	--	--	--	--	--	--	--	--	--
			Vanadium	--	--	--	--	--	--	--	--	--	--	--	--
			Uranium	--	--	--	--	--	--	--	--	--	--	--	--
			Chloroform	1.5E-06	--	1.3E-07	--	1.6E-06	--	--	--	--	--	--	--
			Chemical Total	9.2E-03	--	5.3E-05	--	9.3E-03	--	--	--	--	--	--	--
			Uranium-234	2.0E-05	--	--	--	2.0E-05	--	--	--	--	--	--	--
	Uranium-235+D	9.1E-07	--	--	--	9.1E-07	--	--	--	--	--	--	--		
	Uranium-238+D	2.4E-05	--	--	--	2.4E-05	--	--	--	--	--	--	--		
	Radium-226+D	8.1E-05	--	--	--	8.1E-05	--	--	--	--	--	--	--		
	Radium-228+D	3.5E-04	--	--	--	3.5E-04	--	--	--	--	--	--	--		
	Thorium-230	4.5E-07	--	--	--	4.5E-07	--	--	--	--	--	--	--		
	Lead-210+D	5.5E-05	--	--	--	5.5E-05	--	--	--	--	--	--	--		
	Radionuclide Total	5.3E-04	--	--	--	5.3E-04	--	--	--	--	--	--	--		
	Exposure Point Total					9.8E-03							--		
	Exposure Medium Total					9.8E-03							--		
	Air	Water Vapors from Showerhead	Aluminum	--	--	--	--	--	--	--	--	--	--	--	
			Arsenic	--	--	--	--	--	--	--	--	--	--	--	
			Beryllium	--	--	--	--	--	--	--	--	--	--	--	
			Cadmium	--	--	--	--	--	--	--	--	--	--	--	
Cobalt			--	--	--	--	--	--	--	--	--	--	--		
Manganese			--	--	--	--	--	--	--	--	--	--	--		
Molybdenum			--	--	--	--	--	--	--	--	--	--	--		
Nickel			--	--	--	--	--	--	--	--	--	--	--		
Selenium			--	--	--	--	--	--	--	--	--	--	--		
Vanadium			--	--	--	--	--	--	--	--	--	--	--		
Uranium			--	--	--	--	--	--	--	--	--	--	--		
Chloroform			--	2.0E-06	--	--	2.0E-06	--	--	--	--	--	--		
Chemical Total							2.0E-06						--		
Uranium-234	--	--	--	--	--	--	--	--	--	--	--				
Uranium-235+D	--	--	--	--	--	--	--	--	--	--	--				
Uranium-238+D	--	--	--	--	--	--	--	--	--	--	--				
Radium-226+D	--	1.2E-02	--	--	1.2E-02	--	--	--	--	--	--				
Radium-228+D	--	--	--	--	--	--	--	--	--	--	--				
Thorium-230	--	--	--	--	--	--	--	--	--	--	--				
Lead-210+D	--	--	--	--	--	--	--	--	--	--	--				
Radionuclide Total	--	--	--	--	1.2E-02	--	--	--	--	--	--				
Exposure Point Total					1.2E-02						--				
Exposure Medium Total					1.2E-02						--				
Medium Total					2.2E-02						--				
Receptor Total					2.2E-02						--				
					Receptor Risk Total						Receptor HI Total	--			



TABLE 10.1.RME  
RISK ASSESSMENT SUMMARY - NON-CANCER HAZARDS  
REASONABLE MAXIMUM EXPOSURE  
UNC Church Rock Mill and Tailings Site

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater SW Alluvium	Groundwater	Tapwater	Cobalt	--	--	--	--	--	Thyroid	0.91	--	0.005	0.92
			Manganese	--	--	--	--	--	Central nervous system	3.20	--	0.42	3.6
			Uranium	--	--	--	--	--	Kidney	1.17	--	0.006	1.2
			Chemical Total	--	--	--	--	--		5.3	--	0.43	5.7
		Exposure Point Total					--						5.7
	Exposure Medium Total					--						5.7	
Medium Total													5.7
Receptor Total				Receptor Risk Total				--	Receptor HI Total				5.7

Total Thyroid HI Across All Media =	0.92
Total Central Nervous System HI Across All Media =	3.6
Total Kidney HI Across All Media =	1.2

TABLE 10.2.RME  
RISK ASSESSMENT SUMMARY - NON-CANCER HAZARDS  
REASONABLE MAXIMUM EXPOSURE  
UNC Church Rock Mill and Tailings Site

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient						
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total		
Groundwater SW Alluvium	Groundwater	Tapwater	Cobalt	--	--	--	--	--	Thyroid	2.1	--	0.014	2.1		
			Manganese	--	--	--	--	--	Central nervous system	7.5	--	1.2	8.7		
			Uranium	--	--	--	--	--	Kidney	2.7	--	0.018	2.7		
			Chemical Total	--	--	--	--	--		12.3	--	1.3	13.6		
		Exposure Point Total						--						13.6	
Exposure Medium Total													13.6		
Medium Total														13.6	
Receptor Total				Receptor Risk Total					--	Receptor HI Total					13.6

Total Thyroid HI Across All Media =	2.1
Total Central Nervous System HI Across All Media =	8.7
Total Kidney HI Across All Media =	2.7

TABLE 10.3.RME  
RISK ASSESSMENT SUMMARY - CANCER RISKS  
REASONABLE MAXIMUM EXPOSURE  
UNC Church Rock Mill and Tailings Site

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient						
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total		
Groundwater SW Alluvium	Groundwater	Tapwater	Arsenic	5.7E-05	--	3.3E-07	--	5.8E-05	--	--	--	--	--		
			Chloroform	1.6E-06	--	1.4E-07	--	1.7E-06	--	--	--	--	--		
			Chemical Total	5.9E-05	--	4.7E-07	--	5.9E-05	--	--	--	--	--		
			Uranium-234	5.8E-05	--	--	--	5.8E-05	--	--	--	--	--		
			Uranium-235+D	2.7E-06	--	--	--	2.7E-06	--	--	--	--	--		
			Uranium-238+D	7.0E-05	--	--	--	7.0E-05	--	--	--	--	--		
			Radium-226+D	1.9E-06	--	--	--	1.9E-06	--	--	--	--	--		
			Radium-228+D	1.7E-05	--	--	--	1.7E-05	--	--	--	--	--		
			Radionuclide Total	1.5E-04	--	--	--	1.5E-04	--	--	--	--	--		
			Exposure Point Total						2.1E-04					--	
	Exposure Medium Total							2.1E-04					--		
			Water Vapors from Showerhead	Chloroform	--	2.1E-06	--	--	2.1E-06	--	--	--	--	--	
				Chemical Total		2.1E-06			2.1E-06	--	--	--	--	--	
				Radium-226+D	--	2.9E-04	--	--	2.9E-04	--	--	--	--	--	
				Radionuclide Total	--	2.9E-04	--	--	2.9E-04	--	--	--	--	--	
				Exposure Point Total						2.9E-04					--
	Exposure Medium Total							2.9E-04					--		
	Medium Total									5.0E-04					--
	Receptor Total				Receptor Risk Total					5.0E-04	Receptor HI Total				--

TABLE 10.4.RME  
RISK ASSESSMENT SUMMARY - NON-CANCER HAZARDS  
REASONABLE MAXIMUM EXPOSURE  
UNC Church Rock Mill and Tailings Site

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater Zone 1	Groundwater	Tapwater	Cobalt	--	--	--	--	--	Thyroid	5.1	--	0.03	5.1
			Manganese	--	--	--	--	--	Central nervous system	2.2	--	0.3	2.5
			Vanadium	--	--	--	--	--	Decreased hair cystine	1.1	--	0.006	1.1
			Chemical Total	--	--	--	--	--		8.4	--	0.32	8.7
		Exposure Point Total					--						8.7
	Exposure Medium Total					--						8.7	
Medium Total													8.7
Receptor Total				Receptor Risk Total				--	Receptor HI Total				8.7

Total Thyroid HI Across All Media =	5.1
Total Central Nervous System HI Across All Media =	2.5
Decreased Hair Cystine (Metabolic System) HI Across All Media =	1.1

TABLE 10.5.RME  
RISK ASSESSMENT SUMMARY - NON-CANCER HAZARDS  
REASONABLE MAXIMUM EXPOSURE  
UNC Church Rock Mill and Tailings Site

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater Zone 1	Groundwater	Tapwater	Cobalt	--	--	--	--	--	Thyroid	11.9	--	0.078	11.9
			Manganese	--	--	--	--	--	Central nervous system	5.2	--	0.86	6.1
			Vanadium	--	--	--	--	--	Decreased hair cystine	2.6	--	0.017	2.6
			Chemical Total	--	--	--	--	--		19.6	--	0.95	20.6
		Exposure Point Total				--							20.6
	Exposure Medium Total					--						20.6	
Medium Total												20.6	
Receptor Total						Receptor Risk Total	--				Receptor HI Total	20.6	

Total Thyroid HI Across All Media =	11.9
Total Central Nervous System HI Across All Media =	6.1
Decreased Hair Cystine (Metabolic System) HI Across All Media =	2.6

TABLE 10.6.RME  
RISK ASSESSMENT SUMMARY - CANCER RISKS  
REASONABLE MAXIMUM EXPOSURE  
UNC Church Rock Mill and Tailings Site

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient						
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total		
Groundwater Zone 1	Groundwater	Tapwater	Arsenic	3.2E-05	--	1.9E-07	--	3.3E-05	--	--	--	--	--		
			Chemical Total	3.2E-05	--	1.9E-07	--	3.3E-05	--	--	--	--	--		
			Radium-226+D	8.8E-06	--	--	--	8.8E-06	--	--	--	--	--		
			Radium-228+D	4.1E-05	--	--	--	4.1E-05	--	--	--	--	--		
			Thorium-230	1.1E-06	--	--	--	1.1E-06	--	--	--	--	--		
			Radionuclide Total	5.1E-05	--	--	--	5.1E-05	--	--	--	--	--		
	Exposure Point Total								8.4E-05				--		
	Exposure Medium Total								8.4E-05				--		
	Air	Water Vapors from Domestic Use	Radium-226+D	--	1.3E-03	--	--	1.3E-03	--	--	--	--	--		
			Radionuclide Total	--	1.3E-03	--	--	1.3E-03	--	--	--	--	--		
			Exposure Point Total								1.3E-03				--
			Exposure Medium Total								1.3E-03				--
	Medium Total								1.4E-03				--		
	Receptor Total			Receptor Risk Total					1.4E-03	Receptor HI Total			--		

TABLE 10.7.RME  
RISK ASSESSMENT SUMMARY - NON-CANCER HAZARDS  
REASONABLE MAXIMUM EXPOSURE  
UNC Church Rock Mill and Tailings Site

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater Zone 3	Groundwater	Tapwater	Aluminum	--	--	--	--	--	Central nervous system	1.1	--	0.0056	1.1
			Arsenic	--	--	--	--	--	Skin	37.6	--	0.20	37.8
			Beryllium	--	--	--	--	--	Gastrointestinal	0.28	--	0.21	0.48
			Cadmium	--	--	--	--	--	Kidney	0.41	--	0.04	0.45
			Cobalt	--	--	--	--	--	Thyroid	40.1	--	0.21	40.3
			Manganese	--	--	--	--	--	Central nervous system	12.4	--	1.6	14.1
			Molybdenum	--	--	--	--	--	Increased uric acid (kidney)	4.0	--	0.021	4.1
			Nickel	--	--	--	--	--	Reduced organ and body weights	0.67	--	0.017	0.69
			Vanadium	--	--	--	--	--	Decreased hair cystine	1.0	--	0.0051	1.0
			Uranium	--	--	--	--	--	Kidney	0.39	--	0.0021	0.40
			Chemical Total			--	--	--	--	--	98	--	2.33
Exposure Point Total								--				100	
Exposure Medium Total								--				100	
Medium Total												100	
Receptor Total			Receptor Risk Total					--	Receptor HI Total			100	

Total Skin HI Across All Media =	37.8
Total Thyroid HI Across All Media =	40.3
Total Central Nervous System HI Across All Media =	15.1
Total Kidney HI Across All Media =	4.9
Total Gastrointestinal HI Across All Media =	0.48
Total Reduced Body and Organ Weights HI Across All Media =	0.69
Decreased Hair Cystine (Metabolic System) HI Across All Media =	1.0

TABLE 10.8.RME  
RISK ASSESSMENT SUMMARY - NON-CANCER HAZARDS  
REASONABLE MAXIMUM EXPOSURE  
UNC Church Rock Mill and Tailings Site

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater Zone 3	Groundwater	Tapwater	Aluminum	--	--	--	--	--	Central nervous system	2.5	--	0.017	2.5
			Arsenic	--	--	--	--	--	Skin	87.8	--	0.58	88.4
			Beryllium	--	--	--	--	--	Gastrointestinal	0.65	--	0.61	1.3
			Cadmium	--	--	--	--	--	Kidney	1.0	--	0.13	1.1
			Cobalt	--	--	--	--	--	Thyroid	93.5	--	0.6	94.2
			Manganese	--	--	--	--	--	Central nervous system	29.0	--	4.8	33.8
			Molybdenum	--	--	--	--	--	Increased uric acid (kidney)	9.4	--	0.062	9.5
			Nickel	--	--	--	--	--	Reduced organ and body weights	1.6	--	0.052	1.6
			Vanadium	--	--	--	--	--	Decreased hair cystine	2.3	--	0.015	2.3
			Uranium	--	--	--	--	--	Kidney	0.9	--	0.0061	0.92
			Chemical Total	--	--	--	--	--		228.7	--	6.9	236
Exposure Point Total													
Exposure Medium Total													
Medium Total													
Receptor Total			Receptor Risk Total					Receptor HI Total					

Total Skin HI Across All Media =	88.4
Total Thyroid HI Across All Media =	94.2
Total Central Nervous System HI Across All Media =	36.3
Total Kidney HI Across All Media =	11.5
Total Gastrointestinal HI Across All Media =	1.3
Total Reduced Body and Organ Weights HI Across All Media =	1.6
Decreased Hair Cystine (Metabolic System) HI Across All Media =	2.3



TABLE 10.9.RME  
RISK ASSESSMENT SUMMARY - CANCER RISKS  
REASONABLE MAXIMUM EXPOSURE  
UNC Church Rock Mill and Tailings Site

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater Zone 3	Groundwater	Tapwater	Arsenic	9.2E-03	--	5.3E-05	--	9.3E-03	--	--	--	--	--
			Chloroform	1.5E-06	--	1.3E-07	--	1.6E-06	--	--	--	--	--
			Chemical Total	9.2E-03	--	5.3E-05	--	9.3E-03	--	--	--	--	--
			Uranium-234	2.0E-05	--	--	--	2.0E-05	--	--	--	--	--
			Uranium-238+D	2.4E-05	--	--	--	2.4E-05	--	--	--	--	--
			Radium-226+D	8.1E-05	--	--	--	8.1E-05	--	--	--	--	--
			Radium-228+D	3.5E-04	--	--	--	3.5E-04	--	--	--	--	--
			Lead-210+D	5.5E-05	--	--	--	5.5E-05	--	--	--	--	--
	Radionuclide Total	5.3E-04	--	--	--	5.3E-04	--	--	--	--	--		
	Exposure Point Total						9.8E-03					--	
	Exposure Medium Total						9.8E-03					--	
	Air	Water Vapors from Showerhead	Chloroform	--	2.0E-06	--	--	2.0E-06	--	--	--	--	--
			Chemical Total	--	2.0E-06	--	--	2.0E-06	--	--	--	--	--
			Radium-226+D	--	1.2E-02	--	--	1.2E-02	--	--	--	--	--
			Radionuclide Total	--	1.2E-02	--	--	1.2E-02	--	--	--	--	--
Exposure Point Total							1.2E-02					--	
Exposure Medium Total						1.2E-02					--		
Medium Total								2.2E-02				--	
Receptor Total								Receptor Risk Total	2.2E-02			Receptor HI Total	--