

**Attachment C-7**  
**PHREEQC Input and Output Files**

PHREEQC input, output and selected output files are provided electronically for equilibrium modeling of monitoring ring well groundwater samples and production zone groundwater samples (Table C7.-1). Electronic copies of the PHREEQC input, output and selected output files are also provided for the one-dimensional reactive transport calculations (Tables C.7-2 through C.7-7).

Table C.7-1. PHREEQC input, output and selected output files for equilibrium modeling of production zone groundwater and monitoring ring well groundwater

Groundwater	File Name	File Type	Description
Upgradient baseline monitoring ring wells	MU1UpgradientBaseline.inp	input	Well M-13 through M-21, groundwater data from December 1996
	MU1UpgradientBaseline.out	output	
	MU1UpgradientBaseline_sel.out	selected output	
Production zone	BWells_FeOHam.inp	input	Wells B-1 through B-19, groundwater data from March 2015 to March 2016
	BWells_FeOHam.out	output	
	BWells_sel_FeOHa.out	selected output	
Upgradient, downgradient and cross-gradient monitoring ring wells	MU1MonitorWells2015.inp	input	Wells M-2 through M-5, M-7 through M-10 and M-20 through M-24; groundwater data from July 2015
	MU1MonitorWells2015.out	output	
	MU1MonitorWells2015_sel.out	selected output	

Table C.7-2. PHREEQC input, output and selected output files for one-dimensional reactive transport along Flow Path A  
(M-21 → B-3 → B-2 → B-1 → M-2 → POE A)

Description	Initial Production Zone Concentrations	File Name	File Type	Cell size (m)
Baseline calculations	March 2016 data	PathA_Transport.inp	input	2.5
		PathA_Transport.out	output	
		PathA_Transport_sel.out	selected output	
Increased initial production zone concentrations	March 2016 data with increased initial concentrations of arsenic (0.1 mg/L), radium-226 (2,000 pCi/L), selenium (0.2 mg/L) and uranium (10 mg/L)	PathA_Transport2.inp	input	2.5
		PathA_Transport2.out	output	
		PathA_Transport2_sel.out	selected output	
Eliminate barite-RaSO <sub>4</sub> solid solution precipitation	March 2016 data	PathA_Transport3.inp	input	2.5
		PathA_Transport3.out	output	
		PathA_Transport3_sel.out	selected output	
Lower (median Step III extraction) downgradient goethite concentration	March 2016 data	PathA_Transport4.inp	input	2.5
		PathA_Transport4.out	output	
		PathA_Transport4_sel.out	selected output	
Lower CEC (minimum from Step I extractions) in production zone and downgradient sediments	March 2016 data	PathA_Transport5.inp	input	2.5
		PathA_Transport5.out	output	
		PathA_Transport5_sel.out	selected output	
Increased (factor of 2) groundwater flow rate	March 2016 data	PathA_2_Transport.inp	input	1.0
		PathA_2_Transport.out	output	
		PathA_2_Transport2_sel.out	selected output	

Table C.7-3. PHREEQC input, output and selected output files for one-dimensional reactive transport along Flow Path B  
(M-20 → B-4 → B-5 → M-2/M-3 → POE B)

Description	Initial Production Zone Concentrations	File Name	File Type	Cell size (m)
Baseline calculations	March 2016 data	PathB_Transport.inp	input	2.5
		PathB_Transport.out	output	
		PathB_Transport_sel.out	selected output	
Increased initial production zone concentrations	March 2016 data with increased initial concentrations of arsenic (0.1 mg/L), radium-226 (2,000 pCi/L), selenium (0.2 mg/L) and uranium (10 mg/L)	PathB_Transport2.inp	input	2.5
		PathB_Transport2.out	output	
		PathB_Transport2_sel.out	selected output	
Increased initial pH in well B-4	March 2016 data with initial pH in well B-4 increased to 6.5	PathB_Transport3.inp	input	2.5
		PathB_Transport3.out	output	
		PathB_Transport3_sel.out	selected output	
	March 2016 data with initial pH in well B-4 increased to 6.7	PathB_Transport4.inp	input	2.5
		PathB_Transport4.out	output	
		PathB_Transport4_sel.out	selected output	
	March 2016 data with initial pH in well B-4 increased to 7.0	PathB_Transport5.inp	input	2.5
		PathB_Transport5.out	output	
		PathB_Transport5_sel.out	selected output	

Table C.7-4. PHREEQC input, output and selected output files for one-dimensional reactive transport along Flow Path C  
(M-16/M-17 → B-10 → M-5 → POE C)

Description	Initial Production Zone Concentrations	File Name	File Type	Cell size (m)
Baseline calculations	March 2016 data	PathC_Transport2.inp	input	2.5
		PathC_Transport2.out	output	
		PathC_Transport_sel2.out	selected output	
Increased initial production zone concentrations	March 2016 data with increased initial concentrations of arsenic (0.1 mg/L), radium-226 (2,000 pCi/L), selenium (0.2 mg/L) and uranium (10 mg/L)	PathC_Transport3.inp	input	2.5
		PathC_Transport3.out	output	
		PathC_Transport3_sel.out	selected output	

Table C.7-5. PHREEQC input, output and selected output files for one-dimensional reactive transport along Flow Path D  
(M-15 → B-18 → B-12 → M-7/M-8 → POE D)

Description	Initial Production Zone Concentrations	File Name	File Type	Cell size (m)
Baseline calculations	March 2016 data	PathD_1_Transport.inp	input	1
		PathD_1_Transport.out	output	
		PathD_1_Transport_sel.out	selected output	
Increased initial production zone concentrations	March 2016 data with increased initial concentrations of arsenic (0.1 mg/L), radium-226 (2,000 pCi/L), selenium (0.2 mg/L) and uranium (10 mg/L)	PathD_2_Transport.inp	input	1
		PathD_2_Transport.out	output	
		PathD_2_Transport_sel.out	selected output	

Table C.7-6. PHREEQC input, output and selected output files for one-dimensional reactive transport along Flow Path E  
(M-14 → B-13 → B-12 → M-8 → POE E)

Description	Initial Production Zone Concentrations	File Name	File Type	Cell size (m)
Baseline calculations	March 2016 data	PathE_1_Transport.inp	input	1.5
		PathE_1_Transport.out	output	
		PathE_1_Transport_sel.out	selected output	
Increased initial production zone concentrations	March 2016 data with increased initial concentrations of arsenic (0.1 mg/L), radium-226 (2,000 pCi/L), selenium (0.2 mg/L) and uranium (10 mg/L)	PathE_2_Transport.inp	input	1.5
		PathE_2_Transport.out	output	
		PathE_2_Transport_sel.out	selected output	

Table C.7-7. PHREEQC input, output and selected output files for one-dimensional reactive transport along Flow Path F  
(M-13 → B-14 → M-9 → POE F)

Description	Initial Production Zone Concentrations	File Name	File Type	Cell size (m)
Baseline calculations	March 2016 data	PathF_Transport.inp	input	2.5
		PathF_Transport.out	output	
		PathF_Transport_sel.out	selected output	
Increased initial production zone concentrations	March 2016 data with increased initial concentrations of arsenic (0.1 mg/L), radium-226 (2,000 pCi/L), selenium (0.2 mg/L) and uranium (10 mg/L)	PathF_Transport2.inp	input	2.5
		PathF_Transport2.out	output	
		PathF_Transport2_sel.out	selected output	