

Nonradiological Impacts of Facility Accidents

At the PDC Project, hazardous chemicals are primarily present in two areas, the Chemical Storage and Distribution System and the HVAC Chilled Water System. The chemicals in the Chemical Storage and Distribution System are used in the HEU electro-decontamination process. Chemicals in the HVAC Chilled Water System are used as corrosion inhibitors or as biocides. Table 3-14 lists the chemicals that would be used for the PDC Project, along with expected amounts that would be supplied in a single delivery and their physical form. These chemicals would be diluted for use, so the hazards associated with the chemicals were evaluated in the amount and form as they are delivered.

The chemical quantities are considered greater than amounts “easily and safely manipulated by one person” and were further evaluated by assuming that there would be a spill of the chemical. The chemicals listed in Table 3-14 are not volatile at room temperatures and have low vapor pressures. Therefore, releases were estimated using the bounding airborne release fractions (ARF) for less than 3-m free-fall spills of aqueous liquids or powders from DOE Handbook (HDBK) 3010-94 for airborne releases (DOE 2000).

The ARF used for less than 3-m free-fall spills of aqueous liquids is $2.0E-4$ (page 3-4, DOE-HDBK-3010-94). The ARF used for less than 3-m free-fall spills of powders is $2.0E-3$ (page 4-9, DOE-HDBK-3010-94). In both cases, the RF was assumed to be 1.0, to account for the ability of some chemicals to act externally without being inhaled. In addition, the damage ratio (DR) and leak path factor (LPF) for the spills were assumed to be 1.0.

Exposures to these chemicals were estimated using a ground-level release and a 15-minute averaging time based on DOE-STD-1189 Appendix B for the collocated worker, located 100 m from the spill, and the MOI at the site boundary, located 8.9 km from K-Area. For the collocated worker, exposures were based on a X/Q of $3.5E-3$ s/m³ from DOE-STD-1189, Appendix A (DOE 2008). For the MOI, exposures were based on a X/Q of $1.73E-6$ s/m³, which was the 95th percentile X/Q for 15-minute ground-level releases of plutonium estimated using the MACCS2 Version 1.13.1 computer code (Calculation 47-CLC-25.03-004, URS 2010). To estimate the consequences of potential exposures, the atmospheric concentrations estimated for the MOI and the collocated worker were compared to Protective Action Criteria-2 (PAC-2) and Protective Action Criteria-3 (PAC-3) values, respectively.^{1 2}

Table 3-15 lists the results of the chemical screening analysis. All chemicals were found to be below their respective PAC-2 limits for the MOI, and PAC-3 limits for the collocated worker. Therefore,

¹ The source for the PAC-2 and PAC-3 values was Protective Action Criteria (PAC) with AEGLs, ERPGs, & TEELs: Rev. 26 for Chemicals of Concern (09/2010), U.S. Department of Energy Subcommittee on Consequence Assessment and Protective Actions (SCAPA), <http://www.atlant.com/DOE/teels/teel.html>.

² The order of preference for determining a PAC-2 value is AEGL-2/ERPG-2/TEEL-2. For determining a PAC-3 value, the order of preference is AEGL-3/ERPG-3/TEEL-3. The AEGL-2 and AEGL-3 values are for a 60 minute exposure period.

chemical inventories do not require further analysis. Although the chemical quantities do not require further analysis, the PDC Project will follow the General Duty Clause (see Section 654 of Title 29 of the United States Code).

Table 3-14.
Chemicals Used in the Chemical Storage and Distribution System and the HVAC Chilled Water System

Chemical	Formula	CAS Registry No.	Amount Per Delivery
Sodium Hydroxide (25 weight percent)	NaOH	1310-73-2	55 gallons
Sulfuric Acid (95 weight percent)	H ₂ SO ₄	7664-93-9	55 gallons
Sodium Sulfate (0.4 M)	Na ₂ SO ₄	7757-82-6	55 gallons
Bleach (30 weight percent)	NaOCl	7681-52-9	55 gallons
Tolyltriazole (solid)	C ₇ H ₇ N ₃	29385-43-1	50 lbs.

Table 3-15.
Results of Chemical Screening Analysis

Chemical	Offsite Concentration (mg/m ³)	PAC-2 Concentration (mg/m ³)	100 m Concentration (mg/m ³)	PAC-3 Concentration (mg/m ³)
Sodium hydroxide	2.9E-5	5	5.9E-2	50
Sulfuric acid	1.4E-4	8.7	2.8E-1	160
Sodium sulfate	6.9E-6	500	1.4E-2	500
Bleach	1.5E-5	50	3.1E-2	500
Tolyltriazole	8.7E-5	60	1.8E-1	300

The source for the PAC-2 and PAC-3 values was Protective Action Criteria (PAC) with AEGLs, ERPGs, & TEELs: Rev. 26 for Chemicals of Concern (09/2010), U.S. Department of Energy Subcommittee on Consequence Assessment and Protective Actions (SCAPA), <http://www.atintl.com/DOE/teels/teel.html>.