ATTACHMENT 3

WASTE CHARACTERISTICS and WASTE ANALYSIS PLAN

Attachment 3is divided into three sections and is organized as follows:

- 3-1 describes the chemical and physical characteristics of hazardous wastes stored at Pueblo Chemical Depot (PCD) Resource Conservation and Recovery Act (RCRA) permitted hazardous waste management units

- 3-2 is the Waste Analysis Plan (WAP), outlining parameters for sampling, analysis, and evaluation to ensure safe and proper management of hazardous wastes

- 3-3 discusses waste requirements pertaining to Land Disposal Restrictions (LDRs).

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3-1 CHEMICAL AND PHYSICAL ANALYSES [6 CCR 1007-3 § 100.41(a)(2) and § 264.13(a)]

PCD operates six permitted hazardous waste storage units. When non-agent wastes and/or newly generated agent wastes such as agent contaminated PPE are generated, they may be stored in satellite accumulation areas (SAAs) and/or less than 90-day hazardous waste storage areas in accordance with 6 CCR 1007-3, Section 262.34 before they are transferred to a permitted hazardous waste storage unit or to a permitted treatment, storage, and disposal facility. Chemical munitions, including their associated packaging and propellants, stored in the 94 interim status hazardous waste igloos that may leak are not newly generated wastes and must be overpacked and transferred directly to a permitted hazardous waste storage unit on-site. Hazardous wastes may not be moved to SAAs or 90-day areas once they are moved into a permitted storage unit. Wastes stored at PCD permitted hazardous waste management units include, but are not limited to, the following:

- Waste chemical agent distilled sulfur mustard (HD) and mustard-T mixture (HT) munitions that may contain explosives or propellants
- Agent contaminated secondary wastes (miscellaneous solid and liquid wastes as a result of support, maintenance, and cleanup activities such as used personal protective equipment [PPE], wooden pallets, crates, metal straps, plastic sheeting, etc.)
- PCD Toxic Chemical Laboratory and PCD Analytical Laboratory solid waste
- PCD Toxic Chemical Laboratory and PCD Analytical Laboratory liquid waste
- Spent Agent Decontamination Solution (Hypochlorite solution)
- Contaminated soils and groundwater
- Nonagent-related laboratory waste
- Waste chemicals from chemical analysis
- Facility and vehicle maintenance waste.

Specific agent-related and nonagent-related wastes that may be stored in PCD RCRA-permitted hazardous waste management units include:

- *Permitted Storage Igloos G203, G1009, G1107, G1109, and G1110 (mustard agent-related waste storage).* Leaking 105mm projectiles, 155mm projectiles, and 4.2-inch mortars are stored in overpacks within Igloos G203, G1009, G1107, G1109, and G1110. Agent-contaminated material, including PPE, dunnage, and contaminated pallets, are stored in Igloo G1110.

- *Building 540 (Container Storage Area).* Building 540 is used to store non agent-related hazardous wastes until they can be transferred to an approved treatment, storage, or disposal facility.

PCD RCRA-permitted hazardous waste management units G203, G1009, G1107, G1109, G1110, and Building 540 are depicted in Figure 1-1-2. Temporary waste storage areas (less than 90-day and satellite accumulation areas) are discussed in Attachment 1 to this Permit.

Table 3-1-1[1] presents the physical and chemical properties of the mustard agents.

Table 3-1-2 identifies the wastes stored at PCD hazardous waste management units along with origin, the appropriate U.S. Environmental Protection Agency (USEPA) waste code number, basis for hazardous waste designation, and disposition.

Table 3-1-3 presents a general description of the chemical-fill munitions that are stored in the PCD hazardous waste management units.

The following paragraphs describe the characteristics of the waste streams and source of generation. See Table 3-1-2 for USEPA Waste Codes; Basis for Designation; and Disposition of Waste Material. The waste streams are grouped into the following categories:

- Agent-related waste
- Non agent-related waste

[1] All tables are located at the end of this section.

- Facility maintenance waste
- Vehicle maintenance waste.

3-1a Agent-Related Waste

Agent-related wastes consist of leaking mustard-filled munitions and energetics, wastes generated during management of leaking munitions, waste agent contained in Department of Transportation (DOT) bottles, normal laboratory activities, and material that has come in physical contact with leaking munitions, such as PPE, metal, wood, decontamination solutions, emergency shower water, and contaminated equipment. Diagrams of the waste munitions stored at PCD hazardous waste management units are depicted in **Attachment 3-1**.

3-1a(1) Leaking Munitions

Chemical Fill. Chemical agents HD and HT are liquid at room temperature and exhibit the characteristic of reactivity . HD or HT may exhibit the characteristic of corrosivity but analytical sampling and testing of the agents, including tests to determine whether or not the agents are a free liquid, have not been completed. HD and HT can exhibit certain characteristics of toxicity because they contain concentrations of other inorganic and organic hazardous waste constitutents. The concentrations of inorganic and organic hazardous waste constituents in the mustard agents vary and have generally not been defined or quanitifed by PCD. Agent wastes containing mustard analytical standards carry the P-listings for HD and HT as P909 or P910 respectively. Waste chemical weapons containing manufactured mustard agent and the residues resulting from treatment of waste chemical weapons carry the Colorado K901hazardous waste listing. Any soil, water, debris, or containers contaminated through contact with waste chemical weapons, including mustard agent, carry the Colorado K902 hazardous waste listing. Decomposition and manufacturing by-products associated with the mustard agent are shown in **Table 3-1-4**.

Energetics. Energetics associated with a munition include fuzes and bursters that contain explosives and other components and propellants. All energetic wastes (fuzes, bursters and propellants) are classified as reactive and ignitable hazardous wastes. The energetic wastes are explosive or capable of causing fire through friction, or they contain Class 1.1 explosives or oxidizers as defined in 49 CFR § 173.127and therefore, carry the RCRA reactive and ignitable hazardous waste codes D003 and D001. Examples of explosives (found in bursters and supplementary charges) are tetryl and tetrytol, both Class 1.1 explosives (49 CFR 173.53). Tetrytol contains tetryl and trinitrotoluene (TNT).

Fuzes are composed of boosters, detonators, and other components. These components are classified as reactive hazardous wastes either because they are explosive or contain Class 1.1 explosives. They also are classified as a characteristic waste because they may contain lead from lead azide. The various energetics contained in waste munitions are classified as reactive (D003) because they are composed of or contain explosives. Waste energetic materials that are contaminated with mustard agent carry the reactive code as well as the associated toxicity characteristic (TC) metals, TC organics, and the appropriate K code. **Table 3-1-5** presents physical and chemical characteristics of explosives and **Table 3-1-6** presents the composition of reactive material in HD and HT munitions.

3-1a(2) Secondary Waste

The following agent-related waste streams are potentially generated at PCD during response to a leaking munition:

- Wood pallets, metal banding, bolts, and nails
- Plastic bags
- Liquid-exposed PPE such as suits, gloves, boots and tape
- Liquid-exposed PPE that cannot be laundered
- Decontamination solutions
- High efficiency particulate air (HEPA) filters and other activated carbon adsorption filters exposed to agent (1000 cfm mobile units and igloo front and rear vent filters)
- Mask filters potentially exposed to agent
- Sorbents and other spill cleanup materials
- Laboratory waste and sampling debris associated with leaking munitions such as glassware and gloves

- Miscellaneous debris including hoses, meters, rags, and cords

- Soil and sediment.

The K902 code is applied to waste streams contaminated with mustard agent. Refer to **Figures 3-1-1** and **3-1-2**[2] for decision trees of disposal methods for agent-contaminated PPE and debris.

Other hazardous waste codes such as corrosivity (D002), TC metals (D004-D011) and TC organics for the degradation products and manufacturing impurities of mustard may apply to the agent-related waste streams, depending on the situation and waste stream involved. PCD will make a hazardous waste determination on all solid wastes generated from the munitions stockpile operation in accordance with 6 CCR 1007-3, Section 262.11. The toxic organic and inorganic hazardous waste codes apply to all solid wastes contaminated with agent unless PCD demonstrates either through analytical testing or process knowledge that the wastes do not pose those characteristics. If process knowledge is used to exclude TC metal or organic hazardous waste codes from any secondary wastes contaminated with mustard agent then PCD will document specifically how such determinations were made given the fact that the concentrations of these constituents in the mustard are generally not known. In addition, laboratory wastes may be characterized as ignitable (D001) if solvents are present.

3-1a(3) DOT Bottles

DOT bottles containing mustard agent were generated from drill-and-transfer operations. Since DOT bottles do not contain mustard agent standard, hazardous waste code K901 is applied. Because the mustard agent came from the munition, D004-D011 codes will apply unless adequate analytical or historical data is provided to demonstrate otherwise. The toxicity codes associated with the degradation products and manufacturing impurities of mustard apply.

3-1a(4) PCD Toxic Chemical Laboratory Wastes

The following agent-related waste streams are generated at PCD's Toxic Chemical Laboratory:

- Off-specification mustard HD standard

[2] All figures are located at the end of this section.

- Waste vials containing mustard HD standards
- Broken glassware contaminated with mustard HD
- Decontamination solution contaminated with mustard HD
- Waste Depot Area Air Monitoring System (DAAMS) tubes contaminated with mustard HD
- Emergency shower water containing mustard HD.

Standards used at the laboratory are specifically mustard HD. The P909 or P910 codes are carried on laboratory waste that had contact with mustard HD standards.

Laboratory wastes may also meet the definition of ignitability (D001) due to the solvents (hexane and/or dichloromethane) used in the agent standards and extractions. The waste code D002 will be applied to laboratory waste that meets the definition of corrosivity.

The TC metals waste codes (D004-D011) are not carried on laboratory wastes generated during normal laboratory activities because the mustard agent being utilized is not in contact with the metal alloys associated with the munition casing. TC waste codes for mustard degradation products are not carried on laboratory wastes, as the mustard is utilized within a year and substantial degradation is not expected.

3-1a(5) Emergency Shower Water/Waste Decontamination Solution

In the event of a chemical incident involving agent, personnel at the incident scene may be injured and require medical attention at Building 5, Occupational Health Clinic. Personnel contaminated with liquid agent will be decontaminated in the field prior to receiving emergency care. An emergency shower is located at Building 5 and will be used to further decontaminate personnel if necessary. Used shower water is containerized in a sump and will be pumped into a container for appropriate management.

Shower water used to decontaminate personnel exposed to liquid agent is in contact with mustard. The K902 code is applied to waste streams contaminated with mustard agent. Toxicity Characteristic Leaching Procedure (TCLP) codes for degradation byproducts, TCLP codes for metals, and the

characteristic code for corrosivity may not need to be applied because concentrations in shower water may not exceed TCLP or pH thresholds. PCD will characterize any shower water wastes in accordance with 6 CCR 1007-3, Section 262.11.

Waste decontamination solutions are generated from decontamination activities related to munition storage. Waste agent decontamination solutions comprise hypochlorite or other caustic and generally will have waste codes K902 and D002. Other TCLP codes may apply depending on the quantity of agent involved in the decontamination activities. PCD will characterize any decontamination wastes in accordance with 6 CCR 1007-3, Section 262.11.

3-1b Non agent-Related Wastes

Non agent-related wastes are generated in the administrative and warehouse areas, and during environmental remediation activities and facility and vehicle maintenance. Nonagent-related waste streams include the following:

- Waste paint and thinners
- Wastes from the PCD Analytical Laboratory used to analyze explosives constituents (various solvents, acids, bases, and alcohols used for analyses)
- Waste solvents
- Waste batteries and battery acid
- Contaminated soils, sediment, or water from the remediation of Solid Waste Management Units (SWMUs)
- Used filters from the Interim Corrective Action Groundwater Remediation System (ICAGRS)
- Waste starter fluids
- Used non agent-contaminated PPE

- Universal wastes such as fluorescent bulbs

- Spent carbon from groundwater treatment systems.

3-1c Containerized Wastes [6 CCR 1007-3 § 100.41(b)(1)(ii)(A) and (b)(1)(IV) and § 264.172]

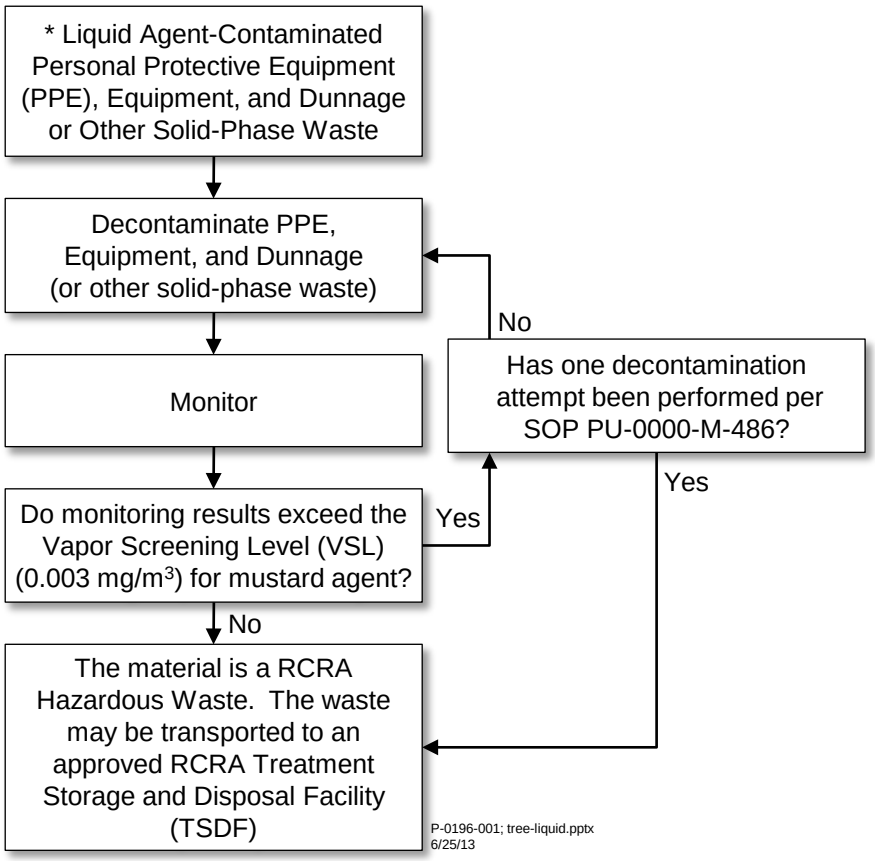
The six permitted hazardous waste storage units are G203, G1009, G1107, G1109, and G1110 for agent-related wastes, and Building 540 for non agent-related waste storage. Units G203, G1009, G1107, G1109, and G1110 are existing concrete-construction munition storage igloos comprising walls, floor, and ceiling that are used to store leaking chemical-agent filled munitions in overpacks pending treatment at a permitted treatment, storage, and disposal facility. Since leaking munitions are contained in overpacks, the overpack is considered the primary container for the munition contained within and provides containment protection. Both the munition casing and overpack are compatible with the material contained within. Overpacks comprise propellant charge cans and single round containers. The overpacked munitions are placed in modified pallets and stored atop secondary containment pallets inside G203, G1009, G1107, G1109, and G1110. G1110may also store agent-related PPE or dunnage contaminated from handling leaking munitions pending shipment to a permitted treatment, storage, and disposal facility.

Building 540 is comprised of four walls, floor, and ceiling that is used to store nonagent-related wastes generated in the administrative and warehouse areas, and during environmental remediation activities. These wastes may include waste paint and thinners; wastes from the onsite laboratory used to analyze explosives constituents; waste solvents; waste batteries and battery acid; contaminated soils, sediment, or water from the remediation of SWMUs, used filters from the ICAGRS, waste starter fluids, used non agent-contaminated PPE, universal wastes, and spent carbon from groundwater treatment systems.

All non agent-related wastes are stored in United Nations (UN)-rated containers compatible with the wastes contained as determined by references such as DOT requirements, container compatibility charts provided by container manufacturers, and information presented in 6 CCR 1007-3 § 264 Appendix V regarding incompatible materials. These wastes are stored at Building 540, the PCD RCRA-permitted, non agent-related hazardous waste management unit, pending transfer to a permitted hazardous waste treatment, storage, and disposal facility for further treatment and/or ultimate disposal.

Attachment 3-1 contains general data sheets and diagrams of the waste munitions that are stored at PCD hazardous agent-related waste management units.

All hazardous wastes in containers are managed in accordance with 6 CCR 1007-3 § 264 Subpart I regulations, including compatibility of waste with respective containers and secondary containment for containers storing waste with free liquids. For a more detailed description of container management practices, see Attachment 7.

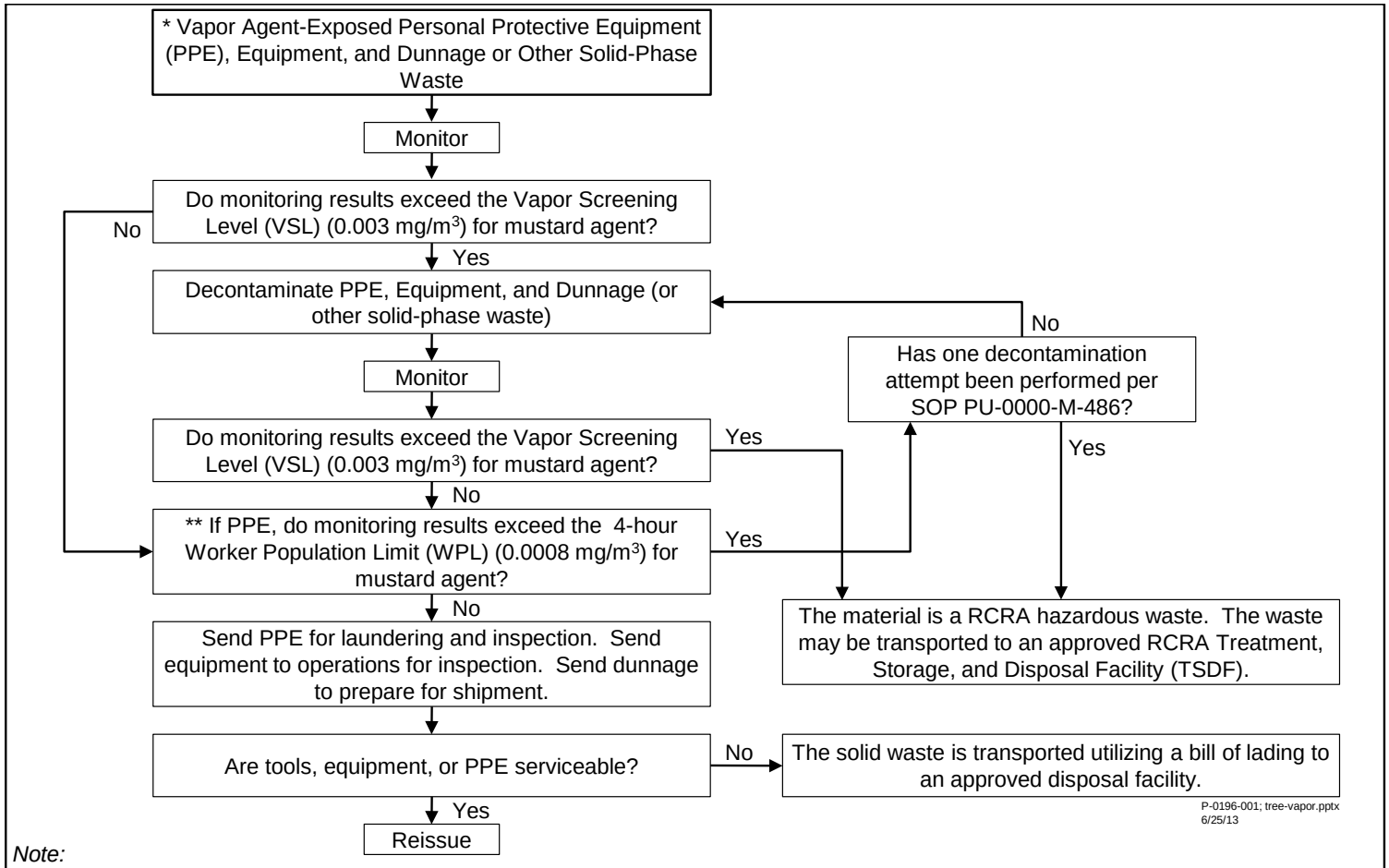


Note:

* *Although PCD presently has no plans to reuse decontaminated liquid-agent exposed materials, the Department of the Army can approve the reuse of such materials. PCD will pursue a permit modification if plans for reuse of these materials change.*

** *Decontamination procedures and monitoring are performed to reduce or eliminate safety concerns (i.e., to minimize or eliminate the amount of PPE that is worn).*

Figure C-1-1. Disposal Method Decision Tree for Liquid Agent-Contaminated PPE and Debris



Note:

* *Materials that are vapor exposed only are not considered to have been "in contact" with the original listed waste, and are therefore not covered by the RCRA "contained-in" policy. While such materials, when determined to be waste, are defined as RCRA solid waste, they are not RCRA hazardous waste unless they exhibit a RCRA characteristic. If vapor exposed waste exceeds the headspace limits, it is a hazardous waste. Materials that can be reissued are reusable and therefore not solid waste.*

** *For PPE only, in lieu of providing continuous near real-time monitoring and periodic WPL monitoring of the laundry facility, PPE that has been exposed to vapor above the Short-Term Exposure Limit (STEL) will be decontaminated and monitored to the 4-hour WPL prior to being sent to the laundry facility.*

Figure 3-1-2. Disposal Method Decision Tree for Vapor Agent-Exposed PPE and Debris

Table 3-1-1. Physical and Chemical Properties of Mustard Agents HD/HT

Chemical Name	Mustard Agent HD Diethyl, 2,2-dichloride sulfide [bis (2-Chloroethyl) sulfide]	Mustard Agent HT Bis-(2-chloroethyl) sulfide; T: Bis {2(2-chloroethylthio)ethyl} ether
Source(s)	FM 3-11.9 and HD SDS	FM 3-11.9 and HT SDS
Short Name	Distilled Mustard (HD)	Distilled mustard and T mixture (HT)
Chemical Formula	$C_4H_8Cl_2S$	(H): $C_4H_8Cl_2S$; (T): $C_8H_{16}Cl_2OS_2$
Molecular Weight	159.07	188.96
Physical State	Pale yellow to dark brown oily viscous liquid	Pale yellow to brown viscous liquid
Liquid Density	1.27 g/mL at 25°C	1.263 g/mL at 20°C
Solid Density	1.372 g/cm^3 at 0°C 1.333 g/cm^3 at 10°C	None listed
Normal Freezing Point or Melting Point	14.45°C	1.3°C (Melting Point)
Boiling Point	218°C extrapolated (decomposes at 180°C)	No constant boiling point
Vapor Density (Relative to Air)	5.5	6.5
Vapor Pressure	0.106 mm Hg at 25°C	0.077 mm Hg at 25°C
Volatility	906 mg/m^3 at 25°C	7.83×10^2 mg/m^3 at 25°C
Viscosity	3.95 cP at 25°C	7.62 at 20°C
Solubility	0.092 g/100 g at 22°C. Freely soluble in fats and oils, gasoline, kerosene, most organic solvents, and CW agents.	Slightly soluble in water; soluble in most organic solvents
Latent Heat of Vaporization	15 kcal/mol at 25°C	Data not available
Special Properties	Permeates ordinary rubber	Permeates ordinary rubber
Flash Point	105°C	Flash point range 109° to 115°C
Corrosivity	0.0001 inch/month at 65°C on steel	0.00007 inch/month at 65°C on steel
Decontaminants (Equipment)	HTH or household bleach	Diluted HTH or household bleach is effective on equipment. Water, soaps, detergents, steam, and absorbents (earth, sawdust, ashes, and rags) are effective for physical removal. STB does not effectively decontaminate mustard if it has solidified at low temperatures.
Stabilizers Commonly Used	None listed	None listed

Table 3-1-1. Physical and Chemical Properties of Mustard Agents HD/HT (Continued)

Notes:

cP	=	centipoises			
CW	=	chemical warfare			
g	=	gram	mg/m^3	=	milligram per cubic meter
g/cm^3	=	gram per cubic centimeter	mm Hg	=	millimeters of mercury
g/mL	=	gram per milliliter	SDS	=	Safety Data Sheet
HTH	=	high test calcium hypochlorite	STB	=	Super Tropical Bleach
kcal/mol	=	kilocalorie per mole			

Sources:

U.S.Army, Marine Corps, Navy, Air Force. FM 3-11.9, *Potential Military Chemical/Biological Agents and Compounds*, January 2005.

U.S. Army Edgewood Chemical Biological Center (ECBC). Safety Data Sheet (HD), 5 March 2009.

U.S. Army Edgewood Chemical Biological Center (ECBC). Safety Data Sheet (HT), 5 March 2009.

Table 3-1-2. RCRA Hazardous Waste Designation, Rationale, and Disposition

Waste Material	Source	EPA Waste Codes[a]	Basis for Designation	Disposition of Waste Material[b]
AGENT- RELATED WASTE				
Mustard Agent (HD, HT)-Related Wastes such as Leaking Munitions, DOT Bottles and Contaminated Energetics	Munitions and DOT bottles storage activities at PCD	D001, D002, D003, D004-D011, D022, D028, D029, D030, D034, D039, D040, D043 K901 and K902	Mustard agent HD/HT carries the EPA waste code of D002 (corrosive). Munitions that may require storage in PCD Hazardous Waste Management Units may or may not contain energetic components (fuzes and bursters); if present, energetics per 6 CCR 1007-3 § 261.23(a)(8) are Class 1.1 explosives per 49 CFR 173.53; thus, are reactive (D003). Several TC organics have been identified as degradation compounds of mustard agents. These analytes and corresponding regulatory levels are: • chloroform (D022) 6.0 ppm • 1,2-dichloroethane (D028) 0.5 ppm • 1,1-dichloroethylene (D029) 0.7 ppm • 2,4-dinitrotoluene (D030) .13 ppm • hexachloroethane (D034) 3.0 ppm • tetrachloroethylene (D039) 0.7 ppm • trichloroethylene (D040) 0.5 ppm • vinyl chloride (D043) 0.2 ppm The Army considers chemical agent a TC organic waste due to the age of the munitions and low regulatory levels for the organics that may be present. The chemical agent may also contain TC metals (D004-D011) since some munitions are constructed of specialty alloys containing heavy metals and the chemical agent over time may leach metals from munition casings. Also, explosive components may contain lead (D008) from lead	If solid waste, including DOT bottles, has a leak or is suspected of leaking, it will be placed in overpack containers and stored in PCD RCRA-permitted hazardous waste management units pending transfer to a permitted TSDF.

Table 3-1-2. RCRA Hazardous Waste Designation, Rationale, and Disposition (Continued)

Waste Material	Source	EPA Waste Codes[a]	Basis for Designation	Disposition of Waste Material[b]
Mustard Agent (HD, HT)-Related Wastes such as Leaking Munitions and DOT Bottles and Contaminated Energetics (Continued)			azide. Mercury (D009) may also be present in the mustard agents The State of Colorado lists waste chemical weapons as K901. The State of Colorado lists residues resulting from the treatment of chemical agents as K902	
Secondary Waste (wooden pallets, crates, metal straps, plastic sheeting, PPE, 1,000 cfm Filters, etc.)	Solid waste generated from chemical munitions storage activities	D002, D003[c], D004-D011, D022, D028, D029, D030, D034, D037, D039, D040, D043 K902	Waste contaminated with chemical agent that is found to be above the 1.0 VSL from headspace monitoring will carry the D003 (reactive) waste code. Waste contaminated with chemical agent HD/HT may contain TC metals and TC organics associated with chemical agent HD/HT. D037 applies to waste wood pallets and boxes associated with the munitions due to a wood preservative that was once used at PCD. Residues resulting from treatment of chemical agents are listed as K902.	Solid waste will be placed in containers and stored in PCD RCRA-permitted hazardous waste management units pending transfer to a permitted TSDF.
PCD Toxic Chemical Laboratory Waste	Liquid and solid waste generated from chemical munitions storage activities and associated lab testing (such as using acetic acid to analyze for pH).	D001, D002, F003 K902	Liquids be may ignitable, corrosive, or contain spent non-halogenated solvents. The State of Colorado lists residues resulting from treatment of chemical agents P909 or P910 as K902.	Liquid and solid wastes will be placed in containers and stored in PCD RCRA-permitted hazardous waste management units pending transfer to a permitted TSDF.

Table 3-1-2. RCRA Hazardous Waste Designation, Rationale, and Disposition (Continued)

Waste Material	Source	EPA Waste Codes[a]	Basis for Designation	Disposition of Waste Material[b]
Agent contaminated explosives and propellants	Leaking chemical munitions	D001, D003-D011, D022, D028, D029, D034, D039, D040, D043 and K902	Explosives and propellants are ignitable and reactive wastes. Explosives and propellants which are contaminated with liquid agent also carry TCLP codes associated with agent and K902 code.	Solid wastes will be placed in containers and stored in PCD RCRA-permitted hazardous waste management units pending transfer to a permitted TSDF
Decontamination Solution	Waste decontamination solution (hypochlorite solution) from chemical munitions storage activities	D002, D004-D011, D022, D028, D029, D034, D039, D040, D043 K902	Liquids may meet the definition of corrosivity and carry the waste code D002. Waste contaminated with chemical agent HD/HT may contain TC metals (D004-D011) and TC organics associated with chemical agent HD/HT. The State of Colorado lists residues resulting from treatment of chemical agent as K902.	Liquid waste will be placed in containers and stored in PCD RCRA-permitted hazardous waste management units pending transfer to a permitted TSDF.
NON AGENT- RELATED WASTE				
Soils, Groundwater, and GETI Filters Containing Hazardous Waste	Environmental Remediation	D004-D043 F001-F005, F039 K047	Liquid and solid wastes may contain TC metals, solvents, leachates, and waste water treatment sludges.	Solid and liquid waste will be placed in containers and stored in PCD RCRA-permitted hazardous waste management units pending transfer to a permitted TSDF.
South Central Terrace Soil Vapor Extraction (SVE) System air filtration, knock-out water, and LNAPL	Environmental Remediation and vadose zone treatment of solvents	F039	May contain hazardous leachates.	Solid and liquid waste will be placed in containers and stored in PCD RCRA-permitted hazardous waste management units pending transfer to a permitted TSDF.

Table 3-1-2. RCRA Hazardous Waste Designation, Rationale, and Disposition (Continued)

Waste Material	Source	EPA Waste Codes[a]	Basis for Designation	Disposition of Waste Material[b]
Interim Corrective Action Groundwater Remediation System Filters	Filtering of groundwater prior to treatment	F039	May contain hazardous leachates.	Solid waste will be placed in containers and stored in PCD RCRA-permitted hazardous waste management units pending transfer to a permitted TSDF.
PCD Analytical Laboratory Waste	Generated from nonagent-related laboratory processes including explosives and nitrate analysis for PCD restoration program projects	D001, D002, F003, F005, U154	Solvents may meet the definition of ignitability (D001) and corrosivity (D002). Liquid and solid laboratory waste may contain spent non-halogenated solvents (F003, F005). May contain chemical product methanol for use as a laboratory reagent (U154).	Solid and liquid waste will be placed in containers and stored in PCD RCRA-permitted hazardous waste management units pending transfer to a permitted TSDF.
Acetic Acid	Generated from chlorine content analysis	D002	Acetic acid meets the definition of corrosive (D002).	Liquid waste will be placed in containers and stored in PCD RCRA-permitted hazardous waste management units pending transfer to a permitted TSDF.
Hexane	Generated from toxic chemical analysis	D001	Hexane meets the definition of ignitability (D001).	Liquid waste will be placed in containers and stored in PCD RCRA-permitted hazardous waste management units pending transfer to a permitted TSDF.

Table 3-1-2. RCRA Hazardous Waste Designation, Rationale, and Disposition (Continued)

Waste Material	Source	EPA Waste Codes[a]	Basis for Designation	Disposition of Waste Material[b]
Chloroform	Generated from toxic chemical analysis	D022, U044	Chloroform is toxic and carries the waste code of D022. May contain chemical product chloroform for use as a laboratory reagent (U044).	Liquid waste will be placed in containers and stored in PCD RCRA-permitted hazardous waste management units pending transfer to a permitted TSDF.
Sodium Hydroxide	Used for explosives testing	N/A	Sodium hydroxide as a solid is not a listed or characteristic waste per 40 CFR 261.10.	Solid waste will be placed in containers and stored in PCD RCRA-permitted hazardous waste management units pending transfer to a permitted TSDF.
Isopropyl Alcohol	Used for RTM maintenance analysis	D001	Isopropyl alcohol meets the definition of ignitability, and therefore, carries the waste code of D001.	Liquid waste will be placed in containers and stored in PCD RCRA-permitted hazardous waste management units pending transfer to a permitted TSDF.
Sulfuric Acid	Used in chlorine content analysis	D002	Sulfuric acid meets the definition of corrosive, and therefore, carries the waste code of D002.	Liquid waste will be placed in containers and stored in PCD RCRA-permitted hazardous waste management units pending transfer to a permitted TSDF.

Table 3-1-2. RCRA Hazardous Waste Designation, Rationale, and Disposition (Continued)

Waste Material	Source	EPA Waste Codes[a]	Basis for Designation	Disposition of Waste Material[b]
Calcium Hypochlorite	Generated during decontamination operations	D001	Calcium hypochlorite meets the definition of an oxidizer, and therefore, carries the waste code of D001.	Solid waste will be placed in containers and stored in PCD RCRA-permitted hazardous waste management units pending transfer to a permitted TSDF.
FACILITY MAINTENANCE WASTES				
Enamel Paints	Facility maintenance painting	D001, D035	Paints may meet the definition of ignitable, and therefore, carry the waste code of D001. Paints may contain methyl ethyl ketone (D035).	Liquid waste will be placed in containers and stored in PCD RCRA-permitted hazardous waste management units pending transfer to a permitted TSDF.
Acetone	RTM maintenance analysis	D001, F003, U002	Acetone meets the definition of ignitability, and therefore, carries the D001 waste code. It is also a spent non-halogenated solvent and carries the waste code of F003. May contain chemical product acetone for use during RTM maintenance (U002).	Liquid waste will be placed in containers and stored in PCD RCRA-permitted hazardous waste management units pending transfer to a permitted TSDF.
Batteries (Lead-acid and Ni-Cads)	Batteries from portable powering equipment and tools	D002, D006, D008, D009	Liquid battery acid meets the definition of corrosive, and therefore, carries the D002 waste code. Batteries also contain the TC metals cadmium (D006), lead (D008), and mercury (D009).	Batteries (Lead-acid) will be placed in containers and stored in PCD RCRA -permitted hazardous waste management units pending transfer to a permitted TSDF. Ni-Cads will be managed in containers and sent to recycler.

Table 3-1-2. RCRA Hazardous Waste Designation, Rationale, and Disposition (Continued)

Waste Material	Source	EPA Waste Codes[a]	Basis for Designation	Disposition of Waste Material[b]
Paint Thinner	Paint solvent used in facility maintenance	D001, D018	Paint thinner meets the definition of ignitable, and therefore, carries the waste code D001. Paint thinner may also contain benzene (D018).	Liquid wastes will be placed in containers and stored in PCD RCRA-permitted hazardous waste management units pending transfer to a permitted TSDF.
Spray Enamels and Lacquers	Facility maintenance painting	D001	Spray paints meet the definition of ignitability and will, therefore, carry the waste code D001.	Liquid wastes will be placed in containers and stored in PCD RCRA-permitted hazardous waste management units pending transfer to a permitted TSDF.
Mercury Containing Lighting Wastes (Universal Wastes)	Light bulbs used in facility maintenance	D009	Light bulbs and tubes contain mercury, and therefore, carry the D009 waste code.	Light bulbs will be placed in containers and stored in PCD RCRA-permitted hazardous waste management units prior to shipment to an approved recycling facility.
VEHICLE MAINTENANCE WASTE				
Lead-Acid Batteries	Vehicle maintenance	D002, D008	Batteries contain battery acid, which meets the definition of corrosive, and therefore, carries the D002 waste code. Batteries contain the TC metal lead, and therefore, carry the waste code D008.	Batteries will be placed in containers and stored in PCD RCRA-permitted hazardous waste management units prior to shipment to an approved recycling facility.

Table 3-1-2. RCRA Hazardous Waste Designation, Rationale, and Disposition (Continued)

Waste Material	Source	EPA Waste Codes[a]	Basis for Designation	Disposition of Waste Material[b]
Starting Fluid	Vehicle maintenance	D001	Starting fluid meets the definition of ignitable, and therefore, will carry the D001 waste code.	Liquid wastes will be placed in containers and stored in PCD RCRA-permitted hazardous waste management units pending transfer to a permitted TSDF.

Notes:

[a] Waste codes may change based on sampling and analysis results.

[b] newly generated wastes may be placed in temporary, non-permitted storage such as satellite accumulation areas or less than 90-day storage , and then will be transferred to PCD RCRA-permitted hazardous waste management units or to a permitted TSDF. Less than 90-day storage areas and satellite accumulation areas are discussed in Attachment 1Section B. Leaking Munitions and wooden pallets and crates are not newly generated hazardous wastes and must be moved directly into the permitted storage units.

[c] All mustard-related secondary waste will carry the D003 (reactive) waste code if the waste is found to be above the 1.0 Vapor Screening Level (VSL) from headspace monitoring.

cfm = cubic feet per minute
CFR = Code of Federal Regulations
DOT = Department of Transportation
EPA = U.S. Environmental Protection Agency
GETI = Groundwater Extraction, Treatment, and Injection
HD = distilled sulfur mustard
HT = mustard-T mixture
N/A = not applicable
PCD = Pueblo Chemical Depot
PPE = personal protective equipment
ppm = parts per million
RCRA = Resource Conservation and Recovery Act
RTM = Real-Time Monitoring
SWMU = Solid Waste Management Unit
TC = toxicity characteristic
TSDF = treatment, storage, and disposal facility
VSL = vapor screening level

Table 3-1-3. General Description of Chemical Fill Munitions

			Dimensions			Fill		Burster			Propellant		Other Components	
Munition	Model	Materials of Construction	Munition Diameter	Munition Length (in.)	Total Mass of Munition (lb)	Chemical Agent	Mass of Agent (lb)	Model	Explosive	Mass of Explosive (lb)	Model	Mass of Propellant (lb)	Fuze Model	Other Energetic Components
105mm Cartridge	M60	Steel	105mm 105mm	31.1[a] 31.1	42.92 42.92	HD HD	2.97 2.97	M5 M5	Tetrytol Tetrytol	0.26 0.26	M67 M67	2.825 2.825	M57 M51A5	M125A1 M21A4
4.2-inch Mortar	M2 M2A1	Steel	4.2-inch 4.2-inch	21.0 21.0	24.67 24.67	HT HD	5.8 6.0	M14 M14	Tetryl Tetryl	0.14 0.14	M6 M6	0.6 0.6	M8 M8	See **Table C-1-6**. See **Table C-1-6**.
155mm Projectile	M110 M104	Steel	155mm 155mm	26.8 26.8	94.59 98.9	HD HD	11.7 11.7	M6 M6	Tetrytol Tetrytol	0.41 0.41	-- --	-- --	-- --	-- --

Notes:

[a] This amount includes the munition shell case and projectile.

HD = distilled sulfur mustard
HT = 60:40 mix of HD and T. T = bis(2-chloroethylthio)ethyl ether
in. = inches
lb = pound

Source: Technical Manual, *Army Ammunition Data Sheets, Artillery, Ammunition, Guns, Howitzers, Mortars, Recoilless Rifles, Grenade Launchers, and Artillery Fuzes* (FSC 1310, 1315, 1320, 1390) TM 43-0001-28, April 1994.

Table C-1-4. Mustard Agent Decomposition Products from Age, and Impurities from Manufacturing

Process Reaction	Decomposition Products and Manufacturing Impurities
Degradation of mustard from age	HCl
	ethylene
	ethylene dichloride
	2,2′-dichlorodiethyl disulfide
	vinyl chloride
	hydrogen sulfide
	oxathiane
	dithiane
	Bis(2-chloroethoxy)-2(2-chloroethylthio)ethane
	1,2-dichloroethane
	ethyl 2-chloroethyl sulfide
	diethyl disulfide
	1,2-Bis(2-chloroethylthio)ethane and oligomers
	Bis-2[bis(2-hydroxy ethyl-sulfonium ethyl)] sulfide dichloride
	thiodiglycol
	2-chloroethyl vinyl sulfide
	divinyl sulfide
	2-hydroxy ethyl vinyl chloride
	1,1,1-trichloroethane
	1,1,2-trichloroethane
	1,1,1,2-tetrachloroethane
	1,1,2,2-tetrachloroethane
Impurities from manufacturing	2-methyl 1-propene
	thiirane

	2-chlorobutane
	trichloroethylene
	tetrachloroethylene
	1,4-oxathiane
	1,4-dithiane
	hexachloroethane
	Bis (2-chloroethyl) sulfide (HD)
	2-chloroethyl 3-chloropropyl sulfide
	Bis (3-chloropropyl) sulfide
	HD isomer
	2-chloroethyl 4-chlorobutyl sulfide
	1,2,5-trithiepane

Table 3-1-4. Mustard Agent Decomposition Products from Age, and Impurities from Manufacturing (Continued)

Process Reaction	Decomposition Products and Manufacturing Impurities
Impurities from manufacturing (continued)	Bis (2-chloroethyl) disulfide 2-chloroethyl (2-chloroethoxyl) ethyl sulfide Bis (2-chloroethyl) trisulfide

Sources: Chemical Stockpile Disposal Program Final Programmatic Environmental Impact Statement, January 1988.

Aberdeen Proving Ground HD Ton Container Survey, Aberdeen Proving Ground RCRA Permit Application, May 1997.

Table 3-1-5. Physical and Chemical Characteristics of Explosives

Waste	Composition	Molecular Weight	Density	Explosion Temperature Test Value (°C)	Heat of Combustion (cal/g) at Constant Pressure
Explosives					
Tetryl	2,4,6-trinitrophenyl-methylnitramine	287.15	1.73 (crystal) 1.62 (cast)	257	2,914
Tetrytol	70% tetryl 30% TNT	266	1.60 (cast)	275	3,136

Notes:

cal/g = calorie per gram
TNT = trinitrotoluene

Source: Technical Manual, *Army Ammunition Data Sheets, Artillery, Ammunition, Guns, Howitzers, Mortars, Recoilless Rifles, Grenade Launchers, and Artillery Fuzes* (FSC 1310, 1315, 1320, 1390) TM 43-0001-28, April 1994.

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Table 3-1-6. Composition of Reactive Material in HD and HT Munitions

Munition Type	Component[a]	Weight	Composition
M2/M2A1 (4.2-inch Mortar)	1. Fuze, M8 Burster Charge	65.2 g	Tetryl
	2. Detonator, M22		
	a. Upper Charge (Primer Mixture AN-6)	50.0 mg	Overall Mixture: 33.4% Potassium Chlorate 33.3% Antimony Sulfide 28.3% Lead Azide 5.0% Carborundum
	b. Intermediate Charge	150.0 mg	Lead Azide
	c. Lower Charge	70.0 mg	Tetryl
	3. Propellant, M6	272 g	Overall Mixture: 52.15% Nitrocellulose 43.0% Nitroglycerin 3.0% Diethylphthalate 1.25% Potassium Nitrate 0.6% Ethyl Centralite
	4. Cartridge, Ignition M2 Assy		
	a. Charge, Propelling M2	7.8 g	Overall Mixture: 77.33% Nitrocellulose 19.47% Nitroglycerin 1.4%Barium Nitrate 0.75% Potassium Nitrate 0.6% Ethyl Centralite 0.45% Graphite
	b. Primer	64.8 g	Overall Mixture: 42%Barium Nitrate 40% Lead Styphnate 11% Antimony Sulfide 6% Nitrocellulose 1% Tetracene
M60 (105mm Cartridge)	1. Percussion Primer M28A2 Assy – Charge Primer (Black Powder)	19.4 mg	Overall Mixture: 74% Potassium Nitrate 15.6% Charcoal 10.4% Sulfur
	2. Percussion Primer M61 Assy – Primer Mix #70	64.8 mg	Overall Mixture: 53% Potassium Chlorate 25% Lead Thiocyanate 15% Antimony Sulfide 5% Trinitrotoluene
	3. Charge, Propelling M67 Assy	1.28 kg	Overall Mixture: 85% Nitrocellulose 9% Dinitrotoluene 5% Dibutylphthalate 1% Diphenylamine

Table 3-1-6. Composition of Reactive Material in HD and HT Munitions (Continued)

Munition Type	Component[a]	Weight	Composition
	4. Fuze, M51A5 (with NSN 1315-00-322-6365)		
	a. Booster, M21A4		
	(1) Booster Pellet	22.7g	Overall Mixture: 98% Tetryl 0.75% Calcium Stearate 0.75% Barium Stearate 0.5% Graphite
	(2) Booster Charge	0.25 g	Overall Mixture: 98%Tetryl 2% Graphite
	(3) Detonator, M17		
	a. Intermediate Charge	0.26 g	Lead Azide
	b. Lower Charge	79.7 g	Tetryl
	b. Fuze PD M48A3 Assy		
	(1) Detonator M24 Assy.		
	a. Primer Mix	55.7mg	Overall Mixture: 33.4% Potassium Chlorate 33.3% Antimony Sulfide 28.3% Lead Azide 5% Carborundum
	b. Lower Charge	179.5mg	Lead Azide
	(2) Delay Element M2		
	a. M54 Primer		
	(1) M54 Primer – Primer Mix #70	11.0 mg	Overall Mixture: 53% Potassium Chlorate 25% Lead Thiocyanate 17% Antimony Sulfide 5% Trinitrotoluene
	(2) Black Powder Delay Charge	2.1g	Overall Mixture: 74% Potassium Nitrate 15.6% Charcoal 10.4% Sulfur
	(3) Relay M7	92.7 mg	Lead Azide
	5. Fuze, M57 (with NSN 1315-00-028-4829)		
	a. Booster, M22		
	(1) Pellet Booster	22g	Tetryl

Table 3-1-6. Composition of Reactive Material in HD and HT Munitions (Continued)

Munition Type	Component[a]	Weight	Composition
	(2) Detonator Assy		
	(a) Charge Detonator	0.65g	Lead Azide
	(b) Pellet Detonator	0.32g	Tetryl
	b. Detonator, M24		
	(1) Upper Charge	55.7mg	Overall Mixture: 33.4% Potassium Chlorate 33.3% Antimony Sulfide 28.3% Lead Azide 5% Carborundum
	(2) Lower Charge	179.5mg	Lead Azide

Notes:

[a] Other munition composition data are presented in **Table 3-1-3**. Components such as the M5, M6, and M14 bursters each consist solely of the explosive listed in **Table 3-1-3**.

g = gram
gr = grains
mg = milligrams
TNT = 2,4,6-trinitrotoluene

Source: Munition Items Disposition Action System (MIDAS) Reports for each individual munition stored at PCD, August 5, 2005.

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3-2 WASTE ANALYSIS PLAN [6 CCR 1007-3 § 100.41(a)(3) and § 264.13(b) and (c)]

This section describes how wastes stored in the PCD RCRA-permitted hazardous waste management units are characterized at PCD and addresses: (1) analytical parameters and the rationale for their selection; (2) test methods; (3) sampling methods; (4) frequency of analyses; (5) additional requirements for wastes generated offsite; and (6) additional requirements for ignitable, reactive, or incompatible wastes. Air monitoring procedures, i.e. procedures to monitor the air in the permitted storage igloos for releases of mustard agent from the hazardous wastes, are performed during inspections and for health and safety purposes. These procedures are provided in a separate site-specific monitoring plan located in **Attachment 2 to this Permit.** Prompt detection of any unplanned sudden or non-sudden releases of mustard agent to the air is necessary to minimize the possibility that such releases could threaten human health, including unmasked workers,

Waste characterization data is used to ensure wastes are properly managed. Materials are typically determined to be hazardous waste based on process knowledge and available Safety Data Sheet (SDS) information that identifies the hazardous characteristics of that material. Normally, sampling is not needed to make a RCRA hazardous determination. However, there may be instances where sampling is required to aid in characterization, such as when waste characteristics, applicable hazardous waste codes or underlying hazardous waste constituents cannot be determined through generator knowledge or other preexisting information sources.

Waste profile forms are completed for each waste stream. Profiles include the following information:

- USEPA/state hazardous waste codes
- Description of process generating the waste
- Dioxin designation
- LDR information
- RCRA characteristic information and physical state
- Material composition
- Information to support waste characterization
- Generator certification.

3-2a Parameters and Rationale [6 CCR 1007-3 § 264.13(b)(1)]

Waste stream analytical parameters and the rationale for selecting these parameters are summarized in **Table 3-2-1**.[3] Wastes stored in PCD RCRA-permitted hazardous waste management units are characterized using results from laboratory analysis, process knowledge, and/or waste profiles in accordance with 6 CCR 1007-3, Section 262.11.

PCD waste characterization data contains information on the Army production processes for the waste munitions, previous sampling and process knowledge at other demilitarization plants, other published data, including SDS, and other Army- or facility-specific sampling data on the hazardous waste characteristics, any of which may be used to establish elements of the waste analysis requirement.

PCD determines the applicable hazardous waste codes for the wastes that have been contaminated with mustard agent and/or other hazardous waste constituents. Documentation to support PCD waste determinations is maintained in the operating record for the facility and made available to the Colorado Department of Public Health and Environment (CDPHE) inspectors upon request.

The extent of sampling and analysis needed to characterize a waste stream is based on the completeness of process knowledge, anticipated end uses of the characterization data, anticipated treatment or disposal options for the wastes, and the Colorado Hazardous Waste Regulations.

3-2b Test Methods [6 CCR 1007-3 § 264.13(b)(2)]

Table 3-2-1 lists the test methods used for characterizing wastes. Both generator knowledge and sampling and analysis are used as appropriate. Analytical methods used for waste characterization are from *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, SW-846, current edition; *Annual Book of ASTM Standards*, American Society for Testing and Materials; or other EPA-recognized methods as referenced in the Colorado Hazardous Waste Regulations (6 CCR 1007-3).

PCD utilizes the following laboratories to characterize wastes stored at PCD RCRA-permitted units G203, G1009, G1107, G1109, G1110, and Building 540:

[3] All tables are located at the end of this section.

a. The PCD Toxic Chemical Laboratory (agent-specific) is an onsite laboratory located at the PCD G-Block area. This laboratory conducts chemical agent analysis using approved U.S. Army and EPA standard analytical methods. Laboratory quality assurance/quality control (QA/QC) procedures for agent-related waste analysis are according to the ***Pueblo Chemical Depot Site-Specific Laboratory Quality Control Plan, April 2013 – Appendix 1.***

b. The PCD Analytical Laboratory is located onsite. This laboratory conducts explosives and nitrate analysis associated with the PCD restoration program projects. Laboratory QA/QC procedures for restoration projects are according to the *PCD Chemical Data Acquisition Plan* (CDAP), U.S. Department of Defense Quality Systems Manual (DoD QSM) and laboratory Standard Operating Procedures (SOPs). Additional restoration sampling analysis is conducted by offsite laboratories contracted by PCD, which are described below.

c. Certified offsite laboratories are contracted by PCD to conduct general RCRA waste characterization analyses as well as restoration sampling analyses mentioned previously. PCD ensures general RCRA waste characterization is performed in accordance with the specified analytical methods for individual parameters (see **Table 3-2-1**), as described in SW-846, *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, current edition as referenced in the Colorado Hazardous Waste Regulations (6 CCR 1007-3), DoD QSM and are detailed in QA/QC plan(s) specific to the contracted laboratory(ies).

3-2c Sampling Methods [6 CCR 1007-3 § 264.13(b)(3)]

Table 3-2-2 lists the type of equipment and sampling methods, where appropriate, that are used to obtain a representative sample of each waste type, if needed. Methods used to obtain a representative sample are consistent with the sampling approaches and protocols described in *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, SW-846, current edition, as referenced in the Colorado Hazardous Waste Regulations (6 CCR 1007-3). For each agent-related waste stream sampled, appropriate QA/QC samples are collected, as described in the ***Pueblo Chemical Depot Site-Specific Laboratory Quality Control Plan, April 2013 – Appendix 1.*** For explosives and nitrate sampling analyses conducted for PCD restoration projects, appropriate QA/QC samples are collected in accordance with the DoD QSM. For each waste stream sampled for general RCRA waste characterization and/or additional restoration sampling analysis that is not conducted by the PCD Analytical Laboratory, appropriate QA/QC samples

are collected, as described in the Chapter 9 of *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, SW-846, current edition, as referenced in the Colorado Hazardous Waste Regulations (6 CCR 1007-3). Each PCD contract laboratory is an accredited National Environmental Laboratory Accreditation Program (NELAP) laboratory. Appropriate sampling techniques and sample containers selected are based on knowledge of the waste material matrix (solid, liquid) and analyte or parameter of interest. For agent-related wastes, the PCD Toxic Chemical Laboratory provides sample containers, which are compatible with the waste being identified. Laboratories contracted by PCD to perform general RCRA waste characterization and restoration sampling analyses provide sample containers, which are compatible with the waste being identified. Each sample is placed in the appropriate container, preserved, and analyzed within the timeframes specified in **Table 3-2-2**.

3-2d Laboratory QA/QC

Each laboratory has QA/QC plans in place that are followed for required analyses. See Section 3-2c for a description of these QA/QC plans.

3-2e Frequency of Analyses [6 CCR 1007-3 § 264.13(b)(4)]

Waste analysis is repeated as often as necessary to ensure accuracy. In addition, samples will be collected and analyzed for new waste streams, when processes change or if process knowledge is determined to be insufficient.

3-2f Additional Requirements for Wastes Generated Offsite [6 CCR 1007-3 § 264.13(c)]

All items stored in the PCD waste management units will come from PCD storage. Therefore, this section is not applicable.

3-2g Additional Requirements for Ignitable, Reactive, or Incompatible Wastes [6 CCR 1007-3 § 264.13(b)(6) and 264.17]

The waste characterization program and information described in Section 3-1, Chemical and Physical Analyses, and Section 3-2, Waste Analysis Plan, provide the information and methods needed to identify ignitable, reactive, and incompatible wastes. The PCD waste management units store items that may contain energetic material (reactives); thus, PCD utilizes DOT guidelines and training to ensure the hazards inherent in handling and managing ignitable, reactive, and incompatible wastes are minimized.

For example, incompatible wastes are not stored together and only qualified waste management personnel who have the proper RCRA and Hazardous Waste Operations and Emergency Response (HAZWOPER) training sample hazardous and nonhazardous wastes. Reactive waste sampling is conducted using **PCD SOP 468 June 4, 2012, "Propellant Sampling for Stability Testing – Appendix 1."** Training is described in **Attachment 5 to this Permit**.

Table 3-2-1. Selected Parameters, Test Methods, and Rationale for Wastes at the PCD Waste Management Units[a]

Parameter/Analysis	Test Methods[b,c,d]	Analysis Rationale
HD/HT[e]	**PCD Site-Specific Monitoring Plan February 13, 2013, PCD SOP 465 Revision 13, February 4, 2013 and PCD SOP 491 Revision 15, February 25, 2013 – Appendix 1**	Verify treatment level is met; ensure safe handling, storage, and treatment; compliance with applicable regulations; ensure all physical and chemical characteristics are known prior to disposition; determine further waste management needs. Process knowledge will be used for RCRA waste characterization where appropriate.
pH	Process knowledge[d] or 9040, 9045	Determine corrosivity
Flash Point	Process knowledge[d] or 1010	Determine corrosivity
Free Liquids	Process knowledge or 9095A	Determine ignitability
Total Metals Content	Process knowledge[d] or 7470A, and 7471b, 6010c, 3010A	Determine metals toxicity
TCLP	Process knowledge[d] or 1311	Obtain leachability sample[f]
Specific Gravity	Process knowledge[d] or ASTM D 5057	Determine specific gravity
Water Content	Process knowledge[d] or 600/4-79/020	Determine water content
Fuel Value	Process knowledge[d] or ASTM D 5468	Determine recyclability of wastes
Volatile Organic Compounds (VOCs)	Process knowledge[d] or 8260C	Determine toxicity[f]
Semi-Volatile Organic Compounds (SVOCs)	Process knowledge[d] or 8270D	Determine organic toxicity[f] and presence of polycyclic aromatic hydrocarbons (PAH)
Explosives and Nitrates	Process knowledge[d] or 8330B, 8321, 300, or 353.2 (Nitrates)	Determine explosives concentrations. Determine secondary explosives concentration and breakdown products for reactivity and to determine nitrate concentrations
Halogenated VOCs	Process knowledge[d] or 8010B	Determine organic toxicity[f]
Pesticides	Process knowledge[d] or 8140	Determine organic toxicity[f]
Cyanide	Process knowledge[d] or 600/4-79-020 Method 335.2	Determine reactivity

Notes:

[a] The following chemicals listed in Table 3-2-1 do not require sampling and are, therefore, not listed in this table: acetic acid, hexane, chloroform, sodium hydroxide, isopropyl alcohol, sulfuric acid, calcium hypochlorite, sodium hypochlorite, enamel paints, acetone, paint thinner, spray enamels and lacquers, and starter fluids.

Table 3-2-1. Selected Parameters, Test Methods, and Rationale for Wastes at the PCD Waste Management Units (Continued)[a]

Notes: (Continued)

[b] Methods are from *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, SW-846, current edition, as referenced in the Colorado Hazardous Waste Regulations (6 CCR 1007-3) , unless otherwise specified. The analytical methods listed may have been updated since this permit application was developed. The most current methods are used.

[c] U.S. Army Test Methods are used for mustard agent analysis.

[d] Process knowledge is used for RCRA waste characterization where appropriate. Waste profiles from previous operations are acceptable process knowledge. The Army will perform additional analysis if process knowledge is determined to be insufficient or if abnormalities in process occur.

[e] HT is analyzed as HD.

[f] TC metals consist of arsenic (D004), barium (D005), cadmium (D006), chromium (D007), lead (D008), mercury (D009), selenium (D010), and silver (D011). TC organics of interest consist of chloroform (D022), 1,2-dichloroethane (D028), 1, 1-dichloroethylene (D029), 2,4 dinitrotoluene (D030), hexachloroethane (D034), tetrachloroethane (D039), trichloroethene (D040), and vinyl chloride (D043).

ASTM	=	American Society for Testing and Materials
HD	=	distilled sulfur mustard
HT	=	mustard-T mixture
RCRA	=	Resource Conservation and Recovery Act
SVOC	=	semivolatile organic compound
TCLP	=	Toxicity Characteristic Leaching Procedure
VOC	=	volatile organic compound

Table 3-2-2. Equipment and Sampling Methods

Parameter	Container[a,b,c,d]	Preservation	Hold Time	
			Extraction	Analysis
Solids				
Total Solids	50mL plastic or glass	Cool 4ºC	N/A	7 Days
Metals	Plastic or Glass	Water: HNO_3 to pH<2	N/A	180 days (Hg = 28 days)
VOCs	Encore Sampler	Cool 4ºC	N/A	48 hours if not extruded and preserved/14 days if extruded and preserved
TCLP Pesticides/Semivolatile Organic Compounds (SVOCs)	2 L amber glass, Teflon®-lined cap	Cool 4ºC	7 days	40 days
Explosives	50 g amber glass	Cool 4ºC	14 days	40 days
Cyanide	1 x 4 oz glass	Cool 4ºC	N/A	14 Days
Liquids				
VOCs	3 x 40 mL glass, VOA vial, no headspace, PTFE septa cap	Cool 4ºC HCl or $NaHSO_4$ to pH<2 Cool 4ºC	N/A	14 days with preservatives 7 days without preservatives
Pesticides/SVOCs	1 L amber glass, Teflon-lined cap	Cool 4ºC	7 days	40 days
Explosives	2 L amber glass, Teflon-lined cap	Cool 4ºC	7 days	40 days
Mustard Agent	40 mL amber glass	Cool 4ºC	7 days	N/A
Metals	1 L plastic	Cool 4ºC HNO_3 to pH<2	N/A	180 days (Hg = 28 days)
Cyanide	1 L plastic	10 M. NaOH, pH>12 Cool 4ºC	N/A	14 days

Notes:

[a] As applicable, equipment used to sample waste materials will be disposable or designed for easy decontamination. Contaminated disposable equipment will be managed as hazardous waste, as appropriate. Cleanable equipment will be thoroughly decontaminated prior to reuse. Spent decontamination solutions will be managed as hazardous waste.

[b] All samples are grab samples unless indicated otherwise.

[c] For solids and semi-solids, the equipment may be a stainless steel scoop.

[d] For large containers of liquids, the equipment may be a composite liquid waste samples (COLIWASA); for small containers of liquids, a pipette may be used.

Table 3-2-2. Equipment and Sampling Methods (Continued)

Notes: (Continued)

g	=	gram
L	=	liter
mL	=	milliliter
N/A	=	not applicable
NaOH	=	sodium hydroxide
PTFE	=	polytetrafluoroethylene
SVOC	=	semivolatile organic compound
TCLP	=	Toxicity Characteristic Leaching Procedure
VOA	=	volatile organic analysis
VOC	=	volatile organic compound

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3-3 WASTE ANALYSIS REQUIREMENTS PERTAINING TO LAND DISPOSAL RESTRICTIONS [6 CCR 1007-3 §100.41(a)(3) and § 262.10, 262.11, 264.13, 264.73, and Part 268]

The Hazardous and Solid Waste Amendments of RCRA prohibit the land disposal of certain types of wastes that are subject to RCRA and establish concentration limits and treatment standards for certain restricted wastes prior to land disposal. All hazardous wastes from PCD permitted hazardous waste management units are managed according to LDR requirements. Information provided in this section describes how wastes from PCD permitted hazardous waste management units subject to LDRs are identified, characterized, documented, and certified.

3-3a Waste Analysis [6 CCR 1007-3 § 261.21 through 261.24, 264.13(a)(1), 268.1, 268.7, 268.9, 268.32 through 268.37, 268.41, 268.42, and 268.43]

Wastes from permitted hazardous waste management units at PCD are characterized as described in Sections 3-1, Chemical and Physical Analyses, and 3-2, Waste Analysis Plan. The information provided by this characterization allows for determinations of LDR applicability and compliance with LDR treatment standards, concentration limits, identification of underlying hazardous constituents, and/or notification and certification requirements.

The sampling and analytical methods followed for waste subject to LDRs are the same as described in Section 3-2, Waste Analysis Plan, and **Table 3-2-1**.

In the absence of process knowledge, the primary analytical method to determine the presence and concentrations of LDR wastes and underlying hazardous waste constituents in a waste sample will be the Toxicity Characteristic Leaching Procedure, and the resulting extract will be analyzed for metals and organics. To determine if free liquids are present, process knowledge will be used or the paint filter liquids test will be performed.

The frequency of analysis requirements for wastes subject to LDRs is the same as described in Section 3-2e, Frequency of Analyses.

3-3a(1) Spent Solvent and Dioxin Wastes [6 CCR 1007-3 § 264.13(a)(1), 268.2(f)(1), 268.7, 268.30, and 268.31]

All F001 through F005 waste constituents are identified on the LDR notification shipped to subsequent, approved treatment, storage, and disposal facilities at the time of shipment.

3-3a(2) Listed Wastes [6 CCR 1007-3 § 264.13(a)(1), 268.7, 268.33 through 268.36, 268.41, 268.42, and 268.43]

All wastes from PCD waste management units (see **Table 3-2-1**) are evaluated prior to shipment to a permitted treatment, storage, and disposal facility to identify listed hazardous waste constituents and applicable waste codes. These waste codes will be identified on an LDR notification given to the subsequent treatment, storage, and disposal facilities with each shipment.

3-3a(3) Characteristic Wastes [6 CCR 1007-3 § 261.3(d)(1), 264.13(a)(1), 268.7, 268.9, 268.37, and Part 268 Appendix IX]

Prior to shipment, wastes from PCD waste management units are evaluated (**Table 3-2-1**) to identify characteristic hazardous waste constituents and applicable waste codes. These waste codes will be identified on an LDR notification given to the subsequent treatment, storage, and disposal facility with each shipment.

3-3a(5) Leachates [6 CCR 1007-3 § 260.10]

The hazardous waste management units addressed in this permit application do not generate or treat leachates. However, leachate wastes generated from PCD SWMU activities are stored in the RCRA-permitted hazardous waste management units pending transfer to a permitted treatment, storage, and disposal facility for further treatment and/or disposal. Analytical data and process knowledge will be used to determine whether F039-impacted soil or groundwater will require further treatment prior to land disposal. LDR notifications indicating whether or not further treatment is required are sent to the treatment, storage, and disposal facility along with the waste to ensure proper management.

3-3a(6) Lab Packs [6 CCR 1007-3 § 268.7(a)(9), 268.42(c), and Part 268 Appendix IV]

When lab packs are generated at the PCD waste management units, process knowledge is used to identify and complete LDR notifications prior to shipment offsite for treatment and/or disposal.

3-3a(7) Contaminated Debris [6 CCR 1007-3 § 100.40(a)(13); § 268.2(g), 268.7(d), 268.9, and 268.45]

Contaminated debris generated at PCD and stored in PCD permitted hazardous waste management units will be characterized through process knowledge or analytical methods to determine whether these wastes will require further treatment prior to land disposal.

3-3a(8) Waste Mixtures and Wastes with Overlapping Requirements [6 CCR 1007-3 § 264.13(a)(1) and 268.7, 268.9]

Tables 3-1-2 and **3-2-1** detail the waste streams that the PCD permitted waste management units are storing, how those waste streams are identified, and what analyses will be performed. Land disposal will not take place at PCD waste management units. The waste streams will be characterized as detailed in **Table 3-2-1** for shipment to treatment and ultimate disposal facilities.

3-3a(9) Dilution and Aggregation of Wastes [6 CCR 1007-3 § 268.3]

The PCD waste management units are storage units and do not treat waste by means of dilution. Therefore, this section is not applicable.

3-3b Notification, Certification, and Recordkeeping Requirements [6 CCR 1007-3 § 264.73, 268.7, and 268.9(d)]

3-3b(1) Retention of Generator Notices and Certifications [6 CCR 1007-3 § 268.7(a)]

Notices, certifications, demonstrations, analyses, and other documentation produced to support the determination for all regulated waste generated and treated offsite, is kept for a period of 5 years in the PCD operating files.

3-3b(2) Notification and Certification Requirements for Treatment Facilities [6 CCR 1007-3 § 268.7(b)]

For all LDR wastes from the PCD waste management units that will be sent from the PCD waste management units for further management (treatment and/or disposal), notices and certifications, as applicable, will be made in writing and forwarded with the waste shipment to the receiving facility in accordance with the requirements of 6 CCR 1007-3 § 268.7(b).

3-3b(3) Notification and Certification Requirements for Land Disposal Facilities [6 CCR 1007-3 § 268.7(1)]

The hazardous waste management units addressed in this permit application are not land disposal facilities; therefore, this section is not applicable.

3-3b(4) Wastes Shipped to Subtitle C Facilities [6 CCR 1007-3 § 268.7(a) and 268.7(b)]

PCD ships hazardous waste offsite for management in a Subtitle C facility. Notifications and certifications will be submitted in compliance with 6 CCR 1007-3 § 268.7(a) and (b). Each first shipment of a waste stream includes a written notification and certification from PCD to the treatment, storage, and disposal facility that the waste either meets or does not meet applicable treatment standards.

3-3b(5) Wastes Shipped to Subtitle D Facilities [6 CCR 1007-3 § 268.7(d) and 268.9(d)]

PCD will not be treating characteristic waste to remove the waste codes assigned in order to ship to a Subtitle D facility; therefore, this section is not applicable.

3-3b(6) Recyclable Materials [6 CCR 1007-3 § 268.7(b)(6)]

The PCD RCRA-permitted hazardous waste management units will not be managing recyclable materials in a manner constituting disposal as described in 6 CCR 1007-3 § 268.7(b)(6); therefore, this section is not applicable.

3-3b(7) Recordkeeping [6 CCR 1007-3 § 264.73 and 268.7]

Determinations of restricted wastes and documentation on where a restricted waste was treated, stored, and/or disposed of will be maintained in the PCD RCRA-permitted waste management units operating records.

As applicable, a one-time notice will be placed in the PCD waste management units operating files detailing: (1) the basis for any waste excluded from the requirements of 6 CCR 1007-3 § 268.7, (2) the generation process, and (3) the basis for exclusion and disposition of the waste. See **Table 3-1-2** for disposition of wastes stored at the PCD waste management units.

3-3c Requirements Pertaining to the Storage of Restricted Wastes [6 CCR 1007-3 § 268.50]

3-3c(1) Restricted Wastes Stored in Containers [6 CCR 1007-3 § 268.50(a)(2)(i)]

As applicable, each waste container will be marked with a description of its content and the start date of accumulation as wastes in containers are managed in accordance with 6 CCR § 264 Subpart I.

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APPENDIX 1

The PCD Standard Operating Procedures and Plans listed below and referenced in the Waste Analysis Plan are attached as Appendix 1. Copies of these documents are available for review by contacting Jeannine Natterman, Public Involvement Officer, Hazardous Materials and Waste Management Division at 303-692-3303.

1. PCD Site Specific Monitoring Plan (SSMP) - February, 2013
2. PCD Site Specific Laboratory Quality Control Plan (LQCP) – April, 2013
3. PCD SOP 465 Toxic Chemical Laboratory Analytical Operating Procedures – Version 13, February 4, 2013
4. PCD SOP 468 Propellant Stability Sampling – Revision 0, June 4, 2012
5. PCD SOP 491 Near Real Time (NRT) Monitoring Systems – Revision 15, February 25, 2013