This document was reviewed by SFC and no OPSEC-sensitive information was discovered.
This document was reviewed by RKG and no ITAR/EAR sensitive information was discovered.

24915-000-GPE-GGPT-00195

Resource Conservation and Recovery Act (RCRA)

Research, Development and Demonstration (RD&D) Permit – Class 2 Modification Request

for the Blue Grass Chemical Agent-Destruction Pilot Plant

Blue Grass Army Depot, Richmond, Kentucky

Submitted To:

Energy and Environment Cabinet

Kentucky Department for Environmental Protection

Division of Waste Management

200 Fair Oaks Lane, 2nd Floor

Frankfort, Kentucky 40601

Submitted By:

Blue Grass Army Depot

431 Battlefield Memorial Highway

Richmond, Kentucky 40475-5060

and

Bechtel Parsons Blue Grass

830 Eastern Bypass, Suite 106

Richmond, Kentucky 40475

Date: 12 NOV 2015

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Acronyms/Abbreviations

Acronym	Definition
ATT	agent transfer tank
ASME	American Society of Mechanical Engineers
BGAD	Blue Grass Army Depot
BGCAPP	Blue Grass Chemical Agent-Destruction Pilot Plant
BPBGT	Bechtel Parsons Blue Grass Team
CFR	Code of Federal Regulations
DWM	Division of Waste Management
EBH	energetics batch hydrolyzers
ENR	energetics neutralization reactor
ENS	energetics neutralization system
EPA	U.S. Environmental Protection Agency
ERD	entrainment removal drum/demister
GB	nerve agent sarin, isopropyl methyl phosphonofluoridate
H	blister agent mustard made by the Levinstein process, bis(2-chloroethyl) sulfide or 2,2'-dichlorodiethyl sulfide
HVAC	heating, ventilation, and air conditioning
IDLH	immediately dangerous to life or health (IDLH)
KAR	Kentucky Administrative Regulation
KDEP	Kentucky Department for Environmental Protection
MDB	munitions demilitarization building
MPT	metal parts treater
MWS	munitions washout system
NIOSH	National Institute for Occupational Safety and Health
P&ID	piping and instrumentation diagram
PFD	process flow diagram
PMR	permit modification request
RD&D	research, development, & demonstration
RHS	rocket handling system
psi	pound per square inch
psig	pounds per square inch, gauge
SCWO	supercritical water oxidation
STEL	short term exposure limit
VX	nerve agent, O-ethyl S-(2-diisopropylaminoethyl) methylphosphonothiolate

1.0 OVERVIEW

This document contains a Class 2 Permit Modification Request (PMR) for the Research, Development, and Demonstration (RD&D) Permit for demonstration testing of hazardous waste treatment using the Blue Grass Chemical Agent-Destruction Pilot Plant (BGCAPP) at the Blue Grass Army Depot (BGAD). BGAD (Permittee, EPA ID KY8-213-820-105, AI 2805) is located at 431 Battlefield Memorial Highway, Richmond, Kentucky. The Bechtel Parsons Blue Grass Team (BPBGT) is a Co-Permittee with BGAD.

BGAD is a 14,596-acre facility operated by the United States Army and is located within Madison County, Kentucky. The depot was established in April 1942 during World War II by the War Department as an expansion of ordnance supply depots, and it serves as a stockpile site for munitions containing the chemical agents H (mustard), GB, and VX. BGAD has permitted hazardous waste storage units for these chemical agents. In addition, BGAD was previously issued a RD&D permit allowing construction of a full scale pilot plant facility for demonstration of neutralization followed by super critical water oxidation (SCWO) processes for disposal of chemical agents (GB) and energetics stored in munitions at the BGAD. An application to revise the RD&D permit application to Revision 6 that would allow the BGBPT to perform demonstration testing with the full scale pilot plant using GB stored at BGAD has been submitted to the Kentucky Department for Environmental Protection (KDEP) Division of Waste Management (DWM). This revision is planned to be the final revision to the permit application. Facility changes will be managed in the future via typical Class 1, 2, or 3 modification requests to modify the issued RD&D permit.

This PMR is being submitted in accordance with 401 Kentucky Administrative Regulation (KAR) 38:040 Section 3 (incorporating Title 40 Code of Federal Regulations (CFR) §270.42(b)). The modifications to the Permit that are being requested are:

- Changes in operating conditions and supporting equipment of the Energetics Neutralization Reactors (ENRs) in the Energetics Neutralization System (ENS) to allow improved destruction of cyanide formed during hydrolysis of energetics.
- Process, equipment, and ancillary changes necessary to provide the option for enhanced agent draining from munitions without the need for agent washout using process water.

These modifications do not change the ability of the Permittees to provide protection to human health and the environment.

2.0 PERMIT MODIFICATION REQUEST

The requested modifications to the Permit and its related supporting documents are provided in this PMR. Requirements of 401 KAR 38:040 Section 3 and 40 CFR §270.42 for a Class 2 permit modification request are specifically addressed in Sections 2.1, 2.2, and 2.3.

2.1 Justification for Permit Modification

Per 401 KAR 38:040 Section 3 and 40 CFR §270.42(b)(1)(iii), the applicant is required to provide an explanation of why the modifications are needed. Sections 2.1.1 and 2.1.2 of this PMR discuss the rationales for the two modifications.

2.1.1 Improved Cyanide Destruction

The BGCAPP will treat three types of munitions containing GB, 8 inch projectiles (designated as M426), 115 mm M55 rockets with M56 warheads, and standalone M56 warheads. Both the projectiles and the M56 warheads include agent cavities containing the chemical agent; the M56 warheads also contain burster wells that hold energetics.

In the Munitions Demilitarization Building (MDB), the projectiles will have the nose closures removed and be placed into the agent drain station. Each projectile will have the burster wells collapsed into the agent cavity, and the agent will be drained through the nose of the projectile. The drained material will be sent to the agent neutralization tanks, and the drained projectiles will be sent to the metal parts treater (MPT) for treatment to remove residual agent.

Also in the MDB, the non-leaking M55 rockets will be separated into three pieces: the M56 warhead, the shipping and firing tube, and the rocket motor. Both the shipping and firing tube and the rocket motor will be removed from the MDB for treatment or disposal at another location. The M56 warhead will be conveyed to the punch-and-drain station where holes will be punched into the agent cavity and the agent drained and sent to the agent neutralization tanks. The agent drained warheads will be sheared into segments, with the segments and energetics sent to the energetics batch hydrolyzers (EBHs). In the EBHs, the energetics will be hydrolyzed by addition of caustic solution. The resulting energetics hydrolysate will be sent to the ENRs for further treatment, with the warhead sections and pieces from the EBHs sent to the MPT. Standalone M56 warheads will be processed in the same manner, except that removal of the shipping and firing tubes and rocket motors will not be necessary. Leaking rockets will also be processed in the same manner, except that shipping and firing tubes will be treated in the MPT, and the rocket motors will be sheared into pieces and transferred to the EBHs and treated using the same methods as the M56 warhead energetics and pieces.

After confirmation that agent concentrations are below target levels, the energetics hydrolysate will be transferred to hydrolysate storage tanks and then sent for aluminum precipitation/filtration followed by treatment in the SCWO units. Aluminum in the energetics hydrolysate will result from partial dissolution of warhead materials at high pH in the EBHs. Aluminum removal will be performed by adjustment of the energetics hydrolysate pH to approximately neutral followed by filtration of the resulting aluminum precipitate.

In 2011, an evaluation of historical studies was conducted to determine the possibility of cyanide formation during the caustic hydrolysis of the energetic materials specific to BGCAPP; the evaluation indicated the potential for cyanide formation at concentration levels that could be problematic in subsequent processing steps (see references – BGCAPP, 2011). Follow up studies in 2012 quantified the potential liquid and gaseous cyanide concentrations (see reference BGCAPP, 2013a). These indicated that cyanide would not be expected to offgas significantly from hydrolysate in the EBHs, ENRs, or hydrolysate storage tanks due to the high pH (>13) of the hydrolysate in these. However, as a result of acid addition for neutralization in the aluminum removal system, cyanide off-gassing above National Institute for Occupational Safety and Health (NIOSH) Immediately Dangerous to Life or Health (IDLH) levels would be possible in the aluminum precipitation reactors, and equilibrium cyanide concentrations in process effluent streams could be several times above the NIOSH Short Term Exposure Limit (STEL).

Subsequent studies evaluated options to control or reduce the levels of cyanide that could offgas from the energetics hydrolysate upon neutralization. Based on minimization of worker exposure risk and treatment method compatibility with existing materials of construction, high temperature/high pressure destruction of cyanide was evaluated (see references - BGCAPP, 2013b); the studies indicated almost complete (98%) destruction of cyanide was possible. Follow-up studies indicated an optimal temperature and pressure based on the hydrolysate boiling point properties and existing EBH construction as 300°F at 45 pounds per square inch gauge (psig), resulting in up to 96% cyanide destruction; under those conditions, calculations indicated that offgas concentrations in the aluminum precipitation system effluents would be substantially less than 1 STEL (see references - BGCAPP, 2013c).

In order to reduce cyanide concentrations, it is proposed that the ENRs and supporting systems be modified to allow the energetics hydrolysate to be heated to an operating temperature of 300°F[1] and operating pressure of 45 psig[2] for approximately 7 hours, resulting in >95% destruction of cyanide. Specific process and equipment modifications to support this change in operating conditions are provided in Section 2.2.1 of this PMR.

2.1.2 Agent Drainage from Munitions

Agent drainage from projectiles and rocket M56 warheads is described in Section 2.1.1 of this PMR. The RD&D permit application identifies the use of high pressure wash in the munitions washout system (MWS) and rocket handling system (RHS) to remove residual agent after the munitions have been drained, with collection and treatment of the wash water in the spent decontamination system. Based on experience at chemical agent destruction baseline sites and with the BGAD munitions inventory, several potential issues have been identified with use of wash water:

- Air in-leakage during draining and washing can result in two-phase fluid flow to the pumps which could result in inability to deliver drained agent to the agent collection system or wash to the spent decontamination system. In addition, entrained air would be delivered to the agent collection system tanks or spent decontamination system tanks where it would then be vented to the MPT off-gas treatment system, potentially creating unsafe operating conditions.
- Existing strainer capacity is insufficient given revised expectations of the quantities of solids and gels that could be present in the munitions.
- Use of washout water during the GB treatment campaign could result in elevated concentrations of hydrofluoric acid in the wash, leading to corrosion problems within the piping and ancillary equipment.
- Hydrogen gas in munitions can be introduced into drain lines, adding to the problem of two-phase fluid flow.
- Washout of VX munitions could result in introduction of small quantities of water to the agent collection tanks, potentially resulting in a runaway exothermic reaction causing elevated temperatures and agent gelling in the tanks.

To mitigate these issues, changes in the agent drainage process are proposed. The existing MWS and RHS washout equipment and process lines will be isolated and not routinely used, except in cases of problematic munitions where washout is necessary.

To enhance agent drainage from the munitions in the proposed process, additional ancillary equipment to the MWS and RHS consisting of an in-line vapor-liquid separator agent transfer tank

[1] ±20 °F
[2] ±10 psig

(ATT), an entrainment removal drum/demister (ERD), and a multiple filter strainer would be used. Agent would drain through process lines directly from the munitions to the ATT. A suction pump would draw on the head space of the ATT, creating a partial vacuum which would assist gravity draining of the munitions and provide separation of air/gases and vapor from the liquid agent. The suction pump discharge would be through an ERD located in proximity to a room ventilation intake, ensuring separated gases and vapors would enter the MDB HVAC filtration system; liquid from the ERD would be returned to the ATT. The proposed drainage method would eliminate the potential for two-phase flow through pumps used to transfer agent to the agent collection system, introduction of air to the off-gas treatment system, formation of hydrofluoric acid, and introduction of water to the agent collection tanks during treatment of VX munitions.

It is also proposed that existing pumps used to move agent from the MWS and RHS to the agent collection system be replaced with larger, more robust models. The new pumps would have better tolerance for the solids expected in the drained agent. These would also provide higher discharge pressure, allowing installation of a multiple filter strainer for filtration of the solids and gels that may be present in the drained agent. The addition of the multiple filter strainers will allow longer processing times, minimizing the number of worker entries for strainer sock change outs. Also, a change in the strainer configuration is proposed that would allow use of air pressure to force standing agent in the strainer back to the ATT prior to filter sock change out, reducing free agent liquid in the strainer socks.

In addition, the proposed modification includes changes that would allow connection of plant air to the existing washout nozzles so that air could be bled into projectile cavities to enhance drainage when viscous agent is encountered. Any air introduced would be removed by the suction pump from the ATT. Redesign of connections and clamps for the munitions have been performed in support of this modification.

The proposed changes would be made for each of the MWS (one) and RHS (two) stations.

The proposed changes will have impacts on downstream processing. With elimination of washout, residual agent, agent heels, gels, and/or crystals are expected to remain in munitions transferred to the EBH (rockets) and MPT (projectiles). These will impact the EBH and MPT operating capacities and strategies to ensure agent destruction. In the EBH system, feed rate and processing condition adjustment may be necessary to allow neutralization of the higher residual agent content. For projectiles with residual agent, gels, and crystals, feed rate adjustment to the MPT may be necessary to ensure adequate heating and residence times as well as adequate thermal oxidizer capacity. Optimum feed rates that provide the required destruction efficiency will be determined during pilot testing.

In addition, spent socks from the strainer containing agent contaminated solids/gels will be generated. These spent socks will be treated in the either the MPT or EBH, depending on solids loading and the sock materials of construction, with treatment residence time adjusted accordingly to ensure agent destruction.

Specific process and equipment modifications to support the changes in munitions drainage are provided in Section 2.2.2 of this PMR.

2.2 Requested Changes and Related Supporting Documents

Per 401 KAR 38:040 Section 3 (40 CFR §270.42(b)(1)(i)), the applicant is required to describe the exact changes to be made to the Permit and its supporting documents. The specific requested changes and lists of supporting documents are described in Sections 2.2.1 and 2.2.2 and in Appendix A and Appendix B of this PMR.

2.2.1 Modification for Improved Cyanide Destruction

In the proposed modification, the operating conditions of energetics hydrolysis as well as supporting equipment of the ENRs in the energetics neutralization system will be changed to allow processing at higher temperatures and pressures to improve cyanide destruction efficiency. The proposed changes impact the following parts of the Permit:

- Section D-0 (Drawings)
- Section D-2 (Drawings)
- Section D-8 (Drawings and Description)

Specific operating conditions related to energetics hydrolysis to be changed are:

- Heating of the energetics hydrolysate to an operating temperature of 300°F during the fill phases of the ENR vessels.
- Maintaining the energetics hydrolysate for approximately 7 hours at an operating temperature of 300°F and an operating pressure of 45 psig in the ENRs.
- Cooling of samples from the ENRs for verifying agent destruction from 300°F to approximately 200°F using a sample cooling heat exchanger.
- Change in processing method to cool energetics hydrolysate from 300°F to approximately 140 °F using existing secondary heat transfer cooling loops.

Specific proposed equipment changes include:

- Addition of another secondary heat transfer heat exchanger connected in series with the existing heat exchanger and associated ancillary items (heat exchanger structural support, piping, piping supports, connections, valves, electrical connections, meters, sensors, gauges, and other supporting instruments) and removal of obsolete piping and ancillary items.
- Addition of an ENS sample cooling heat exchanger and associated ancillary items (heat exchanger structural support, piping, piping supports, connections, valves, electrical connections, meters, sensors, gauges, and other supporting instruments) and removal of obsolete piping and ancillary items.
- Addition of insulation to ENR vessels and piping.
- Rerating and ASME code stamping of the existing ENR vessels.

A list of revised process flow diagrams (PFDs) and piping and instrumentation diagrams (P&IDs) reflecting proposed changes to the process is given in Table 1. These PFDs and P&IDs are provided in Appendix C. Other document changes are referenced in Appendix A, and specific Permit language changes are provided in Appendix B. Since the proposed modifications represent changes only to operating conditions and ancillary items, Part A, Kentucky Hazardous Waste Permit Application, has not been revised.

Table 1. Revised P&IDs for Improved Cyanide Destruction

Drawing Number	Revision	Title
24915-07-M5-ENS-00001	9 (sheet 1), 7 & 6 (sheets 2-4)*	MDB ENERGETICS NEUTRALIZATION PROCESS FLOW DIAGRAM
24915-07-M6-ENS-00005	10	MDB ENERGETICS NEUTRALIZATION REACTOR 1 PID
24915-07-M6-ENS-00006	6	MDB ENERGETICS NEUT. REACTOR 2 PID
24915-07-M6-ENS-00007	6	MDB ENERGETICS NEUT. REACTOR 3 PID
24915-07-M6-ENS-00023	11	MDB ENERGETICS NEUT SAMPLER PID

*Material and energy balances for 24915-07-M5-ENS-00001 (sheets 2-4, revisions 7 & 6) may be revised based on data to be collected as part of systemization and RD&D operation of the facility.

2.2.2 Modification for Agent Drainage from Munitions

In the proposed modification, an alternative option for enhanced agent draining from munitions without the need for agent washout using process water will be incorporated. The revised method will provide the option of draining agent from munitions into intermediate collection tanks using gravity with vacuum assistance and subsequent filtration of solids and gels, thus eliminating the need for washout.

The proposed changes impact the following parts of the Permit:

- Section D-0 (Drawings)
- Section D-2 (Drawings)
- Section D-8 (Drawings and Description)

Specific operating and processing changes are:

- Isolation of existing munition and rocket washout equipment and lines.
- Introduction of a vapor-liquid separator (ATT) into which agent will be directly gravity drained from the munitions.
- Use of a suction pump to draw from the head space of the ATT to enhance air and other gases separation from the drained liquid and provide additional driving force for draining from the munitions.
- Suction pump discharge through an ERD placed near a room ventilation intake, with separated liquid draining to the ATT.
- Use of a larger, multiple filter strainer for filtration of solids and gels from the drained agent, with periodic change out upon saturation.
- Treatment of the strainers in either the MPTs or EBHs.
- Processing of drained munitions containing agent heels in the MPTs (projectiles) and EBHs/MPTs (rockets) with the feed rate adjustment based on extent of heel material.
- Installation of a new clamp design for use in the rocket draining process.

Specific proposed ancillary equipment changes include:

- Addition of an ATT into which munitions will be drained by gravity with vacuum assistance.
- Addition of a suction pump that will pull a partial vacuum on the ATT, assisting in draining the agent from munitions.
- Addition of an ERD for the suction pump discharge.
- Replacement of the agent drain pump with a larger model that can pass solids and discharge at a higher pressure to support filtration of the drained agent prior to its transfer to the agent collection tanks.

- Addition of a larger capacity strainer for filtration of solids and gels in order to minimize filter change out frequency.
- All structural supports, piping, piping supports, connections, valves, electrical connections, meters, sensors, gauges, and other supporting instruments necessary for the alternate agent draining system.
- Redesigned clamps for use in draining rockets.

A list of revised PFDs and P&IDs reflecting proposed changes to the process is given in Table 2. These P&IDs are provided in Appendix C. Other document changes are referenced in Appendix A, and specific Permit language changes are provided in Appendix B. Since the proposed modifications represent changes only to operating conditions and ancillary items, Part A, Kentucky Hazardous Waste Permit Application, has not been revised.

2.3 Class of Permit Modifications

Per 401 KAR 38:040 Section 3 (40 CFR §270.42(b)(1)(ii)), the applicant is required to identify the PMR as a Class 2 modification. The proposed changes are Class 2 modifications based on the criteria in 40 CFR §270.42, Appendix I, as discussed in Sections 2.3.1 and 2.3.2 of this PMR.

2.3.1 Class 2 Modification - Improved Cyanide Destruction

The Permittees are proposing the changes related to improved cyanide destruction as a Class 2 Modification based on Items G.2, “Modification of a tank unit or secondary containment system without increasing the capacity of the unit”, and G.4, “Modification of a tank management practice”, in Appendix I of 40 CFR §270.42. The ENR vessels (tanks) and associated systems will be modified as described above, and the management practices (operating conditions) of the tanks will be changed (300°F at 45 psig). In addition, the same wastes (energetics and agent) will be managed in the tanks. The changes will not result in greater than 25% increase in BGCAPP’s tank capacity, and the waste managed will not be different. In addition, none of the Item A (General Permit Provisions), Item B (General Facility Standards), or other item classifications listed in Appendix I are applicable to the proposed changes.

2.3.2 Class 2 Modification - Agent Drainage from Munitions

The Permittees are proposing the changes related to agent drainage from munitions as a Class 2 Modification. The proposed changes will result in addition of ancillary equipment (ATT, ERD, and strainer) to the MWS and RHS (Subpart X miscellaneous units) that will provide at least partial phase separation (gas/vapor and solids). Subpart X unit class modifications are not specified in Appendix I of 40 CFR §270.42. However, 40 CFR §270.42(d) indicates that considerations can be given to the similarity of the modification to other modifications provided in Appendix I. The proposed changes in agent drainage are similar to Item G.4 in that these are best described as changes in management practices of the agent stream, as entrained gases will be separated prior to entry into the agent collection tanks, solids and gels will be separated by filtration to prevent line plugging during pumping of agent to the agent collection tanks, introduction of unwanted components (i.e., water and air) will be eliminated from the agent collection tanks, and munitions parts and pieces feed rates to the EBH system and MPT may be adjusted. While management practices will change, the same wastes will be managed in the MWS, RHS, and subsequent tank and treatment systems. Also, the changes will not result in greater than 25% increase in BGCAPP’s tank capacity. In addition, none of the Item A (General Permit Provisions), Item B (General Facility Standards), or other item classifications listed in Appendix I are applicable to the proposed changes. Finally, the proposed changes do not substantially alter the pilot plant or its operation.

Table 2. Revised P&IDs for Agent Drainage from Munitions

Drawing Number	Revision	Title
24915-07-M5-MWS-00001	10 (sheet 1) 7 (sheets 2-3)*	MDB MUNITIONS WASHOUT SYSTEM PROCESS FLOW DIAGRAM
24915-07-M5-RHS-00001	10 (sheet 1) 9 (sheet 2)*	MDB ROCKET SHEAR MACHINE PROCESS FLOW DIAGRAM
24915-07-M5-SDS-00001	11 (sheet 1) 7 (sheet 2)*	MDB SPENT DECONTAMINATION SYSTEM PROCESS FLOW DIAGRAM
24915-07-M6-MWS-00001	11	MDB AGENT WASHOUT PUMPS PIPING AND INSTRUMENT DIAGRAM
24915-07-M6-MWS-00002	11	MDB DRAINED AGENT PUMPS PIPING AND INSTRUMENT DIAGRAM
24915-07-M6-MWS-00003	14	MDB WASHOUT WATER TANK AND JET PUMPS PIPING AND INSTRUMENT DIAGRAM
24915-07-M6-MWS-00004	7	MDB CAM INFEED CONVEYOR PIPING AND INSTRUMENT DIAGRAM
24915-07-M6-MWS-00005	9	MDB MWS CAM NO. 1 - 155 MM DETAILS PIPING AND INSTRUMENT DIAGRAM
24915-07-M6-MWS-00006	9	MDB MWS CAM NO. 2 - 155 MM DETAILS PIPING AND INSTRUMENT DIAGRAM
24915-07-M6-MWS-00007	9	MDB MWS CAM NO. 3 - 155 MM DETAILS PIPING AND INSTRUMENT DIAGRAM
24915-07-M6-MWS-00012	6	MDB MWS CAM 155 MM SPARE DETAILS PIPING AND INSTRUMENT DIAGRAM
24915-07-M6-MWS-00013	6	MDB MWS CAM NO. 1 8-INCH DETAILS PIPING AND INSTRUMENT DIAGRAM
24915-07-M6-MWS-00014	6	MDB MWS CAM NO. 2 8-INCH DETAILS PID
24915-07-M6-RHS-00055	8	MDB ROCKET SHEAR MACHINE FEED - LINE 1 P&ID
24915-07-M6-RHS-00056	8	MDB ROCKET SHEAR MACHINE - LINE 1 PID
24915-07-M6-RHS-00057	9	MDB RHS - AGENT WASHOUT PUMP TRAIN 1 PID
24915-07-M6-RHS-00058	7	MDB RHS-DRAINED AGENT PUMPS, TRAIN 1 PID
24915-07-M6-RHS-00063	7	MDB ROCKET SHEAR MACHINE FEED - LINE 2 PID
24915-07-M6-RHS-00064	8	MDB ROCKET SHEAR MACHINE - LINE 2 PID
24915-07-M6-RHS-00065	9	MDB RHS-AGENT WASHOUT PUMP, TRAIN 2 PID
24915-07-M6-RHS-00066	8	MDB RHS-DRAINED AGENT PUMPS, TRAIN 2 PID
24915-07-M6-RHS-00067	7	MDB RHS - WATER JET PUMPS PID
24915-07-M6-SDS-00002	10	MDB SPENT DECON HOLDING TANK 0201 PIPING AND INSTRUMENT DIAGRAM
24915-07-M6-SDS-00003	10	MDB SPENT DECON HOLDING TANK 0301 PIPING AND INSTRUMENT DIAGRAM

*****Material and energy balances for 24915-07-M5-MWS-00001 (sheets 2-3, revision 7), 24915-07-M5-RHS-00001 (sheets 2, revision 9), and 24915-07-M5-SDS-00001 (sheet 2, revision 7) may be revised based on data to be collected as part of systemization and RD&D operation of the facility.

3.0 OTHER APPLICABLE INFORMATION

Per 401 KAR 38:040 Section 3 (40 CFR §270.42(b)(1)(iv)), the applicant is required to provide applicable information required by 40 CFR 270.13 through 270.21, 270.62, and 270.63. Appendix A provides a listing of these as well as applicable 40 CFR 264 requirements (incorporated by reference); requirements affected by this PMR are indicated, along with the section(s) of the permit that would be modified or clarified.

4.0 REFERENCES

BGCAPP WP-125: Cyanide Formation During the Caustic Hydrolysis of Energetic Materials – Potential Impact to BGCAPP Unit Operations, 24915-00-30H-G01-00109, Rev. 3, November 14, 2011.

BGCAPP Test Report for Cyanide and Hydrogen Cyanide Analyses in Caustic Energetics Hydrolysate, 24915-00-GQY-GGEN-00090, Rev. 0, March 2013a.

BGCAPP Test Report for High Temperature/High Pressure Destruction of Cyanide in Energetics Hydrolysate, 24915-00-GQY-GGEN-00098, Rev. 0, September 16, 2013b.

BGCAPP Test Report for High Temperature/High Pressure Cyanide Destruction Follow-On Studies, 24915-00-GQY-GGEN-00104, Rev. 0, November 13, 2013c.

APPENDIX A. PERMIT RELATED INFORMATON OR DOCUMENTS AFFECTED BY PMR

Regulatory Citation(s) 401 KAR 34 (incorporating 40 CFR Part 264 where applicable)	Description of Requirement	Modified or Clarified Information		
		Yes	No	Sections of the RD&D Permit Application Modified or Modified Documents
34:020 (264 Subpart B)	**General Facility Standards**			
34:020 Sec. 2 (§264.11)	Identification number		✓	
34:020 Sec. 3 (§264.12)	Required notices		✓	
34:020 Sec. 4 (§264.13)	General waste analysis		✓	
34:020 Sec. 5 (§264.14)	Security		✓	
34:020 Sec. 6 (§264.15)	General inspection requirements		✓	
34:020 Sec. 7 (§264.16)	Personnel training		✓	
34:020 Sec. 8 (§264.17)	General requirements for ignitable, reactive, or incompatible wastes		✓	
34:020 Sec. 9	Location standards Geological Information		✓	
34:020 Sec. 10 (§264.19)	Construction quality assurance program		✓	
34:030 (264 Subpart C)	**Preparedness and Prevention**			
34:030 Sec. 2 (§264.31)	Design and operation of facility		✓	
34:030 Sec. 3 (§264.32)	Required equipment		✓	
34:030 Sec. 4 (§264.33)	Testing and maintenance of equipment		✓	
34:030 Sec. 5 (§264.34)	Access to communication or alarm system		✓	
34:030 Sec. 6 (§264.35)	Required aisle space		✓	
34:030 Sec. 7 (§264.37)	Arrangements with local authorities		✓	
34:040 (264 Subpart D)	**Contingency Plan and Emergency Procedures**			
34:040 Sec. 2 (§264.51)	Purpose and implementation of contingency plan		✓	
34:040 Sec. 3 (§264.52)	Content of contingency plan		✓	
34:040 Sec. 4 (§264.53)	Copies of contingency plan		✓	
34:040 Sec. 5 (§264.54)	Amendment of contingency plan		✓	
34:040 Sec. 6 (§264.55)	Emergency coordinator		✓	
34:040 Sec. 7 (§264.56)	Emergency procedures		✓	
34:050 (264 Subpart E)	**Manifest System, Recordkeeping, and Reporting**			
34:050 Sec. 2 (§264.71)	Use of the manifest system		✓	
34:050 Sec. 3 (§264.72)	Manifest discrepancies		✓	
34:050 Sec. 4 (§264.73)	Operating record		✓	
34:050 Sec. 5 (§264.74)	Availability, retention, and disposition of records		✓	
34:050 Sec. 6	Annual report		✓	

Regulatory Citation(s) 401 KAR 34 (incorporating 40 CFR Part 264 where applicable)	Description of Requirement	Modified or Clarified Information		
		Yes	No	Sections of the RD&D Permit Application Modified or Modified Documents
34:050 Sec. 7 (§264.76)	Unmanifested waste report		✓	
34:050 Sec. 8	Additional reports		✓	
34:060 (264 Subpart F)	**Releases from Solid Waste Management Units**			
34:060 Sec. 2 (§264.91)	Required programs		✓	
34:060 Sec. 3 (§264.92)	Ground-water protection standard		✓	
34:060 Sec. 4 (§264.93)	Hazardous constituents		✓	
34:060 Sec. 5	Concentration limits		✓	
34:060 Sec. 6 (§264.95)	Point of compliance		✓	
34:060 Sec. 7 (§264.96)	Compliance period		✓	
34:060 Sec. 8 and §264.97	General ground-water monitoring requirements		✓	
34:060 Sec. 9 (§264.98)	Detection monitoring program		✓	
34:060 Sec. 10 (§264.99)	Compliance monitoring program		✓	
34:060 Sec. 11 (§264.100)	Corrective action program		✓	
34:060 Sec. 12	Releases from solid waste management units - corrective action for solid waste management units		✓	
34:060 Sec. 13	Incorporation by reference - groundwater analysis and report forms		✓	
34:070 (264 Subpart G)	**Closure and Post-Closure**			
34:070 Sec. 2 (§264.111)	Closure performance standard		✓	
34:070 Sec. 3 and §264.112	Written plan, content of plan, amendment of plan, notification of partial closure and final closure, removal of wastes and decontamination or dismantling of equipment		✓	
34:070 Sec. 4 and §264.113	Time allowed for closure		✓	
34:070 Sec. 5 (§264.114)	Disposal or decontamination of equipment, structures, and soils		✓	
34:070 Sec. 6 (§264.115)	Certification of closure		✓	
34:070 Sec. 7 (§264.116)	Survey plat		✓	
34:070 Sec. 8 and §264.117	Postclosure care and use of property		✓	
34:070 Sec. 9 and §264.118	Postclosure plan and amendment of plan		✓	
34:070 Sec. 10 (§264.119)	Postclosure notices		✓	
34:070 Sec. 11 (§264.120)	Certification of completion of post-closure care		✓	
34:080-130 (264 Subpart H)	**Financial Requirements**		✓	
34:180 (264 Subpart I)	**Use and Management of Containers**			
34:180 Sec. 2 (§264.171)	Condition of containers		✓	
34:180 Sec. 3 (§264.172)	Compatibility of waste with containers		✓	
34:180 Sec. 4 (§264.173)	Management of containers		✓	
34:180 Sec. 5 (§264.174)	Inspections		✓	
34:180 Sec. 6 (§264.175)	Containment		✓	

Regulatory Citation(s) 401 KAR 34 (incorporating 40 CFR Part 264 where applicable)	Description of Requirement	Modified or Clarified Information		
		Yes	No	Sections of the RD&D Permit Application Modified or Modified Documents
34:180 Sec. 7 (§264.176)	Special requirements for ignitable or reactive waste		✓	
34:180 Sec. 8 (§264.177)	Special requirements for incompatible wastes		✓	
34:180 Sec. 9 (§264.178)	Closure		✓	
34:180 Sec. 10 (§264.179)	Air emission standards		✓	
34:190 (264 Subpart J)	**Tank Systems**			
34:190 Sec. 2 (§264.191)	Assessment of existing tank system's integrity		✓	
34:190 Sec. 3 (§264.192)	Design and installation of new tank systems or components	✓		Section D-0 Section D-2 Drawings
34:190 Sec. 4 (§264.193)	Containment and detection of releases		✓	
34:190 Sec. 5 (§264.194)	General operating requirements	✓		Section D-0 Section D-2 Drawings
34:190 Sec. 6 (§264.195)	Inspections		✓	
34:190 Sec. 7 (§264.196)	Response to leaks or spills and disposition of leaking or unfit-for-use tank systems		✓	
34:190 Sec. 8 (§264.197)	Closure and post-closure care		✓	
34:190 Sec. 9 (§264.198)	Special requirements for ignitable or reactive wastes		✓	
34:190 Sec. 10 (§264.199)	Special requirements for incompatible wastes		✓	
34:190 Sec. 11 (§264.200)	Air emissions standards		✓	
34:190 Sec. 12	Effective dates		✓	
34:250 (264 Subpart X)	**Miscellaneous Units**			
34:250 Sec. 2 (§264.601)	Environmental performance standards	✓		Section D-0 Section D-8 Drawings
34:250 Sec. 3 (§264.602)	Monitoring, analysis, inspection, response, reporting, and corrective action		✓	
34:250 Sec. 4 (§264.603)	Postclosure care		✓	
34:350	**Treatment of Nerve and Blister Agents**	✓		Section D-0 Section D-2 Section D-8 Drawings
Appendices				
34:290 Sec. 1 (264 Appendix I)	Recordkeeping instructions		✓	
34:320 Sec. 1 (264 Appendix IV)	Cochran's approximation to the Behrens-Fisher Students' T-Test		✓	
34:330 Sec. 1 (264 Appendix V)	Examples of potentially incompatible waste		✓	
34:360 Sec. 1 (264 Appendix IX)	List of hazardous constituents for groundwater monitoring		✓	

Regulatory Citation(s) 401 KAR 38 (incorporating 40 CFR Part 270 where applicable)	Description of Requirement	Modified or Clarified Information		
		Yes	No	Sections of the RD&D Permit Application Modified or Modified Documents
38:010 (270 Subpart A)	**General Information**			
38:010 Sec. 2	Considerations under Federal law		✓	
38:010 Sec. 3 (§270.4)	Effect of a permit		✓	
38:010 Sec. 4	Prohibition of use of unpermitted facility		✓	
38:010 Sec. 5 (§270.5)	Noncompliance and program reporting by the cabinet		✓	
38:030 (270 Subpart C)	**Permit Conditions**			
38:030 Sec. 1 and §270.30	Conditions applicable to all permits		✓	
38:030 Sec. 2 (§270.31)	Requirements for recording and reporting of monitoring results		✓	
38:030 Sec. 3 and §270.32	Establishing permit conditions		✓	
38:030 Sec. 4 (§270.33)	Schedules of compliance		✓	
38:080	**Contents of Part A of the Permit Application (Form 7058A)**		✓	
38:090	**General Contents of Part B Application**			
38:090 Sec. 1 (§270.14(a))	Contents of Part B: General requirements Certified documents	✓		Drawings
38:090 Sec. 2 and §270.14	General information requirements General description Topographic map Seismic considerations Subsurface geology and Karst features Groundwater monitoring Floodplain requirements Traffic information Alternative analysis plan Past compliance record Financial responsibility to construct and operate		✓	
38:090 Sec. 3 (§270.14(b) (11))	Location information		✓	
38:090 Sec. 4 (§270.14(c))	Additional groundwater protection information requirements		✓	
38:090 Sec. 5 (§270.14(d))	Information requirements for solid waste management units		✓	
38:150 (§270.15)	**Specific Part B information requirements for containers**		✓	
38:160 (§270.16)	**Specific Part B information requirements for tanks** Number, location, and types of tanks Tank dimensions and capacity Procedures for handling incompatible, ignitable, or reactive wastes Material of construction, volume, dimensions and all design details Type of waste contained in tanks Operating pressure and temperature Description of the feed systems, safety cutoff, bypasses systems, and pressure	✓		Section D-0 Section D-2 Drawings

Regulatory Citation(s) 401 KAR 38 (incorporating 40 CFR Part 270 where applicable)	Description of Requirement	Modified or Clarified Information		
		Yes	No	Sections of the RD&D Permit Application Modified or Modified Documents
	controls Diagrams of piping, instrumentation and process flow for each tank system			
38:230 (§270.23)	Description Treatment unit design/construction details Site assessments Potential exposure pathways Effectiveness of treatment	✓		Section D-0 Section D-8 Drawings
38:060 Sec. 6 (§270.65)	**Research, development, and demonstration permits**	✓		Section D-0 Section D-2 Section D-8 Drawings

APPENDIX B. SPECIFIC LAGUAGE CHANGES IN PERMIT

Section D-8 Process Information: Description and Overview of Facilities

Section D-8a(1)(e) Munition Washout System (Miscellaneous Unit)

At the MWS, the projectile will be inverted and placed into one of the MWS modules that contain a cavity access machine. A ram will be hydraulically forced into the projectile, collapsing the burster well into the agent cavity. The agent will drain by gravity with vacuum assistance, collected in an agent transfer tank (ATT) that provides vapor-liquid separation, and then be pumped to the agent storage tank in the ANS. ~~A washout nozzle array (nozzles providing high-pressure water jets) will be integrated into the shaft of the burster well ram and provide the high-pressure water sprays to clean and flush the cavity. After flushing of the cavity,~~ Specifically, agent will be directly gravity drained from the munitions into a vapor-liquid separator (ATT). A suction pump will draw from the head space of the ATT to enhance air and other gases separation from the drained liquid and provide additional driving force for draining from the munitions. The suction pump will discharge through an entrainment removal drum (ERD) placed near a room ventilation intake, with separated liquid draining to the ATT. The agent will be pumped through a multiple filter strainer to the agent collection system (agent holding tank). The strainer will provide filtration of solids and gels, with periodic change out upon saturation and treatment of the strainers in either the MPTs or EBHs. After draining, the projectile will be placed back on the munition tray and transferred to the MPT. If for any reason a projectile cannot be processed, it will be placed in storage on a reject table (permitted storage area listed in Part A) in proximity to the MWS where the rejects can be managed until processed manually. Munitions with substantial amounts of gel, crystals, or residual solids may have these further pushed out of the projectiles with water or other fluid (such as sodium hydroxide solution) prior to subsequent processing in the MPTs. In some cases, connection of plant air to washout nozzles so that air could be bled into projectile cavities to enhance drainage when viscous agent is encountered may be performed. Any air introduced would be removed by the suction pump from the ATT.

Section D-8a(1)(g) RSM (Miscellaneous Unit)

The RSM will demilitarize the M55 rocket warheads and CRMs. The RSM will extract agent from rockets in a punch~~,~~ and drain~~, and wash~~ station and then shear these into segments to access the energetics for neutralization in the EBH. Specifically, agent will be directly gravity drained from the munitions into a vapor-liquid separator (ATT). A suction pump will draw from the head space of the ATT to enhance air and other gases separation from the drained liquid and provide additional driving force for draining from the munitions. The suction pump will discharge through an entrainment removal drum (ERD) placed near a room ventilation intake, with separated liquid draining to the ATT. The agent will be pumped through a multiple filter strainer to the agent collection system (agent holding tank). The strainer will provide filtration of solids and gels, with periodic change out upon saturation and treatment of the strainers in either the MPTs or EBHs. ~~Drained agent extracted at the RSM will be pumped directly into the agent storage tanks; all agent washout water will be pumped to the spent decontamination solution storage tanks and agent surge tank.~~ From the agent holding tanks ~~storage tanks~~, the agent ~~and flush material~~ will be pumped to the ANS for agent neutralization. The rocket warheads processing at the RSM will occur after these have been removed from their fiberglass SFTs. The RSM to be used at the BGCAPP is similar to the RSM used at baseline operations, but it has been modified to process warheads that have been removed from the SFT ~~to include a high-pressure flushing step that will serve to wash residual agent from the agent cavity and remove any gelled agent~~. A fully automated, hydraulically powered RSM will be installed in each ECR. Munitions with substantial amounts of gel, crystals, or residual solids may have these further pushed out of the projectiles with water or other fluid (such as sodium hydroxide solution) prior to subsequent processing in the EBHs. In some cases, connection of plant air to washout nozzles so that air could be bled into projectile cavities to enhance drainage when viscous agent is encountered may be performed. Any air introduced would be removed by the suction pump from the ATT.

~~*Section D-8a(1)(h) Punch/Drain and Wash Station (Miscellaneous Unit)*~~

~~The punch/drain and wash station will clamp the rocket warhead while it is punched, drained, and washed out. To reduce residual agent in the rocket warhead cavity and therefore minimize the amount of agent processed in the EBH, the baseline RSM punch-and-drain station has been modified to include a pressurized water spray system.~~

~~The sprays will remove the residual agent and dissolve solidified material that does not drain during the punch-and-drain cycle. The high-pressure water flush system will improve cleaning of the rocket warhead while minimizing changes to the baseline RSM system.~~

~~The flush rate will be maintained at less than the drain rate capacity, assisted by vacuum, to avoid pressurizing the warhead.~~

Rocket washout, if necessary, will be performed as described in Section D-8a(1)(g).

Section D-8a(1)(l) ENS (Tank System)

The energetics hydrolysate will not be released from the MDB until it has been tested for agent and verified to have met all requirements for release from engineering controls. The hydrolysate will be transferred to the energetic hydrolysate storage tanks in the HSA. If the residual agent concentration is above the target release level, additional reaction time will be required in the ENRs before transfer to the HSA. Headspace gases from the ENRs will be sent to an air pollution control device (i.e., MPT off-gas treatment system [OTM]) and then released to the MDB HVAC filtration system. In addition, specific operating conditions in the ENRs to allow destruction of cyanide formed during hydrolysis of energetics will include:

- Heating of the energetics hydrolysate to an operating temperature of 300°F during the fill phases of the ENR vessels.

- Maintaining the energetics hydrolysate for approximately 7 hours at an operating temperature of 300°F and an operating pressure of 45 psig in the ENRs.
- Cooling of samples from the ENRs for verifying agent destruction from 300°F to approximately 200°F using a sample cooling heat exchanger.
- Cooling of the energetics hydrolysate from 300°F to approximately 140 °F using secondary heat transfer cooling loops.

Section D-8a(2)(c) Operating Conditions

After all of the subsystems have been subjected to rigorous testing under the systemization program and the results of systemization have been deemed acceptable by the Army, Assembled Chemical Weapons Alternatives (ACWA), and BPBG, the program will move into the second on-site phase of the RD&D program, termed "pilot testing." Pilot testing starts by processing the munitions at very slow rates with a large amount of testing and verification taking place during the processing. Pilot testing will begin with the processing of GB rockets followed by projectiles. It is anticipated that testing with the GB inventory will meet the system integration objectives of the RD&D program.

The bases for this conclusion are as follows:

- All of the components of the BGCAPP are tested during the RD&D program.
- The Newport Chemical Agent Disposal Facility (NECDF) completed operations on VX years prior to starting BGCAPP operations; therefore, an RD&D program is not required for these agents. Treatment of munitions will ramp up during the RD&D program, with GB munitions processing taking place slowly. As the system is validated and issues are identified and resolved, the processing rates will increase over a period of approximately 5 months. The 5-month period is based on an assumption that no major problems arise. The program schedule is designed to allow sufficient time to identify and overcome minor problems. If major problems arise during the RD&D period, the RD&D program may require the full 1-year period allowed by the RD&D regulations that is being requested in this permit application. It is the intent of BPBG to use the entire RD&D campaign to treat all GB agent containing munitions and associated wastes. If operations take longer than the anticipated one year, BPBG may seek additional time as outlined in the Office of Solid Waste and Emergency Response (OSWER) Policy Directive for RD&D permits.

The BGCAPP is an integrated facility whose effectiveness depends on the integrated processes, and not the effectiveness of individual miscellaneous Subpart X (or other) treatment units. The sole function of the BGCAPP is destruction of the chemical agent and treatment or disposal of the associated energetics, and operating conditions will be selected to meet that function. The operating conditions of some units (e.g., MPT) will be well defined before start of operations. The operating conditions of other units will be adjusted as necessary during pilot plant testing to determine optimal conditions.

For hydrolysis of agent and energetics, destruction of GB to a 99.9999 percent DE has been demonstrated at bench scale. Approximate temperature and reaction times have been determined that will ensure agent and energetics are hydrolyzed and aluminum components are dissolved. Conditions will ensure 99.9999 percent DE will be accomplished by the ANS and ENS.

For the MPT, the U.S. Army cites a temperature of 1000°F for at least 15 minutes as a performance based standard for the destruction of chemical agents. The MPT unit has been designed, tested, and demonstrated to meet this military unique chemical agent treatment standard. This standard (previously referred to as XXXXX or 5X) has been used for more than 30 years and, when met, allows the release of the treated item or waste to the public. Treatment of metallic and other solid wastes, including secondary wastes, potentially contaminated with chemical agent at BGCAPP will also occur in the MPT under these conditions. To demonstrate achievement of the performance standard, thermal dosimeters will be applied to munition bodies and other metal parts after liquid agent has been removed. These dosimeters will be located on the outside and inside of the munition bodies and will "pop" when the pre-determined criteria (1000°F for 15 minutes) has been achieved.

In addition, specific operating conditions in the ENRs to allow destruction of cyanide resulting from energetics hydrolysis will include:

- Heating of the energetics hydrolysate to an operating temperature of 300°F during the fill phases of the ENR vessels.
- Maintaining the energetics hydrolysate for approximately 7 hours at an operating temperature of 300°F and an operating pressure of 45 psig in the ENRs.
- Cooling of samples from the ENRs for verifying agent destruction from 300°F to approximately 200°F using a sample cooling heat exchanger.
- Cooling of the energetics hydrolysate from 300°F to approximately 140 °F using secondary heat transfer cooling loops.

BGCAPP SCWO units will treat both energetics and agent hydrolysate and effectively mineralize any remaining organics in these wastes. The SCWO has treated (at the scale employed at the BGCAPP) industrial wastewater in Japan and agent hydrolysate during tests for the U.S. Army at Corpus Christi, TX. In both instances, the technology was extremely effective in treating organics. Treatment of the highly corrosive hydrolysate at Corpus Christi produced an effluent that was essentially devoid of any organics (i.e., TOC <10 ppm). Establishment of a performance standard and adjustment of operating conditions will occur during RD&D Testing associated with the GB Agent campaign.

Following SCWO treatment of hydrolysate, the RO system will treat, recover, and recycle (in the SCWO) the majority of the resulting wastewater (approximately 70 percent). The BGCAPP will ship the RO reject off site to appropriately licensed and permitted RCRA facility(s). The RO unit is a proven technology for removing contaminants like salts from water. The U.S. Army and others have repeatedly demonstrated the RO's treatment effectiveness by treating wastewaters ranging from brackish water to industrial waste streams while meeting a wide variety of water quality requirements. RO Unit operating conditions and effluent will be evaluated and a performance standard established during RD&D Testing associated with the GB Agent campaign.

Process integration involves many individual units and systems performing together to achieve the desired goal of final munitions demilitarization and agent/energetics destruction. This can best be measured by the successful completion of the deliberate ramping up of munitions processing during the GB campaign to the successful demonstration test at full rate. This full scale demonstration will be accompanied by the achievement of the 99.9999 percent DE at the exit of hydrolysate from the ANS. These two components (achievement of full scale throughput and attainment of the 99.9999 percent DE) will demonstrate that all individual processes are working as designed from the onset of munitions processing in the ANS to waste streams exiting the RO unit.

Additional operating details for the miscellaneous units will include:

- GB Nerve Agent Munitions - GB 8-Inch Projectile (no energetics are associated with this munition)

1) Remove the pallet of projectiles from the EONC.

2) Load the projectiles into a tray.

3) Convey the tray to the nose closure removal (NCR) and munitions washout system (MWS).

4) Via robot, transfer each individual projectile to the nose closure removal station (NCRS) and remove the lifting plug from the nose.

5) Via robot, transfer the individual projectiles from the NCRS and load them into the MWS module, nose-down.

6) Hydraulically collapse the burster well into the projectile's agent cavity.

7) Gravity-drain the agent through the nose of the projectile.

~~8) Wash out the agent cavity using high pressure water.~~ Introduce air or washout fluids if necessary to further remove agent, gels, or crystals.

9) Send the drained agent ~~and washout water~~ through a multiple strainer filter to storage tanks in the agent neutralization room.

10) Replace each washed munitions body into its tray.

11) Convey the tray of washed projectiles to the MPT for thermal treatment.

- GB 8-inch Leaking Munition Processing Sequence

1) The overpacked GB projectiles will be removed from the EONC in the UPA.

2) The munition will be transferred to the TMA where they will be manually unpacked and placed on a tray on the conveyor system for processing through the MWS.

3) In the ECV, the overpacked projectiles will be manually unpacked and placed on the conveyor system for transfer to the PMD for processing.

4) The empty overpack containers will be taken to the TMA for chemical decontamination or thermal decontamination in the MPT prior to offsite recycling or disposal at a permitted TSDF.

- GB M55 Rockets - Nonleakers

1) Remove the pallet of rockets from the EONC (UPA).

2) Place each rocket individually onto the rocket input assembly, which conveys it through the airlock to the ECV and to the RCM. The RCM separates the rocket into three pieces: the warhead, the warhead's SFT, and the RM.

3) Transfer the RM (still contained in its section of the SFT) to a container for further treatment at another location on BGAD or an offsite TSDF.

4) Transfer the warhead's SFT to a container for disposal at a permitted TSCA landfill.

5) Convey the rocket warhead to the punch-and-drain station of the RSM in the ECR.

6) Punch holes in the top and bottom of the rocket warhead agent cavity with the punch-and-drain station.

7) Drain the agent through the lower clamp. Send the drained agent through a multiple strainer filter into an agent storage tank in the agent neutralization room.~~8) Introduce high-pressure water. Flush the agent cavity (the optimum flush duration, pressure and flow rate will be evaluated during simulant, surrogate, and agent testing in the RD&D program), maintaining suction at a slightly higher flow rate than the inflow.~~ Determine if additional residual agent, gel, or crystal removal is necessary.

~~9) Send the washout water to a storage tank in the agent neutralization room.~~ If necessary to remove residual agent, gel, or crystals, introduce air or washout fluids to further remove these.

10) Move the rocket warhead to the shear station for cutting.

11) Cut the warhead portion into segments. The warhead includes the fuze, the burster, and the washed agent cavity.

12) Send the warhead segments to the EBHs.

13) Send the energetics hydrolysate from the EBH to the ENS for further hydrolysis, as required.

14) Sample and analyze the energetics hydrolysate to verify that it no longer exhibits the characteristic of reactivity and that the agent concentration is below the target release level for agent before transfer to the HSA.

15) Transfer the energetics hydrolysate from the HSA to the APS and the AFS in the SPB.

16) Chemically precipitate the aluminum and then remove the precipitate by filtration. The aluminum precipitate is characterized and sent offsite to a permitted disposal facility. Send the filtrate to the SCWO for further treatment.

17) Send solid material (rocket sections and pieces) from the EBHs through the MPT for thermal treatment at a minimum of 1,000°F for a minimum of 15 minutes.

- GB M55 Rockets – Leakers - The known leakers will be processed at the end of each agent campaign at BGCAPP. The unknown leakers will be accumulated in the ECVs and then processed in a leaker campaign, or these previously unknown leakers will be overpacked and sent back to the leaker storage igloo for processing during the known leaker rocket campaign.

1) For known overpacked leakers (stored in the igloos in overpacks):

a. The EONCs of overpacked rockets will be monitored for agent in the UPA. If agent monitoring indicates that the EONC does not contain any leaking overpacks, the EONC will be opened and the overpacks transferred to the ECV.

b. In the ECV, the rocket overpack will be opened manually by operations personnel in PPE and the rocket removed from the overpack. The rocket will be placed on the RCM conveyor system in the ECV.

2) For unknown leakers (leakers that are not overpacked and are identified in EONCs and at the RCM):

a. Leaking rocket(s) may be detected during agent monitoring of EONCs in the UPA. EONCs found to contain previously unknown leakers will be transported to the EONC leaker airlock so the leakers can be removed from the EONC and sent to the ECV. Personnel in appropriate PPE will place each potentially contaminated rocket onto the RCM conveyor system.

b. A previously unknown leaker may also be detected when monitoring for agent at the RCM or while observing the RCM. Leakers identified or found at the RCM may either be stored for a short duration, overpacked, and sent back to the igloo for later processing; or the leaker may be processed immediately if the number of stored leakers in the ECV is sufficient to justify stopping normal rocket processing to process the stored leakers. Personnel in appropriate PPE will place the leakers onto the RCM conveyor system.

3) The RCM will separate the leaking rocket into three pieces: warhead, warhead's SFT, and CRM.

4) The warhead will be processed in one of the two ECRs.

5) The agent-contaminated SFT will be removed from the conveyor in the ECV and transferred to the TMA for chemical decontamination and disposal at an off-site permitted TSCA TSDF or the SFT may be thermally treated in the MPT.

6) The CRM will be conveyed to the ECR for processing at the RSM, which will shear the rocket motor into four (approximately) 8 inch pieces and the tailfin.

7) The tailfin section and the segments of rocket propellant will be transferred to and processed in separate EBHs.

8) The energetics hydrolysate will be sent from the EBHs to the ENS for further hydrolysis.

9) Before the energetics hydrolysate is transferred to the HSA, it will be sampled and analyzed to verify that it no longer exhibits the characteristic of reactivity and that the agent concentration is below the target release level for agent. This is accomplished by use of the ASTM E680 Standard, Test Method for Drop Weight Impact Sensitivity of Solid-Phase Hazardous Materials and works with both solid and liquid waste samples.

10) The energetics hydrolysate will be is transferred from the HSA to the APS and AFS in the SPB.

11) In the APS and AFS, aluminum will be chemically precipitated from the energetics hydrolysate and the precipitate will be removed by filtration. The aluminum precipitate will be characterized and sent off site to a permitted disposal facility. The filtrate will be sent to the SCWO for further treatment.

12) Solid material (rocket sections and pieces) from the EBHs will be sent through the MPT for thermal treatment at a minimum of 1,000°F for a minimum of 15 minutes.

13) As an alternative to processing of agent and energetics hydrolysate from rocket leakers in the SPB, these may be collected in separate tanks and shipped off site for treatment and disposal in order to avoid PCB contamination of SPB process equipment. PCBs are part of the matrix found in the rocket SFTs. These waste streams will be treated or disposed of at a permitted, offsite TSCA facility. A TSCA permit application has been prepared and submitted to EPA Region 4 for management of this waste.

Socks generated from the multiple filter strainer during both projectile and rocket processing will be treated in the MPTs or EBHs.

- GB M55 Rockets – Leakers - The known leakers will be processed at the end of each agent campaign at BGCAPP. The unknown leakers will be accumulated in the ECVs and then processed in a leaker campaign, or these previously unknown leakers will be overpacked and sent back to the leaker storage igloo for processing during the known leaker rocket campaign.

  1) For known overpacked leakers (stored in the igloos in overpacks):

     a. The EONCs of overpacked rockets will be monitored for agent in the UPA. If agent monitoring indicates that the EONC does not contain any leaking overpacks, the EONC will be opened and the overpacks transferred to the ECV.

     b. In the ECV, the rocket overpack will be opened manually by operations personnel in PPE and the rocket removed from the overpack. The rocket will be placed on the RCM conveyor system in the ECV.

  2) For unknown leakers (leakers that are not overpacked and are identified in EONCs and at the RCM):

     a. Leaking rocket(s) may be detected during agent monitoring of EONCs in the UPA. EONCs found to contain previously unknown leakers will be transported to the EONC leaker airlock so the leakers can be removed from the EONC and sent to the ECV. Personnel in appropriate PPE will place each potentially contaminated rocket onto the RCM conveyor system.

     b. A previously unknown leaker may also be detected when monitoring for agent at the RCM or while observing the RCM. Leakers identified or found at the RCM may either be stored for a short duration, overpacked, and sent back to the igloo for later processing; or the leaker may be processed immediately if the number of stored leakers in the ECV is sufficient to justify stopping normal rocket processing to process the stored leakers. Personnel in appropriate PPE will place the leakers onto the RCM conveyor system.

  3) The RCM will separate the leaking rocket into three pieces: warhead, warhead's SFT, and CRM.

  4) The warhead will be processed in one of the two ECRs.

  5) The agent-contaminated SFT will be removed from the conveyor in the ECV and transferred to the TMA for chemical decontamination and disposal at an off-site permitted TSCA TSDF or the SFT may be thermally treated in the MPT.

  6) The CRM will be conveyed to the ECR for processing at the RSM, which will shear the rocket motor into four (approximately) 8 inch pieces and the tailfin.

  7) The tailfin section and the segments of rocket propellant will be transferred to and processed in separate EBHs.

  8) The energetics hydrolysate will be sent from the EBHs to the ENS for further hydrolysis.

9) Before the energetics hydrolysate is transferred to the HSA, it will be sampled and analyzed to verify that it no longer exhibits the characteristic of reactivity and that the agent concentration is below the target release level for agent. This is accomplished by use of the ASTM E680 Standard, Test Method for Drop Weight Impact Sensitivity of Solid-Phase Hazardous Materials and works with both solid and liquid waste samples.

10) The energetics hydrolysate will be is transferred from the HSA to the APS and AFS in the SPB.

11) In the APS and AFS, aluminum will be chemically precipitated from the energetics hydrolysate and the precipitate will be removed by filtration. The aluminum precipitate will be characterized and sent off site to a permitted disposal facility. The filtrate will be sent to the SCWO for further treatment.

12) Solid material (rocket sections and pieces) from the EBHs will be sent through the MPT for thermal treatment at a minimum of 1,000°F for a minimum of 15 minutes.

13) As an alternative to processing of agent and energetics hydrolysate from rocket leakers in the SPB, these may be collected in separate tanks and shipped off site for treatment and disposal in order to avoid PCB contamination of SPB process equipment. PCBs are part of the matrix found in the rocket SFTs. These waste streams will be treated or disposed of at a permitted, offsite TSCA facility. A TSCA permit application has been prepared and submitted to EPA Region 4 for management of this waste.

- GB M56 Warheads - The GB M56 warheads will be processed and treated in the same method as the rockets, except that because these have no rocket motors it will not be necessary to cut and remove the rocket motor in the RCM.
- Wood Pallets - Wood pallets not exposed to a leaking munition will not be processed through the BGCAPP and will be managed by appropriate methods to promote waste minimization. The quantity of agent contaminated wood pallets and miscellaneous non-contaminated dunnage is reflected on the Part A Application. All pallets and other dunnage associated with leaking munitions will be tested following Army-approved methods. If these are contaminated, these will be treated by chemical decontamination. The decontaminated wastes will be managed by appropriate means to minimize waste. If chemical decontamination does not prove successful, the contaminated material will be treated in the MPT.
- Agent-Contaminated Plastic and PPE - Plastic materials that are not contaminated with agent will be managed by appropriate methods to promote waste minimization without any further treatment at BGCAPP. Plastic and PPE will be assumed to be contaminated if these have been exposed to agent. Agent-contaminated plastic material (e.g., personnel protective ensembles, aprons, and gloves) generated during the RD&D program will be chemically decontaminated. If chemical decontamination is not successful, the material will be treated in the MPT. The decontaminated residue will be sent off-site to a permitted TSDF for treatment/disposal.
- Miscellaneous Agent-Contaminated Metal Parts (e.g., banding, pumps, and pipe) - Metal material and parts not contaminated with agent will be appropriately managed to minimize waste without any further treatment at BGCAPP. Agent contaminated metal material and parts generated during the RD&D program will be chemically decontaminated. If chemical decontamination is not successful or efficient, the material will be treated in the MPT. The decontaminated residue will be appropriately managed to minimize waste.

- Spent Activated Carbon - Agent contaminated spent activated carbon will be shipped off site for further treatment and disposal at a permitted TSDF. Spent activated carbon not contaminated with agent will be managed to minimize waste.
- Spent Decontamination Solution – Spent Decontamination Solution that is generated during the RD&D program will be processed as follows:

  1) Pump the SDS from sumps in the Category A or Category B areas to the SDS storage tanks. Liquid in the sumps in the Category C areas will be characterized and, based on the results of the characterization; the sumps will either be pumped to the SDS storage tanks or will be managed by other appropriate means.

  2) Sample and analyze the SDS in the SDS tanks to verify that it is below the target release level for agent

     a. If the agent concentration is below the target release level for agent, send the SDS to the HSA for further treatment in the SPB.

     b. If the residual agent concentration is above the target release level for agent, treat the SDS in the SDS tank with caustic and resample or send the SDS to the ANR for further treatment.

APPENDIX C. DRAWINGS AFFECTED BY PMR