

Technical Basis Document

Acceptable Knowledge Process Description

TRU Waste Laundry Decontamination

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TCP-98-03.1.3

Prepared for:

Battelle Columbus Laboratories
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Columbus, Ohio

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1.0 INTRODUCTION

This Technical Basis Document describes the TRU waste laundry decontamination operation performed by the Battelle Columbus Laboratories Decommissioning Project (BCLDP) Transuranic Waste Certification Program (TRU WCP). Specifically, this document describes the process implemented to decontaminate TRU level cotton rags and mop heads to be disposed of as low level waste or reused in the BCLDP decontamination operations.

As described in TCP-98-03.1.2, *Repackaging of Building JN-1 Clean-Up Waste Containers*,⁽⁴⁾ certain wastes generated during the decontamination of JN-1 hot cells will be segregated for decontamination. Rags and mop heads generated during both historical and current clean-up operations will be decontaminated using the Donini laundry unit located in the JN-1 Pump Room. The purpose of this process is to reduce the contamination of these materials allowing for low level waste disposal or reuse of the rags and mop heads for during the continuing decontamination of the JN-1 hot cells.

This report provides an auditable record that serves as a road map to the sources of acceptable knowledge (AK) used to describe the process and characterize each TRU waste stream in accordance with TC-AP-03.1, *Collection, Review, and Management of Acceptable Knowledge Documentation*⁽¹⁾. The purpose of this document is to identify the historical origin of the waste materials, describe the TRU waste process, and characterize the TRU waste streams that will be generated by this process as required by TCP-98-02, *Transuranic Waste Characterization Quality Assurance Project Plan (QAPjP) for the BCLDP TRU WCP*⁽²⁾. The TRU waste stream characterization is based primarily on the review of the Building JN-1 historical operations and waste inventories described in TCP-98-03, *Building JN-1 Hot Cell Laboratory Acceptable Knowledge Document*,⁽³⁾ and TCP-98-03.1.2, *Repackaging of Building JN-1 Clean-Up Waste Containers*,⁽⁴⁾ respectively.

2.0 PROCESS DESCRIPTION

Rags and mop heads generated during the clean-up operations in Building JN-1 will be transferred to the JN-1 Pump Room to be decontaminated by a Donini laundry system.^{P051} Waste materials to be processed also include cotton rags, towels, and mop heads generated during repackaging of historical waste containers performed in the MTC, HEC, and LLC in Building JN-1. Figure 2-1 illustrates the TRU waste laundry decontamination process.^{(4) P028}

Bags of rags and mop heads identified for decontamination will be opened and inspected on the downdraft table in the Pump Room. The rags are then pretreated by saturating them with either Spray Nine^{P025} or De-Solve It^{P025} and allowing the materials to soak overnight (at least 12 hours). Rags already saturated with cleaning fluids from current clean-up activities do not require pretreatment. The items are then placed in the laundry unit with 5 ounces of Trans-10 (a defoaming agent)^{P025} and washed with water in cycles lasting from 99 minutes to 306 minutes depending upon the levels of contamination observed. The system uses water from two tanks that recirculates no more than 45 gallons of water through polypropylene sock filters. The wash water is recirculated and is not released as a waste stream. After the drum has been drained, the items are partially dried by a spin/dry cycle lasting 59 minutes. After the items have cooled they are removed from the system, placed on the downdraft table, and allowed to completely dry.^{C028,P050}

To determine if the items are below the TRU limit, the laundered mop heads and rags are surveyed and sampled in accordance with DD-98-04, *Waste Characterization, Classification, and Shipping Support Technical Basis*,⁽⁷⁾ and WA-OP-33, *Sampling of Waste Materials for Chemical and/or Radiological Characterization*,⁽¹⁰⁾ respectively. If the materials are below TRU levels, they are either bagged for disposal in accordance with WA-OP-20, *Identification, Segregation, Separation and Documentation of Low Level Waste*,⁽⁹⁾ or returned for reuse in decontamination operations. If the rags and mop heads have not been successfully decontaminated, the items will either be washed again or returned to the Repackaging Process (TCP-03.1.2) to be disposed of as TRU waste stream 5390-02, Hazardous Organic Debris.^{(4) C028, P050}

Other wastes generated by this process include the plastic bags used to transfer the contaminated materials into the Pump Room, polypropylene sock filters, cotton lint from the lint trap, sludge from still box, and wipes used during maintenance of the system. The sock filters and lint will be packaged together with Radsorb in plastic radioactive bags. Laundry sludge from the still box is raked into plastic radioactive bags with Radsorb. Used plastic bags and wipes will be disposed of as low level waste in accordance with WA-OP-20⁽⁹⁾. The bags containing the sludge and filters/lint are transferred to the MTC or HEC to be segregated into

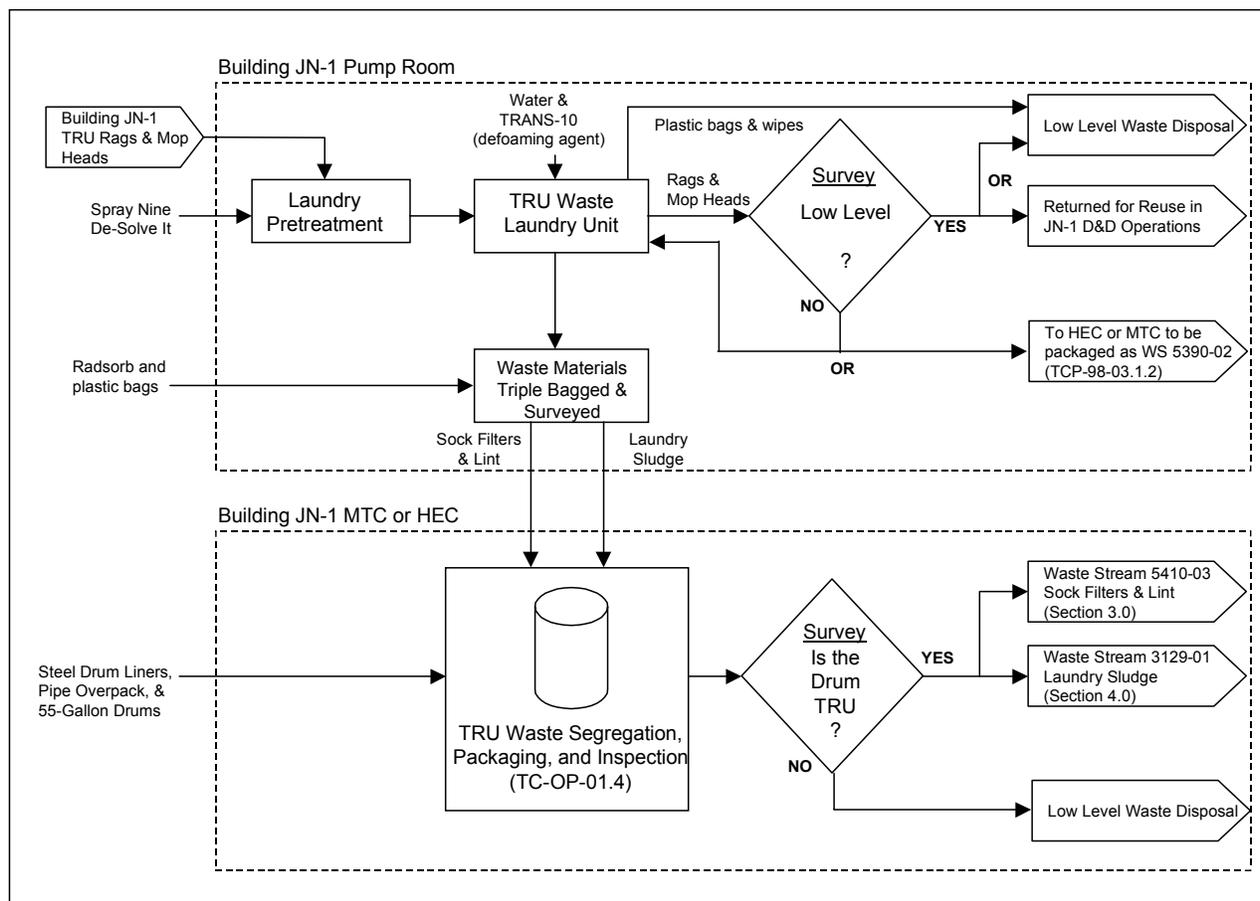


Figure 2.1. TRU Waste Laundry Decontamination Operation.

waste streams 5410-03, Sock Filters and Lint (Section 3.0) and 3129-01, Laundry Sludge (Section 4.0).^{C028, P050}

During packaging the bags will be opened and the contents inspected in accordance with TC-OP-01.4, *Segregation and Packaging of TRU Waste*,⁽⁵⁾ to verify AK and absence of prohibited items (e.g., free liquid). The waste will either be packaged into steel drum liners or pipe overpack containers to be placed into 55-gallon drums. No other confinement layers shall be used in the packaging of these waste streams.

As the liners are placed in 55-gallon drums, each drum will be surveyed to determine if the package is TRU in accordance with DD-98-04, *Waste Characterization, Classification, and Shipping Support Technical Basis*.⁽⁷⁾ In addition, samples from each package within each drum will be taken and composited in accordance with WA-OP-33, *Sampling of Waste Materials for Chemical and/or Radiological Characterization*.⁽¹⁰⁾ The samples will be analyzed to verify the

TRU content of every container. The containers determined to be low level will be managed in accordance with BCLDP-90-1, *The BCLDP Low-Level Waste Certification Plan*.⁽⁶⁾

3.0 LAUNDRY SOCK FILTERS AND LINT

Waste Stream ID:	5410-03
Generation Building:	Building JN-1; Pump Room ^{C028}
Waste Stream Volume (Projected):	3.9 m ³ ^{C028}
Generation Dates (Projected):	February 2000 – February 2003 ^{C028}
EPA Hazardous Waste Numbers:	D005, D007, D008, D009, D011, F001, F002, F003, F005 ^(3,4)
Radionuclides:	JN-1 Standard Isotopic Mix ⁽⁷⁾
TRUCON Content Codes:	SQ121 (CH-TRU), BC321 (RH-TRU) ⁽⁵⁾
Summary Category:	S5000 ⁽⁸⁾
Waste Matrix Code:	S5410 ⁽⁸⁾
Waste Matrix Code Group:	Filters

3.1 Waste Stream Description

Sock filters and lint are generated during the operation of the BCLDP TRU waste laundry decontamination system in the JN-1 Pump Room. This stream includes Rosedale polypropylene high-efficiency liquid filter bags and cotton lint from laundered mop heads and rags. Table 3-1 presents the waste matrix code and estimated waste material parameters for this waste stream.^{C028,P049,P050}

Table 3-1. Sock Filters and Lint Waste Matrix.^{C028}

Waste Stream	Waste Matrix Code	Waste Material Parameters	Weight %
5410-03, Sock Filters and Lint	S5410, Composite Filter Debris	Cellulosics (cotton lint)	40-50%
		Plastics (sock filter matrix)	20-30%
		Organic matrix (Radsorb)	10-20%
		Other Inorganic Materials	10-20%
		Iron-based Metals/Alloys	<5%

Waste Stream 5410-03, Sock Filters and Lint: This waste consists of sock filters and lint generated during the laundering of mop heads and rags. The sock filters are made of a polypropylene material supported by a carbon steel ring. The filters will collect inorganic dirt and debris contained in the mop heads and rags in addition to cotton lint originating from these materials. This stream will also contain lint collected by the lint trap during drying cycles of the laundry unit. The waste matrix will also include Radsorb (10-20% by weight) added to each liner to absorb any water from condensation or dewatering.^{C028,P049,P050}

3.2 Characterization Rationale

The sock filters and lint are characterized based on the characterization of the mop heads and rags being laundered by this process (see waste stream 5390-02). This section provides a RCRA hazardous and TSCA waste determination for this waste stream.⁽⁴⁾

3.2.1 Characteristic Waste

Based on the acceptable knowledge documentation reviewed, the materials do not exhibit the characteristics of ignitability (40 CFR 261.21), corrosivity (40 CFR 261.22), reactivity (40 CFR 261.23), or toxicity for organics (40 CFR 261.24), but may exhibit the characteristic of toxicity for metals originally contained in the mop heads and rags laundered by this operation.

Ignitability: The materials in this waste stream do not meet the definition of ignitability as defined in 40 CFR 261.21. The materials are not liquid and visual examination is performed to ensure free liquids are not added to containers during repackaging. In addition, any free liquid would be water and absorbents have been added to the filters to absorb any liquids that may be generated due to condensation or dewatering. This material will not cause fire through friction, absorption of moisture, or spontaneous chemical changes. This material is not a compressed gas as defined in 49 CFR 173.151. This material is not an oxidizer as defined in 49 CFR 173.300. The materials in this waste stream are therefore not ignitable wastes (D001).^(3,4)

Corrosivity: The materials in this waste stream do not meet the definition of corrosivity as defined in 40 CFR 261.22. The materials are not liquid and visual examination is performed to ensure free liquids are not added to containers during repackaging. In addition, absorbents have been added to the filters to absorb any liquids that may be generated due to condensation or dewatering. The materials in this waste stream are therefore not corrosive wastes (D002).^(3,4)

Reactivity: The materials in this waste stream do not meet the definition of reactivity as defined in 40 CFR 261.23. The materials are stable and will not undergo violent chemical change. The materials will not react violently with water, form potentially explosive mixtures with water, or generate toxic gases, vapors, or fumes when mixed with water. The materials do not contain cyanides or sulfides, and are not capable of detonation or explosive reaction. The materials in this waste stream are therefore not reactive wastes (D003).^(3,4)

Toxicity: The materials in this waste stream may meet the definition of toxicity as defined in 40 CFR 261.24. The toxicity characteristic contaminants fall into one of two categories: metals and organics. Organic compounds include halogenated and nonhalogenated solvents, pesticides, herbicides, and other toxic compounds. This waste stream may exhibit the characteristic of toxicity for barium, chromium, lead, mercury, and silver.^(3,4)

Barium sulfate, chromic acid, potassium dichromate, mercury, and silver nitrate were used in various processes in Building JN-1. The inputs to this process (mop heads and rags) are potentially contaminated with these materials; and therefore, these metals may be concentrated in the filters. Therefore, waste stream 5410-03 is assigned EPA Hazardous Waste Numbers D005, D007, D008, D009, and D011. ^(3,4)

Benzene, carbon tetrachloride, methyl ethyl ketone, and trichloroethylene were used in Building JN-1. These compounds were typically used as solvents and may have contaminated the rags and mop heads. Therefore the filters will be regulated as a listed hazardous waste and not a characteristic waste since these compounds are specifically addressed in the treatment standards for listed hazardous waste. ^(3,4)

3.2.2 Listed Hazardous Waste

This waste stream is characterized as a listed hazardous waste because it may have been mixed with materials contaminated with spent solvents listed in 40 CFR 261, Subpart D. Based on acceptable knowledge documentation reviewed, the material is not, or was not mixed with, a hazardous waste from specific sources (40 CFR 261.32), or as a discarded commercial chemical product, an off-specification species, a container residue, or a spill residue thereof (40 CFR 261.33). ^(3,4)

Carbon tetrachloride, 1,1,1-trichloroethane, trichloroethylene, acetone, methanol, benzene, and methyl ethyl ketone were used in laboratory operations for cleaning and degreasing. The process inputs are potentially contaminated with these spent solvents. Therefore waste stream 5410-03 is assigned EPA Hazardous waste numbers F001, F002, F003, and F005. ^(3,4)

3.2.3 TSCA Waste Determination

The material in this waste stream is not TSCA regulated waste as defined in 40 CFR 761. Review of AK identified no possible source of PCB contamination of this waste. Therefore, waste stream 5410-03, is not a TSCA regulated waste. ^(3,4)

4.0 LAUNDRY SLUDGE

Waste Stream ID:	3129-01
Generation Building:	Building JN-1; Pump Room ^{C028}
Waste Stream Volume (Projected):	0.16 m ³ ^{C028}
Generation Dates (Projected):	February 2000 – February 2003 ^{C028}
EPA Hazardous Waste Numbers:	D005, D007, D008, D009, D011, F001, F002, F003, F005 ^(3,4)
Radionuclides:	JN-1 Standard Isotopic Mix ⁽⁷⁾
TRUCON Content Codes:	SQ121 (CH-TRU), BC321 (RH-TRU) ⁽⁵⁾
Summary Category:	S3000 ⁽⁸⁾
Waste Matrix Code:	S3129 ⁽⁸⁾
Waste Matrix Code Group:	Solidified Inorganics

4.1 Waste Stream Description

Laundry sludge is generated during the operation of the BCLDP TRU waste laundry decontamination system in the JN-1 Pump Room. Table 4-1 presents the waste matrix code and estimated waste material parameters for this waste stream.^{C028,P049,P050}

Table 4-1. Laundry Sludge Waste Matrix.^{C028}

Waste Stream	Waste Matrix Code	Waste Material Parameters	Weight %
3129-01, Laundry Sludge	S3129, Other Inorganic Sludges	Cellulosics (cotton lint)	10-20%
		Organic matrix (Radsorb)	10-20%
		Other Inorganic Materials	60-80%

Waste Stream 3129-01, Laundry Sludge: This waste consists of a particulate sludge (dirt, debris, and lint) generated when the laundry system still box requires cleaning, the box is heated to boil off the water contained in the particulate material. The resulting sludge is raked into plastic radioactive bags with Radsorb (10-20% by weight) added to each liner to absorb any water from condensation or dewatering.^{C028,P049,P050}

4.2 Characterization Rationale

The laundry sludge is characterized based on the characterization of the mop heads and rags being laundered by this process (see waste stream 5390-02). This section provides a RCRA hazardous and TSCA waste determination for this waste stream.⁽⁴⁾

4.2.1 Characteristic Waste

Based on the acceptable knowledge documentation reviewed, the materials do not exhibit the characteristics of ignitability (40 CFR 261.21), corrosivity (40 CFR 261.22), reactivity (40 CFR 261.23), or toxicity for organics (40 CFR 261.24), but may exhibit the characteristic of toxicity for metals originally contained in the mop heads and rags laundered by this operation.

Ignitability: The materials in this waste stream do not meet the definition of ignitability as defined in 40 CFR 261.21. The materials are not liquid and visual examination is performed to ensure free liquids are not added to containers during repackaging. In addition, any free liquid would be water and absorbents have been added to the sludge to absorb any liquids that may be generated due to condensation or dewatering. This material will not cause fire through friction, absorption of moisture, or spontaneous chemical changes. This material is not a compressed gas as defined in 49 CFR 173.151. This material is not an oxidizer as defined in 49 CFR 173.300. The materials in this waste stream are therefore not ignitable wastes (D001).^(3,4)

Corrosivity: The materials in this waste stream do not meet the definition of corrosivity as defined in 40 CFR 261.22. The materials are not liquid and visual examination is performed to ensure free liquids are not added to containers during repackaging. In addition, absorbents have been added to the sludge to absorb any liquids that may be generated due to condensation or dewatering. The materials in this waste stream are therefore not corrosive wastes (D002).^(3,4)

Reactivity: The materials in this waste stream do not meet the definition of reactivity as defined in 40 CFR 261.23. The materials are stable and will not undergo violent chemical change. The materials will not react violently with water, form potentially explosive mixtures with water, or generate toxic gases, vapors, or fumes when mixed with water. The materials do not contain cyanides or sulfides, and are not capable of detonation or explosive reaction. The materials in this waste stream are therefore not reactive wastes (D003).^(3,4)

Toxicity: The materials in this waste stream may meet the definition of toxicity as defined in 40 CFR 261.24. The toxicity characteristic contaminants fall into one of two categories: metals and organics. Organic compounds include halogenated and nonhalogenated solvents, pesticides, herbicides, and other toxic compounds. This waste stream may exhibit the characteristic of toxicity for barium, chromium, lead, mercury, and silver.^(3,4)

Barium sulfate, chromic acid, potassium dichromate, mercury, and silver nitrate were used in various processes in Building JN-1. The inputs to this process (mop heads and rags) are potentially contaminated with these materials; and therefore, these metals may be concentrated in the sludge. Therefore, waste stream 5410-03 is assigned EPA Hazardous Waste Numbers D005, D007, D008, D009, and D011.^(3,4)

Benzene, carbon tetrachloride, methyl ethyl ketone, and trichloroethylene were used in Building JN-1. These compounds were typically used as solvents and may have contaminated the rags and mop heads. Therefore the sludge will be regulated as a listed hazardous waste and not a characteristic waste since these compounds are specifically addressed in the treatment standards for listed hazardous waste.^(3,4)

4.2.2 Listed Hazardous Waste

This waste stream is characterized as a listed hazardous waste because it may have been mixed with materials contaminated with spent solvents listed in 40 CFR 261, Subpart D. Based on acceptable knowledge documentation reviewed, the material is not, or was not mixed with, a hazardous waste from specific sources (40 CFR 261.32), or as a discarded commercial chemical product, an off-specification species, a container residue, or a spill residue thereof (40 CFR 261.33).^(3,4)

Carbon tetrachloride, 1,1,1-trichloroethane, trichloroethylene, acetone, methanol, benzene, and methyl ethyl ketone were used in laboratory operations for cleaning and degreasing. The process inputs are potentially contaminated with these spent solvents. Therefore waste stream 3129-01 is assigned EPA Hazardous waste numbers F001, F002, F003, and F005.^(3,4)

4.2.3 TSCA Waste Determination

The material in this waste stream is not TSCA regulated waste as defined in 40 CFR 761. Review of AK identified no possible source of PCB contamination of this waste. Therefore, waste stream 3129-01, is not a TSCA regulated waste.^{(3,4) n}

5.0 REFERENCES AND AK SOURCES

1. TC-AP-03.1, *Collection, Review, and Management of Acceptable Knowledge Documentation.*
2. TCP-98-02, *Transuranic Waste Characterization Quality Assurance Project Plan for the BCLDP TRU Waste Certification Program.*
3. TCP-98-03, *Building JN-1 Hot Cell Laboratory Acceptable Knowledge Document.*
4. TCP-98-03.1.2, *Acceptable Knowledge Process Description, Repackaging of Building JN-1 Clean-Up Waste Containers.*
5. TC-OP-01.4, *Segregation and Packaging of TRU Waste.*
6. BCLDP-90-1, *The BCLDP Low-Level Waste Certification Plan.*
7. DD-98-04, *Waste Characterization, Classification, and Shipping Support Technical Basis.*

8. DOE 1995. *DOE Waste Treatability Group Guidance*. DOE/LLW-217.
9. WA-OP-20, *Identification, Segregation, Separation and Documentation of Low Level Waste*.
10. WA-OP-33, *Sampling of Waste Materials for Chemical and/or Radiological Characterization*.

TABLE 5-1. Acceptable Knowledge Source Documents

Ref No.	Title / Author	Summary	Date
C028	Interview Record of Peter Erickson, BCL, conducted by Kevin Peters. WASTREN, Inc.	This information supplied by Peter Erickson describes the operation of the BCLDP laundry decontamination unit for TRU mop heads and rags, including the process inputs and process outputs. The composition and volume of the TRU waste streams is estimated.	2000. April 10.
P025	Miscellaneous Materials Safety Data Sheets (MSDSs). Authored by Manufacturers.	Miscellaneous MSDS sheets collected from numerous sources collected during AK research at the West Jefferson site.	Various.
P049	Rosedale High-Efficiency Liquid Filter Bag Information Sheet.	Manufacturer's information identifying the filter media of the Rosedale POMF filter used by the BCLDP laundry operatoin as polypropylene. This filter will be contained in Waste Stream 5410-03.	Undated
P050	Operation of the TRU Level Mop Head Decontamination Unit. Battelle Columbus Laboratories.	Procedure describing the methodology used to operate and maintain the Donini TRU mop head decontamination unit. Procedure describes the process inputs and management of the outputs generated by this operation.	2000. February. Revision 0
P051	Computest Instruction Manual. Donini International.	Manufacturers instructions for operating the Donini Computest 2000 laundry systems. Includes sytem drawings and schematics. Manual describes solvent dry cleaning operation of the unit. BCLDP utilizes water washing system in accorance with TC-OP-01.6 (P050).	1995.