5929

Fluor Fernald, Inc.
P.O. Box 538704
Cincinnati, OH 45253-8704

(513) 648-3000

FLUOR

April 28, 2005

Fernald Closure Project
Letter No. C:PROJ:2005-0045

Mr. John M. Sattler
U. S. Department of Energy
Ohio Field Office - Fernald Closure Project
175 Tri-County Parkway
Cincinnati, Ohio 45246

Dear Mr. Sattler:

CONTRACT DE-AC24-01OH20115, REQUEST FOR CANCELLATION OF PROFILE ONLO-000000133, REVISION 0

Fluor Fernald. Inc. is requesting cancellation of Nevada Test Site (NTS) Waste Profile ONLO-000000133, Revision 0, for conditioned Silo 3 waste titled "Silo 3 – Uranium Ore Processing Residues." This waste will be disposed at a commercial disposal facility.

A suggested letter for transmitting this request to Nevada is enclosed for your convenience. Should you have any questions or require additional information, please contact me at 513-648-3799.

Sincerely,

Dennis J. Carr

Dennis J. Carr
Senior Project Director
Silos Project

DJC:SH:kl
Enclosure

c: With Enclosure
Dave Adkins, MS52-3
Donna Allen, MS52-3
Reinhard Friske, MS52-3
Steve Heffron, MS52-3
Bob Schulten, MS52-3

Without Enclosure
Ralph E. Holland, DOE Contracting Officer, DOE-OH/FCP
Shelby Kawa, DOE-OH
Dennis Sizemore, Fluor Fernald, Inc. Prime Contract, MS 1
DOE Records Center
Letter Log Copy, MS 1
Project Number 40600/1.1, MS 17
Administrative Record, MS 78

5929

Enclosure:

To: Gary Pyles, DOE-NV

From: John Sattler

Subject: **REQUEST FOR CANCELLATION OF PROFILE ONLO-000000133, REVISION 0**

Fluor Fernald, Inc. is requesting cancellation of Nevada Test Site (NTS) Waste Profile ONLO-000000133, Revision 0 for conditioned Silo 3 waste titled "Silo 3 – Uranium Ore Processing Residues." This waste will be disposed at a commercial disposal facility.

Should you have any questions or require additional information, please contact me at 513-648-3145.

c: Dennis J. Carr, MS77
Reinhard Friske, MS52-3
Steve Heffron, MS52-3

5929

CORRESPONDENCE (*BLUE SHEET*) REVIEW RECORD SHEET

NEED DATE: April 27, 2005 — DO NOT USE ASAP

PARALLEL REVIEW: xYES ☐ NO

Type of Commitment	Meets Commitment/Due Date

LETTER NO: PROJ:2005-0042

DATE AFTER SIGNATURE IS OBTAINED

SUBJECT: Submittal of Nevada Test Site Waste Profile ONLO-000000138

AUTHOR & PHONE: Dave Adkins/7260

SIGNER: Dennis Carr

CONTACT PERSON: Kaye Lewis

PHONE:	FAX:	MAIL STOP:
5217	3947	5002

IMPORTANT: Take this document to your division secretary for review of grammar, punctuation and formatting BEFORE sending it out for the formal blue sheet review process

The following have reviewed the subject document. Comments regarding the content may be attached.

Reviewed By	Comments Yes	Comments No	Date	Comments Incorporated Yes	Comments Incorporated No	Date
(Level 1 Secretary)	✓		4-25-05	✓		4-25-05
Steve Heffron, MS52-3		✓	4/25/05			
Bob Schulten, MS52-3 See Email		✓	4/25/05			

Approval by the following Managers required before submittal to the Closure Project Director for signature.	DATE
Dennis Carr	4-26-05
LEVEL 1 Project/Program Director	
CON MURPHY, Field Closure Project Director (Must sign after all Project Directors)	
DENNIS NIXON, Director of Closure Project Management	

NIXON TO DETERMINE IF FURTHER PARALLEL REVIEW REQUIRED BY THOSE LISTED BELOW YES ☐ NO ☐	COMMENTS YES	COMMENTS NO	DATE	COMMENTS INCORPORATED YES	COMMENTS INCORPORATED NO	DATE
Mark Sucher						
(Add Additional Reviewers Here)						

COMMENTS:

5929

Lewis, Kaye

From: Schulten, Robert
Sent: Monday, April 25, 2005 10:02 AM
To: Lewis, Kaye; Heffron, Steve
Subject: RE: Blue Sheet Review

Looks Good - Thanks!

Bob S.

-----Original Message-----
From: Lewis, Kaye
Sent: Monday, April 25, 2005 9:44 AM
To: Heffron, Steve; Schulten, Robert
Subject: Blue Sheet Review
Importance: High

Please review the attachments. Thank you for your time.

Kaye Lewis,
Silos Project
Shipping/Receiving Dept.
Ph: 648-5217
FAX: 3956
MS52-3

Fluor Fernald, Inc.
P.O. Box 538704
Cincinnati, OH 45253-8704

(513) 648-3000

5929

FLUOR

April 25, 2005

Fernald Closure Project
Letter No. PROJ:2005-0042

Mr. John M. Sattler
U. S. Department of Energy
Ohio Field Office - Fernald Closure Project
175 Tri-County Parkway
Cincinnati, Ohio 45246

Dear Mr. Sattler:

CONTRACT DE-AC24-01OH20115, SUBMITTAL OF NEVADA TEST SITE WASTE PROFILE ONLO-000000138, REVISION 0, COLUMBUS CLOSURE PROJECT LOW LEVEL DEBRIS

Enclosed is a signed copy of Nevada Test Site (NTS) Waste Profile ONLO-000000138, Revision 0, Columbus Closure Project Low Level Debris.

A suggested cover letter for transmitting this Waste Profile to Nevada is enclosed for your convenience. Should you have any questions, or require additional information, please contact Steve Heffron at (513) 648-5650.

Sincerely,

Dennis J. Carr
Senior Project Director
Silos Project

DJC:DSA:kl
Enclosure(s)

5929

c: With Enclosures
David S. Adkins, MS52-3
Reinhard Friske, MS52-3
Steve Heffron, MS 52-3
DOE Records Center
Letter Log Copy, MS 1
Project Number, 40600/1.1
Administrative Record, MS 78

Without Enclosures
Ralph E. Holland, DOE Contracting Officer, DOE-OH/FCP
Shelby Kawa, DOE-OH
Dennis Sizemore, Fluor Fernald, Inc. Prime Contract, MS 1

5929

Adkins, David

From: Allen, Donna
To: Adkins, David
Sent: Thursday, April 07, 2005 7:59 AM
Subject: Read: ONLO-138, Rev.0, CCP Low Level Debris, Blue Sheet review

Your message

To:	Tom Walsh (E-mail); Rodney Bell (E-mail); SSchmucker (E-mail); Heffron, Steve; Friske, Reinhard; Allen, Donna; Johnston, Frank; Green, Donna
Cc:	Lee, Linda; Schulten, Robert; Sattler, John
Subject:	ONLO-138, Rev.0, CCP Low Level Debris, Blue Sheet review
Sent:	4/6/2005 9:25 PM

was read on 4/7/2005 7:59 AM.

Adkins, David

5929

From: Brucken, Elizabeth
Sent: Thursday, April 07, 2005 9:25 AM
To: Adkins, David
Cc: Johnston, Frank
Subject: FW: ONLO-138, Rev.0, CCP Low Level Debris, Blue Sheet review

Hi Dave - I reviewed this for Frank Johnston and have no comments.

- Betsy

-----Original Message-----
From: Johnston, Frank
Sent: Thursday, April 07, 2005 7:48 AM
To: Brucken, Elizabeth
Subject: FW: ONLO-138, Rev.0, CCP Low Level Debris, Blue Sheet review

Any chance you could give this a quick look? If so, forward any comments you have directly to Dave and copy me.

Thanks - Frank

-----Original Message-----
From: Adkins, David
Sent: Wednesday, April 06, 2005 9:25 PM
To: Tom Walsh (E-mail); Rodney Bell (E-mail); SSchmucker (E-mail); Heffron, Steve; Friske, Reinhard; Allen, Donna; Johnston, Frank; Green, Donna
Cc: Lee, Linda; Schulten, Robert; Sattler, John
Subject: ONLO-138, Rev.0, CCP Low Level Debris, Blue Sheet review

Attached are the documents related to revision 0 of NTS Profile ONLO-000000138, Columbus Closure Project Low Level Debris. This is an original submittal to NTS. The validation package for the recent NDA work is not included in this review. However, it will be ready for and included in the profile submittal.

Please review the attached documents and provide comments by e-mail no later than COB, Monday, 04/11/05. If you have no comments, please indicate such in a return e-mail for documentation purposes. I require your return e-mail for documentation that you have had the opportunity to review these documents.

Your review and comments are appreciated,

Dave Adkins
513-648-4364

5929

Adkins, David

From: Schulten, Robert
To: Adkins, David
Sent: Thursday, April 07, 2005 11:25 AM
Subject: Read: ONLO-138, Rev.0, CCP Low Level Debris, Blue Sheet review

Your message

To:	Tom Walsh (E-mail); Rodney Bell (E-mail); SSchmucker (E-mail); Heffron, Steve; Friske, Reinhard; Allen, Donna; Johnston, Frank; Green, Donna
Cc:	Lee, Linda; Schulten, Robert; Sattler, John
Subject:	ONLO-138, Rev.0, CCP Low Level Debris, Blue Sheet review
Sent:	4/6/2005 9:25 PM

was read on 4/7/2005 11:25 AM.

5929

Adkins, David

From: Schulten, Robert
Sent: Thursday, April 07, 2005 11:33 AM
To: Adkins, David
Subject: RE: ONLO-138, Rev.0, CCP Low Level Debris, Blue Sheet review

Looks good - Thanks Dave!!

Bob S.

-----Original Message-----
From: Adkins, David
Sent: Wednesday, April 06, 2005 9:25 PM
To: Tom Walsh (E-mail); Rodney Bell (E-mail); SSchmucker (E-mail); Heffron, Steve; Friske, Reinhard; Allen, Donna; Johnston, Frank; Green, Donna
Cc: Lee, Linda; Schulten, Robert; Sattler, John
Subject: ONLO-138, Rev.0, CCP Low Level Debris, Blue Sheet review

Attached are the documents related to revision 0 of NTS Profile ONLO-000000138, Columbus Closure Project Low Level Debris. This is an original submittal to NTS. The validation package for the recent NDA work is not included in this review. However, it will be ready for and included in the profile submittal.

Please review the attached documents and provide comments by e-mail no later than COB, Monday, 04/11/05. If you have no comments, please indicate such in a return e-mail for documentation purposes. I require your return e-mail for documentation that you have had the opportunity to review these documents.

Your review and comments are appreciated,

Dave Adkins
513-648-4364

5929

Adkins, David

From: Green, Donna
To: Adkins, David
Sent: Wednesday, April 13, 2005 7:04 AM
Subject: Read: ONLO-138, Rev.0, CCP Low Level Debris, Blue Sheet review

Your message

To:	Tom Walsh (E-mail); Rodney Bell (E-mail); SSchmucker (E-mail); Heffron, Steve; Friske, Reinhard; Allen, Donna; Johnston, Frank; Green, Donna
Cc:	Lee, Linda; Schulten, Robert; Sattler, John
Subject:	ONLO-138, Rev.0, CCP Low Level Debris, Blue Sheet review
Sent:	4/6/2005 9:25 PM

was read on 4/13/2005 7:04 AM.

Adkins, David

From: Adkins, David
Sent: Wednesday, April 13, 2005 1:23 PM
To: 'Rodney Bell'
Cc: Heffron, Steve
Subject: RE: Profile

Rodney,

I tried again to send the profile to Tom and he did not receive. I think he is planning to come by Fernald and pick up a copy.

Related to the pallets being used for dunnage, I will add to the PKN some verbage talking about the use of skids as dunnage. It will make life easier for all involved if we can use "clean" skids for this purpose. If we use old skids from the lab areas we will need to collect new PKN and add that language to the profile PKN. Let me know if we can simplify by using clean skids.

Thanks,

Dave

-----Original Message-----
From: Rodney Bell [mailto:robell@duratekinc.com]
Sent: Wednesday, April 13, 2005 9:59 AM
To: David.Adkins@fernald.gov
Subject: Re: Profile

Dave,

I didn't receive it, but as previously stated, don't wait for me. I just want to make sure that you included the fact that (4) of the boxes will be shipped in a S/L for burial with pallets used as "dunnage". The 5th box will be removed from a S/L and the box alone will be buried.

Rodney

>>> "Adkins, David" <David.Adkins@fernald.gov> 04/12/05 18:29 PM >>>
Tom & Rodney,

I e-mailed you a copy of the CCP profile at about 2:30 pm today. Did you receive the e-mail? There should be 9 attachments.

Dave
513-648-4364

********** DISCLAIMER **********
The information transmitted is intended only for the person or entity to which it is addressed and may contain confidential and/or privileged material. If you are not the intended recipient of this message you are hereby notified that any use, review, retransmission, dissemination, distribution, reproduction or any action taken in reliance upon this message is prohibited. If you received this in error, please contact the sender and delete the material from any computer. Any views expressed in this message are those of the individual sender and may not necessarily reflect the views of the company.
****

5929

Adkins, David

From: Adkins, David
Sent: Friday, April 22, 2005 11:57 AM
To: 'TomWalsh75@aol.com'
Subject: RE: Profile

Hello Tom!!

Sorry I haven't got back to you before now. It has been rather hectic here at Fernald. We are now producing and shipping Silo 3 bags of waste, about 8 bags per day right now. We also are in the middle of the SSR and RA for Silo 1 & 2. It actually looks like we are getting ready to award the Silo 1 & 2 contract.

Related to your questions below, additional lime was placed in each box based on absorbent determination 2004-0010, Revision 1. With the lime/radsorb mix we should have placed around 65 pounds of lime in each box for condensate control. Also, the 2.3 m3 represents approximately 90% full boxes. The 9.20 m3 represents 4 boxes in one of the MHF sealands.

Thanks for looking over the profile!!

Dave

-----Original Message-----
From: TomWalsh75@aol.com [mailto:TomWalsh75@aol.com]
Sent: Sunday, April 17, 2005 8:53 AM
To: david.adkins@fernald.gov
Subject: Profile

Hello Dave. Looks good. Only two questions on the profile.

1) Was there additional lime placed in the boxes for condensate control during the RTR or is that factored in as part of the 50-100 lbs on page 7 of 8 (Section on sorbents)?

2) Were the same box volumes in Section E used for the PGE calculation Table (2.3 m3 and 9.20 m3)?

Thanks.

Tom

Thomas J. Walsh
General Manager
Environmental Analysis and Solutions, LLC
20 High Street, Suite 104
Hamilton, OH 45011
513-305-0538
www.environanalysis.com

Adkins, David

From: Samples, John
Sent: Wednesday, April 20, 2005 1:34 PM
To: Adkins, David
Subject: RE: Comment Responses for NTS Silos 1 & 2 Profile

I believe what you put for comment 1 (drawing changes) is good and should be sufficient. If they want more, I'll try to put something more detailed together.

JS

-----Original Message-----
From: Adkins, David
Sent: Wednesday, April 20, 2005 1:14 PM
To: Heffron, Steve; Friske, Reinhard; Samples, John; Schulten, Robert
Cc: Carr, Dennis; Cherry, Mark
Subject: Comment Responses for NTS Silos 1 & 2 Profile

Attached are the responses I put together for comments we received from NTS on revision 1 of the Silos 1 & 2 profile. Please look them over and let me know if you concur or if you have changes you would like to see in the responses. I did not attach the verification package or the UC study discussed in the responses. The attachments are rather large and I saw no reason to attach for this review. However, these items will go with the final package to NTS. I am planning to send these responses to NTS by COB tomorrow, 04/21/05.

Thanks,

Dave

 5929

Waste Profile Sheet

☒ NTS Only ☐ Hanford Only ☐ Both NTS and Hanford

A. Generator Information

1. Company name: **Fernald Closure Project**
2. Address: **P.O. Box 538704, Cincinnati, OH 45253-8704**
3. Generator facility: **Battelle West Jefferson North Site (Columbus Closure Project)**

4. Primary Technical Contact: **David S. Adkins** email: **david.adkins@fernald.gov** Phone: **513-648-7260**
   Fax: **513-648-4925**

5. DOE Contact: **John Sattler** email: **john.sattler@fernald.gov** Phone: **513-648-3145**
   Fax: **513-648-3071**

6. Waste Certification Official: **Reinhard Friske** email: **reinhard.friske@fernald.gov** Phone: **513-648-5477**
   Fax: **513-648-5131**

7. Generator's EPA Identification Number (If profile involves hazardous materials): **NA**

B. General Waste Stream Information

1. Waste stream name: **Columbus Closure Project Low Level Debris**

2.a. NTS Waste stream identification number: **ONLO-000000138** N/A ☐

2.b. Hanford Profile Sheet Tracking Number: _____ N/A ☒

☒ New Profile
☐ Revised Profile (attach summary of changes) Revision Number: **0** Profile Revision Date: **04/23/05**

3. Waste generating process description: *Describe the process that generated the waste stream identified by this profile sheet. Attach process flow charts and other available information if helpful in explaining the generating process.* **This waste is primarily a debris/trash/absorbed sludge waste stream. The waste results from decontamination and decommissioning (D&D) activities of the JN-1 Building at the West Jefferson North Site, West Jefferson, Ohio. See attached Process Knowledge Narrative (PKN) for process description.**

4. Waste management services requested:
   ☒ Disposal
   ☐ Storage (Available only at Hanford)
   ☐ Treatment (Available only at Hanford); describe:
   ☐ Other; describe:

5. Waste Category (Check all that apply)
   ☒ Low Level ☐ Mixed Low-Level
   ☐ Mixed Low-Level (Generated within Nevada Only)
   ☐ "Classified Waste" ☐ "Classified Waste" requiring protection from visual observation
   ☐ Asbestiform Low-Level Waste ☐ 11(e)2 By-product Material (Small Quantities)
   ☐ Transuranic Waste ☐ Hanford Category 1 LLW
   ☐ Hanford Category 3 LLW ☐ Exceeds Hanford Category 3 LLW
   ☐ DOE Equivalence GTCC ☐ Contains accountable nuclear material

6. Estimated volume: ☐On-going (m^3/yr): Total remaining volume (m^3):
   ☒One Time Only (m^3): 15.0 m^3

7. Estimated frequency of shipments per fiscal year: 3

C. Physical/Chemical Characterization

1. Physical/Chemical process knowledge. Describe the process knowledge information used for physical/chemical characterization of this waste stream:

Waste Profile Sheet

☒ Material Safety Data Sheets. Attach MSDSs used to designate this waste stream (Hanford Site users can list Hanford MSDS numbers below in lieu of providing MSDSs). **See attached MSDSs for materials that were used in the D&D process.**

☐ Mass balance from process inputs. Describe how process inputs are controlled and recorded:

☒ Historical process and analytical data. Describe: **Refer to Process Knowledge File Narrative under "Radiological/Chemical Composition".**

☐ Inert debris characterized by inventory control. Check this box when the waste stream consists largely of inert debris items that are characterized by inventory control procedures and recorded on inventory sheets. Briefly list or describe inventory procedures:

☒ Other. Describe: **Process knowledge in combination with pre-job walk downs prior to D&D activities by trained staff personnel to ensure no hazardous or mixed wastes were present in the work areas. Also, inspection and segregation activities at the point of generation were utilized.**

☐ Physical/chemical characterization varies. Check this box when the characterization strategy varies from container to container. Describe below the strategy used to meet the acceptable knowledge requirements of the waste acceptance criteria.

2. Physical/chemical analysis. Describe the sampling and analysis performed to characterize this waste stream:

☒ No analysis performed.
☐ Field screening performed. Describe the frequency and type of field screening performed:
☐ Laboratory analysis performed. Describe the sample source and sampling frequency and methods:

List the analytical methods used, including upper confidence limits and explanations of anomalies for all analytes analyzed. Attach representative analytical sample result summary. For NTS, attach Table B-1 and data validation summary.

3. Regulatory status. Check all boxes below that describe the regulatory status of the waste stream:

☐ Federally regulated (RCRA) hazardous waste (40 CFR 261). List all RCRA U, P, F, K or D waste codes that could apply to the waste stream; place waste codes that do not apply to all containers in parentheses:
☐ For Hanford only, Washington State dangerous waste (WaAdminCode173-303), excluding W001. List all Washington waste codes that apply; place waste codes that do not apply to all containers in parentheses:

☐ For Hanford only, Washington State dangerous PCB waste (Waste code W001 of WaAdminCode173-303): Describe PCB source and concentration:
☐ TSCA regulated PCB (40 CFR 761). Describe category of PCB (i.e. PCB waste, PCB bulk product waste, PCB remediation waste, PCB analytical waste, etc). Describe PCB source and concentration:
☐ Waste generated from cleanup activities conducted under CERCLA
☒ Waste is not regulated under any of the above regulations.
☐ Waste is hazardous per state-of-generation regulations? If yes, identify hazardous components and state regulations.

4. Federal land disposal restrictions. Check all boxes that apply:
☒ Waste stream is not subject to federal land disposal restrictions

☐ Waste stream requires treatment to meet land disposal restrictions of 40 CFR Part 268.
If checked, provide the following information:
☐ Wastewater ☐ Nonwastewater ☐ Hazardous debris
☐ Waste contains Underlying Hazardous Constituents (applicable UHCs must be included in Item C.9)
Was the waste treated after August 24, 1998? Yes ☐ No ☐

Waste Profile Sheet

☐ Waste stream meets some of the applicable land disposal restrictions of 40 CFR 268. Check this box if the waste has been treated to meet some federal land disposal restrictions or if it meets some federal land disposal restrictions as generated. If checked, describe the treatment performed and analytical data to support LDR determination:

☐ Waste stream meets all applicable land disposal restrictions of 40 CFR 268. Check this box if the waste has been treated to meet all federal land disposal restrictions or if it meets the land disposal restrictions as generated. If checked, describe the treatment performed and analytical data to support LDR determination:

5. (For Hanford only) Waste characteristics. Check any of the boxes for regulated characteristics (WaAdminCode173-303-090) that apply to the waste stream:

☐ Flash point < 38°C ☐ Flash point 38°C - <60°C ☐ Flash point 60°C – 93.3°C
☐ Ignitable solid ☐ Oxidizer
☐ pH 2 or less ☐ pH 12.5 or greater
☐ Liquid that corrodes steel at a rate greater than or equal to 0.25 inches/year
☐ Reactive cyanide ☐ Reactive sulfide ☐ Water Reactive
☐ Explosive, unstable or pyrophoric ☐ Generates toxic gases, vapors or fumes

6. Physical state:
☐ Liquid ☒ Sludge ☒ Debris ☒ Solid
☒ Powder/Dust ☒ Sealed Source ☐ Encapsulated ☐ Solidified
☒ Other; describe: **Absorbants (Floor Dry, ZapLoc, Radsorb, lime and N990 Petrobond) and void space filler (INSTAPAK foam)**

7. Liquid form. If the waste stream contains liquid, check all that apply:
☐ Containerized liquid ☒ Absorbed Liquid ☐ Stabilized liquid

8. Other contents: Check any of the following that are components of the waste stream, and provide a description of how the waste acceptance criteria for each are met:

☐ Animal carcasses ☐ Infectious waste ☐ Vegetation ☐ Free liquids
☐ Chelating agents ☐ Organic liquids ☐ Asbestos waste ☐ Particulates
☐ Gases ☐ PCBs ☐ Explosives ☐ Pyrophorics
☐ Beryllium Dust ☐ Other

9. Waste composition. Describe the gross composition/component of the waste stream and all hazardous constituents that contribute to any waste codes or LDR treatment standards.
☐ If the chemical composition varies greatly from container to container, check this box and provide bounding values or ranges here. Further evaluation will occur on the specific package paperwork as it is provided for highly variable streams

CAS Number	Chemical constituent	Waste Component	Estimated weight percent ☒ Estimated volume percent ☐
		Plastic/Vinyl	**4.56**
		Paper/Cardboard/Wood	**1.00**
		Concrete	**.24**
		Rubber	**.39**
		Absorbed sludge/liquid	**24.9 (includes all absorbants)**
		Fiberglass Insulation/Glass	**.03**
		Cloth	**1.54**
		Sand/Soil	**1.05**
		Non-hazardous metals (such as Aluminum,copper and	**66.12**

CAS Number	Chemical constituent	Waste Component	Estimated weight percent ☒ Estimated volume percent ☐
		Steel	
		Sealed Source (Battelle Ra-226 source WJS-105)	**0.00 (one source, 0.1338 g)**
See MSDS		**INSTAPAK foam**	**Included as plastic/vinyl %**
See MSDS	**De-Solv-it (absorbed on rags; only as wipe on)**		**Included as absorbed liquid %**
See MSDS	**Spray-Nine (ph adjusted to 10.5, absorbed on rags; only as wipe on)**		**Included as absorbed liquid %**
See MSDS	**ALARA 1146 Strippable Coating**		**.17**
See MSDS	**Floor Dry**		**Included as absorbed sludge/liquid %**
See MSDS	**ZapLoc**		**Included as absorbed sludge/liquid %**
See MSDS	**N990 Petrobond**		**Included as absorbed sludge/liquid %**

D. Radiological Characterization

1. Radiological process knowledge. Describe the source(s) of the radioactive material in this waste stream (i.e., the radiological processes that introduced the radioactive material into the waste stream).

   The pre-work radiological characterization of the West Jefferson North facilities was conducted using samples of drain lines, air ducts, smears of tools and equipment, and a very well documented research history providing solid process knowledge. The radiological waste generating process could result in activation products or mixed fission products. This information is available from the following two documents:

   1) Decommissioning Plan (See Document Reference List)
   2) Waste Characterization and Shipping Support Technical Basis Document for the BCLDP West Jefferson North Facility (DD-98-04) (See Document Reference List)

2. Radiological characterization methods. Describe the analysis and characterization methods used to determine the radionuclide inventory of the waste stream. Check all that apply.

   ☐ Radionuclide material accountability. Describe the accounting methods used to help establish the radionuclide inventory:
   ☐ Radiochemical analysis. Describe type and frequency of sampling and analysis: *For NTS, attach Table B-1 and data validation summary*
   ☒ Nondestructive assay. Describe type and frequency of assay performed: **NDA was performed on each waste container using sodium iodide detectors. Cs-137 was reported for each box. The Cs-137 activity concentration was used in conjunction with the Waste Characterization and Shipping Support Technical Basis Document for the BCLDP West Jefferson North Facility (see Document Reference List). In this case, the Cs-137 value obtained using NDA was used in place of the dose-to-curie model discussed in the aboce document.**
   ☐ Field measurement instruments. Describe the type of instruments and how they are used to help establish the radionuclide inventory:
   ☐ Scaling factors. Explain how the scaling factors were derived and how they are used:
   ☒ Computer models. Describe the computer model used and how it is used to establish the radionuclide inventory: **Refer to Waste Characterization and Shipping Support Technical Basis Document for the BCLDP West Jefferson North Facility (see Document Reference List)**
   ☒ Other. Describe method:**Ratios. All isotopic activities are calculated as described in the Waste Characterization and Shipping Support Technical Basis Document (DD-98-04). However, in place of the dose-to-curie model discussed in DD-98-04 for developing the total activity, the Cs-137 activity is based on the NDA discussed above and in the profile PKN document. All other reported**

radionuclides were developed using the Columbus Closure Project standard isotopic mix which is discussed in depth in DD-98-04.

If several methods are checked above, describe how the methods are used together to establish the radiological inventory of the waste stream. For complex or highly variable waste streams, explain the strategy used to meet the acceptable knowledge requirements of the waste acceptance criteria. **Alpha and Gamma spectroscopy and non-destructive assay (NDA) with sodium iodide detectors were used in conjunction with a computer model. This is described in the Waste Characterization and Shipping Support Technical Basis Document for the BCLDP West Jefferson North Facility. DD-98-04 is the primary method for determining radionuclide content in each package. However, NDA was used in place of the dose-to-curie method as described in DD-98-04.**

3. Estimated Radiation Dose of disposal package (mSv/hr):

Surface **0.07 to 2.5** **30 cm 0.02 to 0.9** **One Meter 0.01 to 0.4**

4. (Section D 4 need not be filled out for Hanford only profiles)
☒Yes ☐No Does the waste contain enriched uranium (^{235}U wt% ≥ 0.90), ^{233}U, ^{239}Pu, ^{241}Pu, ^{242m}Am, ^{243}Cm, ^{245}Cm, ^{247}Cm, ^{249}Cf, ^{251}Cf? If yes, answer the following and check those that apply for compliance with the criticality safety criteria of the NTSWAC. If no, skip to Section D.5.

4.1 ☒ Attach completed NTSWAC, Appendix E, Table E.3, ^{235}U FGE and ^{235}U Effective Enrichment, for each enrichment level or range. **See attached Table E.3**

4.2 ☒ Waste package contains 15 g of ^{235}U FGE or less.
Specify controlling document: **WM:CHAR-T-0001**

4.3 ☐ Fissile material does not exceed 350 g of ^{235}U FGE per package nor does it exceed 2 g of ^{235}U FGE per kilogram of waste (mass of the package is not included in the mass of the waste) (graphite and beryllium must not exceed 1% of the mass of the waste).
Specify controlling document:

4.4 ☐ Waste complies with the limits and conditions as specified in NTSWAC, Appendix E, Table E.4.
Specify controlling document: Container Data Sheet for each package

4.5 ☐ Graphite and beryllium exceeds 1% of the mass of the waste.

4.6 ☐ Waste complies with the limits and conditions as specified in NTSWAC, Appendix E, Tables E.5 and E.6. Specify controlling document: Container Data Sheet for each package

4.7 ☐ A waste specific nuclear criticality safety evaluation (NCSE) was performed to show compliance with the NTSWAC, Section 3.2.1. Attach NCSE for review and specify controlling document:

5. Reportable radionuclides. List the radionuclides that could be reportable in the waste stream:
☒ If the nuclides vary greatly from container to container, check this box and provide bounding values or ranges here. Further evaluation will occur on the specific package paperwork as it is provided for highly variable streams. *Note: For the NTS, concentrations must be entered in Becquerel/cubic meter.*

Isotope	Concentration **(Bq/m3)**; Range and Activity Representative of Final Waste Form	Isotope	Concentration (Bq/m3); Range and Activity Representative of Final Waste Form
Cobalt-60	**7.0E+08 to 4.2E+09, 2.9E+09**		
Strontium-90	**1.3E+09 to 9.0E+09, 6.2E+09**		
Cesium-137	**2.0E+09 to 1.5E+10, 9.4E+09**		
Plutonium-238	**1.0E+08 to 6.5E+08, 4.5E+08**		
Plutonium-239	**1.4E+07 to 8.0E+07, 5.8E+07**		
Plutonium-240	**2.0E+07 to 1.5E+08, 9.5E+07**		
Plutonium-241	**1.7E+09 to 1.5E+10, 7.7E+09**		

Isotope	Concentration (Bq/m3); Range and Activity Representative of Final Waste Form	Isotope	Concentration (Bq/m3); Range and Activity Representative of Final Waste Form
Americium-241	**1.0E+08 to 6.5E+08, 4.7E+08**		
Curium-244	**9.0E+07 to 5.5E+08, 3.8E+08**		
Radium-226	**(2.0E+03) to 1.3E+16, 5.3E+06**		

6. Does the waste contain any alpha-emitting transuranic radionuclides with a half-life greater than 5 years, ^{241}Pu, or ^{242}Cm? If yes, list below.

Transuranic Nuclide	Concentration (nCi/g); Range and Activity Representative of Final Waste Form	Transuranic Nuclide	Concentration (nCi/g); Range and Activity Representative of Final Waste Form
Plutonium-238	**1.1E+01 to 3.4E+01, 1.5E+01**		
Plutonium-239	**1.4E+00 to 4.5E+00, 1.9E+00**		
Plutonium-240	**2.0E+00 to 7.0E+00, 3.1E+00**		
Plutonium-241	**1.9E+02 to 5.7E+02, 2.5E+02**		
Plutonium-242	**7.1E-03 to 2.1E-02, 9.5E-03**		
Americium-241	**1.1E+01 to 3.5E+01, 1.5E+01**		
Americium-242m	**2.3E-02 to 6.9E-02, 3.1E-02**		
Americium-243	**2.6E-02 to 1.0E-01, 4.8E-02**		
Curium-242	**5.8E-03 to 2.3E-02, 1.1E-02**		
Curium-243	**1.8E-02 to 7.3E-02, 3.4E-02**		

7. Are there any packages in this waste stream that exceed the Plutonium Gram Equivalent limits specified in NTSWAC, Section 3.2.2? Yes ☐ No ☒
   Provide container type(s), quantity, and supporting PGE calculations. **See attached PGE calculations.**

8. For Hanford only, Total FGE as defined in Hanford Site Solid Waste Acceptance Criteria, HNF-EP-0063.
   NA

E. Packaging

1. Packaging used. Check the applicable boxes.
   ☐ Drum; describe size(s), type, and weight range:

   ☒ Metal box; describe size(s), type, and weight range

Dimensions, LWH (cm)	Package Type	Volumes(id, m^3)	Tare wt. (kgs)	Manufacturer
219 x 121 x 127 (external)	**Excepted packaging with bolt closures**	**2.55**	**368 to 432**	**CTI**
208 x 147 x 106 (external)	**Excepted packaging with bolt closures**	**2.47**	**368 to 432**	**CTI**

   ☐ Wood box; describe size(s), type, and weight range:
   Do the Metal or Wood boxes meet the 3,375 lb/ft^2 strength test? Yes ☒ No ☐ N/A ☐
   ☐ High integrity container; describe size(s), type, and weight range:
   ☒ Intermodal transport container; describe size(s), type, and weight range:

Dimensions, LWH (cm)	Package Type	Volumes(id, m^3)	Tare wt. (kgs)	Manufacturer
607 x 244 x 259	**IP-2 Type A**	**29.8**	**5344**	**MHF Logistical Solutions**

   ☐ Other container; describe size(s), type, and weight range:
   ☐ Bulk waste – bulk package and shipment dimensions and weight ranges – describe (supersack, burrito wraps, equipment, etc.):

☐ Vented; describe type of venting:
☐ Shielded; describe type of shielding:
☒ Sorbents; describe type and amount used: **Floor Dry (diatomaceous earth), a mixture of Radsorb and lime, and ZapLoc (sodium polyacrylate) were used in varying amounts ranging from 50 lbs to 100 lbs to absorb twice the amount of condensation (water) that may have formed inside the plastic-lined B-25 box prior to addition of INSTAPAK foam.**
☐ Radiologically stabilized in concrete or other stabilization agent; describe type and amount of material used and provide data to demonstrate waste meets stabilization criteria:

2. Maximum container size: **6.1 m x 2.44 m x 2.59 m**

3. Maximum container gross weight: **19048 kg**

4. Describe any liners/protective coatings used to ensure that the container is compatible with the waste: **Each box is lined with one 10-mil liner for materials already wrapped or bagged. Two 10-mil liners are used if the waste is unwrapped or unbagged. The waste is then packaged using a nesting technique to eliminate void spaces that would total over 10% of the waste package. INSTAPAK Rigid Foam is then added as part of the packaging to ensure proper blocking and bracing of the box contents. The remaining void spaces are filled with Floor Dry (diatomaceous earth). The liners are then taped shut and the box is readied for shipment to the NTS.**

5. Does each container meet each of the package criteria as defined in the waste acceptance criteria?
☐ Yes ☒ No – **Documentation is not available to verify the boxes are IP-2 rated. Therefore, the boxes will not be used as the shipping container. Boxes will be shipped in IP-2 rated intermodel containers. Fernald may request at least one of the intermodels be returned. If so, the boxes in that/those intermodel(s) may be the disposal container.**

List documentation that demonstrates compliance with waste acceptance criteria.
The controlling document is DDO-019 Quality Purchase Receiving Control. Container specific data is available upon request.

6. Reference any special handling procedures and ALARA documentation, if applicable. **Boxes will be shipped in MHF intermodels. At the time of shipment, NTS will be notified as to which MHF containers are to be buried and which are to be off-loaded and returned.**

F. Additional Information

1. Comments:

2. Exception or Deviation Request to waste acceptance criteria: Complete if needed
   a) Identify specific requirement for which an exception or deviation is desired: **Revision 5 of the NTSWAC, Section 3.1.14 states "Sealed sources that have an activity of 3.7 MBq (100uCi) or greater shall be segregated from other waste and profiled as a separate waste stream".**
   b) Provide reason an exception or deviation is needed: **Columbus Closure Project has 1 sealed source for disposal.**
   c) Describe any proposed alternative methods to meet the general intent of the requirement:

This source is 3.3 mCi of Ra-226 contained in a metal (platinum) cell 11.8 mm long and 1.00 mm in diameter. The source and metal cell weigh 133.8 mg. The metal cell containing the source was packaged in a small metal can with floor dry surrounding the unit. The small metal can was placed inside the box and wedged between drums in a manner that movement is prohibited. The activity of the source was used for the high reportable profile activity. The source activity was averaged over the box contents for use as the representative activity. The representative activity for Ra-226, which is included in only this source, was used for the PGE calculations.

3. Attachments. List any attachments provided with this profile: **WAC Deviation Request, Document Reference List, Process Knowledge Narrative, MSDS Package, Table E.3:Calculation of U-235 Fissile Gram Equivalent for LLW Packages, PGE Calculations, WA-OP-020, DD-98-04.**

Waste Profile Sheet

G. Generator Signatures

To the best of my knowledge, the information provided on this form and the attached documentation is a full, true and accurate description of the waste stream. Willful and deliberate omissions have not been made. All known and suspected hazardous materials have been disclosed.

Technical Contact Name: David S. Adkins

Signature: _____

Date: 4/23/05

Waste Certification Official Name: Reinhard Friske

Signature: _____

Date: 4-23-05

Profile ONLO-000000138, Revision 0

Table E.3: Calculation of U^{235} Fissile Gram Equivalence and Effective U^{235} Enrichment for LLW Packages

Nuclide (A)	High Activity Conc. (Bq/m3) (B)	Volume of Package (m^3) (C)	Activity (Bq) (D)	Specific Activity (Bq/g) (E)	Mass of Isotope (g) (D/E=F)	U^{235} FGE Factors (G)	U^{235} FGE (FxG=H)	If FGE is >1% of U^{235} Mass, then include (I)
U^{233}			0.0E+00	3.6E+08	0.0E+00	1.4E+00	0.0E+00	
U^{235}	3.12E+03	2.30E+00	7.2E+03	8.1E+04	8.9E-02	1.0E+00	8.9E-02	8.9E-02
Pu^{239}	8.00E+07	2.30E+00	1.8E+08	2.3E+09	8.0E-02	1.6E+00	1.3E-01	5.1E-02
Pu^{241}	1.50E+10	2.30E+00	3.5E+10	3.8E+12	9.1E-03	3.5E+00	3.2E-02	8.9E-03
Am^{242m}			0.0E+00	3.6E+11	0.0E+00	5.4E+01	0.0E+00	
Cm^{243}			0.0E+00	1.9E+12	0.0E+00	7.8E+00	0.0E+00	
Cm^{245}			0.0E+00	6.4E+09	0.0E+00	2.3E+01	0.0E+00	
Cm^{247}			0.0E+00	3.5E+06	0.0E+00	7.8E-01	0.0E+00	
Cf^{249}			0.0E+00	1.5E+11	0.0E+00	7.0E+01	0.0E+00	
Cf^{251}			0.0E+00	5.9E+10	0.0E+00	1.4E+02	0.0E+00	
Effective U^{235} Enrichment =			**Total U^{235} FGE (1.5E-01)/Total grams uranium (12.2)**				**TOTAL U^{235} FGE**	**1.5E-01**
			Effective U235 Enrichment =			**1.22**		

Plutonium Gram Equivalent Calculations for
Reportable Isotopes included in NTS Profile ONLO-000000138, Rev.0

5929

Isotope	Package Activity, Bq/m3	PE-g Conversion Factors	PE-g/m3
Co-60	4.20E+09	1.86E-13	7.81E-04
Sr-90	9.00E+09	1.12E-12	1.01E-02
Cs-137	1.50E+10	2.72E-14	4.08E-04
Pu-238	6.50E+08	3.90E-10	2.54E-01
Pu-239	8.00E+07	4.35E-10	3.48E-02
Pu-240	1.50E+08	4.35E-10	6.53E-02
Pu-241	1.50E+10	8.50E-12	1.28E-01
Am-241	6.50E+08	4.44E-10	2.89E-01
Cm-244	5.50E+08	2.11E-10	1.16E-01
*Ra-226	5.30E+06	7.30E-12	3.87E-05
		PE-g/m3=	**8.97E-01**
Box Volume (m3)=	2.30E+00	**Box Total PE-g =**	**2.06E+00**
Intermodel (m3)=	9.20E+00	**Intermodel PE-g =**	**8.25E+00**
*per e-mail from Deron Linkenheil, Ra-226 activity is the representative value.			

Procedures Reference List for Profile
ONLO-000000138, Revision 0

RM-0053	Waste Characterization Requirements Manual
WM:CHAR-T-0001	Radiological Characterization for Disposal
EW-0001	MEF Characterization Process Procedure
WM:PKGG-A-0002	Absorbent Determination
PT-0018	Preparation of Documentation of Off-Site Shipment of Hazardous Material
DDO-155	Waste Package Loading Record
WA-OP-029	Radioactive Waste and Radioactive Mixed Waste Absorption
DDO-166	Hazardous Material/Waste Shipping Container Checklist
DD-98-04	Waste Characterization, Classification, and Shipping Support Technical Basis Document
WA-OP-020	Identification, Segregation, Separation, and Documentation of Low Level and Radioactive Mixed Waste
DD-MN-01	Quality Manual Decontamination and Decommissioning Operations
DD-93-19	Decommissioning Plan
DDO-019	Quality Purchase Receiving Control
MSDS PACKAGE	Zaploc, ALARA 1146, N990 Petrobond, INSTAPAK Foam (parts A and B), Floor Dry, Rust-Oleum Water Based Resin, Bartlett Stripcoat TLC Free, Spray Nine and De-Solv-it.

PROFILE ONLO-000000138, REVISION 0
WAC Deviation

Requirement: Revision 5 of the NTSWAC, Section 3.1.14 states "Sealed sources that have an activity of 3.7 MBq (100uCi) or greater shall be segregated from other waste and profiled as a separate waste stream".

Justification: The Columbus Closure Project has one sealed source for disposal.

Duration: The duration of the deviation is for the life of this profile. This is a one time only profile for 5 boxes of waste.

Corrective Action: None required.

 5929

PROCESS KNOWLEDGE NARRATIVE
PROFILE ONLO-000000138, REVISION 0
COLUMBUS CLOSURE PROJECT LOW LEVEL DEBRIS

Determination

RCRA non-hazardous, low-level radioactive waste

Descriptive Name

This waste is primarily a debris/trash/absorbed sludge waste stream. Examples of waste include, but are not limited to metal, concrete, rocks, tile, wood, soil, piping, plastic, duct work, transite (non-friable), glass, paper, cloth, personal protective equipment (PPE), ceramic, roofing debris, and rubber. This waste also includes absorbed liquid/sludge from mop water containers, an ultrasonic cleaning unit and an evaporator unit. All liquid/sludge was absorbed with twice the amount of absorbent required to absorb the volume of liquid present. Per the requirements of WM:PKGG-A-002, additional absorbent was also placed in each container to account for twice the volume of possible condensate. Additionally, a single Ra-226 sealed source, Battelle source WJS-105, is packaged in box number W246876. This source is 3.3 mCi of Ra-226 contained in a metal (platinum) cell 11.8 mm long and 1.00 mm in diameter. The source and metal cell weigh 133.8 mg. The metal cell containing the source was packaged in a small metal can with floor dry surrounding the unit. The small metal can was placed inside the box and wedged between drums in a manner that movement is prohibited.

Process Generating the Waste

The materials generated in this waste stream resulted from the decontamination and decommissioning (D&D) activities of the JN-1 Building at the West Jefferson North Site, West Jefferson, Ohio. The JN-1 Building began operations in 1955 to support nuclear research projects such as: the examination of power and research reactor fuels; post irradiation examination of fissile, control rod, source and structural reactor materials; and examination of radiation surveillance capsules. Operations in JN-1 Building were largely dedicated to research supporting the DOE (including predecessor agencies) and other governmental agencies. Remedial D&D activities for contaminated buildings and grounds located at the West Jefferson North Site began in 1989. The debris/trash/absorbed sludge in this waste stream was generated from Phase 3 and 4 D&D activities.

Phase 3 of the work involved the removal of drain lines, plumbing, Heating Ventilation and Air Conditioning (HVAC) systems, and electrical and crane services. A pre-job walk-down of these systems was conducted by trained staff personnel to determine the presence of hazardous waste. The walk-down was conducted prior to commencing D&D activities. Also at the point of generation, waste was inventoried and segregated in accordance with WA-OP-020 to verify that no RCRA or TSCA regulated wastes were packaged as low-level radioactive waste. Examples of items that were inspected and segregated during the D&D work included light ballasts, fluorescent bulbs or bulbs containing lead. Miscellaneous

items including aerosol cans were emptied and punctured to ensure no prohibited items were included in this waste stream.

Phase 4 consisted of final spot contamination removal. This phase was accomplished by removing an entire wall or using scabblers or jack hammers to remove radioactive contamination from concrete, steel, and block surfaces. Examples of debris waste generated from this phase include but are not limited to metal, structural steel, reinforced concrete, rebar, plastic, wood and glass.

Additionally, liquid/sludge mixtures generated by past housekeeping activities (mop water containers), an ultrasonic cleaning unit and a water evaporator unit in the JN-1 Building were absorbed by absorbents during the D&D work.

Data sheets were completed for this waste stream that was packaged in containers during the Phase 3 and 4 D&D activities. These sheets include item descriptions, material types, dose rates, weights, loading dates, loader initials, and summary/comments.

Radiological/Chemical Composition

As previously described, this waste stream consists of various types of debris/trash/absorbed sludges. The radiological content of this waste stream results from contamination through contact with process equipment and materials in Building JN-1. The characterization of the waste is based on process knowledge, analytical data from the in-situ characterization of the general areas where the waste was generated, and NDA.

The measured isotopic distribution is based on laboratory analysis (alpha and gamma spectroscopy) of 69 smear samples taken throughout the work areas of Building JN-1. Using the measured distribution as a base, the remaining isotopes are scaled according to the distribution generated by a computer model known as OakRidge Isotope Generation and Depletion (ORIGEN2.1). The code models the production and decay of fission and activation products of commercial nuclear power plants, since the majority of activities in Building JN-1 are attributable to nuclear power reactor research. The data from the 69 smear samples and the output of the ORIGEN2.1 model were used to develop what is referred to as the "JN Standard Isotopic Mix".

The analysis of the smear samples reveals the presence of Co-60, Cs-134, Cs-137, Eu-154, Am-241, Cm-244, Pu-238, Pu-239/240, U-234, U-238, Np-237, Sb-125 and Sr-90 in measurable quantities in at least one sample, with Cs-137 being dominant. Since Cs-137 is also the dominant isotope in the ORIGEN2.1 output, it is used as the basis for the standard mix specification. Ratios for all isotopes included in the standard mix but not identified in the samples are based on the ORIGEN2.1 calculations and are then normalized to 1 Ci total waste.

The Cs-137 activity concentration was developed, on a container-by-container basis, using NDA with sodium iodide detectors. The Cs-137 activity within the waste container is then used as the basis for calculating all other the constituent isotopes by multiplying the Cs-137 activity by the JN Standard Isotopic Mix activity ratio for each isotope.

The radiological characterization is described in more detail in DD-98-04: *Waste Characterization, Classification, and Shipping Support Technical Basis Document*. The only difference in this case is the Cs-137 activity has been obtained by using NDA in place of the dose-to-curie method as described in DD-98-04.

The total uranium concentration of this waste is 0.0005% with a U-235 enrichment of 0.80%.

The characterization of the absorbed liquid/sludge is based on process knowledge and historical data obtained from liquid/sludge samples from the JN-1 Evaporator, the 5000 gallon tank in the JN-1 Pump Room and the JN-1 Controlled Access Area. These areas are representative of where the liquid/sludge mixtures were generated during the D&D activities and the historical data is used as part of the process knowledge.

Additionally, a single Ra-226 sealed source, Battelle source WJS-105, is packaged in box number W246876. This source is 3.3 mCi of Ra-226 contained in a metal (platinum) cell 11.8 mm long and 1.00 mm in diameter. The source and metal cell weigh 133.8 mg. The metal cell containing the source was packaged in a small metal can with floor dry surrounding the unit. The small metal can was placed inside the box and wedged between drums in a manner that movement is prohibited. The activity of the source was used for the high reportable profile activity. The source activity was averaged over the box contents for use as the representative activity. The representative activity for Ra-226, which is included only in this source, was used for the PGE calculations.

Hazardous Waste Listings and Characteristics

F-listing: The waste is composed of debris/trash/absorbed liquid/sludge. The waste is not any of the spent solvents listed in 40 CFR 261.31/OAC 3745-51-31. It also does not meet the listing description of a listed hazardous waste from a non-specific source in 40 CFR 261.31/OAC 3745-51-31. Based on process knowledge, the waste does not meet the listing description of a spent solvent or hazardous waste from a non-specific source by virtue of the mixture rule, derived-from rule or the contained-in policy.

K-Listing: The waste does not meet the listing description of a listed hazardous waste from a specific source in 40 CFR 261.32/OAC 3745-51-32. Based on process knowledge, the waste does not meet the listing description of a hazardous waste from a specific source by virtue of the mixture rule, derived-from rule or the contained-in policy.

P and U-listing: The waste does not meet the listing description of a listed discarded commercial chemical product, etc. in 40 CFR 261.33/OAC 3745-51-33. Based on process knowledge, the waste does not meet the listing description of a listed discarded commercial chemical product, etc. by virtue of the mixture rule, derived-from rule or the contained-in policy.

Ignitability: The waste is composed of debris/trash/absorbed liquid/sludge as previously described and does not meet the definition of ignitability because it:

- Does not contain liquids with a flash point less than 140 F;

- Does not contain non-liquids that cause fire through friction under standard temperature and pressures, does not cause fire through absorption of moisture or cause spontaneous chemical changes, would not burn so vigorously and persistently if ignited, that it would create a hazard;
- Does not contain ignitable compressed gases as defined in 49 CFR 173.300 and as determined by test methods described in that regulation or equivalent test methods approved by the Administrator under 40 CFR 260.20 and 260.21; and
- Does not contain oxidizers as defined in 49 CFR 173.151.

Corrosivity: The waste is composed of debris/trash/absorbed sludge and does not meet the RCRA definition of corrosivity, which pertains to aqueous materials and liquids.

Reactivity: The waste is comprised of various types of debris/trash/absorbed sludge and does not meet the RCRA definition of reactivity because it:

- Does not contain materials that are normally unstable, readily undergoing violent changes without detonating;
- Does not contain materials that react violently with water;
- Does not contain materials that form potentially explosives mixtures with water;
- Does not contain materials that when mixed with water, generate toxic gases, vapors or fumes in a quantity sufficient to present a danger to human health or the environment;
- Does not contain a cyanide or sulfide-bearing waste, which when exposed to pH conditions between 2 and 12.5, can generate toxic gases, vapors or fumes in a quantity sufficient to present a danger to human health or the environment;
- Does not contain materials capable of detonation or explosive reaction if it is subjected to a strong initiating source or if heated under confinement;
- Does not contain materials readily capable of detonation or explosive decomposition or reaction at standard temperature and pressure; and
- Does not contain forbidden explosives as defined in 49 CFR 171.51, or a Class A explosive as defined in 49 CFR 173.53 or a Class B explosive as defined in 49 CFR 173.88 – 261.23 (a)(8).

Toxicity Characteristics: As previously described, the waste managed in this waste stream was generated in association with D&D activities. Process knowledge of these wastes in conjunction with walk-downs and segregation procedures indicate that no TC organics or TC metals were present in this waste stream. Therefore, TC organics or TC metals are not expected to be present in the wastes at concentrations at or above their respective regulatory thresholds.

TSCA Regulated PCB or Asbestos Waste and OAC Infectious Waste

The debris/trash/absorbed sludge managed in this waste stream does not contain TSCA regulated PCB waste or OAC infectious waste.

Pyrophoricity, Combustibility, Reactivity, Gas Evolution

This waste has been evaluated for pyrophoricity, combustibility, reactivity, and gas evolution based on material description, MSDS information and waste handling procedures. The results of the evaluation indicate that the waste does not exhibit pyrophoric or combustible characteristics. The incompatibilities listed in the MSDS for the foaming materials, absorbents, paints and cleaners that are part of this waste stream are with strong oxidizers and acids. Therefore, no prospective reactivity concerns are associated with this debris/trash waste stream. The waste is not identified as being hydrogen generating. Based on past experience with these types of waste streams, some methane gas may be generated due to organic decomposition associated with soils and/or sludges.

NOTE: THIS WASTE IS BEING SUBMITTED AS A ONE-TIME PROFILE AND REPRESENTS A TOTAL OF 5 BOXES OF WASTE.

NOTE: CLEAN WOOD PALLETS MAY BE USED FOR SHORING PURPOSES WHEN LOADING BOXES IN THE MHF INTERMODAL CONTAINERS.

5929

DD-98-04
Revision 4

WASTE CHARACTERIZATION, CLASSIFICATION, AND SHIPPING SUPPORT TECHNICAL BASIS DOCUMENT

for

Battelle Columbus Laboratories Decommissioning Project (BCLDP)
West Jefferson North Facility

ATTACHMENT

C

BATTELLE
505 King Avenue
Columbus, Ohio 43201

UNCONTROLLED COPY #7 [illegible]

APPROVAL PAGE

Prepared By:

C. W. Skapik — 15 NOV 2002
C. W. Skapik — *Date*
Research Scientist

Thie document, DD-98-04, *Waste Characterization, Classification, and Shipping Support Technical Basis Document*, has been reviewed and concurred with and approved by the following:

Concurred With:

S. J. Maheras — 11/18/2002
S. J. Maheras — *Date*
Senior Research Scientist

Concurred With:

S. R. Mawalkar — 11/15/2002
S. R. Mawalkar — *Date*
Senior Research Scientist

Approved By:

S. D. Schmucker — 11/18/02
S. D. Schmucker — *Date*
Project Manager, Low Level Waste (LLW)

James H. Eide — 11/18/02
J. H. Eide — *Date*
Manager, Transuranic (TRU) Waste Program

TABLE OF CONTENTS

TABLE OF CONTENTS ii

ACRONYMS iii

1.0 INTRODUCTION 1

1.1 OVERVIEW 1

2.0 JN STANDARD ISOTOPic MIX 4

2.1 SITE HISTORY 4
2.2 SOFTWARE MAP 5
2.3 SAMPLE-DERIVED ISOTOPIC MIX 5
2.4 ORIGEN2.1-DERIVED ISOTOPIC MIX 7

3.0 RH-TRU WASTE ACTIVITY CALCULATIONS 9

3.1 RH-TRU WASTE—QUANTIFICATION OF RADIOACTIVE INVENTORIES 9
3.2 MICROSHIELD MODEL FOR RH-TRU WASTE 9
3.3 TREATMENT OF UNCERTAINTY FOR RH-TRU 13
3.4 SOFTWARE QUALITY ASSURANCE 13

4.0 LLW WASTE ACTIVITY CALCULATIONS 14

4.1 QAD-CGGP-95.1 MODEL INPUT PARAMETERS 14
4.2 SPECIFIC PACKAGE MODELS FOR LLW 14
4.2.1 55-Gallon Drums 14
4.2.2 B-25 Boxes 15
4.2.3 Field Sort Waste Bags 19
4.2.4 Other Metal Forms 21
4.2.5 B-12 Boxes 23
4.2.6 IP-1 Intermodal "Rolloff" Containers 24
4.2.7 IP-2 Intermodal "Sealand" Containers 26

5.0 DIRECT SAMPLE ANALYSIS WASTE STREAMS 28

6.0 REFERENCES 29

ACRONYMS

AK	Acceptable knowledge
BCLDP	Battelle Columbus Laboratories Decommissioning Project
CH-TRU	Contact-handled TRU
CoC	Certificate of Compliance
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
JN	Battelle's West Jefferson North Site
LHS	Latin hypercube sampling
LLW	Low-level waste
ORIGEN2.1	Oak Ridge Isotope Generation and Depletion Code
QA	Quality assurance
QAD-CGGP-A	Point Kernel Code System for Neutron and Gamma-Ray Shielding Calculations Using the GP Buildup Factor (CGGP – Combinatorial Geometry with Geometric Progression)
RH-TRU	Remote-handled TRU
SNF	Spent nuclear fuel
SNM	Special Nuclear Material
SWAC	Hanford Site Solid Waste Acceptance Criteria
TRU	Transuranic waste
V&V	Verification and validation
WCP	Waste Certification Program
WIPP	Waste Isolation Pilot Plant

1.0 INTRODUCTION

1.1 OVERVIEW

The purpose of this document is to establish the technical basis for identifying and quantifying the isotopes in the radioactive remote-handled transuranic (RH-TRU) waste and low level waste (LLW) generated by the Battelle Columbus Laboratories Decommissioning Project (BCLDP) at Battelle's West Jefferson North (JN) site. It is divided into the following sections:

1. Definition of the JN Standard Isotopic Mix—Technology limitations and the need to limit personnel exposure associated with the high exposure rate of the waste inventory stored at JN-1 limit the feasibility of direct sampling for the purpose of radiologically characterizing this waste. Since direct sampling is not feasible for all of the waste shipped from the West Jefferson North Site, a "JN Standard Isotopic Mix" is established in this section based upon acceptable knowledge (AK), sampling, and computer modeling a representative source term. Gamma exposure rates from waste packages are compared with the "standard," and isotopic inventories in the waste packages are calculated from that comparison.

2. Method for Estimating Waste Container Radioisotopic Inventories—This section sets forth the method for identifying and quantifying the isotopic inventory for waste based upon the external gamma exposure rate. For RH-TRU, the waste addressed by this section is packaged into 55-gallon drums with liners. The liners are filled remotely inside the hot cells in the JN-1 building. Once filled, each liner will receive two (2) designations as described in this section. The first designation will be either contact-handled (CH) or remote-handled (RH) waste. The second designation will be either TRU waste or LLW. Waste designated as LLW is segregated by the BCLDP from the TRU waste and is handled under the BCLDP LLW program.

The general process for identifying waste container contents—for both RH-TRU and LLW—is as follows:

Step 1: The external gamma exposure rate for each container is measured.

Step 2: The measured rate is compared with that of a known activity modeled using the radiation shielding computer program Microshield for RH-TRU and QAD for LLW.

Step 3: By setting the ratios of exposure rate to activity equal for the unknown drum (shown in Equation 1 below) and the modeled drum, the total activity within the waste container is calculated.

$$\frac{A_{DRUM}}{X_{DRUM}} = \frac{A_{MS/QAD}}{X_{MS/QAD}} \qquad \text{(Equation 1)}$$

Step 4: The total activity within the waste container is then split up into constituent isotopes by multiplying the total activity by the JN standard composite in Table 1

Table 1: The JN Standard Isotopic Mix

Radionuclide	Basis	Activity Ratio	Normalized Activity (Ci/1 Ci)	Ratioed Standard Deviation	Normalized Standard Deviation
Ac-227*	O	1.106E-10	3.730E-11	2.578E-12	8.693E-13
Am-241	S	5.013E-02	1.690E-02	5.931E-03	2.000E-03
Am-242m	O	1.001E-04	3.375E-05	1.137E-06	3.834E-07
Am-243	O	3.746E-04	1.263E-04	4.216E-06	1.422E-06
Ba-133	O	6.222E-30	2.098E-30	5.368E-31	1.810E-31
Be-10*	O	7.465E-11	2.517E-11	3.803E-13	1.282E-13
C-14	O	1.871E-05	6.309E-06	1.741E-07	5.871E-08
Cd-113m	O	4.065E-04	1.371E-04	3.339E-06	1.126E-06
Cf-249*	O	6.009E-10	2.026E-10	2.629E-11	8.865E-12
Cf-250	O	1.410E-09	4.755E-10	6.127E-11	2.066E-11
Cf-251*	O	2.381E-11	8.029E-12	1.149E-12	3.875E-13
Cl-36*	O	1.870E-07	6.306E-08	1.733E-09	5.844E-10
Cm-243	O	2.628E-04	8.862E-05	3.629E-06	1.224E-06
Cm-244	S	4.036E-02	1.361E-02	4.944E-03	1.667E-03
Cm-245	O	6.419E-06	2.165E-06	5.384E-08	1.816E-08
Cm-246	O	2.199E-06	7.415E-07	3.705E-08	1.249E-08
Cm-247	O	1.023E-11	3.450E-12	2.744E-13	9.253E-14
Cm-248	O	4.206E-11	1.418E-11	1.606E-12	5.416E-13
Cm-250*	O	9.677E-18	3.263E-18	5.028E-19	1.696E-19
Co-60	S	3.096E-01	1.044E-01	2.784E-01	9.388E-02
Cs-134	S	4.113E-03	1.387E-03	3.073E-04	1.036E-04
Cs-135	O	4.986E-06	1.681E-06	3.467E-08	1.169E-08
Cs-137		1	3.372E-01	0	0
Eu-150*	O	1.687E-10	5.689E-11	8.858E-13	2.987E-13
Eu-152	O	3.752E-05	1.265E-05	7.151E-07	2.411E-07
Eu-154	S	1.543E-02	5.203E-03	9.435E-04	3.182E-04
Gd-152*	O	5.894E-18	1.988E-18	6.035E-20	2.035E-20
I-129	O	4.757E-07	1.604E-07	2.195E-09	7.402E-10
K-40	O	7.404E-14	2.497E-14	6.586E-16	2.221E-16
Mo-93*	O	1.049E-08	3.537E-09	9.448E-11	3.186E-11
Nb-94	O	2.265E-09	7.638E-10	2.075E-11	6.997E-12
Ni-59	O	7.336E-06	2.474E-06	6.945E-08	2.342E-08
Ni-63	O	9.048E-04	3.051E-04	8.127E-06	2.741E-06
Np-237	O	4.515E-06	1.523E-06	2.681E-08	9.041E-09
Pa-231*	O	2.866E-10	9.665E-11	5.246E-12	1.769E-12
Pb-210	O	3.221E-12	1.086E-12	1.919E-13	6.471E-14
Pd-107*	O	1.851E-06	6.242E-07	1.775E-08	5.986E-09
Pu-238	S	4.829E-02	1.628E-02	3.990E-03	1.345E-03
Pu-239	S	6.201E-03	2.091E-03	4.831E-04	1.629E-04
Pu-240	S	1.011E-02	3.409E-03	1.047E-03	3.530E-04
Pu-241	O	8.132E-01	2.742E-01	8.630E-03	2.910E-03
Pu-242	O	3.025E-05	1.020E-05	4.066E-07	1.371E-07
Pu-244	O	1.292E-11	4.357E-12	9.261E-14	3.123E-14

Table 1: The JN Standard Isotopic Mix (Continued)

Radionuclide	Basis	Ratioed Activity	Normalized Activity (1 Ci)	Ratioed Standard Deviation	Normalized Standard Deviation
Ra-226	O	1.494E-11	5.038E-12	5.753E-13	1.940E-13
Ra-228	O	1.995E-15	6.727E-16	5.133E-17	1.731E-17
Re-187*	O	2.909E-13	9.810E-14	2.500E-15	8.430E-16
Sb-125	O	4.581E-03	1.545E-03	1.376E-04	4.640E-05
Se-79	O	5.938E-06	2.002E-06	2.277E-08	7.678E-09
Si-32	O	6.174E-13	2.082E-13	1.013E-14	3.416E-15
Sm-147*	O	6.541E-11	2.206E-11	3.269E-13	1.102E-13
Sm-151	O	4.739E-03	1.598E-03	7.540E-06	2.543E-06
Sn-121m	O	9.678E-06	3.264E-06	7.716E-08	2.602E-08
Sn-126	O	1.206E-05	4.067E-06	7.395E-08	2.494E-08
Sr-90	O	6.563E-01	2.213E-01	3.127E-03	1.054E-03
Tc-99	O	1.884E-04	6.353E-05	6.950E-07	2.344E-07
Th-228*	O	4.600E-07	1.551E-07	2.466E-09	8.316E-10
Th-229	O	2.991E-12	1.009E-12	4.247E-14	1.432E-14
Th-230	O	3.070E-09	1.035E-09	6.482E-11	2.186E-11
Th-232	O	3.361E-15	1.133E-15	6.332E-17	2.135E-17
Tl-208*	O	1.654E-07	5.577E-08	8.890E-10	2.998E-10
U-232	O	4.620E-07	1.558E-07	2.626E-09	8.855E-10
U-233	O	5.377E-10	1.813E-10	7.163E-12	2.415E-12
U-234	O	1.727E-05	5.824E-06	3.050E-07	1.028E-07
U-235	O	2.523E-07	8.508E-08	7.807E-09	2.633E-09
U-236	O	3.344E-06	1.128E-06	3.620E-08	1.221E-08
U-238	O	4.899E-06	1.652E-06	2.829E-08	9.540E-09
Zr-93	O	2.774E-05	9.354E-06	1.153E-07	3.888E-08
Total		2.965E+00	1.000E+00		

- *The column labeled "Basis" contains either an "O" for ORIGEN2.1-derived data or an "S" for sample-derived data.*
- *Table 1 combines sample data and ORIGEN2.1 data. Because a "log-normal" distribution fit the sample data much better than a "normal distribution," the sample "log-normal" means and "log-normal" standard deviations were used. See the reference document containing the statistical analysis. Arithmetic means were used for the ORIGEN2.1 data because they were calculated values, unlike the sample data, which are experimental values. See the statistical analysis reference document.*
- *The isotopes marked with an "*" are not on the NRC license forEnvirocare. Because they are a very small percentage of the activity and because they were not confirmed by sample data, a check will be performed to assure that they do not represent in aggregate more than 5% of the activitiy. If this is true, they will be deleted from the records sent to Envirocare.*

2.0 JN STANDARD ISOTOPIC MIX

2.1 SITE HISTORY

The West Jefferson North site has four facilities (JN-1, JN-2, JN-3, and JN-4). Only three are covered by the BCLDP: JN-1, JN-2, and JN-3. JN-4 was cleaned and returned to Battelle for use on other projects. The project document TCP-98-03, "Building JN-1 Hot Cell Laboratory Acceptable Knowledge Document," summarizes all of the research conducted at the West Jefferson site and disposition of residual material from that research. The balance of this document deals with the majority of the JN-1 waste that is attributable to nuclear power reactor research. Several other BCLDP waste streams are handled separately.

The majority of waste at the West Jefferson North site is residual material from several years of research on irradiated fuel/Special Nuclear Material (SNM). In addition to the SNM nuclides, and transuranic (TRU) nuclides, decay products and activation products associated with the fuel are also found in varying amounts. While research was also conducted on other sources of radioactive material, those items are either segregated from the JN-1 waste or have been removed from the site completely.

A "JN Standard Isotopic Mix" is defined as a combination of samples and calculations further described as follows: 69 samples were taken throughout the accessible work areas of Building JN-1. The measured distribution of these 69 samples was compared with spent fuel modeled using the Oak Ridge Isotope Generation and Depletion (ORIGEN2.1) computer code. This code estimates the production and decay of fission and activation products of commercial nuclear power plant fuel. The ORIGEN2.1 input parameters of enrichment, burnup, and decay were varied to simulate fuel remnants at JN-1. (The ORIGEN2.1 Verification and Validation [V&V] Report identified in the "References" section documents the initial values for these three parameters and further describes the reasoning for assigning these values.) A series of software scripts and spreadsheets was used to reduce the sample data and the ORIGEN2.1 data so that they could be compared. A description of the various software applications used to define the JN Standard Isotopic Mix (called the software map) is included as Figure 1. The combined distribution of isotopes identified and estimated by sampling and modeling is called the JN Standard Isotopic Mix.

A given quantity of the JN Standard Isotopic Mix is then used as the radioactive material source with the Microshield computer shielding code to simulate external gamma ray interaction-rates for various package and form weights. These interaction rates are used to generate interaction rates-to-weight conversion equations for each package and waste form. The interaction rates are further used to calculate total activity content for individual packages and waste forms. From this, the level of TRU in nCi/g in each container is calculated. Those containers with levels greater than 100 nCi/g are considered TRU.

The direct sample, ORIGEN2.1 derived, and combined distribution means and uncertainties for each of the isotopes of interest are presented in Table 1. Refer to the "References" section for documents including the raw data for the 69 samples and the ORIGEN2.1 output tables. The

radionuclides included in the mix were based on the following:

a. All mobile radionuclides in Hanford Site Solid Waste Acceptance Criteria (SWAC), except for H-3. (Past practices at Battelle make it likely that the H-3 has already been released from the waste.)

b. All radionuclides in the Hanford SWAC with a Category 1 waste limit, except Ti-44, Nb-91, Bi-207, and Bk-247, which were not present in samples or ORIGEN output.

c. All TRU radionuclides in Hanford SWAC with a half life greater than 20 years.

d. Sb-125, Cs-134, Tl-208, and Th-228 added because they were present in samples.

e. Sum of Pu-239/240 from samples; Pu-239/240 alloted based on ORIGEN2.1 output.

2.2 SOFTWARE MAP

Figure 1 demonstrates the relationship between all software packages used in developing DD-98-04. The software packages comprising the model are described in the order of use in the following sections. Please refer to the supporting documentation for specific assumptions and additional detail regarding software operation. Note, each piece of software output is verified and validated. The V&V report for each software output is filed with BCLDP project records.

2.3 SAMPLE-DERIVED ISOTOPIC MIX

Over a period of time, for various reasons, 69 samples have been collected throughout the JN-1 work area. A schematic showing JN-1 with the locations of 69 samples marked is included in the BCLDP project records (see JN Standard Mix Reference Document). This collection of 69 samples was used as the starting point for defining the JN Standard Isotopic Mix. If necessary, the mix will be re-evaluated according to BCLDP procedures (TC-AP-3.3, "Confirmation of TRU Waste Isotopic Mix") and re-established. The analysis of samples from JN-1 (Table 1) reveals the presence of Co-60, Cs-134, Cs-137, Eu-154, Am-241, Cm-244, Pu-238, Pu-239/240, U-234, U-238, Np-237, Sb-125, and Sr-90 in measurable quantities in at least one sample, with Cs-137 being dominant. Since Cs-137 is also the dominant isotope in the ORIGEN2.1 output, it is used as the basis for the standard mix specification. Ratios for all isotopes included in the standard mix but not identified in the samples are based on the ORIGEN2.1 calculations (daughter isotopes are routinely assumed to be in equilibrium with the parent and are not listed separately) and are then normalized to 1 Ci total waste.

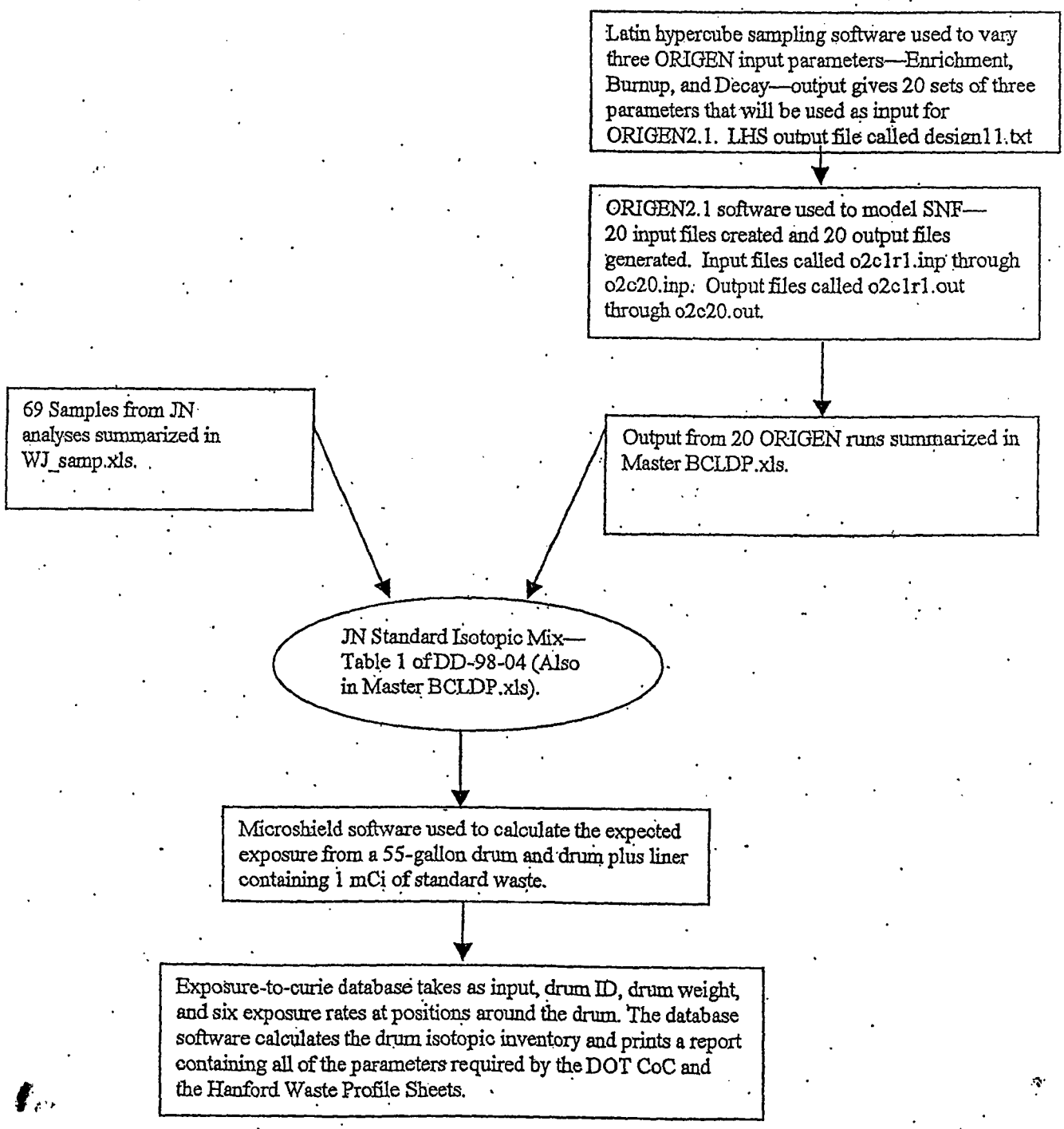

Figure 1: Software Used to Develop DD-98-04

2.4 ORIGEN2.1-DERIVED ISOTOPIC MIX

Table 2 contains the ORIGEN2.1 input parameters and associated value ranges (low, center, and high) considered to represent most of the waste at the West Jefferson North site. Because the number of runs needed to represent the variations of the three parameters is so great, an alternate approach was used, reducing the number of runs to 20. This alternate approach is called Latin hypercube sampling, and it is further described in the subject document listed under the "References" section. Table 2 is further described in the ORIGEN2.1 V&V report included in the BCLDP project records and listed under the "References" section.

Table 2: ORIGEN2.1 Input Parameters

ORIGEN2.1 Parameter	Range of Values		
	Low	Center	High
Enrichment (atom % U-235)	2.0	2.8	4.0
Burnup (MCS/MTU)	15K	33K	45K
Decay (years post-irradiation)	13	17	30

In summary, four replicates of a five-sample Latin hypercube design were developed—using an S-Plus© version 2000 program written for this purpose and based on the procedure outlined in "Large Sample Properties of Simulations Using Latin Hypercube Sampling" by Michael Stein—thereby providing 20 analysis runs. The distribution of each parameter (Table 2) was divided into five partitions of equal probability. Latin hypercube sampling, then, ensures a random value of each partition is included in each of the five replicated designs, while minimizing the total number of required analysis runs. The resulting 20 (5 samples x 4 replicates) analysis runs are presented in Table 3.

Table 3: Experimental Design Parameter Values Used in ORIGEN2.1 Analysis Runs

Run No.	Enrichment	Burnup	Decay	Replicate	Sample
1	2.29	33.83	21.31	2	5
2	3.49	32.32	35.08	3	3
3	2.41	28.70	15.25	2	2
4	2.47	42.53	9.70	1	5
5	3.84	30.66	12.98	1	1
6	4.51	26.62	13.37	4	5
7	2.09	26.30	23.71	1	2
8	2.83	36.94	23.25	4	1
9	2.88	37.98	18.50	3	2
10	2.63	19.91	14.19	3	5
11	3.42	23.33	16.08	4	3
12	3.09	57.25	17.87	4	4
13	2.24	24.62	19.86	1	4

14	3.01	40.46	11.28	3	1
15	2.67	50.19	19.13	3	4
16	3.24	29.73	14.42	4	2
17	2.52	44.14	17.04	2	3
18	3.22	53.81	16.69	1	3
19	2.74	35.43	15.55	2	4
20	1.81	18.15	20.84	2	1

The mean result across the 20 ORIGEN2.1 runs (or equivalently, the mean of the mean results determined for the four replicated designs) calculated for each studied isotope represents its assumed normalized activity ratio (to Cs-137) in the standard isotopic distribution. Because of the extensive modeling capabilities of the ORIGEN2.1 code, the output contains many isotopes that are present in quantities below analytical detectability.

3.0 RH-TRU WASTE ACTIVITY CALCULATIONS

This section sets forth the method for identifying and quantifying the isotopic inventory for TRU waste containers. The waste addressed by this section is packaged into 55-gallon drums with steel liners. The liners are filled remotely inside the JN-1 hot cells. Once filled, each liner will receive two (2) designations. The first designation will be either CH or RH waste. Liners with contact exposure rates equal to or less than 200 mR/hr can be segregated as CH waste. The second designation will be either TRU waste or LLW. The waste is TRU if the concentration of transuranic isotopes is equal to or greater than 100 nCi/g. The U.S. Department of Energy identifies TRU waste as waste containing more than 100 nCi of alpha-emitting TRU isotopes per gram of waste, with half-lives greater than 20 years. CH-TRU will be set aside pending establishment of a method for assaying the waste. The current BCLDP strategy requires Waste Isolation Pilot Plant (WIPP) approved mobile vendor analysis for CH-TRU determination prior to shipment to the WIPP. The RH-TRU likely will be sent to Hanford for interim storage prior to disposal at the WIPP. Consequently, the Hanford Site SWAC is also followed.

3.1 RH-TRU WASTE—QUANTIFICATION OF RADIOACTIVE INVENTORIES

Liners packaging TRU waste with contact readings greater than 200 mR/hr are considered RH TRU waste and are further processed according to the following sections. For each RH-TRU waste-filled liner, two gamma exposure rates will be measured on opposite sides of the container at 1 meter from the mid-height of the side. Typically, this is done as the liner is pulled out of the hot cell. For these measurements, it is assumed that the background radiation level is insignificant in relation to the exposure rate produced by the waste container. The liner is then placed into a 55-gallon drum, weighed, and staged for shipment. The concentration of TRU is then calculated for each container according to the method described in Section 1.1. The following section describes the Microshield model for a 55-gallon drum liner of TRU waste.

3.2 MICROSHIELD MODEL FOR RH-TRU WASTE

The following input parameters describe the Microshield model used to calculate the exposure rate at 1 meter from 1 mCi of JN standard waste placed into a steel liner for a 55-gallon drum. The values are taken from the Microshield V&V report identified in the "References" section.

The steel liner has an outside diameter of 19.5 inches (49.53 cm) and a height of 32.25 inches (91.92 cm). The top and bottom of the liner's circular steel plates have a thickness of 0.5 inches (1.27 cm). The liner wall is 0.105 inches (0.27 cm) thick. The liner has a tare weight of 160 pounds (72.7 kg). The liner can hold a volume of 39.5 gallons (149.7 liters) of waste.

For these calculations, the liner is full of waste and the radioactive material is uniformly dispersed throughout the waste. The waste matrix is assumed to be iron, and 10 waste densities range from 0.1515 to 2.4242 grams per cubic centimeter. These densities yield waste masses ranging from 50 to 800 pounds. The selection of iron as the waste matrix is not of great significance because the attenuation of the gamma rays of predominant interest is more

influenced by the density of the material than by the specific composition or atomic number of the media.

It is also possible to take the exposure rate measurement after the liner has been placed in the 55-gallon container. The 55-gallon drum has a tare weight of 50 pounds (22.7 kg). The 55-gallon container was modeled as having an inside diameter of 22.25 inches (56.52 cm) and an interior height of 33.25 inches (84.46 cm). The 18-gauge steel used to fabricate the 55-gallon drum has a thickness of 0.0478 inches (0.12 cm).

The Microshield code uses the point kernel technique to calculate the exposure rate at a selected location from a distributed, multi-group source. The attenuation of the gamma rays and the build-up factors are computed for the source (the waste) and intervening shielding provided by packaging (the liner and, if appropriate, the 55-gallon drum). The results from this analysis are shown in Table 4 and in Figures 2 and 3. Note: 1 mCi was modeled in Microshield, and the results were then multiplied by 100 as shown in Table 4 and in Figures 2 and 3. This was done to ease data represention. See the MicroShield V&V report in the "References" section for the complete results.

Table 4: Exposure Rates (mR/hr) from 100 mCi Total Activity at 1 Meter From the Surface of the Waste Container at the Container Mid-Height

Waste Mass (lb)	Liner Plus Drum (mR/hr)	Liner Only (mR/hr)
50	12.41	13.50
100	11.52	12.58
150	10.63	11.63
200	9.78	10.72
250	8.99	9.87
300	8.28	9.1
350	7.64	8.41
400	7.07	7.78
450	6.56	7.23
500	6.11	6.73
550	5.71	6.29
600	5.35	5.90
650	5.02	5.54
700	4.73	5.22
750	4.47	4.94
800	4.24	4.68

Solving Equation 1 from Section 1.1 for A_{DRUM}, which is the term for the total activity in a given drum, gives the following:

$$A_{DRUM} = \dot{X}_{DRUM} \frac{A_{MS}}{\dot{X}_{MS}} \qquad \text{(Equation 2)}$$

Where

A_{DRUM} = Total activity in a drum

$\dot{X}_{DRUM}$ = Actual measured exposure rate from a given drum

A_{MS} = Activity modeled by Microshield (1 mCi modeled) x 100 (to convert mCi to 100 mCi listed in Table 4)

$\dot{X}_{MS}$ = Exposure rate calculated by MicroShield from a container of A_{MS} in a matrix of a given weight (From Table 4)

Once the total drum activity is calculated, it is further broken down into individual isotopic activities by multiplying it by the normalized values in Table 1.

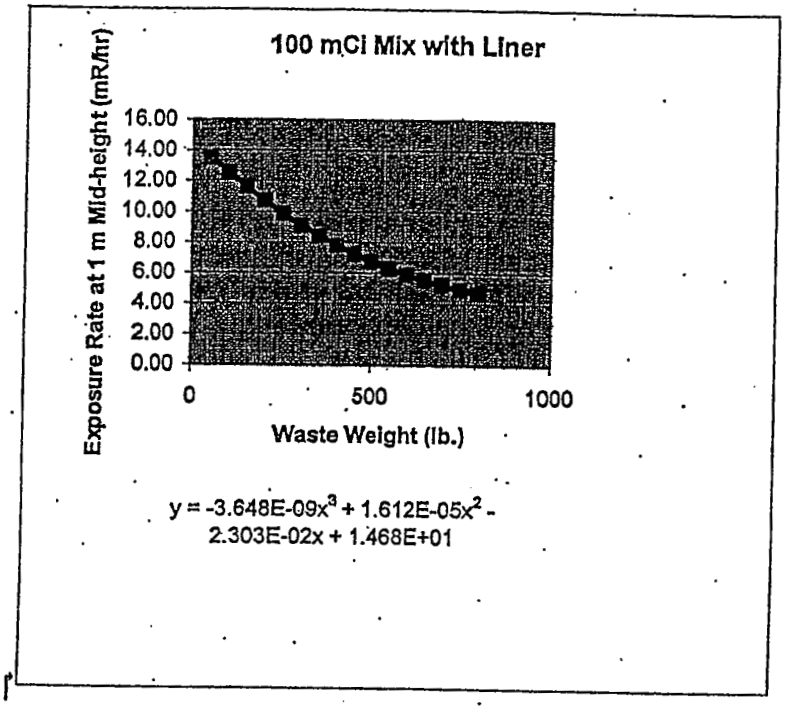

Figure 2: A Graphical Representation of the Data in Table 4—Exposure Rates (mR/hr) from 100 mCi Total Activity at 1 Meter From the Surface of the Waste Container at the Container Mid-Height - LINER ONLY

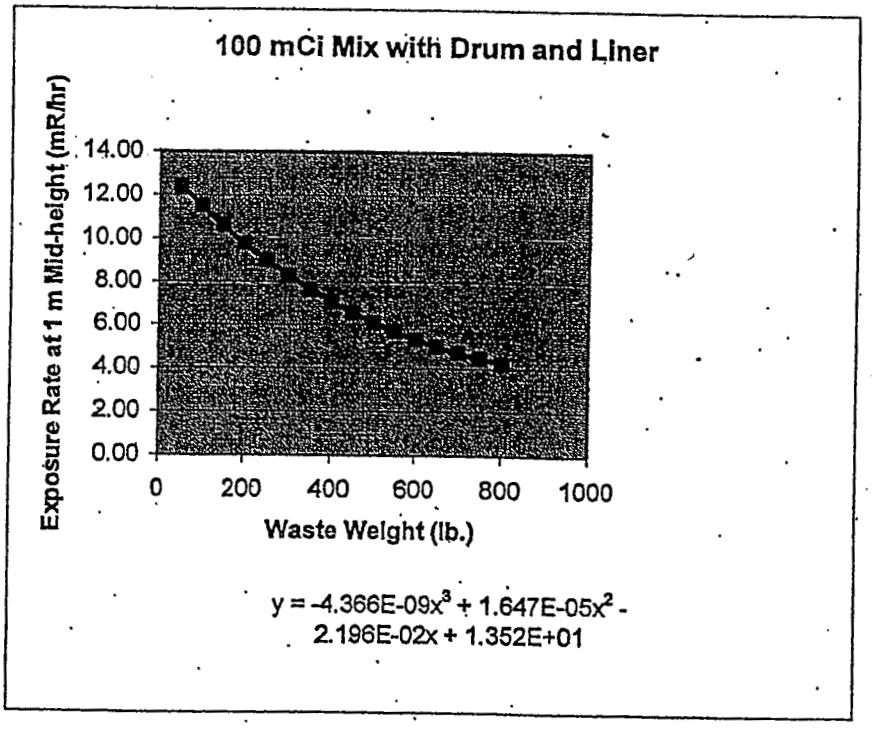

Figure 3: A Graphical Representation of the Data in Table 4—Exposure Rates (mR/hr) from 100 mCi Total Activity at 1 Meter From the Surface of the Waste Container at the Container Mid-Height - DRUM PLUS LINER

3.3 TREATMENT OF UNCERTAINTY FOR RH-TRU

Estimation of the total variance associated with the characterization of TRU waste has five components:

1. Uncertainty in the weight of the container being characterized;
2. Uncertainty in the assumed JN Standard Isotopic Distribution;
3. Uncertainty in measuring exposure rate;
4. Uncertainty in the dosage predicted (as a function of container configuration and weight) by the MicroShield software calculations; and,
5. Bias.

A detailed analysis of these sources of uncertainty is provided in the statistical analysis reference document. In summary, the relative uncertainty in the inventory of the individual isotopes is about 60 percent across the drum weights, with the exception of Co-60, which has relative uncertainty of nearly 110 percent. The consistency in the variance of isotopes other than Co-60 can be explained by noting that the variance of Co-60 contributes 80 percent or more to the total variance in an isotope's inventory. Over the range of weights of interest, the relative uncertainty in the TRU inventory is about 60 percent and the relative uncertainty in the total inventory is around 55 percent.

3.4 SOFTWARE QUALITY ASSURANCE

The use of software packages (i.e., ORIGEN2.1, Microshield, Excel spreadsheets) in the methodology has been determined under TCP-98-07, "Software Quality Assurance (QA) Plan for TRU Waste Certification Program (WCP)," to be compliant with the quality assurance requirements of the Quality Assurance Program Document (CAO-94-1012). All BCLDP TRU WCP software packages are used and maintained in accordance with TCP-98-07.

4.0 LLW WASTE ACTIVITY CALCULATIONS

This section addresses all waste other than that addressed by the TRU section. It sets forth the method for identifying and quantifying the isotopic inventory for LLW containers based upon the external gamma exposure rate. The waste addressed by this section is packaged into several different containers including

1. 55-gallon drums
2. B-25 boxes
3. Field sort waste bags
4. Other metal forms
5. B-12 boxes
6. IP-1 intermodal containers
7. IP-2 intermodal containers

4.1 QAD-CGGP-95.1 MODEL INPUT PARAMETERS

As was done for TRU waste described in the previous section, a known amount of JN waste was modeled for each of the container geometries. For the TRU waste, these calculations were performed using MicroShield; for LLW, these calculations were performed using the QAD-CGGP-95.1 computer program or MicroShield. As discussed in the MicroShield Version 5.05 Primitive Baseline, QAD and MicroShield yield equivalent results. For LLW, only the gamma-emitters Co-60 and Cs-137 were modeled. As discussed in the MicroShield RH-TRU V&V report, there is only a 3 percent difference between the results obtained using Co-60 and Cs-137 and those obtained using all the radionuclides in the JN Standard Isotopic Mix.

QAD-CGGP-95.1 or MicroShield calculations are performed for a range of representative weights for each package. The outputs for each package and form are subjected to regression analysis to obtain an equation describing the exposure rate as a function of weight. Once the external gamma exposure and the weight of the container are measured, a total container activity can be calculated. The total container activity is multiplied by the JN Standard Isotopic Mix fractions (Table 1) to get the inventory by radionuclide for the container.

4.2 SPECIFIC PACKAGE MODELS FOR LLW

4.2.1 55-Gallon Drums

The 55-gallon drum waste container was modeled as a cylinder with an inner radius of 11.25 inches (28.58 cm) and an inner height of 33.25 inches (84.46 cm). The wall of the drum was modeled as 0.0478 inch (0.12 cm) of iron. Exposure rates were determined at a point halfway up the drum, at a height of 16.63 inches (42.23 cm), and at a distance of 2 inches (5.08 cm) from the side of the drum.

Exposure rates were determined for waste weights that ranged from 50 pounds to 500 pounds (Table 5) for a drum containing 1 mCi of the JN Standard Isotopic Mix. The density of the waste

material contained in the drum was derived from the calculated drum volume and waste weight. Because the material placed in 55-gallon drums may vary from lab trash to construction debris, the material chosen for the waste matrix was iron.

The regression equation calculated from these data was

$$y = 1.769 - 1.618E\text{-}3\ x - 1.929E\text{-}6\ x^2 + 5.900E\text{-}9\ x^3 - 4.134E\text{-}12\ x^4 \qquad \text{(Equation 3)}$$

Where

x = Waste weight (lb)
y = Exposure rate (mR/hr for 1 mCi of JN Standard Isotopic Mix)

Table 5: Waste Weights and Exposure Rates in 55-Gallon Drums

Waste Weight (lb)	Exposure Rate (mR/hr)
50	1.6839
100	1.5937
150	1.5007
200	1.4086
250	1.3199
300	1.2359
350	1.1575
400	1.0849
450	1.0181
500	0.95692

Note: Exposure rates are for 1 mCi of JN Standard Isotopic Mix in a 55-gallon drum.
Exposure rates are estimated at 2 inches from the side of drum, halfway up the drum.

4.2.2 B-25 Boxes

B-25 boxes are rectangular sheet-metal bins generally used for packaging irregularly shaped or bulky materials for shipment and/or disposal. The inner dimensions of a standard B-25 box are 6 feet (182.88 cm) wide, by 3 feet 11 inches (119.38 cm) tall, by 3 feet 9 inches (114.3 cm) deep, for a total actual volume of 88 cubic feet.

Box walls were modeled as being 0.105 inches (0.266 cm) thick. Exposure rate calculations were performed for contact radiation level measurements taken halfway up at the midpoint of the long side of the box. The model also included a 2-inch (5.08-cm) air gap between the side of the box and the measurement point since the distance from the outside of a box to the centerline of the ion chamber used is 2 inches.

For the JN site, a typical box weighs approximately 4,500 lbs. Cases were run ranging from 1,000 pounds to 9,000 pounds. The weight limit for B-25 containers being sent to Envirocare is

9,000 pounds. The weight limit for containers being sent to Hanford is 7,000 pounds. Because objects placed in B-25 boxes are often metal, the material chosen for the waste matrix was iron.

Several cases were also run to evaluate the effect of changes in waste material composition on exterior B-25 box exposure rates. Previous modeling demonstrated that changing the waste material to concrete from iron resulted in a change in external package exposure rates of approximately 8 percent. This effect is sufficiently small that the model may be considered valid for B-25 boxes containing metal scrap, concrete debris, or a combination of these materials.

B-25 boxes present a special case in that they must be foam-filled to eliminate void space. To preclude the possibility that a full box will exceed applicable activity limits, and to ensure that a box will not have to be repackaged to meet these limits, QAD-CGGP-95.1 calculations were made for full and ¾, ½, and ¼ full B-25 boxes (see Tables 6 through 9). Cases run with varying densities (i.e., from 1,000 pounds to 9,000 pounds) indicated some variation in expected contact exposure rate with weight.

The regression equation for the full box was

$$y = 4.561E\text{-}1 - 1.201E\text{-}4\,x + 1.695E\text{-}8\,x^2 - 1.235E\text{-}12\,x^3 + 3.639E\text{-}17\,x^4 \qquad \text{(Equation 4)}$$

The regression equation for the 3/4 full box was

$$y = 3.772E\text{-}1 - 1.227E\text{-}4\,x + 2.210E\text{-}8\,x^2 - 2.080E\text{-}12\,x^3 + 7.944E\text{-}17\,x^4 \qquad \text{(Equation 5)}$$

The regression equation for the 1/2 full box was

$$y = 2.280E\text{-}1 - 1.201E\text{-}4\,x + 3.388E\text{-}8\,x^2 - 4.937E\text{-}12\,x^3 + 2.908E\text{-}16\,x^4 \qquad \text{(Equation 6)}$$

The regression equation for the 1/4 full box was

$$y = 1.492E\text{-}1 - 1.279E\text{-}4\,x + 6.341E\text{-}8\,x^2 - 1.669E\text{-}11\,x^3 + 1.788E\text{-}15\,x^4 \qquad \text{(Equation 7)}$$

Where

x = Waste weight (lb)
y = Exposure rate (mR/hr for 1 mCi of JN Standard Isotopic Mix)

Table 6: Waste Weights and Exposure Rates for Full B-25 Boxes

Waste Weight (lb)	Exposure Rate (mR/hr)
1,000	3.51E-01
1,500	3.10E-01
2,000	2.74E-01
2,500	2.44E-01
3,000	2.18E-01
3,500	1.96E-01
4,000	1.77E-01
4,500	1.61E-01
5,000	1.48E-01
5,500	1.36E-01
6,000	1.26E-01
6,500	1.17E-01
7,000	1.09E-01
7,500	1.02E-01
8,000	9.63E-02
8,500	9.08E-02
9,000	8.59E-02

Note: Exposure rates are for 1 mCi of JN Standard Isotopic Mix in a B-25 box. Exposure rates are estimated at 2 inches from the side of the box.

Table 7: Waste Weights and Exposure Rates for 3/4 Full B-25 Boxes

Waste Weight (lb)	Exposure Rate (mR/hr)
750	2.97E-01
1,125	2.65E-01
1,500	2.36E-01
1,875	2.12E-01
2,250	1.91E-01
2,625	1.73E-01
3,000	1.58E-01
3,375	1.45E-01
3,750	1.34E-01
4,125	1.24E-01
4,500	1.16E-01
4,875	1.08E-01
5,250	1.01E-01
5,625	9.55E-02
6,000	9.02E-02
6,375	8.54E-02
6,750	8.11E-02

Note: Exposure rates are for 1 mCi of JN Standard Isotopic Mix in a B-25 box. Exposure rates are estimated at 2 inches from the side of the box.

Table 8: Waste Weights and Exposure Rates for 1/2 Full B-25 Boxes

Waste Weight (lb)	Exposure Rate (mR/hr)
500	1.76E-01
750	1.55E-01
1,000	1.37E-01
1,250	1.22E-01
1,500	1.09E-01
1,750	9.78E-02
2,000	8.85E-02
2,250	8.06E-02
2,500	7.38E-02
2,750	6.80E-02
3,000	6.29E-02
3,250	5.85E-02
3,500	5.46E-02
3,750	5.12E-02
4,000	4.81E-02
4,250	4.54E-02
4,500	4.30E-02

Note: Exposure rates are for 1 mCi of JN Standard Isotopic Mix in a B-25 box. Exposure rates are estimated at 2 inches from the side of the box.

Table 9: Waste Weights and Exposure Rates for 1/4 Full B-25 Boxes

Waste Weight (lb)	Exposure Rate (mR/hr)
250	1.21E-01
375	1.09E-01
500	9.92E-02
625	9.02E-02
750	8.24E-02
875	7.56E-02
1,000	6.97E-02
1,125	6.46E-02
1,250	6.01E-02
1,375	5.62E-02
1,500	5.27E-02
1,625	4.96E-02
1,750	4.68E-02
1,875	4.43E-02
2,000	4.20E-02
2,125	4.00E-02
2,250	3.81E-02

Note: Exposure rates are for 1 mCi of JN Standard Isotopic Mix in a B-25 box. Exposure rates are estimated at 2 inches from the side of the box.

5929

Adkins, David

From: Adkins, David
Sent: Wednesday, April 06, 2005 9:25 PM
To: 'Tom Walsh (E-mail)'; 'Rodney Bell (E-mail)'; 'SSchmucker (E-mail)'; Heffron, Steve; Friske, Reinhard; Allen, Donna; Johnston, Frank; Green, Donna
Cc: Lee, Linda; Schulten, Robert; Sattler, John
Subject: ONLO-138, Rev.0, CCP Low Level Debris, Blue Sheet review

ONLO-138, CCP Debris Profile, ... | ONLO-138 Rev 0 PKN Rev 0.doc | ONLO-138 Rev 0 Procedures Ref... | ONLO-138 Rev 0 Table E3.xls | ONLO-138 Rev 0 PGE Calculatio... | ONLO-138 Rev 0 WAC Deviation.d... | DD-98-04.pdf | WA-OP-020.pdf | ONLO-138 MSDS Package.pdf

Attached are the documents related to revision 0 of NTS Profile ONLO-000000138, Columbus Closure Project Low Level Debris. This is an original submittal to NTS. The validation package for the recent NDA work is not included in this review. However, it will be ready for and included in the profile submittal.

Please review the attached documents and provide comments by e-mail no later than COB, Monday, 04/11/05. If you have no comments, please indicate such in a return e-mail for documentation purposes. I require your return e-mail for documentation that you have had the opportunity to review these documents.

Your review and comments are appreciated,

Dave Adkins
513-648-4364

Tracking:

Recipient	Delivery
'Tom Walsh (E-mail)'	
'Rodney Bell (E-mail)'	
'SSchmucker (E-mail)'	
Heffron, Steve	Delivered: 4/6/2005 9:25 PM
Friske, Reinhard	Delivered: 4/6/2005 9:25 PM
Allen, Donna	Delivered: 4/6/2005 9:25 PM
Johnston, Frank	Delivered: 4/6/2005 9:25 PM
Green, Donna	Delivered: 4/6/2005 9:25 PM
Lee, Linda	Delivered: 4/6/2005 9:25 PM
Schulten, Robert	Delivered: 4/6/2005 9:25 PM
Sattler, John	Delivered: 4/6/2005 9:25 PM

5929

Adkins, David

From: System Administrator
To: Heffron, Steve; Friske, Reinhard; Allen, Donna; Johnston, Frank; Green, Donna
Sent: Wednesday, April 06, 2005 9:25 PM
Subject: Delivered: ONLO-138, Rev.0, CCP Low Level Debris, Blue Sheet review

Your message

To:	Tom Walsh (E-mail); Rodney Bell (E-mail); SSchmucker (E-mail); Heffron, Steve; Friske, Reinhard; Allen, Donna; Johnston, Frank; Green, Donna
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Subject:	ONLO-138, Rev.0, CCP Low Level Debris, Blue Sheet review
Sent:	4/6/2005 9:25 PM

was delivered to the following recipient(s):

Heffron, Steve on 4/6/2005 9:25 PM
Friske, Reinhard on 4/6/2005 9:25 PM
Allen, Donna on 4/6/2005 9:25 PM
Johnston, Frank on 4/6/2005 9:25 PM
Green, Donna on 4/6/2005 9:25 PM
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Sattler, John on 4/6/2005 9:25 PM

5929

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ONLO-138, CCP Debris Profile, ... | ONLO-138 Rev 0 PKN Rev 0.doc | ONLO-138 Rev 0 Procedures Ref... | ONLO-138 Rev 0 Table E3.xls | ONLO-138 Rev 0 PGE Calculatio... | ONLO-138 Rev 0 WAC Deviation.d... | DD-98-04.pdf

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Your review and comments are appreciated,

Dave Adkins
513-648-4364

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Lee, Linda	Delivered: 4/6/2005 9:25 PM
Schulten, Robert	Delivered: 4/6/2005 9:25 PM
Sattler, John	Delivered: 4/6/2005 9:25 PM

CORRESPONDENCE (*BLUE SHEET*) REVIEW RECORD SHEET

5929

NEED DATE: 04/11/05 — DO NOT USE ASAP

PARALLEL REVIEW: ☒ YES ☐ NO

Type of Commitment	Meets Commitment/Due Date

LETTER NO: _____ DATE AFTER SIGNATURE IS OBTAINED

SUBJECT: NTS PROFILE ONLO-000000138, COLUMBUS CLOSURE PROJECT LOW LEVEL DEBRIS, REVISION 0

AUTHOR & PHONE: DAVID ADKINS, 513-648-7260

SIGNER: DAVID ADKINS, REINHARD FRISKE

CONTACT PERSON: DAVID ADKINS

PHONE:	FAX:	MAIL STOP:
7260	5002	52-3

IMPORTANT: Take this document to your division secretary for review of grammar, punctuation and formatting BEFORE sending it out for the formal blue sheet review process.

The following have reviewed the subject document. Comments regarding the content may be attached.

Reviewed By	Comments Yes	Comments No	Date	Comments Incorporated Yes	Comments Incorporated No	Date
DONNA ALLEN		✓	4/11/05			
RODNEY BELL	✓		4/13/05	✓		4/13/05 DSA
REINHARD FRISKE	✓		4/23/05	✓		4/23/05 DSA
DONNA GREEN		✓	4/11/05			
STEVE HEFFRON		✓	4/11/05			
FRANK JOHNSTON (BETSY BRUCKEN)		✓	4/7/05			
JOHN SAMPLES		✓	4/11/05			
STEVE SCHMUCKER		✓	4/11/05			
TOM WALSH	✓		4/12/05	✓		4/22/05 DSA

Approval by the following Managers required before submittal to the Closure Project Director for signature	DATE
Dennis Carr	4-25-05
LEVEL 1 Project/Program Director	
CON MURPHY, Field Closure Project Director (Must sign after all Project Directors)	
DENNIS NIXON, Director of Closure Project Management (Reviews all correspondence prior to final signature by Closure Project Director)	

NIXON TO DETERMINE IF FURTHER PARALLEL REVIEW REQUIRED BY THOSE LISTED BELOW YES ☐ NO ☐	COMMENTS YES	COMMENTS NO	DATE	COMMENTS INCORPORATED YES	COMMENTS INCORPORATED NO	DATE
Mark Sucher						
(Add Additional Reviewers Here)						

COMMENTS:

5929

Adkins, David

From: Friske, Reinhard
To: Adkins, David
Sent: Wednesday, April 06, 2005 10:18 PM
Subject: Read: ONLO-138, Rev.0, CCP Low Level Debris, Blue Sheet review

Your message

To: Tom Walsh (E-mail); Rodney Bell (E-mail); SSchmucker (E-mail); Heffron, Steve; Friske, Reinhard; Allen, Donna; Johnston, Frank; Green, Donna
Cc: Lee, Linda; Schulten, Robert; Sattler, John
Subject: ONLO-138, Rev.0, CCP Low Level Debris, Blue Sheet review
Sent: 4/6/2005 9:25 PM

was read on 4/6/2005 10:18 PM.

5929

ENCLOSURE-1

To: John B. Jones, NNSA/NSO

From: John Sattler

Subject: Submittal of Profile ONLO-000000138, Revision 0, Columbus Closure Project Low Level Debris

Enclosed is a signed copy of Nevada Test Site (NTS) Waste Profile ONLO-000000138, Revision 0, Columbus Closure Project Low Level Debris.

c: Without Enclosures
Reinhard Friske, MS52-3
Steve Heffron, MS52-3
John W. Samples, MS52-3

5929

Adkins, David

From: Lee, Linda
To: Adkins, David
Sent: Thursday, April 07, 2005 6:23 AM
Subject: Read: ONLO-138, Rev.0, CCP Low Level Debris, Blue Sheet review

Your message

To: Tom Walsh (E-mail); Rodney Bell (E-mail); SSchmucker (E-mail); Heffron, Steve; Friske, Reinhard; Allen, Donna; Johnston, Frank; Green, Donna
Cc: Lee, Linda; Schulten, Robert; Sattler, John
Subject: ONLO-138, Rev.0, CCP Low Level Debris, Blue Sheet review
Sent: 4/6/2005 9:25 PM

was read on 4/7/2005 6:23 AM.

5929

Adkins, David

From: Johnston, Frank
To: Adkins, David
Sent: Thursday, April 07, 2005 7:21 AM
Subject: Read: ONLO-138, Rev.0, CCP Low Level Debris, Blue Sheet review

Your message

To:	Tom Walsh (E-mail); Rodney Bell (E-mail); SSchmucker (E-mail); Heffron, Steve; Friske, Reinhard; Allen, Donna; Johnston, Frank; Green, Donna
Cc:	Lee, Linda; Schulten, Robert; Sattler, John
Subject:	ONLO-138, Rev.0, CCP Low Level Debris, Blue Sheet review
Sent:	4/6/2005 9:25 PM

was read on 4/7/2005 7:21 AM.

4.2.3 Field Sort Waste Bags

Two sizes of full, individual, field sort waste bags were considered: a small bag 12 inches in diameter and 15 inches high, and a tall bag 18 inches in diameter and 27 inches high. Cases were calculated for full small bags at incremental weights of 1, 4, 8, 12, 16, 20, 24, 26, 28, and 30 pounds; and for full tall bags at incremental weights of 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, and 70 pounds. In all cases the source material was modeled as cellulose because the bags generally contain light materials (e.g., paper products, latex gloves, and various cloth items). Additionally, the measurement point was set at 1 inch from the surface at the centerline (i.e., mid-plane) of the bag to represent the distance from the outside of a bag to the center of the detector.

Tables 10 and 11 contain the results of QAD-CGGP-95.1 calculations for individual trash bag cases. Curve-fitting techniques were applied to these results used to determine equations to describe external exposure rates as a function of bag weight.

The regression equation calculated for the small bags was

$$y = 7.227 - 1.757E\text{-}2\, x + 4.243E\text{-}4\, x^2 - 2.331E\text{-}5\, x^3 + 3.108E\text{-}7\, x^4 \qquad \text{(Equation 8)}$$

The regression equation calculated for the tall bags was

$$y = 3.208 - 2.968E\text{-}3\, x + 2.601E\text{-}5\, x^2 - 6.034E\text{-}7\, x^3 + 3.319E\text{-}9\, x^4 \qquad \text{(Equation 9)}$$

Where

x = Waste weight (lb)
y = Exposure rate (mR/hr for 1 mCi of JN Standard Isotopic Mix)

Table 10: Waste Weights and Exposure Rates for Small Field Sort Bags

Waste Weight (lb)	Exposure Rate (mR/hr)
1	7.21E+00
4	7.16E+00
8	7.10E+00
12	7.04E+00
16	6.98E+00
20	6.91E+00
24	6.83E+00
26	6.79E+00
28	6.75E+00
30	6.70E+00

Note: Exposure rates are for 1 mCi of JN Standard Isotopic Mix in a small field sort bag.

Table 11: Waste Weights and Exposure Rates for Tall Field Sort Bags

Waste Weight (lb)	Exposure Rate (mR/hr)
5	3.19E+00
10	3.18E+00
15	3.17E+00
20	3.15E+00
25	3.14E+00
30	3.13E+00
35	3.11E+00
40	3.10E+00
45	3.09E+00
50	3.07E+00
55	3.05E+00
60	3.04E+00
65	3.02E+00
70	3.00E+00

Note: Exposure rates are for 1 mCi of JN Standard Isotopic Mix in a tall field sort bag.

4.2.4 Other Metal Forms

The activity content of a number of waste components cannot be adequately calculated by the models described previously. Among these waste components are ventilation ducts, pumps, valves, and motors. To better calculate the activity content of items such as these, two general models and spreadsheets were developed. The models developed are small and large metal (iron) cylinders, which are discussed below in detail. Both models are fixed in size, but cover a range of weights, and therefore densities, to provide a means to calculate activities contained in a broad range of real objects.

4.2.4.1 Small Metal Cylinder

The small metal model is a right circular cylinder 6 inches in radius and 15 inches high. The exposure measuring point is separated from the source by a 1-inch air gap, which simulates the centerline of the indicated ion chamber detector.

QAD-CGGP-95.1 calculations were performed for this model with net weights of 5, 10, 15, 20, 25, 30, 40, 50, and 60 pounds. The radiation source for these calculations was 1 mCi of the JN Standard Isotopic Mix. The point at which the exposure was modeled is the vertical centerline of the cylinder.

Table 12 contains the results of QAD-CGGP-95.1 calculations. Curve-fitting techniques were applied to these results to determine equations to describe external exposure rates as a function of weight.

Table 12: Waste Weights and Exposure Rates for Small Metal Cylinders

Waste Weight (lb)	Exposure Rate (mR/hr)
5	7.10E+00
10	6.98E+00
15	6.84E+00
20	6.71E+00
25	6.57E+00
30	6.42E+00
40	6.14E+00
50	5.85E+00
60	5.57E+00

Note: Exposure rates are for 1 mCi of JN Standard Isotopic Mix in a small metal cylinder.

The regression equation calculated for the small metal waste cylinders was

$$y = 7.225 - 2.352E\text{-}2\, x - 1.464E\text{-}4\, x^2 + 1.448E\text{-}6\, x^3 - 2.486E\text{-}9\, x^4 \qquad \text{(Equation 10)}$$

Where

x = Waste weight (lb)
y = Exposure rate (mR/hr for 1 mCi of JN Standard Isotopic Mix)

4.2.4.2 Large Metal Cylinder

The large metal model is a right circular cylinder 12 inches in diameter by 36 inches high. The exposure measuring point is separated from the source by a 1-inch air gap, which simulates the measuring point of the radiation survey instrument.

QAD-CGGP-95.1 calculations were performed for this model with net weights from 10 pounds to 100 pounds in 10-pound increments. The radiation source for these calculations was 1 mCi of the JN Standard Isotopic Mix. The point at which the exposure was modeled is the vertical centerline of the cylinder.

Table 13 contains the results of QAD-CGGP-95.1 calculations. Curve-fitting techniques were applied to these results to determine equations to describe external exposure rates as a function of weight.

Table 13: Waste Weights and Exposure Rates for Large Metal Cylinders

Waste Weight (lb)	Exposure Rate (mR/hr)
10	3.97E+00
20	3.89E+00
30	3.81E+00
40	3.73E+00
50	3.64E+00
60	3.55E+00
70	3.46E+00
80	3.37E+00
90	3.28E+00
100	3.19E+00

Note: Exposure rates are for 1 mCi of JN Standard Isotopic Mix in a large metal cylinder.

The regression equation calculated for the large metal cylinders was

$$y = 4.050 - 7.329E\text{-}3\ x - 2.439E\text{-}5\ x^2 + 1.275E\text{-}7\ x^3 - 7.139E\text{-}11\ x^4 \qquad \text{(Equation 11)}$$

Where

x = Waste weight (lb)
y = Exposure rate (mR/hr for 1 mCi of JN Standard Isotopic Mix)

4.2.5 B-12 Boxes

The B-12 box was modeled as a rectangular solid with dimensions 6 feet wide by 2 feet tall by 4 feet deep. The wall of the box was modeled as 12-gauge steel, 0.1046 inch thick. Exposure rates were determined at a point halfway up the box (12 inches) and halfway from the edge of the box (36 inches) and at distance of 2 inches from the side of the box.

Exposure rates were determined using MicroShield for waste weights that ranged from 500 pounds to 9,000 pounds (Table 14) for a box containing 1 mCi of the JN Standard Isotopic Mix. The density of the waste material contained in the box was derived from the calculated box volume and waste weight. The material chosen for the waste matrix was lead because lead is often placed in the boxes.

Table 14: Waste Weights and Exposure Rates for B-12 Boxes

Waste Weight (lb)	Exposure Rate (mR/hr)
500	3.672E-1
1,000	2.740E-1
1,500	2.163E-1
2,000	1.777E-1
2,500	1.503E-1
3,000	1.299E-1
3,500	1.143E-1
4,000	1.019E-1
4,500	9.188E-2
5,000	8.360E-2
5,500	7.665E-2
6,000	7.074E-2
6,500	6.565E-2
7,000	6.124E-2
7,500	5.737E-2
8,000	5.395E-2
8,500	5.091E-2
9,000	4.819E-2

Note: Exposure rates are for 1 mCi of the JN Standard Isotopic Mix in a B-12 box.

The regression equation calculated from these data was

$$y = 4.629E\text{-}1 - 2.320E\text{-}4\,x + 5.666E\text{-}8\,x^2 - 6.407E\text{-}12\,x^3 + 2.680E\text{-}16\,x^4 \qquad \text{(Equation 12)}$$

Where

x = Waste weight (lb)
y = Exposure rate (mR/hr for 1 mCi of JN Standard Isotopic Mix)

4.2.6 IP-1 Intermodal "Rolloff" Containers

The 25.4-cubic-yard IP-1 intermodal container was modeled as a rectangular solid with dimensions 230 inches wide by 61 inches tall by 85 inches deep. The half-full IP-1 container was assumed to be filled to a height of 30.5 inches. The wall of the IP-1 container was modeled as 10-gauge steel, 0.1345 inch thick. Exposure rates were determined at a point halfway up the waste (15.25 inches) and halfway from the edge of the box (115 inches) and at distance of 2 inches from the side of the container for a half-full IP-1 container. For a full IP-1 container, exposure rates were determined at a point halfway up the waste (30.5 inches) and halfway from the edge of the box (115 inches) and at a distance of 2 inches from the side of the container.

Exposure rates were determined using MicroShield for waste weights that ranged from 6,000

pounds to 37,000 pounds (Tables 15 and 16) for an IP-1 container containing 1 mCi of the JN Standard Isotopic Mix. The density of the waste material was derived from the calculated IP-1 volume and waste weight. The material chosen for the waste matrix was concrete because building debris and soil are often placed in the containers.

Table 15: Waste Weights and Exposure Rates for Half Full IP-1 Intermodal Containers

Waste Weight (lb)	Exposure Rate (mR/hr)
6,000	7.829E-2
9,100	6.214E-2
12,200	5.144E-2
15,300	4.383E-2
18,400	3.812E-2
21,500	3.369E-2
24,600	3.015E-2
27,700	2.725E-2
30,800	2.484E-2
33,900	2.281E-2
37,000	2.107E-2

Note: Exposure rates are for 1 mCi of the JN Standard Isotopic Mix in a half-full IP-1 intermodal container.

Table 16: Waste Weights and Exposure Rates for Full IP-1 Intermodal Containers

Waste Weight (lb)	Exposure Rate (mR/hr)
6,000	7.723E-2
9,100	6.397E-2
12,200	5.383E-2
15,300	4.611E-2
18,400	4.013E-2
21,500	3.542E-2
24,600	3.163E-2
27,700	2.852E-2
30,800	2.594E-2
33,900	2.377E-2
37,000	2.191E-2

Note: Exposure rates are for 1 mCi of the JN Standard Isotopic Mix in a full IP-1 intermodal container.

For a half-full IP-1 container, the regression equation calculated from these data was

$$y = 1.270E\text{-}1 - 1.075E\text{-}5\,x + 4.986E\text{-}10\,x^2 - 1.156E\text{-}14\,x^3 + 1.039E\text{-}19\,x^4 \qquad \text{(Equation 13)}$$

For a full IP-1 container, the regression equation calculated from these data was

$$y = 1.145E\text{-}1 - 7.785E\text{-}6\,x + 2.948E\text{-}10\,x^2 - 5.825E\text{-}15\,x^3 + 4.641E\text{-}20\,x^4 \qquad \text{(Equation 14)}$$

Where

x = Waste weight (lb)
y = Exposure rate (mR/hr for 1 mCi of JN Standard Isotopic Mix)

4.2.7 IP-2 Intermodal "Sealand" Containers

The 37-cubic-yard IP-2 intermodal container (Sealand Container) was modeled as a rectangular solid with dimensions 227 inches wide by 91 inches tall by 88 inches deep. The half-full IP-2 container was assumed to be filled to a height of 45.5 inches. The wall of the IP-2 container was modeled as 10-gauge steel, 0.1345 inch thick. Exposure rates were determined at a point halfway up the waste (22.75 inches) and halfway from the edge of the container (113.5 inches) and at a distance of 2 inches from the side of the container for a half full IP-2 container. For a full IP-2 container, exposure rates were determined at a point halfway up the waste (45.5 inches) and halfway from the edge of the box (113.5 inches) and at a distance of 2 inches from the side of the container.

Exposure rates were determined using MicroShield for waste weights that ranged from 6,000 pounds to 34,000 pounds (Tables 17 and 18) for an IP-2 container containing 1 mCi of the JN Standard Isotopic Mix. The density of the waste material was derived from the calculated IP-2 volume and waste weight. The material chosen for the waste matrix was concrete because building debris and soil are often placed in the containers.

For a half full IP-2 container, the regression equation calculated from these data was

$$y = 1.228E\text{-}1 - 9.652E\text{-}6\,x + 4.289E\text{-}10\,x^2 - 9.861E\text{-}15\,x^3 + 9.021E\text{-}20\,x^4 \qquad \text{(Equation 15)}$$

For a full IP-2 container, the regression equation calculated from these data was

$$y = 9.508E\text{-}2 - 4.773E\text{-}6\,x + 1.210E\text{-}10\,x^2 - 1.389E\text{-}15\,x^3 + 4.361E\text{-}21\,x^4 \qquad \text{(Equation 16)}$$

Where

x = Waste weight (lb)
y = Exposure rate (mR/hr for 1 mCi of JN Standard Isotopic Mix)

Table 17: Waste Weights and Exposure Rates for Half-Full IP-2 Intermodal Containers

Waste Weight (lb)	Exposure Rate (mR/hr)
6,000	7.833E-2
8,800	6.474E-2
11,600	5.474E-2
14,400	4.723E-2
17,200	4.143E-2
20,000	3.683E-2
22,800	3.310E-2
25,600	3.002E-2
28,400	2.744E-2
31,200	2.525E-2
34,000	2.337E-2

Note: Exposure rates are for 1 mCi of the JN Standard Isotopic Mix in a half-full IP-2 intermodal container.

Table 18: Waste Weights and Exposure Rates for Full IP-2 Intermodal Containers

Waste Weight (lb)	Exposure Rate (mR/hr)
6,000	7.048E-2
8,800	6.159E-2
11,600	5.390E-2
14,400	4.743E-2
17,200	4.207E-2
20,000	3.761E-2
22,800	3.388E-2
25,600	3.075E-2
28,400	2.810E-2
31,200	2.583E-2
34,000	2.388E-2

Note: Exposure rates are for 1 mCi of the JN Standard Isotopic Mix in a full IP-2 intermodal container.

5.0 DIRECT SAMPLE ANALYSIS WASTE STREAMS

Fuel Pool Waste—Waste from the JN-1 fuel pool will be characterized based upon direct sample results. Pool wastes currently drummed and stored pending shipment were individually characterized due to solubility differences between various nuclides in the mix. Cesium, upon which this modeling methodology depends, is highly soluble; while the transuranic isotopes and others tend to be largely insoluble. This inconsistency rendered cesium-based modeling unsuitable for any waste stream in which solubility is a major concern. Therefore, all pool-related wastes will be characterized individually. This is outside the scope of the methodology in this document.

Plutonium Wastes from Buildings JN-2 and JN-4—Plutonium processing was conducted at one time in Building JN-4. After that research was completed, the waste was collected and stored in Buildings JN-2 and JN-3. It has been kept separate from the other JN waste streams and will be addressed by a future revision of this document.

6.0 REFERENCES

1. Battelle Memorial Institute, "Building JN-1 Hot Cell Laboratory Acceptable Knowledge Document," TCP-98-03, Battelle Columbus Laboratories Decommissioning Project (BCLDP), Columbus, Ohio.

2. Battelle Memorial Institute, Software Documentation and Verification and Validation (V&V) reports for each of the following software applications:
   a. Latin Hypercube Sampling
      1. Software Documentation transmitted to BCLDP project records by J. Eide, Date: October 5, 2002
      2. V&V Report by D. Mooney, Date: June 1, 2001
   b. ORIGEN2.1
      1. Software Documentation (called Primitive Baseline according to BCLDP Software Quality Assurance [QA] Plan) transmitted to BCLDP project records by J. Eide, Date: February 1, 2002
      2. V&V Report by R. Tayloe, Date: August 13, 2001
   c. JN Standard Radionuclide Mix Calculation Report transmitted to BCLDP project records by J. Eide on October 14, 2002
   d. MicroShield RH-TRU Calculation Report transmitted to BCLDP project records by Jim Eide on October 5, 2002
   e. QAD and MicroShield LLW Calculation Report transmitted to BCLDP project records by J. Eide on May 2, 2002
   f. Microshield
      1. Software Documentation (called Primitive Baseline according to BCLDP Software QA Plan) transmitted to BCLDP files by Jim Eide on October 15, 2002
      2. V&V Report by A. Plummer
   g. Dose-to-curie Database
      1. Software Documentation transmitted to BCLDP project records by J. Eide November 2002
      2. V&V Report by S. Maheras
3. "Hanford Solid Waste Acceptance Criteria (SWAC)", HNF-EP-0063.

4. U.S. Department of Transportation Certificate of Compliance for the Chem-Nuclear Systems (CNS) 10-160B Container.

5. Stein, Michael. "Large Sample Properties of Simulations Using Latin Hypercube Sampling," *Technometrics*, May 1987, 29(2):143-151.

6. Battelle Memorial Institute, "Software Quality Assurance (QA) Plan for TRU WCP," TCP-98-07, Battelle Memorial Institute, BCLDP, Columbus, Ohio.

7. Carlsbad Area Office Quality Assurance Program Document, CAO-94-1012.

Battelle Columbus Containers

LLW Concrete Drums

New Drum	Old Drum	Tare Weight (kg)	Gross Weight (kg)	Waste Weight (kg)	Contact Dose Rate Side (mR/hr)	Contact Dose Rate Top (mR/hr)	Contact Dose Rate Bottom (mR/hr)	Dose Rate Prior to Grout	TRU Content (nCi/g)	Contents	Comments
SDSBC1564	N/A	28.0		283.0	300	100	700	-	86	Filters	
SDSBC1571	84-25	28.0		426.0	500	-	700	2.2 R	233	Metal	TRU
SDSBC1572	84-24	28.0		448.0	200	50	-	1.8 R	82	Sludge	
SDSBC1574	84-16	28.0		393.0	200	-	50	1.3 R	20	Metal	
SDSBC1575	84-20	28.0		370.0	-	-	-	2.2 R	71	Metal	
SDSBC1576	84-17	28.0		474.0	-	300	300	2.5 R	77	Metal	
SDSBC1577	84-58	28.0		405.0	100	25	-	400 mR	30	Sweeper	
SDSBC1635	84-31	28.0		455.0	100	-	50	450 mR	41	Sludge	

Summary of TRU contents

Drum No.	Contents	Waste wgt, lb	Waste wgt, gm	nCi(TRU)	nCi(TRU)/gm
1564	Filters	625	2.83E+05	2.45E+07	86
1571	Metal	940	4.26E+05	9.95E+07	233
1572	Sludge	988	4.48E+05	3.68E+07	82
1574	Metal	867	3.93E+05	7.74E+06	20
1575	Metal	815	3.70E+05	2.63E+07	71
1576	Metal	1044	4.74E+05	3.66E+07	77
1577	Sweeper	893	4.05E+05	1.20E+07	30
1635	Sludge	1003	4.55E+05	1.88E+07	41
	Totals	7175	3.25E+06	2.62E+08	81 average

Hot Concrete Drums Info. Pre-ISOCS

Note: The following are the identification numbers, weight, and dose rates for the eight concrete drums:

New Drum #	Old Drum #	Weight	Dose Side	Dose Top	Dose Bottom
SDSBC1564	(N/A)	640 lbs.	300 mR/hr	100 mR/hr	700 mR/hr
SDSBC1571	(84-25)	940 lbs.	500 mR/hr		700 mR/hr
SDSBC1572	(84-24)	980 lbs.	200 mR/hr	50 mR/hr	
SDSBC1574	(84-16)	860 lbs.	200 mR/hr		50 mR/hr
SDSBC1575	(84-20)				
SDSBC1576	(84-17)	1020 lbs.		300 mR/hr	300 mR/hr
SDSBC1577	(84-58)	875 lbs.	100 mR/hr	25 mR/hr	
SDSBC1635	(84-31)	1000 lbs.	100 mR/hr		50 mR/hr

CASCADE L1-C2462

55 GALLON DRUMS

5929

HL-Drum No.	Contents	MR/hr Contact	MR/hr 1 Ft	Gross Wt lbs.	Activity mCi	NANDC	GEA	M = main A = annex Location	OK Dis Si
496	(?)								
* 575	COMPACT NAC	150mR	7mR	245				M	
* 588	COMPACT NAC	24mR	3mR	220					
589	COMPACT NAC	1 R	33mR	250			X	A	
* 591	COMPACT NAC	17mR	1.2mR	250					
640	COMPACT	3 R	50mR	230				M	
672	COMPACT	1.5 R	45mR	230				M	
686	RESIN	6 R	275mR	360				M	
689	RESIN	3 R	150mR	310				M	
698	RESIN	5 R	175mR	410				M	
701	COMPACT	1.9 R	12mR	200				M	
704	COMPACT	1.2 R	25mR	210				M	
726	RESIN	4 R	400mR	435				M	
740	COMPACT	1.5 R	30mR	225				M	
743	RESIN	9 R	400mR	320				M	
756	COMPACT	2 R	40mR	160				M	
768	RESIN	7 R	275mR	360				M	
779	3 SWEEPERS	500mR	40mR	120				M	
784	RESIN	4 R	150mR	310				M	
789	RESIN	2 R	90mR	280				M	
793	COMPACT	7 R	200mR	230				M	
815	RESIN	5 R	175mR	310				M	
826	AIR FILTER	2 R	10mR	190				M	
844	COMPACT	1.1 R	11mR	210				M	
847	COMPACT	1-10 R ~~200mR~~	2.5mR	100				M	
84-6	RESIN	3.5 R	70mR	350				M	
84-16	METAL + CEMENT	1.3 R	35mR	840	X	X		A(B)	
84-17	METAL + CEMENT	2.5 R	70mR	1025	X	X		A(B)	
84-20	METAL + CEMENT	2.2 R	60mR	810	X	X		A(B)	
84-24	CEMENT	1.8 R	45mR	960	X	X		A(B)	
84-25	CEMENT	2.2 R	60mR	920	X	X		A(B)	
84-31	CEMENT	450mR	25mR	975				M	
84-33	COMPACT	2.2 R	38mR	100				M	
84-37	BASEMENT WASTE	1.5 R	30mR	210				M	
84-39	BASEMENT WASTE	2 R	35mR	345				M	
84-41	BASEMENT WASTE	1.2 R	20mR	145				M	
84-42	COMPACT	2 R	20mR	250				M	

CONTENTS AND RADIOACTIVITY LEVELS OF THE DRUMS LOCATED IN THE ALCOVE OF THE WASTE STORAGE SHED

84-25	Cement	2.2 R/hr
84-17	Metal and cement	2.5 R/hr
84-20	Metal and cement	2.2 R/hr
84-16	Metal and cement	1.3 R/hr
84-5458	Cement and HEC sweeper ~~bags~~	400 mR/hr
84-24	Cement	1.8 R/hr
88-21	HEC metal	1.2 R/hr
88-13	Waste compacted in CAA	1.8 R/hr
89-00	Steel	450 mR/hr
DDO-30	Waste compacted in Washdown Room	
DDO-31	Waste compacted in Washdown Room	
DDO-32	Waste compacted in Washdown Room	
DDO-33	Waste compacted in Washdown Room	
589	Compacted NAC	1.0 R/hr
88-23	HEC metal	2.5 R/hr
88-19	HEC metal	600 mR/hr
89-06	Compacted waste	1.0 R/hr
89-02	Compacted waste	300 mR/hr
89-04	Steel	250 mR/hr
89-03	Steel	250 mR/hr
89-01	Steel	400 mR/hr

EXHIBIT 9

RADIOACTIVE WASTE INV_

Storage Area: MAIN STORAGE AREA - JN-1 WASTE SHED

Page 1

Waste Description: MISCELLANEOUS WASTE IN 55-GALLON DRUMS

WORK INSTRUCTION

04-05-9

Container ID No.	Size	Description	Contact mR/hr	30 cm mR/hr	1 Meter mR/hr	Gross Weight	Oth
496	55-GALLON	UNKNOWN	1	2	3	4	
640	"	COMPACT WASTE	3000		50	230	
672	"	COMPACT WASTE	1500		45	230	
701	"	COMPACT WASTE	1900		17	200	
704	"	COMPACT WASTE	1200		25	210	
740	"	COMPACT WASTE	1500		30	225	
756	"	COMPACT WASTE	2000		40	160	
HL 779	"	3 SWEEPERS	500		40	120	
793	"	COMPACT WASTE	7000		200	230	
813	"	UNKNOWN	1		3	4	
[illegible]	"	AIR FILTERS (HEC?)	2000		10	190	
44	"	COMPACT WASTE	1100		11	210	
47	"	COMPACT WASTE	200		2.5	100	
4-31	"	CEMENT	450		25	975	←
4-33	"	COMPACT WASTE	2200		38	100	
4-37	"	BASEMENT WASTE	1500		30	210	
4-39	"	BASEMENT WASTE	2000		35	345	
4-41	"	BASEMENT WASTE	1200		20	145	
4-42	"	COMPACT WASTE	2000		20	250	
4-69	"	COMPACT WASTE	2500		15	200	
4-70	"	UNKNOWN	1		3	4	
1-71	"	COMPACT WASTE	1600		50	140	
613	"	UNKNOWN	1		3	4	
-17C	"	COMPACT WASTE	7200		375	220	
[illegible]	"	COMPACT WASTE	3000		475	190	
-62C	"	COMPACT WASTE	1750		17	200	
63C	"	COMPACT WASTE	1800	2	8	235	

1 [illegible]

Comment: TRU content is based on Cs-137

Drum No.	Contents	Waste wgt, lb*	Waste wgt, gm	Cs-137 uCi/Drum**	nCi(TRU)	nCi(TRU)/gm
1571	Metal	940	4.26E+05	8.61E+05	9.95E+07	233

Notes:
* Tare wgt = 62
** QRS assay

Nuclide content relative to Eu-154 in the Standard Mix, except as noted:

Nuclide(x)	uCi(x)/uCi(Cs)	nCi(TRU)/uCi(Cs)	nCi(TRU)/Drum	uCi(x)/Drum	
Cs-137	1.00E+00			8.61E+05	**
Pu-241	8.13E-01			7.00E+05	
Sr-90	6.56E-01			5.65E+05	
Co-60	3.10E-01			1.21E+03	**
Am-241	5.01E-02	5.01E+01	4.32E+07	4.32E+04	
Pu-238	4.83E-02	4.83E+01	4.16E+07	4.16E+04	
Cm-244	4.04E-02			3.47E+04	
Eu-154	1.54E-02			1.11E+04	**
Pu-240	1.01E-02	1.01E+01	8.70E+06	8.70E+03	
Pu-239	6.20E-03	6.20E+00	5.34E+06	5.34E+03	
Sm-151	4.74E-03			4.08E+03	
Sb-125	4.58E-03			3.94E+03	
Cs-134	4.11E-03			3.54E+03	
Ni-63	9.05E-04			7.79E+02	
Cd-113m	4.07E-04			3.50E+02	
Am-243	3.75E-04	3.75E-01	3.23E+05	3.23E+02	
Cm-243	2.63E-04	2.63E-01	2.26E+05	2.26E+02	
Tc-99	1.88E-04			1.62E+02	
Am-242m	1.00E-04	1.00E-01	8.62E+04	8.62E+01	
Eu-152	3.75E-05			3.23E+01	
Pu-242	3.03E-05	3.03E-02	2.60E+04	2.60E+01	
Zr-93	2.77E-05			2.39E+01	
C-14	1.87E-05			1.61E+01	
U-234	1.73E-05			1.49E+01	
Sn-126	1.21E-05			1.04E+01	
Sn-121m	9.68E-06			8.33E+00	
Ni-59	7.34E-06			6.32E+00	
Cm-245	6.42E-06	6.42E-03	5.53E+03	5.53E+00	
Se-79	5.94E-06			5.11E+00	
Cs-135	4.99E-06			4.29E+00	
U-238	4.90E-06			4.22E+00	
Np-237	4.52E-06	4.52E-03	3.89E+03	3.89E+00	
U-236	3.34E-06			2.88E+00	
Cm-246	2.20E-06	2.20E-03	1.89E+03	1.89E+00	
Pd-107	1.85E-06			1.59E+00	
I-129	4.76E-07			4.10E-01	
U-232	4.62E-07			3.98E-01	
Th-228	4.60E-07			3.96E-01	
U-235	2.52E-07			2.17E-01	
Cl-36	1.87E-07			1.61E-01	
Tl-208	1.65E-07			1.42E-01	

Mo-93	1.05E-08			
Th-230	3.07E-09			9.03E-03
Nb-94	2.27E-09			2.64E-03
Cf-250	1.41E-09			1.95E-03
Cf-249	6.01E-10	6.01E-07		1.21E-03
U-233	5.38E-10		5.17E-01	5.17E-04
Pa-231	2.87E-10			4.63E-04
Eu-150	1.69E-10			2.47E-04
Ac-227	1.11E-10			1.45E-04
Be-10	7.47E-11			9.52E-05
Sm-147	6.54E-11			6.43E-05
Cm-248	4.21E-11	4.21E-08		5.63E-05
Cf-251	2.38E-11	2.38E-08	3.62E-02	3.62E-05
Ra-226	1.49E-11		2.05E-02	2.05E-05
Pu-244	1.29E-11	1.29E-08		1.29E-05
Cm-247	1.02E-11	1.02E-08	1.11E-02	1.11E-05
Pb-210	3.22E-12		8.81E-03	8.81E-06
Th-229	2.99E-12			2.77E-06
Si-32	6.17E-13			2.58E-06
Re-187	2.91E-13			5.32E-07
K-40	7.40E-14			2.50E-07
Th-232	3.36E-15			6.37E-08
Ra-228	2.00E-15			2.89E-09
Cm-250	9.68E-18	9.68E-15		1.72E-09
Gd-152	5.89E-18		8.33E-09	8.33E-12
Ba-133	6.22E-30			5.07E-12
Total				5.36E-24
				2.29E+06

Battelle
Putting Technology To Work

WASTE PACKAGE LOADING RECORD

Loading - Itemized Data

Page 1 of 1

CLDP Package Identification No. (PIN)	SOSBC-1571	Package Type/Model	85 gal O/P TW 62 lbs.
Loading Personnel (Print Name)	Milburn, King		

Item No.	Item Description	Material Type	Material %	Dose Rate mr/hr CL*	Dose Rate mr/hr HS**	Weight (lbs)	Loading Date	Loader Initials	Summary/Comments
1	55 GALLON DRUM	CONCRETE	98	300	700	940	6/19/02	MM	55 GALLON CONCRETE
↓	W/CONCRETE	STEEL	2	↓	↓	↓	↓	↓	DRUM OVERPACK T/S
									85 GALLON DRUM
									FROM SN-1 HESR
									SCALE # A27123
									CALDUE 5/9/03
									TELE # 11739
									CALDUE 12/6/02

Package Final Measured Gross Weight (lbs)	1002	Accumulation Date (Mixed Waste Only)	N/A
Contains No Suspect Hazardous Materials (HM)	Initial CT Date 6/20/02	Authorized Review and Approval (Signature)	(date)
Contains Hazardous Materials (HM)	Initial Date		

* Dose Rate ** Hot Spot Dose Rate

5929

Comment: TRU content is based on Eu-154 because of the soluability influence on cesium

Drum No.	Contents	Waste wgt, lb*	Waste wgt, gm	Eu-154 uCi/Drum**	nCi(TRU)	nCi(TRU)/gm
1564	Filters	625	2.83E+05	3.27E+03	2.45E+07	86

Notes:
* Tare wgt = 62
** QRS assay

Nuclide content relative to Eu-154 in the Standard Mix, except as noted:

Nuclide(x)	uCi(x)/uCi(Eu)	nCi(TRU)/uCi(Eu)	nCi(TRU)/Drum	uCi(x)/Drum	
Cs-137	6.48E+01			1.55E+04	**
Pu-241	5.27E+01			1.72E+05	
Sr-90	4.25E+01			1.39E+05	
Co-60	2.01E+01			4.09E+04	**
Am-241	3.25E+00	3.25E+03	1.06E+07	1.06E+04	
Pu-238	3.13E+00	3.13E+03	1.02E+07	1.02E+04	
Cm-244	2.62E+00			8.55E+03	
Eu-154	1.00E+00			3.27E+03	**
Pu-240	6.55E-01	6.55E+02	2.14E+06	2.14E+03	
Pu-239	4.02E-01	4.02E+02	1.31E+06	1.31E+03	
Sm-151	3.07E-01			1.00E+03	
Sb-125	2.97E-01			9.71E+02	
Cs-134	2.67E-01			8.72E+02	
Ni-63	5.86E-02			1.92E+02	
Cd-113m	2.63E-02			8.61E+01	
Am-243	2.43E-02	2.43E+01	7.94E+04	7.94E+01	
Cm-243	1.70E-02	1.70E+01	5.57E+04	5.57E+01	
Tc-99	1.22E-02			3.99E+01	
Am-242m	6.49E-03	6.49E+00	2.12E+04	2.12E+01	
Eu-152	2.43E-03			7.95E+00	
Pu-242	1.96E-03	1.96E+00	6.41E+03	6.41E+00	
Zr-93	1.80E-03			5.88E+00	
C-14	1.21E-03			3.97E+00	
U-234	1.12E-03			3.66E+00	
Sn-126	7.82E-04			2.56E+00	
Sn-121m	6.27E-04			2.05E+00	
Ni-59	4.75E-04			1.55E+00	
Cm-245	4.16E-04	4.16E-01	1.36E+03	1.36E+00	
Se-79	3.85E-04			1.26E+00	
Cs-135	3.23E-04			1.06E+00	
U-238	3.17E-04			1.04E+00	
Np-237	2.93E-04	2.93E-01	9.57E+02	9.57E-01	
U-236	2.17E-04			7.09E-01	
Cm-246	1.43E-04	1.43E-01	4.66E+02	4.66E-01	
Pd-107	1.20E-04			3.92E-01	
I-129	3.08E-05			1.01E-01	
U-232	2.99E-05			9.79E-02	
Th-228	2.98E-05			9.75E-02	
U-235	1.64E-05			5.35E-02	
Cl-36	1.21E-05			3.96E-02	
Tl-208	1.07E-05			3.51E-02	

Mo-93	6.80E-07			2.22E-03
Th-230	1.99E-07			6.51E-04
Nb-94	1.47E-07			4.80E-04
Cf-250	9.14E-08			2.99E-04
Cf-249	3.89E-08	3.89E-05	1.27E-01	1.27E-04
U-233	3.48E-08			1.14E-04
Pa-231	1.86E-08			6.07E-05
Eu-150	1.09E-08			3.58E-05
Ac-227	7.17E-09			2.34E-05
Be-10	4.84E-09			1.58E-05
Sm-147	4.24E-09			1.39E-05
Cm-248	2.73E-09	2.73E-06	8.91E-03	8.91E-06
Cf-251	1.54E-09	1.54E-06	5.05E-03	5.05E-06
Ra-226	9.68E-10			3.17E-06
Pu-244	8.37E-10	8.37E-07	2.74E-03	2.74E-06
Cm-247	6.63E-10	6.63E-07	2.17E-03	2.17E-06
Pb-210	2.09E-10			6.83E-07
Th-229	1.94E-10			6.34E-07
Si-32	4.00E-11			1.31E-07
Re-187	1.89E-11			6.16E-08
K-40	4.80E-12			1.57E-08
Th-232	2.18E-13			7.12E-10
Ra-228	1.29E-13			4.23E-10
Cm-250	6.27E-16	6.27E-13	2.05E-09	2.05E-12
Gd-152	3.82E-16			1.25E-12
Ba-133	4.03E-28			1.32E-24
Total				4.07E+05

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WASTE PACKAGE LOADING RECORD

Loading - Itemized Data

Page 1 of 1

BCLDP Package Identification No. (PIN)	SDSBC-1564	Package Type/Model	85 gal O/P TW 62 lbs.
Loading Personnel (Print Name)	Milburn, King		

Item No.	Item Description	Material Type	Material %	Dose Rate mr/hr CL*	Dose Rate mr/hr HS**	Weight (lbs)	Loading Date	Loader Initials	Summary/Comments
1	55 Gallon Drum w/	Concrete	98	300	700	625	4/19/02	MM	55 Gallon Concrete
↓	Concrete	Steel	2	↓	↓	↓	↓	↓	Drum Overpack IN
									85 Gallon Drum
									From SNL HESR
									Scale # A27123
									Cal Due 5/9/03
									TEIE # 11739
									Cal Due 12/11/02

Loaded Package Final Measured Gross Weight (lbs)	681	Accumulation Date (Mixed Waste Only)	N/A
Contains No Suspect Hazardous Materials (HM)	Initial CJ Date 6/20/02	Authorized Review and Approval (signature)	(date)
Contains Hazardous Materials (HM)	Initial Date		

* Baseline Dose Rate ** Hot Spot Dose Rate

5929

Comment: TRU content is based on Eu-154 because of the soluability influence on cesium

Drum No.	Contents	Waste wgt, lb*	Waste wgt, gm	Eu-154 uCi/Drum**	nCi(TRU)	nCi(TRU)/gm
1572	Sludge	988	4.48E+05	4.92E+03	3.68E+07	82

Notes:
* Tare wgt = 62
** QRS assay

Nuclide content relative to Eu-154 in the Standard Mix, except as noted:

Nuclide(x)	uCi(x)/uCi(Eu)	nCi(TRU)/uCi(Eu)	nCi(TRU)/Drum	uCi(x)/Drum	
Cs-137	6.48E+01			4.50E+05	**
Pu-241	5.27E+01			2.59E+05	
Sr-90	4.25E+01			2.09E+05	
Co-60	2.01E+01			5.08E+02	**
Am-241	3.25E+00	3.25E+03	1.60E+07	1.60E+04	
Pu-238	3.13E+00	3.13E+03	1.54E+07	1.54E+04	
Cm-244	2.62E+00			1.29E+04	
Eu-154	1.00E+00			4.92E+03	**
Pu-240	6.55E-01	6.55E+02	3.22E+06	3.22E+03	
Pu-239	4.02E-01	4.02E+02	1.98E+06	1.98E+03	
Sm-151	3.07E-01			1.51E+03	
Sb-125	2.97E-01			1.46E+03	
Cs-134	2.67E-01			1.31E+03	
Ni-63	5.86E-02			2.89E+02	
Cd-113m	2.63E-02			1.30E+02	
Am-243	2.43E-02	2.43E+01	1.19E+05	1.19E+02	
Cm-243	1.70E-02	1.70E+01	8.38E+04	8.38E+01	
Tc-99	1.22E-02			6.01E+01	
Am-242m	6.49E-03	6.49E+00	3.19E+04	3.19E+01	
Eu-152	2.43E-03			1.20E+01	
Pu-242	1.96E-03	1.96E+00	9.65E+03	9.65E+00	
Zr-93	1.80E-03			8.85E+00	
C-14	1.21E-03			5.97E+00	
U-234	1.12E-03			5.51E+00	
Sn-126	7.82E-04			3.85E+00	
Sn-121m	6.27E-04			3.09E+00	
Ni-59	4.75E-04			2.34E+00	
Cm-245	4.16E-04	4.16E-01	2.05E+03	2.05E+00	
Se-79	3.85E-04			1.89E+00	
Cs-135	3.23E-04			1.59E+00	
U-238	3.17E-04			1.56E+00	
Np-237	2.93E-04	2.93E-01	1.44E+03	1.44E+00	
U-236	2.17E-04			1.07E+00	
Cm-246	1.43E-04	1.43E-01	7.01E+02	7.01E-01	
Pd-107	1.20E-04			5.90E-01	
I-129	3.08E-05			1.52E-01	
U-232	2.99E-05			1.47E-01	
Th-228	2.98E-05			1.47E-01	
U-235	1.64E-05			8.04E-02	
Cl-36	1.21E-05			5.96E-02	
Tl-208	1.07E-05			5.27E-02	

Mo-93	6.80E-07			3.34E-03
Th-230	1.99E-07			9.79E-04
Nb-94	1.47E-07			7.22E-04
Cf-250	9.14E-08			4.50E-04
Cf-249	3.89E-08	3.89E-05	1.92E-01	1.92E-04
U-233	3.48E-08			1.71E-04
Pa-231	1.86E-08			9.14E-05
Eu-150	1.09E-08			5.38E-05
Ac-227	7.17E-09			3.53E-05
Be-10	4.84E-09			2.38E-05
Sm-147	4.24E-09			2.09E-05
Cm-248	2.73E-09	2.73E-06	1.34E-02	1.34E-05
Cf-251	1.54E-09	1.54E-06	7.59E-03	7.59E-06
Ra-226	9.68E-10			4.76E-06
Pu-244	8.37E-10	8.37E-07	4.12E-03	4.12E-06
Cm-247	6.63E-10	6.63E-07	3.26E-03	3.26E-06
Pb-210	2.09E-10			1.03E-06
Th-229	1.94E-10			9.54E-07
Si-32	4.00E-11			1.97E-07
Re-187	1.89E-11			9.28E-08
K-40	4.80E-12			2.36E-08
Th-232	2.18E-13			1.07E-09
Ra-228	1.29E-13			6.36E-10
Cm-250	6.27E-16	6.27E-13	3.09E-09	3.09E-12
Gd-152	3.82E-16			1.88E-12
Ba-133	4.03E-28			1.98E-24
Total				9.79E+05

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WASTE PACKAGE LOADING RECORD

Loading - Itemized Data

Page 1 of 1

W1 1017

BCLDP Package Identification No. (PIN)	50SBC-1572	Package Type/Model	85 gal O/P TW 62 165.
Loading Personnel (Print Name)	Milburn, King		

Item No.	Item Description	Material Type	Material %	Dose Rate mr/hr CL*	Dose Rate mr/hr HS**	Weight (lbs)	Loading Date	Loader Initials	Summary/Comments
1	55 GALLON DRUM	CONCRETE	98	400	500	988	6/19/02	MM	55 GALLON CONCRETE
↓	W/ CONCRETE	STEEL	2	↓	↓	↓	↓	↓	DRUM OVERPACK T/S
									85 GALLON DRUM
									FROM SN-1 HESR
									SCALE # A27123
									CAL DUE 5/9/03
									TELE # 21739
									CAL DUE 12/11/02

Loaded Package Final Measured Gross Weight (lbs)	1050	Accumulation Date (Mixed Waste Only)	N/A
Contains No Suspect Hazardous Materials (HM)	Initial C1 Date 6/20/02	Authorized Review and Approval (Signature)	(date)
Contains Hazardous Materials (HM)	Initial Date		

*Baseline Dose Rate ** Hot Spot Dose Rate

6269

Comment: TRU content is based on Cs-137

Drum No.	Contents	Waste wgt, lb*	Waste wgt, gm	Cs-137 uCi/Drum**	nCi(TRU)	nCi(TRU)/gm
1574	Metal	867	3.93E+05	6.70E+04	7.74E+06	20

Notes:
* Tare wgt = 62 lb
** QRS assay

Nuclide content relative to Eu-154 in the Standard Mix, except as noted:

Nuclide(x)	uCi(x)/uCi(Cs)	nCi(TRU)/uCi(Cs)	nCi(TRU)/Drum	uCi(x)/Drum	
Cs-137	1.00E+00			6.70E+04	**
Pu-241	8.13E-01			5.45E+04	
Sr-90	6.56E-01			4.40E+04	
Co-60	3.10E-01			9.00E+02	**
Am-241	5.01E-02	5.01E+01	3.36E+06	3.36E+03	
Pu-238	4.83E-02	4.83E+01	3.24E+06	3.24E+03	
Cm-244	4.04E-02			2.70E+03	
Eu-154	1.54E-02			6.16E+02	**
Pu-240	1.01E-02	1.01E+01	6.77E+05	6.77E+02	
Pu-239	6.20E-03	6.20E+00	4.15E+05	4.15E+02	
Sm-151	4.74E-03			3.18E+02	
Sb-125	4.58E-03			3.07E+02	
Cs-134	4.11E-03			2.76E+02	
Ni-63	9.05E-04			6.06E+01	
Cd-113m	4.07E-04			2.72E+01	
Am-243	3.75E-04	3.75E-01	2.51E+04	2.51E+01	
Cm-243	2.63E-04	2.63E-01	1.76E+04	1.76E+01	
Tc-99	1.88E-04			1.26E+01	
Am-242m	1.00E-04	1.00E-01	6.71E+03	6.71E+00	
Eu-152	3.75E-05			2.51E+00	
Pu-242	3.03E-05	3.03E-02	2.03E+03	2.03E+00	
Zr-93	2.77E-05			1.86E+00	
C-14	1.87E-05			1.25E+00	
U-234	1.73E-05			1.16E+00	
Sn-126	1.21E-05			8.08E-01	
Sn-121m	9.68E-06			6.48E-01	
Ni-59	7.34E-06			4.92E-01	
Cm-245	6.42E-06	6.42E-03	4.30E+02	4.30E-01	
Se-79	5.94E-06			3.98E-01	
Cs-135	4.99E-06			3.34E-01	
U-238	4.90E-06			3.28E-01	
Np-237	4.52E-06	4.52E-03	3.03E+02	3.03E-01	
U-236	3.34E-06			2.24E-01	
Cm-246	2.20E-06	2.20E-03	1.47E+02	1.47E-01	
Pd-107	1.85E-06			1.24E-01	
I-129	4.76E-07			3.19E-02	
U-232	4.62E-07			3.10E-02	
Th-228	4.60E-07			3.08E-02	
U-235	2.52E-07			1.69E-02	
Cl-36	1.87E-07			1.25E-02	
Tl-208	1.65E-07			1.11E-02	

Mo-93	1.05E-08			7.03E-04
Th-230	3.07E-09			2.06E-04
Nb-94	2.27E-09			1.52E-04
Cf-250	1.41E-09			9.45E-05
Cf-249	6.01E-10	6.01E-07	4.03E-02	4.03E-05
U-233	5.38E-10			3.60E-05
Pa-231	2.87E-10			1.92E-05
Eu-150	1.69E-10			1.13E-05
Ac-227	1.11E-10			7.41E-06
Be-10	7.47E-11			5.00E-06
Sm-147	6.54E-11			4.38E-06
Cm-248	4.21E-11	4.21E-08	2.82E-03	2.82E-06
Cf-251	2.38E-11	2.38E-08	1.60E-03	1.60E-06
Ra-226	1.49E-11			1.00E-06
Pu-244	1.29E-11	1.29E-08	8.66E-04	8.66E-07
Cm-247	1.02E-11	1.02E-08	6.85E-04	6.85E-07
Pb-210	3.22E-12			2.16E-07
Th-229	2.99E-12			2.00E-07
Si-32	6.17E-13			4.14E-08
Re-187	2.91E-13			1.95E-08
K-40	7.40E-14			4.96E-09
Th-232	3.36E-15			2.25E-10
Ra-228	2.00E-15			1.34E-10
Cm-250	9.68E-18	9.68E-15	6.48E-10	6.48E-13
Gd-152	5.89E-18			3.95E-13
Ba-133	6.22E-30			4.17E-25
Total				1.78E+05

Battelle
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WASTE PACKAGE LOADING RECORD

Loading - Itemized Data

Page 1 of 1

W1 1017

CEDP Package Identification No. (PIN)	SDSBC-1574	Package Type/Model	85 gal O/P TW 62 lbs.
Loading Personnel (Print Name)	Milburn, King		

Item No.	Item Description	Material Type	Material %	Dose Rate mr/hr CL*	Dose Rate mr/hr HS**	Weight (lbs)	Loading Date	Loader Initials	Summary/Comments
1	55GALLON DRUM W/	CONCRETE	98	200	200	867	4/19/02	MM	55 GALLON CONCRETE
↓	CONCRETE	STEEL	2	↓	↓	↓	↓	↓	DRUM OVERPACK IS
									85 GALLON DRUM
									FROM SN-1 HESR
									SCALE# A27123
									CALDUE 5/8/03
									TELE# 11739
									CAL DUE 12/4/02

ded Package Final Measured Gross Weight (lbs)	929	Accumulation Date (Mixed Waste Only)	NA
tains No Suspect Hazardous Materials (HM)	Initial CJ Date 6/20/02	Authorized Review and Approval (signature)	(date)
tains Hazardous Materials (HM)	Initial Date		

ne Dose Rate ** Hot Spot Dose Rate

5929

Comment: TRU content is based on Cs-137

Drum No.	Contents	Waste wgt, lb*	Waste wgt, gm	Cs-137 uCi/Drum**	nCi(TRU)	nCi(TRU)/gm
1575	Metal	815	3.70E+05	2.28E+05	2.63E+07	71

Notes:
* Tare wgt = 62
** QRS assay

Nuclide content relative to Eu-154 in the Standard Mix, except as noted:

Nuclide(x)	uCi(x)/uCi(Cs)	nCi(TRU)/uCi(Cs)	nCi(TRU)/Drum	uCi(x)/Drum	
Cs-137	1.00E+00			2.28E+05	**
Pu-241	8.13E-01			1.85E+05	
Sr-90	6.56E-01			1.50E+05	
Co-60	3.10E-01			8.19E+03	**
Am-241	5.01E-02	5.01E+01	1.14E+07	1.14E+04	
Pu-238	4.83E-02	4.83E+01	1.10E+07	1.10E+04	
Cm-244	4.04E-02			9.20E+03	
Eu-154	1.54E-02			4.64E+03	**
Pu-240	1.01E-02	1.01E+01	2.30E+06	2.30E+03	
Pu-239	6.20E-03	6.20E+00	1.41E+06	1.41E+03	
Sm-151	4.74E-03			1.08E+03	
Sb-125	4.58E-03			1.04E+03	
Cs-134	4.11E-03			9.38E+02	
Ni-63	9.05E-04			2.06E+02	
Cd-113m	4.07E-04			9.27E+01	
Am-243	3.75E-04	3.75E-01	8.54E+04	8.54E+01	
Cm-243	2.63E-04	2.63E-01	5.99E+04	5.99E+01	
Tc-99	1.88E-04			4.30E+01	
Am-242m	1.00E-04	1.00E-01	2.28E+04	2.28E+01	
Eu-152	3.75E-05			1.19E+04	**
Pu-242	3.03E-05	3.03E-02	6.90E+03	6.90E+00	
Zr-93	2.77E-05			6.32E+00	
C-14	1.87E-05			4.27E+00	
U-234	1.73E-05			3.94E+00	
Sn-126	1.21E-05			2.75E+00	
Sn-121m	9.68E-06			2.21E+00	
Ni-59	7.34E-06			1.67E+00	
Cm-245	6.42E-06	6.42E-03	1.46E+03	1.46E+00	
Se-79	5.94E-06			1.35E+00	
Cs-135	4.99E-06			1.14E+00	
U-238	4.90E-06			1.12E+00	
Np-237	4.52E-06	4.52E-03	1.03E+03	1.03E+00	
U-236	3.34E-06			7.62E-01	
Cm-246	2.20E-06	2.20E-03	5.01E+02	5.01E-01	
Pd-107	1.85E-06			4.22E-01	
I-129	4.76E-07			1.08E-01	
U-232	4.62E-07			1.05E-01	
Th-228	4.60E-07			1.05E-01	
U-235	2.52E-07			5.75E-02	
Cl-36	1.87E-07			4.26E-02	
Tl-208	1.65E-07			3.77E-02	

Mo-93	1.05E-08			
Th-230	3.07E-09			2.39E-03
Nb-94	2.27E-09			7.00E-04
Cf-250	1.41E-09			5.16E-04
Cf-249	6.01E-10	6.01E-07		3.21E-04
U-233	5.38E-10		1.37E-01	1.37E-04
Pa-231	2.87E-10			1.23E-04
Eu-150	1.69E-10			6.53E-05
Ac-227	1.11E-10			3.85E-05
Be-10	7.47E-11			2.52E-05
Sm-147	6.54E-11			1.70E-05
Cm-248	4.21E-11	4.21E-08		1.49E-05
Cf-251	2.38E-11	2.38E-08	9.59E-03	9.59E-06
Ra-226	1.49E-11		5.43E-03	5.43E-06
Pu-244	1.29E-11	1.29E-08		3.41E-06
Cm-247	1.02E-11	1.02E-08	2.95E-03	2.95E-06
Pb-210	3.22E-12		2.33E-03	2.33E-06
Th-229	2.99E-12			7.34E-07
Si-32	6.17E-13			6.82E-07
Re-187	2.91E-13			1.41E-07
K-40	7.40E-14			6.63E-08
Th-232	3.36E-15			1.69E-08
Ra-228	2.00E-15			7.66E-10
Cm-250	9.68E-18	9.68E-15		4.55E-10
Gd-152	5.89E-18		2.21E-09	2.21E-12
Ba-133	6.22E-30			1.34E-12
Total				1.42E-24
				6.27E+05

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WASTE PACKAGE LOADING RECORD

Loading - Itemized Data

Page 1 of 1

BCI/DP Package Identification No. (PIN)	50SBC-1575	Package Type/Model	85 gal O/P TW 62 lbs.
Loading Personnel (Print Name)	Milburn, King		

Item No.	Item Description	Material Type	Material %	Dose Rate mr/hr CL*	Dose Rate mr/hr HS**	Weight (lbs)	Loading Date	Loader Initials	Summary/Comments
1	55 Gallon Drum	Concrete	98	300	300	815	6/19/02	MM	55 Gallon Concrete
↓	w/ Concrete	Steel	2	↓	↓	↓	↓	↓	Drum Overpack ILS
									85 Gallon Drum
									From Sal HESR
									Scale # A27123
									Cal Due 5/9/03
									Tele # 11739
									Cal Due 12/11/02

Loaded Package Final Measured Gross Weight (lbs)	877	Accumulation Date (Mixed Waste Only)	N/A
Contains No Suspect Hazardous Materials (HM)	Initial CI Date 6/20/02	Authorized Review and Approval (signature)	(date)
Contains Hazardous Materials (HM)	Initial Date		

* Baseline Dose Rate ** Hot Spot Dose Rate

5929

Comment: TRU content is based on Cs-137

Drum No.	Contents	Waste wgt, lb*	Waste wgt, gm	Cs-137 uCi/Drum**	nCi(TRU)	nCi(TRU)/gm
1576	Metal	1044	4.74E+05	3.17E+05	3.66E+07	77

Notes:
* Tare wgt = 62 lb
** QRS assay

Nuclide content relative to Eu-154 in the Standard Mix, except as noted:

Nuclide(x)	uCi(x)/uCi(Cs)	nCi(TRU)/uCi(Cs)	nCi(TRU)/Drum	uCi(x)/Drum	
Cs-137	1.00E+00			3.17E+05	**
Pu-241	8.13E-01			2.58E+05	
Sr-90	6.56E-01			2.08E+05	
Co-60	3.10E-01			6.63E+03	**
Am-241	5.01E-02	5.01E+01	1.59E+07	1.59E+04	
Pu-238	4.83E-02	4.83E+01	1.53E+07	1.53E+04	
Cm-244	4.04E-02			1.28E+04	
Eu-154	1.54E-02			1.42E+03	**
Pu-240	1.01E-02	1.01E+01	3.20E+06	3.20E+03	
Pu-239	6.20E-03	6.20E+00	1.97E+06	1.97E+03	
Sm-151	4.74E-03			1.50E+03	
Sb-125	4.58E-03			1.45E+03	
Cs-134	4.11E-03			1.30E+03	
Ni-63	9.05E-04			2.87E+02	
Cd-113m	4.07E-04			1.29E+02	
Am-243	3.75E-04	3.75E-01	1.19E+05	1.19E+02	
Cm-243	2.63E-04	2.63E-01	8.33E+04	8.33E+01	
Tc-99	1.88E-04			5.97E+01	
Am-242m	1.00E-04	1.00E-01	3.17E+04	3.17E+01	
Eu-152	3.75E-05			1.19E+01	
Pu-242	3.03E-05	3.03E-02	9.59E+03	9.59E+00	
Zr-93	2.77E-05			8.79E+00	
C-14	1.87E-05			5.93E+00	
U-234	1.73E-05			5.47E+00	
Sn-126	1.21E-05			3.82E+00	
Sn-121m	9.68E-06			3.07E+00	
Ni-59	7.34E-06			2.33E+00	
Cm-245	6.42E-06	6.42E-03	2.03E+03	2.03E+00	
Se-79	5.94E-06			1.88E+00	
Cs-135	4.99E-06			1.58E+00	
U-238	4.90E-06			1.55E+00	
Np-237	4.52E-06	4.52E-03	1.43E+03	1.43E+00	
U-236	3.34E-06			1.06E+00	
Cm-246	2.20E-06	2.20E-03	6.97E+02	6.97E-01	
Pd-107	1.85E-06			5.87E-01	
I-129	4.76E-07			1.51E-01	
U-232	4.62E-07			1.46E-01	
Th-228	4.60E-07			1.46E-01	
U-235	2.52E-07			8.00E-02	
Cl-36	1.87E-07			5.93E-02	
Tl-208	1.65E-07			5.24E-02	

Mo-93	1.05E-08			3.33E-03
Th-230	3.07E-09			9.73E-04
Nb-94	2.27E-09			7.18E-04
Cf-250	1.41E-09			4.47E-04
Cf-249	6.01E-10	6.01E-07	1.90E-01	1.90E-04
U-233	5.38E-10			1.70E-04
Pa-231	2.87E-10			9.09E-05
Eu-150	1.69E-10			5.35E-05
Ac-227	1.11E-10			3.51E-05
Be-10	7.47E-11			2.37E-05
Sm-147	6.54E-11			2.07E-05
Cm-248	4.21E-11	4.21E-08	1.33E-02	1.33E-05
Cf-251	2.38E-11	2.38E-08	7.55E-03	7.55E-06
Ra-226	1.49E-11			4.74E-06
Pu-244	1.29E-11	1.29E-08	4.10E-03	4.10E-06
Cm-247	1.02E-11	1.02E-08	3.24E-03	3.24E-06
Pb-210	3.22E-12			1.02E-06
Th-229	2.99E-12			9.48E-07
Si-32	6.17E-13			1.96E-07
Re-187	2.91E-13			9.22E-08
K-40	7.40E-14			2.35E-08
Th-232	3.36E-15			1.07E-09
Ra-228	2.00E-15			6.32E-10
Cm-250	9.68E-18	9.68E-15	3.07E-09	3.07E-12
Gd-152	5.89E-18			1.87E-12
Ba-133	6.22E-30			1.97E-24
Total				8.45E+05

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WASTE PACKAGE LOADING RECORD

Loading - Itemized Data

Page 1 of 1

W11017

CLDP Package Identification No. (PIN)	505BC-1576	Package Type/Model	85 gal O/P TW 62 lbs.
Loading Personnel (Print Name)	Milburn, King		

Item No	Item Description	Material Type	Material %	Dose Rate mr/hr CL*	Dose Rate mr/hr HS**	Weight (lbs)	Loading Date	Loader Initials	Summary/Comments
1	55 GALLON DRUM W/ CONCRETE	CONCRETE	98	300	400	1044	6/19/02	MM	55 GALLON CONCRETE
		STEEL	2	↓	↓	↓	↓	↓	DRUM OVER PACK IS
									85 GALLON DRUM
									FROM SN-6 HESR
									SCALE# A27123
									CALDUE 5/9/03
									TELE# 41739
									CALDUE 12/11/02

Loaded Package Final Measured Gross Weight (lbs)	1106	Accumulation Date (Mixed Waste Only)	N/A
Contains No Suspect Hazardous Materials (HM)	Initial CT Date 6/20/02	Authorized Review and Approval (Signature)	(date)
Contains Hazardous Materials (HM)	Initial Date		

CL* Dose Rate ** Hot Spot Dose Rate

55 Rev. 6

5929

Comment: TRU content is based on Cs-137

Drum No.	Contents	Waste wgt, lb*	Waste wgt, gm	Cs-137 uCi/Drum**	nCi(TRU)	nCi(TRU)/gm
1577	Sweeper	893	4.05E+05	1.04E+05	1.20E+07	30

No
* T.
** (

Nuclide content relative to Eu-154 in the Standard Mix, except as noted:

Nuclide(x)	uCi(x)/uCi(Cs)	nCi(TRU)/uCi(Cs)	nCi(TRU)/Drum	uCi(x)/Drum	
Cs-137	1.00E+00			1.04E+05	**
Pu-241	8.13E-01			8.46E+04	
Sr-90	6.56E-01			6.83E+04	
Co-60	3.10E-01			1.39E+03	**
Am-241	5.01E-02	5.01E+01	5.21E+06	5.21E+03	
Pu-238	4.83E-02	4.83E+01	5.02E+06	5.02E+03	
Cm-244	4.04E-02			4.20E+03	
Eu-154	1.54E-02			1.42E+03	**
Pu-240	1.01E-02	1.01E+01	1.05E+06	1.05E+03	
Pu-239	6.20E-03	6.20E+00	6.45E+05	6.45E+02	
Sm-151	4.74E-03			4.93E+02	
Sb-125	4.58E-03			4.76E+02	
Cs-134	4.11E-03			4.28E+02	
Ni-63	9.05E-04			9.41E+01	
Cd-113m	4.07E-04			4.23E+01	
Am-243	3.75E-04	3.75E-01	3.90E+04	3.90E+01	
Cm-243	2.63E-04	2.63E-01	2.73E+04	2.73E+01	
Tc-99	1.88E-04			1.96E+01	
Am-242m	1.00E-04	1.00E-01	1.04E+04	1.04E+01	
Eu-152	3.75E-05			3.90E+00	
Pu-242	3.03E-05	3.03E-02	3.15E+03	3.15E+00	
Zr-93	2.77E-05			2.88E+00	
C-14	1.87E-05			1.95E+00	
U-234	1.73E-05			1.80E+00	
Sn-126	1.21E-05			1.25E+00	
Sn-121m	9.68E-06			1.01E+00	
Ni-59	7.34E-06			7.63E-01	
Cm-245	6.42E-06	6.42E-03	6.68E+02	6.68E-01	
Se-79	5.94E-06			6.18E-01	
Cs-135	4.99E-06			5.19E-01	
U-238	4.90E-06			5.09E-01	
Np-237	4.52E-06	4.52E-03	4.70E+02	4.70E-01	
U-236	3.34E-06			3.48E-01	
Cm-246	2.20E-06	2.20E-03	2.29E+02	2.29E-01	
Pd-107	1.85E-06			1.93E-01	
I-129	4.76E-07			4.95E-02	
U-232	4.62E-07			4.80E-02	
Th-228	4.60E-07			4.78E-02	
U-235	2.52E-07			2.62E-02	
Cl-36	1.87E-07			1.94E-02	
Tl-208	1.65E-07			1.72E-02	

Mo-93	1.05E-08			1.09E-03
Th-230	3.07E-09			3.19E-04
Nb-94	2.27E-09			2.36E-04
Cf-250	1.41E-09			1.47E-04
Cf-249	6.01E-10	6.01E-07	6.25E-02	6.25E-05
U-233	5.38E-10			5.59E-05
Pa-231	2.87E-10			2.98E-05
Eu-150	1.69E-10			1.75E-05
Ac-227	1.11E-10			1.15E-05
Be-10	7.47E-11			7.76E-06
Sm-147	6.54E-11			6.80E-06
Cm-248	4.21E-11	4.21E-08	4.37E-03	4.37E-06
Cf-251	2.38E-11	2.38E-08	2.48E-03	2.48E-06
Ra-226	1.49E-11			1.55E-06
Pu-244	1.29E-11	1.29E-08	1.34E-03	1.34E-06
Cm-247	1.02E-11	1.02E-08	1.06E-03	1.06E-06
Pb-210	3.22E-12			3.35E-07
Th-229	2.99E-12			3.11E-07
Si-32	6.17E-13			6.42E-08
Re-187	2.91E-13			3.03E-08
K-40	7.40E-14			7.70E-09
Th-232	3.36E-15			3.50E-10
Ra-228	2.00E-15			2.07E-10
Cm-250	9.68E-18	9.68E-15	1.01E-09	1.01E-12
Gd-152	5.89E-18			6.13E-13
Ba-133	6.22E-30			6.47E-25
Total				2.77E+05

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WASTE PACKAGE LOADING RECORD

Loading - Itemized Data

Page 1 of 1

W1 1017

CLDF Package Identification No. (PIN)	SOSBC-1577	Package Type/Model	85 gal O/P TW 62 lbs.
Loading Personnel (Print Name)	Milburn, King		

Item No.	Item Description	Material Type	Material %	Dose Rate mr/hr CL*	Dose Rate mr/hr HS**	Weight (lbs)	Loading Date	Loader Initials	Summary/Comments
1	55 GALLON DRUM W/	CONCRETE	98	100	150	893	6/19/02	MM	55 GALLON CONCRETE
	CONCRETE	STEEL	2	↓	↓	↓	↓	↓	DRUM OVERPACK I/S
									85 GALLON DRUM
									JN-1 HESR
									SCALE # A27123
									CALDUE 5/8/03
									TELE # 11739
									CALDUE 12/11/02

Loaded Package Final Measured Gross Weight (lbs)	955	Accumulation Date (Mixed Waste Only)	N/A
Contains No Suspect Hazardous Materials (HM)	Initial CT Date 6/20/02	Authorized Review and Approval (signature)	(date)
Contains Hazardous Materials (HM)	Initial Date		

*Baseline Dose Rate ** Hot Spot Dose Rate

5929

Comment: TRU content is based on Cs-137

Drum No.	Contents	Waste wgt, lb*	Waste wgt, gm	Cs-137 uCi/Drum**	nCi(TRU)	nCi(TRU)/gm
1635	Sludge	1003	4.55E+05	1.63E+05	1.88E+07	41

Notes:
* Tare wgt
** QRS ass

Nuclide content relative to Eu-154 in the Standard Mix, except as noted:

Nuclide(x)	uCi(x)/uCi(Cs)	nCi(TRU)/uCi(Cs)	nCi(TRU)/Drum	uCi(x)/Drum	
Cs-137	1.00E+00			1.63E+05	**
Pu-241	8.13E-01			1.33E+05	
Sr-90	6.56E-01			1.07E+05	
Co-60	3.10E-01			1.34E+04	**
Am-241	5.01E-02	5.01E+01	8.17E+06	8.17E+03	
Pu-238	4.83E-02	4.83E+01	7.87E+06	7.87E+03	
Cm-244	4.04E-02			6.58E+03	
Eu-154	1.54E-02			1.59E+03	**
Pu-240	1.01E-02	1.01E+01	1.65E+06	1.65E+03	
Pu-239	6.20E-03	6.20E+00	1.01E+06	1.01E+03	
Sm-151	4.74E-03			7.72E+02	
Sb-125	4.58E-03			7.47E+02	
Cs-134	4.11E-03			6.70E+02	
Ni-63	9.05E-04			1.47E+02	
Cd-113m	4.07E-04			6.63E+01	
Am-243	3.75E-04	3.75E-01	6.11E+04	6.11E+01	
Cm-243	2.63E-04	2.63E-01	4.28E+04	4.28E+01	
Tc-99	1.88E-04			3.07E+01	
Am-242m	1.00E-04	1.00E-01	1.63E+04	1.63E+01	
Eu-152	3.75E-05			6.12E+00	
Pu-242	3.03E-05	3.03E-02	4.93E+03	4.93E+00	
Zr-93	2.77E-05			4.52E+00	
C-14	1.87E-05			3.05E+00	
U-234	1.73E-05			2.82E+00	
Sn-126	1.21E-05			1.97E+00	
Sn-121m	9.68E-06			1.58E+00	
Ni-59	7.34E-06			1.20E+00	
Cm-245	6.42E-06	6.42E-03	1.05E+03	1.05E+00	
Se-79	5.94E-06			9.68E-01	
Cs-135	4.99E-06			8.13E-01	
U-238	4.90E-06			7.99E-01	
Np-237	4.52E-06	4.52E-03	7.36E+02	7.36E-01	
U-236	3.34E-06			5.45E-01	
Cm-246	2.20E-06	2.20E-03	3.58E+02	3.58E-01	
Pd-107	1.85E-06			3.02E-01	
I-129	4.76E-07			7.75E-02	
U-232	4.62E-07			7.53E-02	
Th-228	4.60E-07			7.50E-02	
U-235	2.52E-07			4.11E-02	
Cl-36	1.87E-07			3.05E-02	
Tl-208	1.65E-07			2.70E-02	

Mo-93	1.05E-08			1.71E-03
Th-230	3.07E-09			5.00E-04
Nb-94	2.27E-09			3.69E-04
Cf-250	1.41E-09			2.30E-04
Cf-249	6.01E-10	6.01E-07	9.79E-02	9.79E-05
U-233	5.38E-10			8.76E-05
Pa-231	2.87E-10			4.67E-05
Eu-150	1.69E-10			2.75E-05
Ac-227	1.11E-10			1.80E-05
Be-10	7.47E-11			1.22E-05
Sm-147	6.54E-11			1.07E-05
Cm-248	4.21E-11	4.21E-08	6.86E-03	6.86E-06
Cf-251	2.38E-11	2.38E-08	3.88E-03	3.88E-06
Ra-226	1.49E-11			2.44E-06
Pu-244	1.29E-11	1.29E-08	2.11E-03	2.11E-06
Cm-247	1.02E-11	1.02E-08	1.67E-03	1.67E-06
Pb-210	3.22E-12			5.25E-07
Th-229	2.99E-12			4.88E-07
Si-32	6.17E-13			1.01E-07
Re-187	2.91E-13			4.74E-08
K-40	7.40E-14			1.21E-08
Th-232	3.36E-15			5.48E-10
Ra-228	2.00E-15			3.25E-10
Cm-250	9.68E-18	9.68E-15	1.58E-09	1.58E-12
Gd-152	5.89E-18			9.61E-13
Ba-133	6.22E-30			1.01E-24
Total				4.45E+05

Battelle
Putting Technology To Work

WASTE PACKAGE LOADING RECORD

Loading - Itemized Data

W1 1017

CLDP Package Identification No. (PIN)	5058C-1635	Package Type/Model	85 gal O/P TW 62105.
Loading Personnel (Print Name)	Milburn, King		

Item No.	Item Description	Material Type	Material %	Dose Rate mr/hr CL*	Dose Rate mr/hr HS**	Weight (lbs)	Loading Date	Loader Initials	Summary/Comments
1	55 GALLON DRUM	CONCRETE	98	150	150	1003	6/19/02	MM	55 GALLON CONCRETE
↓	W/CONCRETE	STEEL	2	↓	↓	↓	↓	↓	DRUM OVERPACK IN
									85 GALLON DRUM
									FROM JN-1 HESR
									SCALE# A27123
									CALDUE 5/9/03
									TELE# 11739
									CALDUE 12/11/02

Loaded Package Final Measured Gross Weight (lbs)	1065	Accumulation Date (Mixed Waste Only)	N/A
Contains No Suspect Hazardous Materials (HM)	Initial CI Date 6/20/02	Authorized Review and Approval (signature)	(date)
Contains Hazardous Materials (HM)	Initial Date		

*Baseline Dose Rate ** Hot Spot Dose Rate

59229

5929

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WA-OP-020
Revision 8

WASTE MANAGEMENT OPERATING PROCEDURE

IDENTIFICATION, SEGREGATION, SEPARATION, AND DOCUMENTATION OF LOW LEVEL AND RADIOACTIVE MIXED WASTE

BATTELLE
505 King Avenue
Columbus, Ohio 43201

ATTACHMENT

F

Procedure Status:

[X] **Non-Critical Procedure**
[] **Critical Procedure—Procedure Qualification Packet Required**

UNCONTROLLED COPY #9 8/11/04

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REVISION RECORD INDICATING LATEST DOCUMENT REVISION

Title Identification, Segregation, Separation, and Documentation of Low Level and Radioactive Mixed Waste

No. WA-OP-020
Page i of ii

INDEX OF PAGE REVISIONS

Page No.	i	ii								
Rev. No.	8	8								

Page No.	1	2	3	4	5	6	7	8	9	10
Rev. No.	8	8	8	8	8	8	8	8	8	8

Page No.	11	12	13	14	15	16	17	18	19	20
Rev. No.	8	8	8	8	8	8	8	8	8	8

Page No.	21	22	23	24	25	26	27	28	29	30
Rev. No.	8									

Page No.	31	32	33	34	35	36	37	38	39	40
Rev. No.										

REVISION RECORD	
Rev. No.	Date
0	10/10/89
1	08/23/90
2	02/24/93
2.1	03/04/93
3	08/17/93
4	7/28/94

REVISION RECORD	
Rev. No.	Date
4.1	6/15/95
4.2	1/05/96
5	
6	1/28/99
7	9/3/99

CURRENT REVISION	
Rev. No.	8
Issue Date	10-10-01
Issued By	RB

PROCEDURE APPROVAL PAGE

Prepared By:

S. Schmucker — 10/3/01 Date
Project Manager, Low Level Waste

This procedure, WA-OP-020, *Identification, Segregation, Separation and Documentation of Low Level and Radioactive Mixed Waste*, has been reviewed and approved by the following:

Approved By:

P. Weaver — 10/3/01 Date
Manager, Field Operations

A. Chance — 10/4/01 Date
Manager, Radiological Technical Support

M. Jackson — 10/3/01 Date
Manager, Regulatory Compliance and Environment, Safety, and Health Oversight

G. Eriksen — 10/4/01 Date
Manager, Quality

IDENTIFICATION, SEGREGATION, SEPARATION, AND DOCUMENTATION OF LOW LEVEL AND RADIOACTIVE MIXED WASTE

1.0 Scope

This procedure applies to the segregation and documentation requirements for all personnel that generate waste on the Battelle Columbus Laboratories Decommissioning Project (BCLDP).

2.0 Purpose

The purpose of this procedure is to specify how to segregate radioactive waste into different categories, perform initial packaging, and provide initial waste certification documentation to BCLDP Waste Management (WM) prior to submittal of waste for further disposition or final disposal. This procedure meets the requirements of HNF-EP-063, Hanford Site Solid Waste Acceptance Criteria, WM-ADM-I-101, GTS Duratek Waste Acceptance Guidelines, Envirocare of Utah, Material Acceptance Process Manual, DOE/NV-325, Nevada Test Site (NTS) Waste Acceptance Criteria, and TCP-98-01, the Transuranic (TRU) Waste Certification Plan for the BCLDP TRU Waste Certification Program (WCP).

3.0 References, Definitions, and Developmental Resources

3.1 References

3.1.1 BCLDP-90-1, BCLDP Low Level Waste Certification Plan

3.1.2 BCLDP-90-2, Waste Minimization and Pollution Prevention Awareness Plan

3.1.3 40 CFR 261, Identification and Listing of Hazardous Waste

3.1.4 40 CFR 761, Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions

3.1.5 40 CFR 268, Land Disposal Restrictions

3.1.6 49 CFR Subpart I, Class 7 (Radioactive) Materials

3.1.7 DD-98-04, Waste Characterization, Classification, and Shipping Support Technical Basis Document

3.1.8 DD-OP-029, Decontamination of Equipment, Material and Tools

3.1.9 DOE/NV-325, Nevada Test Site Waste Acceptance Criteria

3.1.10 Envirocare of Utah, Material Acceptance Process Manual

3.1.11 HP-OP-011, Release of Materials from Controlled Areas

3.1.12 HP-OP-019, Radiation and Contamination Survey Techniques

3.1.13 HP-OP-106, Volumetric Release Permitting Requirements

3.1.14 HNF-EP-0063, Hanford Site Solid Waste Acceptance Criteria

3.1.15 QD-AP-5.2, Work Instructions

3.1.16 QD-AP-15.1, Non-Conformance Reporting for Activities, Items, and Material

3.1.17 TCP-98-01, TRU Waste Certification Plan for the BCLDP TRU WCP

3.1.18 WAC 173-303, Washington Administrative Code, Dangerous Waste Regulations

3.1.19 WA-OP-022, Radioactive Mixed Waste Accumulation and Storage

3.1.20 WA-OP-029, Low Level Waste and Radioactive Mixed Waste Absorption

3.1.21 WA-OP-030, Packaging, Marking, and Labeling Radioactive and Radioactive Mixed Waste

3.1.22 WA-OP-033, Comprehensive Sampling of Waste Materials for Chemical and/or Radiological Characterization

3.1.23 WM-ADM-I-101, GTS Duratek Waste Acceptance Guidelines

3.1.24 State of Ohio Administrative Code, Section 3785, Parts 50 through 68

3.1.25 BCO EN-PC-4.0, Disposition of Chemical and Radioactive Wastes and Surplus

3.1.26 PR-AP-17.1, Operation of the Project Records Management System

3.2 Definitions

Refer to the BCLDP Procedure Dictionary for the following terms:

Initial Certification
Disassembly/Decontamination
Final Packaging
Dose-to-Curie Charts
Free Release
Generator
Government Property
Hazardous Waste (HW)
Hot Particle
Initial Packaging
Low Level Radioactive Waste (LLW)
Radioactive Material/Waste Inventory Tag (RAM Tag)
Radioactive Mixed Waste (RMW)
RCRA
Segregation
Separation
SWAC
Transuranic Waste
TSCA
Waste Characterization
Waste Management Checklist (Form DDO-164).

3.3 Developmental Resources

None.

4.0 General

4.1 Precautions

4.1.1 During the planning stages of decontamination and decommissioning (D&D) activities, the Project Managers should notify Low Level Waste (LLW) personnel to request a project walkdown of the work location to assist in material identification, sampling, and consequent chemical characterization. Samples taken by LLW personnel shall be taken in accordance with WA-OP-033 (Reference 3.1.22).

4.1.2 Great care should be taken during the early stages of work activities to locate and identify actual or suspect hazardous waste (HW), radioactive mixed waste (RMW) (see Exhibit 6), Washington State Dangerous Waste (see WAC 173-303, Reference 3.1.18), Special Concern Items (see

Exhibit 7), Prohibited Items (see Exhibit 8), and Government Property. The Project Manager, LLW, or designee, should be contacted if any of these items/materials are identified.

4.1.3 For certain activities such as surveillance and maintenance, non-BCLDP individuals may generate waste in BCLDP-controlled areas. If these individuals are not working under a work instruction (which includes a Waste Management Checklist) and are not qualified on this procedure, they or their BCLDP contact shall ask the LLW generator to request a briefing on waste generation requirements and responsibilities for any waste they might generate. LLW personnel will inform these individuals of BCLDP's waste disposal requirements.

NOTE: The assigned Project Manager shall be responsible for certifying that the provisions of this and associated procedures are observed, regardless of the non-BCLDP individuals performing the work.

4.2 Limitations

4.2.1 Any Resource Conservation and Recovery Act (RCRA) RMW (see Exhibit 6) waste that has been identified shall be designated for satellite accumulation or packaged for disposal to an approved treatment, storage, and disposal facility. At no time shall BCLDP personnel dilute or treat any RCRA RMW restricted by 40 CFR 268.3 (a) (Reference 3.1.22).

4.2.2 All Project Managers and/or generators shall ensure that all work instructions, or other activities that generate waste, have been reviewed by the Project Manager, LLW, or the Project Manager, TRU, or designee, and that the Waste Management Checklist (DDO-164) has been completed and approved as required per QD-AP-5.2. (Reference 3.1.15). Additionally, LLW personnel shall be notified via briefing of any changes affecting the waste estimates or instructions that were originally listed/issued on the checklist. (This will require generating and reviewing a new or amended checklist.)

4.2.3 Either the Project Manager, LLW, or the Task Leader, LLW, shall be notified immediately upon the discovery of actual or suspect HW, RMW, or Washington State Dangerous Waste. These wastes shall be handled in accordance with the applicable state and federal regulations, as well as WA-OP-022 and TCP-98-01. (References 3.1.19 and 3.1.17).

5.0 Procedure

5.1 Review of Activities

5.1.1 Each **generator** shall ensure that all applicable work instructions or activities generating waste have been reviewed and the planned work location has been inspected by LLW on DDO-164.

5.1.2 **Health Physics** (HP) shall ensure that any requested radiological surveys are completed as indicated by LLW on DDO-164 to assure that necessary radiological characterization is completed.

5.1.3 The **generator** shall review and complete the Waste Management Checklist Attachment (DDO-164) on a daily basis for the applicable work instruction.

5.2 Separate and Free Release

To limit, to the greatest extent practical, the volume of radioactive waste requiring disposal, the **generator** shall ensure that all waste undergoes a process of separation and survey (HP-OP-019), and, when practical, disassembly/decontamination (DD-OP-029) and free release (HP-OP-011) and/or volumetric release (HP-OP-106) as appropriate. This is required per BCLDP-90-1 and BCLDP-90-2.

5.3 Locate and Identify HW, RMW, and/or Washington State Dangerous Waste

The **generator** shall locate and identify all HW, RMW, Toxic Substances Control Act (TSCA) Waste, and/or Washington State Dangerous Waste as early as possible during D&D work activities and specify on DDO-164. This is accomplished, prior to the beginning of physical work; through prejob walk downs and inspections if possible. Further sampling and analysis of items may be required by LLW. All sampling of waste for chemical characterization shall be done in accordance with WA-OP-033. Refer to WA-OP-022 if waste is characterized as RMW.

5.4 Identify Battelle or Government Property Items

5.4.1 The **generator** shall locate and identify all items having a Battelle inventory number or a government property inventory number/identification tag.

5.4.2 When items of Battelle or government property are identified, the **generator** should perform the following:

5.4.2.1 Provide a complete description of the item on DDO-103. This description shall identify the item as Battelle or government property, provide the identification number, describe what the item is, and whether the item is to be placed into radiological waste or free released. Include the waste package number or free release survey number.

5.4.2.2 Ensure that the Battelle or government property identification tag is not removed or defaced under any circumstances until final disposition and documentation.

5.4.2.3 Ensure that all tagged (i.e., G No., B. No., or I No.) Battelle/government property destined for disposal have been approved by a representative of BCLDP Project Administration and Control (PAC) prior to disposal.

5.4.2.4 Forward DDO-103 to BCLDP PAC.

5.5 Segregate and Document

Unless otherwise specified, the **generator** is responsible for completing the following tasks.

5.5.1 Suspect TRU waste shall be segregated from low-level waste in accordance with Reference 3.1.1 of this procedure. When determining whether waste is suspect TRU or low level waste, perform the following steps:

5.5.1.1 Choose the correct chart to use by the type of package and/or the waste form.

5.5.1.2 An **HP Technician** shall verify the dose rate of the waste in accordance with HP-OP-019. The dose measured shall be taken at the centerline of the waste package.

5.5.1.3 Either the **generator** or the **LLW Technician** shall weigh the waste in its initial packaging.

5.5.1.4 Use the charts in Reference 3.1.7 of this procedure to determine whether the waste is suspect TRU or low level. If the waste is above the line, it is considered to be suspect TRU waste. If the waste is below the line, it is considered to be low-level waste.

5.5.1.5 Tag and process all TRU waste in accordance with TCP-98-01.

5.5.1.6 Tag low-level waste per this procedure and package it for disposal in accordance with WA-OP-030.

5.5.1.7 Re-evaluate all waste for its TRU content using the charts provided in DD-98-04 after it is packaged in its payload container.

5.5.2 RMW shall be segregated from other wastes, as soon as possible after identification. Low-level mixed waste shall be handled in accordance with WA-OP-022 while suspect TRU mixed waste shall be handled according to the BCLDP TRU Waste Certification Program. Contact the Waste Certification Official for instruction and assistance.

5.5.3 Special Concern Items (as indicated in Exhibit 7) and/or Prohibited Items (as indicated in Exhibit 8) shall be segregated and turned over to LLW for disposition.

5.5.4 Radioactive LLW, including Zone III "Hot Particle" contaminated wastes, shall be segregated in accordance with applicable site waste acceptance criteria (SWAC), current disposal options, and priorities primarily based on availability and cost effectiveness. Current options include:

5.5.4.1 Hanford
5.5.4.2 Nevada Test Site
5.5.4.3 Envirocare of Utah, Inc.
5.5.4.4 Alaron Corporation

5.5.5 The **Project Manager, LLW**, or designee, shall instruct the staff to package in accordance with the appropriate SWAC and shall instruct Project Managers and generators through the applicable work instruction and Waste Management Checklist (DDO-164).

5.5.5.1 All waste must be evaluated to determine its potential to release liquid during handling, storage, and transportation.

5.5.5.2 All "Non-Regulated" LLW Liquids (see Exhibit 5) and LLW containing free liquids must be absorbed or evaporated, prior to final packaging, in accordance with WA-OP-029 and the applicable SWAC. Contact the Project Manager, LLW, or designee, for instructions and assistance.

5.5.5.3 The **Project Manager, LLW**, or designee shall complete the instructions on the Waste Management Checklist (DDO-164). On this form Health Physics shall be notified as to what type of survey will be needed by Waste Management to ship and dispose of the waste. The type of survey required will be based upon the requirements of 49 CFR Subpart I and the applicable SWAC.

5.5.6 LLW for the Nevada Test site shall be segregated and processed in accordance with the provisions of Reference 3.1.9 and 3.1.24 of this procedure. See Exhibit 10.

5.5.7 Segregated waste shall then be characterized, and the Radioactive Material/Waste Inventory Tag (RAM Tag) (see Exhibit 1) shall be completed accurately and legibly. If the material is only tagged for Health Physics purposes, or the information is otherwise available, the back of the RAM Tag shall be lined out and marked "N/A" for "not applicable."

5.5.7.1 The **generator** shall list all items contained in the package with the approximate percentages. If the item is not listed specifically in the section, the generator can list the item below in the extra space provided. If an absorbed liquid is present in the bag, specify the type and amount as well as the volume of the initial amount of liquid.

5.5.7.2 The **generator** shall print and sign their name on the line that is contained within the text box under the certification statement if it correctly describes the contents of the package. If the package contains known hazardous waste, the **generator** shall print and sign their name on the line following the certification statement text box and contact LLW personnel.

5.5.7.3 The **HP Technician** shall complete the HP portion of the RAM Tag. Waste will not be accepted by LLW without the HP portion completed.

5.5.7.4 LLW personnel are available to assist the generator in evaluating the waste package as needed to determine if the waste contains any prohibited or hazardous waste.

5.5.7.5 **LLW Technicians** shall check the appropriate block at the top of the tag indicating how the package was inspected and then initial and date this section.

5.5.7.6 If the waste package is not in compliance with this procedure, the **LLW Technician** shall notify the **Project Manager, LLW, or the Task Leader, LLW,** who shall determine the proper disposition of the package and generate a non-conformance report (NCR) per QD-AP-15.1.

5.5.8 All Waste Management work activities shall be recorded on a Summary and/or Special Report Form (DDO-103) and reported to the appropriate work instruction.

5.6 Package Contents Inspection

LLW Technicians shall perform random inspections of waste packages on a weekly basis. These inspections shall be documented on the Waste Management Package Contents Inspection form (DDO-470W).

- **Step 1)** Check the appropriate box for package type. If "other," specify type.
- **Step 2)** Check the appropriate box for the type of inspection being performed.
- **Step 3)** Give the generator's name and location of waste generation that is provided on the package tag. Provide the material and percentages listed on the tag.
- **Step 4)** Check the appropriate box that describes the condition of the package. If the box indicates an NCR number is needed, contact the Task Leader, LLW, or designee, who shall determine the correct disposition of the waste and will then generate an NCR.

  NOTE: If an NCR has been or needs to be generated per Reference 3.1.6, the package shall be segregated and staged until corrective actions have been implemented and the NCR completed.

- The inspector shall sign and date the form.

6.0 Records

The following records will be generated by this procedure, compiled by work groups, and submitted to Project Records in accordance with the provisions of Reference 3.1.26 on a monthly basis, or with the appropriate work instruction data package.

- Summary and/or Special Report Form
- Waste Management Checklist
- Waste Management Package Contents Inspection

7.0 Forms, Exhibits, and Attachments

7.1 Forms

- DDO-103, Summary and/or Special Report Form (Reference 3.1.15)
- DDO-164, Waste Management Checklist
- DDO-470W, Waste Management Package Contents Inspection

7.2 Exhibits

- Exhibit 1, Radioactive Material/Waste Inventory Tag (RAM Tag)
- Exhibit 2, Envirocare Materials
- Exhibit 3, Hanford Materials
- Exhibit 4, GTS Metal (Melt)
- Exhibit 5, Non-Regulated Liquids (LLW)
- Exhibit 6, Radioactive Mixed Waste (RMW)
- Exhibit 7, Special Concern Items
- Exhibit 8, Prohibited Items
- Exhibit 9, GTS Compactibles
- Exhibit 10, NTS Materials

7.3 Attachments

None.

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WASTE MANAGEMENT CHECKLIST

Building:		Work Instruction No:	
Area or Rooms:			
Point of Contact for Waste Issues:			
Will Your Operation Use Release Area?		Yes [ ]	No [ ]

Estimated Quantity of Waste

Volume (ft^3)	Type	Physical Description in %
	Low Level	
	Low Level Mixed	
	Transuranic	
	Transuranic Mixed	
	Liquid (Specify TRU or LLW)	
	TRU Waste for Sonatol	
	Asbestos	
	PCB Waste	

Pre-Characterization Data (if yes, attach)	Yes [ ] No [ ]

Products Approved for this Work Instruction

Spray-Nine	De-Solv-It

Others: List other products and which MSDS is approved.

Waste Management Survey Instructions

Waste Manager: Date:	Waste Management Specialist:

† ✓ - Item Required; N/A - Not Applicable; * - Evaluate daily, required when encountered ** See Attached Special Instructions

DDO-164, Rev. 2

4/99(pim)

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WASTE MANAGEMENT CHECKLIST ATTACHMENT

BUILDING _____ **AREA** _____ **WI** _____

Checklist Completion Requirement **Daily** ____ **Weekly** _____

Checklist Number:	Completed By:					
Month and Year:	Day:					

Subject	Action or Item Required†	Action or Item In-Place				
1. Waste Stream						
Low Level						
Low Level Mixed						
Transuranic						
Transuranic Mixed						
Transuranic Metal						
Low Level Metal						
TSCA Waste (PCB's)						
Transuranic Cloth (Mop Heads & Rags)						
Low Level Cloth (Mop Heads & Rags)						
2. Chemicals Used During Decontamination						
List:						
Approved by Waste Manager						
3. Water Used For Decontamination						
Pressure Washer						
Mops						
Wet Rags						

† ✓ - Item Required; N/A - Not Applicable; * - Evaluate daily, required when encountered ** See Attached Special Instructions

Subject	Action or Item Required†	Action or Item In-Place				
4. Package Type						
Rad Bag						
55 gal. Drum						
D-Box						
Other						
5. Sample Required						
YES						
NO						
If YES Provide Sample #'s						
Sample Instructions Followed						
6. Liquids						
Liquids Absorbed Per WA-OP-029						
7. RCRA SAA Established						
Waste Manager Approval						
Set Up In Accordance With WA-OP-022						
8. Drum Compaction						
Compaction In Accordance With WA-OP-028						
Waste Sorted per WA-OP-020						
9. Marking And Labeling						
Packages Marked and Labeled per WA-OP-030						
Tags Completed per WA-OP-020						

† ✓ - Item Required; N/A - Not Applicable; * - Evaluate daily, required when encountered ** See Attached Special Instructions

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WASTE MANAGEMENT PACKAGE CONTENTS INSPECTION

Step 1) PACKAGE TYPE

- ☐ RAD BAG
- ☐ DRUM
- ☐ B-25 BOX
- ☐ OTHER _____

Step 2) TYPE OF INSPECTION

- ☐ EXTERNAL INSPECTION OF CONTENTS
- ☐ 100% OPEN AND SORT
- ☐ INSPECTION DURING LOADING ACTIVITIES

Step 3) GENERATOR INFORMATION

Generator Name _____ **Location of Waste Generation** _____

Material and Percentages Listed on the Generator Portion of the Tag _____

_____

_____

_____

Step 4) DISPOSITION STATUS

- ☐ Tag is completed properly and the generator portion accurately describes the contents of the package.
- ☐ Tag does not accurately describe the contents of the package. Refer to NCR # _____
- ☐ Liquids present in the package. Refer to NCR # _____
- ☐ Hazardous Waste/Prohibited Items present in the package. Refer to NCR # _____

Inspector Name _____ **Date** _____

DD0-470W Rev. 0

8/99(PJB)

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EXHIBIT 1
Radioactive Material/Waste Inventory Tag (RAM TAG)

CAUTION

RADIOACTIVE MATERIAL

IDENTIFICATION NO.

DESCRIPTION OF MATERIAL

CONTAMINATION DATA

SURFACE CONTAMINATION ON MATERIAL

Beta-Gamma _____ DPM\100 cm²

Alpha _____ DPM\100 cm²

RADIATION DATA

SURFACE DOSE RATE _____ mR/h

_____ mR/h @ 30 cm | _____ mR/h @ 100 cm

SPECIAL INSTRUCTIONS

PRINT & SIGN | DATE

HPS # _____

(front)

CAUTION

RADIOACTIVE MATERIAL

INITIAL & DATE

External Inspection ☐

100% Open & Sort ☐

Inspection During Loading ☐

COMMENT SECTION

BUILDING ROOM

LIST ALL ITEMS CONTAINED IN THIS PACKAGE BY DESCRIPTION AND APPROXIMATE PERCENTAGE

☐	Paper	%	☐	Resp. Filters	%
☐	Plastic	%	☐	Gloves/Shoecovers	%
☐	Cloth	%	☐	PPE (Coveralls)	%
☐	Rubber	%	☐	PPE (Plastic)	%
☐	Wood	%	☐	Diatomaceous Earth	%
☐	Metal	%	☐	Radsorb	%
					%
					%
					%
	Absorbed Liquid				%

Type Amount PERCENTAGE

I CERTIFY, TO THE BEST OF MY KNOWLEDGE, THIS WASTE PACKAGE TO BE FREE OF PROHIBITED OR HAZARDOUS WASTE AND CONTAINS NO NON-RADIOACTIVE UNCONTAMINATED ITEMS.

Print / Sign

(Print) GENERATOR (Sign) DATE

(back)

EXHIBIT 2
Envirocare Materials

Acceptable Items	Prohibited Items
Low radioisotopic activity waste	Items listed in Exhibits 7 and 8 (except asbestos)
Less than 10 inches in at least one dimension and less than 8 feet in any dimension	Project Manager, LLW must approve in advance Items that exceed the dimensional restriction.
Wood, dirt, concrete, blast grit	Free-standing liquid
Electrical wire, glass, filters	
Absorbed non-hazardous liquids (all absorption will be directed by WM)	
Asbestos (packaged in asbestos boxes only)	
Metal, paper, plastic, cloth	
Waste Management Evaluated Zinc containing/galvanized materials*	*"Zinc" is limited! Contact WM!
Respirator cartridges	

EXHIBIT 3
Hanford Materials

Acceptable Items	Prohibited Items
Items with radioisotopic activities greater than Envirocare or GTS can accept	Items listed in Exhibits 7 and 8 (except asbestos)
Dirt, soil, concrete, slag	
Slate, wood, glass, blast grit, ash	
Paper, plastic, cloth	
Asbestos (packaged in asbestos bags/boxes)*	
Absorbed non-hazardous liquids (all absorption will be performed by WM)	See Exhibits 5 and 6

EXHIBIT 4
GTS Metal (Melt)

Acceptable Metals	Prohibited Metals
Steel	Copper
Galvanized pipe and duct work	Aluminum
Stainless steel	High temperature metal
Iron	Lead

EXHIBIT 5
Non-Regulated Liquids (LLW)

Waste Management will approve and direct all liquids to be absorbed and all absorbents to be used.	
All liquids must be non-hazardous by RCRA, Washington State, and State of Nevada proven by analytical data or adequate process knowledge before they can be absorbed.	
Twice the amount of absorbent required to absorb the liquid must be used.	
Envirocare	
Water or aqueous solutions (Absorbed)	Diatomaceous earth, super-absorbent polymer, cement <11.5 pH
Oil in small amounts (Absorbed)	Diatomaceous earth, conweb pads
Hanford	
Water or aqueous solution	Waterworks super-absorbent polymer, diatomaceous earth, cement <11.5 pH.
Absorbed oils are not allowed.	
Nevada Test Site	
Water or aqueous solutions (Absorbed)	Diatomaceous earth, cement <11.5 pH, super-absorbent polymer
Oil in small amounts (Absorbed)	Diatomaceous earth, conweb pads

EXHIBIT 6
Radioactive Mixed Waste

Waste that are radioactive and also exhibit one or more of the following characteristics	Some examples of contaminated waste that could fall into these categories
Ignitable, as defined in 40 CFR 261.21	Spray cans (paint, lubricant, rust retardant, cleaners, etc.)
Corrosive, as defined in 40 CFR 261.22	Spray-nine that is not pH adjusted, nitric acid, sulfuric acid, hydrochloric acid, alkaline liquids
Reactive, as defined in 40 CFR 261.23	Finely divide metals, alkali metals, oxidizing agents
Toxicity characteristic, as defined in 40 CFR 261.24	Heavy metals (Cadmium, Chromium, Lead, Mercury, Silver)
F, K, P, or U listed, as defined in 40 CFR 261.31, 40 CFR 261.32, 40 CFR 261.33, 40 CFR 261.34	Paint related material (empty containers, brushes, solvents, rags, etc.)
Containing polychlorinated biphenyls (PCBs), as defined in 40 CFR 761	Oils or fluids or scrap from hydraulic or electrical equipment and painted material
Dangerous and extremely hazardous, as defined in WAC 173-303	Oil, unused concrete, road salt

EXHIBIT 7
Special Concern Items

Scintillation Liquids
Nonorganic Liquid
Alkali Metals
Gas Generating Items
Used Oil or Grease
Asbestos
Chelating Agents
Chlorofluorocarbons (CFCs)
Suspect Polychlorinated Biphenyl (PCBs)
Beryllium
Sealed Sources
Particulates
Animal Carcasses
Listed or Characteristic Hazardous Waste

EXHIBIT 8
Prohibited Items

Free Liquids
Etiological Agents
Reactive Metals
Chemically Incompatible Materials
Explosives
Pyrophorics
Pressurized or Compressed Gases, Gas Cylinders (Unless Permanently Vented)
Unidentified, Uncharacterized or Poorly Characterized Waste

EXHIBIT 9
GTS Compactibles

ACCEPTABLE ITEMS FOR COMPACTION

PAPER:	Towels, Cardboard, Sheet/Sheaf
PLASTIC:	Bags, Sheeting, Herculite, Bubblehoods, Bottles, PVC Pipe < 24" Long, Formed Pieces < 6" Thick
CLOTH:	Towels, Rags, Clothing, Masslinn
LEATHER:	Shoes, Boots, Gloves, Strips, Belts
RUBBER:	Shoes, Boots, Gloves, Mats, Hoses, Belts
WOOD:	< 6" x 6"
METAL:	Non-RCRA; < 6" x 6"; Aluminum, Brass, Bronze, Copper, Iron, Steel, Galvanized, Tin
MISC:	Fiberglass; Insulation, Ceiling Panels, etc. Floor Sweepings Containing Materials Listed In All Categories Above

UNACCEPTABLE ITEMS FOR COMPACTION

RCRA/TSCA Materials
Asbestos Containing Material
Liquids/Wet Materials
Oils/Grease/Oily Material
Soil/Concrete/Firebrick/Floor Tile
Chemicals Of Any Kind
Pressurized Containers or Empty Spray Cans
Metal, Wood, Plastic or Rubber Items > 6" Thick

EXHIBIT 10

NTS Materials

Acceptable Items	Prohibited Items
Low radioisotopic activity waste	Items listed in Exhibits 7 and 8 (except asbestos)
Wood, dirt, concrete, blast grit	Particulate waste
Electrical wire, glass, filters	Pressurized Containers
Absorbed non-hazardous liquids (all absorption will be directed by WM)	Mixed waste
Asbestos (packaged in asbestos boxes only)	
Metal, paper, plastic, cloth	
Respirator cartridges	

ZappaTec

Material Safety Data Sheet

ZapLoc MSDS ID: ZT/ZL

*** Section 1 - Chemical Product and Company Identification ***

Chemical Name: Sodium Polyacrylate, Crosslinked

Zappa Tec, LLC
2900 Pacific Avenue
Greensboro, NC 27406

Phone: (888) 369-8704

Emergency # (800) 424-9300 CHEMTREC

*** Section 2 - Composition / Information on Ingredients ***

CAS #	Component	Percent
9003-04-7	Sodium polyacrylate	>99
Not Available	Post Treated- Trade Secret	0

Component Information/Information on Non-Hazardous Components

The components of this product are not regulated as hazardous under 29CFR and 49 CFR. However, the manufacturer recognizes the potential for respiratory tract irritation as a result of inhalation of this material as a respirable dust. See Sections 8, 11, 14, and 15 for further regulatory information.

*** Section 3 - Hazards Identification ***

Emergency Overview

Sodium polyacrylate is a white, granular, odorless polymer that yields a gel-like material with the addition of water. It is insoluble in water and causes extremely slippery conditions when wet. Although not regulated as a hazardous material, the respirable dust is a potential respiratory tract irritant. The manufacturer recommends an eight-hour exposure limit of 0.05 mg/m^3.

Potential Health Effects: Eyes

Dust may cause burning, drying, itching and other discomfort, resulting in reddening of the eyes.

Potential Health Effects: Skin

Exposure to the dust, such as in manufacturing, may aggravate existing skin conditions due to drying effect.

Potential Health Effects: Ingestion

Although not a likely route of entry, tests have shown that polyacrylate absorbents are non-toxic if ingested. However, as in any instance of non-food consumption, seek medical attention in the event of any adverse symptoms.

Potential Health Effects: Inhalation

Exposure to respirable dust may cause respiratory tract and lung irritation and may aggravate existing respiratory conditions.

HMIS Ratings: Health: 1 **Fire:** 0 **Reactivity:** 0

Hazard Scale: 0 = Minimal 1 = Slight 2 = Moderate 3 = Serious 4 = Severe * = Chronic hazard

*** Section 4 - First Aid Measures ***

First Aid: Eyes

Immediately flush eyes with plenty of water for at least 15 minutes.

First Aid: Skin

Remove polyacrylate absorbent dust from skin using soap and water.

First Aid: Ingestion

Non-toxic by ingestion. However, if adverse symptoms appear, seek medical attention.

Material Safety Data Sheet

First Aid: Inhalation
If inhaled, move to source of fresh air. Seek medical attention if symptoms persist.

*** Section 5 - Fire Fighting Measures ***

General Fire Hazards
No recognized fire hazards associated with the finished product.

Upper Flammable Limit (UFL): NE
Lower Flammable Limit (LFL): NE
Method Used: None
Flash Point: None
Flammability Classification: None

Hazardous Combustion Products
None known.

Extinguishing Media
Dry chemical, foam, carbon dioxide, water fog. Extremely slippery conditions are created if spilled product comes in contact with water.

Fire Fighting Equipment/Instructions
Firefighters should wear full protective clothing including self contained breathing apparatus.

NFPA Ratings: Health: 1 **Fire:** 0 **Reactivity:** 0
Hazard Scale: 0 = Minimal 1 = Slight 2 = Moderate 3 = Serious 4 = Severe

*** Section 6 - Accidental Release Measures ***

Containment Procedures
Sweep or vacuum material when possible and shovel into a waste container.

Clean-Up Procedures
Use caution after contact of product with water as extremely slippery conditions will result. Residuals may be flushed with water into the drain for normal wastewater treatment. This is a non-hazardous waste suitable for disposal in an approved solid waste landfill.

Evacuation Procedures
None required.

Special Procedures
Avoid respirable dust inhalation during clean-up. Wear appropriate respirator.

*** Section 7 - Handling and Storage ***

Handling Procedures
Handle as an eye and respiratory tract irritant.

Storage Procedures
Store in a dry, closed container.

*** Section 8 - Exposure Controls / Personal Protection ***

Exposure Guidelines

A: General Product Information
This product is not regulated as a hazardous material. However, the manufacturer recognizes the potential for respiratory tract irritation and recommends an eight hour exposure limit of 0.05 mg/m^3.

B: Component Exposure Limits
No information is available.

Material Safety Data Sheet

Engineering Controls

Provide local exhaust ventilation to maintain worker exposure to less than 0.05 mg/m^3 over an eight-hour period.

PERSONAL PROTECTIVE EQUIPMENT

Personal Protective Equipment: Eyes/Face

Wear safety glasses with side shields or goggles.

Personal Protective Equipment: Skin

Use impervious gloves when handling the product in the manufacturing environment.

Personal Protective Equipment: Respiratory

Wear respirator with a high efficiency filter if particulate concentrations in the work area exceed 0.05 mg/m^3 over an eight-hour period.

Personal Protective Equipment: General

Obey reasonable safety precautions and practice good housekeeping. Wash thoroughly after handling.

*** Section 9 - Physical & Chemical Properties ***

Appearance:	White granular powder.	**Odor:**	None
Physical State:	Solid	**pH:**	5.5-6.5 (1% in water)
Vapor Pressure:	<10 mm Hg	**Vapor Density:**	NE
Boiling Point:	NE	**Melting Point:**	>390 F
Solubility (H2O):	Not soluble.	**Specific Gravity:**	0.4-0.7 g/ml
Evaporation Rate:	<1.0		

*** Section 10 - Chemical Stability & Reactivity Information ***

Chemical Stability

The product is stable.

Chemical Stability: Conditions to Avoid

None

Incompatibility

None

Hazardous Decomposition

None known.

Hazardous Polymerization

Will not occur.

*** Section 11 - Toxicological Information ***

Acute and Chronic Toxicity

A: General Product Information

Acute inhalation of respirable dust may cause irritation of the upper respiratory tract and lungs.

B: Acute Toxicity-LD50/LC50

Sodium polyacrylate (9003-04-7)

LD50: Oral LD50 Rat: 40 gm/kg

Carcinogenicity

Component Carcinogenicity

No information is available.

Material Safety Data Sheet

Chronic Toxicity

Chronic inhalation exposure to rats for a lifetime (two years) using sodium polyacrylate that had been micronized to a respirable particle size (less than 10 microns) produced non-specific inflammation and chronic lung injury at 0.2 mg/m^3 and 0.8 mg/m^3. Also, at 0.8 mg/m^3, tumors were seen in some test animals. In the absence of chronic inflammation, tumors are not expected. There were no adverse effects detected at 0.05 mg/m^3.

Mutagenicity

Sodium polyacrylate had no effect in mutagenicity tests.

*** Section 12 - Ecological Information ***

Ecotoxicity

A: General Product Information

Composted polyacrylate absorbents are nontoxic to aquatic or terrestrial organisms at predicted exposure levels from current application rates.

B: Component Analysis - Ecotoxicity - Aquatic Toxicity

No information available,

Environmental Fate

Polyacrylate absorbents are relatively inert in aerobic and anaerobic conditions. They are immobile in landfills and soil systems (>90% retention), with the mobile fraction showing biodegradability. They are also compatible with incineration of municipal solid waste. Incidental down-the-drain disposal of small quantities of polyacrylic absorbents will not affect the performance of wastewater treatment systems.

*** Section 13 - Disposal Considerations ***

US EPA Waste Number & Descriptions

A: General Product Information

This product is a non-hazardous waste material suitable for approved solid waste landfills.

B: Component Waste Numbers

No EPA Waste Numbers are applicable for this product's components.

Disposal Instructions

Dispose of in accordance with Local, State and Federal regulations.

*** Section 14 - Transportation Information ***

International Transportation Regulations

This product is not transport regulated.

*** Section 15 - Regulatory Information ***

US Federal Regulations

A: General Product Information

This product is not Federally regulated as a hazardous material.

B: Clean Air Act

No information is available.

C: Component Analysis

No information is available.

Material Safety Data Sheet

ZapLoc MSDS ID: ZT/ZL

D: Food & Drug Administration

CFR references for the FDA regulated components in this product are listed.

Sodium polyacrylate (9003-04-7)

Direct Food Additives: 173.73, 173.310

Indirect Food Additives: 175.105

State Regulations

A: General Product Information

This product is not regulated by any State as a hazardous material.

B: Component Analysis - State

None of this product's components are listed on the state lists from CA, FL, MA, MN, NJ, or PA.

Component Analysis - WHMIS IDL

No components are listed in the WHMIS IDL.

Component Analysis - Inventory

Component	CAS #	TSCA	CAN	EEC
Sodium polyacrylate	9003-04-7	Yes	DSL	No

*** Section 16 - Other Information ***

Other Information

The information herein is presented in good faith and believed to be accurate as of the effective date given. However, no warranty, expressed or implied, is given. It is the buyer's responsibility to ensure that its activities comply with Federal, State or provincial, and local laws.

Key/Legend

Contact: Product Compliance Officer
Contact Phone: (888) 369-8704

carboline

product data sheet

ALARA™ 1146 CAVITY DECON

5929

VOC plus

SELECTION DATA

GENERIC TYPE: Water-borne vinyl.

GENERAL PROPERTIES: Cavity grade, strippable, decontamination coating. Applied over a contaminated surface, ALARA 1146 CAVITY DECON attracts and binds surface contaminants. The coating migrates into micro-voids of the surface to contact contaminants. Upon cure, the product mechanically locks the contaminants into a polymer matrix. Removal of the film decontaminates the substrate and produces a solid waste.

- High decontamination factors
- Rapid application and removal
- Reduced waste volumes
- Immobilization of surface contamination
- Reduction of surface contamination
- VOC (Volatile Organic Content) compliant
- Chemical composition compatible with primary components
- Used for over 15 years in reactor cavities worldwide

RECOMMENDED USES: For decontamination of reactor cavities during refueling outages. Manufactured in compliance with ANSI N101.4 and ASTM D3843.

NOT RECOMMENDED FOR: Immersion service.

TYPICAL CHEMICAL RESISTANCE:

Exposure	Splash & Spillage	Fumes
Acids	NR	NR
Alkalies	Good	Good
Solvents	Good	Good
Salt	Good	Good
Water	Good	Good

NR - Not Recommended.

TEMPERATURE RESISTANCE: (Non-Immersion)
Continuous: 100°F (37°C)
Non-Continuous: 120°F (49°C)

SUBSTRATES: Contaminated surfaces.

SPECIFICATION DATA

THEORETICAL SOLIDS CONTENT OF MIXED MATERIAL:

	By Volume
ALARA 1146 CAVITY DECON	41% ± 2%

VOLATILE ORGANIC CONTENT (VOC):
As supplied: 0.12 lbs/gal (14 g/l)

RECOMMENDED DRY FILM THICKNESS PER COAT:
12-30 mils (300-750 microns)

Strippability is film thickness dependent. Low film thickness will cause difficulty in removing film. Film thickness above the recommended maximum will cause slower dry times.

5301

THEORETICAL COVERAGE PER GALLON:
658 mil sq. ft. (16.1 sq. m/l at 25 microns)
26 sq. ft. at 25 mils (0.6 sq. m/l at 625 microns)

Mixing and application losses will vary and must be taken into consideration when estimating job requirements.

FIRE DATA (ASTM E-84) @ 20-30 MILS:
20 (flame), 25 (fuel), 25 (smoke)

CHARCOAL FILTER: 99.3% efficiency after 2 hours @ 40 FPM face loading (methyl iodide)

DECONTAMINATION FACTOR: 30-100 (varies with substrate)

CHEMICAL COMPOSITION:

Total Halogens	Less than 80 ppm
Leachable Chlorides	Less than 80 ppm
Total Fluorides	Less than 3 ppm
Total Sulfur	Less than 40 ppm
Total Nitrates	Less than 120 ppm
Leachable Nitrates	Less than 10 ppm
Total Nitrites	Less than 10 ppm
Leachable Nitrites	Less than 2 ppm
Chelating Agents	Less than .01% by weight

STORAGE CONDITIONS: Store indoors.
DO NOT FREEZE
Temperature: 40-90°F (4-32°C) Humidity: 0-90%

SHELF LIFE: 12 months when stored indoors at 75°F (24°C)

COLORS: Yellow 0600 only

ORDERING INFORMATION

Prices may be obtained from your Carboline Sales Representative or Carboline Customer Service Department.

APPROXIMATE SHIPPING WEIGHT:

	1s	5s
ALARA 1146 CAVITY DECON	9.4 lbs. (4.3 kg)	47.5 lbs. (21.5 kg)

FLASH POINT: (Setaflash)
ALARA 1146 CAVITY DECON >200°F (93°C)

June 97 Replaces May 96

To the best of our knowledge the technical data contained herein are true and accurate at the date of issuance and are subject to change without prior notice. User must contact Carboline Company to verify correctness before specifying or ordering. No guarantee of accuracy is given or implied. We guarantee our products to conform to Carboline quality control. We assume no responsibility for coverage, performance or injuries resulting from use. Liability, if any, is limited to replacement of products. Prices and cost data, if shown, are subject to change without prior notice. NO OTHER WARRANTY OR GUARANTEE OF ANY KIND IS MADE BY CARBOLINE, EXPRESS OR IMPLIED, STATUTORY, BY OPERATION OF LAW, OR OTHERWISE, INCLUDING MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

5929

CARBOLINE CO. MATERIAL SAFETY DATA SHEET

SECTION I - PRODUCT: ALARA 1146 STRIPPABLE COATING (5303S1NL)
Date: 05/28/98 Replaces 12/28/95

CHEMTREC TRANSPORTATION EMERGENCY PHONE NO.: 800-424-9300
PITTSBURGH POISON CONTROL CENTER HEALTH EMERGENCY NO.: 412-681-6669

SECTION II - HAZARDOUS INGREDIENTS EXPOSURE LIMITS

CHEMICAL NAME (A) (B) (C) (D) (E)

HAZARDOUS INGREDIENTS ADDITIONAL DATA
CHEMICAL NAME (F) (G)

TABLE (A) CAS NUMBER (B) LESS THAN WT (C) TLV-TWA (D) STEL (E) CEILING (F) TOXICITY DATA (LD50/Route,LC50/Route) (G) SARA 302/SARA 313/ SARA 311-312 CATEGORIES/CERCLA. NE = not established, NR = not required, NO = no. Color Pigment Mixture may contain Iron Oxides, Titanium Dioxide, Carbon Black, and other particulates not otherwise regulated in varying amounts depending on color of product.

WHMIS CLASSIFICATION: Not WHMIS Regulated
HMIS/NFPA CLASSIFICATION: HEALTH 0, FLAMMABILITY 1, REACTIVITY 0,
PERSONAL PROTECTION CODE A, NFPA FIRE FIGHTING PHASE 0

SECTION III - PHYSICAL DATA:

BOILING RANGE: N/A. VAPOR DENSITY: N/A EVAPORATION RATE: N/A VOLATILE BY WEIGHT 54 %. VOLATILE BY VOLUME: 58 %. PRODUCT WT/GAL: 8.9 LBS/U.S.GAL. 1.07 sp gr.

SECTION IV - FIRE AND EXPLOSION HAZARD DATA:

FLAMMABILITY CLASSIFICATION: FLASH POINT: 206 F(96C) (Setaflash) LEL: N/A UEL: N/A
OSHA-COMBUSTIBLE LIQUID/OSHA/CLASS/IIIB, DOT-PAINT, NOT REGULATED, CANADIAN TDGA: NOT REGULATED
EXTINGUISHING MEDIA: Dry Chemical, Foam, Carbon Dioxide, Water Fog.
UNUSUAL FIRE AND EXPLOSION HAZARDS: NONE

SECTION V - HEALTH HAZARD DATA:

INHALATION: Overexposure will be irritating to mucous membranes.
CONTACT: May cause eye irritation. May cause skin irritation.
MEDICAL CONDITIONS PRONE TO AGGRAVATION BY EXPOSURE: If you have a condition that could be aggravated by exposure to dust or organic vapors see a physician prior to use.
PRIMARY ROUTE(S) OF ENTRY: Inhalation, Dermal, Ingestion.
EMERGENCY FIRST AID PROCEDURES: When exposed always get medical attention.
EYE CONTACT: Flush with water for 15 minutes.
SKIN CONTACT: Wash with soap and water. Remove contaminated clothing and clean before reuse.
INHALATION: Remove to fresh air. Provide oxygen if breathing is difficult.

5929

PRODUCT: ALARA 1146 STRIPPABLE COATING (5303S1NL)
Date: 05/28/98 Replaces 12/28/95

Use artificial respiration if not breathing. Get medical attention.
IF SWALLOWED: DO NOT INDUCE VOMITING!! Always get medical attention.

SECTION VI - REACTIVITY DATA:

STABILITY: This product is stable under normal storage conditions.
HAZARDOUS POLYMERIZATION: Will not occur under normal conditions.
HAZARDOUS DECOMPOSITION PRODUCTS: Carbon monoxide and unidentified organic compounds.
CONDITIONS TO AVOID: NONE
INCOMPATIBILITY: NONE

SECTION VII - SPILL OR LEAK PROCEDURES:

STEPS TO BE TAKEN IN CASE OF SPILL: This product is a designed strippable coating. If a leak or spill occurs contain the material. Allow the material to dry or cure. The material presents no fire hazard or health hazard. The material may then be stripped and discarded as non-hazardous waste.

SECTION VIII - SAFE HANDLING AND USE INFORMATION:

RESPIRATORY PROTECTION: Use with good ventilation.
SKIN AND EYE PROTECTION: Recommend gloves and safety glasses to avoid skin and eye contact.
HYGIENIC PRACTICES: Wash with soap and water before eating, drinking, or using toilet facilities. Launder contaminated clothing before reuse.

SECTION IX - SPECIAL PRECAUTIONS:

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE: Keep away from heat, sparks, open flame, and strong oxidizing agents. Keep containers closed. Store in cool, dry place with adequate ventilation. If pouring or transferring materials, ground all containers and tools.
OTHER PRECAUTIONS: Do not weld, heat, cut or drill on full or empty containers.

The information contained herein is, to the best of our knowledge and belief accurate. However, since the conditions of handling and use are beyond our control, we make no guarantee of results, and assume no liability for damages incurred by use of this material. It is the responsibility of the user to comply with all applicable federal, state, and local laws and regulations.

Carboline Company 350 Hanley Ind. Ct. St. Louis, MO 63144
PHONE NO. 314-644-1000 FOR INDUSTRIAL USE ONLY

MATERIAL SAFETY DATA SHEET U.S. DEPARTMENT OF LABOR 5929

May be used to comply with OSHA's Hazard Communication Standard, 29 CFR 1910.1200. Standard must be consulted for specific requirements.

Occupational Safety and Health Administration (Non-Mandatory Form) Form Approved OMB No. 1218-0072

IDENTITY (As used on label and list)

N990 Petrobond (N) (Trade Secret)

Note: Blank spaces are not permitted. If any item is not applicable, or no information is available, the space must be marked to indicate that.

Section I

Manufacturer's Name
NOCHAR, INC.

Emergency Telephone Number
(317) 613-3046

Address *(Number, Street, City, State and ZIP Code)*
8650 COMMERCE PARK PLACE SUITE K
INDIANAPOLIS, INDIANA 46268

Telephone Number for information
FAX: (317) 613-3052

Date Prepared
AUGUST 28,2002

Section II - Hazardous Ingredients/Identity Information

Hazardous Components (Specific Chemical Identity: Common Name(s)	OSHA PEL	ACGIH TLV	Other Limits Recommended	% (optional)
ALIPHATIC HYDROCARBON	ND	ND		30 - 35%
CHEMICAL NAME NAPHTHA CAS # 64742 - 47 - 8				

Section III - Physical/Chemical Characteristics

Boiling Point 316 F TO 351 F

Specific Gravity (H_2O = 1) 0.5015 24 degrees C

Vapor Pressure (mm Hg.) 3.3 at 66 F

Melting Point N/A

Vapor Density (AIR = 1) >1

Evaporation Rate (Butyl Acetate = 1) N/A

Solubility in Water ND

Appearance and Odor Solid, Generally Granular ,Slight Hydrocarbon Odor

Section IV - Fire and Explosion Hazard Data

Flash Point (Method Used) >200 F ASTM D-92

Flammable Limits N/A LEL N/A UEL

Extinguishing Media Water Fog, Foam, Dry Chemical, CO2

Special Fire Fighting Procedures See Section V11 and Section V111

Unusual Fire and Explosion Hazards NONE KNOWN

Section V - Reactivity Data

Stability Unstable Stable X

Conditions to Avoid Extreme heat (>420 F), Open Flame

Incompatibility (Materials to Avoid) STRONG OXIDIZERS

Hazardous Decomposition or Byproducts CO,CO2 MAY PRODUCE ACROLEIN, ACIDS, KETONE, ALDEHYDES, TREAT COMBUSTION PRODUCTS AS TOXIC

Hazardous Polymerization May Occur / Will Not Occur X

Conditions to Avoid N/A

Section VI - Health Hazard Data

Route(s) of Entry: Inhalation X Skin X Ingestion X

Health Hazards *(Acute and Chronic)*

ACUTE NO
CHRONIC NO

EYES:
Direct eye contact may cause irritation, redness, and pain. In case of eye contact, remove contact lenses and

immediately flush eyes with large amounts of water for at least 15 minutes holding eyelids apart to ensure flushing of the entire eye surface. Seek medical attention

SKIN:
Skin exposure may irritate and cause dermatitis. In case of skin contact, immediately flush with large amounts of water, use soap if available.

Inhalation:
Avoid Inhalation, may cause headache, and dizziness. Remove individual to well ventilated area.

Ingestion:
If ingested, do not induce vomiting, seek immediate medical attention.

Carcinogenicity:	NO	NTP?	IARC Monographs?	OSHA Regulated? NO

Section VII - Precautions for Safe Handling and Use

Steps to Be Taken in Case Material is Released or Spilled
RECOVER SOLID WITH BROOM, SHOVEL OR VACUUM AVOID GENERATING DUST CLOUDS PUT RECOVERED MATERIAL IN CONTAINERS FOR RECLAMATION OR DISPOSAL.

Waste Disposal Method
FOLLOW FEDERAL, STATE AND LOCAL REGULATIONS WHEN USED AS ABSORBENT, FOLLOW REGULATIONS FOR ABSORBED MATERIAL.

Precautions to Be Taken in Handling and Storing
PRODUCT CAN POSSIBLY ACCUMULATE STATIC CHARGES THRU EXCESSIVE HANDLING

Other Precautions
AVOID BREATHING VAPORS FROM HEATED PRODUCT

Section VIII - Control Measures

Respiratory Protection (Specify Type) USE OSHA APPROVED RESPIRATOR IF NOT IN WELL VENTILATED AREA

Ventilation **Local Exhaust** X **Special** IF USED IN A CONFINED SPACE, OR PRODUCT IS HEATED, USE MECHANICAL VENTILATION

Mechanical (General) X

Protective Gloves CHEMICAL RESISTANT **Eye Protection** SAFETY GLASSES OR GOGGLES

Other Protective Clothing or Equipment LONG SLEEVES

Work/Hygienic Practice NORMAL HYGIENE PRACTICES SHOULD BE FOLLOWED, WASH HANDS, ETC AFTER HANDLING.

DISCLAIMER:
The information contained herein is based on the data available to us and is believed to be correct. However, the manufacturer makes no warranty, expressed or implied regarding the accuracy of this data or the results to be obtained from the use thereof, and assumes no responsibility for injury from the use of the product described herein. The manufacturer assumes no liability for incidental, consequential or direct damage of any manner or kind, regardless of cause, including negligence.

HMIS HAZARD RATING
HEALTH 1
FLAMMABILITY 1
REACTIVITY 0

MATERIAL SAFETY DATA SHEET

Sealed Air Corporation
Engineered Products Division
10 Old Sherman Tnpk., Danbury, CT 06810
(203) 791-3500 Fax: (203) 791-3618

Attachment K

EMERGENCY NUMBERS:

Sealed Air Corporation: (203) 791-3500 *For emergency and general information*
8:30am-5:00pm, (Eastern Time), Monday-Friday

CHEMTREC: (800) 424-9300 *For Chemical Emergency - spill, leak, fire, exposure or accident*
24 hours

SECTION 1 - PRODUCT AND COMPANY IDENTIFICATION

Product Name:	INSTAPAK® COMPONENT "A"
Chemical Name:	Polymethylene Polyphenylisocyanate
Trade Name:	Polymeric MDI
Chemical Family:	Aromatic Isocyanates
Chemical Formula:	Not Available

SECTION 2 - COMPOSITION / INFORMATION ON INGREDIENTS

Hazardous Components:	CAS No.	Wt.%	OSHA-PEL	ACGIH-TLV
Polymeric Diphenylmethane Diisocyanate (polymeric MDI or PMDI)	9016-87-9	100	Not Listed	Not Listed
Contains:				
4,4'-Diphenylmethane diisocyanate (4,4'-MDI; approx. 45%)	101-68-8		0.02 ppm (Ceiling)	0.005 ppm (TWA)
Other MDI isomers and oligomers	Not Listed		Not Listed	Not Listed

This product is classified as hazardous under OSHA Hazard Communication Standard (29 CFR 1910.1200).

SECTION 3 - HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

Health Hazards: Irritating to eyes, respiratory system and skin. Repeated inhalation of aerosols at levels above the occupational exposure limit could cause respiratory sensitization and risk of serious damage to respiratory system. The onset of the respiratory symptoms may be delayed for several hours after exposure. A hyper-reactive response to even minimal concentrations of MDI may develop in sensitized persons. Sensitized persons should not be exposed to any mixture containing unreacted MDI.

Physical Hazards: Reacts slowly with water to produce carbon dioxide that may rupture closed containers. This reaction accelerates at higher temperatures.

Appearance: Dark brown liquid.

Odor: Slightly aromatic (musty).

Note: Read the entire MSDS for a more thorough evaluation of the hazard information on this product.

This information is furnished without warranty, expressed or implied, except that it is accurate to the best knowledge of Sealed Air Corporation. The data on this sheet relates to the specific material designated herein. Sealed Air Corporation assumes no legal responsibility

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Engineered Products Division
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SECTION 4 - FIRST AID MEASURES

Inhalation: Remove patient from further exposure and obtain medical attention. Treatment is symptomatic for primary irritation or difficulty in breathing. If breathing is labored, qualified personnel should administer oxygen. Apply artificial respiration if breathing has ceased or shows signs of failing. Asthmatic-like symptoms, if manifested, may develop immediately, or be delayed for up to several hours.

Skin Contact: Remove contaminated clothing. Immediately wash affected area thoroughly with soap and water. Some organic materials such as corn oil or propylene glycol are effective in decontaminating MDI from the skin when applied immediately. Contaminated clothing should be thoroughly cleaned before reuse. If irritation, redness, or a burning sensation develops and persists, obtain medical advice.

Eye Contact: Immediately flush eyes with copious amounts of water for a minimum of 15 minutes, holding lids open with fingers. If irritation persists, repeat flushing. Refer individual to a physician for immediate follow-up.

Ingestion: Do NOT induce vomiting. Provided the patient is conscious, wash mouth out with water then give 1 or 2 glasses of water to drink. Refer person to medical personnel for immediate attention.

Note to Physicians: Symptomatic and supportive therapy as needed. Following severe exposure medical follow-up should be monitored for at least 48 hours.

SECTION 5 – FIRE FIGHTING MEASURES

Flash Point: 390°F (199°C) [Pensky-Martens Closed Cup]
Flammable Limits (lower): Not available
Flammable Limits (upper): Not available

Extinguishing Media: Water, carbon dioxide (CO_2), dry chemical, or appropriate foam. If water is used, large quantities are required. Reaction between water and hot isocyanate may be vigorous. Contain run-off water with temporary barriers.

Fire Fighting Procedures: As appropriate for surrounding materials/equipment.

Fire and Explosion Hazards: Containers may burst under intense heat. Due to reaction with water, a hazardous build-up of pressure could result if contaminated containers are re-sealed.

Fire Fighting Protective Equipment: Firefighters must wear self-contained breathing apparatus and full protective clothing (Bunker gear).

NFPA Hazard Code:		
	Health:	2
	Flammability:	1
	Reactivity:	1
	Special Hazard:	None

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SECTION 6 - ACCIDENTAL RELEASE MEASURES

Evacuate area surrounding the spill and prevent further spillage, leakage or entry into drains. Eye and skin protection should be worn during spill cleanup and ventilation maintained. If the potential for airborne concentrations of MDI above the PEL exists, then respiratory protection should be worn. Contain and cover spill with loose absorbent (earth, sand, sawdust or other absorbent material), or absorbent pillows, pads or socks. Collect absorbed material in open containers or plastic bags, and treat with deactivating solution (90% water, 8% concentrated ammonia, 2% detergent). Allow to stand uncovered for 48-72 hours to permit carbon dioxide to escape and solidification to occur. Wash spill area with deactivating solution and let stand for 30 minutes or longer. Dispose of absorbed and neutralized material properly.

SECTION 7 - HANDLING AND STORAGE

Storage Temperature: Min. 50°F (10°C) Max. 100°F (38°C)

Average Shelf Life: 12 months (when stored in original, unopened, sealed containers).

Special Sensitivity: Reacts with moisture to produce carbon dioxide gas.

Precautions to be Taken in Handling and Storage: Do not store product containers uncovered outdoors. Do not reseal containers unless it is certain that no moisture contamination has occurred. Do not breathe vapors or allow skin contact.

SECTION 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure Limits:	OSHA-PEL:	4,4'-Diphenylmethane diisocyanate;	Ceiling = 0.02 ppm
	ACGIH-TLV:	4,4'-Diphenylmethane diisocyanate;	TWA = 0.005 ppm

HMIS Hazard Code:	Health	2*
	Flammability	1
	Reactivity	1
	PPE	B (Personal Protective Equipment) (B= safety glasses and gloves)

*indicates a chronic hazard

Exposure Guidelines: Medical supervision of employees who come into contact with respiratory sensitizers is recommended. Persons with asthmatic-type conditions, chronic bronchitis, other chronic respiratory diseases or recurrent skin eczema or sensitization should be excluded from working with this product. Once a person is sensitized, no further exposure to the material that caused the sensitization should be permitted.

Respiratory Protection: Due to the low vapor pressure of this material, the PEL is not likely to be exceeded under normal conditions. If the material is heated or spilled in a confined area, respiratory protection should be worn. An approved air purifying respirator equipped with an organic vapor cartridge and a HEPA (P100) particulate filter may be used when an appropriate cartridge change-out schedule has been developed in accordance with the OSHA respiratory protection standard (29 CFR 1910.134). Where concentrations exceed the level for which an air-purifying respirator is effective, use a positive pressure, supplied air respirator.

Eye Protection: Safety glasses with side shields or goggles.

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SECTION 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION (continued)

Protective Clothing: Chemical resistant butyl rubber, nitrile rubber, neoprene, or other suitable protective gloves.

Ventilation: Use local exhaust ventilation if necessary to maintain levels below the PEL. For guidance on engineering controls refer to the ACGIH publication "Industrial Ventilation."

Other: Eyewash station, safety shower and deactivating solution should be available. Refer to the "Recommendations for the Safe Use and Handling of Instapak® Foam-in-Place Chemicals" bulletin before handling Instapak® chemicals.

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

Physical State: Liquid
Color: Dark brown
Odor: Slightly aromatic (musty)
Vapor Density (Air = 1): 8.5
Molecular Weight: Approx. 350
Melting Point: Not established.

Boiling Point: 406°F (208°C)
Vapor Pressure: $< 10^{-5}$ mm Hg at 25°C (for Polymeric MDI)
Specific Gravity: 1.24 at 25°C
Bulk Density: 10.3 lbs/gal
% Volatile by Volume: Nil
Solubility in Water: Not soluble. Reacts slowly to liberate CO_2 gas.

SECTION 10 - STABILITY AND REACTIVITY

Stability: Stable under normal conditions. Avoid temperatures above 110°F (43°C) or below 40°F (4°C).

Polymerization: May occur at elevated temperatures in the presence of moisture, alkalies, tertiary amines and metal compounds.

Conditions to Avoid: Contact with moisture and other materials that contain active hydrogen.

Incompatible Materials: Water, amines, strong bases and alcohols. The reaction with water is slow at temperatures less than 120°F (49°C) but is accelerated at higher temperatures.

Hazardous Decomposition Products: Highly unlikely under normal industrial use. Exposure to fire or extreme heat may generate oxides of carbon, oxides of nitrogen, and traces of hydrogen cyanide.

SECTION 11 - TOXICOLOGICAL INFORMATION

Polymeric MDI:	LD_{50} Oral:	>10000 mg/kg (rat)
	LD_{50} Dermal:	>5000 mg/kg (rabbit)
	LC_{50} Inhalation:	370 - 490 mg/m^3/4 hours (rat) for an aerosol of polymeric MDI

Primary Route(s) of Exposure: Skin contact from liquid. Inhalation. However, due to the low vapor pressure, overexposure is not expected under normal conditions unless material is heated or used in a poorly ventilated area.

Inhalation: This product is a respiratory irritant and potential respiratory sensitizer. Inhalation of vapor or aerosol at levels above the occupational exposure limit can cause respiratory sensitization. Symptoms may include irritation to the eyes, nose, throat, and lungs, possibly combined with dryness of the throat, tightness of chest and difficulty in breathing. The onset of respiratory symptoms may be delayed for several hours after exposure.

This information is furnished without warranty, expressed or implied, except that it is accurate to the best knowledge of Sealed Air Corporation. The data on this sheet relates to the specific material designated herein. Sealed Air Corporation assumes no legal responsibility for use or reliance upon these data.

Sealed Air Corporation
Engineered Products Division
10 Old Sherman Tnpk., Danbury, CT 06810
(203) 791-3500 Fax: (203) 791-3618

SECTION 11 - TOXICOLOGICAL INFORMATION (continued)

A hyper-reactive response to even minimal concentrations of MDI may develop in sensitized persons. Sensitized persons should be removed from any further exposure. Persons with asthma-type conditions or other chronic respiratory diseases should be excluded from working with MDI. Like many other non-specific asthmatic responses, there are reports that a sensitized individual can experience symptoms upon exposure to dust, cold air or other irritants. In a single evaluation of 5 men occupationally exposed to MDI and hydrocarbon solvent vapors under conditions where adequate ventilation or other safety precautions were not used, neuropsychologic findings were attributed to MDI.

Skin Contact: May cause irritation or rash. Can cause skin discoloration. Repeated and/or prolonged contact may result in skin sensitization. Individuals who have skin sensitization can develop symptoms (e.g., reddening swelling, rash) from contact with liquid or vapors. There is limited evidence from laboratory tests that skin contact may play a role in respiratory sensitization. This data reinforces the need to prevent direct skin contact and the importance of protective gloves.

Eye Contact: Liquid can cause eye irritation, tearing, reddening and swelling. Permanent corneal injury is unlikely. Exposure to MDI vapors in excess of 0.02 ppm may cause irritation.

Ingestion: Ingestion is unlikely. Based on the acute oral LD_{50}, this product is considered practically non-toxic by ingestion. Ingestion can cause irritation and corrosive action in the mouth, stomach and digestive tract.

Chronic Effects: A study was conducted where groups of rats were exposed for 6 hours/day, 5 days/week for a lifetime to atmospheres of respirable polymeric MDI aerosol either at concentrations of 0, 0.2, 1, or 6 mg/m^3 (which corresponds to MDI levels equal to the OSHA-PEL, 5 times the OSHA-PEL and 30 times the OSHA-PEL). No adverse effects were observed at 0.2 mg/m^3 concentrations. At the 1 mg/m^3 concentration, minimal nasal and lung irritant effects were seen. Only at the top concentration (6 mg/m^3) was there an increased incidence of benign tumor of the lung (adenoma) and one malignant tumor (adenocarcinoma). MDI administration to rats in this study did not change the distribution and incidence of tumors from those seen in control animals. The increased incidence of lung tumors is associated with prolonged respiratory irritation and the concurrent accumulation of yellow material in the lung. In the absence of prolonged exposure to high concentrations leading to chronic irritation and lung damage, it is highly unlikely that tumor formation will occur.

Carcinogenicity: The ingredients of this product (>0.1%) are not classified as carcinogenic by ACGIH or IARC, not regulated as carcinogens by OSHA and not listed as carcinogens by NTP.

Mutagenicity: There is no substantial evidence of mutagenic potential.

Reproductive Effects: No adverse reproductive effects are anticipated.

Teratogenicity and Fetotoxicity: No birth defects were seen in two independent animal (rat) studies. Fetotoxicity was observed at doses that were extremely toxic (including lethal) to the mother. The dose that produced this effect (1.2 ppm) is 60 times higher than the OSHA-PEL. Fetotoxicity was not observed at doses that were not maternally toxic. The doses used in these studies were maximal, respirable concentrations well in excess of the defined occupational exposure limits.

SECTION 12 - ECOLOGICAL INFORMATION

Environmental Fate and Distribution: It is unlikely that significant environmental exposure in the air or water will arise, based on consideration of the production and use of the substance.

This information is furnished without warranty, expressed or implied, except that it is accurate to the best knowledge of Sealed Air Corporation. The data on this sheet relates to the specific material designated herein. Sealed Air Corporation assumes no legal responsibility for use or reliance upon these data.

Sealed Air Corporation
Engineered Products Division
10 Old Sherman Tnpk., Danbury, CT 06810
(203) 791-3500 Fax: (203) 791-3618

SECTION 12 - ECOLOGICAL INFORMATION (continued)

Persistence and Degradation: Immiscible with water, but will react with water to produce carbon dioxide, and inert and non-biodegradable solids.

Aquatic Toxicity:

LC_{50}:	>1000 mg/1 (Zebra fish) At the highest level of 1000 mg/l, there were no deaths.
EC_{50} (24 hour):	>1000 mg/1 (Daphnea magna)
EC_{50}:	>100 mg/1 (E. Coli)

SECTION 13 - DISPOSAL CONSIDERATIONS

Incinerate or dispose of in accordance with existing federal, state and local environmental control regulations. This material is not a hazardous waste under RCRA 40 CFR 261 when disposed of in its purchased form. Small quantities should be treated with deactivation solution outlined in Section 6. Refer to the "Recommendations for the Safe Use and Handling of Instapak® Foam-in-Place Chemicals" bulletin for additional information concerning disposal of wastes and empty containers. Chemical waste, regardless of quantity, should never be poured into drains, sewers or waterways.

SECTION 14 - TRANSPORT INFORMATION

DOT: Single containers less than 5,000 pounds are not regulated.

IMO: Not regulated.

IATA/ICAO Class: Not regulated.

Reportable Quantity (RQ): 5,000 lbs. for Methylene diphenyl diisocyanate (4,4'-MDI), CAS #101-68-8 (≈ 45% of product).

SECTION 15 - REGULATORY INFORMATION

TSCA Status: All ingredients are listed or are not required to be listed.

CERCLA Status: Discarded product is not a hazardous waste under RCRA, 40 CFR 261, when disposed of in its purchased form.

SARA 302 Extremely Hazardous Substances: None

SARA 311/312 Hazard Categories: Immediate (acute) Health Hazard
Delayed (chronic) Health Hazard

SARA 313 Listed Ingredients: This product contains the following chemicals subject to reporting requirements: 100% Diisocyanate compounds (Category Code N120).

SECTION 16 - OTHER INFORMATION

Other Regulations/Legislation which apply to this product: Massachusetts Right-to-Know, New Jersey Right-to-Know, Pennsylvania Right-to-Know [Methylene bisphenyl isocyanate (4,4'-MDI), CAS#101-68-8].

Section(s) Revised: Section 8 – Exposure Controls/ Personal Protection, Section 11 - Toxicological Information, Section 16 – Other Information

This information is furnished without warranty, expressed or implied, except that it is accurate to the best knowledge of Sealed Air Corporation. The data on this sheet relates to the specific material designated herein. Sealed Air Corporation assumes no legal responsibility for use or reliance upon these data.

MATERIAL SAFETY DATA SHEET

Sealed Air Corporation
Engineered Products Division
10 Old Sherman Tnpk., Danbury, CT 06810
(203) 791-3500 Fax: (203) 791-3618

EMERGENCY NUMBERS:

Sealed Air Corporation: (203) 791-3500 *For emergency and general information*
8:30am-5:00pm, (Eastern Time), Monday-Friday

CHEMTREC: (800) 424-9300 *For Chemical Emergency - spill, leak, fire, exposure or accident*
24 hours

SECTION 1 - PRODUCT AND COMPANY IDENTIFICATION

Product Name:	INSTAPAK® RIGID 200 COMPONENT "B"
Chemical Name:	Polyurethane Foam Resin
Trade Name:	Polyol
Chemical Family:	N.A.
Chemical Formula:	N.A.

SECTION 2 - COMPOSITION / INFORMATION ON INGREDIENTS

Hazardous Components	CAS No.	Wt. %	OSHA-PEL	ACGIH-TLV
Amine Catalyst	Proprietary	<1	Not Established	Not Established
Glycerin (mist)	56-81-5	≤ 1.2	15 mg/m3 (TWA) Total dust 5 mg/m3 (TWA) Respirable fraction	10 mg/m3 (TWA)

This product is classified as hazardous under OSHA Hazard Communication Standard (29 CFR 1910.1200).

SECTION 3 - HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

Health Hazards: Irritating to eyes and skin. Inhalation may result in irritation.

Physical Hazards: No immediate hazard.

Appearance: Clear, straw.

Odor: Slight amine.

Note: Read the entire MSDS for a more thorough evaluation of the hazard information on this product.

SECTION 4 - FIRST AID MEASURES

Inhalation: Remove patient from further exposure and obtain medical attention. Administer oxygen if necessary.

Skin Contact: Wash area thoroughly with soap and water. Launder contaminated clothing before reuse.

Eye Contact: Flush with copious amounts of water for at least 15 minutes, holding lids open with fingers.

Ingestion: Drink water to dilute and obtain medical attention.

Note to Physicians: Symptomatic and supportive care as needed.

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(203) 791-3500 Fax: (203) 791-3618.

SECTION 5 - FIRE FIGHTING MEASURES

Flash Point: Product as supplied does not have a flash point. [Pensky-Martens Closed Cup]
Flammable limits (lower): Not applicable.
Flammable limits (upper): Not applicable.

Extinguishing Media: Carbon dioxide (CO_2), chemical foam, dry chemical, water spray.

Fire Fighting Procedures: As appropriate for surrounding materials/equipment.

Fire and Explosion Hazards: Containers may burst under intense heat.

Fire Fighting Protective Equipment: Firefighters must wear self-contained breathing apparatus to protect against toxic and irritating vapors; full protective clothing should also be worn.

NFPA Hazard Code:		
	Health:	2
	Flammability:	1
	Reactivity:	0
	Special Hazard:	None

SECTION 6 - ACCIDENTAL RELEASE MEASURES

Evacuate area surrounding the spill and prevent further leakage, spillage or entry into drains. Eye and skin protection should be worn during spill cleanup and ventilation maintained. Contain and cover spill with loose absorbent (earth, sand, sawdust or other absorbent material) or absorbent pillows, pads or socks. Collect absorbed material in open containers or plastic bags. Dispose of spilled material properly.

SECTION 7 - HANDLING AND STORAGE

Storage Temperature: Min. 35°F (2°C) Max. 110°F (43°C)

Average Shelf Life: 12 months (when stored in original, unopened, sealed containers).

Special Sensitivity: None.

Precautions to be Taken in Handling and Storage: None.

SECTION 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure Limits:			
	OSHA-PEL:	Glycerin (mist)	15 mg/m3 (TWA) Total dust
			5 mg/m3 (TWA) Respirable fraction
	ACGIH-TLV:	Glycerin (mist)	10 mg/m3 (TWA)

HMIS Hazard Code:			
	Health	2	
	Flammability	0	
	Reactivity	0	
	PPE	B	(Personal Protective Equipment) (B= safety glasses and gloves)

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SECTION 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION (continued)

Respiratory Protection: The use of respiratory protection should not be needed under normal use and handling conditions. If protection is chosen, an air purifying respirator, equipped with organic vapor cartridges, is appropriate.

Eye Protection: Safety glasses with side shields or goggles.

Protective Clothing: Chemical resistant butyl rubber, nitrile rubber, neoprene, or other suitable protective gloves.

Ventilation: Good general ventilation. For guidance on engineering controls refer to the ACGIH publication "Industrial Ventilation."

Other: Eyewash station and safety shower should be available. Refer to the "Recommendations for the Safe Use and Handling of Instapak® Foam-in-Place Chemicals" bulletin before handling Instapak® chemicals.

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

Physical State: Liquid
Color: Clear, straw
Odor: Slight amine
Vapor Density (Air = 1): > 1
Molecular Weight: Not applicable
Melting Point: 10°F (- 12°C)

Boiling Point: >201°F (94°C)
Vapor Pressure: Not established (low)
Specific Gravity: 1.07 at 25°C
Bulk Density: 8.9 lbs/gal
% Volatile by Volume: Nil
Solubility in Water: Soluble

SECTION 10 - STABILITY AND REACTIVITY

Stability: Stable.

Polymerization: Will not occur.

Conditions to Avoid: None.

Incompatible Materials: Contact with isocyanates, unless mixed at the proper ratio, should not occur.

Hazardous Decomposition Products: By fire or extreme heat, oxides of carbon and nitrogen.

SECTION 11 - TOXICOLOGICAL INFORMATION

Toxicity Data:		
	LD_{50} Oral:	Not Established
	LD_{50} Dermal:	Not Established
	LC_{50} Inhalation:	Not Established

Primary Route(s) of Exposure: Skin contact from liquid. Inhalation. However, overexposure is not expected under normal conditions.

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SECTION 11 - TOXICOLOGICAL INFORMATION (continued)

Inhalation: Vapors may be irritating if hot.

Skin Contact: Repeated contact may be irritating.

Eye Contact: Can cause eye irritation. Permanent corneal injury is unlikely.

Ingestion: Ingestion is unlikely. Large quantities could cause irritation of mouth and stomach.

Chronic Effects: No applicable data.

Carcinogenicity: The ingredients of this product (>0.1%) are not classified as carcinogenic by ACGIH or IARC, not regulated as carcinogens by OSHA, and not listed as carcinogens by NTP.

Mutagenicity: No applicable data.

Reproductive Effects: No applicable data.

Teratogenicity and Fetotoxicity: No applicable data.

SECTION 12 - ECOLOGICAL INFORMATION

No applicable data for this section.

SECTION 13 - DISPOSAL CONSIDERATIONS

Incinerate or dispose of in accordance with existing federal, state and local environmental control regulations. This material is not a hazardous waste under RCRA 40 CFR 261 when discarded in its purchased form. Also see "Recommendations for the Safe Use and Handling of Instapak® Foam-in-Place Chemicals" bulletin for additional information concerning disposal of wastes and empty containers. Chemical waste, regardless of quantity, should never be poured into drains, sewers or waterways.

SECTION 14 - TRANSPORT INFORMATION

DOT: Not regulated.

IMO: Not regulated.

IATA/ICAO Class: Not regulated.

Reportable Quantity (RQ): Not applicable.

This information is furnished without warranty, expressed or implied, except that it is accurate to the best knowledge of Sealed Air Corporation. The data on this sheet relates to the specific material designated. Sealed Air Corporation assumes no legal responsibility for use or reliance upon these data.

Sealed Air Corporation
Engineered Products Division
10 Old Sherman Tnpk., Danbury, CT 06810
(203) 791-3500 Fax: (203) 791-3618

SECTION 15 - REGULATORY INFORMATION

TSCA Status: All ingredients are listed or are not required to be listed.

CERCLA Status: Discarded product is not a hazardous waste under RCRA, 40 CFR 261, when disposed of in its purchased form.

SARA 302 Extremely Hazardous Substances: None.

SARA 311/312 Hazard Categories: Immediate (acute) Health Hazard.

SARA 313 Listed Ingredient(s): None.

SECTION 16 - OTHER INFORMATION

Other Regulations/Legislation which apply to this product: Pennsylvania Right-to-Know (1,2,3,-Propanetriol, CAS No. 56-81-5). Substances used to manufacture this product do not require listing under California, Massachusetts and New Jersey state regulations.

Section(s) Revised: Section 8 – Exposure Controls / Personal Protection, Section 16 – Other Information.

This information is furnished without warranty, expressed or implied, except that it is accurate to the best knowledge of Sealed Air Corporation. The data on this sheet relates to the specific material designated. Sealed Air Corporation assumes no legal responsibility for use or reliance upon these data.

After Katie Chung

5929

MATERIAL SAFETY DATA SHEET

EAGLE-PICHER MINERALS,

Ohio Chemical Services Inc
1066 KINNEAR ROAD
COLUMBUS, OHIO 43212
(614) 486-2488

PRODUCT CODES: 230130DEAG
150508DEAG
620910DZZZ

DATE ISSUED: November 18, 1985 DATE REVISED: November 1, 1997 REVISION NO: 6

SECTION I: MATERIAL IDENTIFICATION AND USE

MATERIAL NAME: Floor Dry, Super Fine, Celatom MP grades, Solid-A-Sorb I & II, Absorb-O-Sox (Filling)

MANUFACTURER'S NAME: Eagle-Picher Minerals, Inc.

STREET ADDRESS: 6110 Plumas

CITY: Reno STATE: Nevada ZIP: 89509

EMERGENCY TELEPHONE NO.: (702) 824-7600 CHEMICAL FORMULA: SiO2

CHEMICAL NAME: Diatomaceous Earth, calcined TRADE NAME: Celatom

CHEMICAL FAMILY: Silica MATERIAL USE: Absorbent, Filler

NFPA: 0 / 1 / 0 / -

4 - Extreme
3 - High
2 - Moderate
1 - Slight
0 - Insignificant

HMIS:
* Health
0 Flammability
0 Reactivity
E Protective Equipment
* REFER TO DATA ON MSDS

SECTION II: HAZARDOUS INGREDIENTS OF MATERIAL

INGREDIENT IDENTIFICATION	APPROXIMATE CONCENTRATION %	C.A.S. NUMBERS	OSHA PEL [ACGIH TLV]	LD50/ LC 50 SPECIES AND ROUTE
Diatomaceous Earth, calcined	100%	91053-39-3	See below	not available
Crystalline Silica (Cristobalite)	< 1%	14464-46-1	0.05 mg/m3 * [0.05 mg/m3]	not available
Crystalline Silica (Quartz)	<1%	14808-60-7	0.10 mg/m3	

For sampling silica dusts refer to NIOSH Analytical Method 7500 or OSHA method ID 142 (* Refer to OSHA Table Z-3)

SECTION III: PHYSICAL DATA FOR MATERIAL

PHYSICAL STATE: Solid	ODOR AND APPEARANCE: Tan to light pink granules		SPECIFIC GRAVITY: 2.2	BOILING POINT: Not Applicable
VAPOR PRESSURE (mm): Not Applicable	VAPOR DENSITY: Not Applicable	pH: 7 (10% Slurry)	SOLUBILITY/WATER: <2%	FREEZING POINT: Not Applicable

SECTION IV - FIRE AND EXPLOSION HAZARD OF MATERIAL

FLAMMABILITY: YES NO X IF YES, UNDER WHICH CONDITIONS

MEANS OF EXTINCTION: n/ap SPECIAL PROCEDURES: Not Applicable

SECTION V - HEALTH HAZARDS

Calcined diatomaceous earth (Kieselguhr) contains crystalline silica which is a known cause of silicosis, a progressive, sometimes fatal, lung disease. In a 1997 monograph (Volume 68, "Silica, Some Silicates, Coal Dust and Para-Aramid Fibrils"), the International Agency for Research on Cancer (IARC) has classified "inhaled crystalline silica from occupational sources" in Group 1 as a substance "carcinogenic to humans." In making the overall evaluation, the IARC Working Group noted that carcinogenicity in humans was not detected in all industrial circumstances studied.

Although the recent IARC determination was, in part, based on a 1992 study of diatomite workers, a 1996 follow-up which was issued by the University of Washington and Tulane University was not available to the Working Group. The follow-up study reported a Standardized Mortality Ratio (SMR) of 2.01 for non-malignant respiratory disease (NMRD) and an SMR of 1.29 for lung cancer when compared to national and regional populations. This is a reduction in the levels reported in the 1992 report (SMR=2.59 for NMRD and SMR=1.43 for lung cancer).

As noted in the 1992 study, relatively intense exposures to crystalline silica that occurred before the 1950's were probably the most important contributors to the excesses in NMRD and lung cancer. The 1996 report continues to support the conclusion that recent improvements in dust control in the industry appear to have abated any excess risk of silicosis or lung cancer in today's work environment. A soon to be published (1997) radiographic study also appears to support the fact that current occupational exposures and occupational exposure limits are adequate to prevent excess risks of developing silicosis from diatomaceous earth. A more detailed report discussing the IARC classification and the diatomite worker studies is available on request.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE

Pre-existing diseases of the upper respiratory tract and lung such as bronchitis, emphysema, and asthma

IMPORTANT HEALTH HAZARD DATA CONTINUES ON THE SECOND PAGE (BACK)

PAGE 2

MATERIAL NAME/ IDENTIFIER: Floor Dry, Super Fine, Celatom MP grades, Solid-A-Sorb I & II, Absorb-O-Sox (Filling)

5929

SECTION V - HEALTH HAZARDS CONT'D

ROUTE OF ENTRY: Inhalation (Chronic)

TARGET ORGANS: Lungs

EFFECTS OF ACUTE EXPOSURE TO PRODUCT: Upper respiratory irritant - May cause coughing or throat irritation

EFFECTS OF CHRONIC EXPOSURE TO PRODUCT:

Inhalation of crystalline silica dust in excess of the Threshold Limit Value (TLV) recommended by the American Conference of Governmental Industrial Hygienists (ACGIH) or in excess of the Permissible Exposure Limit (PEL) established by OSHA over an extended number of years may cause silicosis, a progressive sometimes fatal lung disease. Although silicosis is a non-cancerous lung disease, a 1992 study conducted by the University of Washington on certain diatomite workers, and a 1996 follow-up to this study, indicates that exposure to high concentrations of crystalline silica for many years may increase the potential risk of developing lung cancer. The 1996 follow-up study continues to support the findings of the 1992 study in that for those workers hired since 1960, no increase in lung cancer mortality risk was found. Consequently, maintainance of crystalline silica dust concentrations at or below levels specified by occupational standards setting agencies will minimize, if not eliminate, any potential excess risk of NMRD or lung cancer.

IARC - "Inhaled crystalline silica from occupational sources" - Group 1 - Carcinogenic to humans
NTP - "Silica, crystalline (respirable)" - "reasonably anticipated to be a carcinogen"
OSHA - Has not classified crystalline silica as a carcinogen

SECTION VI - REACTIVITY DATA

CHEMICAL STABILITY:

YES X NO

INCOMPATIBILITY TO OTHER SUBSTANCES YES X NO
IF YES, WHICH ONES? Hydrofluoric Acid
Products containing Silica may react violently with Hydrofluoric Acid

REACTIVITY AND UNDER WHAT CONDITIONS: Not Applicable

HAZARDOUS DECOMPOSITION PRODUCTS: Not Applicable

SECTION VII - PRECAUTIONS FOR SAFE HANDLING AND USE

PERSONAL PROTECTIVE EQUIPMENT:

Bureau of Mines or NIOSH approved respirators for protection against pneumoconiosis producing dusts recommended when dust is present. If the dust concentration is less than ten (10) times the Permissible Exposure Limit (PEL) use quarter or half mask respirator with replacement dust filter or single use dust respirator approved for silica containing dusts. If dust concentration is greater than ten (10) times and less than one hundred (100) times the PEL use full faceplate respirator with replacable dust filter; if greater than one hundred (100) and less than two hundred (200) times the PEL use power air-purifying (positive pressure) respirator with replacable filter; if greater than two hundred (200) times the PEL use type C, supplied-air respirator, continuous flow type (positive pressure), with full facepiece, hood, or helmet.

GLOVES: Not normally necessary RESPIRATORY: Note Above EYE: Goggles to protect from dust

FOOTWEAR: Not necessary CLOTHING: Not normally necessary

ENGINEERING CONTROLS (E.G. VENTILATION, ENCLOSED PROCESS,): Local - Control within recommended TLV/PEL. Refer to ACGIH publication "Industrial Ventilation" or similar publications for design of ventilation systems.

LEAK AND SPILL PROCEDURE: Vacuum clean spillage, wet sweep or wash away. Avoid creating dust.

WASTE DISPOSAL: Non-Biodegradable. Use solid waste disposal common to landfill type operations or in slurry to sumps. Not considered a hazardous waste under RCRA (40CFR Part 261)

HANDLING PROCEDURES: Avoid creating dust. Repair or properly dispose of broken bags

STORAGE REQUIREMENTS: Store in a dry place to maintain product quality.

SPECIAL SHIPPING INSTRUCTIONS: None

SECTION VIII - FIRST AID MEASURES

SKIN: Not absorbed by the skin. May cause dryness. Use moisture renewing lotions if dryness occurs.

EYE: May cause irritation or inflammation. Wash with generous quantities of water. Consult physician if irritation persists.

INHALATION: Acute inhalation can cause dryness of the nasal passages and congestion of the upper respiratory tract. Remove to fresh air.

INGESTION: Short-term exposure not considered harmful. Drink generous amonts of water to reduce bulk and drying effects

SECTION IX - PREPARATION DATE OF M.S.D.S.

PREPARED BY: Patrick T. Flynn, Jr.

TITLE Director - Government Affairs

PHONE NUMBER: (702) 824-7650

DATE November 1, 1997

RUST FEDERAL SERVICES OF HANFORD, INC.
GENERATOR & WASTE ACCEPTANCE SERVICES

PREDETERMINATION REPORT

REQUEST #: 28497

DATE: October 17, 1996

Mandy (509) 372-0713

SUBJECT:	PRODUCT PREDETERMINATION		
TO:	James Eide	COMPANY:	BCLDF
PHONE:	(614) 424-3785	ADDRESS:	505 King Ave, Columbus, Ohio 43201
FACILITY:	Building JN-3	MSIN:	
ANALYST:	Jeanie M Votava	MSIN: T3-05	PHONE: 372-1145
REVIEWER:	Robert R. Ellis		
cc:			

This waste predetermination is based on the MSDS information for products/materials listed in the predetermination request and was performed according to current state and Federal law (WAC 173-303 and 40 CFR 261). For questions or comments, please contact the Generator & Waste Acceptance Services analyst above and reference the request #. Thank you for your interest in waste predetermination.

REFURBISHED

Item #	MSDS #	Product/Material	Unused Product	Used Product	Empty Container	Rags with 10% Product	Possible Waste Code
1	75097	Epoxy resin-waterborne	Y	Y	N	Y	WT02*
2	75083	Polyamine resin-waterborne	Y	Y	N	Y	WT02, D001
3							
4							
5							
6							
7							
8							

Comments: * DOT Combustible Per. Mandy 10-22-96 3:00 pm if mixed, cured, and dry it will be NR. Duty

DISCLAIMER

This predetermination is based on accurate information provided. Predeterminations are performed to assist generators in selecting less hazardous products. Since solid waste regulations are subject to constant revision, waste codes may change without notice. Waste designations must be performed on site by Generator & Waste Acceptance Services to assure proper approval in the event products are spilled or contaminated during a waste manifest.

5929

Project Number _____

Battelle
... Putting Technology To Work

Internal Distribution

S. Schmucker

Date October 4, 1996

To M. Pascual, Fluor Daniel

From J. Eide, BCLDP

Subject PRODUCT PREDETERMINATION

Mandy,

Please do a predetermination report on the enclosed two Rust-Oleum Corporation MSDS's. The two products are:

1. Epoxy resin-waterbase 75097
2. Polyamine resin-waterbase 75083

These products would be used to coat for contamination control, a controlled area floor at the West Jefferson facility. The Waste Certification System ID# is 100-00, 101-00.

If you have any questions, please contact me at (614)424-3785 or Steve Schmucker at (614)424-3314.

Thank you.

James H. Eide

James H. Eide
BCLDP
Manager, Waste Management and Transportation

MATERIAL SAFETY DATA SHEET (MSDS)

Please retain for your records.

MATERIAL SAFETY DATA SHEET 75097
6A405-6A414

For Coatings, Resins and Related Materials

SECTION I - PRODUCT AND PREPARATION INFORMATION
MANUFACTURER: RUST-OLEUM CORPORATION
ADDRESS: 11 Hawthorn Parkway, Vernon Hills, IL 60061
EMERGENCY AND INFORMATION TELEPHONE: (708) 367-7700

PRODUCT CLASS: Epoxy Resin-Waterbase
MANUFACTURERS CODE: 5323,5331,5343,5368,5369,5371,5379,5381,5382,5392
TRADE NAME: Water-Based Epoxy
DATE OF PREPARATION: February 11, 1993 (rwh)

SECTION II - HAZARDOUS INGREDIENTS

INGREDIENT/CAS NO	WT%	EXPOSURE LIMITS ACGIH-TLV	OSHA-PEL	LEL	mmHg@20C
Epoxy resin/ **	20-30%*	25ppm***	NE	NA	NA
2-Propoxyethanol/2807-30-9	5-10%*	25ppm***	NE	1.3%	1.3
Oil Sol 10/64742-95-6	2-3%	NE	100ppm	1.0%	5.0

**Supplier's trade secret
*Nearest 5%
***Supplier's recommendation
NE-not established NA-not applicable

SECTION III - PHYSICAL DATA
Boiling range: 212-350 F (100-177 C)
Evaporation Rate (Ether=1): Slower
Vapor density: Heavier than air
% Volatile (by volume): 61-65%
Wt/gal: 10.1 - 11.4 lbs
pH: 7.8-8.9

SECTION IV - FIRE AND EXPLOSION HAZARDS
Flammability Classification: OSHA Class II Combustible Liquid
Flashpoint: 141 F (Seta)
DOT Classification: Combustible Liquid
Extinguishing Media:
NFPA Class B extinguishers (Carbon dioxide, dry chemical or foam)
Special Fire Fighting Procedures:
Full protective equipment including self-contained breathing apparatus, should be used. Water spray may be ineffective. Water may be used to cool closed containers to prevent pressure build-up and possible autoignition or explosion. If water is used, fog nozzles are preferred.
Unusual Fire and Explosion Hazards:
Keep containers tightly closed. Isolate from heat, electrical equipment, sparks, and open flame. Closed containers may explode when exposed to extreme heat. DO NOT apply to hot surfaces.

SECTION V - HEALTH HAZARD DATA
Effects of Overexposure:
Acute (Inhalation):
Harmful if inhaled. May affect the brain and nervous system causing dizziness, headache or nausea. Repeated overexposures may lead progressively to staggering gait, confusion, unconsciousness or coma. Causes nose and throat irritation.
Acute (Skin or Eye Contact):
Causes eye and skin irritation which may lead to dermatitis with repeated overexposures. Epoxy resin may cause allergic skin reaction resulting in rash, hives, itching or swelling.
Ingestion:
Gastrointestinal irritation, nausea, vomiting and diarrhea.
Chronic:
Reports have associated repeated and prolonged occupational overexposure to solvents with permanent brain and nervous system damage. Contains solvents which may cause injury to bone marrow and blood cells with repeated overexposure.

Emergency and First Aid Procedures:
Fumes:
Remove from exposure, restore breathing and notify a physician.
Spray (eyes):
Flush immediately with large amounts of water for at least 15 minutes. Notify a physician.
Splash (skin):
Wash affected area with soap and water, remove contaminated clothing and wash before reuse. If allergy develops, contact a physician and have MSDS information available.
Ingestion:
Dilute stomach contents with 2 glasses of water and induce vomiting by either giving Ipecac syrup or by placing 2 finger at back of throat. NEVER give anything by mouth to an unconscious person. Notify a physician.

SECTION VI - REACTIVITY DATA
Stability: Stable
Incompatible:
Not Applicable
Hazardous Decomposition Products:
By flame-Carbon monoxide and Carbon dioxide
Hazardous Polymerization: Will Not Occur

SECTION VII - SPILL OR LEAK PROCEDURES
Release or Spill Procedures:
Remove all sources of ignition, ventilate area and remove with inert absorbent and nonsparking tools. Wash spill area with water and flush to sewer serviced by wastewater treatment facility.
Waste Disposal Method:
Dispose of according to local, state and federal regulations.

SECTION VIII - SPECIAL PROTECTION INFORMATION
Respiratory Protection:
Use NIOSH approved chemical cartridge respirator (TC23C) to remove solid airborne particles of overspray and organic vapors during spray application. In Confined Areas: Use NIOSH approved supplied-air respirators or hoods (TC19C).
Eye Protection:
Use safety eyewear designed to protect against splash of liquids.
Other Protective Equipment:
Use gloves to prevent absorption through the skin.
Ventilation:
Provide general dilution or local exhaust ventilation in volume and pattern to keep TLV of hazardous ingredients below acceptable limits.

SECTION IX - SPECIAL PRECAUTIONS
Handling/Storage Precautions:
KEEP FROM FREEZING. Store large quantities in buildings designed and protected for storage of NFPA Class II Combustible liquids. Empty containers may be hazardous.
CALIFORNIA PROPOSITION 65 STATEMENT:
These products are not known to contain any chemicals known to the State of California to cause cancer, birth defects or other reproductive harm.

MATERIAL SAFETY DATA SHEET (MSDS)

Please retain for your records.

5929

MATERIAL SAFETY DATA SHEET

75083
6A403,5A229

For Coatings, Resins and Related Materials.

SECTION I - PRODUCT AND PREPARATION INFORMATION
MANUFACTURER: RUST-OLEUM CORPORATION
ADDRESS: 11 Hawthorn Parkway, Vernon Hills, IL 60061
EMERGENCY AND INFORMATION TELEPHONE: (708) 367-7700

PRODUCT CLASS: Polyamine Resin-Waterbase
MANUFACTURERS CODE: 5301 and 6001
TRADE NAME: Activators
DATE OF PREPARATION: October 25, 1993 (rwh/amb)

SECTION II - HAZARDOUS INGREDIENTS

INGREDIENT/CAS NO	WT%	EXPOSURE LIMITS ACGIH-TLV	OSHA-PEL	LEL	amlig@20C
Polyethylene polyamine/ **	50%*	25ppm***	NE	NA	NA
2-Propoxyethanol/2807-30-9	35%*	25ppm***	NE	1.3%	1.3

**Supplier's trade secret
*Nearest 5%
***Supplier's recommendation
NE-not established NA-not applicable

SECTION III - PHYSICAL DATA
Boiling range: 212-308 F (100-153 C)
Evaporation Rate (Ether-1): Slower
Vapor density: Heavier than air
% Volatile (by volume): 51%
Wt/gal: 8.8 lbs.
pH: 8.4

SECTION IV - FIRE AND EXPLOSION HAZARDS
Flammability Classification: OSHA Class II Combustible liquid
Flashpoint: 137 F (Seta)
DOT Classification: Flammable liquid 3 PgIII
Extinguishing Media:
NFPA Class B extinguishers (Carbon dioxide, dry chemical or foam)
Special Fire Fighting Procedures:
Full protective equipment including self-contained breathing apparatus should be used. Water spray may be ineffective. Water may be used to cool closed containers to prevent pressure build-up and possible autoignition or explosion. If water is used, fog nozzles are preferred.
Unusual Fire and Explosion Hazards:
Keep containers tightly closed. Isolate from heat, electrical equipment, sparks and open flame. Closed containers may explode when exposed to extreme heat. DO NOT apply to hot surfaces.

SECTION V - HEALTH HAZARD DATA
Effects of Overexposure:
Acute (Inhalation):
Harmful if inhaled. May affect the brain or nervous system causing dizziness, headache or nausea. Repeated overexposures may lead progressively to staggering gait, confusion, unconsciousness or coma. Causes nose and throat irritation.
Acute (Skin or Eye Contact):
Causes eye and skin irritation which can lead to dermatitis with repeated overexposures. May cause allergic skin reaction resulting in rash, hives, itching or swelling
Ingestion:
Causes gastrointestinal irritation, nausea, vomiting and diarrhea.
Chronic:
Reports have associated repeated and prolonged occupational overexposure to solvents with permanent brain and nervous system damage. Contains solvents which may cause injury to bone marrow and blood cells with repeated overexposures.

Emergency and First Aid Procedures:
Fumes:
Remove from exposure, restore breathing and notify a physician.
Spray (eyes):
Flush immediately with large amounts of water for at least 15 minutes. Notify a physician.
Splash (skin):
Wash affected area with soap and water, remove contaminated clothing and wash before reuse. If allergy develops, contact a physician and have MSDS information available.
Ingestion:
Dilute stomach contents with 2 glasses of water and induce vomiting by either giving Ipecac syrup or by placing 2 fingers at back of throat. NEVER give anything by mouth to an unconscious person. Notify a physician.

SECTION VI - REACTIVITY DATA
Stability: Stable
Incompatible:
With strong oxidizing agents
Hazardous Decomposition Products:
By open flame- Carbon monoxide and Carbon dioxide.
Hazardous Polymerization: Will Not Occur

SECTION VII - SPILL OR LEAK PROCEDURES
Release or Spill Procedures:
Remove all sources of ignition, ventilate area and remove with inert absorbent and non-sparking tools
Waste Disposal Method:
Dispose of according to local, state and federal regulations. DO NOT incinerate closed containers.

SECTION VIII - SPECIAL PROTECTION INFORMATION
Respiratory Protection:
Use NIOSH approved chemical cartridge respirator (TC23C) to remove solid airborne particles of overspray and organic vapors during spray application. IN CONFINED AREAS: Use NIOSH approved supplied-air respirators or hoods (TC19C).
Eye Protection:
Use safety eyewear designed to protect against splash of liquids.
Other Protective Equipment:
Use gloves to prevent absorption through the skin.
Ventilation:
Provide general dilution or local exhaust ventilation in volume and pattern to keep TLV of hazardous ingredients below acceptable limit.

SECTION IX - SPECIAL PRECAUTIONS AND REGULATORY ISSUES
Handling/Storage Precautions:
KEEP FROM FREEZING. Store large quantities in buildings designed and protected for storage of NFPA Class II Combustible liquids. Empty containers may be hazardous.

CALIFORNIA PROPOSITION 65 STATEMENT:
This product is not known to contain any chemical known to the State of California to cause cancer, birth defects or other reproductive harm.

5929

SANCHEM, INC.

1600 SOUTH CANAL STREET • CHICAGO, ILLINOIS 60616-1199 • TELEPHONE 312/733-6111

FAX # 312-733-7432

BARTLETT STRIPCOAT TLC FREE

LOT # 4228

Total Sulfur:	28.2
Total Chloride:	3.0
Total Flouride:	<1.0
Total Heavy Metals:	36.0

The Heavy Metals by Metal Were:

Lead:	< 1.0
Mercury:	1.0 ppb
Zinc:	30.2
Tin:	< 1.0
Cadmium:	< 1.0
Copper:	< 2.8
Total Bromine:	< 1.0
Total Iodine:	< 3.0
Nitrite:	< 5.0
Nitrate:	< 5.0
Indium:	< 1.0
Silver:	< 1.0
Arsenic:	< 1.0
Bismuth:	< 1.0
Gallium:	< 1.0
Antimony:	< 1.0
Phosphorus	160

Concentration in ppm unless otherwise noted

SIGNED: John W. Bebber

"Trust Us For Anti-Rust"

BARTLETT SERVICES INC.

TLC STRIPCOAT FREE

Certificate of Conformance

CUSTOMER PURCHASE ORDER NO. 138878

Customer Name: BAtelle Memorial Inst.

Address: 1425 Plains City
Georgesville Road State Rd.142
West Jefferson, oHio 43162

Attention:

Item No	Quantity	DESCRIPTION / UNITS	LOT NUMBER
1	32 x 5gal	TLC Free	4228
2			
3			
4			
5			

The items listed herein conform to Sanchem Inc. product formulations and product process specifications. The items in this shipment are in strict compliance with your purchase order listed above. All required documentation, Material Safety Data Sheets and any necessary analytical documentation is enclosed with this shipment.

The items listed herein have been procured and shipped in compliance with the Bartlett Services, Inc. Quality Assurance Program.

Sanchem, Inc. Representative

Revision 2

5929

Material Safety Data Sheet

May be used to comply with OSHA's Hazard Communication Standard, 29 CFR 1910.1200. Standard must be consulted for specific requirements.

U.S. Department of Labor
Occupational Safety and Health Administration
(Non-Mandatory Form)
Form Approved
OMB No. 1218-0072

PO# 13878

IDENTITY (As Used on Label and List)
Bartlett Stripcoat TLC Free

Note: Blank spaces are not permitted. If any item is not applicable, or no information is available, the space must be marked to indicate that.

Section I

Lot# 4228

Manufacturer's Name Sanchem Inc	Emergency Telephone Number
Address (Number, Street, City, State, and ZIP Code) 1600 S. Canal Street	Telephone Number for Information 312-733-6100
Chicago, Il 60616	Date Prepared 4/12/96
	Signature of Preparer (optional)

Section II — Hazardous Ingredients/Identity Information

Hazardous Components (Specific Chemical Identity; Common Name(s))	OSHA PEL	ACGIH TLV	Other Limits Recommended	% (optional)
NONE				

Section III — Physical/Chemical Characteristics

Boiling Point	212°F	Specific Gravity (H_2O = 1)	0.95
Vapor Pressure (mm Hg.) Same As Water		Melting Point	
Vapor Density (AIR = 1) Same As Water		Evaporation Rate (Butyl Acetate = 1) Same As Water	
Solubility in Water Forms Dispersion in Water			
Appearance and Odor Yellow Liquid			

Section IV — Fire and Explosion Hazard Data

Flash Point (Method Used) N/A	Flammable Limits	LEL N/A	UEL N/A
Extinguishing Media Will Not Burn			
Special Fire Fighting Procedures N/A			
Unusual Fire and Explosion Hazards			

Section V — Reactivity Data

Stability	Unstable		Conditions to Avoid
	Stable	X	Strong Acids

Incompatibility (*Materials to Avoid*): None Known

Hazardous Decomposition or Byproducts

Hazardous Polymerization	May Occur		Conditions to Avoid
	Will Not Occur	X	

Section VI — Health Hazard Data

Route(s) of Entry: Inhalation? X Skin? X Ingestion? X

Health Hazards (*Acute and Chronic*): None Known

Carcinogenicity: NTP? NO IARC Monographs? NO OSHA Regulated? NO

Signs and Symptoms of Exposure: May Casue Minor Skin Irritation

Medical Conditions Generally Aggravated by Exposure: None Known

Emergency and First Aid Procedures: Wash With Soap & Water

Section VII — Precautions for Safe Handling and Use

Steps to Be Taken in Case Material Is Released or Spilled

Absorb With Strong Abosrbing Material & Scoop Up
Store in Sealed Drums

Waste Disposal Method

Sanitary Land Fill

Precautions to Be Taken in Handling and Storing

Do Not Freeze

Other Precautions

None

Section VIII — Control Measures

Respiratory Protection (*Specify Type*)

Ventilation	Local Exhaust	Required	Special	N/A
	Mechanical (*General*)	Required	Other	N/A

Protective Gloves: Vinyl or Rubber | Eye Protection: Goggles

Other Protective Clothing or Equipment: Optional

Work/Hygienic Practices: Wash Hands Before Eating

5929

MATERIAL SAFETY DATA SHEET

KNIGHT'S

Knight Marketing Corporation
251 N. Comrie Ave.
Johnstown, NY 12095

Emergency # 1-800-477-7299
CHEMTREC # 1-800-424-9300
(518)762-4591/FAX (518)762-2566

SECTION I - PRODUCT INFORMATION

Revised: March 31, 1997

PRODUCT NAME: SPRAY NINE® 01

PRODUCT USE: Multi-Purpose germicidal cleaner

HMIS RATING HEALTH: 1 FLAMMABILITY: 0 REACTIVITY: 0 PERSONAL PROTECTION: B

NFPA RATING HEALTH: 1 FLAMMABILITY: 0 REACTIVITY: 0

SECTION II - HAZARDOUS INGREDIENT INFORMATION (29 CFR 1910.1200)

CHEMICAL NAME	CAS NUMBER	%	EXPOSURE LIMITS
n-Alkyl(60%C14,30%C16,5%C12,5%C18)dimethylbenzylammonium Chloride*	139-08-2	0.15	Not established
n-Alkyl(50%C12,30%C14,17%C16,3%C18)dimethylethylbenzylammonium Chloride*	27479-28-3	0.15	Not established

* Quaternary Ammonium Compounds (Active Ingredients for disinfection)

EXEMPTION STATEMENT: Spray Nine®, a registered disinfectant of Knight Marketing Corporation, is regulated by the Environmental Protection Agency (EPA) through the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA). For that reason, Spray Nine® is exempt from any further ingredient reporting requirements. The EPA registration number for Spray Nine® is 6659-3.

SECTION III - PHYSICAL AND CHEMICAL DATA

PHYSICAL STATE:	Liquid	APPEARANCE:	Transparent
ODOR:	Mild	pH:	12.76
EVAPORATION RATE (WATER=1):	>1	BOILING POINT:	~212°F
VAPOR DENSITY (air=1):	>1	VAPOR PRESSURE:	~18mm
SPECIFIC GRAVITY:	1.020	SOLUBILITY IN WATER:	Complete

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT AND METHOD:	None (TCC)
FLAMMABLE LIMITS:	Not applicable
EXTINGUISHING MEDIA:	Not applicable
SPECIAL FIRE FIGHTING PROCEDURES:	Not applicable
UNUSUAL FIRE AND EXPLOSION HAZARDS:	Not applicable

SECTION V - REACTIVITY HAZARD DATA

STABILITY:	Yes
INCOMPATIBILITY (Materials to Avoid):	Strong oxidizing agents
HAZARDOUS DECOMPOSITION PRODUCTS:	Not determined
HAZARDOUS POLYMERIZATION:	Will not occur

SECTION VI - CONTROL AND PROTECTIVE MEASURES

GLOVES:	The use of rubber gloves is recommended for prolonged use.
SAFETY GLASSES:	The use of safety glasses is recommended.
RESPIRATORY:	Not applicable
VENTILATION:	Adequate

SECTION VII - HEALTH HAZARD DATA

PRIMARY ROUTE OF ENTRY: Skin and Eye

EFFECTS OF ACUTE EXPOSURE: Toxicological Data:

Skin: May cause mild to moderate irritation. Primary irritation index score of 1.54 out of a possible 8. LD50: 32cc/kg (Rabbit). Relatively harmless.

Eye: Will sting and cause reversible irritation. Draize score of 20 out of a possible 110 (Rabbit,unwashed), clearing within 3 days with no cornea opacity and no damage to iris.

Oral: LD50: 13cc/kg (Rat). Practically non-toxic.

Inhalation: LC50>200 mg/l (Rat). Practically non-toxic.

EFFECTS OF CHRONIC EXPOSURE: None, based on ingredient safety data, supportive technical information and extensive product history (over 35 years).

MEDICAL CONDITIONS AGGRAVATED BY USE: Persons with pre-existing skin disorders or sensitivity may be more susceptible to irritation.

OTHER HEALTH HAZARDS (Carcinogenic, Mutagenic, Teratogenic): None, based on ingredient safety data, supportive technical information and extensive product history (over 35 years).

SECTION VIII - FIRST AID PROCEDURES

EYE: Flush immediately with water for 15 minutes. Contact physician.
SKIN: Flush with water for 15 minutes. Contact physician if irritation persists.
INHALATION: Not applicable.
INGESTION: Drink plenty of water. Contact physician immediately.

SECTION IX - STORAGE, SPILL AND DISPOSAL INFORMATION

LEAK AND SPILL PROCEDURE: Where possible, salvage product and use for cleaning only or use absorbent material to soak up spill. Thoroughly rinse with water. CAUTION: Area may be slippery.

STORAGE REQUIREMENTS: Avoid freezing or excessive heat. Keep container closed. Keep out of reach of children.

WASTE DISPOSAL: Wastes resulting from the use of this product may be disposed of on-site or at an approved waste disposal facility.

SECTION X - SHIPPING REGULATIONS

DOT: Non-regulated

SECTION XI - OTHER REGULATORY INFORMATION

SARA TITLE III: This product contains 1-5% of 2-Butoxyethanol(111-76-2) which is part of a chemical category (Glycol Ethers); therefore, reporting may be required under Section 313.

TSCA: All of the ingredients in this product are on the Toxic Substance Control Act (TSCA) inventory.

USDA: Spray Nine® is authorized by USDA for use in federally inspected meat and poultry plants.

SECTION XII - MSDS PREPARATION INFORMATION

SOURCES: Ingredient MSDS's, RTECS - NIOSH, The Merck Index, Clinical Toxicology of Commercial Products, The New York Public Health Fact Sheets, TLV's - ACGIH

PREPARED BY: Terry L. Bollbaugh DATE: 3/31/97

REVIEWED BY: Gary M. Greco DATE: 3/31/97

DISCLAIMER: This information contained herein is based on data we believe to be reliable as of the date of preparation of this Material Safety Data Sheet. The accuracy and completeness of such data are not warranted or guaranteed. We cannot anticipate all conditions under which this information and our products, or the products of other manufacturers in combination with our products may be used. We assume no liability or responsibility for loss or damage resulting from the improper or abnormal use or handling of our products, from incompatible product combinations, from the failure to follow instructions and warnings in the product's label and Material Safety Data Sheet, or from any failure to adhere to recommended practices.

5929

Date Prepared: 26 Aug 91
MSDS No: DIFWOL NC

ORANGE-SOL

MATERIAL SAFETY DATA SHEET

The Leader in Citrus Based Cleaning Technology

De-Solv-it®
INDUSTRIAL FORMULA W/O LANOLIN

De-Solv-it® is a registered trademark of Orange-Sol, Inc.

Section 1 PRODUCT & COMPANY IDENTIFICATION

Product Name: De-Solv-it® INDUSTRIAL FORMULA W/O LANOLIN.
Product Use: To clean and degrease for institutional and professional needs.
Chemical Name & Synonyms: Technical white oil and orange oil mixture.
Chemical Family: Hydrocarbon.
Manufacturer: Orange-Sol, Inc., 955 N. Fiesta Blvd., Suite #1, Gilbert, AZ 85234
For Information: 602/497-8822 (7am-4pm Mon-Fri MST)
In an Emergency: 602/497-8822 (7am-4pm Mon-Fri MST)

Section 2 COMPOSITION INFORMATION ON INGREDIENTS

A. Hazardous Components Product mixture (U.S. Patent RE# 29,649). The product has a flash point of 205°F (C.O.C.). No other hazards as per OSHA 29CFR 1910.1200. See Section 3 for product assessment.

B. Components: This section is considered confidential and is provided upon agreement for non-disclosure.

Section 3 HAZARDS IDENTIFICATION

Emergency Overview: Acute and prolonged exposure may cause dermatitis in a sensitive individual.
Primary Routes of Contact: Skin and oral.
Health Hazard:
- **Acute Exposure:**
  - **Vapor Inhalation:** Not considered a hazard.
  - **Eye:** Contact is non-irritating.
  - **Skin:** Ordinary contact with normal individuals is not considered hazardous.
  - **Ingestion:** If swallowed, may cause a laxative effect. Not considered hazardous.
- **Chronic Effects:**
  - **Eye:** None known.
  - **Skin:** None known.
  - **Ingestion:** None known.
  - **Vapor Inhalation:** Not considered hazardous.

Carcinogenicity Listings: NPT-None, IARC-None, OSHA-None, ACGIH-None.
Signs and Symptoms of Overexposure: None known in normal individuals.
Medical Conditions Aggravated by Exposure: Contact may aggravate dermatitis in sensitive individuals.

Section 4 FIRST AID PROCEDURES

Eye: Flush with water as needed.
Skin: Flush skin with water and remove soiled clothing and shoes.

Ingestion: In case of ingestion, do not induce vomiting. May be harmful or fatal if ingested into the lungs.
Inhalation: If the liquid is inhaled into the lungs, get immediate medical help. Otherwise no special requirements.

Section 5 FIRE AND EXPLOSION HAZARD

Flash Point: 205°F, C.O.C.
Auto Ignition: 675°F
Explosion Limits: Lel - 18%, Uel - unknown.
Extinguishing Media: Water fog, carbon dioxide, dry chemical, foam.
Unusual Fire and Explosion Hazard: May produce dense, black smoke.
Special Fire-Fighting Precautions: Stay upwind of a fire. Do not use streams of water. This may cause the scatter of burning liquid and thus spread a fire.
Fire-Fighting Equipment: Use self-contained breathing equipment in any closed area.

Section 6 ACCIDENTAL RELEASE MEASURES

If spilled, this product is not of significant or of immediate concern presenting little or no hazard.

For Small Spills: Absorb with dry sand or oil absorbent.
For Large Spills: Dike and recover uncontaminated product. Keep from entry into public water ways.
Waste Disposal Methods: The product is biodegradable. Dispose in a waste container or incinerate at an approved facility. Keep from public waterways.

Section 7 HANDLING AND STORAGE

Keep away from open flame or other ignition sources.

Section 8 EXPOSURE CONTROLS

Engineering Controls: Adequate general ventilation. Otherwise no special controls.
Personal Protection:
- **Ventilation:** Not required under normal conditions.
- **Respiratory:** No special requirements.
- **Eye Protection:** Not required.
- **Gloves:** Nitrile gloves recommended for a sensitive individual.
- **Ingestion:** Do not ingest.

Section 9 PHYSICAL & CHEMICAL PROPERTIES

Appearance: A liquid of orange color - citrus odor.
Vapor Pressure: 0.15 psi @ 68°F (20°C).
Specific Gravity: 0.799, 6.67 lbs/US Gallon
Solubility in Water: Negligible.
Boiling Point: (50%) 416°F
Viscosity: 1.73 cps
Vapor Density: (Air=1) 4.5
Evaporation Rate: (Butyl Acetate=1) 0.06
Pour Point: -60°F (ASTM-97). There is no true freezing point for this mixture of hydrocarbons.
Dielectric Strength: 50,000 volts.

Section 10 STABILITY & REACTIVITY

Stability: Stable.
Incompatibility: Avoid strong oxidizing agents.
Hazardous Decomposition: As with any other organic material, combustion will produce carbon dioxide and/or carbon monoxide.
Hazardous Polymerizations: Will not occur.

5929
592

Section 11 **TOXICITY TESTS** All test data available on request.

Tests:
Oral: LD_{50} > 17,750 mg/kg (> 16 ml/kg).
Inhalation: No toxic manifestations.
Draize Eye Irritation: Score 0.00
Primary Skin Irritation: Irritation index, 0.2 (low).
Muscle Tissue: No deleterious effects.
Irritancy of Product: Low primary skin irritation. No eye or inhalation effects.

Section 12 **ENVIRONMENTAL TESTS**

Fundulus heteroclitus, LC_{50}, 4 days - 2000 ppm.

Section 13 **TRANSPORTATION**

DOT Labelling: The combustible liquid n.o.s. label is exempt in containers under 110 gallons. Regulation 49CFR173.118A
Proper Shipping Name: Combustible liquid n.o.s.
Hazard Class: Combustible.
Identification Number: NA 1993, UN IAI/Z.80/10.03/91; USA/M4026/.82/1.09 MM

Section 14 **REGULATORY INFORMATION**

OSHA Compliance: MSDS prepared in accordance with 29CFR 1910.1200 to comply with the OSHA Hazard Communication Standard.
RCRA Characteristics: Waste Classification: Product has been evaluated for RCRA characteristics and does not meet criteria of a hazardous waste if discarded in its purchased form.
SARA Title III Superfund: The product in its purchased form is not regulated under the SARA hazard categories as per the EPA "Hazard Categories" under sections 311 and 312 of the Superfund Amendment and the Reauthorization Act of 1986 (SARA Title III).
CERCLA, State and Local Planning (Reportable Quantities): Not required.
State Right-To-Know Compliance:
Pennsylvania: No hazardous components.
Massachusetts: Not regulated.
New Jersey: No hazardous components.
California: Not regulated.

DATE OF PREPARATION

Prepared By: J.A. Gurney, PhD

Approved By: [signature]

Date: 8-26-91

Revision Date: 6-23-92

The information contained herein is furnished without warranty of any kind. Users should consider this data only as a supplement to other information gathered by them and must make independent determinations of suitability and completeness of information from all sources to assure proper use and disposal of these materials and the safety of employees and customers.