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Savannah River National Laboratory (SRNL) Evaluation of Absorbents for the TRU Remediation Project.

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Preface

This document constitutes the facility review for the use of Nochar, Inc. absorbents in the TRU remediation project taking place in F-wing of 773-A. This absorbent has been reviewed to meet such controls as that required by the Solid Waste Management Facility in the 1S Waste Acceptance Criteria Manual.. Controls for this activity are being reviewed and aligned against the facility Safety Basis for SRNL.

The WSRC Integrated Safety Management System (ISMS) ensures worker safety during waste operations.

The SRTC Waste Certification Plan ensures waste is managed and packaged in accordance with 1S Waste Acceptance Criteria, thus waste generated from activities outside the gloveboxes will be managed under this program.

Per DOE Manual 435.1 all waste generated at a DOE facility shall be characterized and managed per the order as Low Level, Transuranic, Mixed, or High Level Waste using a graded approach process.

All JCW generated in support of the TRU remediation project is expected to be Low Level Waste.

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1.0 Introduction

SRNL has been preparing to receive transuranic (TRU) waste drums from the Solid Waste Management Facility (SWMF) to aid in the remediation of Waste Acceptance Criteria prohibited items in SRS TRU waste drums. These prohibited items are primarily containerized liquids and aerosol cans which are easily identified using radiography. The remediation of these drums requires the use of an approved absorbent that is acceptable to the SWMF and Waste Isolation Pilot Plant (WIPP) for disposal. The goal of this document is to help establish guidelines that should be met to produce a final waste product that will be acceptable at the WIPP facility.

Sorbents used by industries to control liquid or recover liquid products can act as adsorbents, absorbents, or both. Absorption is defined as the retention of liquids inside the molecular structure of the material and adsorption as the retention of liquids on the surface of particles. Absorbents are generally preferred for site usage based on their ability to absorb many times their own weight, liquids are not easily squeezed out due to change in the ambient conditions, and they show little evaporation or leaching with change in temperature.

An ideal absorbent for this remediation work is one that stabilizes free liquids to the point that radiolysis, temperature, and settling does not cause release/reappearance of the liquid. Absorbents have already been reviewed extensively by Rocky Flats, F/H Laboratories, and SRNL for the SWMF. Results from these studies indicate that NOCHAR absorbents are the best immobilization agent for absorbing the liquids being remediated from the TRU waste streams. This document will support the use of NOCHAR absorbents in the 773-A facility for the TRU remediation work. It will also provide guidelines for the appropriate absorbing agent and communicate the most effective waste to bonding agent ratio.

2.0 Absorbent Pedigree

NOCHAR products are proprietary polymeric materials that are derived from various processing modifications of polypropylene and polyacrylates. These polymers are absorbents from which immobilized liquids can not be easily removed under varying sets of conditions. The absorbents have low sorbent volume: liquid volume ratios and have minimal volume change. These properties are ideal for remediation work where absorbed materials need to be packaged back into the parent drum.

The NOCHAR absorbents have been looked at extensively by the DOE Rocky Flats facility, SRS F/H Laboratories, and SRNL laboratory. The use of NOCHAR is also supported by the SWMF. The absorbents have passed characterization and certification for shipment and disposal at the WIPP facility in accordance with federal and state regulations. Independent studies have been completed with documented independent technical reviews on the use of NOCHAR absorbents. NOCHAR absorbent products have been previously recommended at SRS by SRNL's WPT group, to use for immobilization of liquids at SRS. In addition, NOCHAR has been approved by SWMF for use at the F/H laboratory for remediation of liquids in TRU waste drums.

3.0 Absorbent and Recommendations

Based on information provided as references for this document it is recommended that NOCHAR absorbents also be used for the TRU remediation project at SRNL. This decision aligns the SRNL facility

with common practices already in use at other DOE facilities, F/H Laboratory, and the Solid Waste Management Facility. This review supports the use of NOCHAR absorbents Petrobond A610 for organic matrixes and Acid Bond A660 for aqueous matrixes. These absorbents have been found to be chemically compatible with the types of liquid waste matrixes found in the SRS TRU waste streams targeted for remediation. However, the following recommendations are made based on the information reviewed for this document. Recommendations for these streams are done so in conjunction with attachment 1.

- Liquid reactivity should be tested prior to adding absorbent.
- A visual inspection should be performed on phase separation to determine if you have an aqueous/organic mixture. If so a combination of absorbents A610 and A660 shall be used.
- If pH reading is acidic, neutralize the liquid before absorption.
- Provide and post operator aid for absorbent selection and usage.
- A strong ammonia smell may be evident when solidifying basic liquids. (pH>9)

It should be noted that Acid Bond A660 and Petrobond A610 are less effective at a low pH. Most acids if not adjusted to greater than a pH of 5 can dramatically effect the volume ratios used for absorption..

4.0 Absorbent Usage

Care should be taken to properly absorb liquid being remediated in the TRU waste containers.. Failure to properly absorb free liquid, thus aiding in its reappearance, could subsequently cause a drum to fail WIPP certification at the SWMF a second time. Such an event could cause other drums to have to be reworked.

Use of NOCHAR absorbents should be done utilizing a table similar to that of F/H laboratories for use of the absorbent (Attachment 1). The minimal and most effective waste volume to absorbent volume ratio has been found to be 3:1. This is the recommended ratio based on the technical review provided by this document. This ratio is based on the best available data and is being utilized by similar remediation programs. It should be noted that the person performing the solidifications should use judgment to add more absorbent as needed. The SRNL facility will use a 1:1 waste volume to absorbent ratio to account for any error in complete absorption made by the worker. This presence of excess absorbent should not have an effect on the overall working time and should provide assurance that all remediated liquids are adequately absorbed.

Informal experimentation has shown that both Acid Bond and Petrobond are effective for solidification of liquids when used in the correct ratios. Mixing of the absorbent and liquid is generally not necessary except when a viscous liquid is being added to dry bonding agent. In this case a crust layer may form over the top preventing reaction of the rest of the liquid with the bonding agent. Normal mixing will not require any vigorous mixing but special attention should be given to ensure complete absorption.

6.0 Conclusions

The use of NOCHAR absorbents Acid Bond A660 and Petrobond A610 meets the expectations of the parties involved with repackaging TRU waste at the SRNL facility. These absorbents meet the approval of the SWMF, which is WIPP certified for shipment of TRU waste. The recommendations from this document along with any lessons learned form F/H laboratories should be used to develop a solidification

program for free liquids received in the candidate drums form Solid Waste. This document is in agreement with other conclusions made concerning NOCHAR absorbents at DOE facilities.

5.0 Other Absorbent Documents and Sources

1. Chemical Compatibility Review of Nochar Absorbents for F/H Laboratories TRU Repack, WSRC-TR-2005-00389.
2. Nochar Inc., www.Nochar.com

6.0 References

1. SRS Waste Acceptance Criteria Manual (1S)
 2. CCP-AK-SRS-3, Central Characterization Project Acceptable Knowledge Summary Report For Savannah River Site Waste Streams: SR-W026-221F-HET, SR-W026-221F-HOM, SR-W026, 221F-HEPA, Rev 3, November 12, 2004.
 3. CCP-AK-SRS-5, Central Characterization Project Acceptable Knowledge Summary Report For Savannah River Site Waste Streams: SR-W026-772F-HET, Revision 2, November 16, 2004
 4. CCP-AK-SRS-4, Central Characterization Project Acceptable Knowledge Summary Report For Savannah River Site Waste Streams: SR-W027-221H-HET, SRW027-221H-HEPA, SR-T001-221H-HEPA, SR-W027-HBL-BOX, Revision 3, November 18, 2004.
 5. CCP-AK-SRS-2, Central Characterization Project Acceptable Knowledge Summary Report For Savannah River Site: SR-W027-FB-Pre86-C, Revision 6, and November 23, 2004.
 6. CCP-AK-SRS-6, Central Characterization Project Acceptable Knowledge Summary Report For Savannah River Site Building 235-F Transuranic Debris Waste Stream SR-W027-235F-HET, Revision 1, November 17, 2004
 7. CCP-AK-SRS-1, Central Characterization Project Acceptable Knowledge Summary Report For Savannah River Site Waste Streams: SRW027-221F-HET-A, HET-C-D, HET-E, Revision 11, November 12, 2004
 8. Rocky Flats Environmental Technology Site, PRO-1582-PQP/PQR REVISION 0, Aqueous and Oil/Organic Liquid TRU Waste Solidification Method Test Plan and Report
 9. WSRC-2001-00966, Evaluation of Absorbents for Compatibility with Site Generated Hazardous and Mixed Liquid Wastes
 10. OBU-TRU-2005-00087, Evaluation of Rocky Flats Data on Testing of NOCHAR Absorbents of Liquids in TRU Waste.
 11. SP-FH A&OL-05-006, NOCHAR Absorbent For Use On Acidic, Basic and Organic Liquids
 12. CBU-TSL-2005-00064, NOCHAR Absorbent Demonstration for F/H Laboratories TRU Repack Use
 13. WSRC-TR-2005-00389, Chemical Compatibility Review of Nochar absorbent for F/H Laboratories TRU Repack Use.
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Attachment 1

Absorbent Selection for TRU Containerized Liquids

