memorandum

DATE: NOV 16 2017

REPLY TO ATTN OF: CBFO:ONTP:NCD:JRS:PG:17-2379:UFC 5900.00

SUBJECT: Approval of the Basis of Knowledge Criteria Evaluation for Waste Stream BNINW216 (Lot 1) from the AMWTP

TO: James Malmo, DOE-ID

The Carlsbad Field Office (CBFO) has reviewed and is providing approval of the subject Basis of Knowledge (BoK) criteria evaluation for waste stream BNINW216 (Lot 1) that is certified but not shipped to the Waste Isolation Pilot Plant (WIPP). The BoK Review Board convened on September 28, 2017 to determine whether the subject waste stream containers meet the criteria in DOE/WIPP-17-3589, Revision 0, Basis of Knowledge for Evaluation Oxidizing Chemicals in TRU Waste. The BoK Review Board conducted an interactive review with you and representatives from your office. During the interactive review your staff walked the BoK Review Board through revised Chemical Compatibility Evaluation and the BoK evaluation, answered questions posed by the Board and its advisors, and responded to comments by the BoK Review Board. All comments from the BoK Review Board members were satisfactorily addressed during the course of the interactive review, and are accurately reflected in re-submittal of the subject documents. The minutes and evaluation from the BoK Review Board meeting are enclosed.

Sincerely,

[Signature]
J. R. Stroble, Director
Office of the National TRU Program
Compliance Division

Jeffrey M. Carswell
CBFO Senior Technical Safety Manager

Enclosure:
cc: w/enclosure

J. Carswell, CBFO * ED
G. Basabillvazo, CBFO ED
G. Birge, CBFO ED
M. Brown, CBFO ED
T. Carver, CBFO ED
N. Castaneda, CBFO ED
H. Cruickshank, CBFO ED
C. Fesmire, CBFO ED
W. Mackie, CBFO ED
S. Foster, CBFO ED
S. Hunt, CBFO ED
C. Peterson, CBFO ED
D. Miehls, CBFO ED
D. Standiford, CBFO ED
K. Watson, CBFO ED
D. Pruitt, DOE-ID ED
J. Viet, DOE-ID ED
E. Espinosa, EM ED
M. Pearcy, NWP ED
G. Byram, ICP ED
C. Dennert, ICP ED
J. McCoy, ICP ED
G. Tedford, ICP ED
R. Wells, ICP ED
R. Lee, NWP ED
M. Ramirez, NWP ED
V. Baliew, NWP ED
J. Biedscheid, NWP ED
L. Burns, NWP ED
J. Carter, NWP ED
M. Devarakonda, NWP ED
T. Groover, NWP ED
C. Hatch, NWP ED
A. Johnson, NWP ED
R. Kantrowitz, NWP ED
J. Knox, NWP ED
R. Martin, NWP ED
M. McDaniel, NWP ED
B. Pace, NWP ED
R. Reeves, NWP ED
B. Schrock, NWP ED
T. Sellmer, NWP ED
C. Simmons, NWP ED
C. Soaterna, NWP ED
J. Stepzinski, NWP ED
L. Turner, NWP ED
D. Wade, NWP ED
M. Walentine, NWP ED
R. Chavez, RES ED
K. Licklitter, CTAC ED
P. Martinez, CTAC ED
M. Doherty, CTAC ED
N. Elkins, LANL-CO ED
T. Burns, LANL-CO ED
B. Crawford, LANL-CO ED
J. Trone, SNL ED
T. Greenwood, TechSpecs ED
E. Licklitter, TechSpecs ED
S. Gonzalez, TFE, Inc. ED
J. Madrid, TFE, Inc. ED
F. Ybarra, TFE, Inc. ED
Site Docs ED
WIPP Operating Record ED
CBFO M&RC ED

*ED denotes electronic distribution
<table>
<thead>
<tr>
<th>Basis of Knowledge Criterion</th>
<th>Analysis Provided</th>
<th>Adequate/Inadequate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>Watson requested that “Lot 1” be added to Section 1, Section 3 and the waste stream name in the checklist. Espinosa asked that the document number for the CCE be referenced in the introduction.</td>
<td>All Board Members agreed that the introduction provided was adequate.</td>
</tr>
<tr>
<td>5.1 Evaluating Oxidizing Chemicals using CBFO Form 3589-1</td>
<td>No criterion in this section.</td>
<td>All Board Members agreed.</td>
</tr>
<tr>
<td>5.2 Oxidizing chemical verification</td>
<td>The Board had several recommendations for clarifying text to this section and the checklist that were adopted.</td>
<td>All Board Members agreed that the evaluation provided was adequate.</td>
</tr>
<tr>
<td>5.3 Distribution of oxidizing chemicals within waste components</td>
<td>The Board had several recommendations for clarifying text to this section and the checklist that were adopted.</td>
<td>All Board Members agreed that the evaluation provided was adequate.</td>
</tr>
<tr>
<td>5.4 Neutralization of Oxidizing Acids, Bases, and Solutions</td>
<td>Minimal discussion from the Board.</td>
<td>All Board Members agreed that the evaluation provided was adequate.</td>
</tr>
<tr>
<td>5.5 Organic sorbents</td>
<td>No discussion from the Board.</td>
<td>All Board Members agreed that the evaluation provided was adequate.</td>
</tr>
<tr>
<td>5.5.1 Organic sorbents oxidizing chemicals</td>
<td>No discussion from the Board.</td>
<td>All Board Members agreed that the evaluation provided was adequate.</td>
</tr>
<tr>
<td>5.5.2 Organic rags, wipes, sorbent pads, and pillows</td>
<td>Minimal discussion from the Board.</td>
<td>All Board Members agreed that the evaluation provided was adequate.</td>
</tr>
<tr>
<td>5.5.3 Miscellaneous organic materials</td>
<td>The Board had several recommendations for clarifying text to this section and the checklist that were adopted.</td>
<td>All Board Members agreed that the evaluation provided was adequate.</td>
</tr>
<tr>
<td>5.6.1 Neutralization of Solutions Prior to Sorption with Inorganic Sorbents</td>
<td>Minimal discussion from the Board.</td>
<td>All Board Members agreed that the evaluation provided was adequate.</td>
</tr>
<tr>
<td>5.7 Mixtures of organic and inorganic materials with oxidizing chemicals</td>
<td>Minimal discussion from the Board.</td>
<td>All Board Members agreed that the evaluation provided was adequate.</td>
</tr>
<tr>
<td>5.8 Oxidizing chemicals that are the sole component of the waste</td>
<td>The Board had several recommendations for clarifying text to this section that were adopted.</td>
<td>All Board Members agreed that the evaluation provided was adequate.</td>
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<tr>
<td>5.9 Solid oxidizing chemicals not mixed with sorbents</td>
<td>Minimal discussion from the Board.</td>
<td>All Board Members agreed that the evaluation provided was adequate.</td>
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<tr>
<td>5.10 Oxidizing chemicals solidified in cement or grout</td>
<td>The Board had several recommendations for clarifying text to this section and</td>
<td>All Board Members agreed that the evaluation provided was adequate.</td>
</tr>
<tr>
<td>Basis of Knowledge Criterion</td>
<td>Analysis Provided</td>
<td>Adequate/Inadequate</td>
</tr>
<tr>
<td>-----------------------------------------------------------------</td>
<td>-----------------------------------------</td>
<td>-----------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>5.11 Surfaces contaminated with oxidizing chemicals</td>
<td>Minimal discussion from the Board.</td>
<td>All Board Members agreed that the evaluation provided was adequate.</td>
</tr>
<tr>
<td>5.12.1 Oxidizing chemicals spilled or released into soils</td>
<td>Minimal discussion from the Board.</td>
<td>All Board Members agreed that the evaluation provided was adequate.</td>
</tr>
<tr>
<td>5.12.2 Oxidizing chemicals in waste retrieved from earthen disposal pits</td>
<td>Minimal discussion from the Board.</td>
<td>All Board Members agreed that the evaluation provided was adequate.</td>
</tr>
<tr>
<td>Conclusion</td>
<td>No Discussion</td>
<td></td>
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</tbody>
</table>
BoK Review Board Meeting Minutes

September 19, 2017

Waste Stream: BNINW216 in WHB and BNINW216 Lot 1


JR called the meeting to order at 8:20 a.m.

This BoK Review Board meeting is being held to finalize the review of BNINW216 in the Waste Handling Building (WHB) and to assess BNINW216 Lot 1 waste stream, certified but not shipped.

The Board reviewed the changes to Section 5.4.2, 5.6, 5.8 and 5.9 in the final BNINW216 WHB BoK document. All Board Members concurred with the revisions.

JR called for a vote, Rick Yes, Kerry Yes, Edgard Yes, and JR Yes. Jeff was not present for this discussion, so the vote is pending his concurrence. Jeff joined the meeting and reviewed the changes. Jeff concurred with changes and votes Yes.

The Board then discussed an open action item related to the Chemical Compatibility Evaluation (CCE) for BNINW216. The open action was the result of a comment by LANL-CO requesting that AMWTP review AK summary report for this waste stream and determine if the chemicals listed were present in the waste stream. The Board agreed that AMWTP will respond to the comment with a summary of the methodology used to exclude chemicals from the CCE. This summary will be included in the minutes to this Review Board meeting, or will be sent out separately for review by the Board. CBFO will instruct AMWTP, in the BoK approval letter for BNINW216 WHB, to include this summary language in a revision to the CCE for the BNINW216. The approval letter will state that CBFO will not approve BoK’s for sub-populations of the BNINW216 waste stream until the CCE is revised to include the summary language.

The Board began review of the BoK for BNINW216 Lot 1. The Board reviewed the BoK to DOE/WIPP-17-3589, Revision 0. The AMWTP team discussed their comments on the BoK checklist. The group discussed the idea of only having a checklist in the future, and eliminating the BoK assessment report all together. The AMWTP team offered that the assessment report is useful at this point, but in the future the checklist will be sufficient.

The Board reviewed each section of the BoK for BNINW216 Lot 1 document and it’s companion section within the checklist.
1.0 Introduction.

Watson requested that “Lot 1” be added to Section 1, Section 3 and the waste stream name in the checklist. Espinosa asked that the document number for the CCE be referenced in the introduction.

Jeff called for a vote, J.R. Yes, Edgard Yes, Rick Yes, Kerry Yes, Jeff Yes.

2.0 Waste stream description

Minimal discussion by the Board.

Jeff called for a vote, J.R. Yes, Edgard Yes, Rick Yes, Kerry Yes, Jeff Yes.

3.0 Waste Included in this Assessment.

Minimal discussion by the Board.

Jeff called for a vote, J.R. Yes, Edgard Yes, Rick Yes, Kerry Yes, Jeff Yes.

4.0 Basis of knowledge criteria evaluation

The Board skipped past this section as it does not contain criteria.

Jeff called for a vote, J.R. Yes, Edgard Yes, Rick Yes, Kerry Yes, Jeff Yes

5.1 Evaluating oxidizing chemicals using CBFO Form 3589-1

The Board skipped past this section as it does not contain criteria.

Jeff called for a vote, J.R. Yes, Edgard Yes, Rick Yes, Kerry Yes, Jeff Yes

5.2 Oxidizing chemical verification

No changes from BoK section 5.1 for BNINW216 WHB containers. The Board discussed improvements to the wording of the checklist to avoid the appearance that checklist items were missed. Minor edits were made to section 5.2, and the checklist section 5.2 text having to do with Ammonium persulfate, Ferric chloride, and Sodium hypochlorite. Oxidizing chemicals of concern from section 5.2 were added to the introduction section of the checklist.

Jeff called for a vote, J.R. Yes, Edgard Yes, Rick Yes, Kerry Yes, Jeff Yes.

5.3 Distribution of oxidizing chemicals within waste components

No changes from BoK section 5.2 for BNINW216 WHB containers. The Board made minor edits to the text of section 5.3, and in the checklist section 5.3.

JR called for a vote, J.R. Yes, Edgard Yes, Rick Yes, Kerry Yes, Jeff Yes.

5.4 Neutralization of Oxidizing Acids, Bases, and Solutions
Minimal discussion from the Board on this section and the checklist.

**JR called for a vote, J.R. Yes, Edgard Yes, Rick Yes, Kerry Yes, Jeff Yes.**

### 5.5 Organic sorbents

No discussion from the Board on this section or the checklist.

**JR called for a vote, J.R. Yes, Edgard Yes, Rick Yes, Kerry Yes, Jeff Yes.**

#### 5.5.1 Organic sorbents with oxidizing chemicals

No discussion from the Board on this section or the checklist.

**JR called for a vote, J.R. Yes, Edgard Yes, Rick Yes, Kerry Yes, Jeff Yes.**

#### 5.5.2 Organic rags, wipes, sorbent pads, and pillows

Minimal discussion from the Board on this section and the checklist.

**JR called for a vote, J.R. Yes, Edgard Yes, Rick Yes, Kerry Yes, Jeff Yes.**

### 5.5.3 Miscellaneous organic materials

Discussion from the Board on this section and the checklist resulted in changes to the text in section 5.5.3 and in section 5.5.3 of the checklist.

**JR called for a vote, J.R. Yes, Edgard Yes, Rick Yes, Kerry Yes, Jeff Yes.**

#### 5.6.1 Oxidizing chemicals sorbed in inorganic sorbents

Minimal discussion from the Board on this section and the checklist.

Adding the cement calculation to 5.6.1 and added the sludge calculation in section 5.9.

See supplemental evaluation provided by BoK Board Member Kerry Watson documented in an email to Jeff Carswell dated 11.01.17.

**JR called for a vote, J.R. Yes, Edgard Yes, Rick Yes, Kerry Yes, Jeff Yes.**

### 5.7 Mixtures of organic and inorganic materials with oxidizing chemicals

Minimal discussion from the Board on this section and the checklist.

**JR called for a vote, J.R. Yes, Edgard Yes, Rick Yes, Kerry Yes, Jeff Yes.**

#### 5.8 Oxidizing chemicals that are the sole component of the waste

Discussion from the Board on this section and the checklist resulted in changes to the text in section 5.8.

**JR called for a vote, J.R. Yes, Edgard Yes, Rick Yes, Kerry Yes, Jeff Yes.**
5.9 Inorganic sludges with oxidizing chemicals not mixed with sorbents

Minimal discussion from the Board on this section and the checklist.

A sludge calculation was added to 5.9. but the bounding calculation exceeded the BoK oxidizer concentration due to too much conservatism in the calculation (i.e. 2M input concentration). The Board called Van Bynum to discuss the process used at RF. He is trying to locate some LANL or RF documents that would provide specific information on how much diatomite was used in the process. CCP has been asked if they can provide some additional information from the LANL process which is similar to the RF process. Additional source documents from RF were provided to allow a more accurate calculation to be completed which resulted in the sludge waste meeting the BoK limits under this section.

JR called for a vote, J.R. Yes, Edgard Yes, Rick Yes, Kerry Yes, Jeff Yes.

A formal vote was not called on this section. It was agreed that AMWTP would write up the final version of the BoK that would include a reference to the new source documents that underpin the calculation that demonstrates that the Lot 1 with the exception of 1 drum would pass this section of the BoK. It was agreed that this 1 drum would be set aside from the Lot 1 Bok.

5.10 Oxidizing chemicals solidified in a cement or grout matrix

Discussion from the Board on this section and the checklist resulted in proposed changes to the text in section 5.6.1 and 5.10. However the Board did not come to agreement on the changes. The review of this section will continue at the next meeting.

Meeting was adjourned. The BoK Review Board will reconvene Thursday September 21, 2017 to complete the review the BoK for BNINW216 Lot 1.

Meeting was reconvened by JR Stroble at 0830 on Sept 21, 2017. Restarted discussion on 5.6.1.

Attendees:

BoK Review Board Meeting Minutes

September 21, 2017

Waste Stream: BNINW216 Lot 1


JR called the meeting to order at 8:20 a.m.

This BoK Review Board meeting is being held to finalize the review of BNINW216 in the Waste Handling Building (WHB) and to assess BNINW216 Lot 1 waste stream, certified but not shipped.

5.10 Oxidizing chemicals solidified in a cement or grout matrix

Discussion from the Board on this section and the checklist resulted in changes to the text in section 5.6.1 and 5.10. The current text in section 5.6.1 assumes that all of the oxidizer is absorbed in the cement. A calculation assuming that all of the oxidizer is absorbed in the sludge was added as a bounding calculation.

JR called for a vote, J.R. Yes, Edgard Yes, Rick Yes, Kerry Yes, Jeff Yes.

5.11 Surfaces contaminated with oxidizing chemicals

Minimal discussion from the Board on this section and the checklist. Moved text from checklist section 5.5.3 to checklist section 5.11.

Jeff called for a vote, J.R. Yes, Edgard Yes, Rick Yes, Kerry Yes, Jeff Yes.

5.12.1 Oxidizing chemicals spilled or released into soils

Minimal discussion from the Board on this section and the checklist.

Jeff called for a vote, J.R. Yes, Edgard Yes, Rick Yes, Kerry Yes, Jeff Yes.

5.12.2 Oxidizing chemicals in waste retrieved from earthen disposal pits

Minimal discussion from the Board on this section and the checklist.

Jeff called for a vote, J.R. Yes, Edgard Yes, Rick Yes, Kerry Yes, Jeff Yes.

Conclusion

No Board discussion regarding the conclusion.
BoK Review Board

BNINW 216

Oct 2, 2017

8:30 a.m.

Attending: Jeff Carswell, J.R. Stroble, Kerry Watson, Rick Chavez (telecon), Edgard Espinosa (telecon), Tim Burns, Bev Crawford, Kenneth Lickliter, Ed Gulbransen (VTC), Clay Dennert (VTC), John McCoy (VTC), Richard Wells (VTC).

Jeff kicked off the meeting stating that we were going to use the Redline/Strikeout to walk through. There was discussion regarding the sequence of the Board Approval and it was agreed that the Board would approve the redline and then AMWTP would send back the finalized document and we would verify.

Jeff then went to Section 5.4.2 and Clay explained their new calculation to the Board. Clay explained that they used the worst-case-drum to do the calculation. Bev checked the calculation and said it appeared good. Rick asked for verification that this is the path forward agreed to in the last meeting and Clay verified that it was. Jeff called for a vote on 5.4.2 and it was unanimous.

Jeff asked them to walk the Board through the changes to Section 5.6. Clay briefed the Board and explained their revised evaluation. New references were provided. Bev checked the calculations and said they appeared good. Rick asked if these results were based upon the paper that was discussed with the Board during the last meeting and AMWTP concurred. Kerry asked why they focused on Sodium and didn’t address Potassium and Clay related that Sodium was used exclusively. Edgard had some language recommendations to the text that were adopted (clarified that the weight was the net weight of the drum). Jeff called for a vote on 5.6 and it was unanimous.

Jeff then asked them to explain Section 5.8. Clay explained their approach to the revision to the calculation. Kerry said that he agreed with the revisions. J.R. requested that some changes be made to the text and AMWTP agreed (blue text is to be deleted). Jeff called for a vote on 5.6 and it was unanimous.

Jeff related that the Board approves based upon the agreed to changes. The Redline/Strikeout reviewed today needs to be part of these minutes.

The CCE, AKA, and BoK for BNINW216 were not completed in accordance with procedures that had been screened by CBFO Nuclear Safety and USQ’d as appropriate (See CBFO QA CAR). The compensatory action required from the NTP Readiness Review Team is for the BoK Review Board, chaired by the Safety Basis Approval Authority (SBAA) to approve the documents. The BoK Review Board reviewed the CCE, AKA, and BoK for BNINW 216 waste in the WHB and agreed that the documents provided meet the necessary requirements. The process procedures are undergoing screening and the process will be approved by a CBFO QA surveillance performed at a future date.
Action. Kerry to provide a memorandum to the Board that shows the Board’s review and approval of the CCE and AKA.

BoK Review Board
BNINW 216 – Lot 1

Same present as above

The Board is reviewing RPT-1596 Rev.1

9:30 a.m.

The Board began with the Word Redline/Strikeout version. The final document will be 1598 Rev.0.

This lot is for a small population of drums in Idaho that are similar to the WHB containers.

The Board reconvened their review on Section 5.6. Clay explained their revisions and Bev checked the calculations. Bev recommended that saturated sodium nitrate should have the word “solution” after it and AMWTP agreed. Jeff called for a vote on 5.6 and it was unanimous.

Section 5.9. The same comment from Bev above applies here. Bev checked the calculations and said they were good. Make sure references are in the final version. Jeff called for a vote on 5.6 and it was unanimous.

Section 5.10. Jeff called for a vote on 5.6 and it was unanimous.

Section 5.11. Jeff/Kerry asked that clarifying language be added to identify the basis of the waste processing explanation. Jeff called for a vote on 5.6 and it was unanimous.

Action. NTP personnel to verify that a Section 7 is added for references.

The Board approves the subject documents against a procedure that has not been USQ reviewed. The USQ will be performed on MCP4015 prior to approving the waste stream.

Kerry and Jeff had questions regarding how they deal with containers that do not meet the BoK criteria. McCoy explained that they were figuring out what to do. Jeff recommended that they add a list of containers that did not pass.

The CCE, AKA, and BoK for BNINW216 were not completed in accordance with procedures that had been screened by CBFO Nuclear Safety and USQ’d as appropriate (See CBFO QA CAR). The compensatory action required from the NTP Readiness Review Team is for the BoK Review Board, chaired by the Safety Basis Approval Authority (SBAA) to approve the documents. The BoK Review Board Reviewed the CCE, AKA, and BoK for BNINW 216 Lot 1 waste and agreed that the documents provided meet the necessary requirements. The process procedures are undergoing screening and the process will be approved by a CBFO QA surveillance performed at a future date.
Jeff asked for any further questions and AMWTP asked if we needed to go through the BoK Checklist. Kerry said yes. Jeff said that the only real changes to the checklist were to Section 5.11 that were based upon changes to the write-up in the text. Jeff asked for any questions and the Board unanimously agreed.

The Redline/Strikeout version to be distributed to the Board for approval.

10:15 a.m. Conclusion

[Signature]

BoK Review Board Chairperson  Date

11/15/17
Basis of Knowledge Assessment Report for First and Second Stage Sludge [BNINW216] (Certified Not Shipped Lot 1)
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Attachment 1 CBFO Form 3589-1 DOE/WIPP-17-3589, Rev. 0 Acceptable Knowledge Checklist for Evaluating Oxidizing Chemicals in TRU Waste Using the Box Criteria ................................................................. 14
1. INTRODUCTION:

This document presents an evaluation of characterization data for waste stream BNINW216 (aqueous sludge wastes from Building 774) Lot 1, certified not shipped containers currently stored at the Advanced Mixed Waste Treatment Project (AMWTP). The evaluation criteria are set forth in the “Basis of Knowledge for Evaluating Oxidizing Chemicals in TRU Waste,” DOE/WIPP-17-3589, Rev. 0 (hereafter referred to as BoK). The purpose of this evaluation is to determine whether the targeted containers meet the specified criteria of the BoK for the treatment and management of oxidizing materials.

The BoK criteria focus on the physical and chemical contents of the waste stream as described in the approved Acceptable Knowledge Summary Report (AKSR) RPT-TRUW-09, “Acceptable Knowledge Summary for First/Second Stage Sludge (BNINW216),” and the Chemical Compatibility Evaluation memorandum CCN 319981 (CCE memo). The CCE memo provides a detailed analysis of the maximum quantity of chemicals and sorbents that can theoretically be present in any given container. The associated Acceptable Knowledge Assessment (AKA) provides information pertaining to the management, characterization, and packaging of the waste containers, with a description of the contents of each container. The CCE memo encompasses the entire waste stream. The approved CCE was considered for purposes of this BoK evaluation.

If BoK criteria have not been met or available information cannot demonstrate that the criteria have been met, Department of Energy (DOE) Carlsbad Field Office (CBFO) must make an assessment of the potential overall risk using the available information. Based on this evaluation of the risk, CBFO will determine the disposition of the subject waste containers.

2. WASTE STREAM DESCRIPTION:

BNINW216 was generated from a carrier precipitation and immobilization process (sludge mixed with diatomite and Portland cement). The First/Second Stage Sludge waste stream is comprised of Item Description Codes (IDCs) RF-001, RF-002, and RF-800. The first/second stage sludge waste stream consists of >50% by volume secondary sludge or filter cake from wastewater treatment processes or heavy metal sludges from recovery processes. The immobilization process for this waste stream was changed in 1986. Prior to 1986, the first/second stage sludge was placed into a drum with Portland cement. The excess liquid was immobilized, but a solid monolith was not formed. Subsequent to 1986, the sludge was co-fed into a drum with a diatomite and Portland cement mixture, which formed a solid monolith after curing. At this point, the IDC was changed from Rocky Flats (RF)-001 and RF-002 to RF-800. The population of drums in this BoK assessment does not contain any waste from the IDC RF-800.
3. WASTE INCLUDED IN THIS ASSESSMENT

This BoK assessment is for the BNINW216 Lot 1, which includes the following list of 21 drums that are located at AMWTP.

<table>
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<tr>
<th>Container Identification</th>
<th>Container Type</th>
<th>Closure Date</th>
<th>IDC</th>
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<td>10452828</td>
<td>55G</td>
<td>10/26/1971</td>
<td>RF-002</td>
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</table>
4. BASIS OF KNOWLEDGE CRITERIA EVALUATION:

The following sections address the individual criteria defined in Section 5.0 of the BoK that must be met prior to acceptability at the Waste Isolation Pilot Plant (WIPP). The containers listed in Section 3 of this evaluation were evaluated against each of these criteria and were determined to satisfy the BoK. This waste includes constituents that are defined in the BoK as requiring evaluation to determine if the waste complies with the BoK requirements. The heading and title of the following sections correspond to both 1) DOE/WIPP-17-3589, Rev 0, “Acceptable Knowledge Checklist for Evaluating Oxidizing Chemicals in TRU Waste Using the Box Criteria,” (CBFO Form-3589-1) of the BoK; and 2) the headings in Section 5.0 of the BoK.

5. CRITERIA FOR EVALUATING TRU WASTE WITH OXIDIZING CHEMICALS

5.1 Evaluating Oxidizing Chemicals Using CBFO Form 3589-1

“The WIPP Certified Program’s AKEs must evaluate waste containing one or more oxidizing chemicals to the criteria in Sections 5.1 through 5.11 using the most current revision of CBFO Form 3589-1, Acceptable Knowledge Checklist for Evaluating Oxidizing Chemicals in TRU Waste Using the BoK Criteria, and include required attachments.”

Form 3589-1 is attached at the end of this assessment report as Attachment 1. The approved containers in this population have been determined to meet this BoK criterion.

5.2 Oxidizing Chemical Verification

“Waste streams with oxidizing chemicals, whether listed on Table 5-1 or not, must be reevaluated by the AKE to determine if oxidizing chemicals are actually present in the waste. The reevaluation must focus on the process chemistry where the waste originated. Actions that could change the oxidizing chemicals during or after the process include: reducing, neutralizing, rinsing, solidifying, drying, calcining, pyrolyzing, and others. If the waste has been repackaged, actions that would have affected the waste chemistry must be identified and evaluated, and additions to the waste must be accounted for.”

The identification and evaluation of the oxidizing chemicals was performed considering the information from the CCE memo and the AKA. The approved CCE memo identified the following oxidizing chemicals of concern for this waste stream. These chemicals include:

- Aluminum nitrate
- Sodium nitrate
- Potassium nitrate
- Iron nitrate
- Lead nitrate
All of the nitrate salts above are bounded by potassium nitrite listed on Table 5-1 of the BoK.

The following oxidizers were listed in the CCE but were consumed or destroyed in the process as explained in the CCE:

- Ammonium persulfate
- Hydrogen peroxide
- Potassium iodate
- Sodium hypochlorite
- Sodium peroxide

The approved containers in this population have been determined to meet this BoK criterion.

### 5.3 Distribution of Oxidizing Chemicals within Waste Components

“TRU waste with oxidizing chemicals may consist of a single waste component or multiple waste components. Only the waste components with oxidizing chemicals require evaluation using the criteria in this BoK. Personnel performing the enhanced AK process must determine how well the oxidizing chemicals are distributed as well as the concentration of oxidizing chemicals within each waste component that contains oxidizing chemicals.”

As identified in the CCE, there will be oxidizing materials distributed throughout the waste matrix. The very nature of the first and second stage aqueous sludge process was such that the chemicals were well mixed before addition of flocculants and filtration. The resulting filtered damp sludge suspension consists of metal salts that are already oxidized, some water containing components that did not precipitate, and the diatomite filter media. This was poured into drums prepared with Portland cement in the bottom. More Portland cement was then added to the top before closure. The nitrates dissolved in the remaining water migrated along with the water into the cement where they solidified. Each of these three main waste components (the two cement layers and the sludge layer) has a relatively even distribution of chemicals within itself.

During characterization at AMWTP, prohibited liquids were identified in 9 of the drums in the population. The drums were opened at AMWTP and liquids were absorbed on Aquaset or Aquaset II-G. (See Section 5.6.1 below.) Based on the process of adding sorbent to the liquid there is no reason to believe the absorbed matrix is not well mixed or evenly distributed in the matrix. Procedures for absorbing liquids were written to ensure that sufficient absorbent was used to eliminate all accessible liquids.

The approved containers in this population have been determined to meet this BoK criterion.
5.4 Neutralization of Oxidizing Acids, Bases, and Solutions

“Oxidizing acids and aqueous solutions with oxidizing chemicals in containers and as free liquids separated from the solid portion of the waste generated or treated and repackaged after the issue date of the BoK shall be neutralized.”

The containers in this population were certified before the issue date of the BoK. No treatment or characterization has been performed after certification. The approved containers in this population have been determined to meet this BoK criterion.

5.5 Organic Sorbents

“Mixtures of polyol materials identified in Table 5-2 and oxidizing chemicals are incompatible and mixing them can result in adverse reaction consequences. Polyol organic sorbents with oxidizing chemicals are not acceptable at the WIPP without treatment.”

Review of applicable procedures for the AKA yielded no evidence that polyol organic sorbents were used in original packaging at Rocky Flats or during treatment and repackaging at AMWTP.

The approved containers in this population have been determined to meet this BoK criterion.

5.5.1 Organic Sorbents with Oxidizing Chemicals

“Table 5-3 lists the weight percent of oxidizing chemical allowed when well mixed in a tested EOPS. Waste shall be evaluated to determine if the oxidizing chemical concentration is below the weight percent in Table 5-3.”

Review of applicable procedures for the AKA yielded no evidence that Engineer Organic Polymer Sorbents (EOPPs) were used in original packaging at Rocky Flats or during treatment and repackaging at AMWTP.

The approved containers in this population have been determined to meet this BoK criterion.

5.5.2 Organic Rags, Wipes, Sorbent Pads, and Pillows

“Requiring treatment for all legacy waste containers with rags, wipes, sorbent pads, and pillows cannot be justified without AK documentation that these specific waste components are likely to contain oxidizing chemicals.”

No rags, wipes, sorbent pads, or pillows have been identified in real-time radiography (RTR) examination of the drums in this population. Thus, there is no documentation of any of the aforementioned components to be in contact with oxidizing chemicals in these containers.

The approved containers in this population have been determined to meet this BoK criterion.
5.5.3 Miscellaneous Organic Materials

"Ion exchange resins, organic solvents, and other miscellaneous organic materials containing oxidizing chemicals are not acceptable at the WIPP without a verifiable basis that can be used to determine the waste will be safe and compliant for receipt and emplacement in the WIPP."

Review of applicable procedures and other AK documents for the AKA yielded no evidence that ion exchange resins, organic solvents, or other miscellaneous organic materials are a part of this waste stream.

The approved containers in this population have been determined to meet this BoK criterion.

5.6 Inorganic Materials with Oxidizing Chemicals

5.6.1 Oxidizing Chemicals Sorbed in Inorganic Sorbents

"Waste shall be evaluated to determine if the oxidizing chemical concentration is below the weight percent of oxidizing chemical allowed in Table 5-4. Sum the dry weight of each of the oxidizing chemicals and divide by the cumulative sum of the weights of the sorbents and oxidizing chemicals to yield the concentration of oxidizing chemicals in the waste."

Of the 21 individual drums in the population, 9 drums underwent liquid absorption at AMWTP (10301780, 10303589, 10303895, 10305056, 10305407, 10306181, 10308575, 10308578, and 10308659). Drums 10301780 and 10303589 were treated using the procedure INST-OI-68, "Drum Treatment Facility Operations," Revision 10, Field Change 2, between July 15 and July 21, 2009. The approved sorbent used during this time period was Aquaset. The measured liquid holding capacity for Aquaset is 0.263 mL/g. The Waste Tracking System (WTS) database, liquid absorption operations in the Drum Treatment Facility reported using Aquaset in excess to ensure absorption. Aquaset was used in ratios 2.7:1 up to 7.5:1 to absorb liquids in these 2 drums.

Saturated sodium nitrate solution was conservatively used as the concentration of the liquid input for the first and second stage sludge. Using the saturated solution (not considering dilution by addition of process chemicals into account), each liter of water would contain 912 g of sodium nitrate. The sludge was moist when packaged, and it is reasonable to expect the liquid that was absorbed at AMWTP to have the same concentration of nitrate as the feed solution. The molar conversion to pints renders 432 g/pint. Aquaset weighs 547 g/pint. With at least 2.7 pints of Aquaset per pint of free liquid, the following demonstrates the concentration of dry nitrate oxidizer in dry Aquaset (if all the water was to evaporate through the drum filter in the desiccant environment of the mine).

\[
\frac{432 \text{ g nitrate}}{432 \text{ g nitrate} + 1477 \text{ g Aquaset}} \times 100\% = 22.6\%
\]

The resulting 22.6% is below the BoK Table 5-4 defined maximum (27%) allowed for oxidizer absorbed in Aquaset.
Drums 10303895, 10305056, 10305407, 10306181, 10308575, 10308578, and 10308659 were treated using the procedure INST-OI-68, Revision 10, Field Change 3, between July 28 and August 22, 2009. Review of this revision and field changes shows the only absorbent approved during this time period was Aquaset II-G. Aquaset II-G’s measured liquid holding capacity is 1.33 mL/g. The WTS database, liquid absorption operations in the Drum Treatment Facility reported using Aquaset II-G in excess to ensure absorption. Aquaset II-G was used in ratios 2.63:1 up to 9:1 to absorb liquids in these 7 drums.

Saturated sodium nitrate solution was conservatively used as the concentration of the liquid input for the first and second stage sludge. Using the saturated solution (not taking dilution by addition of process chemicals into account), each liter of water would contain 912 g of sodium nitrate. The sludge was moist when packaged, and it is reasonable to expect the liquid that was absorbed at AMWTP to have the same concentration of nitrate as the feed solution. The molar conversion to pints renders 432 g/pint. Aquaset II-G weighs 341 g/pint. With 2.63 pints of Aquaset II-G per pint of free liquid, the following demonstrates the concentration of dry nitrate oxidizer in dry Aquaset II-G (if all the water was to evaporate through the drum filter in the desiccant environment of the mine).

\[
\frac{432 \text{ g nitrate}}{432 \text{ g nitrate} + 897 \text{ g Aquaset II-G}} \times 100\% = 32.5\%
\]

The resulting 32.5% is below the BoK Table 5-4 defined maximum (36%) allowed for oxidizer absorbed in Aquaset II-G.

The filtered sludge waste was not completely dry; rather it was added to drums as a thick slurry. Therefore, nitrates are to be assumed to have been retained in the aqueous part of the slurry. The sludge was added to the drum with dry cement, and the cement would sorb water from the sludge. The cement and sludge were not mixed, and did not form a monolith. Each drum was prepared with approximately 35 lb. (15.9 kg) of Portland cement to absorb the remaining water. In order to cure, Portland cement requires a ratio of water to cement of about 1:4. It can be inferred then, that the process at Rocky Flats was expected to sorb up to 4.0 kg (or 4.0 L) of water per drum into cement. At a saturated concentration of 912 g of sodium nitrate per liter of solution sorbed by the cement, this represents 3650 g (3.65 kg) of nitrate in the cement. The concentration of nitrate in the cement is then:

\[
\frac{3.65 \text{ kg of nitrate}}{3.65\text{ kg nitrate} + 15.9 \text{ kg of Portland cement}} \times 100\% = 18.7\%
\]

The resulting 18.7% is below the BoK Table 5-4 defined maximum (20 weight %) allowed for oxidizing chemicals absorbed in Portland cement. The approved containers in this population have been determined to meet this BoK criterion.
5.7 Mixtures of Organic and Inorganic Materials with Oxidizing Chemicals

“When components of the waste have a mixture of inorganic and organic sorbents, the maximum allowed concentration of oxidizing chemicals is determined by the lowest concentration of any of the components.

Sorbents that are not found in Table 5-3 or Table 5-4 are not acceptable for disposal at WIPP until the transuranic (TRU) waste site or acceptable knowledge expert (AKE) has requested an equivalency determination and the CBFO has determined that the sorbent is equivalent to one of the sorbents listed in Table 5-3 or Table 5-4.”

Each component of the waste as described above only has one sorbent associated with it. No organic sorbents are in this waste.

Prior to February 1982, Oil-Dri was used to fill void space outside the polyethylene drum bag. Beginning in February 1982, vermiculite was used. All the drums in this group were originally packaged at Rocky Flats prior to June 1975, or in other words, prior to the use of vermiculite. The absorbents used in contact with the sludge for this waste stream are Portland cement, Aquaset, and Aquaset II-G. All are found on Table 5-4.

The approved containers in this population have been determined to meet this BoK criterion.

5.8 Oxidizing Chemicals that are the Sole Component of the Waste

“Oxidizing chemicals that are the sole waste component(s) (for example, metal nitrate salts with or without free liquid) are not acceptable for disposal at WIPP without treatment.”

This waste stream does not solely consist of oxidizing chemicals, but rather is a sludge consisting of many metallic salts including nitrate salts listed in Section 5.2 and sorbed liquids. Oxidizing chemicals are below the BoK levels of concern (see Sections 5.6.1 and 5.9).

The approved containers in this population have been determined to meet this BoK criterion.

5.9 Inorganic Sludges with Oxidizing Chemicals Not Mixed with Sorbents

“Inorganic sludges with up to 20 weight percent oxidizing chemical that have not been mixed with sorbent are acceptable at the WIPP, provided liquids are not present in excess of the limit specified in DOE/WIPP-02-3122, Rev. 8.0, “Transuranic Waste Acceptance Criteria for the Waste Isolation Pilot Plant.”
This inorganic sludge consists of many metallic salts including nitrate salts listed in Section 5.2. The sludge primarily consists of metal salts, oxides, and hydroxides that were previously oxidized in the production phases before precipitation with PuriFloc A23 and filtration with diatomaceous earth. Taking the saturated concentration of sodium nitrate as the conservative concentration (not taking dilution by addition of process chemicals into account), each liter of water would contain 912 g of sodium nitrate. Nitrate salts are very soluble and most would have passed through the filters into the solar evaporation ponds.

The filtered sludge waste was not completely dry; rather it was added to drums as a thick slurry. Therefore, nitrites are to be assumed to have been retained in the aqueous part of the slurry. The sludge was added to the drum with dry cement, and the cement sorbed approximately 4 kg of water from the sludge. The cement and sludge were not mixed, and did not form a monolith. The amount of water remaining in the sludge was calculated from data acquired through an experimental process for drying the sludge. The experiment used microwave heating to dry the sludge and had an average weight reduction of 21.3%. The weight reduction is due to the loss of water in the sludge. This calculation gives us the dry weight of the solid components of the waste. The first step is to remove the weight of the cement from the waste. The heaviest drum (#10306181, 275.6 kg) was used for these calculations, because it represented the worst case scenario.

\[275.6 \text{ kg net weight of drum} - 15.9 \text{ kg cement} = 259.7 \text{ kg wet sludge}\]

Then calculate the dry weight of the sludge using the average water weight reduction percentage.

\[259.7 \text{ kg wet sludge} \times (1 - 0.213) = 204.4 \text{ kg dry sludge}\]

The maximum concentration of nitrate in the sludge was also determined experimentally, and is up to 21%. Using the maximum concentration, the amount of nitrate in the dry sludge can be determined.

\[204.4 \text{ kg dry sludge} \times 0.21 = 42.9 \text{ kg of sodium nitrate in the sludge}\]

Since this waste in BNINW216 Lot 1 was packaged wet with cement, the amount of nitrate sorbed into the cement needs to be calculated. In order to cure, Portland cement requires a ratio of water to cement of about 1:4. It can be inferred then, that the process at Rocky Flats was expected to sorb up to 4.0 kg (or 4.0 L) of water per drum into cement. Using the saturation limits for sodium nitrate at 25 C (0.912 kg/L) multiplied into the amount of liquid sorbed by cement, we get:

\[4 \text{ L water} \times 0.912 \frac{\text{kg}}{\text{L}} = 3.65 \text{ kg of nitrate sorbed into the cement}\]

Next, subtract the amount of sodium nitrate in the cement from the total amount of sodium nitrate in the sludge.

\[42.9 \text{ kg of nitrate in the sludge} - 3.65 \text{ kg of nitrate in the cement} = 39.3 \text{ kg of nitrate remaining in the sludge}\]
The percent oxidizer remaining in the sludge is then determined by dividing the amount of nitrate remaining in the sludge from the dry weight of the sludge, minus the amount of nitrate that was sorbed by the cement.

\[
\left( \frac{39.3 \text{ kg of nitrate in the sludge}}{204.4 \text{ kg dry sludge weight} - 3.65 \text{ kg of nitrate in the cement}} \right) \times 100 = 19.6\%
\]

The resulting 19.6% is below the BoK criteria listed in Section 5.9, for oxidizing chemicals not mixed with sorbents.

The approved containers in this population have been determined to meet this BoK criterion.

5.10 Oxidizing Chemicals Solidified in a Cement or Grout Matrix

"Oxidizing chemical liquids and particulate containing oxidizing chemicals are sometimes fixed in an inorganic form of cement or grout for disposal. Cement or grout containing oxidizing chemicals shall be considered well mixed if the process involved mixing, stirring, or other manipulation of the cement or grout paste and oxidizing chemicals prior to setting. For purpose of this BoK, wastes with oxidizing chemicals, whether listed in Table 5-1 or not, that are cemented or grouted with no more than 20 percent of the set material having external dimensions less than two centimeters and with the decomposition temperature of the oxidizing chemical equal to or greater than 350° C are not considered oxidizers when there is no free liquid."

This criterion does not apply to containers in this population (see section 5.6.1).

5.11 Surfaces Contaminated with Oxidizing Chemicals

"Waste components with low porosity and impermeable surfaces that have been exposed to liquid or solid oxidizing chemicals are surface-contaminated only. These types of waste components will not exhibit oxidizing behavior regardless of the distribution of the oxidizing chemicals when there is no observable adhesion of the oxidizing chemical to the surface."

Drums in this population have items identified in them besides the regular packaging material. The process that remediated liquid at AMWTP introduced items to the waste. Such items include a knife, filters, leather gloves and sometimes rubber gloves, and are recorded in WTS. The items are the byproduct of repackaging the waste, and remained with the waste because of radiological contamination. These items were placed on top of the waste after treatment and are not comingled. None of these items have observable adhesion of any chemical on their surface.

Drum 10368674 contains a one pint plastic bottle, without liquid, in the waste. Drum 10452583 has tools, wire, and a plastic tube. RTR evaluation does not show observable adhesion of any oxidizing chemical to their surfaces (for example, an observable density difference). Therefore these two containers are BoK compliant.

The approved containers in this population have been determined to meet this BoK criterion.
5.12 Soils Containing Oxidizing Chemicals

5.12.1 Oxidizing Chemicals Spilled or Released into Soils

“When developing criteria for evaluating oxidizing chemicals in soils for this BoK, zeolite (4 Å nominal pore size) was evaluated and tested as a surrogate for minerals in soils. Cellulose represented organic matter and organic waste in soil.

Since 35 weight percent of oxidizing chemicals is allowed in 4 Å zeolite sorbent in Table 5-4, soils with total organic content ≤20 weight percent do not require treatment when the oxidizing chemical concentration is ≤35 weight percent.”

The waste covered by this BoK evaluation does not contain soils with oxidizing chemicals.

The approved containers in this population have been determined to meet this BoK criterion.

5.12.2 Oxidizing Chemicals in Waste Retrieved from Earthen Disposal Pits

“In the case of oxidizing chemicals retrieved from disposal pits where they were likely to have been co-mingled with organic waste, the maximum organic waste concentration and maximum oxidizing chemical concentration must be accounted for, as well as the minimum concentration of inorganic matrix required to mitigate the resulting oxidizer fuel mixture. This requires a total concentration of oxidizing chemicals to be ≤35 weight percent, the total concentration of organic material to be ≤20 weight percent, and the minimum concentration of soil to be ≥45 weight percent.”

The waste covered by this BoK evaluation was not retrieved from earthen disposal pits.

The approved containers in this population have been determined to meet this BoK criterion.

6. CONCLUSION

This assessment is limited to a subset of the BNINW216 containers at AMWTP as listed above in Section 3. The evaluation was able to conclude that these containers are bounded by this BoK assessment and as such are acceptable for disposal in the underground at the WIPP facility.

The final outstanding action required to authorize disposal is CBFO’s approval of this BoK Assessment report.

7. REFERENCES

Attachment 1

CBFO Form 3589-1
DOE/WIPP-17-3589, Rev. 0
Acceptable Knowledge Checklist for Evaluating
Oxidizing Chemicals in TRU Waste
Using the Box Criteria
Acceptable Knowledge Checklist for Evaluating Oxidizing Chemicals in TRU Waste Using the BoK Criteria

Waste Stream Name: BNINW216 Lot 1
Waste Stream Location: AMWTP
AK Summary Report covering this waste stream: RPT-TRUW-09, Acceptable Knowledge Summary for First/Second Stage Sludge (BNINW216)
AKE performing the evaluation: Richard Wells
Start date of the evaluation: 8/22/2017
WIPP Certified Program SPM: Gina Tedford

Input oxidizing chemical(s) identified by AK: Aluminum nitrate, sodium nitrate, potassium nitrate, iron nitrate, lead nitrate, ammonium persulfate, hydrogen peroxide, potassium iodate, sodium hypochlorite and sodium peroxide.

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<tr>
<td>Has this BoK evaluation been preceded by an approved CCEM?</td>
<td>Y</td>
<td>N</td>
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<td>Did the approved CCEM cover the entire waste stream?</td>
<td>Y</td>
<td>N</td>
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<td>If no, did the CCEM cover a defined subpopulation of containers in the waste stream?</td>
<td>Y</td>
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<tr>
<td>Does this BoK evaluation cover the entire waste stream?</td>
<td>Y</td>
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<tr>
<td>If no, identify the waste stream subpopulation covered by this BoK evaluation (list container I.D. numbers or attach list): This BoK evaluation is for a subset of the BNINW216 population currently at the AMWTP. Please see the Sections 2 and 3.</td>
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Are there differences between the BoK subpopulation and the subpopulation covered by the CCEM? | Y | N |
| If yes, explain differences between the BoK subpopulation and CCEM subpopulation and why they are different: | Y | N |
## Section 5.2 Oxidizing chemical verification

Has the AK been reevaluated to determine if identified input oxidizing chemical(s) is/are in the waste?
- If yes, document the result of the AK reevaluation by describing each input oxidizing chemicals identified by AK that is not expected in the waste and why. Ammonium persulfate – breaks down to ammonia in the waste, therefore will not persist. Hydrogen peroxide – decomposes to water and oxygen gas, and will not persist in the waste. Potassium iodate – used in trace amounts and consumed in the reaction. Sodium hypochlorite – will not persist in the waste. Sodium peroxide – used in trace amounts and will hydrolyze to sodium hydroxide, oxygen, and water.

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- If no, reevaluate the AK before proceeding.
  - List the oxidizing chemical(s) in the waste based on the reevaluated AK. Aluminum nitrate, sodium nitrate, potassium nitrate, iron nitrate and lead nitrate

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Are the oxidizing chemicals listed in Table 5-1?
- If no, record the oxidizing chemical(s) not listed in Table 5-1.

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- Has a bounding oxidizing chemical determination request been approved for each oxidizing chemical that is not listed on Table 5-1?
  - If yes, attach the bounding oxidizing chemical determination approval.
  - If no, has the TRU waste site performed tests using a CBFO approved test plan and received acceptance criteria for the oxidizing chemical(s)?
    - If yes, attach CBFO test plan approval and issued acceptance criteria (if the BoK has not been revised to include the criteria).
    - If no, this evaluation cannot continue for the affected containers until oxidizing chemical testing is completed using a CBFO approved test plan and the CBFO Manager has issued acceptance criteria for the oxidizing chemical(s).

*Attach list 5.2 of containers excluded per previous bullet.*
Section 5.3 Distribution of oxidizing chemicals within waste components

Describe the waste component(s) containing the oxidizing chemical(s): First and second stage sludge consisting of an inorganic matrix, inorganic sorbents, water, and cement.

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- Is the oxidizing chemical expected to be well distributed within the waste component? (sections 5.5.1, 5.6.1, 5.9, and 5.10)
  - If no, contact the CBFO Waste Management Senior Technical Advisor for assistance.

- Is the concentration of oxidizing chemical within the waste component known or bounded? (sections 5.5.1 and 5.6.1)
  - If no, this evaluation cannot continue for the affected containers until the TRU waste site selects an option listed in section 2.0 or treats the waste as 100 wt. % oxidizing chemical.
    - Attach list 5.3 of affected containers with oxidizing chemicals that are not well distributed within the waste component.
    - Attach list 5.3.1 of affected containers with unknown concentrations of oxidizing chemicals within a waste component.

- Describe option selected by the TRU waste site and attach CBFO approvals when applicable. (sections 2.0, 5.5.1, or 5.6.1)
Section 5.4 Neutralization of oxidizing acids, bases, and solutions
Was the oxidizing chemical an aqueous liquid or liquid oxidizing acid or base generated or treated and repackaged after the issue date of DOE/WIPP-17-3589? (Section 5.4)

- If aqueous, was pH measured?
  - If yes, list method used for measurement: ____________________________
  - If no, pH must be measured for the affected waste before BoK evaluation can continue.
    - Attach list 5.4 of affected waste.
- Was pH > 2 and < 12.5?
  - If yes, neutralization or buffering is not required.
  - If no, the evaluation cannot continue for the affected waste until it is neutralized or the TRU waste site provides technical justification using option H of section 2, paragraph 2 of the BoK, and has received CBFO concurrence that the waste is acceptable without neutralization. Attach CBFO concurrence when applicable.
    - Attach list 5.4.1 of affected containers.

List the neutralizing or buffering agent(s) manufacturer and product name: ________________________________

- If liquid, has steel corrosion testing been performed?
  - If yes, list method used for determination: ____________________________
  - If no, steel corrosion test must be performed for the affected waste before BoK evaluation can continue.
    - Attach list 5.4.2 of affected containers.

- Does the waste corrode steel at a rate < 6.35 mm (0.250 inches) per year at 55 °C (130 °F)?
  - If yes, neutralization or buffering is not required.
  - If no, the evaluation cannot continue for the affected waste until it is neutralized or the TRU waste site provides technical justification using option H of section 2, paragraph 2 of the BoK, and has received CBFO concurrence that the waste is acceptable without neutralization.
    - Attach CBFO concurrence when applicable.
    - Attach list 5.4.3 of affected containers.
List the neutralizing or buffering agent(s) manufacturer and product name: ________________________________

Can explosive compounds form when the neutralizing or buffering agent(s) are added to the oxidizing chemical?

If yes, notify the SPM, CBFO Manager and the Assistant Manager for the National TRU Program Office immediately so the TRU waste site can be contacted and the affected activity stopped. This BoK evaluation cannot continue for the affected waste until the TRU waste site provides test results demonstrating the waste does not pose a hazard.

- Attach list 5.4.4 of affected containers.

- If organic neutralizing or buffering agent was used to neutralize or buffer previously packaged waste, did it have the potential for forming explosive compounds with the oxidizing chemical?

List the neutralizing or buffering agent(s) manufacturer and product name: ________________________________

- If yes, has testing been performed to demonstrate the waste does not pose a hazard when exposed to mechanical impact, spark, friction, and/or heat?

  - If yes, attach CBFO approval of the testing results.

  - If no, this evaluation cannot continue until the TRU waste site provides test results demonstrating the affected waste does not pose a hazard.

  - Attach list 5.4.5 of affected waste

When testing demonstrates the waste poses a hazard, the TRU waste site must identify a method of treatment and receive CBFO concurrence.

- Attach the CBFO concurrence or stop the evaluation of the affected waste until concurrence is obtained.

- Attach list 5.4.6 of affected waste.

- If no, go to Section 5.5 questions.
<table>
<thead>
<tr>
<th>Section 5.5 Organic sorbents</th>
<th>Y</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is the oxidizing chemical sorbed in polyol organic sorbent(s)?</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>• If yes, has the waste been treated in accordance with section 6?</td>
<td></td>
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<tr>
<td>o If yes, go to Section 5.5.2 questions.</td>
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<tr>
<td>o If no, this evaluation cannot continue for the affected waste until the TRU waste site obtains approval on the proposed method of treatment from CBFO and treatment is performed.</td>
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<tr>
<td>* Attach list 5.5 of affected waste</td>
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<tr>
<td>Describe option selected by the TRU waste site and attach CBFO approvals when applicable. (sections 2.0, 6, and 7)</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Section 5.5.1 Organic Sorbents With Oxidizing Chemicals</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is the oxidizing chemical sorbed in EOPS?</td>
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<tr>
<td>o</td>
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<tr>
<td>• If yes, is the wt. % of oxidizing chemicals allowed ≤ the value listed in Table 5-3? (section 5.5.1)</td>
<td></td>
</tr>
<tr>
<td>*</td>
<td></td>
</tr>
<tr>
<td>• If yes, the oxidizing chemicals at this concentration are allowed without further treatment.</td>
<td></td>
</tr>
<tr>
<td>• If no, this evaluation cannot continue for the affected waste until the TRU waste site selects an option listed in section 2.0 or treats the affected waste as 100 wt. % oxidizing chemical.</td>
<td></td>
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<tr>
<td>• Attach list 5.5.1 of affected waste</td>
<td></td>
</tr>
<tr>
<td>Describe option selected by the TRU waste site and attach CBFO approvals when applicable. (sections 2.0 and 7 or 5.5.1)</td>
<td></td>
</tr>
<tr>
<td>Section 5.5.2 Organic rags, wipes, sorbent pads, and pillows</td>
<td>Enter “Y” for yes or “N” for no</td>
</tr>
<tr>
<td>-------------------------------------------------------------</td>
<td>--------------------------------</td>
</tr>
<tr>
<td>Does the waste include organic rags, wipes, sorbent pads, or pillows mixed with nitrate?</td>
<td>Y</td>
</tr>
<tr>
<td>• If yes, has headspace gas analysis been performed?</td>
<td>-</td>
</tr>
<tr>
<td>• If yes, were other than minimal oxidation gases generated in the container?</td>
<td>-</td>
</tr>
<tr>
<td>• If yes, this evaluation cannot continue for the affected waste until the TRU waste site selects an option listed in section 2.0.</td>
<td></td>
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<tr>
<td>• Attach list 5.5.2 of affected waste.</td>
<td></td>
</tr>
<tr>
<td>Describe option selected by the TRU waste site and attach CBFO approvals when applicable. (sections 2.0 and 7 or 5.5.2)</td>
<td></td>
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</tbody>
</table>
Section 5.5.3 Miscellaneous organic materials

Does the waste contain miscellaneous organic materials with oxidizing chemicals?

List the miscellaneous organic materials with oxidizing chemicals:

<table>
<thead>
<tr>
<th>Enter “Y” for yes or “N” for no</th>
<th>Y</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td></td>
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</tbody>
</table>

- Does the waste contain ion exchange resins?
  - If yes, has the ion exchange resins been cemented or grouted to a concentration of ≤ 10 wt. % or has the monolith been verified to be intact by RTR or VE?
    - If yes, the ion exchange resins are acceptable at WIPP.
    - If no, has CBFO approved a verifiable basis showing that the ion exchange resins waste will be safe and compliant for disposal at WIPP?
      - If yes, attach CBFO approval.
      - If no, the evaluation cannot continue for the affected waste until the TRU waste site selects an option listed in section 2.0.

  Attach list 5.5.3.1 of affected waste

  Describe option selected by the TRU waste site and attach CBFO approvals when applicable. (sections 2.0 and 7 or 5.5.3)

- Does the waste contain spent organic solvents, or organic materials other than sorbents, such as glycerin or sugar solutions, that have been mixed or added to oxidizing chemicals?
  - If yes, has CBFO approved a verifiable basis showing that the miscellaneous organic waste with oxidizing chemicals will be safe and compliant for disposal at WIPP?

If yes, attach CBFO approval.

If no, the evaluation cannot continue for the affected waste until the TRU waste site selects an option listed in section 2.0.

  Attach list 5.5.3.2 of affected waste

  Describe option selected by the TRU waste site and attach CBFO approvals when applicable. (sections 2.0 and 7 or 5.5.3)
<table>
<thead>
<tr>
<th>Section 5.6.1 Oxidizing chemicals sorbed in inorganic sorbents</th>
</tr>
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<tbody>
<tr>
<td>Is the oxidizing chemical sorbed with an inorganic sorbent?</td>
</tr>
<tr>
<td>• If yes, is the wt. % of the oxidizing chemicals allowed ≤ the value listed in Table 5-4?</td>
</tr>
<tr>
<td>• If yes, the oxidizing chemicals at this concentration are allowed without further treatment.</td>
</tr>
<tr>
<td>• If no, this evaluation cannot continue for the affected waste until the TRU waste site selects an option listed in section 2.0 or treats the waste as 100 wt. % oxidizing chemical.</td>
</tr>
<tr>
<td>• Attach list 5.6.1 of affected waste</td>
</tr>
<tr>
<td>Describe option selected by the TRU waste site and attach CBFO approvals when applicable. (sections 2.0 and 7 or 5.6.1)</td>
</tr>
</tbody>
</table>
### Section 5.7 Mixtures of organic and inorganic materials with oxidizing chemicals

Does the waste contain a mixture of organic and inorganic materials with oxidizing chemicals?
- If yes, list the inorganic or organic sorbent with the lowest wt. % of oxidizing chemicals allowed when applicable (see table 5-3 and table 5-4)

If no, skip to section 5.8

- Does the combined oxidizing chemical in both sorbents exceed the wt. % of oxidizing chemicals allowed for the sorbent with the lowest allowed oxidizing chemical concentration?
  - If yes, list the inorganic sorbent that was used to attain the allowed concentration. List the final concentration in the matrix.

- Does the mixture contain sorbents not listed in Table 5-3 or Table 5-4?
  
  Record the unlisted sorbent(s) manufacturer and product name and indicate if EOPS or inorganic sorbent: 

  - If yes, has CBFO approved an equivalency determination for either an unlisted EOPS or inorganic sorbent?
    - If yes, attach CBFO response.

  Check criteria used:
  - If no and the oxidizing chemical concentration in the mixture is > 30 wt. % and the inorganic sorbent's allowable oxidizing chemical concentration is < 30 wt. %, an EOPS equivalency determination is unnecessary.
  - If no and the inorganic sorbent's allowable oxidizing chemical concentration is > 30 wt. %, an EOPS equivalency determination must be requested and approved.

  This evaluation cannot continue for the affected waste until the TRU waste site selects an option listed in section 2.0.
  - Attach list 5.7 of affected waste

  Describe option selected by the TRU waste site and attach CBFO approvals when applicable. (sections 2.0 and 7 or 5.7)
### Section 5.8 Oxidizing chemicals that are the sole component of waste

Is the waste composed of oxidizing chemical only (e.g., a metal nitrate salt) or is a component of the waste composed of oxidizing chemical only?

- If yes, the affected waste is not acceptable for disposal at WIPP without treatment.
  - Attach list 5.8 of affected waste

- If no, proceed to section 5.9

### Section 5.9 Inorganic Sludges With Oxidizing Chemicals Not Mixed with Sorbents

Is the oxidizing chemical and inorganic sludge not mixed with sorbents?

- If yes: Is the weight of oxidizing chemical in the inorganic sludge ≤ 20 wt. %

- If no: This evaluation cannot continue for the affected waste until the TRU waste site treats the inorganic sludge with an inorganic sorbent listed in Table 5-4 to meet the allowable wt. % oxidizing chemical concentration or selects an option listed in section 2.0.
  - Attach list 5.9 of affected waste.

- Describe option selected by the TRU waste site and attach CBFO approvals when applicable. (sections 2.0 and 5.6.1)

### Section 5.10 Oxidizing chemicals solidified in a cement or grout matrix

Is the oxidizing chemical solidified in a matrix such as cement or grout?

- Was the waste well mixed?
  - If yes: 1) does greater than 20% of the set material have dimensions smaller than two centimeters; and
    - 2) is the decomposition temperature of the oxidizing chemical < 350 °C; and
    - 3) does the waste contain free liquids?
If responses to 1, 2 or 3 above are yes, the affected waste may require treatment. Contact the CBFO Waste Management Senior Technical Advisor for assistance.

- Attach list 5.10 of affected waste.
- If no, proceed to section 5.11.

**Section 5.11 Surfaces contaminated with oxidizing chemicals**

Is the waste component a low porosity, impermeable surface contaminated with oxidizing chemicals? Most treated drums have a knife, filters, leather gloves and sometimes rubber gloves. These items are the byproduct of repackaging the waste. These items are on top of the waste and not comingled. Drum 10368674 contains a one pint plastic bottle, without liquid, in the waste. Drum 10452583 has tools, wire, and a plastic tube.

- Is there observable oxidizing chemical salt build up on the surface?
  - If yes, this evaluation cannot continue for the affected waste until the TRU waste site selects an option listed in section 2.0.
    - Attach list 5.11 of affected waste.

Describe option selected by the TRU waste site and attach CBFO approvals when applicable. (sections 2.0 and 7 or 5.11)

- If no, proceed to 5.12
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<tr>
<th>Section 5.12 Soils containing oxidizing chemicals</th>
<th>Y</th>
<th>N</th>
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<tr>
<td>Are oxidizing chemicals mixed with soil?</td>
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<td>N</td>
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<tr>
<td>• Is the organic content in the soil &gt; 20 wt. %? (section 5.12.1)</td>
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<tr>
<td>• If no, is the oxidizing chemical content ≤ 35 wt. %?</td>
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<td>• If yes, no treatment is necessary.</td>
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<td>• If no, this evaluation cannot be completed for the affected waste until the TRU waste site selects an option listed in section 2.0.</td>
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<td>• Attach list 5.12.1 of affected waste.</td>
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<td>Describe option selected by the TRU waste site and attach CBFO approvals when applicable. (sections 2.0 and 7)</td>
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Have required CBFO approvals been obtained for attachment to this checklist?

- Identify all attachments to this form:

  N/A

  

END OF CHECKLIST

AKE:

Richard Wells

Print

Signature

9/27/2017

Date

SPM:

Gina Tedford

Print

Signature

9/27/2017

Date