DOCKET NO: A-98-49; II-A4-97

WASTE CHARACTERIZATION REPORT

TIER 1 CHANGE: EVALUATION OF THE MODIFICATION OF THE CENTRAL CHARACTERIZATION'S REMOTE HANDLED TRU WASTE CHARACTERIZATION PROGRAM AT THE IDAHO NATIONAL LABORATORY TO ADD CONTAINERS OF K-CELL WASTE TO WASTE STREAM ID-ANLE-S5000

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1.0 EXECUTIVE SUMMARY

In accordance with 40 CFR 194.8(b), the U.S. Environmental Protection Agency (EPA or the Agency) conducted Baseline Inspection No. INL-CCP-RH-6.06-8 of the Central Characterization Project Waste Characterization Program at the Idaho National Laboratory (INL-CCP) on June 12–16, 2006, with follow-up inspections on August 9 and 22, 2006. The scope of this baseline inspection included several aspects of the site's program to characterize wastes proposed for disposal in the Waste Isolation Pilot Plant (WIPP). As a result of Baseline Inspection No. EPA-INL-CCP-RH-6.06-8, EPA approved the INL-CCP waste characterization (WC) program with conditions and limitations, as documented in the INL Baseline Final Inspection Report (see EPA Docket No. A-98-49; II-A4-72). This report approved the Acceptable Knowledge (AK) process specific to one retrievably stored remote-handled transuranic (RH TRU) Waste Stream identified as ID-ANLE-S5000, Lots 1 through 20. Table 1 of that report cited the inclusion of containers of K-Cell RH TRU debris wastes as a Tier 1 (T1) change that required EPA approval prior to implementation. On November 5, 2007, the Carlsbad Field Office (CBFO) requested EPA approval of a T1 change in the form of including 56 containers of K-Cell wastes in Waste Stream No. ID-ANLE-S5000. In response to CBFO's request, EPA conducted a T1 evaluation of the inclusion of the K-Cell wastes by reviewing documents provided by INL-CCP, supplemented by a meeting in Denver, Colorado, on January 8 and 10, 2008. Based on EPA's evaluation detailed in this report, EPA approves the inclusion of the 56 containers of K-Cell wastes in Waste Stream No. ID-ANLE-S5000, consistent with the conditions and limitations discussed in this report.

This report serves as EPA's public notification of the results of the proposed T1 change and its evaluation. This information will be provided through the EPA website and by sending e-mails to the WIPPNEWS list, in accordance with 40 CFR 194.8(b)(3). This approval does not make any changes to the tiering table provided with the baseline approval.

2.0 PURPOSE OF INSPECTIONS AND TIER 1 EVALUATIONS

Any changes to the WC activities from the date of the baseline inspection must be reported to, and, if applicable, approved by EPA, according to the tiering requirements set forth in the INL Baseline Final Report cited above.

Under the changes to 40 CFR 194.8 promulgated in the July 16, 2004, *Federal Register* notice, EPA must perform a single baseline inspection of a TRU waste generator site's WC program. The purpose of a baseline inspection is to approve the site's WC program based on the demonstration that the program's components, with applicable conditions and limitations, can adequately characterize TRU wastes and comply with the regulatory requirements imposed on TRU wastes destined for disposal at the WIPP. An EPA inspection team conducts the baseline inspection to verify that the site's system of controls is technically adequate and properly implemented.

Following the EPA's approval of WC processes evaluated during the baseline inspection, EPA is authorized to evaluate and approve, if necessary, changes to the site's approved WC program by conducting additional inspections under the authority of 40 CFR 194.24(h). Under

40 CFR 194.24, EPA has the authority to conduct continued compliance inspections to verify that the site continues to use only the approved WC processes to characterize the waste and remains in compliance with all the regulatory requirements. Based on the adequacies of the WC processes demonstrated during the baseline inspection, including all conditions and limitations, EPA specified which subsequent WC program changes or modifications must undergo further EPA inspection or approval under 40 CFR 194.24. This was accomplished by assigning a tier level to each aspect of the INL-CCP's characterization program. T1 activities have more stringent reporting requirements and require that DOE notify EPA, and that EPA provide approval prior to implementation. The rule under which baseline inspections are conducted can be found in the *Federal Register* (Vol. 69, No. 136, pages 42571–42583 of July 16, 2004).

3.0 PURPOSE OF THIS REPORT

This report presents the results of the EPA's evaluation of a T1 change to include 56 containers of retrievably stored RH TRU debris K-Cell wastes in Waste Stream No. ID-ANLE-S5000, as described in CCP-AK-INL-500, Revision 5, Draft E. This report presents the technical basis and results of EPA's approval decision. EPA's approval decision regarding the inclusion of the K-Cell wastes has been conveyed to DOE separately by letter. As discussed previously, EPA will also announce the decision on its website at www.epa.gov/radiation/WIPP, in accordance with 40 CFR 194.8(b)(3).

4.0 SCOPE OF REVIEW

The scope of this evaluation was the inclusion of 56 containers of retrievably stored RH TRU debris K-Cell wastes as described in CCP-AK-INL-500, Revision 5, Draft E. The evaluation was performed by comparing elements assessed in the previous EPA approval against information about the 56 K-Cell drums that was provided by INL-CCP/CBFO to ensure that these drums fit within the approval issued by EPA previously. Some elements of the previous report, i.e., the Los Alamos National Laboratory mass spectrometry data, were not evaluated again because the addition of these containers did not affect these elements. Only those elements that were affected by the addition of the 56 containers were re-evaluated. Because this evaluation involved expanding an existing stream to incorporate new containers and not the addition of a new Summary Category Group or waste stream, an inspection checklist was not used.

5.0 EVALUATION TEAM

This evaluation consisted of reviewing documents provided by INL-CCP that presented the technical and regulatory support for the inclusion of the K-Cell wastes. Ms. Connie Walker conducted this review with support from Mr. Patrick Kelly. The review was supplemented by a meeting of EPA and INL-CCP technical personnel to discuss specific technical issues. This meeting was held in Denver, Colorado on January 8 and 10, 2008, and the personnel involved in the Denver meeting are listed in Table 1, along with each person's affiliation and function for this evaluation.

Table 1. Personnel at January 8 and 10 2008, Meeting in Denver, Colorado

Personnel	Affiliation	Inspection Function - Area of Expertise
Connie Walker	SC&A	EPA Inspector, Technical Lead
Kevin Peters	Technical Specialists	AK Expert
Steve Schafer	Technical Specialists	AK Expert

6.0 EVALUATION OF THE K-CELL ACCEPTABLE KNOWLEDGE

6.1 Acceptable Knowledge

EPA examined the AK process and associated information to determine whether the INL-CCP WC program demonstrated compliance with the requirements of 40 CFR 194.8 for the addition of 56 K-Cell drums of retrievably stored RH debris to ANL Waste Stream No. ID-ANLE-S5000.

Waste Characterization Element Description

As part of the inspection, EPA reviewed the following with respect to the use of AK for waste characterization as impacted by addition of the K-cell containers:

- Waste stream identification and definition
- Radionuclide content of K-Cell waste
- Physical composition of K-Cell waste
- Sufficiency of modified AK Summary to include the K-Cell waste
- Drum data traceability
- Defense origin of K-Cell waste
- AK source document sufficiency
- Modifications to the Confirmatory Test Plan (CTP)
- Modifications to the Waste Stream Profile Form (WSPF) and Characterization Reconciliation Report (CRR)
- Correlation and Surrogate Summary Form and CH-RH correlation
- Personnel training
- Non Conformance Reports (NCRs) and AK Discrepancy Resolution
- AK accuracy
- Load management
- Identification and attainment of Data Quality Objectives (DQOs)

Documents, Waste Containers, and Batch Data Reports Provided

EPA evaluated the documentation that INL-CCP had prepared to support the inclusion of the 56 containers of K-Cell wastes in Waste Stream No. ID-ANLE-S5000. EPA's evaluation was based on reviewing the following references:

- CCP-AK-INL-500, Central Characterization Project Acceptable Knowledge Summary Report for Remote-Handled Transuranic Debris Waste from Argonne National Laboratory-

East Stored at the Idaho National Laboratory, Waste Stream ID-ANLE-S5000, Revision 5, Draft E, September, 2007

- DOE WIPP 02-3214, Remote-Handled TRU Waste Characterization Program Implementation Plan, Revision 0D, October 30, 2003
- C074, Letter to Mr. Hilary Rauch, Manager, U.S. Department of Energy re: "TREAT Experiment Program", R. Avery, Director, Reactor Analysis and Safety Division, 2694, April 4, 1985
- C138, Intra-Laboratory Memo to Distribution re: Hot-cell Survey, L. A. Neimark, MSD, ANL-26 (11-68), August 20, 1973
- C353, Discussions with Seth Snyder and Al Young; Chemistry Division Operations in Building 200, M-Wing and General Description of Building 200, Tom Krause, CH Ref. AE-C-015, NA, July 27, 2000
- C358, Letter to R.H. Bauer; Activation of K2 Hot Cell for RRT Safety Program Work, J.D. Griffin, December 4, 1977
- C364, Intra-Laboratory Memo to C.H. Youngquist; Priority List for Work in M-Wing Cave Facility for Month of October 1978, L. Neimark, October 12, 1978
- C373, Intra-Laboratory Memo to L.A. Niemark; Cave K-2 Source Document Reference Information (author(s), document and revision number, date, publisher): J.R. McCreary, October 15, 1981
- C378, Intra-Laboratory Memo to R.G. Matlock; Cost Estimate for ANL-E Support for SAREF, Source Document Reference Information (author(s), document and revision number, date, publisher): L.A. Neimark, October 14, 1975
- C381, Results of Document Review Relating to the AK Available for RH TRU Waste Containers Generated in the Building 200 K-Cells at ANL-E, Kevin Peters, October 10, 2007
- DR018, ID-ANLE-S5000, Discrepancy Resolution Waste Stream Description Heterogeneous Debris from AGHCF Operations, Kevin Peters, October 23, 2007
- P006, Safety Analysis for Twenty Year Retrievable Storage of Intermediate Gamma Level Transuranic Waste, W. D. Jackson, Alpha-Gamma Hot Cell Facility, Materials Science Division, Argonne National Laboratory, June 1, 1976
- P032, Procedure for Sorting Remote-Handled TRU Waste (30-Gallon Intermediate-Level Waste), Alpha-Gamma-Hot Cell Facility Irradiation Performance Section Materials and Components Technology Division, January 7, 1987
- P055, Waste Handling Procedures, C. L. Cheever, Manager, Waste Management Operations, September 18, 1986
- P074, Plan for Decommissioning TREAT Loop Disassembly Facility (K-2 Cell, Building 200, M-Wing), W. D. Jackson, Irradiation Performance Group, M4000-0019-SA-00, June 12, 1981
- P614, Identification of Additional Fuel Elements/Materials Examined in the Alpha-Gamma Hot Cell Facility for ANL-E RH TRU Waste, Kerry Martin, EDF-6946, May 19, 2006

- P615, Information on Fuel Elements Examined at the AGHCF at ANL from November 1971 to August 7, 1995 Based on Waste Consolidation Records, P. Kuan, EDF-6685, May 19, 2006
- P616, Decontamination of Hot Cells K-1, K-3, M-1, M-3, and A-1, M-Wing, Building 200: Project Final Report Argonne National Laboratory-East, C.L. Cheever and R.W. Rose, ANL/D&D/TM-96/2, September, 1996
- P617, Criticality Hazards Control Statement for Special Facility MF200-KW, W.D. Jackson, DOC-10146, NA, October 11, 1978
- P618, Quality Assurance Plan for RAS Loop Disassembly Facility, 0-200, M-Wing, K-1 Cell Source Document Reference Information (author(s), document and revision number, date, publisher): L.A. Neimark, M3101-0025-SE-00, January 16, 1974
- P620, Posttest Examination Plan for the L6 Experiment, W.F. Murphy, M4000-0012-SA-00, Revision 0, January 5, 1981
- P621, Posttest Examination Plan for the L7 Experiment, L.A. Neimark, M3203-008-SA-00, Revision 0, February 19,1979
- P624, Quarterly Progress Report for the Period Ending June 30, 1975; Transient Fuel Response and Fission-Product Release Program, L.R. Kelman, July 24, 1975
- U002, Draft Proposal For: Alpha-Gamma Hot Cell Facility Waste Management Plan, undated
- U042, RH-TRU 1976 to 1982, Book 1, data pages for Lots 2, 3, 5a, 5b, and 7C that include all K-Cell wastes, undated
- U339, General Description of Building 200 Provided by Al Young, Unknown, CH Ref. AE-U-5, August 14, 2000
- U839, Excerpted Pages from Various Documents Collected From the ANL-E Scanner Database Pertaining to Fuel Pin Information, undated
- Schafer, Steve CCP AKE, 2007, Memorandum to Larry Porter, CCP SPM, Re: Addition of 56 Containers to Waste Stream ID-ANLE-S5000 CCP-AK-INL-500, R.5, November 1, 2007 and November 14, 2007
- Attachment 4: Argonne Generated RH TRU Waste, Waste Stream Number: ID-ANLE-S5000, Waste Stream Description; provided by ANL January 10, 2007

Waste Container and Batch Data Reports Reviewed

Typically, batch data reports (BDRs) containing the results of radiological and radiographic analysis (i.e., Real-Time Radiography or RTR) are reviewed as part of EPA's traceability examination. An analysis of K-Cell containers had not been performed prior to the 2007 EPA baseline inspection, so traceability was evaluated by examining AK data for selected containers. This evaluation provided an understanding of the information available for the selected drums beginning with their initial packaging, through shipment and interim storage at INL, and their ultimate retrieval from the INL vaults. The results of this analysis are presented in Table 2,

below. Note that the lot number listed for each drum corresponds to the original AGHCF lot evaluated by EPA during the 2007 baseline inspection.

Table 2. Traceability Data Reviewed

Drum Number	AGHCF Lot Number	Container Data	Other
00355	Lot 3	Intermediate Gamma Level TRU Packaging; Sectioned Elements Gram Pu/U worksheet; Loss/Gain SS Materials Sheet Location of Waste Material in Vault at INL including storage date (post shipment); Radioactive Waste Form (INL Transfer Form); Section 1.7 from unknown document, citing abnormal events and addressing Vault 19A including retrieval date	Drum originated from D&D of Cell K-1; Drum was Stored in INL Vault 19A where it was apparently nearly inundated (3/4 of drum was covered) with water at one time.
00504	Lot 5B	- Intermediate Gamma Level TRU Packaging - Sectioned Elements Gram Pu/U worksheet (loss gain request) - Loss Gain SS Materials Sheet - Radioactive Waste form (INL) - Transuranic Waste Container Form (INL) including shipment to INL date of 1982 - INL in Vault Storage Depth Waste Classification - Argonne Log of Intermediate Gamma Level Transuranic Waste and Bin No - Table 2 INL storage/retrieval information	Drum Originated from D&D of K-2 Cell
00507	Lot 5B	- Intermediate Gamma Level TRU Packaging - Sectioned Elements Gram Pu/U worksheet (loss gain request) - Loss Gain SS Materials Sheet - Radioactive Waste Form (INL) - Transuranic Waste Container Form (INL) including shipment to INL date of 1982 - INL in Vault Storage Depth Waste Classification - Argonne Log of Intermediate Gamma Level Transuranic Waste and Bin Number - Table 2 INL storage/retrieval information	Drum Originated from D&D of K-1 Cell

AK was used to characterize Waste Stream ID-ANLE-S5000 with respect to most of the DQOs and "confirmatory testing" was performed to confirm the AK information. All containers in this waste stream, including the 56 K-Cell drums, will be characterized using the same process that was approved by EPA in January 2007. Specifically, RH containers will not be subjected to AK confirmation using nondestructive assay. Instead, confirmation of the AK-reported radiological contents of the RH debris waste containers, TRU waste designation, and activity-related DQOs is performed through the application of the Dose-To-Curie (DTC) technique in conjunction with radionuclide scaling factors that were derived through modeling. Note that the scaling factors were not modified by inclusion of K-Cell drums, indicating that the composition of fuel pins tested in the K-1 and K-2 cells were within the compositional ranges of those used to derive the scaling factors. This evaluation assessed the AK process and related activities necessary for determining the waste's physical and radionuclide composition. The development and application of modeling parameters and radionuclide scaling factors were addressed in EPA's baseline approval report cited earlier, and these remain unchanged.

Technical Evaluation

Modification of the waste stream to include 56 drums from the K-1 and K-2 cells was assessed to determine the following: how these data had been integrated; impacts of the information on the waste stream; changes to the radiological and physical characteristics of the waste; and other elements that could affect pertinent characteristics of Waste Stream ID-ANLE-S5000. Results of the analysis are presented below. When information presented in the text is supported directly by one of the AK references, that reference is cited in parentheses.

(1) The adequacy of the definition of Waste Stream ID-ANLE-S5000 was examined with respect to the addition of the K-Cell wastes.

The Remote-Handled TRU Waste Characterization Program Implementation Plan (WCPIP) defines waste stream as "waste material generated from a single process or activity, or as waste with similar physical, chemical, and radiological properties." Waste Stream ID-ANLE-S5000 is a debris waste stream generated in the Argonne National Laboratory-East (ANL-E) Alpha Gamma Hot Cell Facility (AGHCF) and Cells K-1 and K-2 of the M-Wing[1]. EPA found that the original waste stream was adequately defined, but the stream did not at that time include K-Cell waste. Physical and radionuclide compositions of the 56 K-Cell drums were assessed to determine whether these drums fit within the approval of the original waste stream.

To determine whether the wastes fit into the original AGHCF waste stream, the origin of wastes from the K-Cells had to be understood. INL-CCP representatives stated that the M Wing Hot Cell facility, including the K-Cells, was constructed in 1964. Cell K-1 was put into use in the early 1970s (prior to 1972) following construction of an internal containment structure that was elevated or isolated above the cell floor on floor pans (P618). From 1972–1978, mixed oxide (MOX) and other fuels underwent physical sectioning and testing in the K-1, including direct

[1] The AGHFC and the M-Wing Hot Cell Facility are distinct facilities located in the 200 Area of ANL-East that were used for similar purposes. The M-Wing contained hot cells other than K-1 and K-2 that were used for purposes unrelated to the generation of TRU wastes for WIPP. The K-Cells wastes discussed in this report include materials generated in both K-1 and K-2.

electrical heating. Waste material generated during testing remained in the cell (data suggest that some may have been placed in cans). In 1978, decontamination and decommissioning (D&D) of K-1 began, and drummed wastes were generated from 1978–1981. Use of K-2 began in 1978 with the construction of a similar internal containment structure that was elevated three feet above the cell floor (P617) in which fuels were tested. Testing occurred from 1978–1981 and D&D of K-2 was initiated in 1981. INL-CCP representatives stated that available data show the K-Cells were unused until the containment structures were installed, because no decontamination or other records were found that documented earlier use of the K-Cells (C358, C364, C373, and C378). The K-2 Cell was used for other activities following D&D of the containment structure, but these later wastes are not included in the waste stream. Therefore, K-1 and K-2 Cells were active during the time that the AGHCF was used.

To further ensure that the K-Cell wastes are part of the original AGHCF waste stream, several references were examined to understand the K-Cell processes and procedures in place at the time of cell operations. Data examined (e.g., P032) indicate that the same procedures (i.e., testing) were implemented in the K and AGHCF Cells, and INL-CCP representatives stated that the fuel pins managed in K-Cells are directly traceable to the same fuel pins/AG Nos. in the AGHCF Cells, as evidenced in Reference C381. Available data indicate that the cells were in operation from 1972–1978, with D&D occurring up to 1981, and none of the 56 drums were generated outside of this time period. INL-CCP representatives stated their research did not show any fuel pins or material had been managed or tested in K-Cells during generation of the 56 K-Cell drums, other than those already identified in the AGHCF. Therefore, data indicate that common processes were implemented for testing and waste generation/management in the AGHCF and all cells within the M-Wing, and only AGHCF processes and materials were managed in K-Cells, according to INL-CCP representatives.

With regard to radionuclide composition of the K-Cell containers, INL-CCP representatives indicated that fuel pins accepted at the AGHCF were sometimes moved to the K-Cells for additional sectioning and testing prior to shipment back to the AGHCF for further analysis and/or testing. The K-Cells sometimes accepted fuel pins first for testing or sectioning prior to shipment to the AGHCF. Regardless, all fuel pins within the "system" of the AGHCF/M-Wing operated in a closed loop in that all fuel pins tested in the K-Cells either originated or were sent back to the AGHCF following initial work. This guarantees that the K-Cell fuel pin population is actually a subset of the total fuel pins managed or tested in the AGHCF. Accordingly, the radionuclide composition of waste within the drums of K-Cell wastes is a subset of the waste stream's overall radionuclide composition. See Item (2), below, for additional examination of data pertaining to radionuclide content of K-Cell wastes.

During the original baseline inspection, EPA examined the AK-identified radionuclide (i.e., Pu and ^{235}U) ratios found in the AK records with EDF-6685 to assess whether the general Pu/^{235}U ratios indicated a single waste stream, rather than multiple waste streams, was present. EPA's baseline evaluation showed that the Pu/U ratio for Lots 0–20 (noting that there are 5 additional sublots, for a total of 25 lots) varied by two orders of magnitude, i.e., 0.60 to 1.38. Of the 25 lots originally examined by EPA during the baseline inspection, 21 lots had Pu/^{235}U ratios between 0.4 and 0.85, three lots had values above 1 (Lots 2, 10, and 16) and one lot had a value below 0.1 (Lot 11). The K-Cell wastes are included in Lots 2, 3, 5A, 5B, and 7C, which were part of

EPA's original analysis. Therefore, K-Cell wastes fell within the general radiological envelope assessed by EPA with respect to overall Pu/^{235}U ratios. The purpose of this analysis was to assess the common elements of the radionuclide content among specific wastes based on available data, and it was not intended to serve as a measure of the expected waste radionuclide content.

The waste stream definition includes a demonstration that wastes within the stream exhibit similar physical characteristics. As with the AGHCF wastes, K-Cell wastes were segregated into combustible and non-combustible drums according to the procedures that were in place at the time of waste generation (P006, P042). INL-CCP representatives indicated that the physical data for these early wastes from both the K-Cells and the AGHCF were limited, so physical waste composition was assessed using later (post-1990) AGHCF data. EPA evaluated this process and found it to be acceptable for the AGHCF waste stream approved in January 2007. INL-CCP representatives examined K-Cell data and found that this information was directly comparable to data generated by the AGHCF during the same time period. Inclusion of the K-Cell information resulted in a slight modification of the overall combustible/non-combustible ratio, as identified by similarly aged AGHCF waste (i.e., 25% and 75% combustible/non combustible vs. 28% and 72% combustible/non-combustible for the AGHCF and K-Cell wastes, respectively). The K-Cell wastes in fact more closely mirror the 21%-79% ratios obtained from physical data for post-1990 drums, so the physical waste composition that was identified through available records indicates that the K-Cell waste corresponded to the general combustible/non-combustible waste breakdowns identified for AGHCF waste.

Of the 56 K-Cell containers, 6 underwent fast/quick scanning ("prescan") analysis to assess drum composition. These scans identified a discrepancy with respect to physical composition including the presence of fiberfill packaging, as identified in the AK record and recalled by the ANL-E personnel who packaged the waste (DR018). The discrepancy does not change the overall composition of the stream and therefore does not affect the waste stream determination. Item (12), below, discusses this discrepancy in more detail.

EPA noted that there are an additional 12 drums that were originally included in the K-Cell population but were removed from the grouping due to the lack of AK data at the time of this assessment. As discussed in Item (12), below, the physical composition of these drums assessed during fast/quick scan did not correspond to the anticipated composition of the waste stream (DR018). INL-CCP excluded the 12 drums from the stream at this time. Therefore, EPA's approval only addresses the 56 containers included in the revised waste stream.

Based on the above analysis, the 56 K-Cell drums fit into Waste Stream ID-ANLE-S5000, because these drums originated from the same general process and the radionuclide and physical composition of the K-Cell wastes determined previously. Note that K-Cell wastes were generated during cell D&D, while AGHCF wastes created during the same time were generated "in process." Therefore, while the actual waste generation processes differ, the original input to the waste containers (i.e., waste generated from sectioning and/or testing of fuel pins) is the same, only the time of waste packaging differed.

(2) Radionuclide characteristics of the K-Cell waste were assessed with respect to their similarity to Waste Stream ID-ANLE-5000.

Examination of data show that the K-Cell drums were grouped with AGHCF drums and were assessed in common batch or Lot Numbers 2, 3, 5a, 5b, and 7c. Because the K-Cell drums were already identified within previously assessed AGHCF batches that EPA has evaluated, re-analysis of these batches with respect to overall radionuclide content was not required.

Reference C381 summarizes information pertaining to the fuel pins tested in the K-1 and K-2 Cells. This reference indicates that the following AGHCF Numbers (AG Numbers) are associated with K-Cell wastes: 93B, 116, 125, 143J, 155A, 155B, 155C, 165R, 165P, 165L, 165N, 171A, 171B and 171C, 171D, 171E, 178, 188, 202, and 226. Comparing this listing with References P614 and P615 indicates that almost all AG Numbers were identified in either the original or supplemental listing, both of which were used in the derivation of radionuclide scaling factors. AG Numbers 165 L, N, P, and R were not specifically identified, but AG Numbers 165A, B, and C were included. When queried about this, INL-CCP representatives indicated that all data showed that AG Numbers 165 L, N, P, and R were associated with the same uranium oxide fuels as found in AG Numbers 165 A, B, and C. Therefore, modification of the scaling factors is not required by inclusion of the 56 K-Cell drums. The fuel types identified in Reference C381 are: Mixed Oxide (MOX), Boiling Water Reactor (BWR), Pressurized Water Reactor (PWR), Light Water Reactor (LWR), EPRI/Exxon Uranium Oxide, Sodium Loop Safety Facility (SLSF), and Enriched Uranium/Natural Uranium Oxide, (EU/NU Oxide).

EPA noted that the K-Cell wastes were created during in-cell activities that took place from approximately 1972 through 1978 for K-1 Cell, and 1978 through 1981 for K-2 Cell. Wastes were packaged during D&D of the internal containment cells, and were assigned the same overall radionuclide composition as AGHCF *process* wastes that were generated at the same time. However, this activity was not an accurate way to represent K-1 Cell waste content, because the radionuclide composition of K-1 Cell wastes reflects fuel pins tested in the facilities from 1972 through 1978 and does not reflect the radionuclide composition of fuel pins tested in the AG facilities from 1979 through 1981. Based on this information, the AK Record is not necessarily the best representation of the K-1 Cell waste radionuclide composition. This assessment supports the use of radionuclide scaling factors to characterize these drums, since the scaling factors included the spectrum of fuel pins that were tested. This process is best suited to determine the radionuclide characteristics of the waste stream as a whole rather than to each drum within the waste stream.

Based on this information, the radionuclide composition of K-Cell wastes is bounded by the composition as presented in the AK summary for Waste Stream ID-ANLE-S5000. EPA notes that slight revisions to weight percentages and other values in Table 6 of the AK summary are necessary to incorporate the additional 56 containers, and these changes are not significant.

(3) Physical characteristics of the K-Cell waste were assessed with respect to the physical characteristics of Waste Stream ID-ANLE-5000.

See Items (1), above, and (4), below, for a discussion of physical waste composition and the identification of issues pertaining to AK. INL-CCP representatives indicated that, based on RTR of AGHCF drums and the knowledge that similar processes were applied to the AGHCF and K-Cells, it is possible that the K-Cell waste will contain water and/or compressed gases. If these items are identified during RTR, an NCR will be issued for the container and it will not be shipped to WIPP until the NCR is closed in accordance with the INL-CCP process.

(4) Sufficiency of the AK summary and implementation of AK as required in Attachment A of the WCPIP were evaluated.

Attachment A of the WCPIP specifies that the following elements be a part of every AK summary:

- Executive summary
- Waste stream identification summary
- AK data and information description
- Program information
- Waste stream information
- Qualification of AK information
- Container-specific information

EPA examined the AK Summary and discussed technical content with INL-CCP representatives. As a result of this exchange, INL-CCP agreed to several "freeze file" changes to CCP-AK-INL-500 Revision 5, Draft E. The sections of the text that will be revised are shown below:

1. Replace the last paragraph on page 11 (Section 2.0) with the following:

   The 200 Area building containing the M-Wing Hot Cell Facility was built in 1951. In 1962, the M-Wing was added to the building to support isotopes separation and research on heavy radioactive isotopes. The M-Wing Hot Cell Facility was added in 1964 to support analytical-chemical research on irradiated alpha-emitting materials. These cells were not designed to support the destructive examination associated with the disassembly and sectioning of irradiated fuel elements being conducted in the AGHCF. Based on the review of the AK record, a containment enclosure was incorporated into the K-1 Cell as early as 1972 to support direct electrical heating experiments of breeder reactor mixed oxide fuel samples. From 1973 to 1974, plans were implemented to further expand the AGHCF destructive examination capabilities by expanding the containment in the K-1 Cell and constructing another inert gas alpha-containment enclosure within the K-2 Cell in anticipation of a major increase in demand for destructive examination capabilities associated with the fast breeder reactor and light water reactor fuels. The K-1 Cell operated from 1972 to 1978 and supported direct electrical heating experiments on light water reactor and breeder reactor fuel pin samples. The K-2 Cell operated from1978 to 1981 in support of the AGHCF fuel

disassembly and macroexamination operations. The K-1 and K-2 Cell waste included in waste stream ID-ANLE-S5000 was generated both during the cell operations and cell decontamination, with the later taking place during the 1978 to 1981 time frame.

2. Make changes to the following discussion in Section 3.0 (pages 15 and 16) so that it reads as follows:

   In addition to the 549 containers of RH waste generated by the AHGCF facility at ANL-E originally included in Waste Stream ID-ANLE-S5000, INL manages an additional 56 30-gallon drums generated in containment boxes in the K-Cells of the M-Wing Hot Cell Facility. In an effort to collect sufficient AK to demonstrate that these containers should be included in waste stream ID-ANLE-S5000, information from the following sources were collected and reviewed (Reference C381):

   - CCP AK records collected for the characterization of Contact Handled (CH) TRU waste generated at ANL-E were reviewed and 15 documents contained relevant information relating to M-Wing Hot Cell Facility operations;
   - CCP AK records collected during the preparation of AK Summary Report for the AGHCF debris. These documents included information relating to operations in M-Wing Hot Cell Facility supporting operations in the AGHCF;
   - A record search was performed at ANL-E for the documents that were scanned into their database for information relating to K-1 and K-2 operations. Numerous documents were obtained that contained relevant information relating to these operations;
   - Interviews with generators of the waste containers from the K-1 and K-2 Cells (References C380, C381, and DR018); and
   - Review of quick scan RTR examinations performed on a selected number of these containers (Reference U343).

3. Make changes to the last paragraph of Section 4.2.1 (pg. 28) so that it reads as follows:

   Based on a review of the AK, it has been determined that K-Cell debris should be included in Waste Stream ID-ANLE-S5000 meeting the WCPIP and the WIPP WAP waste stream definition of waste material generated from a single process or from an activity which is similar in material, physical form, and radiological constituents. The K-Cells debris waste containers are “similar” physically and chemically, since these operations were an extension of the AGHCF operations conducting the same destructive operations utilizing AGHCF procedures. In addition, the K-Cell wastes are bounded radiologically by the waste generated in the AGHCF. The operations in these areas worked together to receive, process, and examine the same irradiated breeder reactor and LWR fuel materials identified and included in the radiological evaluations performed by ANL-E on the batches shipped to INL (References 1, 19, C347, C348, C380, C381, DR018, U042, and U343).

4. Make changes to these paragraphs in Section 4.1.3 (pg. 20) so that they read as follows:

   The original mission for the beta-gamma cells in M-Wing Hot Cell Facility was to support analytical-chemical research on irradiated alpha-emitting materials. These cells were not designed to support the destructive examination associated with the disassembly and sectioning of irradiated fuel elements being conducted in the AGHCF. During the 1973–1974 time frame, plans were implemented to formally expand the AGHCF destructive examination capabilities by constructing inert gas alpha-containment enclosures within the K-Cells in anticipation of a major increase in demand for destructive examination capabilities associated with the fast breeder reactor fuels to be discharged from the Hanford Fast Flux Test Facility (FFTF), TREAT, and EBR-II reactors (References C138, C141, C365, C366, C378, C380, C381, P618, P619, and U340).

   In April 1975, the containment enclosure constructed in the K-1 Cell to support the direct electric heating examination of mixed-oxide fuels since the early 1970s was added to the AGHCF Criticality Hazards Control Statement. Existing AGHCF procedures were to be used during operations in the cell. The K-1 Cell supported AGHCF direct electrical heating experiments on Light Water Reactor (LWR) fuels from the Saxton, Dresden-1, and H.B. Robinson reactors during the 1975–1976 time frame. Cleanup of the cell was conducted in late 1978, corresponding with the generation dates for containers originating from K-1 between August and December 1978 (References C364, C380, C381, U042, P618, P622, P623, and P624).

5. Make changes to this paragraph in Section 5.4.3.1 (pg. 48) so that it reads as follows:

   Table 6, Summary of ANL-E Reported Radionuclides, presents the distribution of generator-reported radionuclides for containers in waste stream ID-ANLE-S5000. As discussed in this section, the radionuclides reported by ANL-E varied significantly over the time period of waste shipments to INL, which is reflected by the data in Table 6. The “Total Radionuclide Weight %” values in Table 6 are the reported gram values for each radionuclide over the entire waste stream divided by the total radiological mass reported by the generator in all containers in the waste stream. The same calculation produced the values for the “Total Radionuclide Curie %” using the sum of activity values for each radionuclide over the entire waste stream. These values have been updated to include the 56 containers of debris waste originating from the K-Cell activities supporting AGHCF operations (References C095, C348, U014, U015, U017, U018, U019, U020, U021, U022, U041, U042, and U043).

6. Make changes to Table 6.0 (pg. 49) so that it reads as follows:

Radionuclide	No. of Drums With Reported Values	Total Radionuclide Wt. %	Radionuclide Wt. % Range for Individual Drums	Total Radionuclide Ci %	Radionuclide Ci% Range for Individual Drums
WIPP Required Radionuclides					
Am-241	0	---	--- - ---	---	--- - ---
Pu-238	0	---	--- - ---	---	--- - ---
Pu-239	603	30.59%	5.67% - 56.81%	1.82%	0.01% - 99.99%
Pu-240	120	0.85%	5.81% - 11.12%	0.18%	0.02% - 5.16%
Pu-242	0	---	--- - ---	---	--- - ---
U-233	0	---	--- - ---	---	--- - ---
U-234	0	---	--- - ---	---	--- - ---
U-238	8	Trace	Trace - Trace	Trace	Trace - Trace
Cs-137	116	0.20%	0.02% - 11.12%	16.77%	1.39% - 96.47%
Sr-90	28	0.06%	0.55% - 5.44%	8.02%	6.76% - 13.31%
Additional Reported Radionuclides					
Pu-241	120	0.03%	0.23% - 0.58%	3.40%	0.31% - 91.81%
U-235	603	68.03%	40.76% - 94.33%	Trace	Trace - 0.06%
Np-237	8	Trace	Trace - Trace	Trace	Trace - Trace
MFP	79	MFP Mass Not Reported		13.41%	21.02% - 99.97%
Mn-54	28	Trace	Trace - 0.03%	0.80%	0.63% - 2.13%
Fe-55	28	0.01%	0.08% - 2.11%	20.35%	15.97% - 54.12%
Co-60	28	Trace	0.01% - 0.18%	0.79%	0.62% - 2.10%
Kr-85	18	Trace	0.02% - 0.16%	0.16%	0.63% - 0.69%
Zr-93	28	0.10%	0.87% - 8.56%	Trace	Trace - Trace
Tc-99	28	0.10%	0.92% - 9.06%	Trace	Trace - Trace
Ru-106	28	Trace	0.03% - 0.27%	9.73%	8.18% - 16.17%
Ag-110	28	Trace	Trace - Trace	Trace	Trace - Trace
Cd-113	28	Trace	0.01% - 0.13%	0.31%	0.26% - 0.52%
Sn-123	28	Trace	Trace - Trace	Trace	Trace - Trace
Sb-125	28	Trace	0.01% - 0.05%	0.56%	0.47% - 0.93%
Sn-126	28	Trace	0.04% - 0.37%	Trace	Trace - Trace
Te-127	28	Trace	Trace - Trace	0.04%	0.03% - 0.07%
Cs-134	28	Trace	Trace - Trace	Trace	Trace - Trace
Ce-144	28	Trace	0.04% - 0.43%	14.71%	12.40% - 24.41%
Pm-147	28	0.10%	0.09% - 0.85%	8.54%	7.19% - 14.19%
Sm-151	28	0.01%	0.10% - 1.02%	0.29%	0.24% - 0.48%
Eu-152	28	Trace	Trace - Trace	Trace	Trace - Trace
Eu-154	28	Trace	Trace - Trace	Trace	Trace - Trace
Eu-155	28	Trace	Trace - 0.02%	0.09%	0.08% - 0.15%

Note: “Trace” indicates less than 0.01 weight or activity percent.

7. Make the following changes to the AK SOURCE DOCUMENTS table in Section 9.0 (pg. 66) so that it reads as follows:

C347	Evaluation of Combustible versus Noncombustible Waste Drums in Waste Stream ID-ANLE-S5000	N/A	K. J. Peters	9/19/2007
C348	Evaluation of Generator Reported Radionuclides for Waste Stream ID-ANLE-S5000	N/A	S. Schafer	9/19/2007

8. Make the changes to the RECORD OF REVISION (pg. 2) so that it reads as follows:

Revision Number	Date Approved	Description of Revision
0	02/09/2006	Initial issue.
1	04/28/2006	Revised to address Carlsbad Field Office (CBFO) Document Review Record (DRR) comments.
2	06/01/2006	Revised to remove potential Official Use Only (OUO) information as identified by Idaho National Laboratory (INL). Also revised to address miscellaneous editorial and Acceptable Knowledge (AK) reference corrections and to address concerns identified during the May 9 through May 12, 2006, INL/Central Characterization Project (CCP) Program Evaluation.
3	07/07/2006	Revised to address findings identified during the U.S. Environmental Protection Agency (EPA) Inspection EPA-INL-RH-CCP-06.06-8.
4	11/16/2006	Revised to implement the Waste Isolation Pilot Plant Hazardous Waste Facility Permit requirements and associated Section 311/Remote-Handled (RH) Permit Modification Request (PMR) changes. Also revised to address the resolution of CCP NCR-RHINL-0007-06 to incorporate dried paint into the waste stream description.
5	11/01/2007	Revised to incorporate 56 containers originating from activities supporting Alpha Gamma Hot Cell Facility (AGHCF) examination operations conducted in the K-1 and K-2 cells of the M-Wing Hot Cell Facility. Also revised to incorporate miscellaneous freeze file changes and identify the potential for prohibited items (liquids, unpunctured aerosol cans, and sealed containers greater than 4 liters) identified during Real-Time Radiography (RTR).
6	XX/XX/2008	Revised to incorporate comments provided by EPA inspector during Tier 1 review of this report incorporating 56 containers of K-1 and K-2 cell debris waste into waste stream ID-ANLE-S5000.

9. Make changes to Table 2 (pg. 37) so that it reads as follows:

Waste Material Parameter	Avg. Weight Percent	Weight Percent Range
Iron-based Metals/Alloys	30.6	0.0 – 87.5 %
Aluminum-based Metals/Alloys	13.5 %	0.0 – 66.2 %
Other Metals	20.4 %	0.0 – 60.0 %
Other Inorganic Materials	13.5 %	0.0 – 53.6 %
Cellulosics	12.0 %	0.0 – 80.1 %
Rubber	4.5 %	0.0 – 64.5 %
Plastic (waste materials)	5.0 %	0.0 – 57.4 %
Organic Matrix	0.6 %	0.0 – 30.7 %
Total Inorganic Waste Avg.	78.0 %	
Total Organic Waste Avg.	22.0	

INL-CCP personnel stated that the freeze file changes presented above will be included in Revision 6 of CCP-AK-INL-500 that will be provided to EPA upon completion of the internal CCP review and approval process.

(5) Data traceability of K-Cell waste was examined.

EPA typically evaluates data traceability by examining data for a given container from its genesis through the entire characterization process, including historic AK data pertaining to the waste. In the case of K-Cell waste, WC activities such as DTC or RTR had not yet been performed on any container. Therefore, data traceability was limited to evaluating and tracing the container based on AK data. INL-CCP provided three drums with traceability information: 355 and 507 from K-1 Cell, and 504 from K-2 Cell. The information provided for review included:

- Intermediate Gamma Level TRU Packaging
- Sectioned Elements Gram Pu/U worksheet (loss gain request)
- Loss Gain SS Materials Sheet
- Radioactive Waste Form (INL)
- Transuranic Waste Container Form (INL) including shipment to INL date of 1982
- INL In Vault Storage Depth Waste Classification
- ANL-E Log of Intermediate Gamma Level Transuranic Waste and Bin Number
- Table 2 INL storage/retrieval information

INL-CCP representatives stated that this information was not available for each of the 56 containers in the waste stream, but enough of the information was found to indicate that records were initiated and maintained to characterize each drum and track its movement from ANL-E to INL. EPA performed a fuel pin traceability analysis for these wastes as part of its original baseline inspection to support the correlation of fuel pins and given container groupings. This analysis was not repeated, since new fuel pins were not identified by INL-CCP.

(6) Defense Origin of K-Cell waste was assessed.

Page 20 of the AK summary, Revision 5 states that fuels from the commercial Saxton, Dresden, and HB Robinson reactors were tested in K-1 Cell. Revision 4 in Item 4, above, was added to indicate that INL-CCP also contends that defense-related MOX fuel was managed in K-1 Cell, so any waste originating from that cell may contain defense-related material.

(7) Sufficiency of AK support documents and related document tracking with respect to the addition of K-Cell references was evaluated.

An AK Source Document Reference List was prepared using unique identifiers for the different document types, following the format typically used by INL-CCP for CH wastes. The listing provided is based on CCP-TP-005 Revision 18, Attachment 4, and was provided on January 10, 2008. The listing is complete, and is easy to understand. As shown in the bulleted list at the beginning of this section, INL-CCP identified several references specific to K-Cell wastes. Of the available references, a subset was provided for the purpose of assessing how the information therein pertained to the K-Cell additions to the AK Summary. The reference list at the back of the AK Summary had been updated to include this information, and a revised "Attachment 4" complete reference list was also provided. Available information indicates that the evaluated references support the overall inclusion of K-Cell waste into the existing ID-ANLE-S5000 stream. EPA only examines the documentation specific to the technical element in the AK summary that identifies a reference as relevant to be selected for examination.

(8) Modification of the Waste Stream Profile Form and related Characterization Reconciliation Report (CRR) were assessed.

INL-CCP representatives indicated that neither a revision to the WSPF nor the CRR had been prepared, since characterization of the K-Cell containers has not begun. As required in EPA's baseline approval, revision of the WSPF and related attachments including the CRR is a Tier 2 change, and EPA will receive notification of these changes when they are made.

(9) Changes to the Confirmatory Test Plan were evaluated.

Revisions to the proposed characterization process were not required by the addition of these 56 containers of K-Cell waste. Therefore, changes to CCP-TP-502 were not necessary. Such changes are a Tier 2 requirement under EPA's baseline approval, so EPA will receive notification of changes if or when they are made.

(10) Use of a Correlation and Surrogate Summary Form was evaluated.

Revisions to the Correlation and Surrogate Summary Form were not made in response to inclusion of the K-Cell wastes. It is conceivable that some RH drums will be identified as CH upon application of the DTC procedure. Should this occur and the assay data for the containers are available and are used for characterization, EPA's prior approval of INL-CCP describes the appropriate action.

(11) Personnel training was evaluated.

Training records for Kevin Peters (AKE) and Steve Schafer (AKE) were examined. Records were provided on January 10, 2007. Both must be trained to requirements of the WCPIP Attachment A which includes training to: the RH TRU WCPIP; non-conformance and corrective action processes; the AK procedure presented in Attachment A of the WCPIP; site-specific training relative to the contents of the subject waste stream(s); and determination of radiological contents of individual drums. Messrs. Peters and Schafer demonstrated training in the first four areas. With respect to determination of radiological contents of each drum, EPA previously examined the training of Jene Vance, since he assembled and assessed the AK data that were used to derive the radionuclide scaling factors. Although Mr.Vance did not show direct training with respect to this area, his resume showed sufficient expertise to demonstrate proficiency.

(12) Non Conformance Reports (NCRs) and Discrepancy Resolution (DR) Forms were examined.

NCRs were not available for the K-Cell wastes. DR018 pertained to discrepancies in K-Cell waste physical waste form, and this was provided. Portions of this DR are applicable to the 56 drum K-Cell population, and they are summarized as follows:

> *Mr. William Kettman was responsible for K-Cell waste packaging and shipment during the waste generation time period. Mr. Kettman was interviewed to ascertain a description of the waste in K-Cell containers, which is provided in reference C380. This reference indicates, in part, that the waste was packaged into "SAW" (fiber pac) cardboard cans with metal bottoms closed with gasketless metal lids clamped onto the containers. He indicated that these were unsealed containers that were bagged out of the area in heat-sealed plastic pouches that were packaged in the same configuration before shipping to Idaho. Quick or "pre" Scan of six K-Cell containers in the 56-container grouping showed that the "SAW" container fiber pacs were not observed as described by Mr.Kettman. Instead, drums 00346 and 00354 have a large fiber pac with a slip lid (unsealed) inside of the rigid liner; drums 00352 and 00355 have two cardboard liners no lids shorter than fiber pac; and drums 00478, and 00496 do not have a cardboard liner or fiber pac. Mr. Kettman was interviewed again, and he confirmed that the packaging was consistent with the drums that he packaged. Though none of these drum contained the fiber pacs (in the waste cans) Mr. Ketterman described in his original interview, he thought that he may have been mistaken, but future drums from the fifty-six drum population may show this configuration. To address this, the AK Summary was revised to address the different packaging configurations. If fiber pacs are discovered, an NCR will be initiated to evaluate this packaging configuration and to determine if these containers meet the definition of sealed containers greater than 4 liters.*

Examination of this DR indicates that INL-CCP representatives performed a thorough evaluation of the information pertinent to the 56 K-Cell drums. It should be noted that a portion of the DR addressed issues pertaining to the 12 drums that have yet to be added to the waste stream. INL-CCP representatives stated that they anticipate they will ultimately be able to link these

containers to K-Cell activities, but the DR related to these drums was not included because EPA's review was limited to the 56 drums included in the Tier 1 revision.

(13) AK accuracy was assessed.

INL-CCP revises its AK Accuracy Report annually. The last AK Accuracy Report was provided to EPA during the June 2006 baseline inspection that was the basis for EPA's January 2007 approval. INL-CCP representatives indicated that they were not aware of the preparation of a new AK Accuracy Report specific to Waste Stream No. ID-ANLE-S5000. EPA's baseline approval did not include changes or updates to the AK Accuracy Report as a Tier 2 change. Therefore, INL-CCP/CBFO will not automatically notify EPA when the next AK Accuracy Report specific to this waste stream is available.

(14) Load Management was evaluated.

INL-CCP representatives indicated that load management is not intended for this Waste Stream No. ID-ANLE-S5000 and this will not change with inclusion of the K-Cell wastes that comprise this T1 evaluation. EPA's baseline inspection report indicated that the implementation of load management is a Tier 1 change requiring EPA prior approval.

(15) Continued attainment of DQOs with addition of K-Cell waste was evaluated.

As a result of the analysis presented in items AK (1) through (14), above, EPA was able to assess continued attainment of each DQO. Specifically:

- Defense determination
- TRU waste determination
- RH waste determination
- Activity determination (TRU Alpha activity per canister, including quantification and identification of 10 WIPP-tracked radionuclides)
- Residual liquids
- Physical form, including metals and CPR

All of these DQOs, except for RH waste and defense determination, are based on AK that is confirmed through various WCPIP-allowed techniques or variants thereof, including RTR and DTC. Defense determination is based on AK alone and cannot be confirmed. TRU waste determination was confirmed through scaling factor verification. RH status is confirmed through direct measurement of each container's external radiation field, as described in CCP-TP-504, Revision 2. Determination of the 10 WIPP-Tracked radionuclides will be performed through application of scaling factors and DTC measurements, as described in CCP-TP-504, Revision 2. Physical form information, including the presence of liquids, will be assessed through RTR. As a result of information provided and EPA's analysis of these data, EPA concludes that INL-CCP adequately presents how DQOs will be obtained, including the additional 56 K-Cell drums.

7.0 SUMMARY OF RESULTS

Findings

The EPA Inspection Team did not identify any findings relative to the inclusion of the 56 containers of K-Cell wastes to Waste Stream No. ID-ANLE-S5000 during this T1 change evaluation.

Concerns

The EPA Inspection Team did not identify any concerns relative to the inclusion of the 56 containers of K-Cell wastes to Waste Stream No. ID-ANLE-S5000 during this T1 change evaluation.

Conclusions

During this T1 change evaluation, EPA examined the inclusion of the 56 containers of K-Cell retrievably stored RH TRU debris wastes in Waste Stream No. ID-ANLE-S5000. Based on the results of this evaluation, EPA is approving the inclusion of the 56 containers of K-Cell wastes in Waste Stream No. ID-ANLE-S5000 with the limitations discussed above.