



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

December 5, 2017

Kenneth R. Whitham
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U.S. Department of Energy
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SUBJECT: THE U.S. NUCLEAR REGULATORY COMMISSION'S JUNE 6, 2017, ONSITE OBSERVATION VISIT REPORT FOR THE IDAHO NATIONAL LABORATORY IDAHO NUCLEAR TECHNOLOGY AND ENGINEERING CENTER TANK FARM FACILITY (DOCKET NO. PROJ0735)

Dear Mr. Whitham:

The enclosed onsite observation visit (OOV) report describes the U.S. Nuclear Regulatory Commission (NRC) OOV on June 6, 2017, at the Idaho National Laboratory (INL) Idaho Nuclear Technology and Engineering Center (INTEC) Tank Farm Facility (TFF). The OOV was conducted in accordance with Section 3116(b) of the Ronald W. Reagan National Defense Authorization Act for Fiscal Year 2005 (NDAA), which requires the NRC to monitor certain disposal actions taken by the U.S. Department of Energy (DOE) for the purpose of assessing compliance with the performance objectives set out in Title 10 of the *Code of Federal Regulations* (CFR) Part 61, Subpart C. The 5 10 CFR Part 61 Subpart C performance objectives are: (i) §61.40 (General Requirements); (ii) §61.41 (Protection of the General Population from Releases of Radioactivity); (iii) §61.42 (Protection of Individuals from Inadvertent Intrusion); (iv) §61.43 (Protection of Individuals during Operations); and (v) §61.44 (Stability of the Disposal Site after Closure). That was the seventh INL INTEC TFF OOV since the NRC began monitoring the DOE INTEC TFF disposal actions under NDAA Section 3116(b) in November 2006.

Starting with this INL OOV Report, the NRC has incorporated a consistent format for OOV Reports for the INL OOVs and the Savannah River Site OOVs.

The main activities conducted during the June 2017 INL INTEC TFF OOV were a tour and technical discussions. The tour focused on the INTEC facilities. The technical discussions focused on: (i) the operating status; (ii) the radiation protection program; (iii) the environmental sampling program; and (iv) the engineered surface barrier construction program. Outside of the OOV activities, the DOE provided a presentation on the Calcine Retrieval Project [available via the NRC Agency wide Documents Access and Management System (ADAMS) Accession No. ML17265A573].

The OOV activities were consistent with the activities described in the NRC Onsite Observation Guidance Memorandum for the June 2017 INTEC OOV (dated May 9, 2017) [ADAMS

Accession No. ML17124A399]. The Guidance Memorandum was developed using the INTEC TFF Monitoring Plan, Rev. 0 (dated April 2007) [ADAMS Accession No. ML070650222]. The INTEC TFF Monitoring Plan contains key monitoring areas, which describe how the NRC will monitor the DOE INTEC TFF disposal actions to assess compliance with the performance objectives. As described in the 2007 INTEC TFF Monitoring Plan, the NRC monitoring activities to assess DOE compliance with §61.41, §61.42, §61.43, and §61.44 will be evaluated through a risk-informed process using technical reviews, data reviews, and onsite observation visits. If the NRC concludes with reasonable assurance that the DOE complies with §61.41, §61.42, §61.43, and §61.44, then the NRC will also conclude with reasonable assurance that the DOE complies with §61.40. Thus, the June 2017 INTEC TFF OOV was part of the NRC's overall monitoring approach to assess the DOE compliance with the performance objectives.

If the NRC staff identifies a significant concern during monitoring, then the NRC may establish an "Open Issue" to document that concern. Early communication of an NRC staff concern to the DOE will allow the DOE to perform corrective actions before the NRC issues a Notification Letter. There were no INTEC TFF Open Issues before the June 2017 OOV and there were no INTEC TFF Open Issues identified during the June 2017 OOV. Thus, there are currently no INTEC TFF Open Issues.

During the monitoring process, the NRC does expect to open and close key monitoring areas. In May 2014, the NRC decided to close Key Monitoring Area 3 (Hydrological Uncertainties). Based on the June 2017 INTEC TFF OOV, the NRC has not closed any of the other four INTEC TFF key monitoring areas.

During the monitoring process, the NRC does expect to open and close Follow-Up Action Items from OOVs, clarification teleconference calls, and technical teleconference calls. Most of those Follow-Up Action Items are specific short-term actions to be performed by the NRC or the DOE. Usually, most of those Follow-Up Action Items are closed before the next OOV, clarification teleconference call, or technical teleconference call. There were no open INTEC TFF Follow-Up Action Items before the June 2017 OOV and there were no INTEC TFF Follow-Up Action Items identified during the June 2017 OOV. Thus, there are currently no INTEC TFF Follow-Up Action Items.

In accordance with the requirements of NDAA Section 3116(b), the NRC will continue to monitor the DOE disposal actions at INTEC TFF. If you have any questions or need additional information regarding this onsite observation visit report, then please contact Mr. Robert Lee Gladney of my staff at Robert.Gladney@nrc.gov or at (301) 415-1022.

Sincerely,

/RA/

Andrea Kock, Deputy Director
Division of Decommissioning, Uranium Recovery,
and Waste Programs
Office of Nuclear Material Safety
and Safeguards

Docket No. PROJ0735

Enclosure:
NRC Onsite Observation Visit Report

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SUBJECT: THE U.S. NUCLEAR REGULATORY COMMISSION'S JUNE 6, 2017, ONSITE OBSERVATION VISIT REPORT FOR THE IDAHO NATIONAL LABORATORY IDAHO NUCLEAR TECHNOLOGY AND ENGINEERING CENTER TANK FARM FACILITY (DOCKET NO. PROJ0735) – **DATED December 5, 2017**

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**U.S. NUCLEAR REGULATORY COMMISSION
JUNE 6, 2017, ONSITE OBSERVATION VISIT REPORT FOR THE
IDAHO NATIONAL LABORATORY IDAHO NUCLEAR TECHNOLOGY
AND ENGINEERING CENTER TANK FARM FACILITY**

EXECUTIVE SUMMARY:

The U.S. Nuclear Regulatory Commission (NRC) staff conducted its seventh onsite observation visit (OOV) to the Idaho Nuclear Technology and Engineering Center (INTEC) Tank Farm Facility (TFF) at the Idaho National Laboratory (INL) on June 6, 2017 (INTEC TFF Observation 2017-01). That was the first INTEC TFF OOV in Calendar Year (CY) 2017. On every OOV to INL, the NRC is focused on assessing the U.S. Department of Energy (DOE) compliance with four performance objectives in Title 10 of the *Code of Federal Regulations* (CFR) Part 61, Subpart C: (1) protection of the general population from releases of radioactivity (§61.41), (2) protection of individuals from inadvertent intrusion (§61.42), (3) protection of individuals during operations (§61.43), and (4) stability of the disposal site after closure (§61.44). If the NRC concludes with reasonable assurance that the DOE complies with §61.41, §61.42, §61.43, and §61.44, then the NRC will also conclude with reasonable assurance that the DOE complies with §61.40.

For this OOV, the NRC focused on the key monitoring areas in the INTEC TFF Monitoring Plan, Rev. 0 (dated April 2007) [available via the NRC Agencywide Documents Access and Management System (ADAMS) at Accession No. ML070650222]. The NRC performs monitoring activities in coordination with the state of Idaho. Therefore, the NRC provided the Idaho Department of Environmental (IDEQ) staff the opportunity both to participate in this OOV and to receive the same information from the DOE as the NRC received from the DOE during this OOV. The NRC staff met with the IDEQ staff prior to this OOV on June 5, 2017.

As described in the NRC Onsite Observation Guidance Memorandum for this OOV (dated May 9, 2017) [ADAMS Accession No. ML17124A399] and as added to during the OOV, the main activities conducted during the OOV were a tour and technical discussions. The tour focused on the INTEC facilities. The technical discussions focused on: (i) the operating status; (ii) the radiation protection program; (iii) the environmental sampling program; and (iv) the engineered surface barrier construction program. An Onsite Observation Guidance Memorandum is a plan for what the NRC expects to cover during an OOV, which may be changed based on what happens during the OOV.

The NRC does not expect to close any of the open INTEC TFF key monitoring areas as a result of this OOV. There were no INTEC TFF Open Issues before this OOV and there were no INTEC TFF Open Issues identified during this OOV. Thus, there are currently no INTEC TFF Open Issues.

1.0 BACKGROUND:

Section 3116(a) of the Ronald W. Reagan National Defense Authorization Act for Fiscal Year 2005 (NDAA) authorizes the DOE, in consultation with the NRC, to determine that certain radioactive waste related to the reprocessing of spent nuclear fuel is not high-level waste,

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provided certain criteria are met. NDAA Section 3116(b) requires the NRC to monitor the DOE disposal actions to assess compliance with the performance objectives in 10 CFR Part 61, Subpart C.

On September 7, 2005, the DOE submitted to the NRC the *Draft Section 3116 Determination Idaho Nuclear Technology and Engineering Center Tank Farm Facility* (DOE/NE-ID-11226, Rev. 0) [ADAMS Accession No. ML12345A036] to demonstrate compliance with the NDAA-criteria, including demonstration of compliance with the performance objectives in 10 CFR Part 61, Subpart C. In its consultation role, the NRC staff reviewed the draft waste determination. In the NRC Technical Evaluation Report (TER) issued in October 2006 [ADAMS Accession No. ML062490142], the NRC documented the results of its review and concluded that there was reasonable assurance that the applicable NDAA-criteria could be met provided certain assumptions made in the DOE analyses were verified via monitoring. Taking into consideration the assumptions, conclusions, and recommendations in the NRC 2006 TER based on the validity of certain assumptions listed in NRC staff's TER, the DOE issued the Final INTEC TFF Waste Determination in November 2006 (DOE/NE-ID-11226, Rev. 0) [ADAMS Accession No. ML14317A056].

To carry out its monitoring responsibility under NDAA Section 3116(b), the NRC, in coordination with IDEQ, performs three activities: (1) technical reviews, (2) OOVs, and (3) data reviews. Specifically, technical reviews generally focus on reviewing information generated to provide support for key assumptions that the DOE made in the INTEC TFF performance assessment. OOVs generally focus on either: (1) observing the collection of data and reviewing the data to assess consistency with assumptions made in the Final INTEC TFF Waste Determination; or (2) observing key disposal or closure activities related to technical review areas. Data reviews generally focus on supplementing technical reviews by focusing on monitoring data that may indicate future system performance or reviewing records or reports that can be used to directly assess compliance with the performance objectives.

Information in an OOV report is relevant to all aspects of the NRC monitoring activities. The NRC will use the information in an OOV report to evaluate whether or not DOE disposal actions at the INTEC TFF comply with the performance objectives and whether to open new or close current INTEC TFF key monitoring areas. During an OOV, the DOE may present preliminary data and commit to provide final data in a publicly available document or documents at a later time to the NRC. That DOE commitment to provide that future document or documents to the NRC would be a Follow-Up Action Item in an OOV report. The future NRC decisions on performance objectives and key monitoring areas will be based on evaluating the final data in that future DOE document or documents and will not be based on the preliminary data discussed at an OOV and summarized in an OOV report. The NRC review of the final DOE data may be documented in technical review reports or technical evaluation reports and both types of those reports would be publicly available. The issues evaluated in technical review reports and technical evaluation reports will be related to NRC monitoring activities that are described in the 2007 INTEC TFF Monitoring Plan.

2.0 NRC ONSITE OBSERVATION VISIT ACTIVITIES:

On May 9, 2017, the NRC issued the Onsite Observation Guidance Memorandum [ADAMS Accession No. ML17124A399) for the June 6, 2017, INTEC TFF Observation 2017-01. An Onsite Observation Guidance Memorandum is a plan for what the NRC expects to cover during an OOV, which may be changed based on what happens during the OOV.

The OOV began with introductions and welcoming remarks followed by a short briefing on the agenda. This OOV was attended by representatives from the DOE (staff and contractors) and the NRC. The rest of the OOV consisted of a tour and technical discussions. The tour focused on the INTEC facilities. The technical discussions focused on: (i) the operating status; (ii) the radiation protection program; (iii) the environmental sampling program; and (iv) the engineered surface barrier construction program.

2.1 Tour and Technical Discussion – Operating Status

2.1.1 Observation Scope:

The tour and technical discussion supported the NRC monitoring of the DOE disposal actions to assess compliance with 10 CFR 61.41, 10 CFR 61.42, 10 CFR 61.43 10 CFR 61.44. The tour and technical discussion was most relevant to the following key monitoring areas (KMAs) in the INTEC TFF Monitoring Plan, Rev. 0:

- KMA 1 – Residual Waste Sampling
 - The NRC monitoring of the DOE activities related to residual waste sampling and volume estimation is important because those DOE activities are pertinent to the final waste inventory, which is risk-significant because it is directly related to the projected long-term dose to members of the public and inadvertent intruders.
- KMA 2 – Grout Formulation and Performance
 - The NRC monitoring of the DOE activities related to grout formulation and performance is important because those DOE activities help to retain key radionuclides in the engineered system and fill void space to ensure site stability.
- KMA 4 – Monitoring During Operations
 - The NRC monitoring of the DOE activities related to the radiation protection program for more risk-significant tank closure activities (e.g., reviewing radiation records and As Low As Is Reasonably Achievable (ALARA) documentation) is important because those DOE activities help ensure that the public and the workers radiation dose limits specified in 10 CFR Part 20 (i.e., similar to the DOE regulations and orders) are met.
- KMA 5 – Engineered Surface Barrier/Infiltration Reduction
 - The NRC monitoring of the DOE activities related to design, installation, and maintenance of the engineered cover is important because those DOE activities are pertinent to the infiltration rates, which are important to the radionuclide release rates and those infiltration rates should be consistent with or lower than those assumed in the DOE performance assessment.

2.1.2 Observation Results:

The key points from the tour and technical discussion were:

- The DOE discussed the current and planned closure activities at the INTEC TFF, which included discussions on status and updates on activities as well as discussions on the engineering cover.
- The DOE informed the NRC that the delays in the schedule for the cleanup and closure of the four 1,000 cubic meter high-level waste tanks (including one spare tank) were dependent upon the start-up of the Integrated Waste Treatment Unit (IWTU) and that there is continued DOE uncertainty in the timing of the start-up of the IWTU.
- The DOE informed the NRC that the INTEC TFF closure work is currently in Phase 5A, which includes grouting of transfer lines and valve boxes and that Phase 5B will include grouting of the remaining tanks.
- The NRC appreciated the DOE tour of the INTEC facilities, including a walk-down of structures, operations, remote video surveillance equipment, and other equipment for INTEC TFF closure activities.

2.1.3 Conclusions and Follow-up Action Items:

The NRC staff will continue to monitor the DOE INTEC TFF activities related to the operating status. There were no Follow-Up Action Items that resulted from either the tour or the technical discussion.

2.2 Technical Discussion – Radiation Protection Program (RPP)

2.2.1 Observation Scope:

The technical discussion supported the NRC monitoring of the DOE disposal actions to assess compliance with 10 CFR 61.43. The technical discussion was most relevant to the following KMA in the INTEC TFF Monitoring Plan, Rev. 0:

- KMA 4 – Monitoring During Operations
 - The NRC monitoring of the DOE activities related to the radiation protection program for more risk-significant tank closure activities (e.g., reviewing radiation records and As Low As Is Reasonably Achievable (ALARA) documentation) is important because those DOE activities help ensure that the public and the workers radiation dose limits specified in 10 CFR Part 20 (i.e., similar to the DOE regulations and orders) are met.

2.2.2 Observation Results:

The key points from the technical discussion were:

- The DOE provided the NRC with information on INTEC TFF activities that had occurred since the previous OOV in June 2014:

- recent activities included: grouting of valve boxes and associated pipe modifications, where valve boxes were decontaminated prior to filling with concrete and pipe fill grout over the concrete; and
 - those activities did lead to significant worker doses; but, those doses were below the regulatory requirements.
- The NRC appreciated the DOE discussion on various improvements to the RPP, including:
 - using a Radiation Work Permit record-keeping system;
 - using optically stimulated luminescence dosimeters;
 - using a better air sampling tracking system; and
 - soliciting worker input for continuous improvement in the RPP.

2.2.3 Conclusions and Follow-up Action Items:

The NRC staff will continue to monitor the DOE INTEC TFF activities related to the RPP. There were no Follow-Up Action Items that resulted from the technical discussion

2.3 Technical Discussion – Environmental Monitoring Program (EMP)

2.3.1 Observation Scope:

The technical discussion supported the NRC monitoring of the DOE disposal actions to assess compliance with 10 CFR 61.43. The technical discussion was most relevant to the following KMA in the INTEC TFF Monitoring Plan, Rev. 0:

- KMA 4 – Monitoring During Operations
 - The NRC monitoring of the DOE activities related to the radiation protection program for more risk-significant tank closure activities (e.g., reviewing radiation records and As Low As Is Reasonably Achievable (ALARA) documentation) is important because those DOE activities help ensure that the public and the workers radiation dose limits specified in 10 CFR Part 20 (i.e., similar to the DOE regulations and orders) are met.

2.3.2 Observation Results:

The key points from the technical discussion were:

- The NRC review of environmental monitoring reports for calendar year (CY) 2014 through CY 2016 revealed little change from previous years and groundwater concentrations of strontium-90 and technetium-99 (i.e., primary radiological constituents of concern in groundwater) continued to be similar to or showed a declining trend and were below regulatory requirements.
- The NRC review of monitoring data associated with the INTEC TFF revealed no new or significant information related to the performance of the disposal facility or evidence of new releases from the INTEC TFF.

- The similarity between the IDEQ data and the DOE data provided the NRC with confidence that both provide reasonable representations of the environment surrounding INL.

2.3.3 Conclusions and Follow-up Actions:

The NRC will continue to leverage the IDEQ monitoring of INL operations because the NDAA requires the NRC to monitor DOE disposal activities in coordination with the covered state. The NRC staff will continue to monitor the DOE INTEC TFF activities related to the EMP. There were no Follow-Up Action Items that resulted from the technical discussion.

2.4 Technical Discussion – Engineered Surface Barrier Construction Program (ESBCP)

2.4.1 Observation Scope:

The technical discussion supported the NRC monitoring of the DOE disposal actions to assess compliance with 10 CFR 61.41. The technical discussion was most relevant to the following KMA in INTEC TFF Monitoring Plan, Rev. 0:

- KMA 5 – Engineered Surface Barrier/Infiltration Reduction
 - The NRC monitoring of the DOE activities related to design, installation, and maintenance of the engineered cover is important because those DOE activities are pertinent to the infiltration rates, which are important to the radionuclide release rates and those infiltration rates should be consistent with or lower than those assumed in the DOE performance assessment.

2.4.2 Observation Results:

The key points from the technical discussion were:

- The NRC review of the DOE Work Plan (DOE/ID-11333, Rev. 1, “Project No. 23512 – Operable Unit 3-14, Tank Farm Soil and INTEC Groundwater Remedial Design/Remedial Action Work Plan”) for the work that DOE began on construction of an interim cover under the Comprehensive Environmental Response Compensation and Liabilities Act (CERCLA) program focused on the Phase-III evapotranspiration cap with capillary biobarrier (ET/CB).
- Based on the NRC review, the information that the DOE provided would not be sufficient for the NRC to evaluate performance of the ET/CB.

2.4.3 Conclusions and Follow-up Actions:

The NRC staff will continue to monitor the DOE INTEC TFF activities related to the ESBCP. There were no Follow-Up Action Items that resulted from the technical discussion.

3.0 OVERALL CONCLUSIONS, STATUS OF KEY MONITORING AREAS, OPEN ISSUES, OPEN FOLLOW-UP ACTION ITEMS, AND ISSUANCE OF NRC TECHNICAL REVIEW REPORTS:

3.1 Overall Conclusions:

The information gathered during INL INTEC Observation 2017-91 will be used for multiple NRC Technical Review Reports via memoranda and future OOVs, based on the topics discussed. There is no change in to the NRC staff overall conclusions from the 2006 TER regarding compliance of the disposal actions with the 10 CFR Part 61 performance objectives. The main key message from the OOV was that the NRC staff did not identify the need for any new key monitoring areas.

3.2 Status of Key Monitoring Areas in INTEC TFF Monitoring Plan, Rev.0:

INTEC TFF Observation 2017-01 is the seventh OOV under INTEC TFF Monitoring Plan, Rev. 0. KMA 3 was closed in June 2014 [ADAMS Accession No. ML14149A337]. The NRC staff did not close any key monitoring areas during this OOV. Therefore, KMA 1, KMA 2, KMA 4, and KMA 5 from INTEC TFF Monitoring Plan, Rev. 0 remain open.

3.3 Status of Open Issues for INTEC TFF Monitoring:

There were no INTEC TFF Open Issues at the beginning of INTEC TFF Observation 2017-01. The NRC staff did not open any new Open Issues during this OOV. Therefore, there are currently no INTEC TFF Open Issues.

3.4 Status of Open Follow-up Action Items from Previous INTEC TFF OOV Reports:

There were six previous INTEC TFF OOVs. All Follow-Up Action Items from previous OOVs were closed prior to INTEC TFF Observation 2017-01.

3.5 Status of Open Follow-up Action Items from Clarifying Teleconference Calls and Technical Teleconference Calls:

All Follow-Up Action Items from previous clarification teleconference calls and technical teleconference calls were closed prior to INTEC TFF Observation 2017-01.

3.6 Summary of Follow-Up Action Items Opened During this INTEC TFF OOV:

There were no Follow-Up Action Items opened during INTEC TFF Observation 2017-01.

3.7 Issuance of NRC Technical Review Reports:

Between the previous OOV and INTEC TFF Observation 2017-01, the NRC issued no technical review reports related to the INTEC TFF via memorandum.

4.0 PARTICIPANTS:

U.S. NRC	U.S. DOE	Flour (DOE Contractor)
Cynthia Barr	Robert (Mark) Shaw	Steve Butterworth
R. Lee Gladney		Travis Campbell
Maurice Heath		Sue Evans
Christopher McKenney		Taryl Huebner
		Kevin Montgomery
		Dean Shanklin

5.0 REFERENCES:

10 CFR Part 61, *Federal Register*, "Licensing Requirements for Land Disposal of Radioactive Waste," *Code of Federal Regulations*, Office of the Federal Register, January 2001.

Idaho Department of Environmental Quality – Idaho National Laboratory (IDEQ-INL), "Oversight Program Annual Report for 2015."

____ IDEQ-INL, "Environmental Surveillance Program Quarterly Data Report for January – March, 2016."

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____ IDEQ-INL, "Environmental Surveillance Program Quarterly Data Report for July – September, 2016."

____ IDEQ-INL, "Environmental Surveillance Program Quarterly Data Report for October – December, 2016."

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____ DOE/ID-10966, Rev. 1, "Performance Assessment for the Tank Farm Facility at the Idaho National Engineering and Environmental Laboratory," Errata, December 2, 2003.

____ DOE/ID-11333, Rev. 1, "Project No. 23512 – Operable Unit 3-14, Tank Farm Soil and INTEC Groundwater Remedial Design/Remedial Action Work Plan," October 2013.

_____ DOE/ID-11500, Rev. 0, "Fiscal Year 2013 Annual Operations and Maintenance Report for Operable Unit 3-14, Tank Farm Soil and INTEC Groundwater," June 2014. ML14260A097

_____ DOE/ID-11513, Rev. 0, "Five-Year Review of CERCLA Response Actions at the Idaho National Laboratory Site – Fiscal Years 2010-2014," December 2015.

_____ DOE/ID-11526, Rev. 0, "Fiscal Year 2014 Annual Report for Operable Unit 3-14, Tank Farm Soil and INTEC Groundwater," July 2015.

_____ DOE/ID-11545, Rev. 0, "Fiscal Year 2015 Annual Report for Operable Unit 3-14, Tank Farm Soil and INTEC Groundwater," June 2016.

_____ DOE/NE-ID-11226, Rev. 0, "Basis for Section 3116 Determination for the Idaho Nuclear Technology and Engineering Center Tank Farm Facility," November 2006.

_____ DOE/ID-12082, WAI-ESER-203, "Idaho National Laboratory Site Environmental Report for Calendar Year 2015," September 2016.

_____ PLN-2309, Rev 3, "Compliance and Monitoring Plan for Performing Grouting at the INTEC Tank Farm Facility Closure Project" October 6, 2010.

U.S. Nuclear Regulatory Commission. "U.S. Nuclear Regulatory Commission Plan for Monitoring Disposal Actions Taken by the U.S. Department of Energy at the Idaho National Laboratory Idaho Nuclear Technology and Engineering Center Tank Farm Facility in Accordance with the National Defense Authorization Act for Fiscal Year 2005," Washington, D.C. ML070650222

_____ "U.S. Nuclear Regulatory Commission Technical Evaluation Report for the U.S. Department of Energy Idaho National Laboratory Site Draft Section 3116 Waste Determination for Idaho Nuclear Technology and Engineering Center Tank Farm Facility," Washington, DC: ML052630012

_____ NUREG-1623, "Design of Erosion Protection for Long-Term Stabilization," September 2002. ML022530043

_____ NUREG-1854, "U.S. Nuclear Regulatory Commission Staff Guidance for Activities Related to U.S. Department of Energy Waste Determinations – Draft Final Report for Interim Use," August 2007. ML072360184

_____ "Technical Review of Hydrological Studies and Data for Idaho National Laboratory, Idaho Nuclear Technology and Engineering Center, Tank Farm Facility," May 2014. ML14113A278

_____ "U.S. Nuclear Regulatory Commission Closure of Key Monitoring Area #3 in the [NRC] Idaho National Laboratory Idaho Nuclear Technology and Engineering Center Tank Farm Facility Monitoring Plan," June 2014. ML14149A337

_____ “U.S. Nuclear Regulatory Commission Onsite Observation Report for the Idaho National Laboratory Idaho Nuclear Technology and Engineering Center Tank Farm Facility,” September 2014. ML14265A092

_____ “Onsite Observation Guidance for June 2017 Monitoring Visit to the Idaho National Laboratory Idaho Nuclear Technology and Engineering Center Tank Farm Facility,” May 2017. ML17124A399

**DETAILED TECHNICAL INFORMATION FROM
U.S. NUCLEAR REGULATORY COMMISSION
JUNE 6, 2017, ONSITE OBSERVATION VISIT TO THE
IDAHO NATIONAL LABORATORY IDAHO NUCLEAR TECHNOLOGY
AND ENGINEERING CENTER TANK FARM FACILITY**

Tour and Technical Discussion – Operating Status

The DOE provided a tour of the INTEC facilities, including a walk-down of structures, operations, remote video surveillance equipment, and other equipment for INTEC TFF closure activities.

The DOE discussed the current and planned closure activities at the INTEC TFF, which included discussions on status and updates on activities as well as discussions on the engineering cover. The DOE also discussed delays in the schedule for the cleanup and closure of the four large, 1,000 cubic meter high-level waste tanks (including one spare tank), which are dependent upon the start-up of the Integrated Waste Treatment Unit (IWTU). There is continued uncertainty in the timing of the start-up of the IWTU, which will be used to treat sodium-bearing waste remaining in the four active tanks.

Regarding the TFF activities, the DOE has been in maintenance mode since calendar year (CY) 2012, when malfunctions arose during startup testing of the IWTU. Maintenance activities include:

- Inspection of containment tents placed over the tank risers to support tank closure operations;
- Mock-up tank washing to maintain the skill sets and qualification of tank closure personnel; and
- Refurbishment and replacement of equipment, including:
 - refurbishment of two wash balls and four directional nozzles to support waste retrieval activities for the remaining four tanks to be cleaned; and
 - replacement of seals on the directional nozzles, which will be tested prior to use.

TFF closure work by the DOE is currently in Phase 5A, which includes grouting of transfer lines and valve boxes. Phase 5B will include grouting of the remaining four tanks.

Based on the information provided by IDEQ to the NRC the day before the OOV, the interim cap placement work was underway. That work by the DOE will include backfilling soil around the west end of the INTEC TFF and placing a low permeability asphalt cover over all of the tanks, excluding active tanks WM-187 through WM-190. More details on that work is described below:

- A concrete lined drainage ditch will run between the east and the west portions of the INTEC TFF with the purpose to prevent infiltration of water to the subsurface;
- Drainage water from the cap will be diverted to an evaporation pond located east of the INTEC TFF;

- Originally, the cap was supposed to cover the entire INTEC TFF; however, because closure of the four tanks is delayed by the startup of the IWTU, IDEQ requested that the DOE proceed with covering the seven, large tanks awaiting closure of the four remaining tanks; and
- In the future, an evapotranspirative cover will be placed over the nine-acre area that encompasses the entire INEC TFF.

Technical Discussion – Radiation Protection Program (RPP)

The NRC did not directly observe execution of a Radiation Work Permit (RWP) during the OOV; but, the DOE provided the NRC with information on activities that had occurred since the previous OOV in June 2014:

- Recent INTEC TFF closure activities included grouting of valve boxes and associated pipe modifications where valve boxes were decontaminated prior to filling with concrete and pipe fill grout over the concrete. Those activities did lead to significant worker doses.
- In one case, some wash water being transferred out of tank WM-190 inadvertently drained into the B-3 valve box leading to contamination of the valve box.
 - dose rates in the valve box were:
 - 500 mR/hour for gamma; and
 - 2,500 mR/hour for beta;
 - during decontamination and isolation of the B-3 valve box, workers received:
 - 818 millirem (mrem) during shield installation and welding;
 - 611 mrem during repair; and
 - 101 mrem during shield removal.
- In another case, modifications to valve boxes C-12 and C-16, including installation of grout connections and vents, which led to worker doses of:
 - 197 mrem for modifications to valve box C-12; and
 - 0 mrem for modifications to valve box C-16.

The DOE discussed various improvements to the DOE RPP including:

- Using a sentinel system for record-keeping whereby the DOE is able to enter in an RWP and then read and track worker doses associated with the RWP in a more efficient manner;
- Using optically stimulated luminescence dosimeters (OSLDs) instead of the more common thermoluminescent dosimeters (TLDs);
- Using a better air sampling tracking system with improved respirators and supplied air lines; and
- Soliciting worker input for continuous improvement in the RPP.

Technical Discussion – Environmental Monitoring Program (EMP)

The NRC discussed with the DOE regarding ongoing remedial actions and groundwater monitoring activities performed at the INTEC TFF. In particular, the NRC obtained from the DOE the environmental monitoring reports issued by both the DOE and the IDEQ and the NRC reviewed those reports. The IDEQ environmental reports evaluated the impact of INL operations on the surrounding environment. The DOE reports were specific to the INTEC TFF to support the Comprehensive Environmental Response Compensation and Liabilities Act (CERCLA). While the environmental monitoring data collected by the DOE was collected under the CERCLA program and was related to historical releases from the INTEC TFF, which are outside the scope of the NDAA, the information collected was useful to the NRC. For example, the monitoring well network could potentially detect releases from the INTEC TFF after closure, which is within the scope of the NDAA, and could provide information on the hydrogeological system and natural attenuation of key radionuclides.

The NRC review of environmental monitoring reports for CY 2014 through CY 2016 revealed little change from previous years. Groundwater concentrations continued to be similar to or show a declining trend in the Snake River Plain Aquifer (SRPA) at the INTEC TFF, with two radionuclides, strontium-90 (Sr-90) and technetium-99 (Tc-99) continuing to be the primary radiological constituents of concern in groundwater. With regard to perched water, the more mobile iodine-129 (I-129), Tc-99, and tritium (H-3) concentrations showed declining trends due to dispersion in the groundwater system; while, Sr-90 concentrations remained elevated in many wells, with the highest concentrations in the northern, shallow perched wells (i.e., greater than 10,000 pCi/L [picocuries/liter]). The concentration of Sr-90 increased somewhat in perched well ICPP-2018 in recent years, with maximum concentrations approaching 200,000 pCi/L.

The DOE attributed the increase in concentration in well ICPP-2018 to the presence of fuel oil detected beginning in CY 2007, just before the increasing trend began. According to the DOE, the presence of the fuel hydrocarbons was to have caused geochemical changes in the groundwater (i.e., created anoxic conditions and led to mineral dissolution), which enhanced the release of otherwise sorbed Sr-90 into perched water.

In response to the DOE remedial actions to drain perched water and mitigate transport of radiological constituents to the SRPA, perched water volumes continued to show an overall decreasing trend. Although, seasonal variations in water levels (e.g., increases in water levels due to spring snow melt and precipitation infiltration) were clearly distinguishable, despite that overall trend. Runoff water was diverted to an evaporation pond, which had gross beta activities at around 50 pCi/L. Those levels exceeded the natural background range for SRPA groundwater from naturally occurring uranium-238 (U-238), radium-228 (Ra-228), and potassium-40 (K-40) of less than 7 pCi/L.

According to the DOE, the slightly elevated beta activity in the pond water was partly the result of Sr-90 derived from INTEC TFF run-off as well as Tc-99 extracted from production wells used for cooling water. That cooling water was discharged regularly to the surface during weekly testing and consequently found its way in runoff diverted to the evaporation ponds east of the INTEC TFF.

A 5-year review of remedial actions at the INTEC TFF under the CERCLA program from CY 2010 through CY 2014 was completed in CY 2015. The Report concluded that remedial actions at INTEC TFF continued to protect human health and the environment and were expected to be protective in the future. The NRC review of monitoring data associated with the INTEC TFF revealed no new or significant information related to the performance of the disposal facility or evidence of new releases from the INTEC TFF.

Offsite monitoring data (i.e., air, water, soil, biota, vegetation, agricultural products) conducted from January through December 2015 was used to estimate doses to members of the public. The dose to the maximally exposed individual located south of the INTEC TFF was calculated at 0.033 mrem (i.e., well below the 10 mrem Clean Air Act standard); dose from waterfowl was calculated at 0.5 mrem; and dose from tritium was 0.2 mrem.

The IDEQ also performs monitoring at INL and concluded in the 2015 Annual Report that there was satisfactory agreement between the environmental monitoring data reported by IDEQ and the environmental monitoring data reported by the DOE. The similarity between the IDEQ data and the DOE data provided the NRC with confidence that both provide reasonable representations of the environment surrounding INL.

Technical Discussion – Engineered Surface Barrier Construction Program (ESBCP)

The DOE indicated to the NRC that work had begun on construction of an interim cover under the CERCLA program. The DOE provided the Work Plan for the cover (DOE/ID-11333, Rev. 1, “Project No. 23512 – Operable Unit 3-14, Tank Farm Soil and INTEC Groundwater Remedial Design/Remedial Action Work Plan”) to the NRC. The NRC reviewed the Work Plan, which included three phases to reduce infiltration and drain perched water at the INTEC TFF. A summary of those three phases is the following:

- Phase-I – before closure of the TFF, reduce infiltration and recharge by: (i) capturing rainfall and snowmelt and directing water to the lined evaporation pond east of INTEC (e.g., install low-permeability pavement, line ditches, and add downspouts to buildings in the defined recharge control zone); and (ii) reducing anthropogenic and storm-water recharge to northern perched water zones through additional recharge controls;
- Phase-II – after closure of the TFF; to reduce infiltration and direct water to the lined evaporation pond east of INTEC, by installing low-permeability pavement over the TFF; and
- Phase-III – after INTEC closure, to reduce infiltration and inhibit exposure to underlying contaminated soil by installing an evapotranspiration cap over the TFF.

The NRC review of the Work Plan focused on the Phase-III evapotranspiration cap with capillary biobarrier (ET/CB). Engineered surface covers typically improve the performance of near-surface radioactive waste disposal facilities. For example, engineered surface covers can reduce infiltration, protect against erosion, significantly retard degradation of the wastefrom, reduce the likelihood or consequences of inadvertent intrusion into the disposal facility, and enhance physical stability of the disposal site.

Although the DOE did not consider the performance of the engineered cover in its 2003 performance assessment (PA) for the INTEC TFF, the NRC concluded in its 2006 TER [ADAMS Accession No. ML052630012] that the infiltration rates assumed in the DOE 2005 PA may not be fully supported. Therefore, the NRC included monitoring of the engineered cover in the INTEC TFF Monitoring Plan to ensure that the cover is compatible with the disposal facility and that the performance of the disposal facility was not overstated with respect to infiltration considering performance of the engineered cover. While the DOE assumed natural infiltration rates in the PA, the engineered surface cover is being constructed as part of remedial activities under the CERCLA program with the purpose of the ET/CB as: (i) to reduce infiltration and prevent “biotic” transport through CY 2095; and (ii) to prevent internal and external exposure to workers and other biological receptors from contaminated alluvium through CY 2224.

The NRC expects to evaluate the final closure cap design when the DOE develops the final closure cap design in the future. The DOE will not install the final closure cap until Phase-III. Based on the NRC review of the information provided by the DOE in the Work Plan, the information provided would not be sufficient for the NRC to evaluate performance of the ET/CB. The Work Plan included the following information:

- Sections 3.2.3 and 4.1.10 provided a general description of the engineered cover and its intended location;
- The ET/CB will cover the central and southern portion of the TFF;
- The ET/CB will consist of layers of fine-grained soil, compacted fill, liners to separate the two layers, and a gravel layer;
- The two figures in Appendix C showed that the existing pavement from the Phase-I and Phase-II remedial actions will remain in place and the ET/CB will be constructed on top of that pavement; and
- The design life of the low-permeability pavement is for thirty years and is required during the period of institutional controls through CY 2095.

The NRC is unclear if the low-permeability pavement is intended to be an effective part of the ET/CB in minimizing infiltration and the expected degradation rates of the pavement given its exposure to the elements. The Work Plan indicated that the low-permeability pavement may have varying material specifications, depending upon location, and that a surface seal shall be applied over the pavement to provide for a low-permeability pavement. However, no other information as to the expected infiltration through the low-permeability pavement and the supporting technical basis is in the Work Plan. The DOE will need to clarify the material specifications of the pavement, as well as the specifications on the surface seal to be applied, when this KMA is evaluated in the future by the NRC.

The Work Plan did not include any calculations or modeling results with regards to the effectiveness of the ET/CB in minimizing infiltration and being erosion resistant. Based on the NRC knowledge of the INTEC TFF, current surface cover design, previous experience in evaluating cover performance described in a PA, and evaluating/inspecting covers associated

with the Uranium Mill Tailings Remedial Action Program, the following types of data would be needed to support the NRC evaluation of this KMA in the future:

- All significant assumptions related to minimizing infiltration and information supporting these assumptions;
- An estimated water budget for the cover, including the inflow and outflow components, which usually include rate of precipitation, evapotranspiration, surface runoff, lateral drainage, and recharge into the fill or alluvium;
- Frequency of large storms or large episodic rainfall in comparison to annual averages;
- Expected vegetation to grow on the top soil and the basis for its survival and dominance, and its expected transpiration (if significant to performance);
- Expected material properties, such as hydraulic conductivity of each of the layers and the expected changes to these properties over time;
- Life expectancy of the liners and their ability to prevent silting-in of the gravel and cobble-sized rock; and
- Estimated thickness of potential saturated zones in any of the layers (e.g., saturated condition in the fine-grained soil above the liner on top of the upper gravel layer).

The NRC NUREG-1623, "Design of Erosion Protection for Long-Term Stabilization" provides a series of methods, guidelines, and procedures for developing erosion protection designs, including the following:

- All significant assumptions related to minimizing erosion and information supporting those assumptions;
- Calculations of expected erosion of the top soil with the gravel admixture;
- Estimated probable maximum precipitation of the site;
- Adequacy of the 0 percent cover slope to prevent ponding;
- Adequacy of the 3 percent to 5 percent cover slope to prevent initiation of gullyng;
- Rate of potential lateral drainage from the top of the liner and from the layers of gravel and cobble-sized rock to the side slopes;
- Adequacy of the 25 percent side slope without riprap to prevent erosion or the initiation of gullyng due to water flow from surface and runoff and lateral drainage;
- Size of riprap, if needed, for the toe of the cover and the channel drainage;
- Depth of root penetration from expected vegetation; and

- Source of gravel in top soil, gravel in gravel layer, and of the cobble-sized rock, as well as the expected durability of the rock types.

DOE Presentation on the Calcine Retrieval Project (CRP) (not part of the OOV)

Per NDAA Section 3116 the NRC has a statutorily mandated role at certain DOE locations in Idaho and South Carolina (i.e., NDAA Covered States). Under NDAA Section 3116(a), the DOE must consult with the NRC prior to the DOE making a final WIR waste determination (WD).

The DOE Calcine Retrieval Project (CRP) will be a new INL NDAA WIR activity. When the DOE sends the draft INL CRP WD to the NRC, the NRC will start consulting with the DOE under NDAA Section 3116(a). The NRC requested that the DOE keep the NRC informed of CRP status, including schedule.

The DOE presented that status on the CRP to the NRC [ADAMS Accession No. ML17265A573]. The DOE expects the CRP to demonstrate the ability to transfer calcined waste from Calcined Solids Storage Facility (CSSF) 1 to CSSF 6. The DOE indicated that the CRP is important for the future closure of the CSSFs at the INTEC TFF, with the calcined waste expected to be transported to and disposed of in a deep geologic repository in the future.

Elements of the CRP that the DOE is planning for include:

- The distributor used to distribute calcined waste to various compartments in CSSF 1 will be removed of waste;
- The above-grade portions of CSSF 1 will be removed;
- Risers will be drilled into the top of CSSF 1;
- Piping will be augured into the calcined waste in CSSF 1;and
- A vacuum retrieval system will be installed into the piping in CSSF 1.

The DOE used a calcine simulant (i.e., calcium carbonate) of varying particle size to test the efficacy of selected treatment technologies. The DOE estimated that 85 percent of the waste can be retrieved from CSSF 1 using existing technology. The DOE indicated that additional technologies and washing may be employed to remove additional material, including material associated with stiffener rings (e.g., robotic equipment), from CSSF 1. The DOE indicated that a full scale prototype of the retrieval system will be constructed to support proof of concept.

According to the DOE CRP presentation, the DOE expects:

- To send the draft INL CRP WD to the NRC in FY 2019;
- The NRC to complete the review of the draft INL CRP WD by issuing the INL CRP TER in FY 2019;

- The DOE to issue the INL CRP Final WD in FY 2020; and
- The NRC to issue the INL CRP Monitoring Plan in FY 2021.

After the DOE CRP presentation, the NRC and the DOE discussed NDAA Criterion 2 (Removal of Highly Radioactive Radionuclides to the Maximum Extent Practical), including the types of DOE information that the NRC expected to receive in order to evaluate NDAA Criterion 2. The NRC directed the DOE to NUREG-1854, "NRC Staff Guidance for Activities Related to U.S. Department of Energy Waste Determinations," which provides guidance with respect to the types of information needed to evaluate NDAA Criterion 2.