

EFFLUENT CONTROL AND ENVIRONMENTAL PROTECTION AT URANIUM RECOVERY AND 11e.(2) BYPRODUCT MATERIAL FACILITIES

PROGRAM APPLICABILITY: 2602 and 2801

89045-01 INSPECTION OBJECTIVES

01.01 To establish the inspection program for effluent control and environmental protection programs at conventional uranium mills, in situ recovery uranium mills, 11e.(2) byproduct material disposal sites, and other 11e.(2) byproduct material sites licensed and regulated under Title 10 of the *Code of Federal Regulations* (10 CFR) Part 40.

01.02 To ensure that the licensee effectively controls, monitors, and quantifies releases of radioactive materials in liquid, gaseous, and particulate forms to the environment.

01.03 To ensure that effluent control and environmental protection programs comply with U.S. Nuclear Regulatory Commission (NRC) license and regulatory requirements.

89045-02 INSPECTION REQUIREMENTS

This inspection procedure (IP) provides the inspection requirements and guidance for effluent control and environmental protection programs at sites licensed under 10 CFR Part 40. Because this inspection procedure applies to a variety of licensees, certain inspection requirements and inspection guidance described in this IP may not be applicable to all sites.

02.01 Inspection Requirements to Meet Objectives. To meet the objectives of this IP, the inspector shall conduct the following minimum inspection activities:

- a. Prepare for the inspection in the office before the onsite inspection. This effort should include review of the site's license and license application requirements for the effluent and environmental control and monitoring programs. Review any routine or non-routine effluent or environmental monitoring reports submitted since the last inspection. If the inspection is an announced inspection, the inspector should consider requesting electronic copies of the licensee's manuals or procedures prior to the onsite inspection. The inspector should also request that the licensee provide documentation of any significant changes since the last inspection.
- b. Conduct one or more site tours to verify that critical equipment used to mitigate, control, and monitor effluents are in service and being maintained as required by the license, license application, and site procedures.
- c. Observe one or more critical activities for equipment in service such as calibration, functional test, equipment repair, or filter changeouts.

- d. Review any unplanned effluent or environmental releases that have occurred since the last inspection to ensure that the licensee responded to the events in accordance with commitments made in the license and site procedures. Ensure the licensee reported the events to the NRC as required by the license and regulations.
- e. Verify through a limited records review that the licensee continues to maintain the effluent control and environmental protection programs in accordance with license and procedural requirements. For example, the inspector shall ensure that the licensee continues to collect the required information and report the information to the NRC. The inspector should determine if any negative trends are present in the data, and if trends are identified, the inspector should verify that the licensee has taken actions to address the trends.
- f. If there have been significant changes in the programs since the last inspection, ensure that the changes have been appropriately evaluated and implemented by the licensee.

02.02 Performance-based/Risk-informed Inspections. In accordance with Commission policy (SECY-98-144), inspectors must conduct performance-based inspections with an emphasis on risk-significant activities that have an impact on safety and the environment. A performance-based inspection emphasizes the observation of activities and results of the licensees' programs over the review of procedures or records. The risk-informed inspection approach considers risk insights together with other factors to focus inspection activities commensurate with the risks associated with the implementation of the licensee's NRC-approved programs.

The higher risk activities that impact the effluent control and environmental protection programs include spill responses and other radiological emergencies, yellowcake dryer operations and accidents, groundwater contamination including excursions, radon emissions, and the procedures and training for the risks listed above.

In summary, the inspector shall verify compliance primarily through observations of site conditions, observations of work activities, interviews with workers, demonstrations by workers, and reviews of critical records. The inspector shall focus attention on the most important, risk-significant activities and the results of the licensee's efforts

89045-03 INSPECTION GUIDANCE

This IP does not apply to inspections of onsite groundwater and water management programs. Inspection guidance for the licensee's monitoring and sampling of onsite groundwater and water management programs are provided in IP 89020, "Groundwater and Water Management at Uranium Recovery and 11e.(2) Byproduct Material Facilities."

The emphasis of this inspection effort is to ensure that the licensee has established and implemented critical programs, manuals, and procedures to control and monitor liquid, gaseous, and airborne effluents to minimize the impact on the public and the environment. The inspection should include direct observations of activities as much as possible but may include documentation reviews as needed. This section includes guidance for review of the following program areas:

- Regulatory requirements for effluent control and environmental protection programs
- Program implementation and procedures review
- Liquid effluents
- Airborne effluents
- Environmental monitoring
- Public dose assessments
- Routine audits and program reviews
- Routine and non-routine reports

03.01 Regulatory Requirements. The following regulatory requirements apply to sites with effluent control and environment protection programs:

- 10 CFR 20.1101(b) stipulates that the licensee shall use, to the extent practical, procedures and engineering controls based upon sound radiation protection principles to achieve occupational doses and doses to members of the public that are as low as is reasonably achievable (ALARA).
- 10 CFR 20.1101(d) provides a constraint on air emissions, excluding radon-222 and its progeny, which apply to sites licensed under 10 CFR Part 40 requirements.
- 10 CFR 20.1302 provides requirements for compliance with dose limits for individual members of the public.
- 10 CFR 40.32(c) states, in part, that an application for a specific license will be approved if the applicant's proposed equipment, facilities and procedures are adequate to protect health and minimize danger to life or property. For uranium recovery and 11e.(2) byproduct material sites, these proposed equipment, facilities, and procedures include those needed to control effluent releases, monitor the releases, and quantify the radioactive material released to the environment.
- 10 CFR 40.65 provides the effluent monitoring reporting requirements for uranium milling licensees. The NRC typically adds license conditions for sites other than uranium mills licensed under 10 CFR Part 40 that are equivalent to the 10 CFR 40.65 reporting requirements.

03.02 Program Implementation and Procedures Review. The goal of this inspection effort is to determine if the licensee is implementing the effluent control and environmental protection programs in accordance with license and regulatory requirements. The inspector should:

- Verify that site procedures have been developed for all aspects of the program.
- Determine if the licensee has changed the program and verify that the changes were made in accordance with the performance-based license. Also verify that site staff were provided training or instruction on the program changes.
- Observe licensee staff implementing procedures during routine activities such as operation and maintenance of equipment, changing sample filters, and analysis of samples. Ensure that the procedure is usable by site staff, equipment specified in the procedure is available, and updated copies of the procedures are available in the field for site staff use.

- Ensure that the licensee has established calibration programs for all effluent and environmental monitoring equipment as required by 10 CFR 20.1501(c), and records of these calibrations are being maintained in accordance with 10 CFR 20.2103(a).
- Verify that the licensee has implemented the quality assurance/quality control program for collection of samples and calibration of analytical equipment as required by license or procedural requirements. Verify the analytical methods meet the license-required minimum detectable activities. Refer to Regulatory Guides 4.14, "Radiological Effluent and Environmental Monitoring at Uranium Mills," and 4.15, "Quality Assurance For Radiological Monitoring Programs (Inception Through Normal Operations to License Termination) - Effluent Streams and the Environment," for additional guidance.
- Review any events that occurred since the last inspection involving the effluent and environmental monitoring programs. Ensure that the licensee evaluated the event, reported the event as necessary, and took corrective actions appropriate to the significance of the event.

03.03 Liquid Effluents. Some uranium recovery and 11e.(2) byproduct material sites conduct operations that result in wastewater. Depending on the site-specific license, the licensee may dispose of wastewater via deep well disposal, pond evaporation, land application, or in rare situations, direct release to sewers or the environment. Sites may also experience spills that result in unplanned releases to the environment. In accordance with 10 CFR 20.2103(b)(4), the licensee is required to keep records of measurements and calculations used to evaluate the release of radioactive effluents to the environment.

Some sites may process liquid effluents prior to release. The goal of treatment is to reduce the radioactive concentrations to levels acceptable for release. These effluent processes may include filtering, ion exchange, and/or treatment of the waste stream. The license may provide limits on the effluent, especially if the effluent will be reused. For example, wastewater that will be used for land application will be required to meet certain water quality limits. In addition, groundwater may be recycled as part of the groundwater restoration program. The recycled water must meet certain standards before it can be reinjected into the ground.

The higher risk activities involving liquid effluents include spill responses, groundwater contamination, and inadequate procedures and training for these risks. As part of the inspection program for liquid effluents, through observations of site activities, discussions with licensee staff, and reviews of documentation, the inspector should verify in a risk-informed approach that:

- Limits on release rates, concentrations, and total quantities are being maintained in accordance with license and regulatory requirements
- Points of release are monitored in accordance with license and license application requirements
- Limits on radioactivity contained in holding or storage tanks are maintained or controlled for ALARA reasons

- Water treatment facilities and associated equipment are in service per approved procedures; reasons for recurring equipment problems should be discussed with the licensee to ensure that long-term corrective actions will be considered and adopted

If possible, the inspector should observe the collection of liquid effluent samples for analysis. Verify that the collection technique follows procedural or industry accepted standards. If liquid samples are collected by an automatic sampler, verify that the sampler has been programmed to collect the correct volume of liquid over the prescribed time frame (24 hours, for example). Verify that the licensee's staff manages the collected liquid in accordance with site procedures.

Sewer releases are uncommon but are allowed by regulations in certain situations. Disposals by release into sanitary sewerage must meet the limits and conditions provided in 10 CFR 20.2003 and Table 3 of Appendix B to 10 CFR Part 20. If the licensee disposes of liquid effluents via sewer, the inspector must ensure that the licensee complies with license and regulatory requirements and has maintained records of these disposals as required by 10 CFR 20.2108.

03.04 Airborne Effluents. There are two types of airborne effluents—gaseous and particulate effluents. At uranium recovery and 11e.(2) byproduct material sites, the most common gaseous effluent is radon-222 (or radon-220 at sites with thorium). The most common particulate effluents are isotopes of uranium and thorium which include radium and lead. Depending on the site and license requirements, licensees may have to process the airborne effluents before release. The dryer stack scrubber is a common example. The licensee may be required to monitor releases at the point of release. Point of release monitoring includes stack releases for uranium concentrations and building ventilation discharges for radon concentrations. Details of the airborne effluent sampling program will be provided in the license and license application.

The NRC's constraint rule, provided in 10 CFR 20.1101(d), applies to uranium recovery sites. The NRC established a constraint on air emissions, excluding radon-222 and its progeny, to limit total effective dose equivalent exposures to the public to less than or equal to 10 mrem (0.1 mSv) per year. If the dose constraint limit is exceeded, the licensee is required to report the exceedance to the NRC. At uranium recovery and 11e.(2) byproduct material sites, exceedances of the dose constraint limit are uncommon. The sites with the greatest potential to exceed the limit are sites with uranium dryer stack releases. During inspections of sites with dryer stacks, the inspector should consider the guidance provided in Regulatory Guide 4.20, "Constraint on Releases of Airborne Radioactive Materials to the Environment for Licensees Other than Power Reactors," to verify that the licensee has not exceeded the dose constraint limit.

As noted earlier, in accordance with 10 CFR 20.2103(b)(4), the licensee is required to keep records of measurements and calculations used to evaluate the release of radioactive effluents to the environment, including gaseous and particulate airborne releases. These records should be reviewed, as needed, during the inspection.

The higher risk activities involving airborne effluents include yellowcake dryer releases, dryer accidents, radon emissions, and inadequate procedures and training for these risks. As part of the inspection program for airborne effluents, through observations of site activities, discussions with licensee staff, and reviews of documentation, the inspector should verify in a risk-informed approach that:

- Airborne releases are monitored in accordance with license and license application requirements including the specific radionuclides listed in the license or license application
- ALARA constraint limit specified in 10 CFR 20.1101(d) has not been exceeded at sites with dryer discharge stacks
- Monitoring and sampling equipment is calibrated and functionally tested at the frequencies specified in the license or license application
- Plant equipment installed to maintain airborne effluent releases ALARA should be in service including exhaust filters and dryer exhaust scrubbers

If possible, the inspector should observe the licensee's collection and analysis of airborne effluent samples to ensure that the collection technique is in accordance with procedural or industry accepted standards.

03.05 Environmental Monitoring. Environmental monitoring sampling stations are staged at predetermined locations around the facility and are used to monitor releases at the nearest resident or site boundary. One sampling station is commonly considered as background for comparison to the measurements collected at the other stations. The data collected at these sampling stations are typically used to calculate potential doses to the public. The inspector should ensure that:

- Sampling stations are in service and collecting the radiological data required by the license and license application
- Sampling equipment is calibrated and functionally tested as required by the license
- Air sampling filters, dosimeters, radiation monitoring devices, and radon canisters are replaced at the frequencies specified in the license
- Sample station outages and damaged or missing filters/measuring devices are logged and reported in routine reports to the NRC
- Soil, sediment, vegetation, surface water, offsite groundwater, and similar environmental samples are collected at the locations and frequencies established in the license and license application

If possible, the inspector should observe the operation of one or more environmental sampling stations during site tours. The inspector should observe the condition of the equipment, verify there are no flow blockages, and the equipment is protected from rain as necessary. The inspector should verify that the air flow intake is separated from the air flow exhaust, and the radiation detector is physically located in the direction of the facility.

03.06 Public Dose Assessments. The licensee is required to conduct operations so that total doses to the public are less than the limits specified in 10 CFR 20.1301. The licensee is required to demonstrate compliance with the public dose limits per 10 CFR 20.1302. Depending on the site, licensees use different methods to demonstrate compliance with the dose limits. These methods may be specified in the license and license application. A common

method is to convert all effluent sample results into a dose and then add the dose that is recorded on the radiation monitoring devices. Most licensees subtract background values from the effluent monitoring results and compare the net result (not gross values) to the public dose limits. The methods that licensees use to determine background are usually approved by the NRC in the license or license application.

During reviews of public dose assessments, the inspector should:

- Ensure that the licensee conducts a public dose assessment and ensure that the results of the assessment are less than the limits specified in 10 CFR 20.1301
- Verify that the methods used to calculate the public dose assessment complies with regulations (including 10 CFR Part 20, Appendix B), license, or license application requirements; otherwise, ensure that licensee's methods agree with the guidance provided in Interim Staff Guidance DUWP-ISG-001 or other guidance in effect at that time
- Ensure that the licensee reports the results of the public dose assessment to the NRC as required by license or license application requirements
- Review the licensee's routine ambient gamma radiation surveys to verify that dose measurements observed in areas accessible to the public do not exceed the 2 mrem in any one hour as required by 10 CFR 20.1301(a)(2); the inspector should spot-check the licensee's gamma radiation survey results during site tours

03.07 Routine Audits and Program Reviews. The audit and program review requirements vary by site. At a minimum, licensees are required to conduct annual reviews of the effluent and environmental monitoring programs as part of the comprehensive annual radiation protection program review specified in 10 CFR 20.1101(c). Some licensees may commit to additional audits and reviews, such as quality assurance program or management reviews. The inspector should verify that these routine audits and program reviews are being conducted as required by regulations, license condition, and license application commitments.

03.08 Routine and Non-routine Reports. Licensees are usually required to report the results of effluent and environmental monitoring to the NRC. The reporting requirement may be specified in regulations (10 CFR 40.65) or by license condition. The reports are submitted either semiannually or annually. Depending on the site, the NRC may also require licensees to submit annual land use surveys, surveys which are used to monitor changes in land use around the site. The annual land use survey provides information such as changes in the nearest residence, which may necessitate a corresponding change in the location of the nearest resident sampling station.

Licensees should trend the effluent and environmental monitoring data, although the requirement for trending varies from license to license. Regulations only require the licensees to report the data for the reporting period. Commonly, the licensee will commit in the license application to trend the data. The licensee is also required to conduct a public dose assessment, but licensees vary on how the dose assessment information is presented to the NRC. Some licensees conduct and report these assessments as part of the second semiannual or annual effluent monitoring reports, while other licensees provide the information in their annual ALARA program reviews.

Non-routine reports may be necessary if the licensee experiences an exceedance. The most common reasons for non-routine reports includes spills or leaks of process fluids. Although rare, licensees may experience yellowcake dryer failures that result in releases beyond the structure that houses the dryer. Regulatory reporting requirements for incidents and accidents are provided in 10 CFR Part 20, Subpart M, and 10 CFR 40.60. The requirements for reports of exposures, radiation levels, and concentrations of radioactive material that exceed the constraint or dose limits are provided in 10 CFR 20.2203.

During reviews of this program area, the inspector should:

- Verify that the licensee is reporting the effluent monitoring, environmental monitoring, public dose assessments, and annual land use surveys to the NRC as required by regulation, license, or license application.
- Verify that the reports provide the information required by regulations or the license; refer to Regulatory Guide 4.14, "Radiological Effluent and Environmental Monitoring at Uranium Mills," Section 7, for the types of information to be reported.
- As discussed in Section 7.5 to Regulatory Guide 4.14, ensure the licensee is reporting actual data results and not using the terms "not detected," "less than MDC," or similar terms in lieu of actual data.
- Ensure that the minimum detectable concentrations specified in Regulatory Guide 4.14 or the license are being met by the laboratory. As discussed in the Interim Staff Guidance DUWP-ISG-001, the minimum detectable concentration for radon-222 may be problematic for some sites when compared to the effluent concentration limit and background radon concentrations.
- Ensure that the licensee trends the data to identify adverse trends and take corrective actions as necessary based on these trends.
- Confirm that the licensee identifies and reports incomplete, lost, or missing data in its routine reports, to ensure that the NRC is aware that some of the required data cannot be reported.
- In the rare instances that non-routine reports are required to be submitted in this program area, ensure that the licensee reported the incident as required by regulatory or license requirements.

89045-04 RESOURCE ESTIMATE

The level of technical expertise needed to conduct the inspection will depend on the complexity of the licensee's effluent control and environmental protection programs. Most inspections can be conducted by regional inspectors. However, technical experts from the regional or program office may be needed to review complex activities such as offsite groundwater monitor well installation. Inspections of this program typically would involve one inspector and would require about a day (8 hours) to complete, depending on the complexity of the program.

89045-05 PROCEDURE COMPLETION

This IP is complete when the inspection staff observe the activities, interview site staff, and review records as needed to satisfy the objectives of this IP. This IP should be completed at least once per year, or at other frequencies as established in the Master Inspection Schedule.

89045-06 REFERENCES

Inspection Manual Chapter 2801, "Uranium Recovery and 11e.(2) Byproduct Material Facility Inspection Program," October 8, 2021

Inspection Procedure 89020, "Groundwater and Water Management at Uranium Recovery and 11e.(2) Byproduct Material Facilities," October 8, 2021

Interim Staff Guidance DUWP-ISG-01, "Evaluations of Uranium Recovery Facility Surveys of Radon and Radon Progeny in Air and Demonstrations of Compliance with 10 CFR 20.1301," June 2019 (ML14058A010)

Regulatory Guide 4.14, Revision 1, "Radiological Effluent and Environmental Monitoring at Uranium Mills," April 25, 1980

Regulatory Guide 4.15, Revision 2, "Quality Assurance For Radiological Monitoring Programs (Inception Through Normal Operations to License Termination)-Effluent Streams and the Environment," July 2007

Regulatory Guide 4.20, "Constraint on Releases of Airborne Radioactive Materials to the Environment for Licensees Other than Power Reactors," April 2012

Staff Requirements SECY-98-144, "White Paper on Risk-informed and Performance-based Regulation," March 1, 1999

END

Attachment 1: Revision History for IP 89045

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| Commitment Tracking Number | Accession Number Issue Date Change Notice | Description of Change | Description of Training Required and Completion Date | Comment Resolution and Closed Feedback Form Accession Number |
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