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## INSPECTION PROCEDURE 89020

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### GROUNDWATER AND WATER MANAGEMENT AT URANIUM RECOVERY AND 11e.(2) BYPRODUCT MATERIAL FACILITIES

PROGRAM APPLICABILITY: 2602 and 2801

#### 89020-01 INSPECTION OBJECTIVES

01.01 To establish the inspection program for groundwater and water management activities at conventional uranium mills, in-situ recovery (ISR) 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 determine if groundwater and water management activities are protective of workers, members of the public, and the environment.

01.03 To determine if groundwater and water management activities comply with U.S. Nuclear Regulatory Commission (NRC) license and regulatory requirements.

#### 89020-02 INSPECTION REQUIREMENTS

This Inspection Procedure (IP) provides the requirements and guidance for inspections of groundwater and water management programs at sites licensed under 10 CFR Part 40. These sites include conventional uranium mills, ISR mills, and 11.e(2) byproduct material disposal sites. Because this IP applies to a variety of licensees, some of the inspection requirements and inspection guidance provided in this IP may not be applicable to all sites.

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

- a. To the extent possible, perform in-office preparation before the onsite inspection effort. This should include a review of the site's performance-based license, groundwater corrective action and monitoring program requirements, and routine reports (annual and semi-annual status reports) submitted to the NRC since the last inspection. Also review spill, excursion, and leakage reports that have been submitted since the last inspection. Determine if any significant changes have been made to the licensee's groundwater or water management programs since the last inspection.
- b. Conduct one or more site tours to verify that critical equipment, impoundments, ponds, and underdrains are functioning as required by the license, no leaks or spills are in progress, flow paths are correctly aligned, and process parameters (flow, pressure, level, temperature) are within license and procedural limits.

- c. Observe one or more critical activities, such as a maintenance activity, water sampling, or underdrain sampling, to ensure that the licensee has established and implemented procedures for these activities, and the procedures provide adequate guidance for the activity. The observed activities should be rotated during subsequent inspections.
- d. For each spill or excursion that has occurred since the last inspection, verify that the licensee has identified and corrected the cause of the spill or excursion, implemented cleanup activities as required by the license, reported the event to the NRC as required by the license, and taken corrective actions to prevent recurrence of the spill or excursion.
- e. For any new or existing pond or impoundment leak, or unusual leak detection activity, verify that the licensee has taken actions as required by the license or site procedures to determine the causes of the leakage, impacts on the environment, and planned corrective actions to mitigate or eliminate the leakage.
- f. Verify through a limited records review that the licensee is monitoring, inspecting, and/or sampling ponds, impoundments, wells, and underdrains as required by the license. In addition, the inspector should verify that negative trends in the data have been identified by the licensee.
- g. If there have been any significant changes in the groundwater or water management programs since the last inspection, ensure that the changes have been appropriately evaluated and implemented by the licensee using its performance-based license.

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 licensee's 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 risks include seepage from an impoundment, loss of piping integrity, failure of wellhead venting mechanisms, fluid migration from an ISR wellfield, and spills. An ISR site has a higher potential for a fluid release than a conventional mill site because of the high fluid pumping rates as part of the ISR process. Regardless of the type of site, the groundwater and water management programs should include requirements for controlling, monitoring, and responding to spills, seepage, leakage, and excursions.

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.

## 89020-03 INSPECTION GUIDANCE

03.01 Regulatory Requirements. The inspector should evaluate licensee compliance against the following regulatory requirements, as applicable:

- a. 10 CFR 40.41(c). This regulation states that each person licensed by the Commission pursuant to the regulations in this part shall confine his possession and use of source or byproduct material to the locations and purposes authorized in the license. The licensee is required to comply with all groundwater and water management requirements specified in the license.
- b. 10 CFR Part 40, Appendix A. Criteria 5 and 13 may provide additional regulatory requirements for groundwater programs.

03.02 General Guidance. The inspector should be familiar with the licensee's groundwater and water management program requirements prior to the start of the inspection. Appendix A to this IP provides suggested areas of review during inspections; although, not all program areas will be applicable to all facilities:

- Facility design and program changes
- New wellfields
- Wellfield operations
- Pond/impoundment operations
- Wastewater disposal
- Groundwater restoration
- Groundwater corrective action program
- Groundwater monitoring
- Procedures, notifications, and reports

The inspector will verify compliance with NRC requirements primarily through observations of site conditions, observations of work activities, interviews with workers, demonstrations by workers, and reviews of critical records.

## 89020-04 RESOURCE ESTIMATE

Technical experts from both the regional and program offices may be needed to implement this IP including hydrogeological experts from the program office and radiation protection and operational experts from the regional offices. The inspection effort will require 1-2 NRC staff and will take about 1-2 days (8-32 hours) to complete, depending on the complexity of the licensee's groundwater and water management programs. This resource estimate excludes travel, preparation, and documentation time.

## 89020-05 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 a year, or at other frequencies as established in the Master Inspection Schedule.

89020-06      REFERENCES

Inspection Manual Chapter 0610, "Nuclear Material Safety and Safeguards Inspection Reports," May 18, 2004

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

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

END

Appendix A: Checklist for Groundwater and Water Management Activities at Uranium Recovery and 11e.(2) Byproduct Material Facilities

Attachment 1: Revision History for IP 89020

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## INSPECTION PROCEDURE 89020 APPENDIX A

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### CHECKLIST FOR GROUNDWATER AND WATER MANAGEMENT ACTIVITIES AT URANIUM RECOVERY AND 11e.(2) BYPRODUCT MATERIAL FACILITIES

This appendix provides a checklist of items that should be considered for review during inspections of groundwater and water management activities.

01.01 Facility Design and Program Changes. Some licensees have license conditions that allow it to make changes to existing facilities under certain conditions. These changes could include updating site procedures, adding or removing equipment or ponds/impoundments, and revising the organizational structure. These changes are commonly documented in Safety and Environmental Review Panel (SERP) evaluations, or equivalent, and are summarized in an annual report to the NRC. As appropriate, verify that these changes:

- Comply with performance-based license requirements
- Have been reviewed for their impacts on the environment
- Have been reported to the NRC in annual reports as stipulated in the license
- Do not impact the original licensing bases for the site
- Do not alter the NRC-approved facility design and flow paths as specified in the license and license application
- Have not eliminated the interlocks, alarms, and controls referenced in the license used to monitor critical parameters (flow, pressure, and level) and to initiate safety shutdowns
- Have not introduced new chemicals into the process streams

01.02 New Wellfields. At in-situ recovery (ISR) sites, licensees typically expand operations into new mine units. During wellfield construction or as soon as possible after construction, the inspector should verify that:

- Pre-mining groundwater data have been appropriately collected, and the data indicate that the wellfield has been appropriately designed to prevent horizontal and vertical excursions
- Exploration bore holes have been plugged to prevent vertical excursions
- Stratigraphic data indicate that there are adequate confining units to prevent vertical excursions, and the geological data indicate that there are no features that could cause vertical excursions; if those data indicate that such structures exist, verify that the wellfield has been properly designed to detect and prevent these excursions

- The wellfield is contained within the current licensed area
- Appropriate well completion techniques have been used and that well logs and well completion data confirm that production, injection, and monitor wells have been correctly located to prevent or detect excursions
- Vertical and horizontal monitor wells have been correctly located to detect potential excursions from the wellfield
- Well mechanical integrity tests have been correctly performed and that all injection and production wells have passed the test criteria
- Baseline water quality data have been appropriately collected, analyzed, and evaluated to determine upper control limit values and groundwater restoration goals
- Upper control limits have been appropriately established for all excursion indicators
- Appropriate tests of hydrologic confinement have been performed and that test results meet the criteria established to identify vertical interconnections
- Hydrologic tests have been successfully conducted to determine if the horizontal monitor wells have been completed in the mine zone aquifer
- Pre-mining hydrologic properties, such as transmissivity and storage coefficient, have been correctly determined
- Equipment and instrumentation have been installed to ensure that wellfield pressures will be maintained below casing and formation rupture pressures
- Pipelines and well heads have been designed to detect breakages and leaks

01.03 Wellfield Operations. Inspections of wellfields in operation should be conducted to verify that: (1) wellfields are being safely operated to maintain lixivants in the zone of mining and to prevent vertical and horizontal excursions; (2) operations are not negatively impacting the physical integrity of the geological formation; and (3) appropriate levels of bleed are maintained to help prevent excursions beyond the wellfield. At an ISR site, the program should include routine monitoring for an excursion, alarms for piping loss of pressure and fluid collected at a well head and header house, and physical inspections of the surface condition and components relied on for safety should a release occur. During wellfield operations, the inspector should verify that:

- Injection pressures are being maintained below casing and formation rupture pressures
- Licensee is managing wellfield parameters to prevent excursions
- Licensee is activity monitoring for leaks and excursions, and the licensee is taking prompt corrective action when leaks or excursions are identified
- Corrective actions taken in response to previously identified leaks and excursions are appropriate to prevent recurrence

- Pipelines and injection wells are intact and not actively discharging onto the surface or creating springs and weeps in and around the wellfields
- Licensee is maintaining records required by the license
- Licensee is reporting wellfield information to NRC as required by the license
- Mechanical integrity tests are being conducted at the interval required by the licensee (typically every 5 years)

01.04 Pond/Impoundment Operations. Ponds or impoundments may be used for water storage or wastewater evaporation. For sites with ponds, the inspector should verify through visual inspection of the ponds and impoundments that:

- The pond is being maintained in accordance with commitments provided in the license including freeboard limits
- There are no cracks, leaks, or seepage on top or around the pond embankments
- Visible portions of the liner appear to be in good condition without obvious tears
- Leak detection systems are operational as specified in the license
- Appropriate monitoring, cleanup, corrective actions, and regulatory notifications have been taken when pond fluids have been found in the pond leak detection system
- Licensee is conducting routine pond integrity inspections in accordance with license requirements
- Licensee is reporting pond and impoundment inspection results to NRC in annual reports as required by the license
- Down-gradient monitoring well sample results do not show upward trends indicative of pond leakage

01.05 Wastewater Disposal. During operations and restoration activities, licensees typically dispose of wastewater that may contain measurable quantities of licensed material. The inspector should verify that water disposal operations such as surface-water discharge, deep-well injection, or land application conform with applicable license conditions. Specifically, the inspector should verify that:

- Chemistry and radioactive content of liquid effluents discharged to the environment do not exceed license or regulatory water quality requirements
- Deep-well disposal operations are conducted in accordance with license or permit conditions
- Annulus pressures, flow rates, and flow volumes are within licensed limits

- Any shutdowns or irregularities in disposal well operations are reported as required
- Wastewater discharged via land application does not exceed the chemistry limitations provided in the license
- Wastewater radium removal equipment is being operated per procedural requirements

01.06 Groundwater Restoration. At some ISR sites, licensees may immediately transition from wellfield operations to restoration when the wellfield has been depleted of recoverable quantities of uranium. The goal of restoration is to return the groundwater in the mine unit to the quality standards specified in regulations or the license. Restoration operations include groundwater sweep, pump and treat, chemical treatment, or some combination thereof. The same equipment used during mining operation may be use during restoration, or the licensee may install stand-alone restoration equipment. Some licensees may temporarily suspend flow through mine units for better, long-term restoration results. During reviews of groundwater restoration activities, the inspector should verify that:

- Restoration methodologies and flow paths agree with license requirements
- Licensee continues to maintain wellfield bleed to maintain an inward hydraulic gradient
- Extended shutdowns between operations and restoration are allowed by license
- Licensee continues to monitor wellfield parameters for potential excursions
- Licensee demonstrates progress in the effectiveness of the restoration strategy; otherwise, the licensee may have to change the restoration strategy
- Restoration activities have been completed or will be completed within the time frames specified in the license or application, or licensee has requested an extension in NRC-approved time frames
- Post-restoration groundwater stability data are collected as required by license

Decommissioning of surface structures and equipment may occur simultaneously with wellfield restoration. The inspector should use the decommissioning inspection guidance provided in other inspection procedures as needed when conducting reviews of surface decommissioning activities.

01.07 Groundwater Corrective Action Program. Some licenses include requirements for an NRC-approved groundwater corrective action program in response to onsite or offsite groundwater contamination. The groundwater corrective action program will specify the requirements that the licensee must take to manage the groundwater contamination. The program requirements should be reviewed prior to the inspection so that during the walkdowns, the inspector can verify that the:

- Actions specified in the NRC-approved program are being implemented
- Results of the program are documented in routine reports to the NRC



- Corrective action program activities will be completed within the time frames specified in the license, or licensee has requested an extension in NRC-approved time frames

01.08 Groundwater Monitoring. Licensees may be required to conduct groundwater monitoring using an NRC-approved monitoring plan. The monitoring plan specifies the requirements for installation and sampling of wells located in or around areas where groundwater contamination exists and to take certain actions if exceedances are identified.

Groundwater monitoring is typically conducted onsite, but the monitoring plan may include offsite sampling if contamination has migrated offsite. These offsite wells may be separate from, or a part of, the licensee's environmental monitoring program. If the license includes a condition requiring groundwater monitoring, inspector should verify that the licensee has:

- Implemented the monitoring program in accordance with instructions provided in the monitoring plan or license condition
- Submitted the samples to a laboratory authorized to possess and analyze the samples, and the laboratory used an appropriate analytical method for each contaminate of concern. For example, Method EPA 903 underreports Ra-226 concentrations if the Ra-226 concentration present in the sample is greater than 5 picocuries per liter and EPA 115 does not accurately report alpha or beta numbers if the total dissolved solids are greater than 500 parts per million.
- Reported the monitoring results to the NRC as required by license or monitoring plan
- Taken corrective actions in response to exceedances as specified in the license or monitoring plan; the inspector should review reported exceedances prior to the onsite inspection

01.09 Procedures, Notifications, and Reports. Most licenses have requirements to establish procedures, provide notifications, and issue routine and non-routine reports to the NRC. Accordingly, the inspector should verify that:

- Procedures have been established for all groundwater and water management activities that involve radioactive material, and the procedures have been updated in response to changes in site conditions
- Routine reports have been submitted at the frequencies established in the license, and the reports provide the requested information
- Non-routine notifications and reports have been submitted to NRC as required by the license or regulations (some licensees may voluntarily submit courtesy notifications and reports to the NRC; these reports are not required by the license)

END

Attachment 1: Revision History for IP 89020

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
n/a	ML21202A341 10/08/21 CN21-034	Initial issuance	n/a	ML21202A342