NEI 07-07 [Rev 1]

Industry Groundwater Protection Initiative – Final Guidance Document, Rev. 1

March 2019

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Nuclear Energy Institute

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Nuclear Energy Institute, 1201 F Street, NW Suite 1100 Washington D.C. (202.739.8000)

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NOTICE

EXECUTIVE SUMMARY

In 2007 NEI published NEI 07-07, "Industry Groundwater Protection Initiative – Final Guidance Document." NEI 07-07 has been implemented for over 10 years. During this time industry groundwater programs have matured and have undergone multiple self-assessments and two cycles of reviews performed under the auspices of NEI. Additionally, the NRC had added a review of groundwater programs to their routine inspection process under Inspection Procedure 71124.07, "Radiological Environmental Monitoring Program."

The purpose of this revision is to update NEI 07-07 based on these years of operating experience, assessments and reviews performed, and technical guidance developed by the Electric Power Research Institute (EPRI).

NOTE: In a March 26, 2009, memo the United States Geological Society (USGS) transitioned to the use of the single word "groundwater" vs. "ground water." This revision 1 of NEI 07-07 will use the one-word expression unless the two word version was used in original referenced documents.

NEI 07-07 was developed to describe the industry's Groundwater Protection Initiative. The Groundwater Protection Initiative identifies actions to improve utilities' management and response to instances where the inadvertent release of radioactive substances may result in low but detectible levels of plant-related materials in subsurface soils and water. The inadvertent releases addressed by this initiative fall outside the current requirements of the U.S. Nuclear Regulatory Commission (NRC) and are well below the NRC's limits that ensure protection of public health and safety. Planned liquid and airborne releases performed in accordance with NRC's regulations are not included in the scope of the initiative or this document. The initiative also includes guidance on how the utilities should communicate with their stakeholders about those instances.

The Groundwater Protection Initiative identifies those actions necessary for implementation of a timely and effective groundwater protection program. In addition, objectives are specified to accomplish each action and the acceptance criteria to demonstrate that the objectives have been met. If a licensee reaches an agreement on communication with their stakeholders that differs from the guidance in this document, that difference shall be documented and retained as part of plant records.

It is expected that this initiative will be implemented by each member company currently operating or decommissioning a nuclear power plant and by each member company constructing a new plant after year 2006. In the event that new or amended NRC regulations are enacted that address groundwater protection or inadvertent releases of radioactive liquids, this initiative should be revisited by the Nuclear Strategic Issues Advisory Committee.

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INTRODUCTION

There have been instances of nuclear power plants and materials licensees detecting contamination from inadvertent releases of licensed material to soil and/or groundwater. While none of the identified instances has threatened public health and safety or compromised environmental protection, local stakeholders have expressed concern.

Under the Industry Groundwater Protection Initiative (GPI), each member company operating or decommissioning a nuclear power plant was required to develop and implement a site-specific/company groundwater protection program to ensure timely and effective management of situations involving inadvertent releases of licensed material* to groundwater* and to implement voluntary* communication programs by July 31, 2006. Each member company constructing a new plant after year 2006 will develop the appropriate site procedures and/or programs to meet the GPI and implement them prior to initial fuel load. An effective, technically sound groundwater protection program requires on-going review and evaluation.

PURPOSE

The Industry Groundwater Protection Initiative will help licensees to:

1. Improve management of situations involving inadvertent radiological releases that get into groundwater.

2. Improve communication with external stakeholders to enhance trust and confidence on the part of local communities, states, the NRC, and the public in the nuclear industry's commitment to a high standard of public radiation safety and protection of the environment.

This industry initiative only applies to licensed radioactive materials that are or were generated as a result of plant operations.

BACKGROUND

Nuclear power plant licensees are required to control and monitor releases of radioactive liquids and airborne materials to ensure that they remain below regulatory limits and do not pose a threat to public health and safety. Over time, licensees have progressively reduced their releases to the environment such that individuals living near these facilities typically would not receive more than 1 millirem per year due to these controlled discharges. Licensees establish programs and procedures to carefully control radioactive material, however, leaks and spills occasionally occur and equipment can fail. As plants began to undergo decommissioning in the late 1990s to early 2000s, instances of subsurface and/or groundwater contamination were identified. In addition, several operating facilities also identified groundwater contamination resulting from spills and

* Wherever indicated, see glossary

leaks or equipment failure. In one instance, low levels of licensed material were detected in a private well located on property adjacent to a nuclear power plant.

The industry recognized that these instances of inadvertent contamination posed a public confidence challenge even though the releases themselves were not a significant public health issue. In May 2006, the U.S. commercial nuclear power plants adopted the Nuclear Energy Institute (NEI) Groundwater Protection Initiative (GPI) (Attachment 1). The Nuclear Strategic Issues Advisory Committee (NSIAC) of NEI unanimously voted to implement these voluntary measures to minimize the potential for inadvertent releases of radioactive liquids to the environment and to enhance public trust and confidence in the industry.

Working in parallel, the NRC formed a Liquid Radioactive Release Lessons Learned Task Force to assess the inadvertent release of radioactive liquid to the environment at power reactor sites. On July 10, 2006, the NRC issued Information Notice 2006-13, "Ground-water Contamination due to Undetected Leakage of Radioactive Water," that summarized its review of radioactive contamination of groundwater at multiple facilities as a result of undetected leakage from facility structures, systems, or components that contain or transport radioactive fluids. Licensees were instructed to review the information for applicability to their facilities and consider actions, as appropriate, to avoid similar problems. The final report of the NRC's task force was issued on September 1, 2006, and included 26 recommendations for additional consideration by the NRC. The report stated:

> "The most significant conclusion of the task force regarded public health impacts. Although there have been a number of industry events where radioactive liquid was released to the environment in an unplanned and unmonitored fashion, based on the data available, the task force did not identify any instances where the health of the public was impacted."

Nuclear power provides a significant portion of the electricity needed by society today and must be part of the future diversified generation mix in order to help reduce this nation's reliance on fossil fuels and to reduce the emission of greenhouse gases. Each licensee has voluntarily implemented the Groundwater Protection Initiative and will continue to do so in the future, recognizing that public confidence and trust are critical to the continued successful operation of their facilities.

1 GROUNDWATER PROTECTION PROGRAM

ACTION 1 IMPROVE MANAGEMENT OF SITUATIONS INVOLVING INADVERTENT RADIOLOGICAL RELEASES THAT GET INTO GROUNDWATER

Each licensee shall develop a written Groundwater Protection Initiative (GPI) program that describes their approach to ensure timely detection and effective response to situations involving inadvertent radiological releases to groundwater in order to prevent migration of licensed radioactive material off-site and to quantify impacts on decommissioning. The GPI program shall specify the frequency at which and/or conditions under which each program element is performed to ensure that the licensee's understanding of the site, the potential for leaks or spills to occur, or for equipment to degrade over time accurately reflect actual conditions.

The Electric Power Research Institute (EPRI) has developed a technical guideline for the implementation of groundwater protection programs at nuclear power plants to meet Action 1. The stated objectives of the EPRI document, "Groundwater Protection Guidelines for Nuclear Power Plants," is to demonstrate a commitment to controlling licensed material, minimize potential unplanned, unmonitored releases to the environment from plant operations, and minimize long-term costs associated with potential groundwater and subsurface contamination. Other technically sound, documented approaches that meet the baseline requirements and recommendations in the EPRI Guideline may also be used.

OBJECTIVE 1.1 SITE HYDROLOGY AND GEOLOGY

Ensure that the site characterization of geology and hydrology provides an understanding of predominant groundwater gradients based upon current site conditions. This characterization is the basis for the Conceptual Site Model (CSM).

Acceptance Criteria

NOTE: Acceptance Criteria *a–c* are intended to ensure an adequate Conceptual Site Model has been developed. Therefore, proceed to Acceptance Criteria *d* if the station has a CSM.

a. Perform hydrogeologic and geologic studies to determine predominant groundwater flow characteristics and gradients.

b. As appropriate, review existing hydrogeologic and geologic studies, historical environmental studies, and permit or license related reports.

c. Identify potential groundwater pathways—on-site and/or off-site—at the facility to ensure migration of source materials is understood.

d. Establish the frequency for periodic reviews of site hydrogeologic studies. As a minimum, reviews should be performed whenever any of the following occurs:

   - Substantial on-site construction
   - Substantial disturbance of site property
   - Substantial changes in on-site or nearby off-site use of water
   - Substantial changes in on-site or nearby off-site pumping rates of groundwater

e. As appropriate, update the CSM and the site's Final Safety Analysis Report with changes to the characterization of hydrology and/or geology.

OBJECTIVE 1.2 SITE RISK ASSESSMENT

Identify site risks based on plant design and work practices:

1.2.1 Evaluate all systems, structures or components (SSCs) that contain or could contain licensed material and for which there is a credible mechanism for the licensed material to reach groundwater.

1.2.2 Evaluate work practices that involve licensed material and for which there is a credible mechanism for the licensed material to reach groundwater.

Acceptance Criteria

a. Identify each SSC that involves or could reasonably be expected to involve licensed material and for which there is a credible mechanism for the licensed material to reach groundwater. Examples of SSCs of interest include: refueling water storage tanks, spent fuel pools, spent fuel pool leak detection systems, outdoor tanks, outdoor storage of contaminated equipment, buried piping, retention ponds or basins or reservoirs, lines carrying steam.

b. Identify existing leak detection methods for each SSC that involves or could involve licensed material and for which there is a credible potential for inadvertent releases to groundwater. These may include groundwater monitoring, operator rounds, engineering walk-downs or inspections, leak-detection systems, or periodic integrity testing.

c. Identify work practices that include actions taken by individuals during maintenance, operational, or support activities which could result in or prevent a spill or leak of a source material that has a credible mechanism for release to groundwater.

d. Evaluate for potential enhancements to leak detection systems or programs. These may include additional or increased frequency of rounds or walk-downs or inspections, or integrity testing.

e. Evaluate potential enhancements to prevent spills or leaks from reaching groundwater. These may include resealing or paving surfaces, installing spill containment measures, performing preventative maintenance or surveillance activities to minimize the potential for inadvertent releases of licensed materials due to equipment failure.

f. Identify the mechanism or site process for tracking corrective actions.

g. Establish the frequency for periodic reviews of SSCs and work practices.

A "credible mechanism for the licensed material to reach groundwater" is considered one wherein the failure of a single barrier between the SSC and the environment could result in inadvertent or unintentional contamination of groundwater or native soil.

OBJECTIVE 1.3 ON-SITE GROUNDWATER MONITORING

Establish an on-site groundwater monitoring program to ensure timely detection of inadvertent radiological releases to groundwater.

Acceptance Criteria

a. Using the hydrology and geology studies developed under Objective 1.1, consider placement of groundwater monitoring wells downgradient from the plant but within the boundary defined by the site license. Wells should be placed to ensure groundwater migration pathways are monitored.

b. Groundwater monitoring wells should be placed as close as practical to SSCs that have the highest potential for inadvertent releases that could reach groundwater or SSCs where other means of leak detection capability is limited.

c. Establish sampling and analysis protocols, including analytical sensitivity requirements and quality assurance/quality control processes for groundwater and soil, where applicable. Consider the potential for detectible levels of licensed material resulting from planned releases of liquids and/or airborne materials.

d. Establish a formal, written program for long-term groundwater monitoring. For those groundwater monitoring locations that are also included in the REMP* revise the site's ODCM/ODAM* and ensure the distinction between the programs is clear.

e. Periodically review existing station or contract lab(s) analytical capabilities. An important consideration is the analytical protocols and times needed to obtain results.

f. Establish a long-term program for preventative maintenance of groundwater wells.

g. Establish the frequency for periodic review of the groundwater monitoring program.

* Wherever indicated, see glossary

OBJECTIVE 1.4 REMEDIATION PROCESS

Establish a remediation protocol to prevent migration of licensed material off-site and to minimize decommissioning impacts.

Acceptance Criteria

a. Establish written procedures outlining the decision making process for remediation of leaks and spills or other instances of inadvertent releases. This process is site specific and shall consider migration pathways.

b. Evaluate and document, as appropriate, decommissioning impacts resulting from remediation activities or the absence thereof. EPRI has developed a technical guideline, "Soil and Groundwater Remediation Guidelines for Nuclear Power Plants," to assist in this area.

OBJECTIVE 1.5 RECORD KEEPING

Ensure that records of leaks, spills and remediation efforts are retained and retrievable to meet the requirements of 10 CFR 50.75(g).

Acceptance Criteria

Establish a record keeping program to meet the requirements of 10 CFR 50.75(g). Note that these records are used to determine an area's classification for purposes of performing surveys—see NRC Regulatory Issue Summary 2002-02, "Lessons Learned Related to Recently Submitted Decommissioning Plans and License Termination Plans."

OBJECTIVE 1.6 DECOMMISSIONING/SAFSTOR IMPACTS

For sites entering/participating in active decommissioning or SAFSTOR, evaluate the impact that associated activities will have on the groundwater protection program.

NOTE: EPRI has developed technical guidance, "Groundwater Monitoring Guidance for Decommissioning Planning," that is designed to assist utilities in planning for changes needed to their groundwater monitoring programs as they transition from operational to decommissioning status.

Acceptance Criteria

a. Establish written procedures outlining the commitments made in regulatory documents such as the Post-Shutdown Decommissioning Activities Report (PSDAR) and License Termination Plan (LTP). Establish/change groundwater related procedures accordingly.

b. As site conditions/processes are planned and/or changed:

    1. Evaluate the impact of how actions could impact groundwater protection.

2. Assess the SSCs and Work Practice Risk Assessments to reflect current conditions.

3. Assess the CSM to reflect current conditions.

4. Assess the groundwater monitoring program to reflect changes in the SSC and Work Practice Risk Assessments and any changes in the CSM—e.g., sampling frequency and number of sample wells.

c. Verify that appropriate elements of groundwater protection are evaluated and maintained until radiological remediation of the site is complete and until the license termination plan and any state and local groundwater related requirements have been satisfied.

2 COMMUNICATION

ACTION 2 IMPROVE COMMUNICATION WITH EXTERNAL STAKEHOLDERS TO ENHANCE TRUST AND CONFIDENCE ON THE PART OF LOCAL COMMUNITIES, STATES, THE NRC, AND THE PUBLIC IN THE NUCLEAR INDUSTRY'S COMMITMENT TO A HIGH STANDARD OF PUBLIC RADIATION SAFETY AND PROTECTION OF THE ENVIRONMENT.

OBJECTIVE 2.1 STAKEHOLDERS BRIEFING

During the initial development of the GPI, each licensee conducted periodic briefings of their site-specific GPI program with the designated state/local officials. This initial briefing will be performed by sites that begin operation after 01/01/2020.

Acceptance Criteria

a. The licensee should discuss:

   - The background or industry events that led to the GPI.
   - If there is additional information that the state/local officials need to better understand the issue, or place it in perspective for their constituents.
   - "How" the state/local officials will use or distribute the information.

b. Licensees should consider including additional information or updates on groundwater protection in periodic discussions with state/local officials, as necessary.

c. For licensees that are in states where multiple nuclear power plants are located with multiple owner companies, it is highly recommended that the licensees coordinate their efforts such that voluntary communications with state/local officials are consistent.

OBJECTIVE 2.2 VOLUNTARY COMMUNICATION

Make informal* communication as soon as practicable to appropriate state/local officials and to other stakeholders as required by site specific procedures with follow-up notification to the NRC, as appropriate, regarding new and/or significant* on-site leaks/spills into groundwater and on-site or off-site water sample results exceeding the criteria in the REMP as described in the ODCM/ODAM, as appropriate.

NOTE: It is not expected that a voluntary communication be generated when a subsequent sample(s) is documented to be from the same source/mechanism/event. Documentation shall be created to show that the subsequent samples were all part of the same source/mechanism/event. The documentation shall be available for stakeholder review.

Acceptance Criteria

This guidance provides a threshold for voluntary communication. Some states may require different communication thresholds; the licensee shall document any agreements with state/local officials that differ from Industry guidance.

a. Communication to the designated state/local officials and other stakeholders as required by site specific procedures shall be made before the end of the next business day if an inadvertent leak or spill to the environment has or can potentially get into the groundwater **and** exceeds any of the following criteria:

   i. If a spill or leak exceeding 100 gallons from a source containing licensed material.

   ii. If the volume of a spill or leak cannot be quantified but is likely to exceed 100 gallons from a source containing licensed material.

   iii. Any leak or spill, regardless of volume or activity, deemed by the licensee to warrant voluntary communication.

   AND

   iv. The spill or leak, regardless of volume or activity, occurs which cannot be completely recaptured or remediated per Objective 1.4 within 24 hours of discovery of the event—i.e., if the spill or leak is recaptured or remediated within 24 hours no communication is required.

   To determine whether a leak or spill would trigger voluntary communication, Appendix A provides a flowchart for the voluntary communication protocol as it applies to leaks or groundwater sample results.

* Wherever indicated, see glossary

LEAK OR SPILL: The "leak or spill" represents an inadvertent event or perturbation in a system or component's performance. This event threshold is intended to ensure that state/local officials are made aware that there has been an event of interest at the site and to keep them apprised of the licensee's action to contain and, as needed, remediate the event. "Leak or spill" events that meet the criteria shall be communicated regardless of whether or not the on-site groundwater is, or could be used as, a source of drinking water.

The quantity of liquid resulting from leaks or spills of solid materials or waste or steam leaks should be evaluated with respect to 2.2.a.i–iv, inclusive.

SOURCE CONTAINING LICENSED MATERIAL: A liquid, including steam, for which a statistically valid positive result is obtained when the sample is analyzed to the following a priori lower limits of detection (analytical sensitivity).

The analytical sensitivity for identifying a source containing licensed material is, at a minimum, the licensee's lower limits of detection that are required for radioactive liquid effluents for isotopes as specified in the ODCM/ODAM.

POTENTIAL TO REACH GROUNDWATER

Spills or leaks with the potential to reach groundwater:

- Spill or leak directly onto native soil or fill.
- Spill or leak onto an artificial surface—i.e., concrete or asphalt—if the surface is cracked or the material is porous or unsealed.
- Spill or leak that is directed into unlined or non-impervious ponds or retention basins–i.e., water hydrologically connected to groundwater.

A spill or leak inside a building or containment unit is generally unlikely to reach groundwater, particularly if the building or containment unit has a drain and sump system. However, the sump and drain system should be evaluated as part of the SSC risk assessment.

NOTE: A spill or leak that is recaptured or remediated per Objective 1.4 within 24 hours of discovery and that does not have potential to reach groundwater does not trigger the voluntary communication protocol.

The licensee shall document any agreement with state/local officials and other stakeholders as required by site specific procedures that differ from this industry guidance as part of their record. Such agreements or guidance provided by these officials

override the communication guidance in this document but must be documented and kept current for stakeholder review.

b. Communication with the designated state/local officials and to other stakeholders as required by site specific procedures shall be made before the end of the next business day for a confirmed water sample result:

   i. Of off-site groundwater or surface water that exceeds any of the REMP reporting criteria for water as described in the ODCM/ODAM.

   ii. Of on-site surface water that is hydrologically connected to groundwater, or of groundwater that is or could be used as a source of drinking water—either onsite or downgradient from the site—that exceeds any of the REMP reporting criteria for water as described in the ODCM/ODAM.

   The licensee shall document the basis for concluding that the on-site groundwater is not or would not be considered a source of drinking water. Examples of a defensible basis are documents from the regulatory agency with jurisdiction over groundwater use.

   Appendix A provides a flowchart for the communication protocol as it applies to groundwater sample results.

c. When communicating to the state/local officials and to other stakeholders as required by site specific procedures, be clear and precise in quantifying the actual release information as it applies to the appropriate regulatory criteria—i.e., put it in perspective. The following information should be provided as part of the informal communication:

   i. A statement that the communication is being made as part of the NEI Groundwater Protection Initiative

   ii. The date and time of the spill, leak, or sample result(s)

   iii. Whether or not the spill has been contained or the leak has been stopped

   iv. If known, the location of the leak or spill or water sample(s)

   v. The source of the leak or spill, if known

   vi. A list of the contaminant(s) and the verified concentration(s)

   vii. Description of the action(s) already taken and a general description of future actions

   viii. An estimate of the potential or bounding annual dose to a member of the public, if available at this time

   ix. An estimated time/date to provide additional information or follow-up

d. Voluntary communication to state and/or local officials and to other stakeholders as required by site specific procedures may also require NRC notification under 10 CFR 50.72(b)(2)(xi). Licensees should perform these notifications consistent with their existing program.

e. Contact NEI by email to GRPGroundwaterIssues@nei.org as part of a voluntary communication event as described in Objective 2.2.

OBJECTIVE 2.3 THIRTY-DAY REPORTS

Submit a written 30-day report to the NRC for any water sample result for on-site groundwater that is or may be used as a source of drinking water that exceeds any of the criteria in the licensee's existing REMP as described in the ODCM/ODAM for 30-day reporting of off-site water sample results. Copies of the written 30-day reports for both on-site and off-site water samples shall also be provided to the appropriate state/local officials.

NOTE: Some site ODCM's may state 31 days. The 31-day report is acceptable for those sites.

Acceptance Criteria

a. All groundwater samples taken for the industry initiative shall be analyzed and compared to the standards and limits contained in the station's REMP as described in the ODCM/ODAM. Pre-2006 ODCM/ODAM requirements specify a written 30-day report to the NRC for REMP sample results that exceed any of the REMP reporting criteria. Under the initiative, a written 30-day NRC report is also required for on-site well sample results that exceed any of the REMP reporting criteria and could potentially reach the groundwater that is or could be used in the future as a source of drinking water, either onsite or downgradient from the site. If the groundwater is not currently used for drinking water but is potable, each station should consider the groundwater as a potential source of drinking water—see Objective 2.2, Acceptance Criterion *b* for documentation needed to establish a defensible basis for determining the beneficial use(s) of groundwater.

   The initial discovery of groundwater contamination greater than the REMP reporting criterion is the event documented in a written 30-day report. It is not expected that a written 30-day report will be generated each time a subsequent sample(s) suspected to be from the same "plume" identifies concentrations greater than any of the REMP criteria as described in the ODCM/ODAM. The licensee should evaluate the need for additional reports or communications based on unexpected changes in conditions.

b. The 30-day special report should include:

   i. A statement that the report is being submitted in support of the GPI

   ii. A list of the contaminant(s) and the verified concentration(s)

   iii. Description of the action(s) taken

   iv. An estimate of the potential or bounding annual dose to a member of the public

v. Corrective action(s), if necessary, that will be taken to reduce the projected annual dose to a member of the public to less than the limits in 10 CFR 50 Appendix I

c. All written 30-day NRC reports generated under item 2.3.a are to be concurrently forwarded to the designated state/local officials.

OBJECTIVE 2.4 ANNUAL REPORTING

Document on-site groundwater sample results of licensed material and a description of any new significant on-site leaks/spills into groundwater for each calendar year in the Annual Radiological Environmental Operating Report (AREOR) for REMP and/or the Annual Radioactive Effluent Release Report (ARERR) for the RETS as contained in the appropriate reporting procedure, beginning with the report for calendar year 2006.

Acceptance Criteria

a. For plants constructed after 2008, appropriate procedures that require inclusion of significant on-site leaks/spills into groundwater and all on-site groundwater results shall be developed and implemented prior to initial receipt of nuclear fuel—see NEI 08-08, "Generic FSAR Template Guidance for Life-Cycle Minimization of Contamination," December 2008.

b. Reporting of on-site groundwater sample results shall be as follows:

   i. Groundwater sample results that are taken in support of the GPI but are not part of the REMP program—e.g., samples obtained during the investigatory phase of the Action Plan circa year 2006—are reported in the ARERR required by 10 CFR 50.36a (a)(2).

   ii. Once the long-term monitoring sample points have been established per Objective 1.3, Acceptance Criterion *d*, the results are reported in the AREOR for those sample points that are included in the REMP as described in the ODCM/ODAM. The sample results for those long-term monitoring sample points that are not included in REMP are reported in the ARERR.

c. In addition to 2.4.b, voluntary communications, if any are made, shall be included in an annual report as follows:

   i. A description of all spills or leaks that were communicated per Objective 2.2, Acceptance Criterion *a* shall be included in the ARERR and/or AREOR.

   ii. All on-site or off-site groundwater sample results that exceeded the REMP reporting thresholds as described in the ODCM/ODAM that were communicated per Objective 2.2, Acceptance Criterion *b* shall be included in either the ARERR and/or in the AREOR.

3 PROGRAM OVERSIGHT

ACTION 3 PERFORM PROGRAM OVERSIGHT TO ENSURE EFFECTIVE IMPLEMENTATION OF THE GPI PROGRAM

OBJECTIVE 3.1 PROGRAM SELF-ASESSMENT AND REVIEW

Maintain active oversight of the GPI program—see Appendix B.

Acceptance Criteria

a. An independent, knowledgeable individual(s) shall perform an initial self-assessment within one year after initial criticality—this step only applies to units that begin operation after 01/01/2020.

b. A programmatic assessment of the GPI program shall be performed periodically at least once every 5 years after initial self-assessment. Programmatic assessments should be maintained according to the records management program.

c. The programmatic assessment, at a minimum, shall include evaluating the implementation of all the objectives identified in this document and be documented consistent with applicable station procedures and programs.

GLOSSARY

AREOR means the Annual Radiological Environmental Operating Report – summarizes the results of the REMP to the NRC.

ARERR means the Annual Radioactive Effluent Release Report as required by 10 CFR 50.36a (a)(2) – summarizes the releases of liquid, airborne and solid wastes from the facility and provides the calculated doses attributable to those releases.

Credible mechanism for the licensed material to reach groundwater is considered one wherein the failure of a single barrier between the SSC and the environment that could result in inadvertent or unintentional contamination of groundwater or native soil.

Groundwater as used in the GPI means any subsurface water, whether in the unsaturated or vadose zone, or in the saturated zone of the earth.

Informal (communication) means a communication, typically by telephone, between licensee personnel and the state/local officials. Subsequent notification of the NRC under 10 CFR 50.72 should be performed consistent with station policy.

Licensed material—from 10 CFR 20.1003—means source material, special nuclear material, or byproduct material received, possessed, used, transferred or disposed of under a general or specific license issued by the Commission.

ODCM/ODAM means the Offsite Dose Calculation Manual or Offsite Dose Assessment Manual or equivalent document. The licensee's manual required by Technical Specification that contains the dose assessment methodology and radiological effluent technical specifications.

REMP means the Radiological Environmental Monitoring Program specified by the ODCM/ODAM that provides measurements of radiation and of radioactive materials in those exposure pathways and for those radionuclides which lead to the highest potential radiation exposures of individuals resulting from the station operation.

RETS means the Radiological Effluent Technical Specifications required to control the release of radioactive liquids and airborne materials from the site. Standard radiological effluent technical specifications are found in NUREG CR-1301.

Significant (leak or spill) means an item or incident that is of interest to the public or stakeholders. It does not imply or refer to regulatory terminology nor is it intended to indicate that the leak or spill has public health and safety or environmental protection consequences.

Voluntary as used in the GPI means not required by statute or regulation.

Verbs "may," "shall," "should," "will," and "would" have the meanings commonly used in the nuclear power industry—see ANSI N42.14-1999. "Shall" denotes a requirement; "should" denotes a recommendation; "may" denotes permission.

ATTACHMENT 1

Nuclear Energy Institute Industry Initiative on Groundwater Protection

May 2006

Objectives:

1. Improve management of situations involving inadvertent radiological releases that get into groundwater.

2. Enhance trust and confidence on the part of local communities, states, the NRC, and the public in the nuclear industry's commitment to a high standard of public radiation safety and protection of the environment.

Actions:

By July 31, 2006, each member company operating or decommissioning a nuclear power plant will:

1. Put in place a company/site-specific action plan(s) to help assure timely detection and effective response to situations involving inadvertent radiological releases in groundwater to prevent migration of licensed radioactive material offsite and quantify impacts on decommissioning.

2. Expand the scope of the licensee's existing Radiological Environmental Monitoring Program (REMP) reporting requirements to include additional voluntary formal and informal reporting as follows:

    2.1 Document all onsite groundwater sample results and a description of any significant onsite leaks/spills into groundwater for each calendar year in the Annual REMP Report, beginning with the report covering the calendar year 2006.

    2.2 Submit a 30-day report to the NRC for any water sample result for on-site groundwater that is or may be used as a source of drinking water that exceeds the criteria in the licensee's existing REMP for 30-day reporting of off-site water sample results. Copies of 30-day reports for both onsite and offsite water samples will also be provided to the appropriate state agency.

    2.3 Make informal notification as soon as practicable to appropriate state/local officials with follow-up notification to the NRC, as appropriate, regarding significant on-site leaks/spills into groundwater—see Item 2.1—and on-site or off-site water sample results exceeding the criteria in the REMP—see Item 2.2.

ATTACHMENT 2

FREQUENTLY ASKED QUESTIONS

1) Q: Does the commitment to "develop and implement a site-specific/company groundwater protection program" specifically include a commitment to drill more monitoring wells, modify plant systems, structures, or components, etc.?

   A: No. Companies are expected to complete an evaluation of the specific situation at each site and identify and schedule needed improvements to meet the objective of "help[ing] assure timely detection and effective response to situations involving inadvertent radiological releases to groundwater to prevent migration of licensed radioactive material off-site and minimize the impacts on decommissioning." The scope of the needed improvements will largely depend on site-specific conditions, e.g., the history of leaks or spills and the extent and quality of current programs for detecting leaks and monitoring on-site groundwater. The on-site groundwater monitoring program, including groundwater monitoring well purpose and location should be based on the Conceptual Site Model. The evaluation should be periodically reassessed.

2) Q: How does the voluntary communication protocol under Action 2 relate to reporting requirements in effect before 2006?

   A: Every licensee already has certain reporting requirements specified in their license, i.e., in the RETS, REMP, or ODCM/ODAM, although these criteria may vary somewhat from site to site. 10 CFR Parts 20 and 50 also contain relevant reporting requirements that apply to all licensees. In addition, some licensees may have reporting requirements or commitments that involve state or local agencies and officials. The voluntary communication protocol is intended to supplement the existing body of reporting requirements at each site in order to assure that all sites, at a minimum, consistently inform appropriate state and local officials, and the NRC as appropriate, regarding conditions and occurrences related to inadvertent radiological releases to the groundwater at the site.

3) Q: What is meant by "substantial on-site construction" or "substantial disturbance of site property" in Acceptance Criterion *d* to Objective 1.1?

   A: "Substantial" refers to the likelihood that the construction or disturbance has affected the subsurface flow of groundwater—e.g., major paving projects, constructions of an ISFSI, or new buildings, etc. Licensees at new plants should, for example, review their pre-licensing characterization of hydrology and geology for changes that result from construction of buildings and structures or compaction of soil.

4) Q: What is meant by "periodic review" in Objectives 1.1 to 1.3?

   A: "Periodic" is intended to give each licensee the ability to base the frequency of the reviews on site specific factors that are supported by the conceptual site model, operating status—i.e., new plant, operating facility or decommissioning—and SSC risk ranking. The

time period between reviews should be based on site specific conditions and not exceed 5 years.

5) Q: How does the "periodic review" apply to plants that are in the process of or have completed decommissioning activities?

   A: It is recommended that consistent with FAQ 4, each of the licensees shall evaluate and update the CSM, SSC priority index, and long term groundwater monitoring program to incorporate changes in site conditions and optimize the GWPP to ensure that Action 1 objectives are met in an efficient and cost effective manner.

6) Q: What is meant by Conceptual Site Model or Site Conceptual Model, which are interchangeable?

   A: According to the Electric Power Research Institute (EPRI), "A Site Conceptual Model integrates available information regarding contaminants of concern, plant SSCs, historical and potentially on-going inadvertent releases, and site hydrogeology to form a unifying hypothesis explaining the observed ground contaminant distribution, source areas, transport pathways, contaminant fate and transport in the environment, and risk to receptors.[1]"

   OR

   The America Society for Testing and Materials defines the site conceptual model or conceptual site model as a "written or pictorial representation of an environmental system and the biological, physical, and chemical processes that determine the transport of contaminants from sources through the environmental media to environmental receptors in the system.[2]"

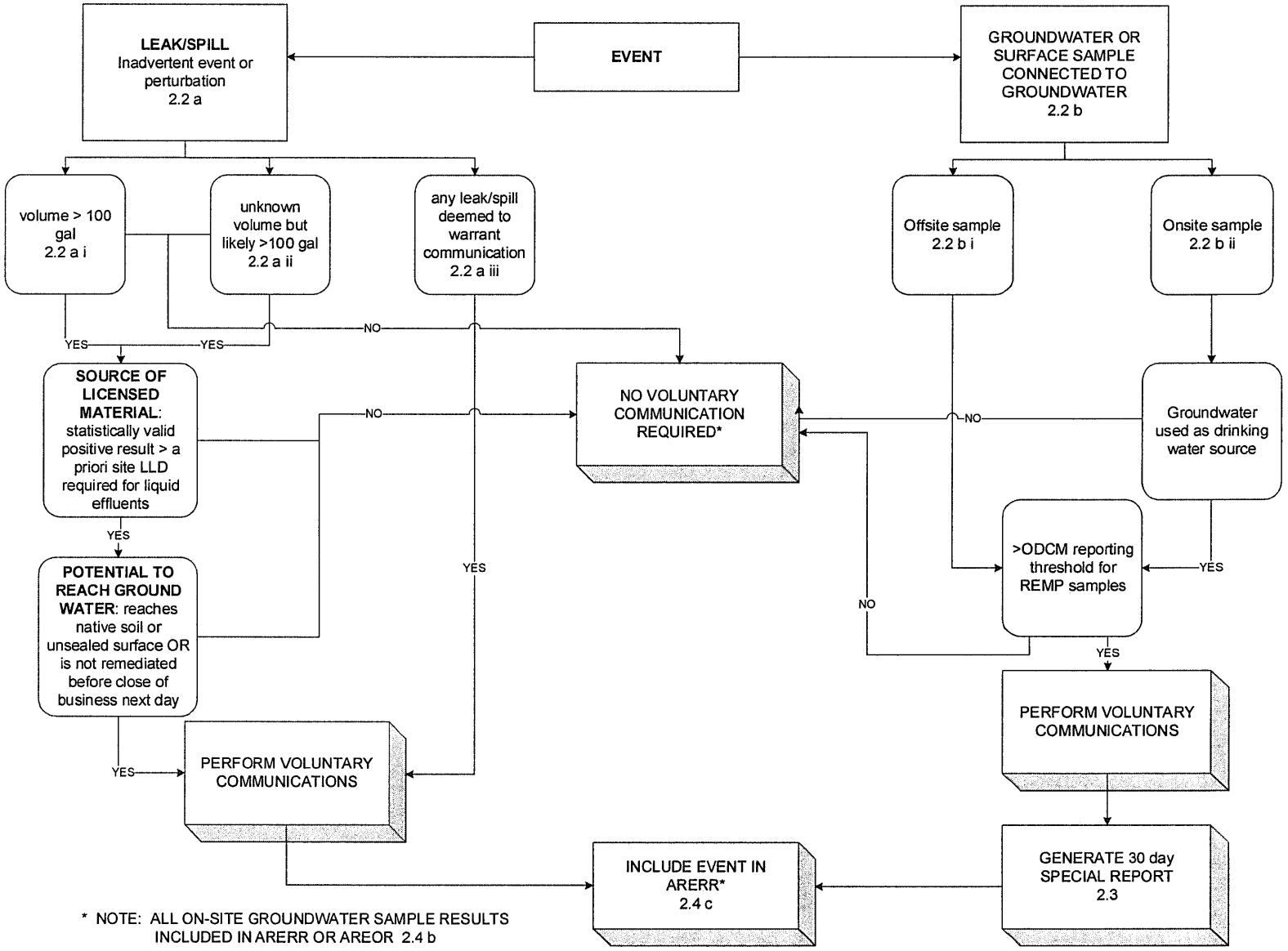
7) Q: Objective 1.6.a states, "Establish written procedures outlining the commitments made in regulatory documents such as the Post-Shutdown Decommissioning Activities Report (PSDAR) and License Termination Plan (LTP). Establish/change groundwater related procedures accordingly." When should these procedures be developed?

   A: Based upon operational experience, it is recommended that the revisions to the groundwater program, monitoring well network and procedures be in place shortly after shutdown. This could result in the development of the procedures beginning before shutdown—e.g., could start when the shutdown date is known or suspected.

[1] Groundwater Protection Guidelines for Nuclear Power Plant, EPRI, 1015118, Final Report, November 2007
[2] Standard Guide for Developing Site Models for Contaminated Sites, ASTM, E1689-95 (Reapproved 2008)

APPENDIX A

COMMUNICATION PROTOCOL FOR LEAK/SPILL AND GROUNDWATER SAMPLE RESULTS



APPENDIX B

SELF ASSESSMENT CHECKLIST
OBJECTIVE 3.1

Plant or Utility Being Reviewed: Date of Review

Reviewers:

Guideline Section	Objective/Acceptance Criteria	Section Met Yes-No	Comments As Required
1.1 Ensure that the site characterization of geology and hydrology provides an understanding of predominant groundwater gradients based upon current site conditions. This characterization is the basis for the CSM.			
1.1.a	Perform hydrogeologic and geologic studies to determine predominant groundwater flow characteristics and gradients.		
1.1.b	As appropriate, review existing hydrogeologic and geologic studies, historical environmental studies, and permit or license related reports.		
1.1.c	Identify potential pathways for groundwater migration from on-site locations to off-site locations through groundwater.		
1.1.d	Establish the frequency for periodic reviews of site hydrogeologic studies. As a minimum, reviews should be performed whenever any of the following occurs: • Substantial on-site construction • Substantial disturbance of site property • Substantial changes in on-site or nearby off-site use of water • Substantial changes in on-site or nearby off-site pumping rates of groundwater		
1.1.e	As appropriate, update the CSM and the site's Final Safety Analysis Report with changes to the hydrology and/or geology.		
1.2 Identify site risk based on plant design and work practices.*			
1.2.1	Evaluate all systems, structures, or components (SSCs) that contain or could contain licensed material and for which there is a credible mechanism for the licensed material to reach groundwater.		
1.2.2	Evaluate work practices that involve licensed material and for which there is a credible mechanism for the licensed material to reach groundwater.		
1.2.2.a	Identify each SSC that involves or could reasonably be expected to involve licensed material and for which there is a credible mechanism for the licensed material to reach groundwater. Examples of SSCs of interest include: refueling water storage tanks, spent fuel pools, spent fuel pool leak detection systems, outdoor tanks, outdoor storage of contaminated equipment, buried piping, retention ponds or basins or reservoirs, lines carrying steam.		
1.2.2.b	Identify existing leak detection methods for each SSC that involves or could involve licensed material and for which there is a credible potential for inadvertent releases to groundwater. These may include groundwater monitoring, operator rounds, engineering walk-downs or inspections, leak-detection systems, or periodic integrity testing.		

Plant or Utility Being Reviewed: Date of Review

Reviewers:

Guideline Section	Objective/Acceptance Criteria	Section Met Yes-No	Comments As Required
1.2.2.c	Identify work practices that include actions taken by individuals during maintenance, operational, or support activities, which could result in or prevent a spill or leak of a source material that has a credible mechanism for release to groundwater.		
1.2.2.d	Evaluate for potential enhancements to leak detection systems or programs. These may include additional or increased frequency of rounds or walk-downs or inspections, or integrity testing.		
1.2.2.e	Evaluate potential enhancements to prevent spills or leaks from reaching groundwater. These may include resealing or paving surfaces, installing spill containment measures, performing preventative maintenance or surveillance activities to minimize the potential for inadvertent releases of licensed materials due to equipment failure.		
1.2.2.f	Identify the mechanism or site process for tracking corrective actions.		
1.2.2.g	Establish the frequency for periodic reviews of SSCs and work practices.		
1.3 Establish an on-site groundwater monitoring program to ensure timely detection of inadvertent radiological releases to groundwater.			
1.3.a	Using the hydrology and geology studies developed under Objective 1.1, consider placement of groundwater monitoring wells downgradient from the plant but within the boundary defined by the site license. Wells should be placed to ensure groundwater migration pathways are monitored.		
1.3.b	Groundwater monitoring wells should be placed as close as practical to SSCs that have the highest potential for inadvertent releases that could reach groundwater or SSCs where other means of leak detection capability is limited.		
1.3.c	Establish sampling and analysis protocols, including analytical sensitivity requirements and quality assurance/quality control processes for groundwater and soil, where applicable. Consider the potential for detectible levels of licensed material resulting from planned releases of liquids and/or airborne materials.		
1.3.d	Establish a formal, written program for long-term groundwater monitoring. For those groundwater monitoring locations that are also included in the REMP, revise the site's ODCM/ODAM and ensure the distinction between the programs is clear.		
1.3.e	Periodically review existing station or contract lab(s) analytical capabilities. An important consideration is the analytical protocols and times needed to obtain results.		
1.3.f	Establish a long-term program for preventative maintenance of groundwater wells.		
1.3.g	Establish the frequency for periodic review of the groundwater monitoring program.		
1.4 Establish a remediation protocol to prevent migration of licensed material off-site and to minimize decommissioning impacts.			
1.4.a	Establish written procedures outlining the decision making process for remediation of leaks and spills or other instances of inadvertent releases. This process is site specific and shall consider migration pathways.		
1.4.b	Evaluate and document, as appropriate, decommissioning impacts resulting from remediation activities or the absence thereof.		

Plant or Utility Being Reviewed: Date of Review

Reviewers:

Guideline Section	Objective/Acceptance Criteria	Section Met Yes-No	Comments As Required
1.5 Ensure that records of leaks, spills, and remediation efforts are retained and retrievable to meet the requirements of 10 CFR 50.75(g).			
1.5.a	Establish a record keeping program to meet the requirements of 10 CFR 50.75(g). Note that these records are used to determine an area's classification for purposes of performing surveys—see NRC Regulatory Issue Summary 2002-02, "Lessons Learned Related to Recently Submitted Decommissioning Plans and License Termination Plans."		
1.6 Decommissioning/SAFSTOR Impacts			
1.6.a	Establish written procedures outlining the commitments made in the Post-Shutdown Decommissioning Activities Report (PSDAR). Establish/change groundwater related procedures accordingly.		
1.6.b	As site conditions/processes are planned and/or changed: 1. Evaluate the impact of how actions could impact groundwater protection. 2. Assess the system, structure and components (SSC) and Work Practice Risk Assessments to reflect current conditions. 3. Assess the CSM to reflect current conditions. 4. Assess the groundwater monitoring program to reflect changes in the SSC and Work Practice Risk Assessments and any changes in the CSM—e.g., sampling frequency and number of sample wells.		
1.6.c	Verify that appropriate elements of groundwater protection are evaluated and maintained until radiological remediation of the site is complete, including the monitoring and remediation of any identified groundwater contamination above drinking water standards.		
2.1 During the initial development of the GPI, each licensee conducted periodic briefings of their site-specific GPI program with the designated state/local officials. This initial briefing will be performed by sites that begin operation after 01/01/2020.			
2.1.a	The licensee should discuss i) The background or industry events that led to the GPI; ii) If there is additional information that the state/local officials need to better understand the issue or place it in perspective for their constituents; iii) "How" the state/local officials will use or distribute the information.		
2.1.b	Licensees should consider including additional information or updates on groundwater protection in periodic discussions with state/local officials.		
2.1.c	For licensees that are in states where multiple nuclear power plants are located and multiple owner companies, it is highly recommended that the licensees coordinate their efforts and communicate with each other. The initial briefing for the state/local officials and the contents of a voluntary communication should be consistent.		
2.2 Make informal communication as soon as practicable to appropriate state/local officials, with follow-up notifications to the NRC, as appropriate, regarding significant "on-site leaks/spills into groundwater and on-site or off-site water sample results exceeding the criteria in the REMP as described in the OCDM/ODAM.*			

Plant or Utility Being Reviewed: Date of Review

Reviewers:

Guideline Section	Objective/Acceptance Criteria	Section Met Yes-No	Comments As Required
2.2.a	Communication with the designated state/local officials shall be made before the end of the next business day if an inadvertent leak or spill to the environment has or can potentially get into groundwater and exceeds any of the following criteria: i) If a spill or leak exceeding 100 gallons from a source containing licensed material; ii) If the volume of a spill or leak cannot be quantified, but is likely to exceed 100 gallons from a source containing licensed material; iii) Any leak or spill, regardless of volume or activity, deemed by the licensee to warrant voluntary communication. **AND** The spill or leak, regardless of volume or activity, occurs which cannot be completely recaptured or remediated per Objective 1.4 within 24 hours of discovery of the event.		
2.2.b	Communication with the designated state/local officials shall be made before the end of the next business day for a water sample result: (i) Of off-site groundwater or surface water that exceeds any of the REMP reporting criteria for water as described in the ODCM/ODAM; (ii) Of on-site surface water that is hydrologically connected to groundwater or groundwater that is or could be used as a source of drinking water—either onsite or downgradient from the site—that exceeds any of the REMP reporting criteria for water as described in the ODCM/ODAM.		
2.2.c	When communicating to the state/local officials, be clear and precise in quantifying the actual release information as it applies to the appropriate regulatory criteria.		
2.2.d	Voluntary communication to state and/or local officials may also require NRC notification under 10 CFR 50.72(b)(2)(xi). Licensees should perform these notifications consistent with their existing program.		
2.2.e	Contact NEI by email to GRPGroundwaterIssues@nei.org as part of a voluntary communication event.		
2.3 Submit a written 30-day report to the NRC for any water sample result for on-site groundwater that is or may be used as a source of drinking water that exceeds any of the criteria in the licensee's existing REMP/ODCM for 30-day reporting of off-site water sample results. Copies of the written 30-day reports for both on-site and off-site water samples shall also be provided to the appropriate state/local officials.			
2.3.a	All groundwater samples taken for the Industry Initiative shall be analyzed and compared to the standards and limits contained in the station's REMP as described in the ODCM/ODAM.		
2.3.b	The 30-day special report should include the items listed in Acceptance Criteria 2.3.b.		
2.3.c	All written 30-day NRC reports generated under item 2.3.a are to be concurrently forwarded to the designated state/local officials.		
2.4 Document on-site groundwater sample results of licensed material and a description of any significant on-site leaks/spills into groundwater for each calendar year in the Annual Radiological Environmental Operating Report (AREOR) for REMP or the Annual Radioactive Effluent Release Report (ARERR) for the RETS as contained in the appropriate Site reporting procedure, beginning with the report for calendar year 2006.			
2.4.a	For plants constructed after 2008 appropriate procedures that require inclusion of significant on-site leaks/spills into groundwater and all on-site groundwater results shall be developed and implemented prior to initial receipt of nuclear fuel—see NEI 08-08, "Generic FSAR Template Guidance for Life-Cycle Minimization of Contamination," December 2008.		

Plant or Utility Being Reviewed: Date of Review

Reviewers:

Guideline Section	Objective/Acceptance Criteria	Section Met Yes-No	Comments As Required
2.4.b	Reporting of on-site groundwater sample results shall be as follows: i. Groundwater sample results that are taken in support of the GPI but are not part of the REMP program—e.g., samples obtained during the investigatory phase of the Action Plan circa year 2006—are reported in the ARERR required by 10 CFR 50.36a (a)(2). ii. Once the long-term monitoring sample points have been established per Objective 1.3, Acceptance Criterion *d*, the results are reported in the AREOR for those sample points that are included in the REMP as described in the ODCM/ODAM. The sample results for those long-term monitoring sample points that are not included in REMP are reported in the ARERR.		
2.4.c	In addition to 2.4.b, voluntary communications, if any are made, shall be included in an annual report as follows: i. A description of all spills or leaks that were communicated per Objective 2.2, Acceptance Criterion *a* shall be included in the ARERR and/or AREOR. ii. All on-site or off-site groundwater sample results that exceeded the REMP reporting thresholds as described in the ODCM/ODAM that were communicated per Objective 2.2, Acceptance Criterion *b* shall be included in either the ARERR and/or in the AREOR.		
3.1 Perform program oversight to ensure effective implementation of the GPI program.			
3.1.a	An independent, knowledgeable individual(s) shall perform an initial self-assessment within one year after initial criticality—this step only applies to units that begin operation after 01/01/2020.		
3.1.b	A programmatic assessment of the GPI program shall be performed periodically but at least once every 5 years after initial self-assessment. Programmatic assessments should be maintained according to the records management program and be available for the life of the plant.		
3.1.c	The self-assessment, at a minimum, shall include evaluating implementation of all of the objectives identified in this document and be documented consistent with applicable station procedures and programs.		

Additional Comments As Required:

· Detailed requirements are in the Industry Groundwater Protection Initiative Final Guidance document, rev. 1, March 2019.