

An Overview of the Idaho National Laboratory Groundwater Monitoring and Contingency Plan Update

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History

- 1993 *Idaho National Engineering and Environmental Laboratory Groundwater Monitoring Plan*
- 2003 *Idaho National Engineering and Environmental Laboratory Groundwater Monitoring Plan Update*
- 2012 Idaho National Laboratory Groundwater Monitoring and Contingency Plan Update

Purpose

- DOE Order 450.1A, “Environmental Protection Program,” directs the implementation of Environmental Management Systems at DOE sites as part of an Integrated Safety Management System (ISMS), including the implementation of a Sitewide approach for groundwater protection. On May 2, 2011
- DOE sites are required to consider the “implementation of a Sitewide approach for groundwater protection” and “ensure the early identification of, and appropriate response to, potential adverse environmental impacts associated with DOE operations.”
- The order has been replaced by DOE Order 436.1, “Departmental Sustainability,” but implementation of DOE Order 450.1A remains a contract requirement for both Battelle Energy Alliance, LLC, and CH2M-WG Idaho

Purpose (cont'd)

- The Plan:
 - Provides a brief history and summary for each of the facilities/areas, groundwater quantity and quality, the primary sources and areas of contamination
 - Addresses the compliance aspects of DOE Order 450.1A by reference to the existing programs and plans that satisfy the specific groundwater monitoring goals of their respective regulatory requirements.
 - Addresses the surveillance network element of DOE Order 450.1A on an INL-wide basis.
 - Provides a comprehensive INL-wide summary of the compliance and surveillance networks, constituent lists, and sampling frequencies (Appendixes A&B)
 - Provides a Contingency Plan for responding to the detection of unexpected groundwater contamination at the INL

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Groundwater is currently monitored at the INL to satisfy three objectives

- **Compliance**—To satisfy applicable regulations (i.e., RCRA, Wastewater Reuse Permits (WRPs), and Safe Drinking Water Act [SDWA]), to monitor specific CERCLA-related remedial action objectives and regulatory requirements contained in Records of Decision (RODs), and to support CERCLA 5-year reviews regarding the effectiveness of those remedies.
- **Characterization**—To determine the nature and extent of groundwater contamination
- **Observation**—To evaluate general groundwater conditions, and contaminant fate and transport on a regional and sub-regional scale as performed by the USGS
- These objectives are addressed individually for each facility within the INL and sitewide, with monitoring performed by multiple organizations and programs.

Additional requirements/recommendations

- U.S. DOE Order 450.1A specifies that DOE sites consider implementing a Sitewide approach to **groundwater protection** and ensure the **early identification of, and appropriate response to**, potential adverse environmental impacts associated with DOE operations, including, as appropriate, preoperational characterization and assessment, and effluent and surveillance monitoring.
- DOE Order 450.1A directs the implementation of Environmental Management Systems (EMS) at DOE sites as part of an Integrated Safety Management System (ISMS)
- According to DOE Guidance 450.1-6, the plan serves as an internal management tool and can also be shared with regulators and the public...useful as possible for site managers and technical staff ...provide descriptions of future plans to improve or optimize the groundwater monitoring network...serve as a historical record.

The basic elements of a DOE groundwater surveillance monitoring plan

1. **Network design** that associates each well or other observation point with a facility-specific or area-specific surveillance monitoring network.
2. **Monitoring methods**, such as wells, cone penetrometers, temporary wells, piezometers, vadose zone monitoring, etc., and seeps, springs, and other observation points.
3. **Sample type, frequency, analytes, and protocols** (e.g., well purging method, security procedures) followed at each well or other observation point to indicate the information to be provided to meet the purpose of the specific network.
4. **Responsibilities** for each aspect of the Sitewide network, to include organizational designations and actual points of contact.
5. A routine system for **inspecting and maintaining the monitoring network** to ensure proper performance and the collection of representative data.
6. Process description that details the **flow of data** from sampling to the point at which specific final results are transmitted to the end user.
7. References to specific **technical documents that contain detailed information needed for day-to-day operations**, including geologic and hydrologic studies, and modeling analyses that form the technical basis for the monitoring network.
8. Descriptions of **data management systems and reporting procedures**.
9. **References to historical documents and data** that describe the technical and organizational aspects of the program throughout the INL's history.

Surveillance network prioritization criteria - general data objectives

- Provide data to determine the baseline conditions of groundwater prior to (upgradient of) potential impacts by DOE operations
- Provide data to support early detection of groundwater contamination resulting from current or historic DOE operations (perched water and facility-specific)
- Provide data to track the extent and migration of known (recognized and documented in existing publications) contaminant plumes resulting from DOE operations.

Surveillance network prioritization criteria - groundwater monitoring wells

- Monitoring wells were evaluated and selected based on the following criteria and are listed in order of priority:
 - conceptual model
 - groundwater flow
 - contaminant source locations
 - contaminant plume locations
 - interval monitored
 - shared use
 - historical data
 - well construction

Surveillance network prioritization criteria - constituents

- The constituents specified for analysis were evaluated and selected based on the following criteria and are listed in order of priority:
 - Potential source contaminants
 - Known plume contaminants
 - Shared-use constituents

Surveillance network prioritization criteria - sampling frequency

- An annual sampling frequency has been specified for all wells identified in the surveillance monitoring network.
- Sampling frequency should be reevaluated during each annual review to ensure that it remains appropriate based on the following criteria:
 - Proximity to key areas
 - Contaminant mobility

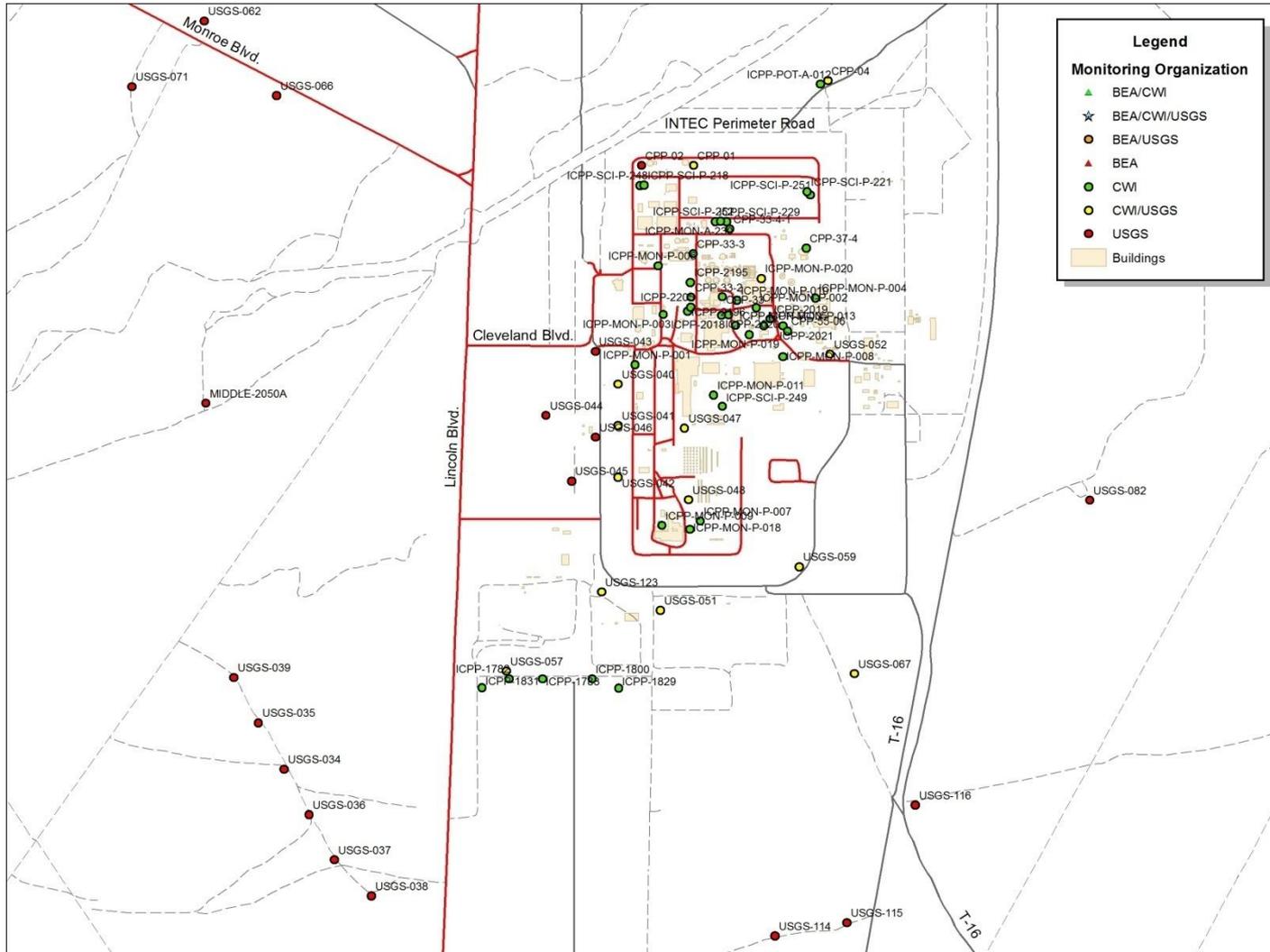
Facility specific & site wide programs

- Facility Specific Monitoring Programs
 - Advanced Test Reactor Complex
 - Central Facilities Area
 - Critical Infrastructure Test Range Complex/Auxiliary Reactor Area
 - Idaho Nuclear Technology and Engineering Center
 - Materials and Fuels Complex
 - Radioactive Waste Management Complex
 - Test Area North
- Site Wide Monitoring Programs
 - CWI Sitewide Monitoring Program (WAG 10)
 - USGS Groundwater Monitoring Program
 - Sitewide Surveillance Monitoring
- Groundwater Monitoring at NRF and AMWTP are **not** included in the plan

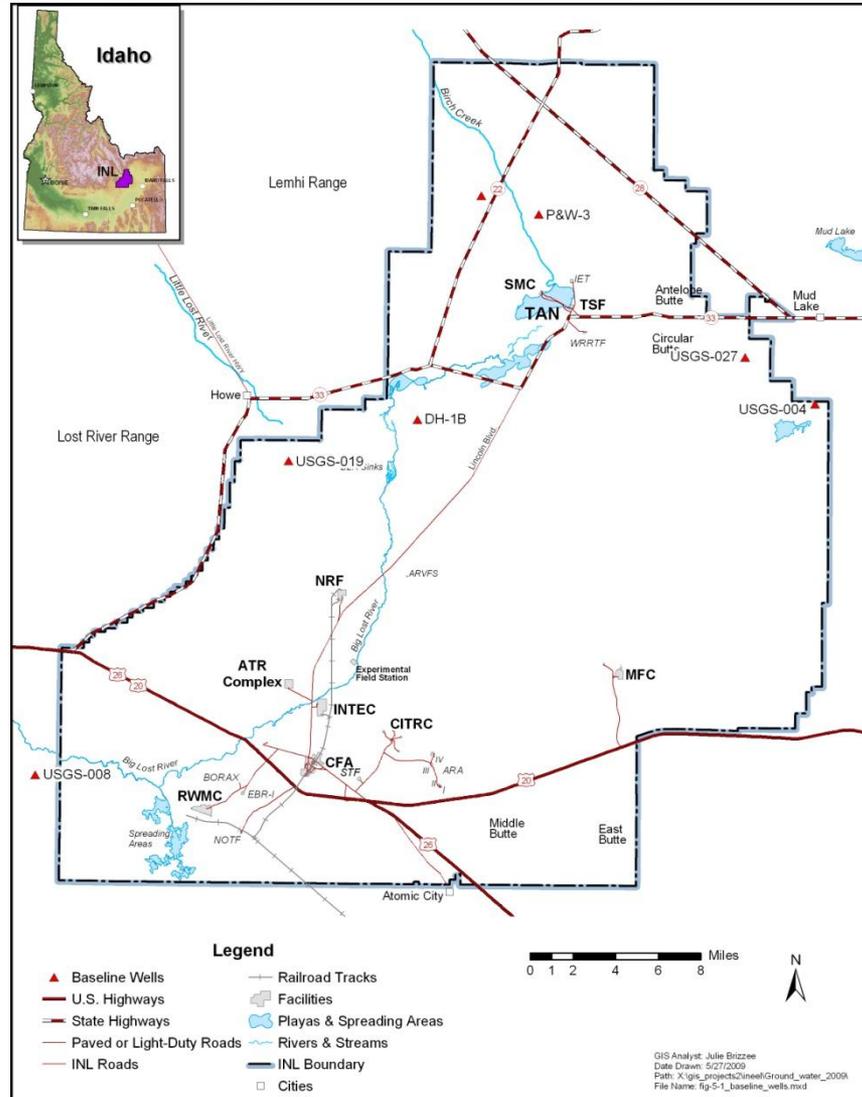
INL monitoring by the numbers

- Monitoring includes a total of 299 wells:
 - 232 aquifer wells
 - 55 perched water well
 - 10 vadose zone “wells”
 - 2 proposed new wells
- Institutionally:
 - 20 wells are monitored solely by BEA
 - 3 are jointly monitored by BEA/CWI
 - 1 is jointly monitored by BEA/CWI/USGS
 - 97 are solely monitored by CWI
 - 55 are jointly monitored by CWI/USGS
 - 123 are solely monitored by USGS

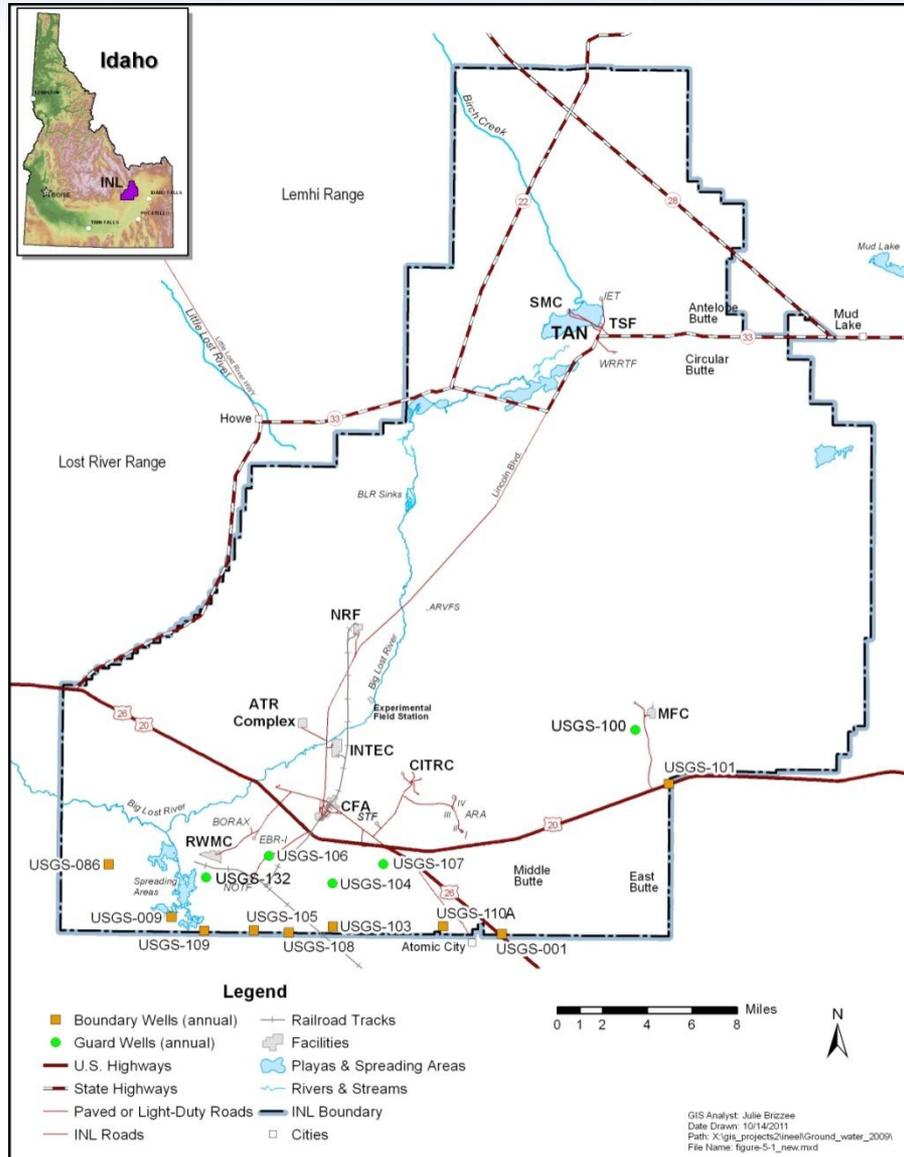
Example of INTEC wells



INL Baseline Wells



INL Guard Wells



Transition to long-term groundwater stewardship – CERCLA related issues

- One of the primary drivers for characterizing INL ground water systems is the INL environmental restoration program
- Under the FFA/CO, extensive groundwater characterization and monitoring were conducted under the various INL RI/FS
- However, all significant CERCLA characterization studies have been completed, all planned RODs have been signed and many of the ground water characterization activities are being reduced or eliminated
- Therefore, monitoring program changes need to be communicated and ongoing activities that need to continue into the future may need to be integrated into INL's other long-term monitoring programs.
- Prior to such transitions, DOE-ID will need to determine the most appropriate approach for continuing ongoing monitoring activities and adjust the appropriate budgets, agreements and/or contracts to conduct the necessary ongoing activities

Transition to long-term groundwater stewardship – climate related issues

- The ESRPA water table has dropped significantly since the last wet period in the late 1990's, with little long-term rebound, e.g.,
 - USGS-001 near Atomic City has dropped about 8 feet;
 - USGS-020 at CFA has dropped 10 feet;
 - and USGS-012 dropped 17 feet, and
 - USGS-017 near NRF has dropped over 20 feet (Davis 2010)
- Changes since the mid-1980's have been even more dramatic
- INL regulatory “skimmer” wells are generally screened to monitor the upper 20 to 50 feet of the aquifer.
- If significant water table declines continue, a number of the compliance and surveillance wells at the INL could go dry in the not too distant future.

Summary and conclusions

- The INL groundwater monitoring program has taken a comprehensive, systematic, long-term approach to groundwater monitoring and protection at the INL-Site
- The program attempts to balance cost and resource constraints with the need for environmental information and regulatory compliance
- As designed, the program meets the groundwater surveillance and monitoring requirements of DOE Order 450.1A and the goals of the INL's Environmental Management Systems (EMS)/Integrated Safety Management System (ISMS) programs