

# Lessons Learned for Institutional Controls at the Weldon Spring Site



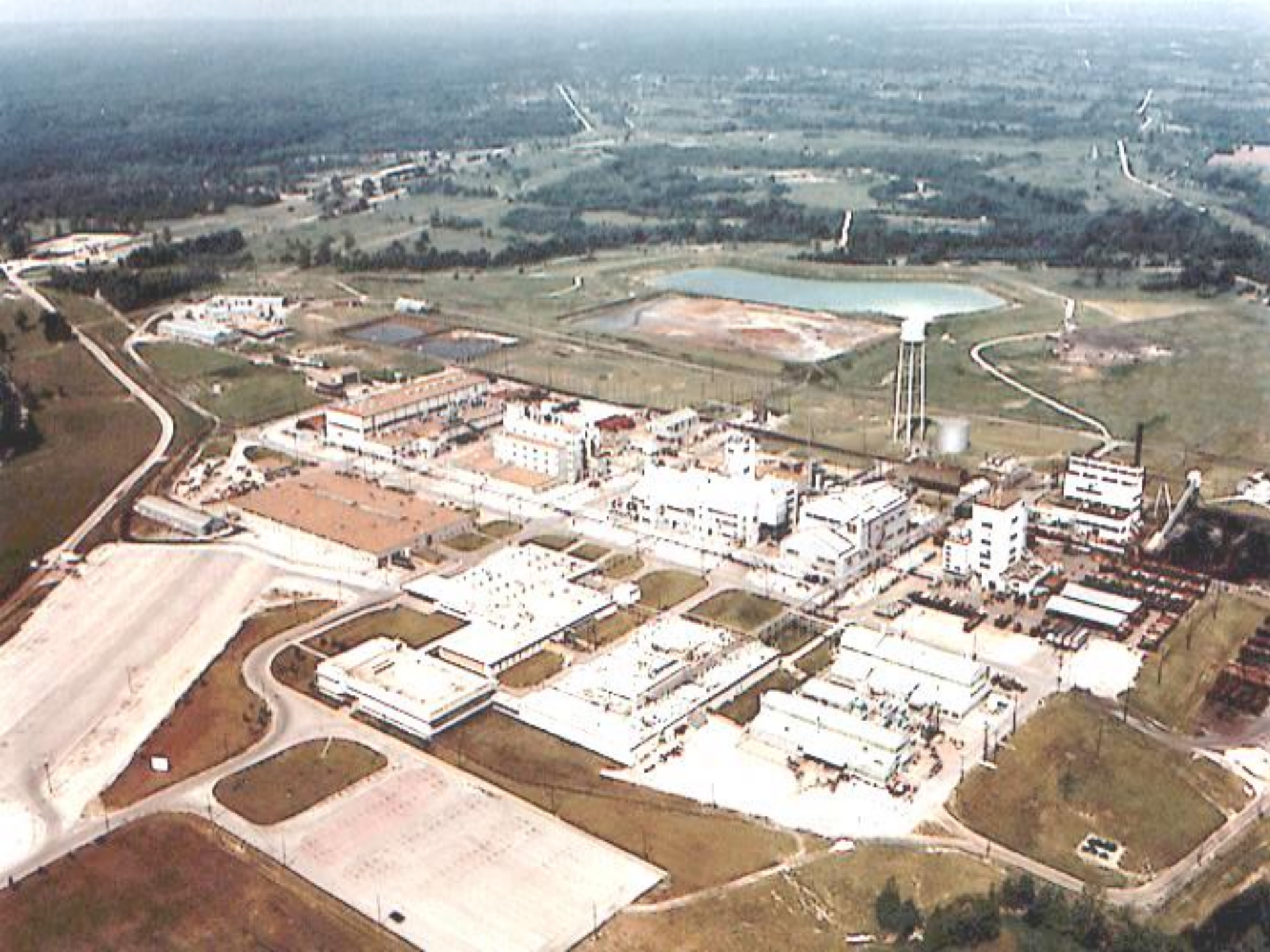
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# Institutional Control Mechanisms

- Institutional control mechanisms are designed to
- Appropriately limit access to or uses of land, facilities, and other real and personal property;
- Protect cultural and natural resources;
- Maintain physical security of DOE facilities; and
- Prevent or limit inadvertent human and environmental exposure to residual contaminants.





**Institutional controls include methods to preserve knowledge and to inform current and future generations of hazards and risks.**





# Institutional Controls

- Institutional controls in place prior to issuance of long-term surveillance and maintenance plan
  - Federal ownership
  - Interpretive Center
  - Notation of land ownership
  - Historical markers
  - Real estate licenses
  - Memorandum of Understanding with the U.S. Army
  - Federal Facility Agreement





# Historical Marker

## The Weldon Spring Site

### Weldon Spring Ordnance Works (WSOW)

The 37,230-acre Weldon Spring Ordnance Works began with groundbreaking on Thanksgiving Day, November 28, 1942. WSOW was said to be one of the largest plants of its kind in the world, having a production capacity of 1,000,000 pounds of TNT per day and 40,000 pounds of DDT per day. The TNT and DDT were used in explosives to benefit the war effort. There were more than 1,000 buildings and a post employment of 13,000 people in 1943. When production was terminated on U.S. Day, August 15, 1945, the Weldon Spring Ordnance Works had produced over 730 million pounds of TNT and 33 million pounds of DDT.



Weldon Spring Ordnance Works, 1940s

### The Disposal Cell

Cross Section of Disposal Cell



The disposal cell provides long-term isolation and management of waste from the former U. S. Atomic Energy Commission Uranium Feed Materials Plant and the former U. S. Department of the Army Ordnance Works.

The disposal cell constructed at the Weldon Spring Site has been designed by defer the migration of contaminants and to remain stable for 1,000 years. To achieve these goals the following factors were considered:

- Topographical features engineered to resist long-term erosion potential and a precipitation event greater than has occurred in the recorded history of the region.
- Slope angles and waste placement methods designed to withstand a Maximum Credible Earthquake (MCE) that considered the New Madrid fault system earthquake potential.
- A geophysical location about one mile from the nearest known ground traps of a capillary fault, and a general siting with no feasible faults within a 10 mile radius according to data experienced movement in the past 2,000 years.
- Located in a geologically stable area with no significant potential for catastrophic collapse due to water in the soil or bedrock.
- Located within a designated 300-year flood plain.



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The cell consists of:

1. The base liner with leachate collection and removal systems designed to prevent leachate migration from the surface of the cell.
2. The containment system, consisting of chemically stabilized and solidified (CSIS) grout waste and structural waste, has been placed and solidified within the cell in a controlled and engineered manner to reduce settling, minimize volume, and prevent radon emission.
3. The cover (10 ft) also constructed of compacted clay soil material, surrounds the disposal facility in order to resist erosion, limit infiltration of moisture into the waste, minimize radon emission, and reduce long-term maintenance.
4. The cover system under that top of the cell generating it from erosion, infiltration, low vegetation, etc. It consists of multiple layers including three layers to top an approximately 100 ft barrier of clay, a geomembrane, a gravel drain, sand filters, and a source of stability.

### Weldon Spring Uranium Feed Materials Plant (WSUFMP)



Weldon Spring Uranium Feed Materials Plant, 1940s

In May 1950, some 300 acres of the former Weldon Spring Ordnance Works property was transferred to the U.S. Department of Army to the Atomic Energy Commission for construction of the WSUFMP, later referred to as the Weldon Spring Chemical Plant. From 1957 until 1968, the plant processed uranium ore concentrates and a small amount of thorium. The site was inactive and went through a period of deterioration from 1967 until 1980, when the U.S. Department of Energy proposed cleanup of the area. After passage of the nuclear Energy Environmental Response Compensation and Liability Act (EERCLA), also referred to as the "Superfund Law", the chemical plant was placed on the Environmental Protection Agency's National Priorities List in 1980. The U.S. Department of Energy began dismantling the facilities and decommissioning the site. Surface remediation activities concluded with construction of the disposal cell as a repository for 1.42 million cubic yards of waste. The disposal cell was completed in 2000.

### The Weldon Spring Site Interpretive Center

The Weldon Spring area and its residents have made vital sacrifices and contributions to the national defense of our country. In recognition of this service, the U.S. Department of Energy established the Interpretive Center that offers 300 years of history about the Weldon Spring Site, and the home and residents that were displaced for the construction and operation of the nation's largest explosive manufacturing plant and later a uranium processing plant.



Interior of the Interpretive Center

### Howell Prairie

The U.S. Department of Energy is committed to revitalizing the Weldon Spring Site to a natural and native ecosystem. To help accomplish this goal, the 150 acres surrounding the disposal cell have been seeded with over 100 species of native prairie grasses and forbs. This reversion, the new European settlement landscape, Howell Prairie and the Native Plant Educational Garden located adjacent to the Interpretive Center will serve as a 200-acre classroom for those interested in the study of native plants, native plants, and prairie ecosystems.



Howell Prairie landscape

Native plant educational garden

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# Interpretive Center



# Interpretive Center (continued)





# Long-Term Surveillance and Maintenance Plan

- Process to obtain additional institutional controls included
- Special-use area (Special Use Area Well Drillers Rule);
- Easements with surrounding property owners; and
- Updated Memorandum of Understanding (MOU) with the U.S. Army.



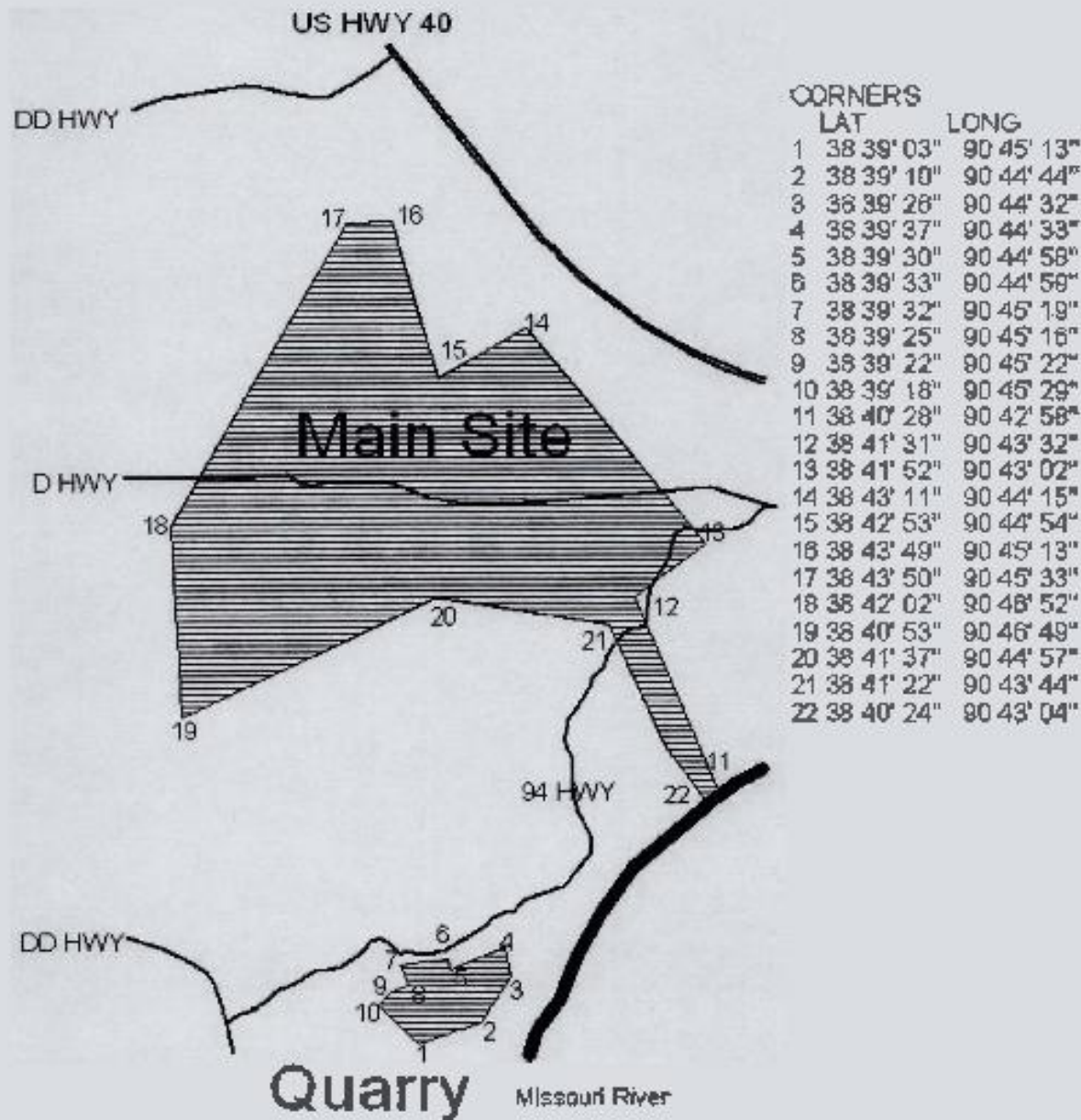
# Special Use Area

- Special Use Area Well Drillers Rule was finalized in July 2007 for DOE and Army sites
- Designated the DOE and Army's groundwater-restricted areas as special areas in the Missouri Code of State Regulations
- Requires additional drilling protocols and construction specifications to be imposed by Missouri Department of Natural Resources (MDNR) on any future domestic wells installed in these areas





# Special Area 4



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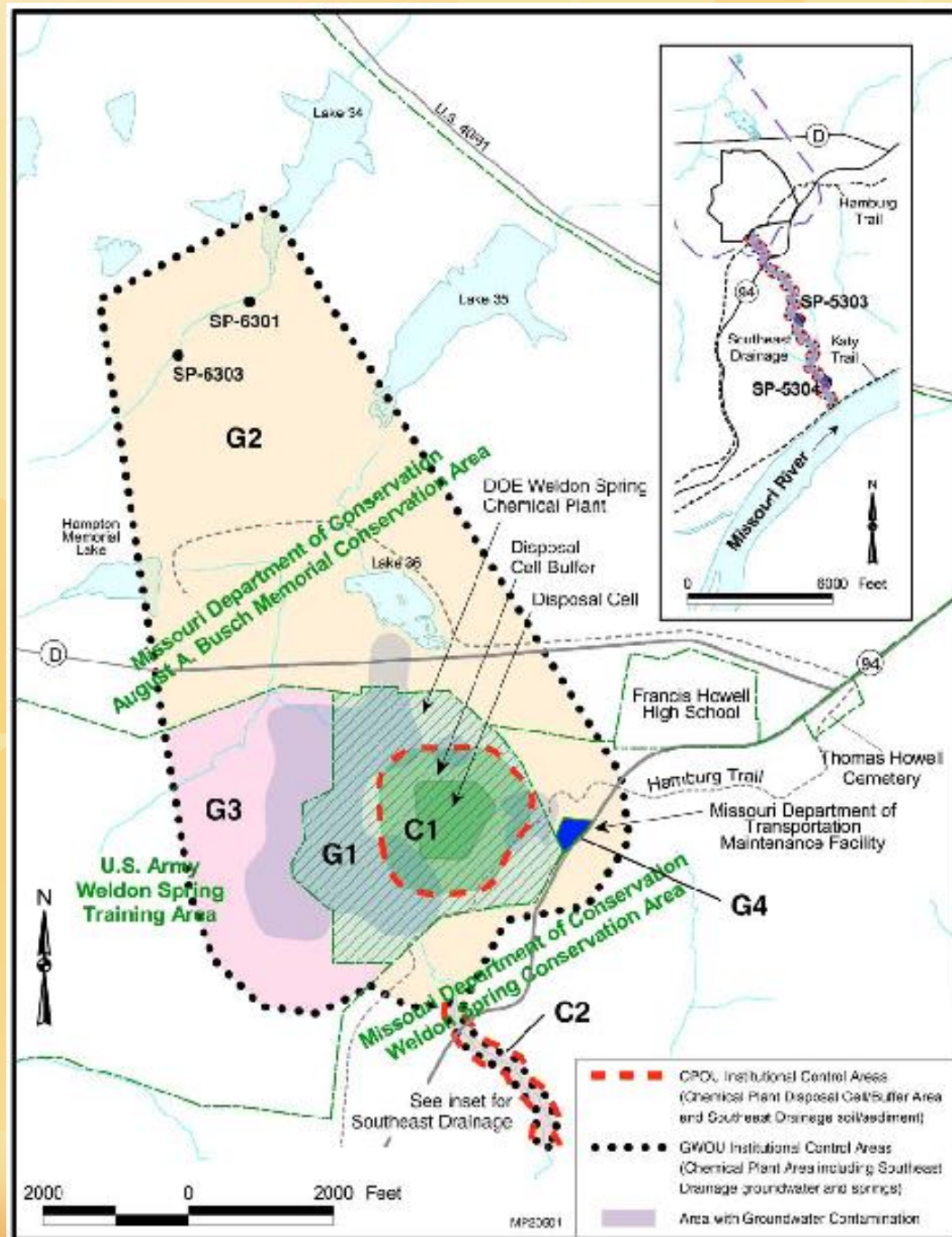
# Easements with Surrounding Non-Federal Property Owners

- MDNR – Division of State Parks
- Missouri Department of Conservation (DCD)
- Missouri Department of Transportation (MDOT)





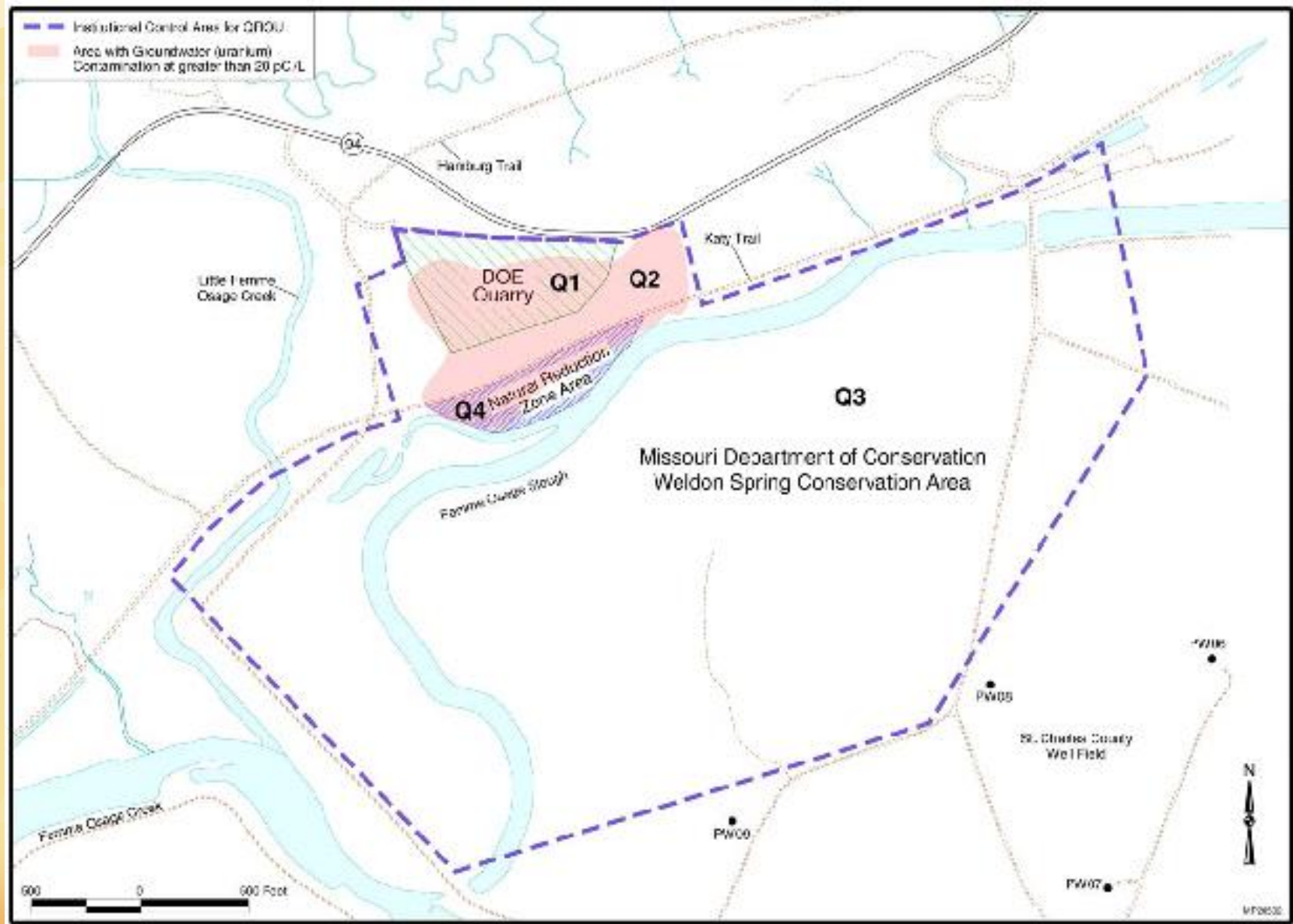
# Institutional Control Areas



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# Institutional Control Areas (continued)





# Easements

- Seeking easements for the purpose of restricting the use of groundwater
- Restrict land use in the Southeast Drainage and Quarry Reduction Zone



# Easements (continued)

- Long and unknown process
- The planned easements are another layer for long-term control in the future
- Currently have controls over the groundwater-restricted areas with State and Federal ownership of properties
- Special use area regulation
- Annual inspection





# DOE Steps Toward Acquiring Easements

- Obtained legal descriptions and surveyed the affected properties
- Conducted a title search for the affected parties
- Obtained preliminary title commitment
- Obtained appraisal of affected areas
- Issued letters to property owners to initiate discussion regarding proposed easements
- Included a letter with a draft easement and offer letter
- Issued periodic reminder letters



# Easements

- DOE and MDNR-Parks finalized and signed the easement in September 2009
- DOE continues to work closely with MDC and MDOT





# Updated MOU with Army

- The MOU with the Army was finalized and signed by both parties in October 2009



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# Annual Inspection Process Includes Inspection of Current and Planned Institutional Control Areas



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# Bergermeister Spring





# Southeast Drainage





# Lessons Learned for Institutional Controls

- Institutional controls take time to develop and patience and persistence to obtain
- The process is best started well in advance
- It is a good practice to layer the institutional controls
- The Weldon Spring site has made good progress in obtaining necessary institutional controls

