Frequently Asked Questions about the Weldon Spring Site in Missouri

What is the U.S. Department of Energy Office of Legacy Management's role at the Weldon Spring Site?

The U.S. Department of Energy (DOE) Office of Legacy Management's (LM) mission is to protect human health and the environment. In that, science drives LM's work at the Weldon Spring Site, Missouri. We coordinate closely with the U.S. Environmental Protection Agency (EPA) Region 7 and the Missouri Department of Natural Resources (MoDNR) to monitor Weldon Spring Site's environmental impact. We continually evaluate how potential environmental changes impact the approaches we take to monitor, inspect, and maintain the site.

LM implements a Long-Term Surveillance and Maintenance Plan (LTS&M Plan) at the Weldon Spring Site to make sure cleanup remedies keep human health and the environment protected for generations to come.

How does DOE coordinate with the U.S. Environmental Protection Agency and the Missouri Department of Natural Resources?

The EPA placed the Weldon Spring Site's Quarry and former Chemical Plant on the National Priorities List in 1987 and 1989, respectively. The National Priorities List (NPL) is a ranking mechanism EPA uses for Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) sites. CERCLA is the law that EPA uses to clean up uncontrolled or abandoned sites.

For federal facilities on the NPL, EPA and (usually) the state enter into a Federal Facility Agreement (FFA). EPA and DOE signed an FFA[1] in 1986 and amended it in 1992. EPA, MoDNR, and DOE signed the most recent site FFA in 2006.

On Oct. 28, 2020, EPA awarded the 2020 National Federal Facility Excellence in Site Reuse Award[2] for the NPL category to the Weldon Spring Site. This award recognizes a federal facility site for restoration and reuse, using innovation and collaboration among federal agencies, states, tribes, local partners, and developers.

What is the Comprehensive Environmental Response, Compensation, and Liability Act?

CERCLA is a federal law that includes a detailed process[3] for investigation and cleanup of sites listed on the NPL that involves input from the public and document review by regulatory agencies. CERCLA requires Five-Year Reviews (FYR) when hazardous substances remain on sites above levels that allow unlimited use and unrestricted exposure. The purpose of a FYR is to evaluate the selected remedy's performance and to ensure the remedy remains protective of

[1] https://lmpublicsearch.lm.doe.gov/lmsites/3507-weldon_ffa.pdf
[2] https://www.epa.gov/newsreleases/epa-presents-2020-national-federal-facility-excellence-site-reuse-awards-federal-and
[3] Superfund Site Assessment Process | US EPA

human health and the environment. A remedy under CERCLA is the response action selected to remediate the contamination at a site.

The CERCLA process was followed when monitored natural attenuation (MNA) was chosen as the remedy for the Groundwater Operable Unit at the Weldon Spring Site. Monitoring natural attenuation means relying on natural processes to decrease contaminant concentrations. The CERCLA process for choosing the remedy included EPA and MoDNR oversight, public participation, and extensive field testing with several alternatives. It was learned during this process that active restoration techniques could not be effectively utilized to assist in cleaning up the groundwater. The site's hydrogeology is not fit for pump-and-treat or in-situ treatment methods. In-situ treatment methods involved pumping chemicals into the ground to react with the contaminants to reduce the levels. DOE and EPA signed the Groundwater Record of Decision[4] that describes the MNA remedy in 2004.

Where can I find information and data about the site?

You can access information and data in many places to be confident the site is safe, including:

- Weldon Spring Site website: https://www.energy.gov/lm/weldon-spring-site-missouri.
- LM data share network (Geospatial Environmental Mapping System site): https://gems.lm.doe.gov/#.
- EPA website: https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0701777.
- MoDNR website: https://dnr.mo.gov/waste-recycling/sites-regulated-facilities/federal/weldon-spring-site.
- In person at the Weldon Spring Site Interpretive Center.

What is the purpose of the Weldon Spring Site Interpretive Center?

DOE built the Weldon Spring Site Interpretive Center based on input from the surrounding community. DOE and the community wanted to ensure the site's history continued to be told and that there was a place the public could go to ask questions about the site.

The interpretive center displays provide historic and scientific information about the surrounding area, site cleanup, and LM's continued stewardship mission at the site. The interpretive center provides educational programs, tours, and information on public use of center meeting rooms. The interpretive center is open seven days a week and is free to the public. You can find detailed information and reports about site history, cleanup, and monitoring in the interpretive center's virtual library.

What is the purpose of the disposal cell and is it safe?

After significant public input, DOE built a disposal cell on-site to store radioactively and chemically contaminated waste from the Weldon Spring Uranium Feed Materials Plant and the Quarry.

[4] https://lmpublicsearch.lm.doe.gov/lmsites/3956-2004_rod.pdf

The 41-acre disposal cell completely secures the waste materials, which are solid, dense, and tightly compacted. Together with the clean soils and the structure holding them, the materials form a gently sloped, stable dome. DOE chose the cell's location carefully because of the stable, dense, low-permeability natural clays beneath it and its remoteness from any fault or weak bedrock zone.

The system was designed to last for 1,000 years, but in reality the construction materials and technologies extend the cell's life for much longer.

- The soil and rock dome on top of the disposal cell can resist some of the most severe natural disasters.
- The cell is designed to sustain the largest earthquake possible in the area (called maximum credible earthquake).
- The rock slopes and cover materials are designed to protect it from erosion caused by the largest possible amount of rainfall (probable maximum precipitation).

The base liner and disposal cell cap have multiple layers of natural and synthetic materials.

The entire cell overlaps 20 to 30 feet of naturally occurring low permeability clay. Permeability measures how easily fluid can pass through a material.

- The cell's base liner is composed of secondary and primary liner systems designed to collect small amounts of leachate that will temporarily be generated from materials in the cell. This leachate is then treated by an on-site water treatment facility.
- The secondary liner consists of a 3-foot-thick layer of highly compacted low-permeability clay, a geosynthetic clay liner, and a flexible membrane.
- The primary liner consists of a thick, flexible geotextile of high-density polyethylene plastic.

The disposal cell's cap consists of multiple layers including (from bottom to top) an infiltration radon barrier of silty clay, a geomembrane and geosynthetic clay liner, a gravel drainage layer, a sand filter, a bedding layer, and a thick layer of limestone riprap. This rock layer prevents intrusion by animals and plants.

This complete encapsulation system makes uncontrolled access to the buried waste materials effectively impossible.

You can read more about the disposal cell's contents and design in the site's Long-Term Surveillance and Maintenance Plan.[5] We publish the disposal cell groundwater monitoring data in the site's annual report, which you can read on the Weldon Spring Site documents page.[6] You can also review the data on our data share network (Geospatial Environmental Mapping System site).[7]

Are stakeholders informed about activities performed at the site?

[5] https://lmpublicsearch.lm.doe.gov/lmsites/3506-wel_ltsp.pdf
[6] https://lmpublicsearch.lm.doe.gov/SitePages/default.aspx?sitename=Weldon_Spring
[7] https://gems.lm.doe.gov/#

The following public stakeholders are routinely notified of events that occur at the site:

- Local government officials.
- Francis Howell School District.
- Missouri Department of Conservation.
- St. Charles County Division of Environmental Health and Protection.
- MoDNR-Parks.
- St. Charles County Police Department.
- Cottleville Fire Protection District.
- U.S. Army.
- Missouri Department of Transportation.
- St. Charles County Highway Department.

Each year, DOE summarizes site activities, compliance status, annual site inspection results, and environmental monitoring data in an annual report. DOE prepares the annual report compliant with the site's LTS&M Plan requirements. You can find the annual report on the Weldon Spring Site documents page and at the Weldon Spring Site Interpretive Center.

Are routine inspections performed at the site?

Yes, our highly qualified staff regularly monitor, inspect, and maintain the site.

Every year in late fall, a formal, annual site inspection compliant with the site Long-Term Surveillance and Maintenance Plan requirements is performed. EPA and MoDNR site regulators typically participate. Annual site inspections began in 2003. The purpose of the annual site inspection is to:

- Confirm integrity of visible features, such as the disposal cell and monitoring wells.
- Document the site condition after cleanup and restoration.
- Identify changes in conditions that may negatively impact the site.
- Determine if institutional controls, which protect people from exposure to remaining contaminants, are working.
- Determine if maintenance or additional inspections and monitoring are needed.

Prior to each annual inspection, DOE contacts stakeholders, local government officials, and surrounding property owners to tell them about the annual inspection, to provide an update about site activities, and to ask them if they have any questions or concerns about the site. DOE also reminds surrounding property owners about institutional controls requirements and restrictions. DOE includes annual inspection results and details in the annual report posted on the Weldon Spring Site documents page.

How often do you sample groundwater at the Weldon Spring Site?

DOE has monitored groundwater since 1986. Currently, the site groundwater network includes 106 monitoring wells, and DOE samples the wells quarterly, semi-annually, or annually, depending on the well. The groundwater network includes wells on the Weldon Spring Site,

including the Quarry, and on adjacent properties. We use groundwater data results to assess environmental impacts and to evaluate the remedy's effectiveness.

We publish the groundwater sampling data in the site's annual report, which you can read on the Weldon Spring Site documents page. You can also review the data on our data share network (Geospatial Environmental Mapping System site).[8]

What were the results of the Sixth Five-Year Review?

Every five years DOE evaluates the remedy's implementation and performance at the Weldon Spring Site to see if the remedy is viable and will continue to keep human health and the environment protected. The FYR is a time for stakeholders, including MoDNR and EPA, to raise questions, concerns, and comments, given their environmental regulatory oversight role.

The Sixth Five-Year Review results showed the MNA remedy at the Weldon Spring Site currently protects human health and the environment — the remedy is working as expected across the majority of the site. However, uranium concentrations in on-site monitoring wells in two locations near the former Raffinate Pits area are not decreasing. Yet, concentrations at the monitoring wells are not increasing, and the residual contamination does not affect drinking water. Until concentrations begin to lower, we cannot estimate a cleanup time frame for the on-site wells.

In response to the Sixth Five-Year Review,[9] DOE created a working group with scientists from four of the nation's top national labs: Savannah River National Laboratory, Pacific Northwest National Laboratory, National Energy Technology Laboratory, and Los Alamos National Laboratory. The working group had two goals: (1) identify the need and location(s) for additional monitoring wells and (2) evaluate different solutions for removing leftover uranium and restoring the site's groundwater, should it be necessary. The collaboration resulted in recommendations that can be acted upon within the next one to five years.

After coordinating with EPA and MoDNR, DOE performed additional sampling in 11 of the 106 groundwater monitoring wells at the site. In the next 24 months, DOE plans to perform additional testing that will validate the wells and groundwater's expected performance and whether they continue to perform consistent with the Record of Decision. As part of ongoing surveillance, DOE will use the data from these tests to determine whether to do more testing or if DOE needs to expand the groundwater monitoring network. You can read a summary about the sampling in the 2022 annual report.[10]

Does DOE sample the surface water in Busch Wildlife Lakes 34, 35, and 36?

Yes, DOE performs surface water monitoring at Busch Wildlife Lakes 34, 35, and 36, as well as in Dardenne Creek. Results show uranium levels have been below maximum contaminant levels since the late 1990s. DOE has monitored surface water since 1986. You can read findings

[8] https://gems.lm.doe.gov/#
[9] https://lmpublicsearch.lm.doe.gov/lmsites/s31922_wel_sixth5yearreview.pdf
[10] https://lmpublicsearch.lm.doe.gov/lmsites/42996_wel_2022_annualreport.pdf

published in the site's annual reports on the Weldon Spring Site documents page.[11] You can see analytical data on our data share network (Geospatial Environmental Mapping System site).[12]

Has DOE sampled the sediment in Busch Wildlife Lakes 34, 35, and 36?

Yes, DOE has sampled the sediment in these lakes. Busch Lakes 34, 35, and 36 are human-made bodies in the eastern portion of the August A. Busch Memorial Conservation Area constructed in the 1960s when the Weldon Spring Uranium Feed Materials Plant operated. Lakes 35 and 36 are part of the Schote Creek surface-water drainage that had stormwater runoff from the former Weldon Spring Site Chemical Plant.

Water flowed to Lake 36 through a natural drainage from the former Weldon Spring Site Chemical Plant. From Lake 36, the water flowed through an overflow structure into another drainage that flowed into Lake 35. Lake 34 was in a surface-water drainage that did not get direct runoff from the former Weldon Spring Site Chemical Plant. Lake 34 did get groundwater that flowed beneath the site and discharged from Burgermeister Spring.

During the Weldon Spring Site cleanup, DOE sampled Lake 36 sediments in 1997 after the Missouri Department of Conservation (MDC) drained the lake for scheduled restoration. DOE sampled Lakes 34 and 35 in 1998 using a floating drill rig. The samples did not have uranium concentrations at levels that required cleanup. You can read full details in the "Completion Report for Sediment Sampling at Busch Lakes 34 and 35."[13]

Results from Lake 36 showed lakebed sediment had uranium at levels more than the as-low-as-reasonably-achievable goal but below criteria that required cleanup. (See the "Busch Lake 36 Summary Closeout Report."[14]) Even so, because the lake drainage made the sediments accessible, DOE dug up and put the sediments in the site's disposal cell.[15] For Busch Lake 36 sediment removal results, see "Closure Report for the Radiological Characterization of Sediments and Soil Within the Southeast Corner of the Busch Lake 36 Sampling Plan."[16]

Were fish and animals tested in the Busch Wildlife Conservation Area?

Yes, studies done in the past evaluated possible contamination in fish and wildlife in the conservation area.[17][18] The studies looked at potential for contamination building up in bodies of fish and wildlife that area fisherman and hunters might eat. Risk assessment analysis based on

[11] https://lmpublicsearch.lm.doe.gov/SitePages/default.aspx?sitename=Weldon_Spring
[12] https://gems.lm.doe.gov/#
[13] https://lmpublicsearch.lm.doe.gov/lmsites/doe-or-21548-768_wel%20completion%20report%20for%20sediment%20sampling%20busch%20lakes%2034-35.pdf
[14] https://lmpublicsearch.lm.doe.gov/lmsites/3556-doe.or.21548.702.r.1.pdf
[15] https://lmpublicsearch.lm.doe.gov/lmsites/3556-doe.or.21548.702.r.1.pdf
[16] Closure Report for the Radiological Characerization of Sediments and Soil Within the Southeast Corner of Busch Lake 36 Sampling Plan (doe.gov)
[17] Radiological and Chemical Uptake in Game Species at the Weldon Spring Site, July 1995, Rev. 1. (doe.gov)
[18] https://lmpublicsearch.lm.doe.gov/lmsites/wel_baseline_assessment_for_chemical_plant_area.pdf

study results showed consuming area fish or wildlife was below the EPA target range for unacceptable human risk levels.

DOE stopped sampling fish in 2002. Review the "Weldon Spring Site Environmental Report for Calendar Year 2001" for more information.[19]

What is a risk assessment and are there risks when visiting the site?

A risk assessment is a method used to quantify threats to human health and the environment. Risk assessments are studies conducted as part of site cleanup. By examining the potential adverse effects caused by radioactive or hazardous chemical substances, a risk assessment can help decide what needs to be cleaned up, where, and to what level. Risk assessments are made up of two parts: a human health risk assessment and an ecological risk assessment. Together, they help to determine the most effective way to clean up a site while reducing the overall risk to human health and the environment. You can read about Weldon Spring Site risk assessments in the site's LTS&M Plan.[20]

Was environmental monitoring done at Francis Howell High School?

During cleanup, the Weldon Spring Site ran an extensive environmental airborne monitoring and surveillance program compliant with DOE orders, EPA and National Emission Standards for Hazardous Air Pollutants regulations, and the site environmental monitoring plan.

Throughout cleanup, the Weldon Spring Site closely monitored the potential for radioactive and other contaminants in the air by measuring gamma exposure rates, radon, airborne radioactive particulates, airborne asbestos, and fine particulate matter concentrations at various bordering and off-site locations, including Francis Howell High School.

The potential for airborne release of contaminants was removed when the last contaminated materials were put in the site's disposal cell. You can read about air monitoring data in historical annual reports on the Weldon Spring Site documents page.[21]

Is my drinking water safe?

In August 2023, Public Water Supply District (PWSD) No. 2 in St. Charles County addressed community concerns on their website about drinking water and the water treatment plant near the Weldon Spring Site.[22] PWSD No. 2 wrote, "All samples are well below the maximum contaminant levels provided by the United States Environmental Protection Agency."

[19] https://lmpublicsearch.lm.doe.gov/lmsites/3965-cy2001ser.pdf
[20] https://lmpublicsearch.lm.doe.gov/lmsites/3506-wel_ltsp.pdf
[21] https://lmpublicsearch.lm.doe.gov/SitePages/default.aspx?sitename=Weldon_Spring
[22] https://web.archive.org/web/20161217112855/http:/www.atsdr.cdc.gov/HAC/pha/PHA.asp?docid=872&pg=0

What does the Quarry look like now?

DOE cleaned up the Weldon Spring Site Quarry and filled it with clean soil. It no longer contains any water. MDC maintains other quarries in the immediate area that have no contamination related to the Weldon Spring Site.

I remember exploring a structure called the Equadome. Was I exposed to radiation there?

No, you were not exposed to radiation at the Equadome, or "Aqua Dome," as some called it. The Equadome was a former WWII era water treatment plant that provided clean water from the Missouri River to the 1940s era Weldon Spring Ordnance Works. The Weldon Spring Uranium Feed Materials Plant was not related to the Equadome, nor did it contaminate it. The U.S. Department of the Army demolished the Equadome in the late 1990s.

Were public health studies done on the area?

In June 1997, the Agency for Toxic Substances and Disease Registry (ATSDR) presented a study in the Public Health Assessments and Health Consultations of the Weldon Spring Site Remedial Action Project (Chemical Plant, Raffinate Pits, Quarry) St. Charles, St. Charles County, Missouri.[23]

The following are excerpts:

Page 25 – Quarry and Raffinate Pits – Swimmer Scenario

> "Residues from the processing of uranium and thorium were placed in the quarry and raffinate pits, and water samples from these areas confirm the presence of radionuclides. Because of community members' concerns, ATSDR evaluated the risk of adverse health effects to persons who may have swum in these areas. ATSDR health physicists calculated an effective radiation dose of 0.4 mrem/yr to swimmers (see Appendix C). Based on this estimated annual effective radiation dose, swimming in the quarry or raffinate pits did not pose a radiation health hazard."

Page 26 – Francis Howell High School – Staff and Students Scenario

> "At the request of local citizens, ATSDR completed a health consultation in 1994 on the potential exposure of Francis Howell High School students and staff to airborne radionuclides from the chemical plant site. Results from DOE air monitoring samples did not indicate any airborne radioactive materials above background concentrations at the school. Also, measurements from monitoring stations at the site boundary and at the high school during building demolition (1993 calendar year) did not show any increased concentrations or exposures to

[23] https://web.archive.org/web/20161217112855/http:/www.atsdr.cdc.gov/HAC/pha/PHA.asp?docid=872&pg=0

site-related contaminants above background. Additionally, gross alpha particulate concentrations at the facility boundary and the high school did not show any off-site migration of airborne alpha-emitting materials (uranium, thorium, etc.). ATSDR health physicists calculated an annual effective radiation dose of 0.3 mrem/yr to the staff and students (see Appendix C). Based on this estimated annual effective radiation dose, the site posed no apparent health hazard to staff and students at the school, and it does not pose a radiation health hazard now nor will it in the future."