

The Road to Genuine Los Alamos Lab Cleanup

Executive Summary

Funding for nuclear weapons is still the priority at the Lab

- \$1.7 trillion 30-year “modernization” program total current estimate across the nation
- LANL receives \$2 billion annually for nuclear weapons work

Legacy Cleanup Program at LANL is getting started with new contractor

- Current cleanup estimate is \$4.1 billion remaining to finish by 2036
- LANL cleanup has been receiving \$195 to \$220 million per year

Consent orders are the key to cleanup

- A gutted 2005 “Consent Order” would have forced the Department of Energy (DOE) and LANL to get more money for cleanup
- A giant loophole in the 2016 Consent Order allows DOE and LANL to say that they don’t have sufficient funding and can choose to exempt themselves from any cleanup

Material Disposal Area G (Area G) is the largest and most expensive cleanup site

- LANL’s own estimate to remove all the wastes from Area G came in at \$29 billion
- Using actual cleanup estimates of another dumps, we can estimate the comprehensive cleanup of Area G could be as low as \$7 billion
- Over 150,000 cubic meters are planned to be “capped and covered” and left behind

Chromium Groundwater Plume

- Ending in 1972 the Lab flushed its cooling towers into Sandia Canyon with chromium
- Cr is now in the regional aquifer, on the border with San Ildefonso Pueblo
- Studies are being conducted to determine whether extraction can achieve active long-term chromium removal from the regional aquifer and if in-situ remediation to convert the chromium into a less dangerous form is an option
- Likely will have to pump and treat for a long time

RDX “Royal Demolition Explosive” Explosives Plume

- Explosives machining wastewater discharged resulted in RDX in soil and water
- RDX is in the regional aquifer.
- Likely will have to pump and treat for a long time

Technical Area 21

- From 1952 to 1986, a liquid-waste treatment plant discharged radionuclides from a plutonium-processing facility into DP Canyon and into buried tanks
- MDAs A & T at TA 21 are expected to not be completely transferred to LA County because of the large amount of wastes planned to be left behind despite the fact that LA County plans to use the rest of area as a commercial industrial park.

Material Disposal Area C at TA-50

- Solid waste containing hazardous constituents and radioactive waste was disposed between 1948 and 1974
- The depths of the 7 pits and shafts at MDA C range only up to 25 ft.
- A total of 28 contaminants have been detected in the vapor plume beneath
- The assumed “cap and cover” would leave the wastes permanently buried in place

The Road to Genuine Los Alamos Lab Cleanup

The fiscal year 2020 Congressional budget request shows that spending for nuclear weapons is still on the rise after a decade in which funding for these programs at Los Alamos National Laboratory (LANL) increased 20%. Nuclear weapons funding is slated to keep climbing under the \$1.7 trillion 30-year “modernization” program started under Obama. Trump is adding yet more money and may accelerate a new arms race with Russia by adding two new types of nuclear warheads. Cleanup funding, on the other hand, is slated to remain flat for the next two decades because the New Mexico Environment Department (NMED) under Gov. Martinez gutted a 2005 “Consent Order” that would have forced the Department of Energy (DOE) and LANL to get more money for cleanup. But weapons are still the priority.

During the Cold War, nuclear weapons research and production left the land and groundwater under LANL contaminated with hundreds of types of radioactive and hazardous wastes spread across the mesas and canyons of the Lab’s 40 square miles. The question is - When did Northern New Mexicans get the chance to decide to leave permanent waste dumps at the Lab? Who struck the deal to trade jobs for nuclear waste dumps that will remain radioactive for thousands of years? The nuclear weapons programs employees at the Lab benefitted from this deal. But the environment will pay for lack of genuine cleanup for centuries to come, and we could end up living with the waste dumps forever if officials from the State, DOE, and LANL have their way.

DOE’s Environmental Management (EM) investigation and cleanup of an estimated 2,100+ contaminated sites and disposal of legacy radioactive waste at LANL has been ongoing for 30 years (1989 to 2019). To date, 1,100+ potentially contaminated sites have been investigated and cleaned up where required. The remaining 900+ sites are covered under a lifecycle cost estimate with some regulation by the State of New Mexico under the cleanup 2016 Consent Order. But the largest, most complex and dangerous sites still remain threats to Northern New Mexico.

The University of California ran the Lab for the first 50 years. Then from 2006 to 2018, management and operating contractor Los Alamos National Security LLC, a consortium led by Bechtel and the University of California, managed LANL’s National Nuclear Security Administration (NNSA) missions. DOE made the decision to split environmental management from the contract for nuclear weapons and scientific programs at the Lab in 2015. This was largely because of the Waste Isolation Pilot Plant (WIPP) shutdown, caused by an improperly packed waste drum from LANL and ongoing nuclear safety problems. Yet, the University of California continues to be a part of managing the Lab.

In 2018 Newport News Nuclear BWXT- Los Alamos, LLC Alamos (N3B) took over cleanup under a separate EM contact from DOE, which could potentially be worth \$1.39 billion over a decade. In contrast, Triad National Security, LLC, which now runs the NNSA part (mostly nuclear weapons work) of the Lab, has a contract with an estimated value of approximately \$2.5 billion per year for a potential \$25 billion contract over ten years.

The Cost of Cleanup

Since a revised Consent Order went into effect in 2016, DOE has estimated total costs, with a current top range of \$4.1 billion to complete DOE's version of LANL cleanup around 2040. Lab cleanup funding was locked in to around \$190 million per year until FY18 and FY19, when NM Senators were able to increase that to \$220 million. For FY 2020 DOE has only requested \$195 million for Lab cleanup. Hopefully, DOE is expecting our NM Senators to come through again. NMED has been on record that around \$250 million annually would be appropriate.

But increasing the cleanup budget on an ongoing basis is unlikely under the 2016 Consent Order (CO) because it currently allows DOE to set cleanup priorities based on anticipated budget. The purpose of the original 2005 Consent Order was to compel DOE and LANL to ask Congress for additional funds needed for comprehensive cleanup. A giant loophole in the 2016 Consent Order allows DOE and LANL to say that they don't have sufficient funding and therefore can choose to exempt themselves from any cleanup. This loophole should be eliminated.

There are ~150,000 cubic meters of radioactive and hazardous wastes buried in unlined trenches in LANL's largest waste dump (Area G) alone. DOE plans to "cap and cover" and leave most all of those wastes buried forever, creating a permanent nuclear waste dump above our groundwater, three miles uphill from the Rio Grande. Alarmingly, plutonium has already been detected 200 feet below Area G's surface, almost a quarter of the way to the Española Basin groundwater aquifer, the sole source water supply for nearly 270,000 people. In addition, the dump is located in an active seismic zone between a rift and a dormant super volcano. Yet cost is the major factor playing into cleanup decisions. The logic seems to be – How can we best do cleanup on the cheap?



Recently, DOE has recalculated its estimate for the cost to clean up the nation-wide nuclear weapons complex at \$377 billion. This is an increase of \$108 billion over last year's estimate, with \$167 billion spent to date. LANL has spent \$3.2 billion on cleanup so far. The remaining cleanup estimate for LANL is increasing faster than it is getting done. LANL's own estimate to remove all the wastes from Area G came in at \$29 billion in a 2008 report. This seems clearly financially impossible to complete, leading to its automatic rejection. A "cap-and-cover" option leaving the wastes permanently buried in unlined pits and shafts was estimated at \$147 million. However, using actual cleanup costs for Material Disposal Area B (MDA B) and LANL estimates of another dump (MDA C), we can estimate the comprehensive cleanup of Area G

could be as low as \$7 billion.¹ That would be a win-win for New Mexicans, permanently protecting the environment, groundwater and the Rio Grande while creating 100's of high paying jobs. Don't forget that LANL spends almost \$2 billion per year doing nuclear weapons work.

We can also suggest a middle path. Conceptually, place large hanger-like enclosures with robust monitoring over an excavated pit and over an old pit next to it. These domes would be on wheels like was done at a successful cleanup in 2012 (Materials Disposal Area B). As waste is exhumed, characterize it. Inventory it. Ship any TRU to WIPP. Very carefully consider cleaning, recycle, and reuse anything possible. Repackage the waste and place it in the new lined and monitored pit (or a facility), along with any low-level dirt. Again, more jobs are created.

Another good example of how sites can be cleaned up is the Advanced Mixed Waste Treatment Plant (AMWTP) at Idaho National Laboratory, which is a facility designed, built, and operated for offsite disposal of hazardous transuranic waste. A key component of AMWTP is a compactor that reduces the volume of waste for disposal by a factor of 6 to 1, significantly saving space when storing waste. After 20 years of operation, the AMWTP delivered more than 44,000 cubic meters of transuranic waste to WIPP and over 13,000 cubic meters of mixed low-level waste to other disposal facilities. The treatment plant cost \$500 million and most of the waste that was processed at AMWTP was contaminated with radioactive materials and other hazardous chemicals from Colorado's Rocky Flats Plant in the 1970s and 1980s. This has led to huge reductions in the amount of waste stored above the Snake River Plain Aquifer, keeping DOE commitments to the people of Idaho.²

Besides cost, some of arguments against removing the waste from LANL's Area G include "it's too dangerous" and "there would be thousands of trucks carrying the waste off the hill." First, if it's too dangerous for highly trained workers to remove now, then it has to be too dangerous to leave for innocent future generations. And everything that is currently on the hill was trucked up there to start with and nobody seemed to care. It is unknown exactly what wastes are in Area G and at what amounts, which is the best reason to dig up the wastes and characterize everything.



An excavator inside the enclosure at MDA B at LANL

¹ See https://www.nukewatch.org/facts/nwd/Area_G_Comparison_Costs-11-14-12.pdf

² See <https://www.latimes.com/nation/la-na-idaho-nuclear-waste-20181208-story.html>

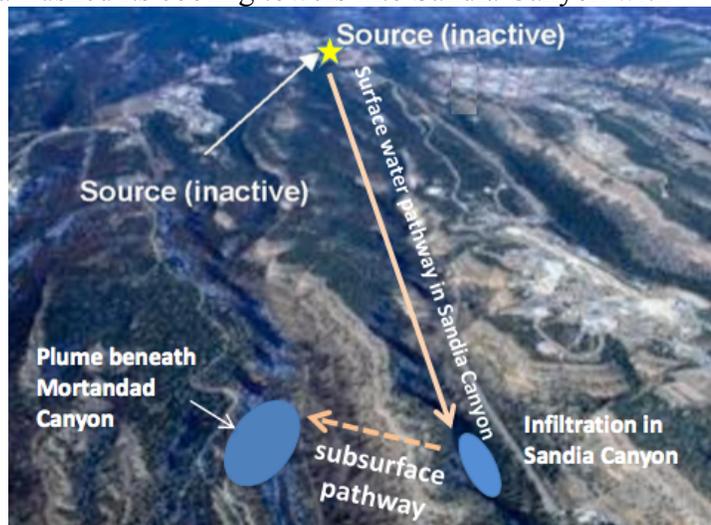
Many Areas at LANL Need Attention, Especially the 2016 Consent Order

The 2016 Consent Order includes sorting cleanup tasks into a so-called “campaign approach,” which currently includes 17 campaigns. A campaign is supposed to be generally based upon a risk-based approach to grouping, prioritizing, and accomplishing corrective action activities at contaminated sites. Interim “milestones” are developed to measure progress towards the completion of the campaigns. The purpose of the campaign approach was allegedly to focus resources, areas, and risks but an unstated purpose seemed to be to come up with another reason to do away with the 2005 CO, which sorted cleanup by specific area. NMED granted more than 160 extensions, and then turned around and claimed the 2005 CO did not work.

Campaigns, projects, tasks, and deliverables may be subject to two types of deadlines: milestones (for the current year), which are enforceable; or targets (for the next 2 years), which are not enforceable. Soon after DOE’s receipt of its first FY appropriation, DOE, NMED, and the cleanup contractor are supposed to meet to discuss any necessary revisions to the milestones, e.g., because DOE did not receive adequate appropriations from Congress to carry out proposed milestones. During this annual planning process, DOE also provides NMED with a date in which it estimates that all work under the Consent Order will be completed, which is also not enforceable. Lack of funding is allowed as a reason to not cleanup. The 2016 Consent Order has no teeth to protect New Mexicans from slow or lack of continued cleanup. And below are some of the reasons why cleanup is so important at Los Alamos.

Chromium Groundwater Contamination

In addition to the mountains of radioactive and hazardous buried wastes, one of the Laboratory’s environmental priorities is addressing a chromium plume in the regional aquifer. From 1956 to 1972 a power plant in the main Lab area flushed its cooling towers into Sandia Canyon with chromium, which was commonly used as a corrosion inhibitor. This chromium-contaminated water flowed down Sandia Canyon as surface water and eventually penetrated the underlying rock layers. The contaminated water infiltrated into the regional aquifer beneath Sandia and Mortandad Canyons and is at the border of neighboring San Ildefonso Pueblo where it magically seems to have stopped at the boundary. The dangers of chromium-hexavalent 6 were made famous in the film *Erin Brockovich*.



The Lab’s theory of the chromium plume

The Laboratory did not make the chromium in the regional aquifer public until 2005. It is estimated to be in the top of the regional aquifer with dimensions of 1 mile long by 1/2 mile wide by 50-75 ft. thick. Characterization of the nature and extent of the plume has been ongoing. Work for the next few years is intended to control plume migration while a final remediation strategy is decided upon. An interim measure

will include the installation and operation of extraction and injection wells in an effort to keep the plume from crossing onto San Ildefonso Pueblo. There will be an extraction well near the center of the plume to test feasibility of removal, as well as studies to identify additional technologies that may be applied to remediation. In other words, it will be many years before the chromium is no longer a threat to our drinking water.

The Chromium Campaign final remedy is presumed to be a long-term pump and treat system that removes chromium from the regional aquifer. The characterization work will be conducted to determine whether extraction can achieve active long-term chromium removal from the regional aquifer and if in-situ remediation such as adding molasses or other chemicals to convert the chromium into a less dangerous form is an option.

Other alternatives must be explored such as pumping the treated water up to perched aquifer areas to try to flush the Cr out of the upper reaches and get it down to an area where it can be treated.

RDX

“Royal Demolition Explosive” (RDX), which is a conventional explosive used to detonate nuclear weapons by imploding plutonium pits into a critical mass, was machined at Technical Area 16 beginning in the 1950s. Over time, machining wastewater discharged at the site resulted in RDX contamination in soil and water. Around 1999, the Laboratory cleaned up the soil; however, levels of legacy RDX still contaminate surface water and groundwater. Wastewater from the machining was produced over several decades, much of which was discharged into Canyon de Valle. Breathing dusts of RDX or swallowing large amounts of RDX may develop seizures. The EPA has determined that RDX is a possible human carcinogen. RDX is in the regional aquifer.

The RDX Campaign Remedy will probably include pump and treat to prevent further migration and will probably include additional characterization of the intermediate/regional groundwater.

Cleanup at Technical Area 21

TA-21 also known as Delta Prime (DP) Site, is on DP Mesa situated immediately east-southeast of the Los Alamos townsite and is coveted by Los Alamos County for economic development, but TA-21 contains two disposal areas that may not ever be remediated. Historical operations included plutonium processing, the production of nuclear weapons detonators, and tritium research, which produced liquid and solid radioactive wastes. From 1952 to 1986, a liquid-waste treatment plant discharged radionuclides from a plutonium-processing facility into DP Canyon.

Material Disposal Area T (MDA T) at TA-21 was one of the first LANL disposal areas. Radioactively contaminated liquid waste from the plutonium-processing laboratories at TA-21 was discharged between 1945 and 1952. MDA T is a 2.2-acre radiological waste disposal site classified as a hazardous category 2 nuclear facility due to the radiological inventory in its disposal shafts. Stormwater runoff from this site drains to the north to DP Canyon. Approximately 18.3 million gallons of contaminated wastewater was released in MDA T between 1945 and 1967. Between 1968 and 1983, treated liquid waste was mixed with cement and pumped into 62 shafts for future disposal. Beginning in 1975, liquid wastes with plutonium were mixed with cement, poured into corrugated metal pipes and buried at MDA T. The total volume of cement paste disposed of in the shafts at MDA T was 122,500 cubic feet.

MDA A is a 1.25-acre disposal site located adjacent to MDA T near the center of TA-21. The site was used intermittently from 1945 to 1949 and from 1969 to 1977 it was used for disposal of radioactively contaminated solid waste, debris from decommissioning and decontamination (D&D) activities and radioactive liquids. MDA A consists of two buried tanks known as the “General’s Tanks” (50,000 gallons each), two rectangular pits, and one large central pit.

MDAs A & T are currently expected to remain under Federal control indefinitely and not completely transferred to LA County because of the large amount of wastes planned to be left behind despite the fact that LA County plans to use the rest of area as a commercial industrial park. Current cleanup plans call for the removal of the two 50,000-gallon plutonium solution tanks and remediation of a central debris pit and waste trenches. DOE and NMED will probably develop a cap-and-cover remedy. DOE will have to control access to MDAs A & T while performing maintenance operations or remedial actions, and monitoring the disposal area performance for at least 100 years.

MDA C

Material Disposal Area C, located at Technical Area 50 (TA-50), is approximately 11 acres in and consists of 7 pits and 108 shafts. MDA C was in operation from 1948 to 1974. Solid waste containing hazardous constituents and radioactive waste was disposed between 1948 and 1974. The depths of the 7 pits at MDA C range from 12 to 25 ft. below the original ground surface, and the depths of the 108 shafts range from 10 to 25 ft. below the original ground surface.

A subsurface volatile organic compound (VOC) vapor plume lies beneath MDA C. The sources of VOC vapors at MDA C are associated with off gassing from wastes disposed of in the pits and shafts at the site. A total of 28 VOCs have been detected in the vapor plume beneath MDA C. Of these, only trichloroethylene (TCE) currently exceeds its threshold limit values (TLV), which is 10 parts per million (ppm), a standard that is lower than the US Occupational Safety and Health Administration standard of 50 ppm. TCE concentrations at MDA C exceed the TLV at depths of 200 to 300 ft. below ground surface.

The peak use of TCE as a solvent, including at LANL, was in the 1960s. As studies began to better define the toxic nature of TCE, its use was largely discontinued in favor of other solvents. Over the long term, it can cause nervous system, kidney and liver damage. TCE is considered to be "highly likely to produce cancer in humans" by the National Academy of Sciences.

The Lab’s assumed remedy of “cap and cover” would leave the wastes permanently buried in place. The cover will have to contain monitoring to ensure it is keeping rodents, plants and trees from creating pathways to the contamination. Groundwater will have to be monitored to ensure there is no migration of the contaminants and a soil vapor extraction system will be installed. DOE plans to control access to MDA C while performing maintenance operations or remedial actions, and monitoring the disposal area performance for at least 100 years.



Workers remove a waste barrel.

2016 Consent Order Campaigns

Below is the Environmental Management Los Alamos (EM-LA) Lifecycle Cost Estimate (LCE) table for cleanup based on the “campaign approach” giving the estimated cost and completion dates.³ The table is aligned with the 2016 Consent Order and has 17 Soil and water campaigns identified. As one campaign completes, the next scheduled campaign is supposed to start, but none are complete and multiple campaigns are underway simultaneously. The items in blue are currently underway.

Item #	Campaign Title	SWMUs/AOCs	Estimated Completion	Estimated Cost (M)
1	Chromium Interim Measure	1	2020 – 2022	\$38.9 - \$50.6
2	Historic Properties Completion	84	2019 – 2020	\$5.3 - \$6.4
3	Royal Demolition Explosives (RDX) Characterization	2	2022 – 2024	\$1.6 - \$2.1
4	Supplemental Investigations Reports	222	2019 – 2019	\$0 - \$1.0
5	TA-21 D&D and Cleanup	41	2020 – 2022	\$45.8 - \$54.9
6	RDX Remedy	0	2024 – 2025	\$22.3 - \$26.8
7	Known Cleanup Sites	20	2027 - 2028	\$34.8 - \$41.8
8	Material Disposal Area (MDAs) A & T Remedy	30	2028 – 2031	\$92.1 - \$124.3
9	Chromium Final Remedy	0	2026 – 2028	\$100.3 - \$130.0
10	Southern External Boundary	60	2025 – 2026	\$10.0 - \$12.0
11	MDA C Remedy	1	2024 – 2026	\$34.6 - \$48.7
12	Sandia Canyon Watershed	49	2024 – 2025	\$6.3 - \$7.6
13	Pajarito Watershed	167	2028 – 2030	\$20.7 - \$24.9
14	Upper Water Watershed	253	2030 – 2031	\$33.5 - \$40.2
15	MDA AB Remedy	12	2027 – 2030	\$41.8 - \$50.2
16	MDA H Remedy	1	2029 – 2030	\$15.3 - \$18.3
17	MDA G & L Remedy / D&D	12	2035 – 2040	\$237.9 - \$356.9

Highlighted rows indicate campaigns currently underway

Recommendations:

- Reject LANL's plans to "cap and cover" Area G, its largest dump, along with several others, turning the Lab into a permanent nuclear waste dump. Say no to “cap and cover” that will forever threaten our precious water resources!
- Increase cleanup funding for Los Alamos to at least \$250 million per year, and make sure it all really goes to cleanup.
- Overturn the 2016 Consent Order, which is a bad deal for NM, and reinstate the 2005 CO with milestone schedules modified as needed.
- Tell the New Mexican congressional delegation and the New Mexico Environment Department that you want full, comprehensive, job-producing cleanup.
- Support NukeWatch!

See the online version of this fact at:
www.nukewatch.org

³ See https://www.energy.gov/sites/prod/files/2019/04/f61/NNMCAB_EM-LA%20Program%20Overview%20and%20Update_November%202018.pdf