

First Chance Mine – Sierra Ancha Locality, Arizona

DRUM PROGRAM MIDYEAR PROGRESS REPORT

January 1-June 30

2023

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Introduction

The 2014 *Defense-Related Uranium Mines Report to Congress* (DOE 2014b) identified the potential physical and environmental risks posed by legacy abandoned uranium mines (AUMs) in the United States on public land, tribal land, and private property. This set of mines provided uranium ore for defense-related atomic energy activities from 1947 to 1970. To help quantify the remnant risks associated with these mines, the U.S. Department of Energy authorized the Office of Legacy Management to initiate the Defense-Related Uranium Mines program in fiscal year 2017. LM subsequently developed multiple campaigns to carry out verification and validation (V&V) fieldwork at these legacy mines. About 2500 mines are on public land, most of which the U.S. Bureau of Land Management, the U.S. Forest Service, the U.S. Bureau of Reclamation, or the National Park Service manages for multiple uses, but primarily for public recreation. The DRUM team documents the information collected about a mine in a mine-specific V&V report, which later serves as the basis for evaluating the risks posed by a group of mines, as presented in a risk roll-up report.

This midyear report describes DRUM program accomplishments and achievements for the reporting period Jan. 1 through June 30, 2023. The DRUM team stores the information presented in this report in a continuously updated database. The report provides information about the progress of Campaign 1 (public land), Campaigns 1 and 3 (mixed-ownership land), Campaign 2 (tribal land), and Campaign 3 (private property). It also includes the program’s overall progress since its initiation in July 2017. This additional information provides context for this reporting period’s accomplishments.

DRUM Progress Summary

The DRUM program’s seventh field season began March 6, 2023. The focus of this season’s fieldwork through June 30, 2023, has been on Campaign 1 (BLM-managed land in Arizona, Nevada, Utah, and Wyoming; USFS-managed land in Arizona and Nevada; USBR-managed land in Arizona; and NPS-managed land in Utah and Arizona) and Campaign 2 (Navajo Nation lands in Arizona and New Mexico). See Table 1 for details about program progress for the reporting period and overall progress by campaign.

Table 1. DRUM Program Progress by Campaign

DRUM Program Progress by Campaign						
Campaign	Reconciled Mines Identified for V&V Field Visits as of Aug 1, 2023	V&V Field Visits Completed Jan 1-Jun 30, 2023	Total V&V Field Visits Completed Through Jun 30, 2023	V&V Field Visits Remaining as of Jun 30, 2023	V&V Reports Completed Jan 1-Jun 30, 2023	V&V Reports Completed as of Jun 30, 2023
Campaign 1	2230	82	2100	130	109	2019
Campaigns 1 and 3 (mixed ownership) ^a	101 ^a	1	85 ^a	16	3	84 ^a
Campaign 2	212	15	31	181	16	16
Campaign 3	541	0	4	537	0	1
Totals for all campaigns	3084	98	2220	864	128	2120

Note:

^a Includes one unconventional site field-evaluated by request and was counted as a Campaign 1-3 mixed-ownership mine.

The DRUM program supports LM’s strategic goal to “Protect human health and the environment” (goal 1) and its strategic objective to “address the environmental legacy of defense-related uranium mining and milling sites” (DOE 2020a).

DRUM Program Accomplishments

Significant DRUM program accomplishments during the reporting period include:

- Receiving the Secretary of Energy’s Achievement Award: On Jan. 18, 2023, LM learned the DRUM program was one of 44 recipients of the Secretary of Energy’s Achievement Award. According to the notice, “These awards are among the highest forms of internal, non-monetary recognition DOE Federal and contractor employees can receive.” This is the first time that an LM program or project has ever received this award. A virtual awards ceremony took place Jan. 24, 2023, to honor 18 individuals, including 11 Legacy Management Support Partner (LMSP) team members and DRUM program retirees.
- Submitting 2000 DRUM V&V reports to LM: On Jan. 23, 2023, the LMSP DRUM program team submitted the 2000th DRUM V&V report to LM. The LM director sent a congratulatory letter to the RSI EnTech, LLC team that day that stated, “The Department of Energy Office of Legacy Management would like to thank the entire RSI EnTech Defense-Related Uranium Mines (DRUM) Program team and supporting functions for their hard work and dedication to the mission. In particular, I congratulate you for the close collaboration with our partner agencies leading to the completion of over 2,000 mine inventories and mine-specific reports and the safeguarding of over 500 hazardous mine features, since the inception of the program . . . As a result, your efforts have earned recognition and praise at all levels of the Department, all the way up to the Secretary of Energy. From researching mine data to field work to report writing, your invaluable contributions ensure the program’s continuing success. Well Done!”
- Preparing risk roll-up reports recording the risk rankings for mines within identified V&V project areas. Project areas include localities, land management agency field offices, or other logical geographical groupings land management agencies create. Risk roll-up reports completed during the reporting period cover 87 mines with V&V reports finalized before and during the same reporting period. The following is a list of the areas with risk roll-up reports completed between January and June 2023:
 - The Radium Group Locality South (25 mines) in western Colorado on BLM-administered land (DOE 2023l).
 - The Pryor Mountains Locality (11 mines) in southern Montana on BLM-administered and USFS-administered land (DOE 2023j).
 - The Radium Group Locality North (17 mines) in western Colorado on BLM-administered land (DOE 2023k).
 - The Monogram Mesa Locality (20 mines) in western Colorado on BLM-administered land (DOE 2023i).
 - The Golden Rod Group Locality (14 mines) in western Colorado on BLM-administered land (DOE 2023h).

- Preparing or revising the following Field Operations Plans that describe reconciled mine locations and provide guidance for a logical approach to field V&V work in specific geographic areas:
 - *Defense-Related Uranium Mines Field Operations Plan for Mines on Public Land in Washington* (DOE 2023e) covering three mines.
 - *Defense-Related Uranium Mines Field Operations Plan for Mines on Public Land in Idaho* (DOE 2023c) covering six mines.
 - *Defense-Related Uranium Mines Field Operations Plan for Mines on Public Land in Oregon* (DOE 2023d) covering three mines.
 - *Defense-Related Uranium Mines Field Operations Plan for the Charlotte Rutherford Mine in New Jersey* (DOE 2023f) covering one mine.
 - *Defense-Related Uranium Mines Field Operations Plan for Mines in California* (DOE 2023b) covering 23 mines.
 - *Defense-Related Uranium Mines Field Operations Plan for Arizona Statewide* (DOE 2020b) covering 57 mines.
 - *Defense-Related Uranium Mines Field Operations Plan for Mines in Nevada* (DOE 2022a) covering 19 mines.
 - *Defense-Related Uranium Mines Field Operations Plan for Monticello Mining Districts, Utah* (DOE 2020c) covering 208 mines.
 - *Defense-Related Uranium Mines Campaign 2 Field Operations Plan for the Northern AUM Region, Navajo Nation, Arizona, New Mexico, and Utah* (DOE 2022c) covering 71 mines.
 - *Defense-Related Uranium Mines Field Operations Plan for National Park Service Sites* (DOE 2020d) covering 44 mines.
 - *Defense-Related Uranium Mines Field Operations Plan for Utah Statewide Mining Districts, Utah* (DOE 2022d) covering 44 mines.
 - *Defense-Related Uranium Mines Field Operations Plan for the Southern Region of the Slick Rock Mining District of Colorado* (DOE 2021) covering 133 mines.
 - *Defense-Related Uranium Mines Field Operations Plan for Remaining Sites in Colorado* (DOE 2022b) covering six mines.
 - *Defense-Related Uranium Mines Field Operations Plan for Mines in the U.S. Forest Service Region 2 and Statewide Colorado* (DOE 2018) covering 141 mines.
 - *Defense-Related Uranium Mines Field Operations Plan for Mines in New Mexico Statewide* (DOE 2017a) covering 99 mines.
 - *Defense-Related Uranium Mines Field Operations Plan for the Black Hills and Northern Rockies Region* (DOE 2019b) covering 125 mines.
 - *Defense-Related Uranium Mines Field Operations Plan for the Grants Mining District, New Mexico* (DOE 2017b) covering 116 mines.
 - *Defense-Related Uranium Mines Field Operations Plan for Mines on Wyoming Public Lands* (DOE 2019a) covering 111 mines.

- Completing the following activities to advance efforts toward finishing Campaign 1:
 - Training DRUM personnel during the winter months to prepare for the 2023 field season, including trailer towing training, utility task vehicle training, Wilderness First Responder training, field training on DOE patented lands as part of the Uranium Leasing Program, job safety analysis, DRUM field season readiness review preparation, and a DRUM Emergency Management tabletop drill.
 - Submitting amended National Environmental Policy Act (NEPA) *NEPA Categorical Exclusion Evaluation (CXE)* (LM-Form-4-20-5.0-04), *NEPA Categorical Exclusion Determination* (LM-Form-4-20-2.0-0.2), and *Environmental Review Forms* (LM-Form-4-20.3-4.0-0.4) for V&V activities in Utah, Wyoming, Montana, North Dakota, and Arizona on Jan. 19, 2023.
 - Participating in collaboration meetings with LM and Real Property to discuss access to mines on Arizona and Nevada public lands.
 - Participating in collaboration meetings with LM and Arizona USFS about land access for V&V fieldwork in the Coronado and Tonto National Forests for the 2023 field season and a V&V kickoff meeting with the Arizona State Land Department and the Arizona Department of Environmental Quality about V&V activities.
 - Submitting “4.26.23 DRAFT DRUM Master Schedule Campaign 1 3.6.2023 – 3.31.2024.”
 - Updating the *Defense-Related Uranium Mines Verification and Validation Work Plan* (DOE 2023m) (V&V Work Plan) for Campaign 1 to reflect approved revisions, deviations, and operation experiences from the previous field season. This is a contract deliverable.
 - Submitting the *Defense-Related Uranium Mines Inaccessible Mine Guidance*.
 - Researching field data collection equipment and software, testing identified replacements, obtaining four Geode global navigation satellite system receivers and 20 user licenses for Uinta software from Juniper Systems, Inc. for use by the field teams.
 - Submitting the Final *Environmental Restoration Group, Inc. RadScout Instrument Evaluation for Defense-Related Uranium Mines Program Gamma Radiation Surveys* (DOE 2023o).
 - Submitting a V&V Work Plan deviation for the Western Arizona Mining District, which modifies the sampling procedures for mines within the Western Arizona Mining District that have extensive surface exploration trenches.
 - Submitting an updated approach for utilizing aerial gamma radiation survey data, a V&V Work Plan deviation for the use of gamma radiation survey data obtained by the National Nuclear Security Administration for large open-pit uranium mines in Wyoming.
- Continuing participating in meetings with the Navajo Nation Working Group, which includes the Navajo Nation Environmental Protection Agency, the Navajo Abandoned Mine Lands Reclamation Department (NAMLRD), the U.S. Environmental Protection Agency

Region 9, the U.S. Bureau of Indian Affairs, LM, and the LMSP contractor. The following activities advanced efforts toward completing Campaign 2:

- Submitting a link to the “Navajo Nation Status Map for 21 Sites.”
- Participating in a Beclabito Chapter House meeting and submitting the Beclabito Chapter House DRUM location map.
- Submitting multiple .kmz files and associated letters to LM for the Navajo Land Department regarding access requests to DRUM sites for V&V work in Arizona, New Mexico, and Utah.
- Participating in the Red Mesa Chapter House meeting to present on upcoming DRUM V&V work planned for March and April 2023.
- Submitting a link to the “Northern Abandoned Uranium Mines (AUM) Region Chapter House Maps.”
- Participating in a Navajo Nation Community Outreach Network meeting.
- Submitting DRUM 2023 radio and newspaper ads related to fieldwork on the Navajo Nation for review and comment.
- Submitting the 2023 Northern AUM Region Field Operations Plan mine visitation schedule to LM.
- Participating in a meeting with a grazing official from the Beclabito Chapter House to gain access to 16 mines for Campaign 2.
- Submitting the first Navajo Nation V&V report, about the Johnny McCoy 1 mine (LM ID 2176), to LM on March 21, 2023.
- Submitting two E-size maps of DRUM sites on the Navajo Nation to NAMLRD for review.
- Providing maps to the Teec Nos Pos Chapter House and the Aneth Chapter House and participating in a chapter house meeting.
- Submitting a DRUM information sheet and a flyer about DRUM fieldwork on the Navajo Nation.
- Compiling and submitting maps with DRUM sites and EPA AUM locations.
- Participating and presenting on the DRUM program’s behalf at the Uranium 101 workshop in Kayenta Township, Arizona; participating in a field trip with NAMLRD; and participating in a resource fair.
- Completing the following activities, which advanced safeguarding efforts:
 - Submitting a NEPA CXE form and *Environmental Review Form* for DRUM V&V activities on federal and state land and private property.
 - Submitting a revised *Environmental Review Form* with comments included for DRUM V&V activities on federal and state land and private property for 2023. This form covers activities in the following states: Arizona, Colorado, New Mexico, North Dakota, Montana, South Dakota, Utah, and Wyoming.
 - Participating in monthly safeguarding planning and collaboration meetings with LM, Bat Conservation International (BCI), and BLM for projects developing in Utah.

- Drafting an article, “LM Uranium Mine Projects Keep People and Wildlife Safe,” documenting safeguarding work completed in eastern Utah.
- Participating in multiple meetings and coordinated efforts with Freeport-McMoRan Inc. (Freeport) about planned 2023 safeguarding projects. Submitting findings from the Freeport 2023 safeguarding project and DRUM features comparison in Colorado and Utah.
- Submitting a comprehensive review and update of the *Defense-Related Uranium Mines (DRUM) Safeguarding Program Management Plan* (LMS/DRM/S33217), modified to reflect changes and lessons learned since the program’s beginning.
- Receiving data from safeguarding projects and uploading the data into the DRUM program database from the following project locations:
 - Kane Creek, Utah (72 safeguards).
 - Pryor Mountains, Montana (4 safeguards).
 - Temple Mountain Maintenance, Utah (12 safeguards).
 - Yellow Cat Maintenance, Utah (25 safeguards).
- Preparing and submitting responses to ad hoc requests, as necessary:
 - Uploading 96 V&V reports for mines in the Black Hills and Custer National Forests to the BLM South Dakota Field Office electronic file transfer (EFT) site.
 - Submitting a link to the requested “Gamma Certification and Source Check Data.”
 - Submitting a link to the “Inventory Request for 2023 DRUM Field Season.”
 - Uploading inventory photos from the Anna May 1 (LM ID 6219), Happy Thought (LM ID 212), and Tango (LM ID 6238) mines to the EFT site, completing an ad hoc request from the Colorado Division of Reclamation, Mining, and Safety.
 - Updating monthly DRUM progress graphics, Campaign 1 ore cart, and Campaign 2 ore bin.
- Completing the following activities, which advanced efforts toward other DRUM contract deliverables:
 - Submitting completion notification for the contract deliverable “Produce Field Operation Plans needed for the calendar year 2023 field season.”
 - Uploading file geodatabases to the BLM EFT site, including spatial data for all visited DRUM sites during the 2022 field season on BLM-managed lands in Colorado, Utah, and Wyoming.
 - Publishing the *Defense-Related Uranium Mines Annual Report, January 1–December 31, 2022* (DOE 2023a), providing details on program activities and accomplishments in 2022, project planning for 2023, and an updated program timeline. This is a contract deliverable.
 - Submitting the *Defense-Related Uranium Mines Reconciliation Report* (DOE 2023g), providing details to account for the findings of reconciliation efforts during the evaluation of mines and their associated U.S. Atomic Energy Commission records for the DRUM program. This is a contract deliverable.

- Submitting Draft *Defense-Related Uranium Mines Report to Congress*, providing a program update summarizing DRUM program results as of December 2022.
- Submitting the contract deliverable “Submit a review letter identifying those program documents that require an update and highlight the portions that need to be updated.”
- Submitting the monthly contract deliverable “Report monthly to communicate active, settled, and potential future litigation related to DOE, potential liabilities for DOE, and other uranium mining-related lawsuits that may directly or indirectly affect or change LM’s programs related to uranium mines and mills.”
- Hosting two Abandoned Uranium Mines Working Group quarterly meetings in March and June. Updated more than 50 participants from across the government about DRUM program progress and the future of V&V activities, safeguarding action status, and coordination activities between strategic partners such as BLM, NPS, and USFS. Participants also listened to a presentation on applied high-pressure slurry ablation technology for recovering uranium and vanadium from mining waste rock.
- Submitting “DRUM List of CERCLA Mines to Forego Verification and Validation” and receiving agreement that these DRUM sites do not require field V&V activities:
 - Alaska: Cub 1 (LM ID 4118).
 - Arizona: Red Bluff (LM ID 6088), Workman 1 (LM ID 3950), Hope Group (LM ID 3923), Jon (LM ID 3927), Little Joe (LM ID 3929), Lucky Stop (LM ID 3931), Melinda Group (LM ID 3933), Suckerite (LM ID 3944), and Sec 9 T27N R10E (LM ID 1239).
 - California: Juniper (LM ID 4041).
 - Oregon: Lucky Lass (LM ID 4045) and White King (LM ID 6064).
- Receiving commendations from LM: one DRUM field team lead received the LM Director’s Excellence Award and another DRUM field team lead received commendations for noteworthy communication methods, openness about decision making, and quality of teamwork.
- Finalizing all V&V reports for the 2022 field season on May 16, 2023. The DRUM team completed 333 V&V reports for the 2022 DRUM field season.
- Receiving a rating of “Superior” for the paper “Radiological Screening Levels and Gamma Survey Methodologies for Characterization of US DOE Legacy Uranium Mining Sites – An Update presented in Session #021 Radiological Waste Characterization Methods” from the 2023 Waste Management Symposium conference.
- Participating in LM/LMSP townhall (LM-23 group) meetings in Westminster, Colorado, for planning and coordination efforts covering Campaigns 1, 2, and 3.
- Completing the quality assurance assessment report for the 2022 V&V report process.
- Publishing the DRUM Program 2022 Annual Progress Report on LM’s public website.

During the 2022 field season, V&V activities focused on areas with a high density of mines, centered on completing Campaign 1 V&V work in Colorado, Utah, and South Dakota mining districts. During the first half of 2023, Campaign 1 V&V activities shifted focus to Arizona and Nevada, which have the highest concentrations of remaining DRUM sites. After LM initiated Campaign 2 V&V activities on tribal land in 2022, primarily focusing efforts on areas with the

largest density of DRUM sites that are on Navajo Nation land, efforts to complete Campaign 2 continued in 2023. V&V fieldwork at mines in the Northern AUM region, specifically in the Beclabito and Red Valley Chapters of the Navajo Nation, began in March 2023.

BLM, USFS, and NPS partnerships and interagency agreements completed previously were updated to continue program collaboration and better facilitate mutual safeguarding objectives. This allows those agencies to have DRUM program-related expenditures.

LM and partner agencies are prioritizing safeguarding physical hazards, primarily mine entries the DRUM program identified. LM collaborates with partner agencies, state and tribal abandoned mine lands (AML) programs, and BCI, a nonprofit, to safeguard DRUM sites. LM provides funding to help partners complete these safeguarding projects and provides project management oversight to ensure safeguarding is fiscally efficient, preserves project timelines, and effectively prevents public access to hazardous features, while preserving wildlife habitats within mine features. Since starting this work in 2020, the DRUM program facilitated safeguarding 488 hazardous features as of Dec. 31, 2022. Although the DRUM team did not perform mine closure work between January and June 2023, planning for projects in the Bull Canyon Area in western Colorado and the Manti-La Sal and Yellow Cat Areas in Utah is ongoing. LM scheduled these projects to begin in fall 2023.

DRUM Return on Investment

The 2014 Report to Congress identified 4225 potential mines on federal, state, and tribal lands and private property. Of these, the report estimated 2500 mines were on public land. Although the report did not explicitly spell out all the potential liabilities related to these mines, the 2014 Report to Congress estimated 80% of these mines required safeguarding (referred to as “reclamation” in the report), and 20% required environmental remediation. Safeguarding involves lessening mining-related physical hazards, generally by building barriers at entries to underground mines so people cannot access them. Reclamation is the process of restoring essential geomorphic functions at previously mined locations. This process may include reshaping waste rock piles and other mining-related disturbances to reduce erosion potential and blend the mine site with the bordering undisturbed landscape. AUM remediation typically involves isolating contaminants or pollutants from the surrounding environment, generally by consolidating waste materials and doing environmental restoration work.

The 2014 Report to Congress estimated mines that threaten human safety would require an average of three safeguards each at an estimated cost of \$18,000 per constructed safeguard, or an average unit cost of \$54,000 per affected mine. The 2014 Report to Congress estimated that mines that require remediation under the Comprehensive Environmental Response, Compensation, and Liability Act to lessen environmental concerns may require an average unit cost of \$1,300,000 per mine. The estimated cost to remediate mines was calculated using data from Table 4 of the *Defense-Related Uranium Mines Cost and Feasibility Topic Report* (DOE 2014a). The maximum remediation cost for each mine size category was multiplied by the percentage of mines in that size category to derive the estimated cost per mine of \$1,300,000 (rounded).

Applying the unit cost estimate from the 2014 Report to Congress for safeguarding a physical hazard to the estimated total number of DRUM sites on public land suggests a total safeguarding cost of \$108,000,000. Applying the unit cost estimate from the 2014 Report to Congress for remediation work to the total estimated number of DRUM sites on public land suggested a

possible remediation cost of \$650,000,000. Implementing DRUM Campaign 1 (V&V work at mines on public land) and screening these mines for potential risks to human health and safety have helped the program substantially reduce these potential cost estimates.

The DRUM program reduces potential costs and liabilities in two ways: (1) removing duplicate mining records from the DRUM program database, thereby decreasing the estimated total of existing mines and (2) applying risk-screening results to refine the estimated amount of physical and environmental risks based on observed mine conditions. To date, LM removed 1126 duplicate records from the database, clarifying the actual number of existing mines, eliminating potential risk associated with the mines removed from the database, and decreasing the overall estimated potential risks.

Following reconciliation, the number of mines in the DRUM program database at the end of the reporting period shows 2330 mines are on public land (2230 Campaign 1 mines plus the public portions of 100 Campaign 1 and 3 mixed-ownership mines). This number will fluctuate until the DRUM team completes the public land campaign. Analysis of site risk-screening evaluations to date shows about 65% of mines require physical hazards safeguarding compared to the 80% estimated in the 2014 Report to Congress. The 2014 Report to Congress estimated mines with hazardous entries would need an average of three safeguards per mine. DRUM program field inventory information appears to generally validate this assumption. These updated estimates reduce safeguarding costs by about \$26,217,000 (Table 2).

DRUM fieldwork the team completed to date suggests about 10% of the mines could require more analysis via the CERCLA process. When implemented, the appropriate land management agencies will handle the CERCLA process. This is a smaller mine population than the 20% estimated in the 2014 Report to Congress. If this trend continues, the resulting potential remediation scope will decrease from about 500 mines (the 2014 Report to Congress estimate) to about 233 mines, representing a potential cost reduction of about \$347,100,000 (Table 2). The \$29,000,000 total projected program expenditure (an average of \$5,800,000 per year for five years) has the potential to reduce cost projections by an estimated \$373,317,000, a return on investment of roughly 13:1.

Table 2. Estimated Versus Projected DRUM Actions and Expenditures at Mines on Public Land

	2014 Report to Congress Estimates	Program Estimates as of June 30, 2023	Difference
Number of mines	2,500	2,330 ^a	170 mines
Estimated percentage of mines requiring safeguards	80%	65%	NA
Estimated number of mines to safeguard	2,000	1,515	485 mines
Estimated safeguard construction cost per mine	\$54,000	\$54,000	\$0
Estimated cost to complete safeguards ^c	\$108,000,000	\$81,783,000	\$26,217,000
Estimated percentage of mines requiring CERCLA remediation	20%	10%	NA
Estimated number CERCLA eligible mines	500	233	267 mines
Estimated CERCLA remediation cost per mine	\$1,300,000	\$1,300,000	\$0
Estimated cost to complete CERCLA remediation	\$650,000,000	\$302,900,000	\$347,100,000
Estimated total safeguarding and CERCLA remediation cost	\$758,000,000	\$384,683,000	\$373,317,000

Note:

^a Excludes one unconventional site field evaluated by request and counted as a Campaign 1-3 mixed-ownership mine.

Abbreviation:

NA = not applicable

Reconciliation of DRUM Sites

The DOE 2014 Report to Congress recognized U.S. Atomic Energy Commission ore-production records were the most comprehensive and representative mine identification records in the DRUM program. The 2014 Report to Congress identified 4225 mines from these records and counted each purchase record as an individual mine. The estimated total of mines changes as the DRUM program obtains more information. The DRUM program confirmed duplicate (two or more) purchase records exist for many mines, resulting in overestimation of the mine total. Aside from merging duplicate records, the DRUM team occasionally discovers previously unreported purchase records and adds them to the mine total. The total number of reconciled DRUM program sites is 3472 (Table 3).

Table 3. Summary of Reconciled DRUM Sites

Number of DRUM sites in 2014 Report to Congress	4225
New sites and records added	373
Duplicate production records removed	(1126)
Total number of reconciled DRUM program sites as of Aug 1, 2023	3472

Subsequent evaluation of these 3472 reconciled mines conducted in preparation for field mobilization revealed additional criteria that further reduced the final number of mines the DRUM team identified for field visits. For example, the DRUM team would not visit mines with active mining permits. Table 4 summarizes the total of mines the DRUM team identified for field visits.

Table 4. Summary of DRUM Sites Identified for Field Visits

Number of reconciled DRUM program sites as of Aug 1, 2023	3472
Unconventional sites removed	(26)
Unlocatable records removed	(106)
Sites with active mining permits removed (not field evaluated)	(41)
Sites under CERCLA regulations removed (not field evaluated)	(207)
NPS sites removed (not field evaluated)	(4)
Inaccessible sites removed (not field evaluated)	(4)
Total number of DRUM sites identified for field visits as of Aug 1, 2023^a	3084

Note:

^a Includes one unconventional site field evaluated by request and counted as a Campaign 1-3 mixed-ownership mine.

DRUM V&V Activities

V&V activities consist of: (1) a reconciliation step completed in the office to confirm land status, location, and ore-purchase data for each mine and to remove duplicate purchase records from the DRUM program database; (2) an inventory step to confirm the mine location in the field and to gather information about mine features and their potential hazards; (3) an environmental sampling step to collect chemical, radiological, and ecological data; and (4) a report preparation step.

The DRUM team completes field V&V work after finishing inventory and environmental sampling or after inventorying mines that do not require sampling. The DRUM team prepares draft and final reports for each mine after completing V&V activities. The DRUM team generally submits draft reports within 120 business days after completing V&V work and prepares final reports after LM reviews and accepts the draft reports. A V&V report is complete when LM accepts the report, and the DRUM team records the acceptance date in the DRUM program database.

Campaign 1 Progress

Campaign 1 field activities began in FY 2017. As of June 30, 2023, the DRUM team conducted V&V field visits at 2185 mines, which includes 2100 mines on public land and 85 mines on the public portion of mixed-ownership land. The DRUM team estimated the Campaign 1 field activities completion date is Dec. 31, 2024. See Table 5 and Table 6 for V&V progress for Campaign 1 mines.

Table 5. Campaign 1 Progress – Mines on Public Land

Campaign 1 – Mines on Public Land						
Land Management Agency	Reconciled Mines Identified for V&V Field Visits as of Aug 1, 2023	V&V Field Visits Completed Jan 1- Jun 30, 2023	Total V&V Field Visits Completed Through Jun 30, 2023	V&V Field Visits Remaining as of Jun 30, 2023	V&V Reports Completed Jan 1- Jun 30, 2023	V&V Reports Completed as of Jun 30, 2023
BLM	1572	27	1515	57	56	1488
USBR	2	2	2	0	0	0
DOD	1	0	1	0	0	1
Local municipality	3	0	0	3	0	0
NPS	35	23	30	5	0	7
State	91	10	67	24	7	57
USFWS	2	0	2	0	0	2
USFS	305	17	270	35	43	254
Mixed public ownership	219	3	213	6	3	210
Total	2230	82	2100	130	109	2019

Abbreviations:

DOD = U.S. Department of Defense

USBR = U.S. Bureau of Reclamation

USFWS = U.S. Fish and Wildlife Service

Campaigns 1 and 3 – Mixed-Ownership Progress

Table 6. Campaigns 1 and 3 Progress – Mines on Mixed-Ownership Land

Campaigns 1 and 3 – Mines on Mixed-Ownership Land						
Land Management Agency	Reconciled Mines Identified for V&V Field Visits as of Aug 1, 2023 ^a	V&V Field Visits Completed Jan 1- Jun 30, 2023	Total V&V Field Visits Completed Through Jun 30, 2023 ^a	V&V Field Visits Remaining as of Jun 30, 2023	V&V Reports Completed Jan 1- Jun 30, 2023	V&V Reports Completed as of Jun 30, 2023 ^a
Mixed ownership (public/private)	101	1	85	16	0	84
Total	101	1	85	16	0	84

Note:

^a Includes one unconventional site field evaluated by request and counted as a Campaign 1-3 mixed-ownership mine.

Campaign 2 Progress

Campaign 2 field activities began in FY 2021. The DRUM team conducted V&V field visits at three mines on Pueblo of Laguna land in August 2022. Field activities at mines on Navajo Nation land began in FY 2022 (October 2022). The DRUM team estimated the Campaign 2 field activities completion date is Sept. 30, 2027. See Table 7 for V&V progress for Campaign 2 mines.

Table 7. Campaign 2 Progress – Mines on Tribal Land

Campaign 2 – Mines on Tribal Land							
Land Management Agency	Local Management Office	Reconciled Mines Identified for V&V Field Visits as of Aug 1, 2023	V&V Field Visits Completed Jan 1- Jun 30, 2023	Total V&V Field Visits Completed Through Jun 30, 2023	V&V Field Visits Remaining as of Jun 30, 2023	V&V Reports Completed Jan 1- Jun 30, 2023	V&V Reports Completed as of Jun 30, 2023
BIA	Navajo Nation	199	15	28	171	13	13
BIA	Hualapai	1	0	0	1	0	0
BIA	Pueblo of Laguna	3	0	3	0	3	3
BIA	Spokane	2	0	2	0	0	2
BIA	Tohono O'odham	1	0	0	1	0	0
BIA	Uintah and Ouray	1	0	0	1	0	0
BIA	Zia Pueblo	1	0	0	1	0	0
BIA	Pueblo of Zuni	1	0	0	1	0	0
Mixed	BLM/private	1	0	0	1	0	0
Private	NA	2	0	0	2	0	0
Total		212	15	33	179	16	18

Abbreviation:

NA = not applicable

Campaign 3 Progress

The DRUM team conducted V&V field visits at four Campaign 3 mines early in the DRUM program, completing fieldwork at one New Mexico mine in May 2018. This mine was originally a Campaign 1 mine, but the DRUM team later moved it to Campaign 3. The DRUM team completed the remaining three V&V field visits under a land donation agreement between the private property landowner and BLM.

Currently, the DRUM team scheduled V&V field visits on Campaign 3 mines to begin Oct. 1, 2024. Table 8 summarizes V&V progress for Campaign 3 mines.

Table 8. Campaign 3 – Mines on Private Property

Campaign 3 – Mines on Private Property						
Land Management Agency	Reconciled Mines Identified for V&V Field Visits as of Aug 1, 2023	V&V Field Visits Completed Jan 1- Jun 30, 2023	Total V&V Field Visits Completed Through Jun 30, 2023	V&V Field Visits Remaining as of Jun 30, 2023	V&V Reports Completed Jan 1- Jun 30, 2023	V&V Reports Completed as of Jun 30, 2023
Private	538	0	4	534	0	1
Mixed (DOE/private)	3	0	0	3	0	0
Total	541	0	4	537	0	1

Physical Hazards

Physical hazards are mining-related features that pose potential harm to human health or safety and are the primary risk at DRUM sites. Physical mining-related features that pose threats to human safety include open vertical mine entries (shafts, some vents, and subsidence features) as well as horizontal mine entries (adits and declines). In some instances, a remnant topographic surface feature, such as a hazardous highwall, may pose a threat to human health. To protect the well-being of members of the public who visit DRUM sites, LM partners with land management and state AML agencies to safeguard hazardous mine features. These safeguards will keep people from entering abandoned mines, while honoring the mines' cultural and ecological value and their environments.

As the DRUM program evolves, it has become apparent partner land management agencies prefer to safeguard most open mine entries rather than only high-hazard mine entries. Safeguarding most open mine entries in a specific area during a single mobilization is the most cost-effective and time-efficient way to complete this work.

Cumulatively, the DRUM program identified about 5161 hazardous mine features at 1379 mines that may require safeguarding. Table 9 shows the number of mines with physical hazards by state and the estimated total safeguarding cost. The estimated cost for constructing mine safeguards may be reevaluated after completing additional mine safeguard projects.

LM expanded its safeguarding assistance to agencies through existing agreements to partner on safeguarding physical hazards the DRUM program identified. In addition to using agreements with land management agencies and state AML programs, LM is using a financial agreement with BCI to bolster the program's overall safeguarding capacity.

In 2022, LM safeguarded 130 hazardous features from projects on BLM-administered land in Utah, Colorado, and Montana. In addition, LM anticipates it will increase the number of safeguarding projects with partner agencies in future years. LM anticipates existing cooperative agreements funding and scope will remain for future safeguarding work.

Lessons learned from these experiences helped formulate the *Defense-Related Uranium Mines (DRUM) Safeguarding Program Management Plan*, which LM updated in June 2023. Most importantly, LM planned additional safeguarding projects for fall 2023 in Colorado and Utah. These projects will safeguard more than 664 hazardous mining-related features at DRUM sites on BLM, State of Utah State and Institutional Trust Lands Administration, and USFS land.

Table 9. Mines with Potential for Safeguarding (Cumulative Through June 30, 2023)

State	Mines Risk Screened	Mines with Physical Hazards	Potential Features for Safeguarding	Total Costs for Safeguarding (\$ millions) ^a
Arizona	16	7	88	\$1.58
Colorado	967	604	1833	\$32.99
Montana	11	10	51	\$0.92
Nevada	2	1	36	\$0.65
New Mexico	64	31	60	\$1.08
North Dakota	2	1	1	\$0.02
South Dakota	96	75	296	\$5.33
Utah	928	630	2744	\$49.39
Wyoming	43	20	52	\$0.94
Total	2129	1379	5161	\$92.90

Notes:

This includes all mines at which V&V work is complete, regardless of land management or ownership status.

^a Total costs are calculated by multiplying \$18,000 by the number of potential safeguarded features.

Human Health Risk and CERCLA Potential

The number of mines that could potentially move from the DRUM program screening process to a CERCLA process is much lower than the number of mines that will require physical hazards safeguarding. Land management agencies utilize their authority under CERCLA to address releases, or potential releases, of hazardous substances. Land management agencies could further investigate mines with “high” or “medium” scores for chemical or radiological risks, potentially leading to CERCLA response actions. Of the 2129 mines risk screened to date, about 204 mines (10%) could require more analysis via the CERCLA process.

However, the DRUM program can further refine the assessment by applying modifying factors. Including risk-modifying factors into the screening process so only mines ranked “high” for camping suitability and “high” or “medium” for ease of access would potentially enhance the CERCLA evaluation and reduce the mine population that requires future remediation. Applying suitability- and access-modifying factors reduces the number of mines that could require more analysis via the CERCLA process to 2%. LM will work with land management agencies to agree on safeguarding priorities and planning, but land management agencies make CERCLA determinations at their discretion.

Table 10 shows mines with “high” or “medium” risk rankings for chemical or radiological hazards (without applying the above-mentioned modifying factors) and potential remediation costs.

Table 10. Mines That Are Potential Candidates for Remediation (CERCLA) Actions
(Cumulative Through June 30, 2023)

State	Mines Risk Screened	“High” Chemical Risk Ranking	“Medium” Chemical Risk Ranking	“High” Radiological Risk Ranking	“Medium” Radiological Risk Ranking	“High” Radium-226 Risk Ranking ^a	“Medium” Radium-226 Risk Ranking ^a	Potential CERCLA Mines (Remediation Process) ^b	Potential CERCLA Costs (Remediation) (\$ million) ^c
Arizona	16	1	0	0	1	0	1	2	\$2.6
Colorado	967	20	30	0	12	6	48	95	\$123.5
Montana	11	4	1	0	0	0	2	6	\$7.8
Nevada	2	0	0	0	0	0	0	0	NA
New Mexico	64	0	3	0	0	NA	NA	3	\$3.9
North Dakota	2	0	0	0	0	0	0	0	NA
South Dakota	96	1	0	0	1	0	2	4	\$5.2
Utah	928	12	100	0	21	9	23	145	\$188.5
Wyoming	43	0	3	0	1	0	0	4	\$5.2
Total	2129	38	137	0	36	15	76	259	\$336.7

Notes:

^a Starting in March 2020, LM began evaluating radium-226 concentration on a separate risk track; therefore, only 1132 mines have been screened for this risk.

^b Forty-three mines had more than one elevated risk ranking (e.g., both a “medium” chemical risk ranking and a “medium” radiological risk ranking). Since one CERCLA action would address any elevated risk rankings at the same mine, these were subtracted from this column to avoid double counting.

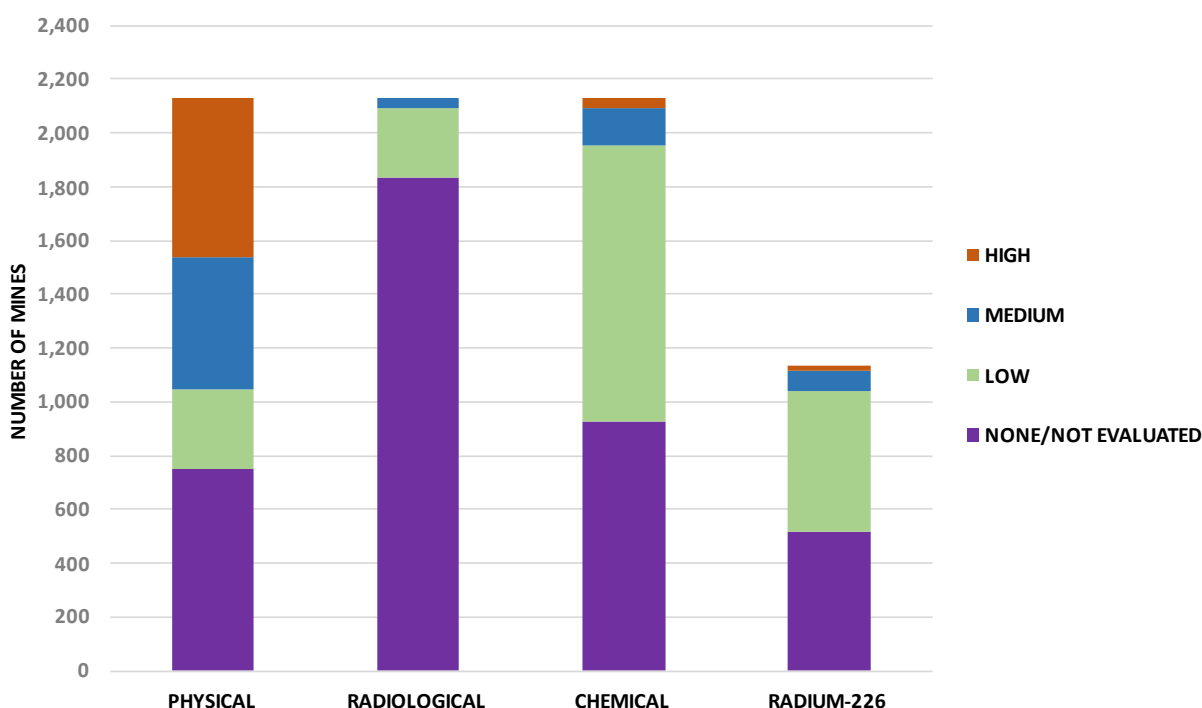
^c The potential CERCLA cost of \$1.3 million per remediated mine was calculated using data from Table 4 in the *Defense-Related Uranium Mines Cost and Feasibility Topic Report*.

Abbreviation:

NA = not applicable

Figure 1 shows mine physical, radiological, and chemical risk rankings. While “high,” “medium,” and “low” physical hazards could be considered for safeguarding activities (“low” hazards [e.g., prospects, trenches] are not always addressed but are often safeguarded when equipment is on-site for other high-priority mine features), only mines with “high” or “medium” radiological and chemical risks may be considered for cost estimates of future remedial (CERCLA) work.

LM observed 43 mines that exhibited more than one “high” or “medium” radiological and chemical risk ranking. For mines that exhibit multiple elevated chemical, radiological, or radium-226 risks, LM concurrently addressed all risks during a single remediation construction event. To avoid overestimating the potential number of remediations, LM considered potential CERCLA actions at the 43 mines exhibiting multiple risk factors as single remediation events. As a result, LM may consider 259 mines for future remedial (CERCLA) work.



Note: Starting in March 2020, LM began evaluating radium-226 concentration on a separate risk track; therefore, only 1132 mines have been screened for this risk.

Figure 1. Mine Physical, Radiological, Chemical, and Radium-226 Risk Rankings

Agency Concurrence

The DRUM program continues to work with partner agencies for successful program implementation and physical hazards identification. Agreement on features that need safeguarding allows LM and partner agencies to start hazardous mine-feature-safeguarding projects. Therefore, concurrence is an important tool for protecting the public and wildlife from natural physical hazards posed by open mine features.

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