DOE-LM DRUM Program

Lone Pine 3 Mine, Cibola County, Ambrosia Lake District, NM

William L. (Bill) Dam

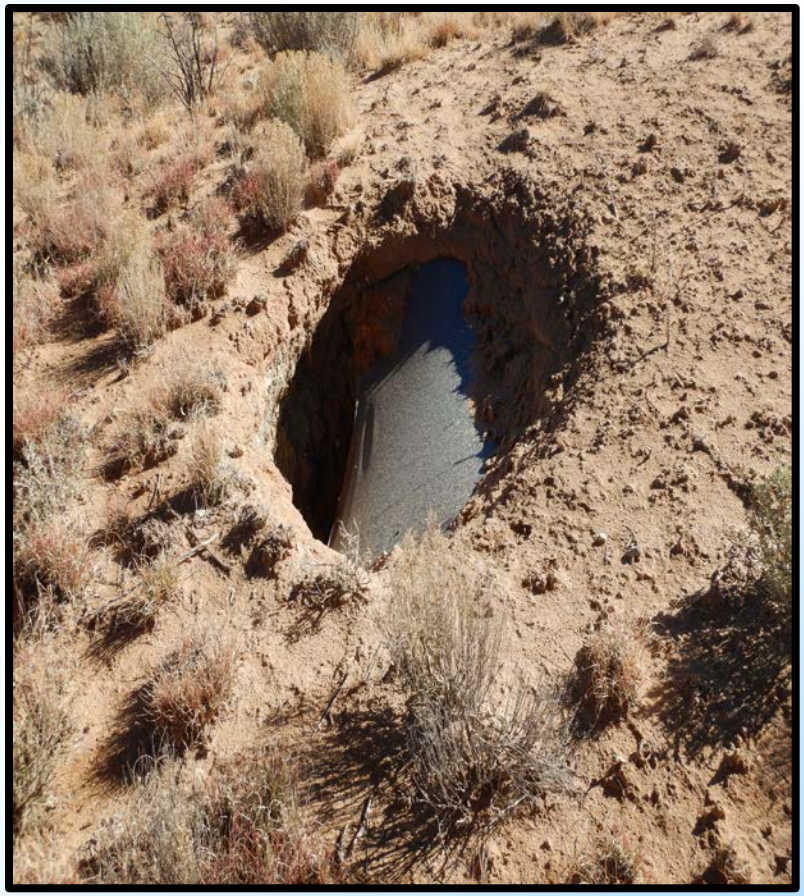
New Mexico EPSCoR Making Abandoned Mine Lands Profitable

March 27 and 28, 2018

U.S. DEPARTMENT OF ENERGY | Legacy Management

Defense-Related Uranium Mines

- DRUM Mine Features
- 2014 Report to Congress
- Current Program Goals
- Mines Distribution in NM
- Program Process
- Partnerships
- Program Execution
- Risk Scoring
- Preliminary Findings
- 2018 Plans

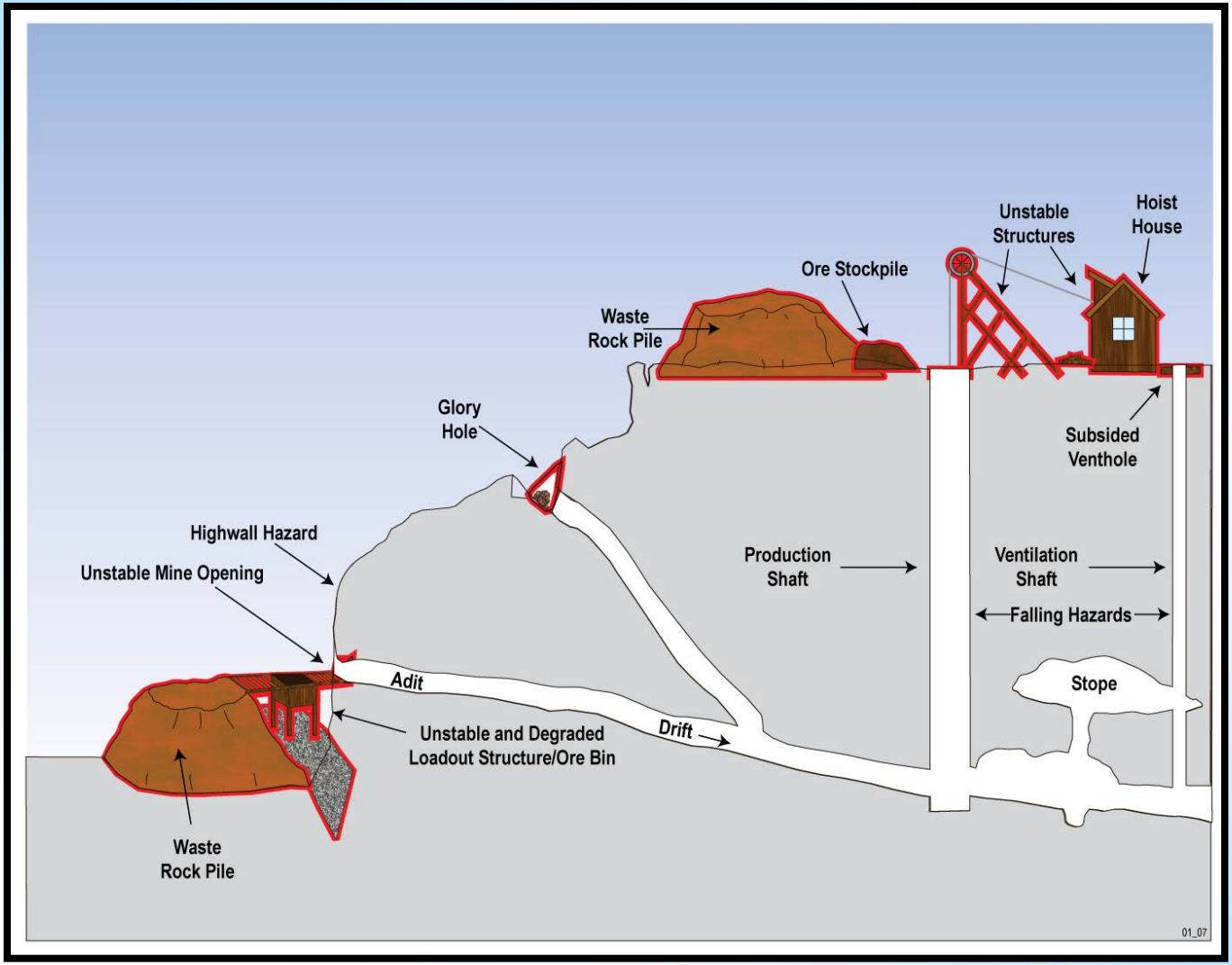


B Hill 18 23 Sec 20 mine, McKinley County, Grants, NM

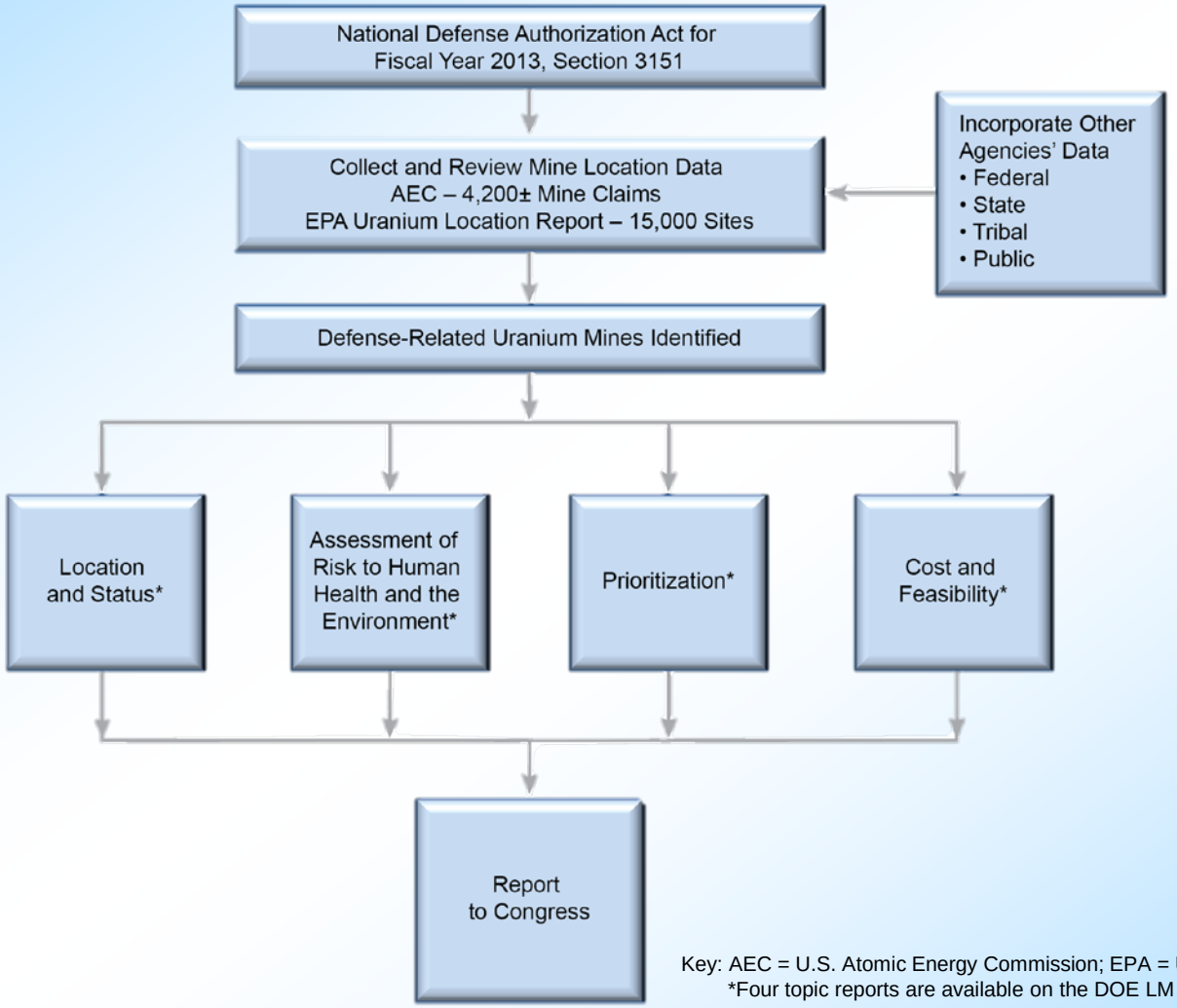
What is a DOE DRUM?

- DOE report to Congress defined a Defense-Related Uranium Mine (DRUM) as mining operations that provided ore for purchase by the Atomic Energy Commission between 1947 to 1970.
  - Features may include:
    - Surface or underground excavation
    - Complex of multiple, interrelated excavations
    - Adits and portals
    - Surface pits and trenches, highwalls, overburden piles
    - Mine waste rock piles, structures, shafts for ventilation
    - Stockpile pads, retention basins or treatment ponds
    - Close-spaced development drill holes, trash and debris

Mine Features



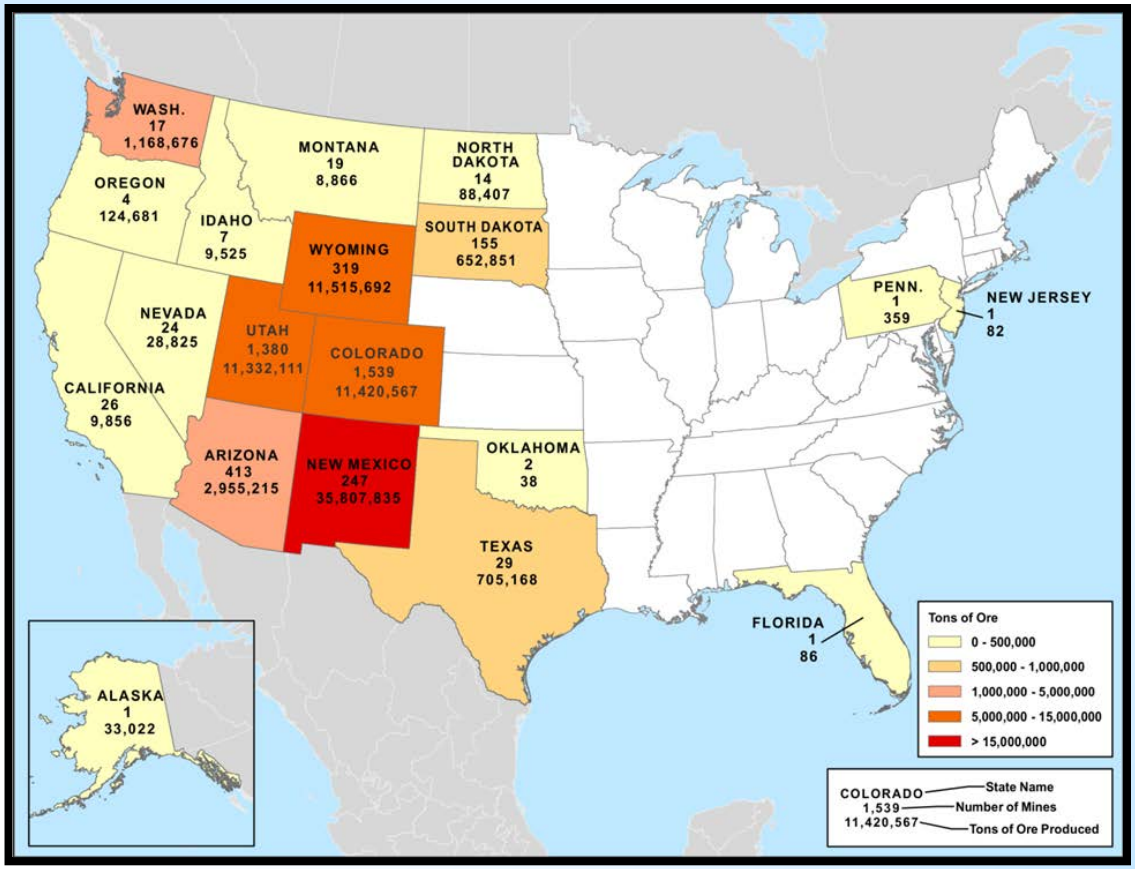
2014 DRUM Report to Congress



Key: AEC = U.S. Atomic Energy Commission; EPA = U.S. Environmental Agency
*Four topic reports are available on the DOE LM website at http://energy.gov/lm

Findings

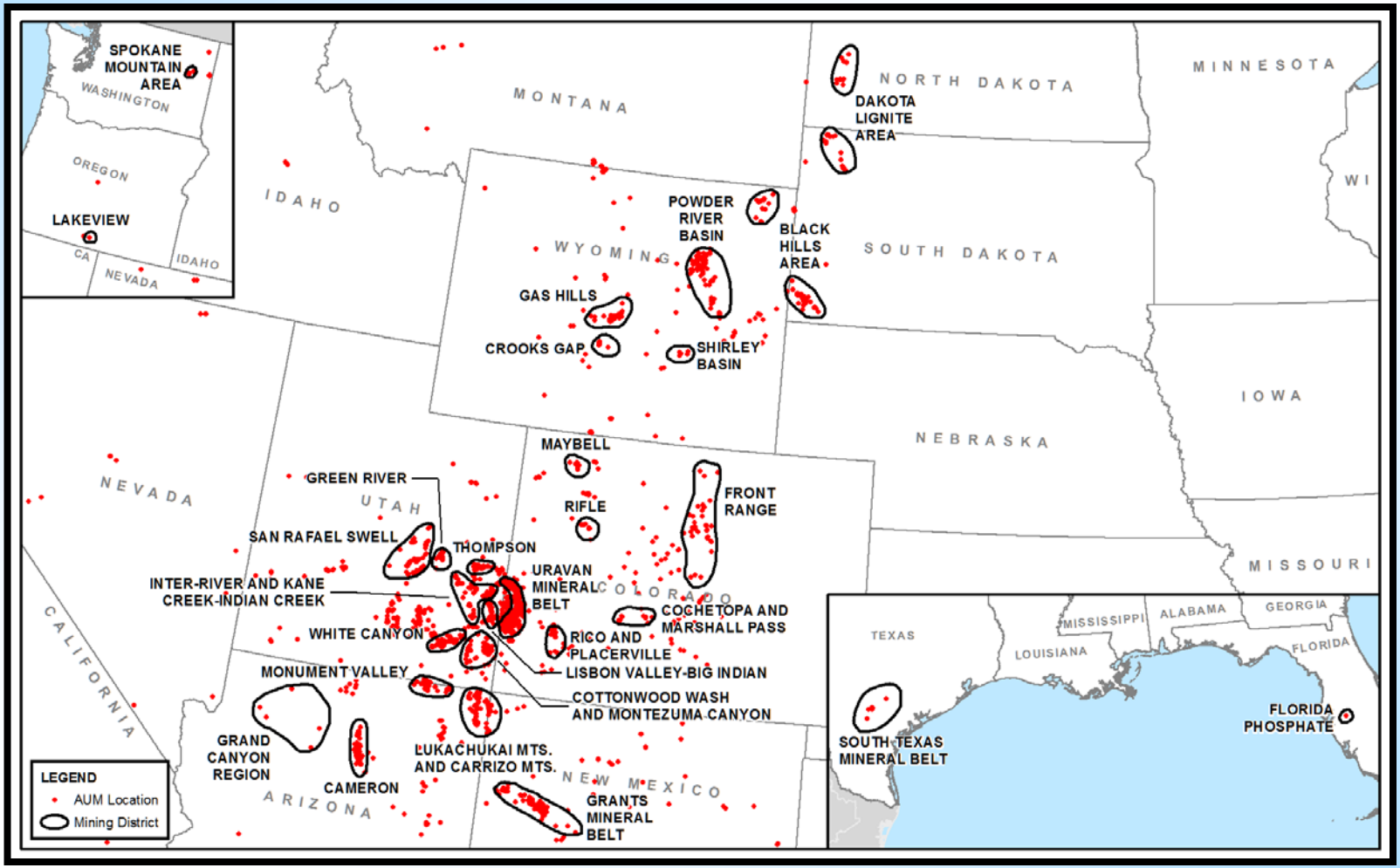
- Over 90 percent of the mines are located in five states (Arizona, Colorado, New Mexico, Utah, and Wyoming)
- The majority (over 65 percent) of these are Small and Small/Medium mines.



- Most of the production in the five states was from Very Large mines located in New Mexico.

DRUM Distribution in U.S.

Locations in Relation to Mining Areas and Districts



From DOE's *Defense-Related Uranium Mines Location and Status Topic Report, June 2014*

DRUM Report to Congress

Report to Congress findings showed approximately 59% of all DRUM are located on BLM- and Forest Service-administered land.

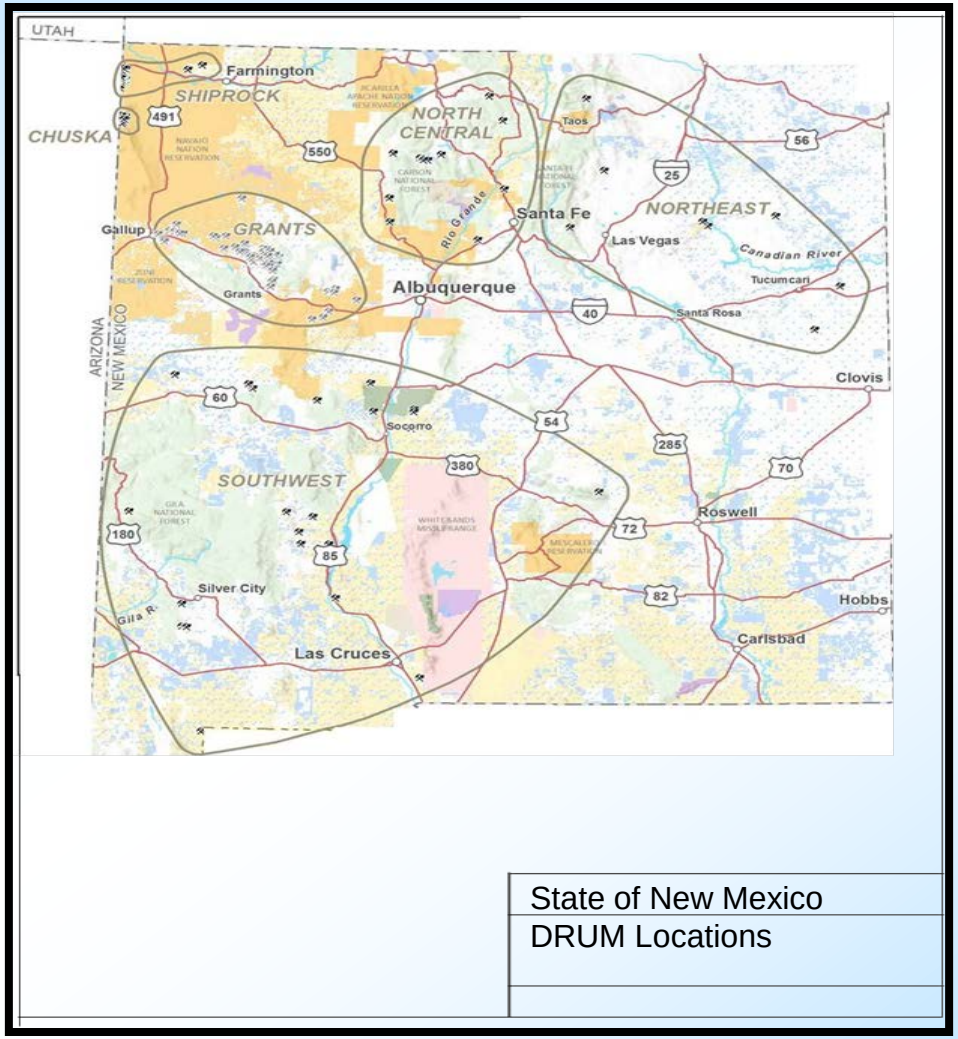
Land Owner/Manager	# of DRUM
BLM	2103
Unknown	657
State, county, private, and other	564
Tribal	453*
Forest Service	369
DOE	43**
U.S. National Park Service	29
U.S. Bureau of Reclamation	3
U.S. Department of Defense	2
U.S. Fish and Wildlife Service	2
Total	**4225**

*Includes sites on Tribal trust lands and Indian allotments
**On land withdrawn from BLM (ULP Lease Tracts)

Current Program Goals

- Locate all DRUM sites using reconciliation process
- Focus characterizing 2500 DRUMs located on Federal Lands by 2022
  - Record site conditions and status
  - Collect radiological and environmental data
  - Rank priorities with hazard screening
- Provide site-specific reports to support partner agency site decisions regarding further analysis, action, or no action
- Upgrade DOE DRUM database

New Mexico DRUM Locations



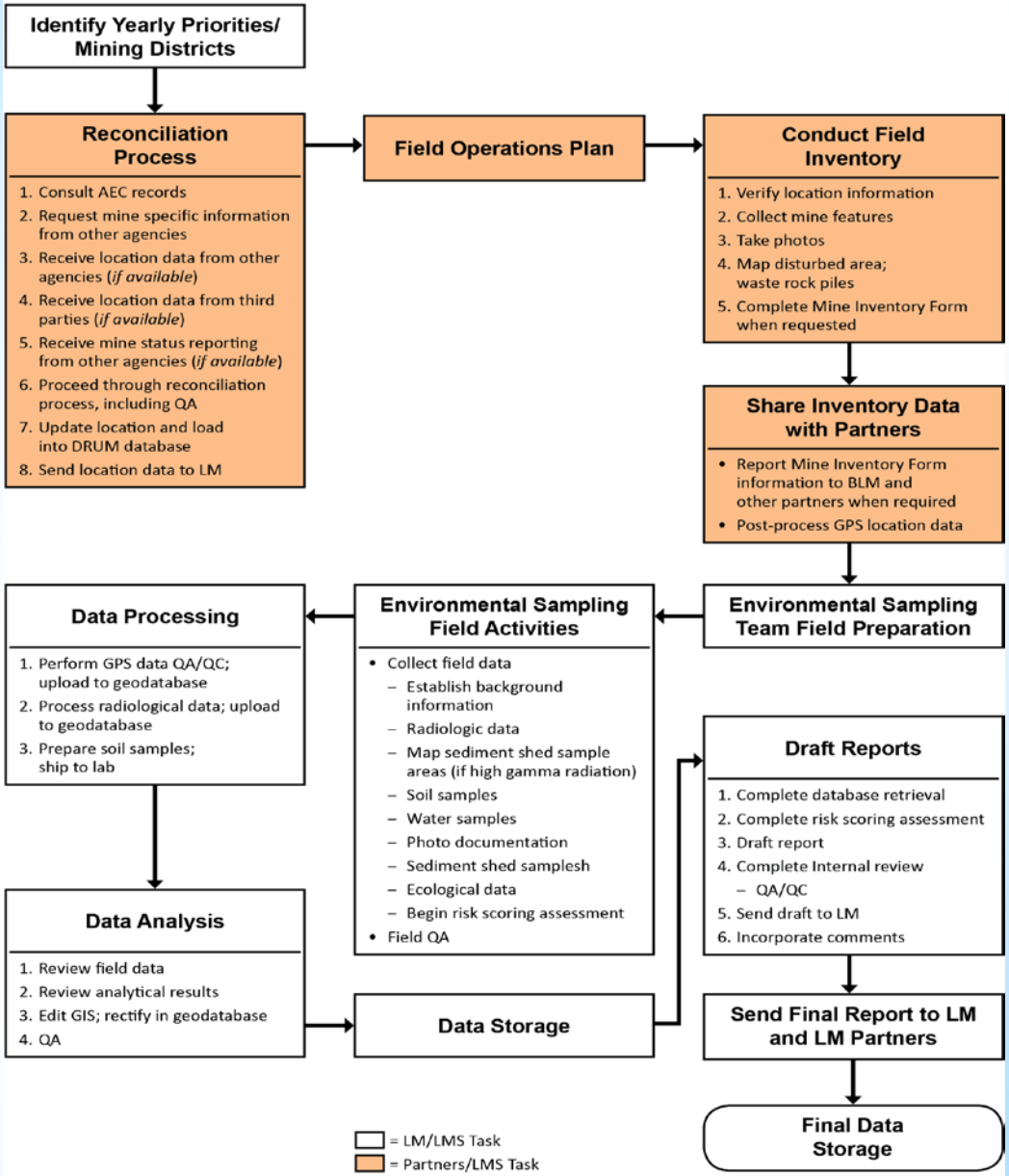
New Mexico DRUM Land Owners

Table 1. Summary of Land Ownership of DRUM Locations in New Mexico

Land Ownership[a]	District or General Area of New Mexico				
	Chuska	Shiprock	North Central	Northeast	Southwest
BLM	0	2	1	0	7
BLM/Private	0	0	1	1	2
USFS	0	0	8	1	2
USFWS	0	0	0	0	2
State	0	0	1	1	3
BIA	12	39	1	0	1
Private	0	0	2	6	6
Total	12	41	14	9	23

Note:
[a] The location is unresolved for two DRUM locations (i.e., the 14 mine and Unknown-Moki Uranium Syndicate mine).

Program Process



Interagency Partnerships

DRUM takes a collaborative approach involving federal agencies and state abandoned mine lands (AML) programs.

- Executed MOUs and Interagency Agreements with BLM, Forest Service regions and state offices
- Pilot program in FY16 and FY17

Program Execution

Perform Environmental Sampling

- Conduct gamma-screening surveys
- Sample sediments
- Sample water, when present
- Record field observations

Telluride 18 Mine, Yellow Cat, Utah

Screen for Physical Safety Hazards, and Risks to Human Health and Environment

- Address all major factors to allow end-user to tailor information to their objectives
- Imminent hazards reported immediately to partner agency

Program Execution

Produce DRUM Verification and Validation Products

- Site-Specific Technical Reports
  - Summarize mine inventory findings and environmental sampling data
  - Include risk screening assessments
  - Distributed to Partners
- DRUM Duplicate Certificates
  - Show a history of records consolidation that occurred during reconciliation of mine data

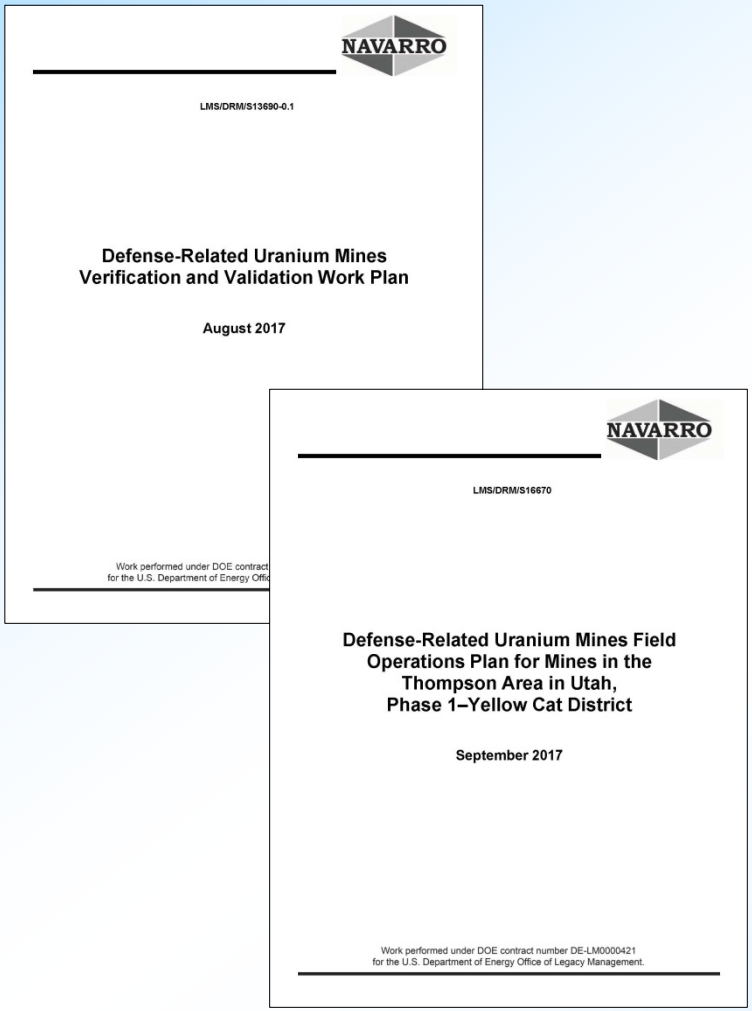
Yellow Circle Mine, UT

Program Execution

Four technical support teams implement field work; each team includes:

- Team Lead
- Geologist
- Radiological Specialist
- Ecological Specialist

Program Execution
Reports

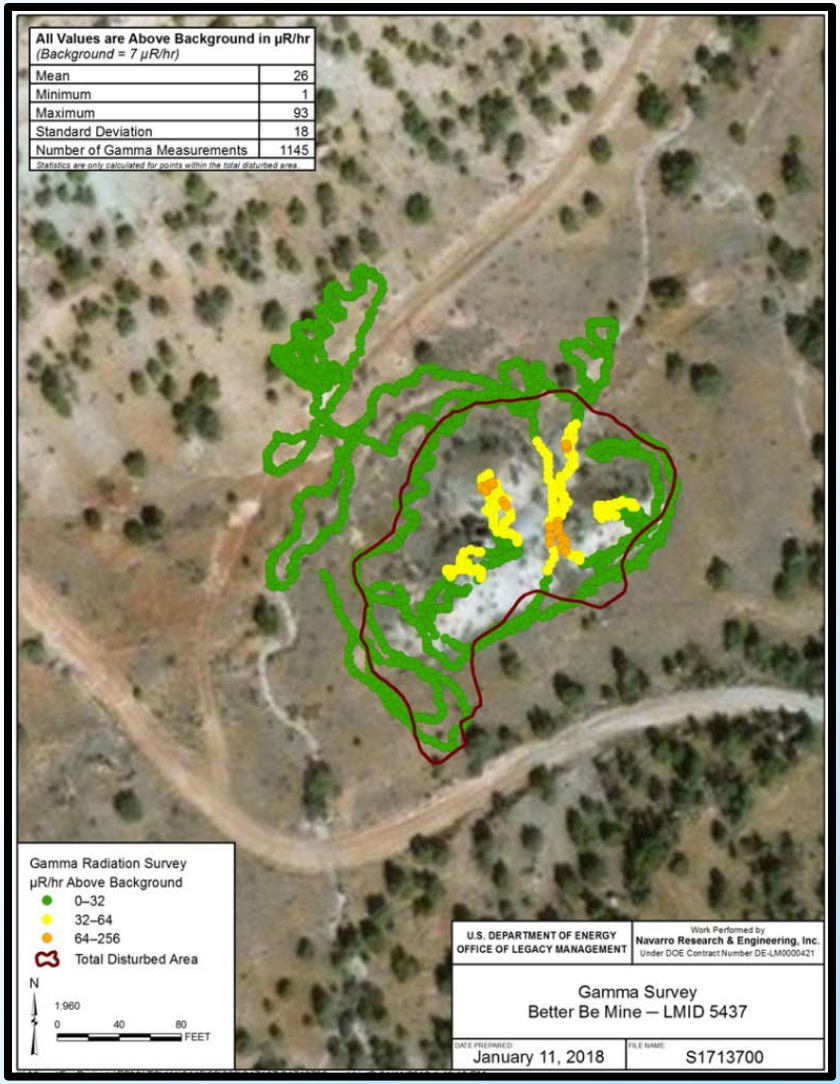


Documents
Program Management Plan
Verification and Validation Work Plan
Quality Assurance Program Plan
Health and Safety Plan
Project Field Operations Plans
Site-Specific Technical Reports
Duplicate Certificates

Program Execution

Gamma Survey

- Field team establishes a "background" area for the mine that was not influenced by mining activity
- All surveys cover the mine site and are bounded by background



Program Execution

Sampling and Analysis

- Sediment samples (30-point composite) of waste rock
- Water samples, as needed
- Analyses include major, minor, and trace elements, Ra-226

Telluride 18 Mine, Yellow Cat, Utah

Risk Scoring Assessment Approach

- Evaluate the primary hazards (physical and human health risks)
- Use modifying factors to adjust or clarify the primary hazard evaluation
- The three modifying factors are
  - Ecological and Environmental Risk Evaluation
  - Access and Suitability Evaluation
  - Complexity and Magnitude Evaluation
- Focus on the endpoint ranking (none, low, medium, or high) - not the numerical risk scores

Buckshot Mine, Club Mesa Area, CO

Recreational Use Scenario

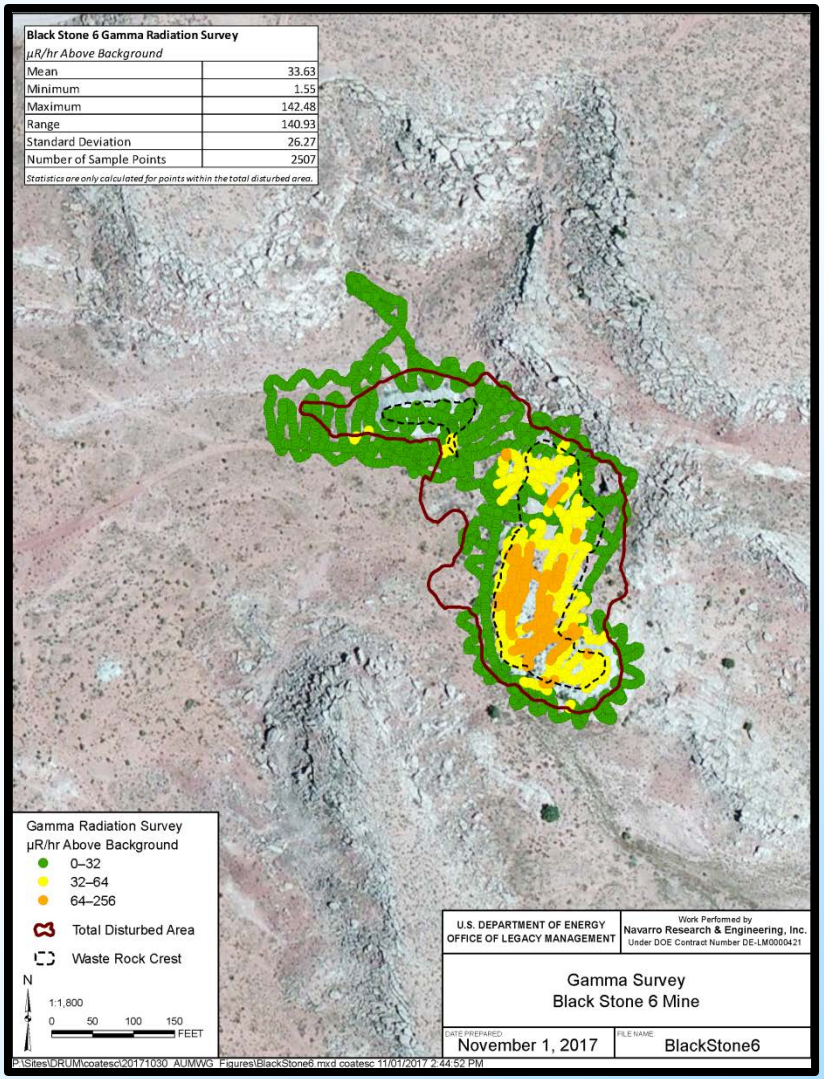
Assumptions

- Federal Public Lands
- Recreationalist spends 2 weeks a year on site
- Relatively arid sites-majority of DRUM in southwest
- 26 years exposure duration (2 years as a child, 24 years adult exposure)
- Radiological and Chemical exposure pathways

Spook Dee Mine, Red Canyon, UT

Radiological Screening Levels

- 256 µR/hr ≅ 100 mrem/yr
  - 100 mrem/yr DOE and NRC public exposure limit for nuclear facilities and ICRP 103 recommendation
- 64 µR/hr ≅ 25 mrem/yr
  - 25 mrem/yr NRC public exposure limit for D&D and license termination
- 32 µR/hr ≅ 12 mrem/yr
  - 12 mrem/yr EPA limit
- Mean µR for the total disturbed area used for the Risk Scoring Assessment



Example of Risk Scoring

Primary Hazards		Risk Ranking	Comments
Physical Safety Hazard Evaluation		High	Open adit with working depth greater than 1000 ft
Human Health Risk Evaluation	Radiological	None	Mean gamma radiation above background is 26 µR/hr
	Chemical	Low	Cumulative risk ratio is 2.85; arsenic is the only COI above recreational screening level
Modifying Factors		**Risk Scoring**	**Comments**
Ecological and Environmental Risk Evaluation	Physical Hazards	None	No physical hazards present to trap wildlife
	Potential Pathways	High	Gamma radiation greater than 64 µR/hr near surface water is present
Access and Suitability Evaluation	Access	Low	Accessible with four-wheel drive vehicle
	Suitability	Low	No evidence of visitation; the total disturbed area is greater than 0.5 acres
Complexity and Magnitude Evaluation	Complexity	None	Only minor disturbances
	Magnitude	None	Cumulative risk ratio is 1.78

Risk ranking summary for the East Wooden Shoe Group Mine, Deer Flats, Utah

FY 2017 Activities

Program Progress Measures

FY 2017 Defense-Related Uranium Mines Program Progress Report

Mines	Mines Reconciled[1]	Mines Inventoried[2]	Mines Sampled[3]	V&V Completed[4]		Radiological Risk to Human Health		Chemical Risk to Human Health	
				Goal	Actual	No/Low Potential[6]	Med/High Potential[7]	No/Low Potential[6]	Med/High Potential[7]
Colorado	224	104	81		104	46	4	47	3
New Mexico	172	-	-		-	-	-	-	-
Utah	174	74	74		74	23	4	20	7
Other States	2	-	-		-	-	-	-	-
Duplicates[5]	184	-	-		184	184	-	184	-
Total	**756**	**178**	**155**	**300**	**362 121%**	**253**	**8**	**251**	**10**

[1]Mine records were reviewed, verified, and updated with the most accurate location data obtained from a variety of (AEC records, USGS maps, economic maps, etc.).

[2]Openings, ore waste piles, and other related features associated with a mine were identified and documented. Accessibility to the mine and physcial safety hazards were also assessed.

[3]Thirty-point soil composite sampling, water sampling (if applicable), gamma surveys, and ecological surveys were performed at mine.

[4]Mine inventory and/or sampling completed and site-specific reports will follow; site duplicate certificates prepared.

[5]Reconciliation determined two or more records for the same mine were in the DRUM database; database corrected to reflect there is only one mine.

[6]Risk evaluation score for a mine is ≤1. DOE anticipates no potential action may be taken under CERCLA.

[7]Risk evaluation scores for a mine is ≥2. DOE anticipates potential action may be taken under CERCLA.

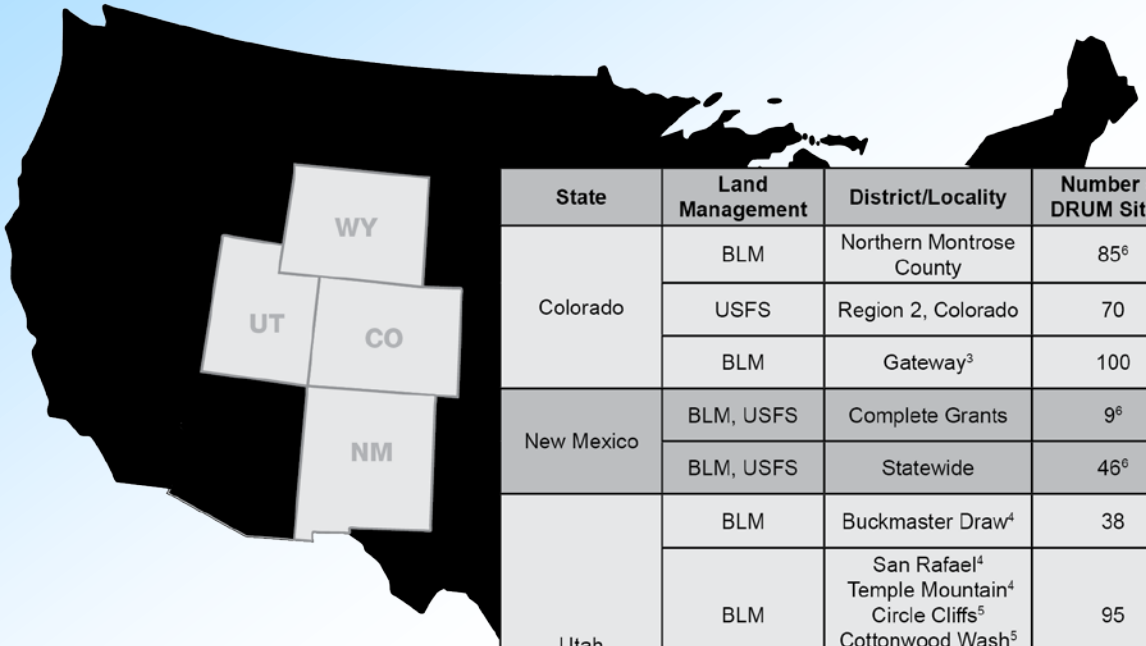
An evaluation of physical safety hazards is not included in these measures. The forthcoming quarterly risk analysis report will include this data. Physical safety hazards exist at the majority of mines; however, mitigating safety hazards is generally quicker and less costly than addressing human health risks under CERCLA.

Preliminary Findings

- Mines on public lands more likely to have physical and not radiological hazards.
- A primary objective of mine reclamation has historically been to eliminate physical hazards.

Flea Bokum Garrett Mine, Grants, NM

2018 Project Plans



State	Land Management	District/Locality	Number of DRUM Sites[1]	Weeks to Complete[2]	Field Work Timing
Colorado	BLM	Northern Montrose County	85[6]	6	Spring
	USFS	Region 2, Colorado	70	5	Summer
	BLM	Gateway[3]	100	7	Fall
New Mexico	BLM, USFS	Complete Grants	9[6]	1	Spring
	BLM, USFS	Statewide	46[6]	4	Spring
Utah	BLM	Buckmaster Draw[4]	38	2	Spring
	BLM	San Rafael[4] Temple Mountain[4] Circle Cliffs[5] Cottonwood Wash[5] Browns Hole[5]	95	6	Fall
	USFS	Manti La Sal/ FishLake NF's	95	6	Summer
	BLM	Henry Mountains TMA	100	7	Fall
Wyoming	USFS, BLM, BOR, NPS	Statewide	119	8	Summer
Totals			**757**		

LEGEND

BOR	Bureau of Reclamation
BLM	Bureau of Land Management
DRUM	Defense-Related Uranium Mines
NPS	U.S. National Park Service
TMA	Travel Management Area
USFS	U.S. Forest Service
V&V	Verification and Validation

[1] Number of DRUM sites to be reconciled, unless otherwise noted. Assumes the number of mines on public land post-reconciliation at approximately 75 percent of total shown.
[2] Assumes completing 14 V&V activities per week (for planning purposes) with two teams working in the field per week for an estimated 37 field weeks per year.
[3] Gateway will be completed at 50 percent in 2018; 50 percent in 2019.
[4] Reconcile San Rafael, Temple Mountain, Browns Hole, Cottonwood Wash, and Circle Cliffs with Buckmaster Draw (complete in 2018).
[5] See 2019 Schedule for performing field work at Browns Hole, Cottonwood Wash, and Circle Cliffs.
[6] Reconciled number of DRUM sites where V&V will be completed.

Questions?

Tramp 2 Mine, Club Mesa, Colorado

William (Bill) Dam

Uranium Mine Team Program Manager

William.Dam@lm.doe.gov

Office: 970-248-6484