U.S. DEPARTMENT OF ENERGY | OFFICE OF ENVIRONMENTAL MANAGEMENT

US DOE CHALLENGES WITH SUB-SURFACE INVESTIGATION AND SITE-SPECIFIC CASE STUDY

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Amanda Anderson, DOE-EM-HQ
Brian Harcek, DOE-EM-LA

DOE Process

DOE Order 458.1, *Radiation Protection of the Public and Environment*, establishes requirements for clearance of property with the potential to contain residual radioactive material under the Atomic Energy Act of 1954, as amended

- Property to be cleared from DOE control must:
  - Be demonstrated not to contain residual radioactive material based on process and historical knowledge and/or radiological surveys or
  - Be evaluated and appropriately monitored or surveyed and
  - Meet the following dose constraints:
    - Personal property (e.g., materials & equipment)
      - 1 mrem/yr (0.01 mSv/yr) – Total Effective Dose (TED)
    - Real property (e.g., land and fixed structures)
      - 25 mrem/yr (0.25 mSv/yr) – TED

Radiological Monitoring & Surveys

- Methodologies used must be sufficient to meet measurement objectives such as those in the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM), the Multi-Agency Radiation Survey and Assessment of Materials and Equipment Manual (MARSME) or other methodologies approved by DOE
  - Land clearance activities typically use MARSSIM methodologies for planning, characterization, final status surveys
  - Scope limited to surface soils (i.e. 15 cm; 6 in) & building surfaces because:

    1) contamination is limited to these media for many sites following remediation

    2) since many sites have surface soil and building surface contamination as the leading source of contamination, existing computer models used for calculating the concentrations based on dose or risk generally consider only surface soils or building surfaces as a source term, and

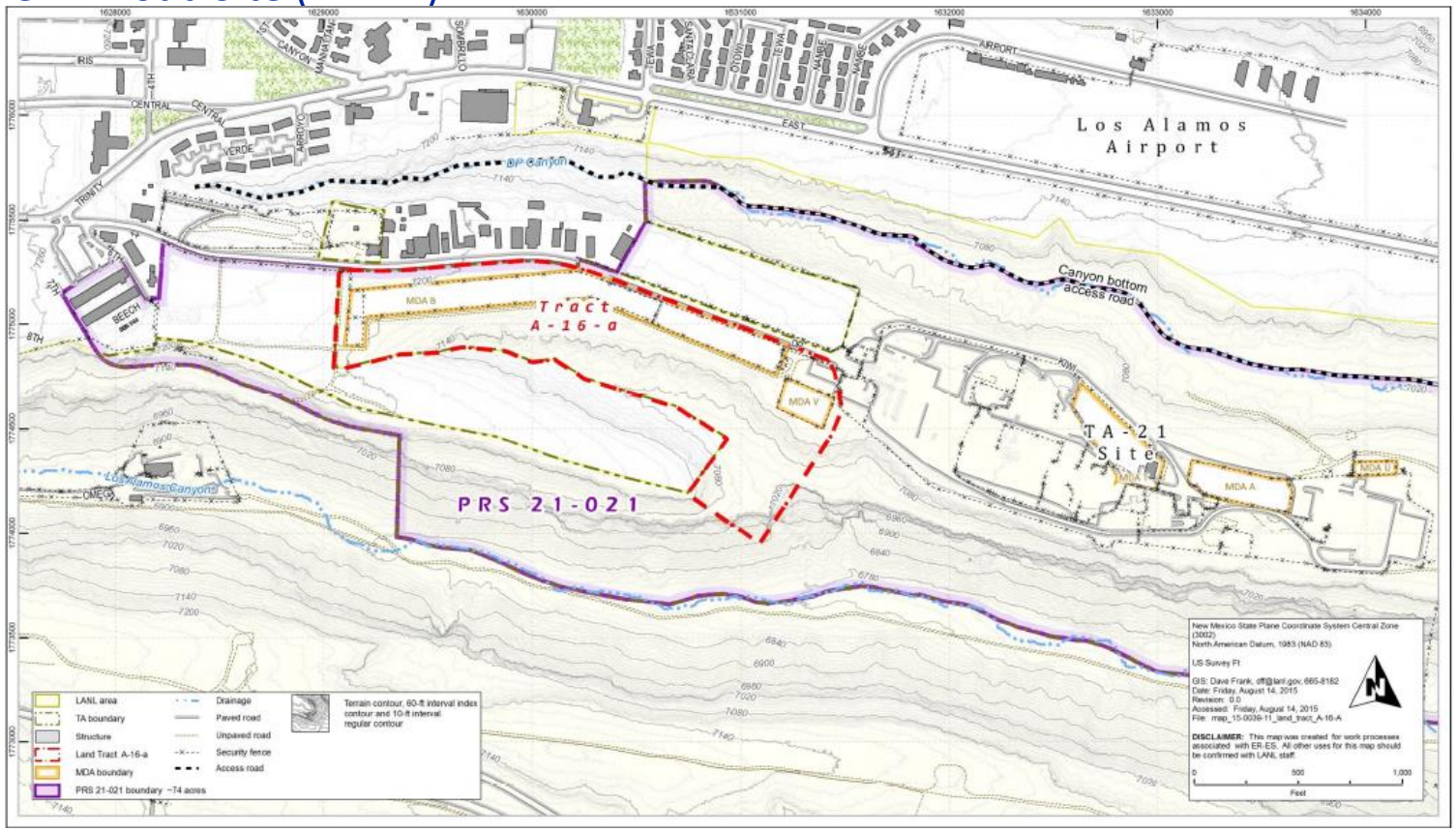
    3) MARSSIM was written in support of cleanup rulemaking efforts for which supporting data are mostly limited to contaminated surface soil and building surfaces

Challenges to MARSSIM Approach

- DOE encounters these situations:
  - Surface contamination is not always the leading source of contamination
  - Residual contamination may exist below a non-contaminated surface layer
  - Sub-surface investigations create the following questions:
    - What is the appropriate 3-dimensional survey model?
    - What is the appropriate depth for survey investigation?
    - What are the appropriate methodologies for such survey investigations?

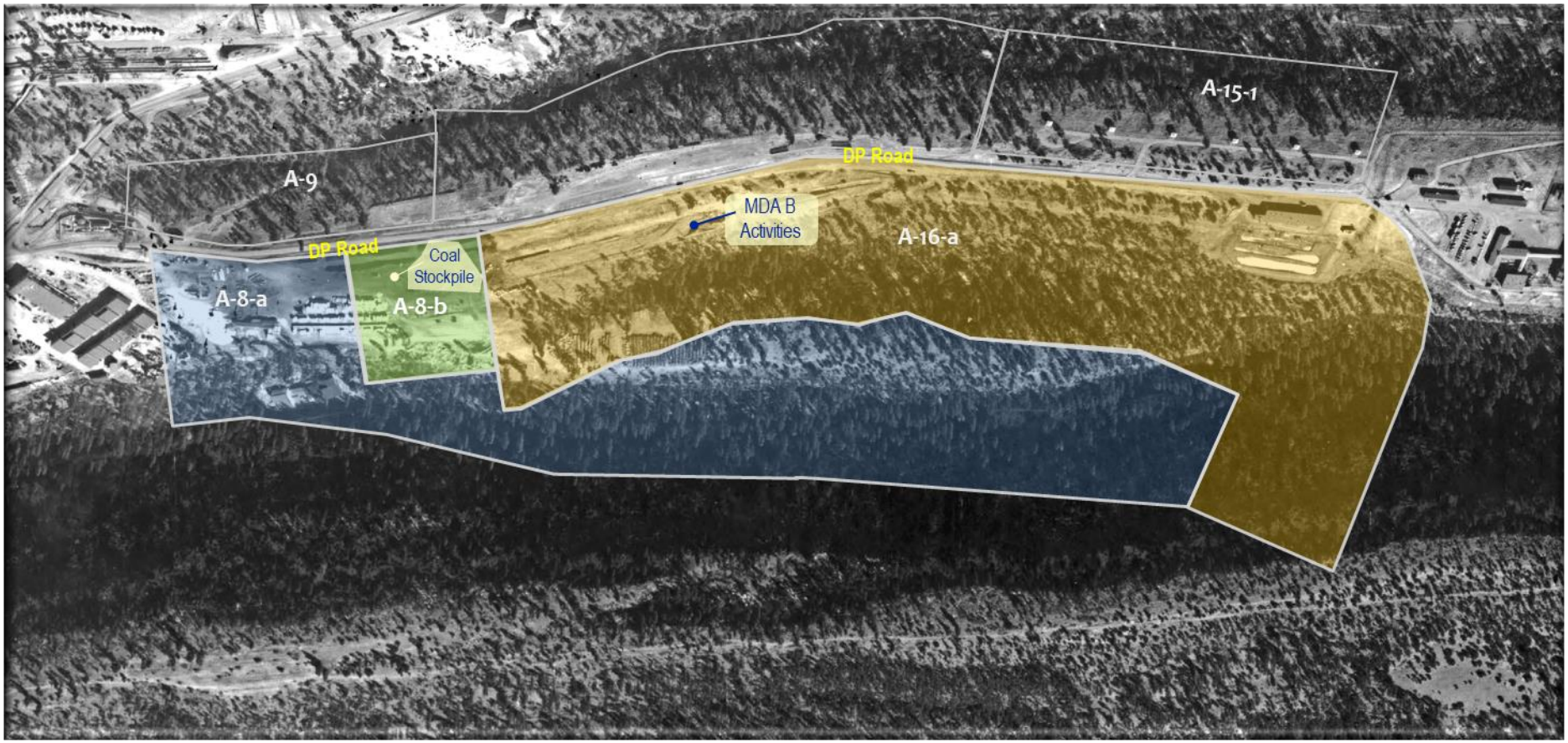
DOE Case Study

A parcel of land used decades ago for the production and purification of plutonium and polonium. The site underwent substantial environmental cleanup under the American Reinvestment and Recovery Act in 2013, which included extensive cleanup of Material Disposition Area (MDA)-B to allow for transfer to Los Alamos County (LAC). The initial site encompassed two tracts of land transferred, A-8(a &b) and A-16-a, known as the Middle DP Road Site (MDPR).



DOE Case Study

- Picture from 1946 showing historical activity locations that contributed to the contamination

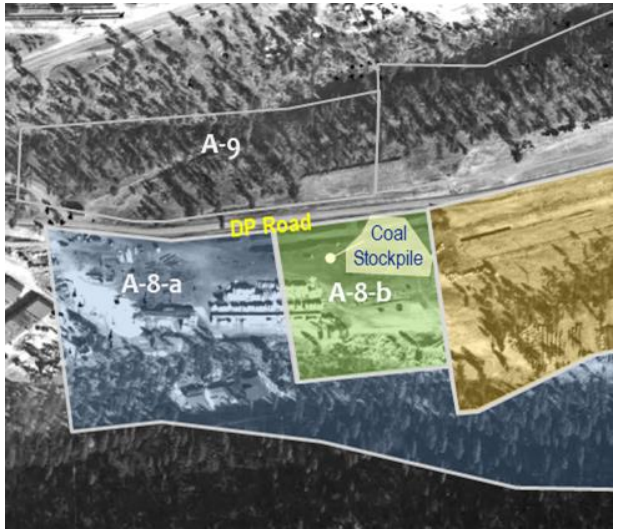


DOE Case Study

- LAC and a commercial developer are separately developing the properties.
- During excavation work in February 2020, the LAC subcontractor found some metal objects. Further inspection showed some of the materials to be contaminated.
- Analysis of samples near the dig, indicated contaminated materials at levels that do not pose a public health risk when land use and sample depths are considered.

DOE Case Study

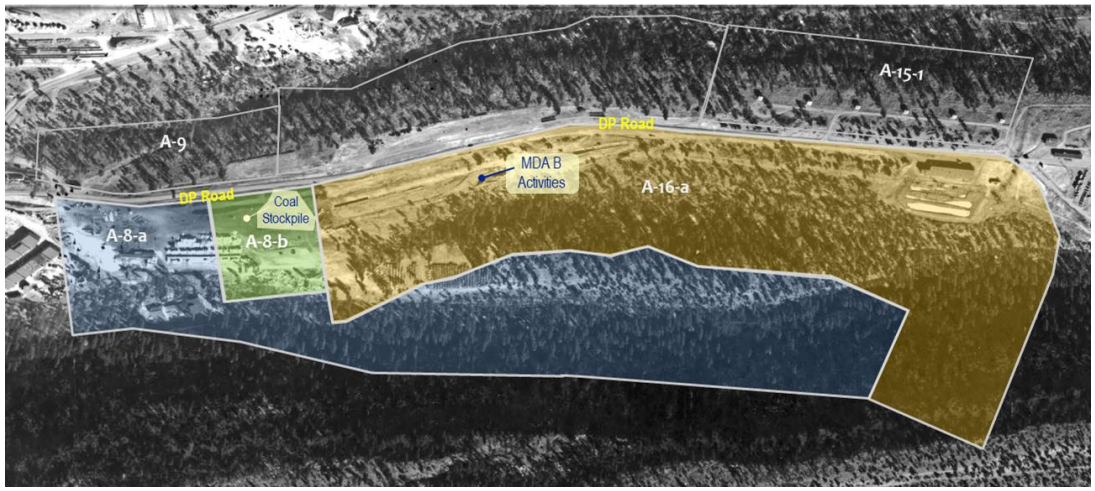
In May 2020, additional materials were discovered SW of the excavation in parcel A-8-b. Field data suggested this material may represent a different waste site from the one initially encountered in February. Work was suspended, and this new area was fenced and secured.



The contaminated debris were determined through forensic investigation to be from the earliest days of the Manhattan Project and as such, were lacking the Americium-241 that would normally be detected with field instruments. There were no surface indications of radiological contamination due to the depth (>6 ft below ground surface (bgs)) and heterogeneous nature of the debris.

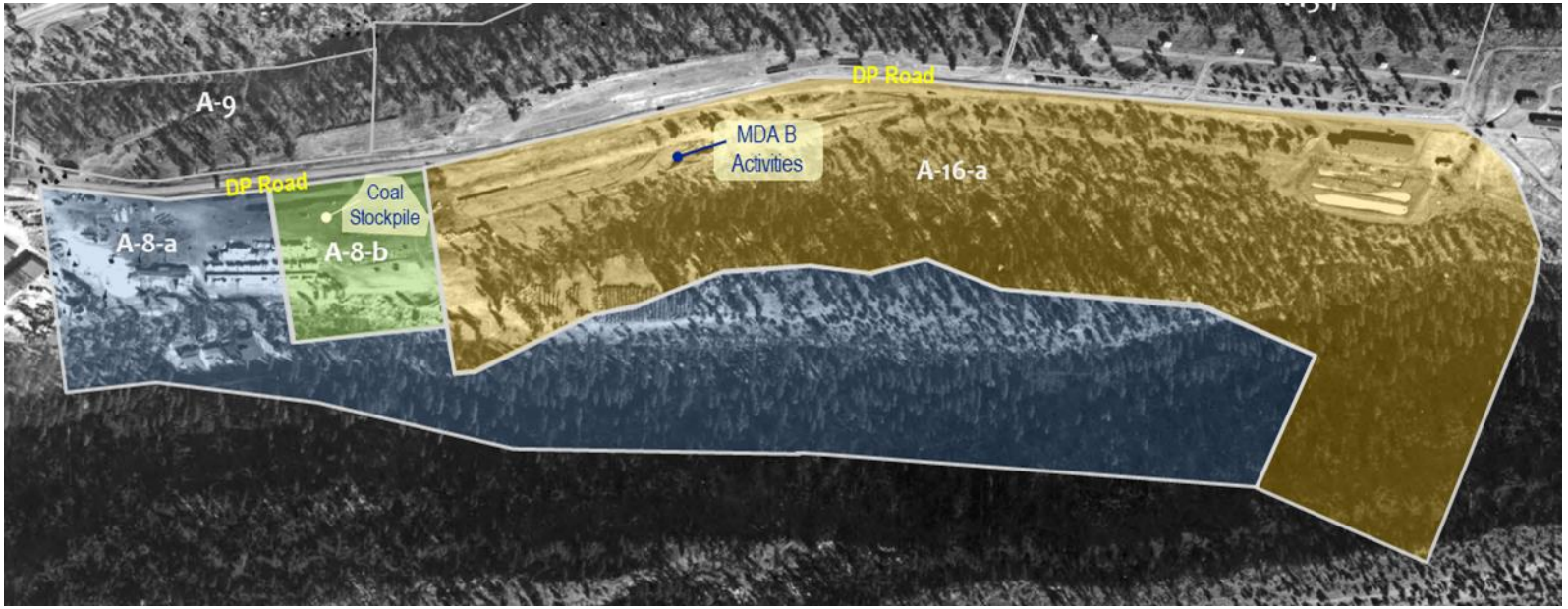
DOE Case Study

- Both parcels had undergone MARSSIM surveys prior to transfer from DOE control; A new survey plan was developed for the area.
  - Updated Historical Site Analysis:
    - Parcel A-8-b was determined to be unimpacted in an earlier analysis due to having a coal pile and residential area in its history. The earlier proposed sewer line on A-16-a was moved to A-8-b and excavated by a DOE subcontractor.
    - Visual inspection for laboratory related debris was performed and none found.
    - 16 locations were identified for potholes to be excavated down to tuff (bedrock, between 3' and 14' bgs). Potholes were chosen over boreholes due to the nature of the debris being sought.



DOE Case Study

- Updated survey plan:
  - Portions of A-16-a and A-8-a were determined to be contaminated.
  - A-16-a and A-8-a were treated as one property for the purposes of investigation and removal.
  - Known areas of contamination were excavated and all visible laboratory debris removed.
  - Potholes, down to tuff, were spaced such that there was a high likelihood of locating a waste pit with an approximate 1,000 ft^2 area (17.5-ft radius) referenced in historical records.



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Questions?