

# What's New with Independent Verification at DOE site

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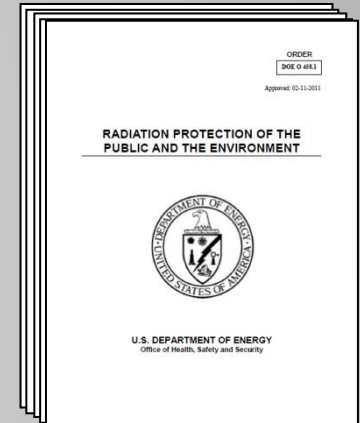
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# DOE Order 458.1

## Release and Clearance of Property

- Use recommended methodologies for property release such as MARSSIM, MARSAME, or “other methodologies approved by DOE”
- Graded approach!
- Field Element Manager responsible to implement oversight duties of contractor’s quality assurance program
- Requires a documented evaluation process for performing process and historical knowledge reviews
- Specific IV requirements!



# Snapshot of DOE O 458.1 IV Requirements

Citation	Category	Minimally (always) required	Responsibility of DOE Field Element Managers
4.k(9)(b)1	Graded approach	<p>Oversight must ensure that clearance contactor procedures, instruments, data and analysis, and documentation used for clearance comply with Order</p> <p>A graded approach to IV activities must be commensurate with scope, complexity, and risk associated with clearance action (required)</p>	Not applicable
4.k(9)(b)2	Personal property	Oversight must ensure operational awareness of radiological monitoring and survey procedures, recordkeeping, methodologies, and techniques used for clearance comply with Order	More formal IV process may be instituted if, for example, clearance action is highly complex or there is a history of poor performance
4.k(9)(b)3	Real property to be retained by DOE	IV personnel will review radiological characterization report or data	IV surveys or sample analysis
	Real property to be transferred <sup>a</sup>	IV personnel will prepare IV plan and will conduct IV surveys and sample analysis	Not applicable
4.k(9)(b)4	Independence – DOE personnel	Not directly involved in specific clearance action	Not applicable
	Independence – contractor	Independent of contractor conducting clearance action; reports to DOE; authority and freedom to report issues to Field Element Managers; qualified, knowledgeable, and experienced in overseeing radiological clearance activities.	Not applicable

# Release and Clearance of Property

- Radiological Monitoring or Surveys for Clearance of Property
  - Use recommended methodologies for property release such as MARSSIM, MARSAME, or “other methodologies approved by DOE”
  - Meet “Measurement Quality Objectives” (a term introduced by MARSAME)
  - Field Element Manager responsible to implement oversight duties of contractor’s quality assurance program
  - DOE must determine type and scope of oversight of IV compliance
  - Graded approach to IV!
  - IV minimum requirements: review procedures, instruments, data and analysis, and documentation to assure compliance with O 458.1

# What is a Graded Approach?

## CONSIDER:

- End State
  - For unrestricted release, IV requirements are much more stringent (field surveys and sampling)
  - For restricted release, the Field Element Manager is responsible for IV requirements
- Complexity
  - Surface versus subsurface contamination
  - Hard-to-detect nuclides, groundwater contamination, etc.
- Stakeholder and Public Interest – can drive the need for more stringent IV

# Release and Clearance of Property (cont'd)

- Real Property IV requirements
  - Review of radiological characterization report or data
  - May include independent surveys or samples
  - **Independent Verification Plan required for** property to be released to public, managed by another agency, or for new facility construction (requires IV surveys and sampling unless determined to be unneeded by DOE)
  - Requirements for IV:
    - DOE personnel not directly involved in clearance action, or contractor independent of contractor performing clearance
    - Direct report to DOE
    - Sufficient authority and freedom to report to Field Element Manager
    - Be qualified or have sufficient knowledge and experience to oversee radiological clearance

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*“If the real property is to be transferred to the public, or managed by another agency/entity other than DOE, or a new facility constructed, an independent verification plan will be prepared and independent verification surveys and sample analysis will be conducted to verify compliance, unless determined to be unneeded by DOE because, for example, the transferred property will be under a license.”*

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# Release and Clearance of Property (cont'd)

- Personal Property IV requirements
  - Operational awareness of instrumentation, survey procedures, recordkeeping, methodologies, and techniques used
  - Field Element Manager can and should require a more formal IV process for specific scenarios (high technical complexity, poor historical performance, etc.)

# Historical Lessons Learned from Environmental Cleanups

EM recognizes “the radiological release of property must be conducted in a manner that is technically defensible and which meets the applicable Departmental requirements.” (*DOE Lessons Learned from Independent Verification Activities, July 2008*)



## Best practices:

- ✓ Early development of authorized limits
- ✓ Early development of final status survey (FSS) plan
- ✓ Early engagement of independent verification personnel

**THE VALUE OF INDEPENDENCE**

"The mission of the Department of Energy's (DOE) Office of Environmental Management (EM) is the cleanup in closure of the Department's facilities... The radiological release of property must be conducted in a manner that is technically defensible and which meets the applicable Departmental requirements." (Stack, O'Brien, July 2008). DOE/EM has stood up as an industry leader to advance independent verification (IV) as the essential quality assurance step that ensures cleanup goals have been achieved.


**REGULATORY FRAMEWORK**

IV requirements are outlined in the recently issued DOE Order 458.1, *Reduction, Protection of the Public and Environment*. Paragraph 4.6 (IV) states that "DOE Field Element Managers responsible for oversight of clearance processes must implement oversight duties to verify that the contractor assurance program is ensuring that the applicable radiological clearance requirements have been met. DOE must determine the type and scope of oversight activities necessary to independently verify compliance." The key IV requirements are as follows:

- The graded approach to IV must be commensurate with the scope, complexity, and risk associated with the clearance action to ensure a minimum data generation, interpretation, data and analysis, and documentation are adequate.
- Planned property release must at a minimum include operational assessments of radiological survey procedures, instrumentation, methodologies, and techniques. Additional IV may be required for high-complexity release or for contractors with a history of poor performance.
- All real property release must include review of data and reporting and may also include independent surveys or sample analysis.
- Real property transferred to the public as managed by another agency requires the development of an IV plan and performance of IV surveys and sampling.

DOE Order 458.1, Paragraph 4.6 (IV) outlines the following criteria for an IV contractor:

- IV must be performed by DOE personnel not directly involved in the specific clearance action or by a contractor who is independent of the contractor conducting clearance activities, and IV personnel must:
  - Report directly to DOE
  - Have authority and freedom to report unsearched issues to the Field Element Manager
  - Be qualified to have knowledge and experience to oversee radiological clearance activities



**ORAU**  
OPERATIONAL RADIATION ASSISTANCE UNIT



# More Recent Lessons Learned





# LL1 – Stakeholder Communications

- Project – characterization of five large metal tanks to support waste disposition planning
- Stakeholders included federal government, facility management, and waste management
- Base plan: scan accessible interior and exterior surfaces for radiation, collect statistical/discrete measurement set for comparison to 5,000 dpm/100 cm<sup>2</sup> (uranium) limit (stakeholder approved!)
- Surveyors identified slightly elevated radiation levels on rusty surfaces —resulted in a work stoppage
- Elevated measurements were due to a buildup of radon decay products, specifically Po-210 that tends to accumulate in rust (stakeholders agreed!)
- Surveys continued and were completed as planned

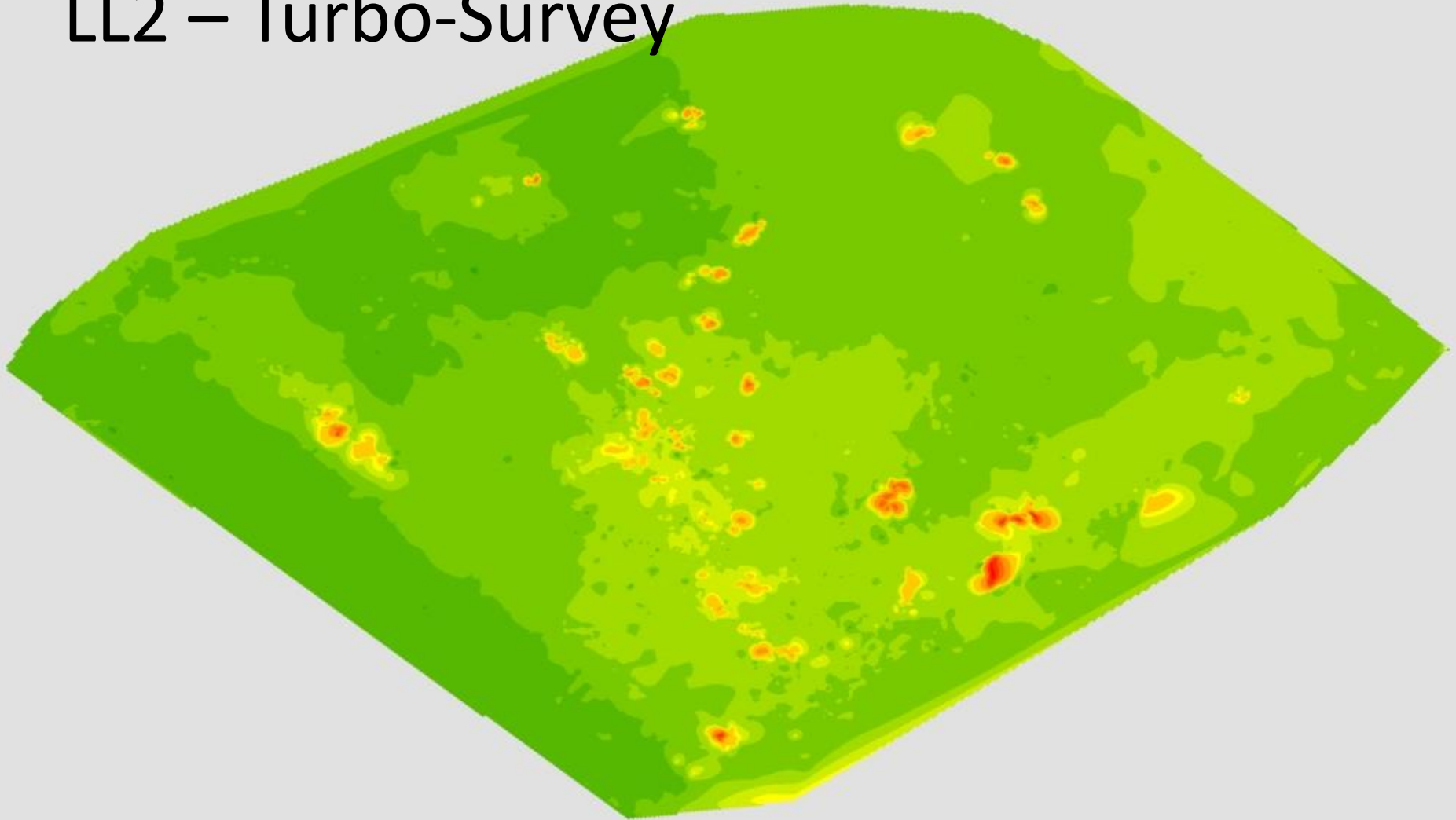
# LL1 – Stakeholder Communications

- ORAU submitted report and the waste management organization sent it to a new stakeholder
- New stakeholder converted scan data to dpm/100 cm<sup>2</sup> and identified measurements above the 5,000 dpm/100 cm<sup>2</sup> limit.
- Here is the problem:
  - The background value (B) was noted estimated for rusty surfaces (there are no “background” rusty tanks lying around)
  - The scanned data was never intended for conversion to dpm

# LL1 – Stakeholder Communications

- The report presented scan data for completeness but did not include warnings or caveats about its use or interpretation
- Investigators should have:
  - Better communication of use of scan data
  - Made an attempt to identify a reasonable background medium (e.g., rusty metal posts or I-beams)
  - And/or gotten written commitments from the existing stakeholder organizations that the levels were not associated with contamination
- ORAU plan to publish a paper on this LL

# LL2 – Turbo-Survey



# LL2 – Turbo-Survey (cont'd)

- ORAU was observing an RCT with the remediation contractor perform a gamma walkover survey
- Individual was walking fast and swinging the detector in an exaggerated pendulum motion
- The RCT definitely could have missed something, but could the something be quantified?
  - Of course the answer is “yes.”

# LL2 – Turbo-Survey (cont'd)

- Results show detector response could have been reduced (or minimum detectable activity increased) by as much as 40% for a 1 m<sup>2</sup> hot spot
- Other finding:
  - Differences are trivial for large areas
  - Results do not vary much by radionuclide (Am-241, Co-60, Cs-137, and Ra-226 were considered)
- Conclusion: keep it low and slow (intuitive)
- A paper on the topic was published in 2012 in *Operational Health Physics* (Vol. 102, No. 2)
- ORAU is looking at whether or not MDC calculation methods should be revised based on these results



# LESSONS LEARNED – Lightning Round

*Recent examples of issues ORAU personnel have encountered!*



# LL – Lightning Round 1

- Do not discard larger objects from sieved soils for lab samples —larger objects often “hotter” than fines
- Do not base sample/no-sample decisions on post-processed high-density gamma walkover survey (audible output is MUCH more reliable)
- Not recommended to backfill an excavation without notice and before confirmatory samples can be collected (especially over lunch hour)

# LL – Lightning Round 2

- Site managers were surprised when ORAU collected samples deeper than 6-inch depth, per procedure, when radiation levels increase with depth—the site’s FSSP did not account for subsurface contamination
- Common error (e.g., by one contractor at three different sites): using wrong surface efficiency for Co-60 (0.5 instead of 0.25)
- One contractor wiped down a location before collecting a smear sample—remove removable before measuring removable
- One contractor used area dose factors from MARSSIM Table 5.6—the table footnote reads, “The values listed in Table 5.6 are for illustrative purposes only”

# LL – Lightning Round 3

- The remediation contractor requested approval to use a source of off-site borrow for backfill at site – but had already started using the borrow prior to approval
- A site record of decision notes a large clean tract of land (nothing ever happened here) that needed a simple final clearance survey; investigators found literally hundreds of hot spots with 1,000s pCi/g Cs-137—how were they missed?
- ORAU reviewed a final clearance report and found a non-conservative error in the DCGL calculation; all survey units had to be re-evaluated (ORAU was not involved during planning)

# Thank you

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