OAK RIDGE INSTITUTE FOR SCIENCE AND EDUCATION

Shaping the Future of Science

Lessons Learned Identified during Independent Verification Activities

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Introduction

- Oak Ridge Institute for Science and Education (ORISE) serves as an independent (third party) verification (IV) contractor for the U.S. Department of Energy, the U.S. Nuclear Regulatory Commission, and U.S. Army Corps of Engineers.
- This presentation summarizes lessons learned (LLs) gathered from a broad range of IV projects.

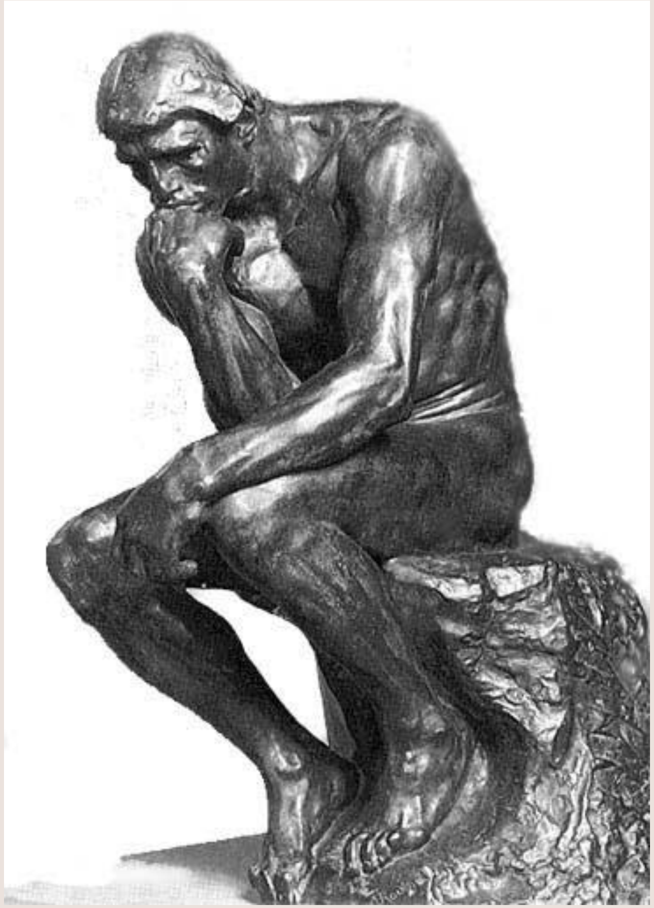
Introduction (cont'd)

- The objective is to inform and to help avoid similar issues by current or future projects.
- Information identifying specific sites, contractors, etc., has been removed.

> It's only a
> failure
> if you don't
> learn
> something

Introduction (cont'd)

- Many LLs could have been addressed during DQO development, which:
  - takes time;
  - should consider site-specific information; and
  - should detail the type, quantity, and quality of data needed to reach decisions.



Lessons Learned

- LL1: ORISE measurement of radiation in a shallow borehole, noted a significant increase, and collected a second sample.
- Site personnel protested because the FSSP did not consider the possibility of subsurface contamination.

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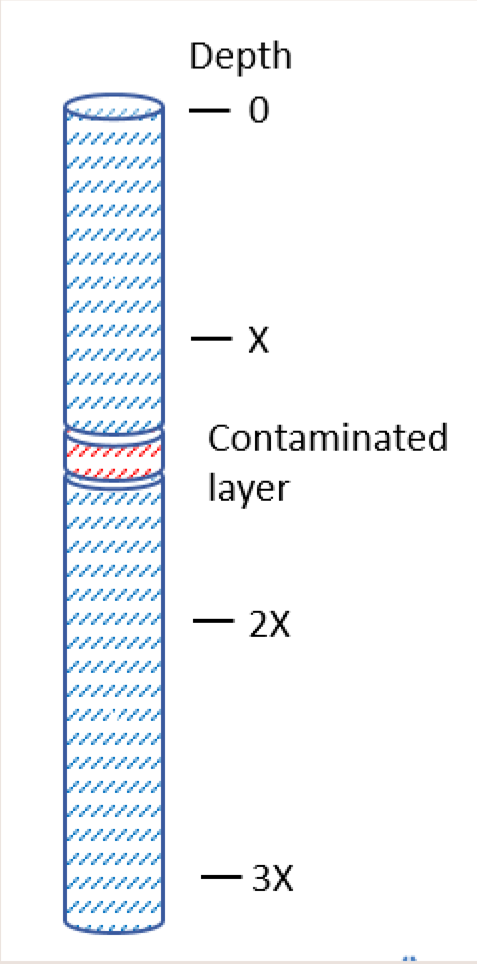
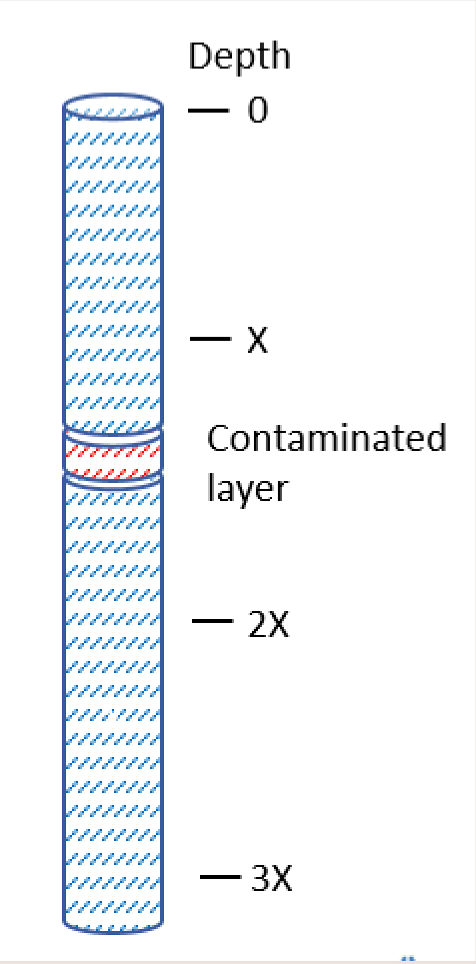
Lessons Learned (cont'd)

- How can LL1 be applied to a "deep" subsurface investigation?
- A plan may call for compositing across certain core intervals without accounting for variability.
  - Composite every X ft.
  - Collect judgmental sample between X and 2X?



Lessons Learned (cont'd)

- This LL also applies to borehole gamma logging.
  - Surveyor told to collect measurement every X meters/feet.
  - Surveyor does not pay attention (i.e., listen) to the detector response when passing a contaminated layer.
  - Conclusion could be that the borehole is "clean" because of the missed opportunity between X and 2X.



Lessons Learned (cont'd)

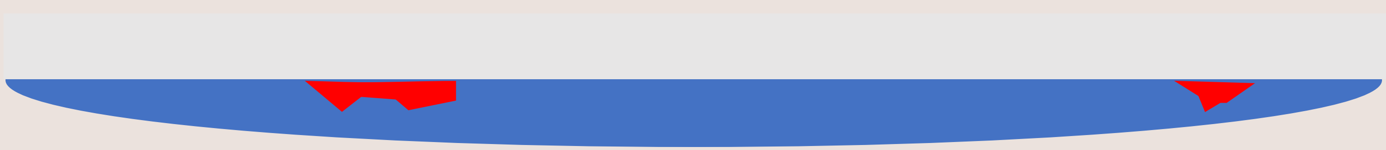
- LL2: Site's surveyors were instructed to survey without listening (i.e., not involved in decisions).
  - A GIS technician reviewed data and instructed the field team where to collect a sample.
  - The coordinates may only get sampler close to "hotspot" even with sub-meter accuracy, so samples were collected in the wrong place (still not listening).
- Surveyors should have listened and provided input to sample decisions.

Lessons Learned (cont’d)

- LL3. Surveyors did not listen to audible response (relying on data loggers), and data loggers average over 5-second period.
  - Long integration period “smoothed out” detector responses
  - Site’s conclusion: 0 hot spots.
  - ORISE surveyors listened to detector responses and found 13 hot spots.

Lessons Learned (cont'd)

- Related, in situ gamma spec systems such as ISOCS^{TM} are sometimes used in decommissioning.
  - ***Results are averages*** across a large shallow bowl-shapes volume.
  - Measurements may not identify small areas of elevated activity (***address in DQOs***).



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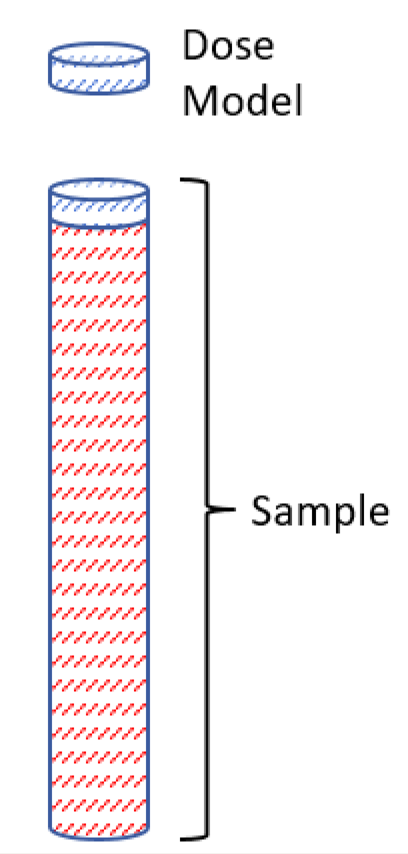
Lessons Learned (cont'd)

- LL4: A site's dose-based cleanup goal assumes the contaminant is evenly distributed in the top 2 inches of concrete.
- However, samplers cored through the entire concrete base (as deep as 2 feet) and submitted the whole core.
- Longer cored diluted samples and were not suitable for demonstrating compliance with cleanup goals.



Lessons Learned (cont'd)

- LL5: Subsurface contamination delineation project was planned **without a site visit**.
  - Borehole locations selected on a systematic grid, sample depth selected using combination of random and judgmental decisions.
  - Plan approved by regulators and new contactor (ORISE) was selected to implement the plan.
- On day 1 **site visit**: ORISE identifies multiple inaccessible locations (unsafe slope and security zone breach).

Lessons Learned (cont'd)

- Related, sometime it is unsafe or impossible to use traditional sampling methods. Some alternatives include (but not limited to):
  - Detector on pole/wheels (low-tech approach of lowering detector along excavation slope)
  - Detector on a boom or mechanical arm, with GSP/total station (replaces listening surveyor)
  - *In situ* HPGe in a basket, count at designated intervals
  - Sample from the "bucket"
  - Surveyor in "aerial lift"

Lessons Learned (cont'd)

- LL6. Instruments calibrated using a 5-ft cable, surveys performed with 25-ft cable.
  - Detector response changes if cable length changes.
  - Calibrate detector with same length cable as used to collect field data.

Conclusions

- The LLs presented here are mostly about ***thinking*** during both the planning and implementation phases of the investigation.
- Many LLs could have been avoided with more detailed, site-specific DQO development.

Thank You

Discussion Questions

1. What techniques have been used to survey excavations and other hard-to-access locations that may be unsafe for surveyors to enter?
2. What is ALARA when looking for discrete sources or elevated areas in the subsurface?
3. Is it important to relate survey design to the dose modeling assumptions used to derive DCGLs?