Module 6

Precise Excavation Support:

Case Study – Ashland 2 Site

Case Study Highlights

- Use of Gamma Walkover Surveys
- Derivation/application of field investigation levels
- Integration of real-time data collection techniques with soil remedial designs
- Dynamic work strategies
- Minimization of waste volumes/cost control

Project Decision Goals

- Address uncertainty in contaminated soil volume estimates and the exact location of contamination
- Minimize soil volumes requiring off-site disposal
- Verify remaining residual soils meet cleanup requirements

Conventional Approach: Block Excavation

- Excavation based on RI/FS data sets
  - Generally sparse data
  - Incomplete data sets (spatially or wrt contaminants)
  - May include additional pre-design characterization to better define footprint
- Relatively static work plans
  - Work plan specifies excavation footprint
  - Verification takes place after excavation
- Issues:
  - Potential for removing "clean material" unnecessarily
  - Potential for surprises when excavation work is "complete"

Alternative: Precision Excavation

- “Peels” a site back in lifts or layers
- Dynamic work plans: each lift is characterized using real time technologies, with excavation footprint refined as work proceeds
- Process continues until the site has achieved remediation goals
- Advantages:
  – Reduces potential for removing “clean material” and leaving material above clean-up guidelines
  – Provides a mechanism for dealing with “surprises” as they arise during excavation
  – Expedites remediation process

Disposal Costs: Block Excavation vs. Precise Excavation

- Block Excavation
  - Requires more site characterization prior to start of work
  - Generally a detailed, defined remedial work plan
  - Inflexible to adapt to changing field conditions
  - Iterative approach with potential for several mobilizations
- Precise Excavation
  - Requires less site characterization prior to start of work but requires “real time” analysis
  - Significant amount of data collected during remediation
  - Requires processes and procedures to rapidly analyze data
  - Maximizes potential that contaminated soil will be removed the first time and that “clean” soil will not be excavated

Components of a Precise Excavation Program

- Dynamic work plan that specifies how decisions will be made in the field regarding excavation and specifies the logistics how excavation work will be done
- An appropriate combination of real-time data collection techniques for the contaminants of concern and action levels required
- Methods for rapidly assimilating, analyzing, and disseminating dig face characterization results so that excavation work can continue unimpeded by characterization process

Case Study: Ashland 2 FUSRAP Site

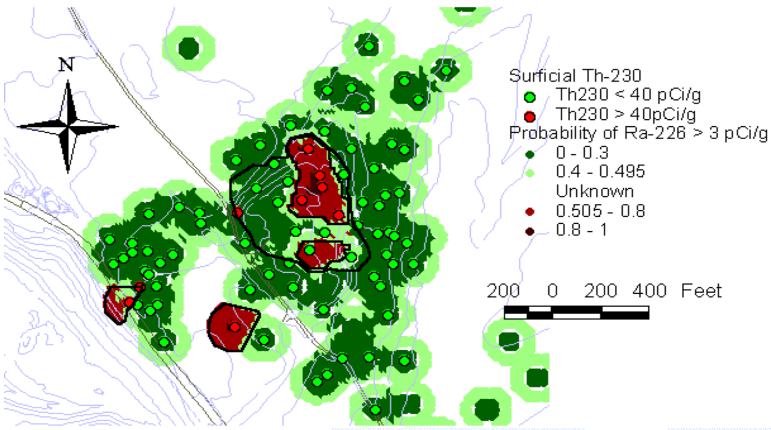
- Site used as a dumping ground for soils contaminated with Th-230, U-238, and Ra-226.
- Th-230 is the driver, with an action level of 30 pCi/g.
- Contaminated soils need to be excavated and disposed of out-of-state with total excavation and disposal costs approximately $300 per cubic yard.
- RI/FS data sets included 341 soils samples from 116 soil bores.
- Existing soil volume estimate was 14,000 cubic yards. Re-analysis suggested a best estimate of 25,000 cubic yards, with a range of 3,000 to 46,000 cubic yards.

Precise Excavation Strategy for Ashland2

- Excavation designed for two foot lifts. Excavation footprints refined after each lift based on real-time results.
- Real-time data collection included:
  - Gamma scans logged with differentially corrected GPS system.
  - On-site gamma spectroscopy lab for quick turn-around of soil samples.
- Off-site alpha spectroscopy served as QA/QC for real-time results.
- 24 hour turn-around time target for new excavation footprints.
- Data integration and analysis through GIS and secure project support Web site.

Relationship Between Th-230 and Ra-226 Critical to Project Success

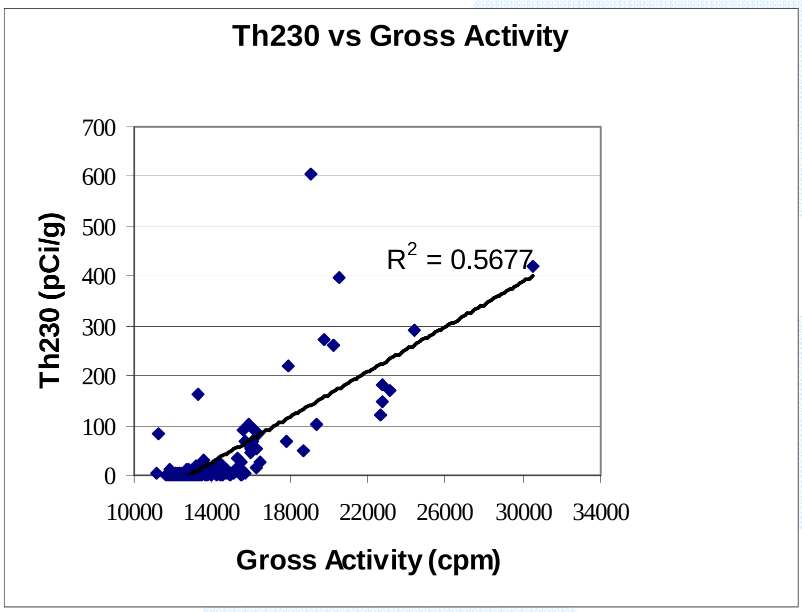
Surficial Lift



- Th-230 impossible to get in the field with real-time technologies.
- Ra-226, in contrast, easy to get and co-mingled with Th-230 contamination.
- Issue is how to develop a relationship between gamma scans and the probability that Th-230 is present above guidelines.

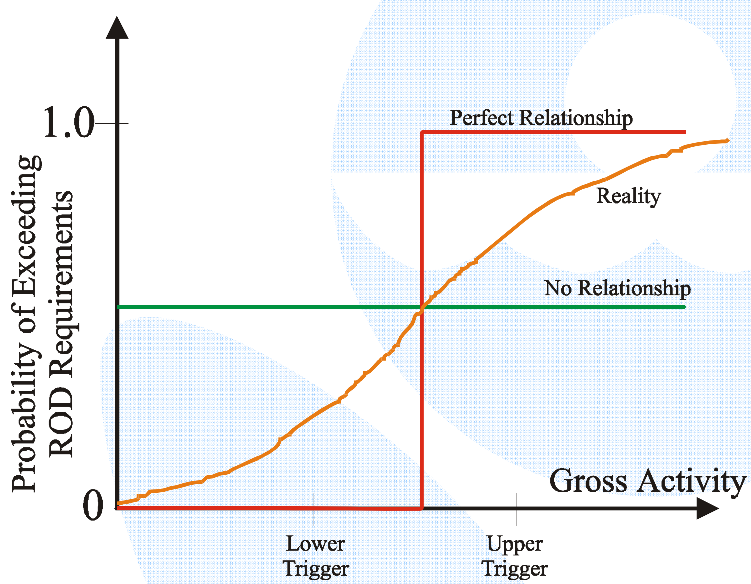
Standard Regression Techniques are Not Particularly Useful

- Assumes a linear relationship that holds over data range
- Fundamental statistical assumptions need to be satisfied
- Often don't get very satisfactory results

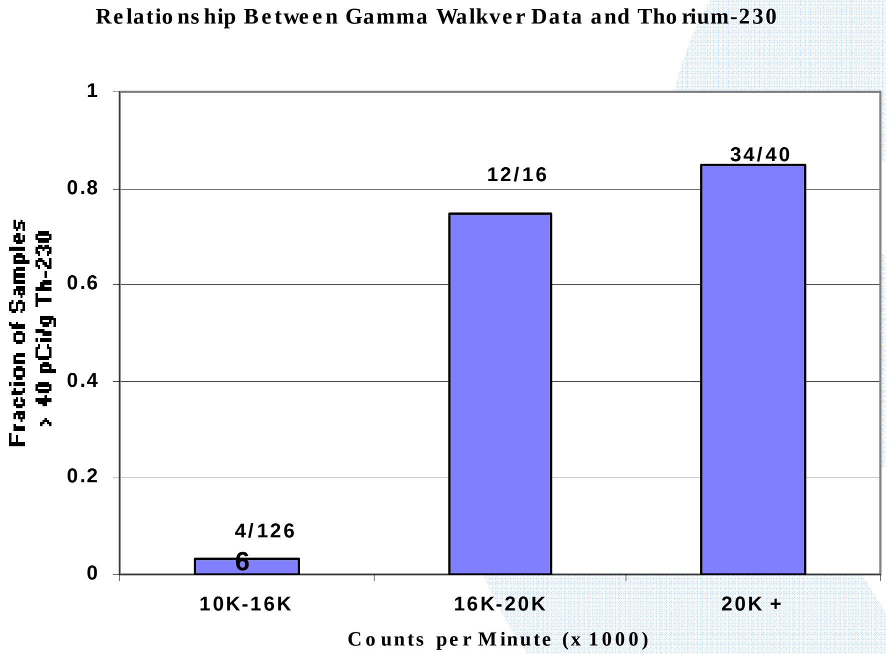


Non-Parametric Methods Can Be Effective in Capturing Relationship

- Most remedial action decisions are yes/no decisions.
- Focus is on the probability of being above or below ROD requirements.
- No significant statistical assumptions being made.
- Results are not affected by outliers and/or non-detects.

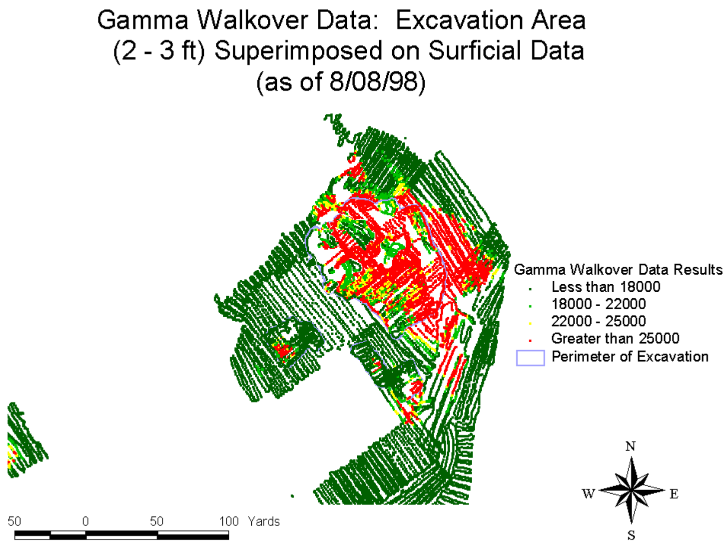


A Non-Parametric Relationship Was Developed Between Gross Activity and Cleanup Level Exceedances



Gamma Walkover Data Guided Excavation

- Gamma walkover data collected, processed and disseminated daily
- Walkover data integrated with historical data and results of discrete samples
- For Ashland 2, walkover data turned out to be definitive
- On-going validation program allowed gross gamma trigger levels to be adjusted as needed



Effectiveness of the Precise Excavation Approach Can Be Measured by:

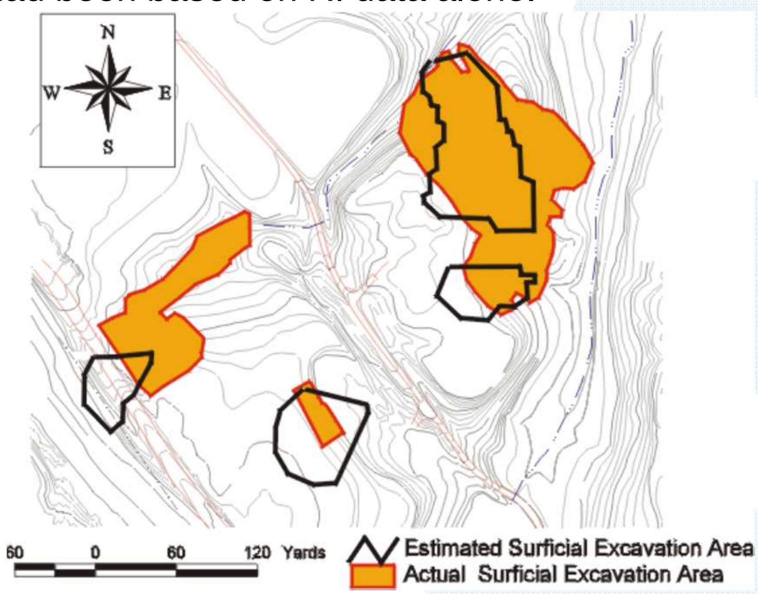
- How “precise” was the excavation?
- What difference was there between the footprints of the precise excavation and one defined solely on characterization data ?
- What additional cost or scheduling burdens did this approach place on the remediation process?

How “Precise” was the Excavation?

- Of 146 composite samples collected to characterize material for shipment 97% exceeded the clean-up criteria. Of the 4 composite samples below the clean-up criteria, 2 were collected during the first two weeks of excavation.
- Of the more than 400 final status survey samples collected, only a few exceeded the Th-230 cleanup criteria.

Was the Difference Between Footprints of Precise Excavation and Characterization Data Significant?

For the surficial lift, 4,000 cubic yards would have been excavated unnecessarily and 8,000 cubic yards would have been missed if excavation had been based on RI data alone.



What Additional Cost or Scheduling Burdens did this Approach Place on the Remediation Process?

- Excavation cannot proceed until after screening, possibility of down-time for excavation crews. This was not the case at Ashland 2.
- Preliminary estimates indicate costs of $200,000 for gamma walkover data and data analysis.
- Considering the surficial lift alone, over $1.5 million in cost savings were achieved by avoiding unnecessary disposal costs.
- Corps estimated total cost savings of >$10M from waste stream minimization.

Other Benefits of the Precise Excavation Approach at Ashland 2

- Money was spent on remediation and not more studies.
- Data collection techniques provided assurance that contaminated soil had been removed when demobilization took place. No final status survey surprises.
- Allowed for the rapid identification and correction of operational problems as they arose.
- Provided documentation and justification for quantities of soil removed. 45,000 cubic yards of soil excavated in all.
- Web page was an excellent way to share data among project team members, including the State of New York.

Conclusions from Precise Excavation Experience at Ashland 2

- When suitable “real-time” data collection technologies exist and disposal costs justify, precise excavation is the preferred alternative to traditional methods.
- Precise excavation techniques can be deployed without compromising schedules, although the logistics are different.
- Additional cost of data collection were more than offset by the saving realized by minimizing off-site disposal volumes.

Alternatives to In Situ Soil Sorting

- Mechanical soil segregation systems
- Ex situ soil sorting
  - Flattened pads
  - Soil piles

Any Questions?