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Environmental Incremental Sampling Methodology Update

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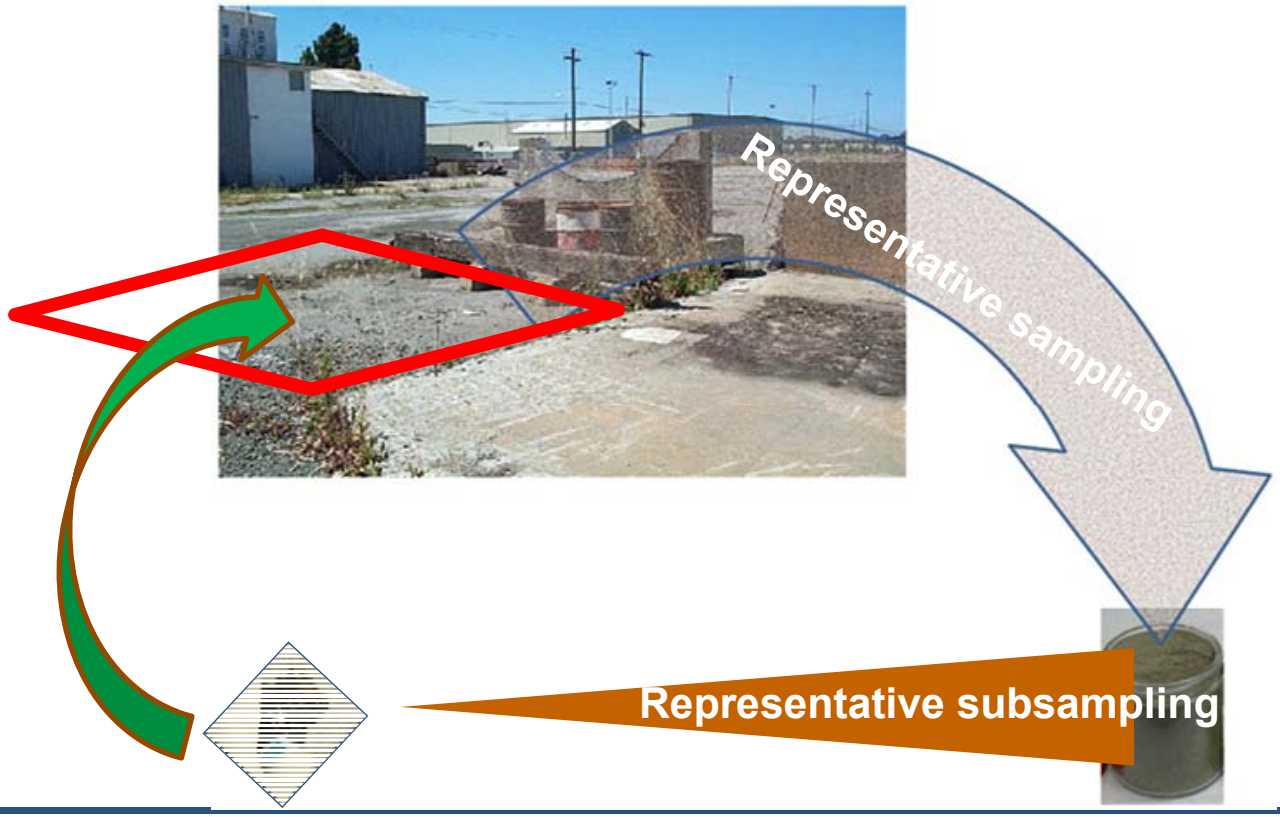
ISM Purpose

Produce representative field samples and analytical subsamples

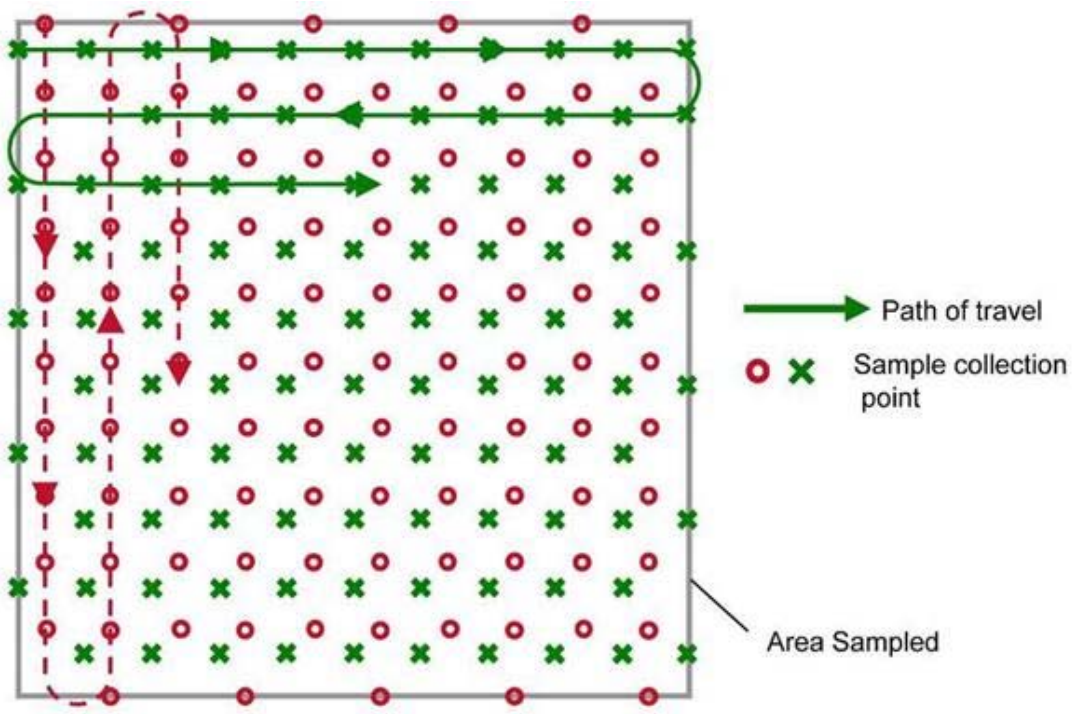
- Parameters / analytes in the right proportions to represent site conditions within the decision unit



ISM Field Process (most common)

Systematic random increment collection

- Collect surface plugs



ISM Lab Process (most common)

Air dry, disaggregate, sieve, mill, 2D slabcake subsampling

New Understanding of Site Conditions

Presumed small scale heterogeneity was minimal

Except Pb on shooting range and other obvious heterogeneous sites

Beginning to realize that small scale heterogeneity is common

Real Site Heterogeneity

What if we could "see" the contaminant distribution?

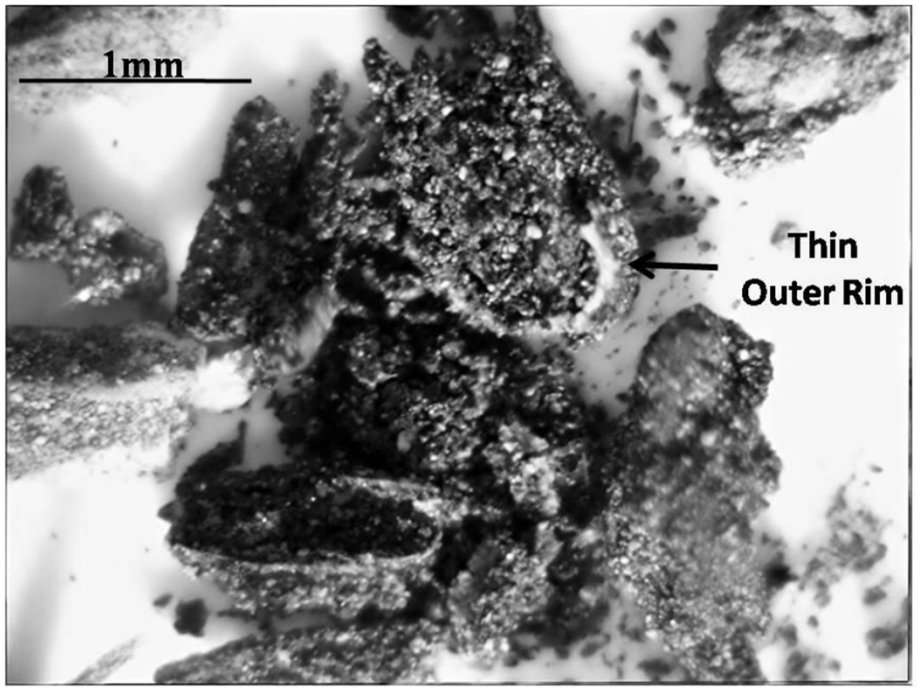
Do we need all the details or just a good average for a decision unit?

ISM is designed to manage the small and moderate scale heterogeneity and produce the good average.

PCB Small Scale Heterogeneity

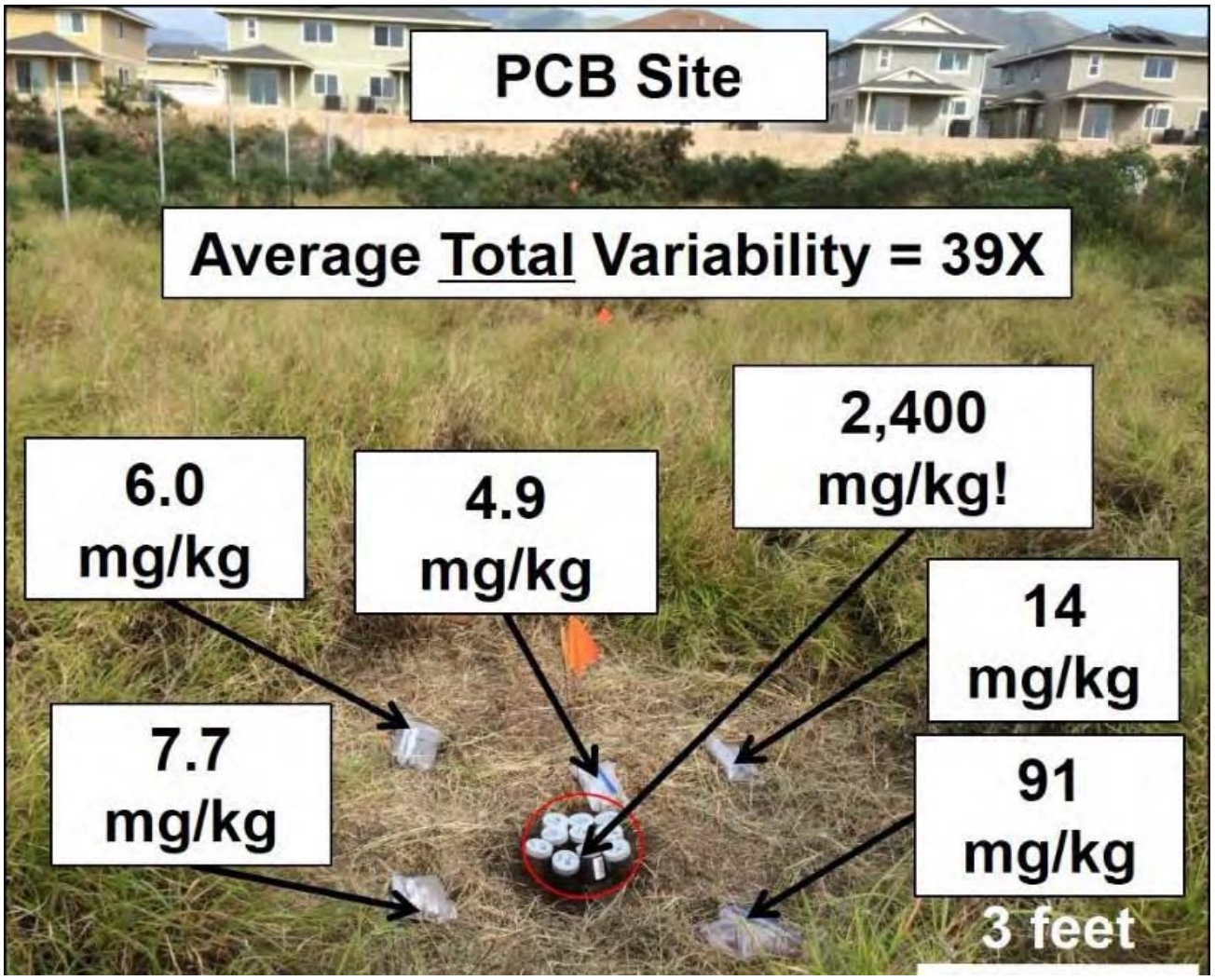
PCB infused tar balls

- How many “nuggets” in field sample?
- How many “nuggets” in lab subsample?



Collocated PCB Samples

Hawaii



New insight – minimum # increments

Original default – 30 increments

- Except for known highly heterogeneous sites
  - 50 – 100 increments

New default – 50 increments for unknown distributions

- Hawaii Technical Guidance Manual 2017
- Can use 30 increments for known low heterogeneity sites

Tools and techniques for increments

When push coring tools don't push well

- Cordless drill, Speedbor bit and collection plate
  - Not for dry sand

Tools and techniques for increments

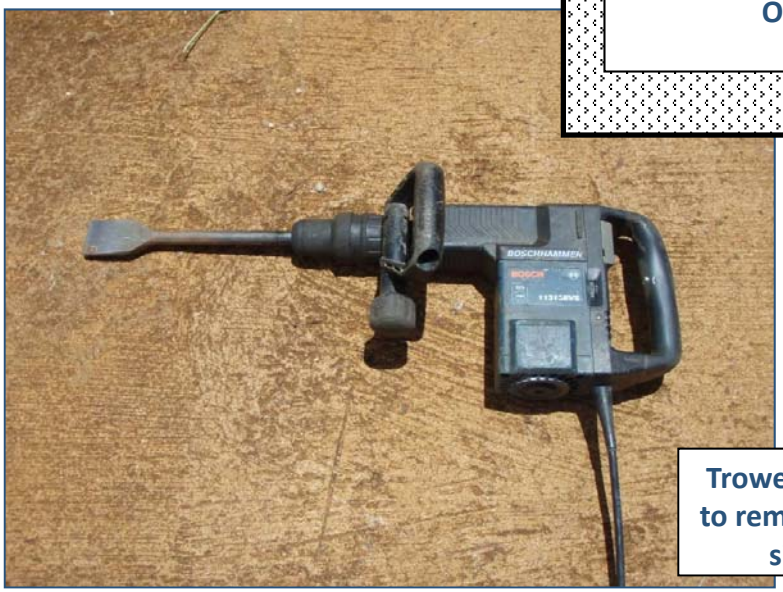
When simple push coring tools don't push well

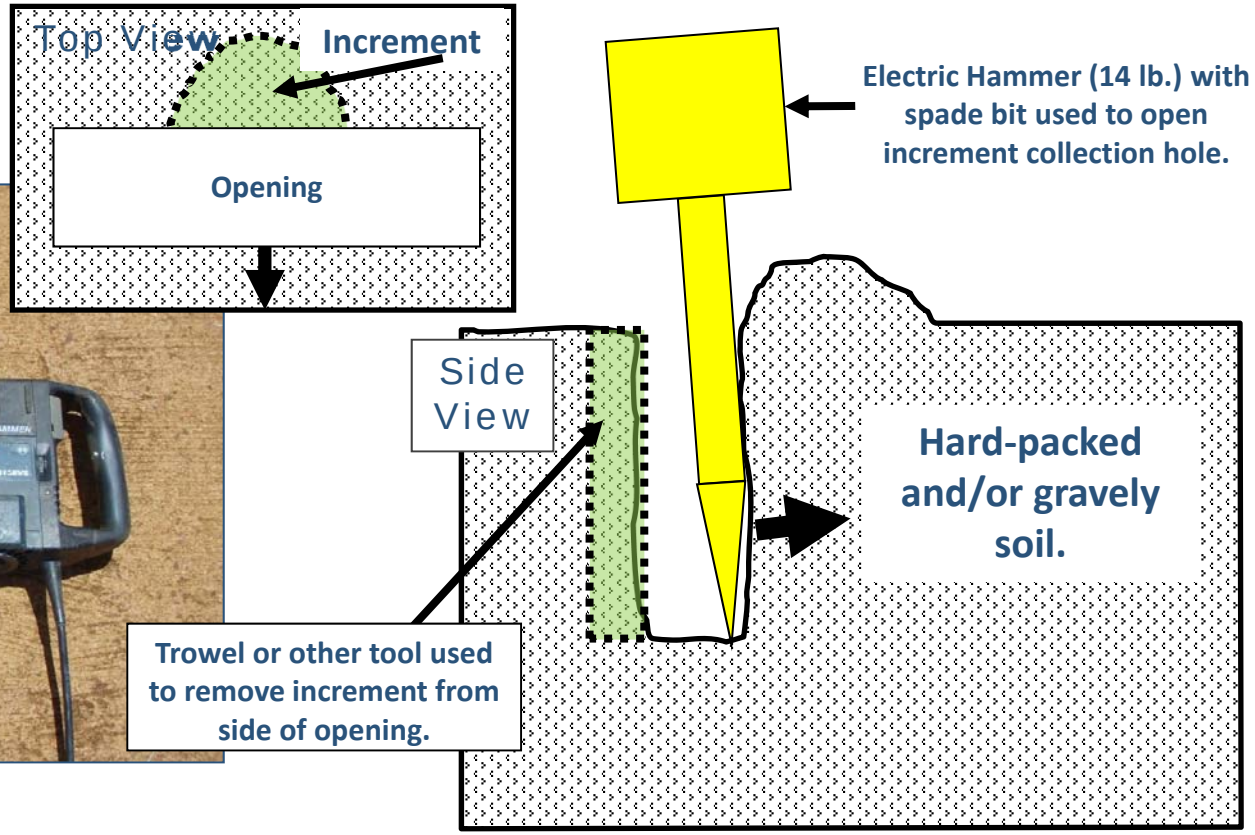
- **Slide hammers**

Tools and techniques for increments

When push coring tools don't push well

- **Electric hammer and chisel bit**
  - **Very hard packed "soil"**





Lab Process Selection

ITRC ISM update - selecting lab process options

- Air drying – yes / no
- Disaggregation
  - Tool selection
- Sieving – yes / no,
  - If yes, size selection
- Milling – yes / no,
  - If yes, tool selection
- Subsampling
  - Tool selection

Precision Improves with Processing

Concerns about analyte loss during air drying

- 2003 matrix spike study showed >80% loss of weakly absorbed low boiling SVOCs
- Led to 2D slabcake subsampling on as-received soil samples
  - Fast
  - Low cost
  - Reduces analyte loss
  - Better than “stir and scoop” subsampling
  - Not as reproducible as dry, disaggregate, sieve, 2D slabcake
- Triplicate comparison for PAH samples

Lab Processing Tools

Faster, cleaner air drying - Air drying towers

Lab Processing Tools

Disaggregation and sieving

Lab Processing Tools

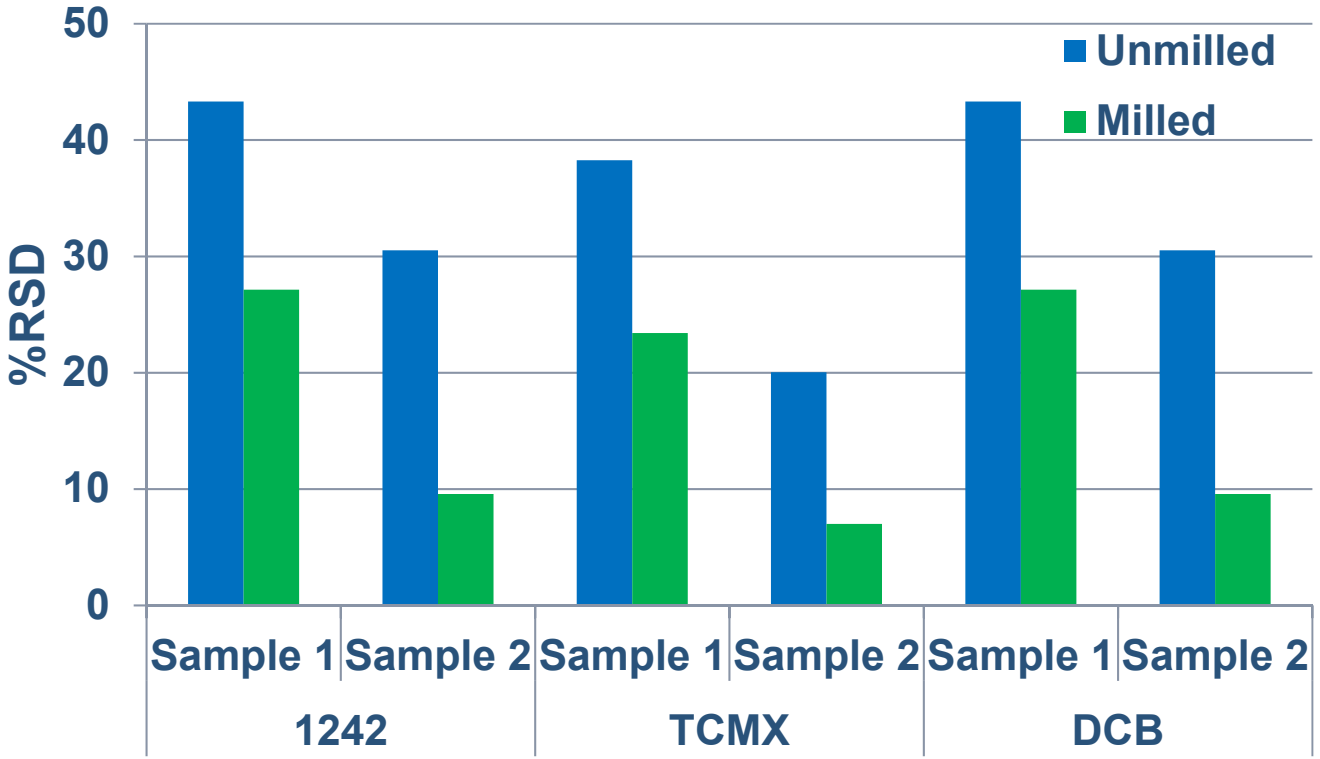
Old reliable mills

- **Puck mill & ball mill**

Lab Processing Tools

Ball Milling PCB samples (7 replicates)

- Aroclor 1242



Lab Processing Tools

Mini ball mill for Wet Chem subsamples

Lab Processing Tools

Jaw crushers

Lab Processing Tools

Disposable scoops for 2D slabcake subsampling

Lab Processing Tools

Large scale (10 g) metals digestion / 250 mL digestion cup

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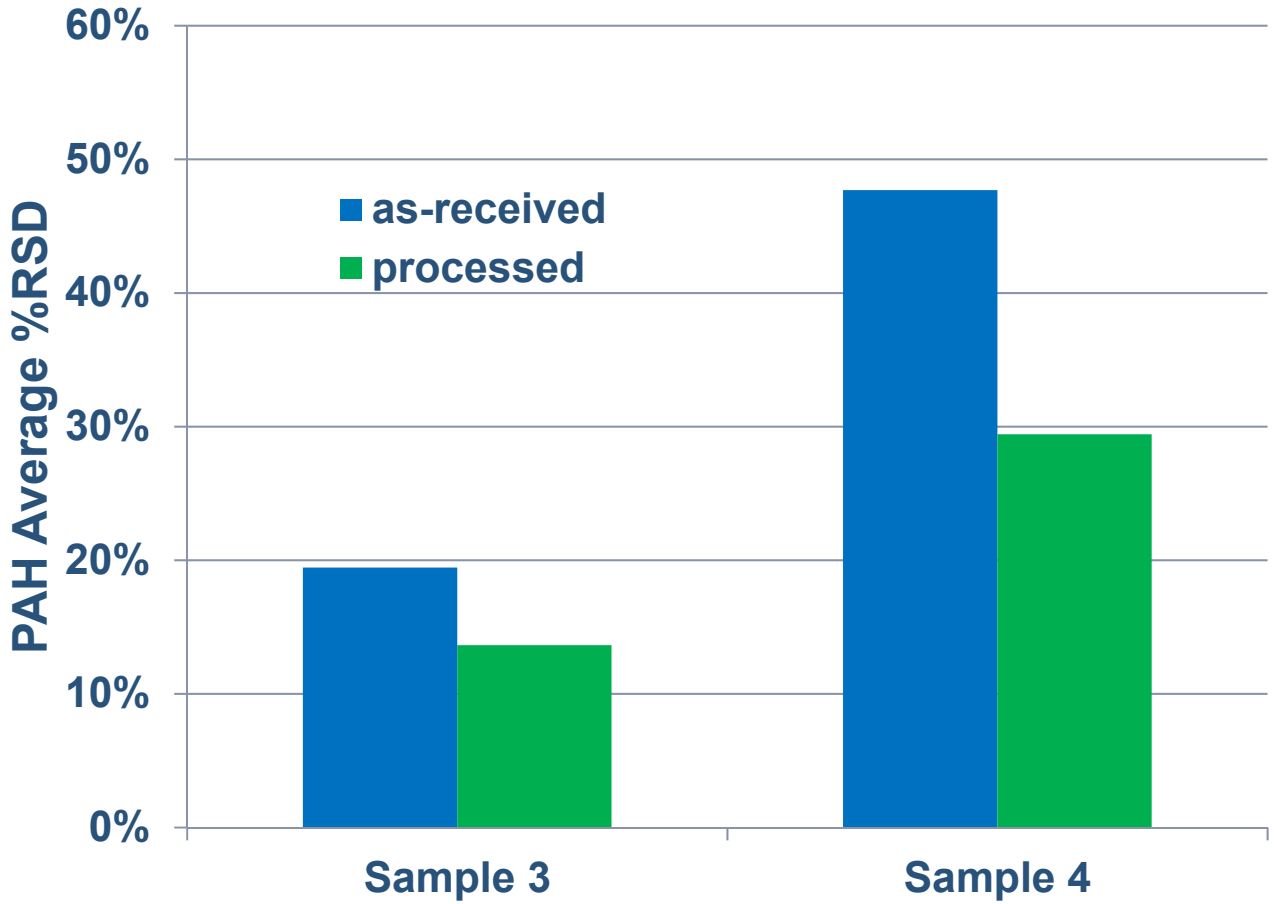
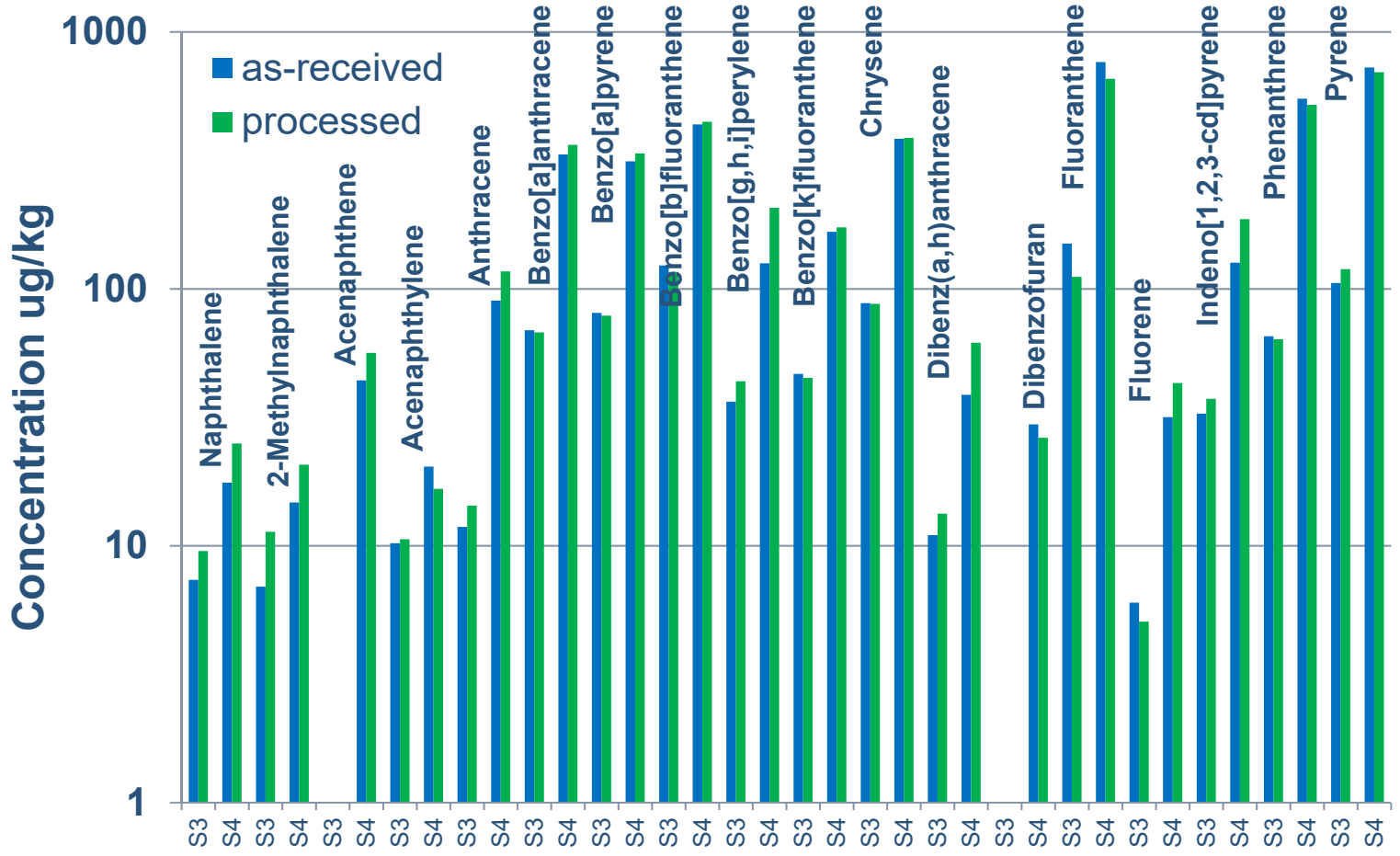
Precision Improves with Processing

Process = air dry, disaggregate, sieve (#10), 2D slabcake subsample



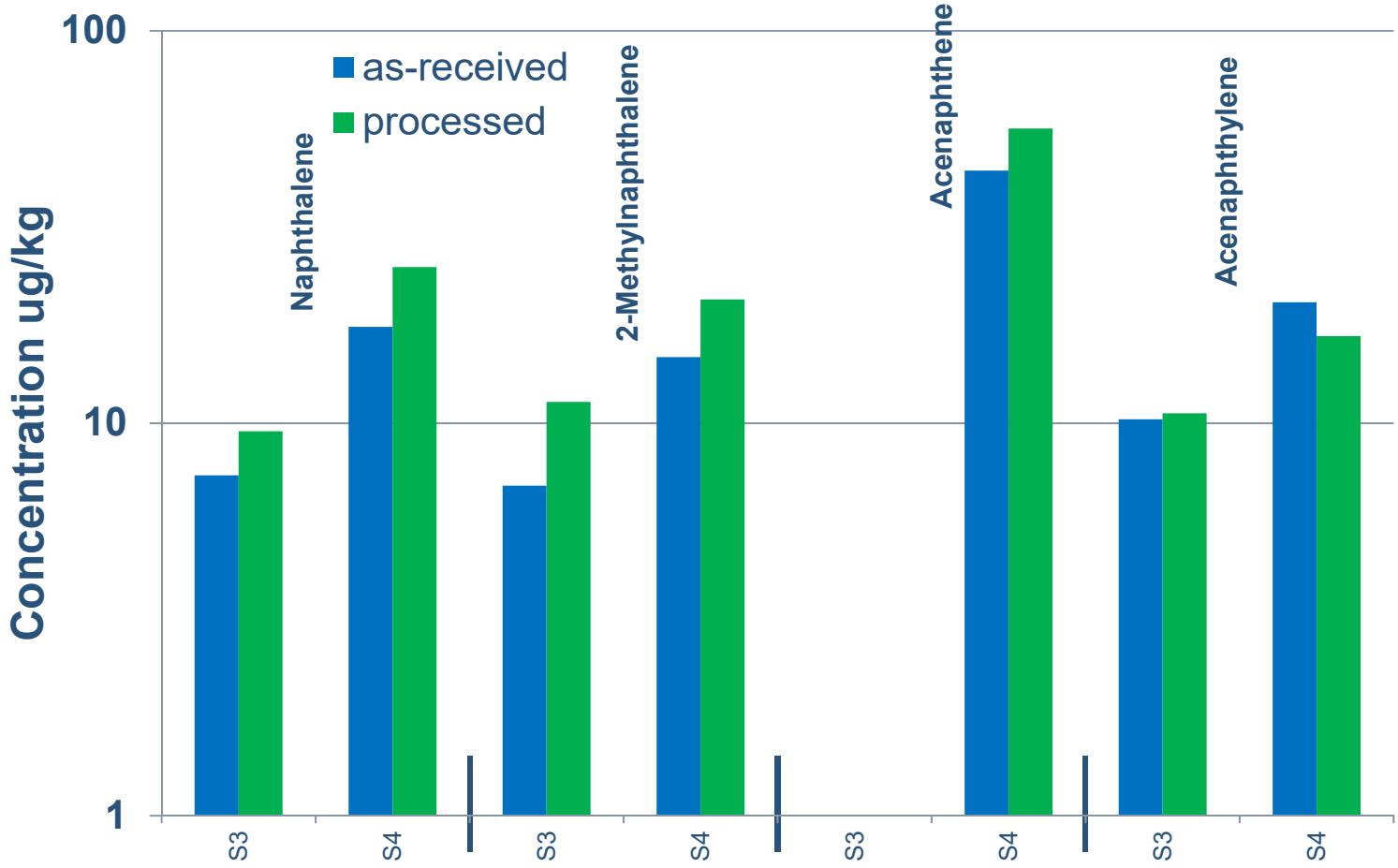
No Analyte Loss (Avg. 7%D)

Surface soil that was exposed to air in the field



Close Look at Low Boiling PAHs

No loss from surface soils during air drying



Lab Process Quality Assurance

ITRC ISM update

- Precision
  - Lab replicates
- Bias
  - Surrogate spiking
    - Solid spike material
  - Contamination control
    - Blank materials

Summary

Field techniques & tools for sampling at more difficult sites

- More increments
- More sampling tools

Lab tools for higher quality and more productive processing

- More selection guidance
- Tools update
- Quality Assurance guidance

Acknowledgements

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