

# **Incremental Sampling Methodology (ISM)**

**EMDQ Workshop  
La Jolla, CA  
March 26, 2012**

| Report Documentation Page                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                    |                                     |                                                           | Form Approved<br>OMB No. 0704-0188                  |                                 |
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# Why Collect Soil Samples?

Representative Data:

- ▶ Accurate
- ▶ Reproducible
- ▶ Defensible



....but how do we get it?

**Incremental Sampling Methodology (ISM)**

.....may be your answer.....

# Are Your Samples Representative?

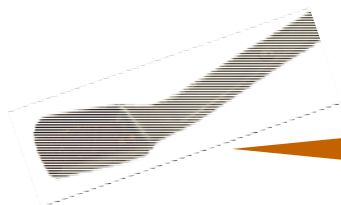
- ▶ How fully do you plan your sampling event?
- ▶ Are you confident in your sample results?
- ▶ How representative are your samples?
- ▶ Do you understand the distribution?
- ▶ How reproducible are your data?



## Sample Results - #%\*&^%!



# What Does the Sample Represent?



**Representative subsampling**



# What Do These Environmental Criteria Have In Common?

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- ▶ Most risk-based environmental criteria based on estimate of mean
  - Soil screening levels
  - Regional screening levels
  - Site-specific cleanup levels
  - Exposure point concentrations

# Uncertainty Sources



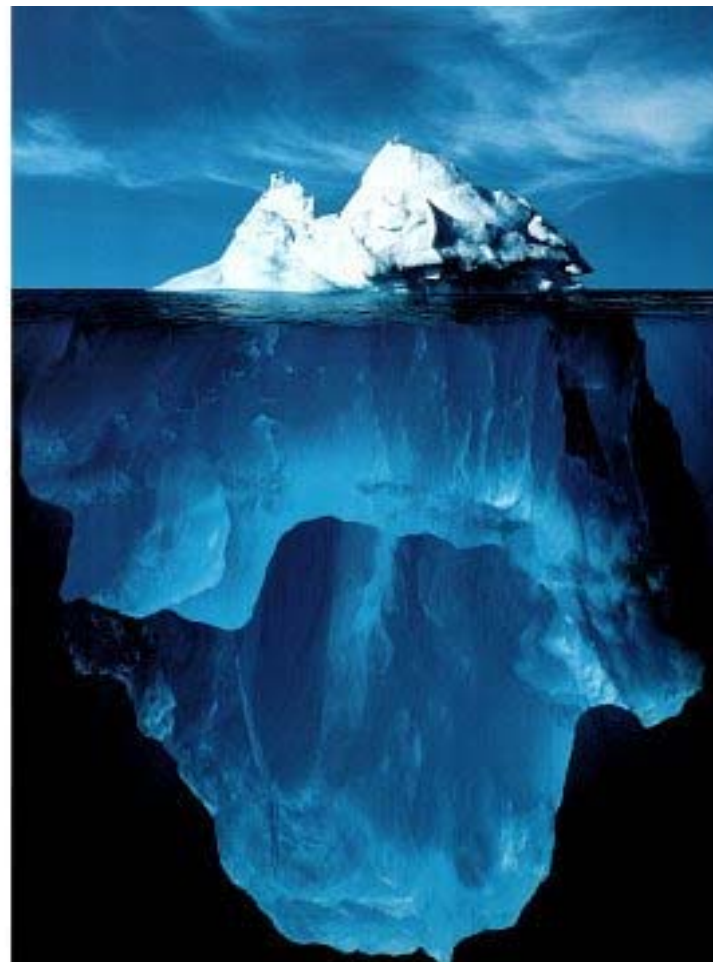
- ▶ Instrument analysis
- ▶ Sample preparation
- ▶ Laboratory sub-sampling
- ▶ Field sample collection



# Uncertainty Sources



- ▶ Instrument analysis
  - ▶ Sample preparation
- 
- ▶ Laboratory sub-sampling
  - ▶ Field sample collection



# What is Incremental Sampling Methodology (ISM)?

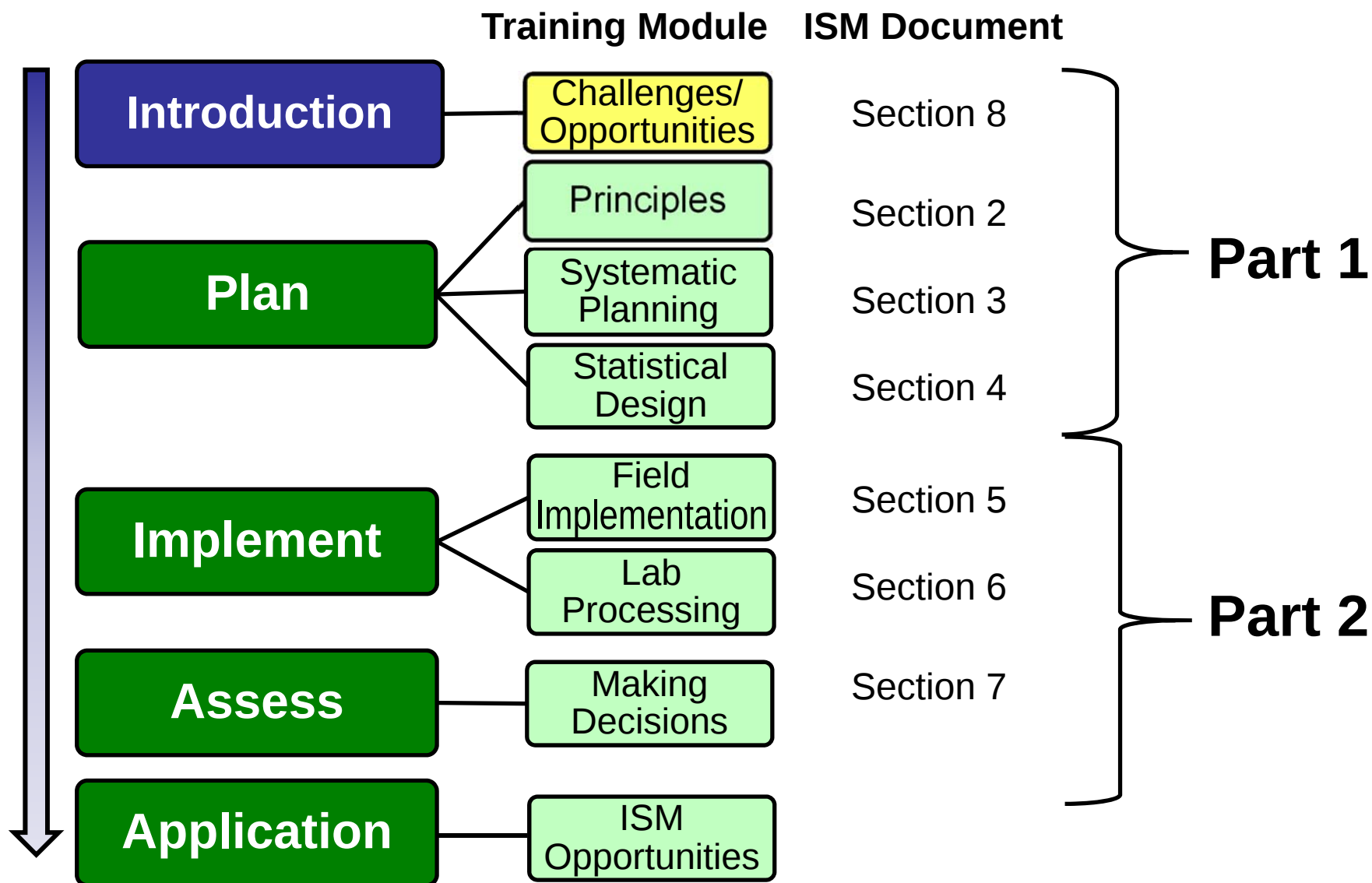
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**ISM Objective:** To obtain a single sample for analysis that has the mean analyte concentration representative of the decision unit

- ▶ Structured composite sampling and processing protocol
- ▶ Reduces data variability
- ▶ Provides a reasonably unbiased estimate of mean contaminant concentrations in an area/volume of soil targeted for sampling

**Decision Unit (DU):** the smallest volume of soil (or other media) for which a decision will be made based upon ISM sampling

# ISM Document and Training Roadmap



## 2009 ISM Survey: Areas of Question/Concern

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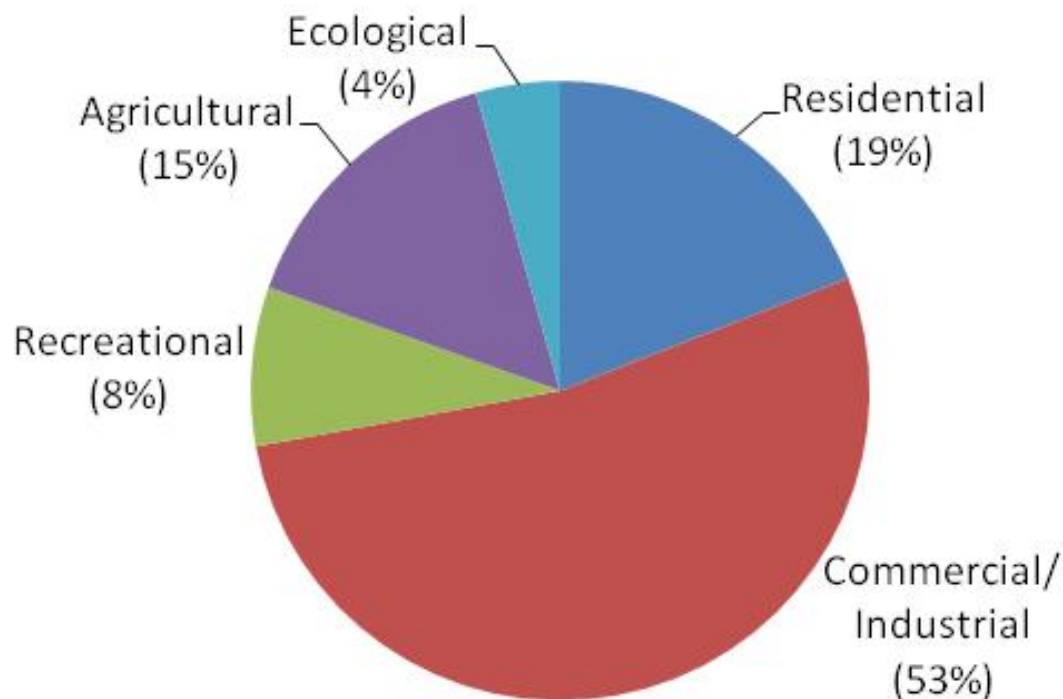
263 responses (75% respondents state regulators and consultants)

- ▶ Can ISM find “hot spots”?
- ▶ Do regulators allow or accept ISM?
- ▶ Can you collect volatile organic compound (VOC) samples?
- ▶ Does ISM delineate the extent of contamination?
- ▶ What’s the right size for a Decision Units (DUs)?
- ▶ Can you obtain Upper Confidence Limits (UCLs)?
- ▶ Can ISM and discrete results be compared?
- ▶ Are there approved laboratory processes and certification?
- ▶ How much does ISM cost?

**Reluctance to use ISM stems from a lack of experience**

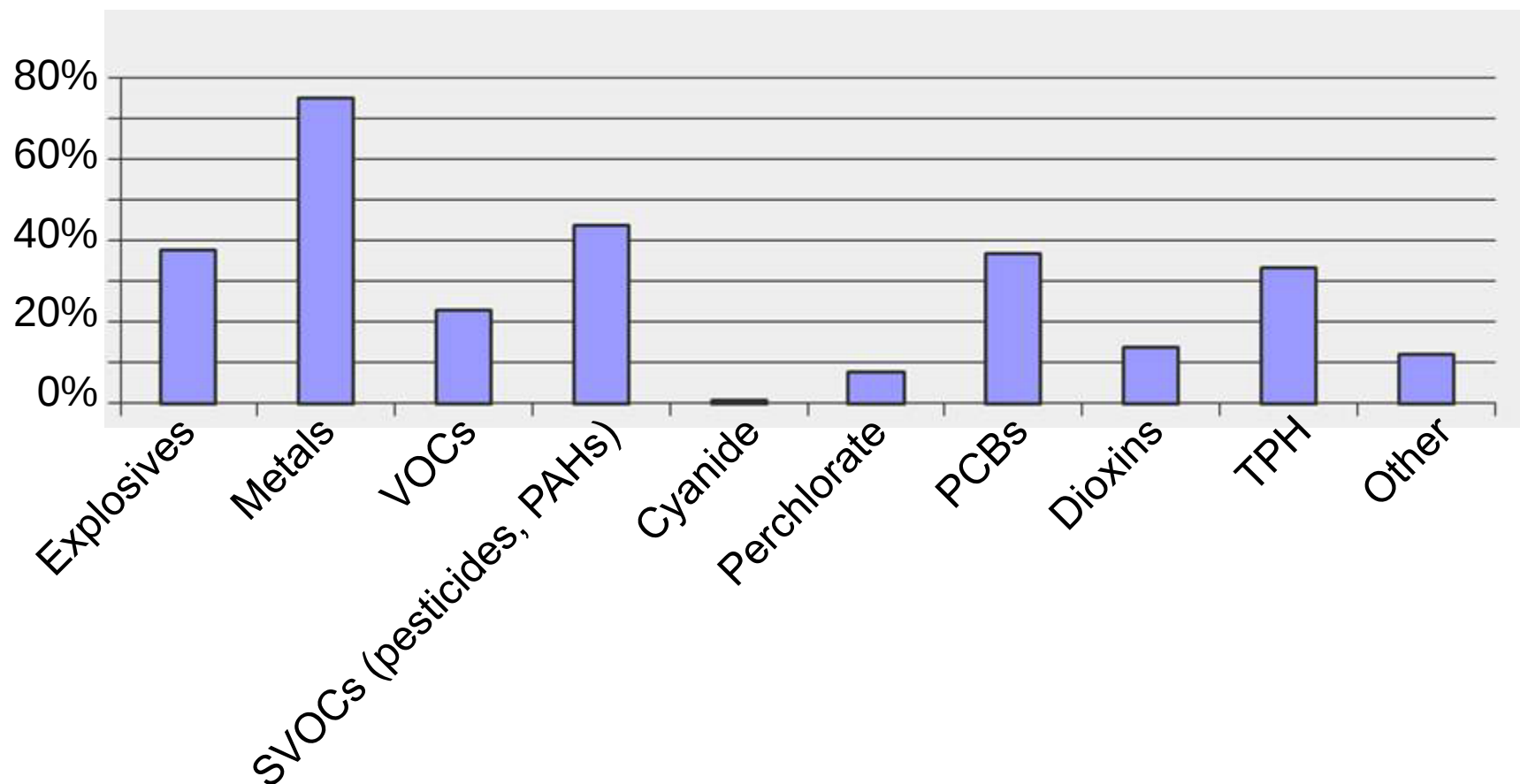
## 2009 ISM Survey: ISM Sampling and Land Use

ISM primarily used at commercial/industrial sites  
but applicable to all types of sites



## 2009 ISM Survey: Chemicals of Interest for Incremental Sampling?

ISM can be used at sites with a broad range of contaminants



## ISM – What is Your Perception? 2009 ISM Survey Revealed.....

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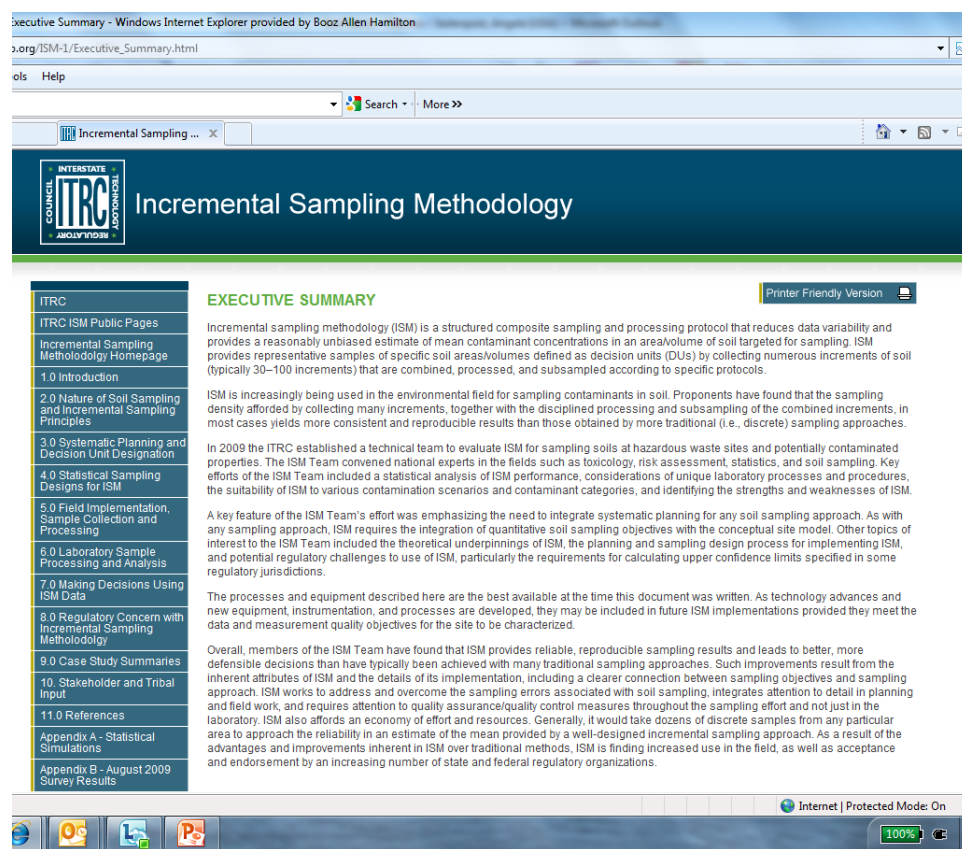
- ▶ Common misperceptions: “It’s just composite sampling, misses hot spots, and costs more.”
- ▶ Few state regulators had heard of ISM and very few with ISM experience
- ▶ Hawaii, California, and Alaska made up over 40% of the reported ISM projects
- ▶ More than half of the state regulators responded that ISM was discouraged

**We accepted the challenge to provide tools for state regulators, consultants, and others to learn the value of ISM and how to apply ISM**

# Our ITRC Solution: ITRC ISM-1 Technical and Regulatory Guidance Document



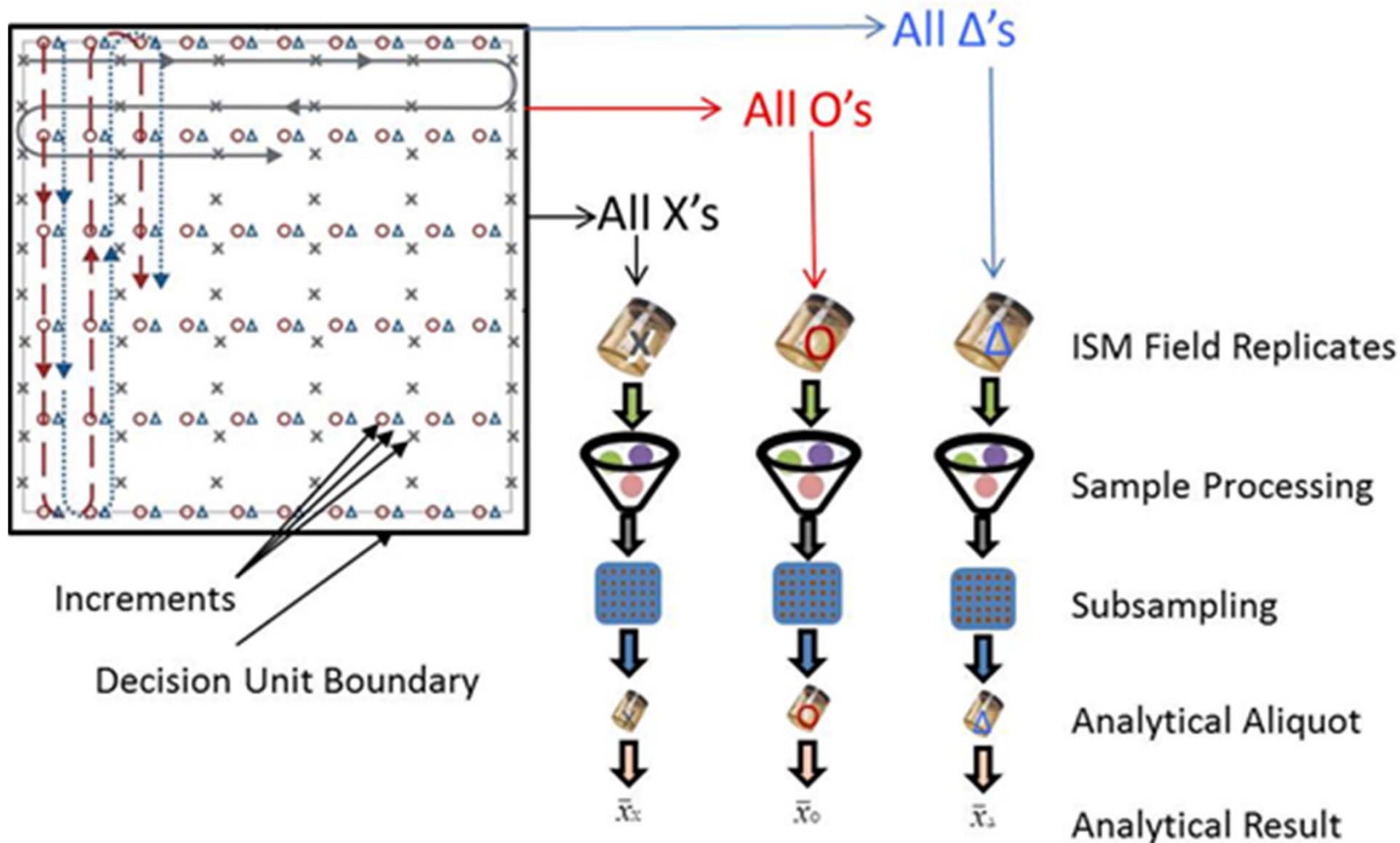
Web-Based Document at:  
<http://www.itrcweb.org/ISM-1/>



- ▶ Fundamental understanding of how and why ISM works
- ▶ Detailed instructions for design and implementation
- ▶ Addresses potential regulatory concerns
- ▶ Provides case studies and simulations



# What is Incremental Sampling Methodology (ISM)?



# Advantages and Limitations of ISM

Include acute toxicity?

| Advantages of ISM                                   | Effect                                                                                 |
|-----------------------------------------------------|----------------------------------------------------------------------------------------|
| Improved spatial coverage (increments x replicates) | • Sample includes high and low concentrations in proper proportions                    |
| Higher Sample Mass                                  | • Reduces errors associated with sample processing and analysis                        |
| Optimized processing                                | • Representative subsamples for analysis                                               |
| Fewer non-detects                                   | • Simplifies statistical analysis                                                      |
| More consistent data                                | • More confident decision                                                              |
| Limitations of ISM                                  | Effect                                                                                 |
| Small number of replicates                          | • Limits Upper Confidence Limit calculation methods                                    |
| No spatial resolution within Decision Unit          | • Limits remediation options within Decision Unit<br>• Limits multivariate comparisons |

## ISM – What's In It For YOU?

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- ▶ Fewer analyses but a more representative sample
- ▶ High quality data leads to a more confident decision
- ▶ Potential for cost savings

## Are YOU the next ISM User?

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This training will provide answers and show you how ISM fits with sampling and decision making.

**How**

**?**

**Why**

**When**

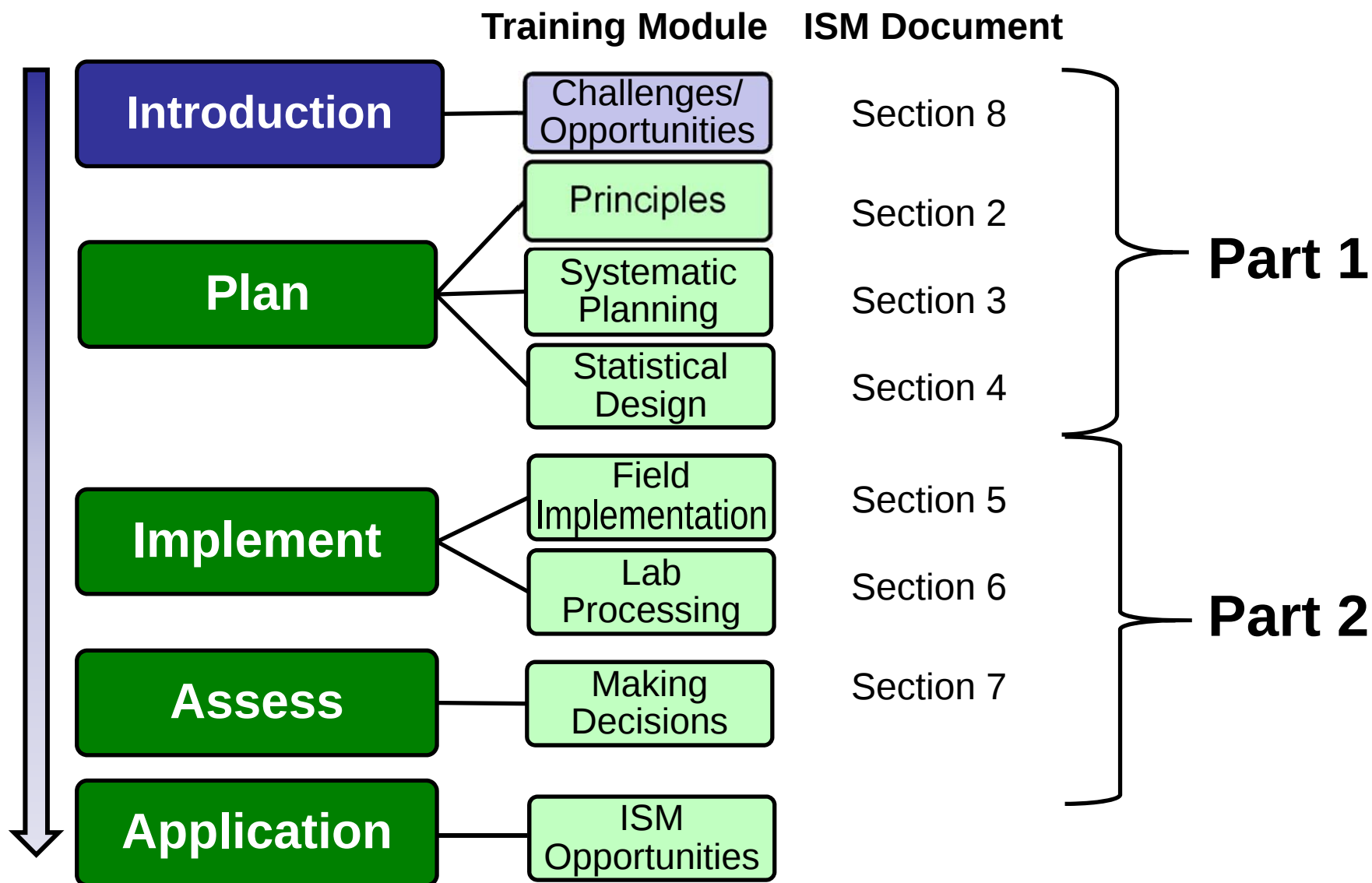
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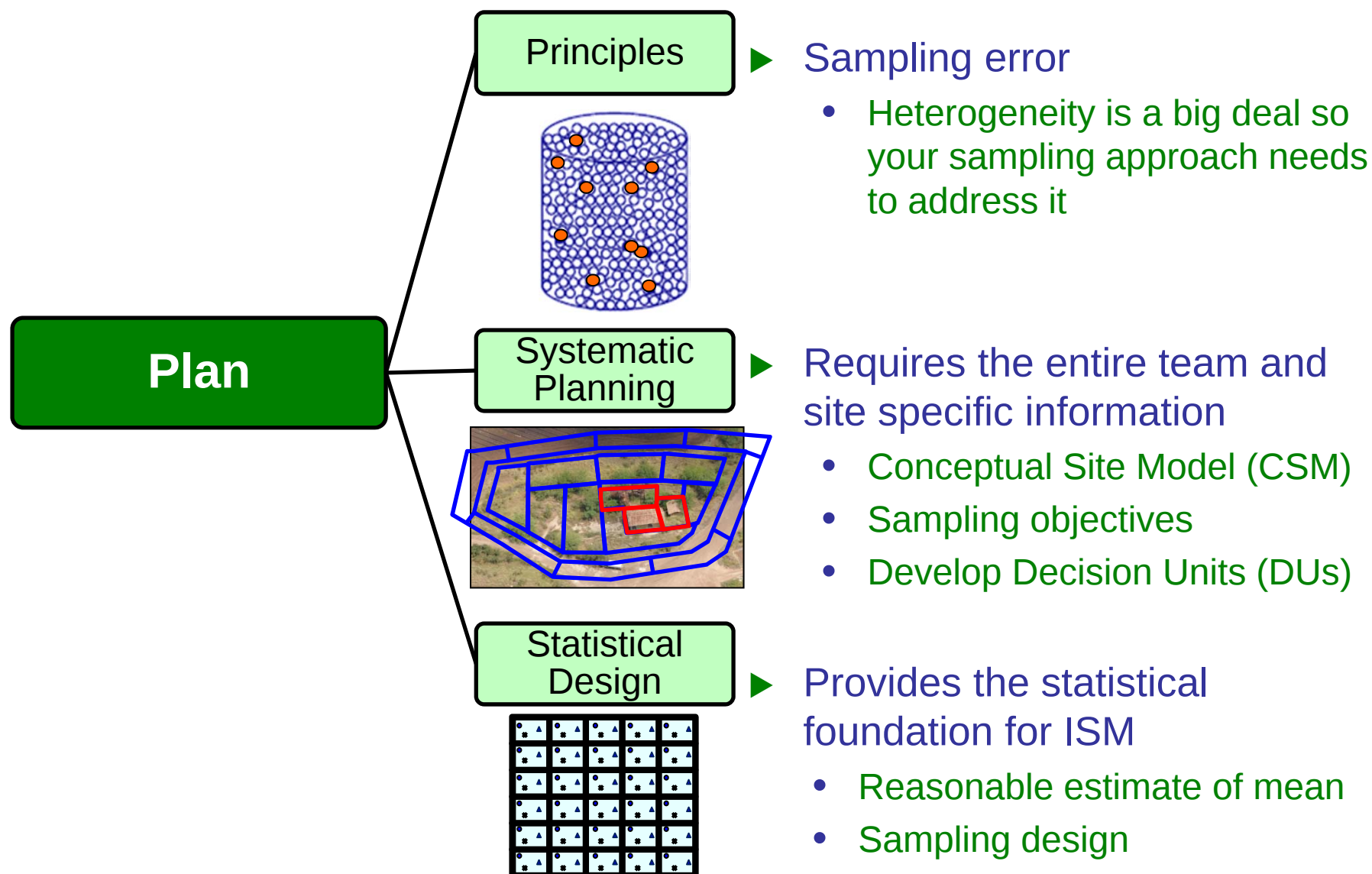
**What**

**Where**

# ISM Document and Training Roadmap



# ISM Part 1 – Principles, Systematic Planning, and Statistical Design



# ITRC ISM Document and Training Roadmap

