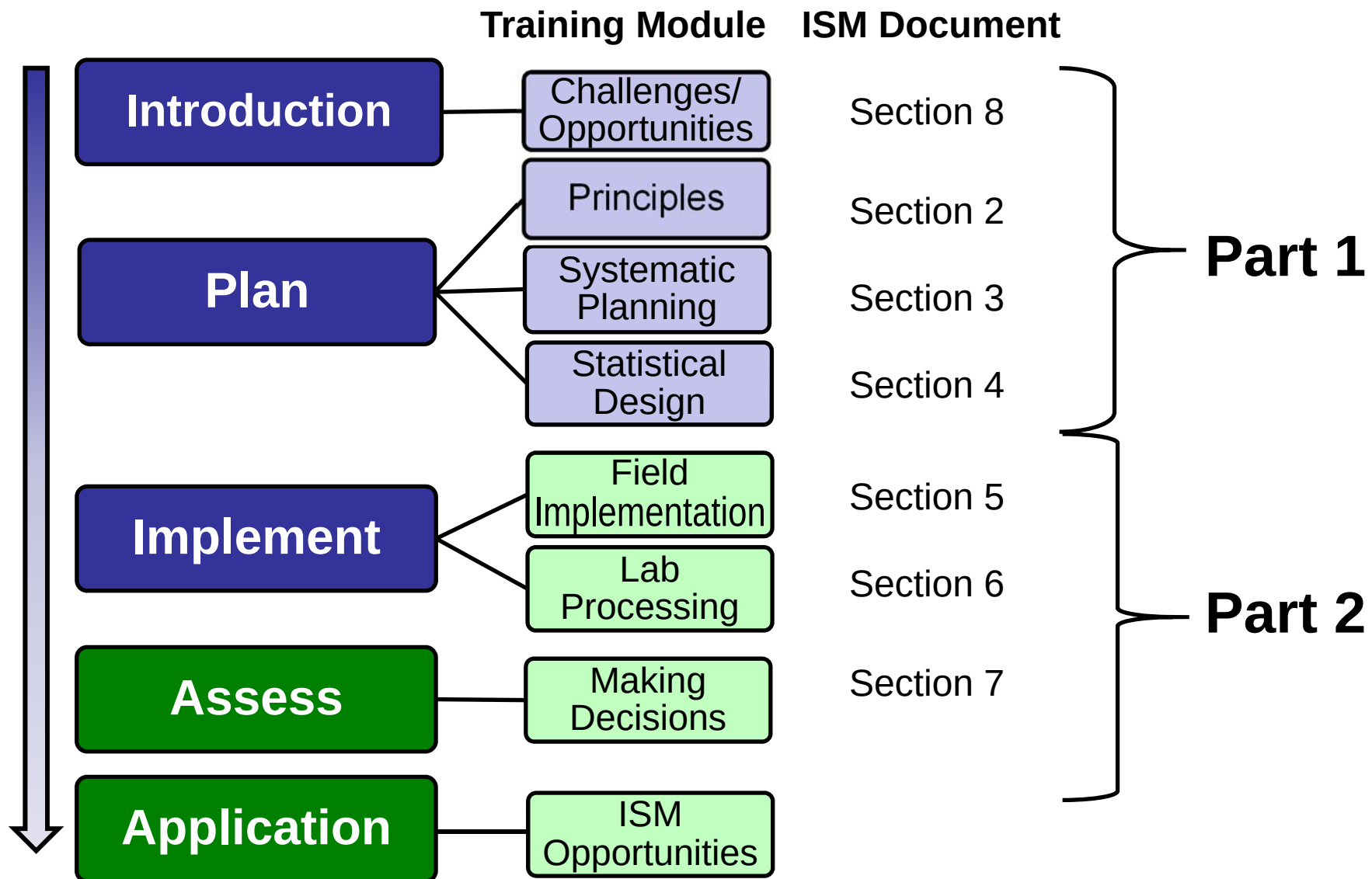


ISM Document and Training Roadmap



Report Documentation Page				Form Approved OMB No. 0704-0188	
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1. REPORT DATE MAR 2012		2. REPORT TYPE		3. DATES COVERED 00-00-2012 to 00-00-2012	
4. TITLE AND SUBTITLE ISM Document and Training Roadmap: Field Implementation Learning Objectives				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S)				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Interstate Technology and Regulatory Council (ITRC), 50 F Street NW Ste 350, Washington, DC, 20001				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release; distribution unlimited					
13. SUPPLEMENTARY NOTES Presented at the 9th Annual DoD Environmental Monitoring and Data Quality (EDMQ) Workshop Held 26-29 March 2012 in La Jolla, CA. U.S. Government or Federal Rights License					
14. ABSTRACT					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT Same as Report (SAR)	18. NUMBER OF PAGES 31	19a. NAME OF RESPONSIBLE PERSON
a. REPORT unclassified	b. ABSTRACT unclassified	c. THIS PAGE unclassified			

Field Implementation Learning Objectives

Learn how to:

- ▶ Collect an ISM sample
 - Understand the similarities and differences between surface and subsurface ISM sampling
 - Consider issues specific to non-volatile and volatile ISM sampling
 - Implement and collect ISM replicate samples

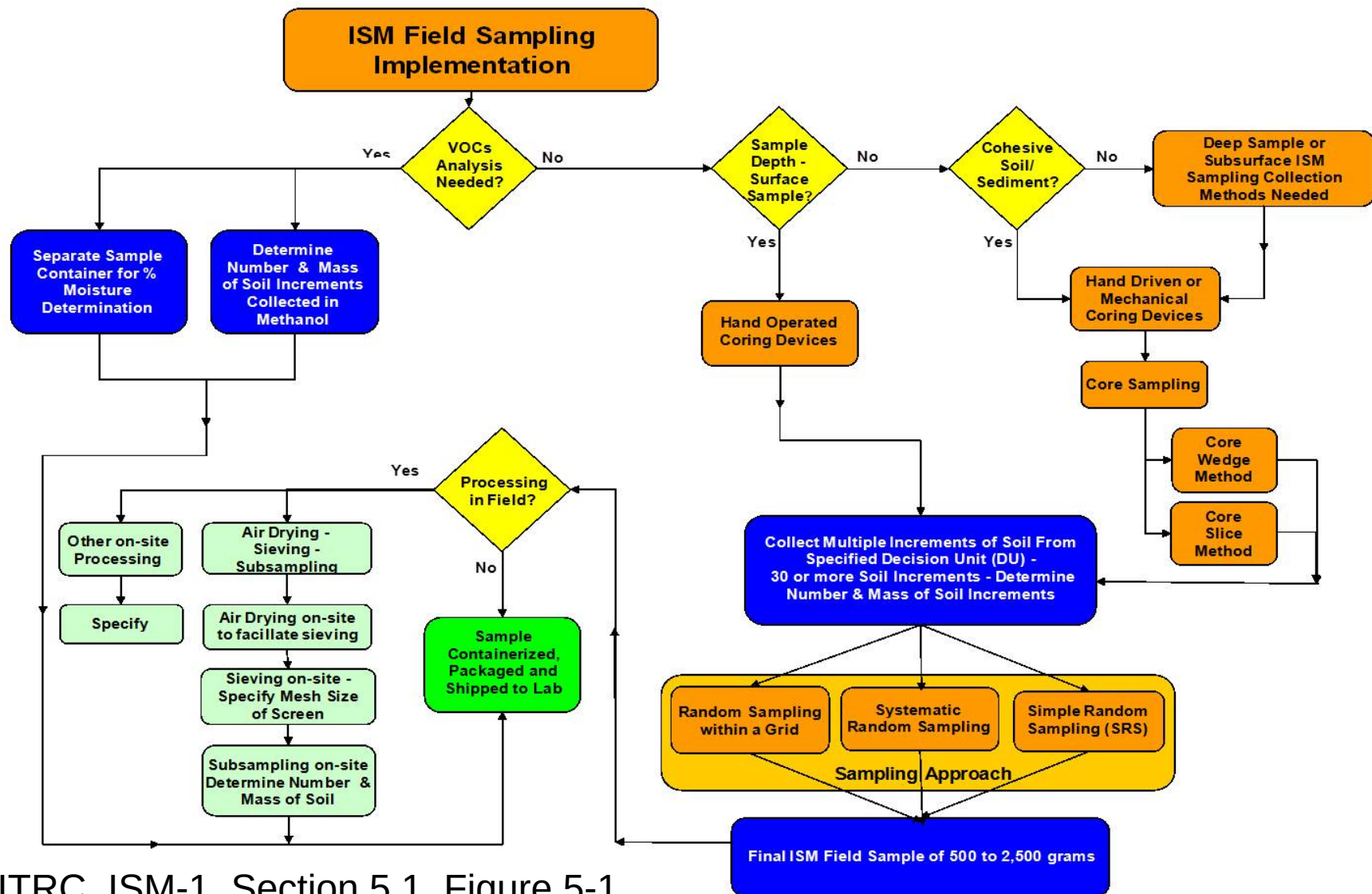


Key Presentation Topics

- ▶ Sampling design
- ▶ Sampling tools
- ▶ ISM surface/subsurface sampling
 - Cores and subsampling
- ▶ Specific contaminant of concern (COC) considerations
 - Non-volatile and volatile
- ▶ ISM replicates



ISM Field Sampling Implementation

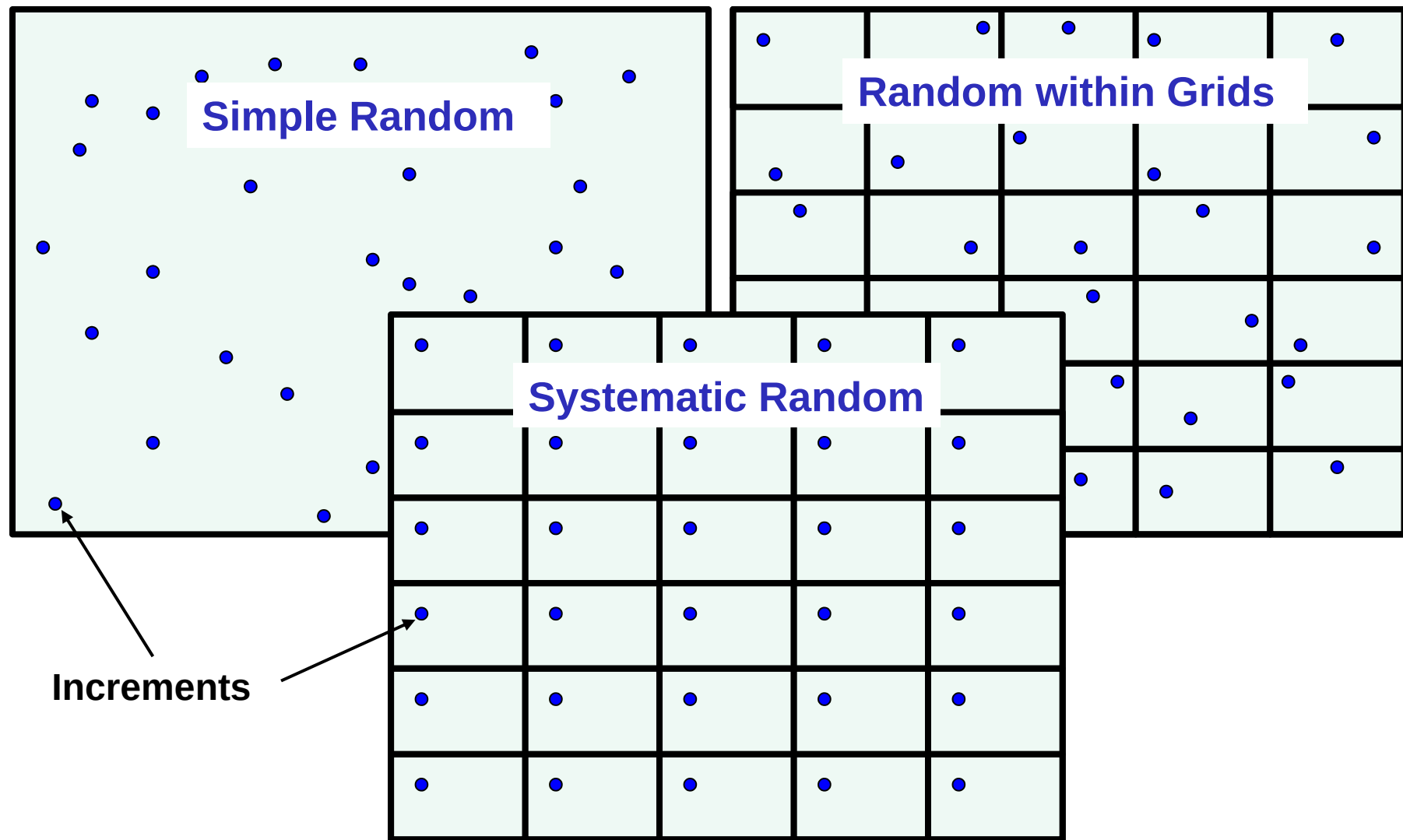


Sample Collection Components

- ▶ Decision Unit (DU) sampling design
 - Simple random sampling
 - Random sampling within a grid
 - Systematic random sampling
- ▶ Sampling tools
 - Core shaped
 - Adequate diameter
- ▶ Mass
 - Increment mass
 - Sample mass



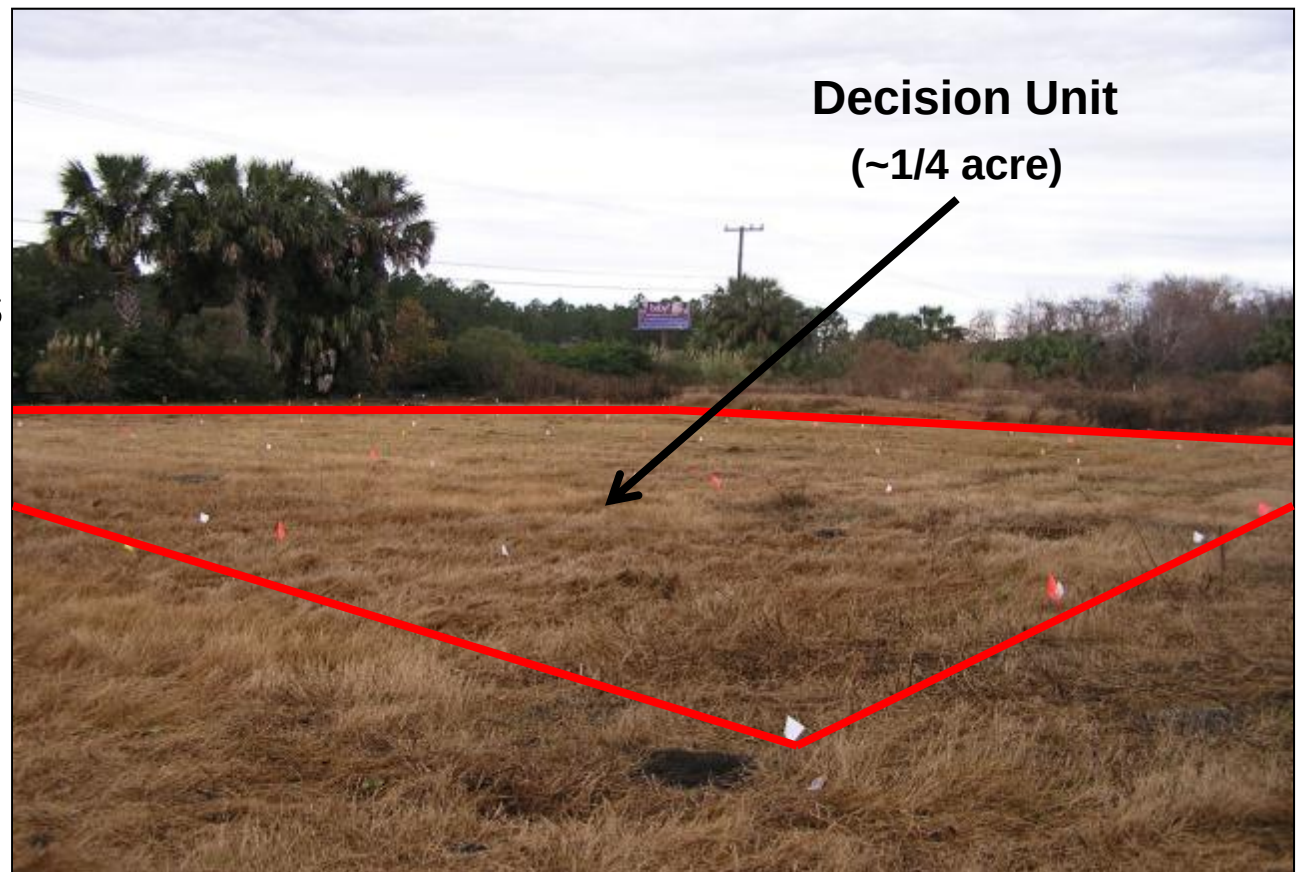
Sampling Designs



Florida Case Study: Decision Unit (DU) Identification

► Identify DU in the field

- Use typical environmental site investigation procedures
- Examples
 - Survey
 - GPS
 - Swing ties



Increment Locations

- Identify increment locations in field
 - Utilize similar site investigation tools



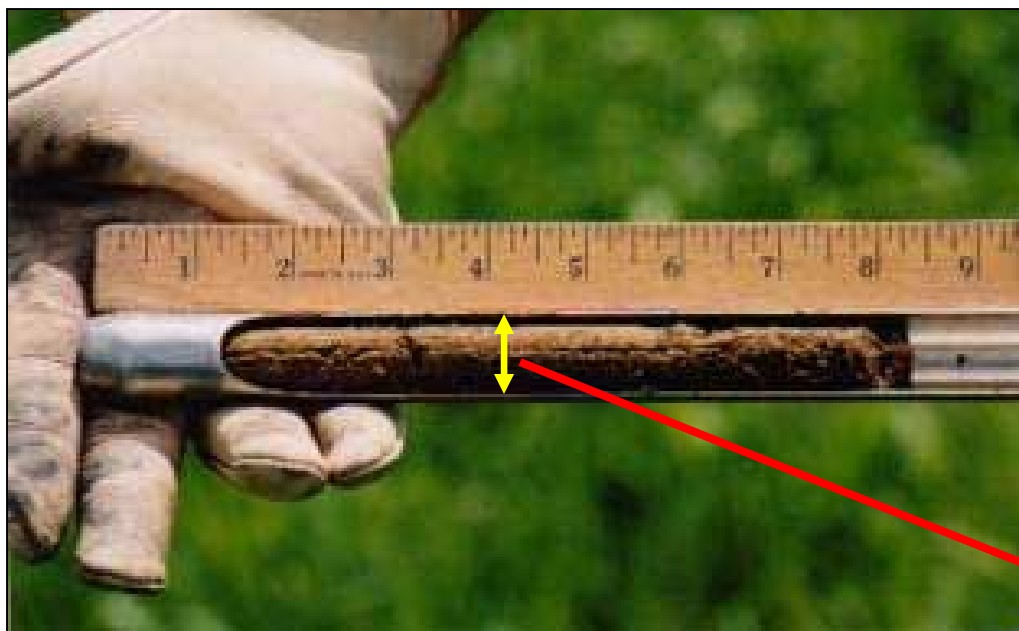
9 Florida Case Study: Increment Field Determination



Sampling Tool Considerations

► Criteria - shape

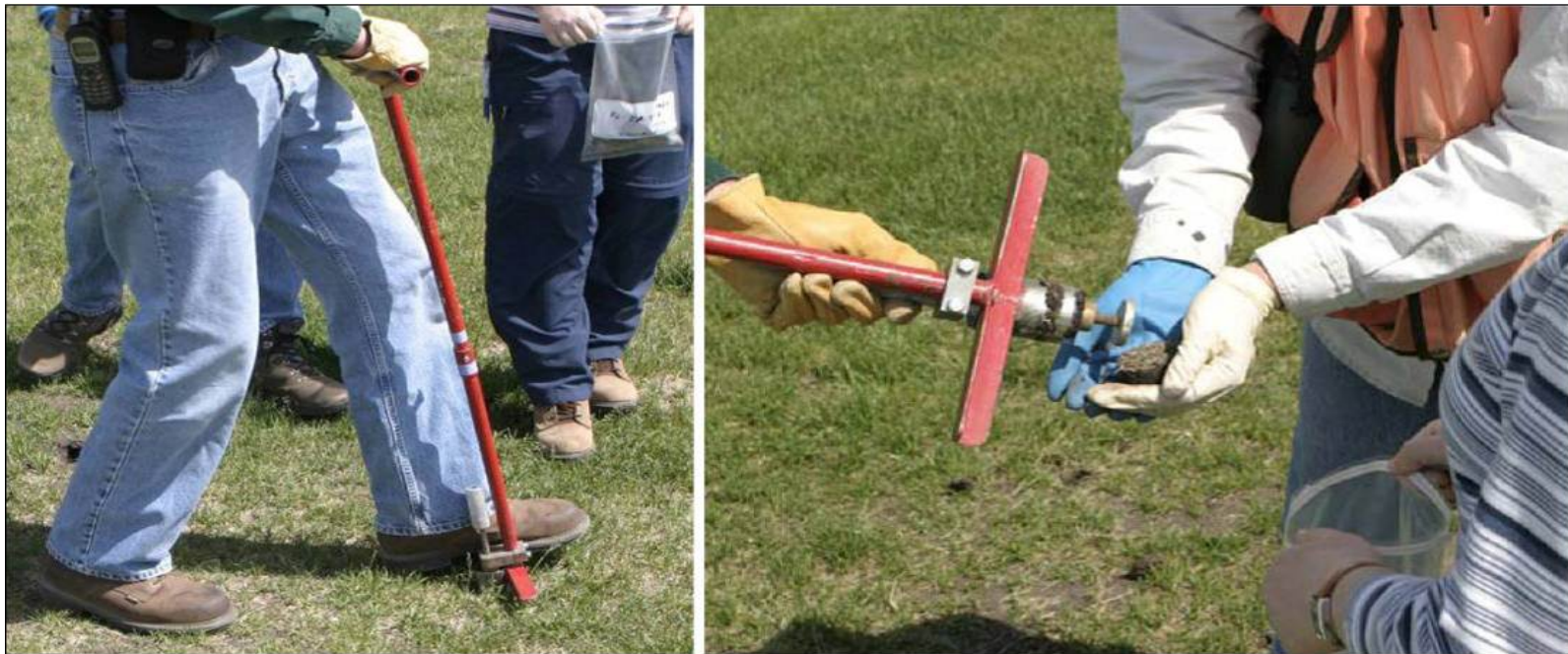
- Cylindrical or core shaped increments
- Minimum diameter required – based on particle size (soil fraction) of interest



e.g., core diameter
>16 mm

Additional Considerations

- ▶ Decontamination
 - Not necessary within DU (including replicates)
- ▶ Sampling tool
 - Appropriate for matrix and contaminant of interest



Sampling Tool Examples

Soft Surface Soil



Source: Courtesy <http://www.jmcsoil.com/index.html>
<http://fieldenvironmental.com/evc-incremental-sampler.php>

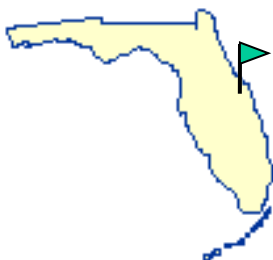
Alternate Sampling Tools



Hard Surface Soil

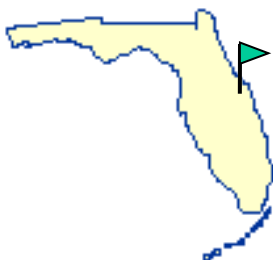
ITRC, ISM-1, Section 5.2; Figure 5-2b

Florida Case Study: Field Sampling



15

Florida Case Study: “Low Tech” Sampling Tools



Adequate Sample Mass

► Criteria – mass (non-volatile)

- Recommended mass per increment: 20-60 grams
- Final ISM samples: generally 600-2,500 grams

$$M_s = \rho \cdot n \cdot D_s \cdot \pi \cdot (q / 2)^2$$

M_s – targeted mass of sample (g)

D_s – increment length (cm)

n – number of increments

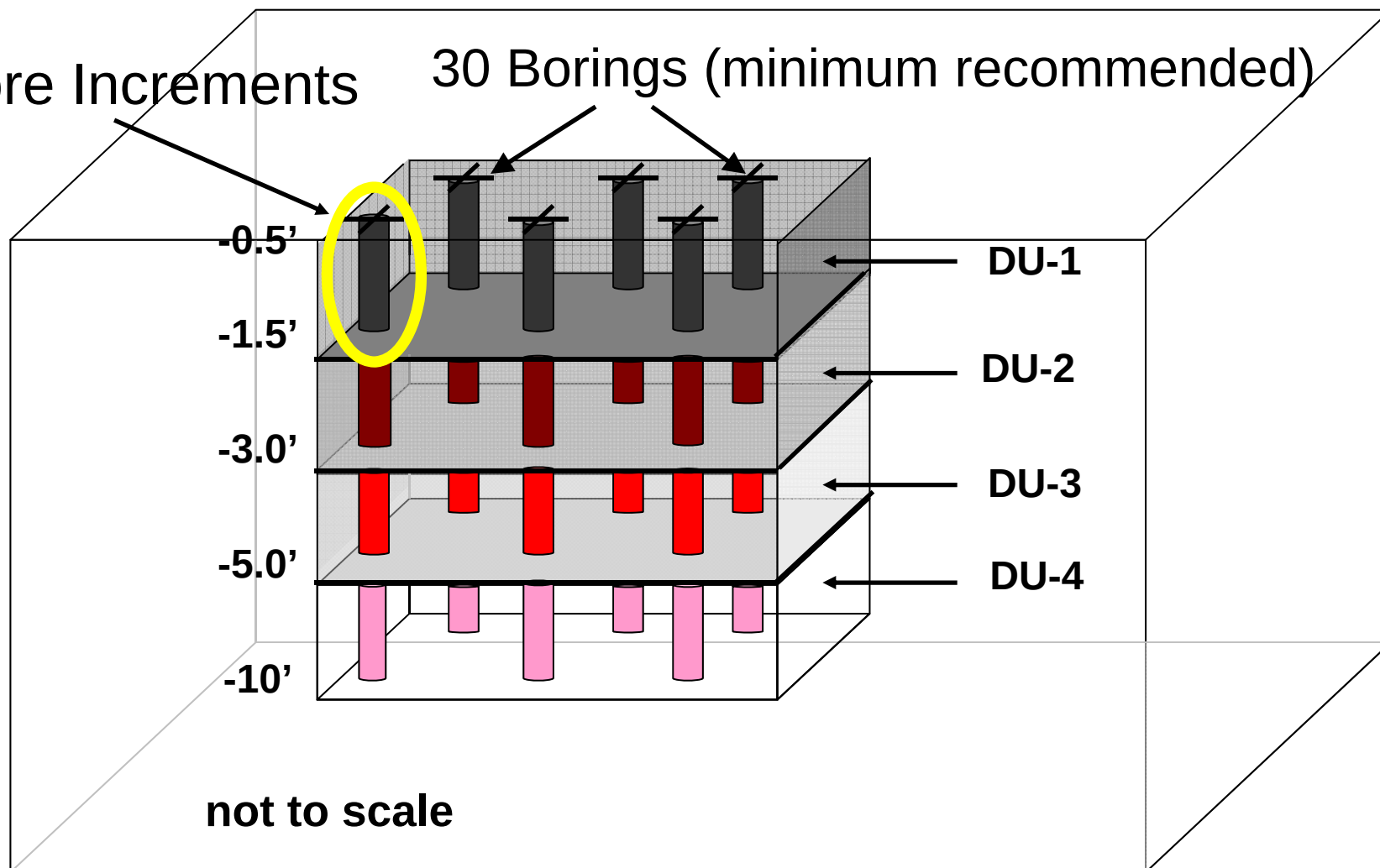
ρ - soil or sediment density (g/cm³)

q - diameter of sample core (cm)



Subsurface Decision Units (DU)

Core Increments 30 Borings (minimum recommended)



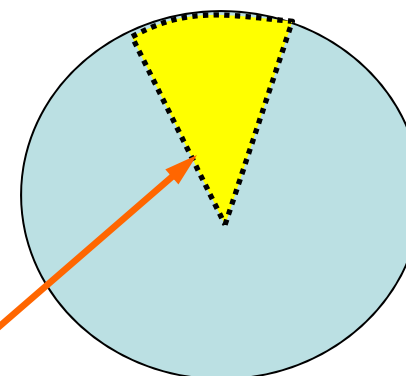
Individual core samples *combined* to prepare an ISM sample for each DU

Subsurface Sampling Considerations

- ▶ Preferred increment – entire core interval
- ▶ Core subsampling alternatives
 1. Core wedge
 2. Core slice



Core Wedge



e.g., wedge width
>16 mm

Continuous wedge removed from entire length of targeted DU interval for 100% coverage

Core Slice



**Core Slice removed from randomly selected interval
length of targeted DU depth**

ITRC, ISM-1, Section 5.3.2.1

Field Processing for Non-Volatiles

- ▶ ISM sample processing in a controlled laboratory environment is recommended to reduce error
- ▶ Field processing may be applicable if project specific DQOs can be met



Florida Case Study: Non-Volatile ISM Sample Logistics

- ▶ Final ISM samples: typically 600-2,500 grams or more
 - Containers, storage, shipping
- ▶ Laboratory
 - Facilities and equipment for correct processing and subsampling



ISM Volatile Sampling Tools

- ▶ Core type sampler
- ▶ Typical for VOC soil sampling per SW846 5035A



ISM Volatile Samples – Subsurface

- ▶ Numerous increments collected across core/depth interval



ISM Volatile Sample Logistics

► VOC preservation and analysis

- Increments are extruded from sampler directly into volume of appropriate container with predetermined methanol
- Methanol preserved sample submitted to laboratory
- Note shipping restrictions/requirements

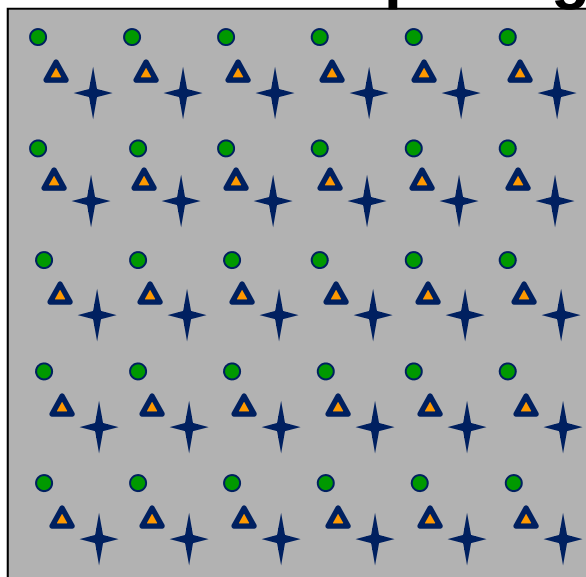


Replicates Recommended

- ▶ Increments collected from alternate random locations
 - Independent samples, not “splits”
- ▶ Minimum 3 replicate set for statistical evaluations
- ▶ Additional replicates may be necessary depending on contaminant heterogeneity and project specific DQOs

Replicate Spacing and Collection

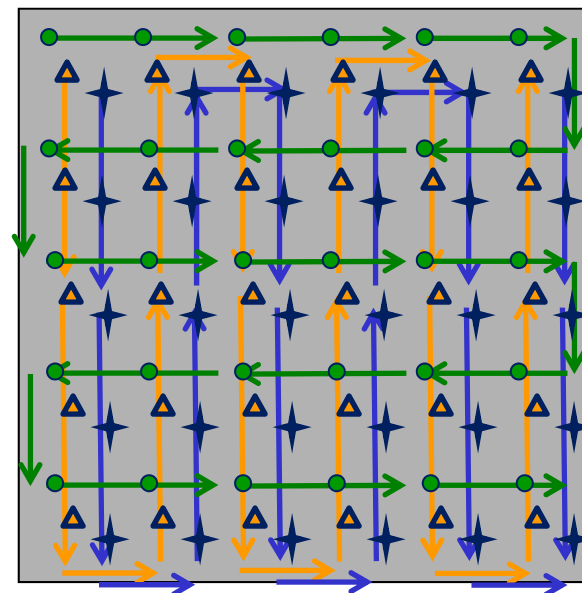
Replicate Increment Spacing



Decision Unit

R1  R2  R3 

Sample Collection



Decision Unit

Replicate 1 
 Replicate 2 
 Replicate 3 

Field Replicates – Simple Example



Replicate/Sampling Reminders

► Replicates

- What type
- How many
- Where/when will they be collected
- How will they be evaluated

► “Homogenizing” or mixing not necessary

- Laboratory processing and subsampling (following module) designed to attain representative analytical sample

Field Implementation Summary

- ▶ Determined during Systematic Planning
 - Sampling design
 - Adequate sampling tools
 - ISM surface/subsurface sampling logistics
 - Subsurface cores and subsampling
 - Specific contaminant of concern (COC) considerations
 - Non-volatile and volatile
 - ISM replicates



ISM Document and Training Roadmap

