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Incremental Sampling Methodology – Final ITRC Guidance

Mark Bruce Ph. D.

August 8, 2012

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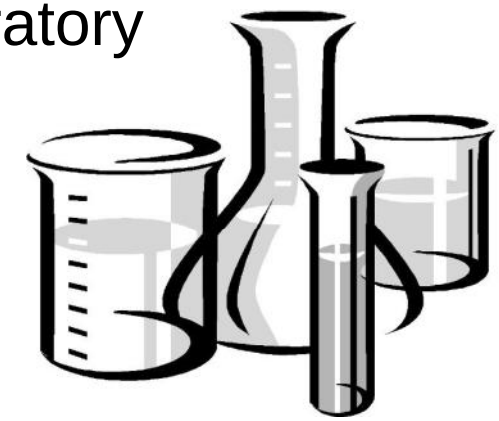
ISM Benefits All

Laboratory



Consultant

Regulators

Industrial company or

other potentially responsible party

Community or

environmental advocate

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Chasing Uncertainty Sources

- Instrumental analysis

- Sample preparation

- Laboratory sub-sampling

- Field sample collection

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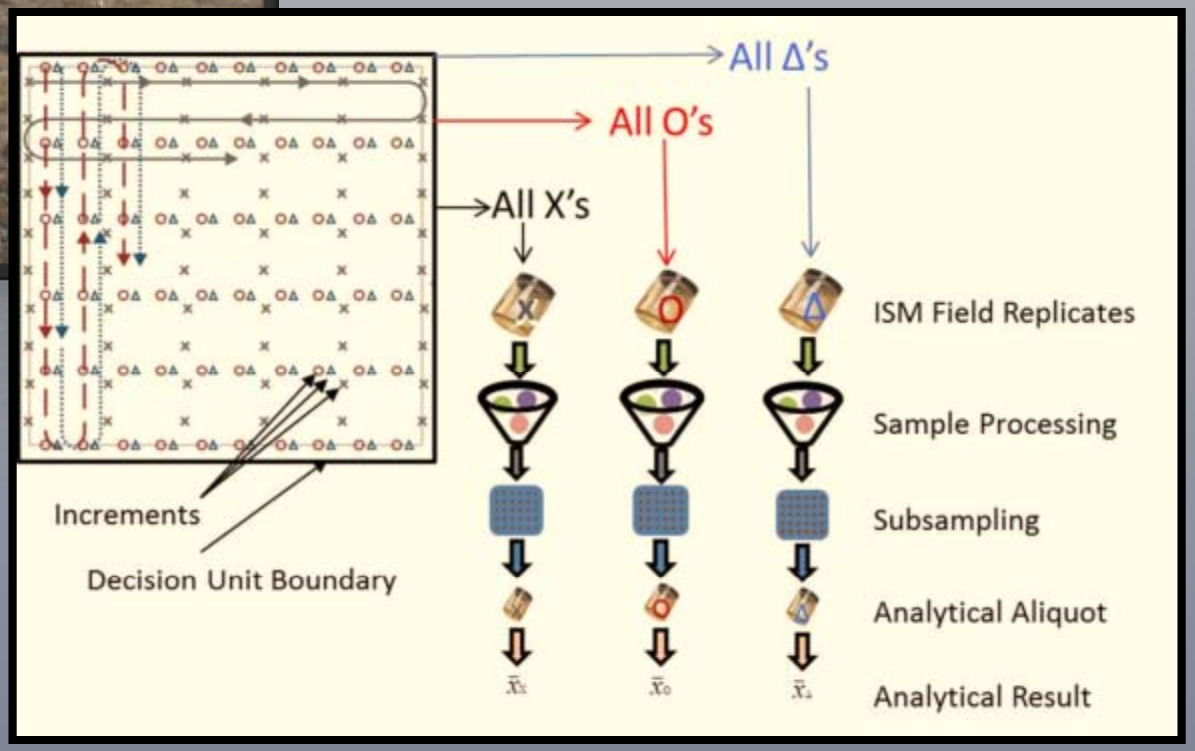
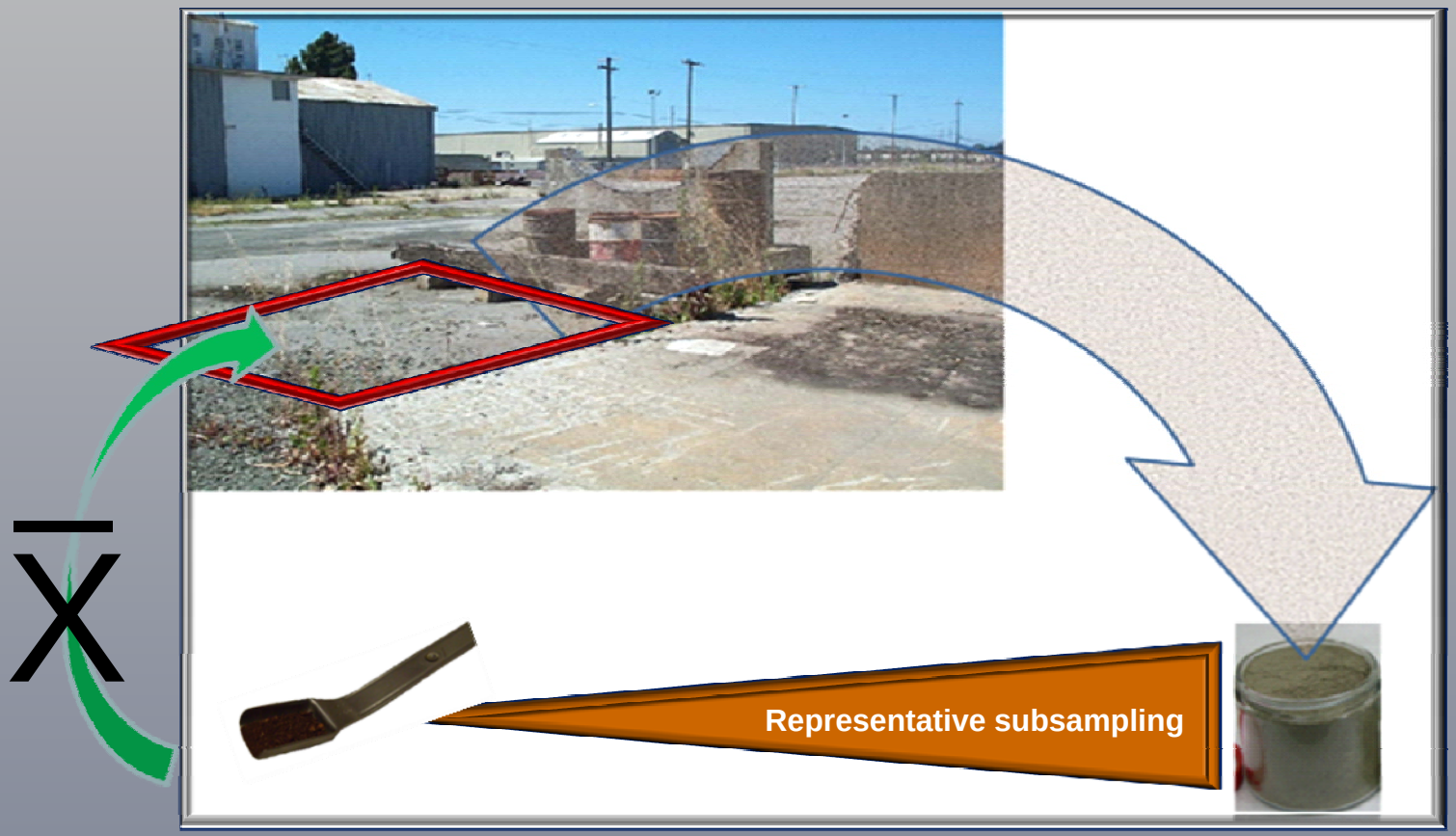
ISM Advantages

Advantage	Effect
• Better spatial coverage	• Includes high & 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

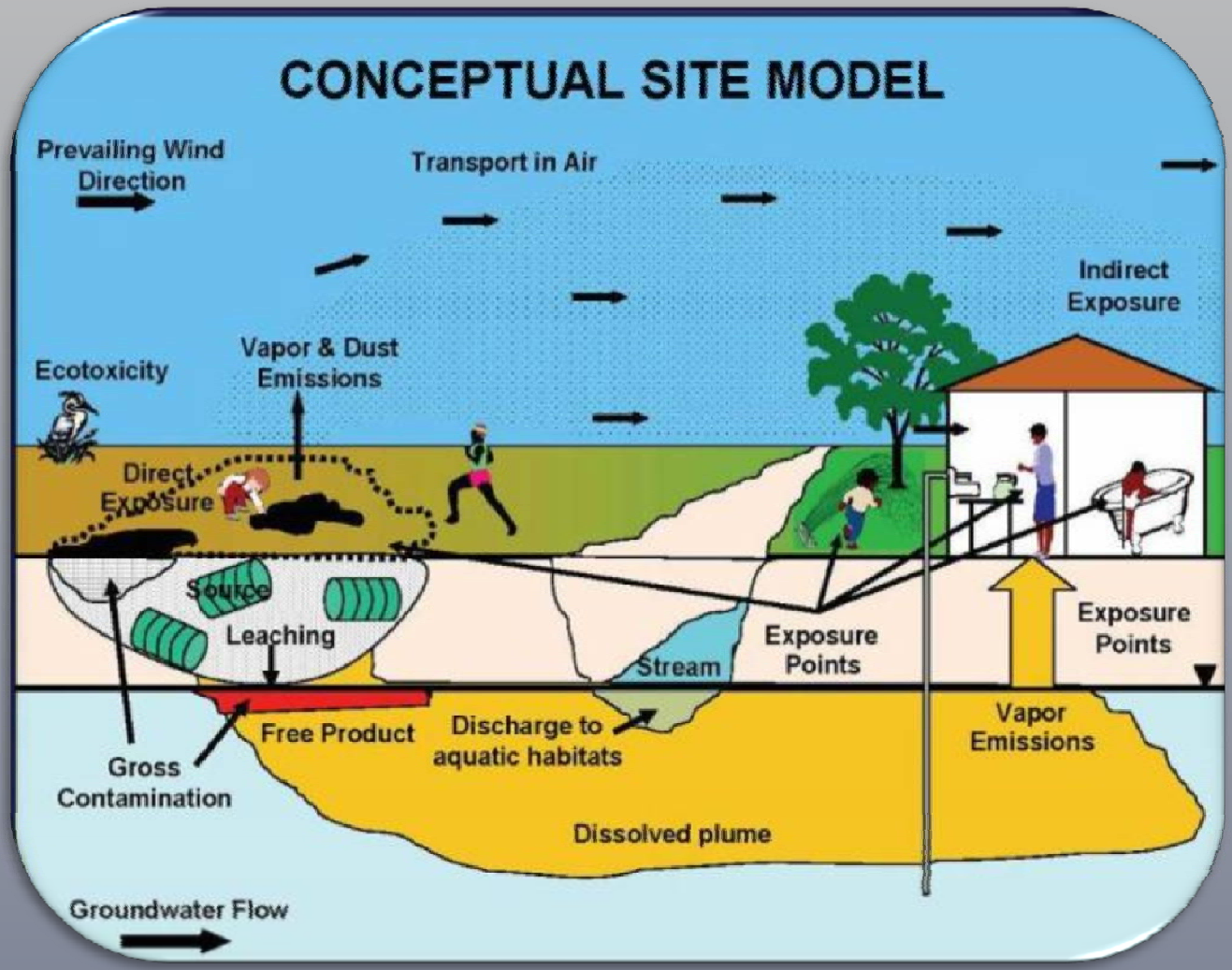
ISM is a “new” approach to site investigation



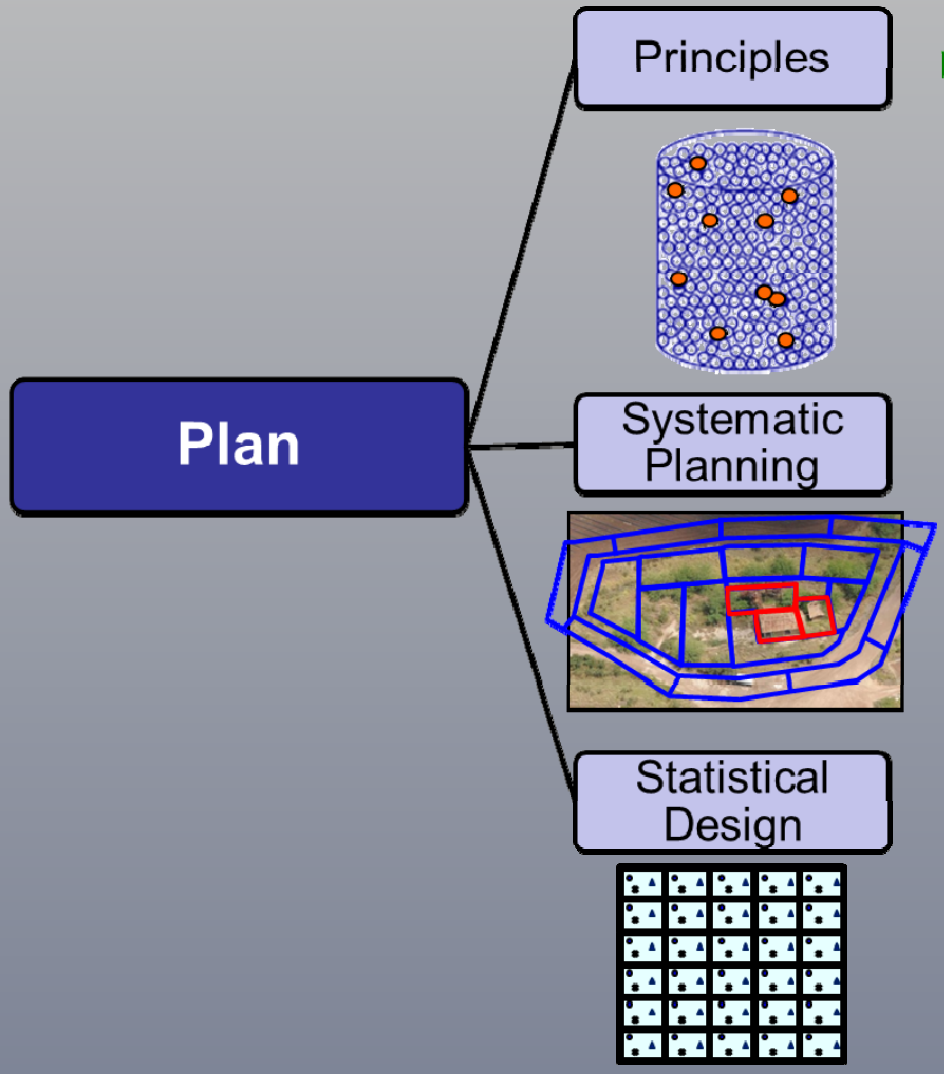
ISM Goal = obtain a representative sample!



ISM relies on systematic planning – to develop a Conceptual Site Model



Develop a plan to meet the objectives; sampling design should align with objectives.



- Reduce sampling errors
  - Heterogeneity rules!

- Plan, Plan, Plan
  - Involve the entire team
  - Know your site
  - Know your objectives
  - Focus your decisions

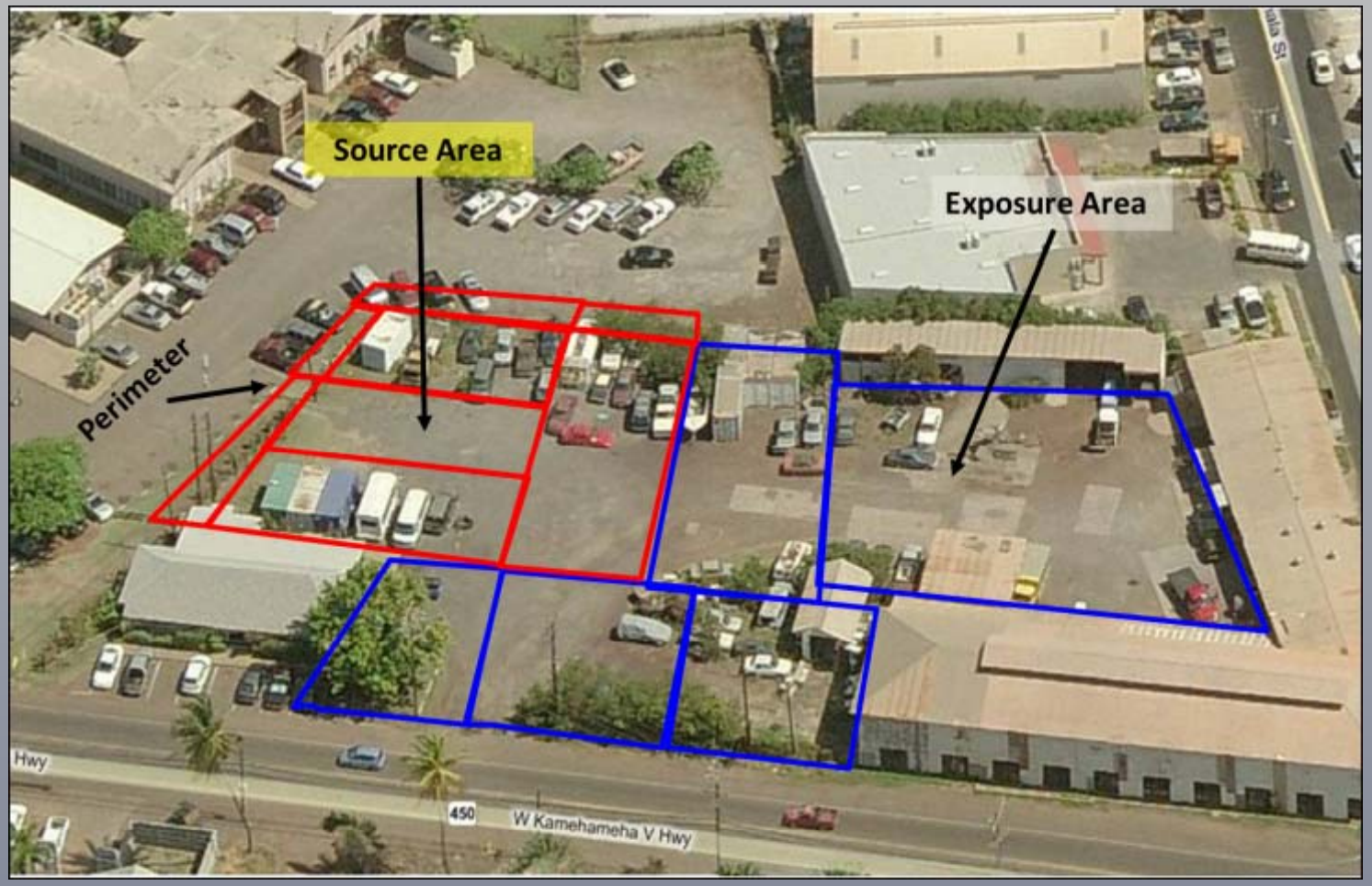
- Design for Confidence
  - The mean is the goal!
  - Collect replicates to calculate UCL

Define the decision units

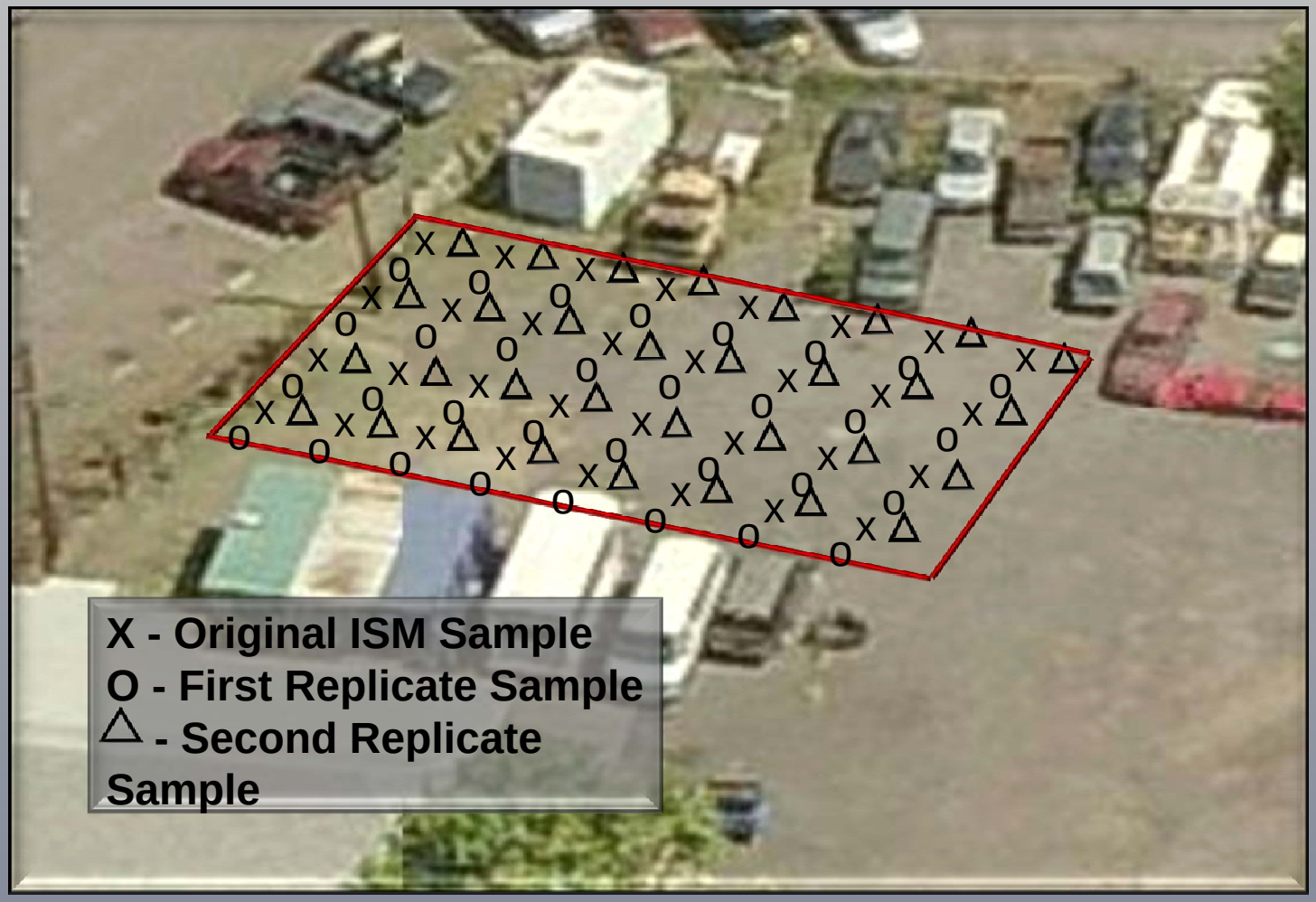
Source Area DUs: Heavy contamination + leaching

Exposure Area DUs: Maximum 5,000 ft²

There are several types of DUs



Randomly determine increments for sampling



Collect Samples

Process Samples

Disaggregating

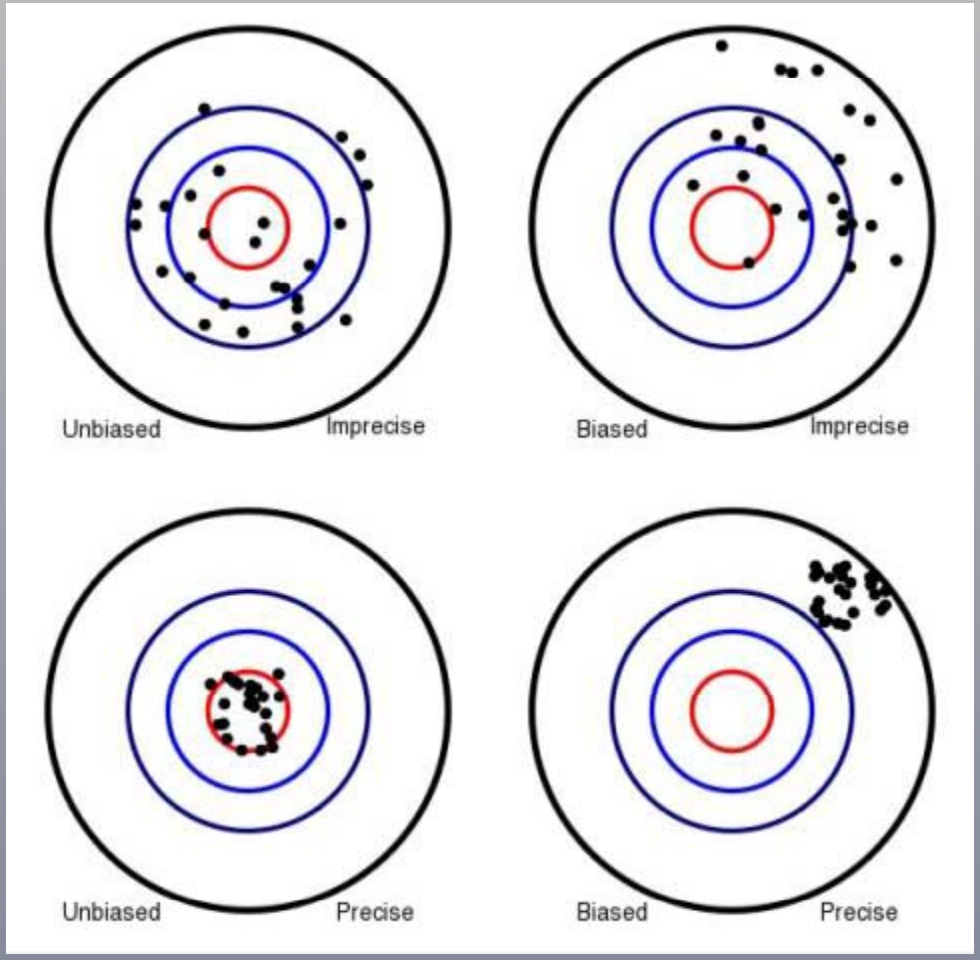
Milling

Collect Subsamples

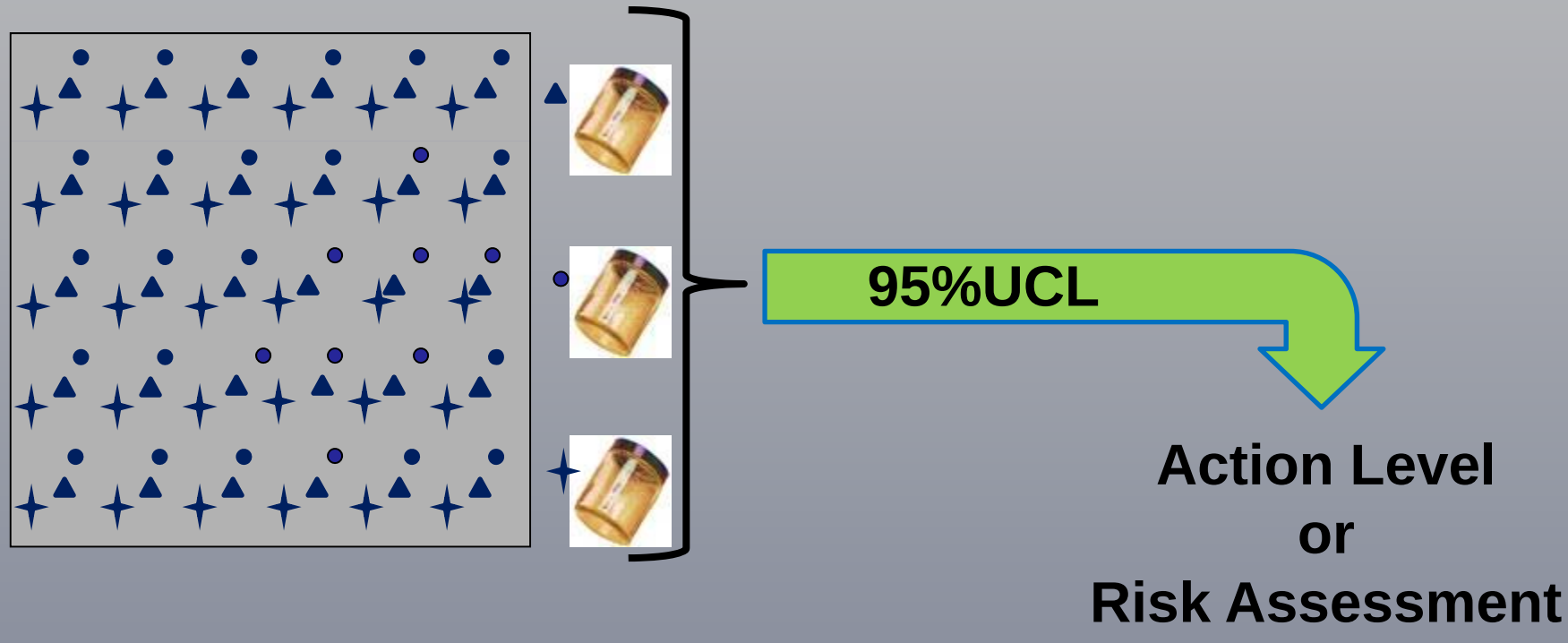
Splitting

Subsampling

Assess the data



Make good decisions!



For additional information on ISM please visit:

www.itrcweb.org/ISM-1

www.itrcweb.org/teampublic_ISM.asp

www.cluin.org/conf/itrc/ISM/

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Representative Sampling, Confident Decisions

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- Incremental Sampling Methodolgy Homepage
- 1.0 Introduction
- 2.0 Nature of Soil Sampling and Incremental Sampling Principles
- 3.0 Systematic Planning and Decision Unit Designation
- 4.0 Statistical Sampling Designs for ISM
- 5.0 Field Implementation, Sample Collection and Processing
- 6.0 Laboratory Sample Processing and Analysis
- 7.0 Making Decisions

EXECUTIVE SUMMARY

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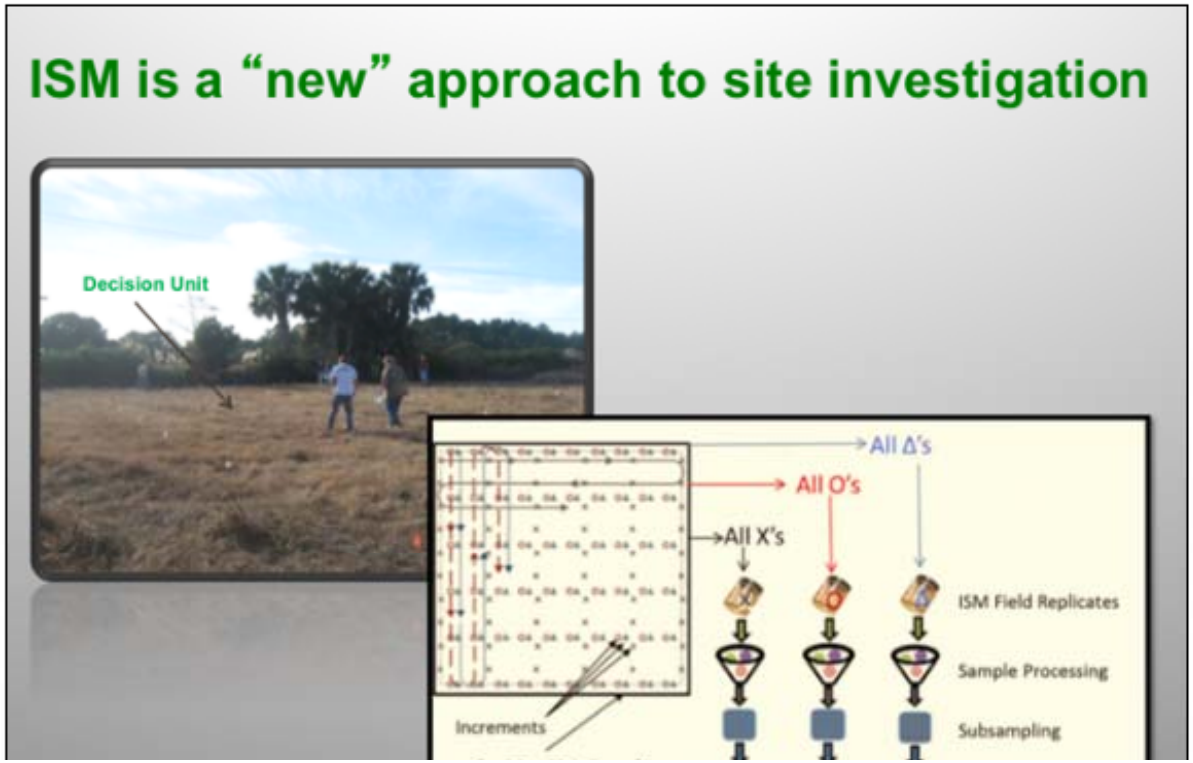

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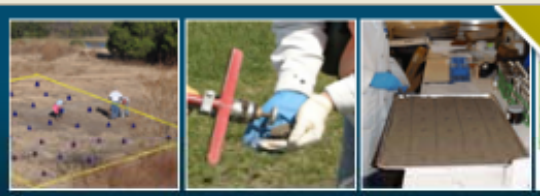

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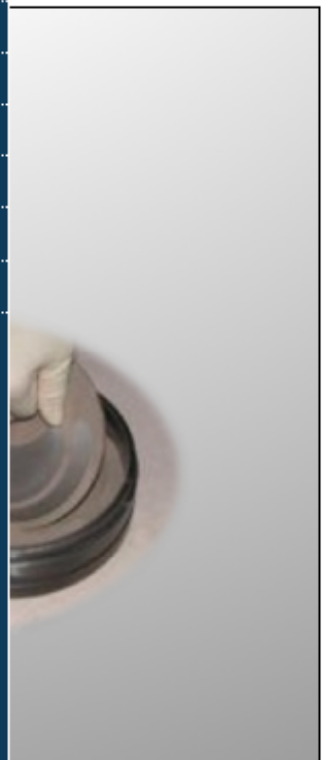

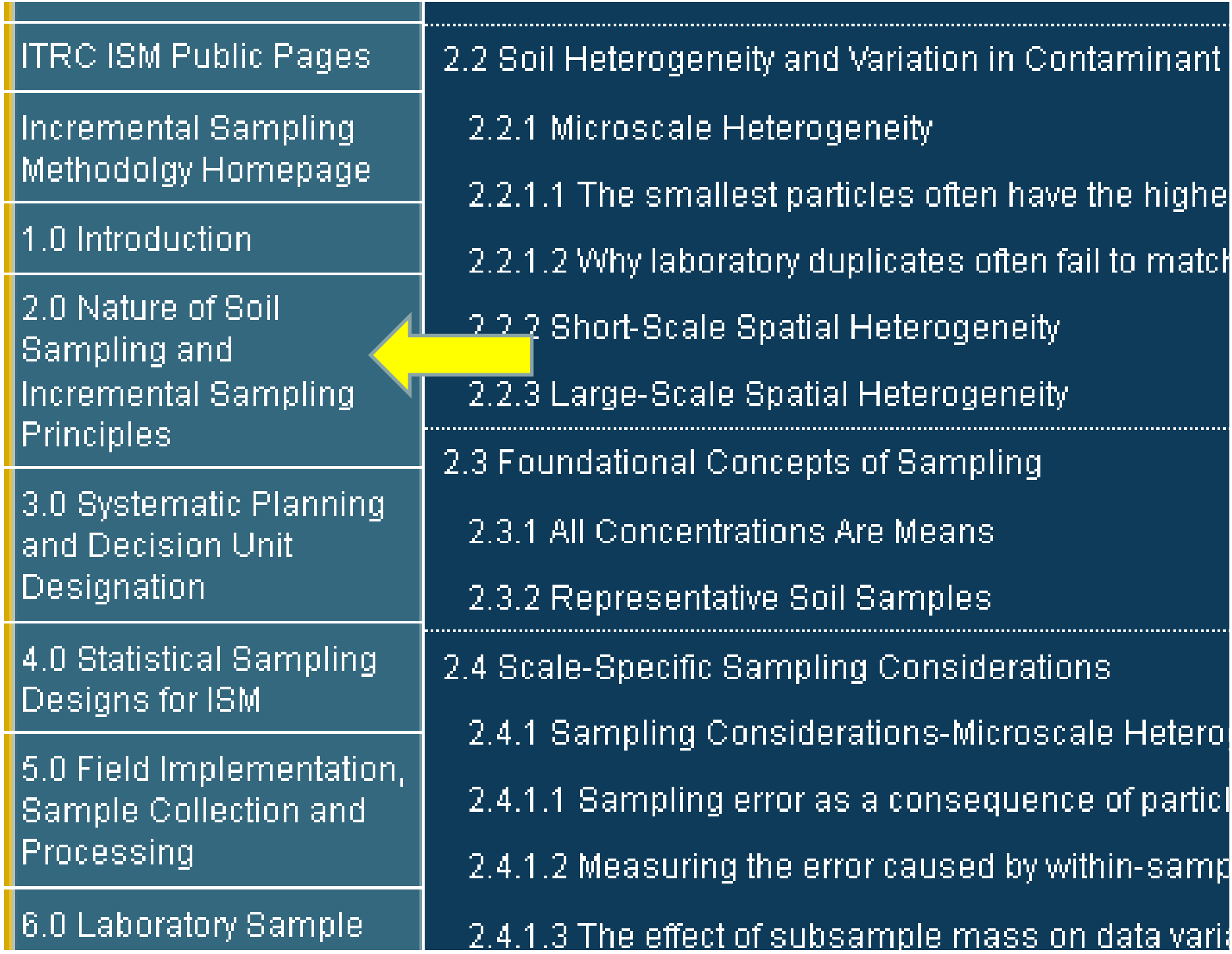
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2.2.2 Short-Scale Spatial Heterogeneity
2.2.3 Large-Scale Spatial Heterogeneity
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2.3.2 Representative Soil Samples
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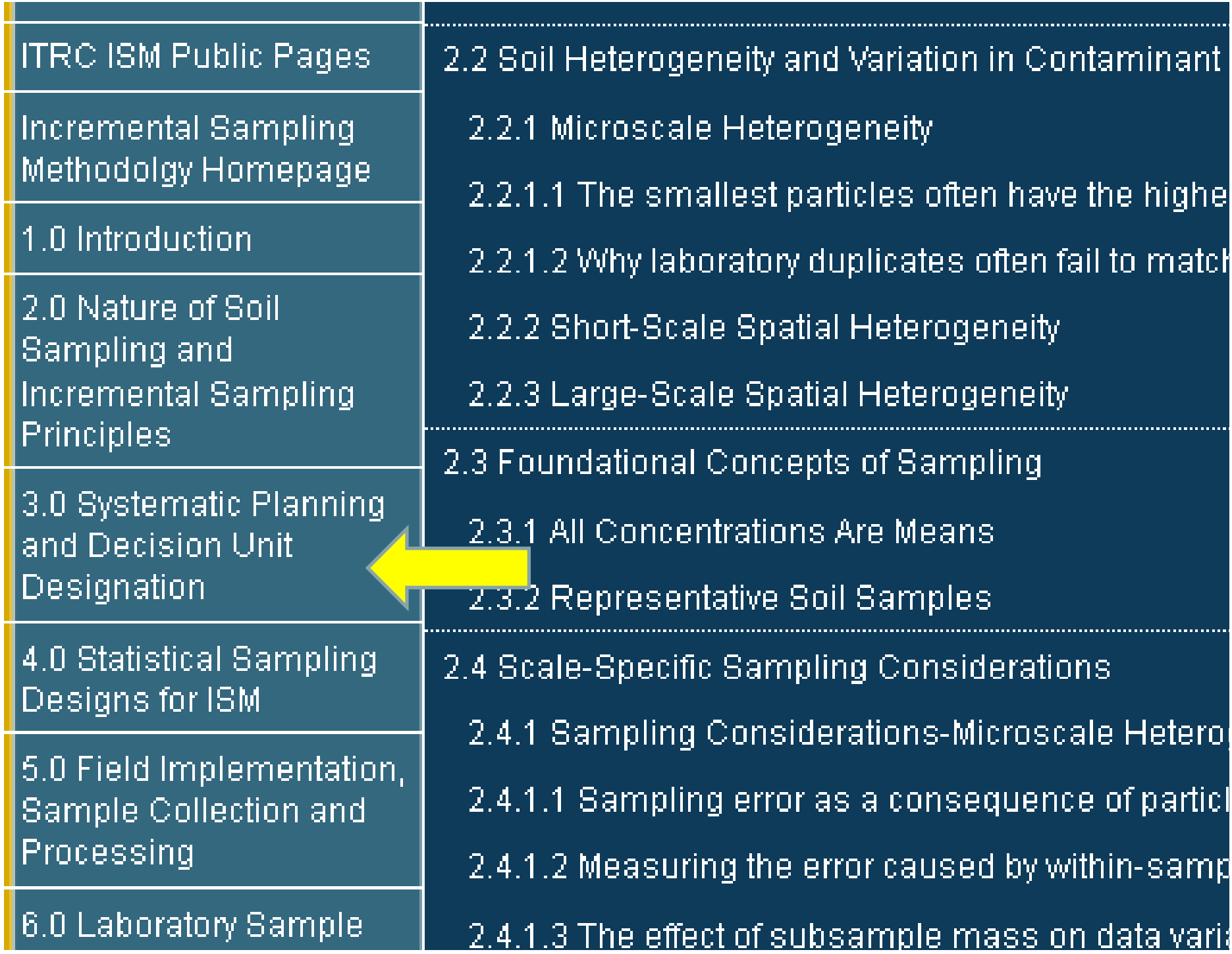
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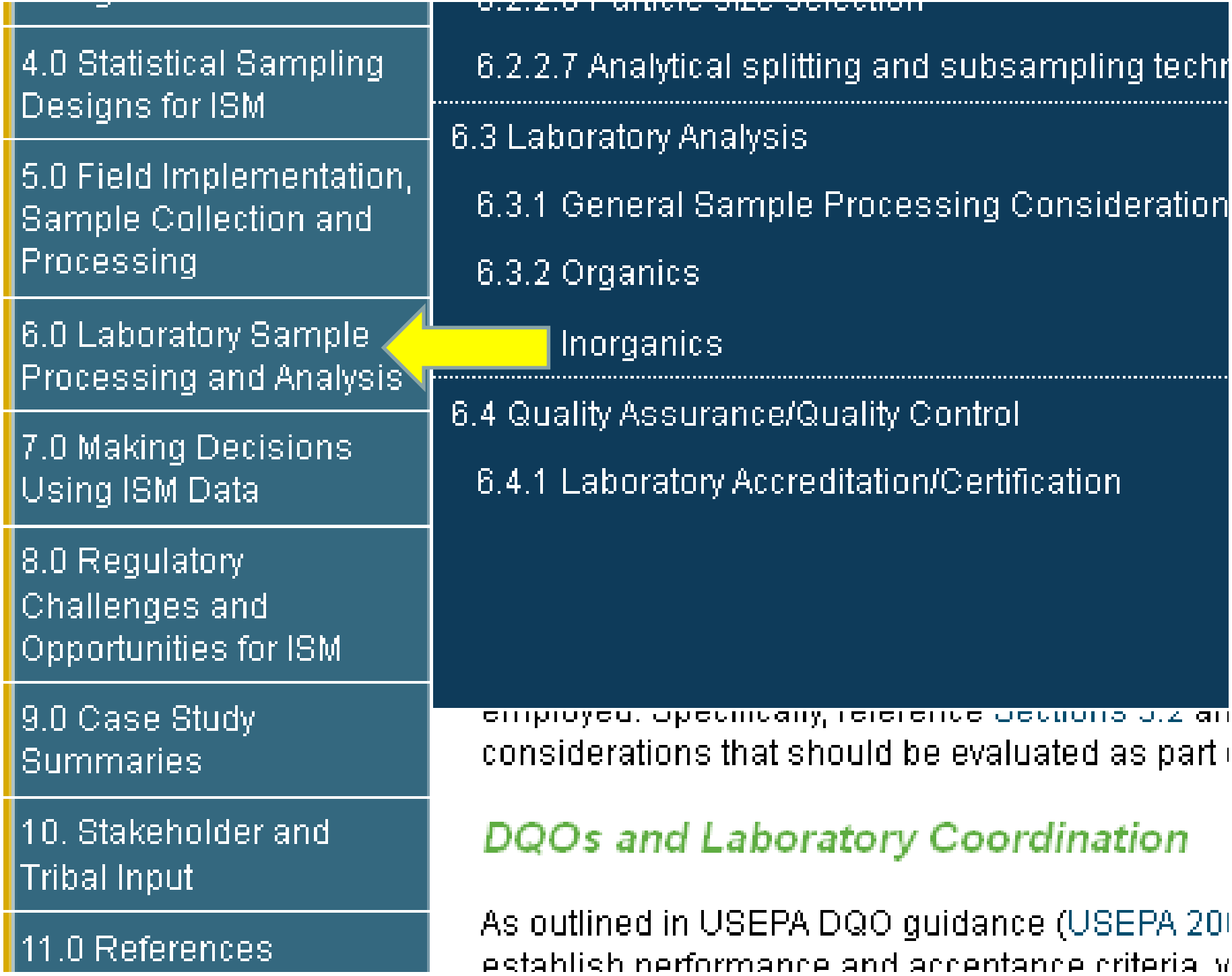
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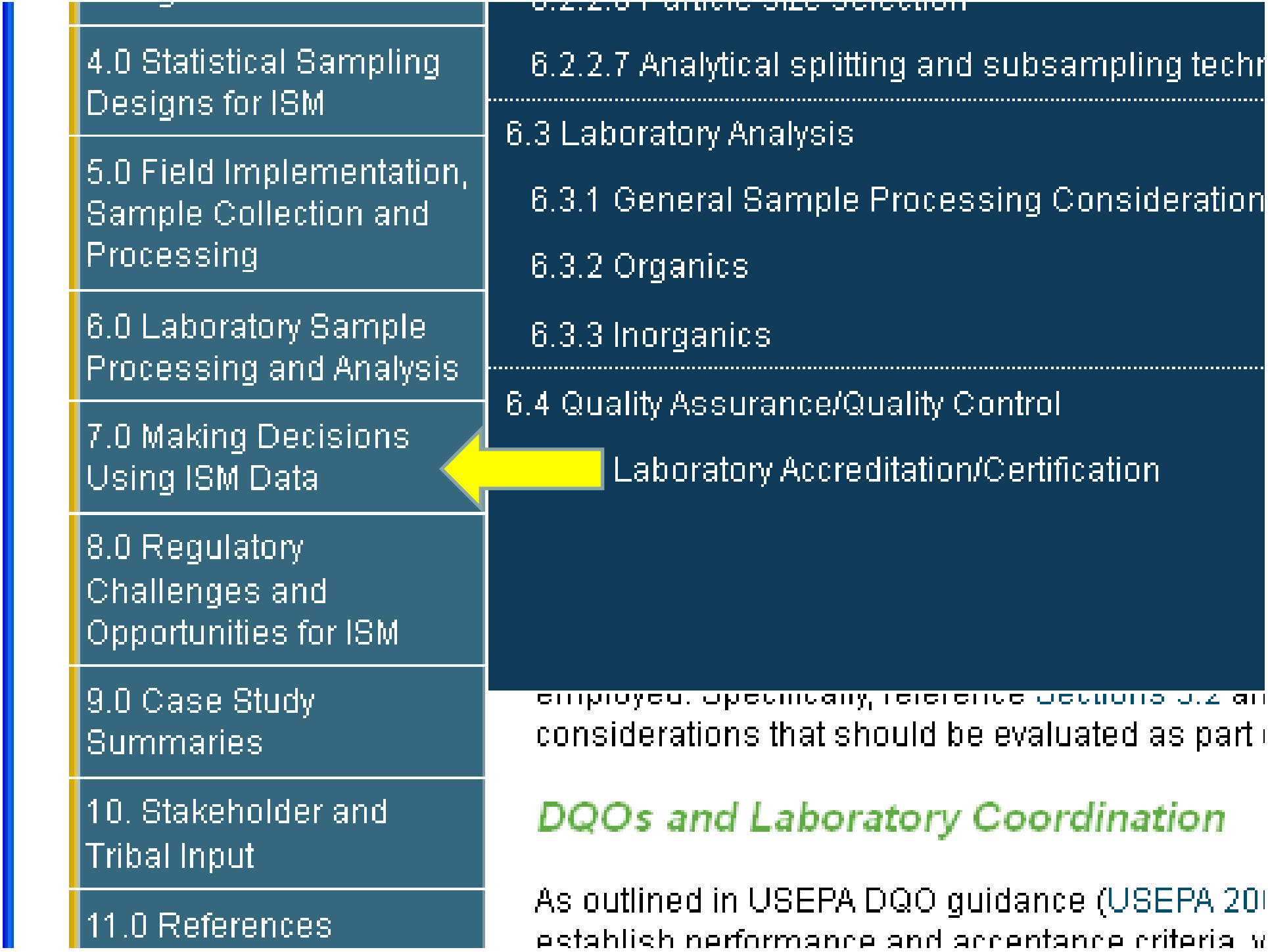
5.0 Field Implementation, Sample Collection and Processing
6.0 Laboratory Sample Processing and Analysis
7.0 Making Decisions Using ISM Data
8.0 Regulatory Challenges and Opportunities for ISM
9.0 Case Study Summaries
10. Stakeholder and Tribal Input
11.0 References
6.2.2.7 Analytical splitting and subsampling techr
6.3 Laboratory Analysis
6.3.1 General Sample Processing Consideration
6.3.2 Organics
Inorganics
6.4 Quality Assurance/Quality Control
6.4.1 Laboratory Accreditation/Certification
considerations that should be evaluated as part
DQOs and Laboratory Coordination
As outlined in USEPA DQO guidance (USEPA 20



considerations that should be evaluated as part

DQOs and Laboratory Coordination

As outlined in USEPA DQO guidance (USEPA 20

acceptable hazard threshold for noncarcin
- comparison of site and background data s
- combination of data across multiple DUs
- extrapolation of statistics across DUs

One of the primary benefits of ISM sampling is th determined prior to sample collection. It is also e be used to make decisions during project planni sampling plan design, as discussed in Section 3

- CSM
- goals of the project and end use of the dat
- scale of the decision

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Take Home Points for Labs

- Master Section 6
- Understand Sections 2, 3 & 5
- Familiarize with everything else

The Take Home Point for Labs

- Choosing ISM processing options without understanding the project objectives is like writing a love letter and addressing it …

to whom it may concern

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Take Home Points for Consultants

- Master Sections 3, 4, 5 & 7
- Understand Sections 2, 8, 9 & 10
- Hire a lab that has mastered Section 6

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Take Home Points for Regulator Teams

- Understand All Sections
- Divide and conquer
- Ask tough questions

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Take Home Points for Responsible Parties

- Understand All Sections
- Divide and conquer
- Ask tough questions

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Take Home Points for Community & Environmental Advocates

- Understand Sections 3, 4, 5 & 6
  - ~ Critical decisions that affect representativeness
- Familiarize with everything else
- Use Section 10 to start conversations

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The Cost Savings of ISM

- Reduced overall analytical costs significantly

- Maintain analytical spend and structure sampling design to reduce uncertainty

Large potential ripple effects for:

~ Liability insurance coverage

~ Remediation costs when site concentration near decision threshold

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Better Precision Changes Decisions

Florida Golf Course - Arsenic Data (mg/kg)

	Discrete n = 10 (mg/kg)	Incr-30 n = 3 (mg/kg)	Incr-100 n = 3 (mg/kg)
Mean	2	1.8	1.7
Std Dev	1.4	0.08	0.03
95%UCL	3.0	2.0	1.8

FDEP SCTL: 2.1 mg/kg

ITRC ISM team Florida golf course case study

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ITRC Guidance & Training

- ITRC ISM guidance publically available
  - ~ Feb 15, 2012
  - ~ www.itrcweb.org/ISM-1
- Internet based training
  - ~ May 8 & 15, Aug. 21 & 28, Nov. 6 &13 2012
  - ~ www.clu-in.org/conf/itrc/ISM/

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Purpose of ISM

Representative samples

Better data

Better decisions

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No one has to change

"No one has to change. Survival is optional."

... Dr. W. Edwards Deming

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Acknowledgements

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Toxic Substances Control

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