



GUIDANCE ON OBTAINING
DEFENSIBLE TEST PORTIONS
(GOOD TEST PORTIONS)

Hot off the press!!



Hot off the press!!

Publication is imminent

GOOD Test Portions: Guidance On Obtaining Defensible Test Portions



GOOD 
Test Portions

Laboratory Sampling Working Group
AAFCO, AFDO, and APHL
June 2018

<http://www.aafco.org/Publications/GOODTestPortions>



Background: *GOODSamples* –

Published Oct 2015 outlines a systematic approach to sampling

FREE download: <http://www.aafco.org/Publications/GOODSamples>

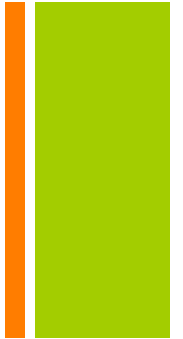


- Introduction
- Terms, Definitions, and Acronyms
- Management Support
- SQC Overview
- Material Properties
- Theory of Sampling
- Sample Correctness and Tools
- Evidentiary and Analyte Integrity
- Laboratory Considerations
- Quality Control
- Inference
- Data Assessment
- Resources





GOODSamples - Oct 2015



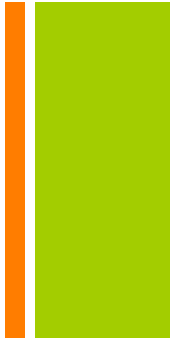
- Introduction
- Terms, Definitions, and Acronyms
- Management Support
- SQC Overview
- Material Properties
- Theory of Sampling
- Sample Correctness and Tools
- Evidentiary and Analyte Integrity
- **Laboratory Considerations***
- Quality Control
- Inference
- Data Assessment
- Resources



****GOODSamples* is prerequisite**



GOOD Test Portion Working Group Members

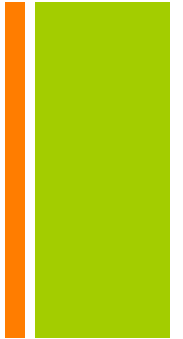


- Jo Marie Cook, FL Department of Ag & Consumer Services
- Heidi Hickes, MT Department of Agriculture
- Lawrence Novotny, SD State University, retired
- Aaron Price, Canadian Food Inspection Agency
- Chuck Ramsey, EnviroStat, Inc., Subject Matter Expert
- Yvonne Salfinger, AFDO & APHL
- Michele Swarbrick, MN Dept of Agriculture
- Nancy Thiex, AAFCO
- Sharon Webb, University of KY Regulatory Services





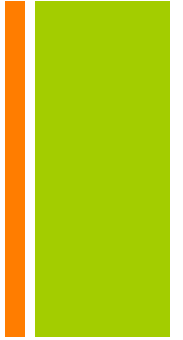
GOOD Test Portions - June 2018



- Introduction
 - Definitions, and Acronyms
 - Expansion of GOODSamples Concepts for Laboratory Sampling
 - Laboratory Sampling
 - QA and QC
 - Laboratory Sampling Processes
 - Data Assessment and Inference
 - Training
 - Appendix – TOS Equations
 - References
- * ***GOODSamples is prerequisite***



GOOD Test Portions - June 2018



- Introduction
 - **Definitions, and Acronyms**
 - Expansion of GOODSamples Concepts for Laboratory Sampling
 - Laboratory Sampling
 - QA and QC
 - Laboratory Sampling Processes
 - Data Assessment and Inference
 - Training
 - Appendix – TOS Equations
 - References
- * **GOODSamples is prerequisite**



Definitions

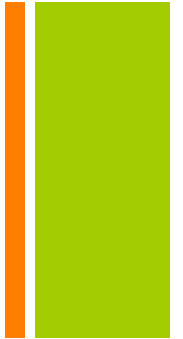
40-some terms



- **Laboratory Sampling:** All manipulations performed on the laboratory sample after receipt and acceptance through selection of the test portion.
- **Selection process:** The act of selecting a smaller mass or volume from a larger mass or volume. There are two types of selection processes: mass reduction and splitting.
- **Mass reduction:** Selection of a smaller mass or volume of material from a larger mass or volume.
- **Splitting:** The division of a mass or volume into two or more equal portions.
- **Nonselection process:** Manipulation of a sample (e.g. comminution, removal of extraneous material, removal of water), usually performed before a selection process (e.g. mass reduction) process.



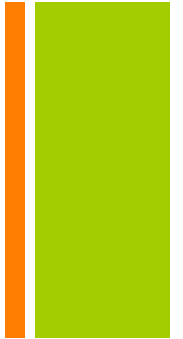
GOOD Test Portions - June 2018



- Introduction
 - Definitions, and Acronyms
 - **Expansion of GOODSamples Concepts for Laboratory Sampling**
 - Laboratory Sampling
 - QA and QC
 - Laboratory Sampling Processes
 - Data Assessment and Inference
 - Training
 - Appendix – TOS Equations
 - References
- * **GOODSamples is prerequisite**



Expansion of *GOODSamples* Concepts for Laboratory Sampling



- Sample Quality Criteria – laboratory's unique role
- Material properties
 - Material Elements, Heterogeneity
- Total Sampling Error
 - Random Errors, Systematic Errors, Blunders
- Maintaining Evidentiary Integrity



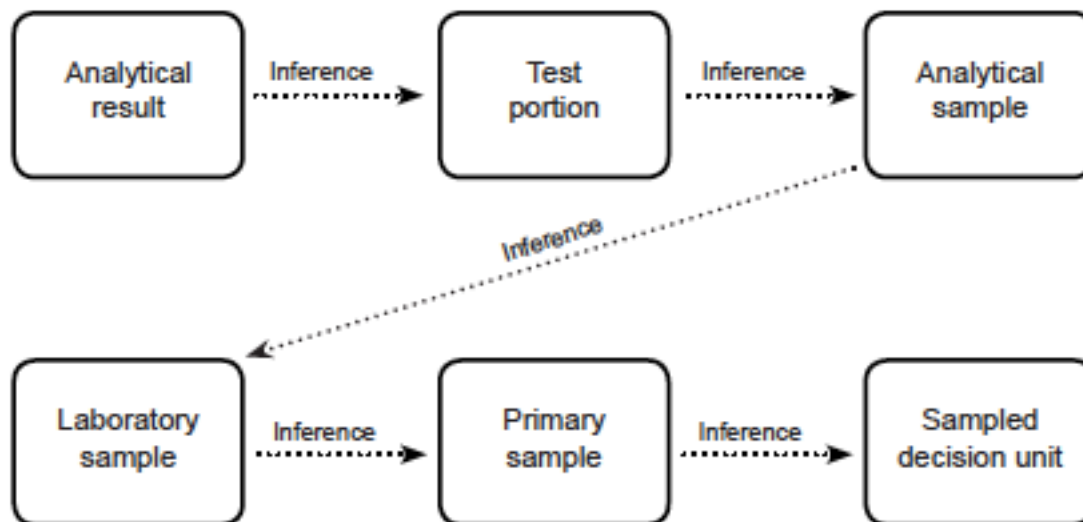
Sample Quality Criteria

Lab must be involved with program staff in SQC process; lab brings scientific expertise.

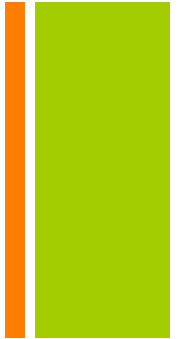
- What is the question?
 - What is analyte or characteristic of concern?
 - What is the concentration of concern?
 - How will inference be made?
- What is the decision unit?
- What is the desired confidence?

+ Applying *GOODSamples* in the Laboratory

► Sampling/inference pathway



+ Material Properties



- ▶ Finite vs Infinite elements. Comminution of a finite element material results in an infinite element material.
- ▶ Heterogeneity is the root cause of error in all sampling. Compositional and Distributional Heterogeneity (CH and DH).
- ▶ The magnitude and nature of CH and DH are unique to each material and dictate the sampling efforts. .

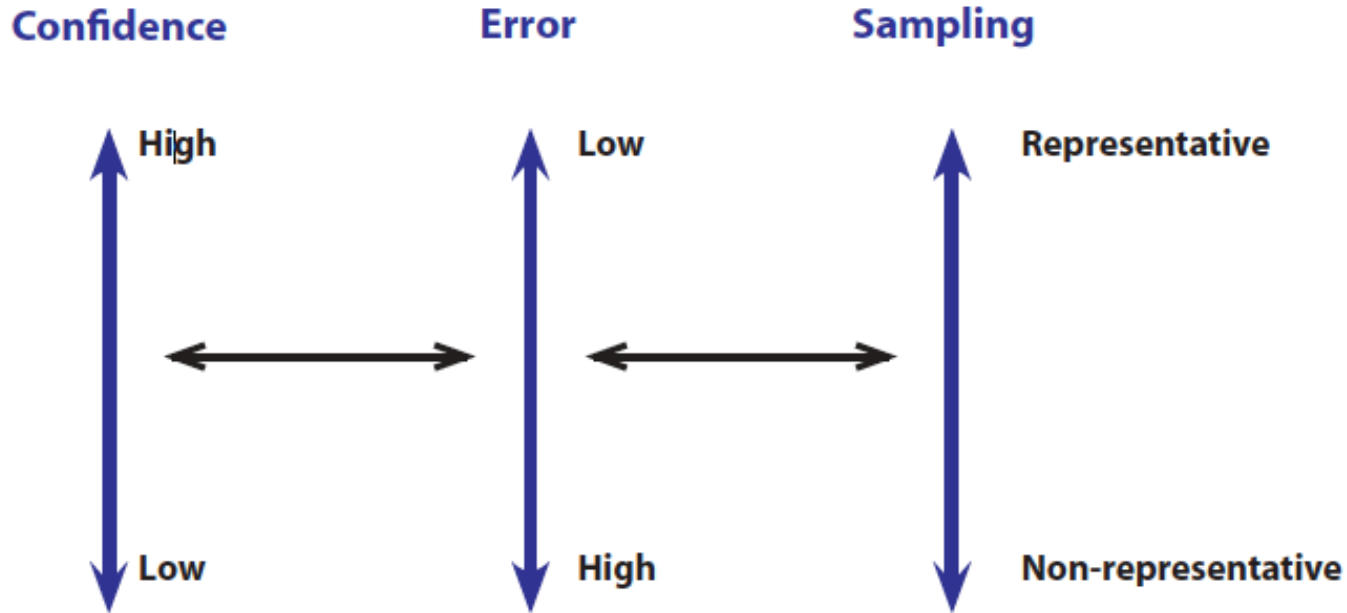
+ Material Properties

Heterogeneity



- Orange juice has many separate components with large distributional heterogeneity. The pulp falls quickly, the foam disperses slowly and volatiles escape rapidly.

+ TSE and relationship among confidence, error & representativeness



+ Evidentiary Integrity



Evidentiary Integrity: Evidence that samples have been properly collected, processed and stored in a manner to ensure that test result(s) can be traced to the decision unit and are a true representation of the decision unit (in legal terms, the identification and authentication of the evidence). Evidentiary integrity is demonstrated by documentation of trace-back (e.g., chain of custody forms); proper sampling procedures to ensure representivity (e.g., sample correctness); and processes to ensure analyte integrity is maintained.



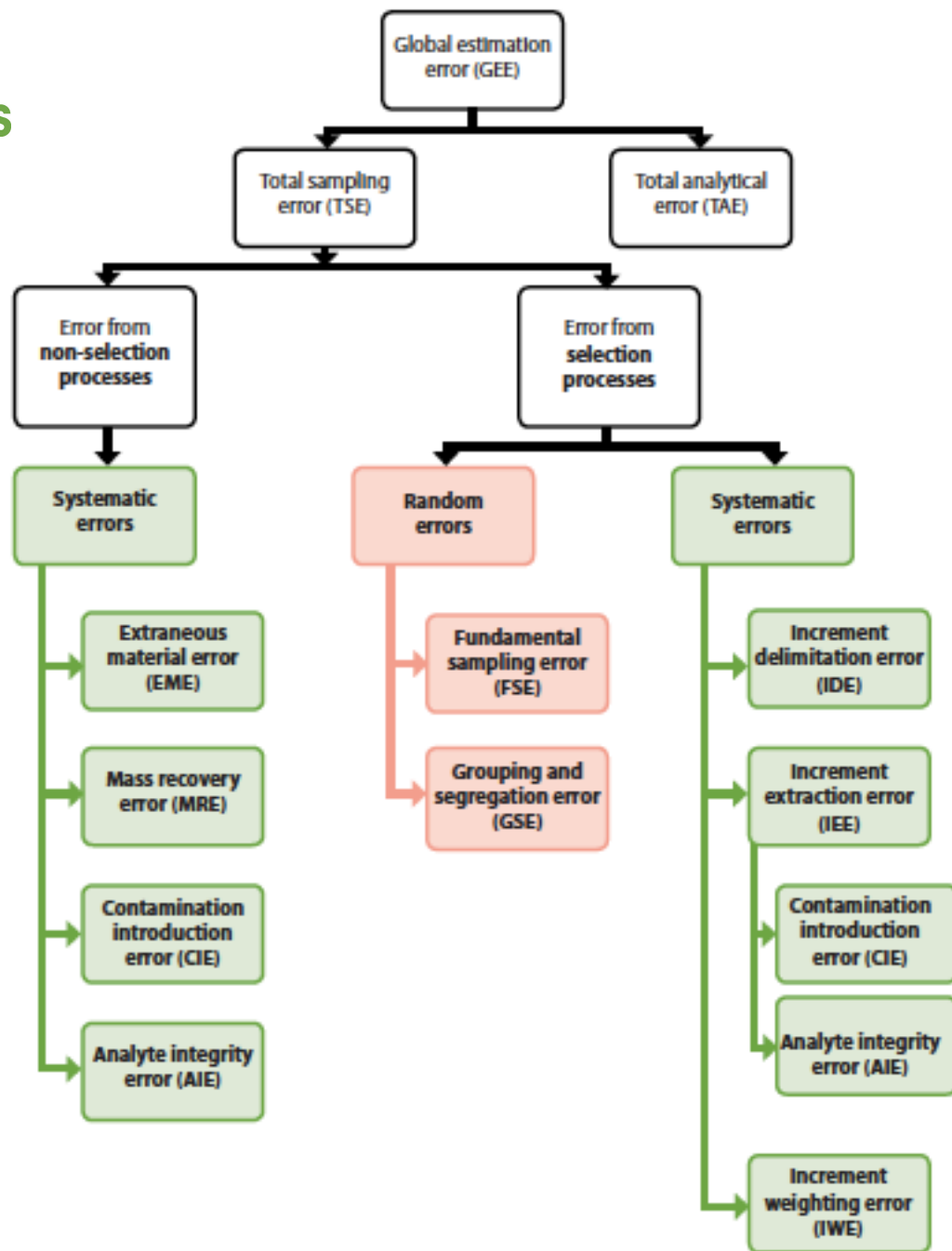
GOOD Test Portions - June 2018

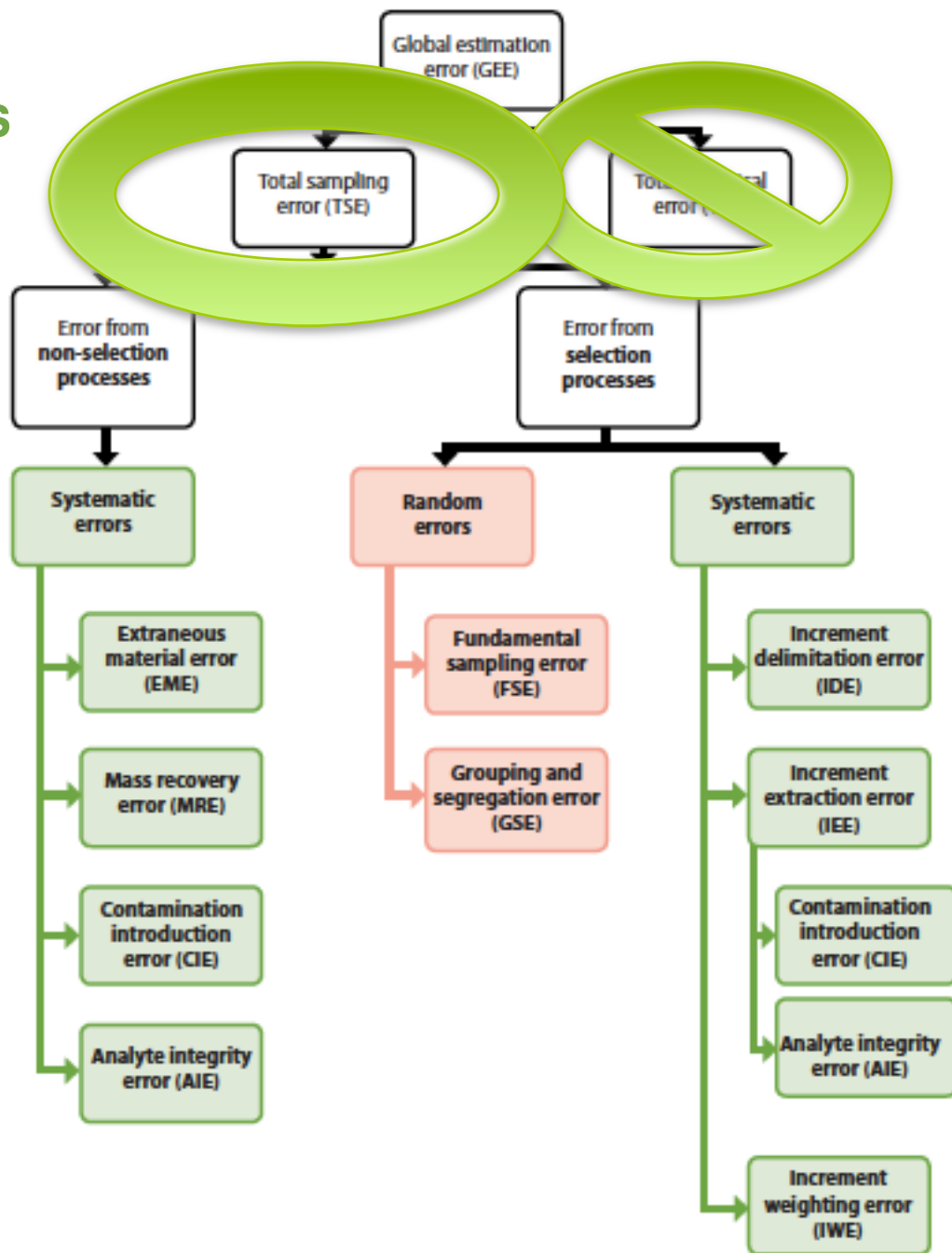


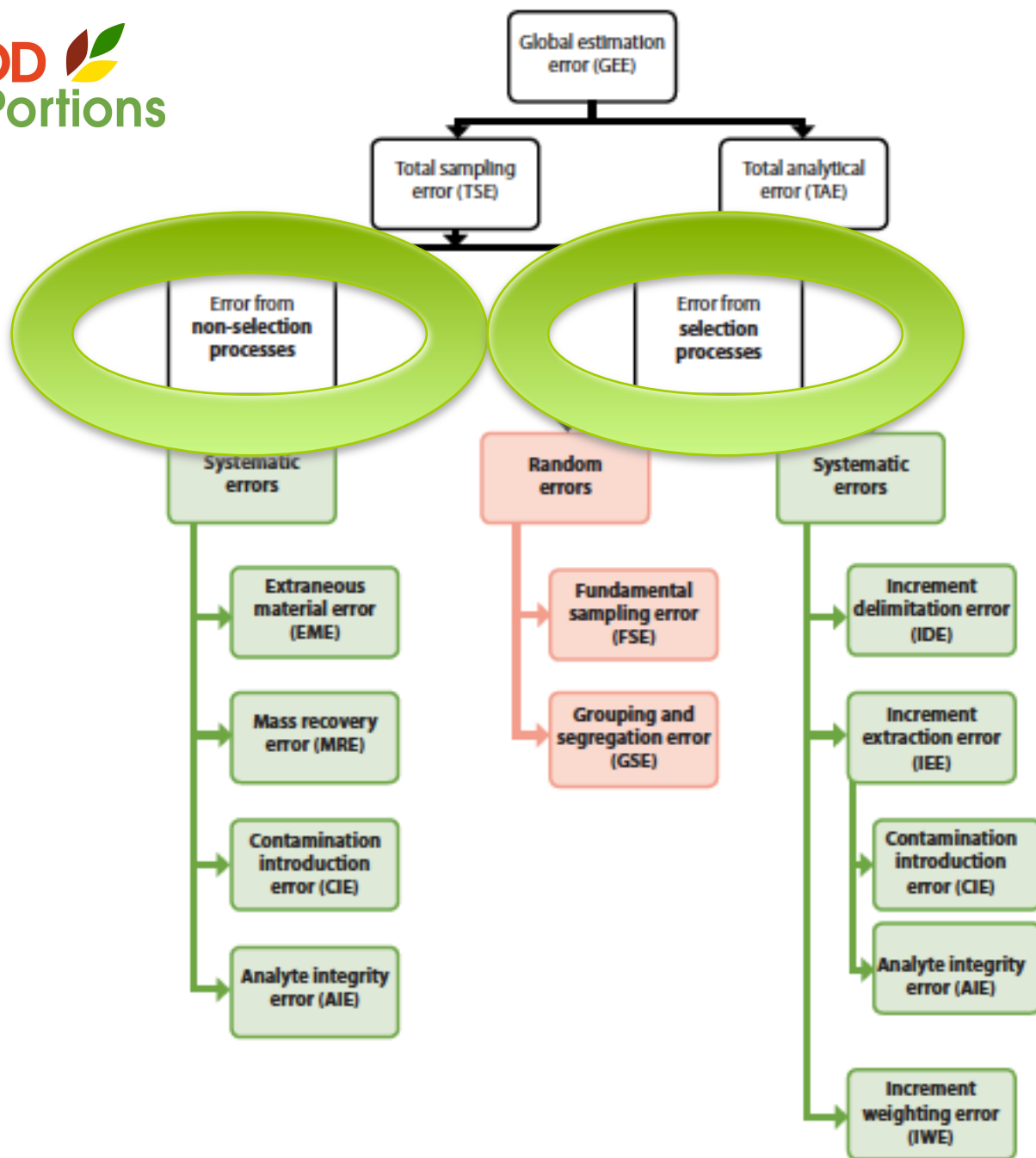
- Introduction
 - Definitions, and Acronyms
 - Expansion of GOODSamples Concepts for Laboratory Sampling
 - **Laboratory Sampling**
 - QA and QC
 - Laboratory Sampling Processes
 - Data Assessment and Inference
 - Training
 - Appendix – TOS Equations
 - References
- ***GOODSamples is prerequisite**

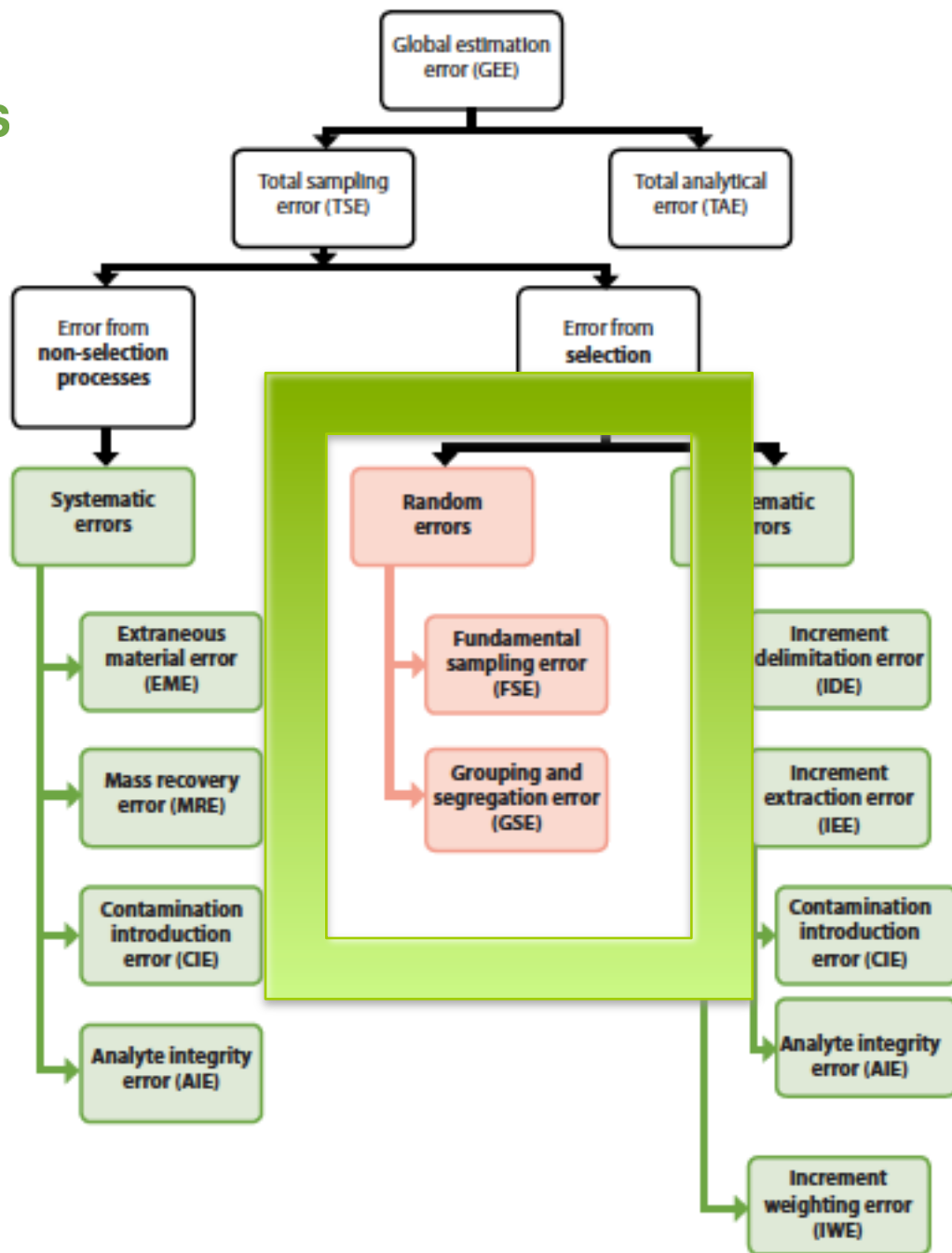
+ Laboratory Sampling

- Introduction
- Nonselection Errors
- Selection Errors
- Relationship of Error to Mass
- Relationship of Error to Increments
- Relationship of Error to Sample Correctness
- Nonselection Techniques and Equipment – next talk by Lawrence
- Selection Techniques and Equipment – next talk by Lawrence
- Safety Considerations



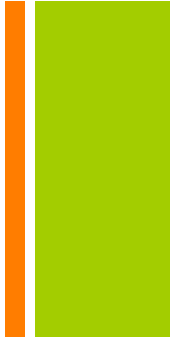




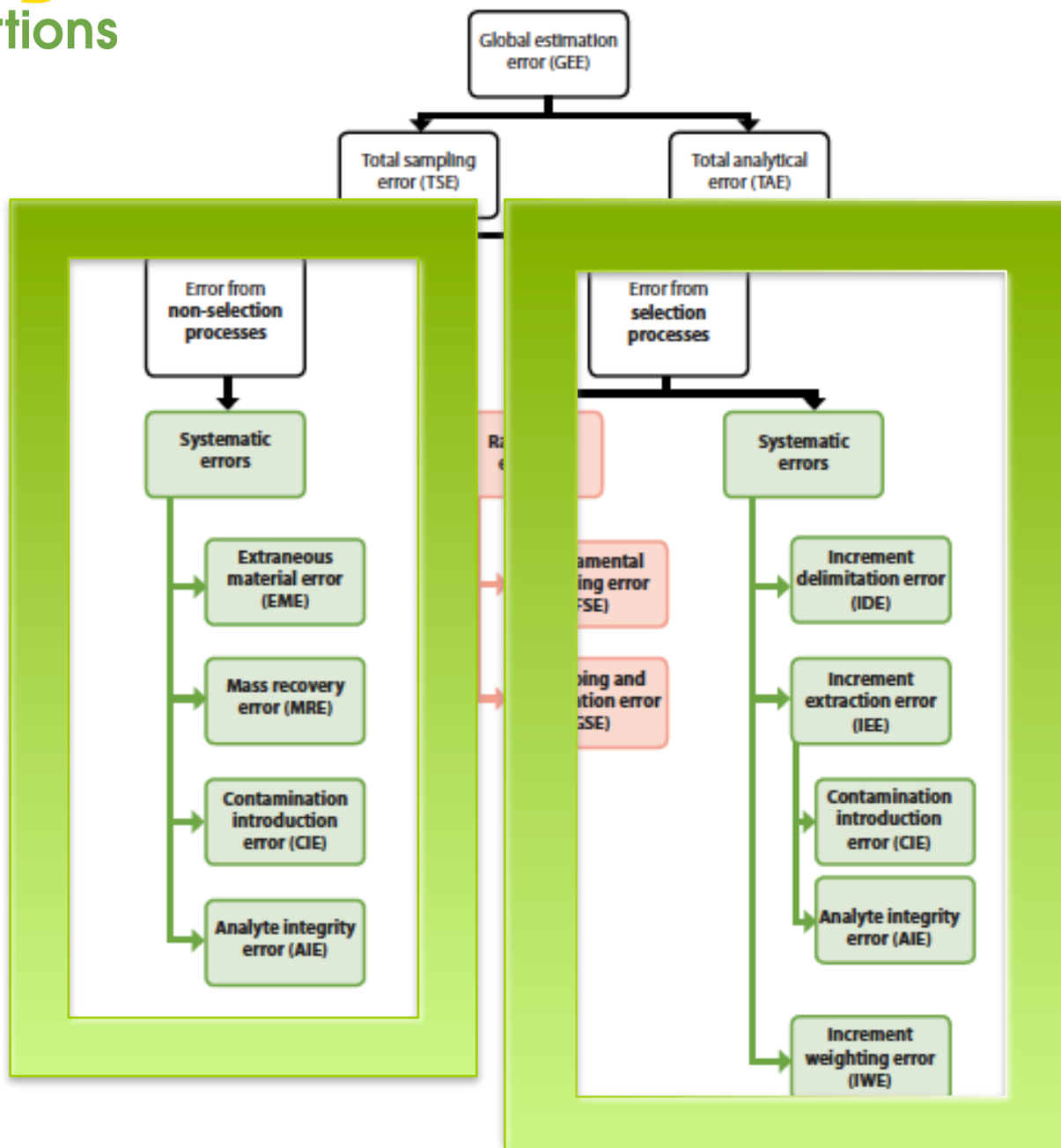




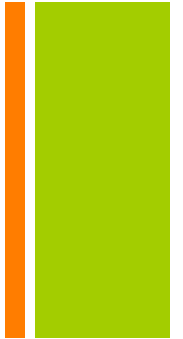
RANDOM ERRORS



- Fundamental Sampling Error (FSE)
 - Function of particle size, mass and CH
- Grouping and Segregation Error (GSE)
 - Function of number of increments and DH
- Relationships
 - Relationship of error to mass
 - Relationship of error to increments
 - Relationship of error to sample correctness



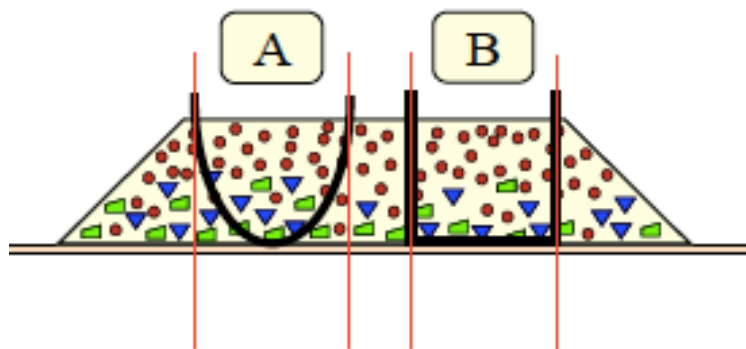
+ Systematic Errors (Bias)



- New systematic error terms introduced
- Systematic errors are impossible to estimate (unlike analytical bias errors).
- Causes of errors and practices to control errors are discussed.

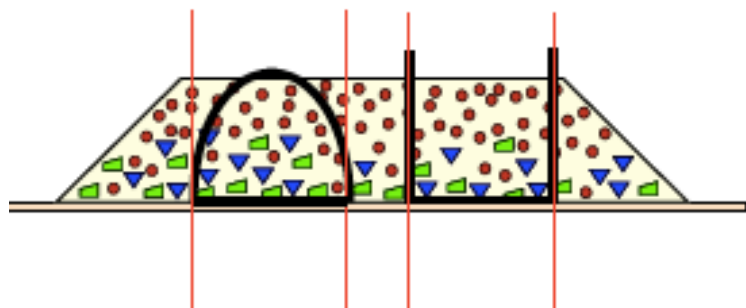


Increment Delimitation Error



Incomplete,
incorrect
increment

Complete,
correct
increment



flat spatula



rounded scoop



square scoop



bias toward
small particles

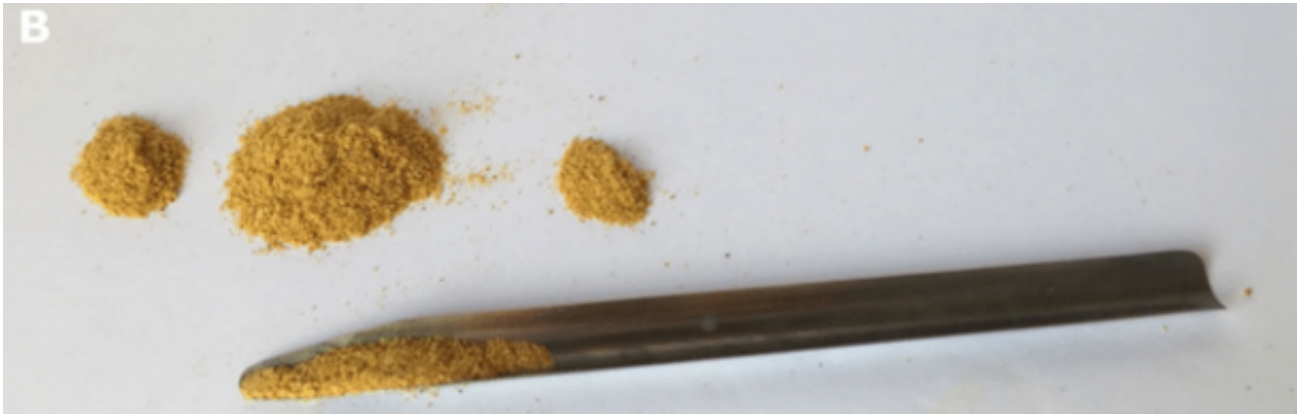


bias toward
large particles



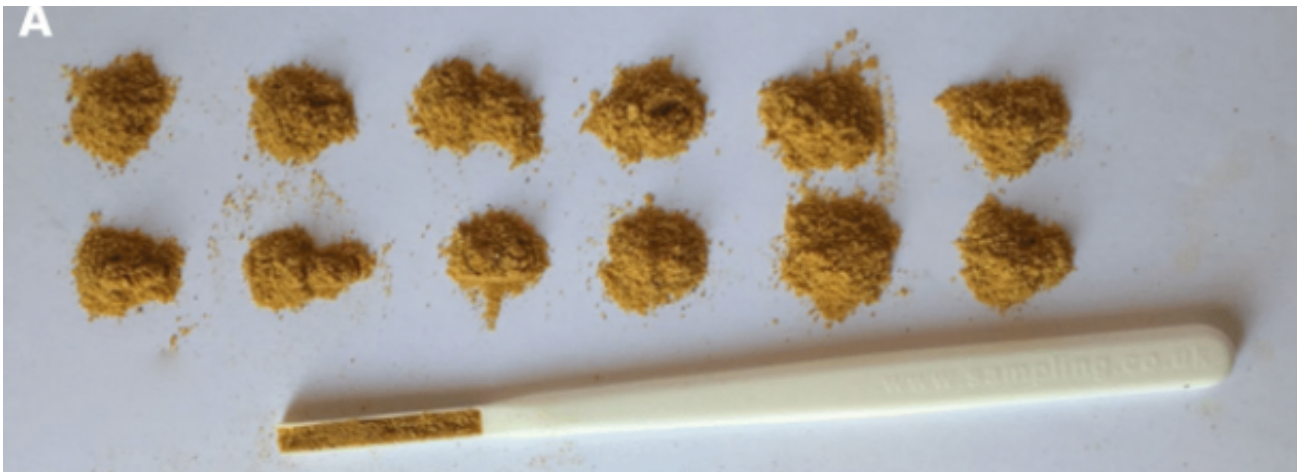
no bias toward
any particles

+ Increment Weighting Error



What is wrong here?

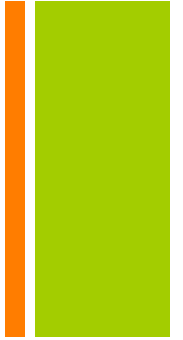
Poor tool choice,
< increments,
> IWE



What is correct here?

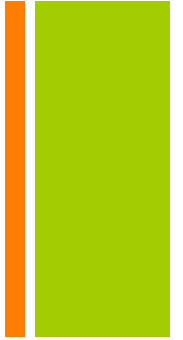
Good tool choice,
> increments,
< IWE

+ Blunders



- Mistakes or accidents in the lab
- Data integrity is lost
- Blunders cannot be incorporated into a global estimation error (GSE) calculation, and must be prevented/eliminated or the procedure must be repeated

+ Sample Correctness



- Sample correctness is control of IDE and IEE
 - IDE occurs when all elements of a material do not have an equiprobable chance of being selected (function of tool design)
 - IEE occurs when all elements have an equal probability of being selection, but the correctly delimited elements do not become part of the increment (function of tool usage)
- Discussed for different states of materials – not different for food, feed, soil, fertilizer, water. Same principles apply and vary by different material properties.

States of Materials

Liquid

- No visible particulates
- Spreads



Slurry

- Visible particulates
- Spreads



Semi-solid

- Moves like a liquid or solid
- Stacks



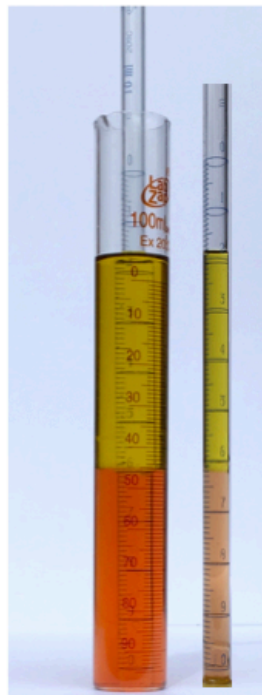
Solid

- Moves like a solid
- Stacks



+ Increment Delimitation Error - Liquids

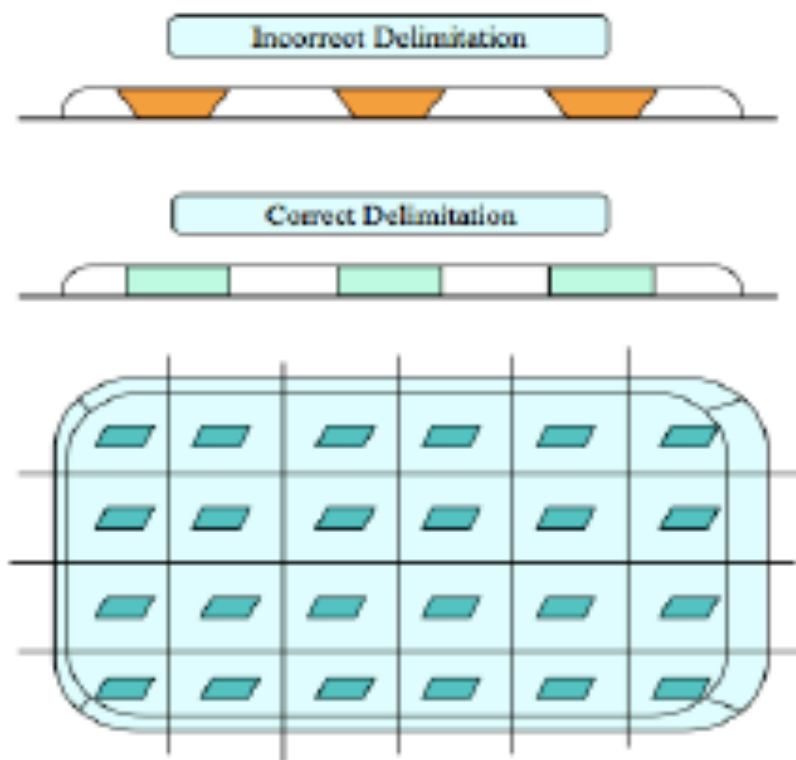
Correct delimitation:
Volumes
proportionately
represented



Incorrect delimitation:
Volumes
disproportionately
represented

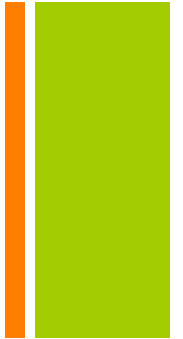


+ Incorrect and Correct Delimitation – Solids using a 2-D Slab Cake





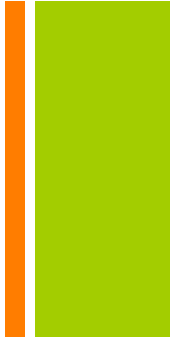
GOOD Test Portions - June 2018



- Introduction
 - Definitions, and Acronyms
 - Expansion of GOODSamples Concepts for Laboratory Sampling
 - Laboratory Sampling
 - **QA and QC**
 - Laboratory Sampling Processes
 - Data Assessment and Inference
 - Training
 - Appendix – TOS Equations
 - References
- * ***GOODSamples is prerequisite***



Quality Assurance and Quality Control

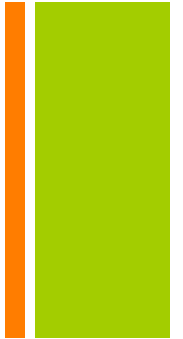


- Quality Assurance
 - Validation of a Laboratory Sampling Protocol
 - Verification of Laboratory Sampling Protocol
- Quality Control
 - Random Error
 - Systematic Error

Will be subject of presentation a bit later this morning .

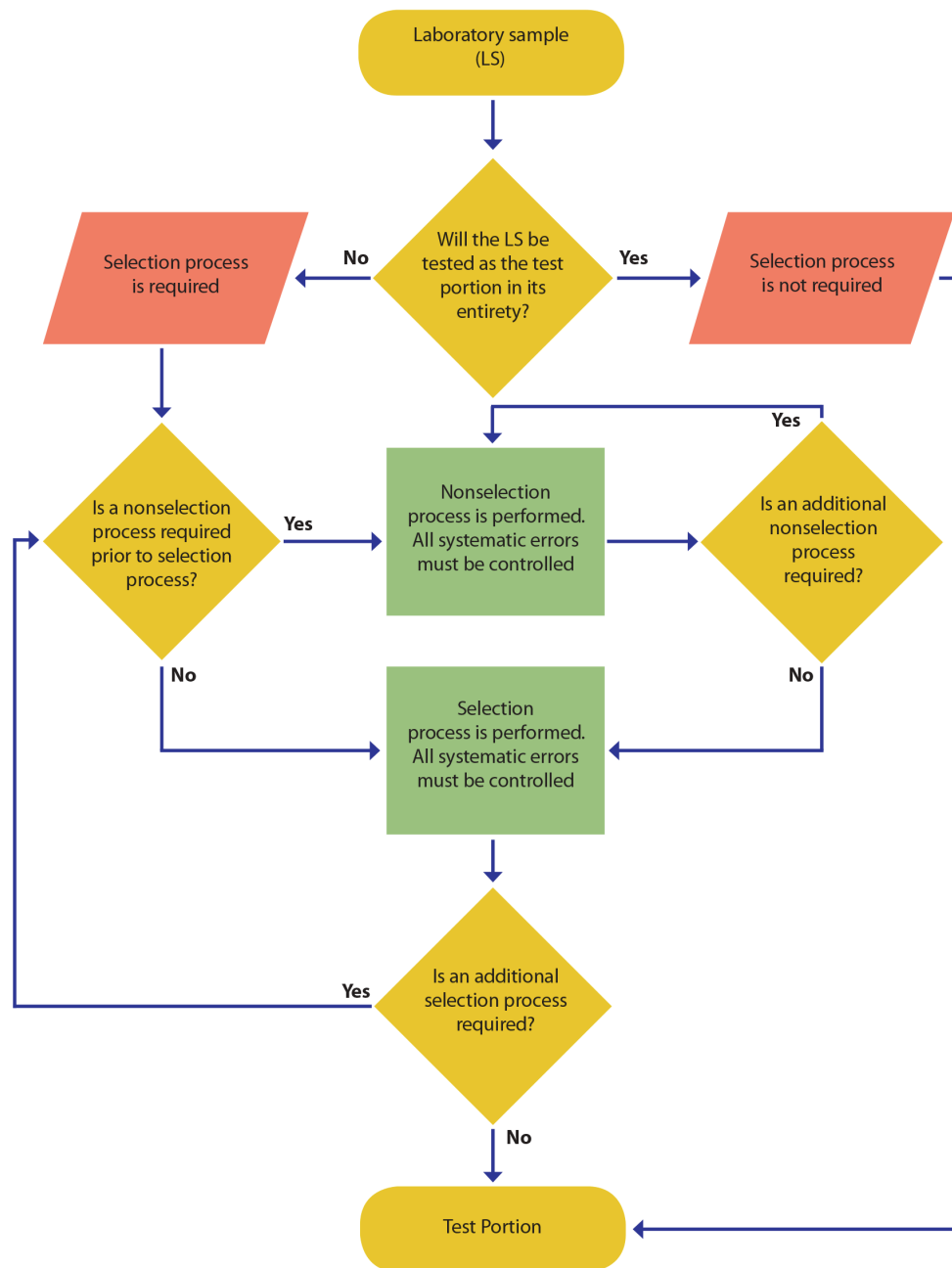


GOOD Test Portions - June 2018



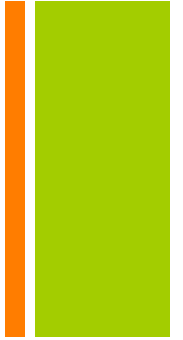
- Introduction
 - Definitions, and Acronyms
 - Expansion of GOODSamples Concepts for Laboratory Sampling
 - Laboratory Sampling
 - QA and QC
 - **Laboratory Sampling Processes**
 - Data Assessment and Inference
 - Training
 - Appendix – TOS Equations
 - References
- * **GOODSamples is prerequisite**

LABORATORY WORKFLOW





Laboratory Sampling Processes



- Special Considerations for Selection of the Test Portion
 - Select an appropriate number of proportionate/equal increments at random. Never take 1 increment unless the material is a single-phase liquid.
 - Do not attempt to obtain an exact weight.
 - Avoid IWE when selecting increments.
 - Ensure the correct tool is used to avoid bias toward one particle size.
 - Do not scale down test portion mass without validating impact on the variance of FSE.



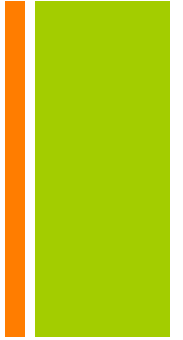
GOOD Test Portions - June 2018



- Introduction
 - Definitions, and Acronyms
 - Expansion of GOODSamples Concepts for Laboratory Sampling
 - Laboratory Sampling
 - QA and QC
 - Laboratory Sampling Processes
 - **Data Assessment and Inference**
 - Training
 - Appendix – TOS Equations
 - References
- * **GOODSamples is prerequisite**



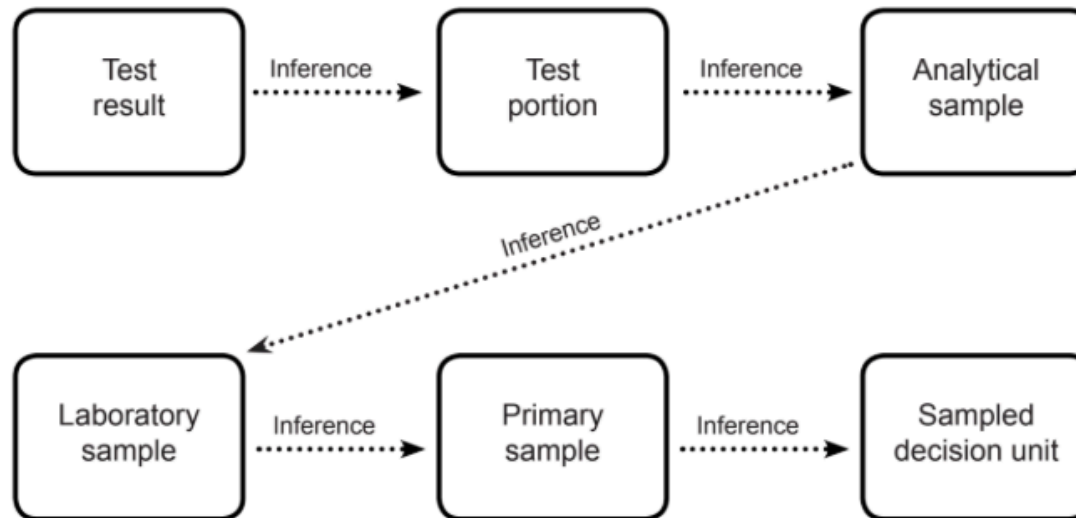
Data Assessment and Inference



- Data Assessment
- Assessing documentation, QC, and global estimation error
 - Quality Control and GEE
 - Inference

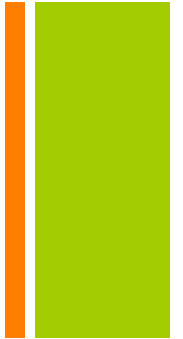
+ Inference

► Sampling/inference pathway



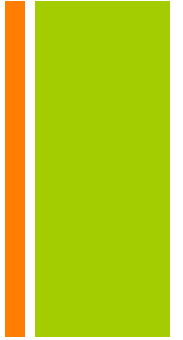


GOOD Test Portions - June 2018



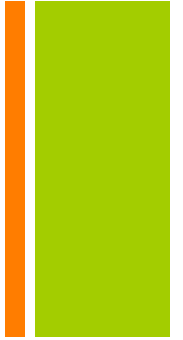
- Introduction
 - Definitions, and Acronyms
 - Expansion of GOODSamples Concepts for Laboratory Sampling
 - Laboratory Sampling
 - QA and QC
 - Laboratory Sampling Processes
 - Data Assessment and Inference
 - **Training**
 - Appendix – TOS Equations
 - References
- * **GOODSamples is prerequisite**

+ Training



- Appropriate PPE and appropriate safety practices
- SQC
- TOS
- Material properties
- Causes and control of systematic errors
- Causes and control of random errors

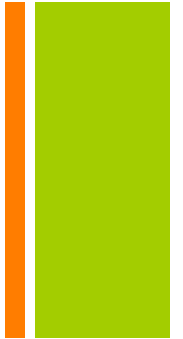
+ Training



- Choice, use and maintenance of:
 - Comminution tools and equipment
 - Splitting tools and equipment
 - Mass reduction tools and equipment
- Maintaining analyte integrity
- Maintaining evidentiary integrity
- QA/QC
- Data assessment



GOOD Test Portions - June 2018



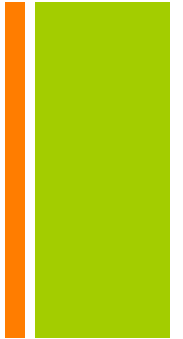
- Introduction
 - Definitions, and Acronyms
 - Expansion of GOODSamples Concepts for Laboratory Sampling
 - Laboratory Sampling
 - QA and QC
 - Laboratory Sampling Processes
 - Data Assessment and Inference
 - Training
 - **Appendix – TOS Equations**
 - References
- * **GOODSamples is prerequisite**

+ Appendix A

- TOS Equations!!
- Example Calculations

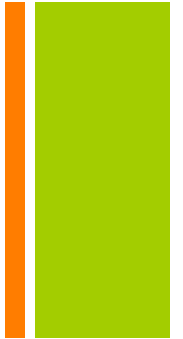


GOOD Test Portions - June 2018



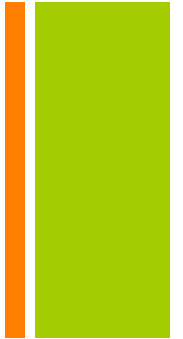
- Introduction
 - Definitions, and Acronyms
 - Expansion of GOODSamples Concepts for Laboratory Sampling
 - Laboratory Sampling
 - QA and QC
 - Laboratory Sampling Processes
 - Data Assessment and Inference
 - Training
 - Appendix – TOS Equations
 - **References**
- ****GOODSamples is prerequisite***

+ References



- Cited works

+ Snapshots



This is brief overview of what is presented in GOOD Test Portions

Currently available for free download at:

<https://www.aafco.org/Publications/GOODTestPortions>



QUESTIONS?

THANK YOU!

Laboratory Sampling Working Group