Sediment Characterization:
Core Sampling Issues

Washington Dredged Material Management Program
& Portland Sediment Evaluation Team

2014 SMARM

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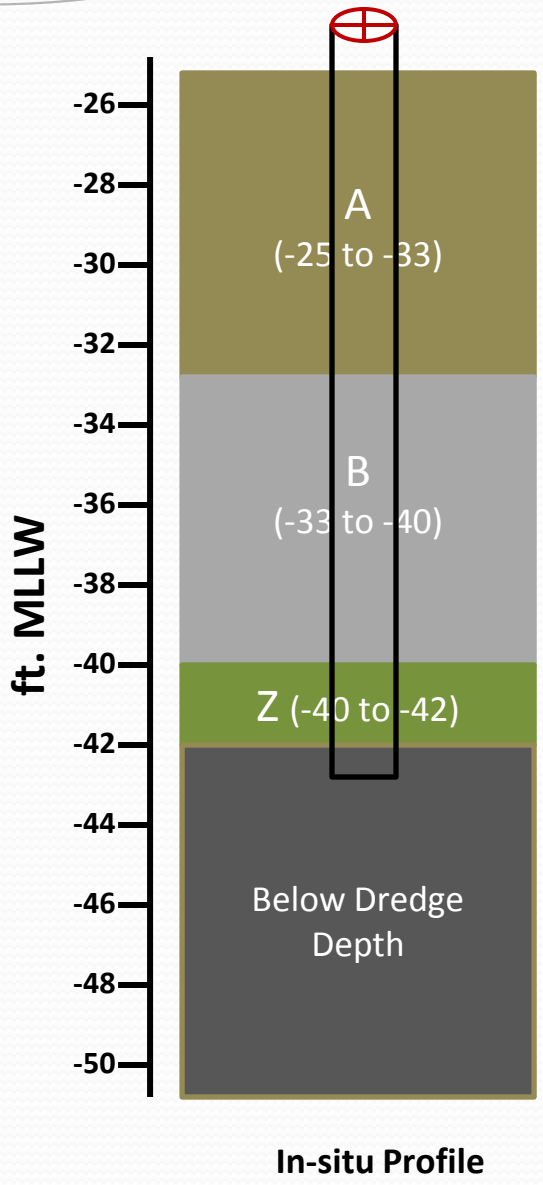
Sampling Objectives

- DMMP & PSET regulatory decisions depend on representative sediment characterization data

CWA **MPRSA** **Anti-deg.**

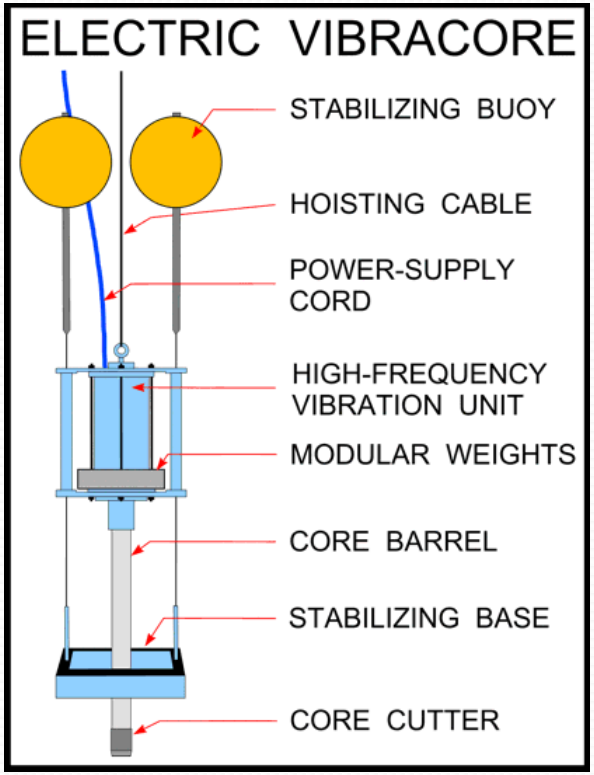
- Samples must adequately characterize the intended decision unit(s) (dredge prism & Z-layer)



In-situ Profile

Core Sampling Objectives

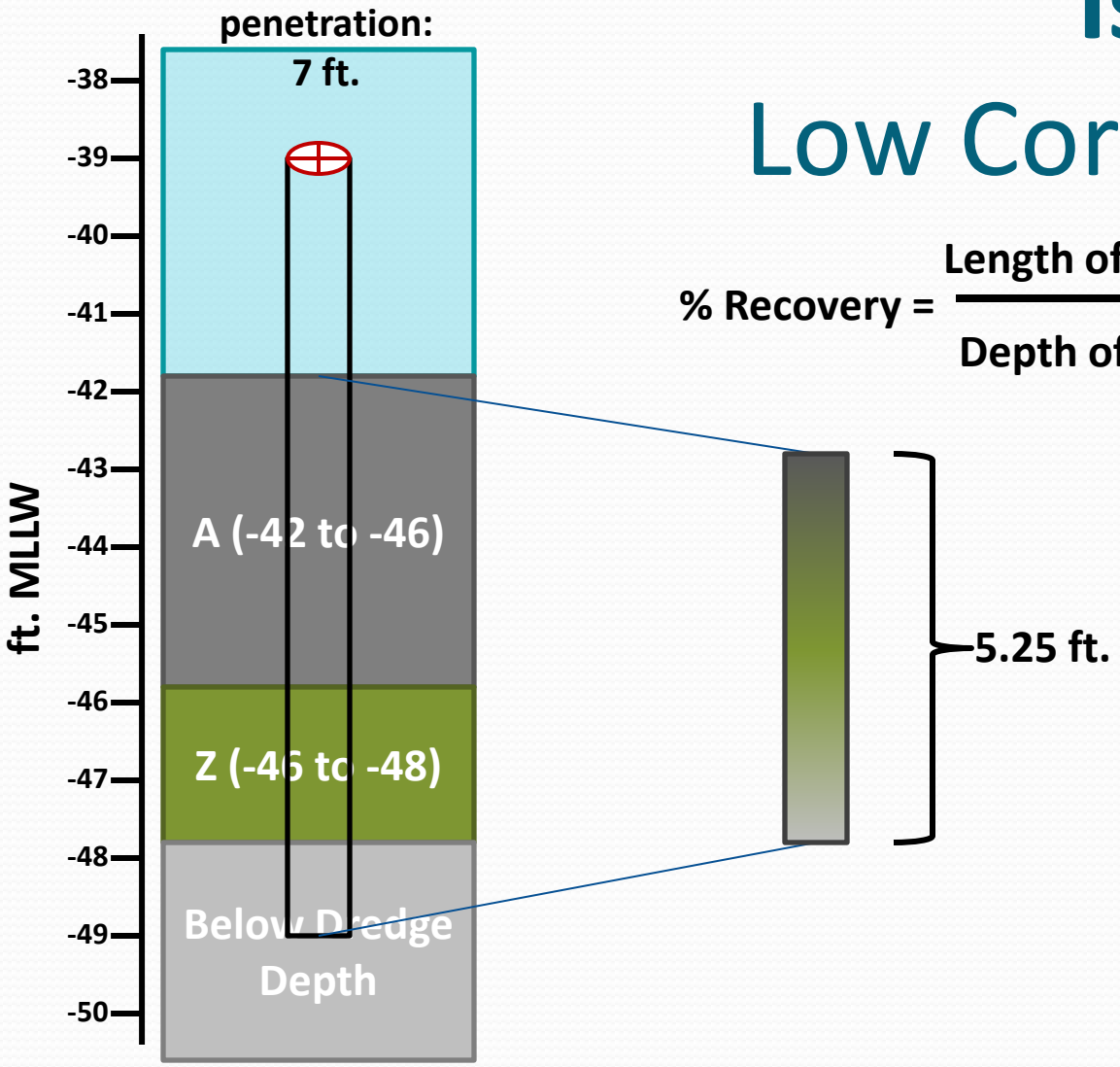
- Sample on station
- Sample the thickest (i.e., most representative) parts of the dredge prism
- Achieve highest possible core recovery
- Collect samples/subsamples from the targeted depths (dredge prism & Z-layer samples)



Presentation Objectives

- Cover the issues:
  - Low core recovery
  - Human-related error
- Propose guidelines and contingencies for core sampling

Issue No. 1:
Low Core Recovery



$$\% \text{ Recovery} = \frac{\text{Length of Sed. Retrieved}}{\text{Depth of Penetration}} \times 100$$

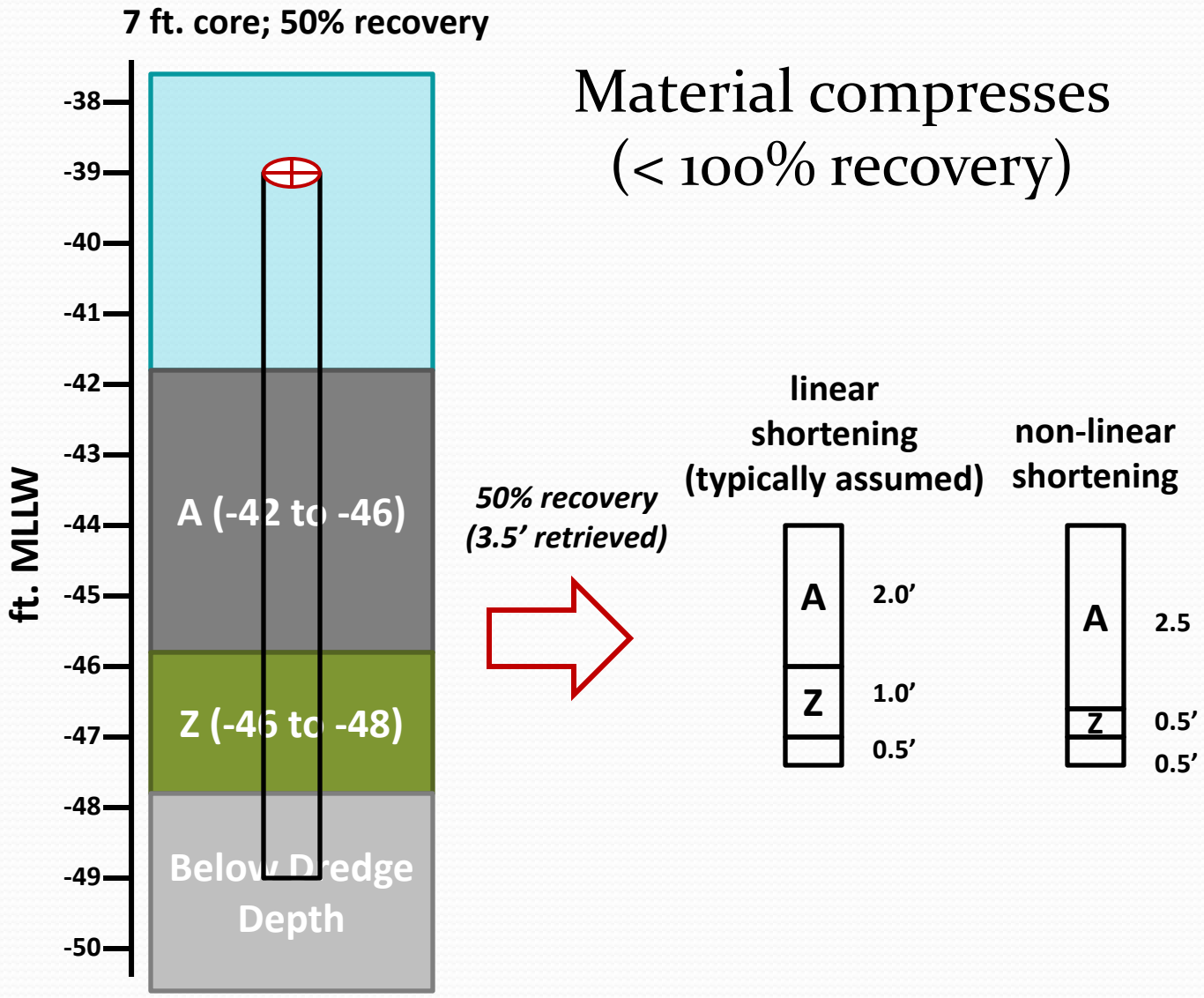
$$\frac{5.25 \text{ ft.}}{7.0 \text{ ft.}} \times 100$$

= 75% Recovery

Low Recovery: Substrate Limitations

- Refusal (gravelly material, debris, etc.)
- Material loss (core catcher doesn't close):
  - Wood debris
  - Coarse-grained sediment

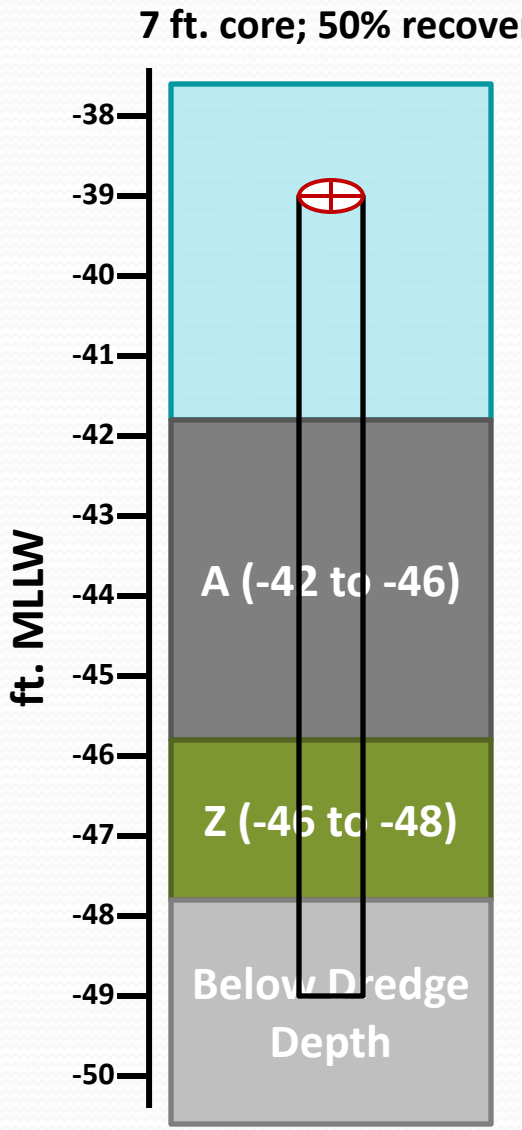
Low Recovery: Sample Shortening



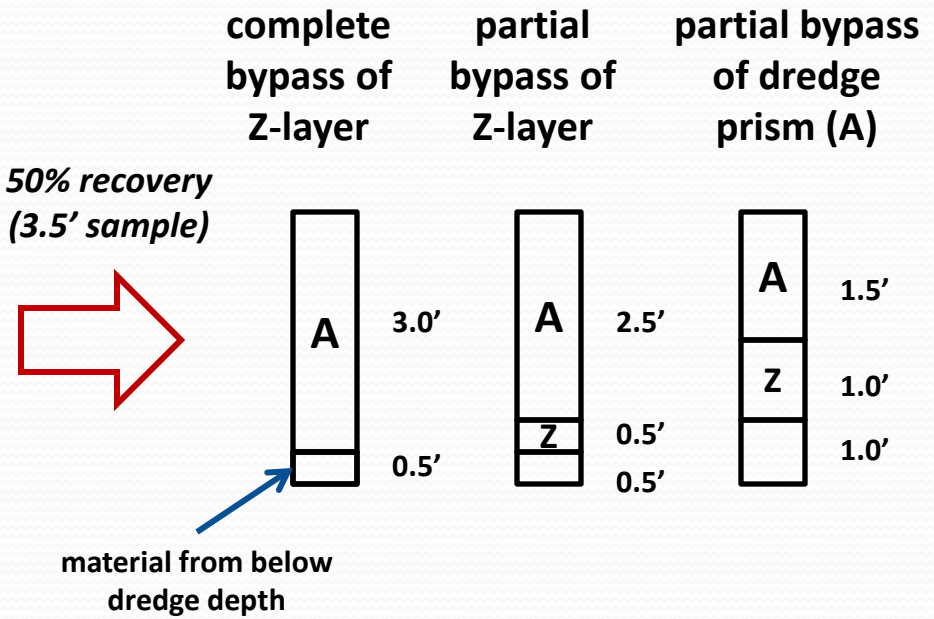
Material compresses (< 100% recovery)

McGuire et al. 2012. Core sampling: influence on sediment profile interpretation. PIANC – Dredging 2012

Low Recovery: Stratigraphic Bypass



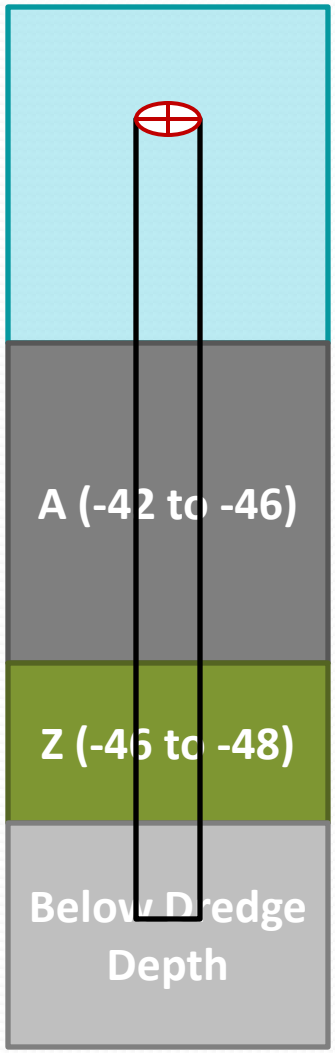
Forces on the inner core wall prevent sediment intake; the core vibrates <u>through</u> the material



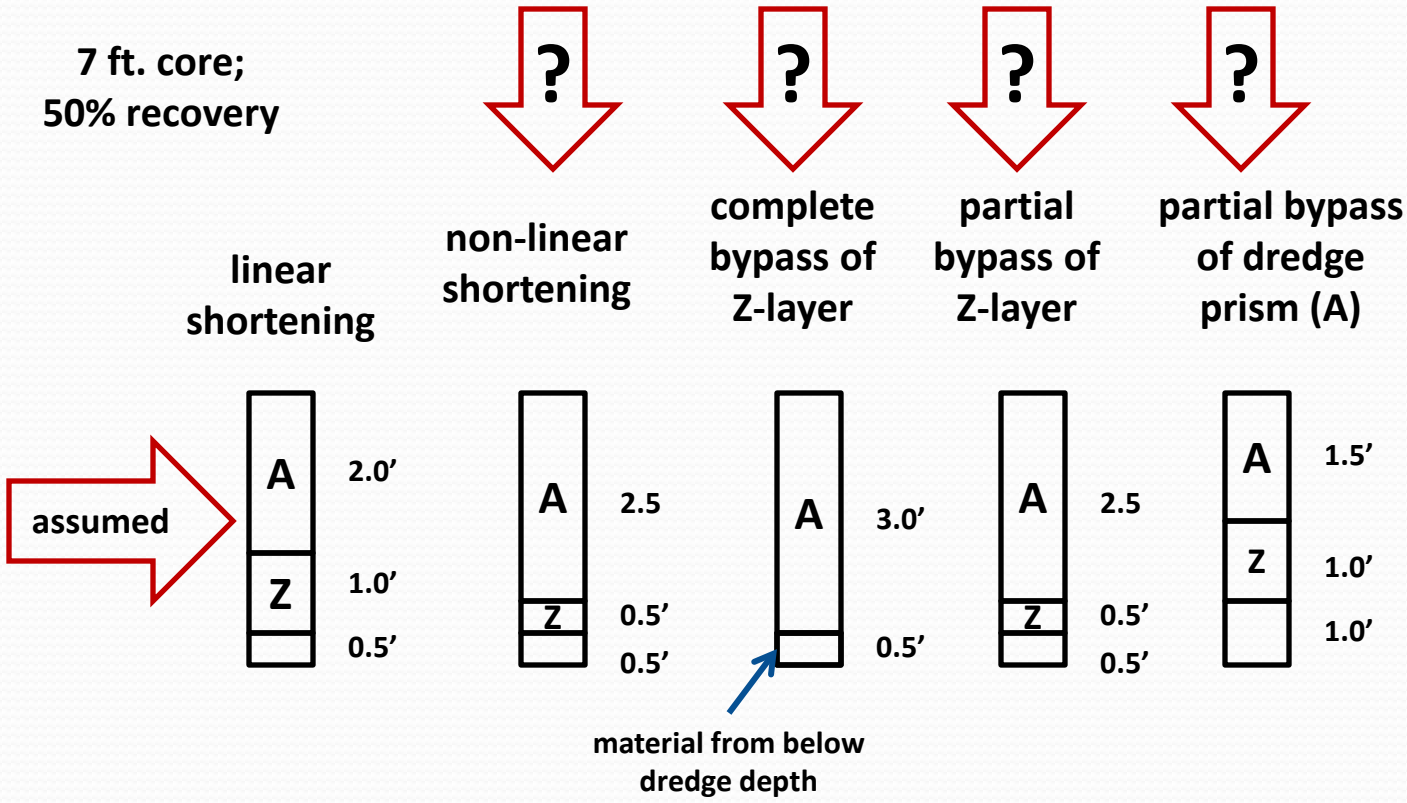
McGuire et al. 2012. Core sampling: influence on sediment profile interpretation. PIANC – Dredging 2012

Low Recovery

THE REGULATORY PERSPECTIVE:



Samples submitted for analysis MUST be representative of the planned dredging project



McGuire et al. 2012. Core sampling: influence on sediment profile interpretation. PIANC – Dredging 2012

Core Sampling Guidelines

- Guideline: MINIMUM CORE RECOVERY **= 75%**

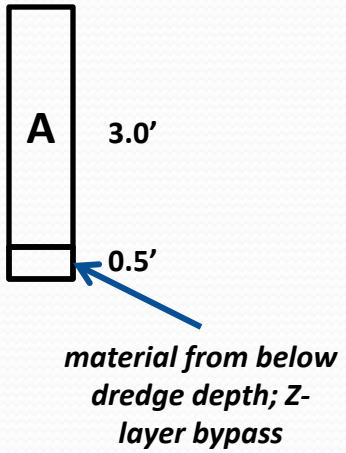
  If at first you don't succeed, try, try again

- Contingency: bring a grab sampler in case of refusal/low recovery in coarse-grained material

- Contingency: post-dredge sampling <u>may</u> be required to characterize Z-layer if:
  - subsurface unit(s) cannot be sampled (refusal)

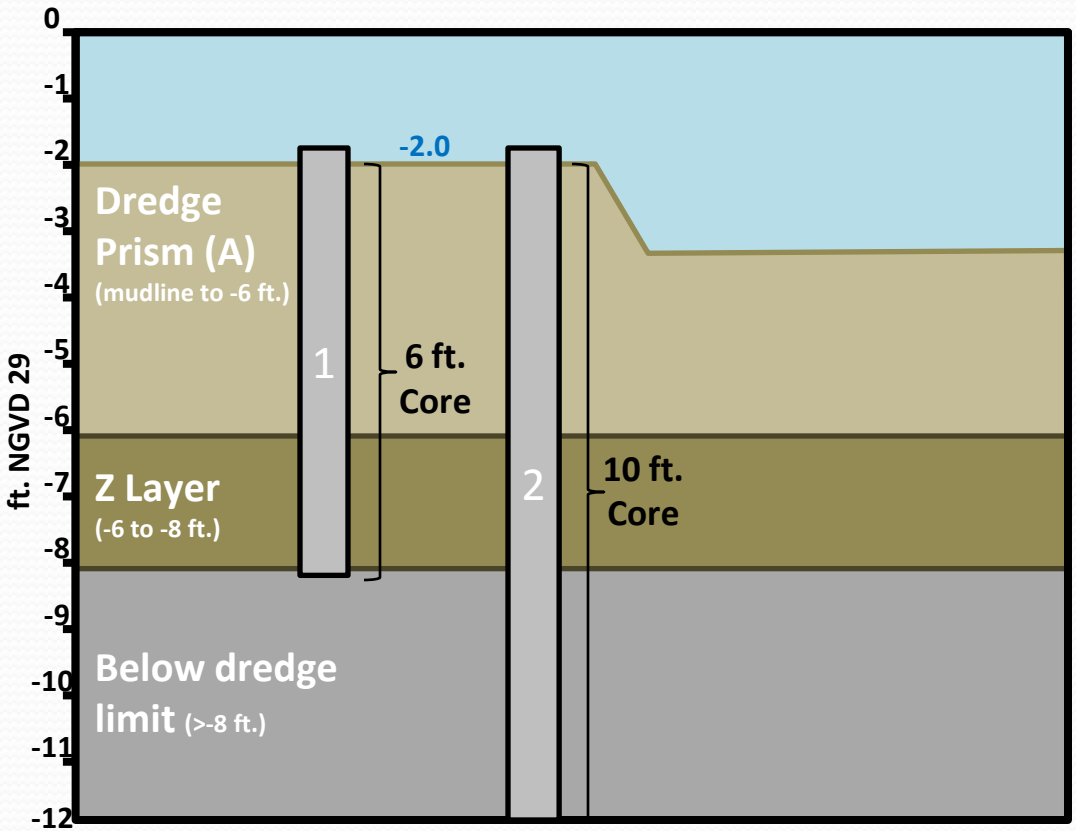
    OR

  - Z-layer sample collection is uncertain (low recovery)

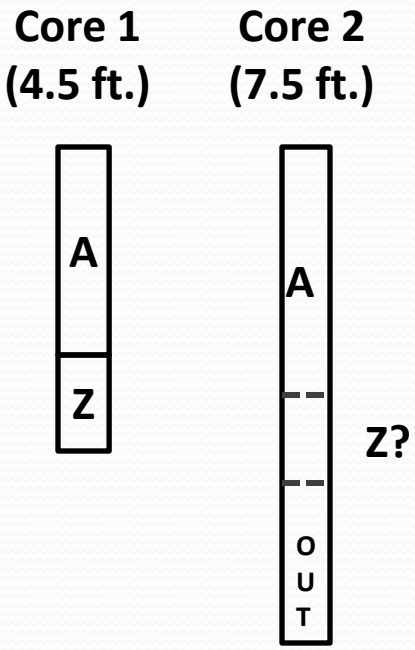


Core Sampling Guidelines (cont.)

Advance the core nose no more than 1 ft. below the Z-layer



75% recovery

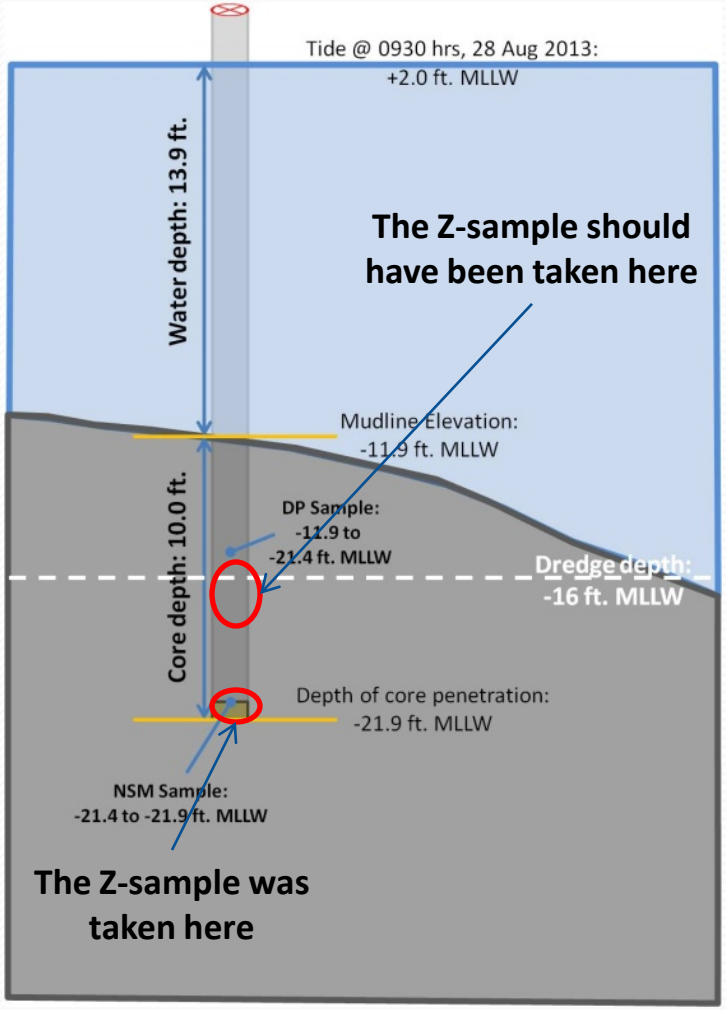


Issue No. 2: Human Error

“We’re Not Gonna Take It”

Human Error

- Poor methodology, field notes, core logging practices
  - Vertical correction for tide/river level
  - Depth to mudline
  - Depth of core barrel penetration
  - Not calculating core recovery
  - Incomplete/incorrect data recording/reporting



Core Sample Log

Page 1 of 8

Project: _____ Date: 06/19/13 Deployment Time: 11:04

Sampling Station: SB-M-1A Lat./Long. N NAD 83'

Station Description: M-1 is near holding pumpout tank @ dock closest to boat Launch

Core Attempt: 1st Depth to Mudline: 9.0 Feet

Tide: 4:18 MLLW ~~GRD~~. Mudline Elevation: -2.105 Ft. NGVD 29 Samplers: _____

Type of Core: Aluminum Model: SDI 3-inch Tube Type: Alum. Liner Type: None

Tube Length: 10 Ft. Double Core Catcher installed.

Core Penetration: -6.105 Ft. NGVD (Ft. Below Mudline) Recovered Core Length 4.0 Ft.

Percent Compaction: No Compaction Noted

Compacted Core Sections: In Dredge Prism: N/A to N/A ____ Ft. Below: _____ to ____

Expanded Core Sections: In Dredge Prism: N/A to N/A ____ Ft. Below: _____ to _____

Notes: _____

	Depth	Core	Description (Soil type, color, MC, odor, etc)	Other notes, Insitu tests
1	0-3	X	Silt Clay - Grey Brn - No odor	N/A
2	3-4	X	Silt Clay - Grey Brn - No odor	N/A
3		Datum		
4 to	-2.105 -5.105	Ft. NGVD 29	Dredge Material SB-M-1-A	Physical & Chemical
5 to	-5.105 -6.10	Ft. NGVD		at Lab.

9439201 20130619 04:24 0.73 2.34
9439201 20130619 04:30 0.79 2.41
9439201 20130619 04:36 0.86 2.50
9439201 20130619 04:42 0.93 2.59
9439201 20130619 04:48 1.00 2.69

http://tidesandcurrents.noaa.gov/data_menu.shtml?bdate=20130619&edate=20130620&wl... 9/23/2013

Sampled on
19 June 2013

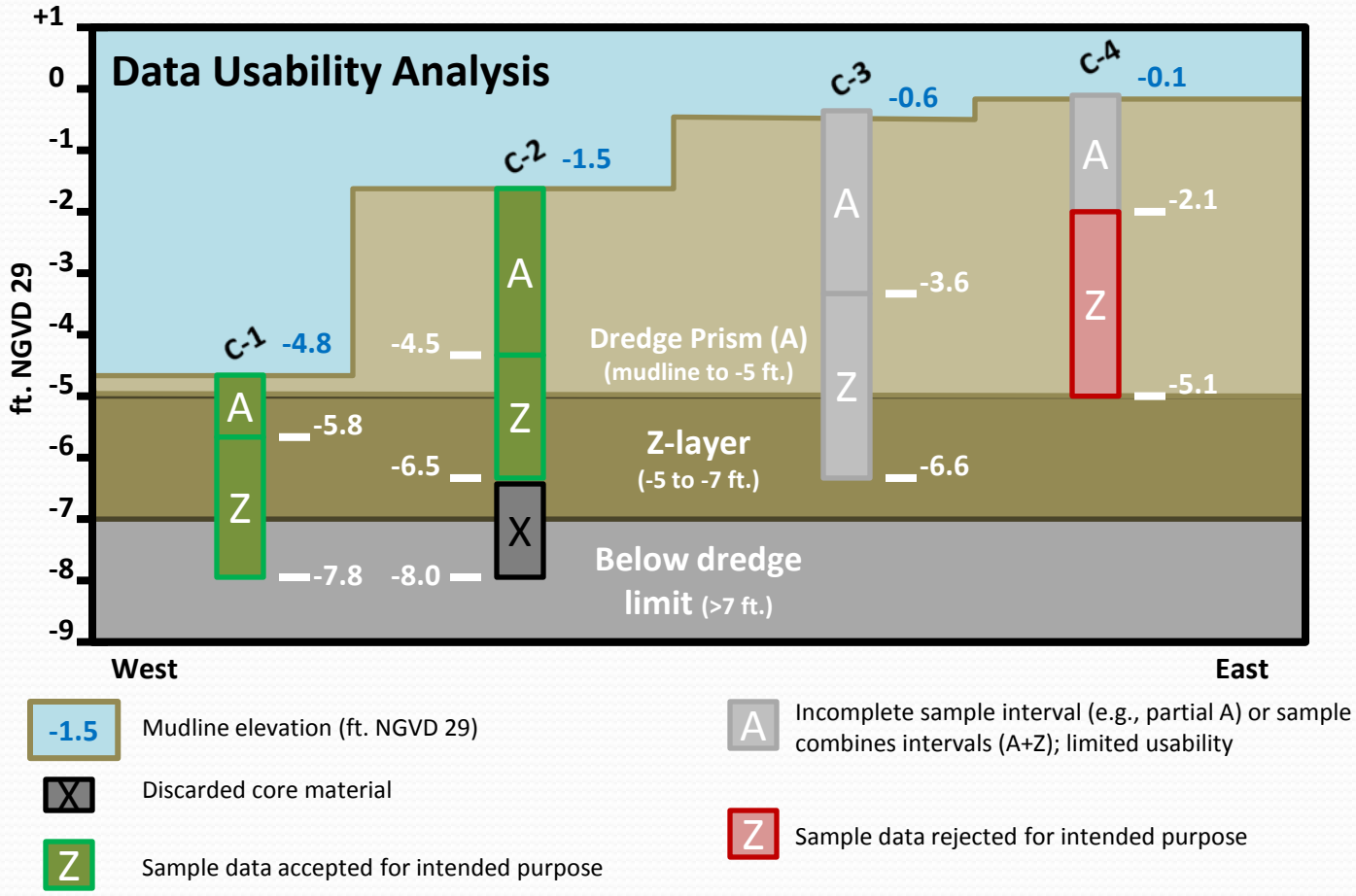
Core log provided on
4 Sept 2013 (uncorrected)

Log revised w/
vertical corrections
on 25 Sept 2013

Tidal corrections made
3 mos. after sampling!

Human Error

Contractor collected Z-sample from the core bottom



Human Error: What We're Going to Do About It

- Preventive measures:
  - Pre-sampling meetings w/ DMMP/PSET
  - Standardize fields in core (and grab) sample logs
  - Develop field checklist for samplers
- Negligent sampling = err on the side of resources
  - Longer review times
  - Reject some or all sample data
  - Re-sample project (& re-analyze samples)
  - Post-dredge characterization

We Need Your Help

Please provide comments to help us improve our core sampling guidelines

Reference

McGuire, C., P. McGuire, D. Richardson, & J. Holmstadt. 2012. Core sampling: influence on sediment profile interpretation. *Presentation by* TetraTech staff at the PIANC-COPRI Dredging 2012 Conference, 24 October 2012, San Diego, CA.

http://dredging12.pianc.us/agd_detailss.cfml?ssid=166

Questions?


DEQ
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