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Northern Lights 2016: Technical Lessons Learned from the Data Analysis

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Northern Lights 2016:

- Nuclear Power Plant accident with significant radionuclide release
- Monticello Nuclear Generating Plant in Monticello, MN
- StartEx: t = +21 days post release
- Exercise consisted of 3 pre-start workshops and 4 days of Exercise Play
  - Onsite Play: Camp Ripley Training Center near Little Falls MN
- Major focus: post-emergency phase leading to recovery phase and transition from DOE to EPA led FRMAC

Exercise the end-to-end laboratory analysis process including field activities, sample management, laboratory activities, data collection/validation

Field Exercise Dilemmas for Laboratories

Not enough time to analyze samples

No radioactivity in samples

How to incorporate off-site labs?

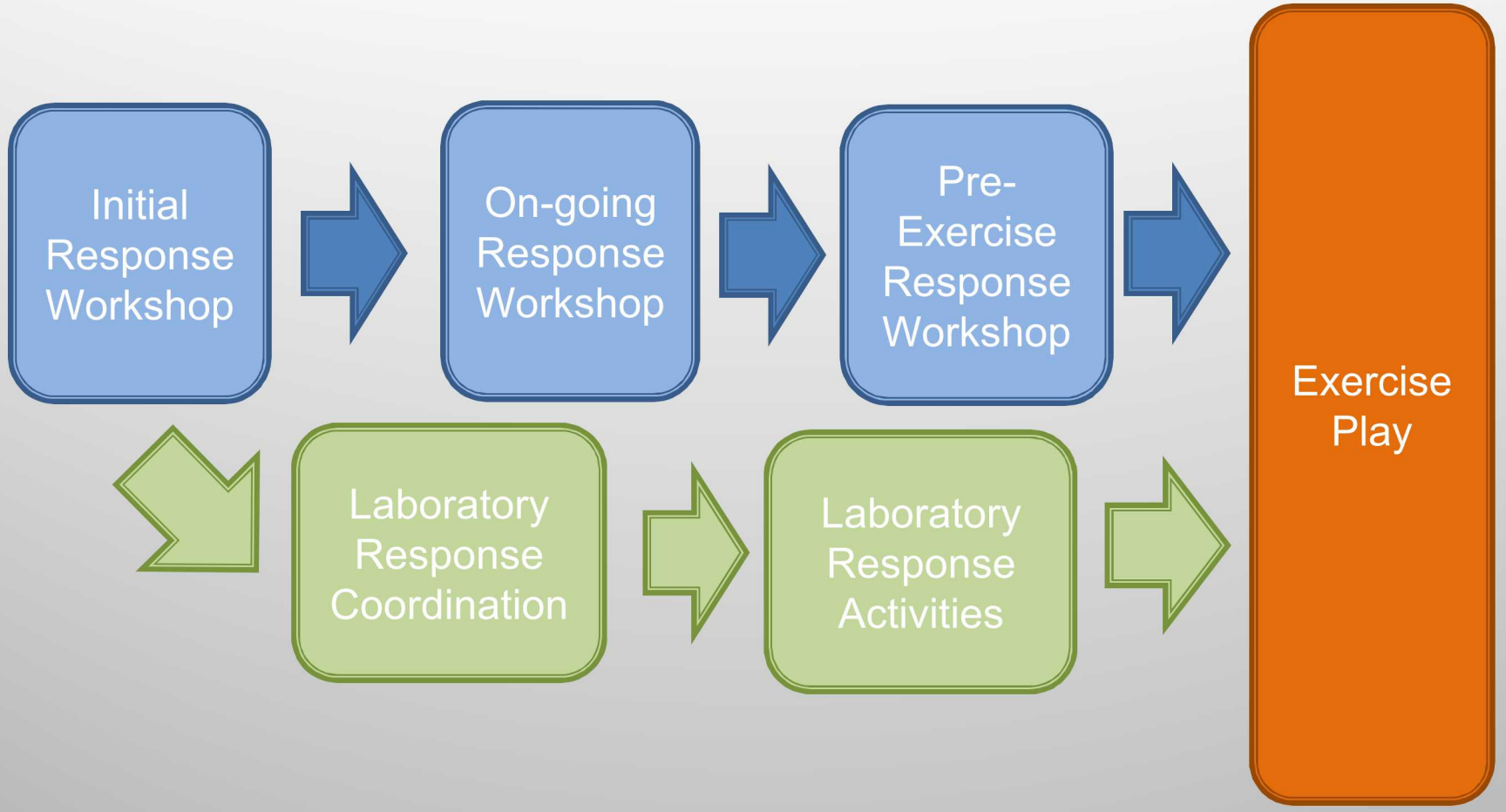
Northern Lights scenario provided opportunity to incorporate off-site lab analysis using “more realistic” samples.

Laboratory Participation

- 8 Laboratories reporting directly to FRMAC Lab Analysis
  - 6 Federal labs planned
  - *1 Federal lab unplanned*
  - 1 State Public Health Lab
- 6 Food Emergency Response Network (FERN) reporting through the Integrated Consortium of Laboratory Networks (ICLN)
  - State Public Health Labs
- 1 Mobile Lab

14 offsite labs representing both federal and state agencies

Pre-Exercise Workshop Process



Sample Development Scope and Timeline

- Highly Enriched U irradiated September 6th, 2016
- Samples Shipped 9/27/16 via overnight FedEx to 13 US Labs from Atlanta
  - Water, Soil, Air Filter (LLNL supplied), Vegetation (Coffee Grounds)
- 75 Active Samples
  - Activity, 0.0128 μCi or 0.1 μCi
- 135 Blank Samples

Eckert & Ziegler Analytics

Metrics for Primary Objective
Complete Analyses and Return Results

Laboratory	Gamma Analyses	Sr-89/90 Analyses	# completed
Lab 1	20	6	26
Lab 2	20	6	26
Lab 3	20		20
Lab 5	20	6	20
Lab 4	20		20
Lab 6	38	10	48
Lab 7	20	4	24
Lab 8	*0*	*2*	*2*
Lab 9 (FERN)	3		3
Lab 10 (FERN)	3		3
Lab 11 (FERN)	3		3
Lab 12 (FERN)	3		3 (qualitative)
Lab 13 (FERN)	3		3 (qualitative)
Lab 14 (FERN)	3		3 (qualitative)

What We Asked For (The ARF)

Water/Soil/Veg
Ba-140
Cs-134
Cs-137
I-131
I-133
La-140
Mo-99
Rb-86
Ru-106
Sb-127
Tc-99m
Te-127m
Te-129m
Te-132
Y-91

Air Filter
Ba-140
Cs-134
Cs-137
Gross Alpha
Gross Beta
I-131
I-133
La-140
Mo-99
Rb-86
Ru-106
Sb-127
Tc-99m
Te-127m
Te-129m
Te-132
Y-91

Veg/Soil/Water/AF
Sr-89
Sr-90

- In the Analysis Request Form (ARF) written Instructions:

"Report an activity for each radionuclide on the request and ***any other analytes that are detected above the measured Lc***"

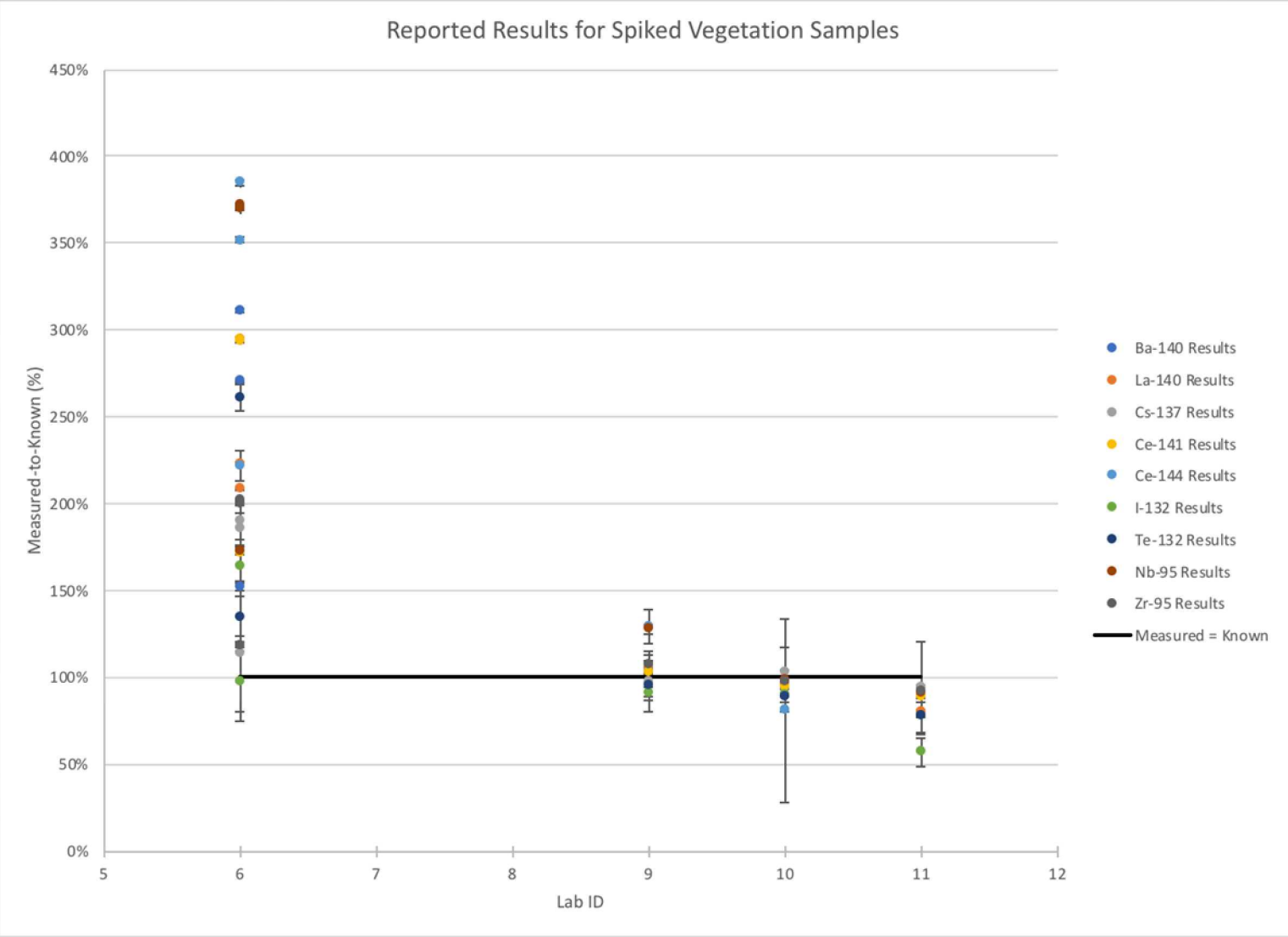
Results returned

- Electronic Data Deliverables (EDD) 30 Separate ARF's (Analysis Request Forms)
- 210 Total Samples
  - 75 Spiked
  - 135 Blanks
- 3624 individual quantitative results for all nuclides reported in both Blanks and Spikes
- Blanks showed no evidence of cross contamination

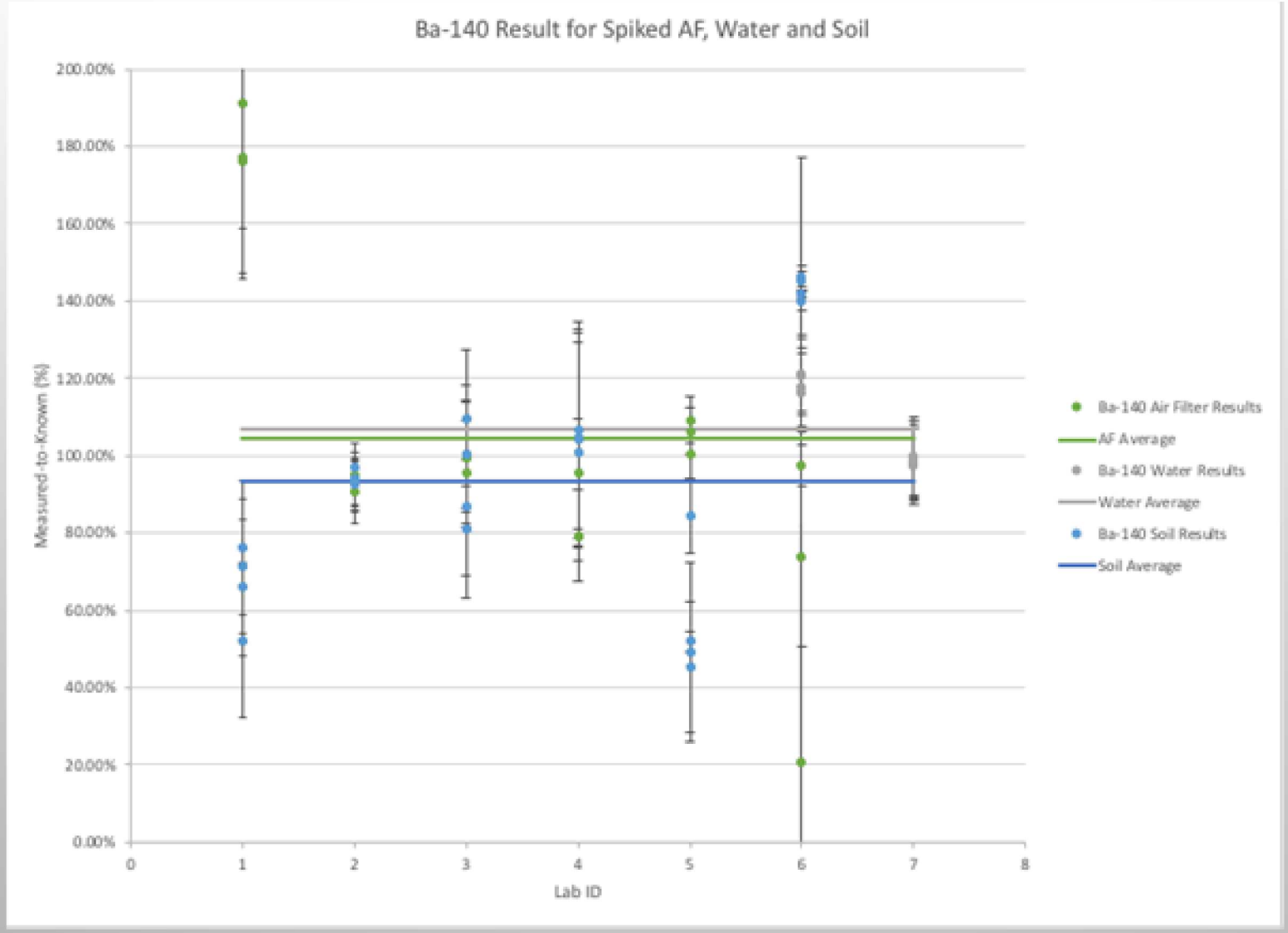
How best to summarize so much data?

- Can’t possibly show all data in this presentation; we’d be here all day.
- What is the most interesting data?
- What elucidates issues to resolve?
- What were the successes?
- What were the nuclides of interest?
  - Parent-Daughter pairs
- Soil vs. Water vs. Air Filter vs. Vegetation

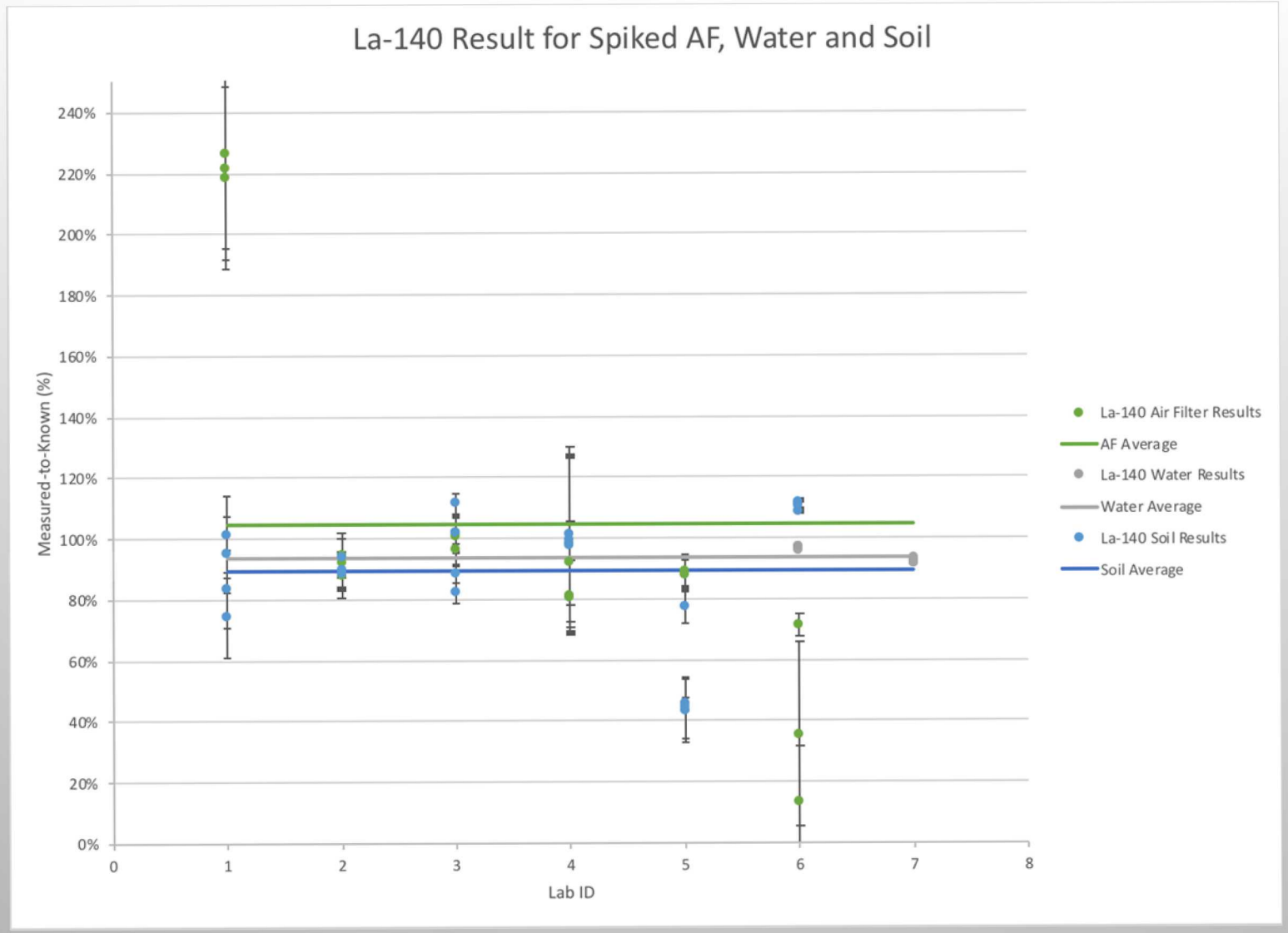
Vegetation results



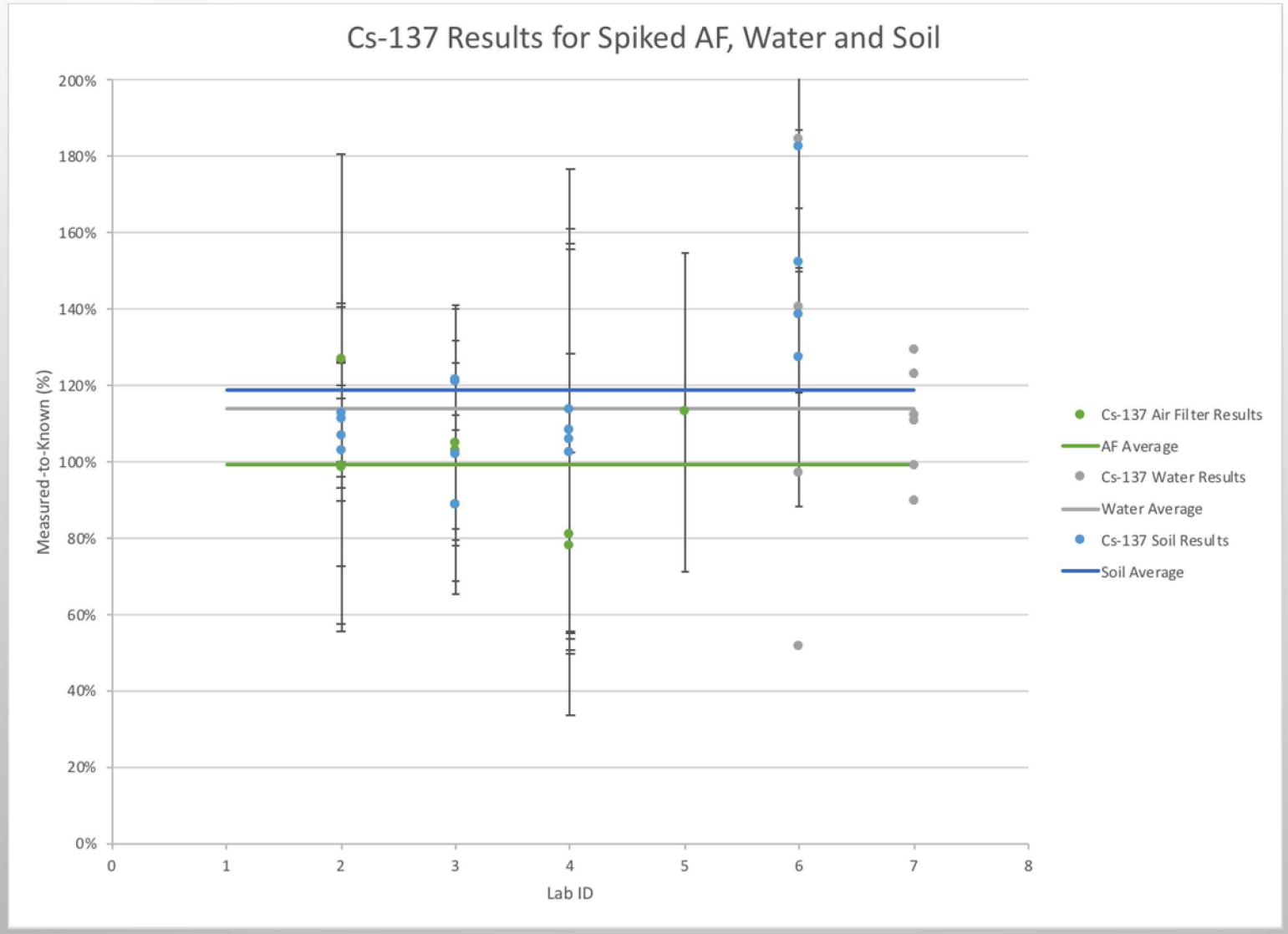
Air Filter vs. Water vs. Soil



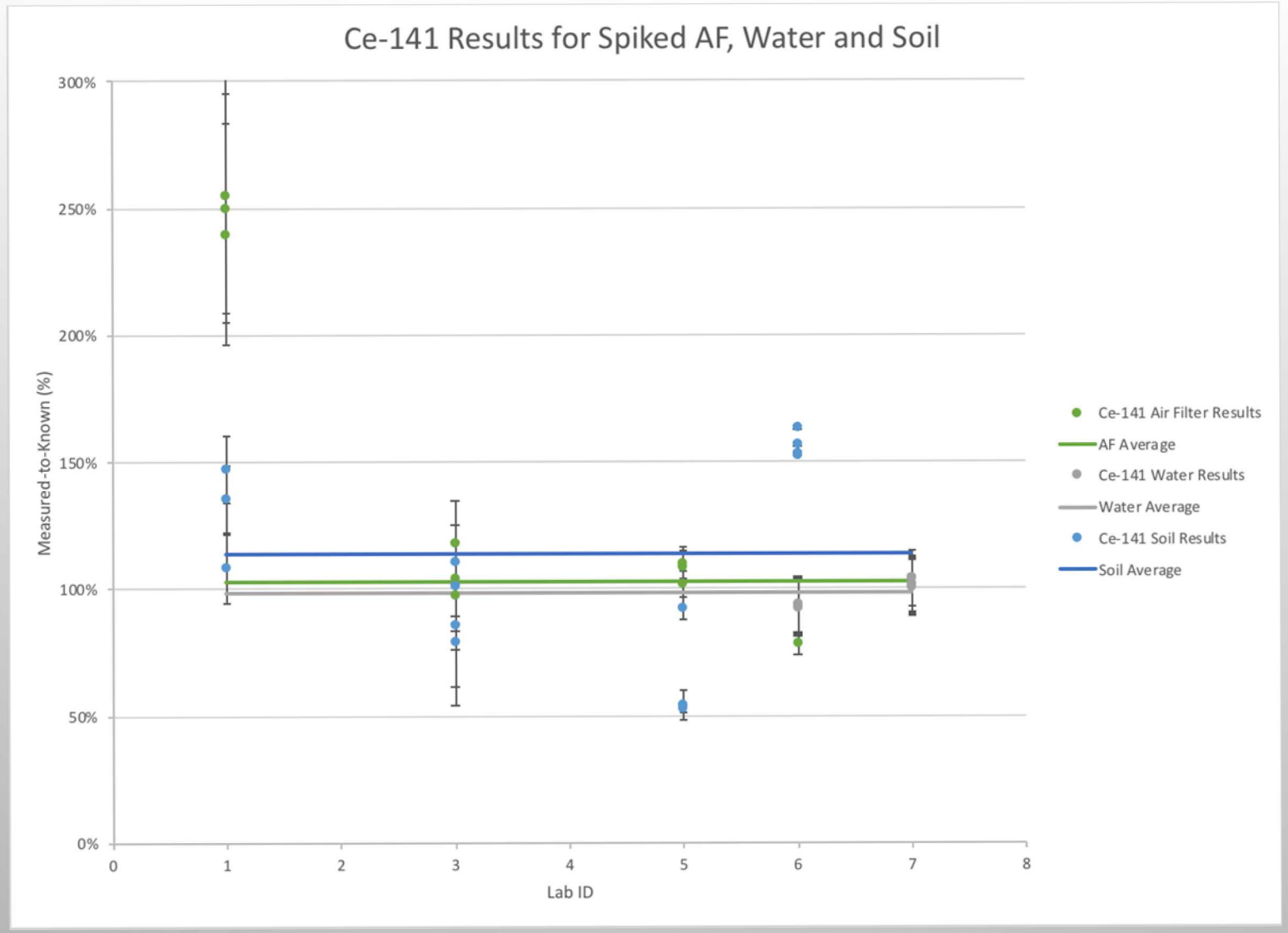
Air Filter vs. Water vs. Soil



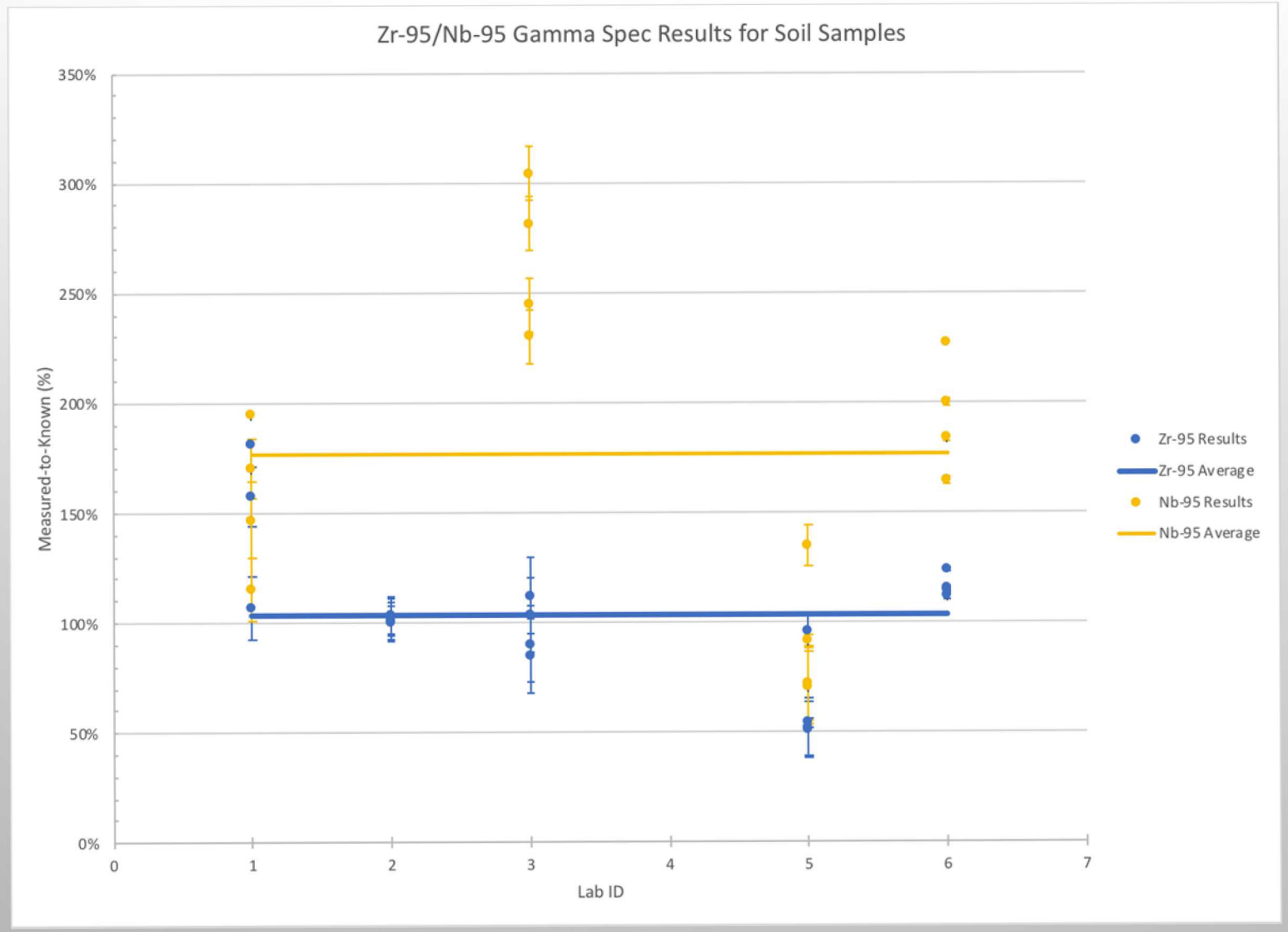
Air Filter vs. Water vs. Soil



Air Filter vs. Water vs. Soil



Parent-Daughter Results



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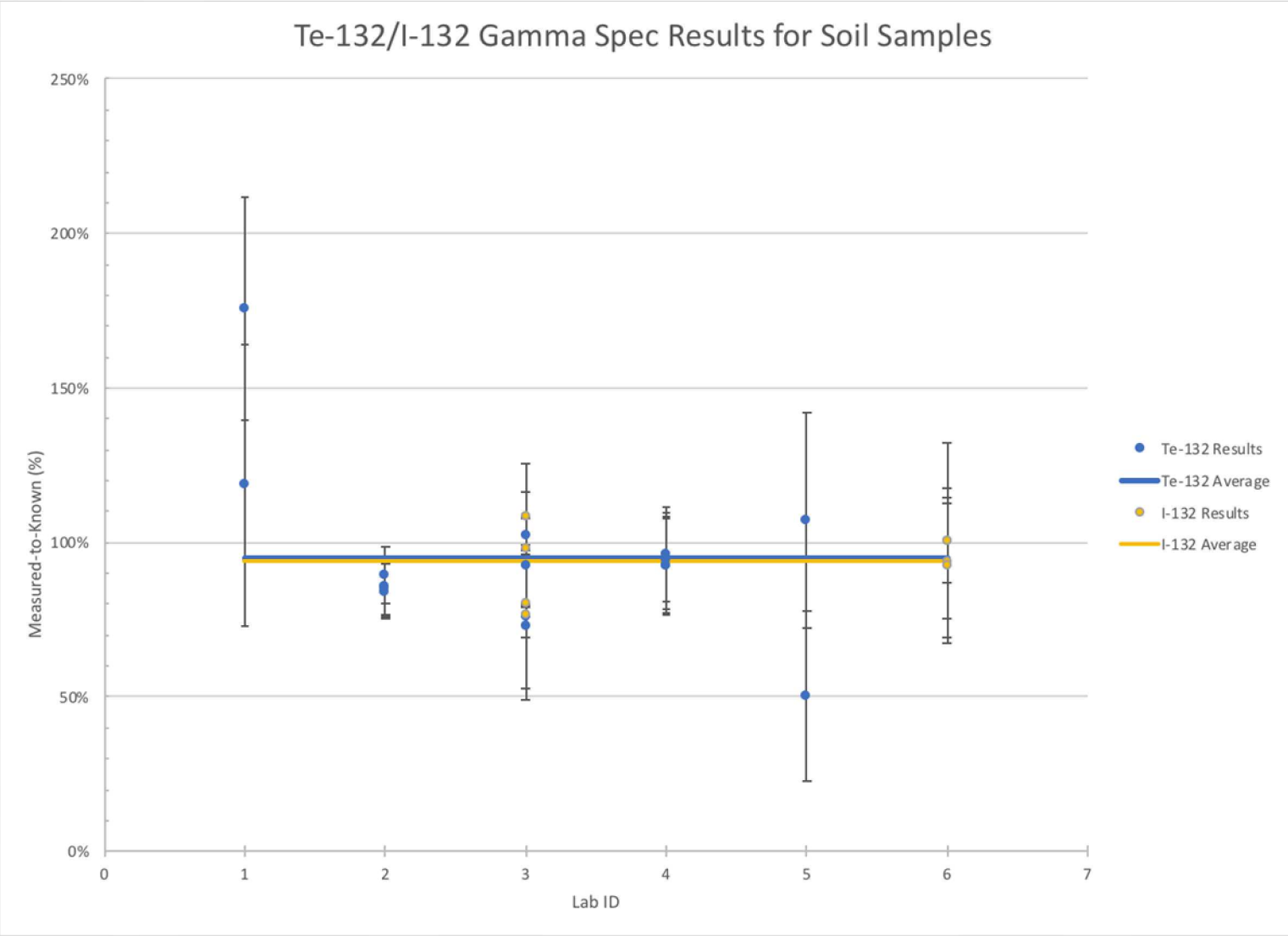
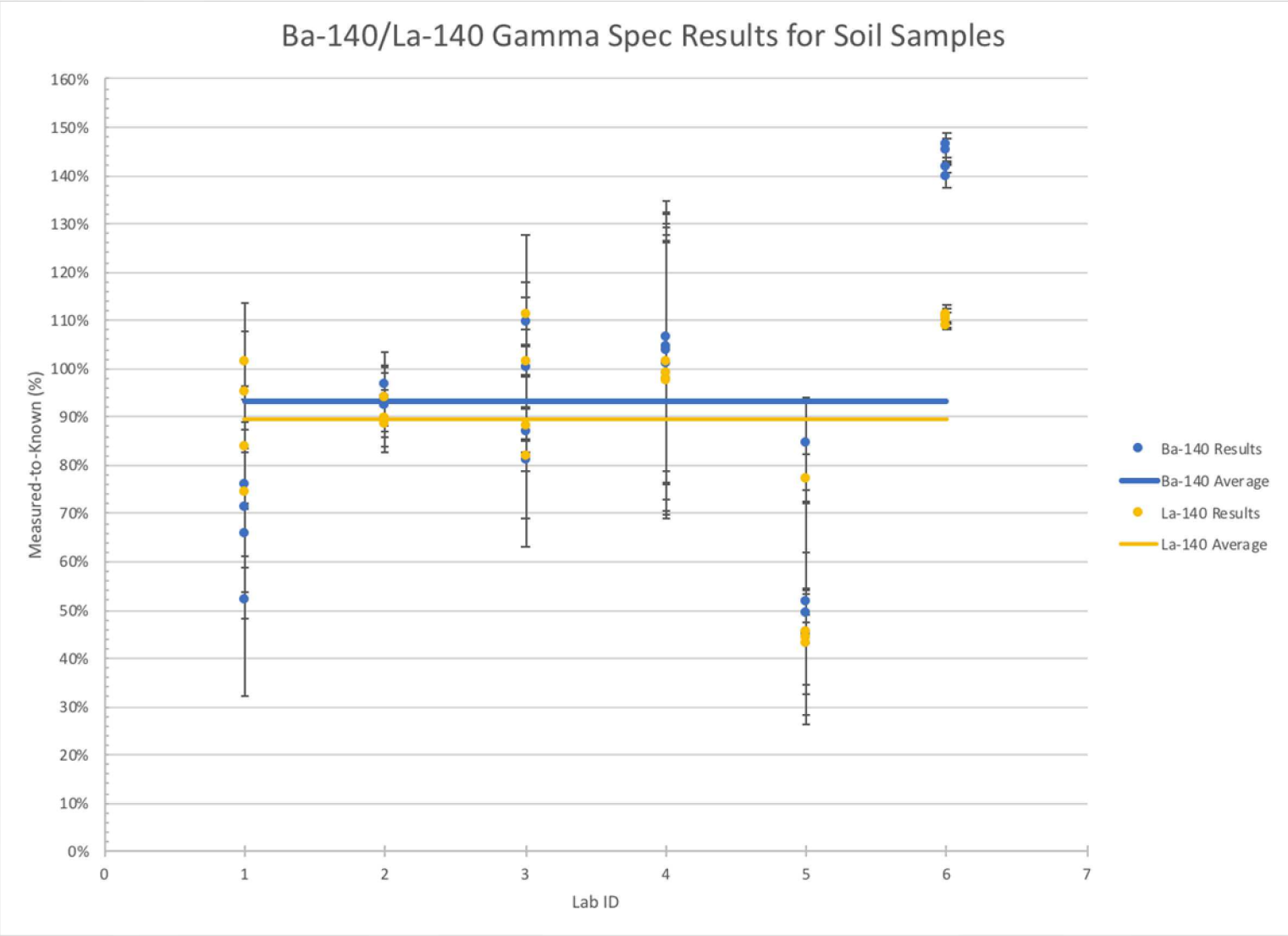
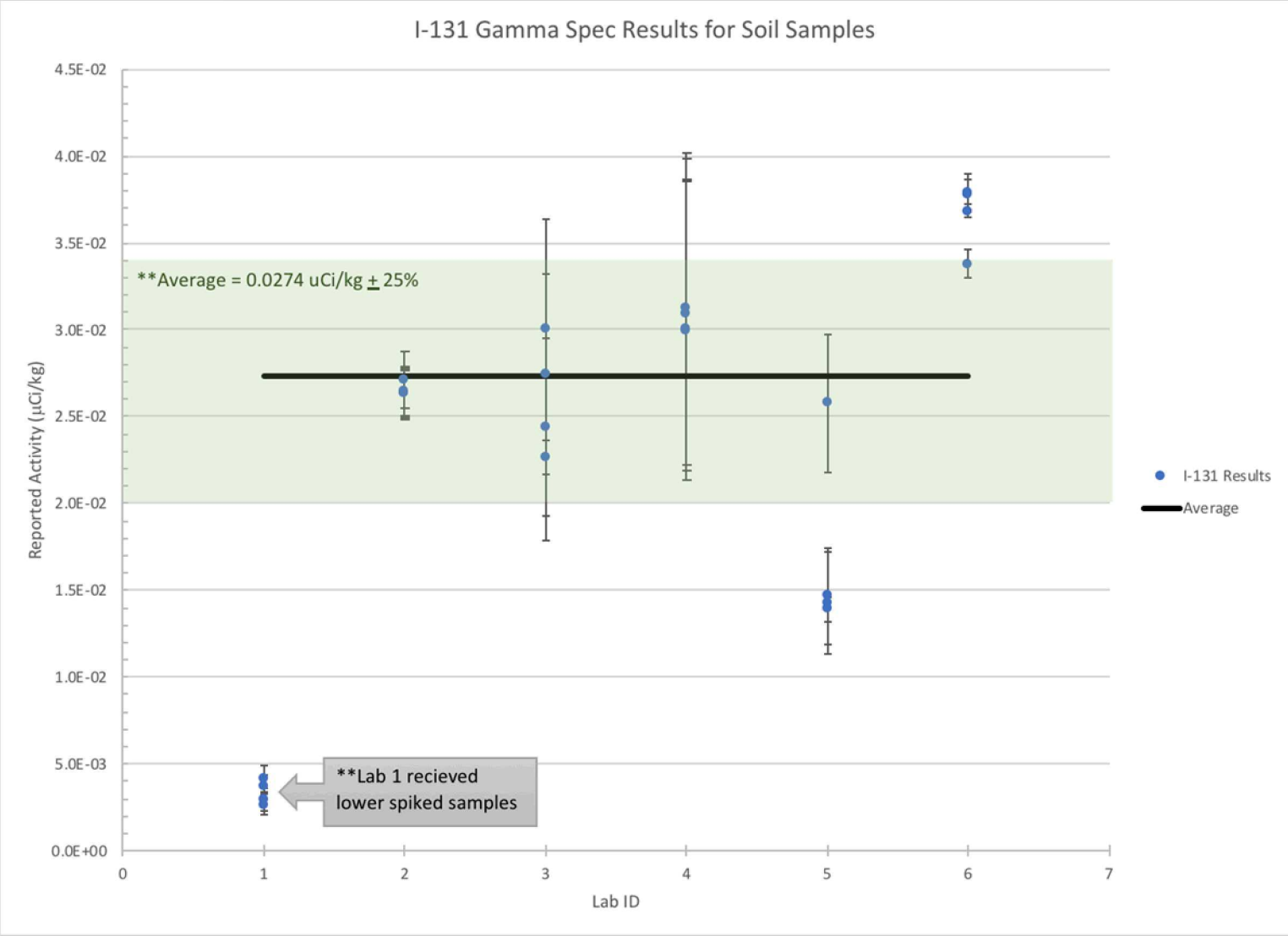


Parent-Daughter Results



Comparison of I-131 Results



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