Automatic Quantification of Dissolved Copper at Remote Mine Drainage Sites

American Society of Reclamation Sciences
Butte, Montana
June, 2025

Presented by:

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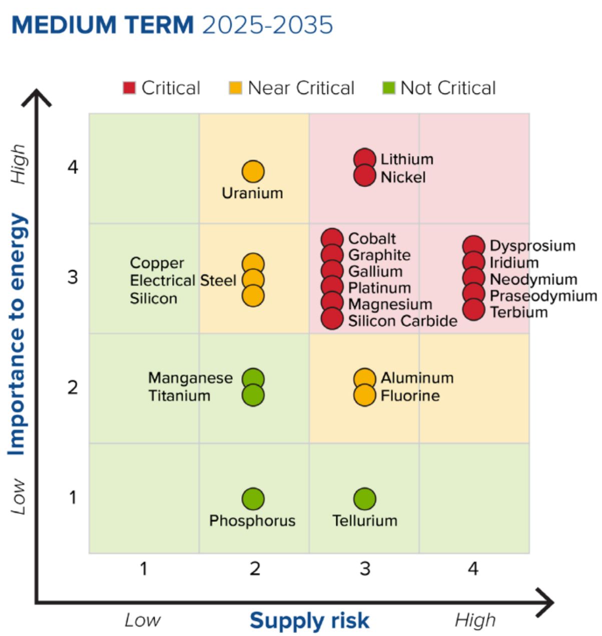
PROBLEM STATEMENT

The demand for refined metals will increase over the next decade.

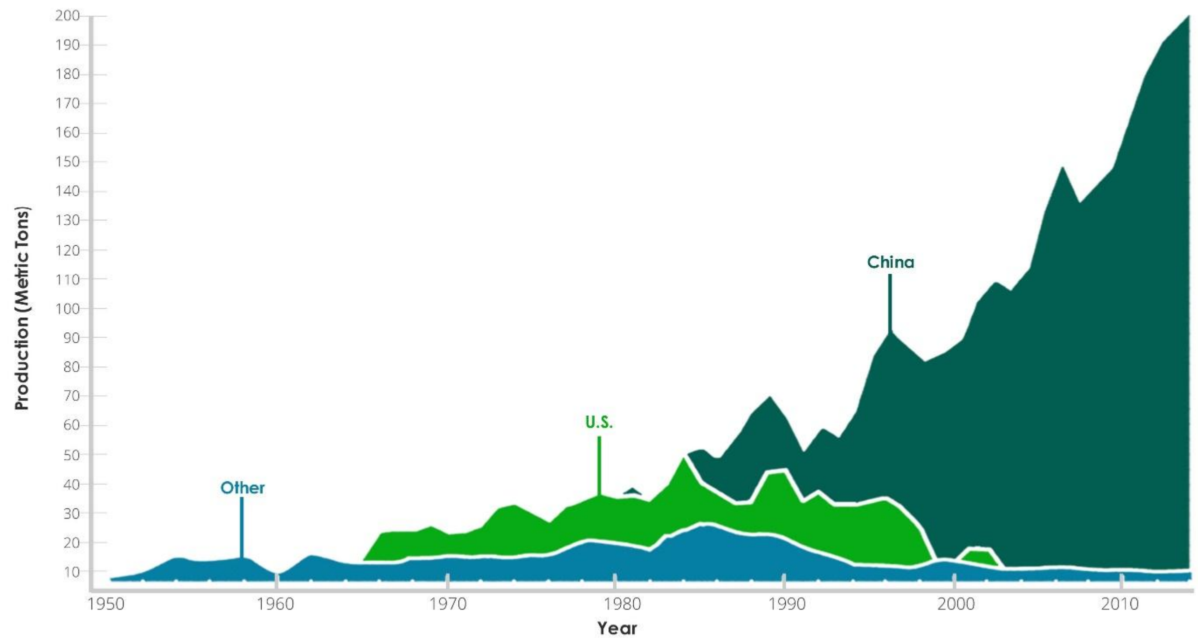
Meanwhile, reliance on imports is at an all-time high.

U.S. Department of Energy

2023 Criticality Assessment



Rare Earth Element Supply by Country over time



U.S. Department of Energy. (2025, May). *Critical Minerals and Materials.* Retrieved from www.energy.gov/topics/critical-minerals-and-materials

Mullen, J. (2023, February 22). Retrieved from US DOE National Energy Technology Laboratory: https://www.energy.gov/sites/default/files/2023-04/overview-netl-critical-minerals-materials-program.pdf

PROBLEM STATEMENT

The Unites States needs more geologists, mining engineers and chemists.

"Our nation faces another critical shortage that jeopardizes our ability to produce the necessary quantity of these minerals efficiently, safely, and sustainably ***:***

a lack of college graduates sufficiently skilled in the key geological and engineering disciplines (mining, metallurgical, mineral, and geological)."

- Essential Minerals Association

PROBLEM STATEMENT

What if we could be 100x more effective or be in 100 places at once?

What is the Hummingbird™ Platform?

- New sensor technology can detect a wide range of chemicals.
- Measurements are performed in-process to provide actionable data for process control.

How does it work?

- The key sensing element is a fluid-fluid microreactor.
- Photochemicals are circulated through the microreactor, where they interact with crossflow.
- Optical instruments measure the fluorescent response of the photochemicals.
- A wide range of substances can be targeted for measurement using photochemicals.

Dean Gouramanis

Automation Engineer

About Myself

- My day job: I build robots that build aircraft.

What does that mean?

- I solve problems through automation.
- I work with hydraulics.

The toolbox of a Chemical Process Control Engineer.

temperature

1885

pressure

1940

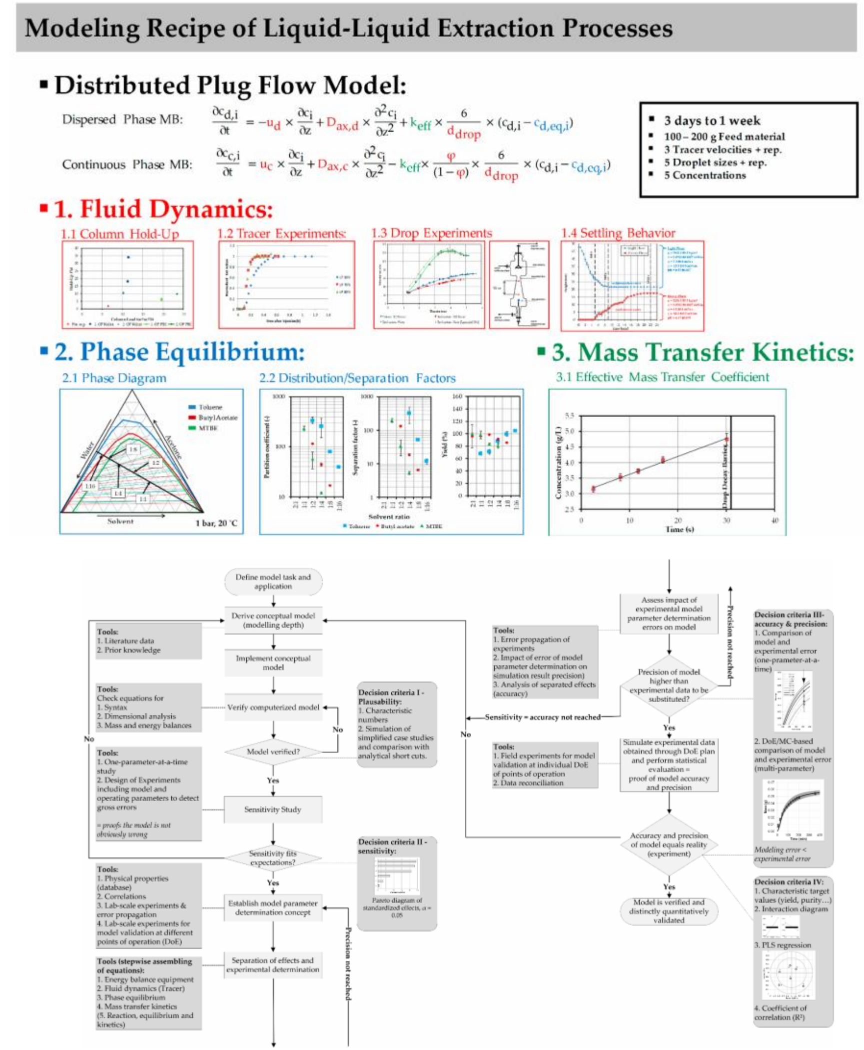
flow

1930

pH

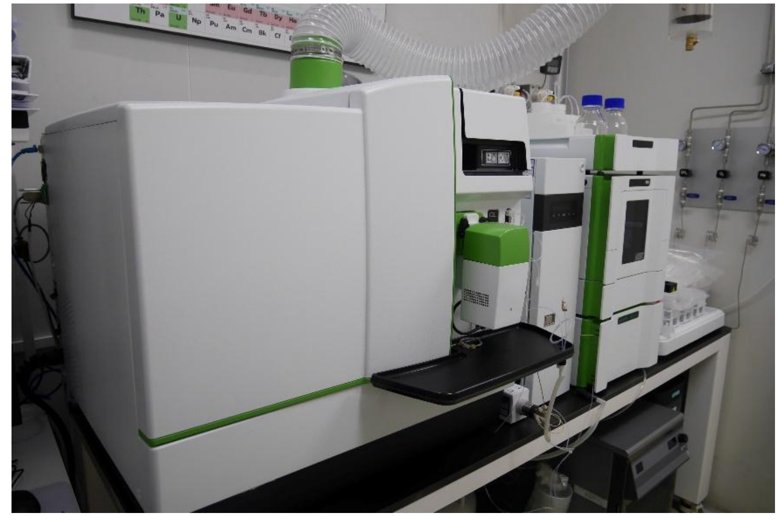
1930

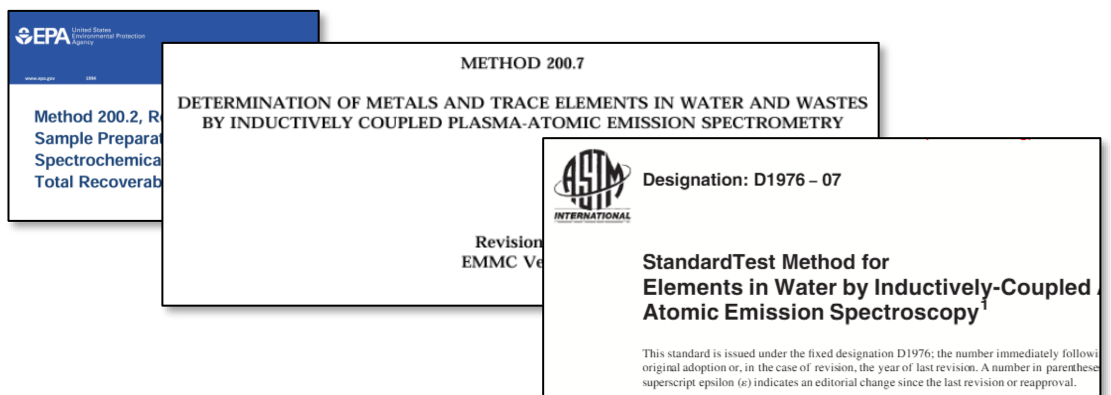
Systems are heavily reliant on mathematical models.



Schmidt, A.; Strube, J. Distinct and Quantitative Validation Method for Predictive Process Modeling with Examples of Liquid-Liquid Extraction Processes of Complex Feed Mixtures. Processes 2019, 7, 298. https://doi.org/10.3390/pr7050298

Chemical composition is measured periodically.

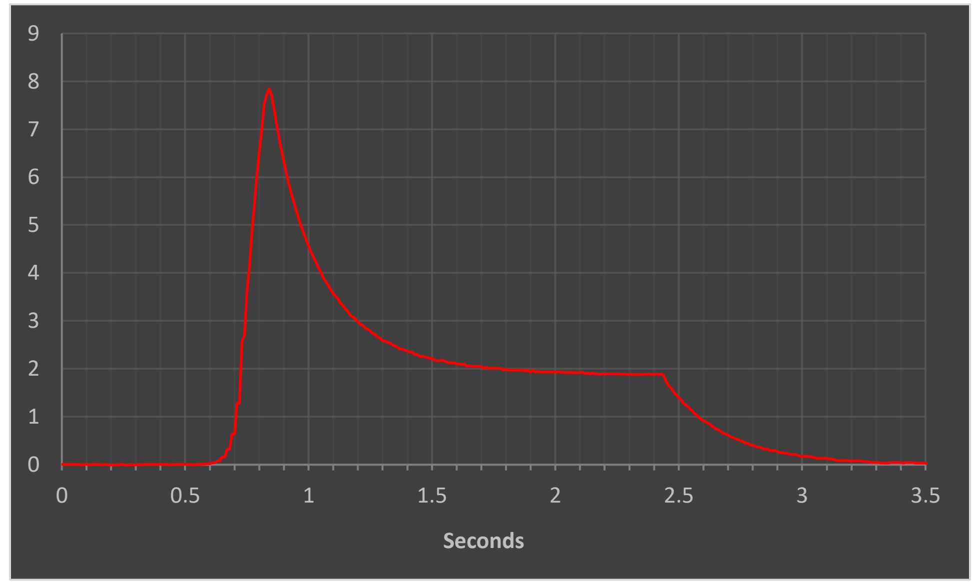




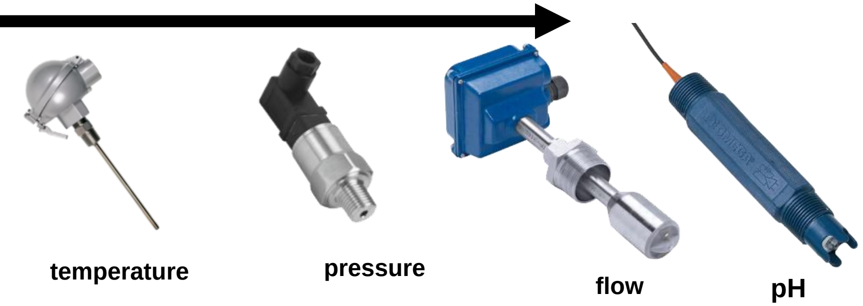
There are different kinds of __precision__.

Accuracy

Event Recording



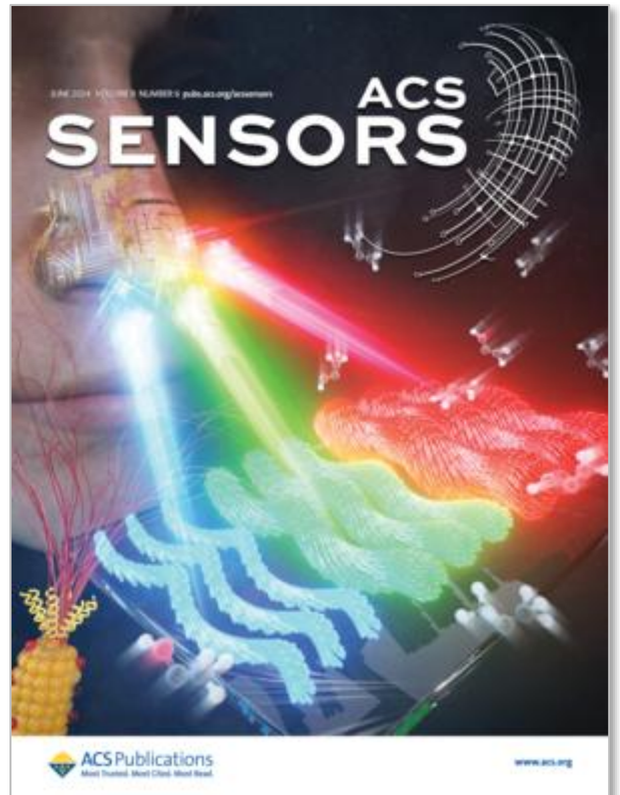
Timing



Photochemical Sensors

Chemical Sensors

- Thousands are published.
- Hundreds of new sensors every year.



ACS Sens. 2024, 9, 6, 2869–2876

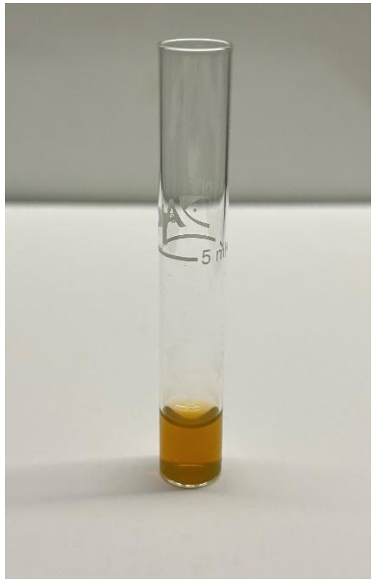
Types of sensors.

Colorimetric reagents

exhibit a change in absorbance.

Examples:

- Copper
- Arsenic
- Molybdenum



Absorbance Signal

Fluorescent reagents

exhibit a change in emission.

Examples:

- Lithium
- Cobalt
- Neodymium

Fluorescent Signal

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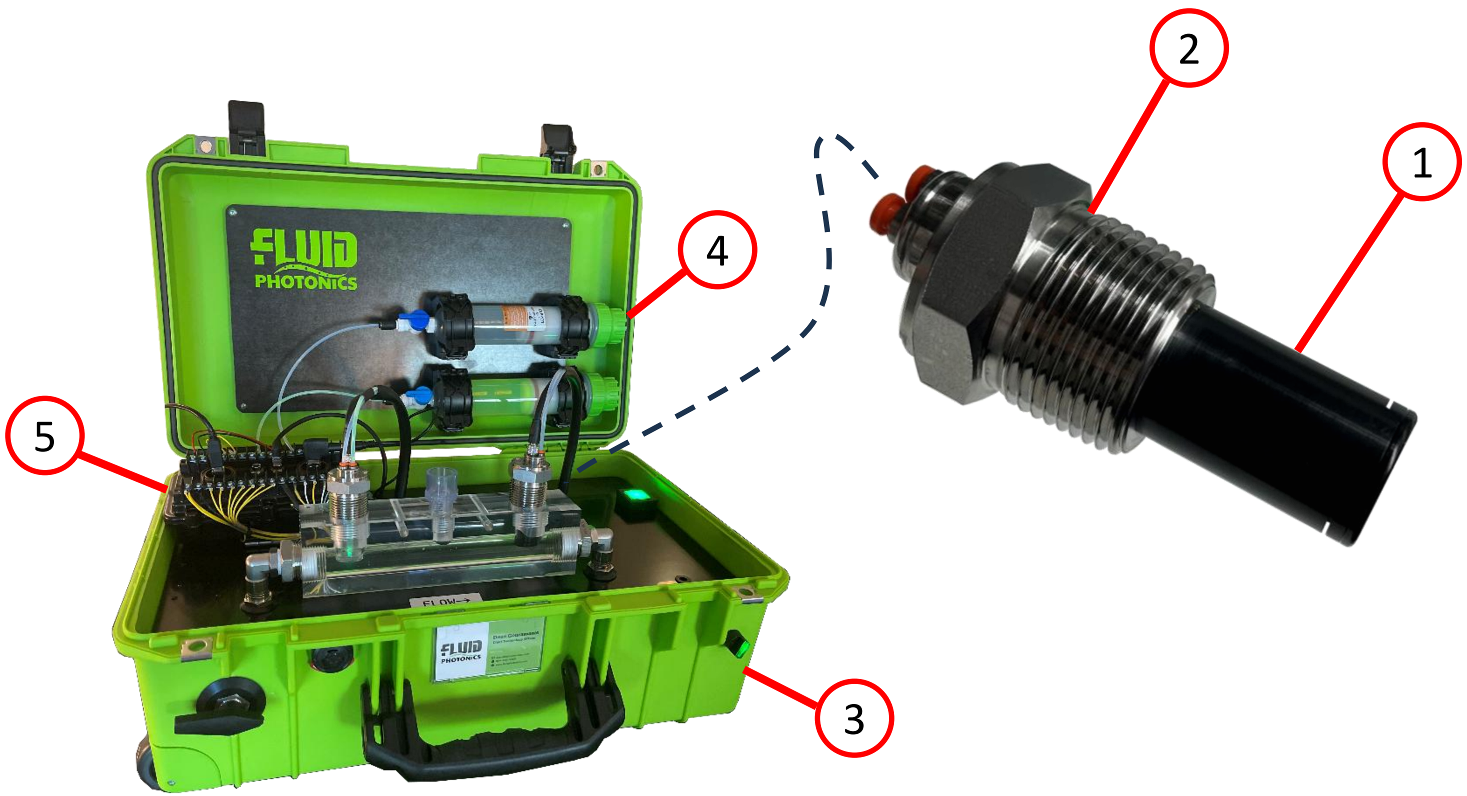
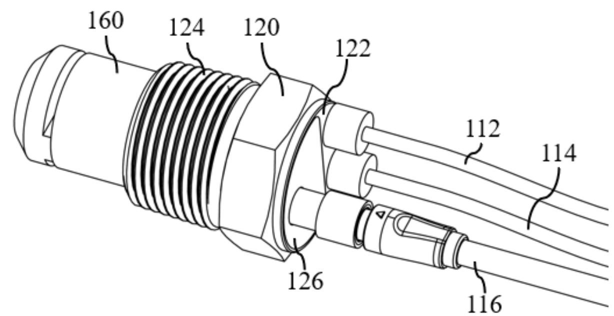
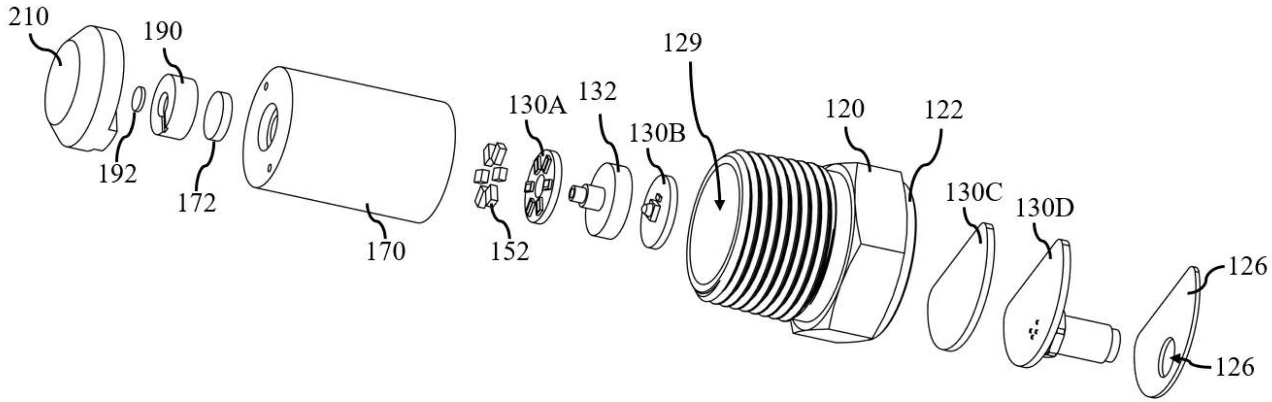
Not a sensor. A sensing platform.



1. **Fluid Reactor**
2. **Optical Instruments**
3. **Pumps**
4. **Reagents**
5. **Computer**

How does it work?





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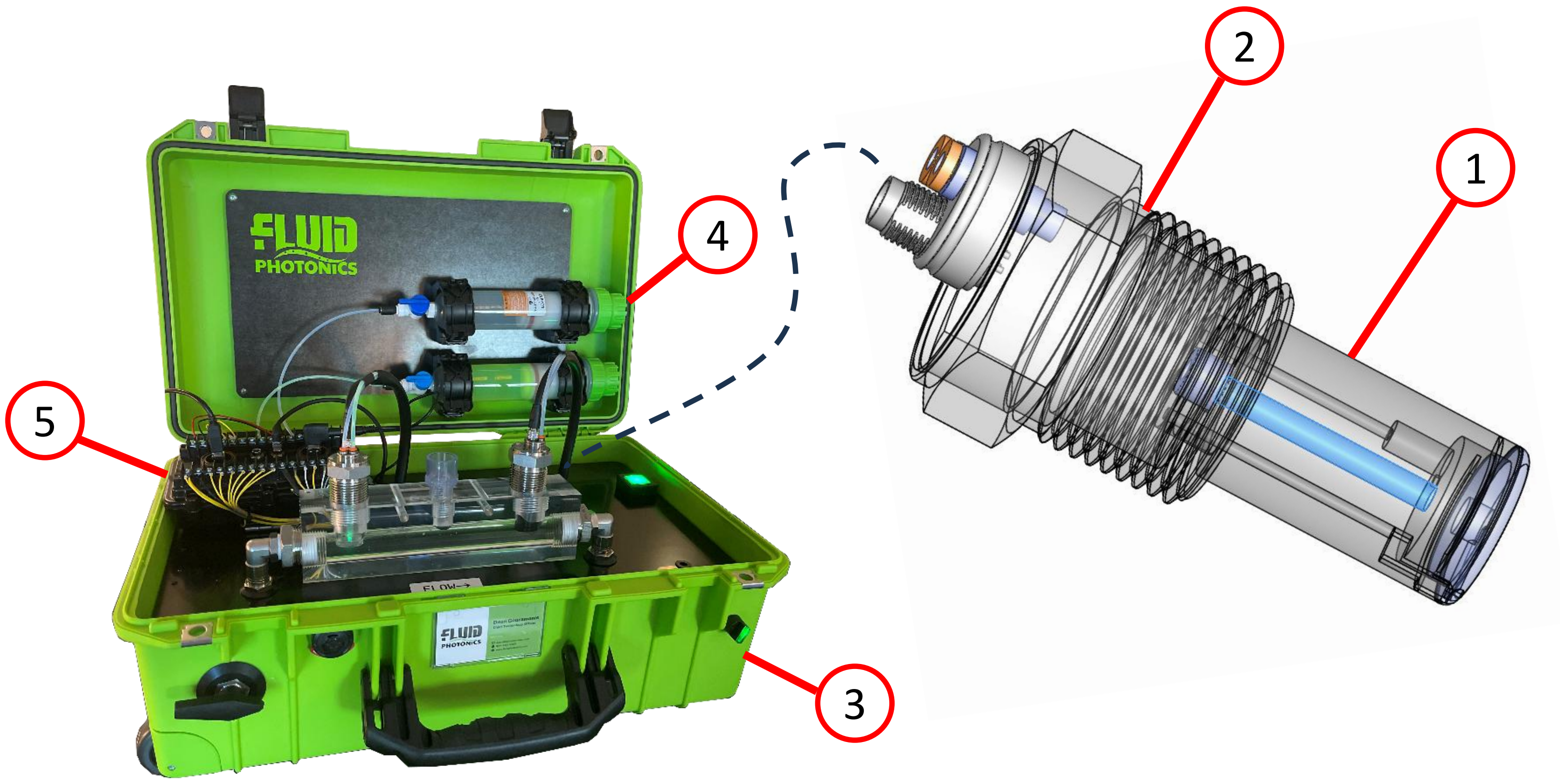
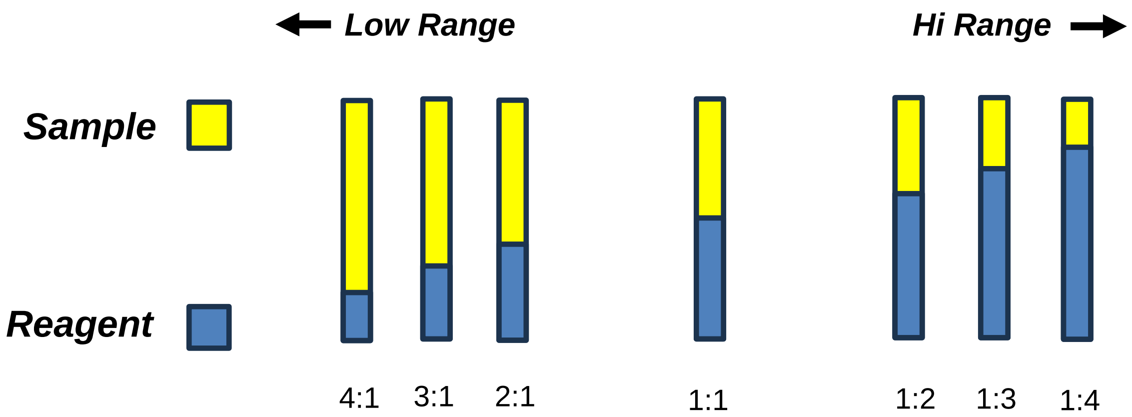
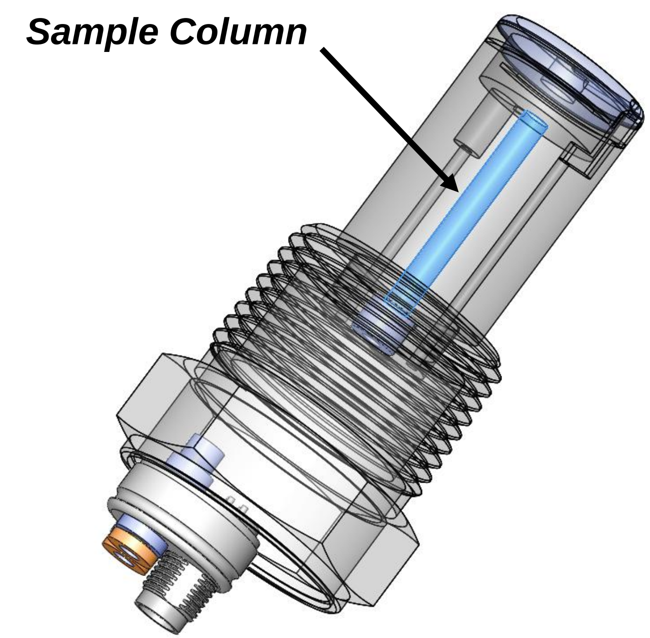


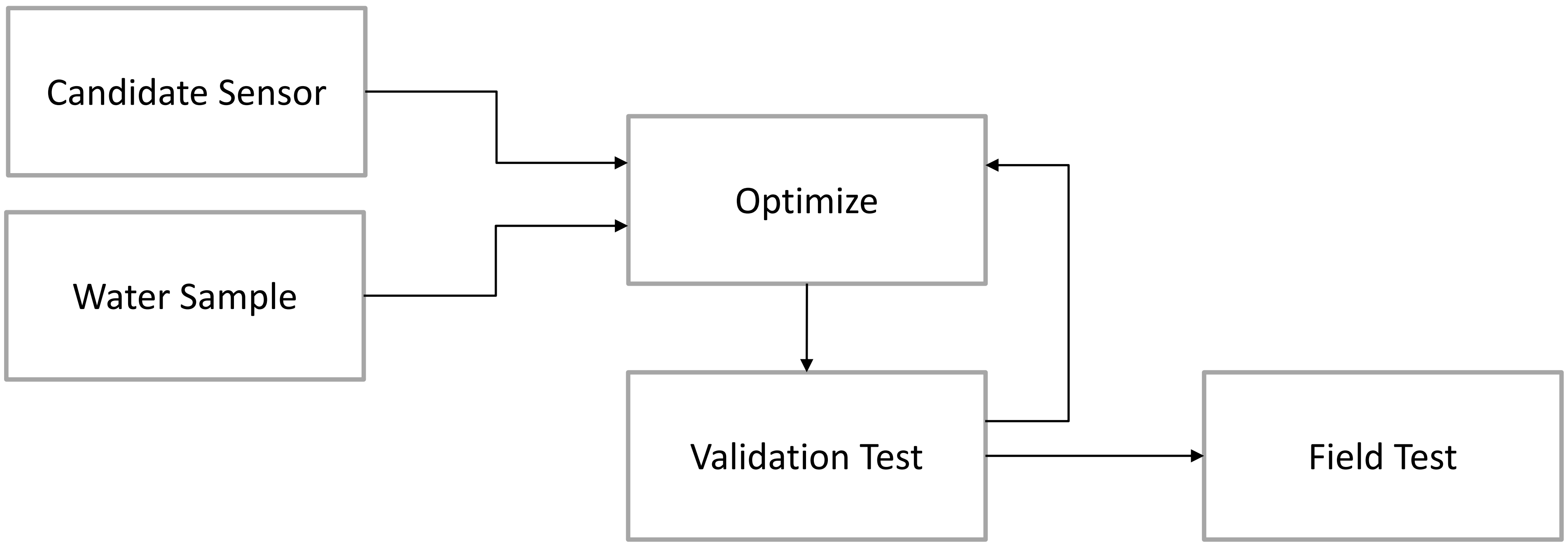
1. **Fluid Reactor**
2. **Optical Instruments**
3. **Pumps**
4. **Reagents**
5. **Computer**

Auto-Ranging





Sensor Creation Process



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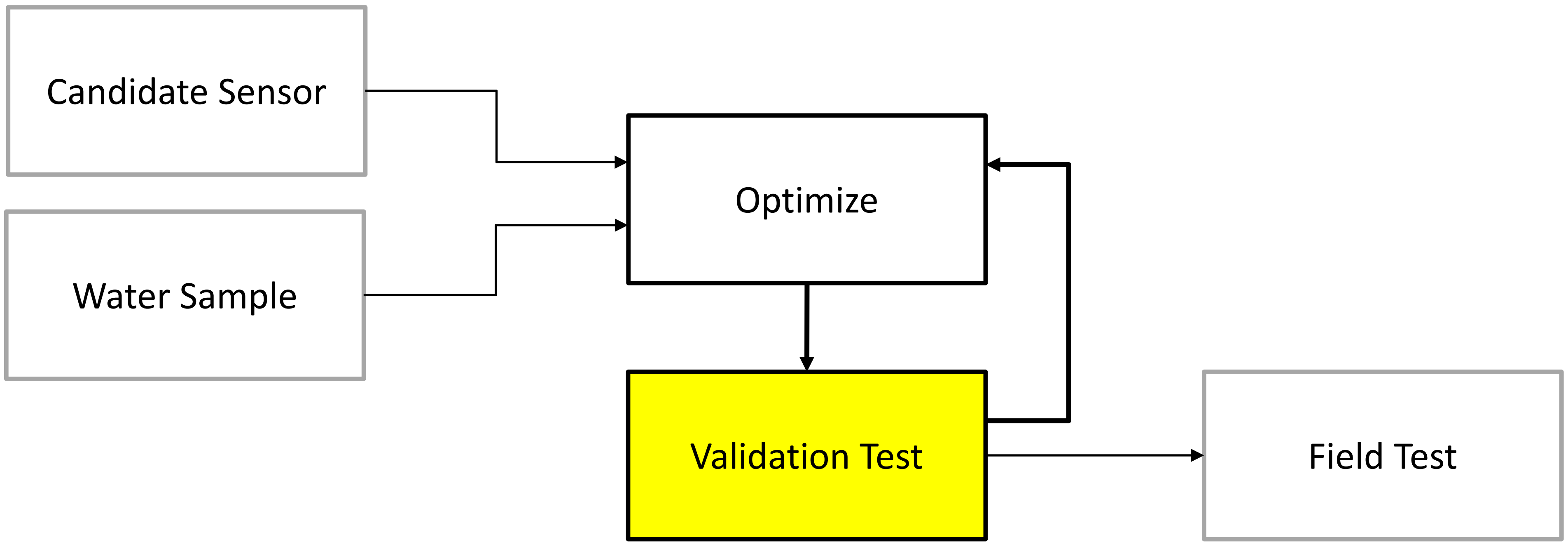

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Case Study: Creating a continuous copper monitor using DDTC

- Originally published in 1956.
- Used to measure copper content in food, rubber and industrial products.
- Used everyday to test for copper in saltwater aquariums.

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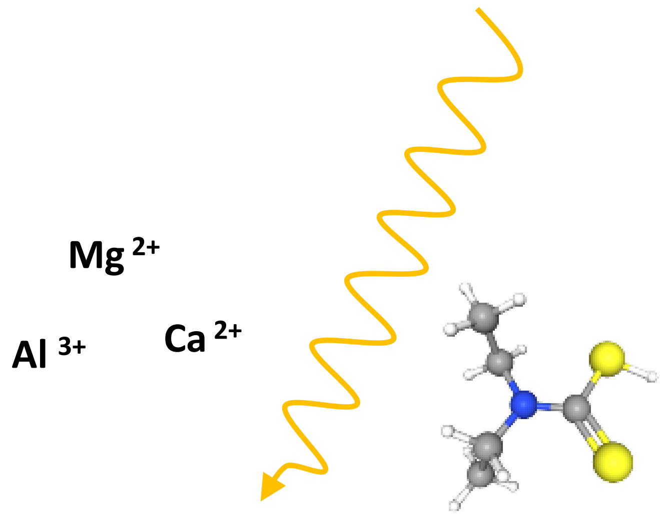
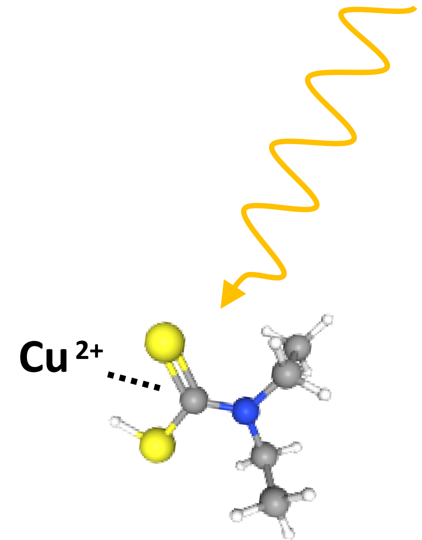
How does it work?

DDTC = diethyldithiocarbamate



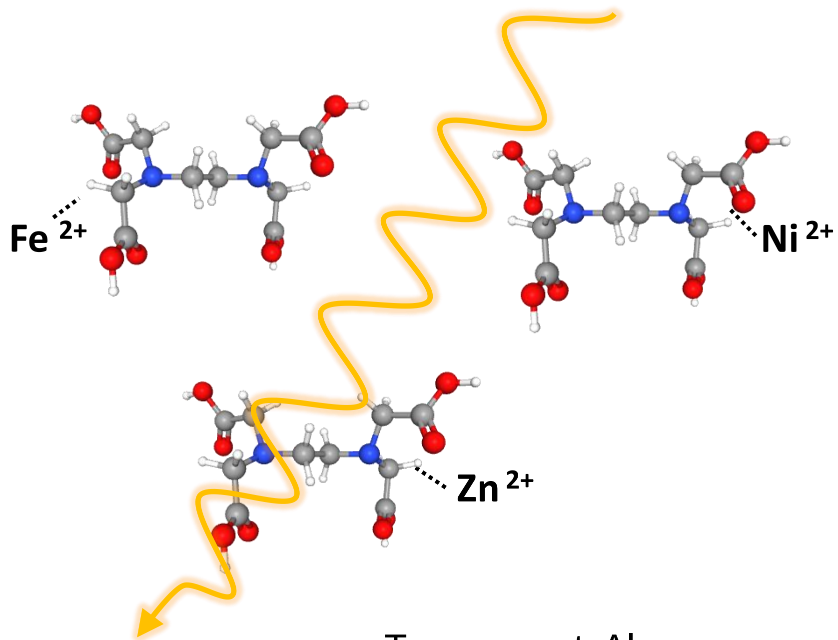
Transparent



Opaque

How does it work?

EDTA = ethylenediaminetetraacetic acid



Transparent, Always

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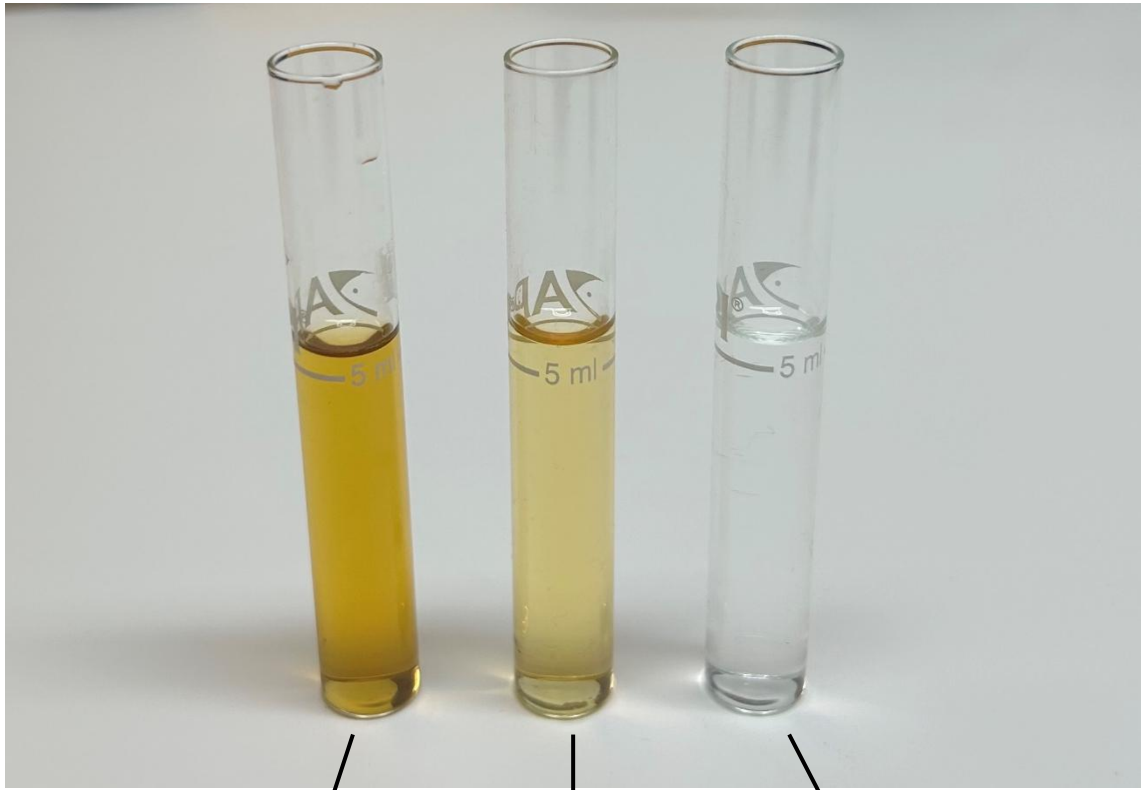
How does it work?



8 ppm 4 ppm 0 ppm

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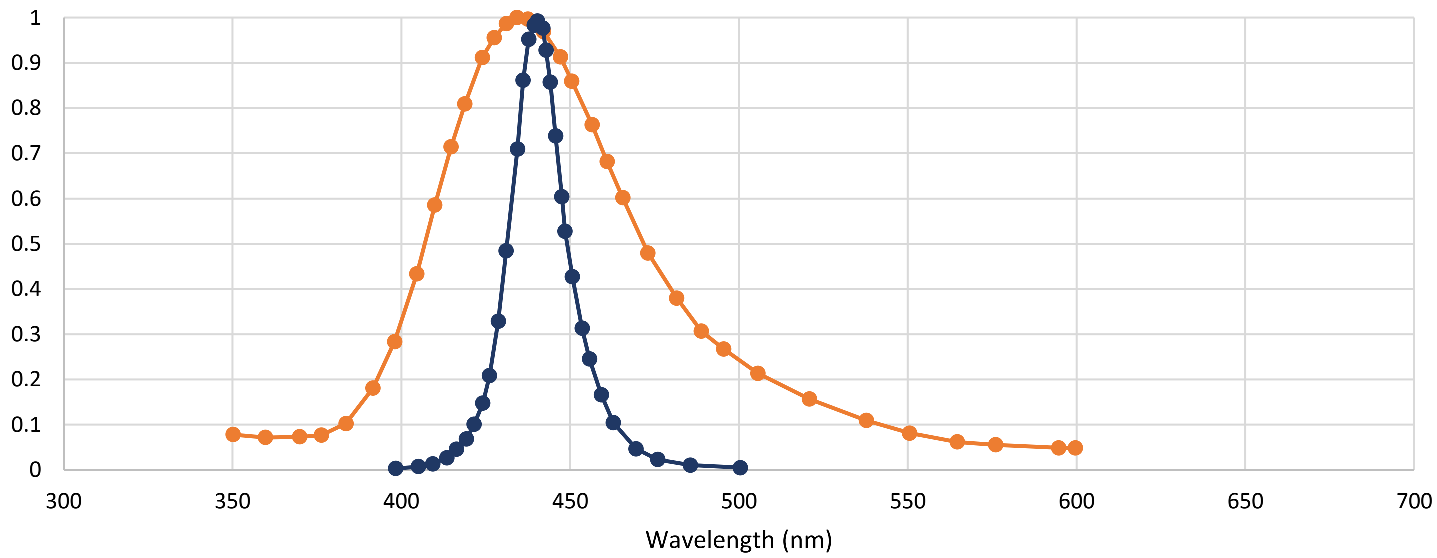
Absorbance vs. Wavelength



Bhuyan, Mohammad. (2014). Copper and Mercury in Food, Biological and Pharmaceutical Samples: Spectrophotometric Estimation as Cu(DDTC)2. American Journal of Analytical Chemistry. 5. 838-850.

Sensor Research

How to we turn reagents into sensors?

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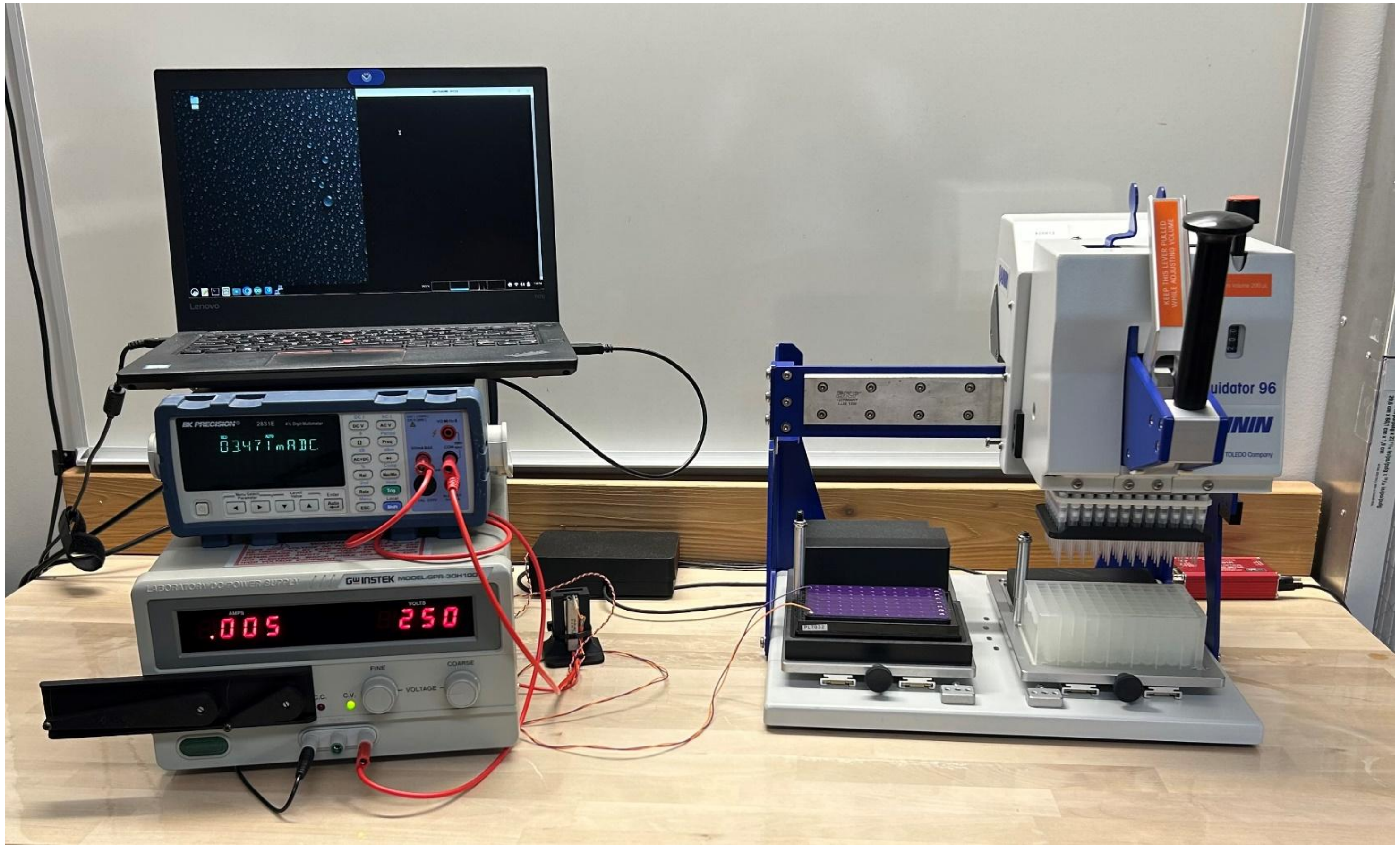
Apparatus



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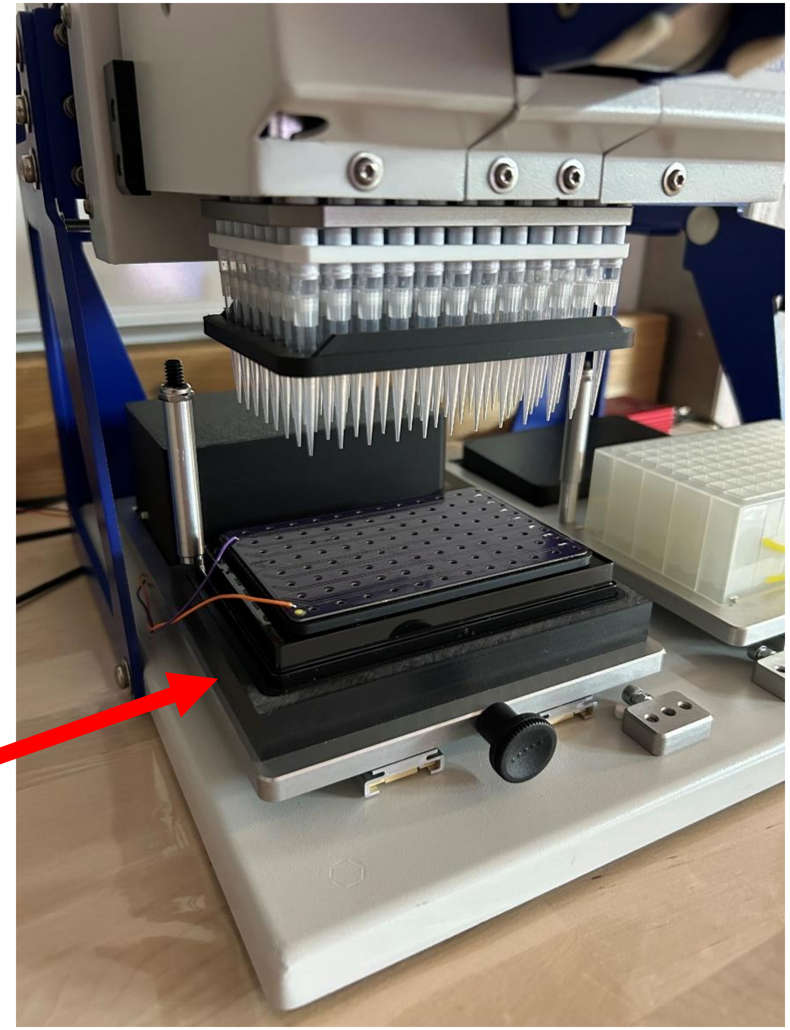
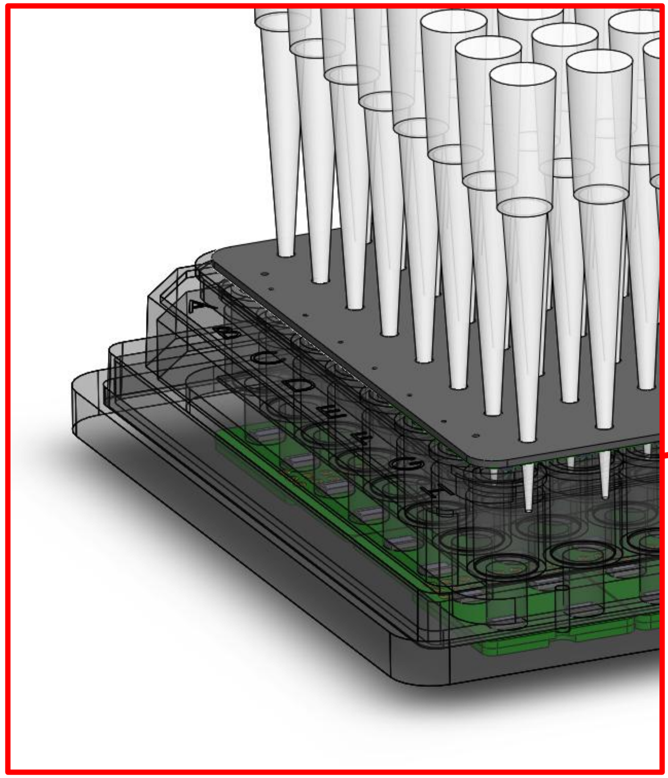
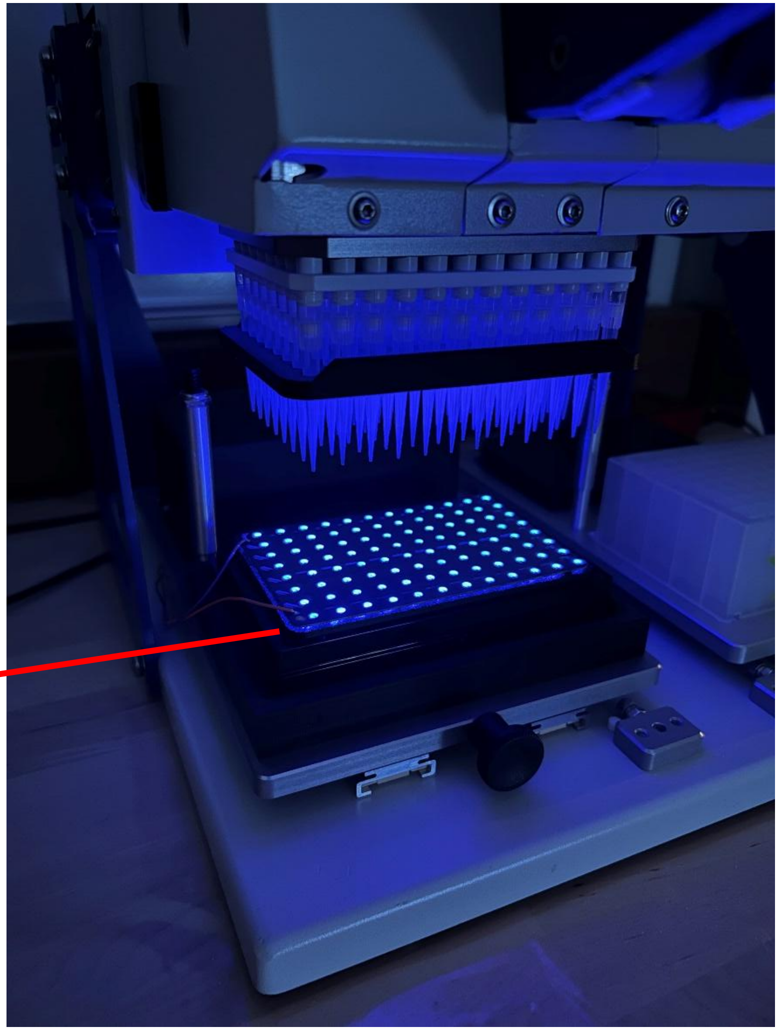
Apparatus

Hummingbird



Apparatus





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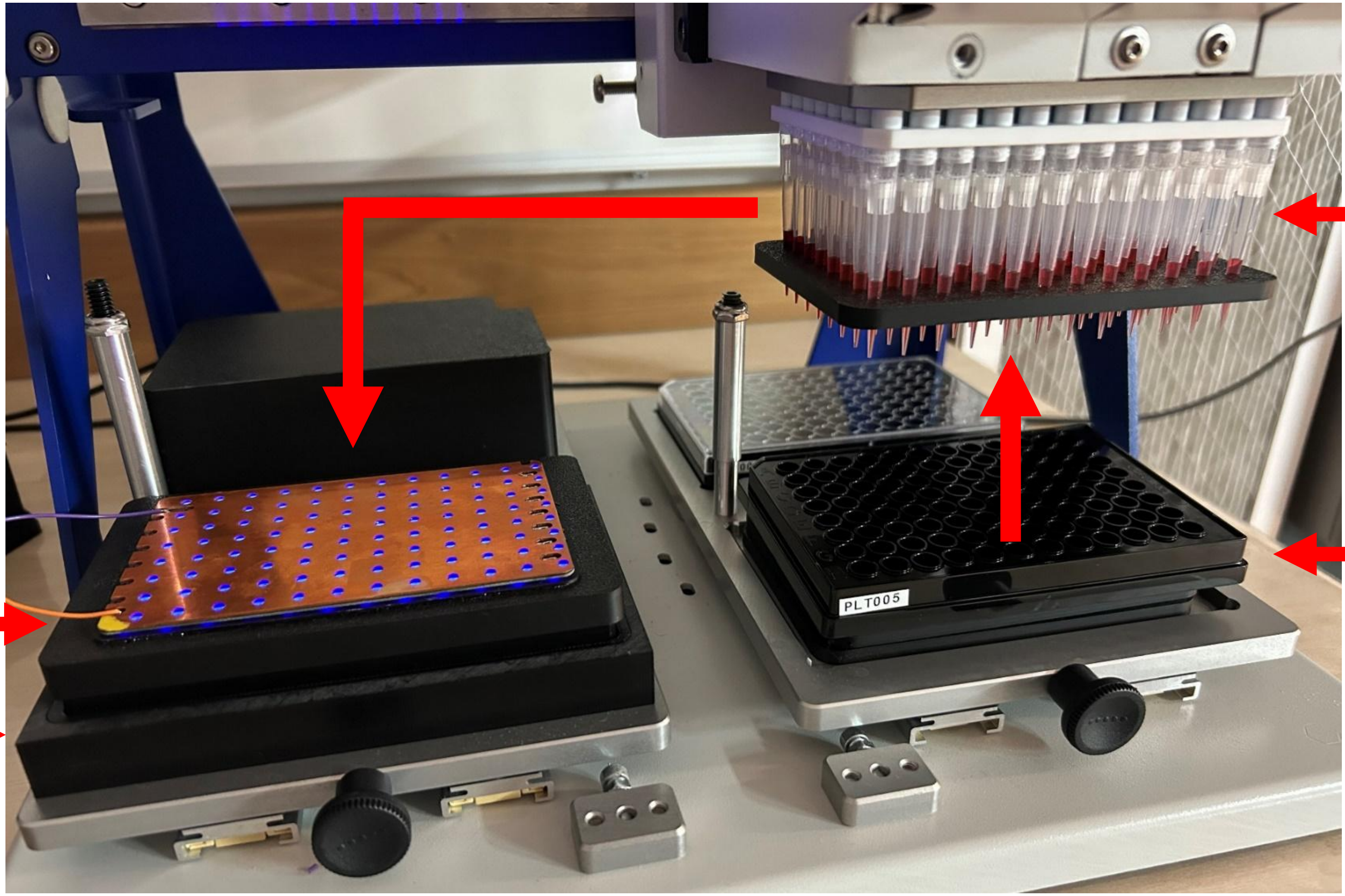
Apparatus



Pipettor 96-ch

Reagent Plate

SAMD Plate

Data Recorder

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120 ppm
100 ppm
80 ppm
60 ppm
40 ppm
20 ppm
10 ppm
5 ppm

Dynamic Range

Test Parameters:

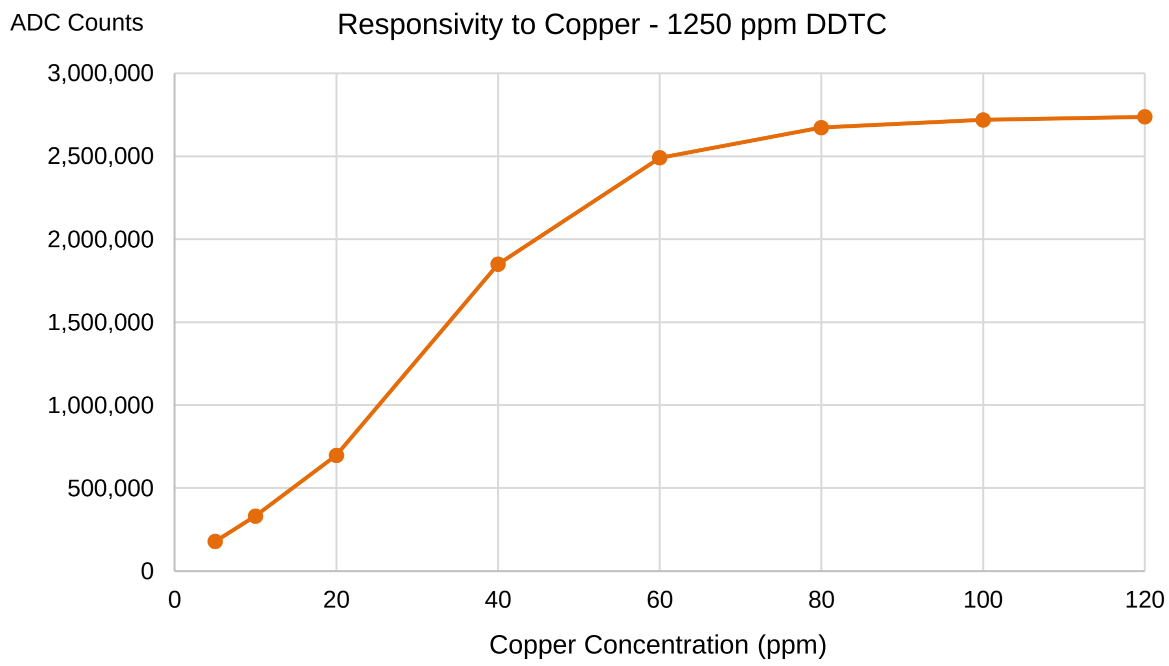
Acidity = 3.0 pH H2SO4

Temperature = 22 °C

Excitation Power = 2.6 mW

Wavelength = 435 nm

Dilution Factor = 1:3



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Dynamic Range

Test Parameters:

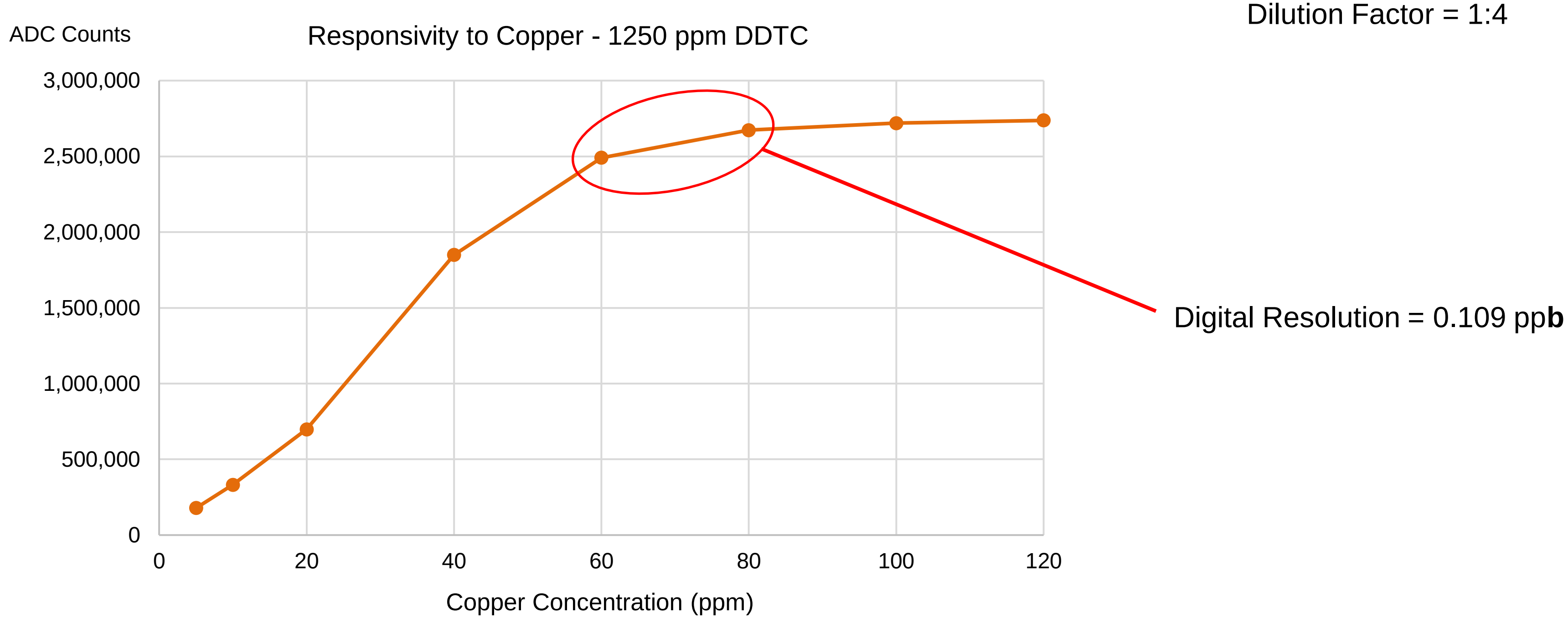
Acidity = 3.0 pH H2SO4

Temperature = 22 °C

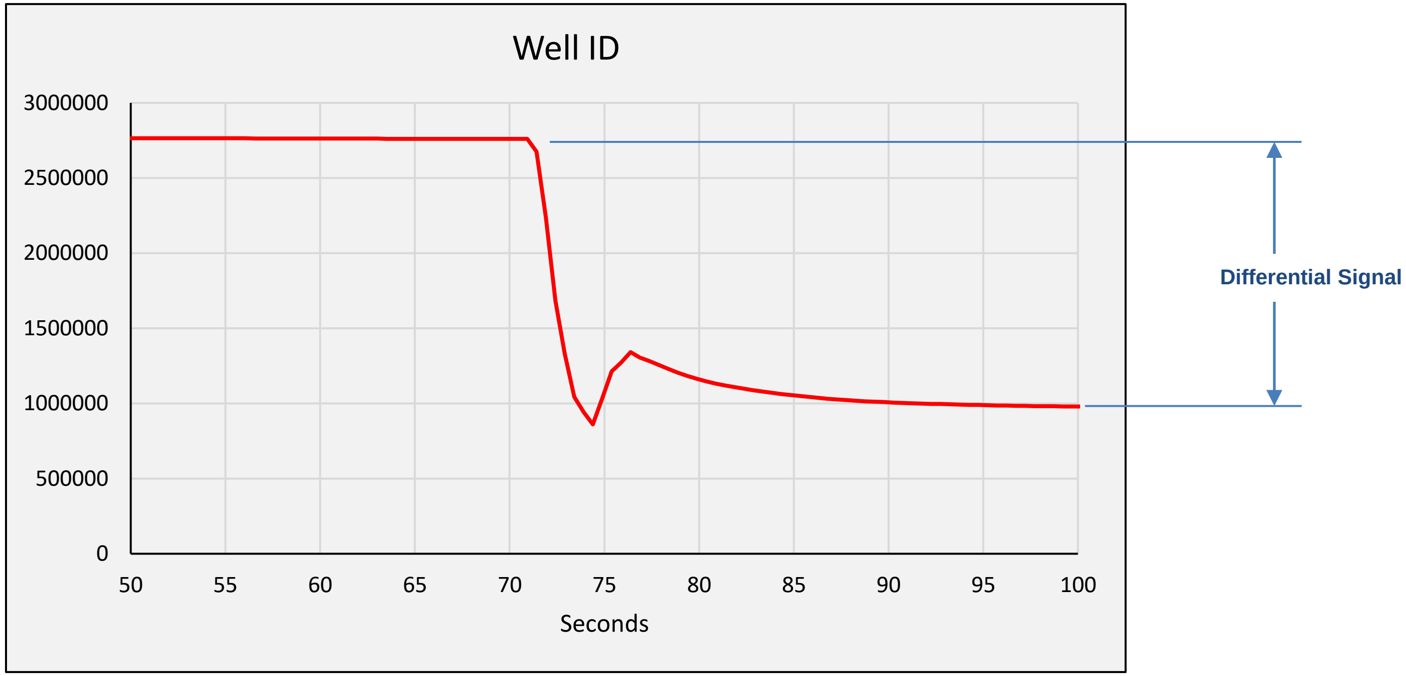
Excitation Power = 2.6 mW

Wavelength = 435 nm

Dilution Factor = 1:4



Raw Data



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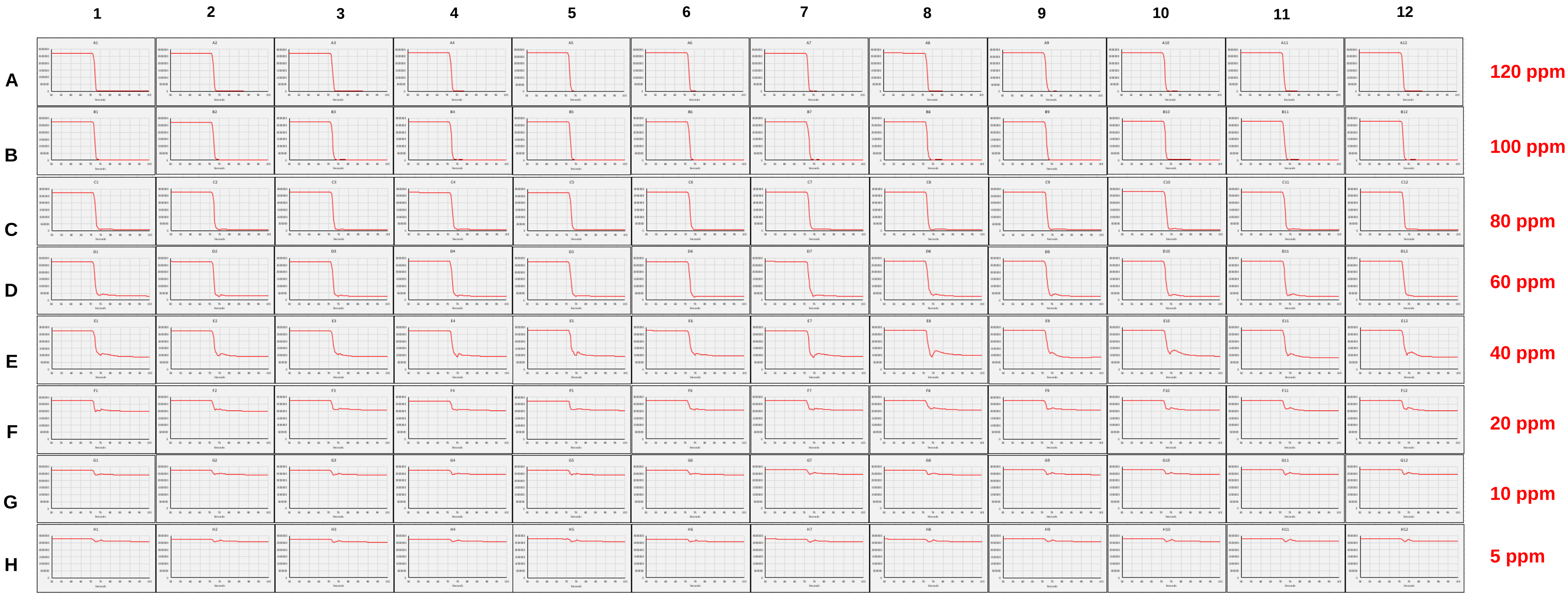
Raw Data Frame



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pH Stability Experiment Design

Excitation: 0.6 mW @ 435nm

140ul – Reagent Plate

	1	2	3	4	5	6	7	8	9	10	11	12
A	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC
B	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC
C	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC
D	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC
E	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC
F	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC
G	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC
H	WATER	WATER	WATER	WATER	WATER	WATER	WATER	WATER	WATER	WATER	WATER	WATER

140ul – Simulated Acid Mine Drainage (SAMD) Plate

	1	2	3	4	5	6	7	8	9	10	11	12
A	WATER	WATER	WATER	WATER	WATER	WATER	WATER	WATER	WATER	WATER	WATER	WATER
B	pH 1.5 20 ppm	pH 1.5 20 ppm	pH 1.5 20 ppm	pH 1.5 20 ppm	pH 1.5 20 ppm	pH 1.5 20 ppm	pH 1.5 10 ppm	pH 1.5 10 ppm	pH 1.5 10 ppm	pH 1.5 10 ppm	pH 1.5 10 ppm	pH 1.5 10 ppm
C	pH 2.0 20 ppm	pH 2.0 20 ppm	pH 2.0 20 ppm	pH 2.0 20 ppm	pH 2.0 20 ppm	pH 2.0 20 ppm	pH 2.0 10 ppm	pH 2.0 10 ppm	pH 2.0 10 ppm	pH 2.0 10 ppm	pH 2.0 10 ppm	pH 2.0 10 ppm
D	pH 2.5 20 ppm	pH 2.5 20 ppm	pH 2.5 20 ppm	pH 2.5 20 ppm	pH 2.5 20 ppm	pH 2.5 20 ppm	pH 2.5 10 ppm	pH 2.5 10 ppm	pH 2.5 10 ppm	pH 2.5 10 ppm	pH 2.5 10 ppm	pH 2.5 10 ppm
E	pH 3.0 20 ppm	pH 3.0 20 ppm	pH 3.0 20 ppm	pH 3.0 20 ppm	pH 3.0 20 ppm	pH 3.0 20 ppm	pH 3.0 10 ppm	pH 3.0 10 ppm	pH 3.0 10 ppm	pH 3.0 10 ppm	pH 3.0 10 ppm	pH 3.0 10 ppm
F	pH 3.5 20 ppm	pH 3.5 20 ppm	pH 3.5 20 ppm	pH 3.5 20 ppm	pH 3.5 20 ppm	pH 3.5 20 ppm	pH 3.5 10 ppm	pH 3.5 10 ppm	pH 3.5 10 ppm	pH 3.5 10 ppm	pH 3.5 10 ppm	pH 3.5 10 ppm
G	pH 4.0 20 ppm	pH 4.0 20 ppm	pH 4.0 20 ppm	pH 4.0 20 ppm	pH 4.0 20 ppm	pH 4.0 20 ppm	pH 4.0 10 ppm	pH 4.0 10 ppm	pH 4.0 10 ppm	pH 4.0 10 ppm	pH 4.0 10 ppm	pH 4.0 10 ppm
H	WATER	WATER	WATER	WATER	WATER	WATER	WATER	WATER	WATER	WATER	WATER	WATER

pH Stability

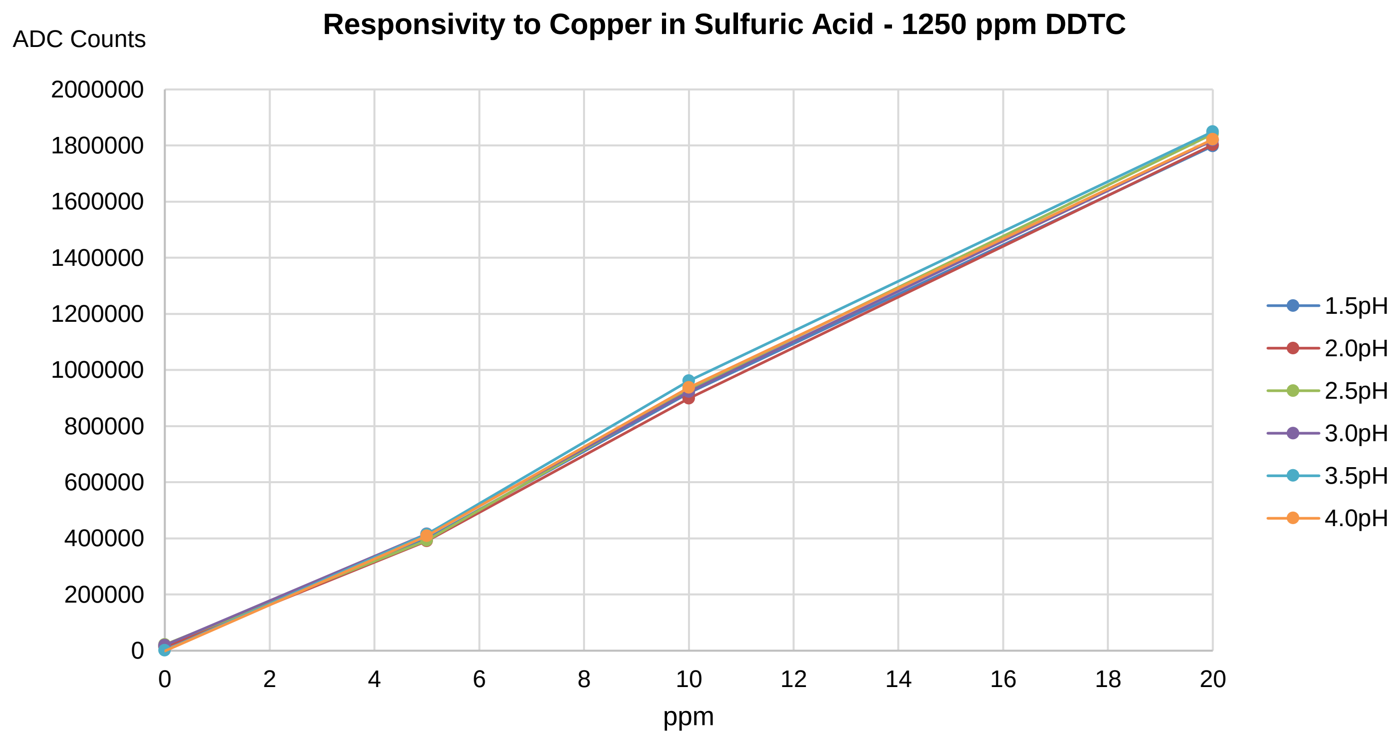
Test Parameters:

Temperature = 22 °C

Excitation Power = 0.6 mW

Wavelength = 435 nm

Dilution Factor = 1



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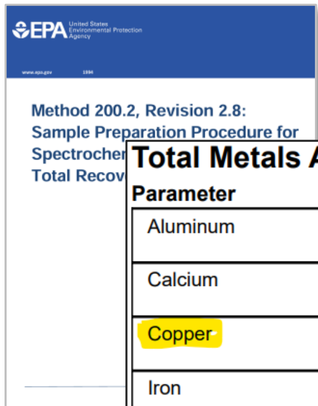
Copper Mining Use Case



Total Metals Analysis

Parameter	Date Analyzed	Method	LOQ	Result	Units	Flag
Aluminum	05/23/2025	EPA 200.7, Rev. 4.4 (1994)	25.0	3160	mg/L	3.E
Calcium	05/23/2025	EPA 200.7, Rev. 4.4 (1994)	1.00	185	mg/L	3.E, 4.R
Copper	05/23/2025	EPA 200.7, Rev. 4.4 (1994)	5.00	525	mg/L	3.E, C
Iron	05/23/2025	EPA 200.7, Rev. 4.4 (1994)	0.20	91.8	mg/L	3.E, 5.P
Magnesium	05/23/2025	EPA 200.7, Rev. 4.4 (1994)	10.0	6660	mg/L	3.E, 4.R
Manganese	05/23/2025	EPA 200.7, Rev. 4.4 (1994)	5.00	273	mg/L	3.E, C
Nickel	05/23/2025	EPA 200.7, Rev. 4.4 (1994)	0.05	7.59	mg/L	3.E
Zinc	05/23/2025	EPA 200.7, Rev. 4.4 (1994)	5.00	124	mg/L	3.E

Date Prepared: 05/23/2025

Preparation Method: EPA 200.2

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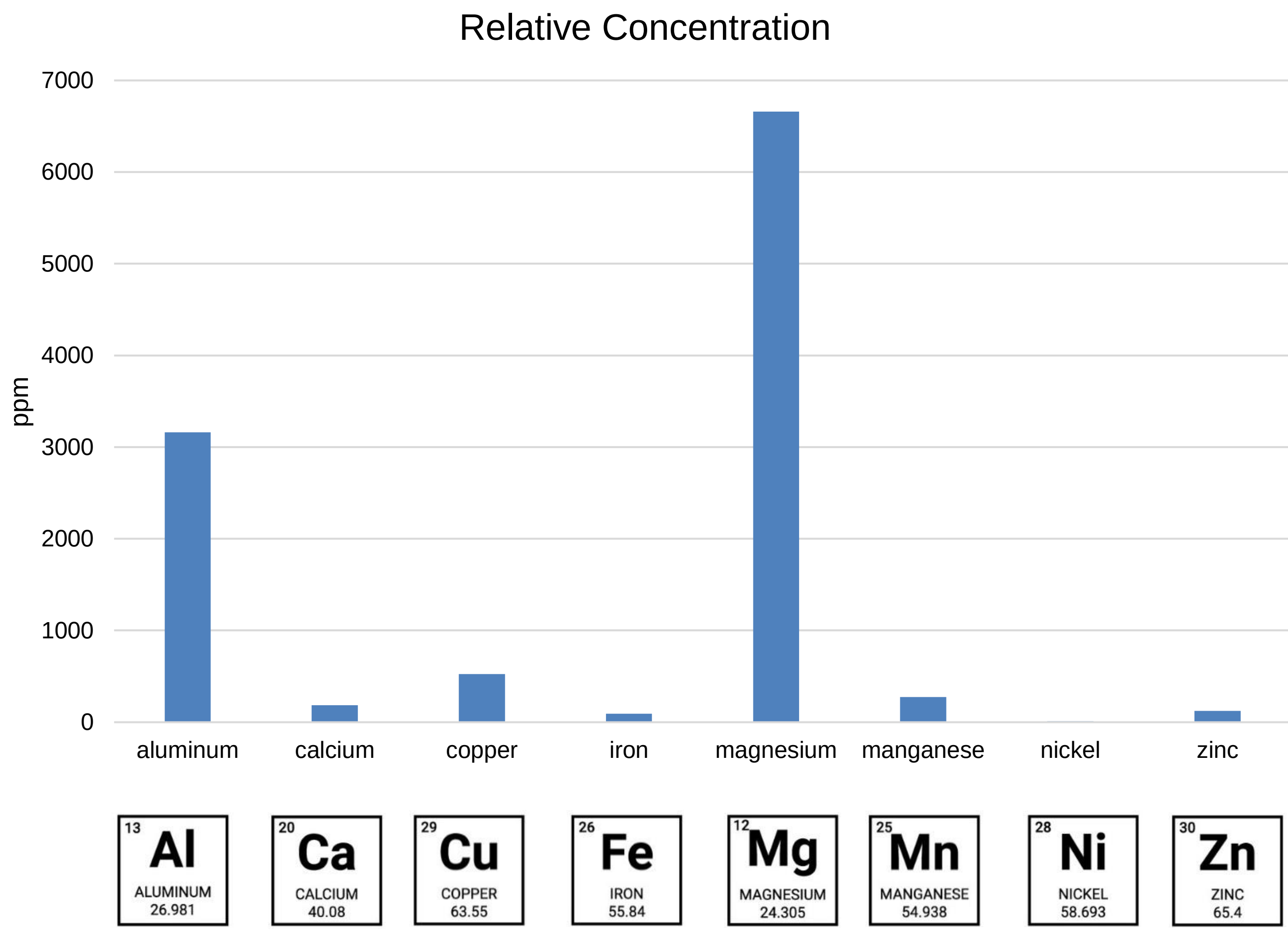
Copper Mining Use Case



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Effect of Interferant Metals

Objectives:

- Determine which interferant metals cause a response by DDTC.
- Quantify the effective concentration of EDTA for mitigating interference.

	PLATE TYPE	Description
Reagent Plates	Reagent **Plate A**	EDTA concentrations 0, 300, 1200, 4800
	Reagent **Plate B**	EDTA concentrations 0, 600, 2400, 9600
SAMD Plates	Interferant Plate 5 ppm	Interferant Metals Only
	Interferant Plate 10 ppm	Interferant Metals Only
	Interferant Plate 20 ppm	Interferant Metals Only
	SAMD Plate 5 ppm	Copper in the presence of Interferant 1:1 ratio
	SAMD Plate 10 ppm	Copper in the presence of Interferant 1:1 ratio
	SAMD Plate 20 ppm	Copper in the presence of Interferant 1:1 ratio

- Each SAMD plate was repeated with each Reagent plate.
- All Reagents contain 1250 ppm DDTC
- Each combination was repeated 3 times (3 columns each)

Table of Contents

	Reagent	SAMD
PLT056	Plate A	Interferant Plate 5 ppm
PLT057	Plate A	Interferant Plate 10 ppm
PLT058	Plate A	Interferant Plate 20 ppm
PLT050	Plate B	Interferant Plate 5 ppm
PLT051	Plate B	Interferant Plate 10 ppm
PLT052	Plate B	Interferant Plate 20 ppm
PLT059	Plate A	SAMD Plate 5 ppm
PLT060	Plate A	SAMD Plate 10 ppm
PLT061	Plate A	SAMD Plate 20 ppm
PLT062	Plate B	SAMD Plate 5 ppm
PLT063	Plate B	SAMD Plate 10 ppm
PLT064	Plate B	SAMD Plate 20 ppm

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PLT051	Plate B	Interferant Plate 10 ppm
PLT052	Plate B	Interferant Plate 20 ppm
PLT059	Plate A	SAMD Plate 5 ppm
PLT060	Plate A	SAMD Plate 10 ppm
PLT061	Plate A	SAMD Plate 20 ppm
PLT062	Plate B	SAMD Plate 5 ppm
PLT063	Plate B	SAMD Plate 10 ppm
PLT064	Plate B	SAMD Plate 20 ppm

PLT050

Optical power = 600uW
SAMD pH = 3.0 ± 0.1 pH

140ul – Reagent Plate: EDTA concentrations 0, 600, 2400, 9600

	1	2	3	4	5	6	7	8	9	10	11	12
A	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA
B	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA
C	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA
D	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA
E	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA
F	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA
G	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA
H	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA

140ul – SAMD Plate: Interferant metals 5 ppm, no copper

	1	2	3	4	5	6	7	8	9	10	11	12
A	0 ppm	0 ppm	0 ppm	0 ppm	0 ppm	0 ppm	0 ppm	0 ppm	0 ppm	0 ppm	0 ppm	0 ppm
B	5 ppm Al	5 ppm Al	5 ppm Al	5 ppm Al	5 ppm Al	5 ppm Al	5 ppm Al	5 ppm Al	5 ppm Al	5 ppm Al	5 ppm Al	5 ppm Al
C	5 ppm Ca	5 ppm Ca	5 ppm Ca	5 ppm Ca	5 ppm Ca	5 ppm Ca	5 ppm Ca	5 ppm Ca	5 ppm Ca	5 ppm Ca	5 ppm Ca	5 ppm Ca
D	5 ppm Fe	5 ppm Fe	5 ppm Fe	5 ppm Fe	5 ppm Fe	5 ppm Fe	5 ppm Fe	5 ppm Fe	5 ppm Fe	5 ppm Fe	5 ppm Fe	5 ppm Fe
E	5 ppm Mg	5 ppm Mg	5 ppm Mg	5 ppm Mg	5 ppm Mg	5 ppm Mg	5 ppm Mg	5 ppm Mg	5 ppm Mg	5 ppm Mg	5 ppm Mg	5 ppm Mg
F	5 ppm Mn	5 ppm Mn	5 ppm Mn	5 ppm Mn	5 ppm Mn	5 ppm Mn	5 ppm Mn	5 ppm Mn	5 ppm Mn	5 ppm Mn	5 ppm Mn	5 ppm Mn
G	5 ppm Ni	5 ppm Ni	5 ppm Ni	5 ppm Ni	5 ppm Ni	5 ppm Ni	5 ppm Ni	5 ppm Ni	5 ppm Ni	5 ppm Ni	5 ppm Ni	5 ppm Ni
H	5 ppm Zn	5 ppm Zn	5 ppm Zn	5 ppm Zn	5 ppm Zn	5 ppm Zn	5 ppm Zn	5 ppm Zn	5 ppm Zn	5 ppm Zn	5 ppm Zn	5 ppm Zn

PLT056

Optical power = 600uW
SAMD pH = 3.0 ± 0.1 pH

140ul – Reagent Plate: EDTA concentrations 0, 300, 1200, 4800

	1	2	3	4	5	6	7	8	9	10	11	12
A	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA
B	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA
C	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA
D	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA
E	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA
F	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA
G	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA
H	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA

140ul – SAMD Plate: Interferant metals 5 ppm, no copper

	1	2	3	4	5	6	7	8	9	10	11	12
A	0 ppm	0 ppm	0 ppm	0 ppm	0 ppm	0 ppm	0 ppm	0 ppm	0 ppm	0 ppm	0 ppm	0 ppm
B	5 ppm Al	5 ppm Al	5 ppm Al	5 ppm Al	5 ppm Al	5 ppm Al	5 ppm Al	5 ppm Al	5 ppm Al	5 ppm Al	5 ppm Al	5 ppm Al
C	5 ppm Ca	5 ppm Ca	5 ppm Ca	5 ppm Ca	5 ppm Ca	5 ppm Ca	5 ppm Ca	5 ppm Ca	5 ppm Ca	5 ppm Ca	5 ppm Ca	5 ppm Ca
D	5 ppm Fe	5 ppm Fe	5 ppm Fe	5 ppm Fe	5 ppm Fe	5 ppm Fe	5 ppm Fe	5 ppm Fe	5 ppm Fe	5 ppm Fe	5 ppm Fe	5 ppm Fe
E	5 ppm Mg	5 ppm Mg	5 ppm Mg	5 ppm Mg	5 ppm Mg	5 ppm Mg	5 ppm Mg	5 ppm Mg	5 ppm Mg	5 ppm Mg	5 ppm Mg	5 ppm Mg
F	5 ppm Mn	5 ppm Mn	5 ppm Mn	5 ppm Mn	5 ppm Mn	5 ppm Mn	5 ppm Mn	5 ppm Mn	5 ppm Mn	5 ppm Mn	5 ppm Mn	5 ppm Mn
G	5 ppm Ni	5 ppm Ni	5 ppm Ni	5 ppm Ni	5 ppm Ni	5 ppm Ni	5 ppm Ni	5 ppm Ni	5 ppm Ni	5 ppm Ni	5 ppm Ni	5 ppm Ni
H	5 ppm Zn	5 ppm Zn	5 ppm Zn	5 ppm Zn	5 ppm Zn	5 ppm Zn	5 ppm Zn	5 ppm Zn	5 ppm Zn	5 ppm Zn	5 ppm Zn	5 ppm Zn

PLT062

Optical power = 600uW
SAMD pH = 3.0 ± 0.1 pH

140ul – Reagent Plate: EDTA concentrations 0, 600, 2400, 9600

	1	2	3	4	5	6	7	8	9	10	11	12
A	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA
B	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA
C	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA
D	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA
E	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	ERROR	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA
F	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA
G	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA
H	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA

140ul – SAMD Plate: 1:1 interferant metals and copper, 5 ppm

	1	2	3	4	5	6	7	8	9	10	11	12
A	5 ppm Cu	5 ppm Cu	5 ppm Cu	5 ppm Cu	5 ppm Cu	5 ppm Cu	5 ppm Cu	5 ppm Cu	5 ppm Cu	5 ppm Cu	5 ppm Cu	5 ppm Cu
B	5 ppm Cu 5 ppm Al	5 ppm Cu 5 ppm Al	5 ppm Cu 5 ppm Al	5 ppm Cu 5 ppm Al	5 ppm Cu 5 ppm Al	5 ppm Cu 5 ppm Al	5 ppm Cu 5 ppm Al	5 ppm Cu 5 ppm Al	5 ppm Cu 5 ppm Al	5 ppm Cu 5 ppm Al	5 ppm Cu 5 ppm Al	5 ppm Cu 5 ppm Al
C	5 ppm Cu 5 ppm Ca	5 ppm Cu 5 ppm Ca	5 ppm Cu 5 ppm Ca	5 ppm Cu 5 ppm Ca	5 ppm Cu 5 ppm Ca	5 ppm Cu 5 ppm Ca	5 ppm Cu 5 ppm Ca	5 ppm Cu 5 ppm Ca	5 ppm Cu 5 ppm Ca	5 ppm Cu 5 ppm Ca	5 ppm Cu 5 ppm Ca	5 ppm Cu 5 ppm Ca
D	5 ppm Cu 5 ppm Fe	5 ppm Cu 5 ppm Fe	5 ppm Cu 5 ppm Fe	5 ppm Cu 5 ppm Fe	5 ppm Cu 5 ppm Fe	5 ppm Cu 5 ppm Fe	5 ppm Cu 5 ppm Fe	5 ppm Cu 5 ppm Fe	5 ppm Cu 5 ppm Fe	5 ppm Cu 5 ppm Fe	5 ppm Cu 5 ppm Fe	5 ppm Cu 5 ppm Fe
E	5 ppm Cu 5 ppm Mg	5 ppm Cu 5 ppm Mg	5 ppm Cu 5 ppm Mg	5 ppm Cu 5 ppm Mg	5 ppm Cu 5 ppm Mg	5 ppm Cu 5 ppm Mg	5 ppm Cu 5 ppm Mg	5 ppm Cu 5 ppm Mg	5 ppm Cu 5 ppm Mg	5 ppm Cu 5 ppm Mg	5 ppm Cu 5 ppm Mg	5 ppm Cu 5 ppm Mg
F	5 ppm Cu 5 ppm Mn	5 ppm Cu 5 ppm Mn	5 ppm Cu 5 ppm Mn	5 ppm Cu 5 ppm Mn	5 ppm Cu 5 ppm Mn	5 ppm Cu 5 ppm Mn	5 ppm Cu 5 ppm Mn	5 ppm Cu 5 ppm Mn	5 ppm Cu 5 ppm Mn	5 ppm Cu 5 ppm Mn	5 ppm Cu 5 ppm Mn	5 ppm Cu 5 ppm Mn
G	5 ppm Cu 5 ppm Ni	5 ppm Cu 5 ppm Ni	5 ppm Cu 5 ppm Ni	5 ppm Cu 5 ppm Ni	5 ppm Cu 5 ppm Ni	5 ppm Cu 5 ppm Ni	5 ppm Cu 5 ppm Ni	5 ppm Cu 5 ppm Ni	5 ppm Cu 5 ppm Ni	5 ppm Cu 5 ppm Ni	5 ppm Cu 5 ppm Ni	5 ppm Cu 5 ppm Ni
H	5 ppm Cu 5 ppm Zn	5 ppm Cu 5 ppm Zn	5 ppm Cu 5 ppm Zn	5 ppm Cu 5 ppm Zn	5 ppm Cu 5 ppm Zn	5 ppm Cu 5 ppm Zn	5 ppm Cu 5 ppm Zn	5 ppm Cu 5 ppm Zn	5 ppm Cu 5 ppm Zn	5 ppm Cu 5 ppm Zn	5 ppm Cu 5 ppm Zn	5 ppm Cu 5 ppm Zn

PLT059

Optical power = 600uW
SAMD pH = 3.0 ± 0.1 pH

140ul – Reagent Plate: EDTA concentrations 0, 300, 1200, 4800

	1	2	3	4	5	6	7	8	9	10	11	12
A	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA
B	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA
C	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA
D	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA
E	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA
F	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA
G	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA
H	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA

140ul – SAMD Plate: 1:1 interferant metals and copper, 5 ppm

	1	2	3	4	5	6	7	8	9	10	11	12
A	5 ppm Cu	5 ppm Cu	5 ppm Cu	5 ppm Cu	5 ppm Cu	5 ppm Cu	5 ppm Cu	5 ppm Cu	5 ppm Cu	5 ppm Cu	5 ppm Cu	5 ppm Cu
B	5 ppm Cu 5 ppm Al	5 ppm Cu 5 ppm Al	5 ppm Cu 5 ppm Al	5 ppm Cu 5 ppm Al	5 ppm Cu 5 ppm Al	5 ppm Cu 5 ppm Al	5 ppm Cu 5 ppm Al	5 ppm Cu 5 ppm Al	5 ppm Cu 5 ppm Al	5 ppm Cu 5 ppm Al	5 ppm Cu 5 ppm Al	5 ppm Cu 5 ppm Al
C	5 ppm Cu 5 ppm Ca	5 ppm Cu 5 ppm Ca	5 ppm Cu 5 ppm Ca	5 ppm Cu 5 ppm Ca	5 ppm Cu 5 ppm Ca	5 ppm Cu 5 ppm Ca	5 ppm Cu 5 ppm Ca	5 ppm Cu 5 ppm Ca	5 ppm Cu 5 ppm Ca	5 ppm Cu 5 ppm Ca	5 ppm Cu 5 ppm Ca	5 ppm Cu 5 ppm Ca
D	5 ppm Cu 5 ppm Fe	5 ppm Cu 5 ppm Fe	5 ppm Cu 5 ppm Fe	5 ppm Cu 5 ppm Fe	5 ppm Cu 5 ppm Fe	5 ppm Cu 5 ppm Fe	5 ppm Cu 5 ppm Fe	5 ppm Cu 5 ppm Fe	5 ppm Cu 5 ppm Fe	5 ppm Cu 5 ppm Fe	5 ppm Cu 5 ppm Fe	5 ppm Cu 5 ppm Fe
E	5 ppm Cu 5 ppm Mg	5 ppm Cu 5 ppm Mg	5 ppm Cu 5 ppm Mg	5 ppm Cu 5 ppm Mg	5 ppm Cu 5 ppm Mg	5 ppm Cu 5 ppm Mg	5 ppm Cu 5 ppm Mg	5 ppm Cu 5 ppm Mg	5 ppm Cu 5 ppm Mg	5 ppm Cu 5 ppm Mg	5 ppm Cu 5 ppm Mg	5 ppm Cu 5 ppm Mg
F	5 ppm Cu 5 ppm Mn	5 ppm Cu 5 ppm Mn	5 ppm Cu 5 ppm Mn	5 ppm Cu 5 ppm Mn	5 ppm Cu 5 ppm Mn	5 ppm Cu 5 ppm Mn	5 ppm Cu 5 ppm Mn	5 ppm Cu 5 ppm Mn	5 ppm Cu 5 ppm Mn	5 ppm Cu 5 ppm Mn	5 ppm Cu 5 ppm Mn	5 ppm Cu 5 ppm Mn
G	5 ppm Cu 5 ppm Ni	5 ppm Cu 5 ppm Ni	5 ppm Cu 5 ppm Ni	5 ppm Cu 5 ppm Ni	5 ppm Cu 5 ppm Ni	5 ppm Cu 5 ppm Ni	5 ppm Cu 5 ppm Ni	5 ppm Cu 5 ppm Ni	5 ppm Cu 5 ppm Ni	5 ppm Cu 5 ppm Ni	5 ppm Cu 5 ppm Ni	5 ppm Cu 5 ppm Ni
H	5 ppm Cu 5 ppm Zn	5 ppm Cu 5 ppm Zn	5 ppm Cu 5 ppm Zn	5 ppm Cu 5 ppm Zn	5 ppm Cu 5 ppm Zn	5 ppm Cu 5 ppm Zn	5 ppm Cu 5 ppm Zn	5 ppm Cu 5 ppm Zn	5 ppm Cu 5 ppm Zn	5 ppm Cu 5 ppm Zn	5 ppm Cu 5 ppm Zn	5 ppm Cu 5 ppm Zn

PLT051

Optical power = 600uW
SAMD pH = 3.0 ± 0.1 pH

140ul – Reagent Plate: EDTA concentrations 0, 600, 2400, 9600

	1	2	3	4	5	6	7	8	9	10	11	12
A	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA
B	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA
C	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA
D	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA
E	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA
F	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA
G	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA
H	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA

140ul – SAMD Plate: Interferant metals 10 ppm, no copper

	1	2	3	4	5	6	7	8	9	10	11	12
A	0 ppm	0 ppm	0 ppm	0 ppm	0 ppm	0 ppm	0 ppm	0 ppm	0 ppm	0 ppm	0 ppm	0 ppm
B	10 ppm Al	10 ppm Al	10 ppm Al	10 ppm Al	10 ppm Al	10 ppm Al	10 ppm Al	10 ppm Al	10 ppm Al	10 ppm Al	10 ppm Al	10 ppm Al
C	10 ppm Ca	10 ppm Ca	10 ppm Ca	10 ppm Ca	10 ppm Ca	10 ppm Ca	10 ppm Ca	10 ppm Ca	10 ppm Ca	10 ppm Ca	10 ppm Ca	10 ppm Ca
D	10 ppm Fe	10 ppm Fe	10 ppm Fe	10 ppm Fe	10 ppm Fe	10 ppm Fe	10 ppm Fe	10 ppm Fe	10 ppm Fe	10 ppm Fe	10 ppm Fe	10 ppm Fe
E	10 ppm Mg	10 ppm Mg	10 ppm Mg	10 ppm Mg	10 ppm Mg	10 ppm Mg	10 ppm Mg	10 ppm Mg	10 ppm Mg	10 ppm Mg	10 ppm Mg	10 ppm Mg
F	10 ppm Mn	10 ppm Mn	10 ppm Mn	10 ppm Mn	10 ppm Mn	10 ppm Mn	10 ppm Mn	10 ppm Mn	10 ppm Mn	10 ppm Mn	10 ppm Mn	10 ppm Mn
G	10 ppm Ni	10 ppm Ni	10 ppm Ni	10 ppm Ni	10 ppm Ni	10 ppm Ni	10 ppm Ni	10 ppm Ni	10 ppm Ni	10 ppm Ni	10 ppm Ni	10 ppm Ni
H	10 ppm Zn	10 ppm Zn	10 ppm Zn	10 ppm Zn	10 ppm Zn	10 ppm Zn	10 ppm Zn	10 ppm Zn	10 ppm Zn	10 ppm Zn	10 ppm Zn	10 ppm Zn

PLT057

Optical power = 600uW
SAMD pH = 3.0 ± 0.1 pH

140ul – Reagent Plate: EDTA concentrations 0, 300, 1200, 4800

	1	2	3	4	5	6	7	8	9	10	11	12
A	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA
B	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA
C	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA
D	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA
E	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA
F	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA
G	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA
H	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA

140ul – SAMD Plate: Interferant metals 10 ppm, no copper

	1	2	3	4	5	6	7	8	9	10	11	12
A	0 ppm	0 ppm	0 ppm	0 ppm	0 ppm	0 ppm	0 ppm	0 ppm	0 ppm	0 ppm	0 ppm	0 ppm
B	10 ppm Al	10 ppm Al	10 ppm Al	10 ppm Al	10 ppm Al	10 ppm Al	10 ppm Al	10 ppm Al	10 ppm Al	10 ppm Al	10 ppm Al	10 ppm Al
C	10 ppm Ca	10 ppm Ca	10 ppm Ca	10 ppm Ca	10 ppm Ca	10 ppm Ca	10 ppm Ca	10 ppm Ca	10 ppm Ca	10 ppm Ca	10 ppm Ca	10 ppm Ca
D	10 ppm Fe	10 ppm Fe	10 ppm Fe	10 ppm Fe	10 ppm Fe	10 ppm Fe	10 ppm Fe	10 ppm Fe	10 ppm Fe	10 ppm Fe	10 ppm Fe	10 ppm Fe
E	10 ppm Mg	10 ppm Mg	10 ppm Mg	10 ppm Mg	10 ppm Mg	10 ppm Mg	10 ppm Mg	10 ppm Mg	10 ppm Mg	10 ppm Mg	10 ppm Mg	10 ppm Mg
F	10 ppm Mn	10 ppm Mn	10 ppm Mn	10 ppm Mn	10 ppm Mn	10 ppm Mn	10 ppm Mn	10 ppm Mn	10 ppm Mn	10 ppm Mn	10 ppm Mn	10 ppm Mn
G	10 ppm Ni	10 ppm Ni	10 ppm Ni	10 ppm Ni	10 ppm Ni	10 ppm Ni	10 ppm Ni	10 ppm Ni	10 ppm Ni	10 ppm Ni	10 ppm Ni	10 ppm Ni
H	10 ppm Zn	10 ppm Zn	10 ppm Zn	10 ppm Zn	10 ppm Zn	10 ppm Zn	10 ppm Zn	10 ppm Zn	10 ppm Zn	10 ppm Zn	10 ppm Zn	10 ppm Zn

PLT063

Optical power = 600uW
SAMD pH = 3.0 ± 0.1 pH

140ul – Reagent Plate: EDTA concentrations 0, 600, 2400, 9600

	1	2	3	4	5	6	7	8	9	10	11	12
A	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA
B	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA
C	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA
D	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA
E	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA
F	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA
G	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA
H	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA

140ul – SAMD Plate: 1:1 interferant metals and copper, 10 ppm

	1	2	3	4	5	6	7	8	9	10	11	12
A	10 ppm Cu	10 ppm Cu	10 ppm Cu	10 ppm Cu	10 ppm Cu	10 ppm Cu	10 ppm Cu	10 ppm Cu	10 ppm Cu	10 ppm Cu	10 ppm Cu	10 ppm Cu
B	10 ppm Cu 10 ppm Al	10 ppm Cu 10 ppm Al	10 ppm Cu 10 ppm Al	10 ppm Cu 10 ppm Al	10 ppm Cu 10 ppm Al	10 ppm Cu 10 ppm Al	10 ppm Cu 10 ppm Al	10 ppm Cu 10 ppm Al	10 ppm Cu 10 ppm Al	10 ppm Cu 10 ppm Al	10 ppm Cu 10 ppm Al	10 ppm Cu 10 ppm Al
C	10 ppm Cu 10 ppm Ca	10 ppm Cu 10 ppm Ca	10 ppm Cu 10 ppm Ca	10 ppm Cu 10 ppm Ca	10 ppm Cu 10 ppm Ca	10 ppm Cu 10 ppm Ca	10 ppm Cu 10 ppm Ca	10 ppm Cu 10 ppm Ca	10 ppm Cu 10 ppm Ca	10 ppm Cu 10 ppm Ca	10 ppm Cu 10 ppm Ca	10 ppm Cu 10 ppm Ca
D	10 ppm Cu 10 ppm Fe	10 ppm Cu 10 ppm Fe	10 ppm Cu 10 ppm Fe	10 ppm Cu 10 ppm Fe	10 ppm Cu 10 ppm Fe	10 ppm Cu 10 ppm Fe	10 ppm Cu 10 ppm Fe	10 ppm Cu 10 ppm Fe	10 ppm Cu 10 ppm Fe	10 ppm Cu 10 ppm Fe	10 ppm Cu 10 ppm Fe	10 ppm Cu 10 ppm Fe
E	10 ppm Cu 10 ppm Mg	10 ppm Cu 10 ppm Mg	10 ppm Cu 10 ppm Mg	10 ppm Cu 10 ppm Mg	10 ppm Cu 10 ppm Mg	10 ppm Cu 10 ppm Mg	10 ppm Cu 10 ppm Mg	10 ppm Cu 10 ppm Mg	10 ppm Cu 10 ppm Mg	10 ppm Cu 10 ppm Mg	10 ppm Cu 10 ppm Mg	10 ppm Cu 10 ppm Mg
F	10 ppm Cu 10 ppm Mn	10 ppm Cu 10 ppm Mn	10 ppm Cu 10 ppm Mn	10 ppm Cu 10 ppm Mn	10 ppm Cu 10 ppm Mn	10 ppm Cu 10 ppm Mn	10 ppm Cu 10 ppm Mn	10 ppm Cu 10 ppm Mn	10 ppm Cu 10 ppm Mn	10 ppm Cu 10 ppm Mn	10 ppm Cu 10 ppm Mn	10 ppm Cu 10 ppm Mn
G	10 ppm Cu 10 ppm Ni	10 ppm Cu 10 ppm Ni	10 ppm Cu 10 ppm Ni	10 ppm Cu 10 ppm Ni	10 ppm Cu 10 ppm Ni	10 ppm Cu 10 ppm Ni	10 ppm Cu 10 ppm Ni	10 ppm Cu 10 ppm Ni	10 ppm Cu 10 ppm Ni	10 ppm Cu 10 ppm Ni	10 ppm Cu 10 ppm Ni	10 ppm Cu 10 ppm Ni
H	10 ppm Cu 10 ppm Zn	10 ppm Cu 10 ppm Zn	10 ppm Cu 10 ppm Zn	10 ppm Cu 10 ppm Zn	10 ppm Cu 10 ppm Zn	10 ppm Cu 10 ppm Zn	10 ppm Cu 10 ppm Zn	10 ppm Cu 10 ppm Zn	10 ppm Cu 10 ppm Zn	10 ppm Cu 10 ppm Zn	10 ppm Cu 10 ppm Zn	10 ppm Cu 10 ppm Zn

PLT060

Optical power = 600uW
SAMD pH = 3.0 ± 0.1 pH

140ul – Reagent Plate: EDTA concentrations 0, 300, 1200, 4800

	1	2	3	4	5	6	7	8	9	10	11	12
A	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA
B	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA
C	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA
D	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA
E	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA
F	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA
G	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA
H	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA

140ul – SAMD Plate: 1:1 interferant metals and copper, 10 ppm

	1	2	3	4	5	6	7	8	9	10	11	12
A	10 ppm Cu	10 ppm Cu	10 ppm Cu	10 ppm Cu	10 ppm Cu	10 ppm Cu	10 ppm Cu	10 ppm Cu	10 ppm Cu	10 ppm Cu	10 ppm Cu	10 ppm Cu
B	10 ppm Cu 10 ppm Al	10 ppm Cu 10 ppm Al	10 ppm Cu 10 ppm Al	10 ppm Cu 10 ppm Al	10 ppm Cu 10 ppm Al	10 ppm Cu 10 ppm Al	10 ppm Cu 10 ppm Al	10 ppm Cu 10 ppm Al	10 ppm Cu 10 ppm Al	10 ppm Cu 10 ppm Al	10 ppm Cu 10 ppm Al	10 ppm Cu 10 ppm Al
C	10 ppm Cu 10 ppm Ca	10 ppm Cu 10 ppm Ca	10 ppm Cu 10 ppm Ca	10 ppm Cu 10 ppm Ca	10 ppm Cu 10 ppm Ca	10 ppm Cu 10 ppm Ca	10 ppm Cu 10 ppm Ca	10 ppm Cu 10 ppm Ca	10 ppm Cu 10 ppm Ca	10 ppm Cu 10 ppm Ca	10 ppm Cu 10 ppm Ca	10 ppm Cu 10 ppm Ca
D	10 ppm Cu 10 ppm Fe	10 ppm Cu 10 ppm Fe	10 ppm Cu 10 ppm Fe	10 ppm Cu 10 ppm Fe	10 ppm Cu 10 ppm Fe	10 ppm Cu 10 ppm Fe	10 ppm Cu 10 ppm Fe	10 ppm Cu 10 ppm Fe	10 ppm Cu 10 ppm Fe	10 ppm Cu 10 ppm Fe	10 ppm Cu 10 ppm Fe	10 ppm Cu 10 ppm Fe
E	10 ppm Cu 10 ppm Mg	10 ppm Cu 10 ppm Mg	10 ppm Cu 10 ppm Mg	10 ppm Cu 10 ppm Mg	10 ppm Cu 10 ppm Mg	10 ppm Cu 10 ppm Mg	10 ppm Cu 10 ppm Mg	10 ppm Cu 10 ppm Mg	10 ppm Cu 10 ppm Mg	10 ppm Cu 10 ppm Mg	10 ppm Cu 10 ppm Mg	10 ppm Cu 10 ppm Mg
F	10 ppm Cu 10 ppm Mn	10 ppm Cu 10 ppm Mn	10 ppm Cu 10 ppm Mn	10 ppm Cu 10 ppm Mn	10 ppm Cu 10 ppm Mn	10 ppm Cu 10 ppm Mn	10 ppm Cu 10 ppm Mn	10 ppm Cu 10 ppm Mn	10 ppm Cu 10 ppm Mn	10 ppm Cu 10 ppm Mn	10 ppm Cu 10 ppm Mn	10 ppm Cu 10 ppm Mn
G	10 ppm Cu 10 ppm Ni	10 ppm Cu 10 ppm Ni	10 ppm Cu 10 ppm Ni	10 ppm Cu 10 ppm Ni	10 ppm Cu 10 ppm Ni	10 ppm Cu 10 ppm Ni	10 ppm Cu 10 ppm Ni	10 ppm Cu 10 ppm Ni	10 ppm Cu 10 ppm Ni	10 ppm Cu 10 ppm Ni	10 ppm Cu 10 ppm Ni	10 ppm Cu 10 ppm Ni
H	10 ppm Cu 10 ppm Zn	10 ppm Cu 10 ppm Zn	10 ppm Cu 10 ppm Zn	10 ppm Cu 10 ppm Zn	10 ppm Cu 10 ppm Zn	10 ppm Cu 10 ppm Zn	10 ppm Cu 10 ppm Zn	10 ppm Cu 10 ppm Zn	10 ppm Cu 10 ppm Zn	10 ppm Cu 10 ppm Zn	10 ppm Cu 10 ppm Zn	10 ppm Cu 10 ppm Zn

PLT052

Optical power = 600uW
SAMD pH = 3.0 ± 0.1 pH

140ul – Reagent Plate: EDTA concentrations 0, 600, 2400, 9600

	1	2	3	4	5	6	7	8	9	10	11	12
A	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA
B	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA
C	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA
D	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA
E	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA
F	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA
G	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA
H	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA

140ul – SAMD Plate: Interferant metals 20 ppm, no copper

	1	2	3	4	5	6	7	8	9	10	11	12
A	0 ppm	0 ppm	0 ppm	0 ppm	0 ppm	0 ppm	0 ppm	0 ppm	0 ppm	0 ppm	0 ppm	0 ppm
B	20 ppm Al	20 ppm Al	20 ppm Al	20 ppm Al	20 ppm Al	20 ppm Al	20 ppm Al	20 ppm Al	20 ppm Al	20 ppm Al	20 ppm Al	20 ppm Al
C	20 ppm Ca	20 ppm Ca	20 ppm Ca	20 ppm Ca	20 ppm Ca	20 ppm Ca	20 ppm Ca	20 ppm Ca	20 ppm Ca	20 ppm Ca	20 ppm Ca	20 ppm Ca
D	20 ppm Fe	20 ppm Fe	20 ppm Fe	20 ppm Fe	20 ppm Fe	20 ppm Fe	20 ppm Fe	20 ppm Fe	20 ppm Fe	20 ppm Fe	20 ppm Fe	20 ppm Fe
E	20 ppm Mg	20 ppm Mg	20 ppm Mg	20 ppm Mg	20 ppm Mg	20 ppm Mg	20 ppm Mg	20 ppm Mg	20 ppm Mg	20 ppm Mg	20 ppm Mg	20 ppm Mg
F	20 ppm Mn	20 ppm Mn	20 ppm Mn	20 ppm Mn	20 ppm Mn	20 ppm Mn	20 ppm Mn	20 ppm Mn	20 ppm Mn	20 ppm Mn	20 ppm Mn	20 ppm Mn
G	20 ppm Ni	20 ppm Ni	20 ppm Ni	20 ppm Ni	20 ppm Ni	20 ppm Ni	20 ppm Ni	20 ppm Ni	20 ppm Ni	20 ppm Ni	20 ppm Ni	20 ppm Ni
H	20 ppm Zn	20 ppm Zn	20 ppm Zn	20 ppm Zn	20 ppm Zn	20 ppm Zn	20 ppm Zn	20 ppm Zn	20 ppm Zn	20 ppm Zn	20 ppm Zn	20 ppm Zn

PLT058

Optical power = 600uW
SAMD pH = 3.0 ± 0.1 pH

140ul – Reagent Plate: EDTA concentrations 0, 300, 1200, 4800

	1	2	3	4	5	6	7	8	9	10	11	12
A	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA
B	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA
C	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA
D	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA
E	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA
F	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA
G	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA
H	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA

140ul – SAMD Plate: Interferant metals 20 ppm, no copper

	1	2	3	4	5	6	7	8	9	10	11	12
A	0 ppm	0 ppm	0 ppm	0 ppm	0 ppm	0 ppm	0 ppm	0 ppm	0 ppm	0 ppm	0 ppm	0 ppm
B	20 ppm Al	20 ppm Al	20 ppm Al	20 ppm Al	20 ppm Al	20 ppm Al	20 ppm Al	20 ppm Al	20 ppm Al	20 ppm Al	20 ppm Al	20 ppm Al
C	20 ppm Ca	20 ppm Ca	20 ppm Ca	20 ppm Ca	20 ppm Ca	20 ppm Ca	20 ppm Ca	20 ppm Ca	20 ppm Ca	20 ppm Ca	20 ppm Ca	20 ppm Ca
D	20 ppm Fe	20 ppm Fe	20 ppm Fe	20 ppm Fe	20 ppm Fe	20 ppm Fe	20 ppm Fe	20 ppm Fe	20 ppm Fe	20 ppm Fe	20 ppm Fe	20 ppm Fe
E	20 ppm Mg	20 ppm Mg	20 ppm Mg	20 ppm Mg	20 ppm Mg	20 ppm Mg	20 ppm Mg	20 ppm Mg	20 ppm Mg	20 ppm Mg	20 ppm Mg	20 ppm Mg
F	20 ppm Mn	20 ppm Mn	20 ppm Mn	20 ppm Mn	20 ppm Mn	20 ppm Mn	20 ppm Mn	20 ppm Mn	20 ppm Mn	20 ppm Mn	20 ppm Mn	20 ppm Mn
G	20 ppm Ni	20 ppm Ni	20 ppm Ni	20 ppm Ni	20 ppm Ni	20 ppm Ni	20 ppm Ni	20 ppm Ni	20 ppm Ni	20 ppm Ni	20 ppm Ni	20 ppm Ni
H	20 ppm Zn	20 ppm Zn	20 ppm Zn	20 ppm Zn	20 ppm Zn	20 ppm Zn	20 ppm Zn	20 ppm Zn	20 ppm Zn	20 ppm Zn	20 ppm Zn	20 ppm Zn

PLT064

Optical power = 600uW
SAMD pH = 3.0 ± 0.1 pH

140ul – Reagent Plate: EDTA concentrations 0, 600, 2400, 9600

	1	2	3	4	5	6	7	8	9	10	11	12
A	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA
B	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA
C	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA
D	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA
E	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA
F	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA
G	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA
H	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 600 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 2400 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA	1250 ppm DDTC 9600 ppm EDTA

140ul – SAMD Plate: 1:1 interferant metals and copper, 20 ppm

	1	2	3	4	5	6	7	8	9	10	11	12
A	20 ppm Cu	20 ppm Cu	20 ppm Cu	20 ppm Cu	20 ppm Cu	20 ppm Cu	20 ppm Cu	20 ppm Cu	20 ppm Cu	20 ppm Cu	20 ppm Cu	20 ppm Cu
B	20 ppm Cu 20 ppm Al	20 ppm Cu 20 ppm Al	20 ppm Cu 20 ppm Al	20 ppm Cu 20 ppm Al	20 ppm Cu 20 ppm Al	20 ppm Cu 20 ppm Al	20 ppm Cu 20 ppm Al	20 ppm Cu 20 ppm Al	20 ppm Cu 20 ppm Al	20 ppm Cu 20 ppm Al	20 ppm Cu 20 ppm Al	20 ppm Cu 20 ppm Al
C	20 ppm Cu 20 ppm Ca	20 ppm Cu 20 ppm Ca	20 ppm Cu 20 ppm Ca	20 ppm Cu 20 ppm Ca	20 ppm Cu 20 ppm Ca	20 ppm Cu 20 ppm Ca	20 ppm Cu 20 ppm Ca	20 ppm Cu 20 ppm Ca	20 ppm Cu 20 ppm Ca	20 ppm Cu 20 ppm Ca	20 ppm Cu 20 ppm Ca	20 ppm Cu 20 ppm Ca
D	20 ppm Cu 20 ppm Fe	20 ppm Cu 20 ppm Fe	20 ppm Cu 20 ppm Fe	20 ppm Cu 20 ppm Fe	20 ppm Cu 20 ppm Fe	20 ppm Cu 20 ppm Fe	20 ppm Cu 20 ppm Fe	20 ppm Cu 20 ppm Fe	20 ppm Cu 20 ppm Fe	20 ppm Cu 20 ppm Fe	20 ppm Cu 20 ppm Fe	20 ppm Cu 20 ppm Fe
E	20 ppm Cu 20 ppm Mg	20 ppm Cu 20 ppm Mg	20 ppm Cu 20 ppm Mg	20 ppm Cu 20 ppm Mg	20 ppm Cu 20 ppm Mg	20 ppm Cu 20 ppm Mg	20 ppm Cu 20 ppm Mg	20 ppm Cu 20 ppm Mg	20 ppm Cu 20 ppm Mg	20 ppm Cu 20 ppm Mg	20 ppm Cu 20 ppm Mg	20 ppm Cu 20 ppm Mg
F	20 ppm Cu 20 ppm Mn	20 ppm Cu 20 ppm Mn	20 ppm Cu 20 ppm Mn	20 ppm Cu 20 ppm Mn	20 ppm Cu 20 ppm Mn	20 ppm Cu 20 ppm Mn	20 ppm Cu 20 ppm Mn	20 ppm Cu 20 ppm Mn	20 ppm Cu 20 ppm Mn	20 ppm Cu 20 ppm Mn	20 ppm Cu 20 ppm Mn	20 ppm Cu 20 ppm Mn
G	20 ppm Cu 20 ppm Ni	20 ppm Cu 20 ppm Ni	20 ppm Cu 20 ppm Ni	20 ppm Cu 20 ppm Ni	20 ppm Cu 20 ppm Ni	20 ppm Cu 20 ppm Ni	20 ppm Cu 20 ppm Ni	20 ppm Cu 20 ppm Ni	20 ppm Cu 20 ppm Ni	20 ppm Cu 20 ppm Ni	20 ppm Cu 20 ppm Ni	20 ppm Cu 20 ppm Ni
H	20 ppm Cu 20 ppm Zn	20 ppm Cu 20 ppm Zn	20 ppm Cu 20 ppm Zn	20 ppm Cu 20 ppm Zn	20 ppm Cu 20 ppm Zn	20 ppm Cu 20 ppm Zn	20 ppm Cu 20 ppm Zn	20 ppm Cu 20 ppm Zn	20 ppm Cu 20 ppm Zn	20 ppm Cu 20 ppm Zn	20 ppm Cu 20 ppm Zn	20 ppm Cu 20 ppm Zn

PLT061

Optical power = 600uW
SAMD pH = 3.0 ± 0.1 pH

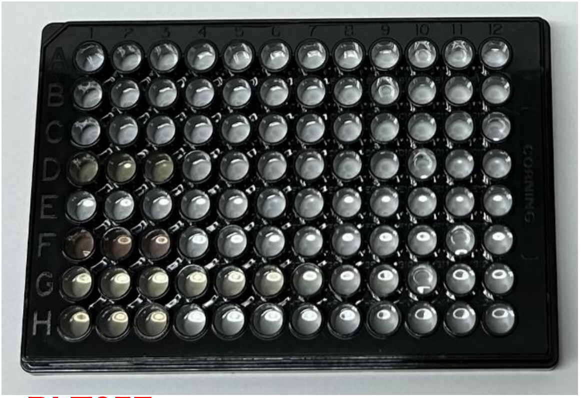
140ul – Reagent Plate: EDTA concentrations 0, 300, 1200, 4800

	1	2	3	4	5	6	7	8	9	10	11	12
A	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA
B	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA
C	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA
D	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA
E	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA
F	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA
G	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA
H	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 300 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 1200 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA	1250 ppm DDTC 4800 ppm EDTA

140ul – SAMD Plate: 1:1 interferant metals and copper, 20 ppm

	1	2	3	4	5	6	7	8	9	10	11	12
A	20 ppm Cu	20 ppm Cu	20 ppm Cu	20 ppm Cu	20 ppm Cu	20 ppm Cu	20 ppm Cu	20 ppm Cu	20 ppm Cu	20 ppm Cu	20 ppm Cu	20 ppm Cu
B	20 ppm Cu 20 ppm Al	20 ppm Cu 20 ppm Al	20 ppm Cu 20 ppm Al	20 ppm Cu 20 ppm Al	20 ppm Cu 20 ppm Al	20 ppm Cu 20 ppm Al	20 ppm Cu 20 ppm Al	20 ppm Cu 20 ppm Al	20 ppm Cu 20 ppm Al	20 ppm Cu 20 ppm Al	20 ppm Cu 20 ppm Al	20 ppm Cu 20 ppm Al
C	20 ppm Cu 20 ppm Ca	20 ppm Cu 20 ppm Ca	20 ppm Cu 20 ppm Ca	20 ppm Cu 20 ppm Ca	20 ppm Cu 20 ppm Ca	20 ppm Cu 20 ppm Ca	20 ppm Cu 20 ppm Ca	20 ppm Cu 20 ppm Ca	20 ppm Cu 20 ppm Ca	20 ppm Cu 20 ppm Ca	20 ppm Cu 20 ppm Ca	20 ppm Cu 20 ppm Ca
D	20 ppm Cu 20 ppm Fe	20 ppm Cu 20 ppm Fe	20 ppm Cu 20 ppm Fe	20 ppm Cu 20 ppm Fe	20 ppm Cu 20 ppm Fe	20 ppm Cu 20 ppm Fe	20 ppm Cu 20 ppm Fe	20 ppm Cu 20 ppm Fe	20 ppm Cu 20 ppm Fe	20 ppm Cu 20 ppm Fe	20 ppm Cu 20 ppm Fe	20 ppm Cu 20 ppm Fe
E	20 ppm Cu 20 ppm Mg	20 ppm Cu 20 ppm Mg	20 ppm Cu 20 ppm Mg	20 ppm Cu 20 ppm Mg	20 ppm Cu 20 ppm Mg	20 ppm Cu 20 ppm Mg	20 ppm Cu 20 ppm Mg	20 ppm Cu 20 ppm Mg	20 ppm Cu 20 ppm Mg	20 ppm Cu 20 ppm Mg	20 ppm Cu 20 ppm Mg	20 ppm Cu 20 ppm Mg
F	20 ppm Cu 20 ppm Mn	20 ppm Cu 20 ppm Mn	20 ppm Cu 20 ppm Mn	20 ppm Cu 20 ppm Mn	20 ppm Cu 20 ppm Mn	20 ppm Cu 20 ppm Mn	20 ppm Cu 20 ppm Mn	20 ppm Cu 20 ppm Mn	20 ppm Cu 20 ppm Mn	20 ppm Cu 20 ppm Mn	20 ppm Cu 20 ppm Mn	20 ppm Cu 20 ppm Mn
G	20 ppm Cu 20 ppm Ni	20 ppm Cu 20 ppm Ni	20 ppm Cu 20 ppm Ni	20 ppm Cu 20 ppm Ni	20 ppm Cu 20 ppm Ni	20 ppm Cu 20 ppm Ni	20 ppm Cu 20 ppm Ni	20 ppm Cu 20 ppm Ni	20 ppm Cu 20 ppm Ni	20 ppm Cu 20 ppm Ni	20 ppm Cu 20 ppm Ni	20 ppm Cu 20 ppm Ni
H	20 ppm Cu 20 ppm Zn	20 ppm Cu 20 ppm Zn	20 ppm Cu 20 ppm Zn	20 ppm Cu 20 ppm Zn	20 ppm Cu 20 ppm Zn	20 ppm Cu 20 ppm Zn	20 ppm Cu 20 ppm Zn	20 ppm Cu 20 ppm Zn	20 ppm Cu 20 ppm Zn	20 ppm Cu 20 ppm Zn	20 ppm Cu 20 ppm Zn	20 ppm Cu 20 ppm Zn

PLT056



PLT050

PLT059

PLT062

PLT057

PLT051

PLT060

PLT063

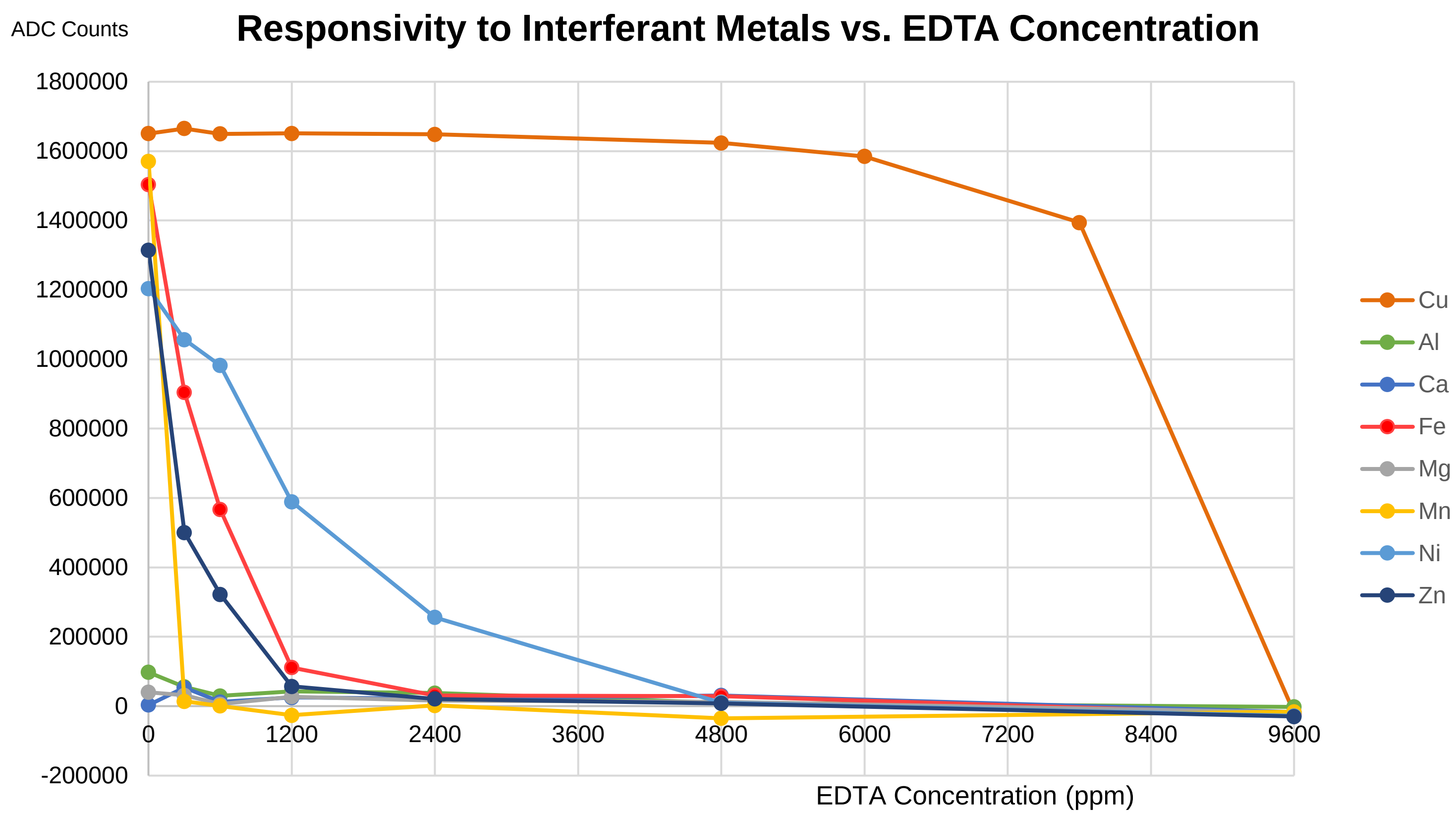
PLT058

PLT052

PLT061

PLT064

Selectivity for Copper



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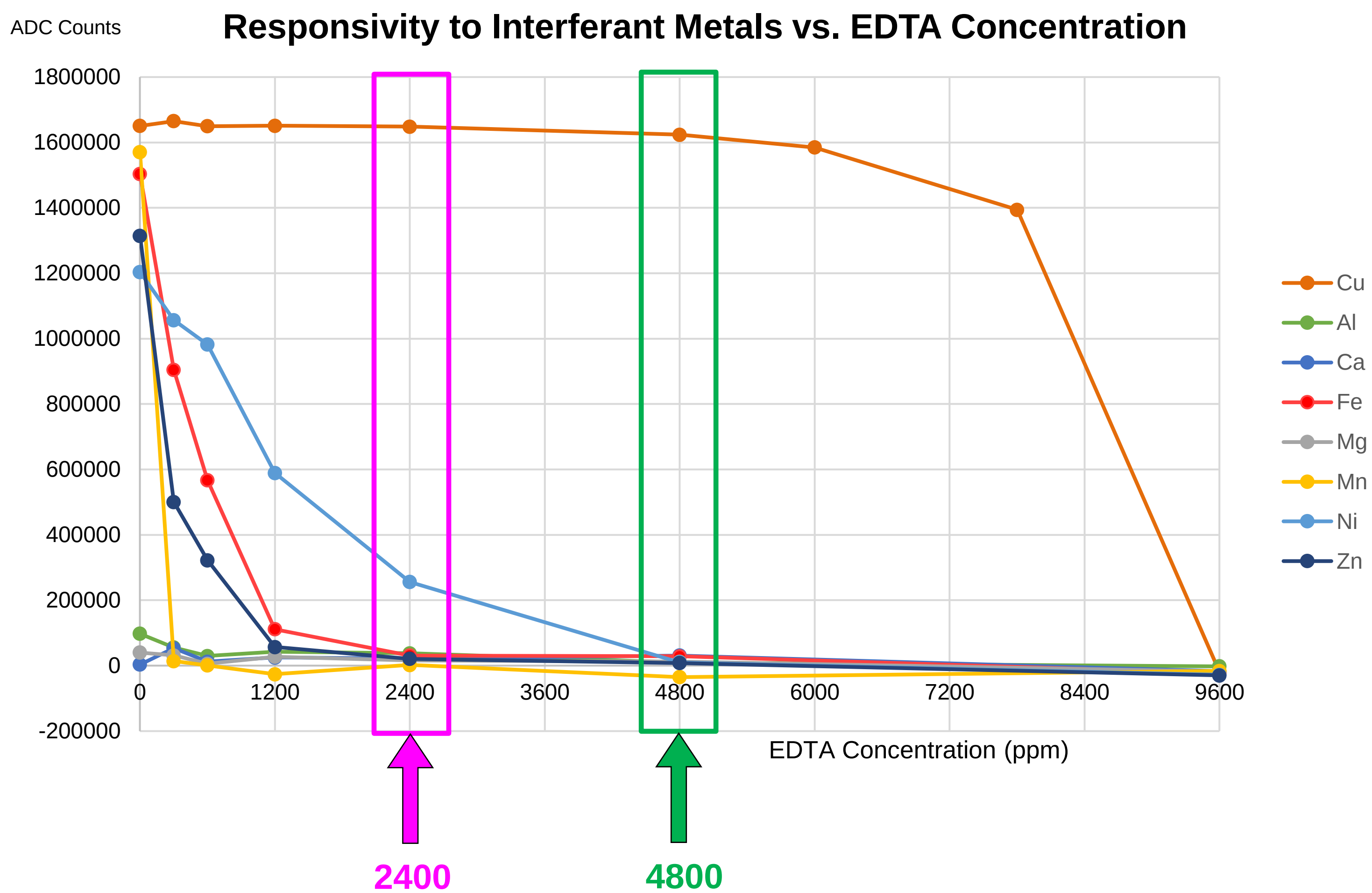
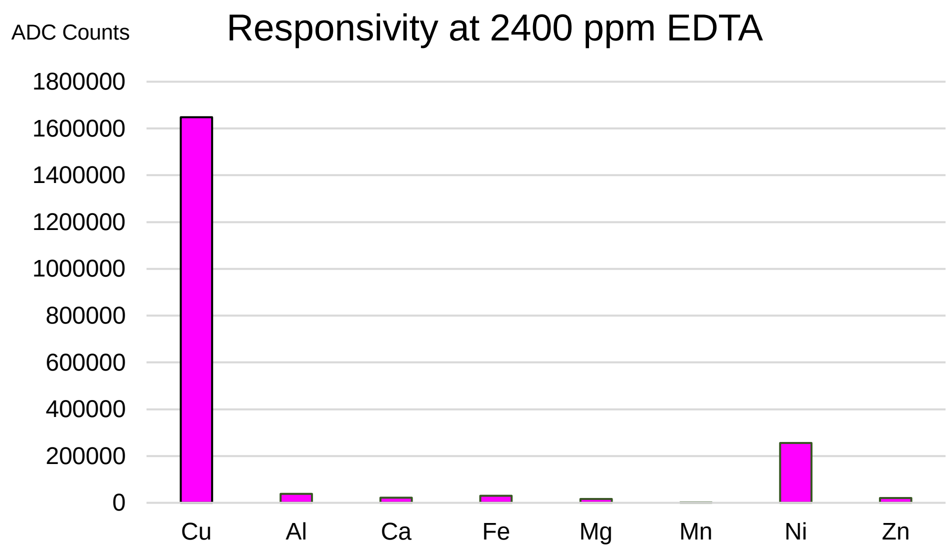
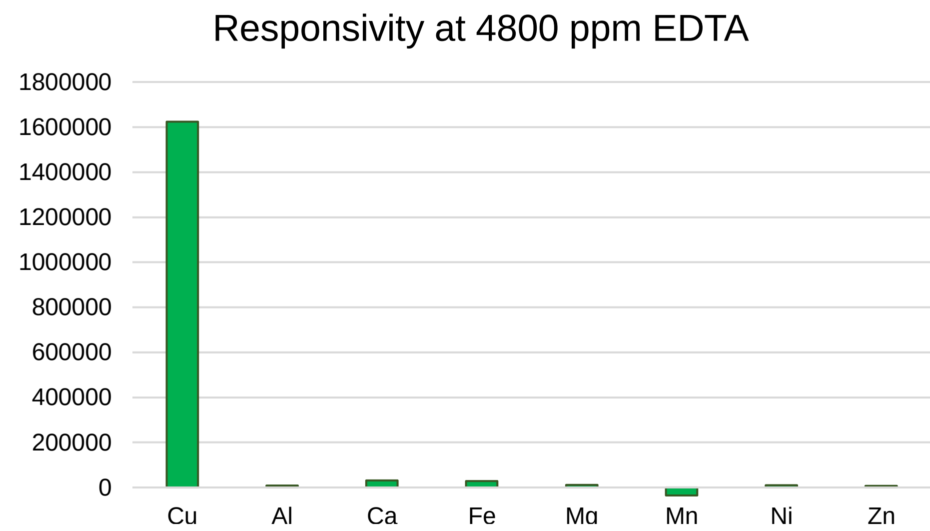
Selectivity for Copper



Selectivity for Copper





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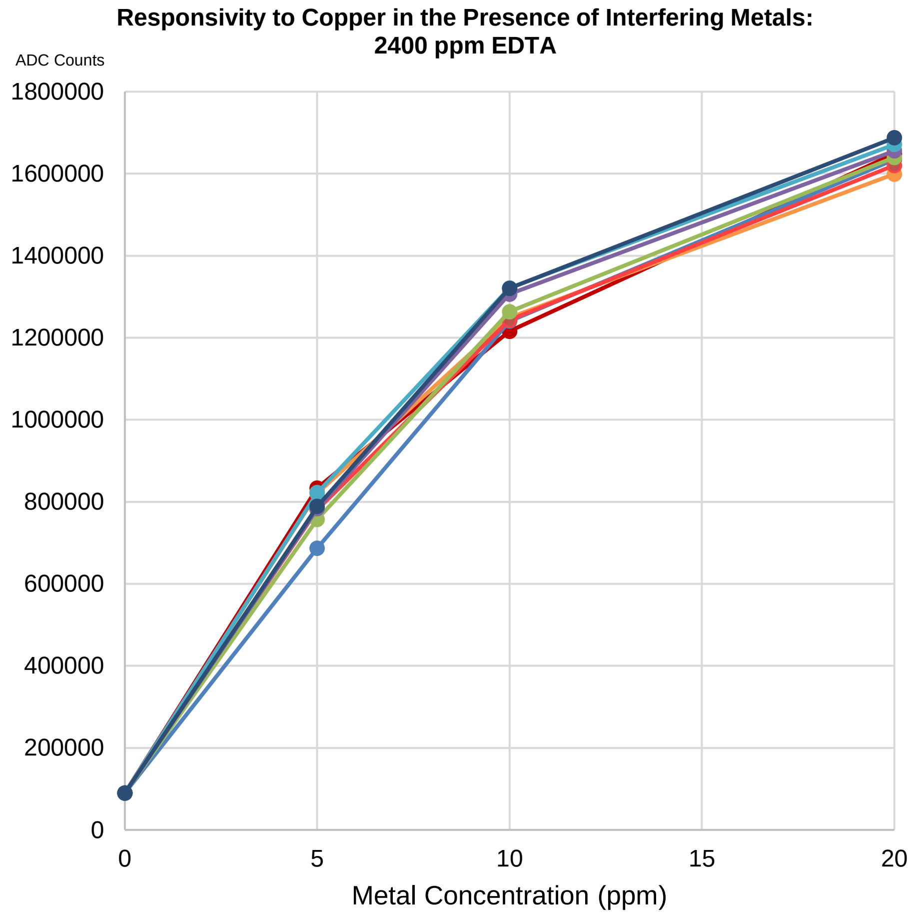
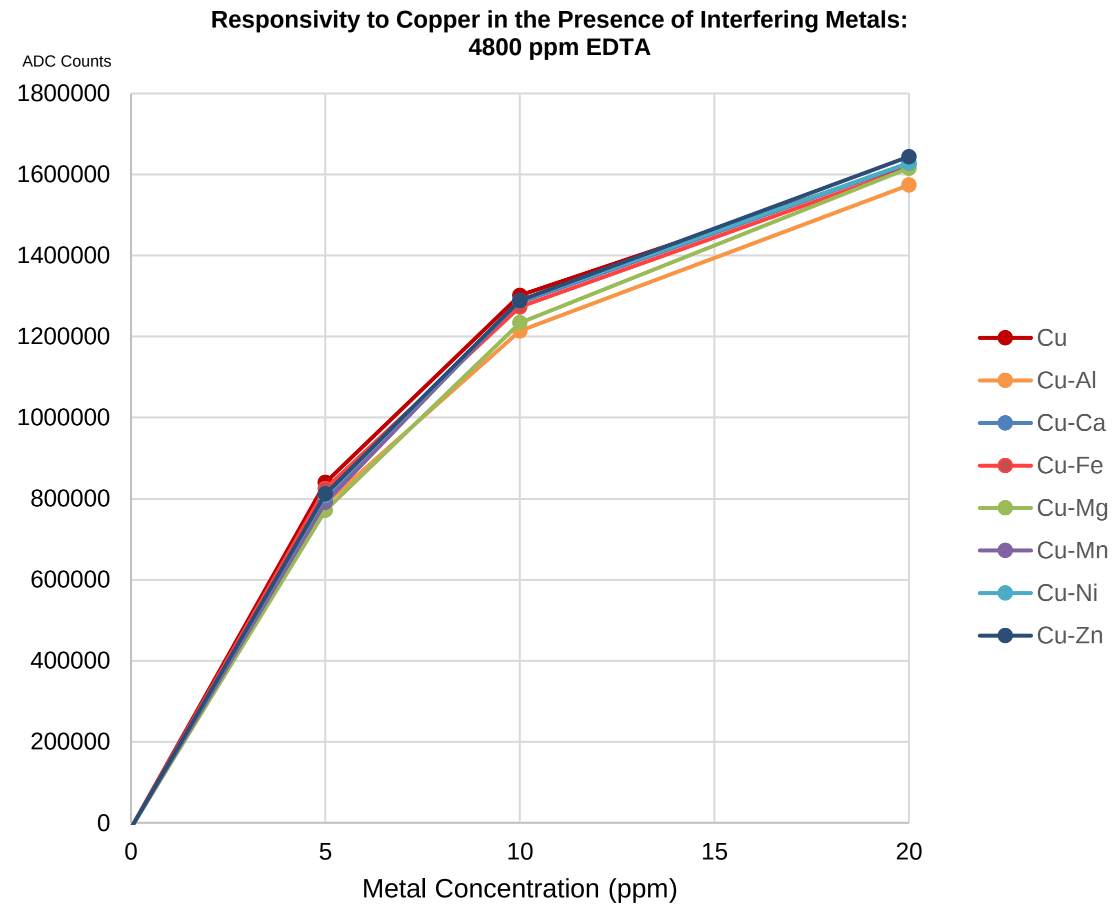
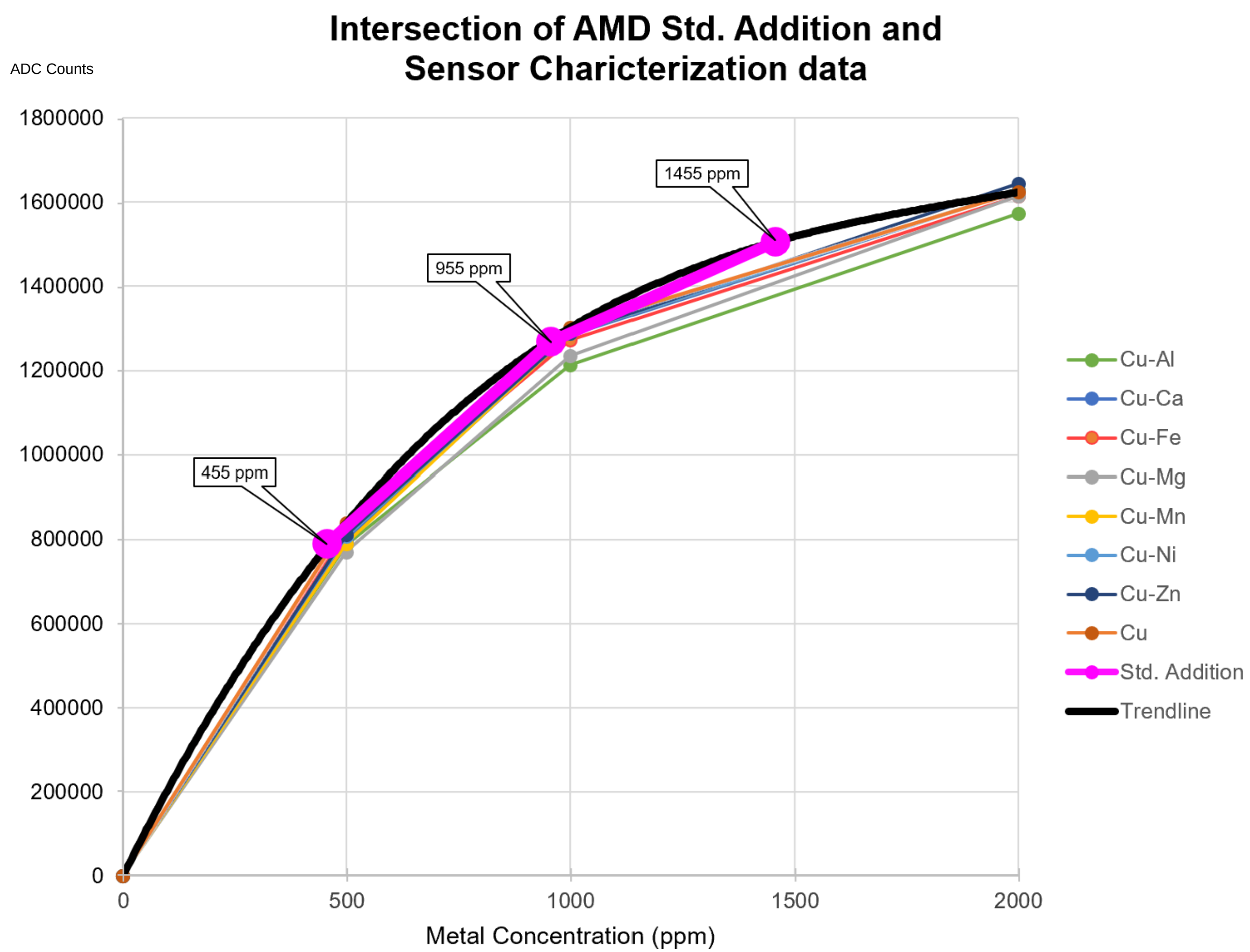
Responsivity in the Presence of Interferants





Standard Addition to AMD



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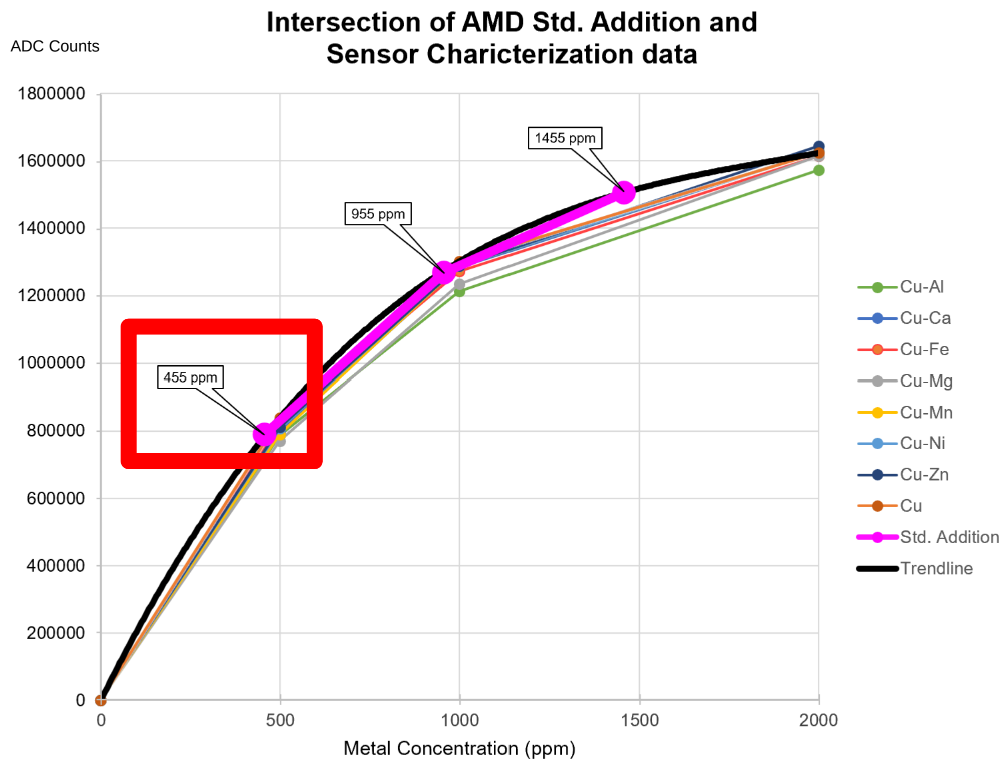

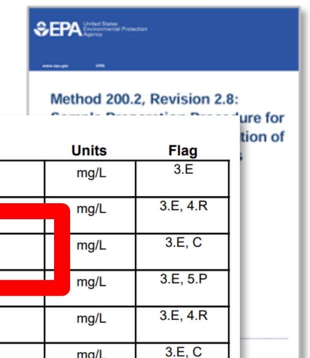

Total Metals Analysis

Parameter	Date Analyzed	Method	LOQ	Result	Units	Flag
Aluminum	05/23/2025	EPA 200.7, Rev. 4.4 (1994)	25.0	3160	mg/L	3.E
[illegible]	[illegible]	[illegible] (1994)	[illegible]	[illegible]	mg/L	3.E, 4.R
Copper	05/23/2025	EPA 200.7, Rev. 4.4 (1994)	5.00	525	mg/L	3.E, C
[illegible]	[illegible]	[illegible] (1994)	[illegible]	[illegible]	mg/L	3.E, 5.P
Magnesium	05/23/2025	EPA 200.7, Rev. 4.4 (1994)	10.0	6660	mg/L	3.E, 4.R
Manganese	05/23/2025	EPA 200.7, Rev. 4.4 (1994)	5.00	273	mg/L	3.E, C
Nickel	05/23/2025	EPA 200.7, Rev. 4.4 (1994)	0.05	7.59	mg/L	3.E
Zinc	05/23/2025	EPA 200.7, Rev. 4.4 (1994)	5.00	124	mg/L	3.E

Date Prepared: 05/23/2025 Preparation Method: EPA 200.2

$$\frac{525 - 455}{525} \times 100\% = $$ 13% error

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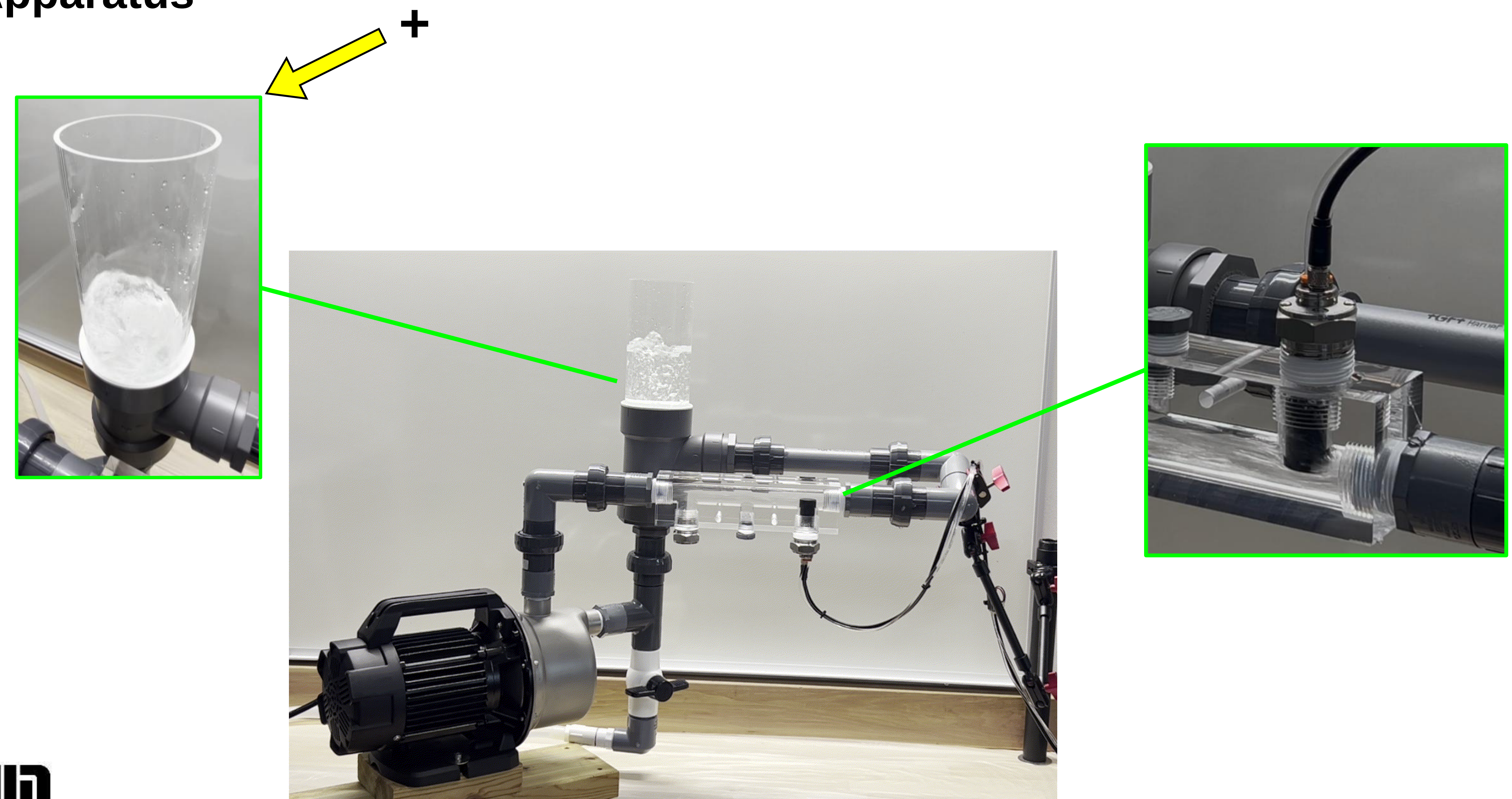
Apparatus



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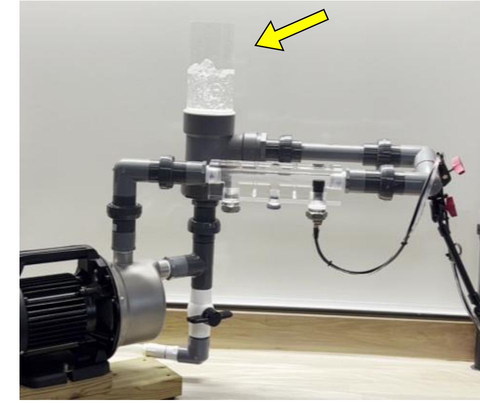
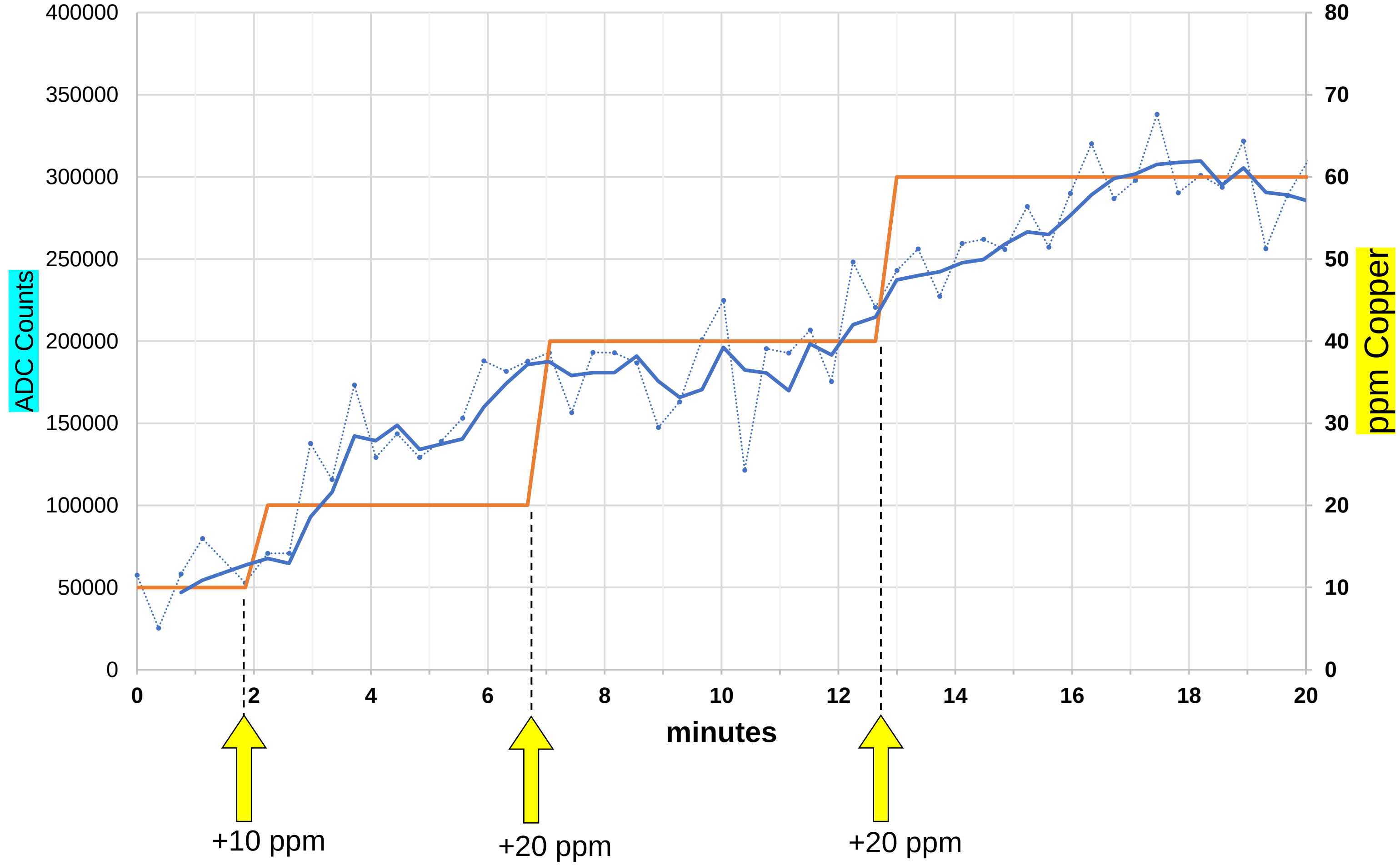
Continuous Monitoring of Copper Concentration





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1

Refinery Process Control

Enable a new generation of intelligent hydrometallurgical processing.

2

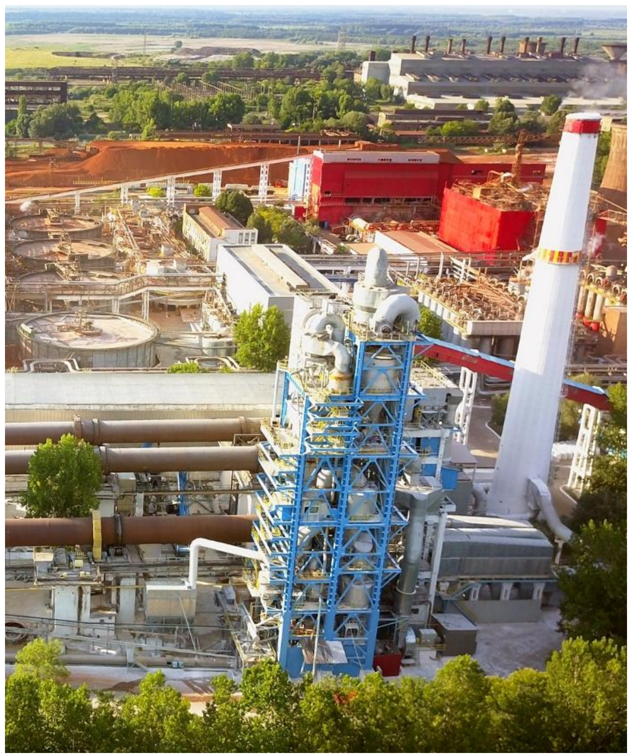
Remote Monitoring

Monitor outflows 24-7, 365.

3

Geological Survey

Accelerate resource discovery.



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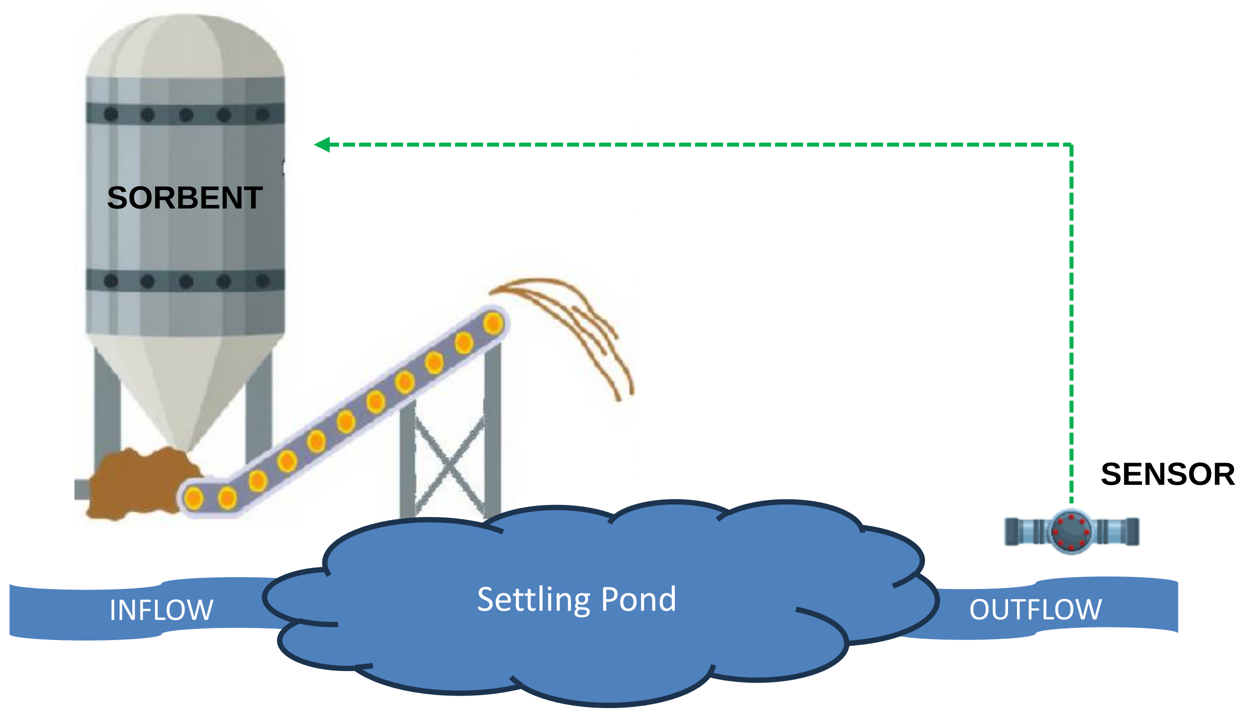
USE CASES

ENGINEERED SORBENT METERING – ENVIRONMENTAL REMEDIATION

- Sorbent addition is triggered when sensors detect dissolved metal at the outflow.
- Sensors work 24/7 to ensure that discharge water is free of dissolved metal.



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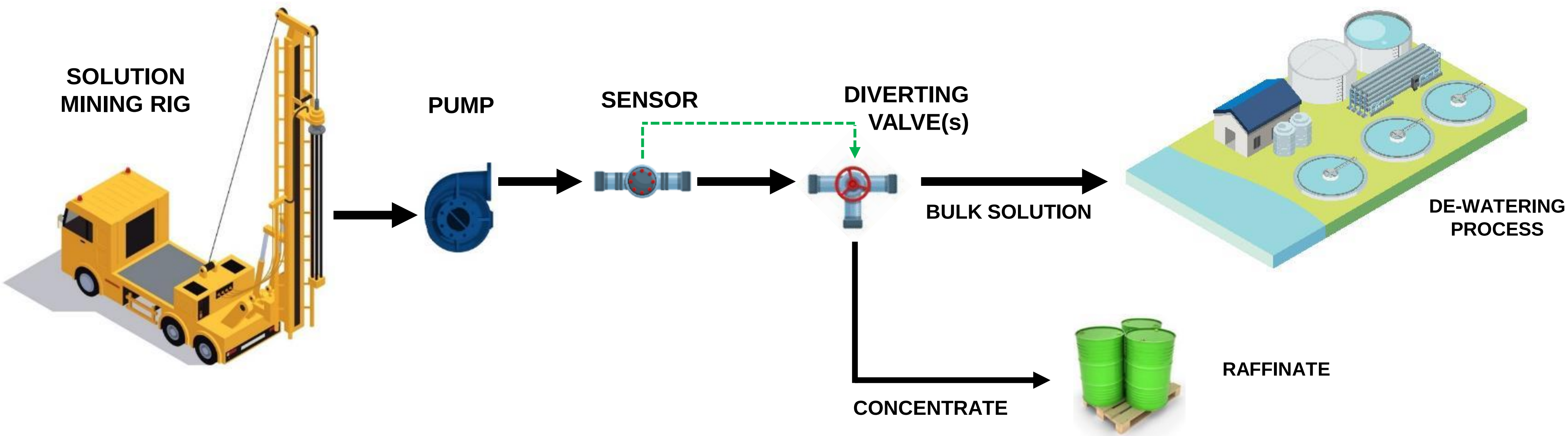
PASSIVE BINNING REFINEMENT – PROCESS CONTROL

- Computer-controlled valves divert flow whenever the concentration of a target material falls above the programmed threshold.
- High-grade and low-grade solutions are automatically binned.



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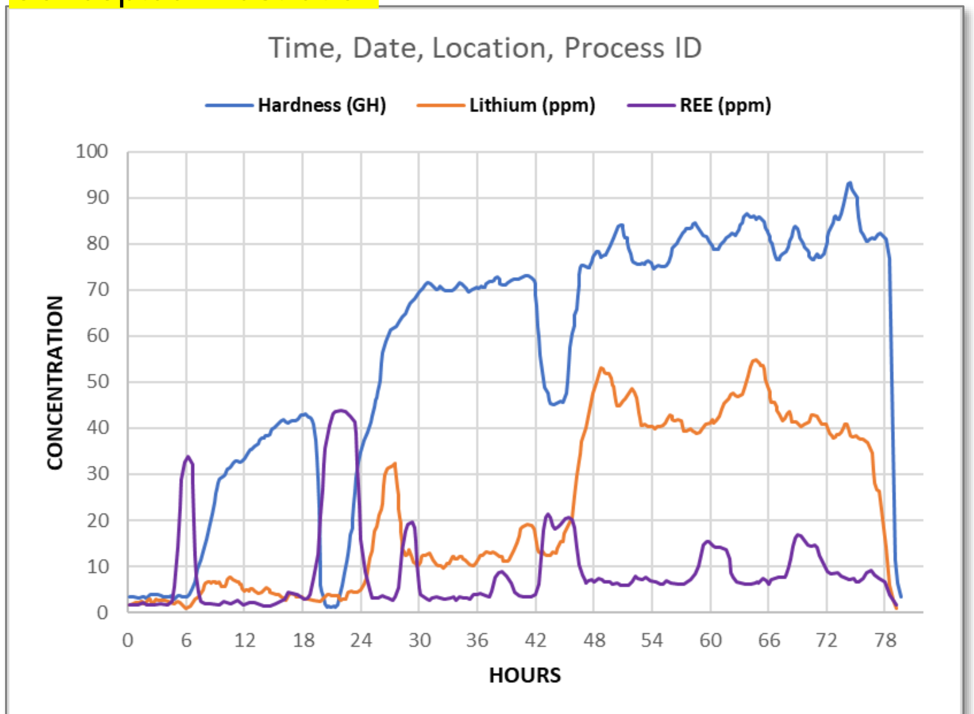
ADAPTIVE DRILLING – GEOLOGICAL SURVEY

- Screen samples in the field.
- Adjust.
- Find deposits faster.

Conceptual Illustration



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THANK YOU

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