

More
Soil Data
Faster



Adopting New Field Screening Methods – A Set of Case Studies

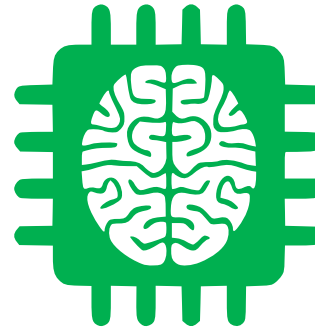
**Background
on
Technology**

**Spectral
Sensing**



+

**Machine
Learning**



=

**Rapid Field
Screening for
Soils**

**Currently available for PHC and Salinity
Parameters**

What does it look like?



Set up scanner in a truck or field trailer



Process in the Field



Scan calibration blank soil samples



Typical industry practice – drilling or grab



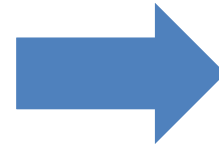
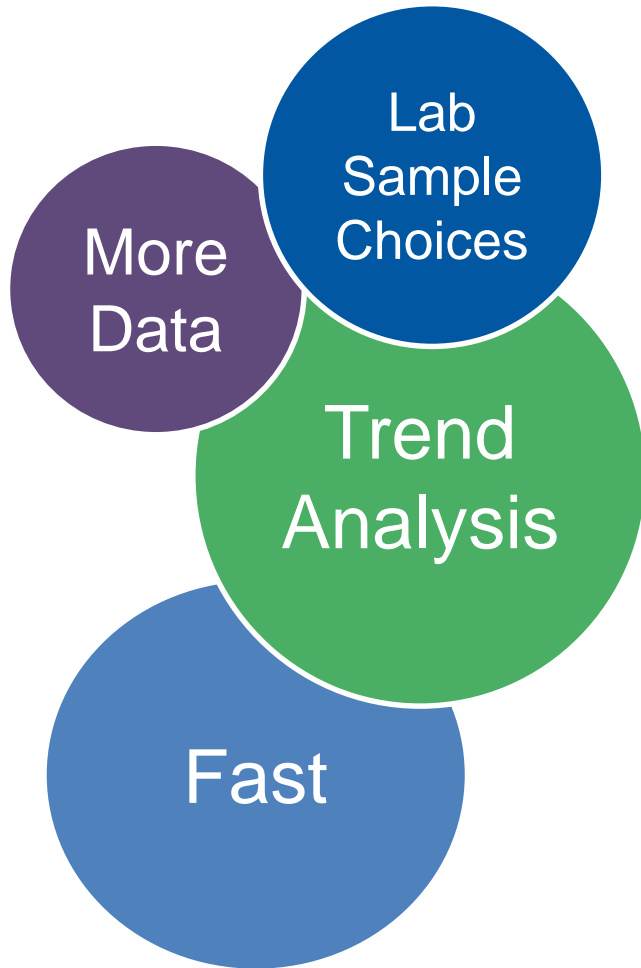
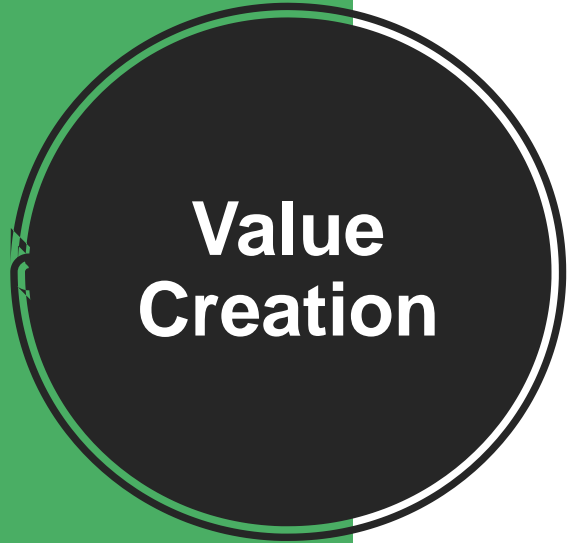
Place probe in contact with soil



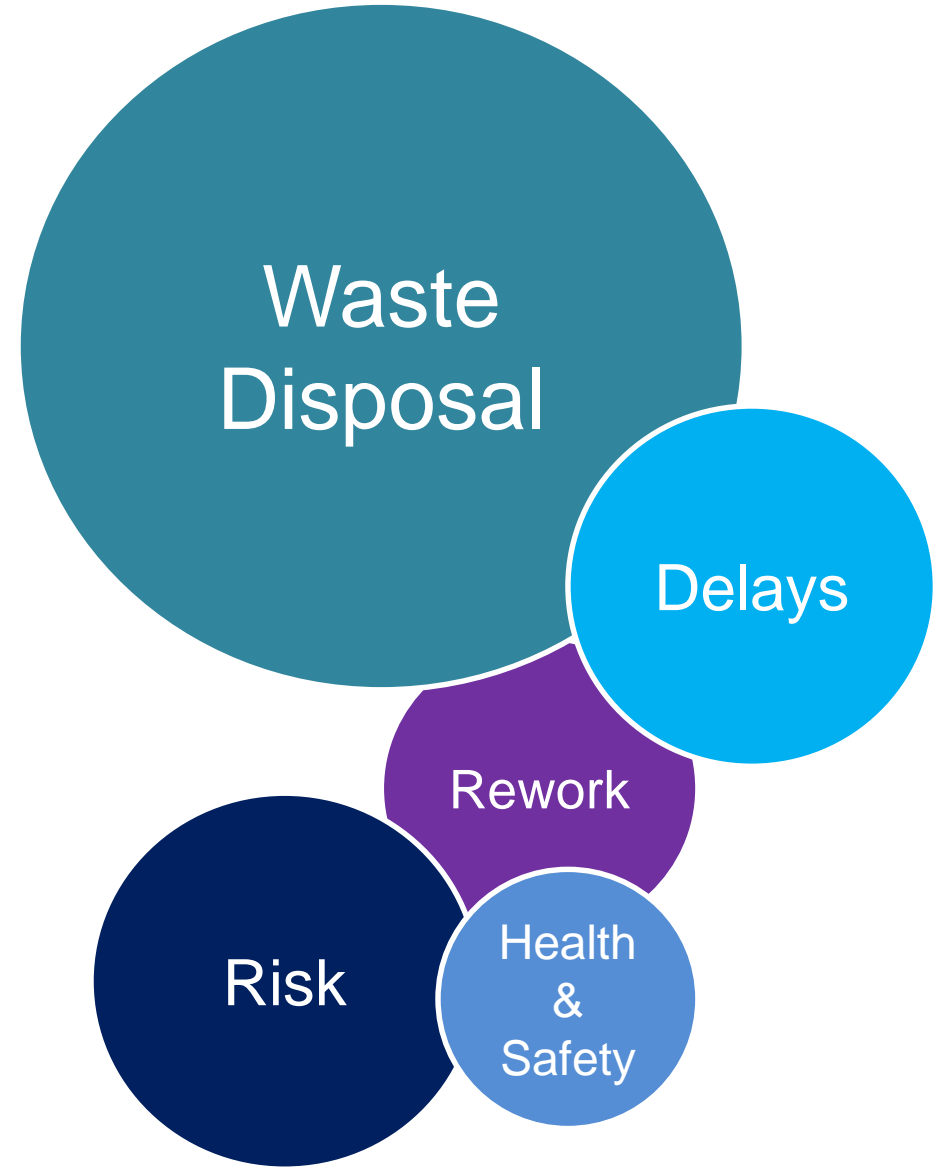
Entering location, comments and click scan (2sec)



Repeat and submit online for results in 3 - 12 minutes



Reduced or Improved



Case 1



- **Retail Fuel Station**
- **USG leakage from Phase II**
- **Remedial Excavation**
- **Commercial – Coarse Alberta Tier 1 Criteria**
- **2 days of site work**

Case 1

OUTCOME:

- Analyzed 38 samples with 5 scans per sample
- Segregate clean soils in near real time – piled suspected clean material
- 4 Rush lab samples confirmed field results
- Avoided 270 m³ of soil in land fill
- Landfill = 125\$/cubic meter
- Maapera's costs = \$2400

Over \$30k
Savings

Case 2



- **Bulk Fuel Storage site being decommissioned**
- **13 years of operations**
- **Phase II Assessment**
- **Commercial – Coarse Alberta Tier 1 Criteria**
- **6 days of site work**
- **Winter site work**

Case 2

Summary of Site Work:

- **Equipment operated by trained Envirosearch personnel**
- **38 bore holes drilled**
- **236 samples analyzed with 3 scans per sample**
- **Also used PID probe for case study evaluation**
- **42 lab analytical samples**

Case 2

OUTCOME:

- PID had 15 out of 42 lab samples with False +ve/-ve
- Spectroscopy had 47% fewer False +ve/-ve
- Spectroscopy provided full F1-F4 values
- Value of Spectroscopy on this site:
 - Able to achieve delineation drilling with dynamic step out decisions
 - No return trip for supplemental drilling required
 - Able to select high value samples for lab with large volume of data
- Cost of Spectrometry = \$5,500

\$18k Savings

Salinity Set Up





Case 3

- **Upstream Well Site**
- **Rainbow Lake Area**
- **Phase II**
- **3 days of site work**
- **Salinity Impacts were primary concern**

Case 3

Summary of Site Work:

- **Equipment operated by Maapera Analytics as part of 60 site demonstration program**
- **44 bore holes drilled**
- **347 samples analyzed with 5 scans per sample**
- **100 lab analytical samples with duplicates to a second lab**
- **Consultant leading the site was not using this data to direct their work or decisions**

Case 3

Lab
v.
Spectroscopy



Metric	EC	Chlorides	SAR
Average RPD	40%	62%	41%



Lab v.
Lab
(Duplicates)



Metric	EC	Chlorides	SAR
Average RPD	36%	66%	42%

Spectroscopy
False +ve/-ve
Rate



Criteria of EC=3, SAR=4, Chlorides=100ppm
2 instances in the 100 samples analyzed that would have had decision making errors (**2%**)

Major Deviation Example

A single value could have errors for many reasons as this is field work. This highlights the value of more data and trend review

Case 3

	Maapera EC	Maapera Cl	Maapera SAR	Lab EC	Lab Cl	Lab SAR
BH19-12 1.4m	2.7	220	2.3	3.21	346	1.8
BH19-12 2.9m	3.7	310	2.7	4.7	548	2.1
BH19-12 3.7m	1.6	96	1.9	4.02	273	2.8
BH19-12 4.4m	2.6	130	1.7	3.81	277	2.6


Would not have affected decision making

Case 3

OUTCOME:

- Similar RPD performance to interlab duplicates
- On 12 of 44 holes (27%) samples sent to lab were selected in error and additional samples needed to be run
- On 9% of holes drilled, decision to stop drilling at depth was an error
- Site required remobilization, supplemental drilling, and additional lab samples to be processed

\$16k Savings



**What did we
learn?**

- Better field screening is possible
- Value for assessment and remediation
- High value lab sample selection
- Interlab variability is 30% - 70%, on average
- Lab values are not ground truth
- Trends in sample analysis from more data is helpful

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In
summary...



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