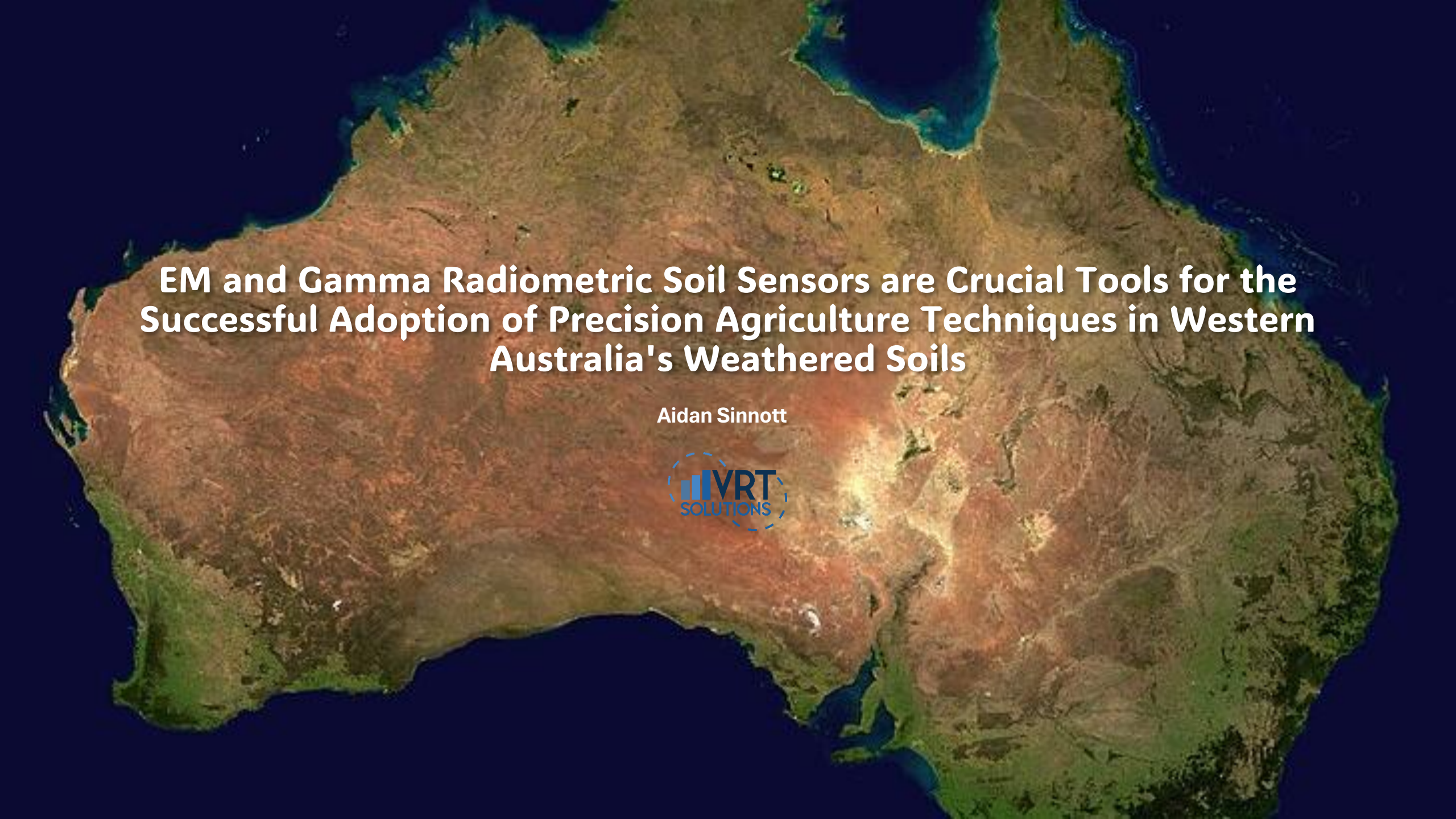
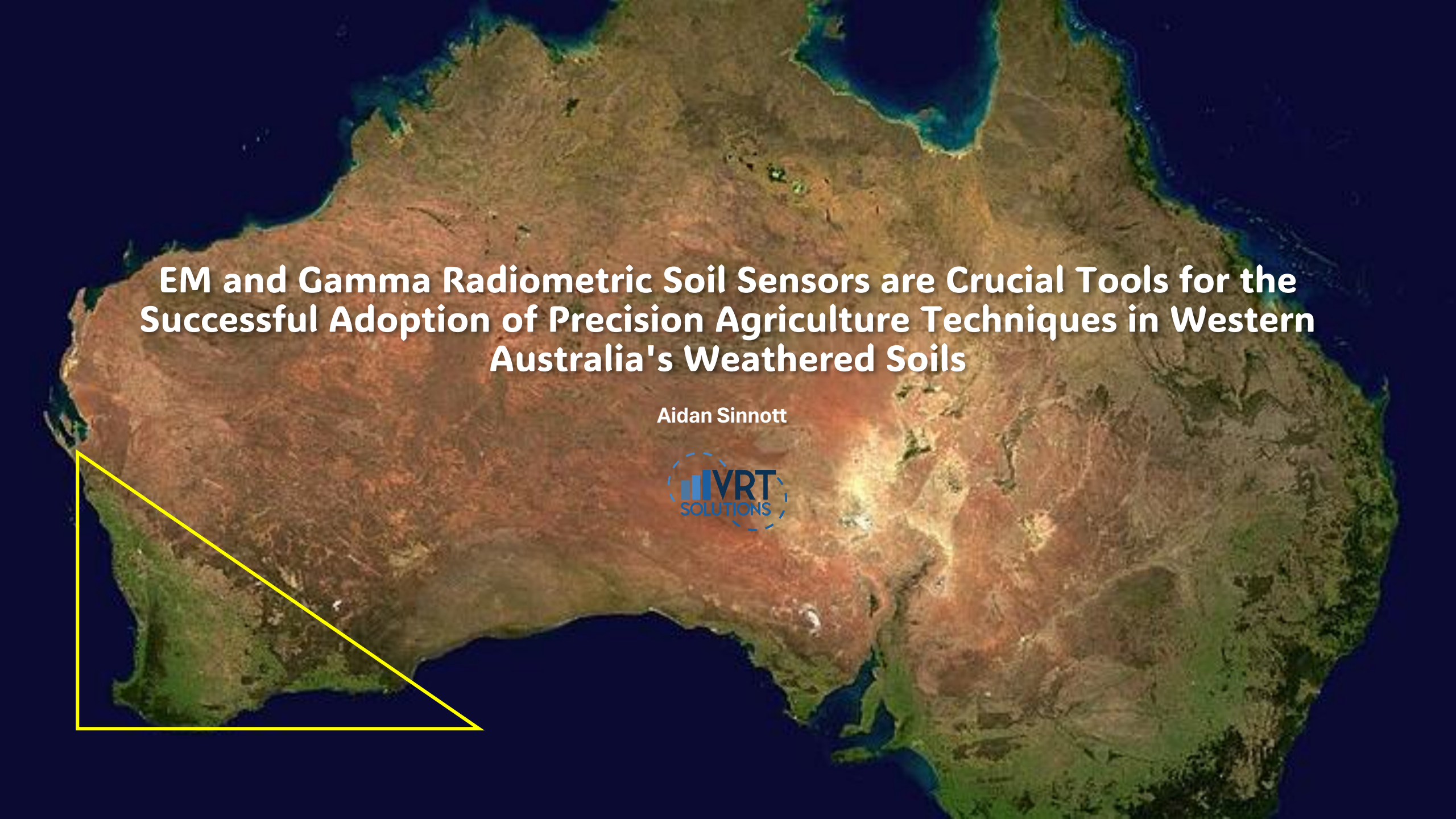


EM and Gamma Radiometric Soil Sensors are Crucial Tools for the Successful Adoption of Precision Agriculture Techniques in Western Australia's Weathered Soils

Aidan Sinnott



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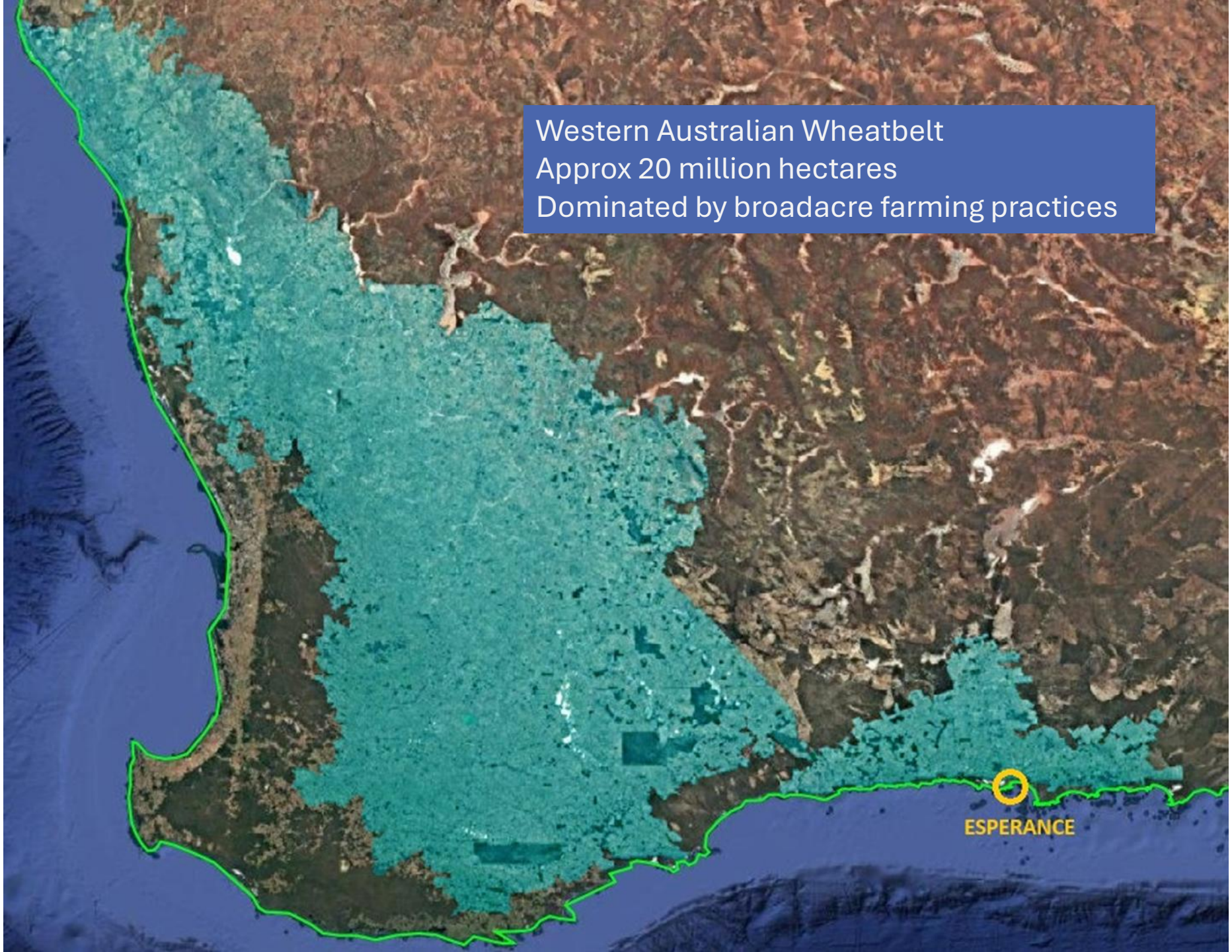
Western Australian Wheatbelt
Approx 20 million hectares
Dominated by broadacre farming practices
ESPERANCE

VRT Solutions: Introduction

Precision Agriculture Consultancy since 2018

Based in Esperance, WA

Independent advice, soil focus

Soil mapping and VR implementation

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“Core” team:

Ari Milverton, Michael Milverton, Aidan Sinnott, Sacha Zaccaria, David Caporn, Jordan White.

Connections with many agronomists around WA Wheatbelt

Variable rate and soil management

- High resolution data sets
- Soils – consistently inconsistent
- Soils – quantification of constraints
- Water – DEM, absorption rates, WHC
- Plant performance and economic return

- Crop margins **(more NB than yield!)**

Photo courtesy of Wickstein Partners

The economic success of agriculture will depend on:

- Greater understanding of soils
  - Landowners
  - Industry R&D

- Greater adoption of PA techniques
- Well proven methods

- Pareto principle: 80 / 20

Photo courtesy of Wickstein Partners

Variable rate and soil management

- Things that really matter:
  - Resolution of base data
  - Quality of interpolated maps
  - Reliability of the data used
  - Independent advice
  - Actionable deliverables

Photo courtesy of Wickstein Partners

Airborne gamma radiometric data

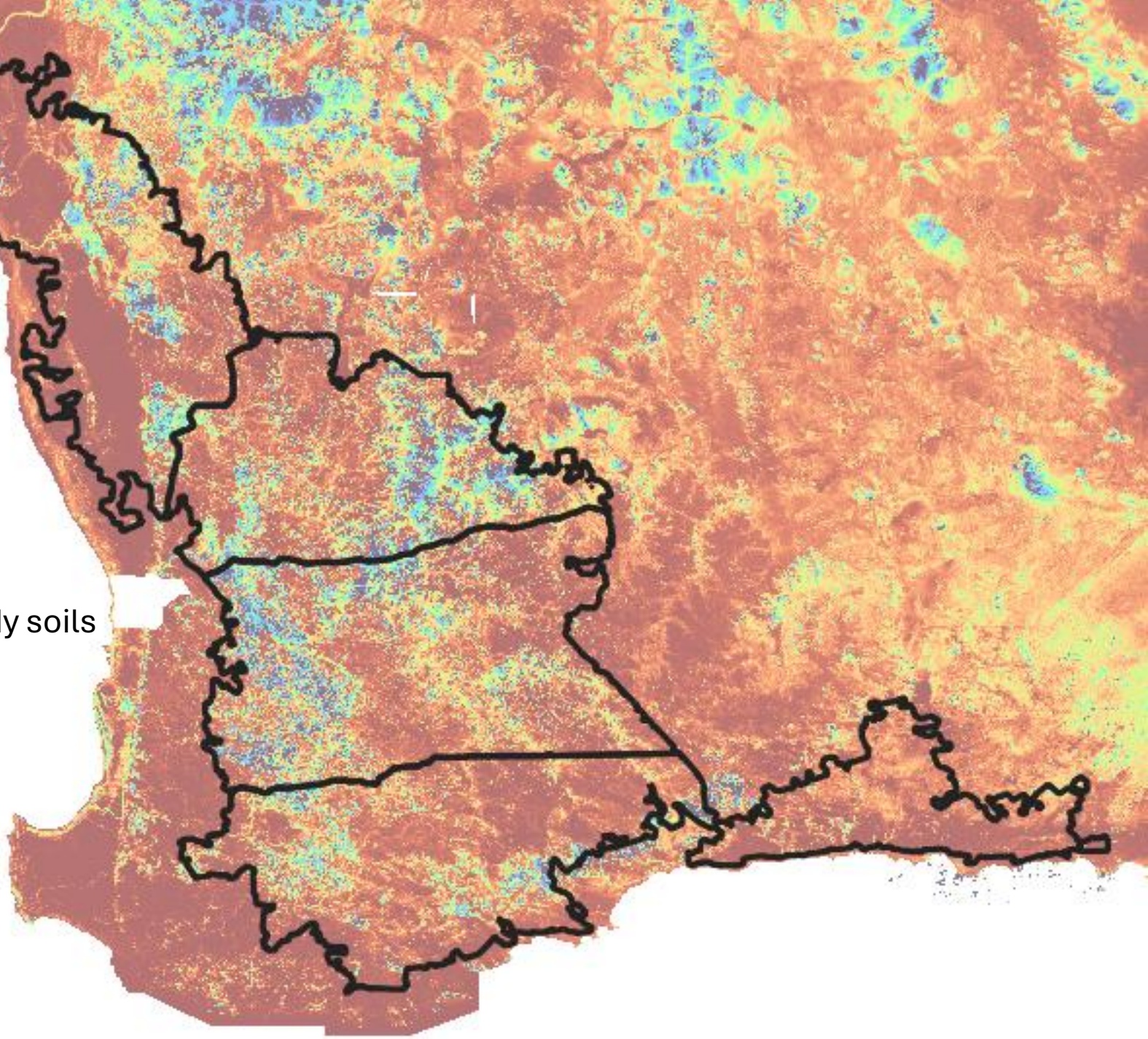
Department of Mine and Petroleum

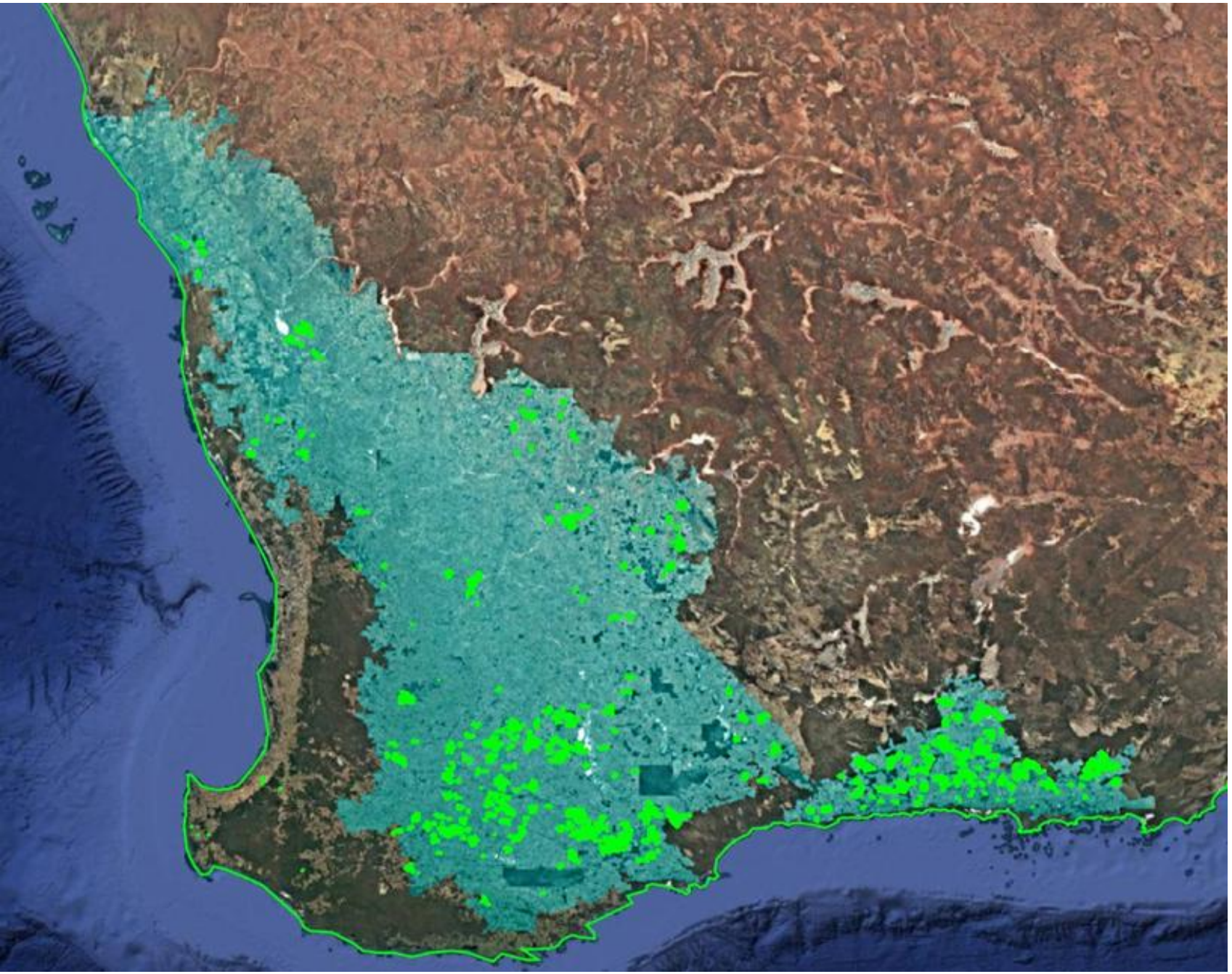
Publicly available

80m pixels
200-500m swath width data collection

Areas of DARK RED are predominated by sandy soils

Big problems:
Poor measure of salinity;
Resolution of data is too low





Proximal surveys completed between 2018-2024

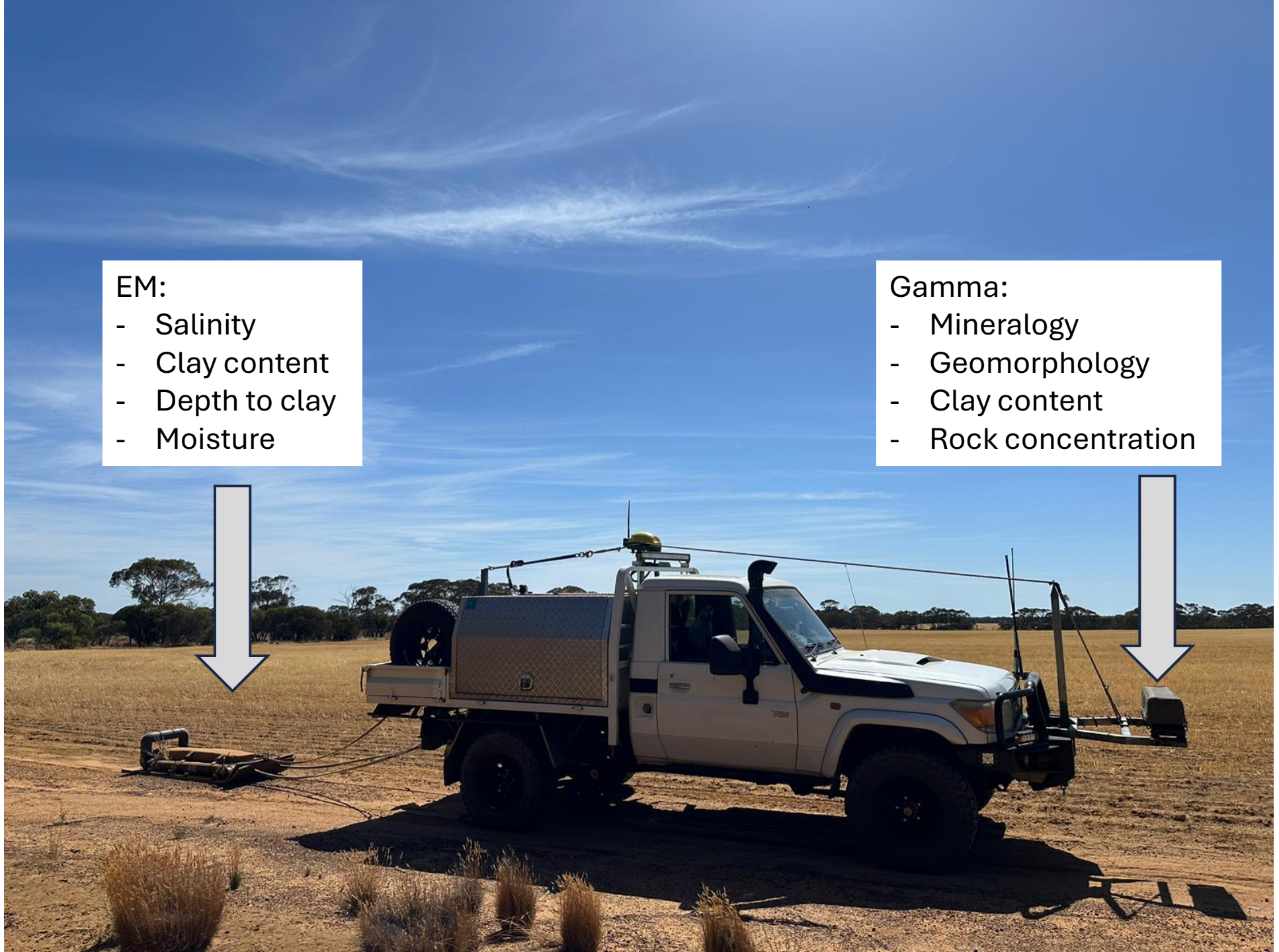
Over 1m hectares of land surveyed since 2010

Gamma radiometrics and Electromagnetic surveys

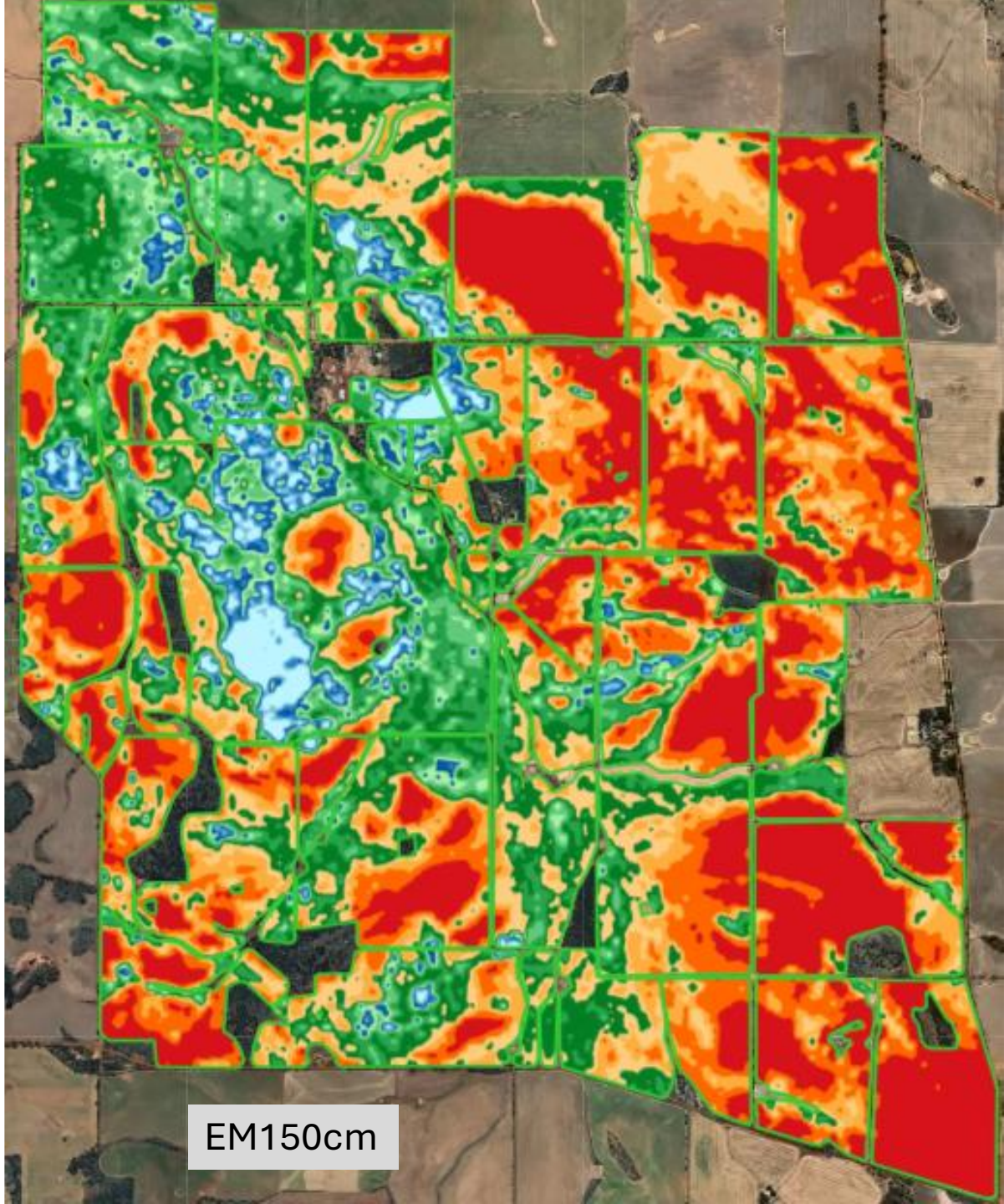
High resolution

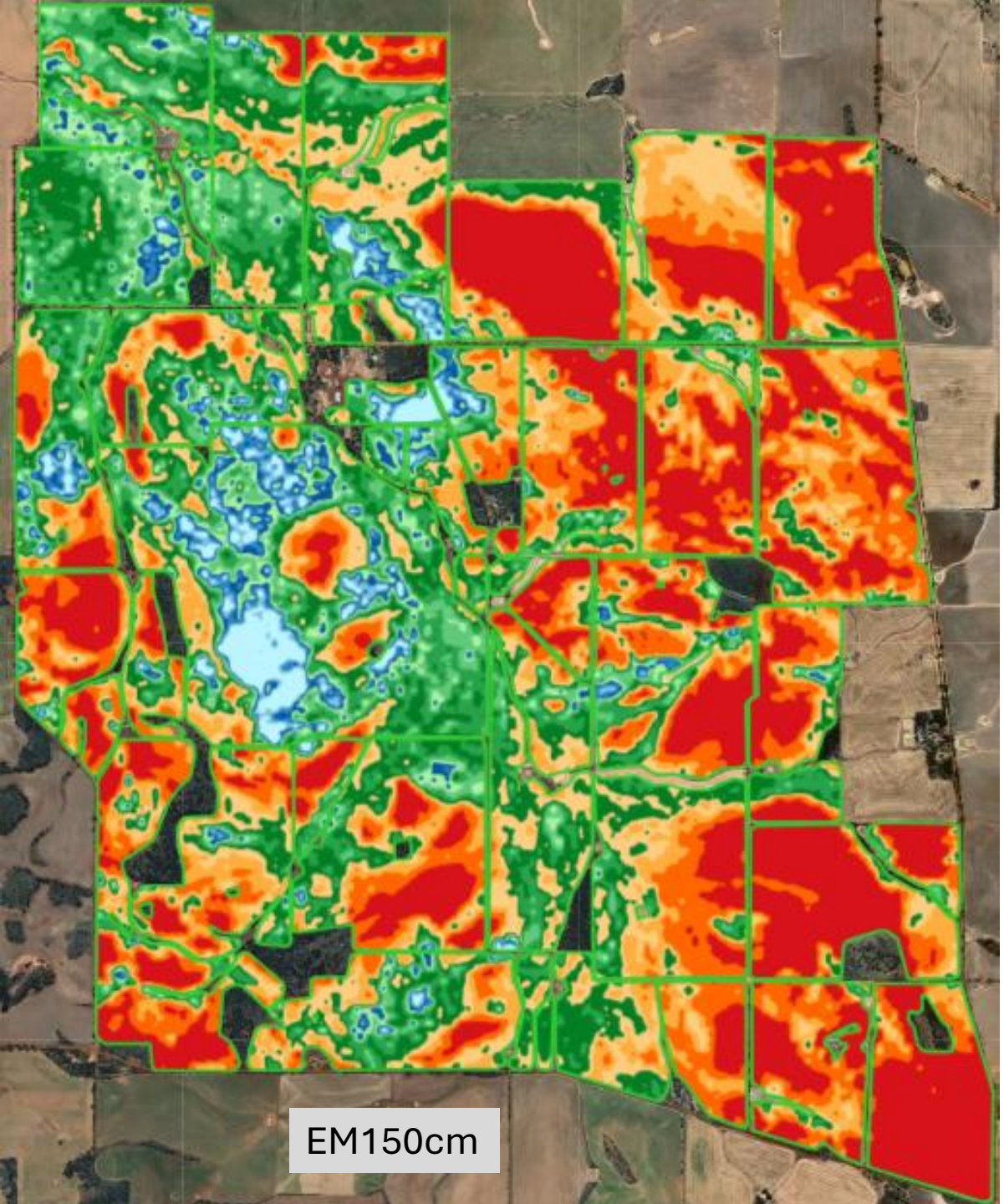
Reliable med-long term datasets


EM:
- Salinity
- Clay content
- Depth to clay
- Moisture


EM:
- Salinity
- Clay content
- Depth to clay
- Moisture
Gamma:
- Mineralogy
- Geomorphology
- Clay content
- Rock concentration

Proximal sensed data



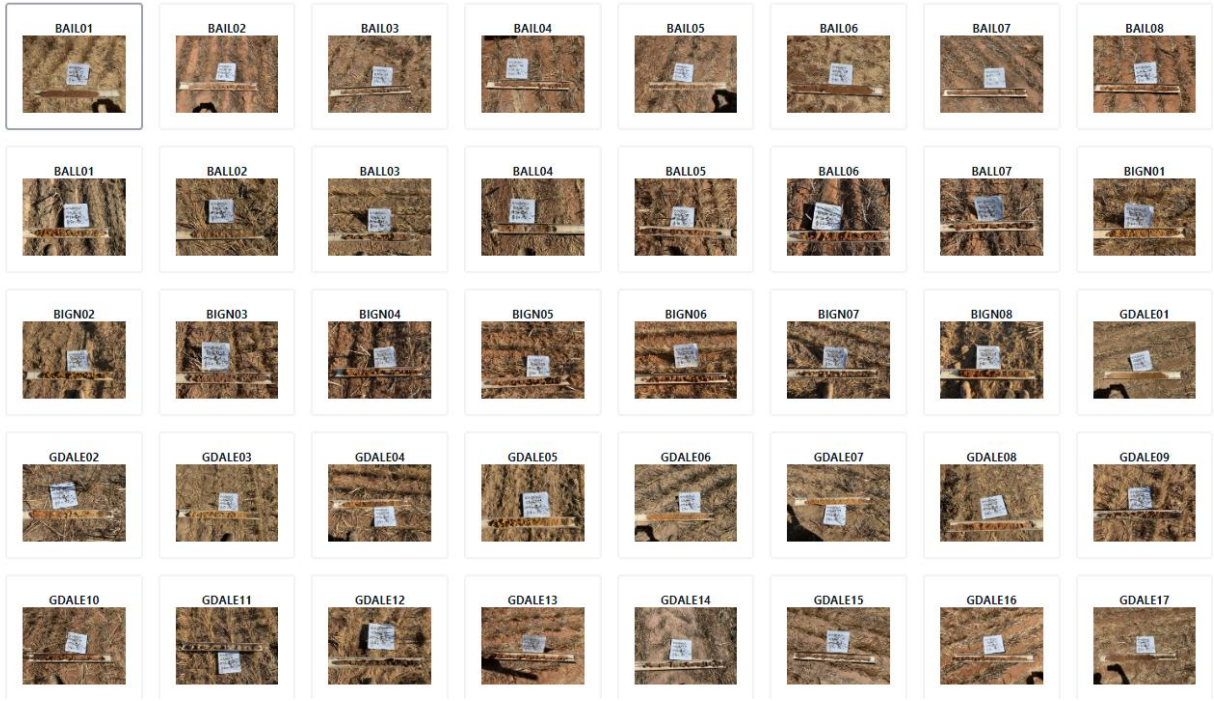

EM150cm


MD28
MD06
MD23
MD15
MD16
MD05
MD18
MD24
MD01
MD19
MD12
MD11
MD29
MD25
MD20
MD09
MD08
MD03
MD26
MD21
MD04
MD27
MD30
MD17
MD13
MD10
MD32
MD22
MD31
MD07
MD14
MD02
Gamma radiometric Thorium

STEP 03

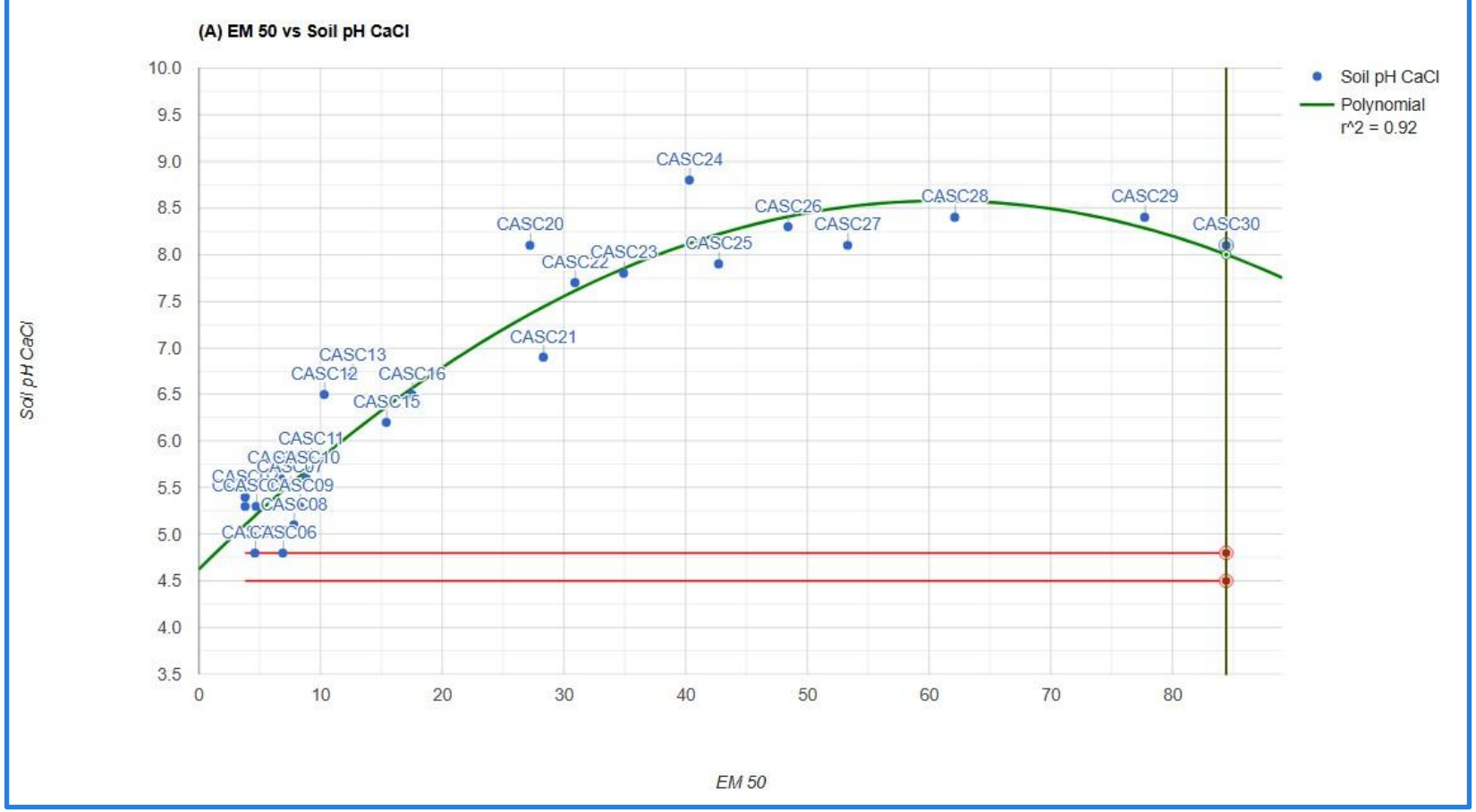
SOIL SAMPLING

SOIL TESTING



Results from all farms:

Conclusive: Soils are not the same from fence to fence.



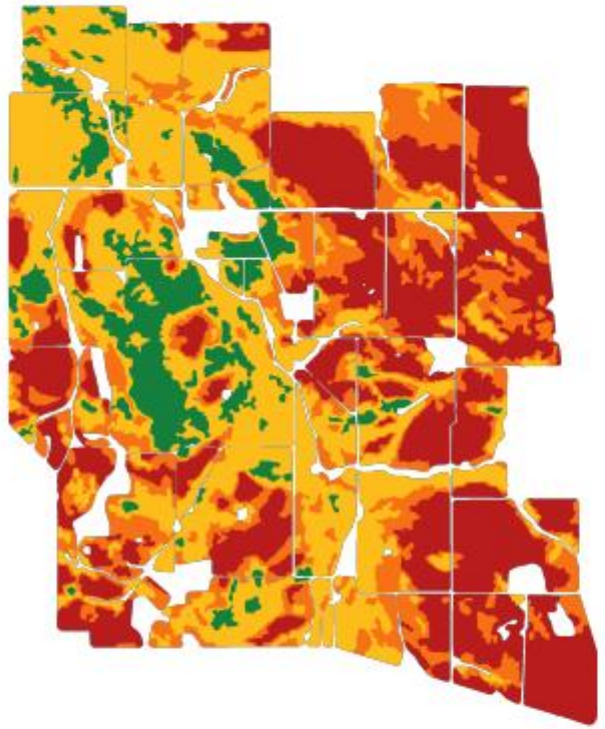
Soils samples are only useful for management if:

- Site selection method is meaningful
- Sampling methods have minimal error
- The test results can be spatially related to a proxy layer

Prescription - Lime

Stats

Year:	2025
Product:	Lime
Product Cost:	$0.05/kg
Classification Method:	Manual Breaks
Min:	500.00 kg/ha
Max:	2000.00 kg/ha
Hectares:	2082.21 ha
Average Applied Rate:	1395.21 kg/ha
Standard Deviation:	502.52 kg/ha
Coefficient Of Variation:	36.02 %
Mode:	1000.00 kg/ha



Zone	Hectares	EM 50 [mS/m]	Rate [kg/ha]	Total [tonne]	Cost [$/ha]	Total Cost
1	688.09	0.00 - 20.00	2000.00	1376.19	$100.00	$68809.40
2	460.66	20.00 - 40.00	1500.00	690.99	$75.00	$34549.56
3	742.41	40.00 - 80.00	1000.00	742.41	$50.00	$37120.30
4	191.05	80.00 - 191.40	500.00	95.52	$25.00	$4776.18
Total	**2082.21**	-	-	**2905.11**	-	**$145255.43**

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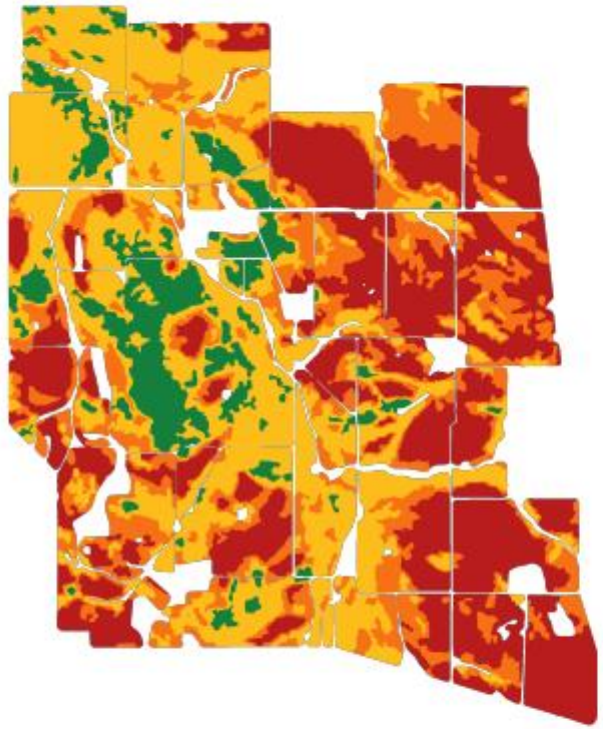

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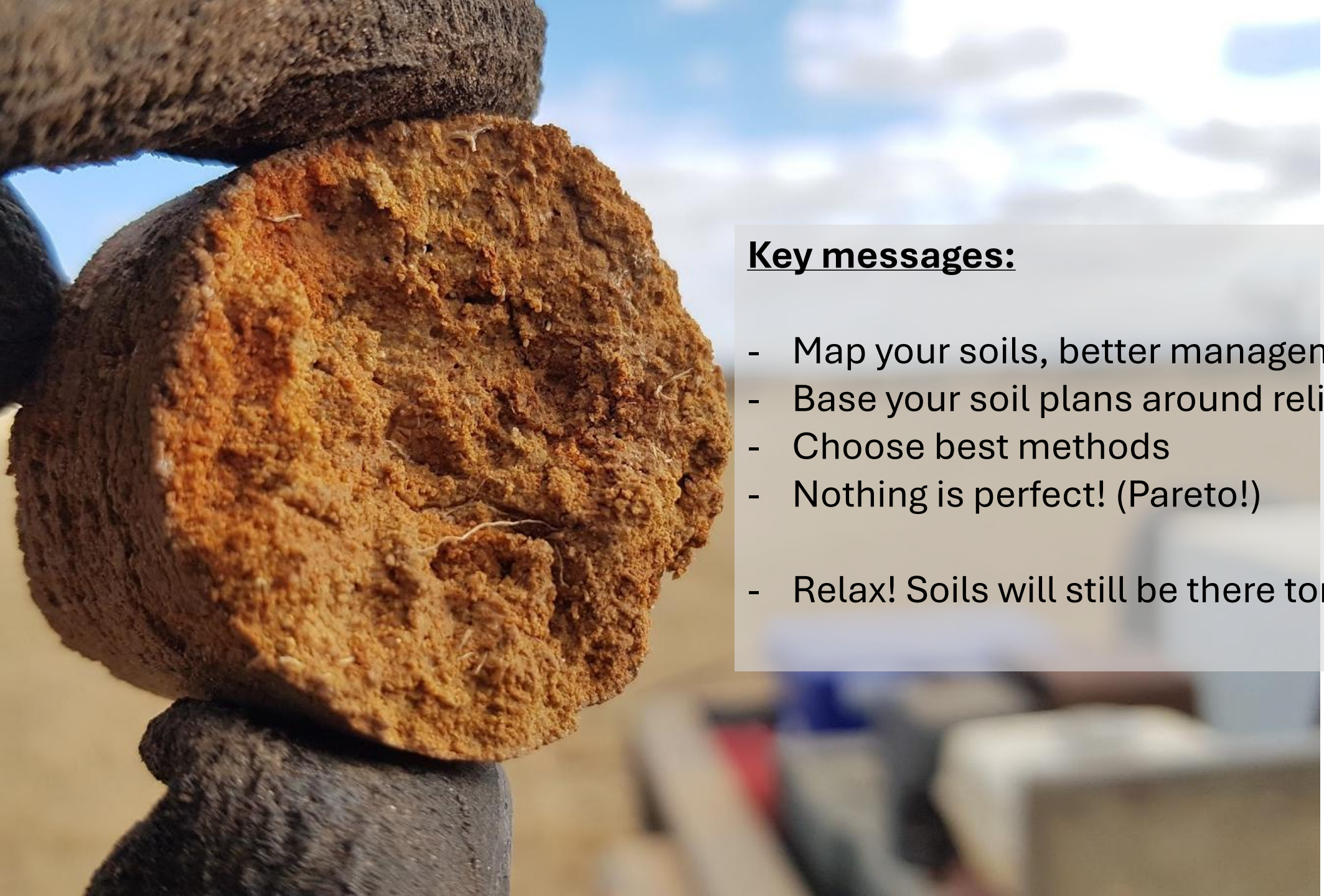
TRACTOR READY - APPLIED



Key messages:

- Map your soils, better management
- Base your soil plans around reliable soil maps
- Choose best methods
- Nothing is perfect! (Pareto!)

- Relax! Soils will still be there tomorrow.

Thank you for the opportunity

Aidan Sinnott

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www.vrt-solutions.com