A Collaboration of Technologies for Site Remediation in Naturally Occurring Saline Areas





Site Background

• Many investigations over the years but did they accomplish what they were supposed to?





Site Background

• EM surveys did not provide a complete picture







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Site Background

• Extensive chloride impacts in groundwater, but this did not correspond to EM results

Regional Salinity

- The presence of naturally occurring saline and sodic soils
- naturally occurring sodium and sulphate concentrations in the content





Assessment

- Subsurface and groundwater investigations to fill in gaps
- AEP's subsoil salinity tool and the application of background salinity values
- Geophysical survey using a rapid conductivity volume technique



Low Altitude Air Photos Using a Drone



Sensors

- Multispectral 5 band imagery (RGB, NIR, RedEdge)
- Normalized Difference Vegetation Index (NDVI) calculated to determine presence of healthy vegetation
 - Green good health
 - Red poor health

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Subsoil Salinity Tool

- Application of SST
- Comparison of background electrical conductivity, SAR and chloride values





Background Assessment

- Needed to be robust due to the variability of EC/SAR across site
- Based on poor to unsuitable soil quality, 10 background holes assessed







Background Compared to Impacted (EC/SAR)

 No discernable difference in terms of EC/SAR







Chloride Comparison

- A comparison of chloride concentrations shows impacts
- Unimpacted boreholes less than 100 mg/kg chloride









DMT Geosciences - Rapid Conductivity Volume Survey

- RCV to develop a 3D model of the subsurface resistivity.
- Direct injection electrical method used to measure apparent resistivity variations with depth and provide a 3D electrical model.
- The RCV lines were targeted to better define the lateral and vertical extent of conductivity zones
- Identify a conductivity iso-surface that best identifies elevated chloride





Misconceptions of EM Data

- Misunderstanding of the limitations of the EM method
- Depth of exploration is controlled by conductivity
- Scaling of colours can vary from site to site



 Identification of non-chloride impacted material overlying impacted material







 Identification of non-chloride impacted material overlying impacted material







 Identification of chloride impacted soils vs. influence of sulphates





 Identification of chloride impacted soils vs. influence of sulphates





 Identification of chloride impacted soils vs. influence of sulphates





Remediation (Ex-Situ)

- Bringing it all together
- Ex-Situ remediation of approx. 3000 m³ of material.
- Re-use/salvage of approx. 1500 m³ of material
- Cost reduction as the result of understanding of site



Remediation – Fluid Pit

- Location of fluid pit obvious during excavation
- Although overburden soils above the pit could be salvaged the depth was less than identified
- Areas surrounding the pit had a greater thickness of un-impacted material allowing more salvage







Final Excavation Limits



Conclusions

• Was the site as bad as everyone thought?

• Returned the site back to usable agricultural land after 100+ years

