

ALGA Awards Nomination for Award 6: Innovation or Research that Advances the Land and Groundwater industry

Victorian Background Soil Survey and Soil Explorer Web Application

Project Team Organisations: RMIT University, CDM Smith, EPA Victoria, Australian Contaminated Land Consulting Association (ACLCA)

Key project team members and contribution/role:

- Hannah Mikkonen (RMIT and CDM Smith). Student who lead and undertook the research as part of her PhD (2014-2018)
- Associate Professor Suzie Reichman (RMIT). Research supervisor.
- Christian Wallis (CDM Smith) Co supervisor and industry mentor.
- Raghava Dasika (EHS support) representing ACLCA as co-supervisor and industry support.
- Andrew Barker and Paul Bentley (Data scientists at CDM Smith, web application developers).

Industry Area advanced by this project: Contaminated Land - Soil Waste Categorisation for offsite disposal.

Project Summary: Naturally enriched background concentrations of metals have been reported in soils of Victoria. Where natural enrichment is not accurately distinguished from pollution, soils can be inappropriately categorised as “contaminated waste”; resulting in unnecessary disposal to landfill.

Research was undertaken involving; (i) collection and analysis of background soil samples; (ii) collation of audit report data (iii) development of a background soil database, (iii) mapping of metal concentrations, (iv) analysis of geochemical correlations between elements; (v) recommendation of methods for distinguishing natural enrichment from contamination and (vi) presentation of the results.

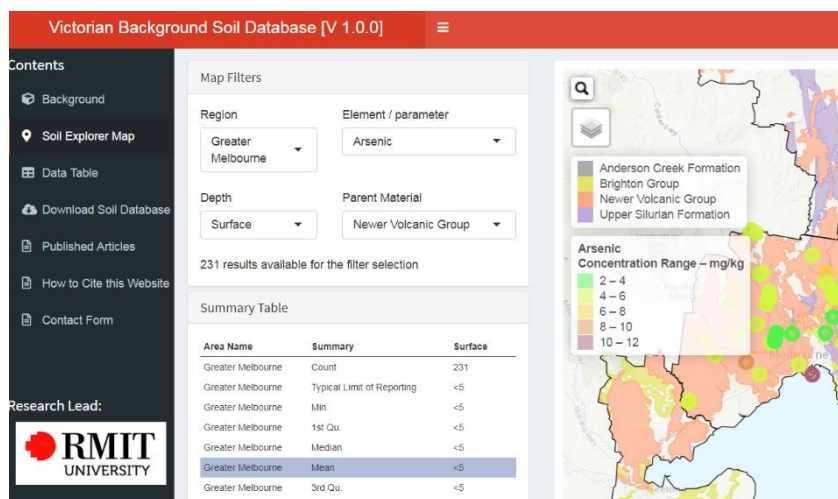


Figure 1 Figure 1 Snapshot from the Soil Explorer interactive map

A website “The Victorian Background Soil Database” (<https://soilexplorer.eres.rmit.edu.au/soil-explorer/>) and an interactive map titled “Soil Explorer” were developed to present and share the results of a Background Soil Survey for Victorian soils.

Award Criteria:

a. Demonstrated progress in uncovering new knowledge in soil or water contamination

The novel results of this research were published in six peer reviewed journal articles (cited on the website). The knowledge highlights for this project are summarised below.

- Arsenic, fluoride and nickel were reported to be naturally enriched in some soils at concentrations greater than the Industrial Waste Resource Guidelines for categorisation of soils as Fill Material. A summary of environmental and geochemical indicators of metal/element enrichment were provided, to support environmental assessors in distinguishing natural enrichment from contamination.
- The National Environmental Protection Measures recommends use of geochemical ratios between primary elements of interest and iron to support derivation of ecological investigation limits. This study found ratios of primary elements of interest and iron were not consistent between soils from different parent materials and regions. Alternative geochemical correlations and multivariate regression models were provided for improved estimation of background element concentrations.
- Iron stones within some tertiary sediments (including Brighton Group) are naturally enriched with arsenic and vanadium. Under environmental conditions these elements had low leachability.

b. Demonstrated applicability of research outcomes to improve industry practice

This research has allowed for improved waste categorisation of naturally enriched soils for the purpose of offsite disposal. 10's thousands of tonnes of soil are disposed of offsite each year, often to landfill. Sharing of this information has allowed for consistency in knowledge of natural enrichment between organisations including different consultancies and waste receivers.

Improved knowledge of natural enrichment has allowed for soils to be re-used (categorised as Fill Material). The data and statistical tools presented by the "Soil Explorer" application has improved the waste classification of more than 50,000 m³ of soil for the Melbourne Metro Rail Authority, Ballarat Line Upgrade (BLU) project alone. We are aware that many other major projects that have applied the data and statistical tools provided by the user-friendly interface to improve waste classifications and reduce the volume of naturally enriched materials going to landfill.

c. Demonstrated communication of new findings and their value to industry.

The results of this study have been communicated through a free to access website and user friendly interactive maps. Results have also been presented at CleanUp conference 2017 and in various published articles. The value of this work to industry is reflected in the number of users of the website. Google analytics has reported almost **1500 users** of the web application, since the site was launched in January 2018.

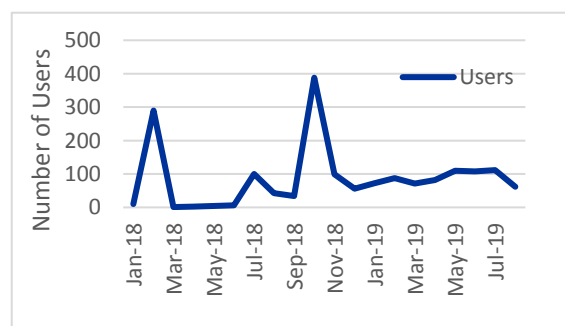


Figure 2: Summary of users of the Soil Explorer website. Peaks shown following announcement of the site on linkedIn in February 2018 and presentation of the website at the Australasian eResearch conference in October 2018.