UltraFine+® Next Gen Analytics. Northern Territory Geological Survey – MacDonnell Ranges

ANZLIC Identifier:

Title: UltraFine+® Next Gen Analytics. Northern Territory Geological Survey – MacDonnell Ranges

Custodian: Northern Territory Geological Survey (NTGS)
Department of Industry, Tourism and Trade

Abstract: Assessing geochemical data in mineral exploration often focuses on understanding outliers, such as elevated Au, Cu or Zn. Commonly the largest concentrations are followed up, but landscape (soil) types can significantly influence concentrations. For example, high metal concentrations may be readily identifiable as outliers in a geochemical dataset where samples were collected over mineralisation in shallow residual soils, while the same mineralisation would have a much weaker elemental signal in samples collected over thicker depositional landscapes. With the ability to approximate landscape types from spatial data via machine learning, the UltraFine+® Next Gen Analytics workflow was developed to improve outlier identification within landscape types. As part of the UltraFine+® Next Gen Analytics for Discovery research project, the MacDonnell Ranges project site was chosen as a first-generation, large-scale trial site with a focus on principal functionality of the UltraFine+® Next Gen Analytics workflow. For this purpose, the Northern Territory Geological Survey provided 785 historic stream sediment samples, and we present some example outputs of the workflow here.

These outputs include proxy regolith landscape clusters to provide context for geochemical samples, maps and boxplots of elemental outliers by landscape type, and exploration indices for a rapid, first-pass identification of element association and potential exploration indices. The data package also contains geochemistry, VNIR (visible to near infra-red spectral mineralogy) and pH as shapefiles. This provides a basic, first-pass interpretation of geochemical samples by proxy regolith type and the identification of otherwise “overlooked” potential anomalies.

The data presented herein was analysed in September 2020. Since then, the components of the UltraFine+® workflow have undergone continuous improvements especially with regards to the consistency of pH and VNIR (visible near-infrared spectroscopy) measurements, as well as the addition of soil sizing, FTIR (Fourier-transform infrared spectroscopy) and Pd analyses. Therefore, some analysis results and related outputs, such as soil texture diagrams, dispersion direction, regolith indices and catchment analyses are not available for this project. However, where data was available, it was reprocessed with the latest workflow updates in February and April 2022.

	A variety of clustering methods were trialled to generate appropriate proxies for regolith types and the recommended outputs for the MacDonnell Ranges project are those produced via an agglomerative algorithm with eight landscape clusters (agg8). Due to the large size of the MacDonnell Ranges project area and the resulting complexity of the landscape an even larger number of clusters would result in a more detailed approximation of the complex regolith types. However, the number of landscape clusters are the result of a balanced approach to represent the major landscape types of the area while also enabling meaningful interpretation of geochemical data. Despite these constraints, the resulting output for the MacDonnell Ranges project area provides a more detailed landscape context than publicly available, interpreted regolith products. The samples submitted to the research project were previously analysed via four-acid digestion and a 24-hour cyanide leach (Au only). A comparison between these methods and the UltraFine+® method confirmed that the UltraFine+® method improves the recovery of trace metals (2 to >5 times higher for Au, Cu, Pb and Zn) and the resolution of concentrations near the detection limit, which enables the delineation of subtle geochemical enrichments for elements. The detection of these subtle variations is particularly relevant for exploration through transported cover and the results of this project provide a good background data set for future exploration activities in the region and surrounding areas. While the UltraFine+® Next Gen Analytics workflow is designed for soil samples and not presently developed for stream sediment analysis and interpretation, the workflow provides a general, large-scale landscape context of the catchment within which the stream sediment samples were collected, and the MacDonnell Ranges project site was crucial in developing the approach, workflow and outputs for the UltraFine+® Next Gen Analytics for Discovery research project.
Search Word(s)	MacDonnell Ranges, HERMANNSBURG, Tjoritja West MacDonnell Ranges National Park, Glen Helen, Glen Helen, Stokes Yard, Mount Larrie, Haasts Bluff, Ulpuruta, Charley Creek, Wangatinya, machine learning, spatial data integration, clustering, base metal, spectral mineralogy, regolith, particle size, clay, mineral exploration, soil, analysis, geochemistry.
Bounding Coordinates (GDA94):	North bounding coordinate: -23.2° South bounding coordinate: -23.8° East bounding coordinate: 133.9° West bounding coordinate: 131.0°
Reference System Information:	Data are supplied in Geocentric Datum of Australia (GDA94) Map Grid of Australia zone 52 projected co-ordinates [EPSG: 28352].
Data Currency Start Date:	August 2022
Data Currency End Date:	August 2022
Progress:	Complete
Maintenance and Update Frequency:	Not planned

Access Constraint:	
Lineage:	Input datasets and processing are outlined in the accompanying document Henne A, Noble RRP, Huang F, Cole D, Williams M, Ibrahimi T and Lau I, 2022. UltraFine+® Next Gen Analytics. Northern Territory Geological Survey – MacDonnell Ranges. Northern Territory Geological Survey, Digital Information Package DIP 036. (Digital Information Package / Northern Territory Geological Survey ISSN 1445-5358).
Positional Accuracy:	Input data are of varying age and quality. Further detail is provided in the accompanying document.
Attribute Accuracy:	Attribution accuracy is high, accurately reflecting the input data.
Logical Consistency:	Data is logically consistent within the scope of the project.
Completeness:	Data is complete within the scope of this project.

Contact Organisation:	Northern Territory Geological Survey GPO Box 4550 Darwin NT Australia 0801
Contact Person:	Manager, Commodities and Territory Wide Ph: (08) 8999 6443 geoscience.info@nt.gov.au
Metadata Date:	29/09/2022