Mean soil sample geochemical data

by

WR Ormsby, J Thom, SHD Howard, D Then, N Gardiner and B Tapping

Abstract

Images and processed mean soil sample geochemical data for the most commonly analysed elements can assist with mineral exploration and other mineral-related studies by providing a spatial overview of elevated soil geochemical locations, trends and patterns. This digital product has been made possible by compiling analytes from the Western Australian Mineral Exploration reports (WAMEX) database from the many disparate submission names and units into flat tables using a common set of units. This is the first time that this process has been attempted by the Geological Survey of Western Australia (GSWA) and despite being incomplete and incorporating significant known errors, data processing has enabled valuable information to be derived.

Publically available industry soil sample geochemical data provided in digital format (generally from the late 1990s to more than five years old) were used in this compilation. The compilation process is acknowledged to be problematic and incomplete for a variety of reasons. The automated identification of all possible analytes and units of measure had limitations, resulting in the loss of about 15% of the data. Furthermore, the compilation contains significant erroneous data with the main contributor being incorrectly recorded units resulting in excessively large or small values when converted to the common set. For example, results incorrectly reported as being in parts per million (when actually in parts per billion) would be incorrect by a factor of 1000. Also, in some cases, the assay range for data points imported as soils would be more typical of rock chip samples. Soil sampling datasets, which combine subsets of analytical results for different sized fractions or analytical techniques could also introduce variability. To partly address these issues, low and high cuts were applied to the data to remove the most obvious erroneous values. This resulted in a further reduction in the dataset by between 7 and 20% (see Table 1) and in addition, the loss of valid data.

Table 1. Statistics and grade threshold summary for the mean soil sample geochemical data

Analyte	No. compiled samples	Minimum grade	Maximum grade	Anomalous threshold	Units	No. samples used	% of compiled samples
Au	3 492 899	1	1000	10	ppb	2 777 932	80
As	3 039 130	1	600	20	ppm	2 761 295	91
Cu	3 583 553	1	2500	50	ppm	3 337 739	93
Zn	3 023 924	1	2500	50	ppm	2 753 631	91
Pb	2 833 759	1	2500	25	ppm	2 584 689	91
Ni	2 962 658	1	2500	100	ppm	2 666 225	90
Co	2 148 242	1	2000	25	ppm	1 879 835	88

Data were processed using the point neighbourhood statistics tool in ESRI ArcGIS software to obtain the mean grade and density of 'anomalous' samples for two different cell sizes (5 km and 300 m) smoothed over the adjoining eight cells. These cell sizes enable visualization of actual and potential mineralization trends at different scales ranging from state-wide, through to regional and district scale. Note that the smoothing effect of this approach, while a powerful visualization tool, does exaggerate the apparent spatial extent of mineralization. This effect is readily evident by comparing the imagery for the two cell sizes at any specific location.

To further visualize mineralization trends, smoothed images of mean grade overlaying a hill-shaded density of 'anomalous' samples were generated using ER Mapper software. For the purpose of visualization, thresholds for 'anomalous' samples (see Table 1) were identified in comparison with the known mineralization sites, the maximum grade in-hole and statistical data. All selected thresholds ranged from between 0.1 and 0.5 times the mean plus one standard deviation and between 1.7 and 3.9 times the median grades.

Noting the above data qualifications, it is strongly recommended that the source data in the original exploration reports (identified by the unique 'A-Number' in the Company Surface Sample Geochemistry layer in GeoVIEW.WA) are examined closely to verify the results before using this information for any detailed work, including exploration targeting.

Despite the significant limitations of the dataset, the resultant mineralization footprints agree well with the relevant known mineralization sites and maximum grade in-hole drilling data and provide further detail and information on state-wide, regional and district scale mineralization trends.

How to access

Selected data are available as a free download from the Data and Software Centre via Datasets — Statewide spatial datasets — Mineral information — Mean soil sample geochemical data.

Smoothed images can also be viewed using GeoVIEW.WA. This online interactive mapping system allows data to be viewed and searched together with other datasets, including orthophotography, geological maps, geophysical images, and mineral exploration datasets.

Recommended reference

Ormsby, WR, Thom, J, Howard, SHD, Then, D, Gardiner, N and Tapping, B 2021, Mean soil sample geochemical data: Geological Survey of Western Australia, digital dataset.