

Elevating accuracy – using an eBee to boost a micro-gravity survey's precision

When MWH Geo-Surveys International was employed to conduct a micro-gravity survey of an Omani mine site, the company's senseFly drone was the only solution its team trusted to produce the high-resolution elevation model the client required

The [Al Ram Chromite Mine](#) in Oman produces approximately 17,000 tonnes of chrome ore every month. It is operated by Al Tamman Trading Establishment, which in 2015 contracted [MWH Geo-Surveys International](#) to run a micro-gravity exploration survey of this mine.

The goal of the survey was to map sub-surface chromite veins. This would in turn allow a targeted drill program to identify the location and depth of chromite veins for future mining operations.

A critical element in high-resolution gravity surveys is the ability to accurately calculate and correct for local topography. Such accuracy is particularly important in areas of difficult, complex terrain such as the Al Ram site.

"Our gravity surveys require precise RTK GNSS surveying at each gravity measurement point," says Kevin MacNabb, a founding partner and owner of MWH Geo-Surveys.

“ In order to produce a micro-gravity survey in an area of difficult topography like Al Ram, which has deep, sheer pit walls and is surrounded by rugged mountains, a high-quality, high-resolution DEM is essential. ”

Filling the data gap

According to MacNabb, the conventional options for obtaining a digital elevation model (DEM) of the site were limited. "The public SRTM DEM that is currently available for the Al Ram site, with its resolution of 90 m, was highly inaccurate, particularly within the altered mine landscape" he says. "Alternatively, creating a DEM using reflector-less laser sightings would have been very time consuming, labour intensive and subject to laser errors. A manned aerial photogrammetric survey or a satellite-derived elevation model were also potential alternatives, but would have cost well beyond the project's budget."

As for existing ground survey data, MacNabb says that, to his knowledge, the site has never been surveyed using traditional instruments. "The mining operation involves tracing and excavating chromite veins, so a site survey isn't a necessity," he notes.

Thus MacNabb turned to MWH's [senseFly eBee drone](#), which the company purchased for exactly this type of data collection. "The drone allows us to create cost-effective, high-resolution DEMs and orthophotos, in support of geophysical surveys like that at Al Ram, solving a technical problem very effectively," he says.

Drone methodology

When configuring the survey's flights using the eBee's supplied eMotion software, MacNabb and co. set the desired ground resolution to 6 cm per pixel, which equated to a flight altitude of 195 m above the take-off point.

As for image overlaps, a key parameter in photogrammetry, MacNabb used eMotion's default overlap setting of 60% lateral and 75% forward. "However," he adds, "we overflew the core areas multiple times, in different directions, to ensure the best overlap and accuracy possible."

The team flew 11 eBee flights in total, aerially surveying an area of 6.5 km².



Kevin MacNabb of MWH Geo-Surveys demonstrates the senseFly eBee to mine managers and equipment operators.

"The topography ranged from 590 to 780 metres above sea level, plus we had gusty winds of 8 metres per second and daytime temperatures of over 38° C were normal," MacNabb explains. "The drone worked effectively throughout."

The project's UAV flights took three days. They were followed by several days of data processing in the office. The team used Postflight Terra 3D to transform the project's 2,398 images into the required DEM. This elevation model was then orthorectified by identifying pre-surveyed ground control targets inside Postflight Terra 3D's rayCloud Editor.

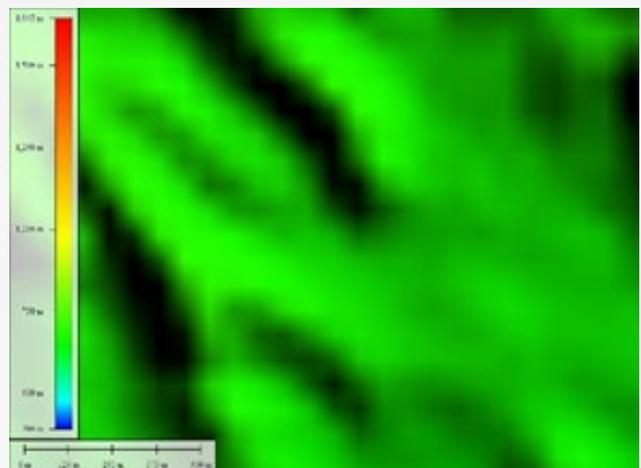
Accuracy the answer

The DEM that MacNabb's team generated was determined to have an average absolute vertical accuracy of 10 cm. This was calculated by comparing the eBee's data to more than 10,000 surveyed RTK GNSS positions, recorded at the gravity survey's sites.

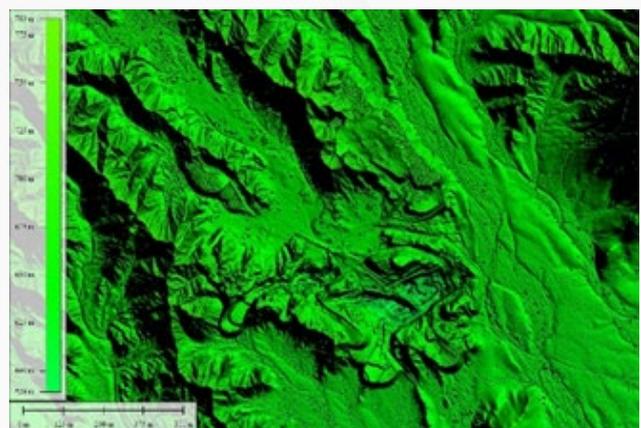
"An effective micro-gravity survey at such a rugged and highly irregular site wouldn't have been possible without an extraordinarily accurate elevation model," MacNabb says.

“ With the drone's model, we were able to compute terrain corrections to the gravity field with an unprecedented level of accuracy. This in turn allowed our subsequent gravity model to map subsurface changes much more precisely, including those caused by small, thin chromite veins. ”

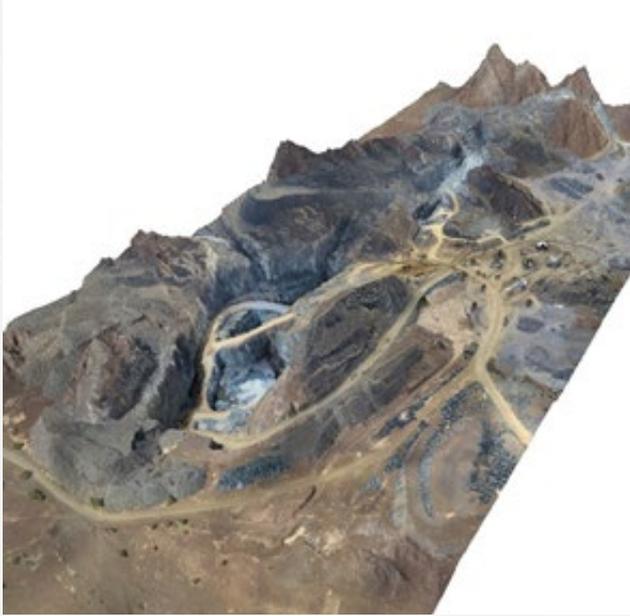
At a client service level, using a drone enables MWH Geo-Surveys to provide both higher quality deliverables and more of them. As MacNabb puts it, "The eBee allows us to utilise our geophysical surveys to better effect, at a competitive cost, providing our exploration clients with a superior product. Customers like Al Ram also benefit by receiving a 3D orthophoto of the survey area to use for any number of GIS applications."



A screenshot of the existing SRTM DEM of the site, with a resolution of 90 metres.



A screenshot of MWH Geo-Surveys' drone-produced DEM, at 1 metre resolution.



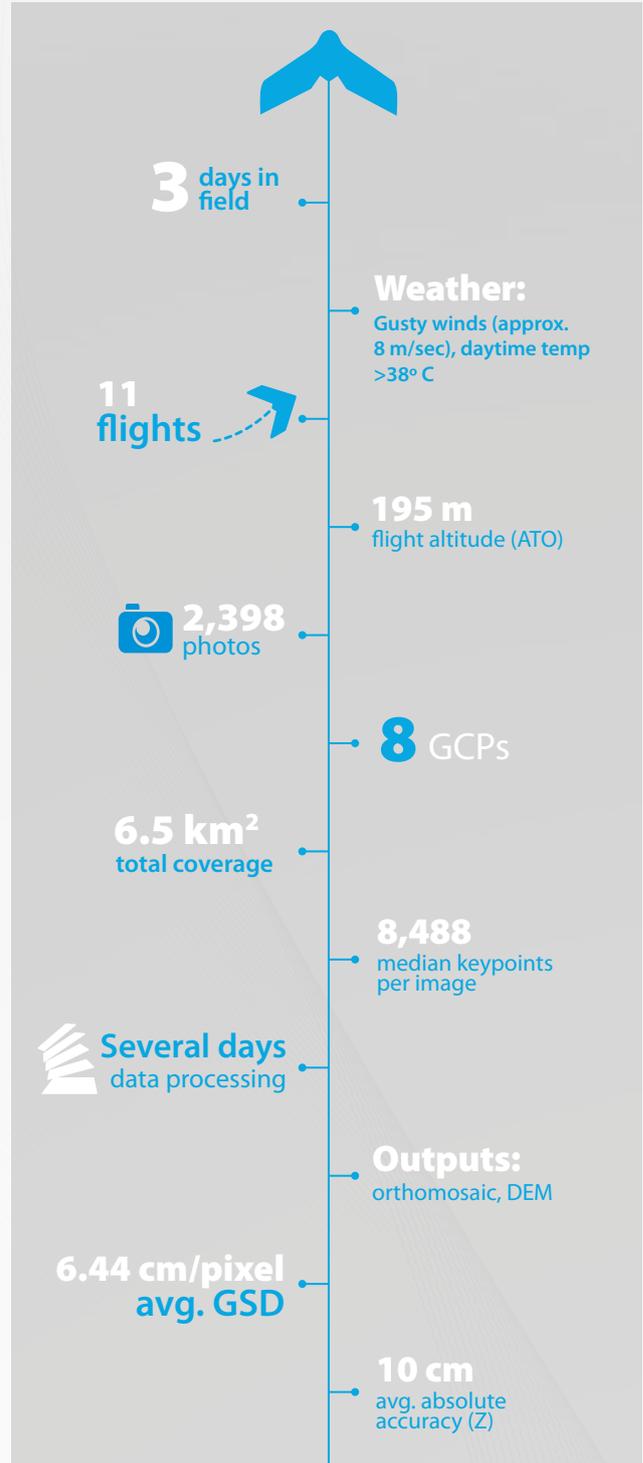
The Al Ram Chromite Mine's final 3D DEM with overlaid orthophoto.

About MWH Geo-Surveys International

MWH Geo-Surveys International Inc. (www.mwhgeo.com) is a contract geophysical company that provides practical and cost-effective gravity surveys for mining, petroleum and geothermal exploration. Based in Vernon, B.C., Canada and Reno, Nevada, USA, its operations span the globe, with the company already having successfully undertaken major contracts in 33 countries on five continents.

[Learn more about gravity surveying.](#)

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