

UAV AERIAL SURVEYS



Reference: CS-40

GWP has been using data captured from Unmanned Aerial Vehicles (UAVs) since 2012 and has revolutionised the way we view and present our survey data.

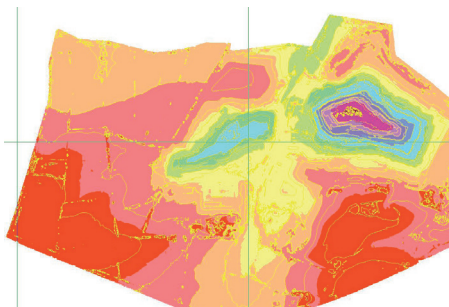
The UAV is able to capture high resolution georeferenced orthomosaic imagery and the production of a dense point cloud model enables GWP to survey large areas quickly and safely.

The ability to survey 5km² in a single day with no interruption to ground based operations offers a unique surveying solution. This solution is providing a reduction in time, cost and complexity of the survey operation whilst increasing safety, accuracy and data interpretability.

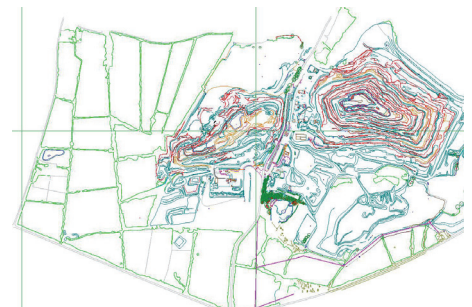
Data output formats (Orthomosaic Imagery / Surface Model / Point Cloud) can be tailored for the end user, we are able to provide outputs compatible with all leading land survey, GIS and CAD packages.



High resolution aerial photograph



DTM model (coloured by heightband)



Linework feature extraction

Airframe

GWP have selected a fixed wing aerial platform that is capable of flying over large areas and in high wind conditions. This versatile platform is equipped with a 20MP resolution gimbaled camera that has been designed for aerial mapping and the UK weather.

GWP have obtained permission from the Civil Aviation Authority to undertake commercial work and the team of pilots have gained considerable experience undertaking UAV surveys nationally and overseas. This survey solution is best adopted for larger sites where conventional surveying costs would be greater, or for sites where access is limited and/or dangerous.

Related expertise:

- Large scale topographic survey of quarries and earthworks, including point clouds and line features
- Volumetrics and monitoring of large earth moving projects and stockpiles
- Real estate planning using the high quality imagery for site identification purposes, boundary mapping, area calculations, planning applications and asset management
- Landscape and visual assessments, Zone of Theoretical Visibility (ZTV) studies, slope analysis, 3D visualisations

Background

The UAV is a small fixed wing plane that is flown over the study area at low altitude. Prior to the commencement of the UAV survey a number of ground control points (GCP) are installed around the site and these are used to geo-reference the aerial imagery. These points are accurately surveyed using a differential Leica GPS reference and rover configuration. Whilst in flight the on-board camera takes a series of overlapping photographs, these are stitched together to produce a high resolution (2-8cm pixel size) ortho-rectified image of the site. Using photogrammetry software an elevation is computed for each pixel and the resultant data is used to create a Digital Elevation Model (DEM) with accuracies up to 6cm RMS. This is comparable to conventional survey techniques.

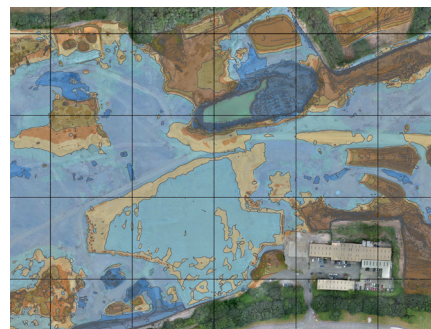
- Deformation monitoring of unsafe/inaccessible or obscured quarry faces or landslides
- Production of Digital Elevation Models (DEM) and Digital Terrain Model (DTM) with the removal of vegetated / built up information
- Level information and photography on road or rail infrastructure without necessary access to the site or closure requirements
- Catchment modelling and characterisation for hydrological studies

Selected projects

Case Study: Bulking factor determination in Devon

Repeat surveys over a 1 million m³ earth moving project were undertaken. The resulting DTM's were used for volumetric analysis and to record the bulking factor of the cut and fill operation. The bulking factor achieved was different to the predicted ratio used to design the final landform.

Using the repeat survey information it was possible to provide an early estimate of the actual bulking factor and the final designs were amended. This helped avoid the costly import, or export of site material. Traditional surveys would not have been able to survey the whole site in the time frames available.



Case Study: Quarry surveying in Nigeria

UAV surveys have been used on two large international quarries where local surveys were often costly and had little quality control. Updated DTM information was required to help devise a dewatering scheme for both sites and the UAV survey was seen as a cost effective method of obtaining large scale topographic information.

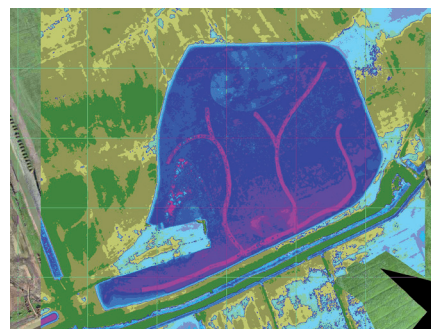
The vegetation was removed from the data to generate a terrain model for the analysis and to characterise the catchment areas.



Case Study: Flood storage calculations in Somerset

A housing development required a flood storage volume check on a number of control structures spread over the large site. A complete DTM of the site was recorded during the flight and this information was used to assist in preparing a material plan.

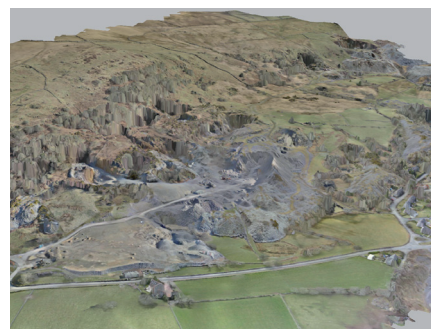
In addition the photography was used to check the construction of some unsafe roofs on the neighbouring industrial estate and assist in an asbestos survey.



Case Study: Mineral reserve estimates in North Wales

A UAV was used to survey an abandoned quarry that contained a number of unsafe or inaccessible working areas. Crest and toe information was added to the survey to produce an updated survey drawing of the site.

In addition the resultant photography and DTM information helped map the presence of minerals in a neighbouring property that would not have been accessible using conventional means.



A UAV survey produces lots of high quality images and DEM information, this amount of detail is often cumbersome and not easy to use by many clients. GWP have developed an efficient work flow where the raw data is imported into a GIS programme where surplus information can be removed. It is then possible to separate areas into different resolutions so that the highest quality information is maintained for important areas and areas around the periphery are exported at a lower resolution. The GIS outputs are then brought into LSS software where the point cloud is further processed into a 3D model and triangulation. Break-lines and survey features can be added to the data to assist drawing production and analysis. The data can be made available in a number of different formats including Google Earth overlays, 3D pdf files or 3D DXF, AutoCAD .dwg and .csv which can be used by most modelling software and clients.

Key contacts

For details and to discuss your requirements, please contact the following:

Rhys Morgans, Senior Surveyor. Specialising in the preparation of 3-Dimensional survey models.
E-mail: RhysM@gwp.uk.com



GWP Consultants LLP
Upton House, Market Street
Charlbury, Oxfordshire OX7 3PJ
United Kingdom

Registered No. OC326183. Registered Office: Upton House, Market Street, Charlbury, Oxfordshire OX7 3PJ. UK

tel +44 (0)1608 810374
fax +44 (0)1608 810093
e-mail info@gwp.uk.com
web www.gwp.uk.com