

Unique Monitoring Solution

SiteMonitor is a state-of-the-art laser measurement-based system to measure and monitor the stability of rock faces and landslips. It has been developed in partnership with mining surveyors to provide a simple-to-use, reliable solution that has the flexibility and performance to function in a wide range of monitoring applications.

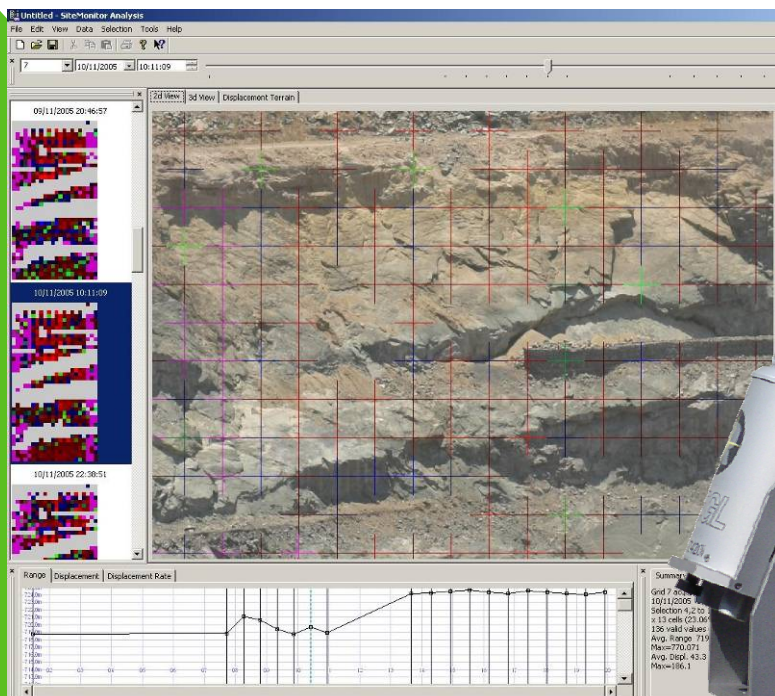
Using non-contact laser hardware, SiteMonitor will make range measurements on a pre-defined grid at a selected interval. The software suite incorporates an Analysis module for displaying and analysing time-series monitoring data.

Key Features

- Remote monitoring of XYZ coordinates on rock faces or structures
- High precision repeatability of point grid
- Simple automated operation for periodic or continuous monitoring tasks
- Scheduler module allows pre-defined scans to be measured at set time intervals and undertake comparison tasks
- Alarm module will analyse results and automatically alert users
- Easy to deploy and maintain
- Data can be imported into 3D mine planning and/or CAD software for comparison between terrain models, generating cross sections and movement vector comparison
- Measurement of known reflector positions provides data for the generation of range corrections, transformation matrices and a check on the stability of control targets and scanner position
- Geo-referenced photos (using calibrated lens)

Key Advantages

- No requirement for prisms to be placed in the survey area
- No problems with prisms getting lost during blasting
- No safety risk during prism installation
- Rapid monitoring of thousands of points rather than single prism locations
- Complete coverage of visible surface
- High speed scanner does not need fixed installation
- Portable system can be moved into areas of limited access
- Up to 2,500m range
- Competitive cost
- Can be extended to volume measurements



Key Applications

- Geo-Hazard and Geotechnical Monitoring, including landslides, cliffs, rock faces, road and rail cuttings, avalanche areas and glaciers
- Continuous measurement of mining and quarrying sites
- Monitoring of man-made structures and structural elements.



Blaencwm landslide monitoring

Blaencwm Landslide, managed by Halcrow for the Coal Authority, lies opposite Blaencwm village. This is an extensive area of ancient landslide deposits in the Rhondda Valley, Wales, that has been reactivated by a deep seated failure from steep rock faces uphill. Parts have moved over 80m since 1989 when the landslide occurred.

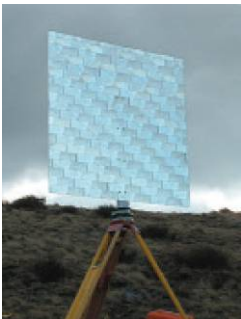
The survey was conducted to measure and quantify the range and extent of movements over the whole of this hazardous site, including areas that were impractical by other means.

Site constraints:

- Extent of survey area: 1,000m x 700m
- Scanning range: 1,500m
- Health & Safety concerns of working on the landslide

Scanning measurements:

- 12 hours scanning
- Approximately 3m grid point spacing
- Approximately 65,000 surveyed 3D points



Survey methodology:

- Riegl LPM-2K scanner
 - Measurement range up to 2,000m
 - Measurement accuracy 25-50mm
 - Measurement speed, 4 points/second
 - Non-contact measurement (H&S requirements)
 - Stable scanner position – concrete survey pillar
 - Monitoring of scanner position stability using GPS
- Control target positions
 - 4 control reflector positions
 - 1m x 1m targets
 - Monitoring of reflector position stability using GPS

SiteMonitor workflow:

- The reflectors are scanned and the centre point of each is calculated. This information used to:
 - Generate a range correction factor which corrects for changes in temperature and atmospheric pressure (i.e. the refractive index of air)
 - Generate a transformation matrix to put the scan data in to the project coordinate system
 - Check the system is measuring correctly
 - Check that the scanner or reflectors have not moved
- SiteMonitor software used to define scan regions by defining
 - Top right and bottom left corners
 - Angular grid size

Measurement Analysis:

- Area and point comparison using SiteMonitor
- Setting of alarm module
- Generation and comparison of surface models

Results

Repeat surveys undertaken on a yearly basis identified an area of significant movement in the centre of the landslide deposits. Measurement of this area by other means would have been both difficult and hazardous.

