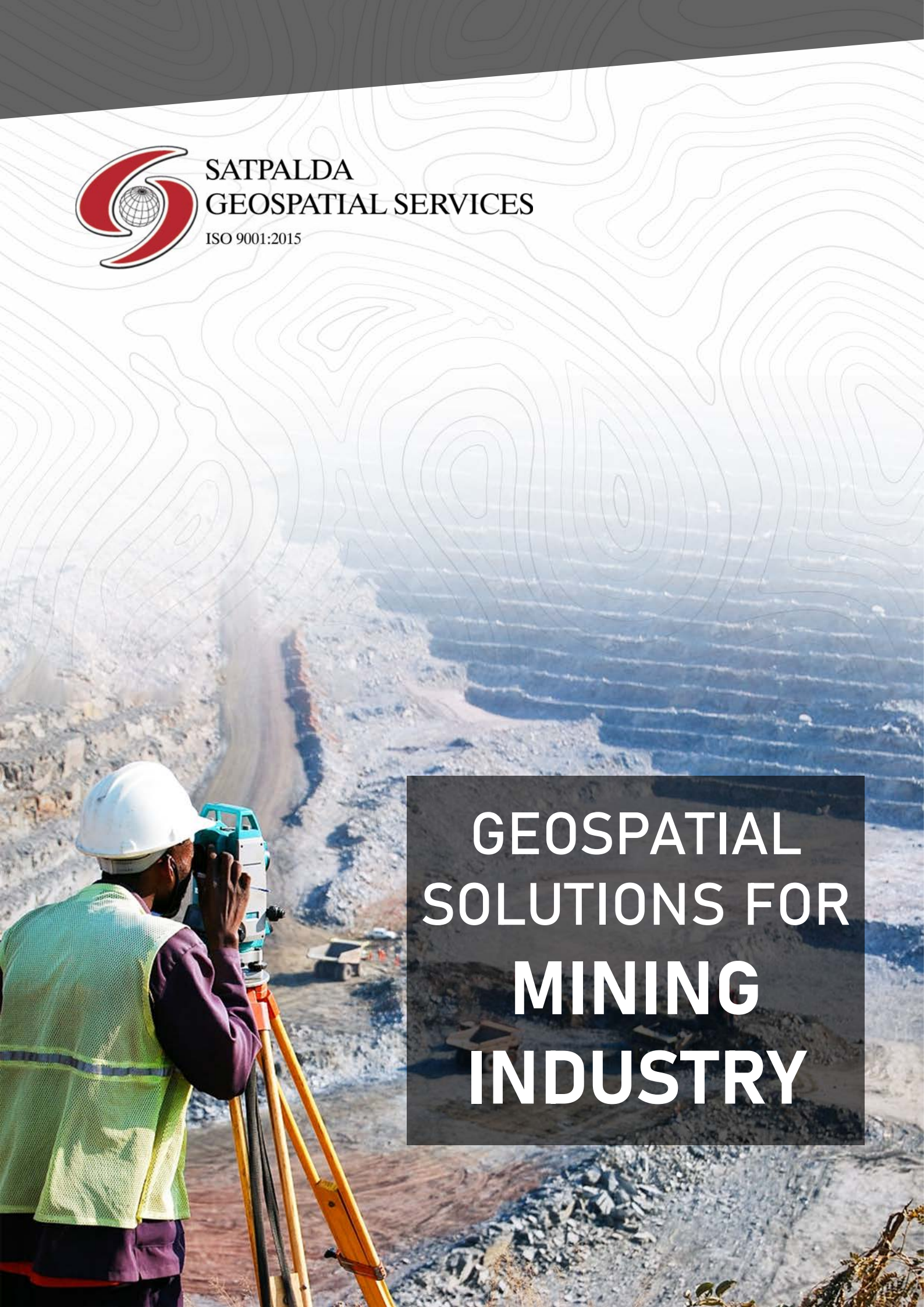
SATPALDA
GEOSPATIAL SERVICES
ISO 9001:2015



GEOSPATIAL SOLUTIONS FOR **MINING INDUSTRY**

Introduction

The business of mineral exploration and extraction is inherently spatial. Since most mines cover large expanses of land, managers require access to volumes of location-based information to guide the operation. For this reason, the tasks of mine management can easily be managed with the help of Remote Sensing and GIS. Remote Sensing and GIS is a versatile tool for gathering, storing, and accessing geographic information quickly and easily. During planning of new mine sites, during mine operation and after closure (rehabilitation), remote sensing methods can be used to obtain necessary information, monitor changes and monitor effects of actions.

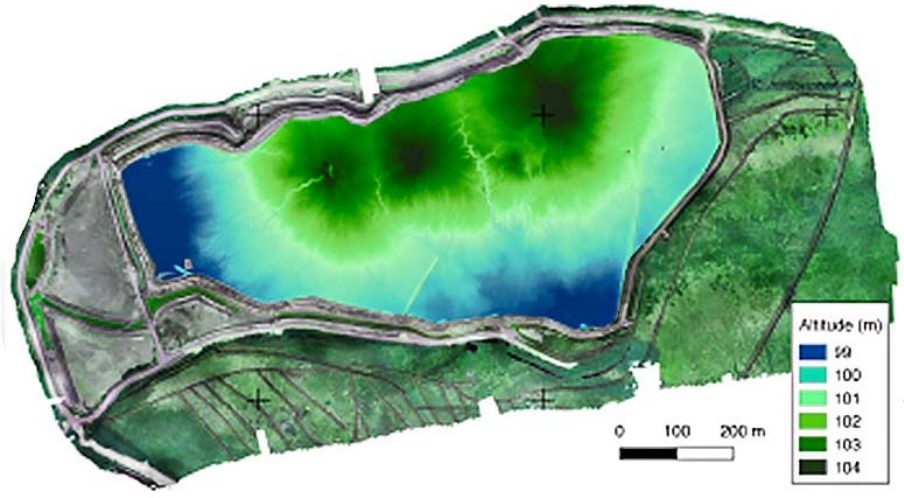
Applications of Remote Sensing and GIS in Mining Industry

1. Topographical Information

Detailed knowledge of the surface topography or the change in surface topography is important in several aspects of the mining industry.

• During the planning phase there may be requirements to document the original surface in order to identify and monitor changes during the operation of the mine. Detailed topographical maps, and 3D models that can be derived from these, can be used to study geomorphological and hydrological features, which can help to optimize mine planning and minimize environmental impact.

• During the operational phase, topographical maps and 3D models can be used to study geomorphological features and assess mineral resources and pit layouts in open pit mines.



(Detailed topography of mine derived from satellite imagery)

2. Land Cover and Vegetation Monitoring

Mapping and monitoring of vegetation around mine sites is important in all phases of mining, from mine planning to mine closure and rehabilitation.

• Vegetation maps are often required during the planning phase to assess the biodiversity in the area, assist in determining the best location of the mine structures, and to establish a base line to assess possible environmental impact.

• During operation of a mine, monitoring of the vegetation can reveal contamination, e.g. caused through leakage, dam failure or spreading of dust, and other environmental effects of mining activities

• After mine closure, vegetation recovery and health can be used as an indicator to assess the results of mine rehabilitation, or to detect and monitor remaining contamination.

(Vegetation Map using Satellite Imagery)

3. Mineral Exploration

Most common methods used for mineral exploration are airborne and ground-based geophysical methods, such as magnetic, electromagnetic, gravity, radiometric and seismic investigations to map the subsurface geology. These methods are costly and require intensive manpower and labor. Remote sensing can be a cost effective solution for mineral exploration.

• High resolution satellite imagery can provide valuable information about the surface mineralogy and geology, which can be an indicator for subsurface geology and presence of ore bodies. This technique is based on the characteristic absorption features in the spectrum for the different minerals or mineral groups.

• Mineral contents can be quantified by comparing the data to known spectral features of minerals and spectral unmixing methods.

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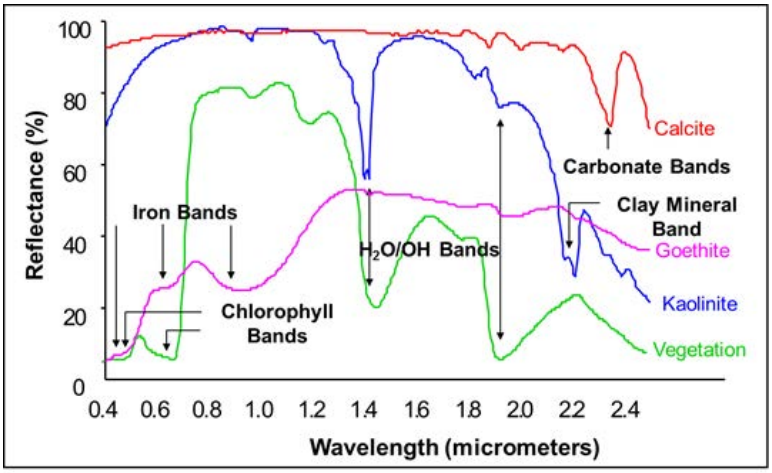


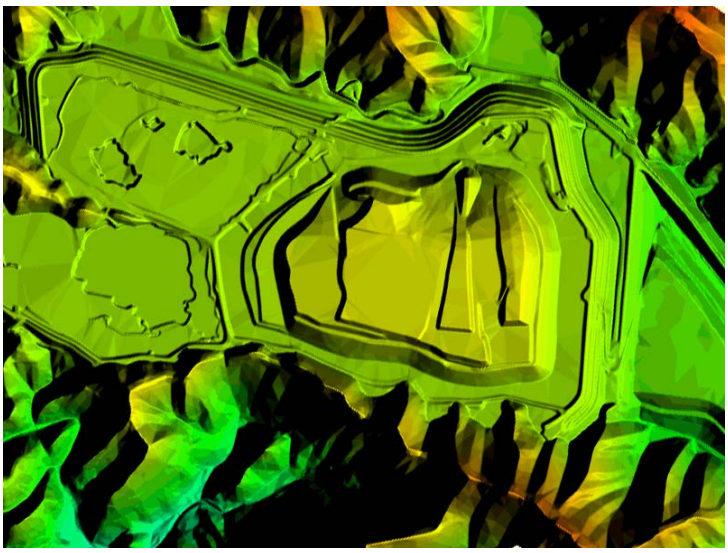
(Reflectance spectra of various minerals with specific spectral features)

4. MINE CONTAMINATION MONITORING

A common type of contamination caused by mining is acid rock drainage. This can cause environmental damage long after a mine is closed. Remote sensing techniques can be used to detect, map and monitor the extent of ARD and the effect on the environment in and around mine sites, and can contribute with additional information to help control ARD and monitor the efficiency of rehabilitation measures.

• High resolution satellite imagery combined with field spectral measurements can be used to classify the degree of ARD pollution at a mine.

• High resolution WorldView-3 satellite imagery can be used to map mine tailings and ARD from small abandoned mines in an alpine environment.



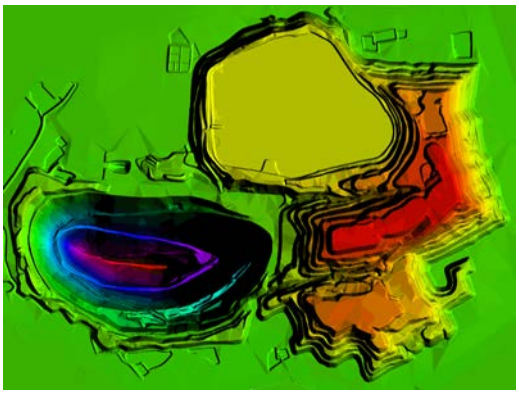
(Mine Contamination Monitoring)

5. Mine Closure and Reclamation

Mining companies can use Remote sensing & GIS to actively monitor the environmental impacts that may be caused by their activities and conduct reclamation. Remote Sensing & GIS is used for monitoring and reclamation by analyzing and mapping soils, vegetation, surface hydrology, and groundwater.

• GIS mapping allows rapid sizing and plotting of mine openings, waste piles and cultural features for accurate drawing and quantity computations during office design of the closures.

• 3D view generated by the GIS system can be used to illustrate the pre- and post-reclamation design features.



(Monitoring of mining site after closure)

Geospatial Technology – a boon to mining industry

- Target mineral exploration
- Evaluate mining conditions
- Model mine construction
- Display geochemical and hydrology data
- Improve facility management and policing
- Apply for mining permits
- Assess environmental impact
- Manage land titles
- Process closures
- Plan reclamation activities

Mining solutions at SATPALDA

- High-resolution satellite imagery for planning and monitoring of mining.
- High resolution and multi band orthorectified imagery for clear texture of soil and vegetation.
- Precise and accurate DTM for topographical information and volume calculations.
- UAV imagery, videos and processed data of the active sites.
- Cut-fill analysis based on ultra high resolution imagery (UAV).
- Environmental impact assessment based on various indices derived from RS data.
- Change and encroachment detection with temporal data.
- LULC maps and hydrology study inside and near the site.

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Corporate Office :

SATPALDA TRADING PRIVATE. LTD.
1006 Kanchenjunga Building, 18, Barakhamba Road, New Delhi-110001(INDIA)

Branch Office :

SATPALDA TRADING PRIVATE. LTD.
CP 2156, First Floor, Sector 16A, Vasundhara, Ghaziabad-201012, Uttar Pradesh (INDIA)

Contact: +91-7838410007, +91-718265000
E-mail: info@satpalda.com
Website: www.satpalda.com