



SURVEILLANCE AND INTELLIGENCE

Line of Mine Support: Exploration Phase

MDA delivers vital support to mine operators throughout the entire life of a mine, from initial exploration and planning through operations, and mine closure. At the beginning of a mine's life, MDA provides information critical to successful exploration and planning initial access.

Exploration Budgets

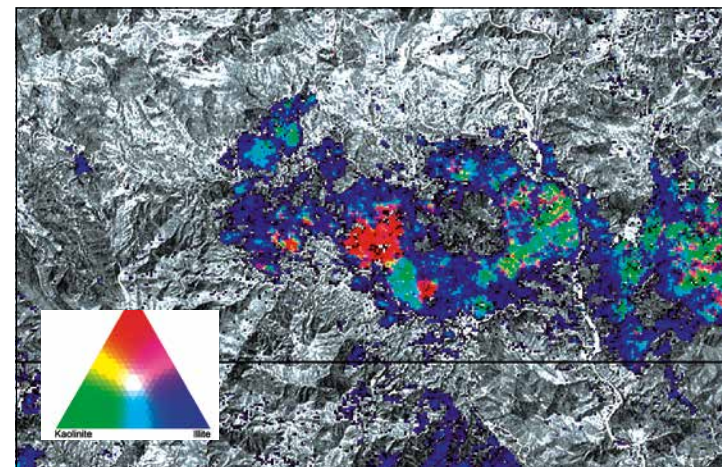
Maximizing limited exploration budgets and obtaining the greatest value from knowing surface topography is key to advancing exploration drilling programs. MDA's mining exploration services include cost-effective products that support the understanding of a region's geological characteristics for geologists and mine operators.

MDA's mining exploration support services include:

- Mineral Mapping Product
- Land Cover Products
- Relative Elevation Products
- Soil Texture Products
- Fracture Density Analysis
- Terrain Complexity Products

Mineral Products

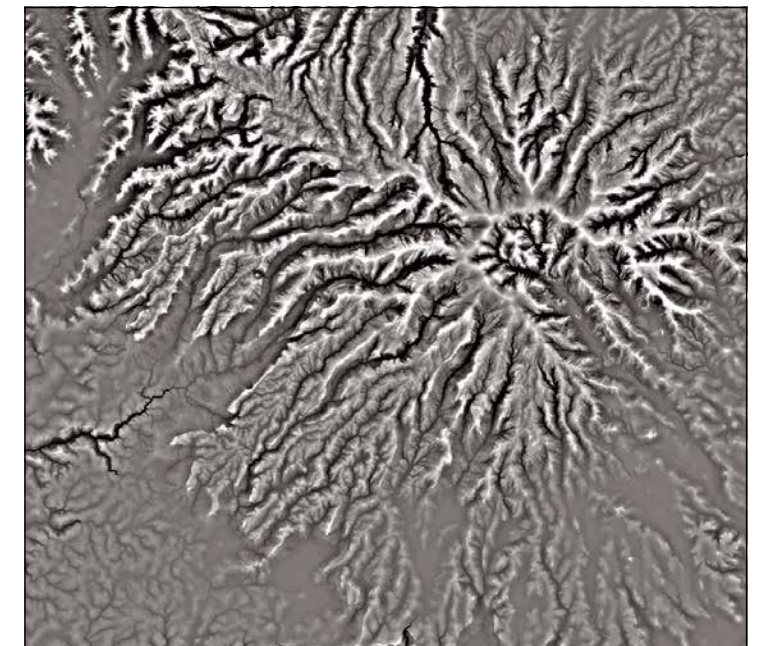
MDA is an all-source image provider, employing both remote sensing and expert geologic knowledge in its assessments. Processed high-resolution and multispectral mid-resolution imagery identify rock types that may be associated with precious or economic minerals. Early identification of exploration targets through mineral mapping helps to focus field efforts, and increase cost efficiencies.



The image above shows a mineral mapping product derived from the ASTER satellite sensor. Different colours indicate concentrations of alunite, kaolinite, and illite.

Relative Elevation Products

Exploration geologists refer to Relative Elevation products to locate patterns that provide information on underlying geology. An example of this approach is the use of drainage patterns to map changes in rock type or geologic structures. Steep terrain can indicate outcrops for the collection of field samples, and locations resistant to erosion often suggest cemented zone with the potential for associated mineralization.



The image above is an example of a relative elevation product. The bright white regions indicate higher, or more resistant terrain, and drainage patterns are easily identified by the darker grey and black areas.

CUSTOMER SATISFACTION

For more than four decades, MDA has worked with its worldwide customer base to provide information solutions that leverage advanced technologies and improve business efficiency.

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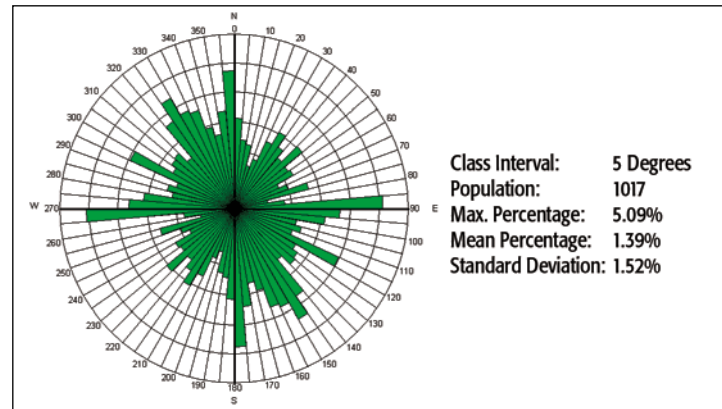
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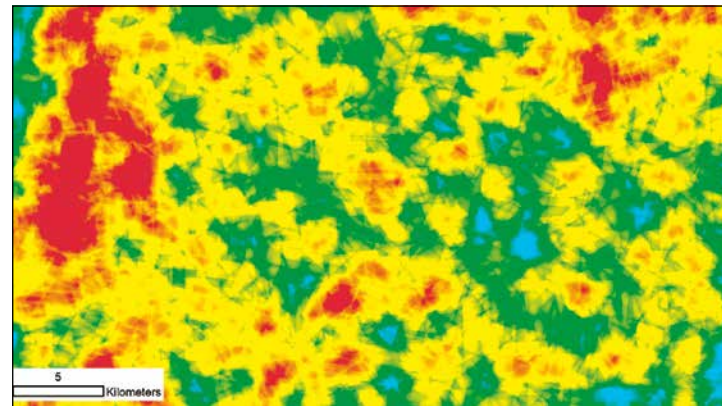
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Fracture Density Analysis

MDA's Fracture Density analysis provide information on regional lineaments and localized fracture zones, typically indicators of areas where mineralization may occur. The analysis augments client data to identify potential target areas for exploration. As a basis of the analysis, MDA staff geologists use value-added satellite imagery and Digital Elevation Models (DEMs) to generate Rose Diagrams, and Density Maps. Rose Diagrams are charts used to visualize fracture orientation and frequency, and Density Maps show overall fracture orientations, as well as specific orientations that are selected based on Rose Diagrams or field data.



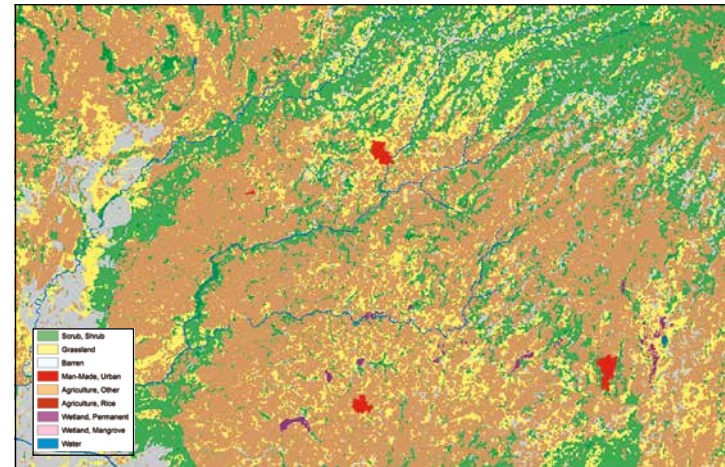
The image above shows a Rose Diagram, where green indicates the relative number of fractures at each orientation shown on the circular graph.



In the Density Map above, the gradation in colour from red to blue represents the highest to lowest density of fractures derived from a variety of image sources.

Land Cover Products

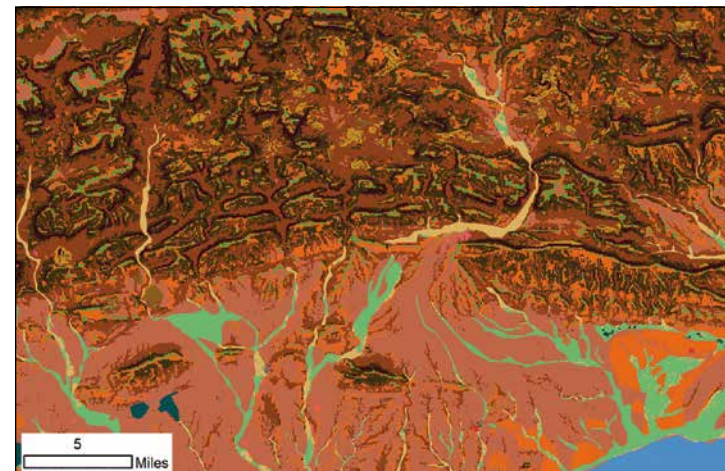
Land Cover products support field operation planning by identifying and classifying mobility routes for vehicles and equipment, as well as land use patterns that highlight potential conflicts for acquisition in agricultural or developed areas. MDA's global 30-metre resolution land cover products derived from satellite imagery can be customized land to address specific project environmental and field mobility needs.



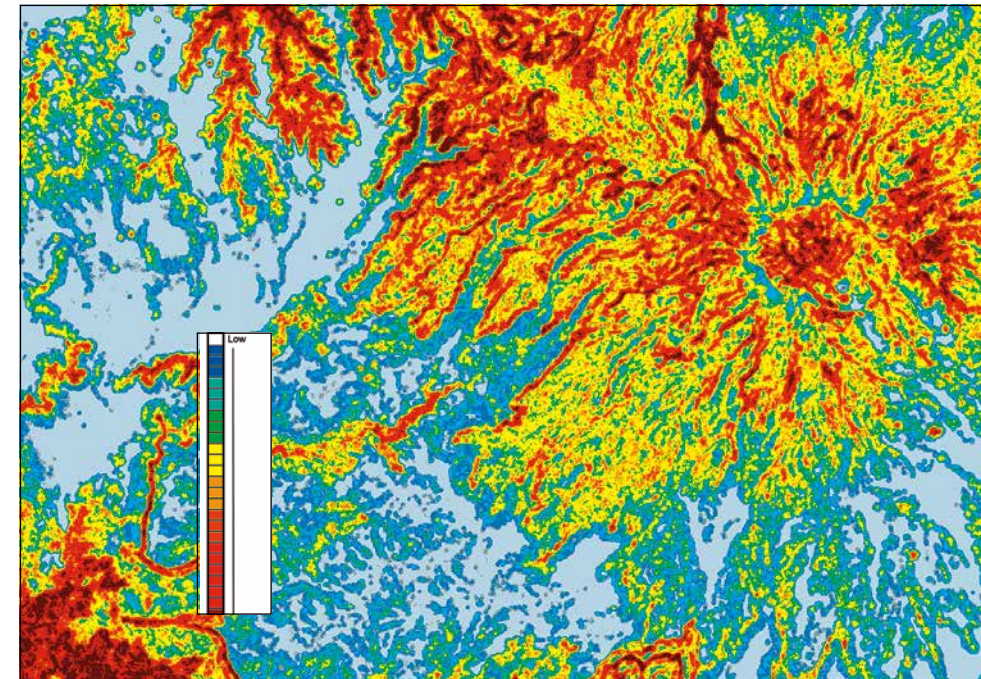
MDA's global land cover image maps are typically based on 13 standard land classes, but can be customized to specific customer requirements.

Soil Texture Products

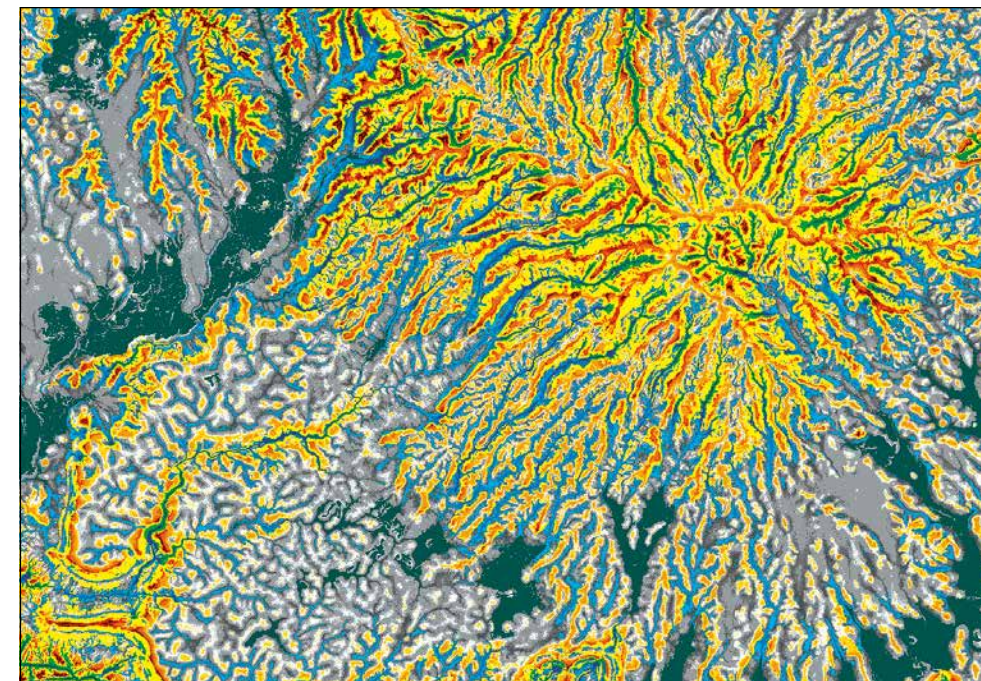
The Unified Soil Classification System (USCS) is the recognized international system of soil engineering properties. MDA generates USCS soil texture products modeled from 90-metre ground resolution or higher satellite imagery to support route and facility planning, geohazard assessment, and hydrologic studies. The USCS map layer provides detail on grain-size distribution, plasticity, organic content, and mineral composition such as marl and evaporates that can affect mobility for field crews and equipment.



The image above shows an example of a 90-metre model of soil texture. Blue indicates water, and each of the other colours represent classes from the American Society of Testing and Materials (ASTM) Unified Soil Classification System (USCS).



In the terrain complexity image above, less-complex areas are shown in gray and blue. Higher terrain complexity is shown in orange and red.



The Terrain/Likely-wet image shown above highlights green areas that are likely to be wet. Yellow and blue areas indicate different classes of terrain and slope.

Terrain Complexity Products

Terrain Complexity increases the time, effort, and resulting costs required to travel throughout an area, in addition to the potential investment in surveying and building facilities and roads. MDA's Terrain Complexity products enable intuitive visualization of the level of terrain and the anticipated level of difficulty traversing routes.

Terrain/Likely-wet image products support operational planning and geohazard assessment by showing slope relative to landform. In addition, the products highlight locations where the water table is likely to be close to the ground surface, indicating the potential for saturated ground and flood risk.

MDA Delivers Critical Information

MDA satellite mapping and terrain analysis products are a cost-effective means of reducing exploration risks and establishing a benchmark of critical geospatial information before commencing mining operations, representing the first step in a years-long monitoring program throughout the life cycle of a mine. Understanding the dynamic processes at a mine site and its surrounding areas generates tangible benefits to mine operators when selecting a site to develop, during operations, in the mine closure phase, and during long-term environmental remediation programs following closure.