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Report

By JAPOSAT Satellite Mapping

For Golden Valley Mines Ltd.

Remote Sensing Work over Matachewan Prospect's claims 1014711-18, 1014722-24 and 4255373: SPOT-4, SRTM and Lineaments' Maps. Cairo Township, Ontario. NTS 41P/15. Larder Lake Mining Division.

October 7th, 2017

By Bronislaw Popiela, P.Geo. M.Sc.

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SUMMARY

The main goal of this mandate is to provide **Golden Valley Mines Ltd** with regional-scale satellite value added products regarding their Matachewan Prospect's claims **1014711 to 1014718, 1014722 to 1014724 and 4255373** located in the west part of Cairo Township, Ontario, Canada.

The Matachewan Prospect's claims are located approximately 2 km north of the Town of Matachewan (**Fig. 1**). Access to the south - southeast part of the property is gained by travelling east along Highway 66 from Matachewan. Direct access to the property is unknown by the author of this report as he had not visited the property. The property is located within the NTS 41P/15 sheet.

The Town of Kirkland Lake and surrounding region including the Matachewan area is well known for its mining heritage and present day gold and base metal mining and processing operations. An experienced mining work force and mining/exploration services and equipment, are readily available in this area of north-eastern Ontario and north-western Quebec that extends over the Timmins to Val-d-Or corridor.

The Matachewan Prospect is located in the southwestern portion of the Abitibi Greenstone Belt. The greenstone belt is itself located within the Abitibi Subprovince of the Canadian Shield. The Abitibi Greenstone Belt extends in an east-west general direction for over a distance of 500 kilometres from Chibougamau, Quebec (to northeast) to west of Timmins, Ontario, making it the largest greenstone belt in the world.

SPOT-4 and SRTM data were used for the remote sensing work. All data were processed in order to enhance the geological, geomorphologic and land cover features. A special emphasis was given to enhance and map the lineaments and their density/stress.

The results of the remote sensing lineament's study show two dominating groups/trends of lineaments. The classification based on their magnitude, direction, length and abundance revealed the North-South and East-West lineaments as the main linear trend. The most common spatial distributions of the lineaments over the prospect are the X-shape and Parallel-shape lineaments. The prospect is crossed by three probably regional major lineaments/structures. The interpreted lineaments/their spatial distribution might represent the transport/conduit and trap linear features/exploration targets.

INTRODUCTION

The following remote sensing study was undertaken by **Japosat Satellite Mapping** (Japosat hereafter) at the request of and completed for **Golden Valley Mines Ltd**.

The main goal of this mandate is to provide **Golden Valley Mines Ltd** with regional-scale satellite value added products regarding their Matachewan Prospect's claims **1014711 - 1014718, 1014722 - 1014724 and 4255373** located in the west part of Cairo Township, Ontario.

SPOT-4 and SRTM data were used for the remote sensing work. All acquired data were processed in order to enhance the geologic, geomorphologic and land cover features. A special emphasis was given to enhance and map the lineaments and their density/stress.

The following report describes the remote sensing work completed in October 2017.

PROPERTY DESCRIPTION AND LOCATION

The Matachewan Prospect is located approximately 2 km north of the Town of Matachewan (**Fig. 1**). Access to the south - southeast part of the property is gained by travelling east along Highway 66 from Matachewan. Direct access to the property is unknown by the author of this report as he had not visited the property. The property is located within the NTS 41P/15 sheet.

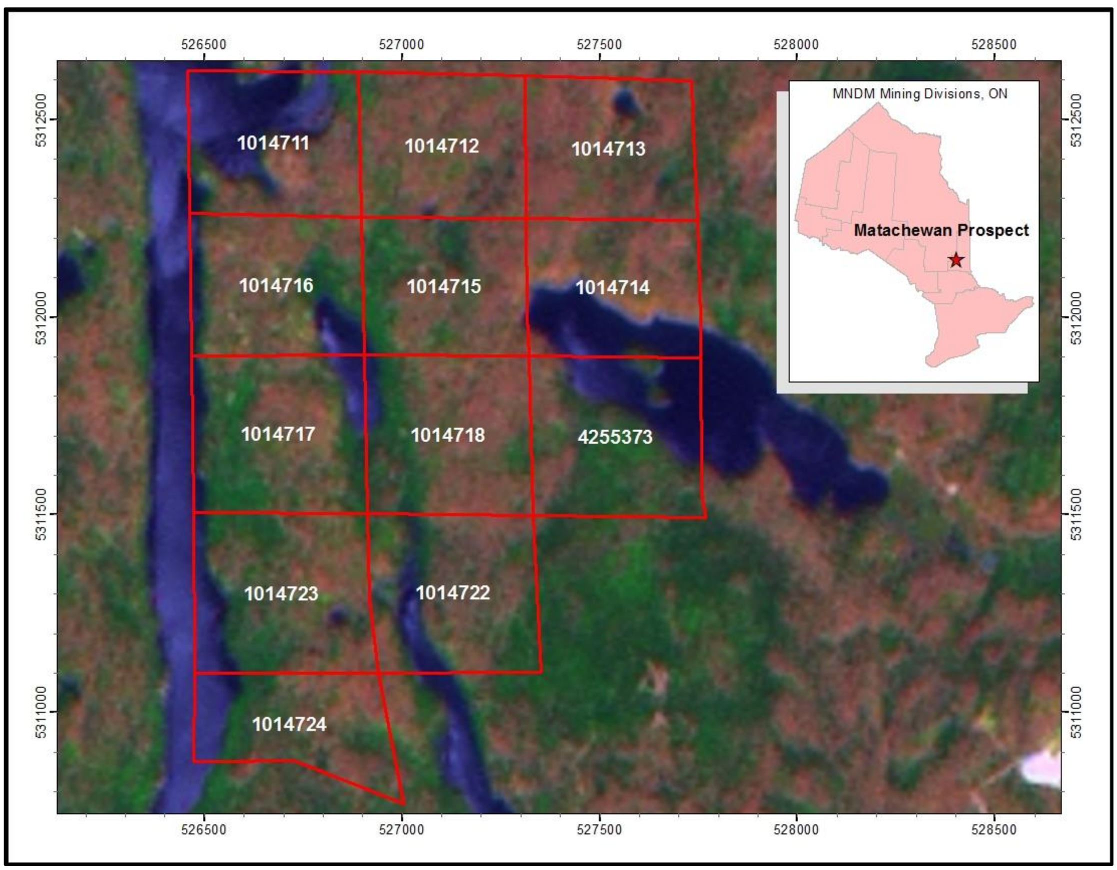


Figure 1. Location map of study area.

ACCESSIBILITY, CLIMATE, LOCAL RESOURCES, INFRASTRUCTURES AND PHYSIOGRAPHY

Direct access to the property is unknown by the author of this report as he had not visited the property. The municipality of Matachewan, Ontario, is accessible by all-weather highways from the Kirkland Lake to the east and Elk Lake southeast. Provincially owned Ontario Northland operates bus and railway services out of Kirkland Lake. Although Kirkland Lake maintains a municipal airport, scheduled air service is currently only available from Timmins or Earlton in Ontario or Rouyn, Quebec.

Climatic conditions are typical for the Canadian Shield, with short, mild summers and long, cold winters. Mean temperatures range from -17°C in January, to +18°C in July. The mean annual precipitation throughout the region ranges from 812 to 876 mm.

The Town of Kirkland Lake and surrounding region including the Matachewan area is well known for its mining heritage and present day gold and base metal mining and processing operations. An experienced mining work force and mining/exploration services and equipment, are readily available in this area of north-eastern Ontario and north-western Quebec that extends over the Timmins to Val-d-Or corridor.

The Matachewan Prospect area is located in a generally low lying / small rolling hill area between the elevations of 300 and 340 metres. Part of Webb Lake, Knott Lake and Matachewan Lake are located in the prospect area.

DESCRIPTION OF DATA

Remote sensing data acquired and processed by JAPOSAT

The following raw data was acquired and processed for this mandate:

- SPOT-4 multispectral data (pixel 20m) (**Map 1**)
- SRTM data (pixel 30m) (**Map 3**)

SPOT-4

The fine spatial resolution of 20m pixel and the 4-band electromagnetic spectrum of the acquired SPOT-4 data are ideal for extracting the regional geological features such as: geological lineaments and outcrops and then, to produce the satellite maps.

All acquired and processed SPOT bands are Standard Terrain Correction (Level 1T and/or Level 3A orthorectified imagery) data products. The Level 1T data processing provides systematic radiometric and geometric accuracy by incorporating ground control points while employing a Digital Elevation Model (DEM) for topographic accuracy. Ground accuracy of the product depends on the accuracy of the ground control points and the resolution of the DEM used. Usually, the ground accuracy is around 1 to 1.5 pixel. The ground control points used for Level 1T correction come from the Global Land Survey 2005 (GLS2005) data set. DEM sources include SRTM, NED, CDED, DTED and GTOPO 30.

The following SPOT-4 data were acquired for this mandate (Tab. 1, Map 1):

Table 1. Specifications of SPOT-4 data.

Area of study	*Satellite*	*Bands*	*Resolution*	*Date of acquisition*
Matachewan Prospect	SPOT-4	B-1 Mono B-2 Green B-3 Red B-4 Near-infrared B-5 Short Wave Infrared	10 metres 20 metres 20 metres 20 metres 20 metres	Best available scene: 2008-05-29

SRTM

The Shuttle Radar Topography Mission (SRTM) is an international research effort that obtained digital elevation models on a near-global scale from 56° S to 60° N, in order to generate the most complete high-resolution digital topographic database of Earth. SRTM consisted of a specially modified SIR-C/X-SAR radar system that was on board the Space Shuttle Endeavour during the 11-day STS-99 mission in February 2000. To acquire topographic (elevation) data, the SRTM payload was outfitted with two radar antennas. One antenna was located in the Shuttle's payload bay, the other on the end of a 60-metre mast that extended from the payload bay once the Shuttle was in space. The technique employed is known as Interferometric Synthetic Aperture Radar.

The resolution of the cells of the source data is one arc second (approx. 30 metres), but that data has only been released in the United States. For the rest of the world, only three-arc-second (approx. 90-metre) data is available. The Shuttle Radar Topography Mission is an international project spearheaded by the U.S. National Geospatial-Intelligence Agency (NGA) and the U.S. National Aeronautics and Space Administration (NASA).
(Source: NASA-JPL)

The following SRTM archived data was acquired for the study area (Table 2, Map 3).

Table 2. Specifications of acquired SRTM data.

Data	*Bands*	*Pixel Resolution*	*Capture Resolution*	*Processing level*
SRTM	SIR-C/X-SAR	30 metres	1 arc second	Filled finished-A

APPROACH AND METHODOLOGY

The study commenced with the acquisition of SPOT-4 and SRTM data. All acquired data were processed in order to enhance the geological, geomorphologic and land cover features. The following remote sensing data processing and methodologies were used for this mandate.

Remote Sensing data, Structuring of GIS Data Base

All data were first pre-processed and processed using Geomatica 2016 (PCI) software and then, imported into ArcGIS data base project for further analysis, compilation and integration. The UTM 17 North projection (UTM 17 N) and NAD-83 datum were used to display and register the data and project.

Lineaments Detection

To avoid a confusion regarding the meaning of the term lineament, the following definition is used to explain the linear features on remote sensing data in geological studies. A lineament is a linear distinctive feature, whose parts show a rectilinear and/or curvilinear correlation in two dimensional space. Most likely, it is a surficial and/or subsurficial expression of geological features. Thus, the detection of lineaments has an important significance in geology. Such features can represent contacts, faults, folds or fracture zones and can signify a favourable environment for ore deposits. Interpreters typically encounter exposed or hidden lineaments. The exposed lineaments are readily identifiable by their geomorphologic expressions. The hidden lineaments are indirectly recognizable by their subtle influence/control of certain physiographic features.

Numerous extraction techniques have been developed in the past in order to enhance structural geology information. In this study, the high frequency wave filtering technique, as well as band ratioing, principal component calculation and band composites were applied to the satellite bands in order to enhance, interpret and map the lineaments. In addition, every selected satellite band and DEM data were separately stretched or filtered to gain the best contrast and color balance for visual interpretation. Also, all extracted lineaments were validated by using a top-down interpretation technique. With the capability of seeing terrain from different azimuths and elevation angles, this technique helps to detect/confirm and correctly draw observed lineaments. Hence, the resulting interpreted lineaments represent what is presumed to correspond to the geo-structural or lithological features (Map 4).

Spatial Density / Stress of Lineaments analysis

Spatial density analysis captures identified quantities of some phenomenon and spreads them across the surrounding surfaces based on the quantity that is measured at each location and the spatial relationship of the locations of the measured quantities. Therefore, density surfaces show where the point and/or line features are concentrated /stressed. In our case, the input lines features are the lineaments interpreted from satellite data, while the input point features are representing the intersections of the interpreted lineaments. Since both points and lineaments do not have any assigned numeric value, by calculating density, the created surfaces show the predicted distribution of the lineaments density/stress throughout the study area. However, the output surface data has the values assigned in accordance with the intensity that is measured at each point/line location and the spatial relationship of the locations of the measured intensities. The resulting high value of density/stress means an intense structural (tectonic) fabric in the immediate area, while low value signifies modest structural (tectonic) fabric in the close neighborhood. The resulting spatial density/stress image is represented by colour scale from blue to red, where blue means low structural density/stress and red means high structural density/stress (Map 4).

RESULTS

Lineaments, Spatial Density / Stress of Lineaments

The lineaments interpreted from SPOT and SRTM data were generally recognized by alignment of spectral features from processed imagery, by topographic offsets or offset streams/rivers or streams/rivers flowing around sharp angles. The changes in vegetation type and densities can also be a result of changes in the moisture level and indicate the changes in rock and soil type, frequently recognized by trees or plant alignment. The interpreted lineaments may indicate the faults, folds, fractures or jointing, contacts and regional mineral foliation trend.

The results of the remote sensing lineament's study show two dominating groups/trends of lineaments. The classification based on their magnitude, direction, length and abundance revealed the North-South and East-West lineaments as the main linear trend. The most common spatial distributions of the lineaments over the prospect are the X-shape and Parallel-shape lineaments. The interpreted lineaments/their spatial distribution might represent the transport/conduit and trap linear features/exploration targets.

As described in ***Approach and methodology*** section of this report, spatial density analysis captures identified quantities of lineaments distribution (line features) and their intersections (point features), and spreads them across the surrounding surfaces. Since both points and lineaments do not have any assigned numeric value, by calculating density, the created surfaces show the predicted distribution of the lineaments density/stress throughout the study area. The output surface data have the values assigned in accordance with the intensity that is measured at each point/line location and the spatial relationship of the locations of the measured intensities.

The resulting high value of density/stress means an intense structural (tectonic) fabric in the immediate area, while low value signifies modest structural (tectonic) fabric. The resulting spatial density/stress image is represented by colour scale from blue to red, where blue means low structural density/stress and red means high structural density/stress.

The spatial density calculation results revealed several zones having a high density values (Map 4).

COMMENTS

Following the processing, interpretation and analysis outlined in the above sections, the lineaments and lineaments stress/density data and maps, and SPOT and SRTM data and maps were produced (Maps 1 to 4).

All these data show a variety of the spatial distribution, magnitude and direction, density/stress of the interpreted lineaments.

The length of lineaments, their direction and density are the most valuable characteristics for defining their relation to the geological structures and known mineralization. The length of mapped lineaments ranges from hundred metres to few kilometres. The interpreted local lineaments are characterized by their short length, heterogeneous direction and density in the same area, while the regional lineaments are characterized by their long length, specific direction and homogenous spatial distribution and continuity.

The classification based on their magnitude, direction, length and abundance revealed the North-South (N-S) and East-West (E-W) lineaments as a main linear trends of interpreted lineaments. The prospect area is also crossed by two major Northwest-Southeast lineaments that might represent regional faults.

The dissimilarity in spatial distribution, magnitude and direction of the interpreted lineaments might indicate several tectonic events and/or geomorphologic controls such as the following: amplitude and direction of the tectonic or geological event, rock resistance or compactness, age of a tectonic event or changes in rock composition/lithology. The project area shows various spatial distributions of lineaments, directions and changes in linear density/stress (Map 4). The most common spatial distributions of lineaments over the prospect study area are:

1. **Single straight** or sub straight direction: this spatial distribution represents the lineaments that cross the entire or almost entire study area over few kilometres. These lineaments probably represent the major fault systems, important dikes or main lithologic contacts. The prospect is crossed by three major single straight lineaments.

2. **Parallel direction**: this spatial distribution depicts parallel or sub parallel lineaments that cross a significant part of the property. These lineaments might represent horst and/or graben structures or rock stratum. The N-S and E-W lineaments, mainly minor, show that spatial distribution over the prospect area.

3. **V-shape or X-shape** directional feature: this spatial distribution is characterized by two lineaments intersected at a more or less acute angle or right angle (X-shape). The less important lineament usually terminates at the intersection with the more important one which makes a longer distance. This might reflect the differences in the energy of tectonic event or might also represent two different tectonic events. The X-shape features are mostly represented by N-S and E-W intersecting lineaments.

The interpreted lineaments/their spatial distribution might represent the transport/conduit and trap linear features - exploration targets.

CONCLUSIONS AND RECOMMENDATIONS

The commonly used methods of image processing and enhancement, as well as the techniques developed by Japosat, were applied on SPOT and SRTM data to enhance the geological features over the Matachewan Prospect area.

The emphasis was given to enhance, interpret and map the lineaments.

Acquiring and processing a very high definition (1.2m - 2m pixel multispectral) 8-band to 16-band multispectral satellite images are common and strongly recommended to identify the exploration targets within and at the property/deposit scale, and to support an in depth exploration programme.

In view of that, Japosat recommends the following work program that includes the validation of remote sensing lineaments, acquiring the high definition satellite data, and finally, the final detailed remote sensing study aiming to complete the lineaments' detection and the geobotany geological study. The work program should include the following:

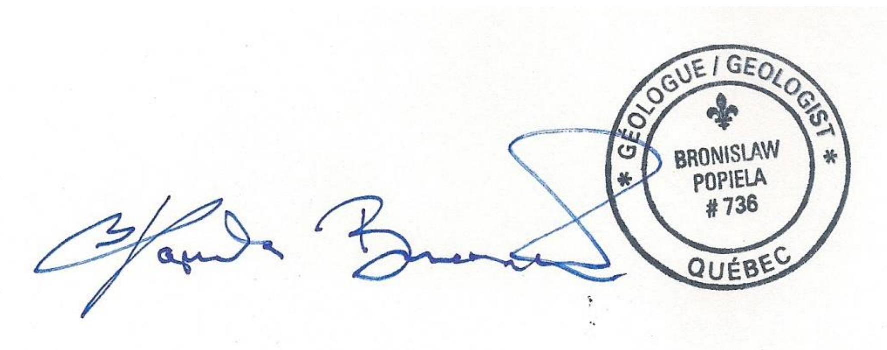
- Acquiring and processing a high definition (1.2m - 2m pixel) multispectral satellite 8-band to 16-band images and stereo images to produce 1m DEM; the collected/acquired and processed data will provide the details over the identified remote sensing/field validation data/results.

- Geobotany geological study as the vegetation over the prospect area might have a signature related to the targeted lithology or mineralization.

The total cost for a recommended satellite work program will be supplied at request. The author consider that the running of the proposed work program will move the Golden Valley Mines' Matachewan Prospect to the next stage and provide the key contribution required to evaluate the mineral potential of the prospect and the surrounding area.

SIGNATURE

Montreal, October 7th, 2017



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Member of l'Association Québécoise de Télédétection

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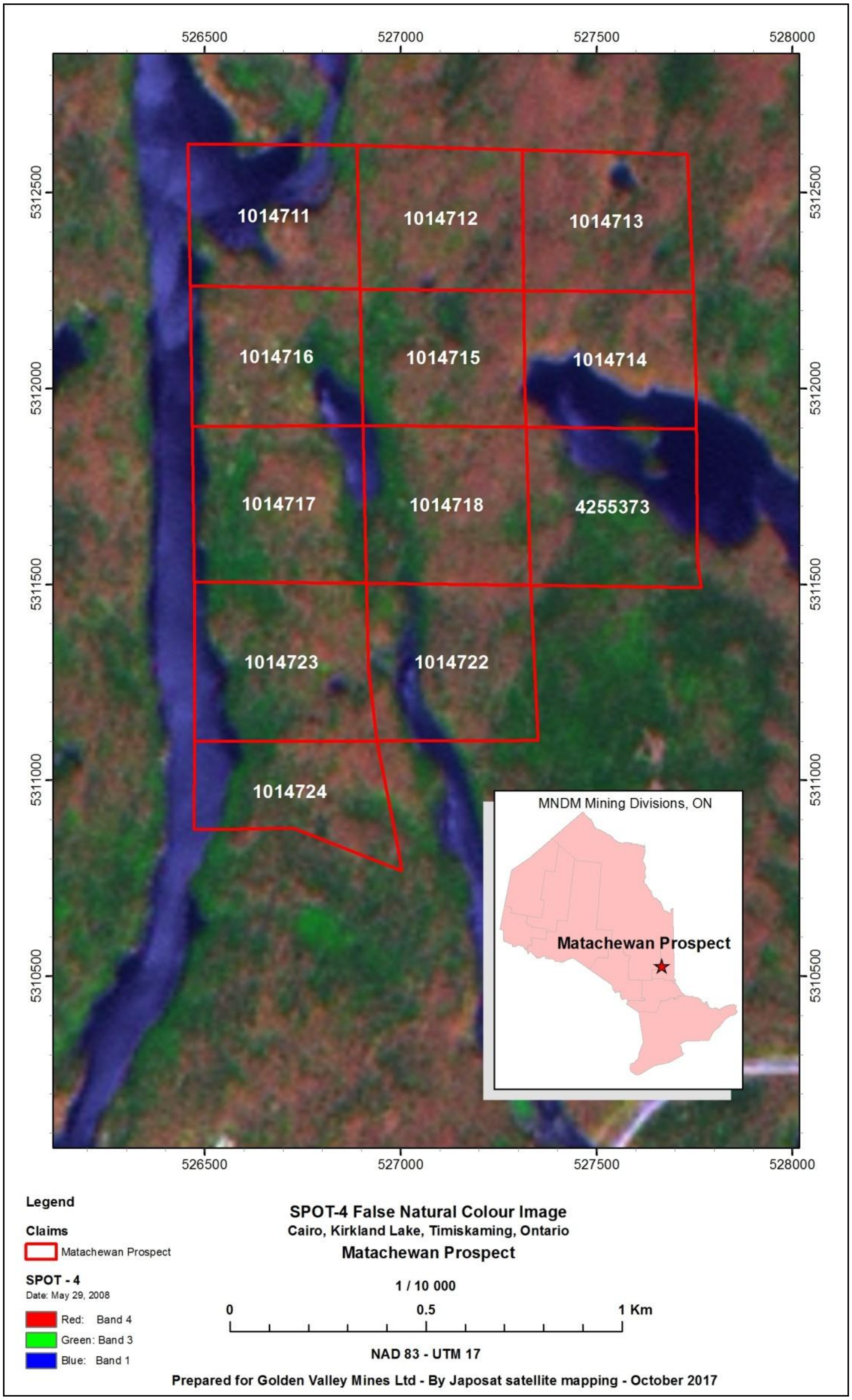
Richore Prospect Report on the 2004 Exploration Program, Baden Township, Ontario, Larder Lake MD, by Michael P. Rosatelli, May 10th, 2006.

Map 1 - SPOT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MNDM Mining Divisions, ON
Matachewan Prospect
Legend
Claims
Matachewan Prospect
SPOT - 4
Date: May 29, 2008
Red: Band 4
Green: Band 3
Blue: Band 1
SPOT-4 False Natural Colour Image
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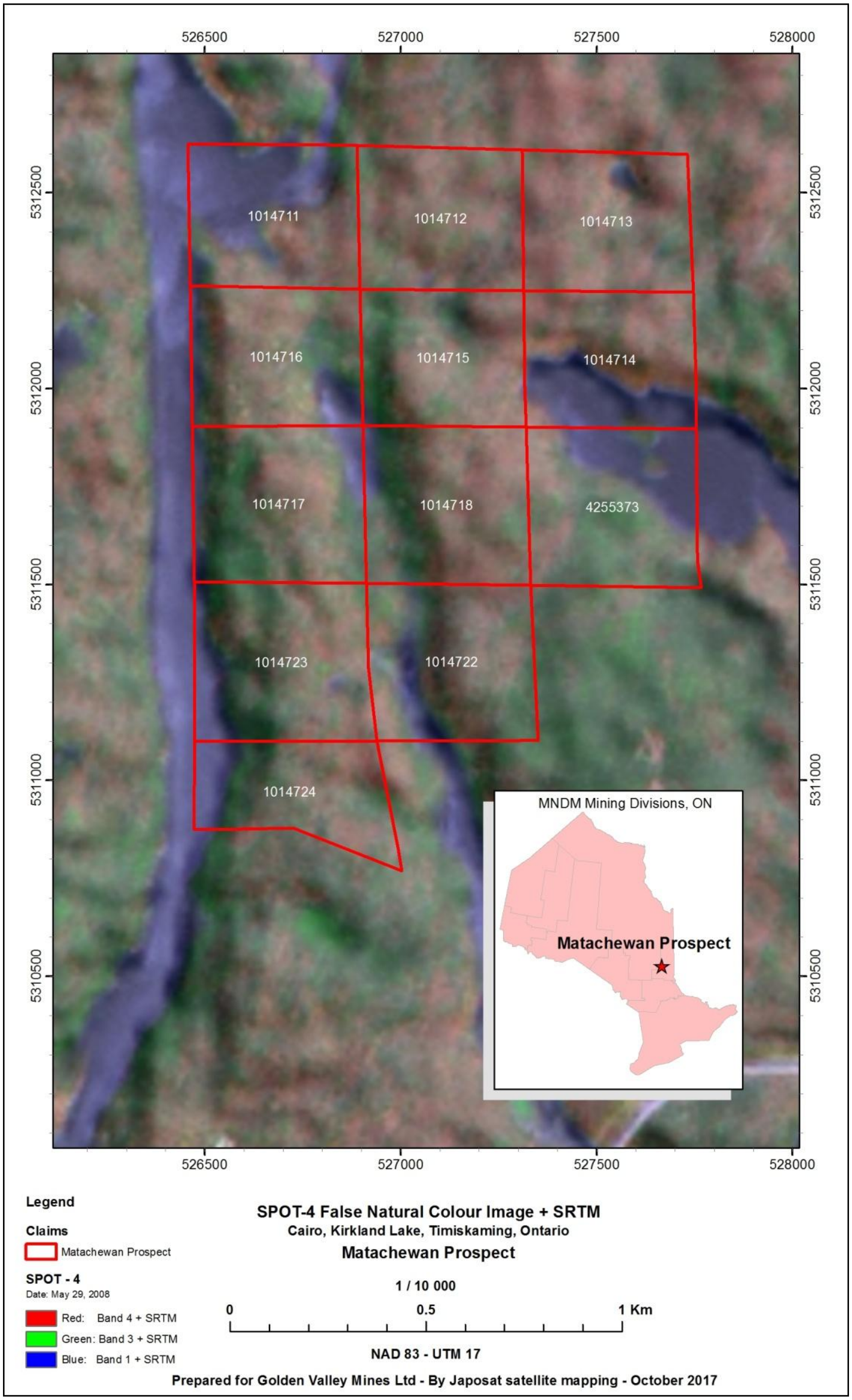
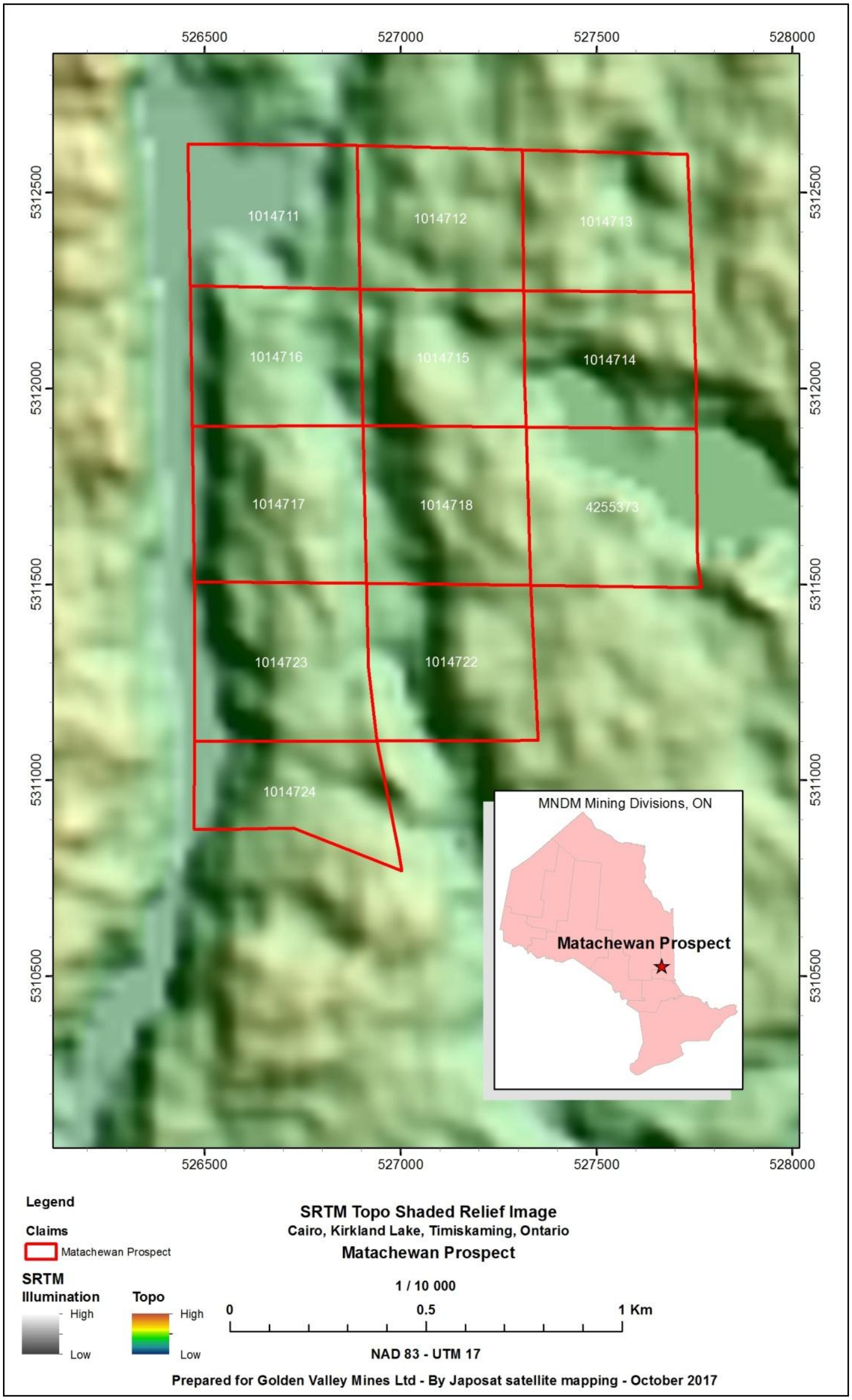
Prepared for Golden Valley Mines Ltd - By Japosat satellite mapping - October 2017

Map 2 - SPOT + SRTM



Map 3 - SRTM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NAD 83 - UTM 17
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Map 4 - Lineaments and Stress of Lineaments