OSG – ORGANO-SULPHUR GEOCHEMISTRY

A Predictive Geochemistry

for

MDRU-EOS-UBC

"GEOSCIENCE BC SURVEY"

August 31, 2012

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(- author, originator)*

EVALUATION OF SAMPLES

DATA EXPLORATION FOR: "COPPER" BASED TARGETS

OSG DATA USED FOR THIS REPORT

Workorder: A12-07481 & A12-07656

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PREFACE

THIS "STANDARD" OSG INTERPRETATION REPORT:

The purpose of this Organo-Sulphur Geochemistry (OSG) interpretation "Standard Report" is to ensure that clients and other potential reviewers of the results have a good understanding of this organo-sulphur based, deep penetrating geochemistry. As OSG provides such a large data set as the possible detection of 105 targeted compounds it is not interpreted in the same way as inorganic geochemistries, this report enables the user to realize the results in a timely fashion and capitalizes on the years of research and development and case studies review since the inception of OGS in 2009. The knowledge obtained by Activation Laboratories through the interpretation of the Soil Gas Hydrocarbon (SGH) data from over hundreds of surveys for a wide variety of target types in various lithologies from many geographical locations will allow the use of the latest advances in interpretation as it capitalizes on 3D-SGH that uses the latest electrochemical cell model (Sutherland, 2011). The report is compulsory as it is the only known organo-sulphur geochemistry that uses non-gaseous semi-volatile organic-sulphur based compounds interpreted using a forensic signature approach. It is based solely on OSG data (SGH analyses if they have been requested are not referenced) and does not include the consideration or interpretation from any other geochemistry (inorganic), geology, or geophysics that may exist related to this survey area(s). This report can also provide evidence of project maintenance. To keep the price to a minimum and to provide as short a turnaround time as practically possible, usually only one OSG Pathfinder Class map is illustrated in a "Standard Report" with an applied interpretation although several other OSG Pathfinder Class maps are used and referenced. As the amount of time and work in producing the OSG results is virtually the same as SGH, the OSG pricing is the same as that of SGH.

"SUPPLEMENTAL REPORT": ($ 1,500.00, as of July 1, 2011)

Those clients who have determined that these OSG results will add an important aspect to their exploration effort can request a "Supplemental Report". This report contains the additional OSG Pathfinder Classes and an explanation of their use in the OSG interpretation that supports the initial applied "Rating" for the survey as a relative comparison to the results previously obtained in case studies that were used to create the OSG template for the general target type. This supplemental report can also be used to request and integrated interpretation of OSG with SGH data if both geochemistries were requested.

"ADDITIONAL INTERPRETATION": ($ 1,500.00, as of July 1, 2011)

Although in its infancy, the OSG data can be interpreted multiple times in comparison to a variety of OSG templates developed for exploration for different mineral targets or petroleum plays as case studies. The samples do not have to be reanalyzed. This can be addressed as a separate section of a report or as a separate report based on the client's wishes. The price is per survey area, e.g. if there are two projects in a submission, perhaps a North area and South area, and both survey areas are to be interpreted for say Gold and Copper, the first interpretation is included in the SGH analysis price, the second interpretation for each area would be priced at $1,500 per area, thus a total of $3,000.

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PREFACE (continued)

"BASIC OR SUPPLEMENTAL REPORT GIS PACKAGE": ($ 120.00)

Those clients that wish to import the SGH results into their GIS software can request a "GIS Package", which will include the geo-referenced image files that reflect the mapped OSG Pathfinder Class or Classes contained in the Standard or Supplemental Report and an Excel CSV file(s) containing the associated Class Sum data.

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ORGANO-SULPHUR (OSG) GEOCHEMISTRY – OVERVIEW

In the search for minerals and elements, geology requires tools to assess the location and potential quantity of minerals and ores. In the past people looked at the landscape to find the deposit. Similar landscapes indicate similar mineral and metal deposits. This is exploration on a macro level, while geochemistry is attempting to explore on a micro level. Organic material requires many minerals and elements, so organic materials can be biomarker of the present of the minerals and elements.

In the same way as SGH, OSG has also illustrated its capability as a deep penetrating geochemistry that involves the analysis of surficial samples from over potential mineral or petroleum targets. The analysis involves the testing for 105 organo-sulphur based compounds in the C7-C17 carbon series range applicable to a wide variety of sample types. SGH has been successful for delineating targets found at over 700 metres in depth; this capability is anticipated to be similar with OSG. Samples of various media have been successfully analyzed with SGH such as soil (any horizon), till, sand, humus, peat, drill core, rock, lake-bottom sediments and even snow; the same is anticipated for OSG. The OSG analysis, like that for SGH, incorporates a very weak leach, essentially aqueous, that only extracts the surficial bound sulphur based hydrocarbon compounds including those compounds in interstitial spaces around the sample particles. These are the organic compounds that have been mobilized from the decomposition of bacteria that have used the target mineralization at depth. This OSG analysis of 105 compounds, representing a subset of 181 compounds monitored during research, is by far the most comprehensive organo-sulphur geochemistry ever documented. The very few references to organo-sulphur compounds as a geochemistry have had a list of less than 10 compounds. This OSG geochemistry uses a forensic approach to identification like that for SGH. The organo-sulphur compounds in the OSG extract are separated by high resolution capillary column gas chromatography to isolate, confirm, and measure the presence of only the individual hydrocarbons that have been found to be of interest from initial research and development and from the set of 25 case studies used for validation.

Over the past 14 years of research, Activation Laboratories Ltd. has developed an in-depth understanding of the unique SGH signatures associated with different commodity targets. Using a forensic approach we have developed target signatures or templates for identification, and the understanding of the expected geochromatography that is exhibited by each class of SGH compounds. OSG is expected to also result in the development of identification templates that have a high degree of confidence. At the time of this report, OSG has already demonstrate the potential to be a geochemistry that has exceptional capabilities in vectoring towards the best possible drill targets for consideration similar to locating the bulls-eye on a dartboard. As for SGH, we include this OSG interpretation report, which is delivered with the spreadsheet of data, to enable our clients to realize the complete value and understanding of the OSG results in the shortest time frame and provide the benefit from past knowledge and research.

SGH has formed the basis of OSG. SGH as an organic geochemistry has attracted the attention of a large number of Exploration companies since its inception in 1996. In the Canadian Mining Industry Research Organization research projects sponsors have included (in no order):

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Western Mining Corporation, BHP-Billiton, Inco, Noranda, Outokumpu, Xstrata, Cameco, Cominco, Rio Algom, Alberta Geological Survey, Ontario Geological Survey, Manitoba Geological Survey and OMET. Further, beyond this research, Activation Laboratories Ltd. has interpreted the SGH data for over 900 surveys. SGH has performed exceptionally well. As an example, in the first CAMIRO research project that commenced in 1997 (Project 97E04), there were 10 study areas that were submitted blindly to Actlabs. These study sites were selected since other inorganic geochemistries were unsuccessful at illustrating anomalies related to the target.

Although Actlabs was only provided with the samples and their coordinates, SGH was able to locate the blind mineralization with exceptional accuracy in 9 of the 10 surveys. Today, OSG has already illustrated success in exploration and discovery of unknown targets e.g. Aura Silver have used both SGH and OSG to delineate Silver and Gold mineralization at their Greyhound project in Nunavut. (www.aurasilver.com)

Sample Type and Survey Design: It is highly recommended that a ***minimum*** of 50 sample "locations" is preferred to obtain enough samples into background areas on both sides of *small* suspected targets (wet gas plays, Kimberlite pipes, Uranium Breccia pipes, veins, etc.). OSG and SGH are not interpreted in the same way as inorganic based geochemistries. Both geochemistries must have enough sample locations over both the target and background areas in order to fully study the dispersion patterns or geochromatography of the SGH classes of compounds. Based on our minimum recommendation of at least 50 sample locations we further suggest that all samples be *evenly spaced* with about one-third of the samples over the target and one-third on each side of the target in order for SGH to be used for exploration.

SGH has been shown to be very robust to the use of different sample types even "within" the same survey or transect. This has already been proven to be true for OSG as well. Research has illustrated that it is far more important to the ultimate interpretation of the results to take a complete sample transect or grid than to skip samples due to different sample media. Research in 2012, based on the latest electrochemical-Redox cell model (Sutherland, 2011) has indicated that even in orientation studies over known mineralization, that there is a risk of 10+ % that a geochemistry that is truly capable of detecting the target mineralization will fail if a simple transect of samples is used. The most ideal natural sample is still believed to be soil from the "Upper B-Horizon", however excellent results can also be obtained from other soil horizons, humus, peat, lake-bottom sediments, and even snow. The sampling design is suggested to use evenly spaced samples from 20 metres to 400 metres depending on the type of target sought, and line spacing from 50 metres to 800 metres again depending on the size and type of target. A 1:4 ratio (sample spacing: line spacing) is suggested, however, orientation surveys having larger spacing also been successful. Ideally even large grids should have one-third of the samples over the target and two-thirds of the samples into anticipated background areas. This will allow the proper assessment of the SGH and OSG geochromatographic vectoring and background site signature levels with minimal bias. Individual samples taken at significant distances from the main survey area to represent background are not of value in the SGH or OSG interpretation as these results are not background subtracted. Samples can be drip dried in the field and do not need special preservation for shipping and has been specifically designed to avoid common contaminants from sample handling and shipping. SGH has also been

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shown to be robust to cultural activities even to the point that successful results and interpretation has been obtained from roadside right-of-ways. OSG should actually prove to be even more robust as the compounds are more rare in the natural environment.

In conclusion, the conditions for the sample type and survey design include:

- Minimum of 50 samples "locations".
- Evenly spaced sample locations with one-third of the samples covering the target and one-third on each side of the target.
- Different sample types even "within" the same survey or transect can be used.
- If a perfect space grid cannot be used, the evenly spaced locations with a ratio of sample spacing: sample line spacing ideally to have a 1:4 ratio.
- Samples can be drip dried.
- No special preservation for shipping is needed.

Sample Preparation and Analysis

Upon receipt at Activation Laboratories the samples are air-dried in isolated and dedicated environmentally controlled rooms set to 40°C. The dried samples are then sieved. In the sieving process, it is important that compressed air is not used to clean the sieves between samples as trace amounts of compressor oils "may" poison the samples and significantly affect some target signatures. At Activation Laboratories a vacuum is used to clean the sieve between each sample. The -60 mesh sieve fraction (<250 microns, although different mesh sizes can be used at the preference of the exploration geologist) is collected and packaged in a Kraft paper envelope and transported from our sample preparation building to our analytical building on the same street in Ancaster Ontario. Each sample is then extracted, separated by high resolution gas chromatography and analyzed by mass spectrometry using customized parameters enabling the highly specific detection of the 105 targeted organo-sulphur hydrocarbons at a *reporting limit* of 0.1 parts-per-trillion (ppt). This trace level limit of reporting is critical to the detection of these organo-sulphur compounds that, through research, have been found to be related to the decomposition and release of hydrocarbons from the death phase of microbes directly interacting with a deposit at depth. The organo-sulphur signatures are expected to be directly linked to the deposit type, which is used as a food source. The organo-sulphur compound flux is constantly replenished as the a portion of the microbe population are constantly decomposing in the death phase of each generation. It is not expected that the organo-sulphur compounds reflect the event of the genesis of the deposit. The results of the OSG analysis is reported in raw data form in an Excel spreadsheet as "semi-quantitative" concentrations without any additional statistical modification.

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Mobilized Inorganic Geochemical Anomalies

It is important to note that SGH is essentially "*blind*" to any inorganic content in samples as only *organic* compounds as hydrocarbons are measured. Thus inorganic geochemical surface anomalies that have migrated away from the mineral source, and thus may be interpreted and found to be a false target location, is not detected and does not affect SGH results. This fact is of great advantage when comparing the SGH results to inorganic geochemical results. If there is agreement in the location of the anomalies between the organic and inorganic technique, such as Actlabs' Enzyme Leach, a significant increase in confidence in the target location can be realized. If there is no agreement or a shift in the location of the anomalies between the techniques, the inorganic anomaly may have been mobilized in the surficial environment. OSG is expected to behave in the same way.

The Nugget Effect

As SGH is "blind" to the inorganic content in the survey samples, any concern of a "nugget effect" will not be encountered with SGH data. A "nugget effect" may be of a concern for inorganic geochemistries from surveys over copper, gold, lead, nickel, etc. type targets. OSG is expected to behave in the same way.

SGH and OSG Interpretation Reports

All SGH and/or OSG submissions must be accompanied by relative or UTM coordinates so that we may ensure that the sample survey design is appropriate for use with SGH or OSG, and to provide an SGH or OSG interpretation with the results. In our interpretation procedure for OSG, we separate the results into 21 OSG sub-classes. These classes include specific Thioanisoles, alkyl-Benzothiophenes, a Halogenated-Thiophene, alkyl-Thiophenes, an alkyl-Sulphone, Sulphur Allotropes, Alkanes, Thiophenols, Thiophene-Carboxylates, Sulphonyl-Phenols, Organo-Sulphides and Thiozole compounds. Note that none of the OSG compounds or SGH hydrocarbons are "gaseous" at room temperature and pressure. The classes are then evaluated in terms of their geochromatography and for coincident compound class anomalies that are unique to different types of mineralization. Actlabs uses a six point scale in assigning a subjective rating of similarity of the SGH signatures found in the submitted survey to signatures previously reviewed and researched from known case studies over the same commodity type. The characteristics of a Rating system for OSG have not been finalized yet. Also factored into an SGH rating is the appropriateness of the survey and amount of data/sample locations that is available for interpretation. This rating scale is described in detail in the following section.

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SGH DATA QUALITY

Reporting Limit

The OSG Excel spreadsheet of results contains statistically unaltered concentrations of the individual SGH compounds in units of "part-per-trillion" (ppt). The reporting of these ultra low levels is vital to the measurement of the small amounts of Organo-Sulphur compounds are also expected from the decomposition of bacteria that have used the ore at depth as a food source. To ensure that the data has a high level of confidence, a "reporting limit" is used. The reporting limit of 0.1 ppt actually represents a level of confidence of approximately 5 standard deviations where SGH data is assured to be "real" and non-zero. Thus in SGH the use of a reporting limit automatically removes site variability, and there is no need to further background subtract any data as the reporting limit has already filtered out any site background effects. Thus we recommend that all data that is equal to or greater than 0.2 ppt should be used in any data review. It is important to review all SGH data as low values that may be the centre of halo anomalies and higher values as apical anomalies or as halo ridges are all important.

Laboratory Replicate Analysis

A laboratory replicate is a sample taken randomly from the submitted survey being analyzed and are not unrelated samples taken from some large stockpile of bulk material. In the Organics laboratory an equal portion of this sieved sample, or pulp, is taken and analyzed in the same manner using the Gas Chromatography/Mass Spectrometer. The comparison of laboratory replicate and field duplicate results for chemical tests in the parts-per-million or even parts-per-billion range has typically been done using an absolute "relative percent difference (RPD)" statistic which is an easy proxy for error estimation rather than a more complete analysis of precision as specified by Thompson and Howarth. An RPD statistic is not appropriate for SGH or OSG results as the reporting limit for SGH is *1 part-per-trillion* and for OSG is *0.1 part-per-trillion*. Further, *SGH and OSG are semi-quantitative techniques* and were not designed to have the same level of precision as other less sensitive geochemistry's as it is only used as an exploration tool and not for any assay work. SGH and OSG are also designed to cover a wide range of hydrocarbons and organo-sulphur compounds with an unprecedented 162 hydrocarbons or 105 Organo-Sulphur compounds being measured for each sample. An SGH or OSG laboratory replicate is a large set of data for comparison even for just a few pairs of analyses. Precision calculations using a Thompson and Howarth approach should only be used for estimating error in individual measurements, and not for describing the average error in a larger data set. In geochemical exploration geochemists seek concentration patterns to interpret and thus rigorous precision in individual samples is not required because the concentrations of many samples are interpreted collectively. For these reasons recent and independent research at Acadia University in Canada promote that a percent Coefficient of Variation (%CV) should be used as a universal measurement of relative error in all geochemical applications. As SGH or OSG results have a relatively large data set for nearly all submissions, %CV is a better statistic for use with SGH and OSG. By using %CV, the concentration of duplicate pairs is irrelevant because the units of concentration cancel out in the formation of the coefficient of variation ratio. For SGH, the %CV is

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calculated on all values ≥ 2 ppt. For OSG, the %CV is calculated on all values ≥ 0.2 ppt. These values are averaged and represent a value for each pair of replicate analysis of the sample. All of the %CV values for the replicates are then averaged to report one %CV value to represent the overall estimate of the relative error in the laboratory sub-sampling from the prepared samples, and any instrumental variability, in the SGH or OSG data set for the survey. Actlabs' has successfully addressed the analytical challenges to minimize analytical variability for such a large list of hydrocarbons or Organo-Sulphur compounds. Thus as SGH and OSG are also interpreted as a signature andiare solely used for exploration and not assay measurement, the data from SGH and OSG is *"fit for purpose"* as a geochemical exploration tool.

Historical Precision

In the general history of geochemistry, studies indicate that a large component of total measurement error is introduced during the collection of the initial sample and in sub-sampling, and that only a subordinate amount of error in the result is introduced during preparation and analysis. A historical record encompassing many projects for SGH, including a wide variety of sample types, geology and geography, shows that the consistency and precision for the analysis of SGH *is excellent* with an overall precision of 6.8% Coefficient of Variation (%CV). When last calculated, this number has a range having a maximum of 12.4% CV, a minimum of 3.0% CV, with a standard deviation of 1.6%, in a population made up of over 400 targets (over 45,000 samples) interpreted since June of 2004. Again the precision of 6.8% CV included all of the sample types as soil from different horizons, peat, till, humus, lake-bottom sediments, ocean-bottom sediments, and even snow. When field duplicates have been revealed to us, we have found that the precision of the field duplicates are in the range of about 9 to 12 %CV. As SGH is interpreted using a combination of compounds as a chemical "class" or signature, the affect of a few concentrations that may be imprecise in a direct comparison of duplicates is not significant. Further, projects that have been re-sampled at different times or seasons are expected to have different SGH concentrations. The SGH anomalies may not be in exactly the same position or of the same intensity due to variable conditions that may have affected the dispersion of different pathfinder classes. However, the SGH "signature" as to the presence of the specific mix of SGH pathfinder classes will definitely still exist, and will retain the ability to identify the deposit type and vector to the same target location.

OSG is expected to work similarly. To date precision values have been in a similar range but slightly higher than SGH data, by approximately 2-3 %CV, most likely due to the even lower level of detection developed.

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LABORATORY MATERIALS BLANK – QUALITY ASSURANCE (LMB-QA)

The Laboratory Materials Blank Quality Assurance measurements (LMB-QA) shown in the SGH or OSG spreadsheet of results are matrix free blanks analyzed for SGH. These blanks are not standard laboratory blanks as they do not accurately reflect an amount expected to be from laboratory handling or laboratory conditions that may be present and affect the sample analysis result. The LMB-QA measurements are a pre-warning system to only detect any contamination originating from laboratory glassware, vials or caps. As there is no substrate to emulate the sample matrix, the full solvating power of the SGH or OSG leaching solution, effectively a water leach, is fully directed at the small surface area of the glassware, vials or caps. In a sample analysis the solvating power of the SGH or OSG leaching solution is distributed between the large sample surface area (from soil, humus, sediments, peat, till, etc.) and the relatively small contribution from the laboratory materials surfaces. The sample matrix also buffers the solvating or leaching effect in the sample versus the more vigorous leaching of the laboratory materials which do not experience this buffering effect. Thus the level of the LMB-QA reported is biased high relative to the sample concentration and the actual contribution of the laboratory reagents, equipment, handling, etc. to the values in samples is significantly lower. This situation in organic laboratory analysis only occurs at such extremely low part-per-trillion (ppt) measurement levels. This is one of the reasons that SGH uses a reporting limit and not a detection limit. The 1 ppt reporting limit used in the SGH spreadsheet, 0.1 ppt for OSG, of raw concentration data is 3 to 5 times greater than a detection limit. The reporting limit automatically filters out analytical noise, the actual LMB-QA, and most of the sample survey site background. This has been proven as SGH values of 1 to 3 parts-per-trillion (ppt) have very often illustrated the outline of anomalies directly related to mineral targets. This is expected to be similar for OSG. **Thus all SGH values greater than or equal to 2 ppt for SGH, or 0.2 ppt for OSG, should be used as reliable values for interpretations.**

The LMB-QA values thus should not be used to background subtract any SGH or OSG data. The LMB-QA values are only an early warning as a quality assurance procedure to indicate the relative cleanliness of laboratory glassware, vials, caps, and the laboratory water supply at the ppt concentration level. *Do not subtract the LMB-QA values from SGH or OSG sample data.*

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SGH DATA INTERPRETATION

GEOCHEMICAL ANOMALY THRESHOLD VALUE

In the interpretation of "inorganic" geochemical data one of the determinations to be made is to calculate a "Threshold" value above which data is considered anomalous. This is done on an element by element basis. In the interpretation of this "organic" geochemical data this determination is done differently. The determination of a threshold value is not calculated for each hydrocarbon compound. The determination of a threshold value is also a concentration below which geochemical data is considered as "noise" for the purposes of geochemical interpretation. As discussed, SGH uses a "Reporting Limit" instead of some type of Detection Limit. The amount of noise that is already eliminated in the data, as below the Reporting Limit of 1 part-per-trillion (shown in the data spreadsheet as "-1" as "not-detected at a Reporting Limit of 1 ppt") is equivalent to approximately 5 standard deviations of variability. *To thus calculate an additional Threshold Value is a loss of real and valuable data.* Further, in the interpretation of SGH data, individual compounds are not considered (unless explicitly mentioned in the report). The interpretation of SGH data is exclusively conducted by "compound chemical class" which is the sum of four to fourteen individual hydrocarbons in the same organic chemical class as these compounds naturally have the same chemical properties that ultimately define their spatial dispersion characteristics in their rise from a mineral target through the overburden. This combined class is more reliable than the measurement of any one compound. SGH also eliminates the need for a Threshold value determination above the Reporting Limit due to the "high specificity" of the specific hydrocarbons and the classes they form. Each of the hydrocarbons has been hand selected due to their lower probability of being found in general surface soils. Further, only those classes where the majority of the compounds are detected above the Reporting Limit are considered in the interpretation. This defines the SGH geochemistry as having less geochemical noise due to the use of a reporting limit and as having higher confidence in the use of groups (classes) of data instead of individual compounds. However the most important aspect of interpretation is the use of a forensic signature. At least three specific "Pathfinder" classes, based on the combinations or template of classes we have developed, must be present to define the hydrocarbon signature to confidently predict the presence of a specific type of mineral target. *Do not calculate another Threshold value*. **Fact:** It has been proven many times that important SGH anomalies that depict mineralization at depth can exist even with data at 3 ppt. OSG is expected to behave in a similar fashion.

SGH PATHFINDER CLASS MAGNITUDE

The magnitude of any individual concentration or that of a hydrocarbon class *does not imply* that the data is of more importance or that mineralization is of higher quantity or grade. SGH interpretation must use the review of the combination of specific hydrocarbon classes to make any interpretation. OSG is expected to behave in a similar fashion.

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DISCLAIMER

This "OSG Interpretation Report" has been prepared to assist the user in understanding the development and capabilities of this Organic based Geochemistry. The interpretation of the Soil Gas Hydrocarbon (SGH) data is in reference to a template or group of SGH classes of compounds specific to a type of mineralization or target that is chosen by the client (i.e. the template for gold, copper, VMS, uranium, etc.). Although the template of SGH Pathfinder Classes that has been developed through research and review of case studies has proven to be able to address many lithologies, Activation Laboratories Ltd. cannot guarantee that the template is applicable to every type of target in every type of environment. The interpretation in this report attempts to identify an anomaly that has the best SGH signature in the survey for the type of mineralization or target chosen by the client. However, this interpretation is not exhaustive and there may be additional SGH anomalies that may warrant interest. It should not be viewed due to the generation of this SGH report, that Activation Laboratories Ltd. has the expertise or is in the business of interpreting geochemical data as a general service. As the author is the originator of the SGH geochemistry, has researched and developed this exploration tool since 1996, and has produced similar interpretations using SGH data for over 500 surveys, he is perhaps the best qualified to prepare this interpretation as assistance to clients wishing to use SGH. Activation Laboratories Ltd. can offer assistance in general suggestions for sampling protocols and in sample grid location design; however we accept no responsibility to the appropriateness of the samples taken. Activation Laboratories Ltd. has made every attempt to ensure the accuracy and reliability of the information provided in this report. Activation Laboratories Ltd. or its employees, does not accept any responsibility or liability for the accuracy, content, completeness, legality, or reliability of the information or description of processes contained in this report. The information is provided "as is" without a guarantee of any kind in the interpretation or use of the results of the SGH geochemistry. The client or user accepts all risks and responsibility for losses, damages, costs and other consequences resulting directly or indirectly form using any information or material contained in this report or using data from the associated spreadsheet of results.

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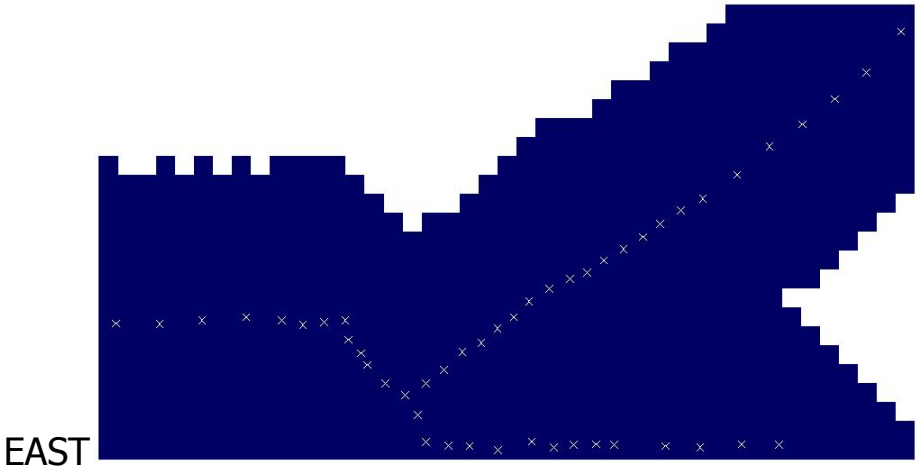
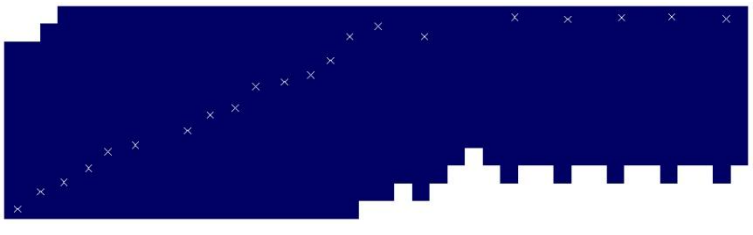
INTERPRETATION OF OSG RESULTS
A12-07481/A12-07656 – MDRU-EOS-UBC - GEOSCIENCE BC SURVEY

OSG SAMPLE SURVEY INTERPRETATION

This report is based on the OSG results from the analysis of a total of 79 samples: 30 samples were initially submitted on July 12th (A12-07481) followed by 49 samples that were submitted on July 17th (A12-07656). These samples described two study areas for this Geoscience BC project. A small single transect of 21 samples (designated as WEST for this report) was obtained approximately 5 kilometres to the south-southwest of a larger survey of three transects totaling 58 samples (designated as EAST for this report). These areas were interpreted separately and were interpreted in the same way in order to observe the possible presence of Copper based mineralization. UTM coordinates were provided on July 16th after the OSG and Organo-Sulphur Geochemistry (OSG) were submitted to Dr. Thomas Bissig. These coordinates allowed the mapping and interpretation of these OSG results.

OSG SURVEY –SAMPLE LOCATION MAP





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MDRU-EOS-UBC - GEOSCIENCE BC SURVEY
SAMPLE OSG SURVEY INTERPRETATION

Note that the associated OSG results are presented in a separate Excel spreadsheet. This data is semi-quantitative, has had no statistics applied, and is presented in units of ng/kg or *parts-per-trillion* (ppt) as the concentration of specific hydrocarbons in the sample. **The number of samples submitted for the single transect at the West survey is typically inadequate to use OSG as an exploration tool.** Lower then the recommended 50 sample locations rarely allow the observation or interpretation of possible Redox cells in the survey. We have found over the last 16+ years that interpretation of <50 sample locations do not result in a high level of confidence if the survey is one for exploration. The use of this single transect does not do justice to the capabilities of OSG as the interpretation of the spatial aspects of the anomalies that surround and vector to mineralization. **The number of samples submitted for the larger East survey is typically adequate to use OSG as an exploration tool although the orientation of this survey provides only a marginal opportunity to observe multiple anomalies to provide a highly confident interpretation. It is predicted that in general OSG dispersion anomalies are wider than those of SGH.**

As OSG is an organic geochemistry it is essentially "blind" to the presence of any inorganic elemental/metal content in the sample analyzed. OSG is a deep-penetrating geochemistry and has been proven to locate many types of mineralization at several hundred metres below the surface irrespective of the type of overburden. It is also initially assumed that there is only one potential target. If known, in surveys with several complex geophysical targets, to obtain the best interpretation the client should indicate that there are possibly multiple targets. The possibility of multiple targets should be known due to potential overlap and the increased complexity of resulting geochromatographic anomalies, which could alter the interpretation as to which targets are mineralized and which ones are not.

The overall precision of the OSG analysis was excellent as demonstrated by 2 samples taken from the **West survey** which was used for laboratory replicate analysis. The average Coefficient of Variation (%CV) of the replicate results for the project samples in this submission was 9.0% which represents an excellent level of analytical performance especially at such low parts-per-trillion concentrations.

The overall precision of the OSG analysis was excellent as demonstrated by 3 samples taken from the **East survey** which was used for laboratory replicate analysis. The average Coefficient of Variation (%CV) of the replicate results for the project samples in this submission was 7.5% which represents an excellent level of analytical performance especially at such low parts-per-trillion concentrations.

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MDRU-EOS-UBC - GEOSCIENCE BC SURVEY
OSG INTERPRETATION - "COPPER" PATHFINDER CLASS MAP

No leveling or statistics were conducted on the data in this report for mapping or interpretation purposes aside from the use of a Kriging trending algorithm in the GeoSoft Oasis Montaj mapping software. **This interpretation is based only on the OSG results associated with the submitted samples.** The maps shown in plan and in 3D views in this report are OSG "Pathfinder Class map" for targeting various Organo-Sulphur based flux patterns. These maps represent the simple summation of several individual hydrocarbon compound concentrations that are grouped from within the same organic chemical class. OSG Pathfinder Class maps have been shown to be robust as they are each described using from 2 to 18 (unless otherwise stated) chemically related OSG compounds which are simply summed to create each class map. Thus each map has a higher level of confidence as it is not illustrating just one compound measurement. A legend of the compound classes appears at the bottom of the OSG data spreadsheet. The *overall* interpretation has even a higher level of confidence as it further relies on the consensus between at least two additional pathfinder classes. A combination of these OSG Pathfinder Classes potentially defines the signature of a target at depth if present.

MDRU-EOS-UBC - GEOSCIENCE BC SURVEY
OSG INTERPRETATION - "COPPER" PATHFINDER CLASS MAP

The Copper template of OSG Pathfinder Classes use low and medium molecular weight classes of organo-sulphur compounds. At least three Pathfinder Class maps, associated with the OSG signature developed for Copper must be present to begin to be considered for assignment of a good rating relative to the OSG performance in case studies over known Copper type mineralization. These OSG classes must also concur and support a consistent interpretation in relation to the expected geochromatographic characteristics of the Pathfinder Class.

SGH has been described by the Ontario Geological Survey of Canada (OGS) as a "REDOX cell locator". Many SGH surveys for Copper and other mineral targets can result in multiple types of anomalies, depending on the class of SGH compounds, even over the same target and in the same set of samples. Thus "Apical", "Nested-Halo", and "Rabbit-Ear" or "Halo" type anomalies are all typically observed within the SGH data set from the effect of REDOX cells that have developed over deposits. REDOX cells are also related to the presence of bacteriological activity. This should also be true for OSG.

Note that any concentration value in the accompanying Excel spreadsheet greater than the "Reporting Limit" of 0.1 ppt (part-per-trillion) is important data and has been able to depict mineralization at depth. The majority of the variability or noise has already been eliminated; additional filtering will adversely affect any interpretation. Note that a Kriging trending algorithm has been applied to the mapping routine in the Geosoft Oasis Montaj software in the development of the OSG Class maps. OSG concentrations are in some way probably related to the amount of mineralization present and the grade of mineralization, which probably defines the characteristics of the biofilm(s) in contact with the deposit, as well as being related to the depth to mineralization.

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MDRU-EOS-UBC - GEOSCIENCE BC SURVEY
OSG INTERPRETATION - "COPPER" PATHFINDER CLASS MAP

OSG is also expected to be a "deep penetrating" geochemistry and should also works well for relatively shallow targets. **Targets shallower than about 3 to 5 metres** will also have a reduced OSG signal due to interaction with atmospheric conditions and samples taken right at surface outcrops will have even weaker signals due to a higher degree of weathering from various processes on these volatile and semi-volatile organic hydrocarbons.

Each of the three OSG Pathfinder Class maps shown in this report is a specific portion of the OSG signature relative to the Copper mineralization discussed. Each pathfinder class map is still just one of the Pathfinder Class maps used in each of the interpretation template (in a standard report additional OSG Pathfinder Class maps are not shown at this price point and report turnaround time).

OSG INTERPRETATION RATING AND CLARIFICATION

A Rating system, using the same scale as SGH will be used. At this time the characteristics to provide a Rating has not been set. No OSG Rating will be given at this time. It is important to remember to consider all of the OSG Class maps together and not focus on any individual one.

The results from some of the research and observations with SGH in recent years which has focused on the potential that the SGH data might be able to further dissect and understand the relationships between the chemical Redox conditions in the overburden and the development of an electrochemical cell. This research has resulted in the development by Activation Laboratories of a new enhanced model of the most recent electrochemical/ Redox cell theory originated by Govett (1976) that has graduated to the current model by Hamilton (2004, 2009). The new enhanced model developed by Sutherland (2011) takes the general anomalies expected by the Hamilton model to a higher resolution. This has resulted is a more confident level of interpretation of SGH and the introduction of a more appropriate terminology for SGH as **"Spatiotemporal Geochemical Hydrocarbons"** rather than Soil Gas Hydrocarbons. The analysis and the SGH acronym has remained the same, however in the future the theory of SGH will be referenced as "Spatiotemporal Geochemical Hydrocarbons". With this enhanced interpretation as 3D-SGH, we mark the beginning of the ability to make more confident statements regarding the possible depth to mineralization as we dissect the Redox cell relative to electrochemical theory. This model has been formally introduced at the International Applied Geochemistry Symposium organized by The Association of Applied Geochemists that took place in Rovaniemi, Finland, in August 2011. It has already been shown that OSG also obeys this theory.

Please note that the standard OSG interpretation report typically contains only one OSG Class map to provide results in a more timely fashion and to reduce the price for those companies where OSG results may not be so compelling. This additional information represents a Supplementary Report level of effort as more detail into the OSG interpretation.

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MDRU-EOS-UBC - GEOSCIENCE BC SURVEY
OSG INTERPRETATION FOR "COPPER" MINERALIZATION

"EAST SURVEY"

OSG Copper Pathfinder Class Map – Pages 20: An anomaly is observed with this Sulphur Allotrope. As Organo-Sulphur compounds are generally of higher molecular weight than measured in SGH, due to the size and weight of the Sulphur molecule(s), they are expected to have more dispersed anomalies. On page 20 we are thus most likely observing only half the anomaly with the other half predicted to be to the southwest of the intersection of the three transects. This anomaly is clearly seen in the 3D view at the bottom of the same page and stands out due to the more rare nature of OSG compounds which adds to their specificity. The dotted blue oval outline has been selected as the common interpretation determined from review of the OSG Pathfinder Class maps illustrated on pages 20, 21 and 22 for the East survey, as well as other OSG Class maps that support and define the complete OSG signature for this survey.

OSG Redox Pathfinder Class Map – Pages 21: An OSG Pathfinder Class as Thiophene Carboxylates is shown in plan and 3D views on page 21. This OSG Class map illustrated a well defined Rabbit-Ear anomaly here and is expected to delineate the Redox conditions present. This interpretation is supported by other OSG Classes. The same dotted blue oval anomaly as the common interpretation falls within the Rabbit-Ear anomaly.

OSG Copper Pathfinder Class Map – Pages 22: This OSG Pathfinder Class as Thiazoles is shown in plan and 3D views on page 22. This nested halo anomaly is actually made up of the smaller bifurcations of the OSG flux originated from this sulphide containing deposit. This is in direct agreement with the latest Redox-Electrochemical Theory presented in 2011. These OSG interpretations predict that Copper mineralization is present at depth. An estimate of depth has not yet been approximated through the use of OSG. Typically OSG interpretations have both directly confirmed SGH anomalies and interpretations or have provided a different set of anomalies that have been able to better vector to the centre of mineralization. A set of OSG characteristics have not yet been formalized to enable the provision of an OSG Rating as a guideline for clients.

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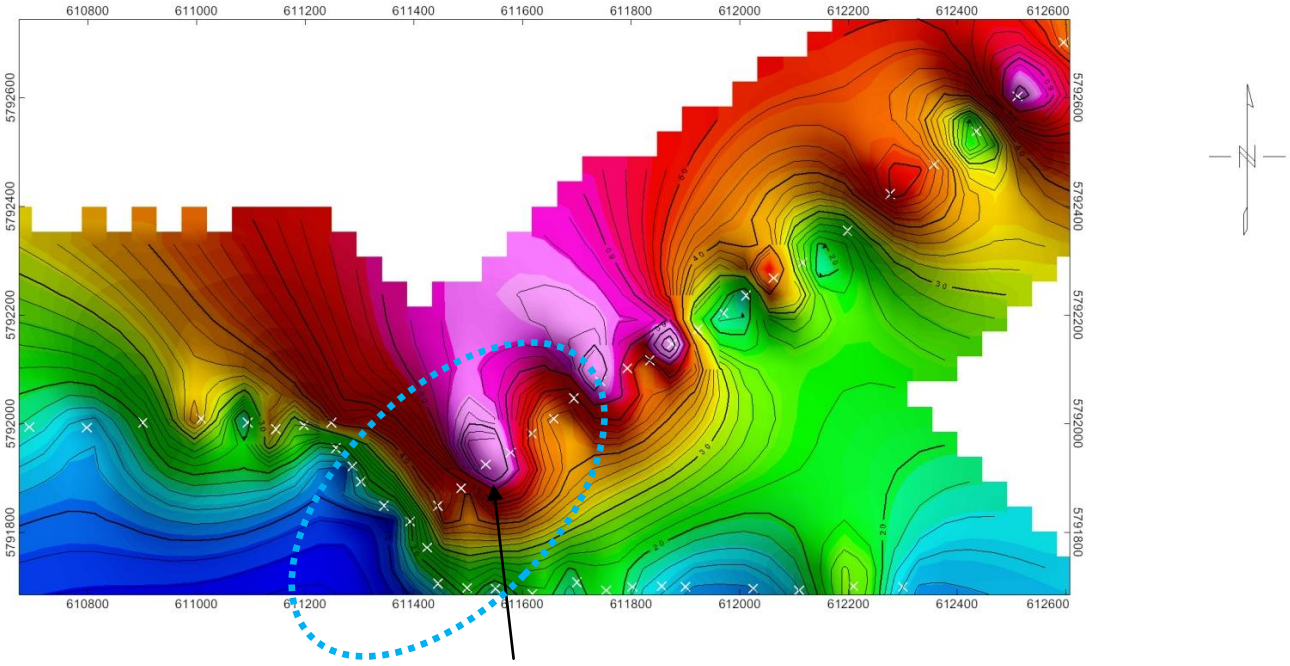
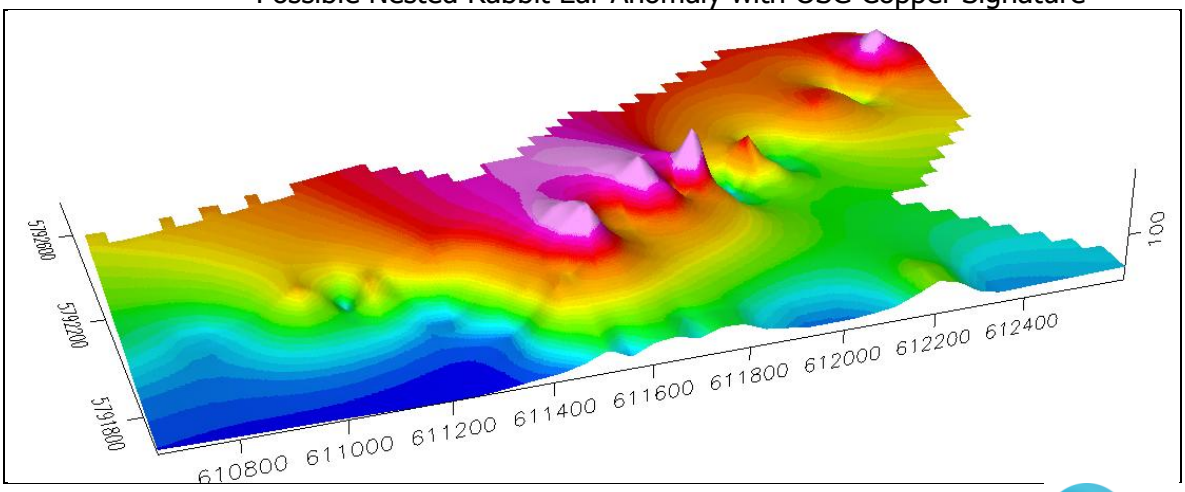
OSG COPPER PATHFINDER CLASS MAP - "EAST SURVEY"





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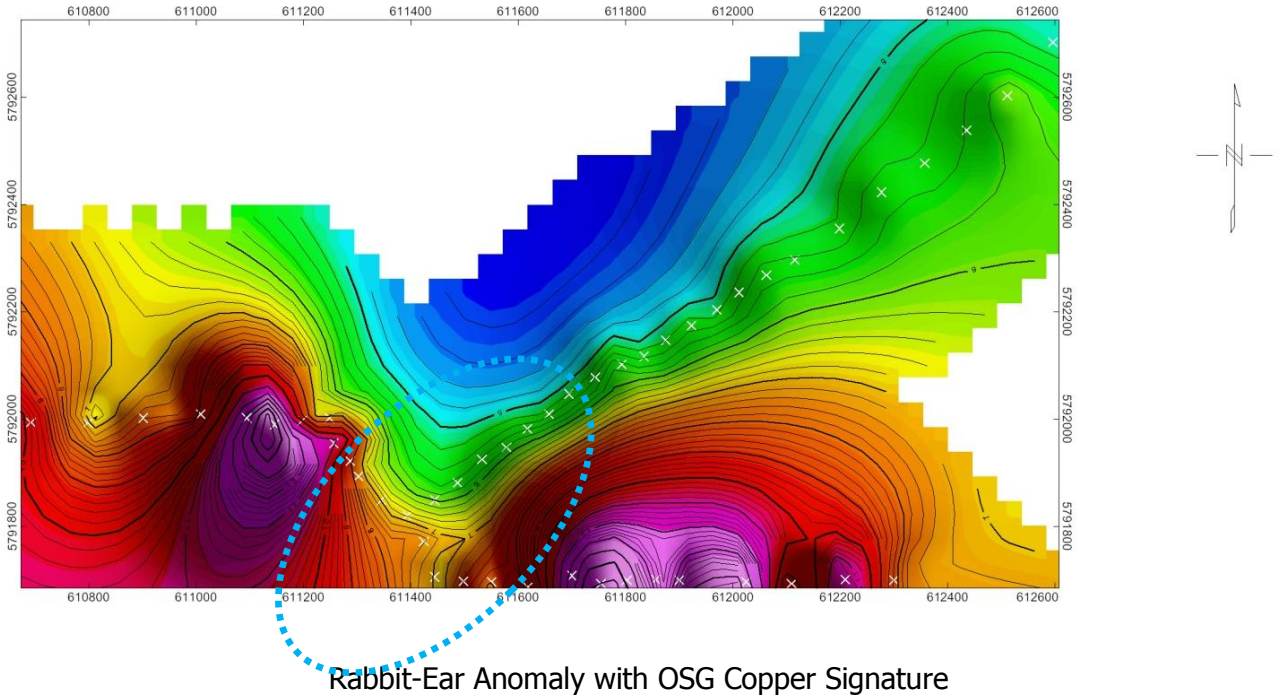
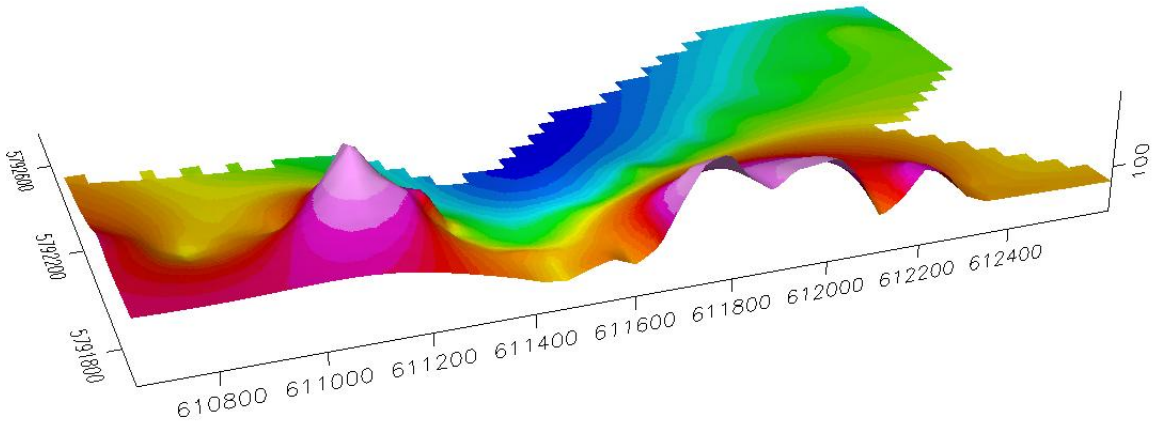
OSG COPPER PATHFINDER CLASS MAP - "EAST SURVEY"



Rabbit-Ear Anomaly with OSG Copper Signature



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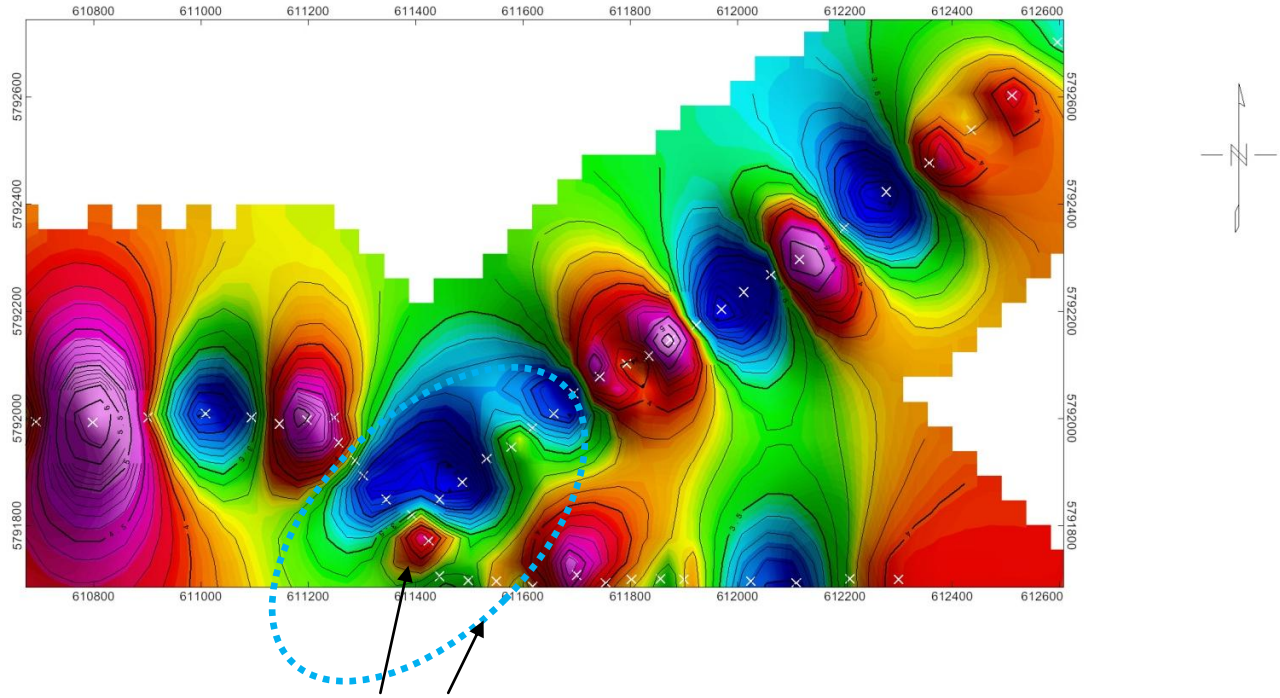
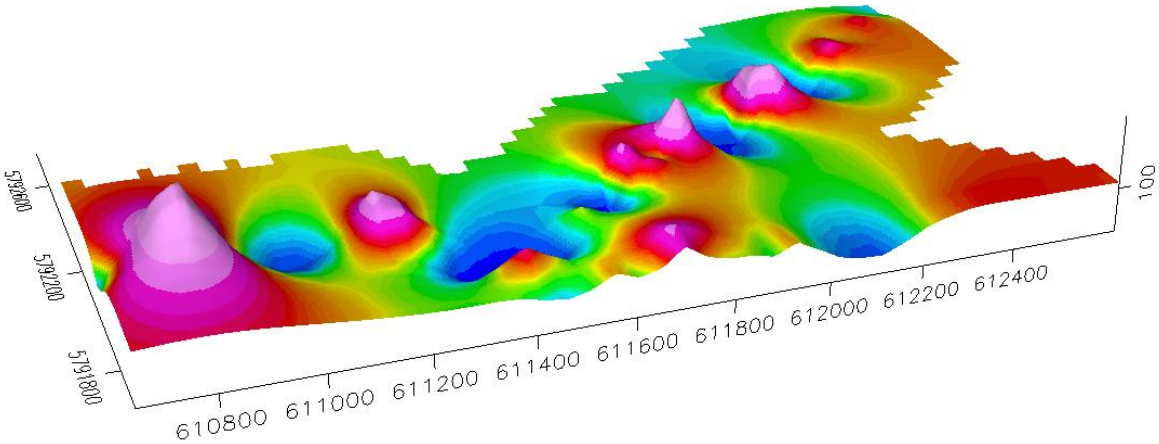
OSG COPPER PATHFINDER CLASS MAP - "EAST SURVEY"





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MDRU-EOS-UBC - GEOSCIENCE BC SURVEY INTERPRETATION FOR "COPPER" MINERALIZATION

"WEST SURVEY"

OSG Copper Pathfinder Class Map – Pages 24: An anomaly is observed with this Sulphur Allotrope. As Organo-Sulphur compounds are generally of higher molecular weight than measured in SGH, due to the size and weight of the Sulphur molecule(s), they are expected to have more dispersed anomalies. This anomaly is either a narrow Rabbit-Ear anomaly or may be essentially apical. OSG relies even more on a survey that can observe more spatial anomalies. OSG does not show well for this very short transect and certainly does not illustrate consistent anomalies to provide a definitive interpretation as well as at the East survey or as well as the SGH results. The anomaly is clearly seen in the 3D view at the bottom of the same page and stands out due to the more rare nature of OSG compounds which adds to their specificity. The dotted blue oval outline has been selected as the common interpretation determined from review of the OSG Pathfinder Class maps illustrated on pages 24, 25 and 26 for the West survey, as well as other OSG Class maps that support and define the complete OSG signature for this survey.

OSG Redox Pathfinder Class Map – Pages 25: An OSG Pathfinder Class as Thiophene Carboxylates is shown in plan and 3D views on page 25. This OSG Class map illustrated a well defined Rabbit-Ear anomaly here and is expected to delineate the Redox conditions present. This interpretation is supported by other OSG Classes. The same dotted blue oval anomaly as the common interpretation falls within the Rabbit-Ear anomaly.

OSG Copper Pathfinder Class Map – Pages 26: This OSG Pathfinder Class as Thiazoles is shown in plan and 3D views on page 26. This nested halo anomaly is actually made up of the smaller bifurcations of the OSG flux originated from this sulphide containing deposit. This is in direct agreement with the latest Redox-Electrochemical Theory presented in 2011. These OSG interpretations may predict that Copper mineralization is present at depth. An estimate of depth has not yet been approximated through the use of OSG. Typically OSG interpretations have both directly confirmed SGH anomalies and interpretations or have provided a different set of anomalies that have been able to better vector to the centre of mineralization. A set of OSG characteristics have not yet been formalized to enable the provision of an OSG Rating as a guideline for clients. As observed with SGH, the anomalies in this West survey may be convoluted by the presence of another signature and the anomaly on page 26 is significantly wider than expected through the review of all of the OSG Class maps at the West survey.

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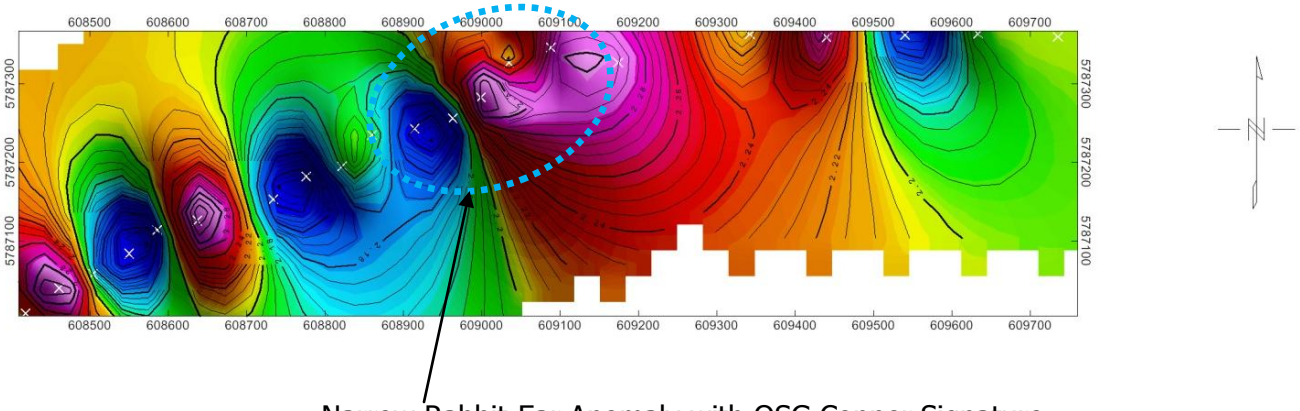
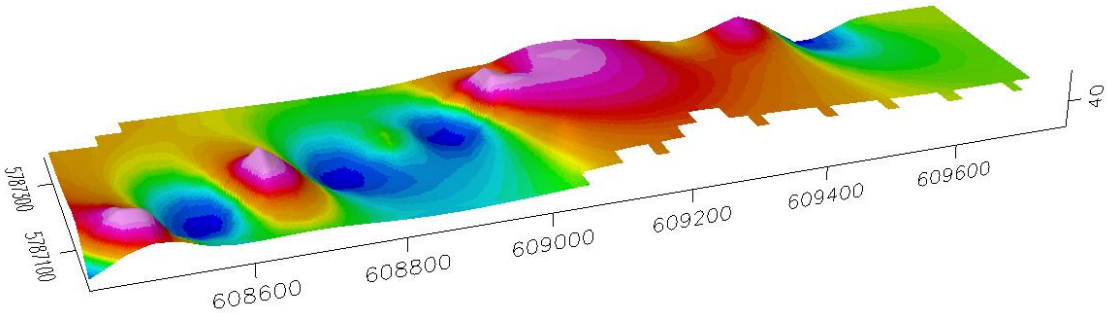
MDRU-EOS-UBC - GEOSCIENCE BC OSG SURVEY
OSG COPPER PATHFINDER CLASS MAP

"WEST SURVEY



Narrow Rabbit-Ear Anomaly with OSG Copper Signature



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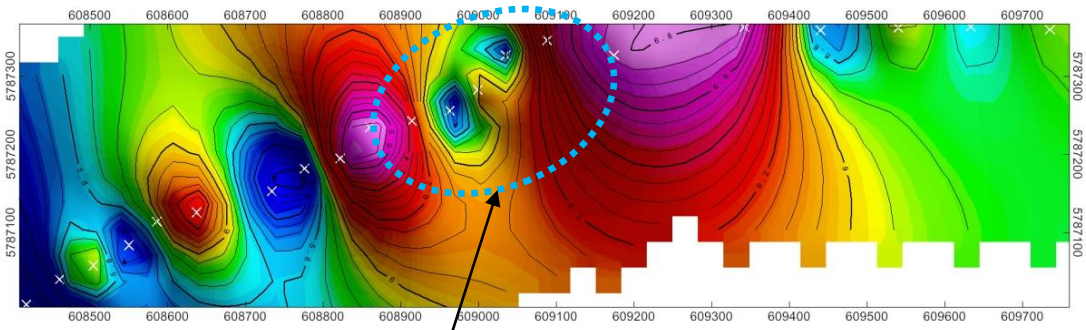
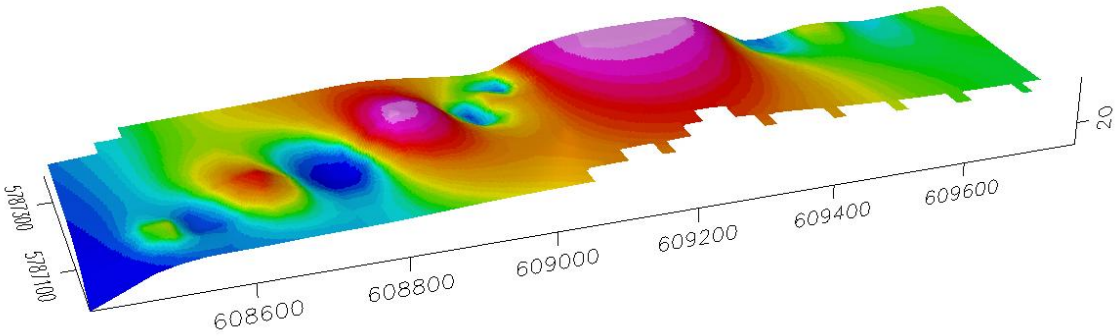
MDRU-EOS-UBC - GEOSCIENCE BC OSG SURVEY
OSG COPPER PATHFINDER CLASS MAP

"WEST SURVEY



Rabbit-Ear Anomaly with OSG Copper Signature



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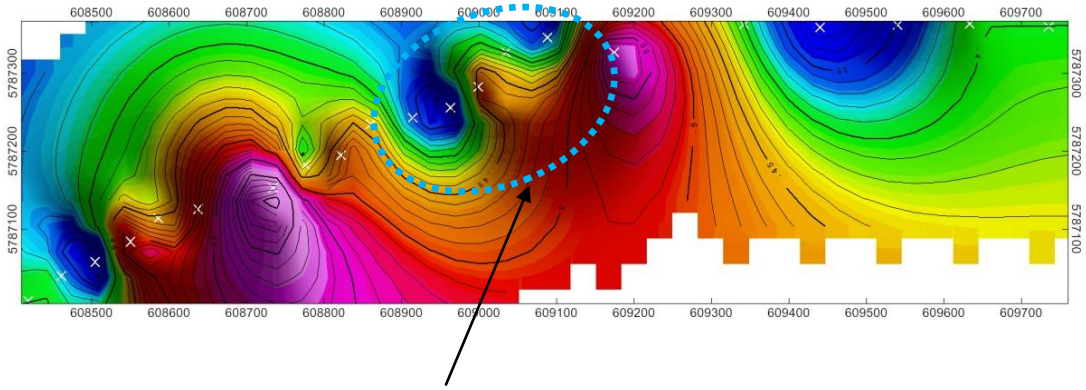
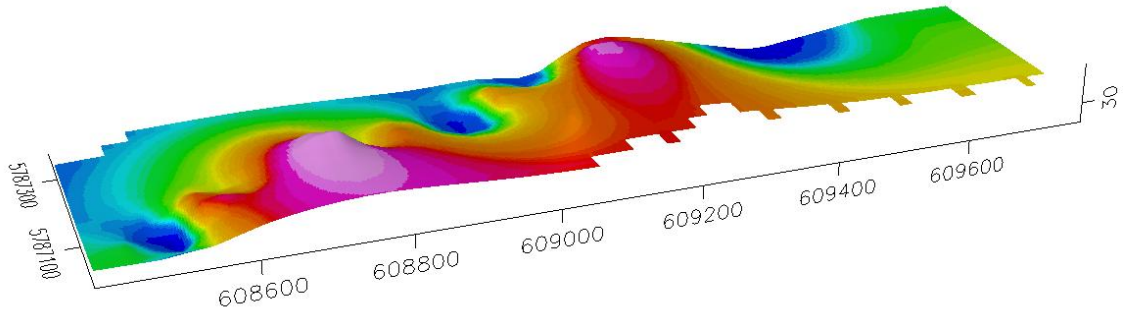
OSG COPPER PATHFINDER CLASS MAP

"WEST SURVEY



Nested-Rabbit-Ear Anomaly with OSG Copper Signature



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MDRU-EOS-UBC - GEOSCIENCE BC SURVEY
OSG SURVEY INTERPRETATION FOR COPPER MINERALIZATION

"EAST SURVEY": Using only this OSG data, there is predicted to be Copper mineralization within the same dotted blue interpretive outline as shown on pages 20, 21, and 22. The OSG results at the East survey compares well to results from over known Copper mineralization reviewed in several case studies in the development stage of OSG. The results also agree well with SGH. Note that OSG does not have to be requested or analyzed in conjunction with SGH. It is believed from the results seen to date for this new geochemistry that OSG will provide new information to support the exploration of surveys. In some surveys it has been observed to provide very strong symmetry and vectoring capabilities to perhaps provide even better drill targeting and thus reduce the high cost of these programs.

"WEST SURVEY": OSG was not observed to work very well at the West survey, however, this does not mean that it did not perform well; there are just not enough samples locations to provide the data to be able to see the spatial anomalies detected from this OSG geochemistry. There was still some consistency with the dotted blue interpretive outline as shown on pages 24, 25, and 26. As OSG can have patterns of anomalies that are somewhat more dispersed than that of SGH, the single transect provides less information for OSG than for SGH.

NOTE: The interpretation procedure for the West Survey purposely followed the same interpretation, i.e. used the same OSG classes as was used for the East Survey. This however does not mean that there were no other OSG anomalies or better OSG anomalies to agree with the dotted blue oval interpretation at the West survey. An example is illustrated on page 28 for a class of Sulphonyl-Phenols that provided a very definitive anomaly similar to a nested-Rabbit-Ear anomaly although data is lacking to the north of the centre of this transect. This anomaly is clean from background, due to its very rare nature and thus high level of specificity.

Any discussion or identification of a drill target(s) is not an explicit recommendation by Activation Laboratories Ltd. to drill test the associated OSG anomaly. A drill target is implied to ensure that the reader is aware of the location having the highest confidence of being the location of the vertical projection of the mineralization, based only on OSG data. This is also not a recommendation for vertical drilling. Vertical drilling may not be the best approach to test the OSG anomaly in this area. Activation Laboratories Ltd. has no experience in actual exploration drilling technique.

It must be remembered that several other OSG Class maps not shown in this report have also been reviewed to support the interpretation shown. Other geological, geochemical and/or geophysical information should always be considered. This is not a statement to convey some lower level of confidence in OSG results. This statement is made to recognize the proper use and interpretation of any scientific data. Whenever possible, multiple methods should always be employed so that any decisions do not rely on any one technique.

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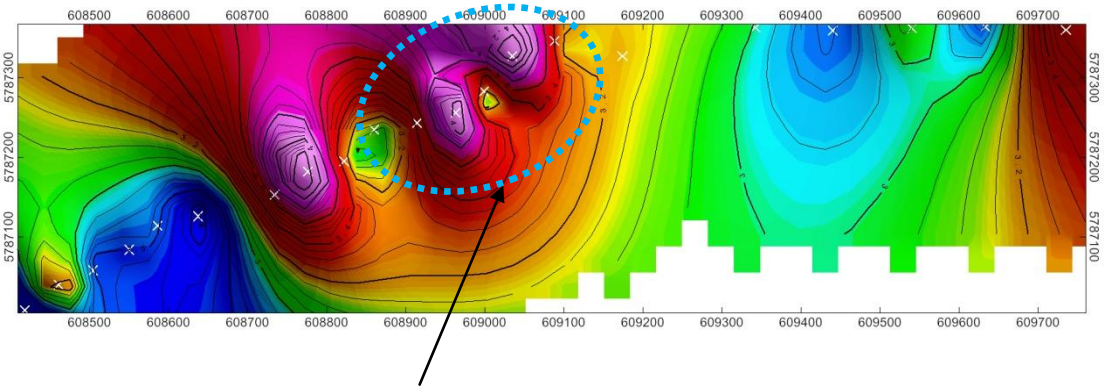
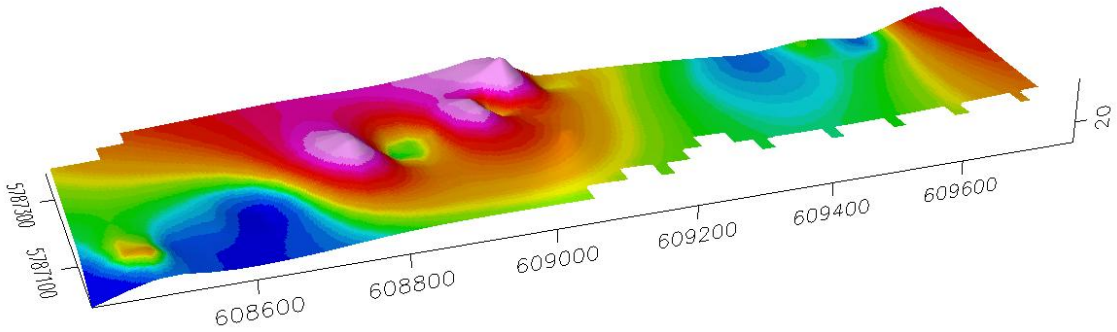
MDRU-EOS-UBC - GEOSCIENCE BC OSG SURVEY
OSG COPPER PATHFINDER CLASS MAP

"WEST SURVEY



Possible Nested-Rabbit-Ear Anomaly with OSG Copper Signature



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MDRU-EOS-UBC – GEOSCIENCE BC OSG SURVEY RECOMMENDATIONS

A short recommendation section is standard to OSG reports. It would be suggested in these studies that potential infill samples to fill in the quadrants between each transect at the East survey may confirm the OSG interpretation discussed in this report. It would be highly recommended that additional samples be taken at the West survey perhaps as a series of transects to the north and south of the transect discussed in this report. A Rating is given since it is known that this is a research study. Had this been a typical submission from a client an OSG Rating would not be given to further underline the need for more data from the results of additional sample locations. The results of any additional infill sampling, which could be combined with the surveys discussed in this report, may improve the OSG Rating relative to the confidence of the interpretation for Copper at the West survey in particular.

Please refer to the general recommendations for additional or in-fill sampling for OSG in the next section if this is considered.

Note that these OSG analyses were completed by July 26th and typically this OSG interpretation report would be provided within one week of analysis. This report was purposely delayed so that the new Organo-Sulphur Geochemistry (OSG) could be analyzed, deliverables refined, interpreted and reported at the same time.

GENERAL RECOMMENDATIONS FOR ADDITIONAL OR IN-FILL SAMPLING FOR SGH OR OSG ANALYSIS

Based on the results of this report and/or other information, the client may decide that in-fill sampling may be warranted. To obtain the best results from additional sampling for SGH or OSG it is recommended that sample locations within, or bordering, the area of interest be re-sampled rather than just combining new sample results with the sample data from the initial survey. Although several SGH surveys have previously been easily and directly, combined without data leveling, it cannot be guaranteed that data leveling will not be required. It has been found that data leveling is more apt to be required should the new samples be collected under significantly different environmental conditions than during the initial sample survey, i.e. summer collection versus winter collection. The process of data leveling adds a minimum of 3 to 5 days of work to conduct the additional data evaluation, develop additional plots of the results, conduct new interpretations, and in additional report descriptions. Results from data leveling is also always considered "an approximation", thus the confidence in a combined interpretation will be lower that the interpretation from samples collected during one excursion to the field and submitted as one survey. As of September 2010, an additional cost will be invoiced should data leveling operations be required if the client requests that multiple data sets be interpreted and reported together. Thus re-sampling a few of the original sample locations will provide a faster turnaround time for results and provide more accurate and confident surveys for evaluation and aid in deciding specific drill targets.

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Cautionary Note Regarding Assumptions and Forward Looking Statements

The statements and target rating made in the Soil Gas Hydrocarbon (SGH) interpretive report or in other communications may contain certain forward-looking information related to a target or SGH anomaly.

Statements related to the rating of a target are based on comparison of the SGH signatures derived by Activation Laboratories Ltd. through previous research on known case studies. The rating is not derived from any statistics or other formula. The rating is a subjective value on a scale of 0 to 6 relative to the similarity of the SGH signature reviewed compared to the results of previous scientific research and case studies based on the analysis of surficial samples over known ore bodies. No information on other geochemistries, geophysics, or geology is usually available as additional information for the interpretation and assignment of a rating value unless otherwise stated. The rating does not imply ore grade and is not to be used in mineral resource estimate calculations. References to the rating should be viewed as forward-looking statements to the extent that it involves a subjective comparison to known SGH case studies. As with other geochemistries, the implied rating and anticipated target characteristics may be different than that actually encountered if the target is drilled or the property developed.

Activation Laboratories Ltd. may also make a scientifically based reference in this interpretive report to an area that might be used as a drill target. Usually the nearest sample is identified as an approximation to a "possible drill target" location. This is based only on SGH results and is to be regarded as a guide based on the current state of this science.

Unless stated, Activation Laboratories Ltd. has not physically observed the exploration site and has no prior knowledge of any site description or details. Actlabs makes general recommendations for sampling and shipping of samples. Unless stated, the laboratory does not witness sampling, does not take into consideration the specific sampling procedures used, season, handling, packaging, or shipping methods. The majority of the time, Activation Laboratories Ltd. has had no input into sampling survey design. Where specified Activation Laboratories Ltd. may not have conducted sample preparation procedures as it may have been conducted at the client's assigned laboratory. Although the Company has attempted to identify important factors that could cause actual actions, events or results to differ scientifically which may impact the associated interpretation and target rating from those described in forward-looking statements, there may be other factors that cause actions, events or results not to be as anticipated, estimated or intended.

In general, any statements that express or involve discussions with respect to predictions, expectations, beliefs, plans, projections, objectives, assumptions, future events or performance are not statements of historical fact. These "scientifically based educated theories" should be viewed as "forward-looking statements".

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Readers of this interpretive report are cautioned not to place undue reliance on forward-looking information. Forward looking statements are made based on scientific beliefs, estimates and opinions on the date the statements are made and the interpretive report issued. The Company undertakes no obligation to update forward-looking statements or otherwise revise previous reports if these beliefs, estimates and opinions, future scientific developments, other new information, or other circumstances should change that may affect the analytical results, rating, or interpretation.

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Date Submitted at Actlabs Ancaster: July 12 and July 17, 2012

Date Analyzed: August 16, 2012

OSG Interpretation Report: August 31, 2012

MDRU-EOS-UBC

University of BC

6339 stores road, Vancouver, BC

V6T 1Z4

Attention: Thomas Bissig

RE: GEOSCIENCE BC Survey – Interpreted for Copper Based Targets

Activation Laboratories Workorder: A12-07481 & A12-07656

CERTIFICATE OF ANALYSIS

This Certificate applies to the associated Excel Spreadsheet of Hydrocarbon results combined with the discussion and SGH Pathfinder Class maps of the data shown in this report.

79 samples were submitted for analysis.

Sample preparation was completed at Actlabs Ancaster facility:
Code S4 – Drying at 40°C, Sieving -60 mesh

The following analytical package was requested:
Code OSG – Organo-Sulphur Geochemistry

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REPORT/WORKORDER: A12-07481/A12-07656

This report may be reproduced without our consent. If only selected portions of the report are reproduced, permission must be obtained. If no instructions were given at the time of sample submittal regarding excess material, it will be discarded within 90 days of this report. Our liability is limited solely to the analytical cost of these analyses. Test results are representative only of the material submitted for analysis.

Notes: The SGH – Soil Gas Hydrocarbon Geochemistry is a semi-quantitative analytical procedure to detect and measure 162 hydrocarbon compounds as the organic signature in the sample material collected from a survey area. It is not an assay of mineralization but is a predictive geochemical tool used for exploration. This certificate pertains only to the SGH data presented in the associated Microsoft Excel spreadsheet of results.

The author of this SGH Interpretation Report, Mr. Dale Sutherland, is the creator of the SGH organic geochemistry. He is a Chartered Chemist (C.Chem.) and Forensic Scientist specializing in organic chemistry, and a member of The Association of the Chemical Profession of Ontario, the Association of Applied Geochemists, and the International Association of GeoChemistry. He is not a professional geologist or a professional geochemist.

CERTIFIED BY:

Dale Sutherland, B.Sc.,B.Sc.,B.Ed.,C.Chem.

Forensic Scientist, Organics Manager,

Director of Research

Activation Laboratories Ltd.

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