Hy-Grade Geoscience
Environmental and Earth Science Investigations

Bay St. George, Newfoundland and Labrador, Salt and Potash Resource Assessment

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TABLE OF CONTENTS

PAGE

LIST OF TABLES
APPENDIX A.

LIST OF FIGURES
APPENDIX B.

Cover Photo: Flat Bay #2 well head, Flat Bay, Newfoundland and Labrador. The photo taken by the author during a site visit on April 11, 2011. Note that the Flat Bay #2 well was constructed as part of the Vulcan petroleum exploration program, however, the well intersected over 200 metres of evaporate stratigraphy.

1.0 EXECUTIVE SUMMARY

This Executive Summary is subject to the same standard limitations as contained in the report and must be read in conjunction with the entire report.

The Bay St. George Sub-Basin is the northeastern extension of the Maritimes Basin. The Maritimes Basin is comprised of a series of sub-basin and highland structures which accumulated dominantly non-marine clastic rocks. The only demonstratable marine incursion into the basin occurred during the Carboniferous time and resulted in the deposition of a complex cyclic succession of carbonate, evaporate and clastic sediments. The present distribution of these rock units represents the erosional remnants of these sub-basin and arch or uplift structures.

In the Bay St. George Sub-Basin, salt deposits, including potash mineralization, are found within the Codroy Group. Since the 1960's, the sub-basin has been intermittently explored for evaporates (salt and potash) initially based on brine springs and then on the results of regional and detailed gravity surveys. The drilling of these negative bouguer gravity anomalies has confirmed the occurrences of salt as well as potash (sylvite, with carnallite and trace polyhalite) mineralization. The exploration work, undertaken by Vulcan Minerals Inc., although targeted to evaluate the petroleum potential of the stratigraphic section underlying the evaporate rocks, has identified a significant evaporate occurrence, including salt and potash.

Vulcan's discovery area, termed the Captain Cook area, is not defined by a negative bouguer gravity anomaly and this may provide a new model for evaporate exploration in the sub-basin. The salt occurrence, approximately 200 m below grade and 250 m thick extending over 2 km between drillholes, is controlled by the basin margin on the southwest and is open on the northeast. This area may have rock salt development potential.

The Captain Cook #1 well also intersected a potash ore zone (sylvite with minor carnallite), which may be stratigraphically representative of the middle halite, potash zone. The halite overlying, within and underlying the ore zone shows indications of halokenetic salt flow which may indicate thinning or shortening of the sequence. It is suggested that this could indicate that the main potash ore zone, may be preserved or thickened adjacent to this area, most probably to the northeast. That new model may provide a target for future exploration.

The satellite anomalies east and southwest of the Fischells Brook negative gravity anomaly, also within the Vulcan licence block, have not been tested for potash potential. Based on the historical potash intersections in the area and the interpreted structure of the deposit, these areas, on the flanks of the structure, may also be attractive potash exploration targets.

An exploration program including of the construction of a minimum of two (2) cored drillholes in the Captain Cook area is recommended. The drillholes should be cored from surface to TD and should target the base of the evaporate sequence at the Ship Cove Limestone / Fischells Conglomerate. Based on the success of the drilling program, a follow-up, high resolution, evaporate specific, seismic program is also recommended. Consideration should also be given to drilling the satellite Fischells Brook targets.

2.0 INTRODUCTION AND TERMS OF REFERENCE

2.1 Introduction

This report has been prepared by David C. Carter, P.Geo., of Hy-Grade Geoscience Ltd. (Hy-Grade) as retained by and for the sole and exclusive benefit of Vulcan Minerals Inc. (Vulcan) of St. John's, Newfoundland and Labrador. Hy-Grade is an environmental and earth science consulting firm based in Nova Scotia. Both the firm and Mr. Carter have extensive experience with the exploration, investigation, feasibility and development of evaporate (salt and potash) deposits. Mr. Carter has previously been involved in the exploration work (including mapping, surveying, drilling, feasibility and development planning work) undertaken in the Bay St. George Sub-Basin.

This report is based on information, present and available in the public domain; published and unpublished data from the author's personal files; and public and confidential data provided to and/or supplied by Vulcan, as indicated in this report, and it applies solely to the site conditions existing at the time of the investigation.

Hy-Grade was retained by Vulcan to prepare an evaluation of the salt and potash resource potential of the Bay St. George area, western Newfoundland and Labrador, with specific reference to the Vulcan Minerals Inc. claim group.

Hy-Grade is aware that Vulcan has requested this report in support of disclosure and filing requirements with the Canadian Securities Regulators. This report has an effective date of May 31, 2011.

Hy-Grade completed a site visit to the subject lands on April 11, 2011 and visited the Vulcan office to review files, maps and reports on April 12, 2011. No intrusive investigations were undertaken, no samples were obtained and no analytical work completed as part of this investigation.

This investigation / resource evaluation was performed in cooperation with and assistance from Vulcan Minerals Inc. staff, in order to prepare a National Instrument 43-101 compliant, preliminary assessment / resource evaluation report of its mineral claim block properties located in western Newfoundland, Bay St. George area.

The scope of work for the report included the assessment of salt and potash, including tonnage estimates (where applicable) and resource estimates (if applicable), as defined by the national instrument. The report work was also defined to include a proposed exploration program (if required). The assessment work included a combination of historical and recent exploration data as identified and made available by Vulcan Minerals staff and from the author's personal files and records as well as a site visit to the claim area and the Geological Survey of Newfoundland and Labrador, A.K. Snelgrove, Mineral Core Library in Pasadena.

David C. Carter, P.Geo., Senior Geoscientist with Hy-Grade Geoscience, accompanied by Stephen Emberley, P.Geo, Geologist with Vulcan Minerals Inc., visited the subject area, as well as the mineral core storage library facility, on April 11, 2011. Reports, files, maps, and sections, etc. were reviewed at the Vulcan Minerals Inc. office in St. John's, Newfoundland and Labrador on April 12, 2011.

2.2 Reference

Salt, or rock salt, is the general term used to describe halite or sodium chloride (NaCl). The analysis and evaluation of rock salt is usually referenced to the ASTM standard which requires a minimum grade of 95% NaCl for rock salt product. Chemical salt requires NaCl in excess of 99%.

Potash is the generic term that includes several potassium salts, of which the most important is the mineral sylvite or potassium chloride (KCl). Sylvinite is the whole rock term used to describe a sylvite-bearing rock, which normally is a mixture of sylvite and halite, sometimes with carnallite ($KClMgCl_2.6H_20$) and other high-order salts. Carnallitite is the whole rock term used to describe the rock where carnallite is the dominant evaporate mineral.

2.2.1 Salt Production and Uses

The annual production of salt in Canada is approximately 13.5 million tonnes, of which approximately 80% is produced as rock salt. Approximately 75% of Canada's rock salt production is located in southwestern Ontario (6.5 million tonnes from the IMC, Goderich Mine and 2.7 million tonnes from the Canadian Salt Co., Ojibway Mine). In eastern Canada, rock salt is produced from the Canadian Salt Co. mines located at the Madeliene Islands, P.Q., (1.7 million tonnes) and at Pugwash, N.S. (1.2 million tonnes). Salt is also produced by the Potash Corporation of Saskatchewan in New Brunswick (700,000 tonnes) as a by-product of potash mining. Sifto Canada Inc. - IMC produces chemical and table salt (100,000 tonnes) at a brining operation located at Nappan, N.S.

The salt production in the US is approximately 45 million tonnes, of which approximately 32% is rock salt. To accommodate demand, the US imports approximately 8 to 9 million tonnes of salt per year. Canada accounts for approximately one third of this volume. Other suppliers of salt to the US market are Chile, Mexico, the Bahamas, Peru, and the Netherlands Antillies.

The two largest end uses of salt in Canada and the US are for road de-icing and chloralkali manufacture. In the chloralkali industry, salt is usually supplied as brine, often from a captive, local source, owned or under contract to the production facility. Road de-icing salt, rock salt, must meet certain physical specifications which allow the product to be compatible with standard application equipment.

Contracts to supply de-icing salt are generally to public or municipal customers. These customers generally have limited handling and storage facilities. Therefore, the salt supply contracts often are for relatively small volumes of rock salt and are sensitive to pricing. Salt is normally purchased on a delivered basis and transport costs can often make up the majority of the price.

The main influences on the annual rate of consumption of road de-icing salt in Canada and the US include weather conditions, local preferences and the demand for, availability and success of competing materials such as calcium chloride. The environmental impact of salt run-off from road de-icing operations on potable groundwater supplies has been a concern, however, salt is still considered the most cost-effective de-icing material. Cost and availability of alternatives such as potassium, calcium and magnesium chloride limit their use as de-icing agents.

Rock salt for road de-icing, is required to meet the ASTM designation (D632-72 Standard Specification for Sodium Chloride). The rock salt is normally crushed, screened and sized and must have a purity (NaCl content) of 95%. Ferric ferrocyanide (Prussian Blue) or sodium ferrocyanide (Yellow Prussiate of Soda) is used to prevent the salt from caking. Rock salt for de-icing is marketed as one of two grades; Grade 1, less than 12.5 mm (1/2 inch); and Grade 2, less than 19.0 (3/4 inch). The fines content of the product is also controlled (greater than 600um).

2.2.2 Potash

Potash is normally graded for fertilizer expressed in oxide form, as percent K_2O equivalent. The conversion constant to convert KCl to K_2O equivalent is 63.14% or 0.6341. Potash fertilizer is milled and concentrated from the raw ore to greater that 95% pure KCl.

A table of the principal or most commonly occurring salt and potash minerals, are presented in Table 1.

Table 1. Principal Salt and Potash Minerals (after Borchart and Muir, 1964)

Mineral	Formula	K_2O (%)	Na (%)	K (%)	Mg (%)	Cl (%)	H_2O (%)
halite	NaCl	-	39	-	-	61	-
sylvite	KCl	63	-	52	-	48	-
carnallite	$KClMgCl_2.6\ H_2O$	17	-	14	9	38	39

Several accessory evaporate minerals, excluding limestone, dolomite and magnesite which are not normally considered as evaporate deposits, are the calcium sulphates gypsum ($CaSO_4.2\ H_2O$) and anhydrite ($CaSO_4$) which are volumetrically important. Next in order of abundance is rock salt followed by the much scarcer, high order (by solubility) potash salts. Sylvite and carnallite as well as langbeinite ($K_2SO_4.2MgSO_4$) and kainite (4KCl.4Mg SO4.11H_2O) are the most important, however, polyhalite

($Ca_2K_2Mg(SO_4)_4.2H_2O$), bischofite ($MgCl_2.6H_2O$) and tacyhydite ($CaMg_2Cl_6.12H_2O$), as minor accessory minerals, have been reported in eastern Canada and are, in some world deposits, economically important.

The Potash Corporation of Saskatchewan (PCS) owns and operates a potash mine at Penobsquis, New Brunswick. This mine has been in production since 1983 and has hoisted over 46 million tonnes of potash ore to produce over 15 million tonnes of potash product. The concentration ratio of tonnes-of-ore-mined to tonnes-of product-shipped over the life of the mine is 3.06 (Moore et al, 2008).

The potash unit at the Penobsquis Mine is a steeply dipping bed which is over 20 m thick in places. The mine method is cut-and-fill, with mill tailings used as fill, at depths ranging from 300 to 700 m below grade. The tonnage-weighted average raw-ore grade observed over the life of the mine is 23.24 % K_2O equivalent (Moore et al, 2008).

PCS is currently developing a second New Brunswick potash mine, the Picadilly Mine, located approximately 800 m south of the Penobsquis Mine. The feasibility and planning work has been completed and the project is currently sinking service and production shafts, in excess of 950 m depth below grade. The estimated proven plus probable reserve is 195.9 million tonnes with an average grade of 24.6 % K_2O equivalent over an average thickness of 7.9 metres.. The mining operation has a planned capacity of 2 million tonnes per year of potash product at a mining rate of 5.6 to 6.4 million tonnes per year mined and hoisted. This will provide a mine life of 30.6 to 35.0 years (Moore et al, 2008).

The Picadilly potash deposit comprises two potash units and it ranges from steeply dipping to flat lying. The mining plan includes production from the steeply dipping areas using the cut and fill method as at Penobsquis and the flay lying sections will be mined using a variation of the long-room and pillar mining method using continuous boring / mining machines. The thickness of the potash unit will permit a two-pass bench (undercut) method similar to the mining method used at the Denison-Potacan Mine at Cassidy Lake, New Brunswick (Moore et al, 2008).

Potash is sold into the world market as a primary and essential agricultural nutrient for commodities such as rice, soybeans, corn, palm oil, sugar cane, rubber, bananas, oranges and coffee. Potash is also marketed to offshore industrial users (Moore et al, 2008).

3.0 DISCLAIMER – STANDARD LIMITATIONS – RELIANCE ON OTHER EXPERTS

In the preparation of this report, Hy-Grade has relied on historical reports, opinions and statements as provided by Vulcan and not prepared under its supervision. Therefore, Hy-Grade cannot attest to the accuracy or take responsibility for the historical data.

Hy-Grade Geoscience warrants that this work was performed in general compliance with National Instrument 43-101 and Form 43-101F1 (June 30, 2011) as well as currently acceptable practices for geoscience investigations, and specific client requests. This report was prepared to meet the requirements of National Instrument 43-101 (June 30, 2011) for the exclusive use of Vulcan Minerals Inc. It is based on a study undertaken on behalf of Vulcan. Information for this investigation is available through public sources, or has been obtained by Vulcan, or generated by Vulcan, and is considered privileged and confidential.

The assumptions and estimates indicated in this report should be considered generic based on the preliminary stage of the exploration and/or evaluation in the Vulcan claim group area of the Bay St. George Sub-Basin. Consequently, no comments or opinions regarding grade, tonnage, valuation, revenue, expenses, etc., have been made, advanced or presented. There is no reference given, provided, intended or inferred with respect to “ore”, “reserve” or “resource”.

This report is intended as a summary and interpretation of basic information which may form the basis for additional geoscience (geological, geophysical), engineering and economic studies and/or analysis.

Hy-Grade Geoscience disclaims responsibility of consequential financial effects on transactions or property values, or requirements for follow-up actions and costs. No other warranties are implied or expressed.

Hy-Grade Geoscience makes no other representations whatsoever, including those concerning the legal significance of its findings, or as to other legal matters touched on in this report, including, but not limited to, ownership of any property, or the application of any law to the facts set forth herein. With respect to regulatory compliance issues, regulatory statutes are subject to interpretation and these interpretations may change over time.

4.0 PROPERTY DESCRIPTION AND LOCATION

Vulcan Minerals Bay St. George Property is located in Western Newfoundland, Canada (NTS sheets 12B/01, 12B/02, 12B/07 & 12B/08), approximately 50 kilometres southeast of the town of Stephenville. There are several small communities located adjacent to the property including St. Georges, Flat Bay, Robinson’s, Jeffrey’s and Heatherton, with some of the municipal boundaries extending into the licence area. The property consists of 11 contiguous mineral licences (6107M, 8838M, 10069M, 11159M, 11160M, 12669M, 17955M, 17956M, 18054M, 18929M & 19059M), consisting of 1195 map staked claims, covering a total area of 298.75 km^2. All licences are owned 100% by Vulcan Minerals, and as such Vulcan holds the exclusive right to explore for minerals within their boundaries but does not hold any surface rights to the property. A summary of the Vulcan Mineral Licences and their status, as of May 31, 2011, is presented in Table 2 (Appendix A).

To the author’s knowledge, there are no environmental liabilities applicable to the Bay St. George property, and no exploration permits are currently in place. For any further work to be carried out on the property exploration approval must be obtained from the provincial Department of Natural Resources and all provincial and federal conditions, acts or regulations complied with. Vulcan has obtained exploration approval in the past and there is no reason to assume that they would not be granted exploration approval in the future. A summary of approvals that may need to be obtained can be found below and it should be noted that 4-6 weeks should be allowed to acquire the necessary approvals.

1. **Exploration Approval Permit:** This permit would cover prospecting, rock and soil geochemistry, line cutting, trenching, bulk sampling, airborne &/or ground geophysical surveys, fuel storage, ATV usage, diamond drilling, etc.

2. **Timber Rights Permit:** This permit would cover the removal of timber for line cutting, diamond drilling site preparation, trenching, etc.

3. **Temporary Water Use Permit:** This permit would allow the use of water, from a specified location, for camp and drilling related needs.

4. **License to Occupy:** This would be required if a camp location was to be used for a period of time longer than that which was allowed as part of the Exploration Approval. This permit is obtained from the Provincial Department of Crown lands.

Mineral exploration licences are issued by the Newfoundland and Labrador Department of Natural Resources and must be registered with the Mineral Claims Recorders Office. Licences are comprised of 500 m^2 single claim blocks which are based on one-quarter of a Universal Transverse Mercator (UTM) grid square. Licences are acquired via map staking using an online system and are referenced using UTM coordinates for the corner points in a relevant map projection. A maximum of 256 contiguous claims can be covered by one exploration licence. The fees for staking are comprised of a $10/claim claim staking fee as well as $50/claim security deposit, which is refunded upon completion of the 1st year assessment requirements. Each licence is issued for a 5 year term and may be held for a maximum of 20 years, with renewal fees due on the anniversary date in assessment years 5, 10 and 15. In order for claims to remain in good standing, assessment expenditures must be met for each year, with a report summarizing work completed due annually. A summary of the renewal fees and expenditure requirements can be found in the table below.

Assessment Year	Renewal Fees	Minimum Expenditure Required
1	N/A	$200/claim
2	N/A	$250/claim
3	N/A	$300/claim
4	N/A	$350/claim
5	$25/claim	$400/claim
6 through 10	$50/claim (Year 10)	$600/claim
11 through 15	$100/claim (Year 15)	$900/claim
16 through 20	N/A	$1200/claim

Figure 1 (Appendix B) shows the outline of the Maritimes Basin, extending from southwestern Newfoundland, underlying the Gulf of St. Lawrence, northern mainland and Cape Breton Island areas of Nova Scotia and southern and central New Brunswick. The location of the Sussex area in southern New

Brunswick is also noted on Figure 1. This area is host to several potash developments; one operating mine (Penobsquis), one mine under development (Picadilly) and one former mine (Cassidy Lake). The New Brunswick government has recently released a request for proposals for exploration and development of a fourth potash deposit (Millstream), also in this area.

Figure 2 shows a 1:250,000 scale location map of southwestern Newfoundland with the Vulcan mineral licences highlighted (the project area). The Town of Stephenville is also highlighted for location. Note the proximity to ice-free deep water shipping and the network of highways and access roads.

ACCESSIBILITY, CLIMATE, LOCAL RESOURCES, INFRASTRUCTURE AND PHYSIOGRAPHY

The area is developed and relatively sparsely populated with numerous small communities situated along the coastal plain or Highway #1 which connects Channel-Port aux Basques in the south (approximately 100 km from the subject claim block area) with Corner Brook in the north (approximately 60 km).

Passenger and air freight access is provided with services into Stephenville (approximately 50 km from the claim block) and Deer Lake (approximately 100 km from the claim block area, 40 km north of Corner Brook). Year-round ferry service from Nova Scotia docks at Channel-Port aux Basques. Marine terminal facilities are also located at Stephenville, less than 50 km from the claim block and St. Georges, less than 5 km from the claim block. These are ice-free ports with the ability to accommodate vessels in excess of 50,000 tonne capacity.

Road access within this corridor is good. The availability of electrical power to the area of the subject claim group is also good with a 138 kVolt transmission line crossing the company's claims and a 230 kVolt transformer station nearby.

The area of the Bay St. George Sub-Basin, southwestern Newfoundland west of the Long Range Mountains (600 to 800 m range), is comprised of rolling hills and a broad plain typical of the Appalacian Region. It is characterized with variable thickness of sandy to stony glacial till cover which is draped on the flanks of bedrock outcrop. The area can be classified as northern boreal climatic zone with dramatic seasonal variations, somewhat modified by its near-ocean location. Winter conditions, including freezing conditions and thick snow cover can be expected from November through March. Spring and fall seasons are cool with frequent precipitation. Summer conditions can be expected from June through September. The daily mean temperature, recorded for Stephenville (1971 through 2000), for August was 16.2^0C with a maximum of 29.9^0C. Similarly, the average daily February temperature was -3.2^0C with a minimum temperature of -29.5^0C. The average yearly precipitation total is 1,392 millimeters.

Access to most areas of the Bay St. George Sub-Basin is reasonable, given the limitations of travel on secondary or woods roads during the spring (weight related travel restrictions). Winter operations can be subject to high snowfall events and extreme temperature conditions.

6.0 HISTORY

6.1 Summary of Regional Exploration

The Bay St. George Sub-Basin represents the northeastern extension of the Maritimes Basin. The Maritimes Basin is a large scale, post-orogenic, successor-type basin represented by a series of sub-basin and highland structures extending from southeastern New Brunswick, the northern mainland and Cape Breton Island areas of Nova Scotia, underlying most of the Gulf of St. Lawrence and extending onto southwestern Newfoundland as the Bay St. George Sub-Basin.

The Maritimes Basin accumulated a sequence of non-marine, marine, and non-marine sediments from Late Devonian to Early Permian time. Figure 3 presents a generalized stratigraphic table, focused on the evaporate-bearing, Early Carboniferous, Visean-age Windsor (mainland) and Codroy (Newfoundland) groups. The present distribution of these sedimentary units represents the erosional remnants of a complex series of sub-basin and arch or uplift structures. The only demonstrable marine incursion into the basin occurred during Visean time during which a complex cyclic succession of carbonate, evaporite and clastic sediments were deposited.

Carboniferous rocks in the Bay St. George Sub-Basin cover an area approximately 22 km wide by 125 km long, totalling approximately 2,700 square kilometres (Knight, 1983). The Carboniferous sedimentary rocks lie unconformably on pre-Carboniferous anorthosites and mafic gneisses of the Long Range Complex. These rock units are represented by the basal, non-marine Anguille Group (equivalent to the Horton Group in Nova Scotia and New Brunswick), the medial, marine, evaporate-bearing, Codroy Group (Windsor Group equivalent) and upper, non-marine, Barrachois Group (Mabou Group equivalent).

Deformation of the Carboniferous strata, including regional compression and tilting, has resulted in broad, open folds with northeast trending axes, as well as normal and reverse faulting. The timing of the deformation may have contributed to, or in part been the result of, halotectonic or halokenetic effects (salt tectonism).

The mainland equivalent of the Codroy Group, the Windsor Group, is the host for several evaporate developments including several open pit gypsum mines, the Pugwash (underground) and Nappan (solution) salt mines, the former Malagash (underground) salt mine, the operating Penobsquis (underground) salt and potash mine, the under development Picadilly (underground) potash mine, as well as the former Cassidy Lake (underground) potash mine. There are several other deposits / occurrences where salt, with or without potash, has been reported from the Carboniferous Windsor Group strata.

Brine seeps and salt water wells have been known in the Bay St. George region for many years. The exploration for evaporates dates to the definition of gravity anomalies and early drilling conducted by the Newfoundland government from 1946 to 1953. Most of the drillholes were less than 1,000 feet (305 metres) and they were not successful in locating salt, but they did intersect gypsum and anhydrite which was recognized by the geological survey as an indication of the potential for salt deposits.

The first relatively deep hole with a significant salt intersection was drilled at Fischells Brook by Hooker Chemical (Nanaimo) Ltd. 1968. Hooker had been granted a concession to explore for sodium and potassium salts and elemental sulphur in 1967. Based on that discovery and subsequent gravity surveys, the concession area was reduced to "development" areas which included the anomalies which had been located at Fischells Brook, Robinsons, St. Fintan's and Flat Bay. Salt was encountered by drilling at Robinsons River and St. Fintans in 1972 and 1973 respectively. The development licenses were reduced to the Fischells Brook and Flat Bay licenses in 1974 (Fleming, 1974).

The historical work in the Bay St. George area identified several gravity anomalies within the project area which were considered to have potential to include salt and potash occurrences or deposits (Anderle, 1982, 1985; Hulet, et al, 2001). These included:

- Fischells Brook,
- Robinsons River – Heatherton,
- St. Fintans's – St. David's – Lochleven/Highlands,
- St. Teresa – Flat Bay,
- Barrachois Brook, and
- Harry's River.

The more recent work undertaken by Vulcan as part of the evaluation of the area for hydrocarbon potential, has identified salt and potash mineralization at Flat Bay North (Captain Cook area) which is not apparently defined by a negative gravity anomaly. These locations are shown on Figure 4 and a summary of the relevant areas is presented in the sections below.

6.2 History of Salt and Potash Exploration

As noted above, the presence of salt deposits in the Bay St. George area was suspected on the basis of minor halite mineralization noted in association with gypsum-anhydrite and the presence of brine seeps. The first exploration for salt in the basin was carried out by the Newfoundland Geological Survey between 1946 and 1953 when a series of holes were drilled:

- Robinson's -Heatherton (8 holes total 2,840 feet; - tested 1,700 feet of strata to a maximum depth of 865 ft);
- St. Fintan's - Salt Springs - Highlands River (4 holes total 3,522 ft);
- Doyles -O'Regan's (2 holes total 1,737.5 ft);
- Boswarlos - Port au Port Peninsula (4 holes);
- Fischell's (2 holes); and
- Cartyville (3 holes).

No salt was intersected however gypsum-anhydrite, with minor halite, was noted in some holes and only one of the holes exceeded 1,000 feet (305 m) in depth.

In 1953, a detailed gravity survey of the St. Fintan's area was carried out by the Nova Scotia Research Foundation for the Newfoundland Department of Mines. In 1954, a follow-up gravity survey, covering the area from Little Barachois Brook in the northeast to Highland's River in the southwest, was carried out for the Newfoundland Geological Survey (Verall, 1954). A number of negative gravity anomalies, thought to be due to underlying salt structures, were outlined by the survey.

In 1967, Hooker Chemical (Nanaimo) Limited obtained a four year concession from the Newfoundland government giving them the exclusive rights for exploration for sodium and potassium salts and elemental sulphur over most of the Codroy - Bay St. George's Carboniferous basin. A detailed gravity survey and electrical resistivity measurements were carried out by Huntec for Hooker over the Fischells Brook gravity low originally located in the Verall survey.

Based on the new gravity information, Hooker drilled one hole (Hooker FB-1) near the Trans Canada Highway (TCH) to a total depth of 1,099 m (3,605 ft). The "Codroy Evaporites" were intersected at 337 m with the salt section beginning at 358 m and continuing for approximately 750 m to the bottom of the hole at 1,099 m. The salt was described as excellent quality with an upper, middle and lower salt sequence. Potash was also reported with a section of 7.6 m (25 ft) at 6.9 % K_2O from 376.1 to 383.7 m. The highest value was a 1.5 m (5 ft) intersection grading 13.4 % K_2O.

In 1971 Hooker carried out regional gravity surveys over the concession and selected several other areas, including Fischells, Robinson's, St. Fintan's, and Flat Bay, to be held as development licences after the expiration of the concession agreement. Two drill holes tested the gravity anomalies on the Heatherton - Robinson's River (1972) and St. Fintan's - St. David's (1973) development licences. Both of these intersected salt with some potash indicated. The development licences were reduced to the Fischells Brook and Flat Bay licences in 1974 (Fleming, 1974).

In 1975, Amax Minerals optioned the Hooker development licences and drilled two holes in 1976. One hole (FB-2-76) of 916 m (3,005 ft) tested the Fischell's Brook anomaly on the north side of Rocky Pond and the second (ST-1-76) of 1,044 m (3,426 ft) tested the St. Teresa's gravity anomaly. Neither of these holes reported salt or evaporite units.

In 1979, the Fischell's Brook gravity anomaly area was staked by the RPF Syndicate. The other former Hooker development licences were withdrawn from staking and made exempt mineral lands (eml's) but were subsequently opened for staking again in June, 1980.

In 1980, the Nova Scotia Research Foundation carried out a gravity survey of an area surrounding the Fischells Brook anomaly, mainly to the south and east, primarily on Reid Lot 15. This work was aimed at levelling and incorporating data from previous surveys by Verrall (1959), Huntex (1968) and CAI-GMX

(1971). The survey delineated the southern portion of the gravity low and located an eastern extension (of -4.3 to -5.7 mgals) centred on the brook, 4.5 km to the east of FB-1 (Anderle, 1985).

The gravity target has been drilled by various other groups including Amax (1976), the Pronto/RPF /Noranda syndicate for potash (1980-86), Inco (1988) and Leeson Resources (now Atlantic Salt, 1999) under option from GeoStorage Associates. The core area of the Fischells Brook gravity anomaly is held by GeoStorage Associates who staked the property for underground oil/gas storage. The Amax, Noranda/Pronto/RPF Syndicate drillholes were aimed at assessing the potash (sylvite) potential. The Inco drilling was primarily aimed at potash (carnallite) potential. These programs targeted the flanks of the anomaly. The Leeson program was to evaluate the salt potential with one drillhole on the flank and one hole at the core of the anomaly. The second hole was terminated at the top of salt (358 m) and not completed.

6.3 Summary of Salt and Potash Exploration

Brine seeps and wells have been known in the Bay St. George area of southwestern Newfoundland for many years however salt and potash was first encountered in drilling in 1968 when Hooker Chemicals drilled the Fischells Brook gravity anomaly. Prior to this all salt exploration, including some drilling (most holes less than 1000 feet), was carried out by the Newfoundland government in the years 1946-1953. This early work by the Newfoundland government was not successful in locating any salt although the location and drilling of gypsum / anhydrite indicated the potential for salt deposits within an evaporite sequence which was recognized by the geological survey. The government drill holes are not listed in the drill hole summaries for the various areas as they are considered to offer little of exploration interest.

The various gravity anomalies which may contain salt / potash are: Fischell’s Brook; Robinson’s River - Heatherton; St. Fintan’s - St. David’s – Lochleven / Highlands; St.Teresa -Flat Bay (west of the Flat Bay anticline).

The more recent work undertaken by Vulcan Minerals, as part of the evaluation of the area for hydrocarbon potential, has identified salt and potash mineralization in the Captain Cook area which is not apparently defined by a negative gravity anomaly. A summary of the relevant areas is presented below.

7.0 GEOLOGICAL SETTING

7.1 Regional Geology and Stratigraphy

As noted in the section above, the Bay St. George Sub-Basin represents the northeastern extension of the Maritimes Basin. The Maritimes Basin is a large scale, post-orogenic, successor-type basin represented by a series of sub-basin and highland structures extending from southeastern New Brunswick, northern mainland and Cape Breton Island areas of Nova Scotia, underlying most of the Gulf of St. Lawrence and extending onto southwestern Newfoundland as the Bay St. George Sub-Basin.

The basin accumulated a sequence of non-marine, marine, and non-marine sediments from late Devonian through early Permian time. The sedimentary rocks lie unconformably on pre-Carboniferous anorthosites and mafic gneisses of the Long Range Complex. In the Bay St. George Sub-Basin the Carboniferous sedimentary rocks are represented by the basal, non-marine Anguille Group (mainland Horton Group equivalent), the medial, marine, evaporate-bearing, Codroy Group (Windsor Group equivalent) and upper, non-marine Barrachois Group (Mabou Group equivalent). Figure 5 shows geological map of the Bay St. George Sub-Basin area (1:250,000 scale) with the area of the Vulcan licences superimposed. Figure 6 shows the geology with the Vulcan licences (1:125,000 scale) as well as the locations of the Vulcan seismic lines and drillholes.

The mainland equivalent of the Codroy Group, the Windsor Group, is the host for several evaporate developments including several open pit gypsum mines, the Pugwash (underground) and Nappan (solution) salt mines, the former Malagash (underground) salt mine, the operating Penobsquis (underground) salt and potash mine, the under development Picadilly (underground) potash mine, as well as the former Cassidy Lake (underground) potash mine. There are several other deposits / occurrences where salt, with or without potash, have been reported from the Carboniferous Windsor Group strata.

The onshore portion of the Bay St George Sub-Basin is approximately 22 km wide and extends from St. Georges Bay to the Long Range Mountains. The sub-basin is approximately 125 km long, stretching from Stephenville to the Codroy Valley.

Figures 7 and 8 present the compilation of the historic and modern total magnetic intensity. Figures 9 and 10 present the compilation of the historic and modern Bouguer gravity. Both of these maps are focused on the Vulcan licence area and have the licence area highlighted for reference. Figure 8 clearly shows the basement high of the Flat Bay Anticline and the Carboniferous sedimentary units draped on the flanks. Figure 10 also shows the Flat Bay Anticline as well as the location of the Fischells Brook gravity anomaly. Figure 11 is a topography map showing the locations of Vulcan seismic lines as well as the locations of the petroleum and mineral drillholes.

7.2 Evaporite Stratigraphy

7.2.2 General

The detailed sedimentology and stratigraphy of the Bay St. George Sub-Basin has been documented by Knight (1976 and 1983) although the original stratigraphic designations are those of Hayes and Johnson (1938). The Carboniferous age sedimentary basin fill is marked by a basal fluvial deltaic lacustrine sequence (the Anguille Group) which is for the most part unconformable on pre-Carboniferous basement. The basal sequence is conformably overlain by a marine evaporate sequence (the Codroy Group) including a basal carbonate, basal sulphate, basal halite, and is some cases a middle and upper evaporate unit. The marine evaporate sequence is conformably overlain by a transitional to non-marine sequence typical of fluvial interchannel and to coal swamp deposits (the Barrachois Group).

The geology of the Bay St. George Sub-Basin and the Vulcan licence area (after Knight 1983) is shown on Figure 5 and 6. Figure 3 presents a stratigraphic column focused on the Lower Carboniferous, Visean-age, Windsor Group in the Moncton Sub-Basin and the Codroy Group of the Bay St. George Sub-Basin. The column is a schematic representation of the evaporate-bearing sequence (not to scale).

7.2.3 Anguille Group

The Anguille Group, the oldest and lowermost of the Carboniferous units was, at least in part, deposited coheval with the development of the sub-basin. This unit is a series of grey and red sandstones, conglomerates, black and grey shales, minor dolostones and limestone deposited in a lacustrine and fluvial environment. Rocks of the Anguille Group have been measured in excess of 1,850 metres thick. They are exposed in the Anguille Mountains and Bald Mountain in southwestern Bay St. George Sub-Basin and further north in the Deer Lake Basin. Limited outcrops also occur on the Port aux Port Peninsula underlying the Ship Cove Formation of the Codroy Group.

As noted above, the Anguille Group has been established as age equivalent to the Upper Devonian – Lower Carboniferous Horton Group of Nova Scotia and New Brunswick. This is the basal sedimentary unit of the post-orogenic Carboniferous Maritimes Basin.

The Anguille Group has been subdivided into several formations. The oldest, the Kennel's Brook Formation, lies to the south and is succeeded by the Snake’s Bight Formation consisting of black shales and mudstones with dolomitic laminations and slump units. The Friar's Cove Formation overlies the Snakes Bight formation and consists of grey, poorly sorted conglomerates, sandstone and minor shales. The upper unit is composed of meander/braided river and alluvial fan deposits of the Spout Falls Formation which consist of grey conglomerate, red sandstone and minor grey marine siltstones. The uppermost member of the formation is represented by 200 metres of coarse, grey conglomerate termed the Fischells conglomerate (Anderle, 1985).

7.2.4 Codroy Group

The Codroy Group is defined as intercalated, coarse to fine grained redbeds, evaporates including sulphate and chloride salts, limestones and dolomites, with some lacustrine siliciclastics. The group includes, in ascending order, the Ship Cove (basal carbonate), the Codroy Road (basal sulphate), Robinsons River (salt), and Woody Cape formations.

The Codroy Group is in excess of 6,000 metres thick and occurs in the Codroy Valley, Codroy lowlands, St. Georges Bay lowlands, from Ship Cove north to Stephenville and east to the foot of the Long Range Mountains.

The Codroy Group conformably to disconformably overlies the Upper Devonian – Lower Carboniferous Anguille Group in the Bay St. George Sub-Basin and it unconformably overlies pre-Carboniferous rocks on the Port aux Port Peninsula. The Codroy Group is conformably overlain or in faulted contact with the Middle to Upper Carboniferous Barrachois Group. This unit is equivalent to the Lower Carboniferous marine evaporate Windsor Group in Nova Scotia and New Brunswick.

The base of the Codroy Group is marked by a 20 to 45 metre limestone, finely laminated, oolitic, dark grey, algal to argillaceous which has been designated as the *Ship Cove Formation*. This unit represents the basal carbonate member of the marine evaporite sequence and is equivalent to the Gays River / Macumber / Parleeville units as designated in Nova Scotia and New Brunswick.

The basal carbonate unit is conformably overlain by gypsum and anhydrite of the Codroy Road Formation. This unit represents the basal sulphate member of the evaporite sequence. A locally developed, dark grey reefal limestone, termed the Cormorant/Black Point limestone, occurs within the gypsum/anhydrite unit and separates it into upper and lower units. The upper 40 metre thick gypsum unit of the Codroy Road Formation was mined at Flat Bay.

The basal anhydrite unit is overlain by a 200 to 1,000 metre thick sequence of salt and grey shale which has been designated the Jefferies Village Member of the Robinsons Road Formation. This member has been subdivided into four units; basal, middle, upper halite and a grey shale. Borate minerals have not been reported.

The Basal Halite Unit consists of a dominantly coarse-grained grey halite with anhydrite occurring as whispy to large-size clots, blebs and solution rims around clear halite crystals. Large anhydrite breccia fragments may be massive or show fine internal lacey lamination and syn-sedimentary structures. Flow related deformation (compression folds) to boudinage-type (pull apart) features are common.

The Middle Halite Unit is represented by fine to very coarse-grained, banded to massive, predominantly orange, multicolored, halite. The grain size and color can change rapidly over intervals of less than 1 to more than 10 metres. Minor grey-brown to olive-grey clay beds are present with minor thin anhydrite laminae and veinlets of light orange acicular halite. This member includes the *Main Potash Zone*.

The potash mineralization consists of fine to very coarse-grained, clear to milky white to rusty or blood-red sylvite with an associated metallic copper red potash residue stain. The sylvite is disseminated in the halite matrix or as distinct sylvinite beds within the upper portion of the potash unit. The lower portion of the unit consists of fine-grained metallic-copper red, disseminated carnallite. Minor powdery, pale white-yellow secondary sylvite occurs as cavity and vug fillings. Borate minerals have not been reported.

The Upper Halite Unit contains thinly interbedded halite and grey clay beds, including minor potash units which overlie the main potash unit. Fine to coarse-grained halite occurs in thin alternating, multicolored bands from clear through to dark brown. The clay beds decrease in number with depth.

The Grey Shale Unit is predominantly light olive grey/dark grey to reddish-brown marine shale with gypsum filled fractures, veins and blebs and minor (1-2mm) clear, cubic crystals and pseudomorphs of halite and veins infilled with light orange, acicular halite.

7.2.5 Barachois Group

The Barachois Group is represented by a series of micaceous, arkosic and sub-arkosic, grey to red sandstones and pebbly sandstones, grey to red siltstones, grey to black shale and coal beds. These are arranged in a series of fining upward sequences with locally developed conglomerates along the faulted margins of the sub-basin. The group is more than 2,500 m thick in the Codroy Lowlands and more than 1,600 m thick in the St. George Bay Lowlands. In outcrop, the Barachois Group is in faulted contact with the underlying groups and the upper contact is not exposed. Thin coal seams are present throughout and the Barachois Group have been age dated as Namurian A to Westphalian A.

7.3 Mineralization

The potash mineralization in the Bay St. George Sub-Basin has not been the subject of a detailed analysis, other than to evaluate the basic rock forming mineralogy and the percentage of sodium, potassium, magnesium and insolubles.

In New Brunswick at the Penobsquis/Picadilly mines, the potash mineralization has been typified as magnesium sulphate deficient, with a chemical composition dominated by chloride-type minerals (Na, K, Mg, Ca, Cl) in which the main potash minerals are sylvite (KCl) and carnallite ($KMg_2Cl.6H_20$) (Moore, et. al, 2008).

The previous exploration work in the Bay St. George Sub-Basin has identified the potash mineralization as sylvite with lesser carnallite and trace polyhalite. In the Captain Cook area, the lithological and analytical work completed by Vulcan has confirmed a thick sequence of high purity halite along with potash mineralization, sylvite and minor carnallite, similar to the New Brunswick mineralization.

8.0 DEPOSIT TYPE

The Bay St. George Sub-Basin is the northeast extension of the Maritimes Basin. The Maritimes Basin is a post orogenic, successor-type basin represented by a series of sub-basin and highland structures. The basin accumulated dominantly non-marine clastic rocks during late Devonian through early Permian time. The only demonstratable marine incursion into the basin occurred during the Carboniferous (Visean) time during which a complex cyclic succession of carbonate, evaporate and clastic sediments were deposited.

The present distribution of these rock units represents the erosional remnants of these sub-basin and arch or uplift structures.

In the Bay St. George Sub-Basin, salt deposits, including potash mineralization, are found within the Codroy Group which is equivalent to the Windsor Group as mapped in New Brunswick and Nova Scotia. The Windsor Group hosts several open pit gypsum mines, the Pugwash (underground) and Nappan (solution) salt mines, the former Malagash (underground) salt mine, the operating Penobsquis (underground) salt and potash mine, the Picadilly (underground under development) potash mine, as well as the former Cassidy Lake (underground) potash mine. There are also several other deposits / occurrences where salt and/or potash have been reported from the Carboniferous Windsor Group strata.

9.0 EXPLORATION

The Bay St. George Sub-Basin has been explored for salt, potash, base metals, and uraniuim, as well as petroleum since the 1960's.

Since 1996, Vulcan has conducted and acquired a number of geophysical surveys in the Bay St. George Area. This includes a compilation of regional gravity surveys, a high resolution airborne magnetic survey and a number of seismic surveys.

A number of regional and detailed gravity surveys were shot by a various operators in the Bay St. George area throughout its exploration history, the resulting data compiled from these surveys were integrated and merged by the provincial Department of Natural Resources and made available to the public. Vulcan obtained a copy of this data in both raster and vector formats from the government and one of the resulting images is presented in Figure 10.

In 2005, Vulcan contracted Aeroquest Ltd. of Milton, Ontario to shoot a 4420 km high resolution airborne magentic survey of the Bay St. George area. This survey was successful in assisting in delineating geologic contacts and other structural features such as faults throughout the licence area. An image representing the Total Magnetic Intensity as interpreted from the data collected is presented in Figure 8.

From 1998 to 2010, Vulcan shot 341 km of 2D seismic data. This includes the 6 km "98-106" line shot in 1998, the 19 km "Flat Bay" program shot in 2002, the 58 km "H Line" program in 2004, the 70 km "VUL-05" program shot in 2005 and the 58 km "VUL-07" program shot in 2007. In conjunction with a partner, Vulcan acquired 130 km of 2D seismic data in 2010. Vulcan also acquired seismic data that was not commissioned by Vulcan. This includes the 13 km "Robinson's River" Line that was shot by the Newfoundland government in 1996, as well as the 100 km "SR-Lines" which were acquired in 1998. This seismic data is useful in determining the presence or absence of salt and the depth as to which salt may be intersected. The location of these lines is presented in Figure 11.

The salt and potash exploration was focused on the identification of gravity anomalies as drill targets. Several of these negative gravity anomalies were tested by diamond and/or rotary drilling programs as previously discussed. A brief overview of the exploration of the following areas as they pertain to Vulcan's mineral licenses is presented.

- Fischell's Brook;
- Robinson's River - Heatherton;
- St. Fintan's - St. David's - Lochleven/Highlands;
- St.Teresa -Flat Bay (west of the Flat Bay Anticline); and
- Captain Cook area

Based on the results of incidental petroleum exploration in the basin, the salt and potash occurrences / mineralization at St. Fintan's, Hooker-Robinsons, and Fischells Brook have been confirmed. In addition, salt and potash mineralization has been identified in the area north and northeast of the Flat Bay anticline, the Captain Cook area. The occurrence of salt in this area is not apparently defined by a negative gravity anomaly. The occurrence of the salt in this area may be "masked" from the gravity data by the shallow northern extension of the Flat Bay anticline. It does also suggest that the Captian Cook occurrence is a bedded evaporate, and is not related to a halokinetic structure or "dome" This may open up large areas of the sub-basin for exploration that have been overlooked because they did not present negative gravity anomalies.

A summary of each of these areas is presented in the sections below. Figure 4 shows the locations of the mineral and petroleum exploration drillholes in the area of the Vulcan licences in the Bay St. George Sub-Basin. It also shows the locations of the seismic programs. A summary of the petroleum and mineral exploration drillhole data is presented in Tables 3 and 4 respectively.

9.1 Fischells Brook

In 1968, Hooker Chemicals Ltd. constructed a 1,098.8 meter drillhole (FB-1) at Fischells Brook (Figure 11). The purpose of the hole was to test the potential of the anomaly for underground storage and/or chemical production of salt. The Fischells Brook gravity structure has been interpreted to lie within the "inner basin" and is approximately 10.5 km by 8.5 km in size. It has associated satellite lows to both the east and west (Anderle, 1985).

Salt, thinly bedded, red-brown to light and dark grey, was intersected a 358.4 meters. A low grade potash unit, similar to that described at St. Fintans and Robinsons (see below) was also reported. Sylvite was reported at 381.0 m to 402.3 m (The zone assayed from 7.95% to 15.1% K_20, however, the insoluble content was 11.6%. A low grade carnallite-bearing zone was also reported at 402.3 m to 409.6 m. The carnallite occurs within brown mudstone and with polyhalite. The basal halite member (grey halite) was intersected at 430.0 m and continued to the end of the hole at 1,099 m

The true thickness of the evaporate section is approximately one half of the drill interval due to steep dips of 50-60 degrees (Anderle, 1985). The salt section was described as excellent with strong potash enrichment in some areas. The base of the salt-bearing section was not intersected by the drillhole.

Although a total of 669 meters of the basal (grey) halite was intersected by the drillhole, no additional work was undertaken in the Fischells Brook area by Hooker.

Additional drilling to evaluate the potash potential of the Fischells Brook area (see Figure 11) was undertaken by Amax Exploration, (one drillhole in 1976), Pronto Explorations, (two drillholes in 1979 to 1980), and Inco, (one drillhole in 1986 – 1987). The Fischells Brook deposit was also explored by Leeson Resources Inc., two drillholes during 1998 to 1999, to evaluate the rock salt development potential.

The Amex drillhole, constructed in 1976, TD'd in red-bed clastics and did not intersect any evaporates. In 1980, Pronto drilled two holes to test the northwestern flank (PF-1) and northern crest (PF-2) of the gravity anomaly. Both holes intersected salt and stopped in the basal halite. Both also intersected potash bearing units as follows:

- PF-1 - a minor unit 18.9 m thick at 375 m depth and a main unit of low grade carnallite in four beds ranging in thickness from 5.6 m to 20.7 m starting at 515.1 m and representing 62.2 m true thickness of carnallite ranging in grade from 3.5 to 9.75 % K_2O; and

- PF-2 - 214.9 to 421.5 m is mixed mudstone, halite and sylvite /carnallite then a 3 m bed of sylvite which grades 13 % K_2O is repeated three times and a 13.6 m carnallite bed which begins at 551.6 m ranges in values from 2.6 to 11.6 K_2O (Anderle, 1985).

The Inco (1988) drillhole (hole #77501 to a depth of 924.8 m) was located to further evaluate the carnallite (magnesium salt) identified by the Pronto work and achieved similar results. It is notable that the drillhole was constructed using an oil-based drilling fluid to increase core recovery. The top of salt was intersected at 526.9 m and the hole remained in salt to the bottom of the hole. Some potash was reported with the values of 2.4 m at 6.5 % K_2O and 11.8 % $MgCl_2$ (681-683.4) and 1.9 m at 6.2 % K_2O and 11.5 % $MgCl_2$ (807.2-809.1 m) (Phipps et al, 1988).

The Leeson Resources (1999) work was intended to evaluate the Fischells Brook deposit for rock salt. The first drillhole (LR-98-1) was located to further define the flank of the salt deposit. It was anticipated that the results would be similar to the Pronto PF-1 drillhole and it was successful. The drillhole TD'd at 771.23 m and the top of salt was intersected at 379.50 m. The evaporate section, dominantly upper and middle halite, was dominated by mudstone with halite and minor potash (sylvite and minor carnallite). The hole TD'd in the Anguille Group conglomerate. The potash zones were not sampled or analyzed.

The second drillhole, LR-98-2, was located to duplicate the Hooker FB-1 drillhole and obtain representative core and downhole logs. The drillhole intersected salt at 357.38 m and was suspended with casing installed at the top of salt and cemented to surface The program was terminated due to financial constraints.

Table 5. Summary of Drilling - Fischells Brook Area

Hole #	Operator	Year	Total Depth (m)	Top of Salt (m)	Bottom of Salt (m)	potash present	Notes
FB-1	Hooker	1968	1099.0	358.4	1099 eoh	yes	---
FB-2	Amax	1976	794.0	no	no	no	---
PF-1	Pronto	1980	879.9	328.1	879.9 eoh	yes	---
PF-2	Pronto	1980	641.9	220.3	641.9 eoh	yes	---
77501	Inco	1986	924.8	526.9	924.8 eoh	yes	---
LR-98-1	Leeson	1998	771.23	379.50	706.44	yes	---
LR-98-2	Leeson	1998	358.38	357.38	358.38	no	suspended
Total	---	---	5469.21	---	---	---	---

9.2 Robinsons - Heatherton

In 1972, Hooker Chemicals Ltd. drilled a core hole at Robinsons (see Figure 11). The drillhole intersected grey halite at a depth of 206.0 meters. Potash mineralization (sylvite) was intersected at 249.0 meters to 282.5 meters The section had a reported maximum K_20 content of 6.30% and an average of 1.98%. A carnallite-bearing zone was also reported from 418.5 meters to 422.1 meters. This zone averaged 5.9% K_20. The remainder of the drillhole intersected dirty halite with minor potash mineralization and ended at 694.9 meters in dark grey, dolomitic mudstone.

In 2009, Vulcan constructed the Red Brook #2 well, approximately 2.0 km northeast of the Hooker Robinson hole, to test the petroleum potential of the area (see Figure 11). The Red Brook #2 well was drilled to a total depth 1,965 m. The section was not cored (rotary drilled) and the downhole geophysical logs do not suggest the presence of potash mineralization.

Table 6. Summary of Drilling - Robinsons Area

Hole #	Operator	Year	Total Depth (m)	Top of salt (m)	Bottom of Salt (m)	potash present	Notes
Robinsons # 1	Hooker	1972	695.0	206.0	685.5	yes	cored
Red Brook #2	Vulcan	2009	1,965	Yes	Yes	no	no core
Total			2,660				

9.3 St. Fintan's - St. David's - Highlands/Lochleven

In 1973, Hooker Chemicals Ltd. drilled a 459.0 meter hole at St. Fintans #1. The hole intersected grey halite a depth of 230.4 meters. The hole was abandoned at 459 m after drilling through predominantly clastic sediments consisting of mixed siliceous shale and anhydrite. Potash mineralization (sylvite) was reported from 230.4 meters to 255.7 meters. The K_20 assay values ran as high as 5.91% to 8.15%, with an average value of 4.19%. A carnallite-bearing zone was also reported from 255.7 meters to 287.6 meters (839 feet to 943.5 feet). Assay values (K_20) were as high as 6.55% to 8.29%, with an average value of 3.04%. The dirty halite (up to 50% insoluble clay), with minor amounts of potash mineralization, continued to a depth of 410.2 meters where the hole intersected a grey, dolomitic shale with interbedded anhydrite. (Anderle, 1985).

Visual inspection of the salt core indicated that "very little high quality salt was present" so analysis was primarily aimed at the potash potential of the area. Two narrow potash sections were encountered, 906-941 (35 ft) - KCl 3.9-13.2 %, and 1204-1214 (10 ft) - KCl 7 % with the zone described as a "carnallite breccia". It was concluded that nowhere in the section cored is a bed of salt 10 feet or more in thickness with as much as 90 % NaCl (Stormon, 1973).

In 1980/81, Noranda Exploration carried out a compilation of previous work, line cutting, gravity and stratigraphic mapping. That work concluded that there was intense deformation in the salt and potash beds of the area, that the salt structure is small and is bounded by thrust faults, and therefore had limited economic possibilities.

Table 7. Summary of Drilling - St. Fintan's - St. David's - Highlands/Lochleven Area

Hole #	Drilled By	Year	Total Depth (m)	Top of Salt (m)	Bottom of Salt (m)	potash present	Notes
St. Fintan's # 1	Hooker	1973	459.0	230.4	319.0	yes	carnallite
Total			459.0				

9.4 St. Teresa - Flat Bay

The St. Teresa -2 to -3 mgal gravity anomaly (see Figure 4) lies adjacent to the coast on the west side of the Flat Bay Anticline.

The Amax hole (ST-1-76) was sited to test the west of and between two negative gravity anomalies defined in the regional survey. It was concluded that the hole was drilled over a down faulted basement block with the hole remaining in the clastic Highland's member of the Robinson's River Formation which overlies the evaporite sequence (Howie, 1988). Based on the drillhole data, the depth to the top of salt was estimated at approximately 1,098 m (Anderle, 1985).

To the east of the Amax hole and St. Teresa, the Jeffrey's Village Formation is exposed at surface in an up faulted block and consequently the evaporite sequence is expected to be closer to surface (Howie, 1988). The interpretation of the gravity data indicated a potential salt "pillow" of significant thickness which was targeted by the Pronto / Noranda drillhole. That drillhole intersected a total of 411.5 meters of dominantly red-brown clastic rocks. This section is not readily correlated to the Codroy Group type stratigraphy, however, it was interpreted as middle to upper Jefferies Village Formation, possibly several hundred metres above the salt-bearing sequence.

Table 8. Summary of Drilling - St. Teresa Area

Hole #	Drilled By	Year	Total Depth (m)	Top of Salt (m)	Bottom of Salt (m)	potash present	Notes
ST-1-76	Amax	1976	989.3	no	no	no	no salt
ST-1	Pronto/Noranda	1981	411.5	no	no	no	no salt
Total			1,400.8				

9.5 Captain Cook area (north and northeast of the Flat Bay anticline)

The Captain Cook area is atypical of the evaporate occurrences in the Bay St. George Sub-Basin in that it is not clearly defined by a negative gravity anomaly. Vulcan has compiled all the available geophysical data, as well as acquiring new data, for the claim block area.

Figure 7 shows the total magnetic intensity data for the sub-basin and the surrounding area (1:250,000 scale). This figure also shows the outline of the Vulcan licence area. This data shows the influence of the Flat Bay Anticline.

Figure 8 shows the same data set (1:125,000 scale) with the location of seismic lines and drillholes included.

Figure 9 shows the regional bouguer gravity data (1:250,000 scale) and the Vulcan licence area and Figure 10 shows the gravity data with the location of the seismic lines as well as the drillholes. The gravity data clearly defines the location of the Flat Bay Anticline as a positive gravity feature. The data also identifies the negative gravity anomaly at Fischells Brook and the satellite anomalies to the east and southwest.

As noted above, the Fischells Brook area was tested by drillholes and a thick section of clean, “basal” salt was intersected at the center of the anomaly. Thinner, interbedded, dirtier salt, with potash mineralization, was intersected on the flanks of the structure. The interpretation of the evaporate geology, based on detailed lithological descriptions, is that the basal salt had flowed away from the flanks of the anomaly toward the core of the structure. This halokenetic movement, likened to the initiation of a diaper, would thicken the basal salt at the center of the structure. The “immigration” of the basal salt into the core of the structure would “swell” and push upward. The upper stratigraphic units, including the potash beds, may be pierced and pushed aside, or rafted upward passively where they might have been removed by dissolution. In this model, the prospective areas for potash exploration were located on the flanks of the negative gravity anomaly.

The areas of the Robinsons and St. Teresa anomalies are also apparent in the bouguer gravity data. As noted in the sections above, drillhole testing of both of these areas confirmed the presence of salt as well as minor potash mineralization, however, both appear to be related to salt which may have been deposited in an "outer basin" setting, dominated by agitation and interbedded with clastic deposition. Alternatively, it may represent salt which was deposited in a higher stratigraphic position than the salt drilled at Fischells Brook.

The anomalous area to the northeast was tested with drilling at Barrachois Brook and Harry's River, however, the salt was below the depth of the drilling. The drilling at Captain Cook may have intersected the evaporate sequence in transition from the shallow flanks of the Flat Bay Anticline to the deeps at Barrachois Brook.

The evaporate related negative gravity anomaly in the Captain Cook area may be masked by the northeastern subcrop extension of the basement rocks of the Flat Bay anticline. Based on the lithologic observations by the author, the evaporate sequence in this area may represent an area of salt "emmigration", where the section has been thinned by halokenetic flowage or removal of the salt, presumably to the northeast and similar to that described for the Fischells Brook anomaly.

A summary of the Captain Cook drilling is presented in Table 11. It is important to note that none of these holes were located to target salt or potash exploration. The intersections reported occur stratigraphically above the petroleum targets which were the subject of the drilling.

Table 11. Summary of Drilling – Captain Cook Area

Hole #	Operator	Year	Total Depth (m)	Top of Salt (m)	Bottom of Salt (m)	potash present	Notes
Captain Cook #1	Vulcan	2002	605	197	357	yes	160 m of salt
Flat Bay #2	Vulcan	2004	845	188	495	possible	307 m of salt
Flat Bay #3	Vulcan	2005	370	na	no	no	above salt
Flat Bay #5	Vulcan	2006	719	154	365	unknown	211 m of salt
Flat Bay 93-101 #1	American Reserve Energy	1993	660.94	184	478	no core recovery through zone	294 m of salt
Total			2,654				

Detailed examination of selected drill cores from the Captain Cook #1 drillhole by the author indicated that the upper section of the evaporate sequence has been shortened significantly by salt flowage. The section is dominated by red bed clastic rocks, siltstone and mudstone, highly fractured with fractures filled with secondary halite. The halite is dominantly orange brown in colour and has an acicular texture typical of secondary vein or fracture fill. This flow texture continues to the bedded halite and the potash units. The underlying salt is grey to moderate dark grey, fine to medium grained and also has sections with elongate to acicular crystals. This is atypical of the clear to light grey medium to coarse grained equigranular halite typical of the basal unit however it is consistent with a basal unit that has been thinned by halokenetic flowage.

The detailed litholigical description of selected drill core samples by the author confirms the interpretation from the magnetic and gravity data, that the evaporate sequence at the Captain Cook area represents an area where the salt has “emigrated”, i.e. the salt section has been shortened by halokinetic flowage, possibly toward the northeast and deeper portion of the sub-basin.

Figure 12 shows a portion of the lithological log from the Captain Cook #1 drillhole. The upper halite and siltstone package is actually a mixture of bedded, dirty salt with siltstone and mudstone and secondary halite. Three separate sylvite units were logged, including a lower unit which may represent a rollover fold due to flowage. As noted above, the halite appears to represent a thinned basal unit.

It is noteworthy that the downhole geophysical logging of the Flat Bay #2 drillhole, (rotary drilled, therefore, no core), exhibits a downhole gamma log spike which has been attributed to a potash-bearing salt (see Figure 13). The author has not reviewed this data in detail, however, the position is consistent with the stratigraphic cross-section (see Figure 14) showing the relationship between the PF-2 (Fischells Brook), the Captain Cook #1 drillhole and the Flat Bay #2 well.

Samples of the potash mineralization (not collected by the author or under the author’s supervision, therefore methodology and QA/QC, which was not reported, can not be confirmed), returned a K_2O value of 20.40% over a reported thickness of 0.60 m. The analysis of the sample also reported MgO at 0.02% and insolubles at 1.80%. This analysis was carried out for Vulcan by the Saskatchewan Research Council. Although this by itself would not be considered an “ore grade” intersection, it may indicate, along with the lithologic description presented above, the stratigraphic position of the Captain Cook #1 drillhole section. This intersection is likely within the middle halite unit, possibly equivalent or part of the main potash zone, directly overlying the basal halite unit. As noted above, the interpretation of significant thinning of these units due to halokinetic flowage, possibly to the northeast presents a target for additional exploration for salt and/or potash in that area for a thickened section

9.7.1 Conclusions and Recommendations

9.8 Summary

Cuthbert (2008) compiled the potash analytical data from the Bay St. George Sub-Basin area.

At St. Fintan’s a total of eleven (11) samples were collected from 235.61 to 286.21 m. The sample intervals ranged from 0.61 to 0.91 m. The reported K_20 ranged from 5.06 to 9.11% with MgO ranging from 0.15 to 1.80% and insolubles not reported.

At Robinsons one (1) sample was reported from 262.43 to 267.31 m an interval of 4.88 m. The reported K_20 value was 6.30% with MgO at 0.04% and insolubles at 0.71%.

At Fischells Brook two (2) samples were reported from 396.85 to 398.07 m. The sample intervals were 0.30 m. The reported K_20 ranged from 5.10 to 7.10% with MgO ranging from 0.06 to 0.11% and insolubles at 0.28 to 1.10%.

The Fischells sidetrack hole reported a total of fourteen (14) samples from 376.28 to 381.61 m. The sample intervals were 0.15 m. The reported K_20 ranged from 5.30 to 19.00% with MgO ranging from 0.01 to 1.53% and insolubles from 0.07 to 29.10%. It is noteworthy that the zone from 376.43 to 377.49 m that reported insolubles ranging from 3.95 to 29.10% also reported K_20 ranging from 12.40 to 18.80% and MgO ranging from 0.12 to 1.53%.

The PF-1 drillhole reported three (3) samples from 493.17 to 729.56 m with intervals of 5.18, 0.91 and 2.13 m. The reported K_20 ranged from 5.00 to 9.92% with MgO ranging from 0.11 to 0.32% and insolubles at 1.50 to 6.08%.

The PF-2 drillhole reported eleven (11) samples from 231.07 to 529.89 m with intervals of 0.91 to 3.81 m. The reported K_20 ranged from 5.38 to 14.40% with MgO ranging from 0.07 to 0.23% and insolubles at 0.06 to 2.13%.

The analytical data from the Captain Cook #1 drillhole reported seven (7) samples from 278.60 to 328.60 m with an interval of 0.10 to 0.75 m. The reported K_20 ranged from 4.44 to 20.40% with MgO ranging from 0.01 to 0.29% and insolubles at 0.90 to 1.80%.

Kurcina (2007) reported the results of sampling of the drill core from Captain Cook #1 for salt. He indicated that, based on visual inspection of the core, the two “cleanest” salt zones were intersected between 227 and 254 m and between 306 and 327 m. These two zones were sampled by Kurcina in the presence of Vulcan representatives at the Provincial core storage facility in Pasadena, Newfoundland. The samples were selected and placed in sealed plastic bags and shipped to the Saskatchewan Research Council, Saskatoon, Saskatchewan for analysis (P. Laracy, personal communication, 2011). Copies of the analytical results, supplied by Vulcan, are included in Appendix C of this report and summarized on Figure 15. The Kurcina report provides no further information on the sampling method, the analytical method of any QA/QC protocol. The laboratory analytical data is summarized in the histogram presented as Figure 15. Kurcina reported, “… an excellent section for potential underground salt mining almost 30 m thick, at depth of about 225 – 254 m, and the average salt content is likely 98% or better, depending on the exact horizon selected.”

9.8.1.1 Fischells Brook (east of the Flat Bay Anticline)

The thickness of the potash mineralization identified at Fischells Brook may be adequate for conventional underground mining. However, the mineralization, sylvite and carnallite, does not represent an economic grade or tonnage. Further, the presence of carnallite, as a primary potash mineral, with lesser amounts of polyhalite and bischofite, all unstable, deliquiesent minerals, as well as the high insoluble content of the ore zone, presents significant potential problems to the metallurgy of the deposit.

The grade and the nature of the potash mineralization might be more attractive further away from the core of the structure, towards the satellite anomalies, located approximately 5 km to the east and south which occur on Vulcan's licenses.

The exploration work at Fischells Brook has identified a rock salt (halite) deposit which may have economic development potential. Further exploration and feasibility work, to determine the vertical and lateral extent (size and shape) of the deposit, the composition (grade and purity) of the salt, as well as the internal structure and stratigraphy may be warranted in this area.

9.8.1.2 Robinsons – Heatherton (southwest of the Flat Bay Anticline)

It is unlikely that the low grade of the potash mineralization and the high insoluble content will justify additional exploration or potential development for potash in the Robinsons – Heatherton area. The Red Brook #2 well intersected a thick salt sequence, including units prescribed to the basal anhydrite and the basal carbonate, however, there was no indication of potash mineralization in the downhole geophysical logs. Drill cuttings recovered from the salt section of the well have not been analysed for NaCl.

9.8.1.3 St. Fintan's - St. David's - Highlands/Lochleven (west of the Flat Bay Anticline)

As with the Robinsons area noted above, based on the available data, no further work is recommended or anticipated for the St. Fintan's area.

9.8.1.4 St. Teresa - Flat Bay (west of the Flat Bay Anticline)

As with the evaporate sequences drilled at St Fintan's and Robinsons, the St. Teresa - Flat Bay area, west of the Flat Bay Anticline appears to be dominated by redbed clastics of the upper Codroy Group. It is anticipated that the clastic / evaporate sequence may represent either down faulted block of upper Codroy Group or a relatively thin main evaporate sequence marginal to the main depocenter offshore in the Bay St. George Basin. The occurrences in this area are low grade potash with a high insoluble content. In the downfaulted blocks, the main salt is at a significant depth. Further work, seismic or possibly gravity surveys will be required to understand the geology of the area prior to any additional exploration drilling.

9.8.1.7 Captain Cook area, (north and northeast of the Flat Bay Anticline)

Although the Captain Cook area does not present a typical negative gravity anomaly target, the drilling at Captain Cook #1 and Flat Bay #2 has identified a significant evaporate section, halite with associated potash mineralization. The lithological description of the drillcore indicates that the section is possibly the middle halite unit, main potash zone, and that the unit has undergone significant thinning due to halokenetic flowage. This suggests a potential target for a thickened salt and/or potash sequence, possibly to the northeast.

10.0 DRILLING

The modern mineral exploration drilling undertaken in the Bay St. George Sub-Basin area has, for the most part, been completed using standard or modified diamond drilling equipment. These programs have produced a combination of rotary and core holes. These programs have produced varying degrees of success with respect to core recovery and hole condition. Most have utilized a water-based, saturated salt drilling fluid for core recovery. The Inco drilling at Fischells Brook used an oil-based fluid to evaluate the carnallite potential. Early attempts to drill the evaporites using a water well-type drill rig (e.g. Barrachois Brook, Harry’s River, etc.) were not successful in reaching the top of salt.

The Vulcan drilling programs (Captain Cook, Flat Bay, etc.), which were targeted to evaluate the hydrocarbon potential, utilized a combination of contract and in-house drilling equipment with significant success. The Captain Cook #1 well was drilled by Petro Drilling Co. using a Boyles 56 diamond drill. There were no downhole logs obtained from that drilling operation. At Flat Bay, FB #2 and FB #3 were constructed using the in-house equipment, an Ingersoll Rand RD10, modified water well drill. The Red Brook #2 was constructed with conventional rotary oil field drilling equipment.

11.0 SAMPLING METHOD AND APPROACH

Drill cores from the various exploration programs has been submitted or acquired by the Geological Survey of Newfoundland and Labrador, and are stored in a climate-controlled room at the A.K. Snelgrove, Mineral Core Library in Pasadena, Newfoundland.

There were no samples collected or submitted for detailed laboratory analysis as part of this study. Laboratory data presented in this report is as reported in the literature cited. There is no information available on the analytical methodology, the analytical methods, quality control or quality assurance (QA/QC) other than as cited in this report based on personal interviews with Vulcan personnel.

12.0 SAMPLING PREPARATION, ANALYSES AND SECURITY

Standard procedures for handling and sampling of prospective potash cores include a dry cut, diamond impregnated blade to cut sections of drill core lengthwise. One half of the split section is bagged and submitted to an accredited laboratory. Whole rock analysis is normally undertaken to determine %K_20 as an indicator of sylvite and/or carnallite, %Mg as an indicator of carnallite, and %insolubles (clay, silt, anhydrite, etc.).

As noted in Sections 10.0, 12.0 and 13.0, there were no samples collected or submitted for detailed laboratory analysis as part of this study. Laboratory data presented in this report is as reported in the literature cited and presented by Vulcan personnel.

13.0 DATA VERIFICATION

Selected drill cores from the Captain Cook #1, Pronto PF-1 and PF-2, Leeson LR-98-1 and LR-98-2, Hooker FB-1 were examined at the Pasadena core storage library to confirm the geological / lithological logs description of potash mineralization. The presence of sylvite and carnallite in the drill cores was confirmed by visually and tactile inspection. No samples were collected and no detailed laboratory analysis was undertaken as part of this investigation.

14.0 ADJACENT PROPERTIES

Potash mineralization has been documented by exploration drilling in the Fischells Brook area (see sections above). The central portion of the negative gravity anomaly at Fischells Brook is held by other parties who are interested in its potential as an underground gas storage facility.

Other claims in the area which are held to explore for salt and potash resources include claim blocks to south in the Highlands River area. There have been no reports of evaporates (salt / potash) or sulphate (gypsum / anhydrite) occurrences in this area.

15.0 MINERAL PROCESSING AND METALLURGICAL TESTING

This section is not applicable. There is no mineral processing and metallurgical testing data available for this report.

16.0 MINERAL RESOURCE AND MINERAL RESERVE ESTIMATES

This section is not applicable. The data available to this report is of a preliminary nature which identifies a mineral occurrence (salt and potash). There is insufficient data available for a mineral resource and mineral reserve estimate.

16.1 Definitions of Mineral Resource and Mineral Reserves

This section is not applicable. There is no data on the mineral resources or mineral reserves on the Vulcan claim block available.

17.0 ADDITIONAL REQUIREMENTS FOR TECHNICAL REPORT ON DEVELOPMENT PROPERTIES AND PRODUCTION PROPERTIES

This section is not applicable since this report deals with a mineral (salt and potash) occurrence and does not represent a report on development and/or production properties.

18.0 OTHER RELEVANT DATA AND INFORMATION

This section is not applicable.

19.0 INTERPRETATIONS AND CONCLUSIONS

19.1 Rock Salt

The exploration work undertaken to date in the Bay St. George Sub-Basin has not been sufficient to demonstrate the grade or thickness or lateral extent for an economic rock salt or chemical salt (halite) deposit. The petroleum exploration work in the Captain Cook area has identified a salt occurrence that may have development potential.

The top of salt in the Captain Cook #1 well and the Flat Bay #5 (ARE93-101#1) is on the order of 200 m below grade and the total salt-bearing section is over 250 m thick. These drillholes are separated by approximately 2 km. The eastern extension of this area has not been defined by drilling.

A possible rock salt (halite) resource has been identified at Fischells Brook. The depth to top of salt at the center of the negative gravity anomaly is on the order of 360 m below grade. This deposit has previously been explored for the potential development of an underground salt mine (the Leeson Resources drilling in 1998), however, the program was terminated due to financial considerations.

It is considered unlikely that economic rock salt or potash deposits will be located, at an accessible depth, in the “outer basin”, the area from Robinsons to St. Teresa, west of the Flat Bay Anticline. This area may represent an “outer basin” of deposition or it may be marginal to the depositional basin located offshore in Bay St. George. In that case the evaporite sequence in this area may represent an upper subzone of Codroy Group deposition, similar to the upper sub-zones documented in the Windsor Sub-Basin in Nova Scotia. That area is characterized by an interbedded sequence of distinctive carbonate and sulphate units with lesser amounts of halite and redbed clastics (siltstone and mudstone). Additional geological and geophysical research will be required to identify and evaluate the stratigraphy and structure of this area.

19.2 Potash

The historical exploration for potash in the Bay St. George Sub-Basin targeted negative bouguer gravity anomalies. Potash mineralization was identified at several locations, however, none have yet demonstrated the appropriate grade or thickness of potash (sylvite and/or carnallite) mineralization for an economic deposit.

The relatively low % of K_2O may be attributed to the combined sylvite / carnallite ore zones as well as the relatively high insoluble (clay and anhydrite) content of the ore zones.

The more recent work by Vulcan in the Captain Cook area is an area that is not defined by a negative bouguer gravity anomaly. This may provide a new model for evaporate exploration in the sub-basin. Further, modern exploration will benefit from the availability of seismic imaging to define drilling targets.

The identified potash ore zone in Captain Cook #1 may be stratigraphically representative of the middle halite, potash zone. The halite overlying, within and underlying the ore zone shows indications of halokenetic salt flow (specifically “emigration”, thinning or shortening of the salt sequence from the zone). This may indicate that the main ore zone, may be preserved or thickened adjacent to this area, most probably to the northeast. This new model provides a target for future exploration.

Similarly, the satellite anomalies east and southwest of the Fischells Brook gravity anomaly have not been tested for potash potential. The Fischells Brook, and the Captain Cook deposits may be analogous, or at least have significant similarities, to the PCS Penobsquis / Picadilly deposits in New Brunswick. These deposits are shown as a simplified cross section in Figure 3. The cross section shows the area of the Penobsquis Mine, potash development on the north side of the anticline, and the Picadilly Mine, potash development on the south side. Note that the Penobsquis Mine also extracts rock salt from the core of the structure and that the Picadilly Mine will extend to the south, following the sub-horizontal extension of the potash unit.

19.3 Basin Evaluation

Brine seeps and gypsum occurrences in early drilling suggested that salt may be present in the Bay St. George Sub-Basin. The potential was explored using regional and detailed gravity surveys. Negative gravity anomalies were drilled to confirm the presence of salt in the subsurface. The Captain Cook area was identified by petroleum exploration drilling. Unlike the historical salt and potash occurrences it is not expressed as a negative bouguer gravity anomaly (see Figures 8 and 10). However, the evaporate sequence is imaged by the seismic data in the area.

Figure 17 shows the interpreted seismic data from line 98-106. The location of the line intersects the Captain Cook #1 well providing lithological control. The seismic section suggests that the evaporate sequence extends at least two (2) kilometres to the northeast and that the sequence may thicken in that direction. Similarly, the SR-4 seismic line is shown in Figure 18. That line passes adjacent to Flat Bay #5, ARE #1 and Flat Bay #2 providing lithological control. The evaporate sequence intersected by the drilling and interpreted on the seismic (with vertical exaggeration) dips and thins rapidly to the east but then appears to thicken at depth approximately two (2) kilometres from the well sites. This model is consistent with the interpretation provided in this report.

20.0 RECOMMENDATIONS

The Captain Cook area of the Vulcan Minerals licence block area has significant potential for evaporate exploration (rock salt and potash). The area east and northeast of the Captain Cook #1 well has limited seismic coverage but there is potential for the occurrence of a thickened evaporite sequence, including salt and possibly potash, and therefore is should be the focus of further exploration work.

It is recommended that an exploration drilling program to examine the distribution (horizontal and vertical) of the rock salt / potash should be undertaken. The program should include a minimum of two cored drillholes. Based on the results of these drillholes, additional drilling may be considered. The drillholes should be cored from surface (or the bottom of the conductor casing). They should target the base of the evaporate sequence, the Ship Cove Limestone / Fischells Conglomerate contact. The drillhole construction should include a full suite of downhole geophysical logs as well as sampling and detailed analysis of representative core sections.

If successful, the drilling should be followed up by a high resolution seismic survey. The seismic program should be designed and targeted at the imaging of the relatively shallow evaporate sequence, perhaps on a grid with spacing of approximately one (1) kilometre or less. The survey should be tied to the existing (e.g. Captain Cook #1) and planned drilling to maximize the potential for delineating the deposit. If the drilling and seismic programs are successful in defining a deposit with development potential, it should be anticipated that a detailed seismic program (3-D seismic) will be required to determine feasibility and for planning.

The area west of the Flat Bay Anticline, extending from St. Fintan’s and Robinsons in the southwest to the St. Teresa and Flat Bay areas in the northeast, has well defined negative gravity anomalies, however, the subsequent historical drilling has not intersected economically attractive rock salt or potash mineralization. The Vulcan licence block includes the area of the Robinsons anomaly. This region may have potential for development, however, additional work will be required to characterize the structure and stratigraphy before any specific targets can be established. Additional seismic surveying of the area may assist in the identification of evaporate targets and the requirement for high resolution, shallow focus, parameters should be a consideration in planning these projects.

The Fischells Brook area has satellite anomalies located east and south of the main evaporate deposit. These areas are covered by the Vulcan licence block. They have limited seismic coverage and no drilling has been undertaken. Testing these targets with a core drilling program may be warranted. As above, the program should include core from surface and target the base of the evaporate sequence at the Ship Cove / Fischells Conglomerate if possible. Additional seismic data may useful in identifying potential drill targets or as a follow-up to define the evaporate area.

The core drilling should include a program and equipment specifically designed to evaluate the evaporate sequence. The drillhole construction, the casing program, the evaluation and the abandonment must be undertaken to minimize the potential risk for sterilization of all or part of the evaporate deposit. The goals of an evaporate drilling program must include; as close to 100% core recovery, from surface to TD, as possible; a drilling fluid system which is compatible with the evaporate mineralogy and the environment of the area; the drillhole should be constructed with a sufficient diameter and in a condition which is suitable for geophysical and geotechnical testing as required; and casings must be set, sealed and tested at appropriate depths so as to ensure, as much as possible, the long term integrity of the evaporate deposit. As noted above, the target depth for the drillholes should be the base of the Ship Cove Limestone / top of the Fischells Conglomerate in order to define the stratigraphy and gather information for correlation with the subsurface geophysical (seismic) data.

20.1 ESTIMATED EXPLORATION BUDGET - BACKGROUND

The exploration program outlined in the section above recommends the construction of a minimum of two (2) diamond drillholes in the Captain Cook area to evaluate the potential for rock salt and / or potash. It must be noted that the successful completion of an evaporate drillhole requires as significant level of logistical planning, specialized equipment and trained personnel as well as on-site supervision. The drillhole must be constructed to limit the risk to the long term integrity of the evaporite deposit and will require site preparation, fluid management, a casing program and a drillhole abandonment program.

Further, the drill core must be handled and stored to ensure that it does not degrade. The drillhole should be logged with downhole geophysical instruments and the core should be sampled for detailed laboratory analysis. Based on the author’s experience in eastern Canada as well as western Newfoundland, an evaporate drilling program in western Newfoundland will require a budget of approximately **$1,000,000.00 per hole**. Note that this is an “all in” cost estimate with respect to drilling, supervision, logging, sampling and reporting, but it does not include a budget for permitting, construction of site access, site preparation, specialized waste disposal or site restoration work.

If the drilling program in the Captain Cook area is successful in identifying a potentially ecomonic deposit of rock salt and / or potash, it is anticipated that a high resolution seismic program will be undertaken to define the structure of the deposit (depth to the top and bottom of the evaporate section as well as the limits of the deposit area). It is anticipated that a seismic program, utilizing a one (1) kilometre grid, with the location of the Captain Cook #1 and the Flat Bay wells as tie points on the west and extending at least five (5) kilometres to the east with length overshot to achieve the proper required data fold, and including at least one mid-point tie line, may be recommended. This program represents a grid of approximately 40 km in total length. The estimated budget for the seismic program, based on the seismic programs conducted in the area by Vulcan, is a line kilometre cost estimate of **$25,000.00 per km or $1,000,000.00.** This is an "all in" cost estimate incorporating acquisition, processing, supervision and reporting. The cost estimate does not include a budget for permitting, construction of site access, site preparation or site restoration work.

A similar two (2) hole drilling program is recommended to test the evaporate (potash) potential of the two Fischells Brook satellite anomalies. As per the Captain Cook area drilling, these drillholes will also require a budget of approximately **$1,000,000.00 per hole**. If the drilling in either of these locations is successful in identifying a potentially economic potash occurrence, it is anticipated that a second drillhole may be undertaken at either location (estimated budget **$1,000,000.00 per hole**) followed by a similar high resolution seismic program to define the extend of the evaporate deposit (40 km estimated at **$25,000.00 per km or $1,000,000.00** at each anomaly).

20.2 ESTIMATED EXPLORATION BUDGET – SUMMARY

Table 12. Estimated Exploration Budget - Summary

Location / Phase	Activity	Estimated budget
Captain Cook / Phase I: Selection of Drill Locations	undertake a complete geological / geophysical data integration, interpretation and evaluation, identify drill locations, complete pre-drilling planning, permitting, engineering, procurement, etc.	$500,000.00 pre-drilling
Captain Cook / Phase II: Drilling	construction of two (2) drillholes in the Captain Cook area; geophysical logging and geochemical / metallurgical testing; reporting	$2,000,000.00 drilling operations
Fischells Brook East / Phase I: Selection of Drill Locations	complete geological / geophysical data integration, interpretation and evaluation, drill location identification, pre-drilling planning, permitting, engineering, procurement, etc.;	$250,000.00 pre-drilling
Fischells Brook East / Phase II: Drilling	construction of one (1) drillhole at the Fischells Brook East anomaly; geophysical logging and geochemical / metallurgical testing; reporting	$1,000,000.00 drilling operations
Fischells Brook South / Phase I: Selection of Drill Locations	complete geological / geophysical data integration, interpretation and evaluation, drill location identification, pre-drilling planning, permitting, engineering, procurement, etc.;	$250,000.00 pre-drilling
Fischells Brook South / Phase II: Drilling	construction of one (1) drillhole at the Fischells Brook South anomaly; geophysical logging and geochemical / metallurgical testing; reporting	$1,000,000.00 drilling operations
Delineation of Successful Locations	Based on the success of each respective drilling program; delineate the evaporate deposit with high resolution seismic; acquisition, processing, supervision, reporting	$1,000,000.00 per successful location

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22.0 DATE AND SIGNATURE PAGE

22.1 Statement of Certification by Author

I, David C. Carter, P.Geo., do hereby certify that:

1. I am a Professional Geoscientist, President and Senior Geoscientist with Hy-Grade Geoscience Ltd., an environmental and earth science consulting firm.

2. I graduated with a Bachelor of Science degree in Geology from Mt. Allison University in 1982. In addition, I graduated with a Master of Science degree in Geology from the University of New Brunswick in 1985.

3. I am a member-in-good-standing (life member) of the Association of Professional Geoscientists of Nova Scotia (APGNS), registered as a Professional Geoscientist (Geology and Environmental Geoscience), Certificate #001.

4. I have worked as a geologist since my graduation from university (B.Sc) in 1977. I am a consulting geologist and have been practicing in this capacity since 1990.

I have been directly involved in the exploration, feasibility and development of evaporate (salt and potash) projects, particularly in eastern Canada.

As a Regional Geologist/Economic Geologist Specialist with the Nova Scotia Department of Mines and Energy, I mapped the underground mine workings of the Pugwash Salt deposit, including the definition of the structure and stratigraphy of the diapir. I also supervised several evaporate drilling projects.

I later reviewed the geological resources and previous mineral exploration in Saudi Arabia. The project was to identify evaporate exploration targets for a geological mission. I have consulted on numerous evaporate projects in Newfoundland and Labrador, Nova Scotia, and New Brunswick (exploration drilling, feasibility and development of salt and potash resources as well as underground storage and waste disposal). I have also toured several evaporate operations and consulted on the evaluation of an evaporate mining project in Saskatchewan.

I have consulted / managed the exploration and development drilling (materials delivery) as well as deep hole monitor wells for a producing salt and potash mine in New Brunswick as well as on the exploration, discovery, feasibility and development (shaft pilot hole) and shaft sinking for a new salt and potash mine.

I also worked with the management team on the inflow control project at a potash mine and am currently involved (Senior Geoscientist / Drilling Consultant) on the decommissioning of two injection wells at another former potash mine.

I have read the definition of "Qualified Person" set out in National Instrument 43-101 and certify that by reason of my education, professional registration and relevant work experience, I am a "Qualified Person" as defined by NI 43-101.

5. I am responsible for each item in this Technical Report titled **"Bay St. George, Newfoundland and Labrador, Salt and Potash Resource Potential"** as per Form 43-101F.

6. I visited the area and subject property on April 11, 2011, including time at the core library in Pasadena. I also visited the St. John's office of Vulcan Minerals Ltd. on April 12, 2011 to review files, maps and sections.

7. My previous involvement in the area was as a Geologist on the Pronto, Inco, Noranda projects and Senior Geologist on the Lesson exploration drilling program. This work was primarily on the Fischells Brook property but also included work at St. Teresa, Barachois Brook, and Harry's River. I also visited and consulted on salt issues at the Flintcote Mine in Flat Bay; visited and consulted on drilling issues on projects in the Port aux Port area; and visited and consulted on exploration work in the Deer Lake Basin. I was contracted by the Newfoundland Department of Mines and Energy to visit and comment on the drilling equipment and operations at the American Reserve Energy (ARE #1) well site at Flat Bay during a suspension in the drilling operations. I have not previously contracted or consulted or worked in any capacity for Vulcan Minerals Inc. on these subject or other properties.

8. As of the date of this certificate, to the best of my knowledge, information and belief and professional understanding, this report contains all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

9. I am independent of Vulcan Minerals Inc. applying all the tests defined by the NI 43-101, Section 1.5, as well as Part 3.3 of the companion policy document (NI 43-101CP), as well as any and all tests and/or definitions as set forth in NI 43-101.

10. I have read National Instrument 43-101 and Form 43-101F1, and the Technical Report has been prepared in compliance with that instrument and form, including the repeal and replacement of National Instrument 43-101 and Form 43-101F1 effective June 30, 2011.

11. I consent to the filing of the Technical Report with any stock exchange and other regulatory authority and any publication by them for regulatory purposes, including electronic publication in the public company files on their websites accessible by the public, of the Technical Report.

Dated this 31 day of May, 2011.

David C. Carter, P.Geo. Professional seal

APPENDIX A

TABLES

Table 2: Vulcan Minerals Mineral Licence; Bay St. George Sub-Basin Area; May 31st, 2011

Licence No.	Claims	Held by	Area	NTS sheets	Issue date	Report date	Renewal date	Assessment Year	Required Expenditure	Required by
006107M	60	Vulcan	Flat Bay	12B07	6/8/1998	August 8th	6/8/2013	13	$34,466.03	6/8/2016
008838M	240	Vulcan	Flat Bay	12B07, 12B08	6/10/2002	August 9th	6/10/2012	9	$165,488.96	6/10/2013
010069M	45	Vulcan	Flat Bay	12B07	4/12/2004	June 13th	4/12/2014	8	$5,645.65	4/12/2012
011159M	114	Vulcan	Robinsons River	12B02, 12B07	8/1/2005	September 30th	8/1/2015	6	$61,619.71	8/1/2011
011160M	166	Vulcan	Robinsons River	12B02, 12B07	8/1/2005	September 30th	8/1/2015	6	$136,958.44	8/1/2016
012669M	160	Vulcan	Robinsons River	12B02, 12B07	10/27/2006	December 29th	10/27/2011	4	$73,532.65	10/27/2014
017955M	32	Vulcan	Fischells Brook	12B08, 12B07	9/16/2010	November 15th	9/16/2015	1	$6,400.00	9/16/2011
017956M	12	Vulcan	Fischells Brook	12B07	9/16/2010	November 15th	9/16/2015	1	$2,400.00	9/16/2011
018054M	19	Vulcan	Fischells Brook	12B07	11/4/2010	January 3rd	11/4/2015	1	$3,800.00	11/4/2011
018929M	91	Vulcan	Fischells Brook	12B08, 12B07	5/5/2011	July 4th	5/5/2016	1	$18,200.00	5/5/2012
019059M	256	Vulcan	Big Otter Pond	12B07, 12B08	9/18/2006	November 17th	9/18/2011	4	230,400	9/18/2019

Table 3. Petroleum Well Data Inventory

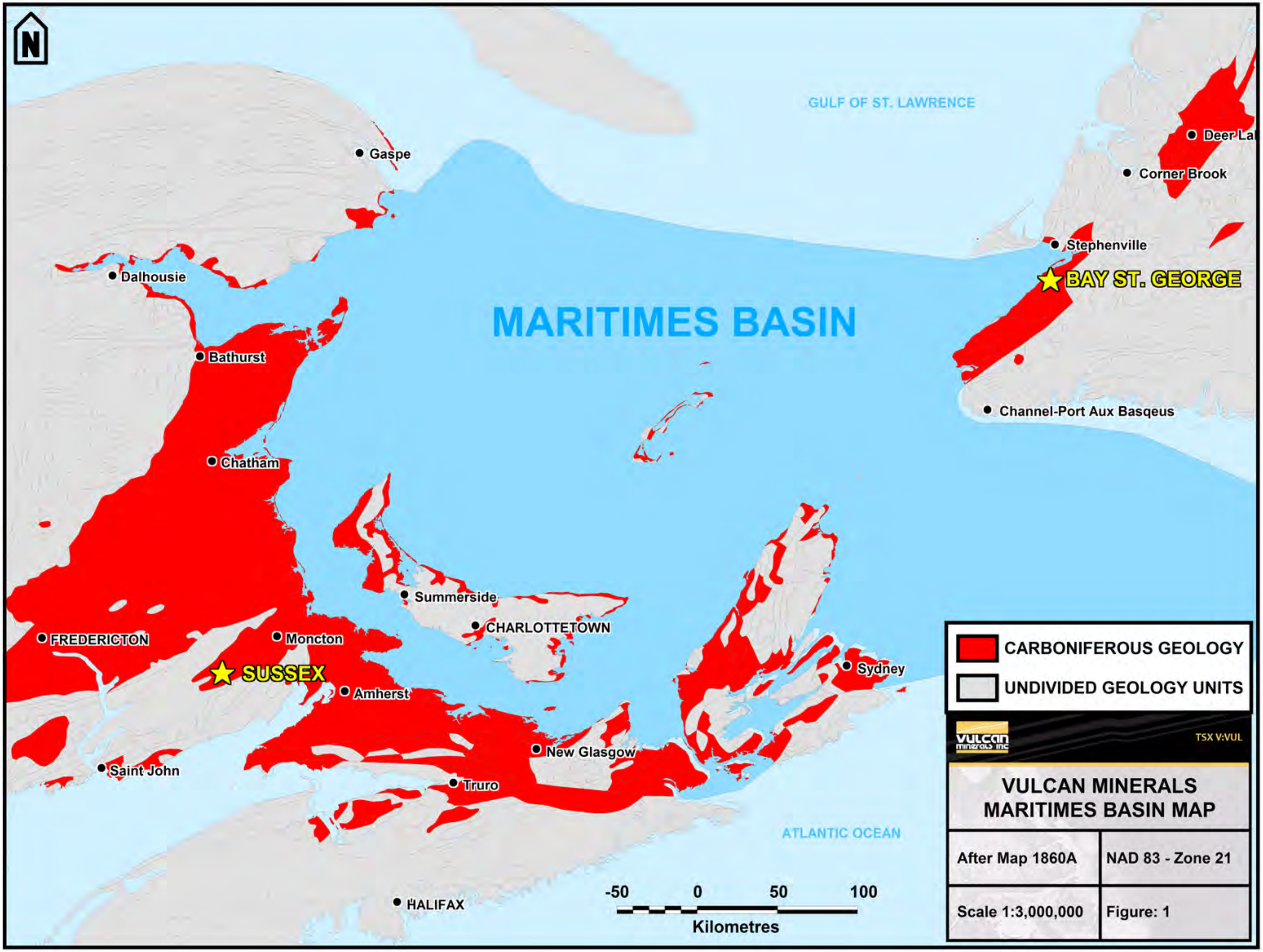
Well_Name	Company	Projection	UTM_Zone	UTM_Easting	UTM_Northing	Elevation	Depth	Spud_Date	TD_Group
Captain Cook #1	Vulcan Minerals Inc	NAD 27	21	386829	5361915	54.2	605.2	7-Jan-02	Pre-Carb.
Flat Bay #1	Vulcan Minerals Inc	NAD 27	21	384435	5360238	47	286	10-Aug-99	Anguille
Flat Bay #2	Vulcan Minerals Inc	NAD 27	21	386697	5359963	55.45	845.6	23-Oct-04	Anguille
Flat Bay #3	Vulcan Minerals Inc	NAD 27	21	384422	5360085	45.36	370.3	7-Oct-05	Pre-Carb.
Flat Bay #5	Vulcan Minerals Inc	NAD 27	21	386152	5359952	68.63	719	25-Oct-06	Anguille
ARE 93-101 #1	American Reserve	NAD 27	21	386750	5359970	50	671	1-Jul-00	Codroy
Storm #1	Vulcan Minerals Inc.	NAD 27	21	393461	5363638	111.75	880.5	10-Jul-05	Codroy
Hurricane #1	Vulcan Minerals Inc.	NAD 27	21	377162	5344650	138.32	876	10-Oct-05	Anguille
Hurricane #2	Vulcan Minerals Inc.	NAD 27	21	375855	5347196	145.7	935	24-Nov-05	Anguille
Robinsons #1	Vulcan - Invescan	NAD 27	21	379782	5343073	169.24	3560	Jun-09	
Red Brook #2	Vulcan - Invescan	NAD 27	21	370104	5347380	57.1	1965	Oct-09	

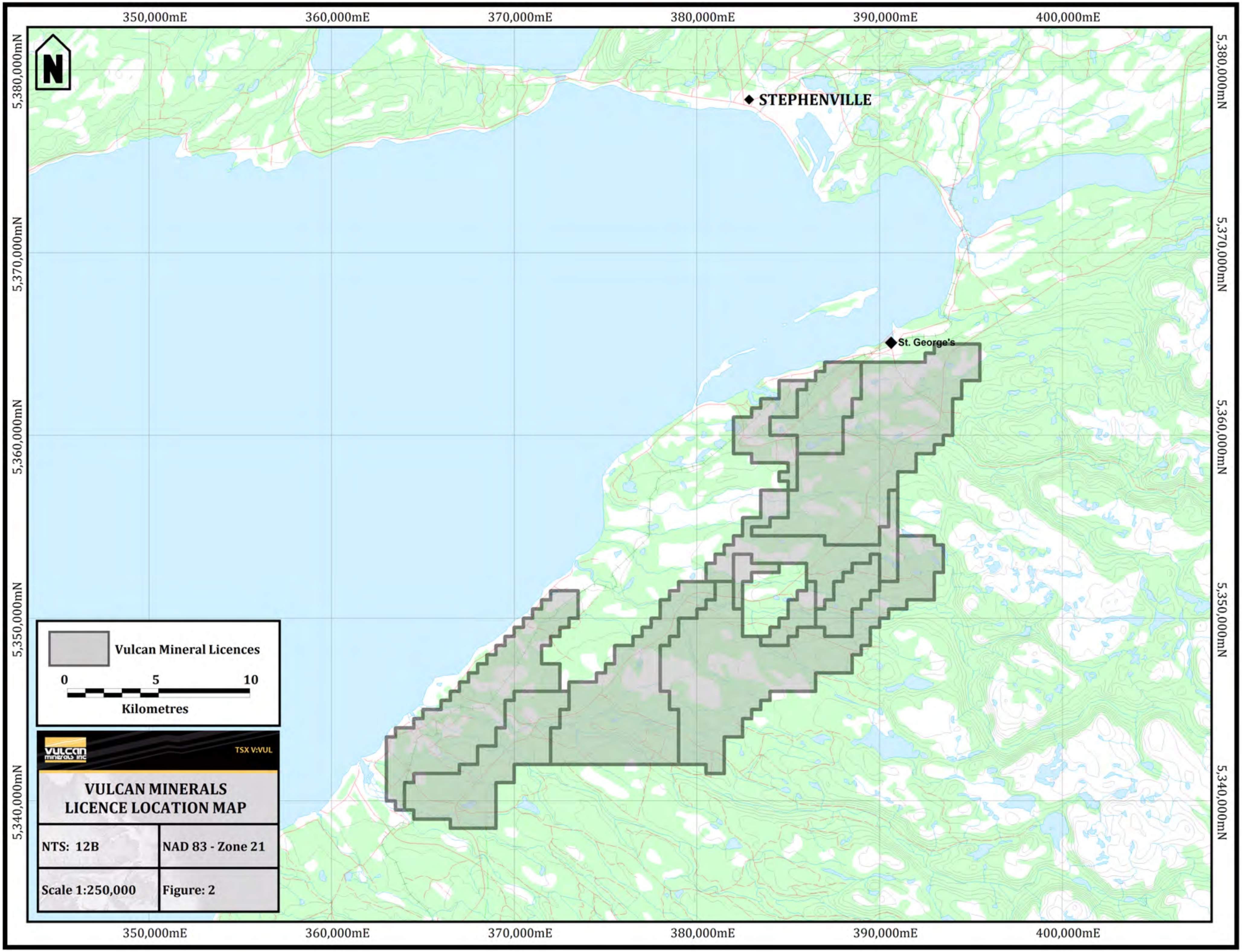
Table 4. Mineral drillhole inventory (source Vulcan Minerals).

YEAR	COMPANY	PROPERTY	Hole #	NTS	EAST	NORTH	TOTAL DEPTH
1968	Hooker	Fischell's Brook	HOOKER #1	12B/07	383830.00	5351000.00	1097.3
1972	Hooker	Robinson's	R-1-73?	12B/07	368058.20	5345989.50	694
1973	Hooker	St. Fintan's	DDH?	12B/07	362500.00	5339100.00	489 ?
1980	Pronto	Fischell's Brook	PF-1	12B/07	383300.00	5352220.00	879.9
1980	Pronto	Fischell's Brook	PF-2	12B/07	384010.00	5352380.00	641.9
1998	Leeson	Fischell's Brook	LR-98-01	12B/07	382250.00	5351650.00	771.23
1998	Leeson	Fischell's Brook	LR-98-02	12B/07	383830.00	5351050.00	358.38
1987	Inco-Pronto	Fischell's Brook	IP77501	12B/07	383146.40	5351204.80	924.8
1976	AMAX	Fischell's Brook	FB-2-76	12B/07	384450.00	5351200.00	794
1976	AMAX	St. Teresa's	ST-1-76	12B/07	375580.00	5358300.00	989.38
1981	Pronto	St. Teresa's	ST-1	12B/07	376600.00	5356310.00	411.4
1981	Pronto-Noranda	Barachois Brook	BB-#1	12B/07	398940.00	5367860.00	701
1982	Pronto-Noranda	Barachois Brook	BB-#2	12B/07	398140.00	5367400.00	1025.6
1992	Westminer	Little Otter Pond	LOP-01	12B/07	385400.00	5344885.00	130.00
1983	NL DME	Robinson's River	DDH-01	12B/07	379600.00	5342000.00	343.20

APPENDIX B

FIGURES


N
GULF OF ST. LAWRENCE
MARITIMES BASIN
Gaspe
Dalhousie
Bathurst
Chatham
Deer La
Corner Brook
Stephenville
BAY ST. GEORGE
Channel-Port Aux Basqeus
Summerside
CHARLOTTETOWN
FREDERICTON
Moncton
SUSSEX
Amherst
Sydney
New Glasgow
Saint John
Truro
ATLANTIC OCEAN
HALIFAX
-50
0
50
100
Kilometres
CARBONIFEROUS GEOLOGY
UNDIVIDED GEOLOGY UNITS
TSX V:VUL
VULCAN MINERALS
MARITIMES BASIN MAP
After Map 1860A
NAD 83 - Zone 21
Scale 1:3,000,000
Figure: 1



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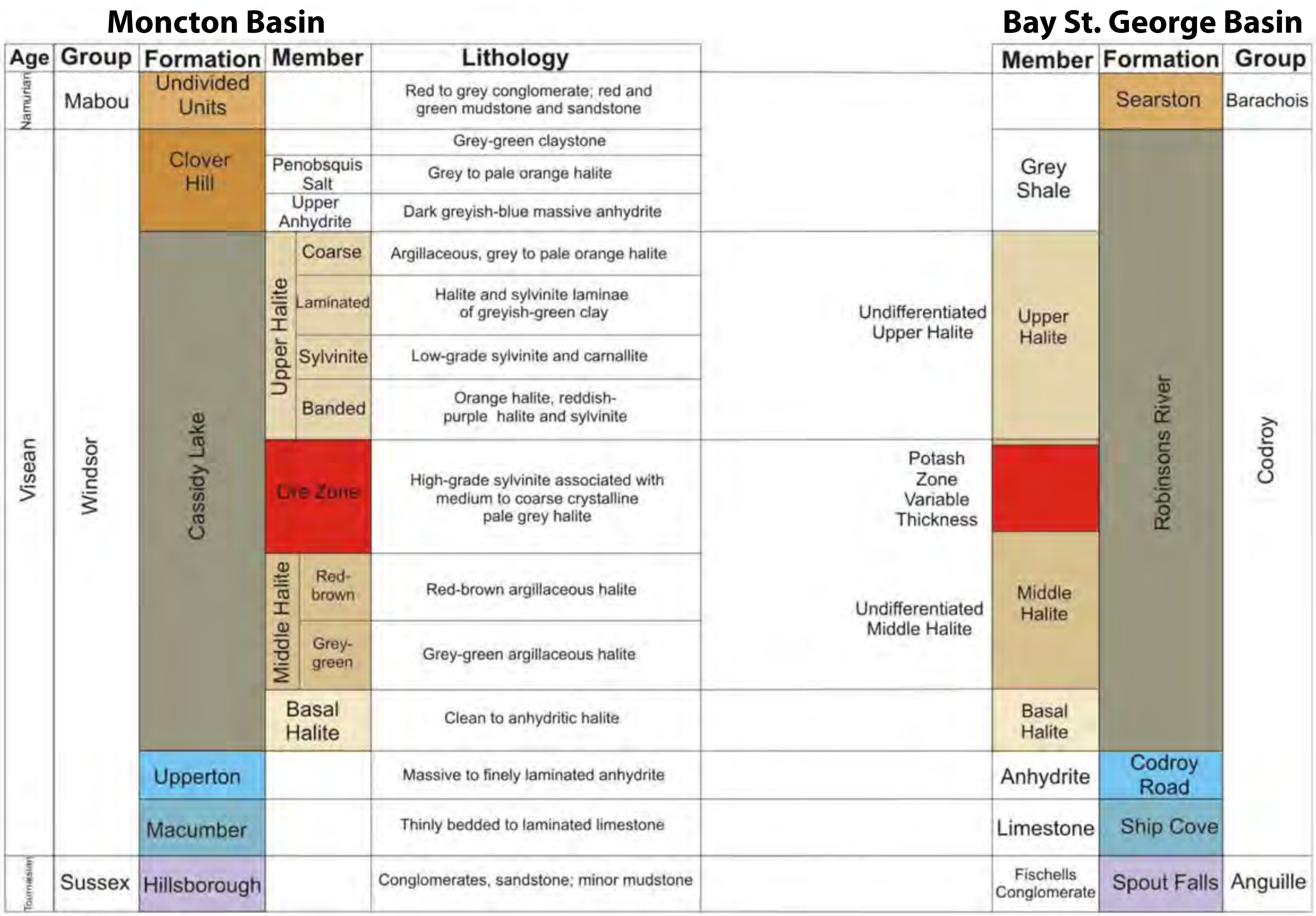
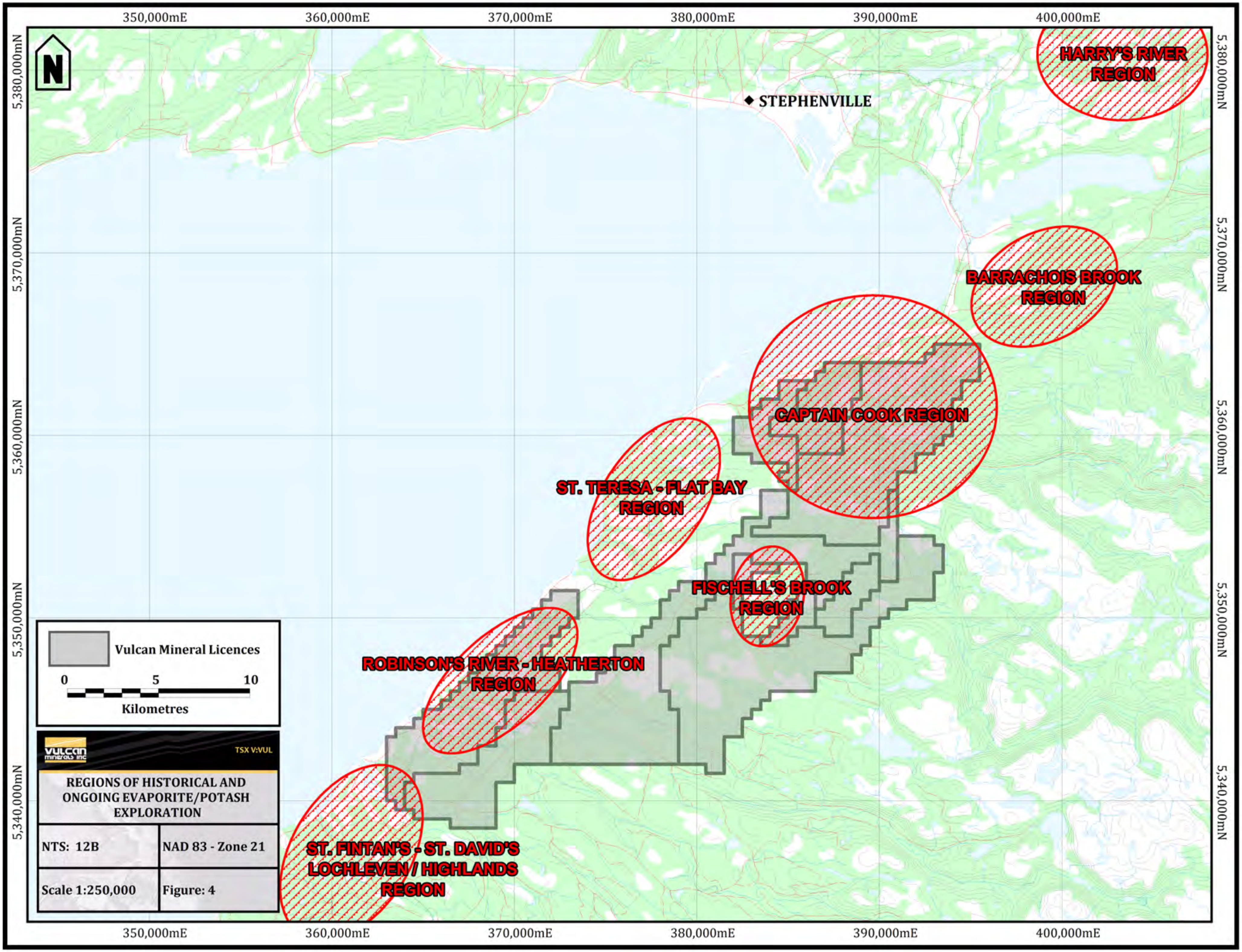
5,360,000mN
5,350,000mN
5,340,000mN
N
STEPHENVILLE
St. George's
Vulcan Mineral Licences
0
5
10
Kilometres
TSX V:VUL
VULCAN MINERALS
LICENCE LOCATION MAP
NTS: 12B
NAD 83 - Zone 21
Scale 1:250,000
Figure: 2

FIGURE 3: EVAPORITE STRATIGRAPHY OF THE MARITIMES BASIN



After Wilson 2006



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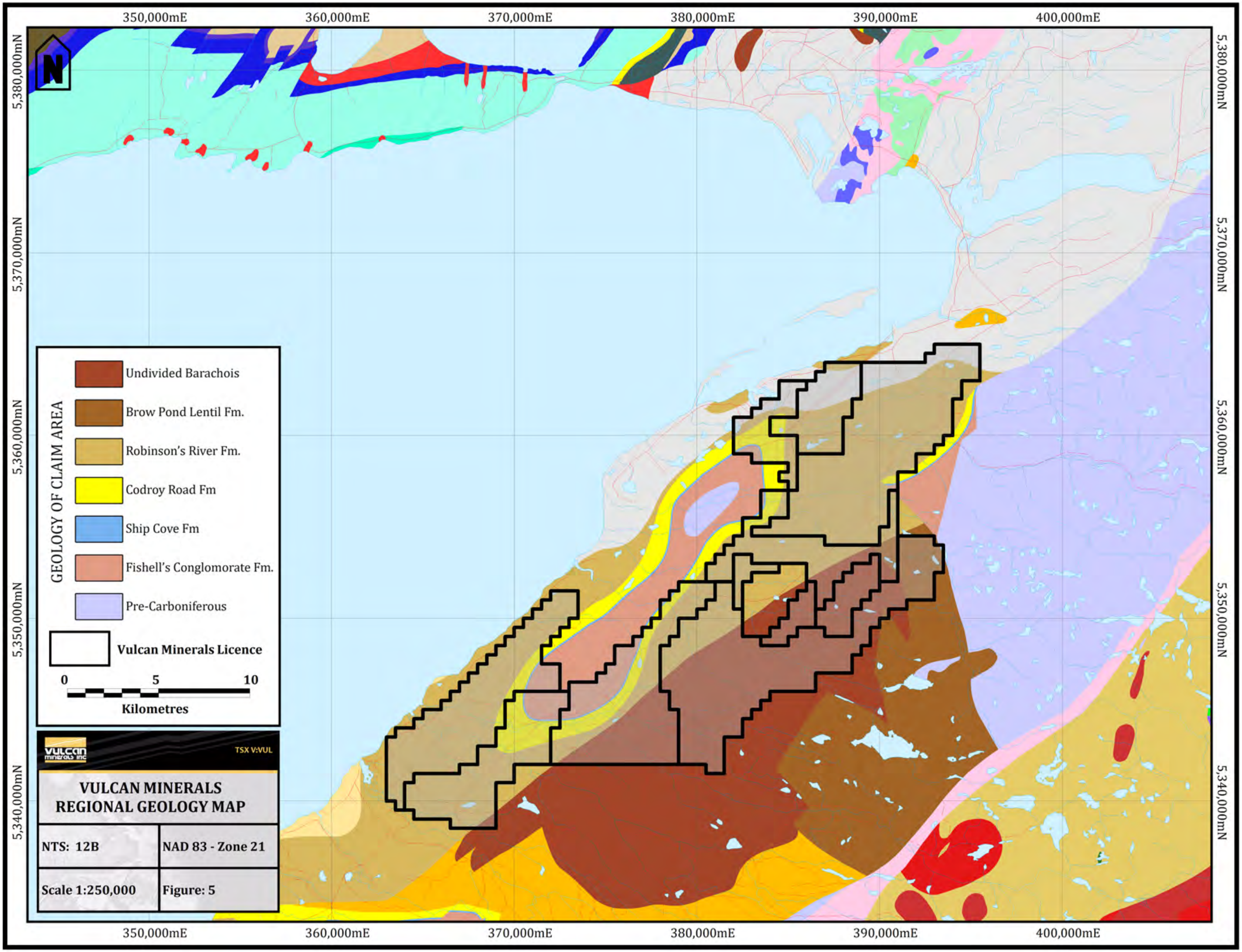
5,350,000mN
5,340,000mN
N
STEPHENVILLE
HARRY'S RIVER REGION
BARRACHOIS BROOK REGION
CAPTAIN COOK REGION
ST. TERESA - FLAT BAY REGION
FISCHELL'S BROOK REGION
ROBINSON'S RIVER - HEATHERTON REGION
ST. FINTAN'S - ST. DAVID'S LOCHLEVEN / HIGHLANDS REGION
Vulcan Mineral Licences
0 5 10
Kilometres
TSX V:VUL
REGIONS OF HISTORICAL AND ONGOING EVAPORITE/POTASH EXPLORATION
NTS: 12B
NAD 83 - Zone 21
Scale 1:250,000
Figure: 4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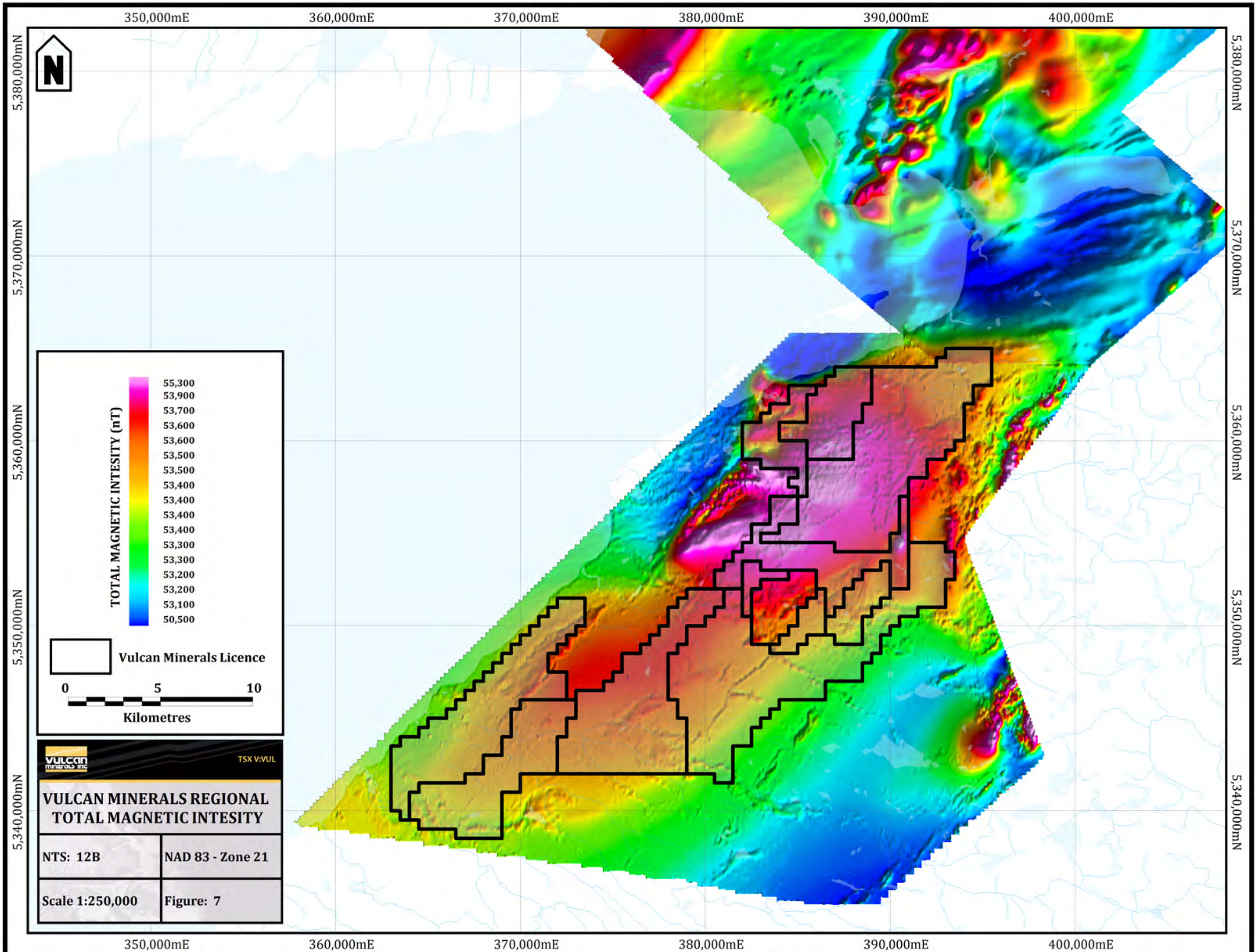
5,360,000mN
5,350,000mN
5,340,000mN
N
GEOLOGY OF CLAIM AREA
Undivided Barachois
Brow Pond Lentil Fm.
Robinson's River Fm.
Codroy Road Fm
Ship Cove Fm
Fishell's Conglomerate Fm.
Pre-Carboniferous
Vulcan Minerals Licence
0
5
10
Kilometres
TSX V:VUL
VULCAN MINERALS
REGIONAL GEOLOGY MAP
NTS: 12B
NAD 83 - Zone 21
Scale 1:250,000
Figure: 5

370,000mE
380,000mE
390,000mE
5,360,000mN
5,350,000mN
5,340,000mN
N
Storm #1
Captain Cook #1
Flat Bay #1
Flat Bay #3
Flat Bay #5
Flat Bay #2
ARE 93-101 #1
ST-1-76
ST-1
PF-1
PF-2
LR-98-01
INCO
FB-2-76
Hooker #1
LR-98-02
Red Brook #2
Hurricane #2
Hooker Robinsons
Hurricane #1
Robinsons #1
St. Fintans
St Anthony
Corner Brook
Gander
Stephenville
Clarenville
Port Aux Basques
St. John's
Vulcan Mineral Licence
Seismic Line
Drill Hole/Oil Test Well
GEOLOGY OF CLAIM AREA
Undivided Barachois
Brow Pond Lentil Fm.
Robinson's River Fm.
Codroy Road Fm
Ship Cove Fm
Fishell's Conglomerate Fm.
Pre-Carboniferous
Kilometres
TSX V:VUL
VULCAN MINERALS
REGIONAL GEOLOGY MAP
NTS: 12B/07
NAD 83 - Zone 21
Scale 1:125,000
Figure: 6



VULCAN MINERALS REGIONAL TOTAL MAGNETIC INTESITY

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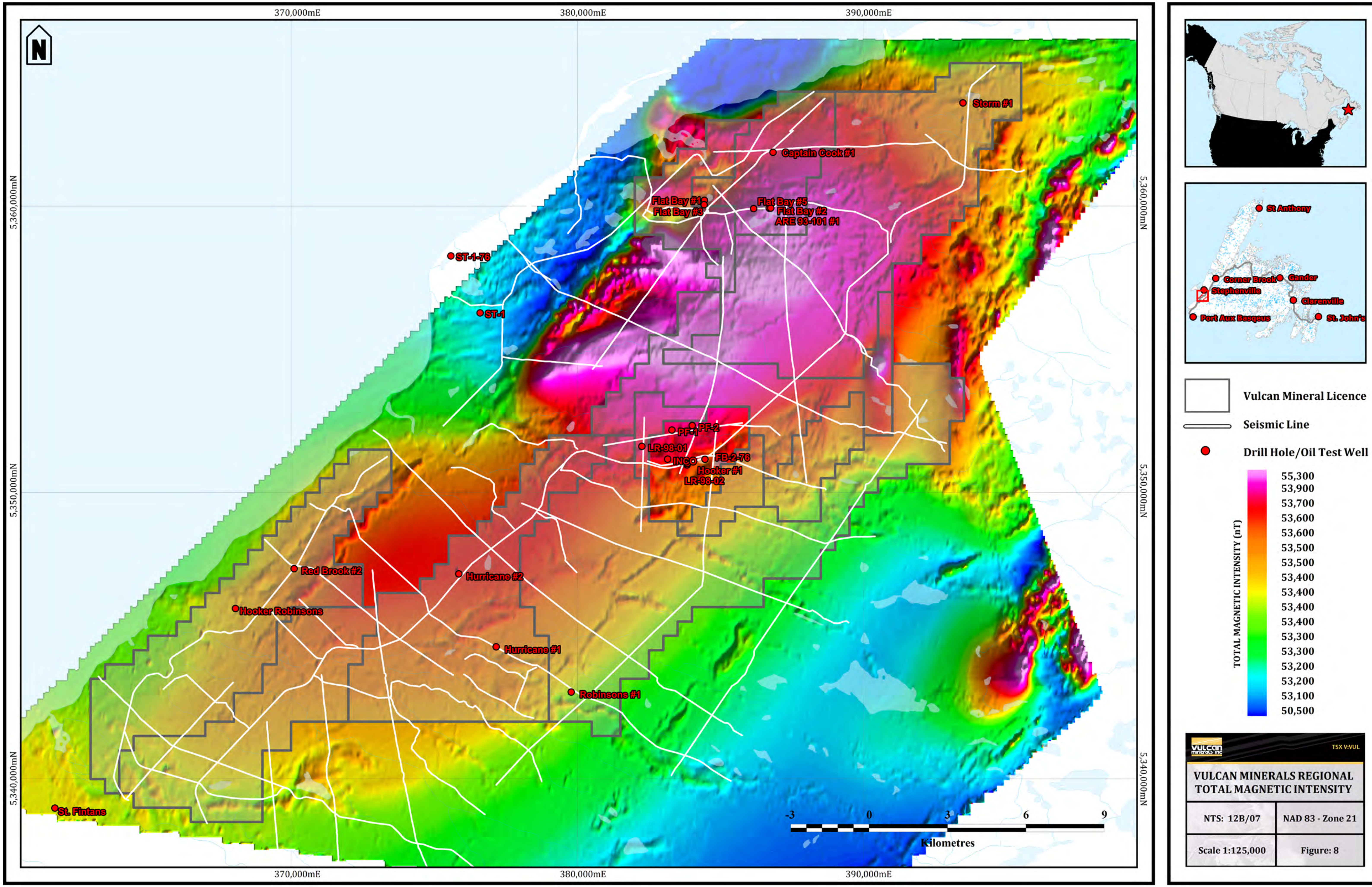
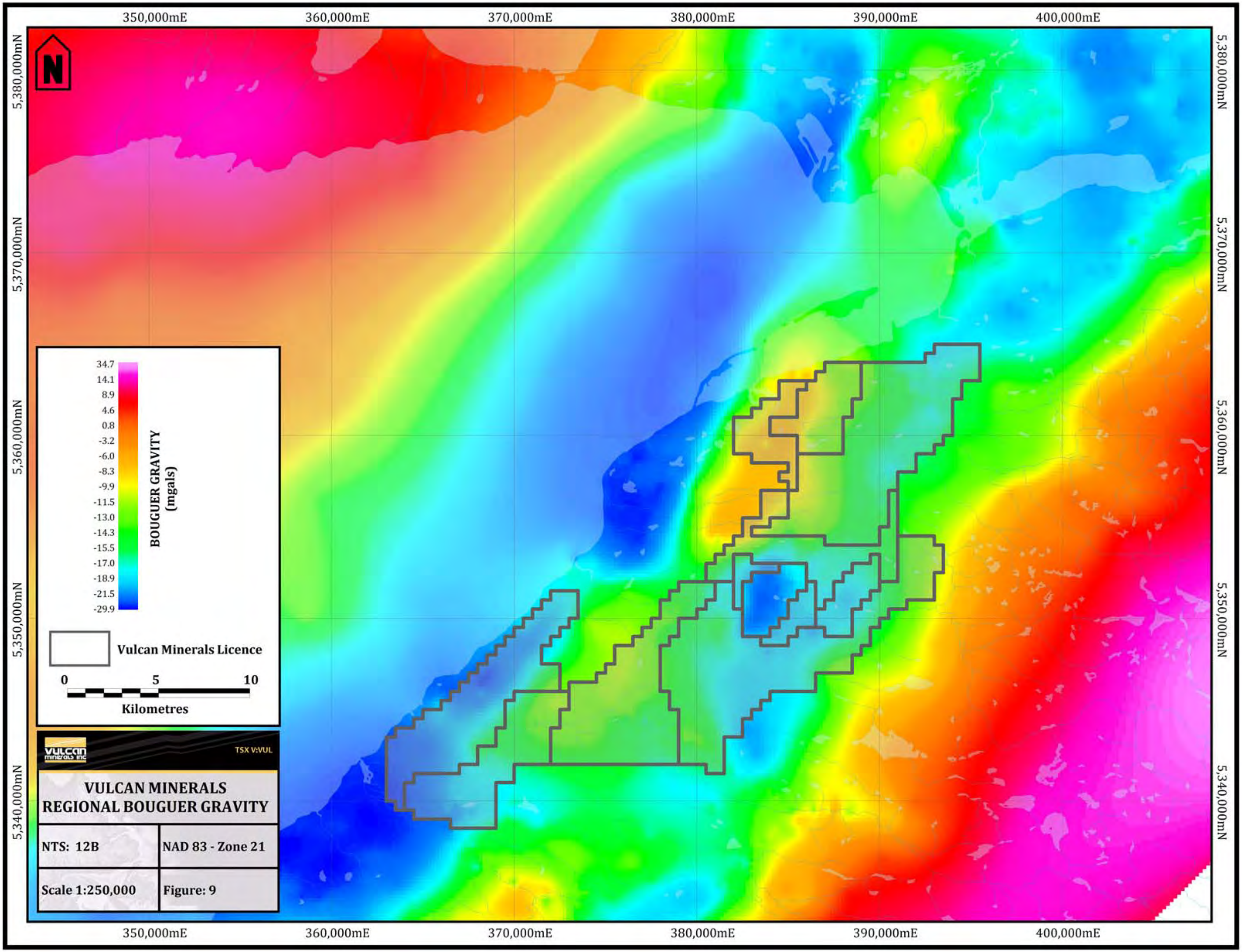
Scale 1:250,000	Figure: 7



N
370,000mE
380,000mE
390,000mE
5,360,000mN
5,350,000mN
5,340,000mN
Storm #1
Captain Cook #1
Flat Bay #1
Flat Bay #3
Flat Bay #5
Flat Bay #2
ARE 93-101 #1
ST-1-76
ST-1
PF-1
PF-2
LR-98-01
INCO
FB-2-76
Hooker #1
LR-98-02
Red Brook #2
Hurricane #2
Hooker Robinsons
Hurricane #1
Robinsons #1
St. Fintans
-3
0
3
6
9
Kilometres
St Anthony
Corner Brook
Gander
Stephenville
Clarenville
Port Aux Basques
St. John's
Vulcan Mineral Licence
Seismic Line
Drill Hole/Oil Test Well
TOTAL MAGNETIC INTENSITY (nT)
55,300
53,900
53,700
53,600
53,600
53,500
53,500
53,400
53,400
53,400
53,400
53,300
53,300
53,200
53,200
53,100
50,500
TSX V:VUL
VULCAN MINERALS REGIONAL TOTAL MAGNETIC INTENSITY
NTS: 12B/07
NAD 83 - Zone 21
Scale 1:125,000
Figure: 8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5,350,000mN
5,340,000mN
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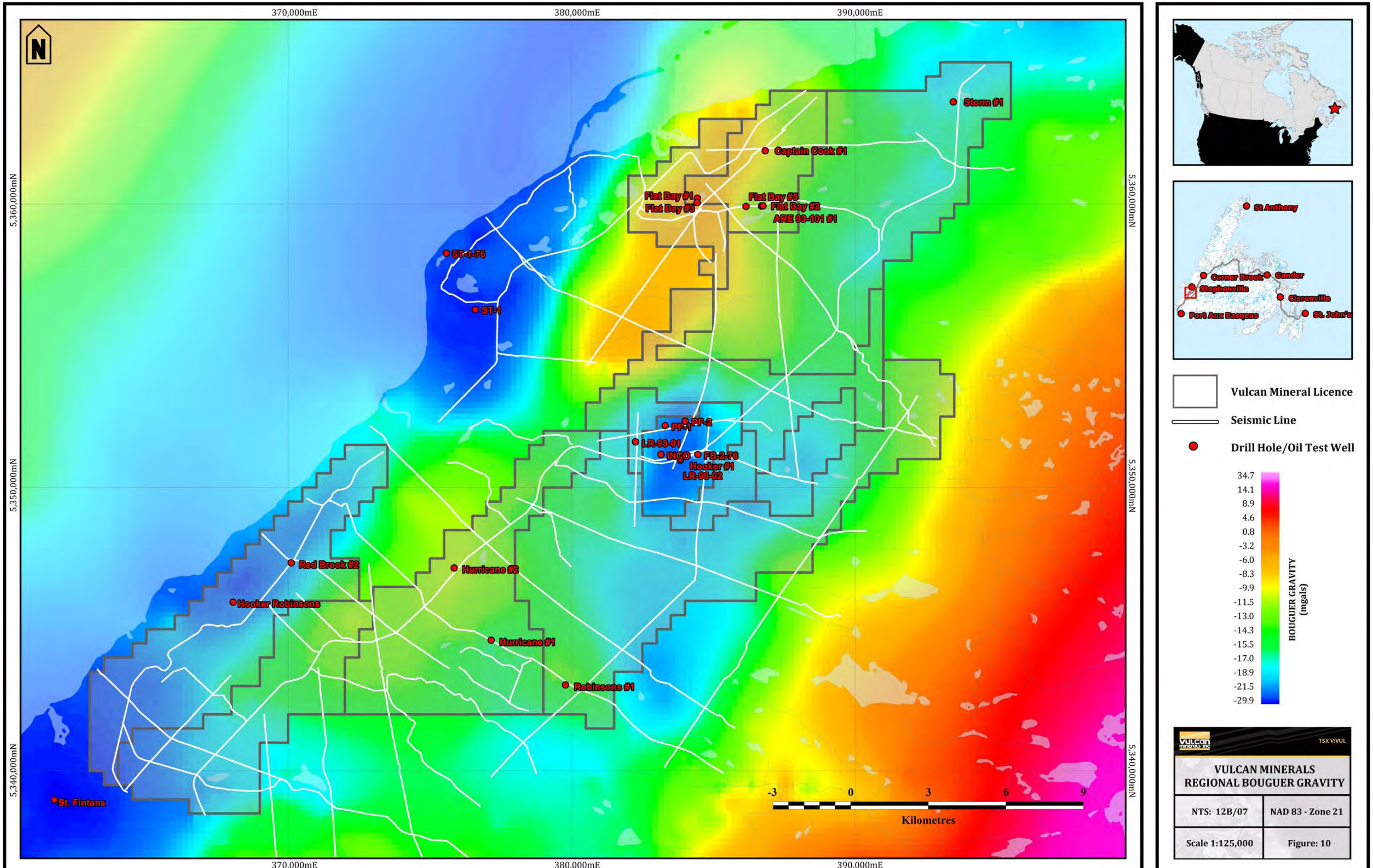
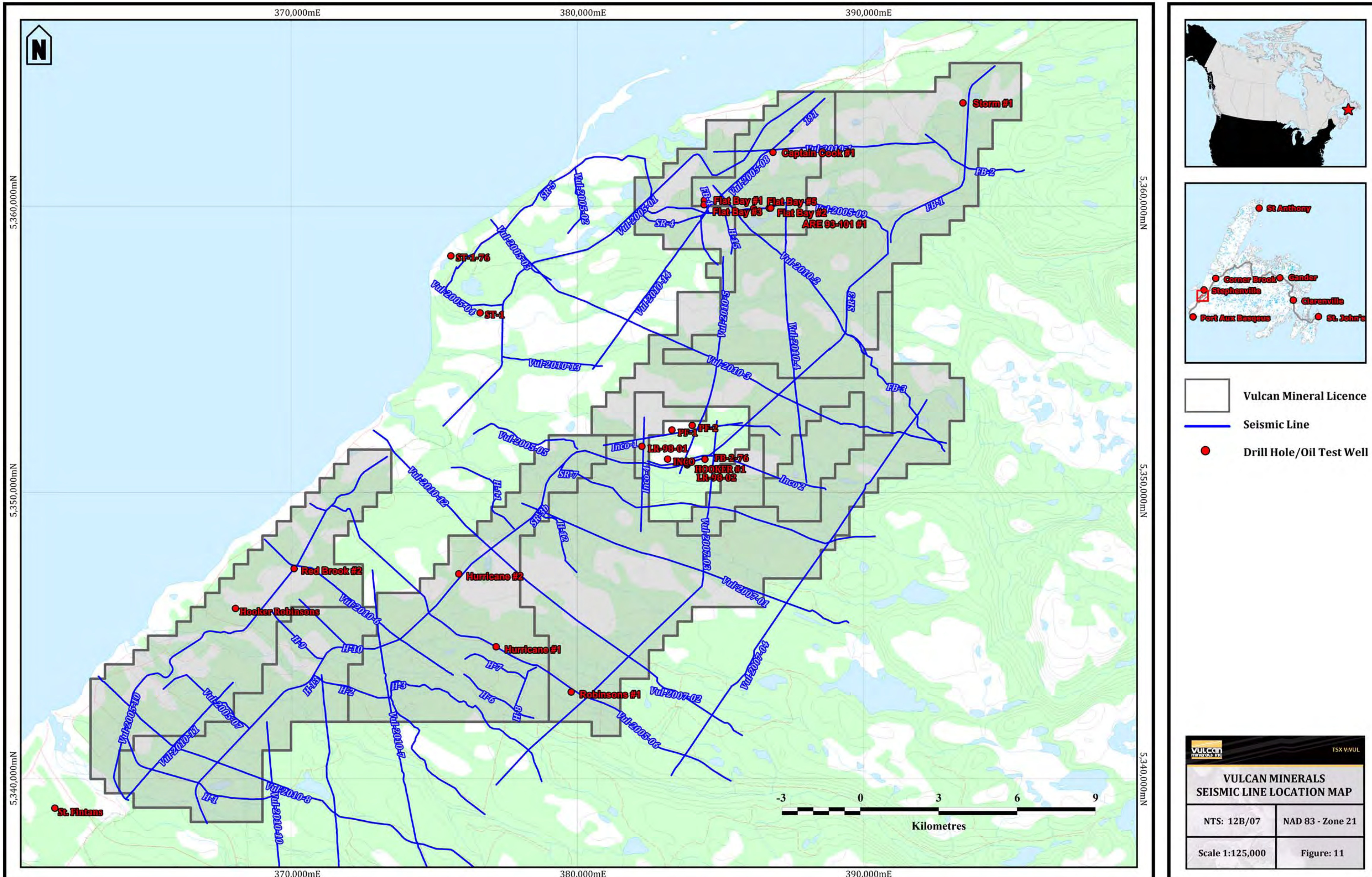
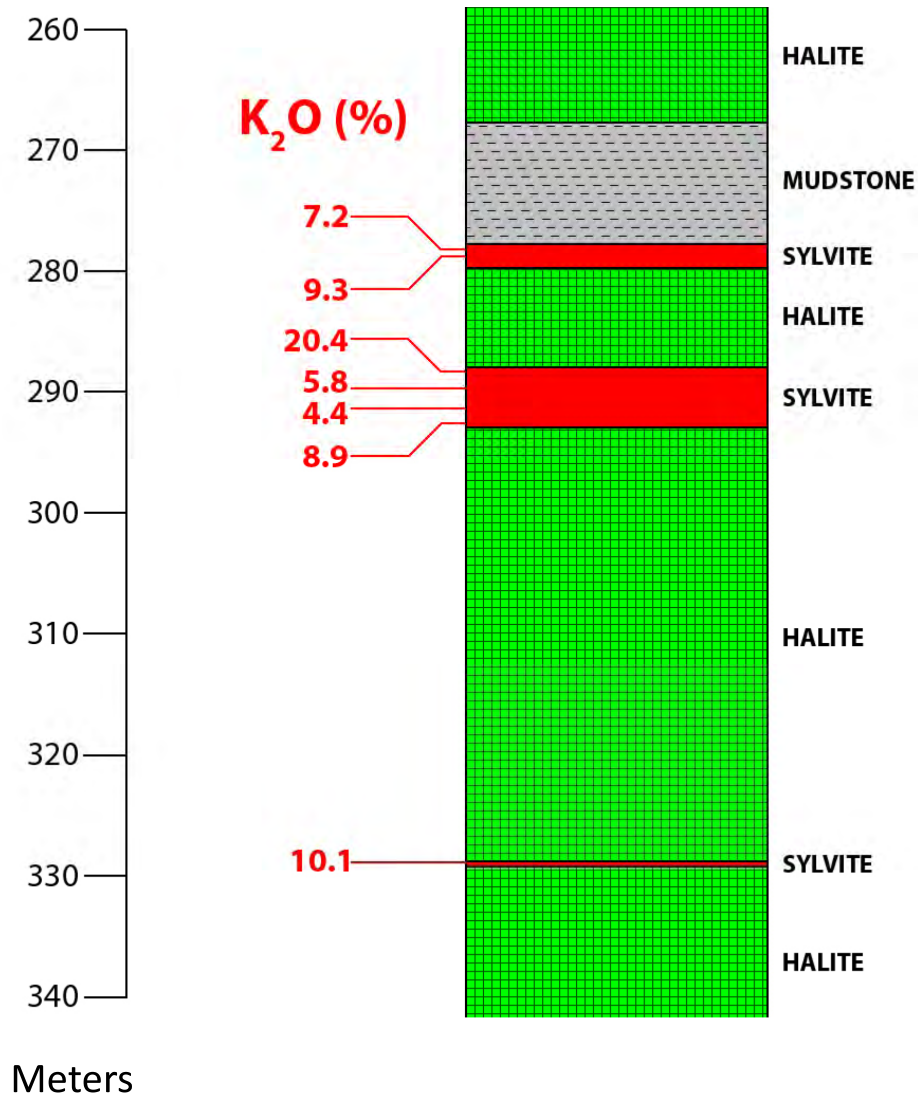
34.7
14.1
8.9
4.6
0.8
-3.2
-6.0
-8.3
-9.9
-11.5
-13.0
-14.3
-15.5
-17.0
-18.9
-21.5
-29.9
BOUGUER GRAVITY
(mgals)
Vulcan Minerals Licence
0
5
10
Kilometres
TSX V:VUL
VULCAN MINERALS
REGIONAL BOUGUER GRAVITY
NTS: 12B
NAD 83 - Zone 21
Scale 1:250,000
Figure: 9


N
370,000mE
380,000mE
390,000mE
5,360,000mN
5,350,000mN
5,340,000mN
Storm #1
Captain Cook #1
Flat Bay #1
Flat Bay #3
Flat Bay #5
Flat Bay #2
ARE 93-101 #1
ST-1-76
ST-1
PF-2
PF-1
LR-98-01
INCO
FB-2-76
Hooker #1
LR-98-02
Red Brook #2
Hurricane #2
Hooker Robinsons
Hurricane #1
Robinsons #1
St. Fintans
-3 0 3 6 9
Kilometres
St Anthony
Corner Brook
Gander
Stephenville
Clarenville
Port Aux Basques
St. John's
Vulcan Mineral Licence
Seismic Line
Drill Hole/Oil Test Well
34.7
14.1
8.9
4.6
0.8
-3.2
-6.0
-8.3
-9.9
-11.5
-13.0
-14.3
-15.5
-17.0
-18.9
-21.5
-29.9
BOUGUER GRAVITY (mgals)
TSX V:VUL
VULCAN MINERALS
REGIONAL BOUGUER GRAVITY
NTS: 12B/07
NAD 83 - Zone 21
Scale 1:125,000
Figure: 10



370,000mE
380,000mE
390,000mE
5,360,000mN
5,350,000mN
5,340,000mN
N
Storm #1
Captain Cook #1
Flat Bay #1
Flat Bay #5
Flat Bay #3
Flat Bay #2
ARE 93-101 #1
ST-1-76
ST-1
PF-1
PF-2
LR-98-01
INCO
FB-2-76
HOOKER #1
LR-98-02
Red Brook #2
Hurricane #2
Hooker Robinsons
Hurricane #1
Robinsons #1
St. Fintans
St Anthony
Corner Brook
Gander
Stephenville
Clarenville
Port Aux Basques
St. John's
Vulcan Mineral Licence
Seismic Line
Drill Hole/Oil Test Well
-3 0 3 6 9
Kilometres
TSX V:VUL
VULCAN MINERALS
SEISMIC LINE LOCATION MAP
NTS: 12B/07
NAD 83 - Zone 21
Scale 1:125,000
Figure: 11



Hole	Depth	(m)	Thickness	$\%K_2O$	%MgO	% Insolubles
Captain Cook	278.60	279.10	0.50	7.27	0.01	1.10
	279.60	279.80	0.20	9.34	0.01	1.50
	287.80	288.40	0.60	20.40	0.02	1.80
	288.80	289.55	0.75	5.79	0.05	1.00
	290.80	291.10	0.30	4.44	0.29	0.90
	291.80	292.20	0.40	8.91	0.05	1.30
	328.50	328.60	0.10	10.10	0.03	1.50

Figure 12: Captain Cook #1; Lithological Log and Assay Data

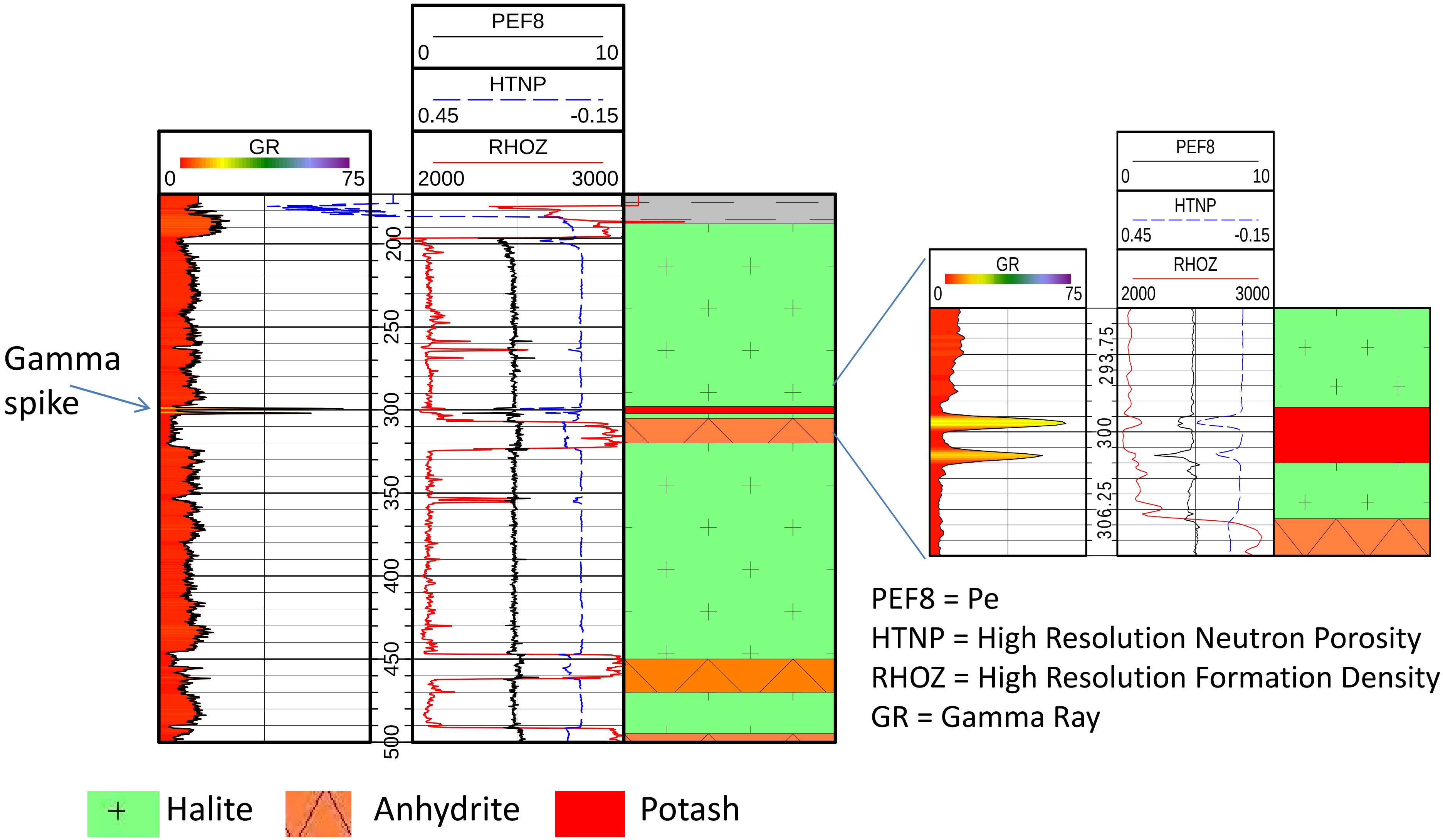


Figure 13: Flat Bay #2; Lithological Log and Downhole Geophysical data

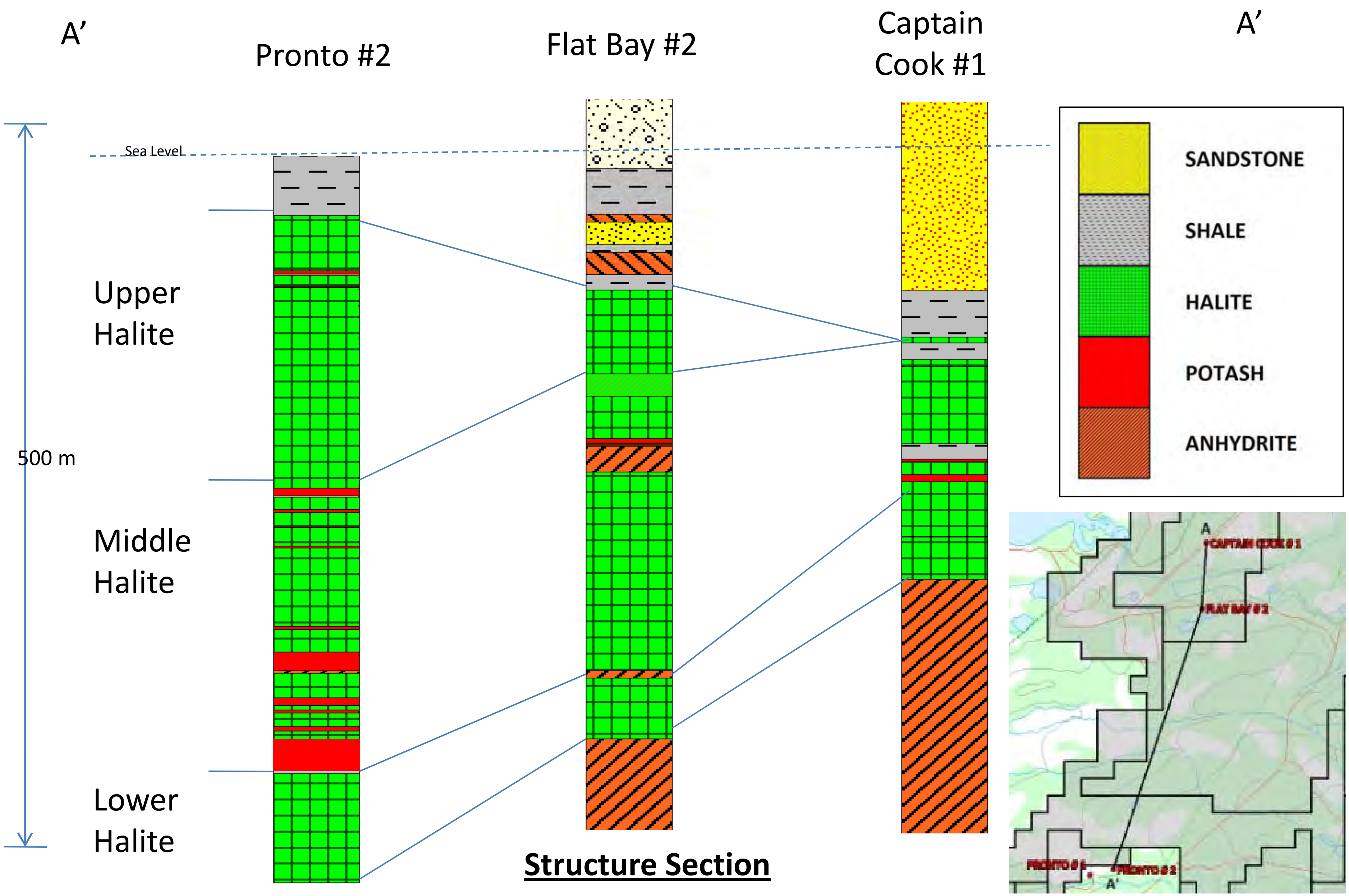
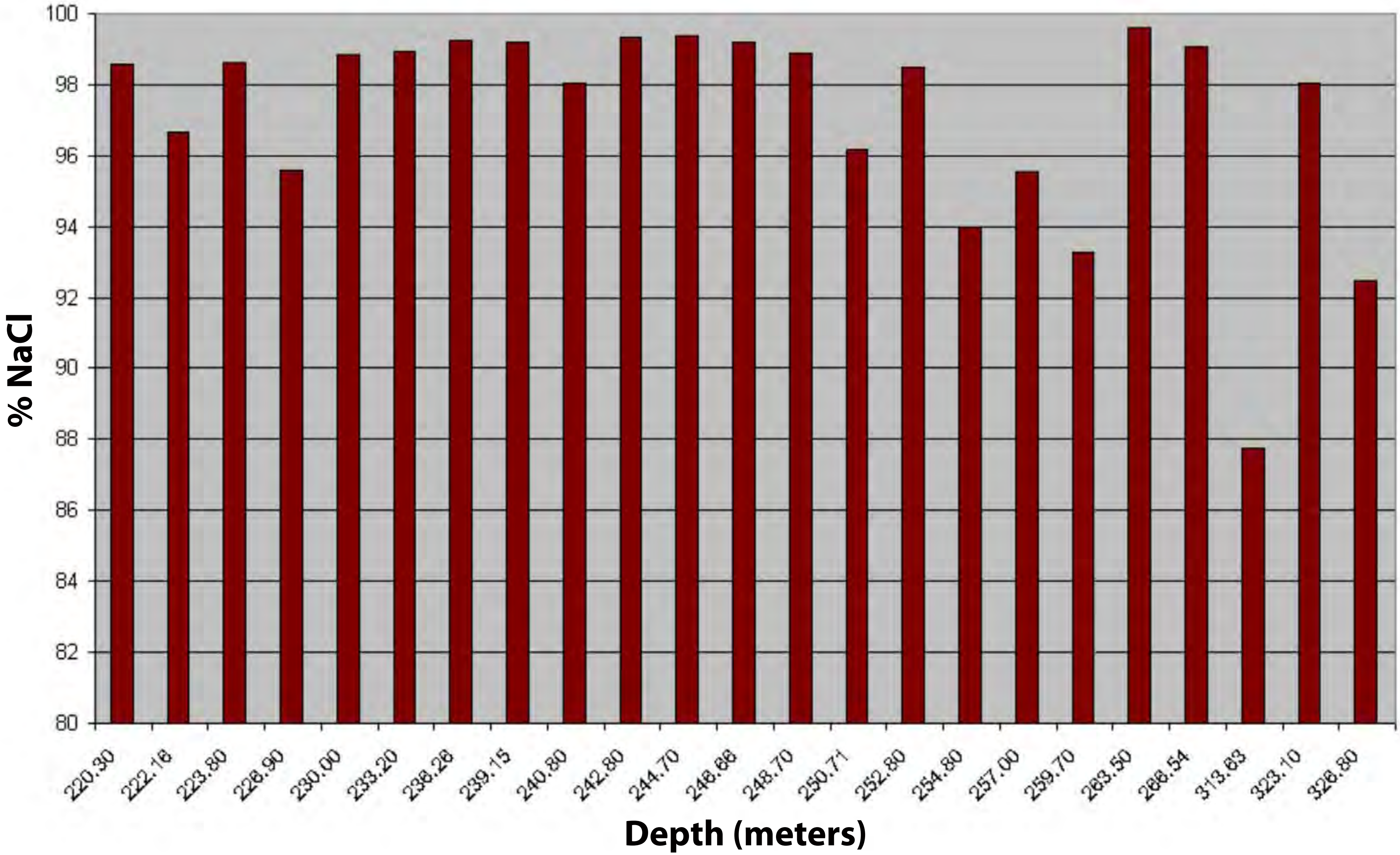


Figure 14: PF #2, Flat Bay #2, Captain Cook #1 Geological Cross-Section

Figure 15: Captain Cook Assay Histogram



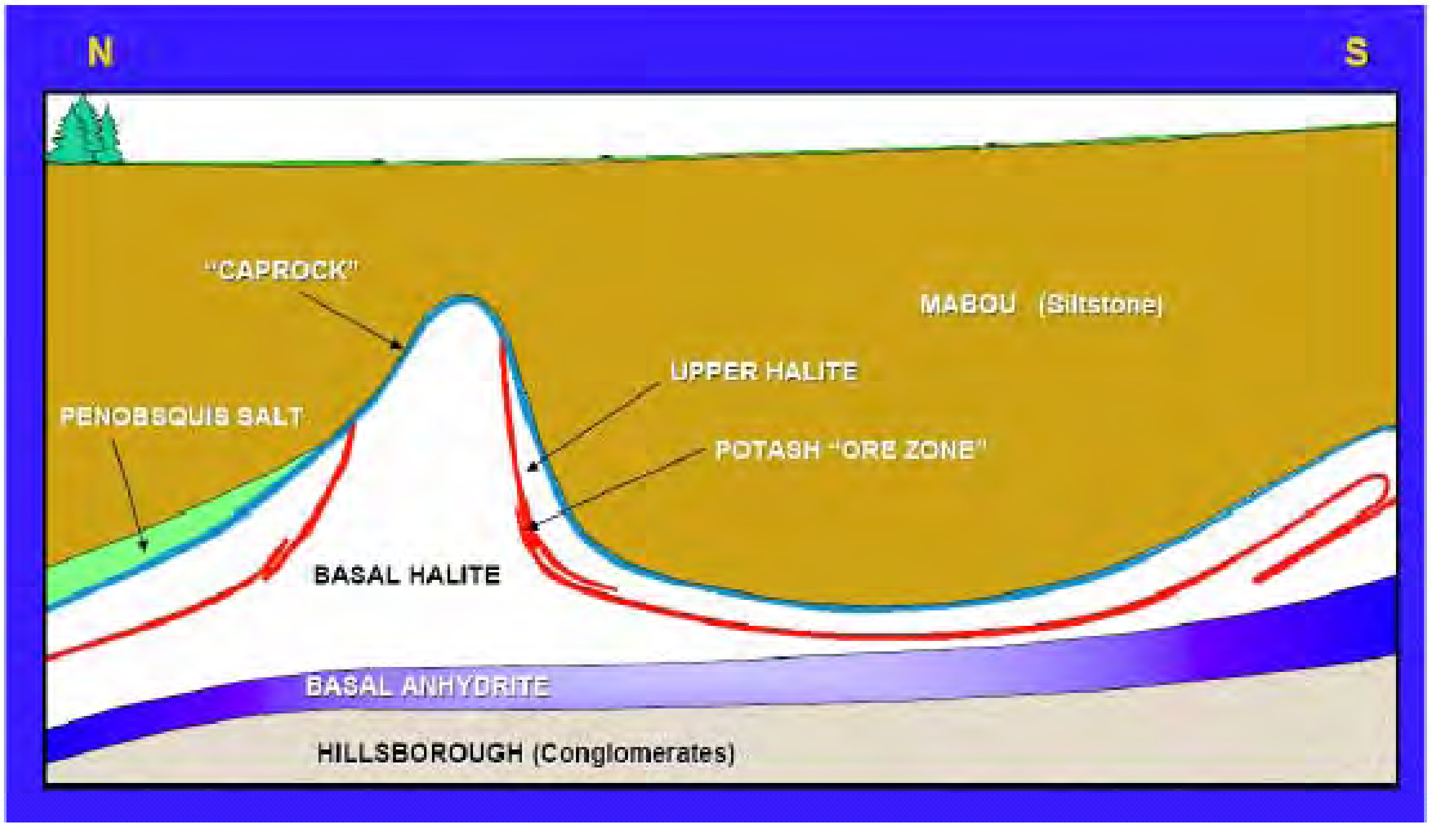


Figure 16: Schematic Cross Section, Pennobsquis, New Brunswick (Moore, 2008).

Figure 17 – Seismic Line 98-106; Captain Cook Region

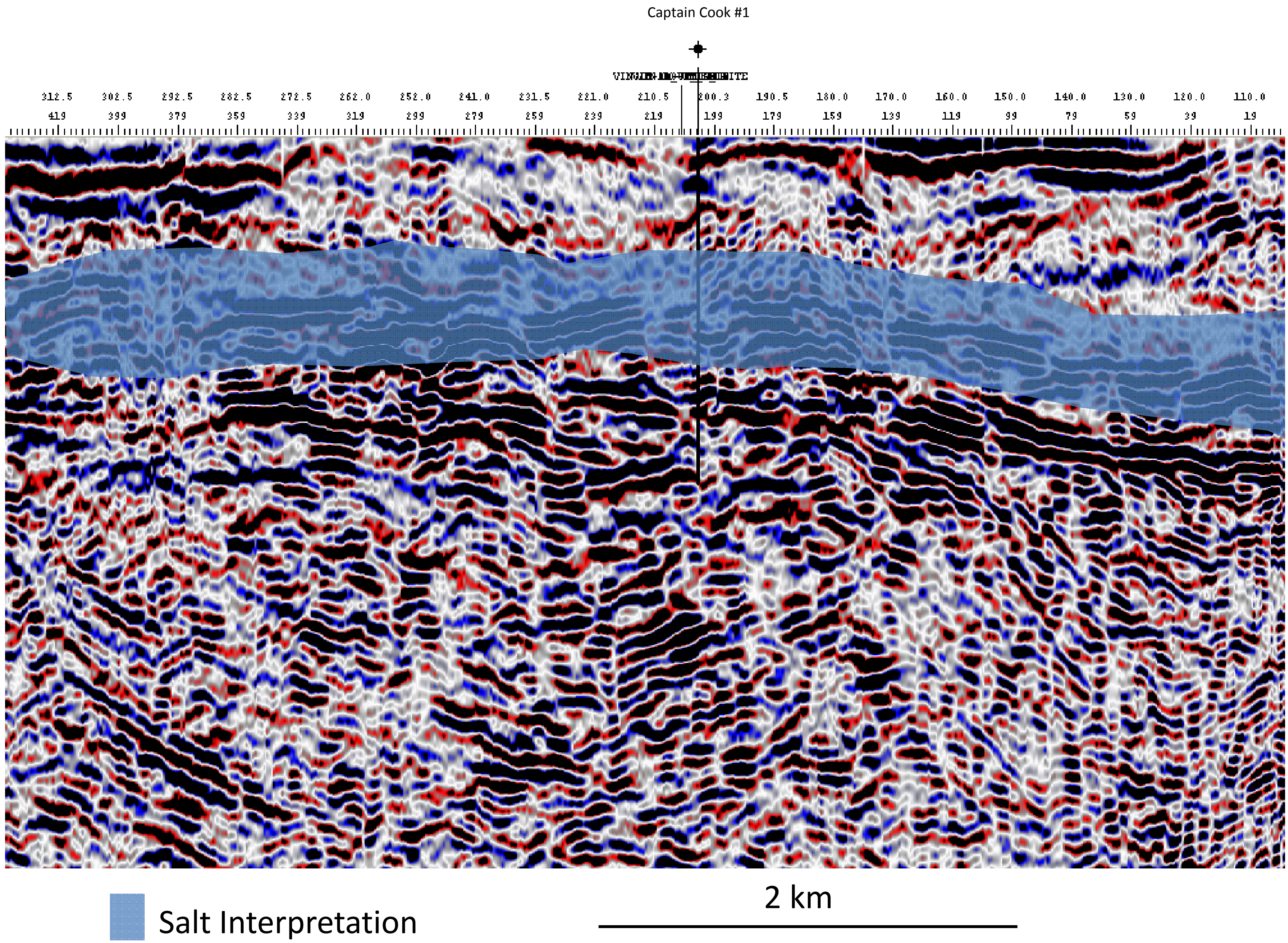
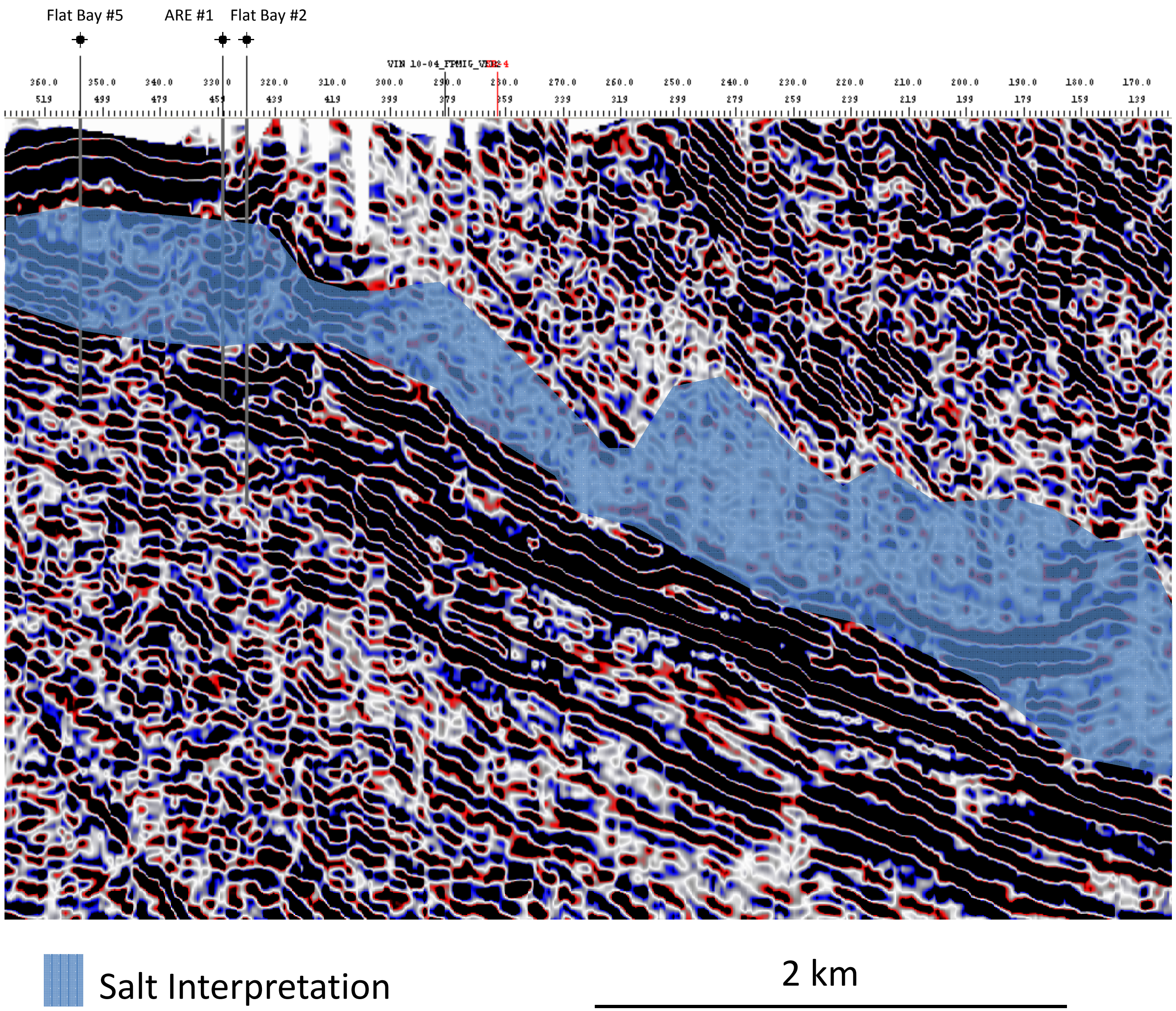


Figure 18 – Seismic Line SR-4; Captain Cook Region



APPENDIX C

LABORATORY CERTIFICATES

Appendix 1
Table 1
SRC Salt Assay Results for Captain Cook #1

Assays for Salt Zones

Captain Cook#1 (CC) and American Reserve Well (AR)

SRC Analytical

422 Downey Road

Saskatoon, Saskatchewan S7N 4N1

(306) 933-6932 1-800-240-8808

				Calcium	Magnesium	Moisture	Potassium	Sodium chloride	Sulfate	Water insolubles
				ug/g	ug/g	%	ug/g	%	ug/g	%
Group #	Sample #	Description	Sample Type			01015				
2006-8003	34942	11/16/2006 CC 200601 (A)	SOLIDS	1840	88.8	0.10	61.3	98.57	4320	0.70
2006-8003	34943	11/16/2006 CC 200602 (A)	SOLIDS	6840	130	0.19	59.5	96.65	15000	0.95
2006-8003	34944	11/16/2006 CC 200603 (A)	SOLIDS	3350	44.5	0.15	66.9	98.62	8320	0.05
2006-8003	34945	11/16/2006 CC 200604 (A)	SOLIDS	4250	240	0.22	156	95.61	9890	2.72
2006-8003	34946	11/16/2006 CC 200605 (A)	SOLIDS	1910	66.7	0.17	73.5	98.85	4630	0.31
2006-8003	34947	11/16/2006 CC 200606 (A)	SOLIDS	2020	63.1	0.13	62.7	98.91	4390	0.31
2006-8003	34948	11/16/2006 CC 200607 (A)	SOLIDS	1520	48.7	0.09	60.0	99.26	3290	0.16
2006-8003	34949	11/16/2006 CC 200608 (A)	SOLIDS	1060	69.1	0.12	66.7	99.18	2180	0.36
2006-8003	34950	11/16/2006 CC 200609 (A)	SOLIDS	3910	86.4	0.13	101	98.02	10000	0.44
2006-8003	34951	11/16/2006 CC 200610 (A)	SOLIDS	1120	62.5	0.09	64.5	99.34	2280	0.22
2006-8003	34952	11/16/2006 CC 200611 (A)	SOLIDS	1190	51.6	0.10	49.4	99.39	2770	0.10
2006-8003	34953	11/16/2006 CC 200612 (A)	SOLIDS	1310	77.7	0.14	41.0	99.19	2930	0.23
2006-8003	34954	11/16/2006 CC 200613 (A)	SOLIDS	1940	74.7	0.23	32.5	98.87	4380	0.26
2006-8003	34955	11/16/2006 CC 200614 (A)	SOLIDS	1150	71.6	3.27	46.5	96.18	2680	0.15
2006-8003	34956	11/16/2006 CC 200615 (A)	SOLIDS	1540	86.2	0.78	32.7	98.48	3300	0.24
2006-8003	34957	11/16/2006 CC 200616 (A)	SOLIDS	4920	324	0.35	228	93.98	11300	3.99
2006-8003	34958	11/16/2006 CC 200617 (A)	SOLIDS	5700	201	0.33	149	95.56	14700	2.04
2006-8003	34959	11/16/2006 CC 200618 (A)	SOLIDS	4510	347	0.35	236	93.27	10800	4.79
2006-8003	34960	11/16/2006 CC 200619 (A)	SOLIDS	768	49.8	0.13	29.0	99.61	1500	0.023
2006-8003	34961	11/16/2006 CC 200620 (A)	SOLIDS	1210	73.0	0.10	61.6	99.08	2700	0.42
2006-8003	34962	11/16/2006 CC 200621 (A)	SOLIDS	21800	30	0.11	66.3	87.73	53800	4.59
2006-8003	34963	11/16/2006 CC 200622 (A)	SOLIDS	3900	50	0.10	80.6	98.05	10100	0.44
2006-8003	34964	11/16/2006 CC 200623 (A)	SOLIDS	18200	22	0.10	133	92.48	47000	0.88
2006-8003	34965	11/16/2006 CC 200624 (A)	SOLIDS	17200	<10	0.10	38.4	91.62	43700	2.18
2006-8003	34966	11/16/2006 AR 200625 (A)	SOLIDS	18400	<10	0.16	77.1	91.69	44800	1.82
2006-8003	34967	11/16/2006 AR 200626 (A)	SOLIDS	32300	20	0.48	59.4	64.76	79300	23.59
2006-8003	34968	11/16/2006 AR 200627 (A)	SOLIDS	27400	<10	0.13	53.9	87.33	67400	3.05
2006-8003	34969	11/17/2006 AR 200628 (A)	SOLIDS	17900	18	0.13	60.5	84.89	45500	8.63
2006-8003	34970	11/17/2006 AR 200629 (A)	SOLIDS	13300	<10	0.05	69.4	94.60	31900	0.82
2006-8003	34971	11/17/2006 AR 200630 (A)	SOLIDS	20700	10	0.11	76.7	90.25	48500	2.71
2006-8003	34972	11/17/2006 AR 200631 (A)	SOLIDS	8900	<10	0.10	14.6	96.65	21200	0.23
2006-8003	34973	11/17/2006 AR 200632 (A)	SOLIDS	18000	<10	0.13	54.2	91.85	41900	2.02
2006-8003	34974	11/17/2006 AR 200633 (A)	SOLIDS	12100	<9	0.10	8.28	95.23	29000	0.55
2006-8003	34975	11/17/2006 AR 200634 (A)	SOLIDS	12700	<10	0.08	42.5	93.05	29900	2.61
2006-8003	34976	11/17/2006 AR 200635 (A)	SOLIDS	19500	<10	0.12	30.3	89.79	52400	2.90
2006-8003	34977	11/17/2006 AR 200636 (A)	SOLIDS	13600	<10	0.12	40.8	94.31	34600	0.74

2006-8003	34978	11/17/2006	AR 200637 (A)	SOLIDS	13400	<10	0.08	17.7	94.63	33600	0.59
2006-8003	34979	11/17/2006	AR 200638 (A)	SOLIDS	19800	12	0.14	38.1	90.90	48700	2.10
2006-8003	34980	11/17/2006	AR 200639 (A)	SOLIDS	10700	<10	0.07	33.6	95.23	28000	0.82
2006-8003	34981	11/17/2006	AR 200640 (A)	SOLIDS	18500	<10	0.11	21.6	91.04	48400	2.16
2006-8003	34982	11/17/2006	AR 200641 (A)	SOLIDS	13600	<10	0.09	20.7	94.14	35500	0.86
2006-8003	34983	11/17/2006	AR 200642 (A)	SOLIDS	18600	<10	0.10	12.0	92.08	49200	1.04
2006-8003	34984	11/17/2006	AR 200643 (A)	SOLIDS	16900	<10	0.10	<0.1	92.58	43500	1.28
2006-8003	34985	11/17/2006	AR 200644 (A)	SOLIDS	12600	12	0.05	<0.1	94.82	32700	0.60
2006-8003	34986	11/17/2006	AR 200645 (A)	SOLIDS	16600	<10	0.11	<0.1	92.27	43300	1.63
2006-8003	34987	11/17/2006	AR 200646 (A)	SOLIDS	10800	<10	0.08	<0.1	94.99	28300	1.02
2006-8003	34988	11/17/2006	AR 200647 (A)	SOLIDS	14500	<10	0.10	<0.1	93.05	36900	1.71
2006-8003	34989	11/17/2006	AR 200648 (A)	SOLIDS	16000	<9	0.11	<0.1	92.38	42000	1.71
2006-8003	34990	11/17/2006	AR 200649 (A)	SOLIDS	12100	<10	0.08	14.5	94.49	31600	1.06
2006-8003	34991	11/17/2006	AR 200650 (A)	SOLIDS	11900	<10	0.11	2.44	94.51	31100	1.08
2006-8003	34992	11/16/2006	AR 200651 (A)	SOLIDS	12900	30	0.13	7.77	93.21	34700	1.90
2006-8003	34993	11/16/2006	AR 200652 (A)	SOLIDS	15600	11	0.10	<0.1	92.66	41700	1.51
2006-8003	34994	11/17/2006	AR 200653 (A)	SOLIDS	13800	10	0.09	<0.1	91.00	34800	4.05
2006-8003	34995	11/17/2006	AR 200654 (A)	SOLIDS	19400	10	0.12	6.72	91.45	49000	1.58
2006-8003	34996	11/17/2006	AR 200655 (A)	SOLIDS	15800	19	0.11	<0.1	93.42	38700	1.01
2006-8003	34997	11/17/2006	AR 200656 (A)	SOLIDS	19800	30	0.09	3.96	87.90	47600	5.27
2006-8003	34998	11/17/2006	AR 200657 (A)	SOLIDS	27000	20	0.14	8.53	81.92	66600	8.58
2006-8003	34999	11/17/2006	AR 200658 (A)	SOLIDS	14600	<10	0.07	9.10	93.83	36500	0.99
2006-8003	35000	11/17/2006	AR 200659 (A)	SOLIDS	15800	<10	0.08	32.7	93.37	39800	0.99
2006-8003	35001	11/17/2006	AR 200660 (A)	SOLIDS	15400	10	0.13	68.0	93.23	39000	1.19

Vulcan Minerals Inc
Attention: Gerri MacNeil
PO #/Project: BSG Potash
Samples: 10

SRC Geoanalytical Laboratories
125 - 15 Innovation Blvd., Saskatoon, Saskatchewan, S7N 2X8
Tel: (306) 933-8118 Fax: (306) 933-5656 Email: geolab@src.sk.ca

Report No: G-08-1192

Date of Report: August 28, 2008

Moisture and Insoluble Determination

Column Header Details

Insoluble Determination of Potash in % (% Insoluble)
Moisture @ 105 C in wt % (Moisture)

Sample Number	% Insoluble %	Moisture wt %
K301	N/R	N/R
CC 4	1.1	<0.1
CC 5	1.5	0.1
CC 7	1.8	0.1
CC 8	1.0	0.2
CC 9	0.6	0.3
CC 10	0.9	0.6
CC 11	1.3	0.2
CC 14	1.5	0.2
CC 9 R	0.6	0.2

Moisture: A 1.00 gram pulp is heated at 105 C overnight and the weight loss determined.
Insolubles: A 2.00 g pulp is dissolved in 15 ml of 30°C DI water then centrifuged for 2 minutes, decanted and repeated.

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Report No: G-08-1192

Date of Report: August 28, 2008

ICP1 Soluble

Column Header Details

Silver in ppm (Ag)
Aluminum in wt % (Al2O3)
Barium in ppm (Ba)
Berylium in ppm (Be)
Calcium in wt % (CaO)

Cadmium in ppm (Cd)
Cerium in ppm (Ce)
Cobalt in ppm (Co)
Chromium in ppm (Cr)
Copper in ppm (Cu)

Dysprnnosium in ppm (Dy)
Erbium in ppm (Er)
Europium in ppm (Eu)
Iron in wt % (Fe2O3)
Gallium in ppm (Ga)

Gadolinium in ppm (Gd)
Hafnium in ppm (Hf)
Holmium in ppm (Ho)
Potassium in wt % (K2O)
Lanthanum in ppm (La)

Lithium in ppm (Li)
Magnesium in wt % (MgO)
Manganese in wt % (MnO)
Molybdenum in ppm (Mo)
Sodium in wt % (Na2O)

Niobium in ppm (Nb)
Neodymium in ppm (Nd)
Nickel in ppm (Ni)
Phosphorus in wt % (P2O5)
Lead in ppm (Pb)

Praseodymium in ppm (Pr)
Scandium in ppm (Sc)
Samarium in ppm (Sm)
Tin in ppm (Sn)
Strontium in ppm (Sr)

Tantalum in ppm (Ta)
Terbium in ppm (Tb)
Thorium in ppm (Th)
Titanium in wt % (TiO2)
Uranium in ppm (U, ICP)

Vulcan Minerals Inc
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Report No: G-08-1192

Date of Report: August 28, 2008

ICP1 Soluble

Column Header Details

Vanadium in ppm (V)
Tungsten in ppm (W)
Yttrium in ppm (Y)
Ytterbium in ppm (Yb)
Zinc in ppm (Zn)

Zirconium in ppm (Zr)

Vulcan Minerals Inc
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PO #/Project: BSG Potash
Samples: 10

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Report No: G-08-1192

Date of Report: August 28, 2008

ICP1 Soluble

Sample Number	Ag ppm	Al2O3 wt %	Ba ppm	Be ppm	CaO wt %	Cd ppm	Ce ppm	Co ppm	Cr ppm	Cu ppm	Dy ppm	Er ppm	Eu ppm	Fe2O3 wt %	Ga ppm	Gd ppm	Hf ppm
K301	<0.2	<0.01	<1	<0.2	0.06	<0.2	<1	<1	<1	<1	<0.2	<0.2	<0.2	<0.01	<1	<0.5	<0.5
CC 4	<0.2	<0.01	1	<0.2	0.44	<0.2	<1	<1	<1	<1	<0.2	<0.2	<0.2	<0.01	<1	<0.5	<0.5
CC 5	0.3	<0.01	<1	<0.2	0.45	<0.2	<1	<1	<1	<1	<0.2	<0.2	<0.2	<0.01	<1	<0.5	<0.5
CC 7	<0.2	<0.01	<1	<0.2	0.27	<0.2	<1	<1	<1	<1	<0.2	<0.2	<0.2	<0.01	<1	<0.5	<0.5
CC 8	<0.2	<0.01	<1	<0.2	0.43	<0.2	<1	<1	<1	<1	<0.2	<0.2	<0.2	<0.01	<1	<0.5	<0.5
CC 9	0.3	<0.01	<1	<0.2	0.62	<0.2	<1	<1	1	<1	<0.2	<0.2	<0.2	<0.01	<1	<0.5	2.0
CC 10	<0.2	<0.01	<1	<0.2	0.58	<0.2	<1	<1	<1	<1	<0.2	<0.2	<0.2	<0.01	<1	<0.5	3.8
CC 11	<0.2	<0.01	5	<0.2	0.36	<0.2	<1	<1	<1	<1	<0.2	<0.2	<0.2	<0.01	<1	<0.5	<0.5
CC 14	<0.2	<0.01	<1	<0.2	0.50	<0.2	<1	<1	<1	<1	<0.2	<0.2	<0.2	<0.01	<1	<0.5	0.6
CC 9 R	<0.2	<0.01	<1	<0.2	0.62	<0.2	<1	<1	<1	<1	<0.2	<0.2	<0.2	<0.01	<1	<0.5	2.4

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Vulcan Minerals Inc
Attention: Gerri MacNeil
PO #/Project: BSG Potash
Samples: 10

Report No: G-08-1192

Date of Report: August 28, 2008

ICP1 Soluble

Sample Number	Ho ppm	K2O wt %	La ppm	Li ppm	MgO wt %	MnO wt %	Mo ppm	Na2O wt %	Nb ppm	Nd ppm	Ni ppm	P2O5 wt %	Pb ppm	Pr ppm	Sc ppm	Sm ppm	Sn ppm
K301	<0.4	60.0	<1	<1	0.026	<0.001	<1	1.77	<1	<1	<1	<0.002	<1	<1	<1	<0.5	<1
CC 4	<0.4	7.27	<1	<1	0.014	<0.001	<1	46.1	<1	<1	<1	<0.002	<1	<1	<1	<0.5	<1
CC 5	<0.4	9.34	<1	<1	0.012	<0.001	<1	43.6	<1	<1	1	<0.002	<1	<1	<1	<0.5	<1
CC 7	<0.4	20.4	<1	<1	0.016	<0.001	<1	34.4	<1	<1	1	<0.002	<1	<1	<1	<0.5	<1
CC 8	<0.4	5.79	<1	<1	0.048	<0.001	<1	46.0	<1	<1	<1	<0.002	<1	<1	<1	<0.5	<1
CC 9	<0.4	0.893	<1	<1	0.145	<0.001	<1	50.3	<1	<1	<1	<0.002	<1	<1	<1	<0.5	<1
CC 10	<0.4	4.44	<1	<1	0.292	<0.001	<1	47.3	<1	<1	<1	<0.002	<1	<1	<1	<0.5	<1
CC 11	<0.4	8.91	<1	<1	0.046	<0.001	<1	44.6	<1	<1	<1	<0.002	<1	<1	<1	<0.5	<1
CC 14	<0.4	10.1	<1	<1	0.033	<0.001	<1	43.2	<1	<1	<1	<0.002	<1	<1	<1	<0.5	<1
CC 9 R	<0.4	0.854	<1	<1	0.148	<0.001	<1	51.2	<1	<1	<1	<0.002	<1	<1	<1	<0.5	<1

Vulcan Minerals Inc
Attention: Gerri MacNeil
PO #/Project: BSG Potash
Samples: 10

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ICP1 Soluble

Sample Number	Sr ppm	Ta ppm	Tb ppm	Th ppm	TiO2 wt %	U, ICP ppm	V ppm	W ppm	Y ppm	Yb ppm	Zn ppm	Zr ppm
K301	3	<1	<0.3	<1	<0.002	<2	<1	3	<1	<0.1	<1	<1
CC 4	18	<1	<0.3	<1	<0.002	<2	<1	1	<1	<0.1	<1	<1
CC 5	18	<1	<0.3	<1	<0.002	<2	<1	<1	<1	<0.1	<1	<1
CC 7	7	<1	<0.3	<1	<0.002	<2	<1	<1	<1	<0.1	<1	<1
CC 8	11	<1	<0.3	<1	<0.002	<2	<1	<1	<1	<0.1	<1	<1
CC 9	19	<1	<0.3	<1	<0.002	<2	<1	1	<1	<0.1	1	<1
CC 10	19	<1	<0.3	<1	<0.002	<2	<1	<1	<1	<0.1	1	<1
CC 11	9	<1	<0.3	<1	<0.002	<2	<1	<1	<1	<0.1	<1	<1
CC 14	11	<1	<0.3	<1	<0.002	<2	<1	<1	<1	<0.1	<1	<1
CC 9 R	20	<1	<0.3	<1	<0.002	<2	<1	<1	<1	<0.1	1	<1

Soluble Digestion: A 0.125g pulp is dissolved with 2.25 ml of D.I. H20 for 1 hour at room temperature. Samples are vortexed in the beginning at half an hour and one hour.
The standard is K301.