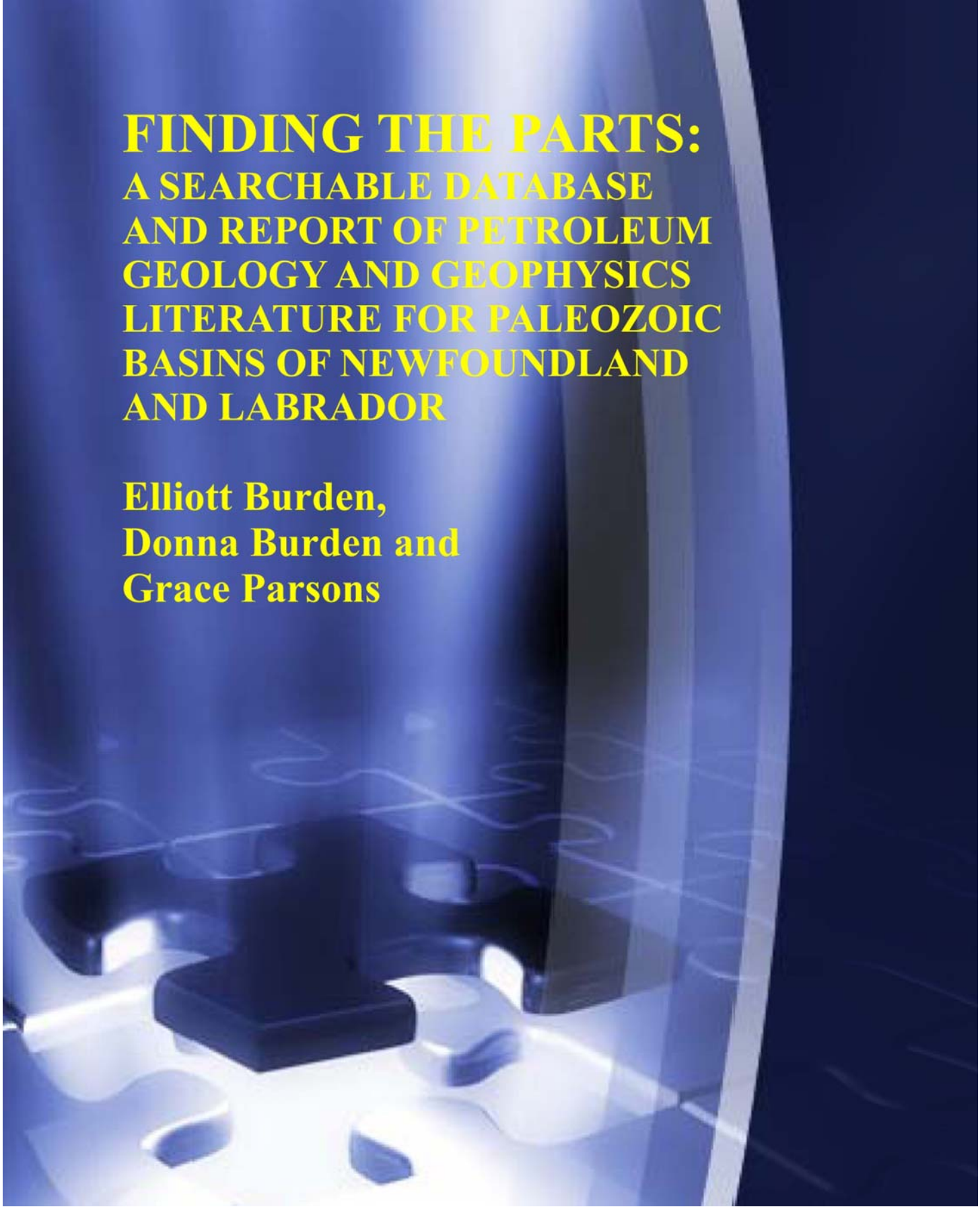

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FINDING THE PARTS:
A SEARCHABLE DATABASE AND REPORT OF PETROLEUM GEOLOGY AND GEOPHYSICS LITERATURE FOR PALEOZOIC BASINS OF NEWFOUNDLAND AND LABRADOR

by

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April, 2014

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INDEX

PART 2

Digital bibliography of reference materials for sedimentary and petroleum geology and geophysics of Paleozoic sedimentary basins of Newfoundland and southern Labrador

EXECUTIVE SUMMARY

In the applied areas of petroleum geology a need exists for a searchable database identifying our knowledge of the geology of Paleozoic sedimentary basins on and around Newfoundland and Labrador, and presented in a manner that allows researchers to compile their own specific sets of background data and to identify where information gaps and risks might exist in our exploring these areas.

Under agreement with the Provincial Government Department of Natural Resources, the accompanying Excel spreadsheet of more than 3330 references (Part 2 of this project) is designed to become part of an open access, coded, and searchable file, constructed to capture most of the publically available, substantive, geologically relevant reports (as of April 2013), as well as a subset of conference abstracts, presentations and promotional materials, and other related, but extraregional, papers. URL, DOI and other codes attached to many of the papers will allow researchers to navigate to other sites where some files may be freely downloaded or to publishing houses where subscriptions are required.

A summary report of the quantity of geology and opinion about petroleum systems is presented with this spreadsheet. It represents some of our own queries to the literature and addresses many general aspects of data quantity, quality and regional distribution patterns. Given that this study and compilation is specifically focused upon regional sedimentary and petroleum geology our research review examines the sources of scientific knowledge explaining petroleum systems that may have been active in the region. With this information, theoretical "risks" associated with "proof of concept" or "confirmation of play" can be noted or corrected.

As a summary of basic findings, the following points are made.

For past and present efforts - *what have we accomplished?*:

- In the last 50 years in Newfoundland and Labrador, the rate of production of Paleozoic petroleum geology studies has not kept pace with other disciplines in the earth sciences. Overall, and in comparison with other aspects of the earth sciences in Newfoundland and Labrador, sedimentary and petroleum geology studies of the Paleozoic basins amount to

about 12% of research production.

- The total body of research concerning the Paleozoic basins of Newfoundland and Labrador is very clearly skewed towards studies of the Anticosti Basin. Nearly two-thirds of the total data base (>2000 papers) is Anticosti Basin material.
- The Sydney Basin has about 250 references we consider related to offshore exploration under CNLOPB jurisdiction. Outside our search parameters there are in fact many others references describing coal deposits in Nova Scotia.
- At the other end of the spectrum, and with little more than 150 reports captured in our survey of the St Anthony Basin, much of the reporting is based upon extrapolations from the Maritime/Magdalen basin several hundred kilometres away. Very little direct physical research has ever been reported here.
- Collectively, the Deer Lake and Bay St George Basins have over 1050 references. More than 20% of this material is over 50 years old and a clear indication that little new geological research is either being conducted, reported or published on these regions.
- In the last 50 years, the overall rate of production of research amounts to about 45 reports per year for all of the Paleozoic basins covered by this report. Nearly two-thirds of the reports (28/year) are Anticosti Basin studies. The median rate for production for each of the other basins is generally fewer than 5 reports per year. Such small numbers are an indication of low levels for any (petroleum) exploration and research.
- Under guidelines we selected for identifying the many different parts for petroleum systems, and namely studies captured under the titles source, reservoir, seal, maturation and timing, in the last 50 years, research in the Anticosti Basin generates about 6 reports per year that have some relationship with hydrocarbons. For each of the other basins, the median level of activity is about 2 reports per year - and in our opinion not a sufficient indication of any progress in petroleum geology studies.

For content of research - *finding the gaps*:

- In our subset of references describing the parts for petroleum systems, there are 622 papers (26% of the modern (post 1960) database) that describe one or more aspects of the source, reservoir, seal, maturation and timing for hydrocarbon generation and capture.

From this total, and in the Sydney, St George, Deer Lake and St Anthony basins, 40 to 50% of the references for those basins are viewed as direct application studies related to petroleum system analysis.

- Numerically, the Anticosti Basin has more petroleum system studies than the other basins. However, taken in context with the total number of studies from this basin, the number of hydrocarbon studies amounts to little more than 20% of the total sedimentary and petroleum geology research for the Anticosti region. More work is available to describe Anticosti Basin paleontology.

Moving forward - *reducing risk of failure*

- There is no simple solution to for reducing the risks from incomplete data.
- The St Anthony Basin, in particular, and the Sydney Basin, in general, have very little direct evidence in support of any Paleozoic hydrocarbon exploration and in determining if a petroleum system exists.
- The Anticosti Basin has a significant research base in stratigraphy, biostratigraphy and structure, but with relatively little substantive data to support petroleum system modelling - and particularly beneath the Gulf of St Lawrence
- Deer Lake, and St George are somewhere between the two extremes and perhaps where specific research agendas may be beneficial.
- Given that gaps in our knowledge base have been identified, future research into hydrocarbon systems should be encouraged to:
    1. Engage in new studies into all aspects of the principal components of petroleum systems of the Anticosti Basin and particularly for new work in the offshore regions.
    2. Improve on identifying and characterizing source rock properties, reservoir porosity and permeability, maturation levels and timing of events in the St George Sub-basin. This knowledge will help guide petroleum exploration of this Sub-basin and offshore into the general region of the Magdalen Basin.
    3. Learn more about reservoir and seal distribution and properties, and regional maturation levels and timing for hydrocarbon charge in the Deer Lake Basin.
    4. Grow larger data sets for every part of the petroleum systems that may exist in the St

Anthony and Sydney basins. For the St Anthony Basin this can also include new seismic studies and shallow or deep boreholes for seabed geology.

5. Build a proper set of measurements for porosity and permeability of strata from the entire region and specifically improve upon measurements from reservoir rocks from the St George Sub-basin.

New knowledge will reduce risks associated with *proof of play concepts* as new exploration programmes develop.

Fundamentally, there is a general need to improve the quantity of production of all petroleum geology and geophysics research conducted in all of the basins and with special efforts being made to get new research ignited in the St Anthony, Sydney, St George and Deer Lake Basins.

INTRODUCTION

In frontier exploration risks of failure are very real when data are sparse, disconnected and unfocused. More often than not the reward is shining light upon the darkness.

The same principles hold true for frontier geological exploration, mapping, prospecting, and wildcat drilling. With rags to riches as a romantic vision for a successful exploration programme, the reality is knowledge, proof of principle, and improved predictive capacity for taking the next steps.

The Anticosti, Sydney, Bay St. George, Deer Lake and St. Anthony basins and sub-basins of western and northern Newfoundland are frontiers where data on the geology, geophysics, geochemistry, age and history of strata are, by the very nature of the exploration cycle, sparse. Specialists working in these regions and conducting fundamental and basic geological research commonly publish their findings in highly technical journals, government reports or theses. In contrast, explorationists and promoters, with permits to explore and to develop, may offer summaries of data and interpretations in promotional materials, trade magazines, corporate news releases, annual reports and legislated regulatory documents. Raw and interpreted company assessments of geological, geophysical and geochemical data, fluid and rock samples and biostratigraphy reports may reside with provincial and federal government departments and regulatory agencies where, after a time, they may be available for public review. Building new opportunities from basic science and exploration means all of the data are in some way relevant to understanding paths where others have travelled, enhancing old and generating new exploration strategies, and perhaps also realizing that there may be other avenues to follow to generate new benefits for industry and the province.

Basically, there may be something to be said about a variant on Edmond Burke's old adage "if you are unable to catalog the past, you are doomed to repeat it" - Lemony Snicket (*The End*) . Without a clear picture of the spectrum of available geological exploration, science and technical materials covering the Paleozoic basins around Newfoundland it will be difficult to appreciate what has been attempted, to realize where new opportunities exist, or to recognize possibilities

for future needs and applications.

The goal of this report is to identify, locate and catalog all or most of the published and unpublished sedimentary and petroleum geology studies for the Paleozoic basins on and around Newfoundland and Labrador. As a keyword coded and searchable database, Part 2 of this report should offer a broad palate of science and technology for any to review and comment upon. Our own summary of the geology and of current levels of research into this geology will provide a starting point for identifying knowledge gaps and proposing new directions for research contributions to regional exploration, engineering and development strategies.

PROJECT OUTLINE

Within the context of the guidelines proposed for a Paleozoic Petroleum Geology Scoping Study, the geographic area includes most of the offshore territory surrounding Newfoundland and southern Labrador, and other onshore and nearshore sedimentary basins on the west coast of the island (Figure 1). The expressed aims for this work are to:

(1) generate a spreadsheet or database (catalogue) of all relevant references for Anticosti, Sydney, Bay St. George, Deer Lake and St. Anthony basins, and where possible to provide digital links to help locate papers and files (Part 2);

(2) compile a spreadsheet or database listing for geological and geophysical surveys and samples held at government laboratories and other institutions (Appendix 1);

(3) produce summary reports for each basin to outline the quantity and type of literature available on basin geology and including descriptions and discussions on factors contributing to Petroleum System Models, and namely;

a) quality and distribution of source rocks, thermal maturation and reservoir rock;

b) stratigraphy and structural evolution of a basin;

c) possible migration paths, seals and critical moments in the history of a petroleum system, and;

d) a summary of risk from quantity and quality of available data.

For completeness, this catalogue will attempt register citations for all of the relevant non-confidential data from published and unpublished sources. Where possible, citations will also include petroleum geology, geophysics, and geographical keyword search terms (Appendix 2) as found in glossaries from other government agencies (GSC and CNSOPB). In practical applications, this catalogue should include sufficient search terms to help a diverse research community compile, categorize and qualify the quality of modern and vintage reports.

With a large database and library on the history and scope of investigations of the Paleozoic Basins of Newfoundland and Labrador, our overall scientific and technical understanding of practical geology and geophysics of the region will be improved. Furthermore, and given a large reference collection, popular topical areas can be measured against other less documented disciplines to identify systemic knowledge gaps that need investigation in support of an idea or to pursue new research directions.

In practice, a systematic catalogue of searchable data and reference material should be viewed as an entry to literature describing our present understanding of regional petroleum systems - and namely, the correct assembly of source, reservoir and seal in a timely manner that permits petroleum to be formed, migrated and trapped. In examining the geology and geophysics of the Paleozoic basins on and around Newfoundland and Labrador, logic dictates that coded references identified as one or more parts of a petroleum system will assist in placing historical accomplishments in context, identifying where weaknesses in petroleum system modelling exist, and focusing exploration and research agendas on proof of concept scientific risk (not technical or engineering risk) for a successful exploration play. Basically stated, if an exploration model or concept is developed on weak, old or inaccurate science that is locally generated from limited measurements or extrapolated from other regions, then that is a scientific, proof of design, risk.

By creating a compilation of geologically coded and linked reference material, we will have produced a hierarchical listing of search terms that identify most of the knowledge describing our present level of understanding of petroleum system models for each basin. This reference base should be viewed as a first pass at defining an exploration risk - proof of play - analysis, and one that outlines and categorizes real from extrapolated data from each of the basins. Our petroleum system summaries will highlight our view on some of the overall body of data, and inform on

regions and on topics where explorers may need to ask and to answer more questions.

GEOGRAPHIC AND GEOLOGIC SCOPE

This report is directed to the study of Paleozoic basins on and about Newfoundland and Labrador. Specifically, work is aimed at cataloguing *relevant* literature for the Sydney Basin, along the south coast of Newfoundland, the Bay St. George Sub-basin (Magdalen Basin) and the Anticosti Basin in the Gulf of St. Lawrence, the onshore Deer Lake Basin in central and western Newfoundland, and the St. Anthony Basin off the northeast coast of Newfoundland and extending north into coastal Labrador waters.

Generalized, regional maps for these basins (Figure 1) are available from Provincial and Federal government web sites - each has a slightly different focus. The Provincial Government map shows a general outline of the 5 basins in context with one another, with adjacent and overlying Mesozoic strata of the Orphan Basin and the Laurentian Basin, and with agreed national (France-Canada) and provincial (Nova Scotia-Newfoundland and Labrador) territorial and economic boundaries. The Federal Government map is an interpreted geology and geophysics map showing the thickness of the Upper Paleozoic strata and the extension of the Sydney Basin offshore, beneath Mesozoic and Tertiary cover, and towards the Whale and Jeanne d'arc Basins.

For our purpose, basin names and geographical boundaries simply serve as a high level search term for this literature survey (e.g. search "Sydney Basin" and you should get more than 250 citations). Inasmuch as territorial and jurisdictional boundaries are relevant to royalties and development, the real geology and geophysics are not constrained by legislation and reach much farther afield. Since reference searches are focussed upon capturing all materials directly relevant to Newfoundland and Labrador interests, we have also included non Newfoundland and Labrador extra-regional subsets of references that we consider important scientific and technical studies. In particular, strata from Nova Scotia, New Brunswick, Prince Edward Island, and Quebec may offer better outcrop exposures and certainly show events on the opposite side of a basin. For strata from Greenland, Ireland, Britain, the United States and elsewhere, there may also be direct relationships through comparative conjugate margin studies of rocks, paleontology, resource, and facies models.

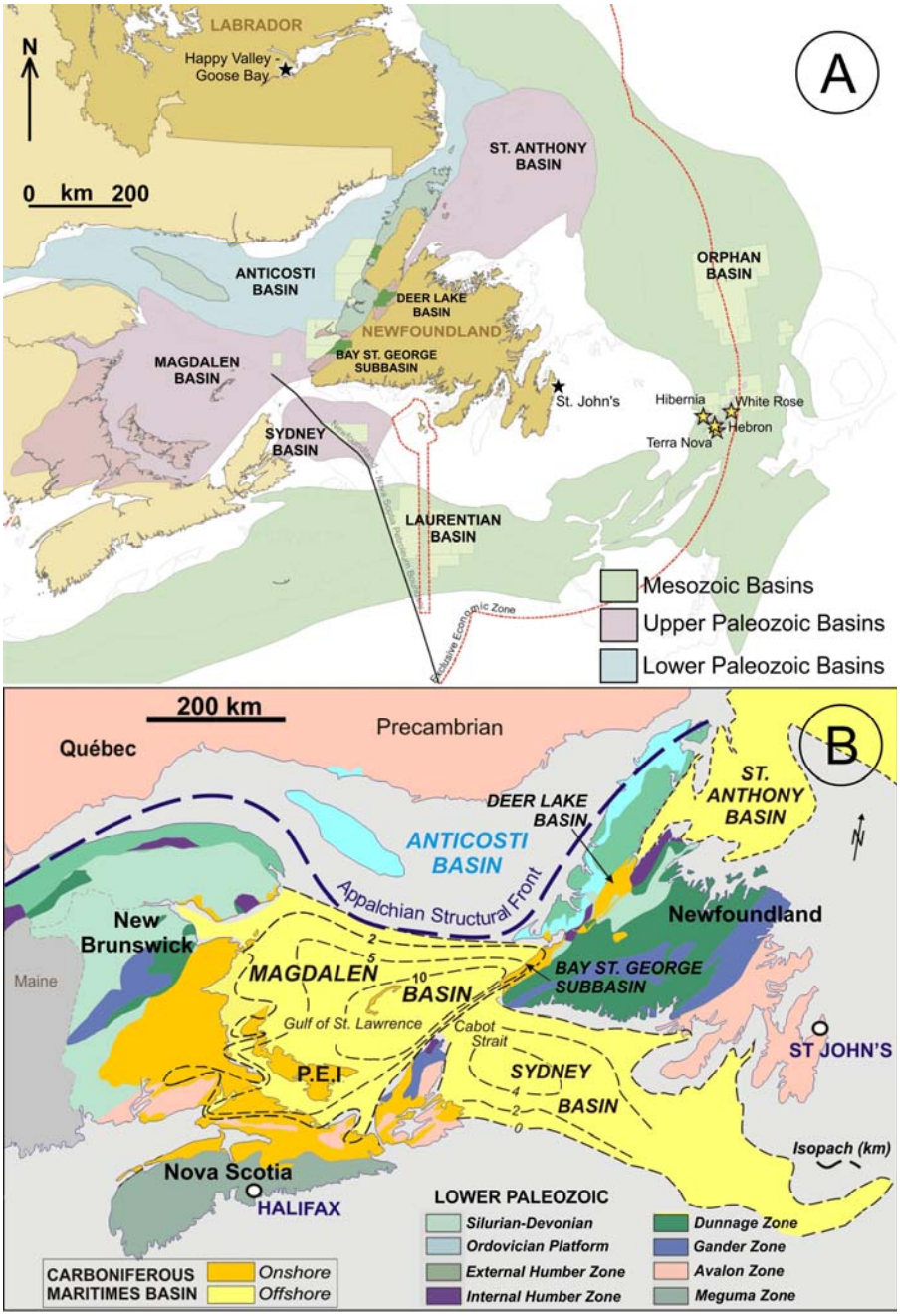


Figure 1: A. Government of Newfoundland and Labrador map illustrating basins, petroleum leases, fields and agreed economic boundaries. B. Federal Government map offering a slightly more detailed view of Paleozoic Basin boundaries and depth to dense igneous and metamorphic basement.

From the searches and informed choices we made, we include bibliographic citations of additional science, exploration strategies, successes and failures that either specifically acknowledge Newfoundland and Labrador or inform our understanding of the geology and geophysics of Newfoundland and Labrador.

Just as our reference searches are complicated by limits of geography and science, the geological boundaries for basins are also difficult to draw. For instance, the outer margins for the Sydney and St Anthony basins are indeterminate features laying beneath thick Mesozoic cover and also found as outliers on and around the coasts and large ponds in Newfoundland (Kean and Jayasinghe, 1980; Hyde, 1995). Likewise, the stratigraphy and structure of the eastern margin for the Anticosti Basin is extremely complicated and therein not well defined. In many places in western Newfoundland obducted oceanic crust lays upon mildly deformed platform rocks. Elsewhere, significant tectonism has metamorphosed the Cambrian and Ordovician platform creating opportunity for mineral exploration studies. For completeness of coverage and some confirmation of limits for petroleum exploration, we also include small subsets of some of the many igneous, structural and metamorphic geology studies of these complicated regions.

LEGAL LIABILITY

Opinions expressed herein are intended for use by Research Development Corporation of Newfoundland and Labrador and its partners NALCOR and the Government of Newfoundland and Labrador. If redistributed, used, and published by another person or agency, appropriate recognition should be made. In preparing this report and opinion, the authors and OMNICHRON Associates Inc. have relied on input from the Steering Committee and other well qualified professionals and with care taken in our own collecting and compiling published and unpublished research.

ACKNOWLEDGEMENTS

The authors gratefully acknowledge the assistance and advice of the professional librarians at the Geological Survey of Canada (Vancouver, Calgary and Dartmouth) and at the Queen Elizabeth II Library at Memorial University of Newfoundland. Staff at the Newfoundland and Labrador Department of Mines and Energy helpfully extracted from their database a subset of assessment reports containing drill hole data. The members of the Scoping Study Steering Committee are thanked for valuable direction and input.

Acknowledgement is also made of the contributions by earlier compilers of several important bibliographies of Newfoundland and Labrador geology, most of them completed without the benefit of modern computers, software and online databases. Liberal use was made of these bibliographies as well as those found included in individual scientific papers and reports.

PETROLEUM GEOSCIENCE (SCOPING STUDY) DATABASE

The last few years has witnessed an explosion in the volume of geoscience literature available digitally via a wealth of free and subscription-based online databases created by Canadian federal and provincial governments and agencies, libraries, geoscience societies and the publishing industry.

In the call for bids, the officially titled ***RDC - "Western Newfoundland Petroleum Geoscience (Scoping Study) Database"*** project was generated from a practical exploration and research need. The general aim is to compile and evaluate all of the literature resource types, along with regular non-digitized paper copy and a sample of accessable unpublished material, and to identify topic areas where research is scanty. While geographic provincial and territorial boundaries are a starting point, there is also a need to view stratigraphy and structure from the original shape and configuration of basins and tectonic plates. Consequently, and while focussed upon Newfoundland and Labrador, this database is distinguished from other compilations by specifically respecting the geology and Petroleum Systems of the five Paleozoic sedimentary basins and namely the Anticosti, Bay St. George, Deer Lake, Sydney and St. Anthony basins. Importantly, this database differs in that it has been custom-indexed from that perspective, utilizing petroleum systems terminology and Newfoundland and Labrador geographic and geologic terms and formation names.

The database is comprised of publically accessible data from scientific journals, books and book chapters, government and industry reports and maps, conference proceedings (including abstracts, posters and PowerPoint presentations), field trip guidebooks, bibliographies, well and drill hole data; geophysical maps and data, mineral assessment reports, and a few websites.

The database stands at some 3330 references. At least 3,000 of those relate to one or more of the western Newfoundland sedimentary basins either entirely or only peripherally. The remaining 200 or so, while not mentioning Newfoundland and Labrador directly, were included in the database as potentially useful analogues from other distant localities and sometimes beyond Quebec or the Maritime provinces. Some are regional papers covering all or part of eastern Canada or USA, Greenland and European conjugate margins.

The database is ultimately geared to the furtherance of work in support of and by those engaged in the exploration for oil and natural gas in the province, though it may serve as a useful finding aid for almost anyone working in the sedimentary basins. It was designed to consolidate all of the literature and materials potentially relevant to the hydrocarbon prospectivity of western Newfoundland. The associated reports, one for each of the basins, summarize the current knowledge of the petroleum systems, address the quality and quantity of data available, and attempt to identify gaps in the knowledge base.

It is a given that the complex tectonic history of western Newfoundland bears heavily on the potential for the generation of, and more importantly, the preservation of economic hydrocarbon volumes. If any field requires an interdisciplinary approach it is petroleum exploration. While collection effort was concentrated on entries touching on one or more aspects of the hydrocarbon system, a liberal approach was taken to the inclusion of papers. The type of literature captured ranges from obscure paleontology papers to oil and gas company drilling reports - with work published as long ago as 1703, and as recently as 2014 (official cut-off for searches - April 2013).

PRIMARY REPOSITORIES AND SOURCES ACCESSED

Government sites may also contain lists of technical materials from cores, cuttings, geochemical and geophysical analyses, and from seismic records and reports. Access portals for some of this material are identified below and with additional instructions for accessing other types of provincial and federal government data in Appendix 3.

- The Geological Survey Division of the Newfoundland and Labrador Department of Natural Resources maintains an on-site library on Elizabeth Avenue in St. John's. Its website portal GeoScience OnLine**,** provides links to several databases used in this compilation, chief among them the Geofiles search engine, Geological Reports and Maps and the Geoscience Atlas Online. The databases provided access to extensive collections of in-house and external scientific publications, geological and geophysical maps and data, as well as industry-generated mineral assessment reports. The Geoscience Atlas

incorporates a set of petroleum resource layers **with** onshore and onshore-to-offshore wells, onshore seismic lines, petroleum basins and leases and permits, in addition to available literature, bedrock geology and a drill core database.

- The Energy Branch of Newfoundland and Labrador Department of Natural Resources' website provides links to compilations of petroleum exploration-related publications, including well history reports, Call for Bids supporting documents, lists of released geological and geophysical reports, and a selection of other scientific publications.
- Memorial University of Newfoundland's Queen Elizabeth II Library and Centre for Newfoundland Studies and the Map Room provide access, both on-shelf and digitally, to comprehensive Newfoundland and Labrador geoscience collections, including theses. Of course the stacks are freely perusable to anyone, as are many of the digital materials. Otherwise, the non-university community may be able to access some Ebooks, EJournals and Article Indexes on-site upon obtaining a temporary Labnet account at the Library Service desk on any of the Memorial University Campuses in the province .
- To identify relevant theses created and housed outside of the province, academic colleagues and university website portals from the Maritime Provinces and elsewhere were consulted. Often these theses are available online in full, or at least as an abstract.
- Natural Resources Canada's (NRCAN's) GEOSCAN Database, an online search portal for in-house and external publications by NRCAN scientists, including those at the Geological Survey of Canada (GSC), was extensively consulted. The GSC Vancouver provided on-site access to other geoscience databases and on-shelf collections of GSC publications and external journals over a period of several months. Hard-copy materials were reviewed for relevant material not available online.
- Geological, geophysical and engineering data relating to oil and gas exploration in Canada's offshore frontier basins is available via NRCAN's BASIN database. NRCAN describes the database as *"both basic and interpreted information for most petroleum industry exploration wells and locational data for a large number of seismic surveys. Basic well data has been gathered from well history and drilling reports while interpretative data such as formation picks, geochemical analysis, age determinations and vitrinite reflection values have been compiled from petroleum industry and*

government sources." BASIN provides links to the relevant federal-provincial or provincial boards where the original material is housed.

- Data for the Newfoundland and Labrador offshore is under the jurisdiction of the Canada-Newfoundland and Labrador Offshore Petroleum Board (C-NLOPB). As of writing, publically-released material, including well reports and seismic data, is available upon request, for viewing or reproduction, by appointment, at cost recovery including labour, from its Information Resource Centre in downtown St. John's. It is hoped that this material will soon become more easily and economically accessible, preferably in a digital format.

OTHER REPOSITORIES AND DATABASES

- See Appendix 3 for information regarding Canada Nova Scotia Offshore Petroleum Board

- Quebec's Oil and Gas Geoscience Information System database (SIGPEG) provides access to geological, geophysical and well reports for the province, the well reports dating back to 1860. Most of the reports are available for purchase.

USING THE DATABASE

Fundamental indexing of the database is by author, title, publisher, publishing date, geographic area, basin, broad topic areas, formation names and ages. Permanent link, URL and/or DOI information is provided for more than 75% of the files in this database. Links are not provided for files that remain in paper format. Other web links provided for some documents are unstable and may prove fleeting; such is the nature of the web. In the case of commercial publications, the links will lead to the publishers' websites where abstracts and purchasing information may be available. With non-digital materials sourced physically in libraries or institutions, finding aids such as location and Call Numbers may be provided, though this wasn't consistently done.

Beyond the basic indexing, the approximately 700 keywords assigned to citations (Appendix 2) enable identification, to a finer level, of materials potentially relevant to the exploration for

hydrocarbons in Newfoundland and Labrador. The keywords may be similar to or a subset of those supplied by an originating database, if obtained from such a source. To the extent that keyword lists were often not available at all, or not sufficiently detailed to capture the level of information thought necessary for the purposes of this database, much of this keyword list was custom-generated. This was accomplished by both visual and computer scans of the abstracts or full documents where available. The latter process is fraught with limitations, but hopefully those errors that slipped through the editing process were minimal.

The user of the database is cautioned on the limitations of the keyword search. The scope of this study did not allow for a detailed indexing of every paper or report, though the more relevant the paper to petroleum systems of western Newfoundland, the more detailed the indexing should be, assuming the text of the paper or a good pre-existing keyword list was available. Many were not.

The keywords are designed to be hierarchical. Not every level of the hierarchy is necessarily attached to every reference, although for key papers, that was the aim, if not the result.

- *Forty-five Brook Formation > Anguille Group > Deer Lake Basin > Maritimes Basin*
- *Hydrogen Index > Rock-Eval > Source Rock > Hydrocarbon System*
- *Seismic data > Geophysics*

Some sample searches:

- *Reservoir* or *Porosity + Aguathuna Formation*
- *Oil seeps + Newfoundland and Labrador*
- *salt tectonics/structures + Bay St. George Sub-basin*
- *Structural geology + traps + Anticosti Basin*
- *Thermal Maturation + Deer Lake Basin*
- *Magnetic Anomalies or Magnetic Data*
- *Marine Geology + Gulf of St. Lawrence*
- *Coalbed methane + Sydney Basin*
- *Biostratigraphy or Paleontology + Cow Head Group*
- *Seamus #1 well*

It is suggested the user be creative in choice of keywords and phrases, and to use them singly or in combinations of two or more (Appendix 2). Search results may include papers or reports with a mere mention of the word, so additional filtering will likely be necessary once the results are obtained.

GENERAL AND REGIONAL REVIEW OF DATABASE

COMPARISONS OF HISTORIC AND MODERN REFERENCE MATERIALS

In considering the search term “historic” and modern, December 31, 1959 was selected as a cut-off date for old versus new references. Aside from the fact that 1960 is roughly 50 years ago, it also stands on the eve of the introduction of the plate tectonic revolution, the way we view the planet, and the opening of many new areas of geology and geophysics research in exploration and development. In another light, the separation of “historic” from modern references also shows changes in the levels for current activities in this region.

To get an appreciation for the significance of this general time, one must first refer to old bibliographies that summarize a clearly defined geographic area - in this case, the island of Newfoundland. To be clear, the data we collected cannot offer such clear and unbiased measure of productivity. Our search mandate is not the same as that presented in older bibliographies. Certainly, the trends are seen to be similar between our measures and the older collection parameters from early bibliographic surveys, but, the search criteria established for our study are not as well constrained by geographic boundaries and definitions; we have offshore studies and an interest in relevant extra-regional work. The decisions made in our selection process are based upon geography and *opinions* on perceived relevance to petroleum studies. Older studies, are entirely delimited by geography and, for the most part, terrestrial studies of the island.

A simple view on changes in research productivity may be achieved by measuring old versus new publications collected from old bibliographies. The age and quality for older bibliographies and the references contained therein is not really in question; they are the products of their time. To appreciate the significance of the historic period before 1960, the first three comprehensive bibliographic compilations by Betts (1936), Baird et al. (1954) and Butler and Bartlett (1969) are proper starting points.

As a part of the Princeton University contribution to the Geological Survey of Newfoundland, Betts (1936) identified 301 papers for all geological topics concerning the island of Newfoundland. Considering that no comprehensive offshore work was ever reported for this

time, more than 180 of these papers, and nearly 60% of her database, cover one or more aspects of the sedimentary rocks of Newfoundland. Many of these papers are clearly focused upon coal and oil in western Newfoundland (Figure 2). Nearly 30 years later Baird et al. (1954) have another 342 new papers identified for Newfoundland and with 152 (36%) new papers focussed upon the island's sedimentary rocks and their mineral and energy resources - coal, gypsum, salt, limestone, sphalerite and galena. In total, all of the basic geological science research from 1937 until 1954 amounted to about 20 new papers per year with about 9 papers per year that actually address any aspect of the provinces sedimentary and petroleum geology (Figure 3).

Beginning in 1955 and continuing until 1969, Butler and Bartlett (1969) report 800 new papers for the island portion of the province, and with 154 new papers (26%) closely related to sedimentary and petroleum geology. In terms of productivity, this period shows more than a 100% increase in overall research levels and with about a 60% increase in sedimentary and petroleum geology activity (Figure 3; 11 papers per year). In particular, the 1960's now include some major offshore geophysical studies and drilling.

Since 1970 and until today the production of geoscience research in Newfoundland and Labrador has never been higher, and with more than 20,000 research papers and reports registered with the Newfoundland and Labrador government geoscience database. Across the province, this amounts to more than 450 new geoscience papers and reports per year. To get a sense of the numbers of sedimentary and petroleum geology studies available for review, we believe we have collected most of the published materials in the government files and beyond, and also sampled a subset of the larger and more comprehensive industry reports filed with the government. In comparison with total research productivity for the province, the rate of production for sedimentary and petroleum geology papers is at least 66 papers and reports per year (Figure 3). Significantly, in onshore areas, exploration has resulted in important hydrocarbon discoveries on the Port au Port Peninsula (Cooper et al., 2001). For offshore regions covered under our report, there are a number of large targets that await testing.

In summary, in 1960 there was little more than 375 papers and reports describing all of the sedimentary geology of Newfoundland. While numbers of papers have certainly increased in the

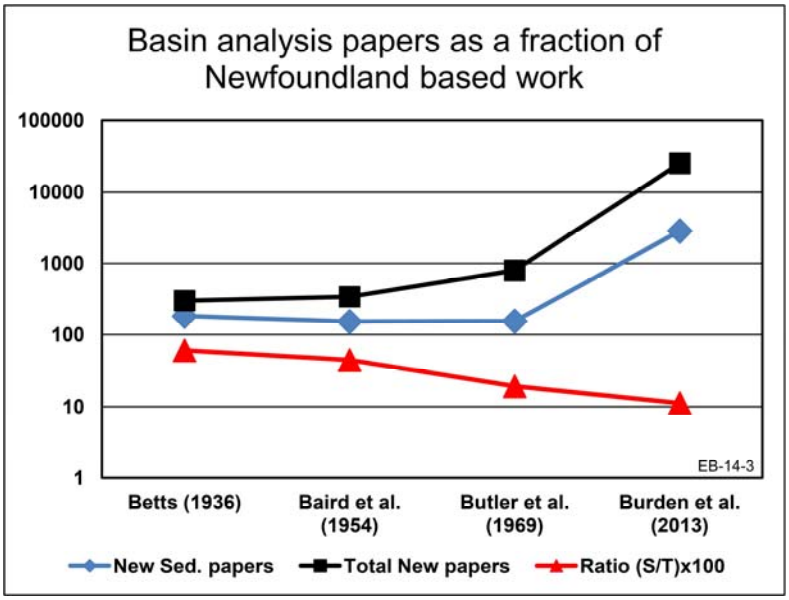


Figure 2: Graph of the production history for sedimentary geology and geophysics publications for Newfoundland Island and the total of all geoscience papers. The percent ratio of sedimentary and petroleum geology studies to Total publications (now 12%) has declined since the 1950's.

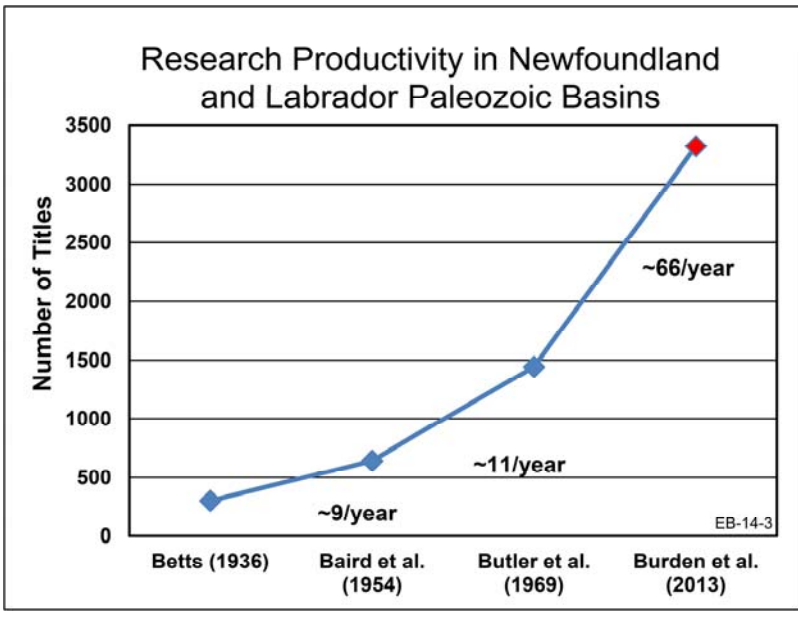


Figure 3: After about 1960 the rate of research production in Paleozoic basins on and around Newfoundland increased to about 66 papers, presentations and reports each year.

last 50 years, the rate of production of sedimentary and petroleum geology studies has not kept pace with other disciplines in the earth sciences. Overall the trend in sedimentary and petroleum geology research in Newfoundland and Labrador is down (Figure 2).

GEOGRAPHICAL VARIATIONS IN RESEARCH EFFORTS ACROSS BASINS

Additional important observations on research effort can be seen in a historical analysis of activities in comparisons with the sum total of modern (post 1960) studies. By comparing the volume and direction of modern and historic efforts, one can readily see whether significant new research has been completed across the discipline or simply focussed in one area of study or region.

In examining the total body of research concerning the Paleozoic basins of Newfoundland and Labrador (Figure 4), and this also includes 625 “regional” studies, it is very clear that work on the Anticosti Basin dominates all other sedimentary and petroleum geology studies. More than half of the total data base (>2000 papers) is material discussing the Anticosti Basin. In sharp contrast, the St Anthony Basin has not many more than 150 papers and other reports.

The distribution of papers between “historic” and modern literature offers an excellent proxy for the current state and intensity of research. Regions containing significant volumes of reference material that is more than 50 years old may be considered to have a long and extremely well documented history, or, more likely, these are poorly studied areas. The Anticosti Basin has a large number of research papers, and with less than 10% of that material more than 50 years old. The geology of this part of Canada is globally recognised as a classic part of the Appalachian Orogen and the literature is populated with reports generated from a large and active academic research community.

In comparison, the St Anthony Basin also has relatively few substantive geological and geophysical studies, and yet, older “historic” publications simply form about 5% of the total number of reports from this area (Figure 5). For this region of the northeast Newfoundland coast, this observation should be no surprise. Until the 1960's, the St Anthony Basin was an

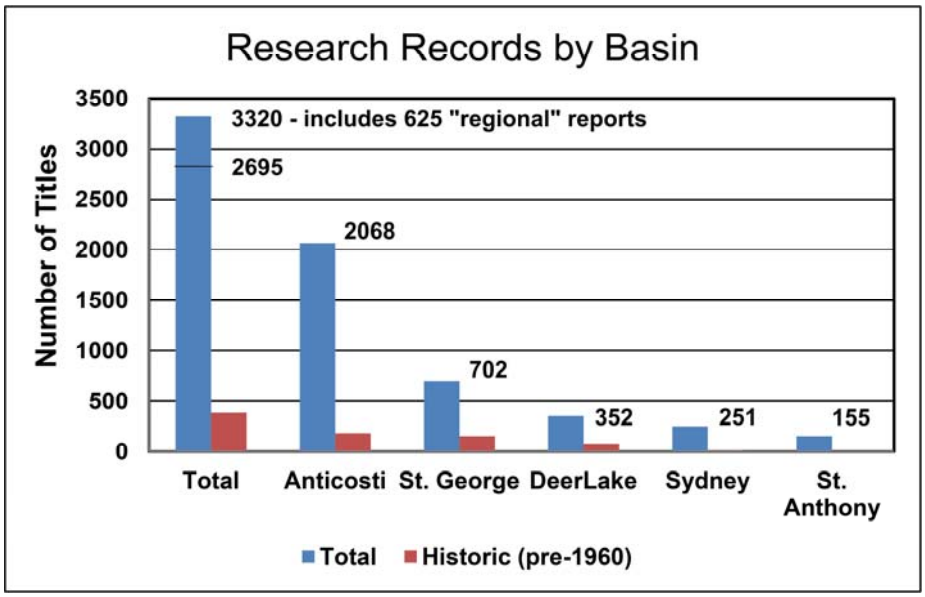


Figure 4: The Anticosti Basin with more than 10 times the number of reports than the St. Anthony Basin is by far the most intensively studied and documented region examined for this study.

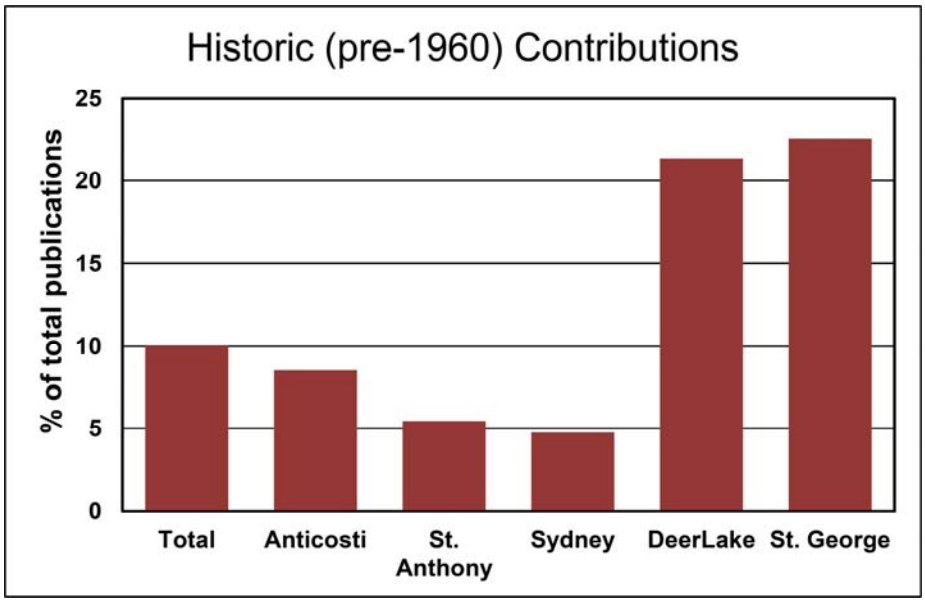


Figure 5: Historic publications as a percent fraction of the material available from each basin.

unknown and unnamed feature off the Newfoundland coast and where it remains to this day a minimally studied region.

The Sydney Basin, along the south coast of Newfoundland and extending onto the coast of Nova Scotia, has 251 research papers and is also seen to have a small number (11) of pre-1960 research contributions (Figure 5). Unlike the St. Anthony basin where little research has ever been conducted, we believe this reporting anomaly is a function of our own search parameters and not a real representation of the facts. In Nova Scotia, the Sydney basin has a long history as a coal mining district. The Nova Scotia papers identified in our files are specifically selected to show our current understanding of the Newfoundland offshore and with a smaller comparative sample of old and new material from the Nova Scotia side of this basin.

A surprising contrast to these earlier examples rests with the fact that old “historic” vintage publications and reports form over 20% of the > 1050 references for the Deer Lake and Bay St George Basins (Figure 4 and 5). Both of these areas are either onshore or nearshore regions of western Newfoundland. The significant volume of older reference material is a clear indication that little new research is either being conducted, reported or published on the geology of this part of Newfoundland. A large part of the available reference material was generated in the search for coal more than 50 years ago and before the plate tectonics paradigm was conceived.

In total, it is clear that our knowledge base is very uneven and with some basins receiving relatively little attention for more than 50 years.

PETROLEUM SYSTEMS ANALYSIS

SUMMARY OF THE REGIONAL REFERENCE BASE FOR PALEOZOIC PETROLEUM SYSTEMS

The Petroleum System reference base is a first pass at determining where research efforts have developed. It is roughly constructed around a hierarchical succession of search terms and topics (Table 1 and Appendix 2) that can be used to identify specific data, papers and reports that show one or another component for an active petroleum system in each of the Paleozoic basins. In selecting search terms, we have tried to stay away from common words or phrases that may include many or all of the main headings in a petroleum system (e.g. lithostratigraphy). Compilations of numbers of reports in one or another petroleum system topic area and for each of the basins (Table 2) can provide additional significant insight into the rate and direction research has taken in the last 50 years.

Source	Reservoir	Seal	Maturation	Timing
Source rock	reservoir rock	seal rock	Thermal maturation	Fluid Inclusions
Organic petrology	Porosity	Porosity	Diagenesis	Hydrothermal Dolomite
Kerogen	Permeability	Permeability	Vitrinite Reflectance	Hydrocarbon expulsion
Macerals	oil shale	pock marks	Fluid Inclusions	Hydrocarbon generation
Bitumen	shale gas	Salt	Hydrothermal Dolomite	Burial History
TOC	coalbed methane	clathrates	Clay Mineralogy	Thermochronology
coal	shale oil	seeps	Thermochronology	Thermal history
Rock Eval	API Gravity		Hydrocarbon expulsion	Hydrocarbon Migration
organic geochemisty	Clay Mineralogy		Hydrocarbon generation	Traps
total organic carbon	water saturation		Thermal alteration index	fluid migration
black shale	unconventionals		fission track dating	radiometric dates
oil shale			reflectance	hydrocarbon migration
			coal rank	hydrocarbon inclusions
			fluorescence analyses	biostratigraphy
			hydrocarbon inclusions	fission track dating
			conodont alteration index	

Table 1: Hierarchical listing of some of the search terms used to identify papers and reports that describe indicators for the main elements for a petroleum system.

For each of the basins, the basic components for a petroleum system (Source, Reservoir, Seal, Maturation, and Timing) are identified and populated with two numbers, total number of reports, and total number of reports minus all of the pre-1960 studies and also without conference and

other abstracts that are normally short on details (Table 2a). The immediate impact of these two numbers clearly highlights the fact that 27% of the data base (3311 - 2420 = 891) is populated with conference abstracts and historic studies (Table 2a).

With our selected indicators, and under totals for petroleum system reports, the 622 papers captured for this survey indicates that about 26% of the total data base has some bearing upon the principal parts of a petroleum system. In the total reports for the Anticosti Basin, and in absolute terms, the 338 papers identified as relevant are numerically not that much different from the 100-200 papers registered for the other large basins. Given the significantly larger number of reports from the Anticosti Basin (1510 vs 500 for Bay St. George), it must be concluded that less emphasis has been placed on the body of research expected for petroleum systems for Anticosti Basin (Figure 6). Additional evidence in support of this observation is presented elsewhere in the Basins analysis part of this study and report .

Under Petroleum System Reports, the Columns in Table 2 illustrate differences in research direction and intensity between the different basins. For Table 2c, the numbers are represented as percents . For instance, in the Anticosti Basin, the total number of papers mentioning source rocks is 262 (Table 2a), but when old papers and abstracts are removed, there is only 176 papers presenting more substance and detail (Table 2b). The intensity of this research is very different from, say, the St Anthony Basin where in the same period, only 34 modern source rock papers make some mention of this basin (Table 2b). The bottom Totals for each column show the actual numbers of papers in a topical heading. For our five basins, there are 307 papers describing or discussing Source Rocks and 346 in the entire data base. Nearly 90% of the total number of source rock papers collected for this study are included in this summary; others are spread amongst regional papers. Please note that the numbers in a column will not add up to the total for a column (e.g. 307); many papers in a count are reporting data from more than one basin.

Rows in Table 2 track the mechanisms of a petroleum system showing in a schematic way the intensity of research into the parts. For instance, source rock is an important part of the research conducted in the Deer Lake Basin with 80% of the reports either contributing data or commenting on this part of the petroleum system. This is considered as evidence in support of

BASIN	BASIN DATABASE Total (>1960 -Abst.)	PETROLEUM SYSTEM REPORTS					
		TOTAL ROWS (HC-SYSTEM)	SOURCE	RESERVOIR	SEAL	MATURATION	TIMING
Anticosti	2067 (1510)	488 (338)	262 (176)	287 (196)	121 (83)	206 (139)	294 (203)
St George	698 (500)	287 (201)	98 (64)	90 (64)	203 (138)	67 (50)	78 (60)
Deer Lake	346 (252)	151 (114)	121 (92)	93 (67)	36 (26)	58 (52)	52 (45)
Sydney	251 (198)	128 (103)	87 (64)	64 (48)	49 (45)	68 (52)	58 (42)
St Anthony	154 (135)	70 (56)	48 (34)	38 (28)	23 (21)	30 (25)	35 (30)
Total Columns	NA	878 (622)	454 (307)	419 (285)	306 (218)	334 (233)	406 (284)
Total Database	3311 (2420)	NA	513 (346)	471 (318)	349 (239)	385 (266)	467 (323)

2a

BASIN	DATABASE (>1960 -Abst.)	PETROLEUM SYSTEM REPORTS					
		TOTAL ROWS (HC-SYSTEM)	SOURCE	RESERVOIR	SEAL	MATURATION	TIMING
Anticosti	1510	338	176	196	83	139	203
St George	500	201	64	64	138	50	60
Deer Lake	252	114	92	67	26	52	45
Sydney	198	103	64	48	45	52	42
St Anthony	135	56	34	28	21	25	30
Total Columns	NA	622	307	285	218	233	284
Total Database	2420	NA	346	318	239	266	323

BASIN	DATABASE (>1960 -Abst.)	PETROLEUM SYSTEM REPORTS					
		TOTAL ROWS (HC-SYSTEM)	SOURCE	RESERVOIR	SEAL	MATURATION	TIMING
Anticosti	1510	22%	52%	58%	24%	41%	60%
St George	500	40%	32%	32%	68%	25%	30%
Deer Lake	252	45%	80%	59%	22%	45%	39%
Sydney	198	52%	62%	47%	44%	50%	41%
St Anthony	135	41%	60%	50%	38%	45%	54%
Total Columns	NA	26%	49%	46%	35%	37%	46%
Total Database	2420	NA	14%	13%	10%	11%	13%

2b, c

Table 2: Charts showing pattern of petroleum system reports by basins and studies. Table 2a provides numbers of reports for the total data base and a subset created by removing historic (pre-1960) documents and Abstracts from conferences. Table 2b is the subset of filtered data. Table 2c is rendered as percent abundance with Petroleum System parts (e.g. Source) measured against Total Rows (e.g. 176/338 x 100). The percent value for Total Rows (e.g. Anticosti - 338) is calculated against the total Anticosti data base (e.g. 338/1510 x 100). Please note that these results are trends and different numbers can be generated from different search terms.

regular and continued research interests (Figure 6). In comparison, the relative number of reports examining timing of events (39%) and seal (22%), are modest and needing additional work (Figure 6).

Reference lists created from the search terms are used to gain an appreciation of the quantity, and publication dates for research conducted on the possibility of Paleozoic petroleum systems on and around Newfoundland. This type of reference listing may also be useful for anyone wishing to identify and examine data availability for specific topic areas and to improve upon old and limited data sets. It should also be made clear that having any or all of the basic parts of a petroleum system identified does not necessarily reduce exploration risk if data are old, limited by geographic coverage, stratigraphic names and correlations, and basic technical analyses for properly measuring petrophysical and other properties.

The most recent word on this subject, and namely a series of papers by a team of Geological Survey of Canada scientists (Hu and Dietrich, 2008; 2010; Hu and Lavoie, 2008; Lavoie, 2008; Lavoie et al., 2009a; 2009b; 2009c; 2009d; 2009e; 2009f; 2009g; Dietrich et al., 2011; Hannigan and Dietrich, 2012) offer a comprehensive, reasoned and well researched view on whether petroleum systems exist in the Paleozoic basins of Atlantic Canada and (statistically) under appropriate circumstances, how much hydrocarbon might be recovered. Nevertheless, these scientists also recognise limits to data that is available, and the need for significant new efforts if this region is to reduce exploration risk. Our listing of the parts shows all or most of the data and analyses that have been completed in advance of the GSC reviews (Figures 6 and 7). Disciplines, regions, and topic areas in need of closer examination are visible from this compilation. All of the parts of a hydrocarbon system must be assembled in a manner that allows hydrocarbons to form, migrate and become trapped and preserved. An appropriate understanding of stratigraphy, structural geology, and history of basic petrophysical properties is critical to reducing this basic form of exploration risk.

BASIN	DATABASE (>1960 -Abst.)	PETROLEUM SYSTEM REPORTS					
		TOTAL ROWS (HC-SYSTEM)	SOURCE	RESERVOIR	SEAL	MATURATION	TIMING
Anticosti	1510	22%	52%	58%	24%	41%	60%
St George	500	40%	32%	32%	68%	25%	30%
Deer Lake	252	45%	80%	59%	22%	45%	39%
Sydney	198	52%	62%	47%	44%	50%	41%
St Anthony	135	41%	60%	50%	38%	45%	54%
Total Columns	NA	26%	49%	46%	35%	37%	46%
Total Database	2420	NA	14%	13%	10%	11%	13%

Regular continuing progress Efforts being made Needs work

Figure 6: Table 2 rendered as a "report card" using abundances of publications measured against Total Rows (Table 2b) and used as an indication of levels for research conducted in this region. Those parts of a petroleum system that barely register in total numbers of hydrocarbon system publications for a basin are identified as needing work. Topic areas that regularly find their way into reports are seen as representing continuing progress. So too, all of this should be examined with Figure 7 to see that the records for rate for annual production of reports indicates that in total very little work on petroleum systems is actually being conducted in 4 of the 5 basins.

BASIN	REPORTS/YEAR (>1960) (HC-SYSTEM)	(BASIN)	BASIN DATABASE	(HC-SYSTEM) REPORTS
Anticosti	(6)	(28)	2067 (1510)	488 (338)
St George	(4)	(9)	698 (500)	287 (201)
Deer Lake	(2)	(5)	346 (252)	151 (114)
Sydney	(2)	(4)	251 (198)	128 (103)
St Anthony	(1)	(2.5)	154 (135)	70 (56)
Total Columns	(11)	(--)	NA	878 (622)
Total Database	(--)	(45)	3311 (2420)	NA

Figure 7: A >50 year measure of the annual rate of production of reports on any aspect of a hydrocarbon system and on any aspect of the geology of the 5 sedimentary basins. Production of reports at fewer than 5 papers per year indicates little progress in understanding the geology.

REGIONAL ANALYSIS OF PETROLEUM SYSTEMS

ANTICOSTI BASIN

Introduction

Since the early part of the nineteenth century, Parsons Pond (1812) and Shoal Point (Port au Port Peninsula - pre-1874) on the Newfoundland side of the Anticosti Basin figure very prominently in the early history of North American oil exploration. Both areas are well known for oil seeps and oil shale, and with a recorded history of exploration and drilling at Parsons Pond beginning in 1867 (Fleming, 1970). For at least 150 years the Anticosti Basin has remained a very large and elusive target for petroleum studies and the site for significant and continuing exploration and drilling in Quebec and in Newfoundland and Labrador (Cooper et al., 2001; Dietrich et al., 2011).

For purposes of this report, Anticosti Basin is viewed as a depositional centre accommodating latest Precambrian through lower Paleozoic Laurentian (sedimentary) strata deposited in and around the present Gulf of St. Lawrence. The northern limit for the basin is the Paleozoic erosional edge with metamorphic Precambrian rocks, and not far inland from the Quebec and Labrador coastline. The southern limit, not always easily detected, is the ancient margin of Laurentia, beneath transported and structurally deformed strata, and where the volcanigenic oceanic crust of Iapetus (the Dunnage Zone) becomes the dominant lithology. This basin includes thickened undeformed rocks of the St. Lawrence Platform, the deformed rocks of the Humber Zone and thick layers of detritus shed from advancing thrusts. Bell and Howie (1990) suggest that the Anticosti Basin depocentre in the middle of the Gulf of St Lawrence may contain as many as 7000 m of lower Paleozoic strata.

In spite of a lengthy history of research and exploration activity in this basin, virtually all of the hydrocarbon drilling is concentrated in three relatively small areas, Anticosti Island, Port au Port Peninsula, and Parsons Pond. With a number of interesting targets identified offshore (Jose and Sargent, 2007) exploration of the broader region that presently underlies the Gulf of St Lawrence is very much in its infancy.

Regional Geology, Tectonics, and Stratigraphy

The late Precambrian break-up of Rodina, a Neoproterozoic supercontinent, began around 620 Ma when rift related granitic intrusions and dike swarms developed on what was to become the southern margin of Laurentia, the ancient core of North America (Stukas and Reynolds, 1974; Williams et al., 1985; Waldron et al., 1998; van Staal et al., 1998). Rifting, and later spreading left the southern coast of this new continent with an irregularly shaped, and faulted, passive margin defined by major promontories and reentrants (Thomas, 1977; 2006). These, in fact, are features that define basic basin shape and determine aspects of the sediment fill for the basins of the southern Laurentian margin (Miall and Blakey, 2008).

In the early Cambrian, and as rifting transitioned to spreading, Iapetus, the southern bounding sea, gradually covered this stretched, broken and subsiding continental margin, becoming the site for deposition of thick deposits of continentally derived shelf sandstone and shale. Locally, across the Quebec, Gulf of St. Lawrence, and western Newfoundland regions, Ediacaran and lower Cambrian rocks are known as the Labrador Group, Curling Group, Penguin Cove, South Brook and Blow Me Down Brook formations (Figure 8). Compositionally, these rocks range from immature alluvial and fluvial marginal marine and glauconitic sandstones, marine mudstones mature quartzose sandstones, arkosic sandstones and greywacke turbidites.

Later in the Cambrian, the southern margin of Laurentia (the St Lawrence Platform) developed as a vast carbonate shelf with several kilometres of limestone and dolomite of the Port au Port and St. George Groups deposited upon a wide continental shelf and facing into a deep marine setting. Onshore, to the north, and inland across the Laurentian craton, thin carbonate deposits of an expansive epiric sea, covered the irregular Precambrian surface and filled ancient grabens (Salad Hersi et al., 2003; Dix and Salad Hersi, 2004; Ettensohn, 2008). Farther to the south, and off the edge of this carbonate shelf, deep marine and pelagic carbonates and clastics of the Cow Head and Northern Head Groups are thought to lay upon attenuated continental granitic crust, and much farther seaward, oceanic basaltic crust (Figure 8). If spreading did not happen, it is unlikely if any Cow Head and Northern Head strata could be deposited.

Spreading ended by the beginning of the Middle Ordovician and, with the start of the Taconic

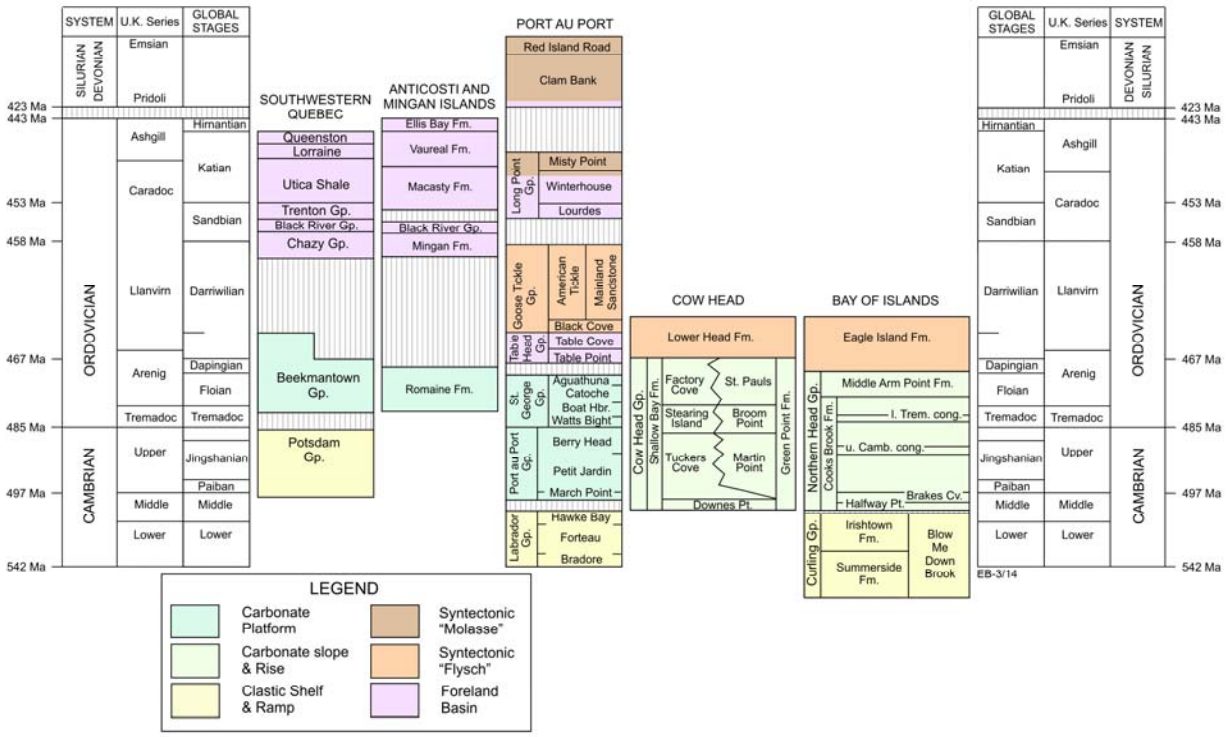


Figure 8: Stratigraphic correlation of strata from deep marine slope deposits on the southern margin of Laurentia (Bay of Islands - Humber Arm Allochthon) and north onto the St Lawrence Platform epiric sea in what is now Anticosti and southwestern Quebec. Data are compiled and interpreted from many sources and including those containing a variety of biostratigraphic controls.

Orogeny, a lengthy episode of more than 200 Ma of Appalachian mountain building began. Far to the south, mixed and volcanigenic Taconic "flysch" was accumulating upon distal Northern Head and Cow Head group strata. Closer to shore and on what is now the Port au Port Peninsula, Table Head Group strata record an episode of deformation and basin deepening thought to be in response to crustal loading (Stenzel et al., 1990). Soon after, Taconic thrusting detached and carried large slices of deep marine strata and oceanic crust onto the older shallow marine carbonate platform.

Today, a distinctive structural boundary (the Appalachian Structural Front, and also known as Logan's Line), extends from near Quebec City, down the St Lawrence River, through the Straits of Belle Isle and into the North Atlantic (Figure 9). This separates all of the essentially undeformed St Lawrence Platform rocks in the west from their transported, deformed and metamorphosed counterparts, and now known as the Humber Zone, farther east (St Julian and Hebert, 1975; Williams, 1995).

From structures and metamorphic gradients, the Humber Zone is divided into External and Internal Subzones (Waldron et al., 1998). The External Humber Zone is unmetamorphosed and weakly metamorphosed strata that may, at least in part, remain as a zone of hydrocarbon prospectivity. Farther east, and towards the next adjacent tectonostratigraphic domain, the Internal Humber Zone is significantly deformed metamorphic rock of the greenschist and amphibolite facies (Waldron et al., 1998).

The eastern limit of the Humber Zone is a shear zone known as the Baie Verte - Brompton Line (Figure 9), and a place where deformed and metamorphosed sedimentary rocks lie adjacent to volcanigenic oceanic crust and ophiolites (Williams and St Julien, 1978). In addition, some of these allochthonous rocks, and other ophiolitic successions have become detached from their oceanic source to become far travelled thrusts laying upon External Humber Zone and near platform carbonates on the shore of the Gulf of St Lawrence.

Over the course of decades and with involvement of many researchers, the Paleozoic geology of mountain building in Newfoundland, in particular, and Atlantic Canada, in general, is now divided into 5 major tectonostratigraphic divisions, each representing a part of the Appalachian

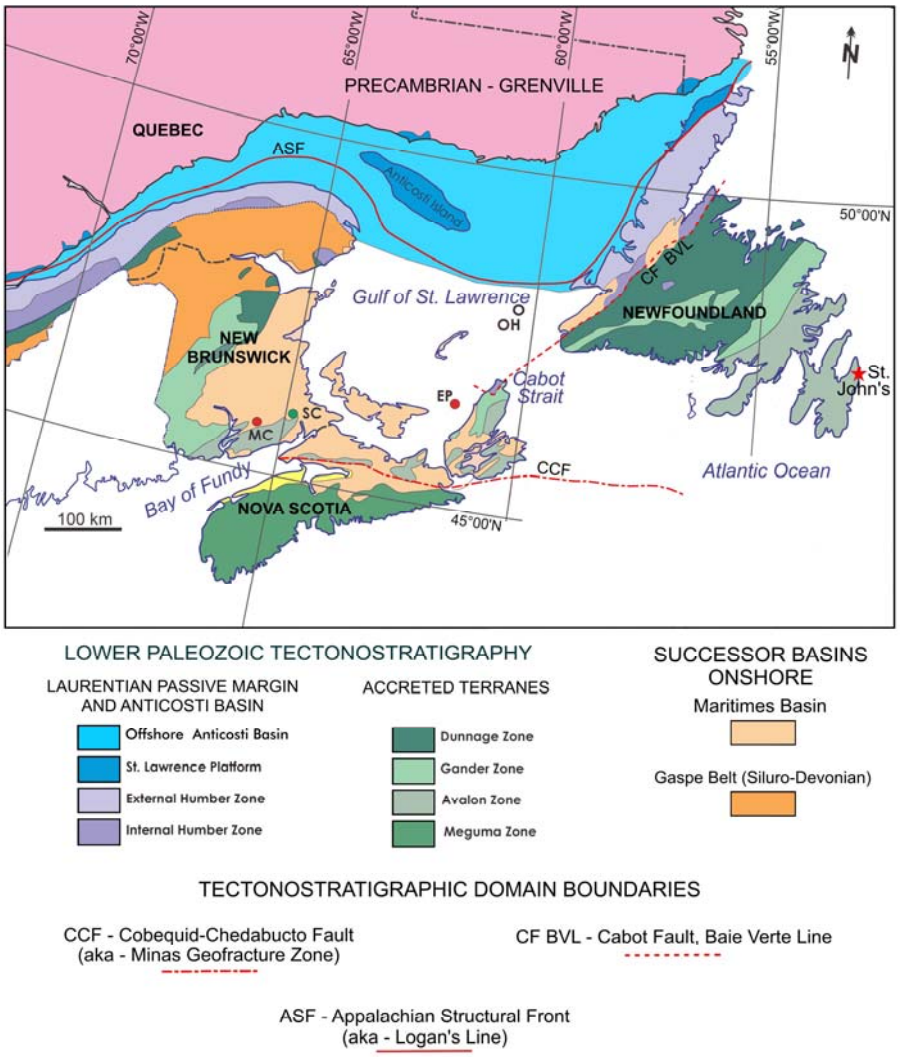


Figure 9: Regional tectonostratigraphic setting of eastern Canada modified slightly from maps published by Lavoie et al. (2003), and Hannigan and Dietrich (2012). The eastern margin of the Anticosti Basin on the coast of Newfoundland is the site for significant petroleum exploration for structural and stratigraphic traps in carbonate and clastic strata, hydrothermal dolomite, and unconventional shale oil deposits. Named fault systems on tectonostratigraphic domain boundaries may be important controls on Carboniferous petroleum systems.

Orogeny (Williams, 1995). Essentially, flat-lying, undeformed St. Lawrence Platform rocks become a part of the deformed and metamorphosed Humber Zone strata, the first of the five major tectonostratigraphic divisions defining the Paleozoic Appalachian mountains (Williams, 1979; 1995). The remaining four zones, known as Dunnage, Gander, Avalon and Meguma physically delineate the suturing of ancient oceanic crust from Iapetus and slices of other continents (e.g. Africa, and Avalonia) that are now a part of North America (Figure 9).

These outlying tectonostratigraphic zones figure prominently in the basic geology and development for younger, Carboniferous sedimentary basins discussed elsewhere in this report, but, in general, it is the tectonism associated with the movement of the allochthons and suturing of Dunnage Zone terrain that plays a larger role in determining the petroleum prospectivity of the Anticosti Basin. A significant amount of the folding and faulting associated with trapping and maturing of Paleozoic hydrocarbons can be traced to Taconic, Acadian and Alleghenian orogenesis. These events also pose a considerable risk with respect to metamorphism, destruction of hydrocarbons, and to fracturing and destroying the integrity of reservoir seals.

Data quality and quantity

There is more than 2000 references captured in our search of all Anticosti Basin geology and geophysics studies, and directly or indirectly tied to Newfoundland and Labrador strata. In this number fewer than 10% are historic pre-1960 papers.

Our collection contains 200 major and final assessment reports filed with the the provincial government. They show significant interest in Pb/Zn exploration, marble, and industrial limestone. A few of the pre-1960 assessment documents are focussed upon hydrocarbons in sediments and copper from igneous strata.

Nearly one-third of the Anticosti reference base (633 reports) and the single largest area of research is paleontology and biostratigraphy. Trilobites (165), graptolites (141) and conodonts (140) form more than two thirds of the paleontology reports. These are the fossils that form the worldwide standard for dating and correlating Cambrian and Ordovician strata. In contrast, fewer than 10% of the paleontology reports address palynology (chitinozoa and acritarchs), an otherwise useful proxy for age, environment, source rock quality and thermal maturation

analyses for cores and cuttings.

Structural geology contributes more than 20% of research and applications papers and presentations (444), with fewer than 10% as historic documents. Topic areas cover a spectrum of items from plate tectonism to cleavage analyses, and with many generally directed towards improving our understanding of the assembly of the tectonic regimes (e.g. Allen et al., 2009). A smaller number of papers address the geology of reservoir size structures (e.g. Knight and Boyce, 2000; Gillis et al., 2004; Lavoie and Chi, 2007).

Very few of the 370 geophysical studies identified in this survey are more than 50 years old. In fact, most of the geophysical data directly related to the Anticosti Basin are less than 30 years old. Specifically, there are 140 reports covering crustal magnetism and including 16 new aeromagnetic surveys of the Gulf of St Lawrence adjacent to western Newfoundland (Dumont and Jones, 2013a - p). Resolution achieved in some of these new surveys can be very high, and allow beds or other stratigraphic markers to be traced long distances (Waldron et al., 2002).

There is 52 geophysical reports on gravity analyses of the crust. Eight of these are Abstracts for conference presentations, and 4 others are unpublished thesis studies. Many of the remaining reports are concerned with regional assessments of basement conditions (e.g. Marillier and Verhoef, 1989), and a smaller subset of 8 older reports are measuring gravity over ore bodies (e.g. Collins et al., 1970).

Federal Government reports as recent as Pinet et al. (2009) cite more than 40,000 line kilometres of “poor quality” seismic surveys in the Gulf of St Lawrence. Some of these seismic lines for the Anticosti Basin are summarized in the 200 reports collected for this survey. A surprising observation rests with the knowledge that over 50 of these “seismic” reports are simply abstracts for papers presented at conferences, and another 8 files are promotional materials from government land sales.

A substantial body of literature exists to describe the petroleum system for this basin and for its parts. There are 257 reports on source rock and 208 on thermal maturation, 288 reports on reservoir rocks, 121 on seal rock and 295 on timing. The critical missing link is recognition and measurement of porosity and permeability for transport and storage of hydrocarbons. Only 70

papers with reference to those attributes appeared in our compilation.

Petroleum System Elements

Source Rock and Maturation

This is a broad topic area and one where the combined source and maturation topics generate 286 distinct papers that address one or another aspect of Anticosti Basin source rock and thermal maturation. More than 30% of these papers are simply abstracts or historic documents with little or no numerical data. Another 10% are clearly promotional materials from industry and government sources and citing other primary research. Other papers addressing source rock and maturation may contain a variety of information derived from mineralogy (Azomani et al., 2013), fluid inclusions (Conliffe et al., 2009), fission tracks (Stockmal et al., 1995a; 1995b), organics (Fowler et al., 1995) and fossils (Williams et al., 1998).

There are two significant episodes of source rock generation in the Anticosti Basin. The middle Cambrian through lower Ordovician Green Point Formation (Fowler et al., 1995) at Cow Head and on the Port au Port Peninsula, can be a very rich (>10% TOC) Type I/II, dark, organic shale, laying at the bottom of the oil window and in the zone of gas condensates (Cooper et al., 2001; Dietrich et al., 2011). Elsewhere on the west coast of Newfoundland, correlative beds of the Cooks Brook Formation also contain source rocks with more than 2% TOC (Burden et al., 2005).

The second confirmed source rock interval is middle and upper Ordovician foreland basin shale of the Black Cove Formation of western Newfoundland (~1.5% TOC) and in younger rocks of the Utica/Macasty formations of Anticosti Island (up to 7.1% TOC) - Dietrich et al. (2011). To date, Winterhouse Formation strata from the Port au Port Peninsula have not shown TOC values to indicate any source rocks ever developed in these otherwise correlative rocks of the Utica Formation.

Oil seeps and stain identified from many other Cambro-Ordovician strata from western Newfoundland (Hicks, 2009) may yet indicate other source rock beds in the allochthon and autochthon (Figure 10). No comprehensive and systematic study of potential and probable source rock has ever been produced for all the Paleozoic basins on and around Newfoundland.

Porosity and permeability

There are 70 reports identified as containing information relating to porosity and permeability. Within this number are 17 Abstracts, 5 graduate theses, and 7 promotional summaries from industry and government sources.

For the remaining 40 papers, many of the studies examine the physics and chemistry of dolomite as a mineral that may generate porosity (e.g. Lynch and Trollope, 2001; Lavoie et al., 2005). Comparatively few of these 40 papers actually address physical measures for porosity and permeability or on styles of change for these properties in the subsurface. Be it primary or secondary porosity of fossils and lithoclasts, or brittle fracture porosity from burial and tectonism, there is a general lack of knowledge of physical properties for mechanically and diagenetically altered clastic and carbonate rock in western Newfoundland. This is a very real exploration risk.

One small and new contribution to this compilation of research comes from a set of figures from the recently completed Nalcor et al. - Finnegan well at Parsons Pond (Table 3). Rocks from the target area are very indurated, and with very low porosity and permeability values.

Traps, Seals and Reservoirs

Over 450 papers and reports cover many aspects of the variety of possible traps, seals and reservoirs that might exist in this basin. Under appropriate circumstances, hydrothermal dolomitization can generate porous and permeable zones along faults and unconformities (Lavoie et al., 2003). Elsewhere in this basin clastic strata can be their own source, reservoir and seal in conventional and unconventional shale hosted deposits (Burden et al., 2005; Hicks et al., 2010). Seals can also be related to faulting during rifting, reactivation of faults during the Taconic and younger orogenies, or simply diagenesis from burial. The limited numbers of exploration programmes and tests that have been conducted in this basin can be viewed as an opportunity to develop other exploration strategies.

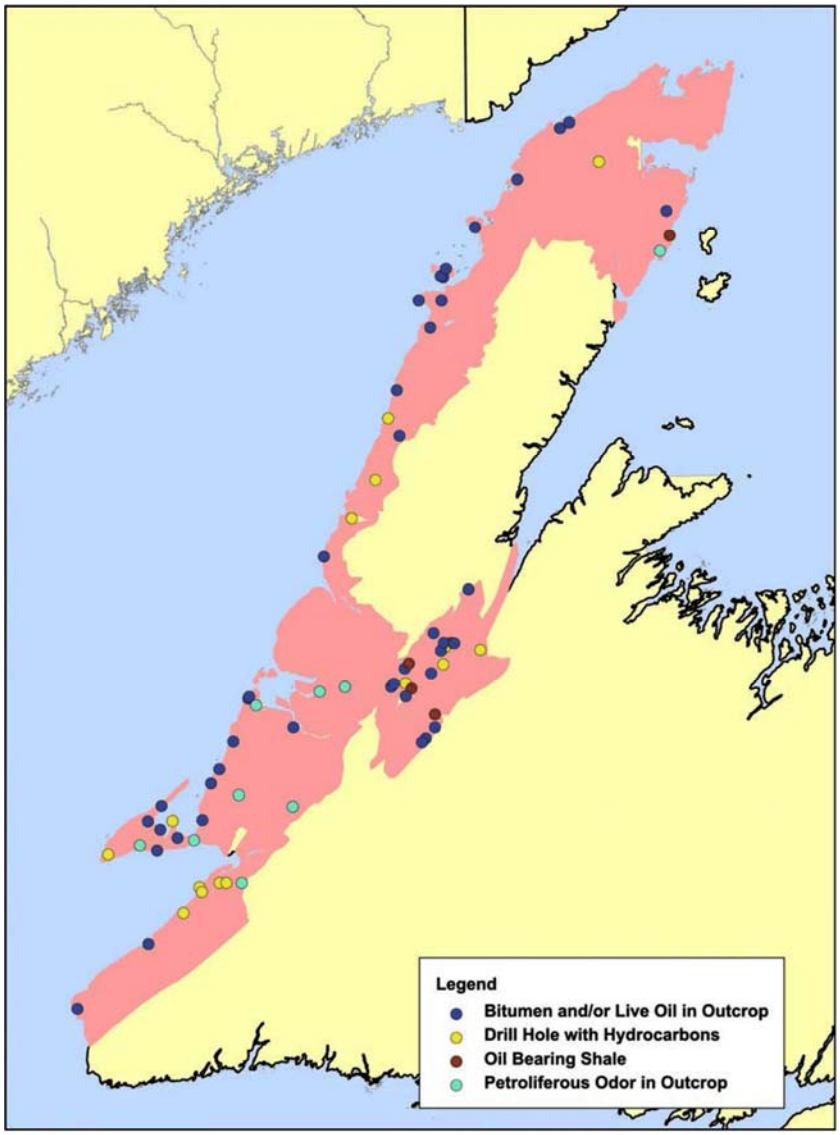


Figure 10: Map of hydrocarbon occurrences in western Newfoundland (From Hicks, 2009). Many of these stations cannot be correlated to any documented hydrocarbon source.

NALCOR FINNEGAN SIDEWALL CORE ANALYSIS

	SAMPLE NUMBER	SPOT DEPTH m	UNSTEADY STATE PRESSURE DECAY PERMEABILITY kair	POROSITY (HELIUM) fraction	BULK DENSITY (kg/m3)	GRAIN DENSITY (kg/m3)	DESCRIPTION
Allochthon C	SP 25	1073.05	0.011	0.030	2630	2710.	ss vf f calc
	SP 22	1162.06	0.003	0.001	2710	2710.	sltst calc
	SP 20	1214.94	0.010	0.014	2680	2720.	sltst
	SP 16	1486.59	0.007	0.003	2650	2660.	ls i
	SP 15	1525.58	0.008	0.006	2650	2670.	ss vf f calc
	SP 12	1576.05	0.006	0.006	2690	2710.	sltst calc lam
Allochthon D	SP 10	1683.96	0.009	0.005	2660	2670.	ss vf f calc
	SP 6	1974.02	*	*	*	2680.	ss vf calc GD ONLY
Goose Tickle	SP 5	2052.97	0.006	0.001	2690	2690.	ss vf slty dol
	SP 3	2131.99	0.008	0.001	2720	2720.	sltst dol
Table Point	SP 1	2264.99	0.003	0.003	2700	2710.	ls i

Table 3: Porosity and permeability analyses on sidewall cores from the Nalcor et al. Finnegan well and showing tight, impermeable strata (from Provincial Government Natural Resources web site).

Potential Plays in the Anticosti Basin

Pinet and Lavoie (2007), Lavoie et al. (2009) and Dietrich et al. (2011) offer 6 petroleum plays in or above the St Lawrence Platform and adjacent Humber Zone. Five of their plays rightly belong in the Anticosti Basin; their sixth play in younger foreland basin sandstone and limestone may be sourced from hydrocarbons migrating from older strata. Their petroleum systems events chart (Figure 11) and our slightly modified vied of their potential plays (Figure 12) builds upon their work and introduces some other possible variants in strategy for this region.

Cooper et al. (2001) and Lavoie (2009) recognise that significant porosity attributed to secondary dissolution of carbonate cements can develop in Hawke Bay Formation and Potsdam Group sandstones of the platform successions. Under appropriate structural conditions, these beds may become traps for migrating hydrocarbons.

Two hydrothermal dolomite plays, and nominally associated with the Tremadoc Boat Harbour disconformity and the Floian St George Group unconformity, contain significant porosity and permeability (Cooper et al., 2001). At Garden Hill, the Aguathuna formation is a major hydrocarbon discovery for this region.

Cambrian sandstones of the Laurentian margin, and now a part of the Humber Zone also have reservoir potential. Burden et al. (2005) report oil saturated sandstones from Blow Me Down Brook formation turbidites from western Newfoundland outcrops, and with Dietrich et al. (2011) reporting gas in Cambro-Ordovician sandstones from Quebec.

Much younger flyschoid, turbiditic sandstones of the Goose Tickle Group on the Port au Port Peninsula can carry a petroliferous odour. It is unclear whether this is a result of an active petroleum system or simply traces carried into these rocks from the Green Point oil shales laying a short distance away and beneath these beds.

In Newfoundland, Winterhouse Formation strata may carry a petroliferous odour in some of the fine-grained sandstone beds, but are generally unappealing next to their Quebec equivalents in

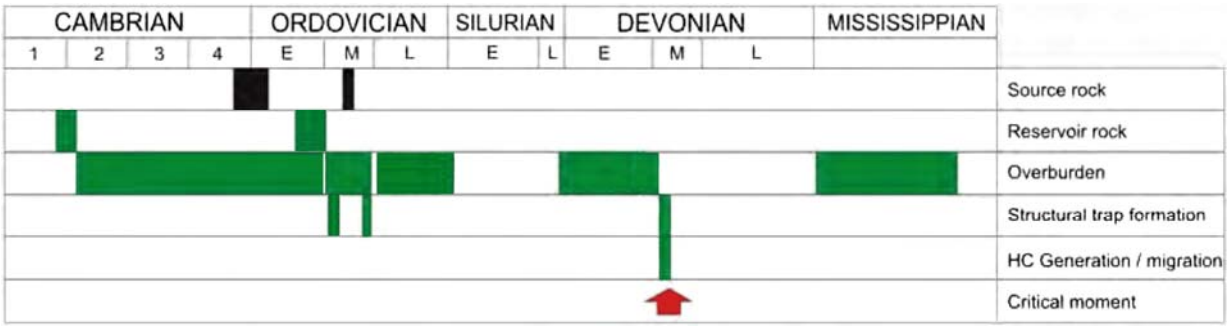


Figure 11: Petroleum system chart, as a slightly modified composite of two charts in Lavoie et al. (2009), and showing Cambrian clastic and Ordovician dolomite reservoir strata with Cambro-Ordovician source rocks. Additional opportunities may yet be found in Cambro-Ordovician clastics and carbonates of the allochthon. A critical feature not addressed is the seal rock.

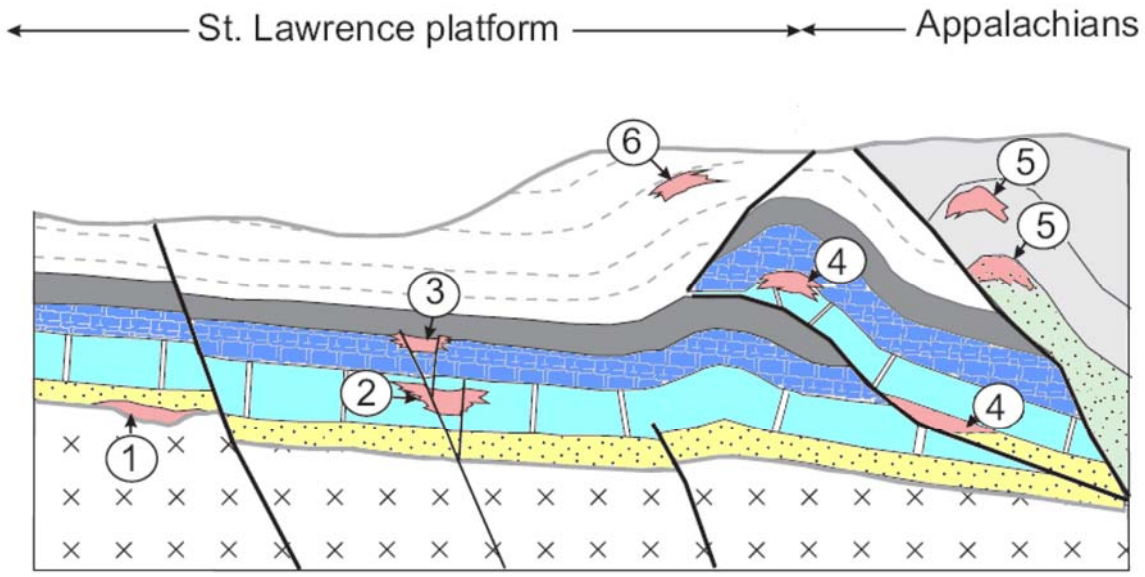


Figure 12: A modified version of a figure from Pinet and Lavoie (2007) and Dietrich et al. (2012), and meant to schematically show the 6 petroleum plays for the Anticosti Basin. Our modifcation shows additional variation in the deformed parautochthonous platform (4) and the allochthon (5) to accommodate multiple sandstones from different settings.

the Macasty Formation of Anticosti Island. For strata beneath the Gulf of St Lawrence, it remains to be seen where the organic matter, source rock characteristics become more promising

Summation

The body of data for the Anticosti Basin is much larger than that for the other Paleozoic basins in this region. For onshore regions in particular, much is known about the age, sedimentary environments, plate tectonic assembly and deformation of the platform and Humber Arm Allochthon. A much smaller quantity of data is available to explain potential hydrocarbon systems and to direct exploration programmes. A play strategy involving dolomitic beds on or about the St George Unconformity has shown some success on the Port au Port Peninsula. It is still too early to say whether this is a unique play or part of a spectrum of other similar, dolomitic, and unconformity bound structures that may be found in other parts of the basin. Some Cambrian sandstone does contain significant porosity (Cooper et al., 2001; Lavoie, 2009) and may also be oil saturated (Burden et al., 2005). To date, exploration has not seriously addressed the possibility for clastic plays in Cambrian shelf sands or Cambro-Ordovician turbiditic flysch. With land based records as our only comparative data, little is actually known of the source rock and potential reservoirs laying beneath the Gulf of St Lawrence. A significant, well known, yet largely unstudied risk for this region rests with determining the sealing capacity for cap rock.

MAGDALEN BASIN - BAY ST. GEORGE SUB-BASIN

Introduction

The Magdalen Basin beneath the Gulf of St Lawrence (Figure 13) is the central core of the Carboniferous and Permian Maritimes Basin, a complex Late Paleozoic tectonostratigraphic domain of largely transtensional successor basins covering an area of more than 250,000 km^2 (Giles, 2008; Hu and Dietrich, 2010). Here, a generally common onshore stratigraphy from New Brunswick, Nova Scotia and Prince Edward Island forms a reference for all other regional upper Paleozoic studies across Atlantic Canada, and in particular the poorly documented Sydney and St Anthony Basins (Figure 14). In fact, and including other nineteenth century studies of North American strata (e.g. Jukes, 1842 - for Newfoundland), this common pattern for sedimentation, and namely a thick succession of clastics, carbonates, evaporites, coal and clastics becomes the basis for differentiating all lower and upper Carboniferous in western Europe and the Mississippian and Pennsylvanian in North America (Gibling et al., 2008). Across this entire trans-Atlantic region these rocks are well known for industrial (halite, gypsum), metallic (Pb, Zn) and energy minerals (U), coal deposits and oil and natural gas fields.

Hydrocarbon exploration activity in the Magdalen Basin in mainland Canada certainly goes back to the nineteenth century with attempts at commercializing oil seeps in outcrops and later, oil shale deposits from Mount Albert, New Brunswick (Macauley, 1984). Some modest success came in 1909 when conventional oil was discovered and developed at Stoney Creek, New Brunswick (Dietrich et al., 1911). Between then and now, several hundred shallow and unsuccessful exploration wells have been drilled across New Brunswick and in the search for oil (Lavoie et al., 2009).

In 2000, and nearly a century after the Stoney Creek discovery, a significant gas discovery (> 1 Tcf) led to the development of the McCully gas field in southeastern New Brunswick. Subsequent drilling in the same area (South Branch G-36), and cited on the Corridor Resources website (2014) as the Caledonia field, suggests the possibility of a large Carboniferous resource that may require stimulation before commercial production rates can be achieved.

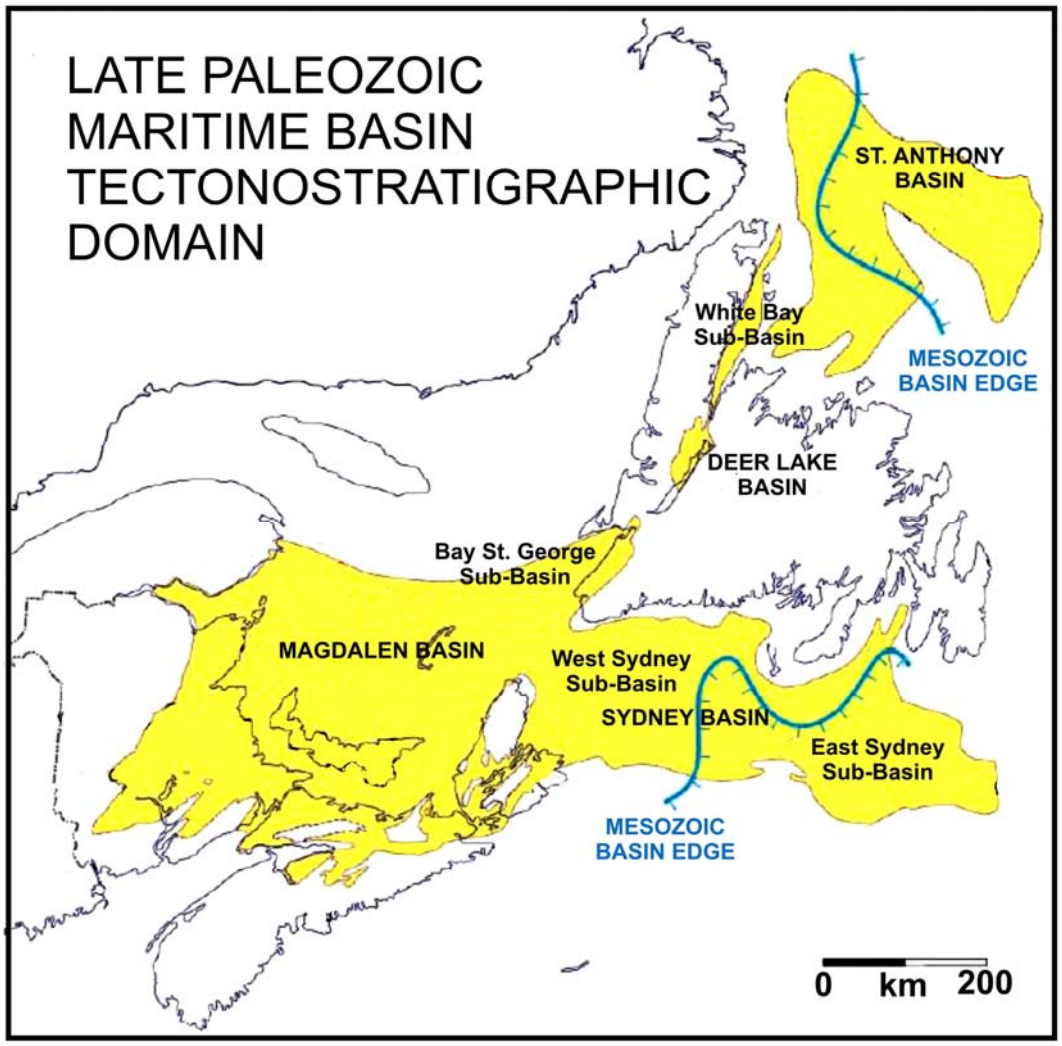


Figure 13: The concept of a Late Paleozoic Maritime Basin (yellow) emerged from isopach mapping onshore strata of New Brunswick, Nova Scotia and Prince Edward Island. The moniker has grown to become a regional tectonostratigraphic domain including many Late Paleozoic successor basins (labelled) that formed in eastern Canada from plate motions during and following the Alleghenian Orogeny. Figure adapted from Lavoie et al. (2009); Hu and Dietrich (2010).

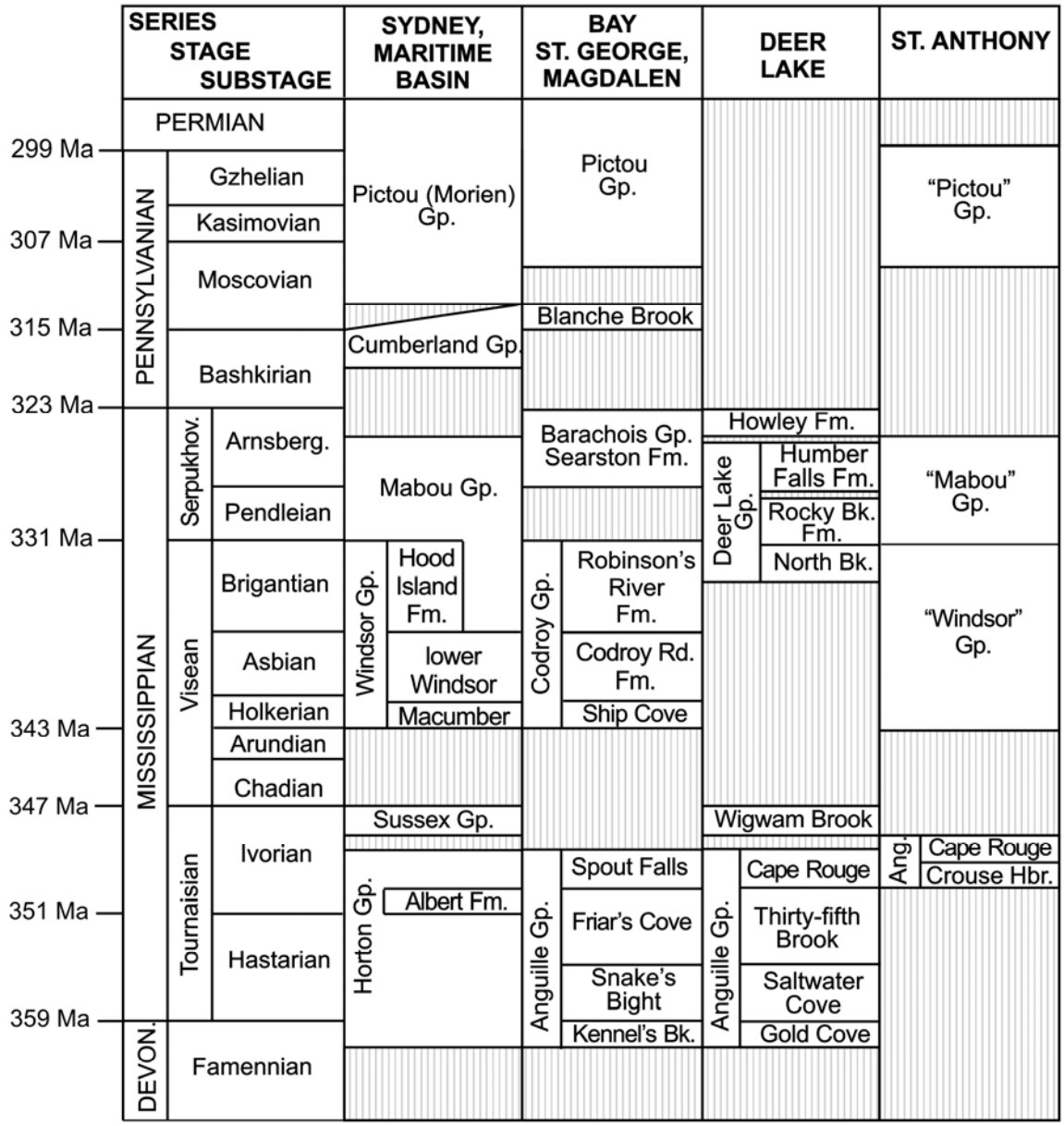


Figure 14: Summary stratigraphic correlation of sedimentary basins of the Late Paleozoic Maritimes Basin Tectonostratigraphic Domain. Formations of the St Anthony and Sydney basins are a mix of formal names from outcrop and informal names derived from inferences from limited submarine and subsurface data. Compiled from Hyde (1982), Knight (1983), Utting (1987), Hamblin et al. (1995), Hamblin et al. (1997), Lavoie et al. (2007); Utting and Giles (2008); Giles (2009); Dietrich et al. (2011), with ages from Richards (2013).

Offshore exploration and drilling of the Gulf of St Lawrence began in the early 1940's (Dietrich et al., 2011). By the early 1980's, Lavoie et al. (2009) report more than 50,000 km of seismic surveys were completed and three rounds of offshore drilling (1965, 1970-74, and 1980-83) discovered one large but subeconomic gas deposit in the East Point E-49 well off the coast of Prince Edward Island (Figure 15). While significant as possible analogues for Newfoundland geology and exploration models, none of the 15 exploratory holes are in the jurisdiction administered by the Canada Newfoundland and Labrador Offshore Petroleum Board.

In Newfoundland, and throughout the latter half of the nineteenth century and into the middle of the twentieth century, our survey of government open files and other reports suggest very little petroleum exploration was conducted on Carboniferous strata of the onshore parts of the Magdalen Basin (Hayes and Johnson, 1938; Fleming, 1970). In contrast, mineral exploration programmes show a history of significant and continuing interests in exploring Cu/Pb/Zn/ deposits in black shales and hydrothermal vein minerals (Knight, 1983; Hyde, 1990). Proven and probable mineral deposits include gypsum, anhydrite, halite, sylvite, barite and celestite.

In the mid 1950's the Provincial government sponsored a programme to drill and delineate the Flat Bay gypsum and anhydrite deposit (McKillop, 1957). During that work, some of the cores collected from the proposed mine site contained fractures leaking oil from evaporitic rocks and from conglomerate beneath the gypsum deposit. By the early 1970's and in conjunction with renewed exploration efforts in the Gulf of St Lawrence, Brinex partnered with Union Oil to drill a stratigraphic test on the crest of a large anticline in the Anguille Mountains. At about 2300 m when it was plugged and abandoned, the Union Brinex Anguille H-98 well sampled a thick section of lithified and indurated red bed sandstones (Harris, 1973)

Over the last 15 years Vulcan Minerals acquired a mineral and petroleum exploration licence for areas near the now abandoned quarry where trace oil was discovered. Shallow boreholes confirmed reports from the 1950's and indicate that some parts of a Carboniferous hydrocarbon petroleum system remain (Smith, 2007a; 2007b; 2007c). Elsewhere in this onshore area, Vulcan Minerals recently released basic data on other suspended wells with hydrocarbon shows (Halley, 2011a; 2011b).

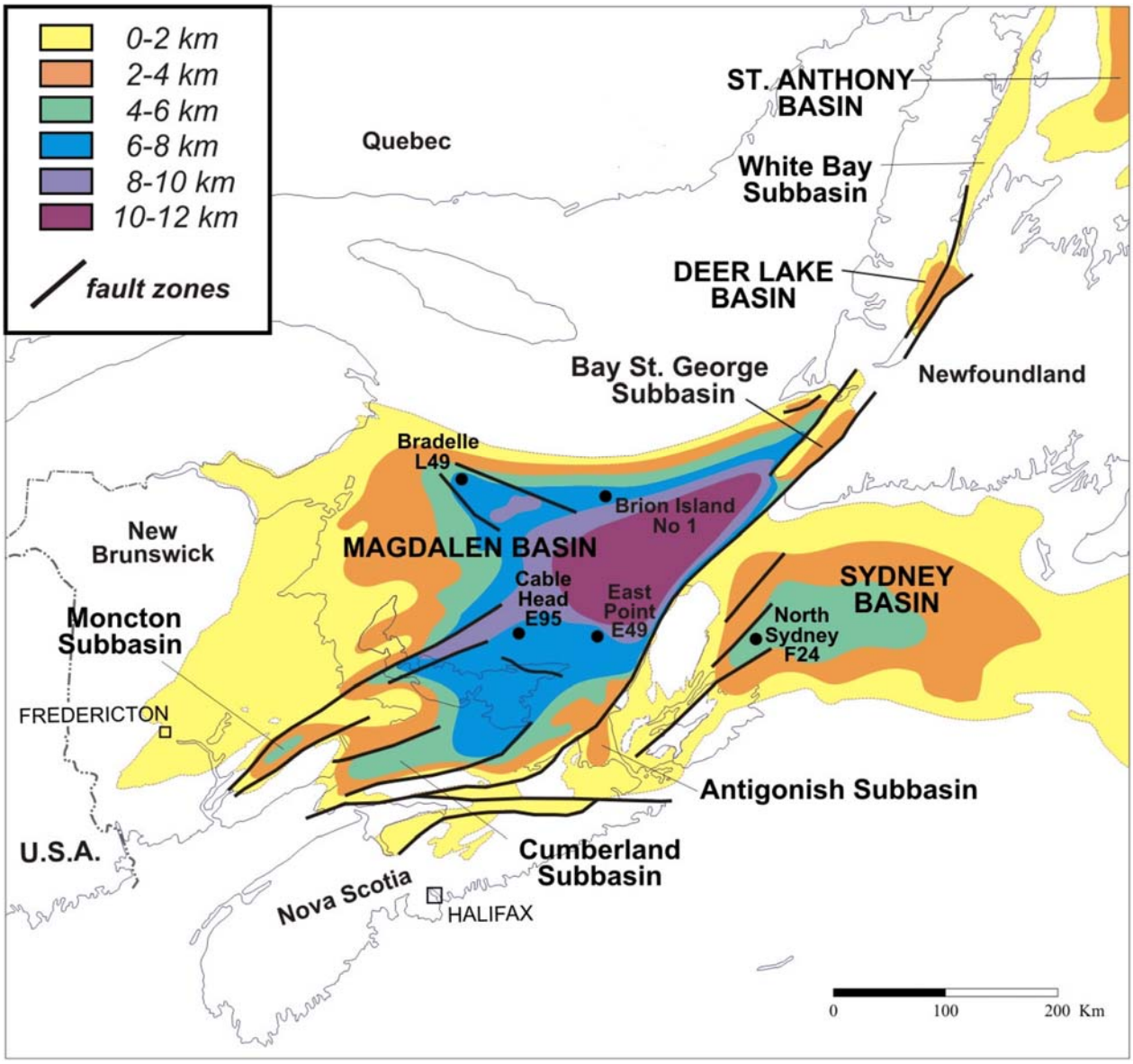


Figure 15: Outline of the general shape and fill for basins of the Maritimes Basin tectonostratigraphic zone (from Lavoie et al. 2009). The fan-like system of radiating and probably deep seated faults from the margin of the Moncton Basin in the south and the head of St George's Bay in the north define a part of the basin known as the Maritime Rift and described as a zone of strong post orogenic strike-slip faulting in Hall et al. (1998). These faults tend to be in close proximity to major early Paleozoic plate boundaries.

Data quality and quantity

The database for the Bay St George Sub-basin of the Magdalen Basin holds close to 700 references on geology, geophysics and resources. A surprisingly large number of these reports (> 20%), and particularly those involving geology, paleontology, coal, and mineral exploration, are more than 50 years old.

In contrast, very few of the 177 geophysical studies reported in this compilation are more than 50 years old. About 50 of these geophysical reports directly address or refer to gravity analyses of the crust. These are studies to show anomalies suggesting salt and gypsum deposits for mineral and petroleum exploration and for faulting of Paleozoic and older crust (Miller et al., 1990; Wiseman and Miller, 1995; Zsamboki, 2012). In addition, there are nearly 90 research papers that address some aspects of magnetometer and EM surveys and with many new maps recently published (e.g. Cook and Kilfoil, 2009; Dumont and Jones, 2013a - g); all provide very clear indications of strata, basement structures, and tectonic terrain boundaries.

Seismic lines for St Georges Bay and for onshore regions are summarized in more than 80 reports. Shallow seismic (e.g. Hall et al., 1992; Langdon and Hall, 1994) and deep seismic studies (e.g. Marillier et al., 1989) clearly show large exploration targets (e.g. Old Harry) in St Georges Bay and very thick sediment in the deepest part of the Magdalen Basin. Elsewhere in the area, basement crust, mantle, regional structures, fabrics and plate sutures are seen (Hall et al., 1998). Very little of this seismic data represents any of the onshore regions.

For our selective review of wells, well reports and drill holes held in Provincial Government assessment files and other publications, there are 170 files identified. In this number, nearly 20% are historic, pre-1960 assessments for coal and other industrial minerals. Other reports containing some compiled data from earlier studies are designed to promote exploration opportunities in the region (e.g. Fleming, 1970; Enachescu, 2006a; 2006b; Hicks, 2010). Our own sample of some of the longer and more comprehensive front line drilling reports contains 100 significant references including 59 borehole logs and other analyses of strata (e.g. reports describing, coal quality and quantity, memos on oils and seeps, Reid lot exploration programmes, and files on uranium, potash, gypsum, and anhydrite claims). Many of the

remaining reports sampled from the Provincial Government files are pure and applied research studies with stratigraphic sections, analyses and discussions (e.g. Knight, 1983; Soloman, 1986; Rehill, 1996).

Generalized geological assessments for strata and age include more than 100 published scientific studies using paleontology of plants, pollen and spores, conodonts, corals, bryozoans, and microbial mounds to offer insight into the age and sedimentary environments; many of these reports are more than 50 years old. Specifically, these works tends to concentrate on areas and formations where fossils are more common (e.g. Ship Cove Formation, and muddy, coal bearing strata). Elsewhere across the onshore region, many of the rocks are oxidized terrestrial deposits and evaporites and not normally favourable environments for fossil preservation. Large gaps in biostratigraphic coverage in Carboniferous strata in Newfoundland and Labrador affect our understanding of sedimentation histories and local and regional correlations. Any new fossil discoveries are likely to be significant.

There are more than 90 source rock and thermal maturation reports for the onshore St. Georges Bay Sub-basin. Many of these reports are simply parts of other studies and may contain few or no original analyses. Others (>15%) are historic accounts on coal, and offering some information on coal grade (Howley, 1917). Two nearly identical vitrinite reflectance maps from Hacquebard and Donaldson (1970) and Rehill (1996) suggest few refinements to the thermal maturity work since Knight (1983) Soloman (1986), Utting (1987) and Hyde et al. (1991) completed their studies. A single analysis of mature, undegraded Flat Bay #1 oil by Fowler (1996,) and included as Appendix B in Brett (1997), indicates a Carboniferous lacustrine source.

Over 100 papers address basic principles of the structural geology of this basin. While important for regional assessments, a great many of these reports have little to do with specifics of a petroleum reservoir and the timing for the hydrocarbon charge. Fewer than 40 reports address one or more aspects of sediment diagenesis, porosity and permeability, and traps. Today, and to their credit, some of the exploration companies are routinely conducting porosity and permeability assessments on cores (eg. Stuckless, 2012). This will have significant bearing on our understanding petroleum systems, trap location, hydrocarbon charge and recovery strategies.

Regional Geology, Tectonics, and Stratigraphy

In overall shape, the Magdalen Basin is an irregular trapezoid, broadly distributed across the Gaspé region of Québec, New Brunswick, Prince Edward Island and Nova Scotia, and narrowing to become a more elongated feature beneath the Gulf of St Lawrence and through St George's Bay (Figure 15).

With local topography and structure as complicating factors, the overall general pattern for sedimentation is distinctively asymmetric from the erosional edges in Gaspé, New Brunswick and Nova Scotia, and beneath the northwest Gulf of St. Lawrence. From this unconformity, the overlying Carboniferous strata onshore thicken into the Gulf of St Lawrence, becoming more than 10 km thick beneath the Magdalen Islands and on into Bay St George where Carboniferous strata may be as many as 8 km thick (Figure 15). Immediately east of the Magdalen Islands and on the depositional centre for this basin, the total fill onto what is perhaps Acadian or older basement exceeds 12 km (Durling and Marillier, 1993).

Major sutures defining lower Paleozoic plate boundaries, and figuring prominently in Taconic through Acadian orogenies, form eastern and southern margins to the Magdalen Basin. In the northeast along the west coast of Newfoundland, a network of converging fault systems, variously known as the Cabot Fault - Baie Verte Line, clearly differentiate the ancient margin of North America (the Humber Zone) from the volcanigenic oceanic crust of Iapetus (the Dunnage Zone) to the east. On the southern boundary for the basin, another major fault, the Cobequid-Chedabucto Fault, is the suture for the Avalon and Meguma terranes (Figure 16).

In the late Devonian and early Carboniferous, crustal rifting, and reactivation of old faults on early Paleozoic terrain boundaries generated accommodation space for Carboniferous fill and networks of new synsedimentary faults. In total, the zone of thick sediment and faults in the eastern half of the Magdalen Basin delimits a feature known as the Maritimes Rift, an area considered to be the zone of maximum crustal extension and sag (Belt, 1969; van de Pol et al., 1995). Hall et al (1998) illustrate and describe this region as a zone of "strong post-orogenic strike-slip faulting".

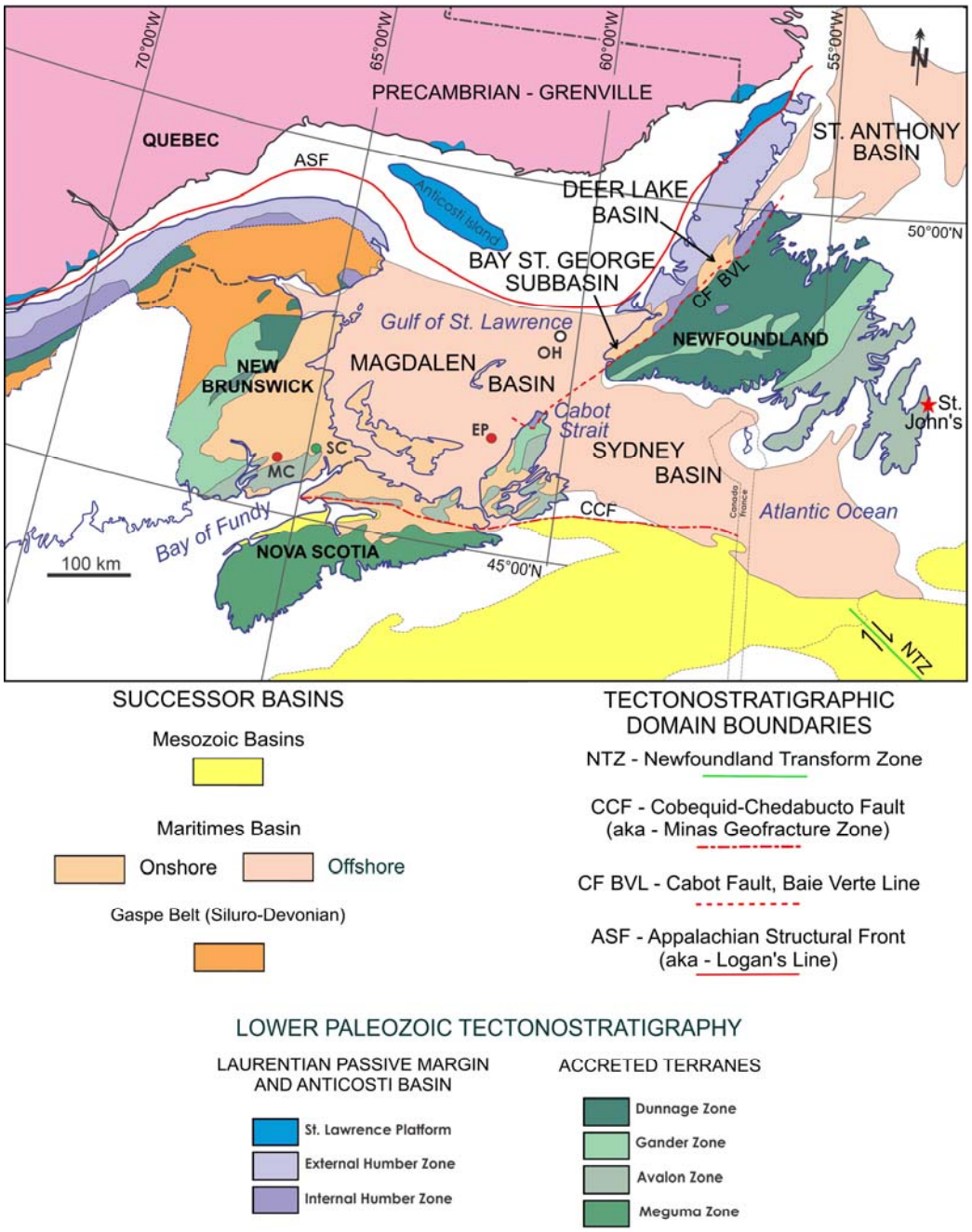


Figure 16: Lower and Upper Paleozoic tectonostratigraphic domains and important boundaries. Oil (green) and gas (red) fields and undrilled targets (white) are labelled circles (MC - McCully, SC - Stoney Creek, EP - East Point E-49, OH - Old Harry). Modified from maps published by Lavoie et al. (2003), and Hannigan and Dietrich (2012)

As a focal point for thick sediment deposits, the Maritimes Rift holds massive salt and gypsum deposits that have flowed to create salt diapirs and salt withdrawal zones above Horton or Anguille Group strata (Figures 17 and 18). Some of these diapirs have been drilled. One well, East Point E-49, is a large, sub-economic gas discovery. Another, nicknamed "Old Harry", is a massive salt dome laying off the west coast of Newfoundland.

The youngest strata of the Magdalen Basin are Late Carboniferous and Early Permian Pictou Group, coarse and fine clastics, coal, and red beds, formed in non-marine fluvial-deltaic settings and later deformed by minor latest Paleozoic and Jurassic tectonism. In deeper parts of the basin in the Gulf of St Lawrence, these beds can be more than 4 km thick. Hu and Dietrich (2010), building upon earlier work by Gibling et al. (2000), Martel and Durling (2002) and Chi et al. (2003), indicate that wide ranges in porosity and permeability in these beds might have an impact upon reservoirs and seals. Nevertheless, in their assessment, Hu and Dietrich (2010) suggest that Upper Carboniferous strata "may be the most prospective in the study region"

Petroleum System Elements

Source Rock and Maturation

Under search words "source rock" and "thermal maturation", about 100 papers, reports and presentations are identified. Amongst this number, about 15% are historic documents and another 20% are compilations, reviews, and promotional materials that may include data from other published or unpublished studies.

Coal and palynology studies for source rock age, quality and maturity are captured in reports by Hayes and Johnson (1938), Hayes (1949), Hacquebard and Donaldson (1970), Solomon and Hyde (1985), Soloman (1986), Utting (1987), Hyde et al., (1991), Mossman (1992), Rehill (1996), Williams et al. (1998), and Fowler (1996) - in Brett (2001). In total, there is not a large number of analyses described. Type III, coaly, and gas prone material is dominant over Type I, oil prone, lacustrine strata (Mossman, 1992). A regional maturation map (Figure 19) does not differ in any substantive way from work by Hacquebard and Donaldson (1970). Late Mississippian and Pennsylvanian strata on the northern and eastern rim of the basin are

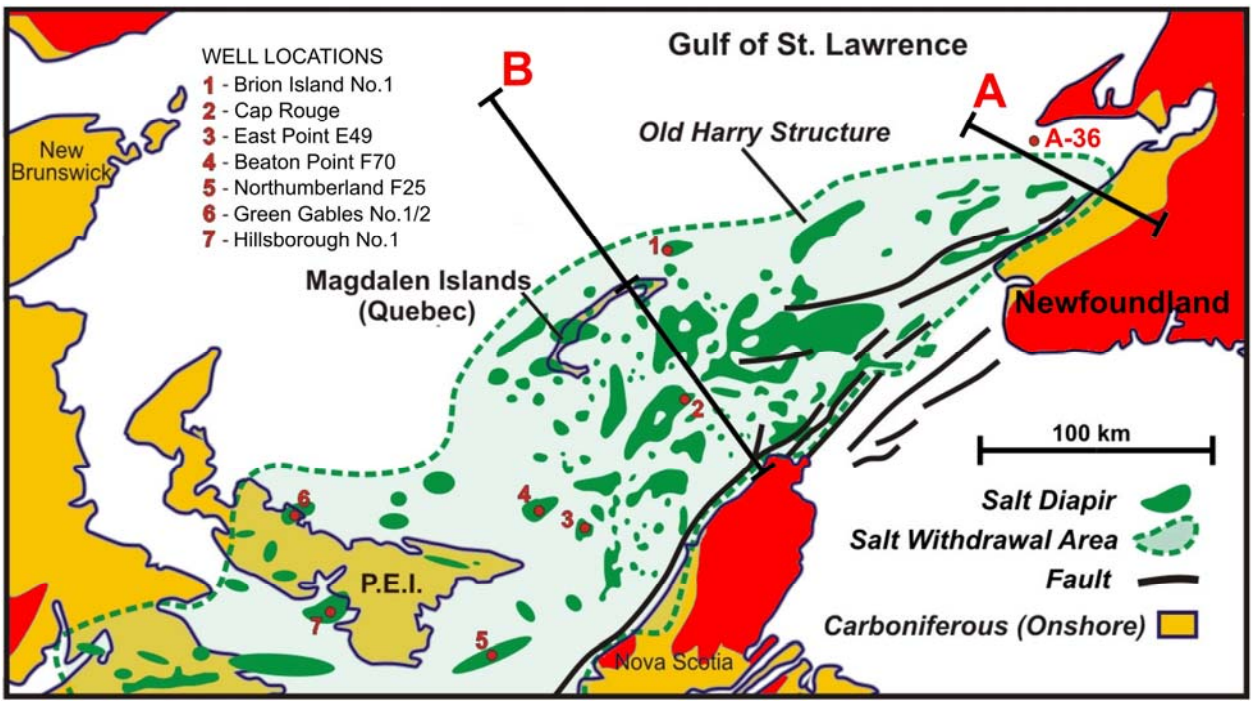
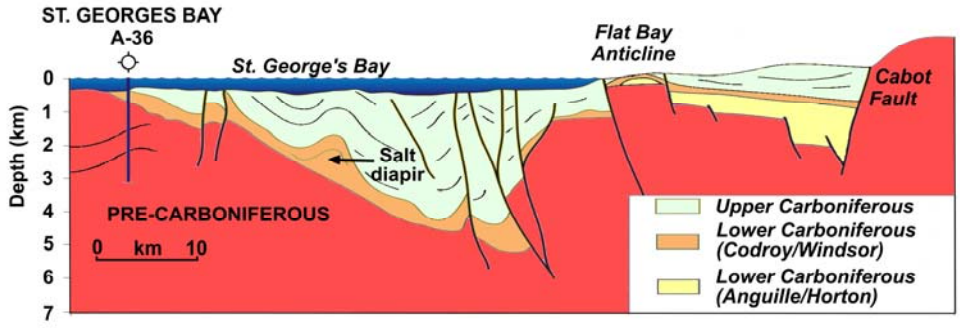


Figure 17: The Maritime Rift zone outlined in in pale blue is a region with very thick sedimentary cover significantly deformed by transtensional and transpressional faults. Evaporite deposits in this rifted region are modified as diapirs and salt withdrawal areas. Well locations on or adjacent to salt diapirs are mostly dry and abandoned. One significant gas discovery (#3 - East Point E-49) is subeconomic. The Old Harry Structure is reported as a promising target for up to 5 bcf of natural gas (Bourque, 2004). Sections A and B are in Figure 18. Map from Dietrich (2009) is derived from Langdon and Hall (1994), and Durling and Martel (2004).



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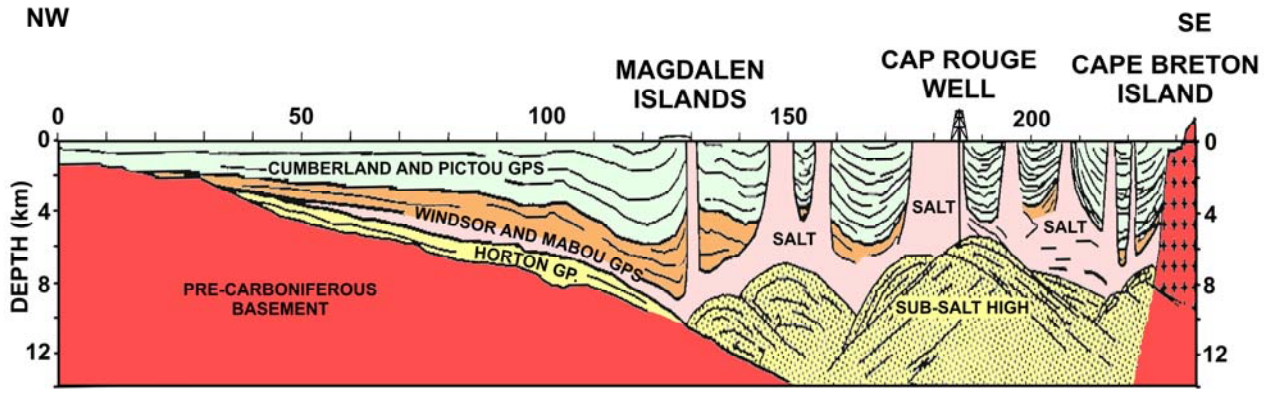


B

Figure18: Interpreted seismic lines (A) from Dietrich et al. (2009) and (B) from Durling and Marellier (1994) showing thick sediment cover in the Maritime Rift zone tectonically deformed and intruded by salt diapirism. Note the 2X difference in vertical and horizontal exaggeration in basin width and depth between A and B.

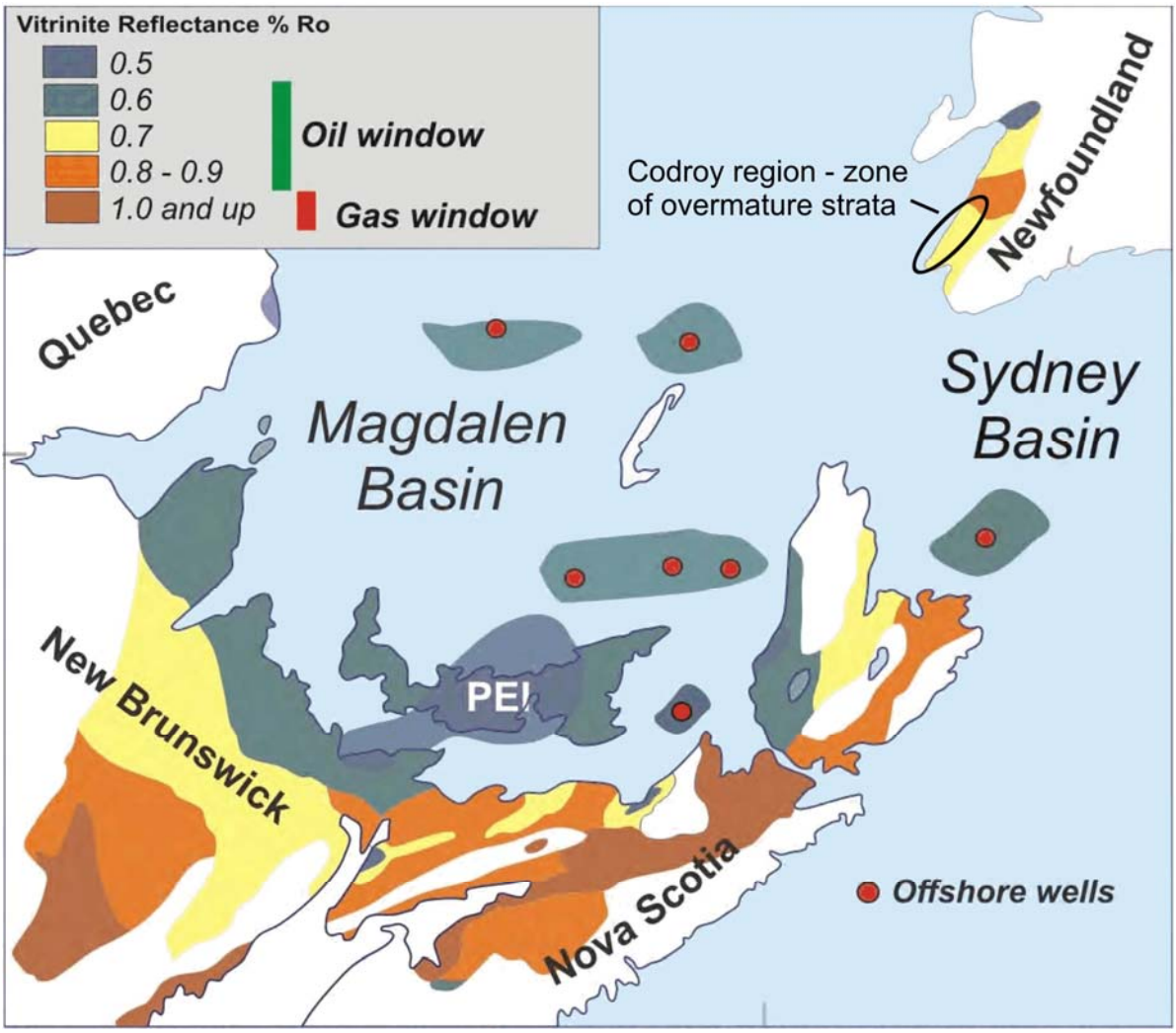


Figure 19: Vitrinite reflectance distribution map for the Magdalen Basin from Lavoie et al. (2009) and based upon work by Hacquebard and Donaldson (1970). In Newfoundland, work by Utting (1987) and Burden (unpublished) indicates that rocks at Codroy, and west of the Anguille Mountains are overmature and likely in the Gas Window.

immature to marginally mature rocks just entering the oil window. In contrast, and perhaps also confirming the limited number of studies for this area, Utting (1987) and Burden (unpublished) report darkened spores on the southwest coast of the island, and indicating mature, gas prone rocks; Mississippian and Pennsylvanian strata are at or below the bottom of the oil window. Across this region, the major fault systems should also be considered major structural boundaries separating distinctive regions with different burial histories and complex regional patterns for thermal maturation.

One other report pointing to additional complexity to the pattern of thermal maturity is found in a short report by Fowler (1996) and contained in the well site report for the Flat Bay #1 test hole (Brett, 2001). In it, Fowler describes the chemistry for a "mature, unbiodegraded, lacustrine", Type I oil trapped in upper Anguille conglomerate and sandstone immediately below Codroy Group carbonates. No lacustrine source rocks are directly known from the Flat Bay area. The nearest outcrops for source rocks, on another large structure many kilometres to the south, belong to the lower Anguille, Snakes Bight Formation,. Other source rock beds should be present down dip from the Flat Bay site and beneath St Georges Bay.

Porosity and permeability

To their credit and in this last round of activities, some of the companies working on the shore of St Georges Bay have generated real and synthetic porosity and permeability measurements from cores and geophysics. In addition, industry and government scientists have examined large collections of older samples and geophysical well logs from the mainland of Canada and other offshore areas. A key part of this list of assessments is the work of Bibby and Shimeld (2000), a massive compilation of porosity and permeability data for Maritimes Basin strata from mainland Canada. Their study and later work by Chi et al. (2003), Lavoie et al. (2009) and Hu and Dietrich (2010) now show general patterns for changes in porosity with depth and can flag specific horizons where porosity and permeability are above normal by secondary dissolution of calcite cements. In their summation, Hu and Dietrich (2010) concluded that most of the enhanced reservoir quality in the Maritimes Basin wells is likely related to secondary porosity development, and with strata from the northern part of the basin being slightly more mature (Martel and Durling, 2002).

In Newfoundland and Labrador, porosity and permeability measurements are not anywhere near as commonly collected. The values for Flat Bay Test Hole #7 (Figure 20) show some of the variability for petroliferous Anguille Group strata in comparison with other wells and formations of the Gulf of St Lawrence and the Deer Lake Basin. In Flat Bay Test Hole #7, porous and permeable strata that contain oiled fractures are in many respects similar in physical attributes to Pictou Group sandstones found farther offshore and perhaps better than the McCully Gas Field in New Brunswick. With the data reported here, the interval examined at Flat Bay is apparently suitable for conventional exploitation.

Traps and seals

Late Paleozoic depositional and structural history including strike-slip faulting in wrenched foreland basins with subsequent basin inversions provide many opportunities for stratigraphic and structural traps to form (Bradley, 1982; Durling and Marillier, 1983; Lavoie et al. 2009). Evaporite deposits of the Windsor and Codroy groups are characteristic and widespread deposits across much of this region and where they may become effective seals for underlying strata. In the offshore, seismic imaging of salt and gypsum show this to be a common seal in some sub-evaporite plays. Sealing capacity does become an issue if salt diapirism compromises the integrity of overlying strata that may otherwise be potential targets (e.g. Old Harry).

The Flat Bay prospect provides some interesting insights into problems and opportunities that may only be resolved with more exploration and drilling. The reports show (a) the seal at the top of this reservoir is tight and impermeable, well cemented, sandstone and conglomerate described as containing calcite and traces of pyrite (Brett, 2001); (b) the underlying slightly more porous and permeable reservoir is created from secondary dissolution of calcite, and: (c) the reservoir sands apparently thicken to the west and into Bay St George. At this point little can be confirmed about the local and regional distribution of this porous zone, where the dissolving fluids travelled, and whether thicker, more porous horizons are a regional or local attribute of sandstones laying beneath evaporites at the head of St Georges Bay. In this region, seals and traps are largely unknown opportunities.

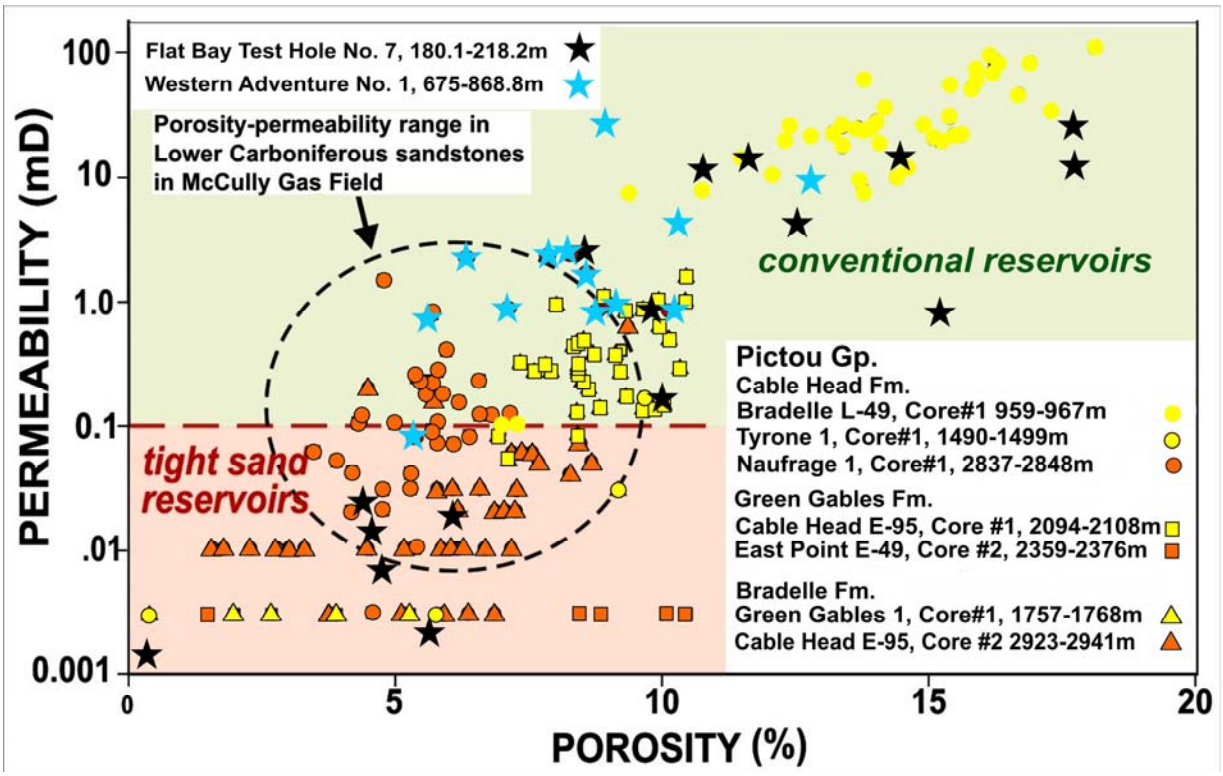


Figure 20: Comparison of measured porosity and permeability samples from Flat Bay Test Hole No 7 (Stuckless (2012); St Georges Bay Sub-basin – Black star) and Western Adventure No. 1 (Brooker (2003); Deer Lake Basin – Blue star) with compiled data reported in Lavoie et al. (2009) and Dietrich et al. (2009). Previously published data from the Pictou Group has been refigured with symbols to clearly separate stratigraphy and wells. The Flat Bay and Western Adventure rocks apparently fall within strata considered acceptable conventional reservoir rocks.

Potential Plays in the Magdalen Basin (Bay St. George Sub-basin)

Lavoie et al. (2009) and Dietrich et al. (2011) suggest clastic and carbonate plays retain significant potential for success in this basin. With the producing Stoney Creek and McCully fields as commercial successes, other Horton and Anguille group strata from alluvial, fluvial, and lacustrine settings will likewise show significant variations in grain size and matrix with ample opportunity for reservoir and seals to form. Calculated porosity-depth plots for Horton Group sandstones presently buried up to 4 km show many of these rocks can retain more than 7.5% pores, therein indicating strata can be treated as conventional reservoirs (Hu and Dietrich, 2010). For charge, lacustrine Type I and II source rocks of the Mount Albert and Snakes Bight formations are relatively widespread across many parts of the basin and in diverse settings where, according to burial depth, they can generate oil and gas. Structures on and adjacent to the Maritime Rift in St George's Bay may include anticlines and tilted fault blocks generated in transpressional and transtensional domains. However, it is unclear whether much, if any, Anguille rock is present at the head of St Georges Bay. Nevertheless, a promising sign rests with the lacustrine signature for oil from shallow holes drilled near the coast (Fowler in Brett, 2001).

A second exploration strategy indicated by Lavoie et al (2011) offers Mississippian Ship Cove Formation carbonates of the Codroy Group as prospective targets that can form biohermal structures as much as 5 km in length and 2 km wide. Evidence in Nova Scotia, provided by Giles (1981) shows Mississippian reefs are locally developed upon faulted topographic highs. In western Newfoundland, outcrops of porous and permeable bryozoan reef rock with a strong oily smell are located along inversion structures on the shore of Bay St George (Burden pers. observ.). In subsurface settings (offshore?), where folding and faulting can generate traps, the development of porous and permeable Ship Cove reservoirs rocks will be sealed with Codroy Road Formation halite and gypsum.

For Newfoundland and Labrador, upper Mississippian and Pennsylvanian sandstone plays are likely to be entirely offshore where thick beds of Pictou Group strata lay upon Codroy Group evaporites. Salt diapirs and withdrawal features have generated many structures in the general area of Bay St George and the eastern edge of the Gulf of St Lawrence. Reservoir rocks are likely to be fluvial sandstones equivalent to the Cumberland and Pictou groups (Dietrich et al.,

2011). One of the larger features, known as “Old Harry” lies off the southwest coast of Newfoundland. If oil is present, reserve estimates are as much as 2 billion barrels recoverable.

Summation

The Bay St George Sub-basin and adjacent St Georges Bay are two distinctive aspects of the complex evolution of this part of the Maritimes Basin Tectonostratigraphic Domain. Early on, in the late Devonian or early Mississippian, rifting and subsidence on and about older Early Paleozoic terrain boundaries partitioned what is now Atlantic Canada into new and distinctive, intracontinental sedimentary basins. The Magdalen, Sydney, Deer Lake and St Anthony basins each hold broadly similar sedimentary successions (clastics, carbonates, evaporites, coal and clastics) determined by their paleo equatorial position but differing through variations in connected local and regional tectonic events. With subsidence and burial some Mississippian source rocks of the Mount Albert and Snakes Bight formations gradually approached or entered the oil window. Variations in the intensity of Late Paleozoic rifting, transpression and basin inversion across the region, indicates there is no single model for predicting if or how a petroleum stystem might operate. Each of the regional sub-basins, horsts or graben complexes has to be addressed separately. Specifically, the onshore strata in western Newfoundland have a different history of formation and inversion from their offshore counterparts.

Key risks remain in determinations of quality of source rocks and thermal maturity. Porosity and permeability measurements from ongoing exploration programmes in Atlantic Canada indicate generally low values for Mississippian strata - sufficient for gas but perhaps requiring enhanced fractures and secondary diagenetic dissolution for oil production. Given the tectonic setting of an intermontane transtensional rift system, traps and seals will be complex combination features derived from fluvial and lacustrine sedimentary environments, folded and faulted into structures formed during Alleghenian orogenesis, and modified by one or more thermally induced diagenetic events. Alternatively, with appropriate engineering for relatively shallow conditions, unconventional plays may be possible through secondary stimulation of the mature and overmature fine-grained source rock beds.

Confirmation of hydrocarbons in seeps and fractures in a quarry is useful information for

examining the possibilities for a petroleum system remaining active in this region. Significant work is required to address the source and quality of this oil (e.g. primary or degraded) and whether it has travelled any significant distance. However, without continued research, exploration, and drilling, to at least offer new materials to correctly formulate a diagenetic lithostratigraphy, and to address quantity and extent of porous and permeable strata and source rocks, the identification and delineation of traps, seals, and commercial liquid hydrocarbons will remain elusive targets.

DEER LAKE BASIN

Introduction

Amongst the petroliferous basins examined for this summary, the only completely onshore basin, the Deer Lake Basin (Figure 21) is by far the smallest feature, and currently covering an area of no more than 4000 km^2 (<40 x ~100 km). Onshore, across Newfoundland, the Deer Lake basin is the largest of a spectrum of small inliers in or adjacent to structurally bounded, generally northeast trending ponds and fiords (e.g.the informally named Shanadithit Brook formation at Red Indian Lake (Kean and Jayasinghe; 1980), and the Terranceville, Formation (Bradley, 1962), Spanish Room Formation (Laracy and Hiscott, 1982), and the Cashel Cove beds (Laracy and Hiscott (1982), on the shore of Fortune Bay.

Located slightly inland from the northeast and west coasts of the island, and centred upon the Humber River watershed, this basin merited little attention until the nineteenth century when the first official surveys formally identified coal from reconnaissance work (Jukes 1839). By the early part of the twentieth century, oil shale was added to this inventory of prospective rocks, and after the Second World War, uranium. For more than a century, much of the land in the Deer Lake Basin has been under coal and petroleum leases, and mineral claims. The Provincial Government database contains many files and assessment reports outlining the history of large and small exploration programmes. A smaller subset of these resource assessments, and that is specifically some of the longer reports with information that can be relevant for petroleum exploration (e.g. stratigraphy for long cores, and mineral exploration concepts tied to fluid transport in this basin), are captured for this inventory of activities.

Over the last 35 years a modest amount of hydrocarbon exploration and government and university based research was completed (Hyde, 1979; 1995; Gall, 1984; Wright et al., 1996; Hamblin et al., 1997; Mukapahydhay, 2009). Businesses are still active in this area and where recently, lands formerly licenced to Deer Lake Oil and Gas were transferred to Black Spruce Resources.

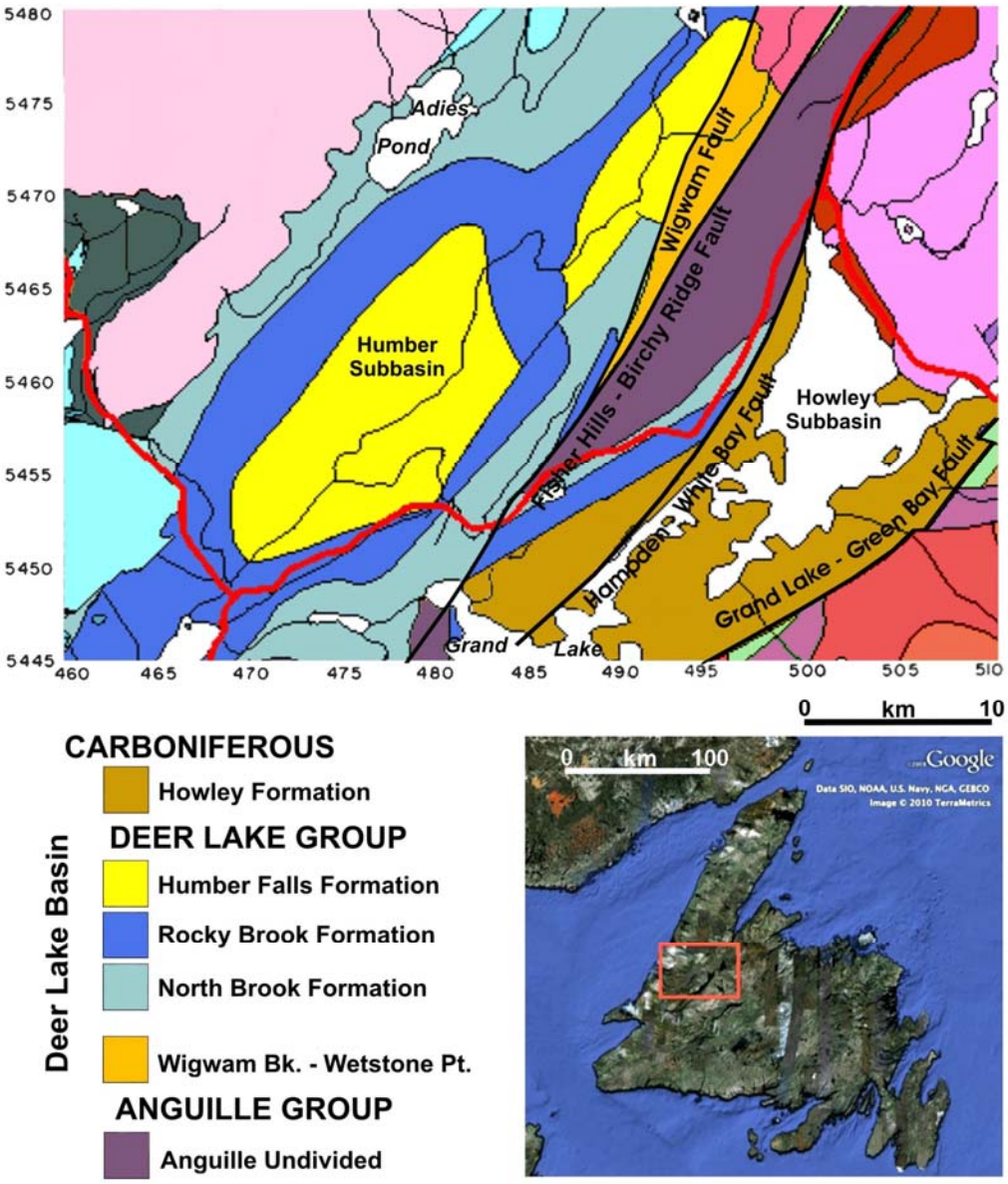


Figure 21: Geology map for the Deer Lake Basin showing Humber (aka Cormack) and Howley sub-basins, Grand Lake - Green Bay bounding fault and other major faults associated with development of a major flower structure. Inset satellite image shows basin as an isolated feature on an elevated platform between the Bay St. George and St. Anthony basins. Geology from "Geofiles", a Government of Newfoundland and Labrador web site.

Data quality and quantity

In our search of Government files and other accessible published materials we identified approximately 350 references (search Deer Lake) meeting criteria set out for this compilation. In that number, fewer than 10 % explain fossils, age and paleontology. Given that the age and general sedimentary environment relationships are relatively well established from basic palynology and other paleontology analyses, these rocks are not otherwise particularly well known for any abundance of macrofossils. Any new discoveries are likely to be scientifically significant and relevant for more precise paleoenvironment and facies analyses.

Quaternary physical geology studies likewise number less than 10% of the total. For surficial materials we have no doubt that more reports can be discovered if Quaternary study parameters are expanded to include aspects specific to forestry, local agriculture and hydroelectricity industries.

Nearly 25% of all the files are older pre-1960 "historic" reports and reflect the significant efforts made in the exploration for coal. So too, about 30 % of the Deer Lake Basin files are post-1960 mining, economic mineral and exploration geology studies. Core collected and initially reported for uranium mineral deposit studies are important contributions confirming stratigraphy for hydrocarbon exploration, and provide a substantial geochemistry in support of our understanding fluid flow and hydrodynamics (Hyde, 1979; 1982; Hamblin et al., 1997; Kelly and Burden, 2011). In addition to the mineral exploration *per se*, some of the most modern geophysical studies (Cooke and Kilfoil, 2009) use techniques (e.g. airborne EM) commonly found in mineral exploration. Less than 10% of the studies conducted across this region involve seismic geophysics for stratigraphy and hydrocarbons. A very tiny part of this basin has any seismic coverage whatsoever.

For hydrocarbon indicators, approximately 15% of the studies cover one or more aspects of Rocky Brook Formation source rock geology or thermal maturation and diagenesis (e.g. Kalkreuth and Macauley, 1989; Hamblin et al., 1997; Langdon and Abrajano, 1999; Kelly and Burden, 2011). If some of the pre-1960 coal studies are included amongst the modern studies (e.g. very basic identifications and physical properties analyses), the relative abundance of

(Rocky Brook) source and maturation studies may climb slightly to less than 20%.

On the other side of petroleum system modelling, and namely trap, seal and timing, about 20% of the collected papers are basin studies of general physical geology and structure. Another 15% of the studies are multi regional reports on basin origins and the plate tectonic assembly of Atlantic Canada and beyond. A common feature for nearly all of the older reports rests with a general lack of quantified information addressing specific parts of a trap, seal or timing, and namely on porosity, permeability, fluid chemistry, cements, diagenesis, faults and fractures, and migration paths. In modern practice, suites of geophysical logs are completed on recently drilled oil and gas exploration wells. These logs do contain indicators for determining porosity, fluid chemistry and other rock properties (Brooker, 2010).

Regional Geology, Tectonics, and Stratigraphy

The Deer Lake Basin rests on or about lower Paleozoic tectonostratigraphic boundaries separating Laurentian Humber Zone strata from the Dashwood Terrane and other Dunnage Zone rocks to the south and east. Basement for the basin is Precambrian and lower Paleozoic strata that tend to be significantly deformed, by Taconic and Acadian orogenesis, intruded by Ordovician and Silurian plutons and locally metamorphosed (Williams, 1979; 1995; Hyde et al., 1988; Cawood and van Gool, 1993; 1998; Waldron et al, 1998).

Given that this basin has its origins on the pre-existing tectonostratigraphic boundaries between Laurentia and Iapetus, dextral transtensional slip in the Alleghenian Orogeny created a narrow zone of accommodation for what today amounts to less than 4 km of (late Devonian?) - Carboniferous strata remaining in the Howley Sub-basin (Wright et al., 1996; Hamblin et al., 1997). The origins for this slip, be it transtensional downwarps or simple pull-apart basins (see Hyde et al., 1988), and the impact of the variety of tectonostratigraphic terrain boundaries along the Appalachian front, are not entirely resolved (Lin et al., 1994; van Staal, 2005; Hibbard and Waldron 2009). Advanced deformable plate reconstruction models (see for instance Whittaker et al., 2011) may soon be able to address some of the large regional questions surrounding basin origin and structure and therein help refine architectural parameters for reservoir, seal, heat flow and timing for petroleum generation and trapping for Deer Lake and other Carboniferous basins

in this region.

Hyde et al (1988) produced a general review of end-member diagnostic features differentiating strike-slip basins formed from transtensional downwarps and simple pull-apart basins. In support of transtension, the Deer Lake Basin contains diverging faults that contribute to a complicated pattern of “shingled” basin-wide sedimentation modified by formation of flower structures exposing and recycling once deeply buried strata. For pull-apart basins, Hyde et al. (1988) report crustal thinning, thermal subsidence, and minor volcanism as significant diagnostic characteristics. Neither end member is particularly appropriate for explaining mechanisms for the origin, and architecture for this basin, and both mechanisms may have operated.

Several significant stratigraphic studies have been conducted in this area in the last 60 years (e.g. Belt, 1966a; 1966b; 1968; 1969; Popper, 1970; Fong, 1976; Hyde, 1979; 1983; 1984a; 1984b) Basin fill consists almost entirely of Carboniferous sedimentary strata resting upon Silurian and older metamorphosed sedimentary and volcanogenic basement. Rocks are broadly contained within two groups, the late Devonian (?) and Tournaisian Anguille Group and the latest Visean and Serpukovian Deer Lake Group (Figure 22). In addition, Hyde (1982) also identifies Wigwam Brook and nearby (equivalent?) Wetstone Point formations as fault bounded, orphaned formations not explicitly tied to the Anguille or Deer Lake groups and with undefined or poorly defined contacts. Furthermore, and on the east margin of the basin, the late Serpukovian Howley Formation is everywhere seen as a fault bounded interval and currently without any observed basal contacts.

All Carboniferous sedimentary strata in the Deer Lake Basin are terrestrial deposits of fluvial and lacustrine origins. Formations are broadly distinguished on the basis of their colour, bedding, the relative ratios of conglomerate, sandstone and mudstone fractions, and accessory dolomite and limestone beds and concretions (see Hyde, 1982; 1985; 1990 for summaries of lithologic characteristics). The oldest strata of the Anguille Group strata are loosely described as “well cemented, micaceous gray sandstones, siltstones and black mudstones” (Hyde, 1984a). In subtle contrast, the overlying Deer Lake Group is “poorly indurated conglomerates and coarse grained sandstones, together with finer-grained siliciclastics, limestones, and oil shales”

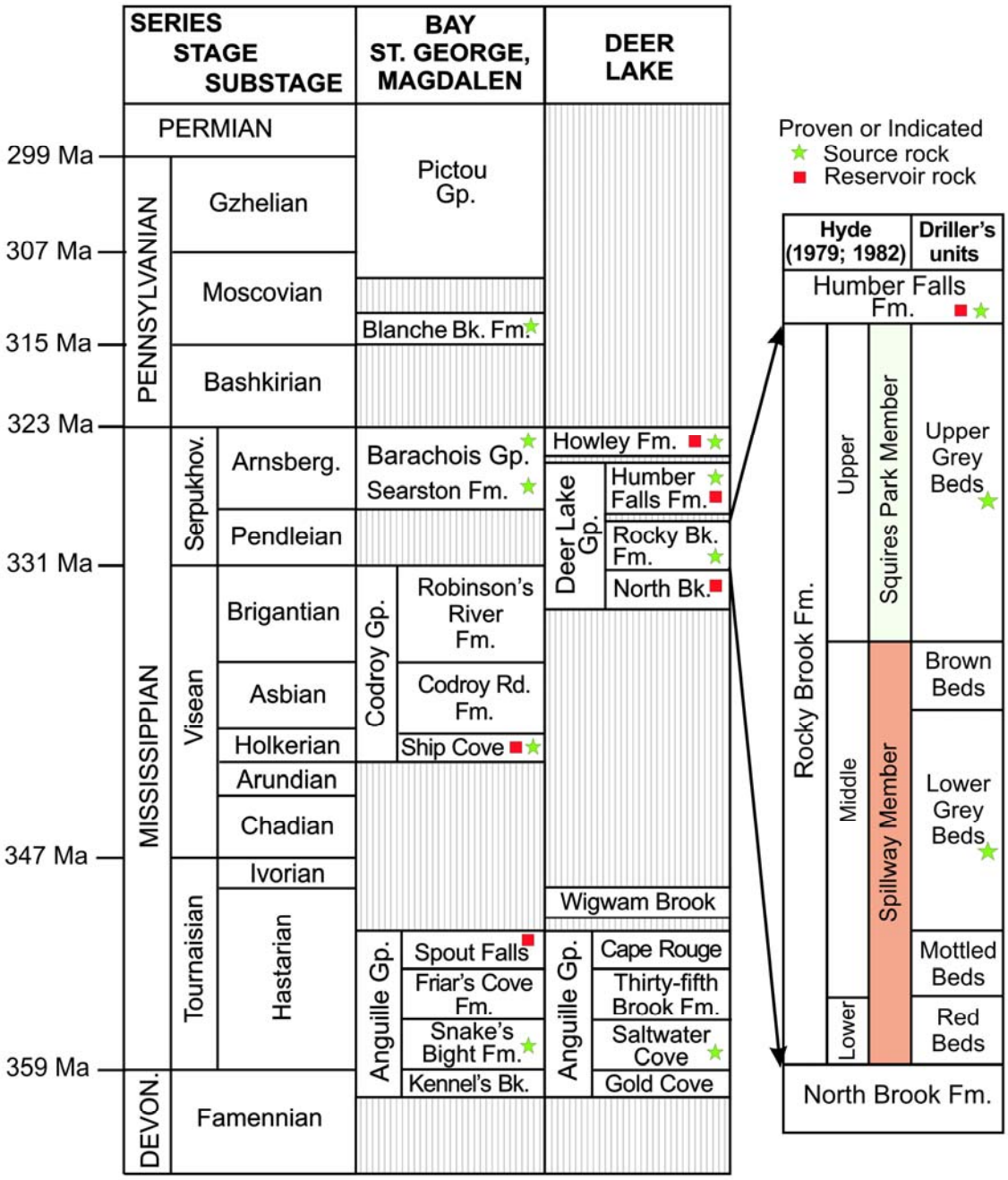


Figure 22: Stratigraphy and correlation of the Deer Lake sedimentary successions. Figure modelled after Hamblin et al. (1997) with ages for younger beds from Utting and Giles (2008).

(Hyde, 1984b). Howley Formation, the youngest interval in this basin, is mixed sandstone, conglomerate, siltstone, black carbonaceous shale and coal (Hyde, 1982). Be it conglomerate, black shale or coal, there are no unique indicators for any of these formations.

Strata contained in the Anguille and Deer Lake groups tend to show a coarse - fine - coarse sequence of sedimentary events on a variety of scales. Blue Gulch Brook, Gold Cove, and Thirty-fifth Brook rocks are likely facies and provenance variants of one another and collectively, these reddish sandstones and conglomerates tend to be coarser than the overlying strata of the Saltwater Cove Formation, a sandstone and (sometimes dolomitic) siltstone with black carbonaceous mudstone interbeds. On White Bay, the top of the Anguille Group is apparently a slightly coarser and redder facies of the Cape Rouge Formation, a stratigraphic interval having its type locality much farther north and on the edge of the St Anthony Basin at Conche. For Deer Lake Group, the North Brook, Humber Falls and Little Pond Brook formations are somewhat more conglomeratic sandstones and relatively easy to differentiate from (sometimes dolomitic) siltstones, fine sandstones and dark carbonaceous (oil) shales of the Rocky Brook Formation.

Basically, given their local provenance, it should be no surprise that all of the strata forming these groups are lithologically very similar, and simply reflect subtly different tendencies in physical and sedimentary environment parameters (i.e. climate, water depth, lake shape and profile, water chemistry, organic productivity, etc.). At times, the basin was underfilled and sediments were fluvial or aeolian. In other times, the basin was filled with fine-grained lacustrine sediment. Some of these beds were organically enriched muds and now carbonaceous shale.

Howley Formation strata are not at all well documented and all of the very old cores have long since disappeared. Written records mention bitumenous sands but there is no clear context on whether this is simply coaly detritus in sandstone beds or degraded petroleum stain; an illustration in Fowler (2009) shows a degraded, loosely cemented conglomerate with a black petroliferous matrix. One of the last of the old reports suggests that the rocks are sheared and therein leaves opportunity to reinterpret the strata as simply repeat sections of the same horizons. For age, Haquebard et al. (1960) indicate Bashkirian. More recently, Utting and Giles (2008)

suggest it is correlative with the Searston Formation, latest Serpukovian (Arnsbergian) in age, and clearly younger than the early Serpukovian (Pendleian) age for Rocky Brook strata of the Deer Lake Group.

Petroleum System Elements

Source Rock and Maturation

Source rocks and thermal maturation data are distributed among more than 40 published and unpublished reports (e.g. Hyde et al., 1988; Langdon and Abrajano, 1994; Hamblin et al. 1997; Mukhopadhyay, 2010), and where different methods for measuring change (e.g. clay minerals, vitrinite, and carbon isotopes) are examined. All reports generally agree on the regional pattern for change - outcrops of Anguille Group strata are cooked and lie in the dry gas zone (Figure 23), but show less consensus on more subtle points (Kelly and Burden, 2011) - are Rocky Brook strata in the Humber Sub-basin above or below the top of the oil window and the zone for peak oil generation. Data and reports from the recently released well Werner-Hatch #1 (Mukhopadhyay, 2009) clearly shows this situation (Figure 24). In Rock-Eval analyses, and what is likely statistical noise (e.g. from slightly different sample horizons), different laboratories will generate slightly different answers. The spread on the data in this short 400 m hole can be attributed to labs, quality of samples, variations in strata, and fractures carrying hydrothermal fluids. These source rock and maturation details will only be resolved as additional mapping and new drilling takes place.

A less well documented issue concerning maturation rests with a set of anomalous apatite fission track ages showing significant heating and annealing of apatite in this basin during and after the Carboniferous (Hendricks, 1991). Hendricks (1991) notes there is no satisfactory solution from fission track analysis and suggests an uncharacteristically thick upper Paleozoic sediment cover developed in this region. A second solution may rest with regional examination of hydrothermal fluid migration during this time. Ongoing mineral exploration activities are following leads in this area, and Hyde (1984a; 1995) reports basaltic rock in the North Brook Formation. Long overlooked, this volcanic material is now evident from recently published airborne geophysical

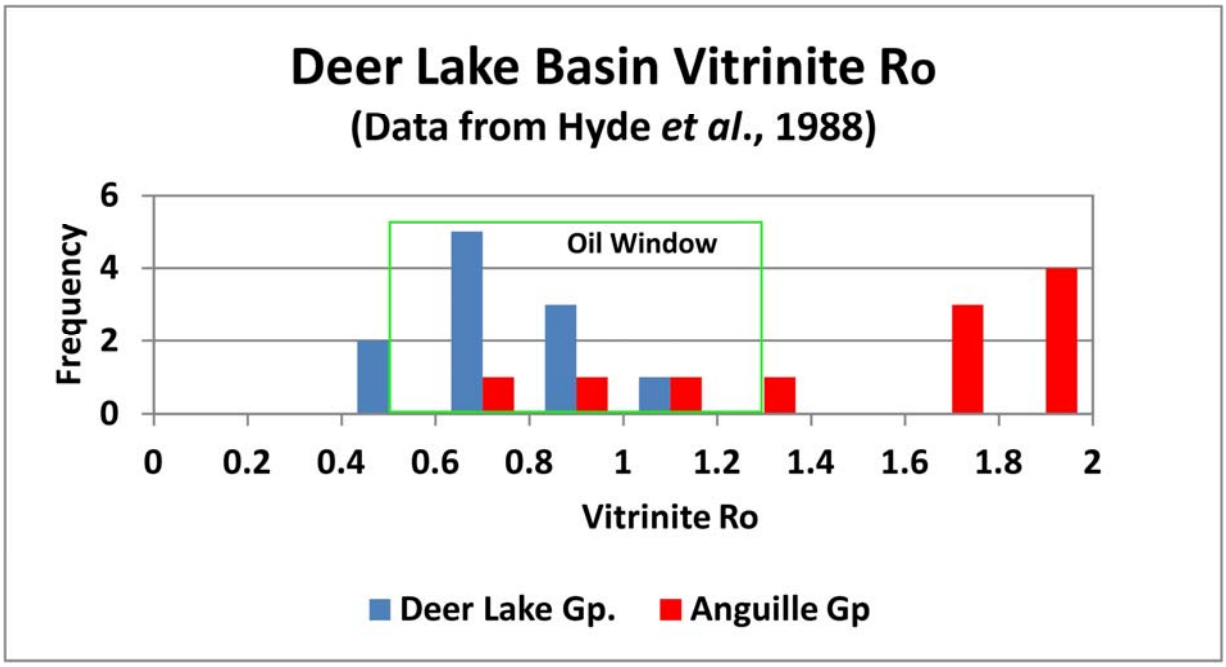


Figure 23: Vitrinite data from Hyde et al. (1988) showing significant differences in thermal maturity between Deer Lake Group and Anguille Group rocks. In today's practice, vitrinite is further subdivided to separate autochthonous from allochthonous and oil stained particles.

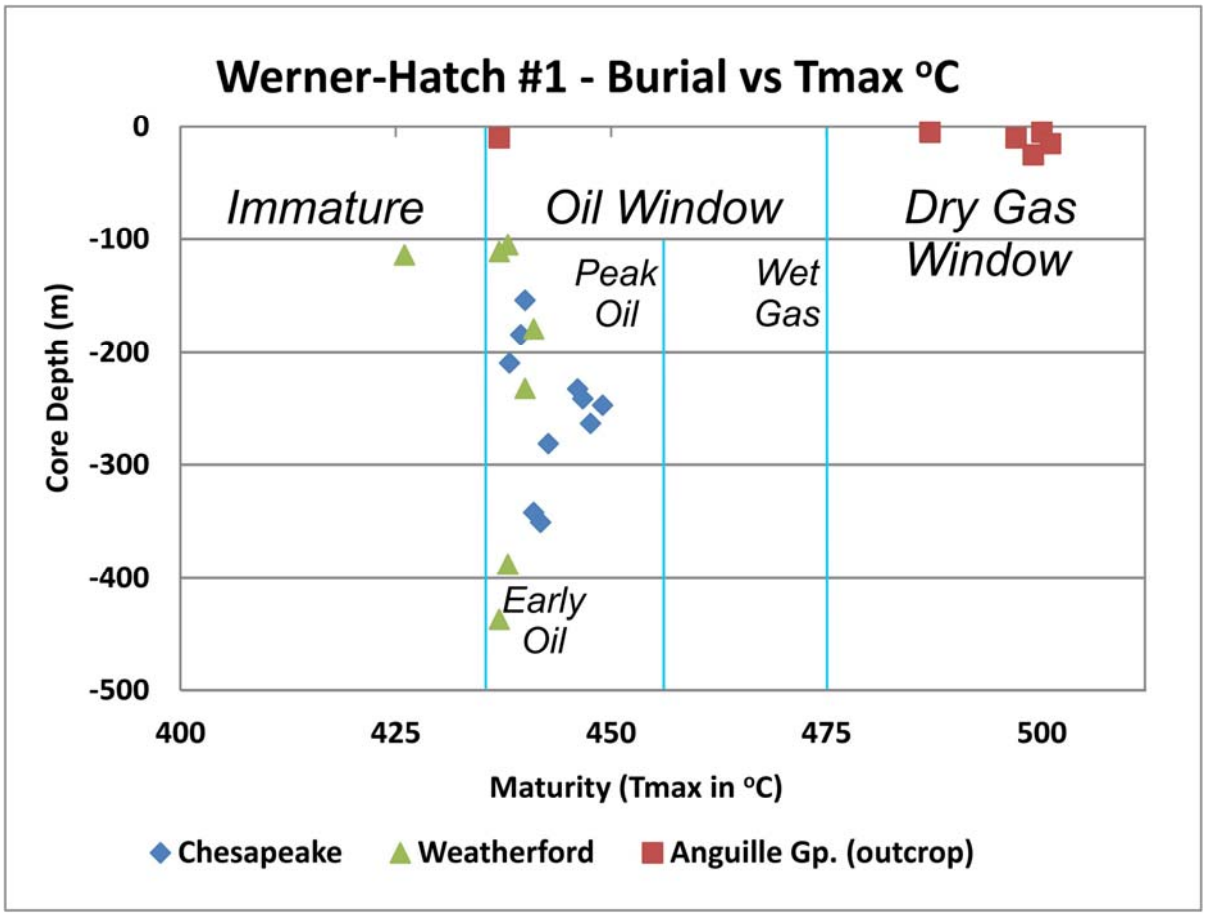


Figure 24: Rock-eval Tmax values plotted against burial depth show the Rocky Brook Fm inside the oil window but not at the critical point for peak oil generation (Tmax > 450^{o} C). Differences between Weatherford and Chesapeake labs should be viewed as statistical "noise" from sample variability. The figured Anguille strata reported in Mukhopadhyay (2010) are not a part of this Rocky Brook stratigraphy and are showing the significant differences with strata that are almost entirely well outside the oil window.

surveys (Cooke and Kilfoil, 2009a).

In total, there are significant quantities of rich, that is greater than 2% TOC, Type I and Type II source rock mudstones in the basin with values ranging up to about 16% (Hyde et al., 1988; Kalkrueth and Macauley, 1989; Hamblin et al., 1997). Less is known about their overall stratigraphic distribution, with Kelly and Burden (2011) suggesting two composite bands of thin and thick bedded, rich and lean source rocks in the middle of the lower grey beds and the middle of the upper grey beds (Figure 25).

For organic composition, source rock materials from the Rocky Brook Fm are much more thoroughly analysed than their older, more mature cousins in the Anguille Group. Anguille Group beds can show high TOC content and Type I source rock characteristics, but this must be viewed in the context of what appears to be anomalously high vitrinite Ro values and well inside the zone for gas generation.

Porosity and permeability

A small number of porosity and permeability measurements are starting to become available for the rocks of the Deer Lake Basin. In Western Adventure #1, Brooker (2003) reports a gas bearing zone at the top of the North Brook Fm. Here, sandstone and conglomerate porosities range between 7 and 9 % with permeability from 1 to 10 mD and water saturation between 45 and 65% (Figure 20). In the Brooker report, porosity and permeability measurements for the entire hole are usually in the low single digits with higher permeabilities (10 - 30 mD) as spot samples and probably located on small fractures and other areas of secondary porosity development. For Werner-Hatch #1, the gamma log and compression and shear sonic logs appear to be imaging fractures that carried radioactive fluids in what are otherwise tight Rocky Brook mudstones. By comparison, correlative strata in the Hare Bay E-21 and Verrazano L-77 offshore wells reach porosities of up to 15 - 25 % and with permeabilities of up to 100 mD (Hu and Dietrich, 2010). In their summation, Hu and Dietrich (2010) concluded that most of the enhanced reservoir quality in the Maritimes Basin wells is likely related to secondary porosity development.

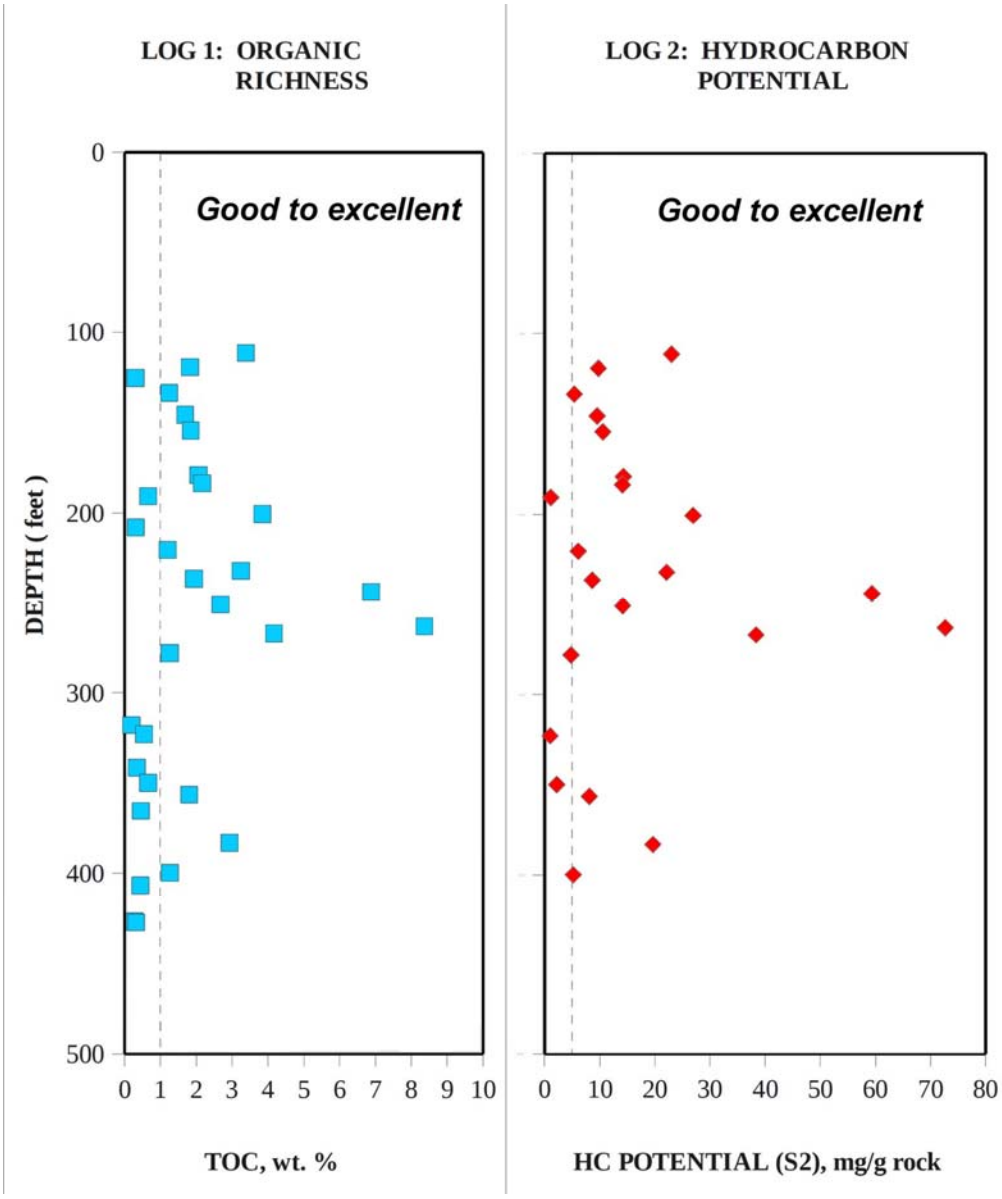


Figure 25: Weatherford organic richness and hydrocarbon potential logs for Werner Hatch #1 showing significant source rock development in the upper and lower grey units of the Rocky Brook Formation (Data from Brooker, 2010).

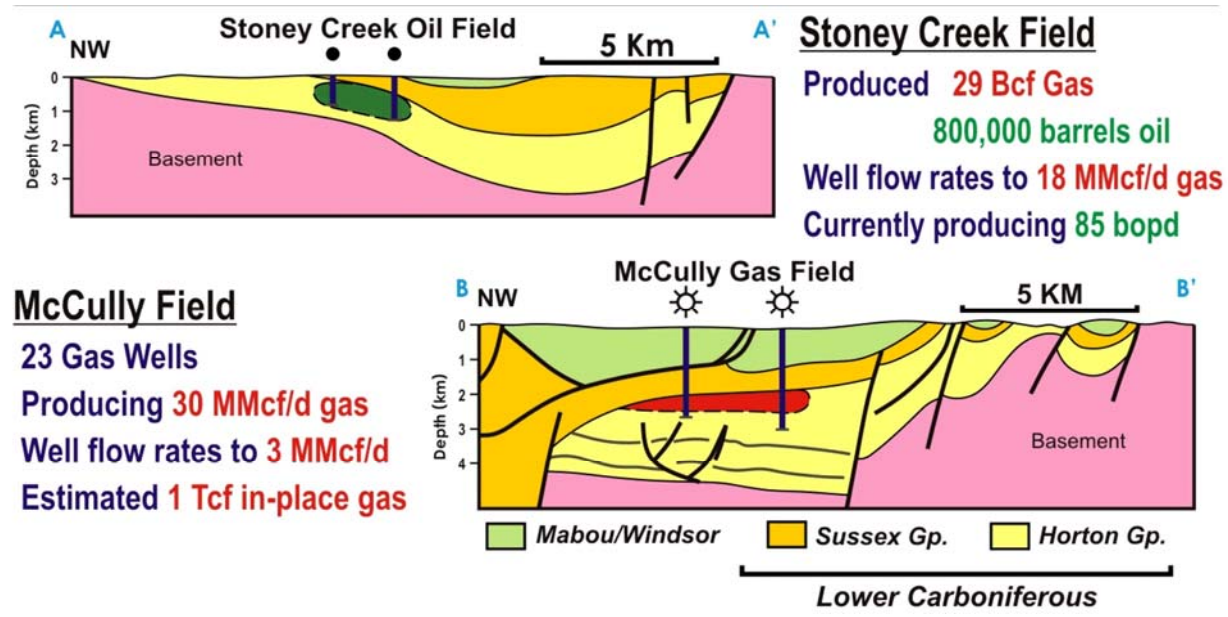
Traps and seals

With the overall structural configuration for this basin being that of a narrow elongated transtensional and transpressional trough filled with fluvial and lacustrine strata, Carboniferous clastic sedimentation and syntectonic deformation has generated many opportunities for structural traps to form. In New Brunswick, two oil and gas fields, McCully and Stoney Creek are older but otherwise generally similar analogues for strata beneath the Humber Sub-basin (Figure 26). On the elevated terrain separating the Humber and Howley sub-basins, one of the flower structures contains the Western Adventure #1 discovery well, a significant gas showing (Figure 26). Productive strata in the trap belong to sandstones of the North Brook Formation and the seal is mudstones of the Rocky Brook Fm.

Potential Plays in the Deer Lake Basin

Deer Lake Basin can be divided into two major play strategies (1) unconventional resource plays capitalizing upon the now well recognised organic rich mudstones of the Rocky Brook Formation and to a lesser extent the older organic mudstones of the Anguille Group, and (2) structural plays taking advantage of the flower structures juxtaposing Anguille source beds adjacent to North Brook sandstone. Any discussion of plays involving unconventional hydrocarbons of the Rocky Brook Formation could run through a range of historic (strip mining) through current technologies (fracture enhanced porosity and permeability) and is well outside the scope of this review.

Within the context of the play types identified in Lavoie et al. (2009), the Deer Lake Basin clearly fits the regional profile for lower Carboniferous clastic plays. Here, fluvial and alluvial sandstones and conglomerates are overlain by lacustrine mudstones. Structures generated during and after deposition create traps, and migration paths for fluid flow. Western Adventure #1 and the older Claybar and Mills wells confirm proof of concept for a Mississippian clastics petroleum play. Additional targets likely exist but each requires significantly more background geology and geophysics to image and define the size for structures, determine potential recoverable volumes and reduce financial risk.



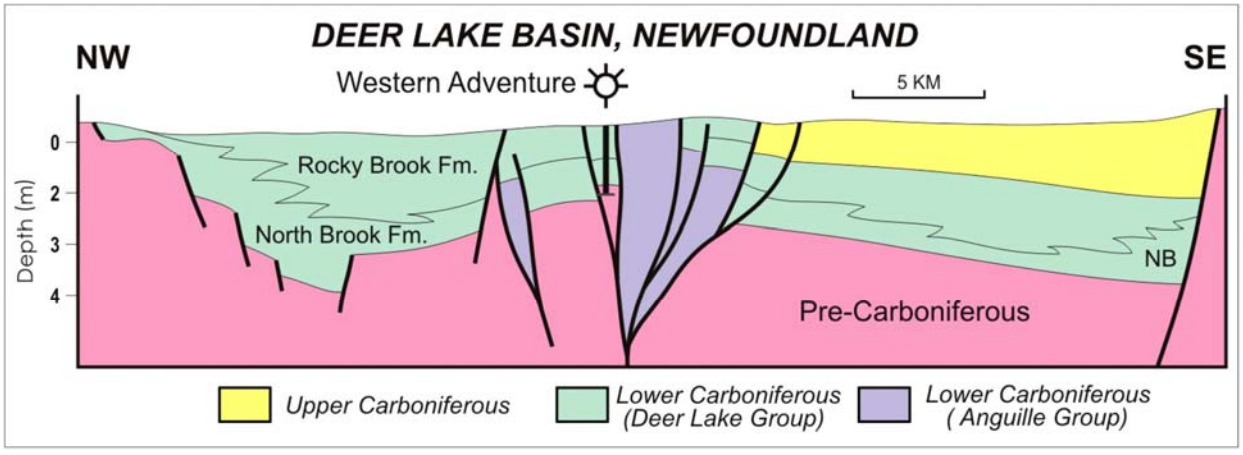


Figure 26: Simplistic comparison of size and structural elements defining trap and seal from the Stoney Creek and McCully fields in New Brunswick and with the Western Adventure #1 gas discovery. In New Brunswick, the Sussex Group (seal) is an important defining character with no obvious equivalent in the Deer Lake Basin. Figures are from Lavoie et al. (2009).

Summation

The Deer Lake Basin is a challenging exploration region characterized by contrasts in quantity and quality of specific petroleum system features (e.g. source rocks versus traps and seals). This is a tendency that is in some ways typical for many other ancient lacustrine settings. In future research, geological analogues should be sought from other similar regions in Atlantic Canada, the eastern United States, and northern and western Europe.

A significant exploration risk may be attached to the age and quality of the available reference data. A lack of sustained active research is clearly seen by measuring substantial numbers of research papers and other reports that are more than 50 years old. For new studies, there is a real need for many new measurements of basic rock properties (porosity, permeability, geochemistry and mineralogy), structures and seismic stratigraphy.

In practical terms, the relatively small size for this ancient lake basin is an issue that will significantly limit the size and number of commercial developments. This is partially balanced by knowledge of other basically similar oil and gas fields elsewhere in Atlantic Canada (Stoney Brook and McCully), and recognising at least two, well developed, organic-rich, type I and II Rocky Brook mudstones are in the oil window. In addition, a third rich source rock encompasses older, black mudstones of the Tournaisian, Saltwater Cove Fm. These older beds are considered overmature and perhaps retaining some potential for gas.

Porosity and permeability measurements from ongoing exploration programmes in Atlantic Canada indicate generally low values for Mississippian strata - sufficient for gas but perhaps requiring enhanced fractures and secondary diagenetic dissolution for oil production. Given the tectonic setting of an intermontane transtensional rift system, traps and seals will be complex combination features derived from fluvial and lacustrine sedimentary environments, folded and faulted into structures formed during Alleghenian orogenesis, and modified by one or more thermally induced diagenetic events. Alternatively, with appropriate engineering for relatively shallow conditions, unconventional plays may be possible through secondary stimulation of the mature and overmature fine-grained source rock beds.

The proof of play concept has been demonstrated from old gas discoveries and more recently, the

Western Adventure #1 discovery. However, without continued research, exploration, and drilling, to at least offer new materials to correctly formulate a diagenetic lithostratigraphy, and to address quantity and extent of porous and permeable strata and source rocks, the identification and delineation of traps, seals, and commercial liquid hydrocarbons will remain elusive targets.

ST ANTHONY BASIN

Introduction

The St. Anthony Basin is a post-Acadian Carboniferous basin formed on the continental shelf off the northeast coast of Newfoundland (Figure 27). It overlies Precambrian/Paleozoic basement rocks (Cutt and Laving, 1977) and, in its eastern part, it is overlain by Mesozoic-Cenozoic sediments of the modern continental shelf and slope. The area of the basin (sensu Dietrich et al., 2011) is estimated to be approximately 55,000 square kilometres. For this report, the St. Anthony Basin is a correlative, but distinct and separate entity to the Maritimes Basin tectonostratigraphic domain, a feature located several hundred kilometres to the west and across a mostly uplifted Appalachian orogenic terrain. Until more drilling takes place in the St. Anthony Basin, the Maritime Basin stratigraphy should be considered a nomenclature of descriptive convenience.

In some reports, the St. Anthony Basin is subdivided into the Notre Dame Sub-basin (Bell and Howie, 1990), a north trending feature on the continental shelf off Notre Dame Bay, and the Belle Isle Sub-basin (Cutt and Laving, 1977), a northwest trending feature farther offshore and closer to the continental slope. The adjacent onshore-offshore White Bay Sub-basin, along the axis of White Bay, apparently opens to the northeast and in this study is also included in the St. Anthony Basin. Of all the major Late Paleozoic basins in Atlantic Canada, the St. Anthony Basin is the least studied. Our search located little more than 150 references with some bearing upon this region. Very few of these references (8) are pre-1960 historic works. For early researchers, this offshore region was inaccessible.

The regional stratigraphic framework for Carboniferous strata of the St. Anthony Basin is almost entirely based on work done on the onshore exposures of Maritimes Basin strata in New Brunswick and Nova Scotia (Figure 28). In reality, only two wells have been drilled in the St. Anthony Basin – the Verrazano L-77 well, where drilling problems forced abandonment at 460 m, and the longer Hare Bay E-21 well (~4875 m). Both wells have been included in a number of compilation studies involving the Labrador Shelf and the Orphan Basin. Reviews are generally focussed upon the Cenozoic part of the succession, and with limited discussions on Carboniferous strata.

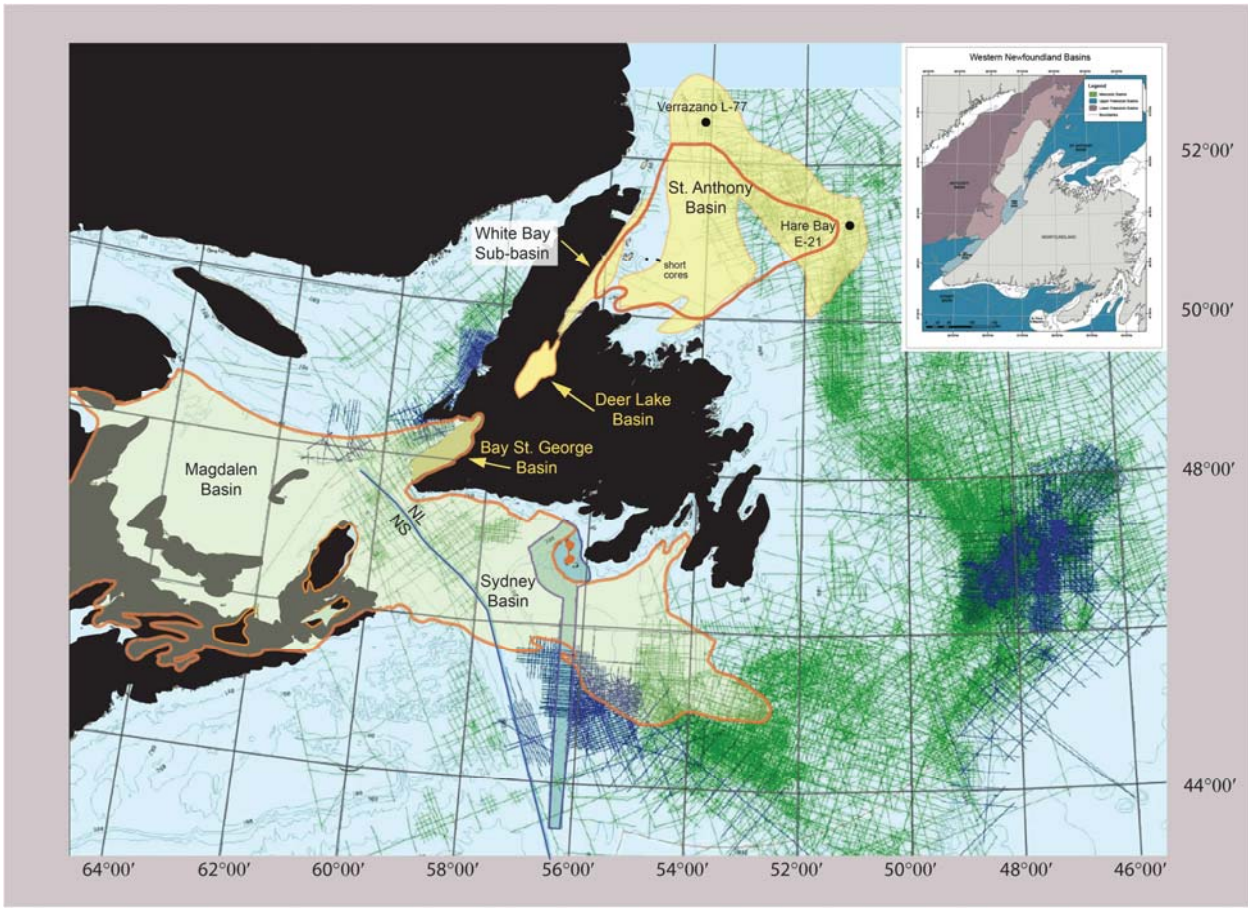


Figure 27: Base map, seismic line coverage and red outline for the St. Anthony Basin are from the CNLOPB publication *Seismic Data Coverage Offshore Newfoundland and Labrador* (2010). The geographic outline of the St Anthony Basin according to the Geological Survey of Canada (yellow; Dietrich et al. (2011)) indicates significant differences in opinions on geographic boundaries. Neither the northeast limits for the basin, nor the relationship of the basin to the White Bay Sub-basin are well defined. Hydrocarbon exploration holes Verazanno L-77 and Hare Bay E-21 and Short Cores (surficial) are discussed in the text. The inset map shows the basin outlines as illustrated in the call for this RDC Scoping Study (2012).

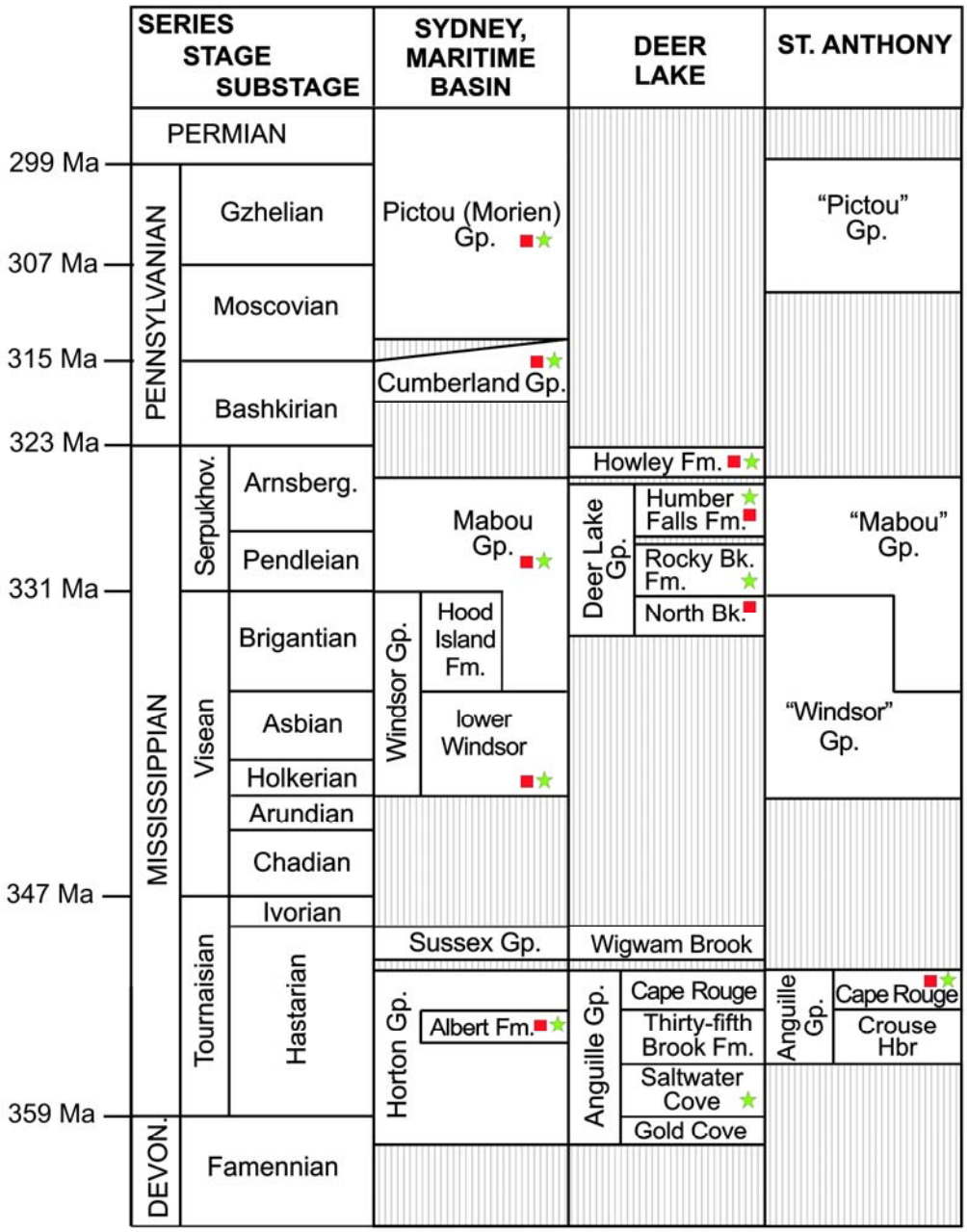


Figure 28: Table of strata and correlations for St Anthony Basin and with the Deer Lake and Maritime Basins to the south and west.

Onshore, Carboniferous outcrops in the White Bay area (Conche-Groais Island-Rouge Island) have been described by Baird (1966), Hamblin et al. (1995) and Hyde (1995). In addition, three shallow drillholes close to shore also encountered Carboniferous limestones (Haworth et al., 1976a, 1976b; Jansa et al., 1978; Barss et al., 1979).

A comprehensive review of biostratigraphic zonations for all of eastern Canada, including the St. Anthony Basin, is given in Williams et al. (1990). A compilation of Windsor to Pictou Group spore zones, and post-Windsor macrofloral zones for Atlantic Canada is given in Allen et al. (2011).

The Hare Bay E-21 well has been incorporated in reports on the Labrador Sea and the Orphan Basin. Most biostratigraphic data from this well deals with the Cenozoic part of the well which penetrates approximately 3400 m of Tertiary and Cretaceous strata (D'Iorio 1988 Ph.D. thesis; Gradstein and Kaminski, 1989; Gradstein et al., 1975, 1994; Gradstein in Srivastava, 1986). Hu and Dietrich (2010) have assigned the 3398-4874 m interval to be equivalent to the Middle Pennsylvanian Pictou Group of the Maritimes Basin.

The Verrazano L-77 well did not reach the targeted Lower Carboniferous play and penetrated only Late Carboniferous strata. Reports by Utting et al. (1976) and Barss et al. (1979) assigned samples from Verrazano L-77 a late Visean to early Namurian age. Zonation of the Upper Paleozoic basins of eastern Canada by Barss and Hacquebard (1967), Hacquebard (1972) and Utting (1980) as reviewed by Williams et al. (1990) shows the entire drilled section in Verrazano L-77 to be Visean based on spore ages.

The three short cores of Windsor Group carbonates recovered by the Bedford Institute (Haworth et al., 1976a: 5044.4' N, 5509.9' W; 5044.0' N, 5454.1' W; 5044.1, 5457.1 W) provide biostratigraphic information from the western side of the basin. These were studied by Jansa et al. (1978) who described the lithology and paleontology (primarily foraminifera and algae) recovered from the cores. A Late Visean age was assigned.

Adjacent to the St. Anthony Basin, outcrop rocks in the Conche area, assigned by Knight (1983) to the "White Bay Basin", may be significant for interpretation of the southwestern part of the St. Anthony Basin. Early mapping of the region was undertaken by Baird (1966) and the Lower

Carboniferous rocks of the Crouse Harbour and Cape Rouge formations (partial equivalents of the Anguille/Horton groups) from the Conche, Groais Island and Rouge Island areas were later described by Hyde (1995). Hamblin et al. (1995) described the palynology, sedimentology and source rock potential of these two formations in the Conche area and assigned the spore assemblages a Tournaisian age.

Interpretations of St. Anthony Basin strata are entirely based on age relationships with strata from distant parts of the Maritime Basin, and from immediately adjacent rocks outcropping in the nearby White Bay area. The offshore data amounts to two wells and three short drill cores, accompanied by a limited number of seismic lines concentrated mainly in the Belle Isle Sub-basin. Lithostratigraphic definitions, formation nomenclature, and detailed internal architecture for the rocks is, therefore, speculative.

Data quality and quantity

The total data base with mentions of the St Anthony Basin amounts to little more than 150 papers. As indicated in earlier parts to this report (Figure 7), the quantity of actual data is in fact much smaller and indicating fewer than 3 reports a year make any reference to or present data from this basin. For instance, there are 9 papers identified as containing information on porosity for the St Anthony Basin. Two of these papers (Hu and Dietrich, 2009; Lavoie et al., 2009), two abstracts (Dietrich et al., 2009; Hu and Dietrich) and one Power Point Presentation (Hicks, 2009) are a part of the recently completed regional review conducted by the Geological Survey of Canada GEM Programme. Two older papers (Fogwell, 1966; Fleming, 1970) are Provincial Government petroleum assessments, and two other papers (Hamblin et al., 1995 and Hamblin, 2006) are part of an earlier GSC programme to review petroleum geology in Canada.

Appendices 1 and 3 of this report describe the extent of seismic information provided by federal/provincial government agencies, and offers a brief summary on how to access seismic information from government websites.

The CNLOPB report, *Seismic Data Coverage Offshore Newfoundland and Labrador* (2010), shows the distribution of seismic lines for the St. Anthony Basin (Figure 27). The Geological Survey of Canada, *East Coast Basin Atlas Series: Seismic coverage, Labrador Sea* is a more

detailed map of the distribution of seismic lines for the northern part of the St. Anthony Basin. Overall, it is evident that there are very few seismic lines crossing the White Bay and Notre Dame sub-basins while the eastern part, represented by the Belle Isle Sub-basin, has better coverage.

The two cross-sections based on seismic data from Grant and McAlpine (1990) have subsequently formed the basis, in part, for diagrammatic representations in various GSC Open-File reports, publications and conference presentations (e.g. Lavoie et al., 2009; Dietrich et al., 2011). In addition to shallow seismic data, a map of subcrop surface at seismic basement for the northern part of the St. Anthony Basin, including the Hare Bay E-21 and Verrazano L-77 wells, is available from the Geological Survey of Canada as part of their *East Coast Basin Atlas Series (Structure, III, Labrador Sea, Seismic Basement and Basement Structure*, 1989).

For physical samples, Appendix 1 offers lists of sample inventory relevant to the study area, including available core, sidewall core and cuttings from the following offshore wells in the St. Anthony Basin as well as details on the following basement cores:

- offshore wells Newfoundland and Labrador: Verrazano L-77, Hare Bay E-21
- three short Carboniferous cores (18-20) from the northeast Newfoundland Shelf (described in Haworth et al., 1976a; Jansa et al., 1978)

The locations of these cores and additional short cores from the northeast Newfoundland Shelf are shown in Haworth et al. (1976a). No latitude-longitude information for individual cores is provided in this article. Information on Carboniferous outcrops in the Conche-Groais Island-Rouge Island area has been presented in papers by Baird (1966), Jansa et al. (1978), Hamblin et al. (1995) and Hyde (1995).

Regional Geology, Tectonics, and Stratigraphy

The St. Anthony Basin formed in equatorial latitudes during oblique collision of Laurussia and Gondwana during the Alleghenian Orogeny. This event produced the Maritimes Basin, the Central Appalachian Basin, Black Warrior Basin (Alabama, Mississippi) and in a broad way, a similar suite of Western European Late Paleozoic basins (summary from Lavoie et al., 2009).

The European basins, and, in particular those off the west coast of Ireland, would have been in close proximity to the St. Anthony Basin during the Carboniferous. They too can provide models for understanding Carboniferous events in the St. Anthony Basin.

The framework for interpreting the St. Anthony Basin relies heavily on stratigraphic interpretations from the Maritimes Basin, and especially the Magdalen Basin, which has been a reference point for correlating the main Late Paleozoic strata in Atlantic Canada. A comprehensive description of the developmental history of Atlantic Canada, and including the St. Anthony Basin during the Late Paleozoic, is presented in Gibling et al. (2008). For hydrocarbon prospectivity, the geological setting and petroleum resource potential of the Paleozoic basins is discussed in Dietrich et al. (2011).

Detailed structural cross-sections and reconstructions of local events within the offshore St. Anthony Basin have, as a function of the limited data from exploration wells, been primarily dependent on seismic data. Outcrop information from the White Bay Sub-basin Crouse Harbour and Cape Rouge formations demonstrates that rocks which are partial age equivalents of the Lower Carboniferous Anguille/Horton groups are present onshore (Hamblin et al., 1995). The short cores examined by Jansa et al. (1978) confirm that limestones correlative with Windsor Group strata farther west (or Ireland to the east) are on the sea bottom off the eastern shore of the Northern Peninsula.

Deep seismic techniques employed in the geophysical studies of Keen et al. (1986) and Hall et al. (1998), were focused on the Appalachian Orogeny. However, one line, documented by Hall et al. (1998, fig. 1-84/2A) is a deep seismic reflection transect WNW to ESE across the St. Anthony Basin.

Shallow seismic interpretations of the Upper Paleozoic sedimentary rocks and immediately subjacent basement of the St. Anthony Basin have been presented in a number of studies including Haworth et al. (1976a, 1976b), Cutt and Laving (1977), Grant and McAlpine (1990), Lavoie et al. (2009), and Hu and Dietrich (2010). Early reconstructions apparently form the basis for later interpretations. The structure of the St. Anthony Basin, as depicted by Bell and Howie (1990), has not changed in any appreciable manner for more than 20 years. Their map

shows Pennsylvanian rocks in the middle of the Belle Isle and Notre Dame sub-basins are intruded by salt diapirs and surrounded by a rim of Mississippian rocks which extends into the White Bay Sub-basin (Figure 29).

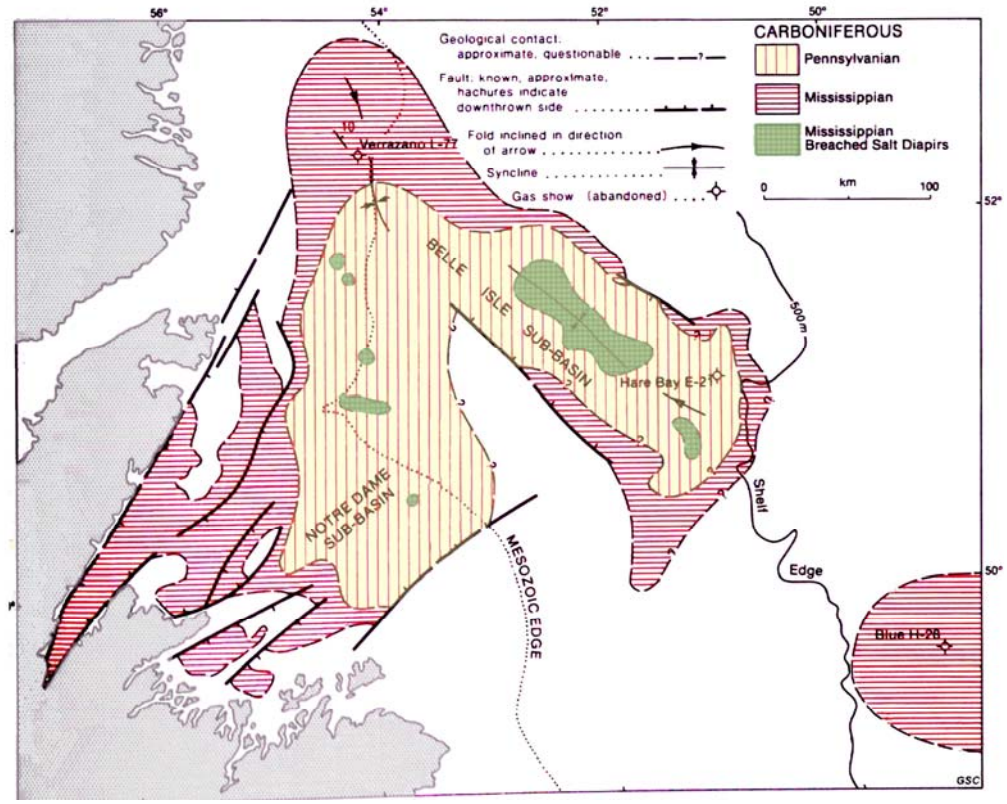
Lavoie et al. (2009) constructed their diagrammatic representation of the SAB from the Grant and McAlpine figure. Their cross-section (~ENE-WSW) across the Bell Isle Sub-basin shows Windsor salt diapirs disrupting Upper Carboniferous strata and other Cretaceous-Tertiary strata on the shelf and shelf margin. The cross-section by Hu and Dietrich through the Verrazano L-77 and Hare Bay E-21 wells shows fault basins to the WNW and extensive salt diapirism extending to the ESE. Neither the Verrazano L-77, nor the Hare Bay E-21 wells intersected the Windsor Group at TD. Verrazano L-77 penetrated 250 m of Mississippian, Serpukovian, Mabou equivalent strata, whereas Hare Bay E-21, cut through 1476 m of Pennsylvanian, Moscovian and Gzhelian, Pictou equivalent rocks.

The vintage and limited number of seismic lines for the Notre Dame Sub-basin limits the resolution of interpretation of local structures (Haworth et al., 1976a, 1976b; Bell and Howie, 1990). Bell and Howie (1990) show patchy development of salt diapirs in the Pennsylvanian core area, and Lavoie et al. (2009) outline a general salt structure area. Multichannel seismic data from the Belle Isle Sub-basin is more comprehensive and allows for delineation of salt diapirs, and solution, collapse and withdrawal structures (Cutt and Laving, 1977), such as those identified near Hare Bay E-21, where Late Carboniferous strata identified through drilling overlie a seismically identified salt-bearing sequence. The Cutt and Laving reconstruction proposes a fit to the evaporate sequence of Bailey (1975) described from the west Irish shelf.

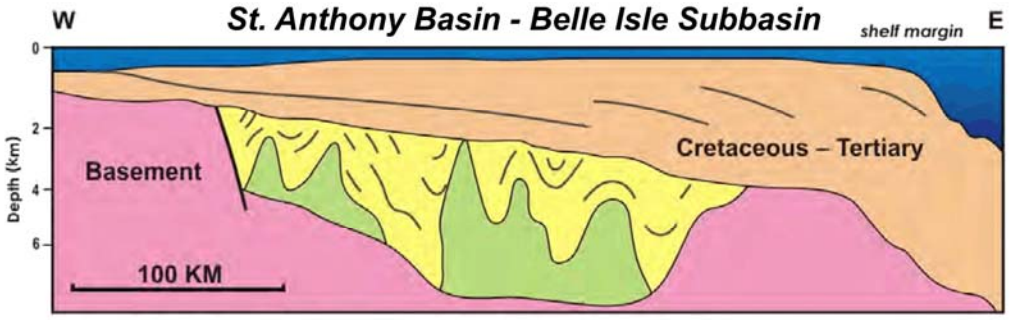
Petroleum System Elements

Source Rock and Maturation

Source rocks and thermal maturation data for the offshore Hare Bay E-21 and Verrazano L-77 wells in the St. Anthony Basin can be accessed through the Natural Resources Canada, Earth Sciences Sector, Basin Database (see Appendix 3). Onshore coverage is provided in Hamblin et al. (1995), where source rock potential for the White Bay Sub-basin outcrops from the Conche area is evaluated. An overview of petroleum system elements for the St. Anthony Basin is



A



B

Figure 29: (A) Geologcal map of the St Anthony Basin (from Bell and Howie, 1990) and derived from work first conducted in the early 1970's. (B) Schematic cross-section (from Lavoie et al., 2009) of Belle Isle Sub-basin from near the Hare Bay E-21 well. In this area, Carboniferous strata remain buried more than 2 km beneath Cretaceous and Tertiary deposits.

included in Dietrich et al. (2011) as part of their assessment of the Maritimes Basin.

Source rock information for the Hare Bay E-21 well is also presented diagrammatically in the *Geological Survey of Canada, East Coast Basin Atlas Series: Biostratigraphy Maturation data, V, Labrador Sea* (1989). Here the Carboniferous is coded as Source Rock Type III with TOCgenerally <2%, and mostly ~1%, although TOC is higher in the upper half of the Pictou Group and just above TD. Total carbon recorded for the Mabou Group in the Verrazano L-77 well ranges from 0.12-to 0.4% (Natural Resources Canada, Earth Sciences Sector, Basin Database: source Geochem Labs, 1977).

Hamblin et al. (1995) conducted a detailed study of rocks and oil seeps in the White Bay area. Their results, (Hamblin et al., 1995) show that organic matter present in the Crouse Harbour and Cape Rouge formations is mainly Type I with TOC for the mudstones commonly falling within the 1 to 2% range, with a maximum TOC of 1.7% recorded from the Cape Rouge Formation and 4.6% from the Crouse Harbour Formation. Of significance is recovery of *Botryococcus* algae from some of their samples. These algae can be abundant in fresh to brackish water deposits, and according to Chowdhury et al (1991) often are a main component of Type I kerogen source rocks associated with lacustrine deposits. Based on the limited data available, TOC is highest in the outcrops in the White Bay area and lowest in the Mabou Group in the Verrazano L-77 well.

Thermal maturation data in the public domain for the Hare Bay E-21 and Verrazano L-77 wells is from the Natural Resources Canada, Earth Sciences Sector, Basin Database. It forms the basis for the vitrinite plots in Figure 30. Outcrop values for the White Bay area are from Hamblin et al. (1995).

For the Hare Bay E-21 well, three sets of vitrinite data for the Carboniferous section were compiled by Geochem Laboratories, Shell and Robertson Research respectively, with values ranging from 1.20 to 2.33 (data from an internal report by M.P. Avery is also available on the Basin Database). The *Geological Survey of Canada, East Coast Basin Atlas Series: Biostratigraphy Maturation data, V, Labrador Sea* (1989) gives a different range (>1.2 to 1.7) overlapping the lower part of the Geochem Laboratories-Shell-Robertson numbers. Depth to 0.7% Ro is given as 3451'. Both sets of data for this well, which is a test of a salt structure, show

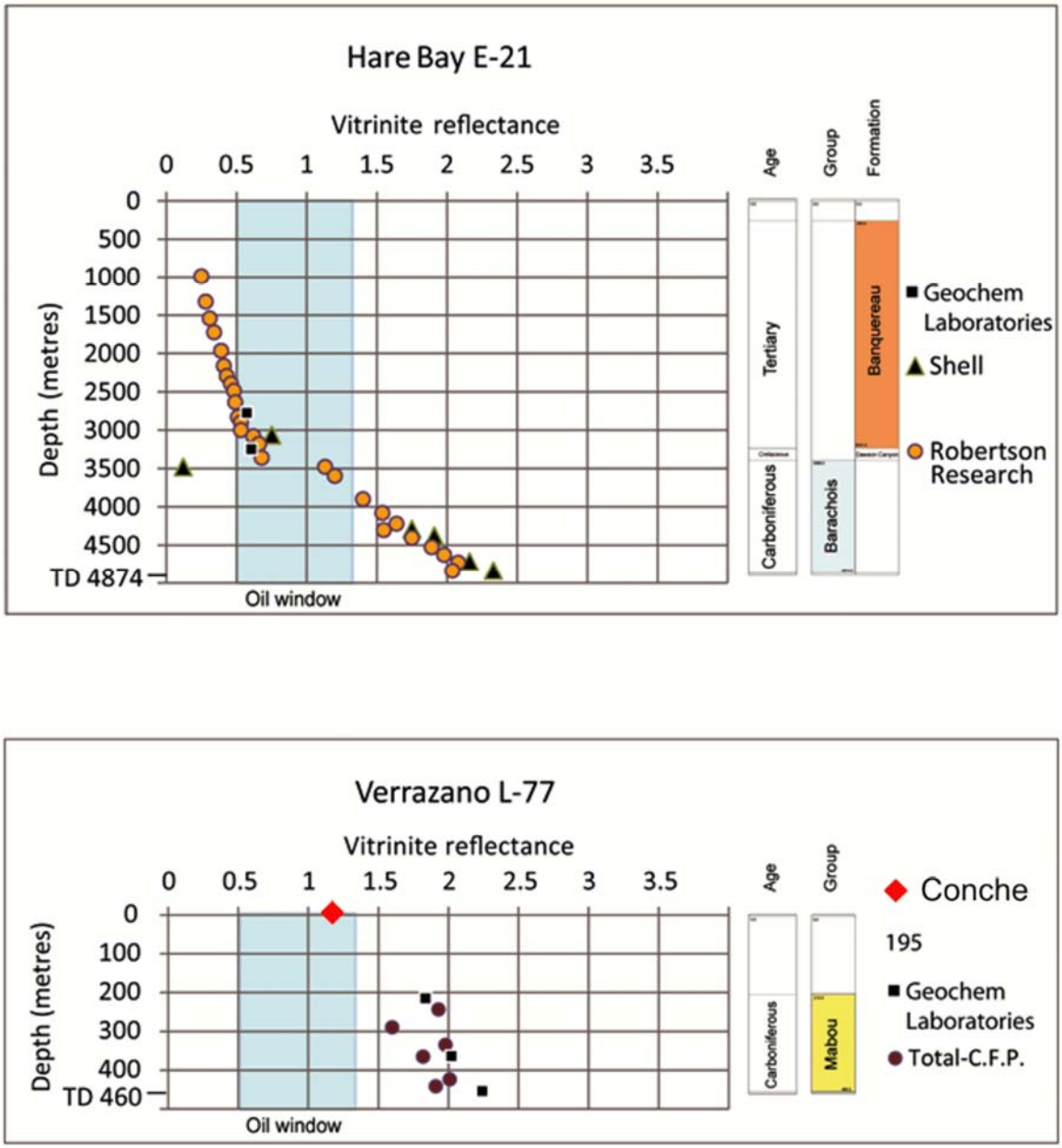


Figure 30: Vitrinite reflectance data for the Hare Bay E-21 and Verrazano L-77 wells from the NRC, Earth Sciences Sector, Basin Database. Lithostratigraphic picks for Hare Bay E-21 from the NRC Basin Database (CNLOPB Schedule of Wells, 2007). Top of the Banquereau Formation estimated from RT and WD values. Lithostratigraphic picks for Verrazano L-77 from Hu and Dietrich (2010). Conche (red diamond) is average of outcrop data from Hamblin et al. (1995) and showing older Anguille Group strata onshore remain in the oil window.

TAI's ranging from 3+ to 4- (equated with VRo of 1.4 to 1.7%). The two sets of data place this well at the upper limit of the oil window (using a cutoff of 1.5) to overmature but within the range for gas generation.

For the White Bay area, the assessment by Hamblin et al. (1995) was that these rocks are high in the oil window based on vitrinite readings (1.0 to 1.2% Ro) and TAI's ranging from 2/2+ (equivalent VRo = 0.6%) to 2+/3- (equivalent VRo = 1.0%).

Limited data seems to indicate a gradient from onshore where strata are in the oil window to somewhere offshore where strata are gas prone.

Porosity and Permeability

Porosity and permeability for the Hare Bay E-21 and Verrazano L-77 wells are calculated from well reports and presented graphically in Hu and Dietrich (2010). Hare Bay E-21 sandstones reach porosities of up to 15% in the deepest parts of the well up to ~4500 m. Mabou Group sandstones in the Verrazano L-77 well have porosity of up to 25 % and permeability of up to 100 mD. Hu and Dietrich (2010) concluded that most of the enhanced reservoir quality in the Maritimes Basin wells is likely related to secondary porosity development. They also noted that the two SAB wells did not provide enough data for comparison of average porosity-depth trends with other Maritimes Basin wells in the study.

Their calculated porosity-permeability represents the only significant new information extracted for rocks and well records for this basin. It also shows that there is still a possibility for discoveries.

Traps and Seals

Traps and seals for the Maritimes Basin have been discussed by Hannigan and Dietrich (2012). Of particular relevance to the St Anthony Basin are traps related to salt structures and potential seals formed by evaporite deposits in the middle Windsor/Codroy Group and shale intervals in the Mabou and Pictou/Morien groups.

Trap style differs throughout the Carboniferous in the Maritimes Basin. Lower Carboniferous

clastic rocks occur in fault sub-basins in which fold and fault-block traps predominate. These fault sub-basins have not been identified in the offshore St Anthony Basin sensu stricto (Lavoie et al., 2009) but are known from the White Bay area where rocks of the Crouse Harbour and Cape Rouge formations (partial equivalents of the Anguille/Horton groups) are exposed in outcrop.

Lower Carboniferous carbonate reef-style traps developed in the lower Windsor Group have not yet been identified from the St Anthony Basin. However, slightly older rocks of the Crouse Harbour and Cape Rouge formations outcrop on the Great Northern Peninsula (White Bay Sub-basin). These are partial equivalents of the Horton Group, which underlies Windsor strata elsewhere in the Maritimes Basin. Nearby, off the Great Northern Peninsula, Lower Carboniferous (Late Visean) Windsor limestones were recovered as short cores, and, in addition, Windsor salt structures have been identified seismically in the Belle Isle and Notre Dame sub-basins. The presence of a suite of Lower Carboniferous rocks, including marine carbonates, suggests there is potential for reefs having been present in the area if water conditions were right.

Upper Mississippian–Pennsylvanian salt structure traps are widespread in both the Notre Dame and Belle Isle sub-basins. The traps are juxtaposed with clastic rocks which occur next to or overlie the salt structures and, throughout much of the basin, underlie Mesozoic strata. Both salt diapirs and solution collapse features have been recognized from the Belle Isle Sub-basin (Haworth et al., 1976a; Cutt and Laving, 1977).

Seal rocks such as Windsor evaporites, identified from seismic data, are known to extend throughout much of the St Anthony Basin. These rocks can be effective cap rocks for underlying Lower Carboniferous sandstones. Sub-Windsor Carboniferous clastic rocks have not been drilled in either of the two offshore wells (Hare Bay E-21, Verrazano L-77), but have been identified from outcrops in the White Bay Sub-basin (Crouse Harbour and Cape Rouge formations). Short cores from offshore have yielded Windsor limestones, and Windsor evaporites have been identified seismically from the both the Notre Dame and Belle Isle sub-basins. The Verrazano F-77 well, which was intended to test Lower Carboniferous reservoirs, was abandoned after reaching TD at 460 m.

Younger Carboniferous seals are possibly present in the Belle Isle Sub-basin where Mabou (Verrazano F-77) and Pictou (Hare Bay E-21) strata are present. Overlying Mesozoic strata (Hare Bay E-21) likewise may provide seals, or potentially even reservoirs which could have been charged by migrating Upper Paleozoic hydrocarbons as in the Dutch North Sea.

Potential plays in the St. Anthony Basin

Late Paleozoic petroleum plays in the Central Appalachian, Black Warrior and Western European basins have been discussed in other sections of this report and will not be detailed here. Age equivalent plays elsewhere in the Maritimes Basin will be briefly referenced as the study of these plays provides a stratigraphic framework for interpretation of potential source rocks in the St Anthony Basin. Details of these plays are taken from Lavoie, et al. (2009, 2012) and from an assessment of the Sydney Basin and Orpheus Graben by Hannigan and Dietrich (2012).

Lavoie et al. (2009) identified three conventional plays in in Carboniferous-Permian strata of the Maritimes Basin

- Lower Carboniferous sandstones *(and Middle Devonian sandstones locally in the Sydney Basin: Hannigan and Dietrich, 2012)
- Lower Carboniferous carbonate play including a carbonate reef play
- Upper Carboniferous sandstones (and an unconventional coal bed methane play).

The Lower Carboniferous (Mississippian) clastic play

Today in the Maritimes Basin this play type is in production in two wells developed in “fault-bounded extensional or strike-slip sub-basins” (Lavoie et al. 2009, p.139). It involves the Horton, Windsor and Mabou groups, but is largely confined to the Tournaisian Horton and Anguille groups and their age equivalents. One known exception is in the Deer Lake Basin, where Visean clastic strata are involved.

Two onshore fields in the Maritimes Basin are currently producing hydrocarbons - the Lower Carboniferous Horton Group sandstones of the Stoney Creek oil field and McCully gas field of

the Moncton Sub-basin. Other oil and gas discoveries in this field are not in production. Two significant Lower Carboniferous petroleum accumulations occur onshore in Newfoundland - the Flat Bay oil show (Bay St. George Basin) and Western Adventure Gas Field (Deer Lake Sub-basin).

Lavoie et al. (2009) show this Lower Carboniferous play extending into the White Bay Sub-basin. This would be in keeping with a 1966 report by Baird in which he described onshore Lower Carboniferous rocks of the Horton Group from the Conche-Groais Island area and noted there were "petroliferous with bituminous residues (Baird, 1966, p. 247). However, fault sub-basins associated with the Lower Carboniferous clastic play have not been identified from seismic data in the St Anthony Basin sensu stricto (Lavoie et al., 2009). The Verrazano L-77 well, which was drilled to potentially identify this play in the St Anthony Basin, was abandoned after encountering Mabou Group rocks between 210 and 460 m.

The Lower Carboniferous (Middle Mississippian) carbonate play

As defined by Lavoie et al. (2009), this play includes all marine carbonate rocks in the Windsor Group (and equivalent strata). It includes the carbonate reef play, a Middle Mississippian carbonate play developed in the basal Windsor/Codroy Group and is usually dolomitized. It has been recognized onshore mainly from mineral exploration drilling

The Mississippian carbonate play is not shown to extend into the St Anthony Basin or White Bay Sub-basin in Figure 22 of Dietrich et al. (2011), although Windsor limestones occur in the area. The carbonate reef play also has not been recognized from the St Anthony Basin, but the limits of these reefs are poorly constrained for the most part. Sub-Windsor rocks of the Crouse Harbour and Cape Rouge formations occur in outcrop on the Great Northern Peninsula, Visean limestones assigned to the Windsor Formation are known from short cores off the Northern Peninsula (Jansa et al., 1978), and Windsor diapirs show on seismic in the Notre Dame Sub-basin (Bell and Howie, 1990). The potential for carbonate reefs exists but is dependent on paleoshoreline, coastal configuration and paleoebathymetry.

The Upper Carboniferous clastic play

(Upper Mississippian-Pennsylvanian: Mabou/Barachois and Pictou/Morien groups) have well

recognised reservoir rocks with greatest thickness in the Bradelle and Cable Head formations. In the Gulf of St Lawrence, the offshore East Point E-49 gas discovery in the Cable Head Formation (drilled in 1970) is designated a significant discovery but has not been developed. A step-out well was not productive (Hannigan and Dietrich, 2012). Several other wells have shown gas at low flow rates in drill-stem tests (Lavoie, et al., 2009, 2012).

In this play, the main trap type is associated with salt structures – salt-withdrawal anticlines, salt pillows and anticlines, and salt overhang and sub-salt structures. Other traps include sandstone pinchout structures and unconformities (Dietrich et al., 2011). The Upper Mississippian-Pennsylvanian sandstone play extends across much of the St Anthony Basin (Lavoie et al., 2009). Seal is an unknown

Summation

The knowledge base is the single largest risk assigned to the St Anthony Basin. With little more than 150 research reports covering an area of 55,000 km^2, that is approximately 2/3 the size of Ireland, little more than broad generalizations and trends can be addressed. Given that simplistic overview, specific reports do offer some tangible insights into possibilities once additional studies are completed. Specifically, reports indicating oil and gas prone source rocks laying in the oil window and in the productive gas zone do exist, as do indicators for conventional porous and permeable rocks. Without exploration, and drilling, to at least offer new materials to correctly formulate a lithostratigraphy, address quantity and extent of porous and permeable strata and source rocks, the identification of trap, seal, and commercial hydrocarbon preservation will remain open questions. So too, and while models for the geology for this region are based upon other eastern Canadian examples, this basin sits well apart from the Maritimes region and may find other appropriate exploration analogues in Ireland and continental Europe.

A systematic survey of seabed bedrock from dredges and short cores may begin to fill in some of the blanks on a very large part of the shelf off the northeast coast of Newfoundland and southeast Labrador. With appropriately preserved samples, baseline conditions on thermal maturity and perhaps also source rock quality may be attainable.

SYDNEY BASIN

Introduction

The Sydney Basin is the eastern extension of the Maritimes Basin region, a system of post-Acadian Middle Devonian to Carboniferous and earliest Permian infill basins, with extensive onshore exposures on Cape Breton Island, small outcrops on the Burin Peninsula, and more extensive offshore exposures which lie beneath thin Pleistocene cover off the south coast of Newfoundland (Figure 31). The total area of the Sydney Basin (sensu Dietrich et al., 2011) is estimated to be at least 100,000 square kilometres, and extends an unknown distance offshore beneath Mesozoic cover.

The basin margins are most clearly defined to the north, west and south (Figure 32). Strike-slip faults of the Cabot Strait fault zones (specifically the Hollow Fault Zone) separate the Sydney Basin from the Magdalen Basin to the northwest. The Proterozoic Scatarie Ridge forms a southern boundary, and the island of Newfoundland, a northern boundary (Pascucci, et al.1999; 2000; Enachescu, 2008). Pascucci et al. (2000) report that the eastward extent of the basin under the Burin Platform and onto the margin of the Grand Banks, is not known; Late Paleozoic strata are buried by Mesozoic strata. In general, interpretation of the structure of the Sydney Basin has relied heavily on offshore seismic studies in combination with an extensive onshore database derived primarily from a long history of Cape Breton Island coal mining, and a limited number of offshore wells.

Readily recognised as a distinctive part of the Maritimes Basin complex of large lakes and marine fingers, the Sydney Basin is one of several conjugate margin analogues for the same lacustrine and marine depositional system seen in Ireland. In offshore Ireland, Carboniferous strata are the source rocks for gas trapped in the Triassic reservoir rocks of the Corrib gas field. Regionally, in the adjacent Magdalen Basin, the Stoney Creek and McCully fields are in production from Horton Group (Albert Formation) sandstones (Hu and Dietrich, 2010), and prospects such as the Old Harry structure are thought to have significant potential. Inasmuch as upper Carboniferous strata of the North Sydney F-24 and P-05 wells contain traces of gas, no production or significant shows have been located in the offshore Sydney Basin (Enachescu,

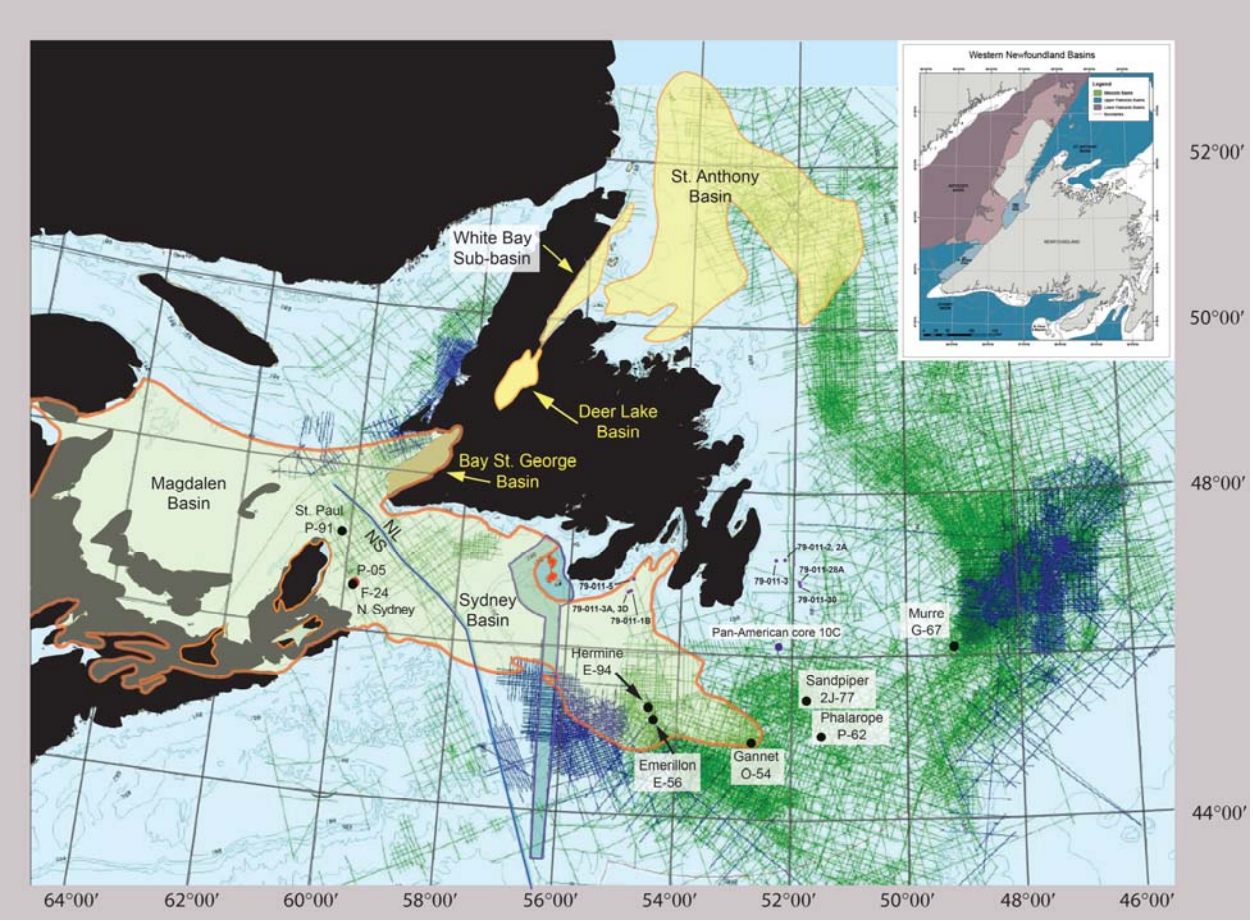


Figure 31: Upper Paleozoic basins showing locations of the Sydney Basin wells, wells that are peripheral to the basin, and shallow bedrock cores in Placentia Bay and around the Avalon Peninsula. The basin outlines beneath Mesozoic cover are from Dietrich et al. (2011). The seismic lines are taken directly from the CNLOPB publication *Seismic Data Coverage Offshore Newfoundland and Labrador* (2010). The inset map shows a much smaller basin outline from the bid for an RDC Scoping Study (2012).

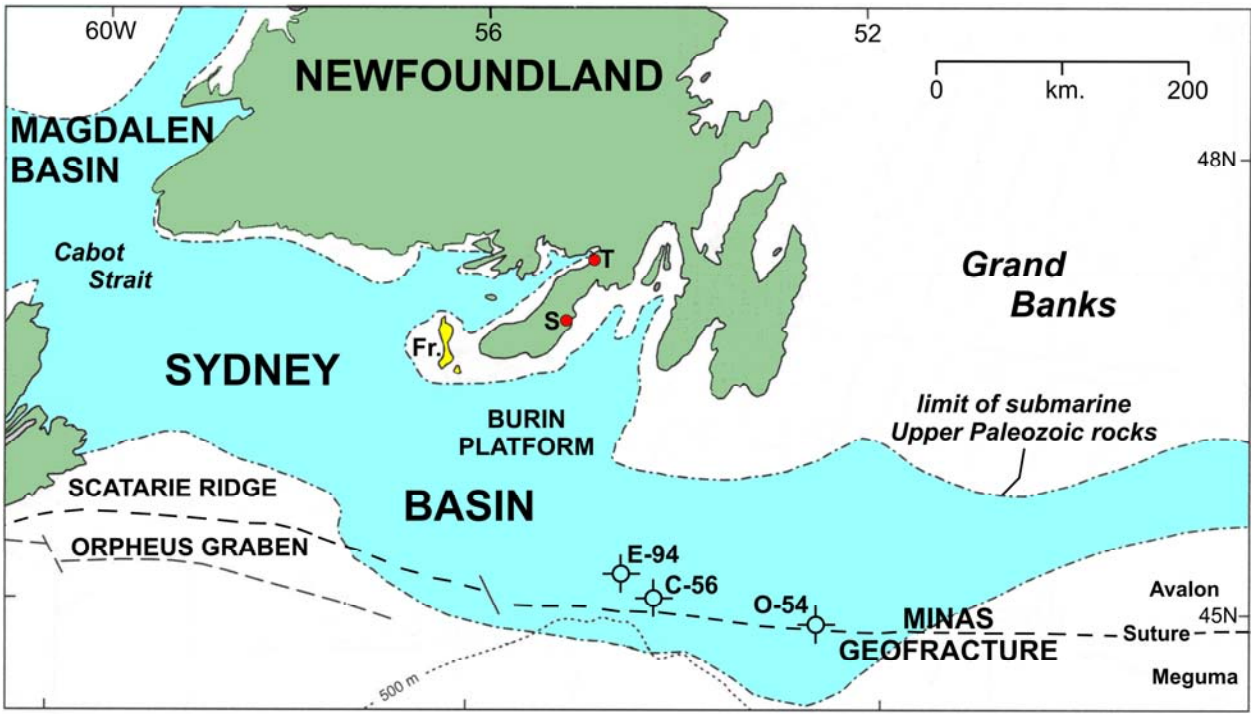


Figure 32: Outline of Sydney Basin, bounding conditions and proposed eastern extension (modified from Pascucci et al., 1999). Cabot Strait is a complex strike-slip fault zone defining the western limit to this basin. In the south, the Scatarie Ridge, in particular, and the Minas Geofracture, in general, define southern limits for Upper Paleozoic strata. Northern limits are the faulted and erosional edge of Upper Paleozoic strata on the coast of Newfoundland and on the Grand Banks. Spanish Room (S) and Terranceville (T) are prominent Carboniferous outliers along the southern coast of Newfoundland.

2006a). Potential exists for unconventional resources, including gas hydrates in surface strata and coal bed methane in fractured rocks. Coal bed methane is known to be associated with coal measures in the Sydney coalfields of the west Sydney Basin (Grant and Moir, 1992; Hacquebard, 2002). It might also occur in southwestern Newfoundland and within the Sydney Basin beneath the Cabot Strait (Hannigan and Dietrich, 2012). Pascucci et al. (2000) also noted that coal measures overlie basement rocks in Placentia Bay (King et al., 1986), although they do not appear to be developed under the Burin Platform (Pascucci et al., 1999).

Overall, the basin remains a largely unexplored region, and is very often simply called "basement" beneath Mesozoic cover.

Data quality and quantity

The bulk of the petroleum exploration well data has been collected from the Nova Scotia side of the Sydney Basin. Information from the onshore Birch Grove No. 1 well (Cape Breton), the North Sydney P-05 and F-24 wells off Cape Breton Island and the St. Paul P-91 well, in the transition zone between the Sydney and Magdalen basins, is especially pertinent to understanding the structure and petroleum potential of this area.

On the Newfoundland side of the basin, a small sample suite comes from the Hermine E-94 well drilled in the East Sydney Basin, from short bedrock cores from Placentia Bay and southeast of the Avalon Peninsula (King et al., 1986), and small outcrops on the Burin Peninsula (Bradley, 1962; O'Brien et al., 1984; Laracy and Hiscott, 1982; Hyde, 1995). Farther east of this coastal offshore region, there are 5 other wells (Gannet O-54, Sandpiper 2J-77, Phalarope P-62, Murre G-67, and Emerillon E-56) reporting Carboniferous and/or Devonian "basement" (Jansa et al.,1975; Bell and Howie, 1990). These wells provide useful information for interpreting the structure and eastern extent of the Sydney Basin beneath thick Mesozoic cover.

Appendices 1 and 3 of this report describe the location and extent of geophysical information provided by each government agency, and a brief summary on how to access reports and other information from government web sites.

Seismic coverage of the Sydney Basin which is in the public domain comprises a collection of

industry seismic lines, and with many of low quality (Pascucci et al., 2000; Enachescu, 2006a). A comprehensive assessment of the available seismic coverage to 2006 for the Sydney Basin was assessed by Enachescu (2006a), who evaluated the quality of the available lines and constructed a series of seismic profiles for the Newfoundland side of the basin.

The CNLOPB report, *Seismic Data Coverage Offshore Newfoundland and Labrador* (2010), shows the distribution of seismic lines for the Sydney Basin and forms part of our Figure 31 of this report.

Most of the seismic lines in the public domain were shot before the mid-seventies. In 2010, Husky Oil completed a 3005 km 2-D seismic acquisition survey on the Newfoundland side of the basin (Husky Exploration license area EL1115 2009-2018). That area, outlined as a part of a figure in Hannigan and Dietrich (2012), is in an area where strata are more than 9 km thick. In addition to these new collections, some of the old data from industry is being reprocessed, as, for instance, by Kendell et al. (2005, abstract) who reprocessed 1800 km of 2D industry seismic collected in 1981 and 1983.

Very little of the released seismic data comes from the central part of the basin, and farther east, seismic lines are concentrated in places where the Late Paleozoic strata are onlapped by Mesozoic strata.

Our sample and core inventory (Appendix 1) contains a list of materials from a number of wells in the Sydney Basin and includes details on basement cores from the Newfoundland part of the basin:

- offshore wells Nova Scotia: North Sydney F-24, North Sydney P-05, St. Paul P-91
- offshore wells Newfoundland: Hermine E-94
- Newfoundland wells peripheral to the Sydney Basin: Gannet O-54, Sandpiper 2J-77, Phalarope P-62, Murre G-67, Emerillon E-56
- basement cores from Placentia Bay and southwest of the Avalon Peninsula

Information on Carboniferous outcrops from the Burin Peninsula sampled for various purposes is provided in the following references: Bradley (1962: Terrenceville area); Smith (1975: volcanics), Strong et al. (1978), O'Brien (1979), Laracy and Hiscott (1982: Carboniferous redbeds, Spanish Room Point), O'Brien et al. (1984: Terrenceville area), Irving and Strong (1985: paleomagnetism) and Hyde (1995).

Regional Geology, Tectonics, and Stratigraphy

The general tectonic setting for the evolution of the mid Devonian to Carboniferous/ Permian Sydney Basin is covered in more detail in reviews by Bell and Howie (1990), Gibling et al. (2008), Lavoie et al. (2009), and others. Only a brief summary specific to the Sydney Basin is presented here and relies heavily on the study of the offshore Sydney Basin by Pascucci et al. (2000), the Nova Scotia part of the Basin by Boehner and Giles (2008), the Laurentian Channel by Hannigan and Dietrich (2012) and the regional studies of Dietrich et al. (2011) and others. Early exploration history and geological studies pertinent to the Maritimes Basin, including the Sydney Basin, are covered in some detail in Calder (1998).

The western Sydney Basin, and the traditional focus for coal and oil exploration, is a saucer-shaped (King and Maclean, 1976) feature, up to 5 km thick, and cut by a series of half-grabens which provided sites for early episodes of sedimentation (Hannigan and Dietrich, 2012).

The Sydney and Magdalen basins are in direct contact along a fault bounded sill that defines the western margin of the Sydney Basin. The Cabot Strait area, which geographically forms the boundary between the Magdalen and Sydney basins, has been the focus of many deep and shallow seismic studies. Two transects across the western part of the Sydney Basin, and documented by Hall et al. (1998), show the Cabot Strait area as being "affected significantly by late Carboniferous strike-slip faulting" (Hall et al. 1998, p. 1215).

Interpreting the stratigraphy of the Upper Paleozoic sediments which infill the Sydney Basin has relied heavily on shallow seismic data linked to the extensive onshore exposures on the eastern part of Cape Breton Island, the more limited exposures on the Burin Peninsula, and the offshore Grand Banks wells which intersect Upper Paleozoic “basement”.

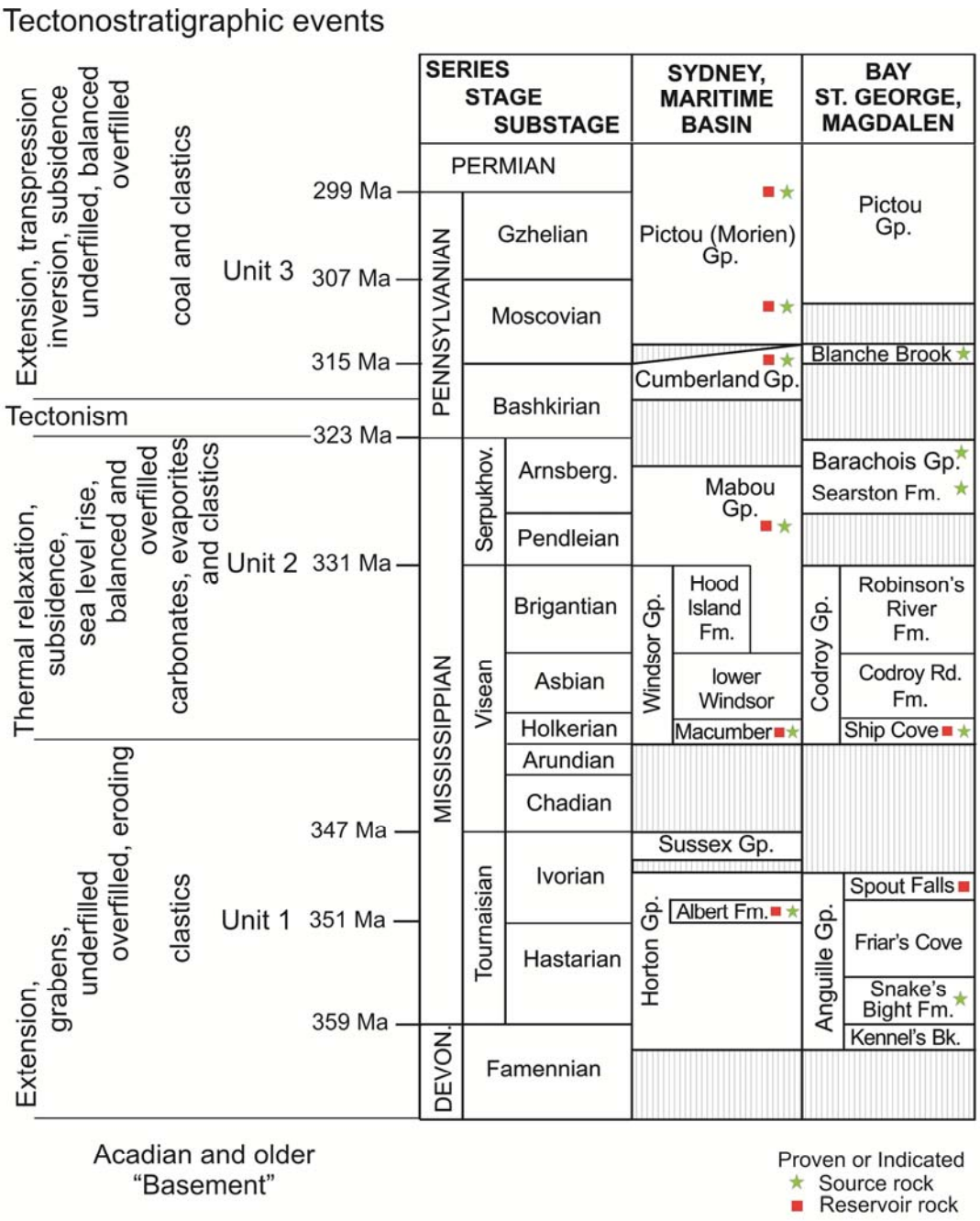


Figure 32: Stratigraphy of the Sydney Basin showing formation names corresponding with basic lithologic characteristics for onshore strata and identifying horizons where source and reservoir strata may be found. The 3-fold tectonostratigraphic division and interpretation of events and strata is in part derived from Pascucci et al. (2000).

Shallow seismic records of the Sydney Basin and environs have been described in a number of offshore studies including those by Grant and McAlpine (1990), Grant and Moir (1992), Grant (1994), Langdon and Hall (1994), Pascucci et al. (1999; 2000), Lavoie et al. (2009), Hu and Dietrich et al. (2010), and Hannigan and Dietrich (2012) and Enachescu (2012). Biostratigraphic correlations are based upon a much more modest set of samples (commonly cuttings) and where anomalies may exist between physical and biostratigraphic markers (e.g. Pascucci et al., 1999; p.303).

The following summary of the sequence of events associated with deposition of sediments of the Sydney Basin was proposed by Pascucci et al. (2000) and incorporates comments from Enachescu (2006) and Gibling et al. (2008), and others:

- Three older extensional and compressional phases created the Basement: Acadian basement of Precambrian and Lower Paleozoic rocks form rift related extensional half-grabens.
- Basin fill divided into three seismic megasequences: Units 1-3 (Figure 32).
- Unit 1: the areal restricted Middle Devonian McAdams Lake Formation occurs in outcrop on Cape Breton Island, and may occur in some of the deep grabens (Enachescu, 2006); White and Barr (1998) postulated it could extend to the NE under the Sydney Basin. The main depositional episode associated with Unit 1 involves infilling of extensional basins by terrestrial lacustrine and alluvial Lower Carboniferous strata of the Late Devonian(?) and Tournaisian Horton and Anguille Groups; depositional geometry supports active fault zones during deposition of the Horton Group
- Unit 2: Visean to early Namurian subsidence resulting from thermal relaxation and eustatic sealevel rise provided accommodation space for deposition of marine evaporites and carbonates and non-marine clastics of the Windsor/Codroy and Mabou/Barachois groups
- re-activation of some extensional faults and inversion of some depocentres produced a Namurian-Westphalian unconformity during a tectonic episode correlated with the Alleghanian Orogeny

- Unit 3: Late Carboniferous subsidence produced an extensive basin with lacustrine deposits of the Morien group in the Sydney basin; these were overlain by Stephanian to possibly Permian Pictou Group alluvial, fluvial and estuarine clastics.
- A post-Carboniferous (probably Permian) compression deformed the coal measures

Of significance for petroleum exploration are the distribution and mobilization of evaporites, the distribution of faults and folds, and the series of exhumations and burial of strata.

Pascucci et al. (2000) focussed mainly on the west Sydney Basin and noted that, based on the available seismic at that time, salt related structures were not evident, except for a diapir north of Scatarie Ridge (Webb, 1973) and domal reflector patterns showing on seismic in the northeast area and possibly related to diapirs. For the east Sydney Basin they noted that Lower and Upper Carboniferous strata, including Windsor diapirs, have been recorded as underlying the Burin Platform and the eastern Grand Banks. Hannigan and Dietrich (2012) later discussed the petroleum potential of the west and east basin, and observed that salt diapirs were widespread in the southeastern part of the basin and also present in the central part, east of Scatarie Ridge, but not in the westernmost part, where a complex zone of faults and ridges are predominant (Hannigan and Dietrich et al., 2012). They also recorded inversion anticlines as a major structural element in the basin. The disparity between the western part of the basin and the eastern part means that good seismic resolution across the entire basin is essential for evaluation of potential plays and play fairways.

The polycyclic nature of extension and compression and associated erosion and burial of sediments has consequences for hydrocarbon generation, petrophysical characteristics of reservoir and seal rocks, and in the creation and unroofing of structural traps.

Petroleum System Elements

Source Rock and Maturation

The source rocks and thermal maturation for the Sydney Basin have been assessed in a number of journal articles, industry reports, Open file reports and other publications commissioned by the Geological Survey of Canada and the Nova Scotia Departments of Natural Resources and Energy. Government reports in the public domain covering TOC and thermal maturation for individual

onshore and offshore wells and drill cores can be accessed through the Natural Resources Canada, Earth Sciences Sector, Basin Database, the CNSOPB Digital Data Management Centre, and the Nova Scotia Departments of Energy and Natural Resources (see Appendix A). Recent GSC publications which provide comprehensive evaluations of petroleum system elements include the CSPG Bulletin by Dietrich et al. (2011) and Open-file 6953 by Hannigan and Dietrich (2012).

Source rock assessments include work by Barss et al. (1980), Marchioni et al. (1994; 1996), Mossman (1992), and Mukhopadhyay, (2004). Barss et al. (1980) plotted kerogen data, TOC, TAI's, and vitrinite data for the western Sydney Basin (North Sydney P-05), the east Sydney Basin (Hermine E-94), and peripheral wells of the Grand Banks (Gannet O-54, Sandpiper 2-J-77, Murre G-67). Table 4 summarizes their results for the Carboniferous/Devonian strata in these wells and shows amorphogen to be an important maceral in the marine Windsor Group as would be expected.

Kendall and Altebaumer (1984; proprietary report referenced in Mukhopadhyay, 2004) looked at maturity and geochemistry, including TOC, for the St. Paul P-91 well and recorded low TOC for the well. A high methane content of >1000 ppm from cuttings (Windsor and Horton Groups) was interpreted as possible contamination but three good gas and condensate-prone source rock zones were defined in the Pictou Group.

Mukhopadhyay (2004) analyzed samples from the onshore Sydney Basin and the North Sydney F-24 and P-05 offshore wells and provided TOC details for 63 samples and Rock-Eval pyrolysis data for 41 samples, and summarized in this report as Table 5.

The high TOC in the McAdams Lake Formation, which is an approximate age equivalent of the marine Marcellus Shale, may be significant. This Middle Devonian (late Emsian-early Eifellian) formation is known only from the outcrop on Cape Breton Island but could extend to the NE under the Sydney Basin (White and Barr, 1998). White and Barr provide additional information on this unit, noting that Smith and Naylor (1990) considered the older member to have humic rather than algal content while the upper member remained untested at that time. Hannigan and Dietrich (2012) list the McAdams Lake Formation as an oil-prone lacustrine and alluvial shale.

WELL	*TOC*	*TYPE OF ORGANIC MATTER*
North Sydney P-05	Highest in the Pictou Group (0.54-15.99%)	dominated by melanogen, hylogen, phyrogen
Hermine E-94	no TOC available	Pictou to Windsor groups dominated by melanogen, hylogen, phyrogen
Gannet O-54	no TOC available	Windsor Group - amorphogen, melanogen, hylogen, phyrogen: Horton Group - primarily melanogen, hylogen, phyrogen
Sandpiper 2-J-77	no TOC available	Windsor Group: mainly amorphogen, hylogen, phyrogen: Horton Group: primarily melanogen, hylogen, phyrogen
Murre G-67	no TOC available	

Table 4: Summary of kerogen and TOC data from Barss et al. (1980). In the Bujak et al. (1977) classification of organic matter: (1) amorphogen is structureless; (2) pyrogen is non-woody plant material including palynomorphs; (3) hylogen is derived from woody material; (4) melanogen is opaque.

FORMATION/GROUPS	*TOC MUKHOPADHYAY (2004)*	*COMMENTS*
McAdams Lake Fm.	1.67 to 9.28%	2.6-18.6% TOC lower member (review in White and Barr, 1998)
	McAdams Lake area (3 samples)	
Horton Group, Grantmire Fm.	0.03%- 0.37%,	
Windsor Group	0.1 to 2.12%	
Mabou Group	0.31- 2.58% grey to black shales	
	0.04% sandstone	
Cumberland Group	0.93 – 77.15% coal, coaly shale, grey shale	

Table 5. Summary of TOC by formation and group based on Mukhopadhyay (2004) with additional information from White and Barr (1998).

Calder et al. (2002) noted it falls within the oil window.The following summary of potential source rocks is from Hannigan and Dietrich (2012) who incorporated information from Macauley and Ball (1984), Gibling and Kalkreuth (1991), Mukhopadhyay (1991) and Mukhopadhyay (2002; 2004), Mossman (1992), and Pascucci et al. (2000). In the Hannigan and Dietrich (2012) compilation, they show the source rock and reservoir intervals on a stratigraphic column for the Sydney Basin (see our Figure 32). Their key points are as follows:

- McAdams Lake Formation (Devonian): lacustrine and alluvial shale (oil-prone)
- Horton/Anguille Group: lacustrine (oil-prone) fluvio-deltaic shale (gas-prone) TOC of black shale frequently >2% and can reach 20%
- Windsor/Codroy Group: marine carbonate and shale (oil- and gas-prone) Type II and III kerogens, up to 5% TOC
- Mabou/Barachois Group: fluvio-deltaic shale and coal (gas-prone)
- Pictou/Morien Group: fluvio-deltaic shale (oil- and gas-prone) and coal (gas-prone) coal measures: Type II and III organic matter, TOC values of up to 40%. Type III kerogens dominant.

In addition to conventional gas plays, coal measures in the Sydney Basin are widespread and a potential source of gas in the form of coal-bed methane. The extent of the coal measures, mapped by Grant and Moir (1992), Hacquebard (2002), Masson and Rust (1990), and the potential for coal-bed methane is discussed in Hacquebard (2002) and Hannigan and Dietrich (2012).

Thermal maturation data in the public domain for onshore and offshore wells can be accessed through the Natural Resources Canada, Earth Sciences Sector, Basin Database, and forms the basis for some of the vitrinite plots used in our compilations. Other sets of vitrinite data generated from other non-government sources are presented in other publications including Mukhopadhyay (2004) and Mossman (1992).

Vitrinite data from onshore sources has been presented in numerous publications such as:

- the Hacquebard and Donaldson (1970) summary study of coal maturity and hydrocarbon prospectivity in the Atlantic provinces, and including the Sydney Basin
- Late Carboniferous carbonaceous limestones and shales of Nova Scotia, immature with Ro < 0.5% which is lower than the accompanying coals. (Gibling and Kalkreuth, 1991)

- Horton Group, Nova Scotia, with low TAI (2 to 3) to high TAI (4 to 5?) (Utting and Hamblin, 1991).

Mossman (1992) assessed the source rock potential for the Carboniferous rocks of the western Sydney Basin as well as the strata east and south of Newfoundland. The latter were characterized as mostly strongly overmature, but based on the recovery of Horton Group strata within the oil window in a Grand Banks well, could have some potential for oil generation (see also TAI Gannet O-54, Barss et al., 1980). Mossman also postulated that the type I kerogen associated with the Horton Group could withstand greater burial depths than other kerogen types and still generate hydrocarbons.

Thermal maturation across the offshore Sydney Basin is variable and this is evident in the plots of data from the North Sydney P-05 and F-34 wells, compared with the St. Paul P-91 well at the western margin of the basin (Figures 33 and 34), and the Hermine E-94 well in the eastern Sydney Basin (Avery, 1987).

Mukhopadhyay (2004) and Mossman (1992) summarized vitrinite data from a number of reports from the onshore and offshore Sydney Basin. This data shows:

- Cumberland Group coal seams: 0.6 to 1.0% Ro for most surface and near-surface coals (Avery in unpublished GSC reports 1977-1985 and Mukhopadhyay, 1992);
- Horton Group, Macumber Formation, and Cumberland Group: range of 0.73 to 1.16% Ro (Mossman, 1992, in a review of Hacquebard, 1986);
- North Sydney F-24 and P-05 wells (Figure 33): 0-1000 m rapid increase from 0.5 to 0.85% Ro, 1000-1700 m very little increase. North Sydney P-05 approaches 1.8% (overmature) near TD (Mukhopadhyay, 2004);
- St. Paul P-91 well (Figure 34): vitrinite reflectance 0.97% at 690 m to 3.19% at 2833 m, so mostly overmature (Kendall and Altebaumer, 1984 proprietary report referenced in

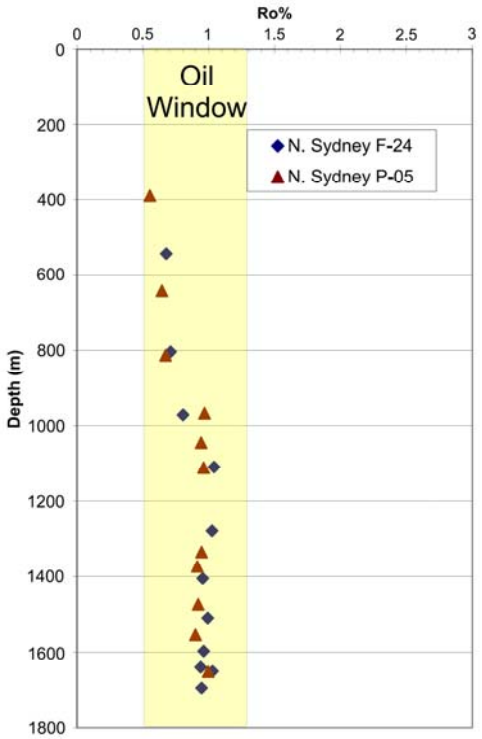


Figure 33: North Sydney F-24 and P-05 in northwest Sydney Basin and near Cabot Strait remain in the oil window . Figure from Mukhopadhyay (2000).

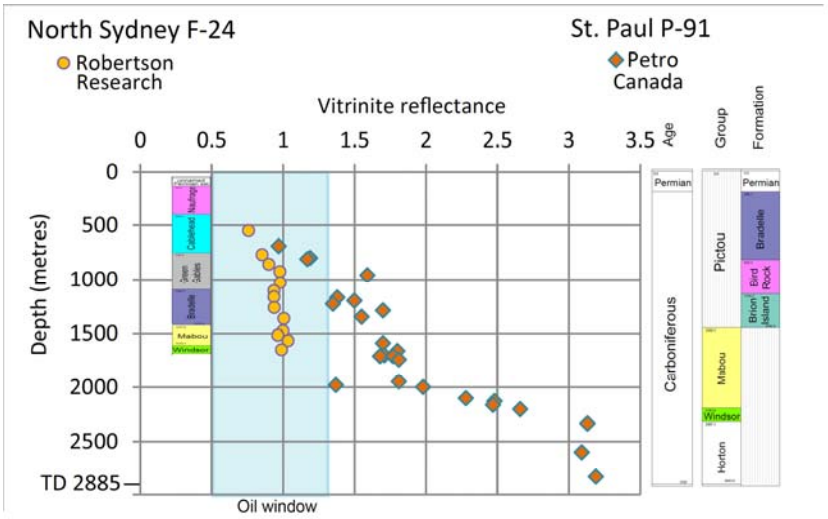


Figure 34: St Paul P-91 on the fault zone separating Sydney and Magdalen basins is overmature and well outside the oil window. Composite figure derived from Mukhopadhyay (2000).

Mukhopadhyay, 2004); most of the Carboniferous within the gas generation window (Hannigan and Dietrich, 2012);

- Hermine E-94 well: oil window lost, as Ro jumps from 0.5 to 1.82 at Carboniferous/Cretaceous unconformity; peak maturation of Carboniferous strata before Mesozoic erosion and sedimentation (Avery, 1987).

Mukhopadhyay's assessment of 63 samples from the west Sydney Basin onshore and the North Sydney wells concluded that vitrinite reflectance showed all samples to be within the " the so-called oil window (0.5 – 1.35% Ro)" (Mukhopadhyay, 2004).

Hannigan and Dietrich (2012) provide the following assessment of maturation for the Magdalen and Sydney Basins:

- Highest maturation (on surface) in onshore basin margins (gas generation window or over-mature);
- Offshore strata are within the oil window (at surface) for most areas;
- Peak hydrocarbon generation during late Carboniferous to Permian;
- For the Maritimes Basin, maturation models indicate post-Permian uplift and erosion of 1000-4000 m of strata.

Pascucci et al. (2000) stress that because of the polycyclic history of the Sydney Basin, strata may have passed through several phases of hydrocarbon generation. In addition, the basin fill today is at moderate depths as a result of the removal of considerable thickness of strata from the early Mesozoic or possibly earlier.

In summary, an extensive database already exists for the onshore Nova Scotia part of the Sydney Basin and the three nearshore wells. The west Sydney Basin wells are within the oil window (North Sydney F-24 and P-05) or mostly overmature (St. Paul P-91), but as noted by Mukhopadhyay (2004), the North Sydney F-24 and P-05, St. Paul P-91 wells are close to a major fault zone and this could influence maturation due to hydrothermal activity along the faults and results may not be typical. As is generally the case for the Maritimes Basin, data from the offshore is sparse, and in the case of the Sydney Basin, is concentrated on or peripheral to the basin margins. In the east Sydney Basin, Carboniferous strata in the Hermine E-94 well have a

different burial history from the west basin and are overmature. A complex series of grabens and folds and salt diapirs characterize different parts of this polycyclic basin. The general paucity of well data from the offshore east basin, and of both well data and seismic data from the central part of the basin, sets constraints on high resolution modelling within these areas, especially within the area bordering the St. Pierre-Miquelon corridor.

Traps, Seals and Reservoirs

In Nova Scotia, reservoir quality for the Sydney Basin was assessed as a part of a comprehensive assessment of well porosity and permeability data for the Maritimes Basin (Bibby and Shimeld, 2000). These authors compiled reservoir data which summarized all public domain data then available for the Permian to Carboniferous sandstones of the Maritimes Basin, primarily well logs and core samples (cores from 24 onshore/offshore wells and 202 core samples from the Sydney Coalfield) as well as two outcrop reservoir studies, and clay mineral analyses, and used the data which they considered to be reliable, while excluding the data they deemed questionable from the plots. Hu and Dietrich (2008, 2010) among others provide more recent reservoir information for the Sydney Basin, and specific information on the North Sydney F-24 and Hermine E-94 wells.

Specific details of porosity and permeability for Sydney Basin offshore wells are provided in the following publications, but are discussed in others:

- North Sydney F-24: Hu and Dietrich 2008, 2010; Bibby and Shimeld (2000) core and well logs;
- North Sydney P-05: *Bibby and Shimeld (2000) well logs;
- Hermine E-94: Hu and Dietrich 2010; * Bibby and Shimeld (2000) well logs;
- St. Paul P-91: Bibby and Shimeld (2000) core and well logs.

*Questionable data quality according to Bibby and Shimeld (2000).

Hu and Dietrich (2010) assessed porosity and permeability for Carboniferous strata from North Sydney F-24 and Hermine E-94, expanding on the earlier work of Hu and Dietrich (2008) which dealt only with the North Sydney F-24 well for the Sydney Basin. A summary of sandstone porosity for the North Sydney F-24 well is given in Table 7 of Hu and Dietrich (2008: and reproduced here as Table 4) while a graphic plot of porosity and permeability for the

Carboniferous strata of the North Sydney F-24 and Hermine E-94 wells is given in Fig. 7 of Hu and Dietrich (2010), and sandstone porosity depth trends based on these wells are plotted in their Figs. 9 to11. Figures based on these two wells show that porosity spans the 7.5% line between conventional and non-conventional porosity in the western part of the Sydney Basin, although it is skewed towards conventional figures (North Sydney F-24), while in the eastern Sydney Basin (Hermine E-94), where Carboniferous strata are overlain by approximately 1.6 km of Cenozoic and Mesozoic strata, the plot lies almost entirely within the range for non-conventional reservoirs, except for three intervals of greater porosity, likely reflected secondary porosity. The summary assessment of North Sydney F-24 core samples by Hu and Dietrich (2008) states that most samples have porosities between 6-12% and permeabilities between 0.01 to 1.0 md. Based on well logs, the best quality porosity is 20% and permeability 100 md for this well (Hu and Dietrich, 2010). Overall, porosity and permeability decreases with depth in the Sydney Basin (Hu and Dietrich, 2010).

Unit	Porosity (%)					Permeability (md)			
	<3	3 - 6	6 - 9	9 - 12	>12	0.01~0.1	0.1~1	1~10	>10
Naufrage Fm.	0	0	0	70	30	0	72	18	10
Cable Head Fm.	0	4	41	46	9	28	63	8	1
Green Gables Fm.	1	14	47	33	5	40	55	3	2
Bradelle Fm.	0	7	60	26	7	48	45	6	1
Mabou Gp.	4	39	33	20	4	57	38	4	1
Windsor Gp.	0	5	79	16	0	57	43	0	0

Table 4: North Sydney F-24 well showing percentage of sandstone beds in each formation and group with indicated porosity and permeability ranges. Modal values are highlighted. Table redrawn from Table 7 of Hu and Dietrich (2008).

Compared to the Magdalen Basin, Hu and Dietrich (2010) concluded that, based on the studied wells, the Sydney Basin had "the poorest reservoir quality, with the lowest average porosity over most depth intervals".

The earlier report by Bibby and Shimeld (2000) included data plots for the two North Sydney wells, F-24 and P-05, as well as the St. Paul P-91 well in their reservoir study. As would be expected, their plots for the North Sydney wells are comparable to those of Hu and Dietrich for North Sydney F-24, with median values of 7.9-10.2 p.u. for both wells from well logs (Bibby and Shimeld, 2000). Two cores from North Sydney F-24 plot mostly in the 5-10% porosity range with permeability mainly in the 0.001 to just over 0.1md range (Bibby and Shimeld, 2000).

Based on geophysical logs, they reported generally very low porosities (<5 p.u. effective porosity) for the St. Paul P-91 well, with minor streaks of higher porosity (Bibby and Shimeld, 2000, fig. 17). Two core samples from the Horton Group (2883-2884.75 m) show porosities of 7% and 9%, with permeabilities between 0.001 and 0.1 md.

A general assessment of reservoir potential for the Sydney Basin includes recent studies by Enachescu (2006), Hu and Dietrich (2008, 2010), Dietrich et al. (2011), and Hannigan and Dietrich (2012). Hannigan and Dietrich (2012, p. 7) considered the main reservoir sandstones to represent " lacustrine shoreface, deltaic-fluvial channel fills, alluvial fans, and multi-storied fluviatile channels" distributed among the (i.) McAdams Lake Formation; (ii.) Horton/Anguille Group; (iii.) Mabou/Barachois Group; and (iv.) Bradelle and Cable Head formations in the Pictou/Morien Group and, potentially,(v.) marine carbonate rocks of the Windsor/Codroy Group. The distribution of potential petroleum plays is presented diagrammatically in Dietrich et al. (2011) and Hannigan and Dietrich (2012).

Based on the previous discussion, the following are factors to consider in assessing reservoir potential in the Sydney Basin:

- Porosity and permeability decreases with depth in the western Maritimes Basin sandstones (Bibby and Shimeld, 2000; Hu and Dietrich, 2010);
- Based on the wells examined by Hu and Dietrich (2010), the Sydney Basin has the poorest reservoir quality;

- The Sydney Basin is complex and laterally variable, and only a limited number of wells have provided the data discussed here which may not be representative of the entire basin from west to east; the North Sydney and St. Paul P-91 wells, for example, were drilled on structural highs (Enachescu, 2006).
- Porosity is quite variable across the entire Maritimes Basin, and the tested areas may not be representative spatially or stratigraphically;
- Since higher porosities occur in other wells in the Maritimes Basin not cited above, secondary porosities could be higher in untested parts of the basin (Bibby and Shimeld, 2000)
- Horton and Windsor Group sandstones potentially could be better reservoir rocks (Kendell and Harvey, 2006)
- Only thin intervals of Horton and/or Windsor Group strata have been drilled in the North Sydney wells; thicker sections have been drilled at the western and eastern limits of the Sydney Basin (HG: St. Paul P-91; WG: Hermine E-94) and onshore (H&WG: Birch Grove No. 1, no hydrocarbon accumulations or shows; Hannigan and Dietrich, 2012);
- Windsor Group carbonates show good porosity onshore on Cape Breton Island and are also preserved on the Burin Peninsula of Newfoundland;
- The porosity database for the entire Maritimes Basin is skewed towards the Upper Carboniferous Morien/Pictou Group (Bibby and Shimeld, 2000)

Seals and traps were accessed by Hannigan and Dietrich (2012) who noted that there are many effective seals over a widespread area. These include:

- Thick halite deposits in the middle Windsor/Codroy Group seal reservoirs in the McAdams Lake Formation, Horton/Anguille Group and lower Windsor/Codroy Group;
- Thick shale intervals in the Mabou and Pictou/Morien groups are potential seals (shale seals in the Stoney Creek, McCully, and East Point fields).

Potential traps described by Enachescu (2008, fig. 5 and summarized in Hannigan et al., 2012) include:

- faultblocks;
- roll-over anticlines, transpressional anticlines;

- salt-diapir structures (central and eastern Sydney Basin);
- Windsor Group carbonate reefs;
- onlap of sandstone onto basement highs or sub-basin margins;
- unconformity truncations.

Overall, low porosity and permeability is a risk factor for most of the Sydney Basin reservoir rocks if only conventional porosity is considered.

Potential plays in the Sydney Basin

The three conventional plays identified by Lavoie et al. (2009) in their assessment of petroleum potential of the Carboniferous-Permian strata of the Maritimes Basin are all represented in the Sydney Basin and are discussed and presented diagrammatically in Hannigan and Dietrich (2012).

- Lower Carboniferous (Tournaisian-Visean) sandstones, Horton/Anguille Group, plus Middle Devonian sandstones, McAdams Lake Formation, which occur locally in the Sydney Basin. This play is restricted to the west Sydney Basin, offshore Nova Scotia and Newfoundland and was not identified in the east Sydney Basin (Hannigan and Dietrich, 2012).
- Lower Carboniferous (Visean) carbonate play, all marine carbonates of Windsor/Codroy Group, esp. Gays River bioherms. This play is known only from the west Sydney Basin (Hannigan and Dietrich, 2012).
- Upper Carboniferous (Namurian)-Early Permian sandstones, Mabou/Barachois and Pictou/ Morien groups. This play is known from both the west and east Sydney Basin (Hannigan and Dietrich, 2012).
- Unconventional coal bed methane play. This play is associated with the coal measures in the west Sydney Basin only (Hannigan and Dietrich, 2012), although coal measures are also present on the Burin Platform (King et al., 1986).

Rocks tend to be gas prone type 3 strata with some oil prone type 1 lacustrine algal deposits. Plays identified from regional studies include fault blocks and diapirs. With significant uplift and erosion documented, seal rock and trap integrity remain issues.

Summation

The knowledge base for the Sydney Basin is extensive, but is mostly derived from onshore studies on Nova Scotia outcrops, drill holes, drill cores and wells. This information is augmented by data from three offshore wells on the Nova Scotia side of the basin, a single well off the south coast of Newfoundland, and the peripheral wells on the Grand Banks. Much of the onshore and offshore information is in the public domain, or, if derived from internal reports, may be referenced in published studies. Nonetheless, there are a lot of internal studies which not available for general access. A number of comprehensive studies specific to the Sydney Basin and of a more regional nature have addressed many aspects of tectonics, stratigraphy, and petroleum potential. The lithostratigraphic and biostratigraphic framework developed primarily from onshore studies appears to be robust and applicable to the wells in the offshore Sydney Basin.

Seismic studies in the public domain are mainly older studies and quality of seismic data is often poor. Better quality recent studies such as the Husky Oil study are still confidential but will no doubt provide useful information on the structure of the west basin. There is very little available seismic data from the central part of the basin. The east basin, except near the eastern margins where the Sydney Basin and Mesozoic basins overlap on the Grand Banks, also has poor seismic coverage. High resolution analysis of petroleum systems associated with complex fault systems and diapirs in the central and eastern parts of the Sydney Basin is limited in scope given the available seismic database.

Vitrinite data from onshore strata, and from the few offshore wells which have been drilled is available through the databases and publications cited earlier. Reservoir studies of porosity and permeability are also available for the wells, but again, coverage is peripheral, and most data is from the onshore west basin. Variability in thermal maturation apparently occurs across the basin, and the details of exhumation and burial for localized fault basins can only be postulated but not accessed without good quality seismic data at the least, and well data at best.

Biostratigraphic zonations for the Sydney Basin and Atlantic region were originally based on plant macrofossils, but have been supplemented by zonations based on palynology which are readily applied to suitable strata in the subsurface. Numerous publications and open-file reports

are in the public domain. These palynostratigraphic zonations have been modified and are still in a process of revision but our assessment is that these biostratigraphic units are of good resolution and regionally applicable.

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2013c: Vulcan Investcan Flat Bay Test Hole #6. Final Well Report, 151 p. Available from http://www.nr.gov.nl.ca/nr/publications/energy//FBTH6_FWR.pdf

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Appendix 1

Tables of location information for samples, geophysical data and reports held by government agencies.

CANADA NEWFOUNDLAND AND LABRADOR OFFSHORE PETROLEUM BOARD (CNLOPB)

Formation Tests - Exploration and Delineation Wells, as of February 2014

Well Name	Well #	Classification	Land Tenure Region	Age	Formation	Test #	Test Top	Test Base	Test Type	Gas/ Oil/ Other Fluids	Recovery
Long Range A-09	142	Exploration	WNL	Early Ordovician	Catoche	1	3436.0	3461.0	DST	Other	Recovered 2.42 m^3 of slightly gas cut salt water (190,000ppm Cl-), fresh water cushion and drilling mud.
Long Range A-09	142	Exploration	WNL	Early Ordovician	Costa Bay Member	2	3308.5	3327.0	DST	Other	Misrun
Long Range A-09	142	Exploration	WNL	Early Ordovician	Costa Bay Member	3	3308.5	3327.0	DST	Other	No recovery
Long Range A-09	142	Exploration	WNL	Early Ordovician	Catoche	4	3343.0	3361.5	DST	Other	Recovered drilling mud
Shoal Point K-39	159	Exploration	WNL	Early Ordovician	HAA Shale	1	1251.5	1260.5	DST	Other	Recovered 375 m^3 salt water, 2 m^3 sand
Shoal Point 3K-39	365	Exploration	WNL	Early Ordovician	HAA Shale	1A	1287.0	1325.0	DST	Other	2.673 m^3 drilling mud
Shoal Point 3K-39	365	Exploration	WNL	Early Ordovician	HAA Shale	1B	1293.0	1331.0	DST	Other	1 m^3 drilling mud
Shoal Point 3K-39	365	Exploration	WNL	Early Ordovician	HAA Shale	2A	1293.0	1331.0	DST	Other	Misrun
Shoal Point 3K-39	365	Exploration	WNL	Early Ordovician	HAA Shale	2B	1283.0	1321.0	DST	Other	Misrun
Shoal Point 3K-39	365	Exploration	WNL	Early Ordovician	HAA Shale	3A	1288.0	1326.0	DST	Other	Misrun
Shoal Point 3K-39	365	Exploration	WNL	Early Ordovician	HAA Shale	3B	1288.0	1326.0	DST	Other	Misrun
Shoal Point 3K-39	365	Exploration	WNL	Early Ordovician	HAA Shale	4A	1068.5	1108.5	DST	Other	Misrun
Shoal Point 3K-39	365	Exploration	WNL	Early Ordovician	HAA Shale	4B	1069.5	1107.5	DST	Other	Misrun

C-NLOPB Geoscientific Reports, as of March 2014	
Title	**Land Tenure Region(s)**
GL-CNOPB-88-03 - 1988 Southern Grand Banks Geology and Hydrocarbon Potential	Regional - Southern Newfoundland, Southeastern Newfoundland
GP-CNOPB-99-01 - Canada-Newfoundland and Labrador Offshore Petroleum Board - 1999 S Whale And Laurentian Reservoir Geology	Regional - Southern Newfoundland, Western Newfoundland and Labrador
GP-CNOPB-93-01 - Canada-Newfoundland and Labrador Offshore Petroleum Board - 1993 Former Moratorium Area Regional Mapping	Southern Newfoundland
GL-CNOPB-90-01 - 1990 A Review Of the Upper Precambrian and Lower Paleozoic Geology of Western Newfoundland and the Hydrocarbon Potential of the Adjacent Offshore Area of the Gulf of St. Lawrence	Western Newfoundland and Labrador
GL-CNOPB-92-01 - 1992 Review Geological and Hydrocarbon Potential Carboniferous Bay St. George Sub-Basin By Ian Sinclair	Western Newfoundland and Labrador

Natural Resources Canada, Geological Survey of Canada, Geoscience Data Repository, BASIN Database (as of March 26, 2014)

Project	Company	Year	Area	Status	Geophysical Type	Approx. Release Date	Nav	Digital Data	Description
CABOT STRAIT									
8924-H032-008E	HUSKY OIL	2010	CABOT STRAIT	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	21-Jan-16	N		3005 KM SYDNEY BASIN 2-D SEISMIC SURVEY COMPLETED 21-JUL-2010
NS24-H033-001P	HUNT OIL	2005	SCOTIAN SHELF/CABOT STRAIT	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	20-May-16	N		940.25 KMS OF 2-D SEISMICS (SYDNEY BIGHT) COMPLETED 20-NOV-2005
LITHOPROBE 1986	GSC (ATLANTIC)	1986	G. OF ST. LAWR/CABOT STRAIT/SCOTIAN SHELF	COMPLETED	SEISMIC REFLECTION SURVEY (DEEP)	released	Y		GULF OF ST. LAWRENCE AREA DEEP SEISMIC REFLECTION SURVEY
8624-P028-056E	PETRO-CANADA	1983	G. OF ST. LAWR/CABOT STRAIT	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y	digital data available from the CNSOPB DMC	1983 MARINE REFLECTION SEISMIC, GRAVITY & MAGNETIC SURVEY - ST. PAUL, CABOT STRAIT, NOVA SCOTIA AND NEWFOUNDLAND
8624-P028-057E	PETRO-CANADA	1983	SCOTIAN SHELF/CABOT STRAIT	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y	digital data available from the CNSOPB DMC	1983 MARINE REFLECTION SEISMIC, GRAVITY & MAGNETIC SURVEY - SYDNEY BASIN
N.S. NEARSHORE NO. 47	PETRO-CANADA	1983	NOVA SCOTIA (NEARSHORE)/CABOT STRAIT	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	N		OFFSHORE ST. PAUL ISLAND, CABOT STRAIT (SEISMIC PROJECT #47 IN NSDME PUBLICATION INFORMATION SERIES #14)
N.S. NEARSHORE NO. 50	PETRO-CANADA	1983	NOVA SCOTIA (NEARSHORE)/CABOT STRAIT	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	N		OFFSHORE INGONISH-SYDNEY, VICTORIA & CAPE BRETON COUNTIES (SEISMIC PROJECT #50 IN NSDME PUBLICATION INFORMATION SERIES #14)
8624-P028-035E	PETRO-CANADA	1982	G. OF ST. LAWR/CABOT STRAIT/SCOTIAN SHELF	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y	digital data available from the CNSOPB DMC	1982 MARINE REFLECTION SEISMIC, GRAVITY & MAGNETIC SURVEY - CABOT STRAIT
8626-P028-009E	PETRO-CANADA	1982	CABOT STRAIT	COMPLETED	SHALLOW SEISMIC, SEABED SURVEY	released	N	digital data available from the CNSOPB DMC	WELLSITE SURVEY FOR CABOT STRAIT AREA
8624-P028-025E	PETRO-CANADA	1981	G. OF ST. LAWR/CABOT STRAIT/SCOTIAN SHELF	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y	digital data available from the CNSOPB DMC	MARINE REFLECTION SEISMIC, GRAVITY & MAGNETIC SURVEY - CABOT STRAIT
N.S. NEARSHORE NO. 39	PETRO-CANADA	1981	NOVA SCOTIA (NEARSHORE)/CABOT STRAIT/ASPY BAY	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	N		ASPY BAY, VICTORIA CO. (SEISMIC PROJECT #39 IN NSDME PUBLICATION INFORMATION SERIES #14)
N.S. NEARSHORE NO. 34	N.S. DEPT OF MINES	1978	NOVA SCOTIA (NEARSHORE)/CABOT STRAIT	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	N		OFFSHORE SYDNEY, CAPE BRETON CO. (SEISMIC PROJECT #34 IN NSDME PUBLICATION INFORMATION SERIES #14)
N.S. NEARSHORE NO. 32	N.S. DEPT OF MINES	1977	NOVA SCOTIA (NEARSHORE)/CABOT STRAIT/ST. ANNS BANK	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	N		OFFSHORE PORT MORIEN, CAPE BRETON CO. (SEISMIC PROJECT #32 IN NSDME PUBLICATION INFORMATION SERIES #14)
8627-M006-006E	MURPHY OIL	1976	CABOT STRAIT	COMPLETED	REPROCESSING/REINTERPRETATION	released	N	digital data available from the CNSOPB DMC	1975 EXPERIMENTAL DATA PROCESSING - CABOT STRAIT
8620-M006-003E	MURPHY OIL	1974	G. OF ST. LAWR/CABOT STRAIT	COMPLETED	COMBINED GEOPHYSICAL SURVEY	released	Y	digital data available from the CNSOPB DMC	EXPERIMENTAL REFLECTION SEISMIC SURVEY, OFFSHORE CAPE BRETON ISLAND
8624-T007-011E	TEXACO CANADA	1974	SCOTIAN SHELF/CABOT STRAIT/G. OF ST. LAWR	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y	digital data available from the CNSOPB DMC	CABOT STRAIT GEOPHYSICAL SURVEY
8620-T007-007E	TEXACO CANADA	1973	SCOTIAN SHELF/CABOT STRAIT/G. OF ST. LAWR	COMPLETED	COMBINED GEOPHYSICAL SURVEY	released	Y		GEOPHYSICAL SURVEY, CABOT STRAIT
N.S. NEARSHORE NO. 22	TEXACO CANADA	1973	NOVA SCOTIA (NEARSHORE)/CABOT STRAIT	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	N		CABOT STRAIT (SEISMIC PROJECT #22 IN NSDME PUBLICATION INFORMATION SERIES #14)
N.S. NEARSHORE NO. 23	TEXACO CANADA	1973	NOVA SCOTIA (NEARSHORE)/CABOT STRAIT	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	N		CABOT STRAIT (SEISMIC PROJECT #23 IN NSDME PUBLICATION INFORMATION SERIES #14)
8620-M006-002E	MURPHY OIL	1972	G. OF ST. LAWR/CABOT STRAIT/SCOTIAN SHELF	COMPLETED	COMBINED GEOPHYSICAL SURVEY	released	Y	digital data available from the CNSOPB DMC	REFLECTION SEISMIC SURVEY OF A PART OF CABOT STRAIT

Project	Company	Year	Area	Status	Geophysical Type	Approx. Release Date	Nav	Digital Data	Description
8620-A004-005E	AMOCO CANADA	1971	G. OF ST. LAWR/CABOT STRAIT	COMPLETED	COMBINED GEOPHYSICAL SURVEY	released	Y	digital data available from the CNSOPB DMC	GULF OF ST. LAWRENCE & CABOT STRAIT SURVEY
8620-G005-001P	GSI	1971	CABOT STRAIT/LAURENTIAN SUBBASIN/GRAND BANKS/NE NFLD SHELF/LABRADOR SHELF	COMPLETED	COMBINED GEOPHYSICAL SURVEY	released	N		REGIONAL NON-EXCLUSIVE SURVEY
8620-T007-005E	TEXACO CANADA	1971	G. OF ST. LAWR/CABOT STRAIT/SCOTIAN SHELF	COMPLETED	COMBINED GEOPHYSICAL SURVEY	released	Y	digital data available from the CNSOPB DMC	MARINE VIBROSEIS SURVEY, CABOT STRAIT
8624-D001-003P	DIGICON	1971	SCOTIAN SHELF/SCOTIAN SLOPE/CABOT STRAIT/GRAND BANKS	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y		NON-EXCLUSIVE REGIONAL SURVEY - SCOTIAN SHELF AND GRAND BANKS
8624-M006-001E	MURPHY OIL	1971	G. OF ST. LAWR/CABOT STRAIT/SCOTIAN SHELF	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y		REFLECTION SEISMIC SURVEY, CABOT STRAIT, OFFSHORE CAPE BRETON ISLAND
8627-T007-009E,10E,14E	TEXACO CANADA	1971	CABOT STRAIT	COMPLETED	REPROCESSING/REINTERP RETATION	released	N		REPROCESSING OF 8624-C015-001P/2P, 8624-T007-004E, GRAVITY & MAGNETICS REPROCESSING
N.S. NEARSHORE NO. 07	TEXACO CANADA	1971	NOVA SCOTIA (NEARSHORE)/CABOT STRAIT	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	N		CABOT STRAIT (SEISMIC PROJECT #07 IN NSDME PUBLICATION INFORMATION SERIES #14)
N.S. NEARSHORE NO. 14	TEXACO CANADA	1971	NOVA SCOTIA (NEARSHORE)/CABOT STRAIT	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	N		CABOT STRAIT (SEISMIC PROJECT #14 IN NSDME PUBLICATION INFORMATION SERIES #14)
N.S. NEARSHORE NO. 16	MURPHY OIL	1971	NOVA SCOTIA (NEARSHORE)/CABOT STRAIT	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	N		OFFSHORE BAY ST. LAWRENCE, OFFSHORE SYDNEY (SEISMIC PROJECT #16 IN NSDME PUBLICATION INFORMATION SERIES #14)
8620-M006-001E	MURPHY OIL	1970	G. OF ST. LAWR/CABOT STRAIT/SCOTIAN SHELF	COMPLETED	COMBINED GEOPHYSICAL SURVEY	released	Y	digital data available from the CNSOPB DMC	REFLECTION SEISMIC SURVEY OF A PART OF CABOT STRAIT AND LAURENTIAN CHANNEL
8624-C015-002P,3P,4P	CATALINA EXPLORATION	1970	SCOTIAN SHELF/GRAND BANKS/G. OF ST. LAWR/NORTHUMBERLAND STRAIT/CABOT STRAIT	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y		1970 PARTICIPATION SURVEY: GULF OF ST. LAWRENCE, GRAND BANKS AND SCOTIAN SHELF
8624-T007-006E	TEXACO CANADA	1970	SCOTIAN SHELF/G. OF ST. LAWR/CABOT STRAIT/OFFSHORE W NFLD	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y	digital data available from the CNSOPB DMC	MARINE VIBROSEIS SURVEY, CABOT STRAIT
8626-M006-001E	MURPHY OIL	1970	G. OF ST. LAWR/CABOT STRAIT	COMPLETED	SHALLOW SEISMIC, SEABED SURVEY	released	N		GULF OF ST. LAWRENCE & CABOT STRAIT SURVEY
8627-T007-001DA	TEXACO CANADA	1970	CABOT STRAIT	COMPLETED	REPROCESS/REINTERPRET OF ACQUIRED DATA	released	N		CABOT STRAIT SURVEY - ASSOCIATED WITH 8624-T007-006E
N.S. NEARSHORE NO. 12	TEXACO CANADA	1970	NOVA SCOTIA (NEARSHORE)/NORTHUMBERLAND STRAIT/CABOT STRAIT	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	N		NORTHUMBERLAND STRAIT-CABOT STRAIT (SEISMIC PROJECT #12 IN NSDME PUBLICATION INFORMATION SERIES #14)
8624-C015-001P	CATALINA EXPLORATION	1969	SCOTIAN SHELF/SCOTIAN SLOPE/GRAND BANKS/G. OF ST. LAWR/CABOT STRAIT/LABRADOR SHELF	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y		REGIONAL NON-EXCLUSIVE SURVEY
8624-T007-004E	TEXACO CANADA	1969	G. OF ST. LAWR/CABOT STRAIT/SCOTIAN SHELF	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y	digital data available from the CNSOPB DMC	1969 MARINE VIBROSEIS SURVEY, CABOT STRAIT
8624-A004-004E	AMOCO CANADA	1968	G. OF ST. LAWR/CABOT STRAIT	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y	digital data available from the CNSOPB DMC	GULF OF ST. LAWRENCE & CABOT STRAIT SURVEY
N.S. NEARSHORE NO. 11	PAN AMERICAN	1968	NOVA SCOTIA (NEARSHORE)/CABOT STRAIT	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	N		OFFSHORE CAPE ST. LAWRENCE (SEISMIC PROJECT #11 IN NSDME PUBLICATION INFORMATION SERIES #14)
8624-D004-001P	DELTA EXPLORATION	1967	G. OF ST. LAWR/CABOT STRAIT	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y		REGIONAL MARINE VIBROSEIS SURVEY, GULF OF ST. LAWRENCE & NORTHERN ATLANTIC
GULF OF ST LAWRENCE									

Project	Company	Year	Area	Status	Geophysical Type	Approx. Release Date	Nav	Digital Data	Description
8926-C137-001E	CORRIDOR RESOURCES	2010	G. OF ST. LAWR/OFFSHORE W NFLD	COMPLETED	SHALLOW SEISMIC, SEABED SURVEY	18-Apr-16	N		MARITIMES BASIN (OLD HARRY PROSPECT) GEOHAZARD SURVEY COMPLETED 18-OCT-2010
8924-G005-019P	GSI	2008	G. OF ST. LAWR/OFFSHORE W NFLD	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	23-Jun-19	N		2555 KM (OF A PLANNED 7842 KM) NON-EXCLUSIVE ANTICOSTI BASIN 2-D SEISMIC PROGRAM COMPLETED 23-DEC-2008
8927-C137-001E	CORRIDOR RESOURCES	2003	G. OF ST. LAWR	COMPLETED	REPROCESS/REINTERPRET OF ACQUIRED DATA	released	N		PURCHASE OF 2002 NON-EXCLUSIVE GULF OF ST. LAWRENCE DATA
NS24-C137-001P	CORRIDOR RESOURCES	2003	G. OF ST. LAWR	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	25-Jun-14	N		505.6 KMS OF 2-D SEISMICS (OFFSHORE WESTERN CAPE BRETON ISLAND) COMPLETED 25-DEC-2003
8924-G005-009P	GSI	2002	G. OF ST. LAWR/OFFSHORE W NFLD	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	N		743 KM 2-D SEISMIC SURVEY (WESTERN NEWFOUNDLAND & GULF OF ST. LAWRENCE) COMPLETED 15-DEC-2002
8924-C137-001E	CORRIDOR RESOURCES	1998	G. OF ST. LAWR/OFFSHORE W NFLD	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	N		90 KMS OF 2-D SEISMICS (OFFSHORE WESTERN NEWFOUNDLAND AND ANTICOSTI ISLAND)
8627-D003-001E	DOME PETROLEUM	1994	G. OF ST. LAWR/NORTHUMBERLAND STRAIT	COMPLETED	REPROCESSING/REINTERPRETATION	released	N	digital data available from the CNSOPB DMC	NORTHUMBERLAND AREA 1983 SEISMIC REPROCESSING
LITHOPROBE 1986	GSC (ATLANTIC)	1986	G. OF ST. LAWR/CABOT STRAIT/SCOTIAN SHELF	COMPLETED	SEISMIC REFLECTION SURVEY (DEEP)	released	Y		GULF OF ST. LAWRENCE AREA DEEP SEISMIC REFLECTION SURVEY
N.S. NEARSHORE NO. 52	N.S. DEPT OF MINES	1985	NOVA SCOTIA (NEARSHORE)/NORTHUMBERLAND STRAIT/G. OF ST. LAWR	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	N		OFFSHORE PORT HOOD, INVERNESS CO. (SEISMIC PROJECT #52 IN NSDME PUBLICATION INFORMATION SERIES #14)
N.S. NEARSHORE NO. 53	N.S. DEPT OF MINES	1985	NOVA SCOTIA (NEARSHORE)/NORTHUMBERLAND STRAIT/G. OF ST. LAWR	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	N		OFFSHORE INVERNESS, INVERNESS CO. (SEISMIC PROJECT #53 IN NSDME PUBLICATION INFORMATION SERIES #14)
8624-G005-010P	GSI	1983	G. OF ST. LAWR	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	N		EXPERIMENTAL LINES, GULF OF ST. LAWRENCE
8624-G022-001E,2E	GOLDEN EAGLE	1983	G. OF ST. LAWR	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y	digital data available from the CNSOPB DMC	GULF OF ST. LAWRENCE SURVEY
8624-P028-056E	PETRO-CANADA	1983	G. OF ST. LAWR/CABOT STRAIT	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y	digital data available from the CNSOPB DMC	1983 MARINE REFLECTION SEISMIC, GRAVITY & MAGNETIC SURVEY - ST. PAUL, CABOT STRAIT, NOVA SCOTIA AND NEWFOUNDLAND
8626-C047-001E	CHEVRON	1983	G. OF ST. LAWR	COMPLETED	SHALLOW SEISMIC, SEABED SURVEY	released	N	digital data available from the CNSOPB DMC	WELLSITE SURVEY FOR CABLEHEAD E-95
8626-P028-010E	PETRO-CANADA	1983	G. OF ST. LAWR	COMPLETED	SHALLOW SEISMIC, SEABED SURVEY	released	N	digital data available from the CNSOPB DMC	WELLSITE SURVEY FOR ST. PAUL P-91, GULF OF ST. LAWRENCE
8624-C004-013E	CHEVRON	1982	G. OF ST. LAWR/NORTHUMBERLAND STRAIT	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y	digital data available from the CNSOPB DMC	GEOPHYSICAL SURVEY, GULF OF ST. LAWRENCE
8624-C004-014E	CHEVRON	1982	G. OF ST. LAWR/NORTHUMBERLAND STRAIT/ST. GEORGES BAY (N.S.)	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y	digital data available from the CNSOPB DMC	GEOPHYSICAL SURVEY, NORTHUMBERLAND STRAIT, STANHOPE, CAPE TORMENTINE AND ST. GEORGES BAY AREAS (INCLUDES ALL OF 'N.S. OFFSHORE NO. 45')
8624-G005-006P	GSI	1982	SCOTIAN SHELF/SCOTIAN SLOPE/G. OF ST. LAWR	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	N		GULF OF ST. LAWRENCE, SCOTIAN SHELF AND CABOT STRAIT SPECULATIVE SURVEY
8624-P028-035E	PETRO-CANADA	1982	G. OF ST. LAWR/CABOT STRAIT/SCOTIAN SHELF	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y	digital data available from the CNSOPB DMC	1982 MARINE REFLECTION SEISMIC, GRAVITY & MAGNETIC SURVEY - CABOT STRAIT
8624-S014-012E	SOQUIP	1982	G. OF ST. LAWR	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y	digital data available from the CNSOPB DMC	1982 SEISMIC SURVEY, GULF OF ST. LAWRENCE
8624-S014-013E	SOQUIP	1982	G. OF ST. LAWR	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y	digital data available from the CNSOPB DMC	1982 SEISMIC SURVEY, GULF OF ST. LAWRENCE
8624-S014-014E	SOQUIP	1982	G. OF ST. LAWR	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y	digital data available from the CNSOPB DMC	1982 SEISMIC SURVEY, GULF OF ST. LAWRENCE
8626-T007-001E	TEXACO CANADA	1982	G. OF ST. LAWR	COMPLETED	SHALLOW SEISMIC, SEABED SURVEY	released	D	digital data available from the CNSOPB DMC	WELLSITE SURVEY FOR ALPHA SITE

Project	Company	Year	Area	Status	Geophysical Type	Approx. Release Date	Nav	Digital Data	Description
8624-C004-009E	CHEVRON	1981	G. OF ST. LAWR/NORTHUMBERLAND STRAIT/ST. GEORGES BAY (N.S.)	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y	digital data available from the CNSOPB DMC	GEOPHYSICAL SURVEY, NORTHUMBERLAND STRAIT (SAME AS 'N.S. OFFSHORE NO. 38')
8624-C004-010E	CHEVRON	1981	G. OF ST. LAWR	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y	digital data available from the CNSOPB DMC	GEOPHYSICAL SURVEY, GULF OF ST. LAWRENCE
8624-P028-025E	PETRO-CANADA	1981	G. OF ST. LAWR/CABOT STRAIT/SCOTIAN SHELF	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y	digital data available from the CNSOPB DMC	MARINE REFLECTION SEISMIC, GRAVITY & MAGNETIC SURVEY - CABOT STRAIT
8624-S014-008E	SOQUIP	1981	G. OF ST. LAWR	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y	digital data available from the CNSOPB DMC	1981 SEISMIC SURVEY, GULF OF ST. LAWRENCE
8624-S014-009E	SOQUIP	1981	G. OF ST. LAWR	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y	digital data available from the CNSOPB DMC	1981 REFLECTION SEISMIC SURVEY, GULF OF ST. LAWRENCE
8624-S014-010E	SOQUIP	1981	G. OF ST. LAWR	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y	digital data available from the CNSOPB DMC	1981 SEISMIC SURVEY, GULF OF ST. LAWRENCE
8624-S014-011E	SOQUIP	1981	G. OF ST. LAWR	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y	digital data available from the CNSOPB DMC	MARINE SEISMIC SURVEY, BANC BEAUGE & MECATINA AREAS
8624-C004-007E	CHEVRON	1980	G. OF ST. LAWR/NORTHUMBERLAND STRAIT	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y	digital data available from the CNSOPB DMC	GULF OF ST. LAWRENCE SURVEY
8626-H007-001E	HUDSONS BAY OIL	1980	G. OF ST. LAWR	COMPLETED	SHALLOW SEISMIC, SEABED SURVEY	released	N	digital data available from the CNSOPB DMC	WELLSITE SURVEYS FOR BEATON POINT F-70 & EAST POINT E-49
N.S. NEARSHORE NO. 33	N.S. DEPT OF MINES	1978	NOVA SCOTIA (NEARSHORE)/NORTHUMBERLAND STRAIT/G. OF ST. LAWR	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	N		OFFSHORE MABOU, INVERNESS CO. (SEISMIC PROJECT #33 IN NSDME PUBLICATION INFORMATION SERIES #14)
N.S. NEARSHORE NO. 30	N.S. DEPT OF MINES	1977	NOVA SCOTIA (NEARSHORE)/NORTHUMBERLAND STRAIT/G. OF ST. LAWR	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	N		OFFSHORE MABOU MINES, INVERNESS CO. (SEISMIC PROJECT #30 IN NSDME PUBLICATION INFORMATION SERIES #14)
8627-A004-016DA	AMOCO CANADA	1976	G. OF ST. LAWR	COMPLETED	REPROCESS/REINTERPRET OF ACQUIRED DATA	released	N	digital data available from the CNSOPB DMC	GULF OF ST. LAWRENCE SURVEY
8620-S014-004E	SOQUIP	1975	G. OF ST. LAWR/NORTHUMBERLAND STRAIT/ST. GEORGES BAY (N.S.)	COMPLETED	COMBINED GEOPHYSICAL SURVEY	released	Y	digital data available from the CNSOPB DMC	GEOPHYSICAL EXPLORATION OF ONSHORE PEI, BEATON POINT, NORTHUMBERLAND, MIRAMICHI & BAIE GEORGES AREAS (INCLUDES 'N.S. OFFSHORE NO. 26')
8620-M006-003E	MURPHY OIL	1974	G. OF ST. LAWR/CABOT STRAIT	COMPLETED	COMBINED GEOPHYSICAL SURVEY	released	Y	digital data available from the CNSOPB DMC	EXPERIMENTAL REFLECTION SEISMIC SURVEY, OFFSHORE CAPE BRETON ISLAND
8620-S014-001E	SOQUIP	1974	G. OF ST. LAWR	COMPLETED	COMBINED GEOPHYSICAL SURVEY	released	Y	digital data available from the CNSOPB DMC	GEOPHYSICAL SURVEY ON EAST ANTICOSTI ISLAND
8620-S014-002E	SOQUIP	1974	G. OF ST. LAWR	COMPLETED	COMBINED GEOPHYSICAL SURVEY	released	Y	digital data available from the CNSOPB DMC	GEOPHYSICAL SURVEY ON THE MECATINA AND BANC-BEAUGE, GULF OF ST. LAWRENCE, ONSHORE PEI, NAUFRAGE AND EAST POINT AREAS
8620-S014-003E	SOQUIP	1974	G. OF ST. LAWR	COMPLETED	COMBINED GEOPHYSICAL SURVEY	released	Y		GULF OF ST. LAWRENCE SURVEY
8620-S014-005E	SOQUIP	1974	G. OF ST. LAWR/NORTHUMBERLAND STRAIT	COMPLETED	COMBINED GEOPHYSICAL SURVEY	released	Y		GULF OF ST. LAWRENCE SURVEY
8621-S014-001E	SOQUIP	1974	G. OF ST. LAWR	COMPLETED	AEROMAGNETIC SURVEY	released	N	digital data available from the CNSOPB DMC	GULF OF ST. LAWRENCE SURVEY
8624-S014-005E	SOQUIP	1974	G. OF ST. LAWR	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y	digital data available from the CNSOPB DMC	GEOPHYSICAL SURVEY, MAGDALEN BLOCK B

Project	Company	Year	Area	Status	Geophysical Type	Approx. Release Date	Nav	Digital Data	Description
8624-T007-011E	TEXACO CANADA	1974	SCOTIAN SHELF/CABOT STRAIT/G. OF ST. LAWR	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y	digital data available from the CNSOPB DMC	CABOT STRAIT GEOPHYSICAL SURVEY
8627-A014-002P	AQUA-TERRA	1974	G. OF ST. LAWR/OFFSHORE W NFLD	COMPLETED	REPROCESSING/REINTERP RETATION	released	N		INTERPRETATION OF CANADIAN GOVERNMENT DATA, GEOLOGICAL AND GEOPHYSICAL EVALUATION OF GULF OF ST. LAWRENCE
8627-H007-001DA	HUDSONS BAY OIL	1974	G. OF ST. LAWR/OFFSHORE W NFLD	COMPLETED	REPROCESS/REINTERPRET OF ACQUIRED DATA	released	N	digital data available from the CNSOPB DMC	PURCHASE OF 8627-A014-002P (AQUA-TERRA 1974)
8627-H007-002E	HUDSONS BAY OIL	1974	G. OF ST. LAWR/OFFSHORE W NFLD	COMPLETED	REPROCESSING/REINTERP RETATION	released	N	digital data available from the CNSOPB DMC	PURCHASE OF SEISCAN DELTA, CATALINA AND DELTA DATA
8620-G001-001E	GULF CANADA	1973	G. OF ST. LAWR/OFFSHORE W NFLD	COMPLETED	COMBINED GEOPHYSICAL SURVEY	released	Y	digital data available from the CNSOPB DMC	MARINE GEOPHYSICAL SURVEY, WEST NEWFOUNDLAND
8620-T007-007E	TEXACO CANADA	1973	SCOTIAN SHELF/CABOT STRAIT/G. OF ST. LAWR	COMPLETED	COMBINED GEOPHYSICAL SURVEY	released	Y		GEOPHYSICAL SURVEY, CABOT STRAIT
8624-H007-006E	HUDSONS BAY OIL	1973	G. OF ST. LAWR	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y	digital data available from the CNSOPB DMC	MARINE SEISMOGRAPH SURVEY, OFFSHORE PEI
8624-M003-017E	MOBIL OIL CANADA	1973	G. OF ST. LAWR/OFFSHORE W NFLD/ST. GEORGES BAY (NFLD)	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y	digital data available from the CNSOPB DMC	SURVEY OVER PORT AU PORT BLOCK
8624-S006-011E	SHELL CANADA	1973	G. OF ST. LAWR	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y	digital data available from the CNSOPB DMC	GEOPHYSICAL SURVEY, GULF OF ST. LAWRENCE
8624-S006-013E	SHELL CANADA	1973	G. OF ST. LAWR	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y	digital data available from the CNSOPB DMC	GULF OF ST. LAWRENCE SURVEY
8624-S006-015E	SHELL CANADA	1973	G. OF ST. LAWR/OFFSHORE W NFLD	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y	digital data available from the CNSOPB DMC	SEISMIC SURVEY OFF WESTERN NEWFOUNDLAND
N.S. NEARSHORE NO. 21	SHELL CANADA	1973	NOVA SCOTIA (NEARSHORE)/G. OF ST. LAWR	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	N		GULF OF ST. LAWRENCE, OFFSHORE OF NORTHERN CAPE BRETON ISLAND (SEISMIC PROJECT #21 IN NSDME PUBLICATION INFORMATION SERIES #14)
8620-M006-002E	MURPHY OIL	1972	G. OF ST. LAWR/CABOT STRAIT/SCOTIAN SHELF	COMPLETED	COMBINED GEOPHYSICAL SURVEY	released	Y	digital data available from the CNSOPB DMC	REFLECTION SEISMIC SURVEY OF A PART OF CABOT STRAIT
8624-H007-003E	HUDSONS BAY OIL	1972	G. OF ST. LAWR	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y	digital data available from the CNSOPB DMC	SEISMOGRAPH SURVEYS AND MARINE VIBROSEIS SURVEY AROUND PEI
8624-H007-004E	HUDSONS BAY OIL	1972	G. OF ST. LAWR	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y		GULF OF ST. LAWRENCE SURVEY
8624-S014-003E	SOQUIP	1972	G. OF ST. LAWR	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y	digital data available from the CNSOPB DMC	GEOPHYSICAL SURVEY OF THE BRADELLE PROJECT
8624-S014-004E	SOQUIP	1972	G. OF ST. LAWR	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y	digital data available from the CNSOPB DMC	GEOPHYSICAL SURVEY RELATIVE TO THE MAGDALEN ISLANDS PROJECT
8627-C004-008DA	CHEVRON	1972	G. OF ST. LAWR	COMPLETED	REPROCESS/REINTERPRET OF ACQUIRED DATA	released	N	digital data available from the CNSOPB DMC	GULF OF ST. LAWRENCE SURVEY - OFFSHORE ANTICOSTI ISLAND
8627-C022-001DA	CANADIAN HOMESTEAD	1972	G. OF ST. LAWR	COMPLETED	REPROCESS/REINTERPRET OF ACQUIRED DATA	released	N		GULF OF ST. LAWRENCE SURVEY
8627-C022-002DA	CANADIAN HOMESTEAD	1972	G. OF ST. LAWR/OFFSHORE W NFLD	COMPLETED	REPROCESS/REINTERPRET OF ACQUIRED DATA	released	N	digital data available from the CNSOPB DMC	PURCHASE OF 8624-C015-001P (CATALINA 1969)
8627-M006-002DA	MURPHY OIL	1972	G. OF ST. LAWR	COMPLETED	REPROCESS/REINTERPRET OF ACQUIRED DATA	released	N		GULF OF ST. LAWRENCE SURVEY
8627-M006-004DA	MURPHY OIL	1972	SCOTIAN SHELF/G. OF ST. LAWR	COMPLETED	REPROCESS/REINTERPRET OF ACQUIRED DATA	released	N	digital data available from the CNSOPB DMC	INTERPRETATION OF SEISMIC DATA FROM THE ORPHEUS BASIN
8627-S008-001DA	SUN OIL	1972	G. OF ST. LAWR	COMPLETED	REPROCESS/REINTERPRET OF ACQUIRED DATA	released	N	digital data available from the CNSOPB DMC	EAST COAST MARINE SEISMIC PARTICIPATION SURVEY

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8627-S009-001E	SCURRY-RAINBOW	1972	G. OF ST. LAWR	COMPLETED	REPROCESSING/REINTERP RETATION	released	N	digital data available from the CNSOPB DMC	GULF OF ST. LAWRENCE SURVEY
N.S. NEARSHORE NO. 19	SHELL CANADA	1972	NOVA SCOTIA (NEARSHORE)/G. OF ST. LAWR	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	N		GULF OF ST. LAWRENCE, NW OF NORTHERN CAPE BRETON ISLAND (SEISMIC PROJECT #19 IN NSDME PUBLICATION INFORMATION SERIES #14)
8620-A004-005E	AMOCO CANADA	1971	G. OF ST. LAWR/CABOT STRAIT	COMPLETED	COMBINED GEOPHYSICAL SURVEY	released	Y	digital data available from the CNSOPB DMC	GULF OF ST. LAWRENCE & CABOT STRAIT SURVEY
8620-C004-003DA	CHEVRON	1971	G. OF ST. LAWR	COMPLETED	COMBINED GEOPHYSICAL SURVEY	released	N		GULF OF ST. LAWRENCE SURVEY
8620-C004-004E	CHEVRON	1971	G. OF ST. LAWR	COMPLETED	COMBINED GEOPHYSICAL SURVEY	released	Y	digital data available from the CNSOPB DMC	GULF OF ST. LAWRENCE SURVEY
8620-H007-004E	HUDSONS BAY OIL	1971	G. OF ST. LAWR	COMPLETED	COMBINED GEOPHYSICAL SURVEY	released	Y	digital data available from the CNSOPB DMC	SEA MAGNETOMETER AND SEISMOGRAPH SURVEYS, GULF OF ST, LAWRENCE
8620-T007-005E	TEXACO CANADA	1971	G. OF ST. LAWR/CABOT STRAIT/SCOTIAN SHELF	COMPLETED	COMBINED GEOPHYSICAL SURVEY	released	Y	digital data available from the CNSOPB DMC	MARINE VIBROSEIS SURVEY, CABOT STRAIT
8624-C012-001E	CANADIAN RESERVE	1971	G. OF ST. LAWR	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y		MARINE SEISMIC REFLECTION SURVEY IN THE BELLE ISLAND AND ANTICOSTI ISLAND AREAS OF THE GULF OF ST. LAWRENCE
8624-C022-001E	CANADIAN HOMESTEAD	1971	G. OF ST. LAWR	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y	digital data available from the CNSOPB DMC	GULF OF ST. LAWRENCE SURVEY
8624-M003-007E	MOBIL OIL CANADA	1971	G. OF ST. LAWR/ST. GEORGES BAY (NFLD)	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y	digital data available from the CNSOPB DMC	GEOPHYSICAL SURVEY IN THE ST. GEORGES BAY AREA (PORT AU PORT BLOCK)
8624-M006-001E	MURPHY OIL	1971	G. OF ST. LAWR/CABOT STRAIT/SCOTIAN SHELF	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y		REFLECTION SEISMIC SURVEY, CABOT STRAIT, OFFSHORE CAPE BRETON ISLAND
8624-S014-001E	SOQUIP	1971	G. OF ST. LAWR	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y	digital data available from the CNSOPB DMC	MARINE VIBROSEIS SURVEY, GULF OF ST. LAWRENCE
8624-S014-002E	SOQUIP	1971	G. OF ST. LAWR	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y	digital data available from the CNSOPB DMC	MARINE VIBROSEIS SURVEY IN ESTUARY, GULF OF ST. LAWRENCE AND BAY OF CHALEUR
8627-C004-003DA	CHEVRON	1971	G. OF ST. LAWR	COMPLETED	REPROCESS/REINTERPRET OF ACQUIRED DATA	released	N	digital data available from the CNSOPB DMC	1970 MARINE SEISMIC PROGRAM, ANTICOSTI ISLAND
8627-G001-001DA	GULF CANADA	1971	G. OF ST. LAWR/GRAND BANKS	COMPLETED	REPROCESS/REINTERPRET OF ACQUIRED DATA	released	N	digital data available from the CNSOPB DMC	PURCHASE OF DATA FROM 8624-C015-002P/4P (CATALINA 1970)
8627-G001-002DA	GULF CANADA	1971	G. OF ST. LAWR/OFFSHORE W NFLD	COMPLETED	REPROCESS/REINTERPRET OF ACQUIRED DATA	released	D	digital data available from the CNSOPB DMC	PURCHASE OF 8624-C015-001P (CATALINA 1969)
8627-M003-001DA	MOBIL OIL CANADA	1971	G. OF ST. LAWR/OFFSHORE W NFLD	COMPLETED	REPROCESS/REINTERPRET OF ACQUIRED DATA	released	N		PURCHASE OF 8624-C015-001P (CATALINA 1969)
8627-M003-002DA	MOBIL OIL CANADA	1971	G. OF ST. LAWR	COMPLETED	REPROCESS/REINTERPRET OF ACQUIRED DATA	released	N		GEOPHYSICAL INTERPRETATION - CATALINA EXPLORATION
N.S. NEARSHORE NO. 15	AMOCO CANADA	1971	NOVA SCOTIA (NEARSHORE)/G. OF ST. LAWR	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	N		GULF OF ST. LAWRENCE, NW OF NORTHERN CAPE BRETON ISLAND (SEISMIC PROJECT #15 IN NSDME PUBLICATION INFORMATION SERIES #14)
8620-B006-001E	BALLINDERRY EXPL	1970	G. OF ST. LAWR	COMPLETED	COMBINED GEOPHYSICAL SURVEY	released	N	digital data available from the CNSOPB DMC	GULF OF ST. LAWRENCE SURVEY
8620-H007-002E	HUDSONS BAY OIL	1970	G. OF ST. LAWR/NORTHUMBERLAND STRAIT	COMPLETED	COMBINED GEOPHYSICAL SURVEY	released	Y	digital data available from the CNSOPB DMC	GRAVITY, MAGNETOMETER AND SEISMOGRAPH SURVEYS, GULF OF ST. LAWRENCE
8620-M006-001E	MURPHY OIL	1970	G. OF ST. LAWR/CABOT STRAIT/SCOTIAN SHELF	COMPLETED	COMBINED GEOPHYSICAL SURVEY	released	Y	digital data available from the CNSOPB DMC	REFLECTION SEISMIC SURVEY OF A PART OF CABOT STRAIT AND LAURENTIAN CHANNEL
8620-S009-001E	SCURRY-RAINBOW	1970	G. OF ST. LAWR	COMPLETED	COMBINED GEOPHYSICAL SURVEY	released	N	digital data available from the CNSOPB DMC	GULF OF ST. LAWRENCE SURVEY

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8624-C015-002P,3P,4P	CATALINA EXPLORATION	1970	SCOTIAN SHELF/GRAND BANKS/G. OF ST. LAWR/NORTHUMBERLAND STRAIT/CABOT STRAIT	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y		1970 PARTICIPATION SURVEY: GULF OF ST. LAWRENCE, GRAND BANKS AND SCOTIAN SHELF
8624-T007-006E	TEXACO CANADA	1970	SCOTIAN SHELF/G. OF ST. LAWR/CABOT STRAIT/OFFSHORE W NFLD	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y	digital data available from the CNSOPB DMC	MARINE VIBROSEIS SURVEY, CABOT STRAIT
8624-T007-007E	TEXACO CANADA	1970	G. OF ST. LAWR	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y	digital data available from the CNSOPB DMC	MARINE VIBROSEIS SURVEY, GULF OF ST. LAWRENCE
8624-V001-001E	VOYAGER	1970	G. OF ST. LAWR/OFFSHORE W NFLD	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y	digital data available from the CNSOPB DMC	MARINE SEISMIC SURVEY - THE RICH POINT STRAITS OF BELLE ISLE AREA
8626-M006-001E	MURPHY OIL	1970	G. OF ST. LAWR/CABOT STRAIT	COMPLETED	SHALLOW SEISMIC, SEABED SURVEY	released	N		GULF OF ST. LAWRENCE & CABOT STRAIT SURVEY
8627-M006-001DA	MURPHY OIL	1970	G. OF ST. LAWR	COMPLETED	REPROCESS/REINTERPRET OF ACQUIRED DATA	released	N	digital data available from the CNSOPB DMC	ANALYSIS OF VIBROSEIS IN GULF OF ST. LAWRENCE & SYDNEY BASIN
8624-B004-001E	BANNER PETROLEUM	1969	G. OF ST. LAWR	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y	digital data available from the CNSOPB DMC	GULF OF ST. LAWRENCE SURVEY
8624-C015-001P	CATALINA EXPLORATION	1969	SCOTIAN SHELF/SCOTIAN SLOPE/GRAND BANKS/G. OF ST. LAWR/CABOT STRAIT/LABRADOR SHELF	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y		REGIONAL NON-EXCLUSIVE SURVEY
8624-T007-003E	TEXACO CANADA	1969	G. OF ST. LAWR	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y	digital data available from the CNSOPB DMC	1969 MARINE VIBROSEIS SURVEY, GULF OF ST. LAWRENCE
8624-T007-004E	TEXACO CANADA	1969	G. OF ST. LAWR/CABOT STRAIT/SCOTIAN SHELF	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y	digital data available from the CNSOPB DMC	1969 MARINE VIBROSEIS SURVEY, CABOT STRAIT
8620-H007-001E	HUDSONS BAY OIL	1968	G. OF ST. LAWR	COMPLETED	COMBINED GEOPHYSICAL SURVEY	released	Y	digital data available from the CNSOPB DMC	MAGNETOMETER, GRAVITY METER & SEISMOGRAPH SURVEYS, GULF OF ST. LAWRENCE 1967 & 1968
8620-T007-001E	TEXACO CANADA	1968	G. OF ST. LAWR	COMPLETED	COMBINED GEOPHYSICAL SURVEY	released	N	digital data available from the CNSOPB DMC	MARINE GRAVITY METER AND MAGNETOMETER SURVEY, MAGDELEN ISLANDS AREA, GULF OF ST. LAWRENCE
8624-A004-004E	AMOCO CANADA	1968	G. OF ST. LAWR/CABOT STRAIT	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y	digital data available from the CNSOPB DMC	GULF OF ST. LAWRENCE & CABOT STRAIT SURVEY
8624-H007-002E	HUDSONS BAY OIL	1968	G. OF ST. LAWR/NORTHUMBERLAND STRAIT	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y		GULF OF ST. LAWRENCE SURVEY
8624-A004-002E	AMOCO CANADA	1967	G. OF ST. LAWR	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y		GULF OF ST. LAWRENCE SURVEY
8624-D004-001P	DELTA EXPLORATION	1967	G. OF ST. LAWR/CABOT STRAIT	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y		REGIONAL MARINE VIBROSEIS SURVEY, GULF OF ST. LAWRENCE & NORTHERN ATLANTIC
8624-H007-001E	HUDSONS BAY OIL	1967	G. OF ST. LAWR/NORTHUMBERLAND STRAIT/ST. GEORGES BAY (N.S.)	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y		MAGNETOMETER, GRAVITY METER AND SEISMOGRAPH SURVEYS, GULF OF ST. LAWRENCE IN 1967 AND 1968 (INCLUDES ALL OF 'N.S. OFFSHORE NO. 08')
8624-T007-002E	TEXACO CANADA	1967	G. OF ST. LAWR	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y		MARINE DIGITAL SEISMIC SURVEY, GULF OF ST. LAWRENCE
NORTHEAST NEWFOUNDLAND SHELF									
45120-020-004	MULTI KLIENT INVEST	2013	NE NFLD SHELF/FLEMISH PASS	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	11-May-24	N		14353.5 KM NORTHEAST NEWFOUNDLAND SLOPE 2-D SEISMIC PROGRAM COMPLETED 11-NOV-2013
45120-020-003	MULTI KLIENT INVEST	2012	NE NFLD SHELF	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	28-May-23	D		7957.35 KM NE NEWFOUNDLAND SLOPE 2-D SEISMIC PROGRAM COMPLETED 28-NOV-2012
45120-020-001	MULTI KLIENT INVEST	2011	NE NFLD SHELF/LABRADOR SHELF/LABRADOR SEA	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	25-Apr-22	D		5144 KM 2-D SEISMIC PROGRAM FOR MKI (MULTI KLIENT INVEST) COMPLETED 25-OCT-2011

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8926-S998-004E	STATOIL CANADA	2010	NE NFLD SHELF/FLEMISH PASS	COMPLETED	SHALLOW SEISMIC, SEABED SURVEY	21-Mar-16	N		FLEMISH BASIN WELLSITE ROV PROGRAM COMPLETED 21-SEP-2010 (SDL 1047)
8924-C047-002E	CHEVRON CANADA	2005	NE NFLD SHELF/ORPHAN BASIN	COMPLETED	SEISMIC REFLECTION SURVEY (3-D)	released	N		268545 KM ORPHAN BASIN 3-D SEISMIC AND GRAVITY PROGRAM COMPLETED 9-OCT-2005
8924-C047-001E	CHEVRON CANADA	2004	NE NFLD SHELF/ORPHAN BASIN	COMPLETED	SEISMIC REFLECTION SURVEY (3-D)	released	N		101382 KM ORPHAN BASIN 3-D SEISMIC PROGRAM COMPLETED 18-SEP-2004
8924-G005-010P	GSI	2003	NE NFLD SHELF	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	28-Mar-14	N		3352 KMS OF 2-D SEISMICS (ORPHAN BASIN) COMPLETED 28-SEP-2003
8924-G005-011P	GSI	2003	NE NFLD SHELF	COMPLETED	SEISMIC REFLECTION SURVEY (3-D)	07-Mar-14	N		13165 KMS OF ORPHAN BASIN 3-D SEISMICS (788 OF A PROPOSED 1600 KM2) COMPLETED 07-SEP-2003
8924-T063-005P	TGS-NOPEC	2003	NE NFLD SHELF/LABRADOR SLOPE	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	N		874 KMS OF 2-D SEISMICS (ORPHAN & LABRADOR SLOPE) COMPLETED 01-JUL-2003
8924-G005-008P	GSI	2002	NE NFLD SHELF	SUSPENDED	SEISMIC REFLECTION SURVEY (2-D)	released	N		601 KM 2-D SEISMIC SURVEY (ORPHAN BASIN) COMPLETED 07-SEP-2002
8924-T063-002P	TGS-NOPEC	2002	NE NFLD SHELF/LABRADOR SHELF	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	D		13595 KMS OF 2-D SEISMICS (ORPHAN BASIN & LABRADOR SLOPE) COMPLETED 22-NOV-2002
8924-G005-006P	GSI	2001	NE NFLD SHELF/ORPHAN BASIN	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	N		6944 KM ORPHAN BASIN 2-D SEISMIC SURVEY COMPLETED 30-SEP-2001
8924-G005-004P	GSI	2000	NE NFLD SHELF/ORPHAN BASIN/LAURENTIAN SUBBASIN	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	D		13626 KMS OF 2-D SEISMICS COMPLETED 01-DEC-2000 (ORPHAN BASIN & SOUTH NEWFOUNDLAND - PARTIALLY WITHIN FRENCH JURISDICTION)
8624-P028-075E	PETRO-CANADA	1985	FLEMISH PASS/NE NFLD SHELF	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y		ORPHAN EAST BLOCKS
8624-S006-049E	SHELL CANADA	1985	NE NFLD SHELF	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y		GANDER BLOCK
8624-J001-004E	ESSO RESOURCES	1984	NE NFLD SHELF/FLEMISH PASS	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	D		FLEMISH PASS AREA
8624-S006-044E	SHELL CANADA	1984	NE NFLD SHELF	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y		GANDER BLOCK
8626-B003-002E	BRITISH PETROLEUM	1984	NE NFLD SHELF	COMPLETED	SHALLOW SEISMIC, SEABED SURVEY	released	N		WELLSITE SURVEY FOR BAIE VERTE J-57
LITHOPROBE 1984	GSC (ATLANTIC)	1984	NE NFLD SHELF	COMPLETED	SEISMIC REFLECTION SURVEY (DEEP)	released	Y		E NFLD SHELF & ORPHAN BASIN DEEP SEISMIC REFLECTION SURVEY
8620-B003-008E	BRITISH PETROLEUM	1983	NE NFLD SHELF	COMPLETED	COMBINED GEOPHYSICAL SURVEY	released	Y		EAST NEWFOUNDLAND BASIN
8624-P028-064E	PETRO-CANADA	1983	FLEMISH PASS/NE NFLD SHELF	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y		ORPHAN WEST AND TORBAY PROSPECT
8626-M003-018E	MOBIL OIL CANADA	1983	NE NFLD SHELF	COMPLETED	SHALLOW SEISMIC, SEABED SURVEY	released	N		WELLSITE SURVEY FOR TITUS, EAST NEWFOUNDLAND SHELF
8620-H006-005E	HUSKY OIL	1982	FLEMISH PASS/NE NFLD SHELF	COMPLETED	COMBINED GEOPHYSICAL SURVEY	released	Y		NORTH JEANNE D'ARC AND CUMBERLAND AREAS
8620-J008-005E	ICG RESOURCES	1982	NE NFLD SHELF	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y		EAST NEWFOUNDLAND SHELF SURVEY
8624-B003-008E	BRITISH PETROLEUM	1982	NE NFLD SHELF	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	D		TEST LINE PRIOR TO 1982 SURVEY
8624-B003-009E	BRITISH PETROLEUM	1982	NE NFLD SHELF	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y		EAST NEWFOUNDLAND BASIN
8624-C055-001E	CANTERRA ENERGY	1982	FLEMISH PASS/NE NFLD SHELF	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y		JEANNE D'ARC BASIN AND CUMBERLAND AREA
8624-G005-001P	GSI	1982	FLEMISH PASS/NE NFLD SHELF	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	N		REGIONAL NON-EXCLUSIVE SURVEY
8624-G005-002P	GSI	1982	FLEMISH PASS/NE NFLD SHELF	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	N		REGIONAL NON-EXCLUSIVE SURVEY
8624-G005-005P	GSI	1982	NE NFLD SHELF/LABRADOR SHELF/DAVIS STRAIT	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	N		REGIONAL NON-EXCLUSIVE SURVEY
8624-M003-046E	MOBIL OIL CANADA	1982	FLEMISH PASS/NE NFLD SHELF	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y		JEANNE D'ARC BASIN, CENTRAL RIDGE & CUMBERLAND AREAS
8624-P028-038E	PETRO-CANADA	1982	FLEMISH PASS/NE NFLD SHELF	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y		ORPHAN EAST BLOCKS
8624-P028-041E	PETRO-CANADA	1982	NE NFLD SHELF	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y		GANDER BLOCK
8620-G005-012P	GSI	1981	FLEMISH PASS/NE NFLD SHELF	COMPLETED	COMBINED GEOPHYSICAL SURVEY	released	N		REGIONAL NON-EXCLUSIVE SURVEY

Project	Company	Year	Area	Status	Geophysical Type	Approx. Release Date	Nav	Digital Data	Description
8624-B003-007E	BRITISH PETROLEUM	1981	NE NFLD SHELF/LABRADOR SHELF	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y		EAST NEWFOUNDLAND SHELF & LABRADOR SHELF BLOCKS
8624-G001-002E	GULF CANADA	1981	FLEMISH PASS/NE NFLD SHELF	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y		BOUNDARY OF BONAVISTA PLATFORM AND JEANNE D'ARC BASIN - ASSOCIATED WITH 8624-G001-001E (GULF 1980)
8624-J001-002E	ESSO RESOURCES	1981	GRAND BANKS/FLEMISH PASS/NE NFLD SHELF	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y		FLEMISH PASS AND CARSON BASIN, INCLUDES DATA FROM 8620-G005-012P (GSI 1981)
8624-M003-038E	MOBIL OIL CANADA	1981	FLEMISH PASS/NE NFLD SHELF	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y		CUMBERLAND STRUCTURE, JEANNE D'ARC BASIN & OUTER RIDGE
8624-M003-039E	MOBIL OIL CANADA	1981	FLEMISH PASS/NE NFLD SHELF	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y		CUMBERLAND STRUCTURE, JEANNE D'ARC BASIN & OUTER RIDGE - ASSOCIATED WITH 8624-M003-038E (MOBIL 1981)
8624-M003-042E	MOBIL OIL CANADA	1981	NE NFLD SHELF	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	D		LINNET STRUCTURE
8624-P028-012E	PETRO-CANADA	1981	NE NFLD SHELF	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y		GANDER BLOCK
8624-P028-013E	PETRO-CANADA	1981	FLEMISH PASS/NE NFLD SHELF	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y		ORPHAN WEST BLOCK
8624-P028-018E	PETRO-CANADA	1981	NE NFLD SHELF	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y		GANDER BLOCK
8624-P028-019E	PETRO-CANADA	1981	FLEMISH PASS/NE NFLD SHELF	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y		ORPHAN WEST BLOCK
8624-P028-020E	PETRO-CANADA	1981	FLEMISH PASS/NE NFLD SHELF	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y		ORPHAN EAST BLOCK
8624-S006-029E	SHELL CANADA	1981	NE NFLD SHELF	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y		GANDER BLOCK
8626-M003-010E	MOBIL OIL CANADA	1981	NE NFLD SHELF	COMPLETED	SHALLOW SEISMIC, SEABED SURVEY	released	D		WELLSITE SURVEY FOR LINNET E-63
PARSONS	IOS	1981	GRAND BANKS/NE NFLD SHELF	COMPLETED	COMBINED GEOPHYSICAL SURVEY	released	Y		COMBINATION OF 3 SURVEYS DONE IN 1979, 1980 & 1981 BY THE IOS (INSTITUTE OF OCEANOGRAPHIC SCIENCES, SURREY, U.K.) - ORPHAN KNOLL & FLEMISH CAP AREA
8620-G005-011P	GSI	1980	FLEMISH PASS/NE NFLD SHELF	COMPLETED	COMBINED GEOPHYSICAL SURVEY	released	N		REGIONAL NON-EXCLUSIVE SURVEY
8620-J001-010E	ESSO RESOURCES	1980	FLEMISH PASS/NE NFLD SHELF	COMPLETED	COMBINED GEOPHYSICAL SURVEY	released	D		FLEMISH PASS AND ORPHAN BASINS
8624-B003-005E	BRITISH PETROLEUM	1980	NE NFLD SHELF	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y		EAST NEWFOUNDLAND BASIN
8624-G001-001E	GULF CANADA	1980	FLEMISH PASS/NE NFLD SHELF	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y		BOUNDARY OF BONAVISTA PLATFORM AND JEANNE D'ARC BASIN - ASSOCIATED WITH 8624-G001-002E (GULF 1981)
8624-M003-037E	MOBIL OIL CANADA	1980	FLEMISH PASS/NE NFLD SHELF	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y		FLYING FOAM, CUMBERLAND, NAUTILUS, WHITEROSE, ARCHER, SHERIDAN & SOUTH TEMPEST STRUCTURES
8626-M003-007E	MOBIL OIL CANADA	1980	GRAND BANKS/NE NFLD SHELF	COMPLETED	SHALLOW SEISMIC, SEABED SURVEY	released	D		WELLSITE SURVEYS FOR NAUTILUS, SHERIDAN, NORTH DANA AND RAGNAR
8626-S006-002E	SHELL CANADA	1980	NE NFLD SHELF	COMPLETED	SHALLOW SEISMIC, SEABED SURVEY	released	D		WELLSITE SURVEY FOR ENGLEE AND CONCHE, EAST NEWFOUNDLAND SHELF
8627-J001-003DA	ESSO RESOURCES	1980	FLEMISH PASS/NE NFLD SHELF	COMPLETED	REPROCESS/REINTERPRET OF ACQUIRED DATA	released	D		DATA PURCHASED FROM 8620-G005-011P (GSI 1980)
8627-B003-005E	BRITISH PETROLEUM	1979	NE NFLD SHELF/LABRADOR SHELF	COMPLETED	REPROCESSING/REINTERPRETATION	released	N		GRAVITY AND MAGNETIC INTERPRETATION WITH SEISMIC CORRELATION
8620-B003-007E	BRITISH PETROLEUM	1978	NE NFLD SHELF	COMPLETED	COMBINED GEOPHYSICAL SURVEY	released	Y		HARE BAY STRUCTURE
8620-J001-008E	ESSO RESOURCES	1978	GRAND BANKS/FLEMISH PASS/NE NFLD SHELF	COMPLETED	COMBINED GEOPHYSICAL SURVEY	released	Y		FLEMISH PASS AREA
8627-J001-001DA	ESSO RESOURCES	1978	NE NFLD SHELF	COMPLETED	REPROCESS/REINTERPRET OF ACQUIRED DATA	released	N		REPROCESSING OF SHELL AND GSI LINES IN ORPHAN BASIN
8620-B003-006E	BRITISH PETROLEUM	1977	NE NFLD SHELF?/LABRADOR SHELF	COMPLETED	COMBINED GEOPHYSICAL SURVEY	released	Y		(EAST NEWFOUNDLAND SHELF ?) AND LABRADOR SHELF SURVEY
8620-J001-007E	IMPERIAL OIL	1977	GRAND BANKS/FLEMISH PASS/NE NFLD SHELF/LABRADOR SHELF	COMPLETED	COMBINED GEOPHYSICAL SURVEY	released	Y		CUMBERLAND, FLEMISH PASS & ORPHAN BLOCKS - ALSO PADDON-HUGHES BJARNI PERMITS
8627-A014-005P	AQUA-TERRA	1977	NE NFLD SHELF/LABRADOR SHELF	COMPLETED	REPROCESSING/REINTERPRETATION	released	N		INTERPRETATION OF AVAILABLE DATA
8620-J001-006E	IMPERIAL OIL	1976	GRAND BANKS/FLEMISH PASS/NE NFLD SHELF/LABRADOR SHELF	COMPLETED	COMBINED GEOPHYSICAL SURVEY	released	Y		CUMBERLAND, FLEMISH PASS AND ORPHAN BLOCKS

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8624-B003-002E	BRITISH PETROLEUM	1976	NE NFLD SHELF?/LABRADOR SHELF	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y		(EAST NEWFOUNDLAND SHELF ?) AND LABRADOR SHELF SURVEY
8624-M003-029E	MOBIL OIL CANADA	1976	NE NFLD SHELF	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	D		TOOKER BANK
8624-S006-020E	SHELL CANADA	1976	SCOTIAN SHELF/SCOTIAN SLOPE/NE NFLD SHELF?	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y	digital data available from the CNSOPB DMC	SEISMIC SURVEY, EAST COAST OFFSHORE - SLOPE 32, MOHEIDA, SOUTH SABLE, WENONAH, ONONDAGA & ALBATROSS (INCLUDING THE GANDER BLOCK ?)
8624-T021-001E,2E	TEXACO CANADA RES	1976	NE NFLD SHELF	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y		EAST NEWFOUNDLAND SHELF SURVEY
8627-A006-005DA	ANCO EXPLORATION	1976	NE NFLD SHELF	COMPLETED	REPROCESS/REINTERPRET OF ACQUIRED DATA	released	D		INTERPRETATION OF AREA EAST OF BONAVISTA C-99, DATA FROM 8620-G005-001P (GSI 1971)
8627-A006-006DA	ANCO EXPLORATION	1976	NE NFLD SHELF	COMPLETED	REPROCESS/REINTERPRET OF ACQUIRED DATA	released	D		INTERPRETATION FROM AEROMAG SURVEY 8621-S017-001P (SPARTAN AERO 1972)
8627-H007-007DA,8DA	HUDSONS BAY OIL	1976	NE NFLD SHELF/LABRADOR SHELF	COMPLETED	REPROCESS/REINTERPRET OF ACQUIRED DATA	released	D		INTERPRETATION OF DATA PURCHASED FROM CGG AND GSI
8620-B003-005E	BRITISH PETROLEUM	1975	NE NFLD SHELF/LABRADOR SHELF	COMPLETED	COMBINED GEOPHYSICAL SURVEY	released	Y		EAST NEWFOUNDLAND SHELF AND LABRADOR SHELF SURVEY
8620-E002-002E	EASTCAN	1975	NE NFLD SHELF?/LABRADOR SHELF	COMPLETED	COMBINED GEOPHYSICAL SURVEY	released	Y		NAIN, HARRISON AND DOMINO AREAS
8620-H007-005E	HUDSONS BAY OIL	1975	NE NFLD SHELF/LABRADOR SHELF	COMPLETED	COMBINED GEOPHYSICAL SURVEY	released	D		GREY ISLE BLOCK
8620-J001-005E	IMPERIAL OIL	1975	SCOTIAN SHELF/SCOTIAN SLOPE/GRAND BANKS/FLEMISH PASS/NE NFLD SHELF/DAVIS STRAIT	COMPLETED	COMBINED GEOPHYSICAL SURVEY	released	Y	digital data available from the CNSOPB DMC	1975 GEOPHYSICAL SURVEYS: FLEMISH PASS, SOUTH LABRADOR, ORPHAN BLOCK AND NORTH FLEMISH CAP
8620-W006-003E	WESTERN DECALTA	1975	NE NFLD SHELF	COMPLETED	COMBINED GEOPHYSICAL SURVEY	released	D		EAST NEWFOUNDLAND SHELF SURVEY
8624-C006-001E	CIGOL	1975	FLEMISH PASS/NE NFLD SHELF	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y		NORTH FLEMISH PASS
8624-M003-026E	MOBIL OIL CANADA	1975	GRAND BANKS/FLEMISH PASS/NE NFLD SHELF	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y		FLEMISH PASS AND GRAND BANKS
8624-M003-027E	MOBIL OIL CANADA	1975	NE NFLD SHELF	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	D		TOOKER BANK
8624-S006-017E	SHELL CANADA	1975	NE NFLD SHELF	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y		GANDER BLOCK
8624-S006-019E	SHELL CANADA	1975	NE NFLD SHELF	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	N		GANDER BLOCK
8627-A014-003P	AQUA-TERRA	1975	NE NFLD SHELF/LABRADOR SHELF	COMPLETED	REPROCESSING/REINTERPRETATION	released	D		GEOLOGY OF LABRADOR AND NORTHEAST NEWFOUNDLAND SHELVES - INTERPRETATION OF DATA AVAILABLE 1975
8627-B003-003DA	BRITISH PETROLEUM	1975	NE NFLD SHELF	COMPLETED	REPROCESS/REINTERPRET OF ACQUIRED DATA	released	N		INTERPRETATION OF AEROMAG SURVEY 8621-S017-001P (SPARTAN AERO SERVICE 1972)
8627-H007-004DA,5DA	HUDSONS BAY OIL	1975	NE NFLD SHELF/LABRADOR SHELF	COMPLETED	REPROCESS/REINTERPRET OF ACQUIRED DATA	released	D		INTERPRETATION OF DATA FROM 8627-A014-003P (AQUA-TERRA 1975)
8627-H009-003DT,6DA	HOUSTON OILS	1975	NE NFLD SHELF	COMPLETED	REPROCESS/REINTERPRET OF ACQUIRED DATA	released	D		PURCHASE OF 8627-A014-001P (AQUA-TERRA 1974)
8627-M003-013DA	MOBIL OIL CANADA	1975	GRAND BANKS/NE NFLD SHELF	COMPLETED	REPROCESS/REINTERPRET OF ACQUIRED DATA	released	N		DIAGRAMMATIC SEISMO-GEOLOGICAL SECTIONS PREPARED FROM PURCHASE OF 8620-G005-001P (GSI 1971)
8627-M003-014DA	MOBIL OIL CANADA	1975	GRAND BANKS/NE NFLD SHELF	COMPLETED	REPROCESS/REINTERPRET OF ACQUIRED DATA	released	N		DIAGRAMMATIC SEISMO-GEOLOGICAL SECTIONS PREPARED FROM PURCHASE OF 8620-G005-004P (GSI 1972)
8627-S006-016E	SHELL CANADA	1975	SCOTIAN SHELF/NE NFLD SHELF	COMPLETED	REPROCESSING/REINTERPRETATION	released	D	digital data available from the CNSOPB DMC	1974 GEOPHYSICAL SURVEY - SCOTIAN SHELF AND GANDER BLOCK
8620-B003-004E	BRITISH PETROLEUM	1974	NE NFLD SHELF/LABRADOR SHELF	COMPLETED	COMBINED GEOPHYSICAL SURVEY	released	Y		EAST NEWFOUNDLAND SHELF & LABRADOR SHELF SURVEY
8620-E002-001E	EASTCAN	1974	NE NFLD SHELF/LABRADOR SHELF	COMPLETED	COMBINED GEOPHYSICAL SURVEY	released	Y		SAGLEK, NAIN, HARRISON & DOMINO AREAS
8620-J001-004E	IMPERIAL OIL	1974	NE NFLD SHELF/LABRADOR SHELF/DAVIS STRAIT	COMPLETED	COMBINED GEOPHYSICAL SURVEY	released	Y		CUMBERLAND, NORTH & SOUTH LABRADOR AND ORPHAN BLOCKS
8620-M003-021E	MOBIL OIL CANADA	1974	GRAND BANKS/NE NFLD SHELF?	COMPLETED	COMBINED GEOPHYSICAL SURVEY	released	Y		PHOENIX, TRAVE, DANA, RAGNAR, WEALTHY ANN, GOLCONDA, CONQUEST, WHITEROSE & ADOLPHUS STRUCTURES (ALSO THE CUMBERLAND STRUCTURE ?)
8620-S006-003E	SHELL CANADA	1974	NE NFLD SHELF	COMPLETED	COMBINED GEOPHYSICAL SURVEY	released	Y		EAST NEWFOUNDLAND SHELF SURVEY

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8620-W006-002E	WESTERN DECALTA	1974	NE NFLD SHELF	COMPLETED	COMBINED GEOPHYSICAL SURVEY	released	D		EAST NEWFOUNDLAND SHELF SURVEY
8624-E002-004E	EASTCAN	1974	NE NFLD SHELF/LABRADOR SHELF	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y		SAGLEK, NAIN, HARRISON & DOMINO AREAS
8624-H009-001E	HOUSTON OILS	1974	NE NFLD SHELF	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	D		EAST NEWFOUNDLAND SHELF SURVEY
8627-A004-008DA	AMOCO CANADA	1974	NE NFLD SHELF/LABRADOR SHELF	COMPLETED	REPROCESS/REINTERPRET OF ACQUIRED DATA	released	N		INTERPRETATION OF PURCHASED SEISCAN DELTA DATA FROM 8627-S024-001P AND TRADED DATA FROM BP AND TENNECO
8627-A006-003DA,4DA	ANCO EXPLORATION	1974	GRAND BANKS/NE NFLD SHELF	COMPLETED	REPROCESS/REINTERPRET OF ACQUIRED DATA	released	D		PURCHASE OF 8627-A014-001P (AQUA-TERRA 1974)
8627-A014-001P	AQUA-TERRA	1974	GRAND BANKS/NE NFLD SHELF/LABRADOR SHELF	COMPLETED	REPROCESSING/REINTERPRETATION	released	N		SYNTHESIS OF GOVERNMENT GEOPHYSICAL FIELD DATA OVER GRAND BANKS, NE NEWFOUNDLAND SHELF AND LABRADOR SHELF
8627-S006-015E	SHELL CANADA	1974	NE NFLD SHELF	COMPLETED	REPROCESSING/REINTERPRETATION	released	N		REPROCESSING OF 1974 DATA - ASSOCIATED WITH 8620-S006-003E (SHELL 1974)
8620-B003-003E	BRITISH PETROLEUM	1973	NE NFLD SHELF/LABRADOR SHELF	COMPLETED	COMBINED GEOPHYSICAL SURVEY	released	Y		EAST NEWFOUNDLAND SHELF AND LABRADOR SHELF SURVEY
8620-G001-002E	GULF CANADA	1973	GRAND BANKS/FLEMISH CAP/NE NFLD SHELF	COMPLETED	COMBINED GEOPHYSICAL SURVEY	released	Y		FLEMISH CAP AREA
8620-J001-002E	IMPERIAL OIL	1973	SCOTIAN SLOPE/LAURENTIAN SUBBASIN/GRAND BANKS/NE NFLD SHELF/LABRADOR SHELF/DAVIS STRAIT	COMPLETED	COMBINED GEOPHYSICAL SURVEY	released	Y	digital data available from the CNSOPB DMC	REGIONAL SURVEY: LAURENTIAN FAN, ORPHAN BLOCK AND NORTH & SOUTH LABRADOR
8620-M003-017E	MOBIL OIL CANADA	1973	FLEMISH PASS/NE NFLD SHELF	COMPLETED	COMBINED GEOPHYSICAL SURVEY	released	Y		BONNITION, CONQUEST, CUMBERLAND, DOMINION, FLYING FOAM, HIBERNIA, PHOENIX & TRAVE STRUCTURES
8620-M003-019E	MOBIL OIL CANADA	1973	NE NFLD SHELF	COMPLETED	COMBINED GEOPHYSICAL SURVEY	released	D		TOOKER BANK
8620-T007-009E	TEXACO CANADA	1973	NE NFLD SHELF	COMPLETED	COMBINED GEOPHYSICAL SURVEY	released	D		EAST NEWFOUNDLAND SHELF SURVEY
8620-T007-010E	TEXACO CANADA	1973	NE NFLD SHELF	COMPLETED	COMBINED GEOPHYSICAL SURVEY	released	D		SIDE-SCAN SONAR SURVEY
8624-A012-001E	AUSTIN EXPLORATION	1973	GRAND BANKS/FLEMISH CAP/NE NFLD SHELF	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y		EAST FLANK OF FLEMISH CAP
8624-O008-001E	OSEC	1973	NE NFLD SHELF	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	D		BELLE ISLE STRUCTURE
8624-S006-014E	SHELL CANADA	1973	GRAND BANKS/NE NFLD SHELF	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y		EXCLUSIVE AND PURCHASED NON-EXCLUSIVE SURVEYS OVER GANDER BLOCK
8627-B003-002DA	BRITISH PETROLEUM	1973	GRAND BANKS/NE NFLD SHELF	COMPLETED	REPROCESS/REINTERPRET OF ACQUIRED DATA	released	N		INTERPRETATION OF DATA PURCHASED FROM 8620-G005-001P (GSI 1971)
8627-H006-001DA,2DA,3DA	HUSKY OIL	1973	NE NFLD SHELF	COMPLETED	REPROCESS/REINTERPRET OF ACQUIRED DATA	released	D		INTERPRETATION OF SEISMIC, GRAVITY & MAGNETIC DATA FROM 8620-S024-001P (SEISCAN 1972) AND 8620-C015-001P (CATALINA 1970)
8627-M003-012DA	MOBIL OIL CANADA	1973	NE NFLD SHELF/LABRADOR SHELF/DAVIS STRAIT	COMPLETED	REPROCESS/REINTERPRET OF ACQUIRED DATA	released	D		PURCHASE OF REGIONAL DATA FROM DELTA
8640-B003-003E	BRITISH PETROLEUM	1973	NE NFLD SHELF	COMPLETED	GEOLOGICAL/GEOPHYSICAL RESEARCH PROGRAM	released	N		SITE SURVEY FOR BONAVISTA C-99
8620-B003-001E,2E	BRITISH PETROLEUM	1972	NE NFLD SHELF/LABRADOR SHELF	COMPLETED	COMBINED GEOPHYSICAL SURVEY	released	Y		EAST NEWFOUNDLAND SHELF & LABRADOR SHELF SURVEY
8620-G005-004P	GSI	1972	SCOTIAN SHELF/SCOTIAN SLOPE/GRAND BANKS/NE NFLD SHELF	COMPLETED	COMBINED GEOPHYSICAL SURVEY	released	N		REGIONAL NON-EXCLUSIVE SURVEY - SOME LINES NEAR TO FRENCH JURISDICTION (ST. PIERRE)
8620-J001-001E	IMPERIAL OIL	1972	SCOTIAN SHELF/SCOTIAN SLOPE/LAURENTIAN SUBBASIN/NE NFLD SHELF/LABRADOR SHELF/DAVIS STRAIT	COMPLETED	COMBINED GEOPHYSICAL SURVEY	released	Y	digital data available from the CNSOPB DMC	LAURENTIAN CONE, CUMBERLAND, NORTH & SOUTH LABRADOR AND ORPHAN BLOCKS
8620-S024-001P	SEISCAN EXPLORATION	1972	SCOTIAN SHELF/SCOTIAN SLOPE/GRAND BANKS/NE NFLD SHELF/LABRADOR SHELF	COMPLETED	COMBINED GEOPHYSICAL SURVEY	released	Y		1972 REGIONAL NON-EXCLUSIVE (PARTICIPATION) SURVEY
8621-S017-001P	SPARTAN AERO	1972	FLEMISH PASS/NE NFLD SHELF	COMPLETED	AEROMAGNETIC SURVEY	released	N		REGIONAL AEROMAG SURVEY, NON-EXCLUSIVE

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8624-E002-001E	EASTCAN	1972	NE NFLD SHELF/LABRADOR SHELF/DAVIS STRAIT	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y		RECONNAISSANCE OVER SAGLEK, NAIN, HARRISON, DOMINO & SAGLEK AREAS
8624-M003-013E	MOBIL OIL CANADA	1972	FLEMISH PASS/NE NFLD SHELF	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y		JEANNE D'ARC BASIN
8624-S006-010E	SHELL CANADA	1972	FLEMISH PASS/NE NFLD SHELF	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y		EXCLUSIVE AND PURCHASED NON-EXCLUSIVE SURVEYS OVER GANDER BLOCK
8627-A002-001DA	ACROLL OIL	1972	NE NFLD SHELF	COMPLETED	REPROCESS/REINTERPRET OF ACQUIRED DATA	released	D		INTERPRETATION OF DATA FROM 8620-G005-001P (GSI 1971)
8627-A004-003DT	AMOCO CANADA	1972	NE NFLD SHELF	COMPLETED	REPROCESS/REINTERPRET OF ACQUIRED DATA	released	N		1971 BP DATA PURCHASED FROM 8624-T015-001E
8627-S006-001DA,3DA	SHELL CANADA	1972	NE NFLD SHELF	COMPLETED	REPROCESS/REINTERPRET OF ACQUIRED DATA	released	D		INTERPRETATION OF DATA PURCHASED FROM 8620-G005-001P (GSI 1971) AND 8620-C015-001P (CARAVEL 1971) OVER GANDER BLOCK
8620-C006-001E	CIGOL	1971	GRAND BANKS/FLEMISH PASS/NE NFLD SHELF	COMPLETED	COMBINED GEOPHYSICAL SURVEY	released	Y		REGIONAL SURVEY OVER FLEMISH PASS
8620-C015-001P	CARAVEL EXPLORATION	1971	SCOTIAN SHELF/SCOTIAN SLOPE/GRAND BANKS/NE NFLD SHELF/LABRADOR SHELF	COMPLETED	COMBINED GEOPHYSICAL SURVEY	released	Y		REGIONAL NON-EXCLUSIVE (PARTICIPATION) SURVEY
8620-C020-003E	CANADIAN SUPERIOR	1971	GRAND BANKS/FLEMISH CAP/NE NFLD SHELF	COMPLETED	COMBINED GEOPHYSICAL SURVEY	released	Y		TAIL OF THE BANK, EAST FLANK OF GRAND BANKS AND FLEMISH CAP
8620-G005-001P	GSI	1971	CABOT STRAIT/LAURENTIAN SUBBASIN/GRAND BANKS/NE NFLD SHELF/LABRADOR SHELF	COMPLETED	COMBINED GEOPHYSICAL SURVEY	released	N		REGIONAL NON-EXCLUSIVE SURVEY
8620-H007-003E	HUDSONS BAY OIL	1971	NE NFLD SHELF/LABRADOR SHELF	COMPLETED	COMBINED GEOPHYSICAL SURVEY	released	D		GREY ISLE BLOCK
8620-M003-011E	MOBIL OIL CANADA	1971	NE NFLD SHELF	COMPLETED	COMBINED GEOPHYSICAL SURVEY	released	Y		TOOKER BANK SURVEY
8624-A004-008E,9E	AMOCO CANADA	1971	GRAND BANKS/FLEMISH CAP/NE NFLD SHELF	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y		RECONNAISSANCE OVER FLEMISH CAP (JOINTLY WITH IMPERIAL OIL)
8624-M003-005E,6E	MOBIL OIL CANADA	1971	FLEMISH PASS/NE NFLD SHELF	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y		NORTHEAST GRAND BANKS BLOCK
8624-M003-008E	MOBIL OIL CANADA	1971	GRAND BANKS/FLEMISH CAP/NE NFLD SHELF	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y		NORTHERN AND EASTERN EDGE OF FLEMISH CAP
8624-M003-009E	MOBIL OIL CANADA	1971	FLEMISH PASS/NE NFLD SHELF	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	D		NORTHWEST GRAND BANKS (TOOKER BLOCK)
8627-A006-001DA	ANCO EXPLORATION	1971	NE NFLD SHELF	COMPLETED	REPROCESS/REINTERPRET OF ACQUIRED DATA	released	N		INTERPRETATION OF DATA PURCHASED FROM 8620-G005-001P (GSI 1971)
8627-B003-001DA	BRITISH PETROLEUM	1971	NE NFLD SHELF	COMPLETED	REPROCESS/REINTERPRET OF ACQUIRED DATA	released	N		PURCHASE OF 8620-G005-001P (GSI 1971)
8627-C006-001DA	CIGOL	1971	NE NFLD SHELF	COMPLETED	REPROCESS/REINTERPRET OF ACQUIRED DATA	released	D		INTERPRETATION OF DATA PURCHASED FROM 8620-C015-001P (CATALINA 1971)
8627-H009-001DA	HOUSTON OILS	1971	NE NFLD SHELF	COMPLETED	REPROCESS/REINTERPRET OF ACQUIRED DATA	released	N		PURCHASE OF 8620-G005-001P (GSI 1971)
8627-W006-001DA	WESTERN DECALTA	1971	NE NFLD SHELF	COMPLETED	REPROCESS/REINTERPRET OF ACQUIRED DATA	released	D		DATA PURCHASED FROM 8620-G005-001P (GSI 1971)
8620-T009-001E	TENNECO	1970	NE NFLD SHELF/LABRADOR SHELF	COMPLETED	COMBINED GEOPHYSICAL SURVEY	released	Y		NOTRE DAME, ST. ANTHONY, DOMINO, HARRISON & SAGLEK AREAS
8624-T015-001E	BRITISH PETROLEUM	1969	NE NFLD SHELF/LABRADOR SHELF	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y		SEISMIC AND SEAMAG SURVEY ON LABRADOR SHELF
8621-T009-002E	TENNECO	1967	NE NFLD SHELF/LABRADOR SHELF	COMPLETED	AEROMAGNETIC SURVEY	released	N		REGIONAL AEROMAGNETIC SURVEY
labrador	OPERATORS	1111	NE NFLD SHELF/LABRADOR SHELF	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)?	released	Y		LABRADOR SHELF SURVEY
OFFSHORE SOUTHERN NEWFOUNDLAND									
8924-G005-005P	GSI	2001	GRAND BANKS/OFFSHORE S NFLD	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	N		3217 KM SOUTH WHALE SUBBASIN 2-D SEISMIC SURVEY COMPLETED 24-JUN-2001
8921-F023-001P	FUGRO GEOSURVEYS	2000	GRAND BANKS/OFFSHORE S NFLD	COMPLETED	AEROMAGNETIC SURVEY	released	N		40816 KM SOUTH GRAND BANKS AEROMAG SURVEY COMPLETED 20-APR-2001 (SEE NS21-F023-001P FOR THE SCOTIAN SHELF PORTION OF THIS SURVEY)

Project	Company	Year	Area	Status	Geophysical Type	Approx. Release Date	Nav	Digital Data	Description
8924-W013-001P	WESTERN GEOPHYSICAL	1999	OFFSHORE S NFLD/GRAND BANKS/FLEMISH PASS	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	N		7724 KMS OF 2-D SEISMICS COMPLETED ON 15-OCT-1999
8924-G033-001E	GULF CANADA	1998	OFFSHORE S NFLD	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	N		1998 SOUTH NEWFOUNDLAND 2-D SEISMIC SURVEY (SEE NS24-G001-001E)
OFFSHORE WESTERN NEWFOUNDLAND									
8926-C137-001E	CORRIDOR RESOURCES	2010	G. OF ST. LAWR/OFFSHORE W NFLD	COMPLETED	SHALLOW SEISMIC, SEABED SURVEY	18-Apr-16	N		MARITIMES BASIN (OLD HARRY PROSPECT) GEOHAZARD SURVEY COMPLETED 18-OCT-2010
8924-G005-019P	GSI	2008	G. OF ST. LAWR/OFFSHORE W NFLD	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	23-Jun-19	N		2555 KM (OF A PLANNED 7842 KM) NON-EXCLUSIVE ANTICOSTI BASIN 2-D SEISMIC PROGRAM COMPLETED 23-DEC-2008
8924-G005-009P	GSI	2002	G. OF ST. LAWR/OFFSHORE W NFLD	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	N		743 KM 2-D SEISMIC SURVEY (WESTERN NEWFOUNDLAND & GULF OF ST. LAWRENCE) COMPLETED 15-DEC-2002
8921-E033-001P	ENCAL ENERGY LTD	1998	OFFSHORE W NFLD	COMPLETED	AEROMAGNETIC SURVEY	released	N		AIRBOURNE STRESS FIELD DETECTION SURVEY
8924-C137-001E	CORRIDOR RESOURCES	1998	G. OF ST. LAWR/OFFSHORE W NFLD	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	N		90 KMS OF 2-D SEISMICS (OFFSHORE WESTERN NEWFOUNDLAND AND ANTICOSTI ISLAND)
8927-I015-001E	IMPERIAL VENTURE	1997	OFFSHORE W NFLD	COMPLETED	REPROCESS/REINTERPRET OF ACQUIRED DATA	released	N		2001 INTERPRETATION OF PURCHASED MOBIL DATA
8924-H028-004E	HUNT OIL	1996	OFFSHORE W NFLD	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	N		OCEAN BOTTOM CABLE SURVEY CONDUCTED IN PORT AU PORT BAY
8927-T057-001E,2E	TALISMAN ENERGY INC	1996	OFFSHORE W NFLD	COMPLETED	REPROCESS/REINTERPRET OF ACQUIRED DATA	released	N		PURCHASE AND INTERPRETATION OF 1996 AEROMAG AND LAND GRAVITY DATA
8924-T057-001E	TALISMAN ENERGY INC	1995	OFFSHORE W NFLD	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	N		WESTERN NEWFOUNDLAND 2-D SEISMIC SURVEY
8926-H028-001E	HUNT OIL	1995	OFFSHORE W NFLD/ST. GEORGES BAY (NFLD)	COMPLETED	SHALLOW SEISMIC, SEABED SURVEY	released	N		WELLSITE SEISMIC SURVEY FOR ST. GEORGE'S BAY A-36
8927-H028-001E	HUNT OIL	1995	OFFSHORE W NFLD/ST. GEORGES BAY (NFLD)	COMPLETED	REPROCESSING/REINTERPRETATION	released	N		REPROCESSING OF 8920-M033-001E (MARATHON 1992)
8921-H028-001E	HUNT OIL	1993	OFFSHORE W NFLD	COMPLETED	AEROMAGNETIC SURVEY	released	N		3300 KM AEROMAGNETIC SURVEY, PORT AU PORT PENINSULA
8920-M033-001E	MARATHON PETROLEUM	1992	OFFSHORE W NFLD/ST. GEORGES BAY (NFLD)	COMPLETED	COMBINED GEOPHYSICAL SURVEY	released	N		2-D SEISMICS AND GRAVITY, ST. GEORGE'S BAY
8924-H028-003E	HUNT OIL	1992	OFFSHORE W NFLD	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	N		PORT AU PORT PENINSULA, OFFSHORE WEST NEWFOUNDLAND
8924-B058-001E	BHP PETROLEUM	1991	OFFSHORE W NFLD	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y		OFFSHORE WEST COAST OF NEWFOUNDLAND, NORTHERN PENINSULA
8924-H028-002E	HUNT OIL	1991	OFFSHORE W NFLD	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y		OFFSHORE WEST COAST OF NEWFOUNDLAND, PORT AU PORT PENINSULA
8924-M003-001E	MOBIL OIL CANADA	1991	OFFSHORE W NFLD	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y		OFFSHORE WEST COAST OF NEWFOUNDLAND
8924-W015-002P	WESTERN GEOPHYSICAL	1991	OFFSHORE W NFLD	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	D		OFFSHORE WEST COAST OF NEWFOUNDLAND
8924-H028-001E	HUNT OIL	1990	OFFSHORE W NFLD	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y		4 LINES OFF WEST COAST OF NEWFOUNDLAND
8627-A014-002P	AQUA-TERRA	1974	G. OF ST. LAWR/OFFSHORE W NFLD	COMPLETED	REPROCESSING/REINTERPRETATION	released	N		INTERPRETATION OF CANADIAN GOVERNMENT DATA, GEOLOGICAL AND GEOPHYSICAL EVALUATION OF GULF OF ST. LAWRENCE
8627-H007-001DA	HUDSONS BAY OIL	1974	G. OF ST. LAWR/OFFSHORE W NFLD	COMPLETED	REPROCESS/REINTERPRET OF ACQUIRED DATA	released	N	digital data available from the CNSOPB DMC	PURCHASE OF 8627-A014-002P (AQUA-TERRA 1974)
8627-H007-002E	HUDSONS BAY OIL	1974	G. OF ST. LAWR/OFFSHORE W NFLD	COMPLETED	REPROCESSING/REINTERPRETATION	released	N	digital data available from the CNSOPB DMC	PURCHASE OF SEISCAN DELTA, CATALINA AND DELTA DATA
8620-G001-001E	GULF CANADA	1973	G. OF ST. LAWR/OFFSHORE W NFLD	COMPLETED	COMBINED GEOPHYSICAL SURVEY	released	Y	digital data available from the CNSOPB DMC	MARINE GEOPHYSICAL SURVEY, WEST NEWFOUNDLAND
8624-M003-017E	MOBIL OIL CANADA	1973	G. OF ST. LAWR/OFFSHORE W NFLD/ST. GEORGES BAY (NFLD)	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y	digital data available from the CNSOPB DMC	SURVEY OVER PORT AU PORT BLOCK
8624-S006-015E	SHELL CANADA	1973	G. OF ST. LAWR/OFFSHORE W NFLD	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y	digital data available from the CNSOPB DMC	SEISMIC SURVEY OFF WESTERN NEWFOUNDLAND

Project	Company	Year	Area	Status	Geophysical Type	Approx. Release Date	Nav	Digital Data	Description
8627-C022-002DA	CANADIAN HOMESTEAD	1972	G. OF ST. LAWR/OFFSHORE W NFLD	COMPLETED	REPROCESS/REINTERPRET OF ACQUIRED DATA	released	N	digital data available from the CNSOPB DMC	PURCHASE OF 8624-C015-001P (CATALINA 1969)
8627-G001-002DA	GULF CANADA	1971	G. OF ST. LAWR/OFFSHORE W NFLD	COMPLETED	REPROCESS/REINTERPRET OF ACQUIRED DATA	released	D	digital data available from the CNSOPB DMC	PURCHASE OF 8624-C015-001P (CATALINA 1969)
8627-M003-001DA	MOBIL OIL CANADA	1971	G. OF ST. LAWR/OFFSHORE W NFLD	COMPLETED	REPROCESS/REINTERPRET OF ACQUIRED DATA	released	N		PURCHASE OF 8624-C015-001P (CATALINA 1969)
8624-T007-006E	TEXACO CANADA	1970	SCOTIAN SHELF/G. OF ST. LAWR/CABOT STRAIT/OFFSHORE W NFLD	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y	digital data available from the CNSOPB DMC	MARINE VIBROSEIS SURVEY, CABOT STRAIT
8624-V001-001E	VOYAGER	1970	G. OF ST. LAWR/OFFSHORE W NFLD	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y	digital data available from the CNSOPB DMC	MARINE SEISMIC SURVEY - THE RICH POINT STRAITS OF BELLE ISLE AREA
ST GEORGE'S BAY, WESTERN NEWFOUNDLAND									
8926-H028-001E	HUNT OIL	1995	OFFSHORE W NFLD/ST. GEORGES BAY (NFLD)	COMPLETED	SHALLOW SEISMIC, SEABED SURVEY	released	N		WELLSITE SEISMIC SURVEY FOR ST. GEORGE'S BAY A-36
8927-H028-001E	HUNT OIL	1995	OFFSHORE W NFLD/ST. GEORGES BAY (NFLD)	COMPLETED	REPROCESSING/REINTERP RETATION	released	N		REPROCESSING OF 8920-M033-001E (MARATHON 1992)
8920-M033-001E	MARATHON PETROLEUM	1992	OFFSHORE W NFLD/ST. GEORGES BAY (NFLD)	COMPLETED	COMBINED GEOPHYSICAL SURVEY	released	N		2-D SEISMICS AND GRAVITY, ST. GEORGE'S BAY
8620-G022-001E	GOLDEN EAGLE	1977	ST. GEORGES BAY (NFLD)	COMPLETED	COMBINED GEOPHYSICAL SURVEY	released	N		ST. GEORGES BAY SURVEY
8624-M003-017E	MOBIL OIL CANADA	1973	G. OF ST. LAWR/OFFSHORE W NFLD/ST. GEORGES BAY (NFLD)	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y	digital data available from the CNSOPB DMC	SURVEY OVER PORT AU PORT BLOCK
8624-M003-007E	MOBIL OIL CANADA	1971	G. OF ST. LAWR/ST. GEORGES BAY (NFLD)	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y	digital data available from the CNSOPB DMC	GEOPHYSICAL SURVEY IN THE ST. GEORGES BAY AREA (PORT AU PORT BLOCK)

Natural Resources Canada, Geological Survey of Canada, Geoscience Data Repository, BASIN Database (as of March 26, 2014)									
Project	**Company**	**Year**	**Area**	**Status**	**Geophysical Type**	**Approx. Release Date**	**Nav**	**Digital Data**	**Description**
8620-G001-001E	GULF CANADA	1973	G. OF ST. LAWR/OFFSHORE W NFLD	COMPLETED	COMBINED GEOPHYSICAL SURVEY	released	Y	digital data available from the CNSOPB DMC	MARINE GEOPHYSICAL SURVEY, WEST NEWFOUNDLAND
8624-S006-015E	SHELL CANADA	1973	G. OF ST. LAWR/OFFSHORE W NFLD	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y	digital data available from the CNSOPB DMC	SEISMIC SURVEY OFF WESTERN NEWFOUNDLAND
8624-V001-001E	VOYAGER	1970	G. OF ST. LAWR/OFFSHORE W NFLD	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y	digital data available from the CNSOPB DMC	MARINE SEISMIC SURVEY - THE RICH POINT STRAITS OF BELLE ISLE AREA
8627-A014-002P	AQUA-TERRA	1974	G. OF ST. LAWR/OFFSHORE W NFLD	COMPLETED	REPROCESSING/REINTERPRETATION	released	N		INTERPRETATION OF CANADIAN GOVERNMENT DATA, GEOLOGICAL AND GEOPHYSICAL EVALUATION OF GULF OF ST. LAWRENCE
8627-C022-002DA	ANADIAN HOMESTEA	1972	G. OF ST. LAWR/OFFSHORE W NFLD	COMPLETED	REPROCESS/REINTERPRET OF ACQUIRED DATA	released	N	digital data available from the CNSOPB DMC	PURCHASE OF 8624-C015-001P (CATALINA 1969)
8627-G001-002DA	GULF CANADA	1971	G. OF ST. LAWR/OFFSHORE W NFLD	COMPLETED	REPROCESS/REINTERPRET OF ACQUIRED DATA	released	D	digital data available from the CNSOPB DMC	PURCHASE OF 8624-C015-001P (CATALINA 1969)
8627-H007-001DA	HUDSONS BAY OIL	1974	G. OF ST. LAWR/OFFSHORE W NFLD	COMPLETED	REPROCESS/REINTERPRET OF ACQUIRED DATA	released	N	digital data available from the CNSOPB DMC	PURCHASE OF 8627-A014-002P (AQUA-TERRA 1974)
8627-H007-002E	HUDSONS BAY OIL	1974	G. OF ST. LAWR/OFFSHORE W NFLD	COMPLETED	REPROCESSING/REINTERPRETATION	released	N	digital data available from the CNSOPB DMC	PURCHASE OF SEISCAN DELTA, CATALINA AND DELTA DATA
8627-M003-001DA	MOBIL OIL CANADA	1971	G. OF ST. LAWR/OFFSHORE W NFLD	COMPLETED	REPROCESS/REINTERPRET OF ACQUIRED DATA	released	N		PURCHASE OF 8624-C015-001P (CATALINA 1969)

Project	Company	Year	Area	Status	Geophysical Type	Approx. Release Date	Nav	Digital Data	Description
8924-C137-001E	CORRIDOR RESOURCES	1998	G. OF ST. LAWR/OFFSHORE W NFLD	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	N		90 KMS OF 2-D SEISMICS (OFFSHORE WESTERN NEWFOUNDLAND AND ANTICOSTI ISLAND)
8924-G005-009P	GSI	2002	G. OF ST. LAWR/OFFSHORE W NFLD	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	N		743 KM 2-D SEISMIC SURVEY (WESTERN NEWFOUNDLAND & GULF OF ST. LAWRENCE) COMPLETED 15-DEC-2002
8924-G005-019P	GSI	2008	G. OF ST. LAWR/OFFSHORE W NFLD	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	23-Jun-19	N		2555 KM (OF A PLANNED 7842 KM) NON-EXCLUSIVE ANTICOSTI BASIN 2-D SEISMIC PROGRAM COMPLETED 23-DEC-2008
8926-C137-001E	CORRIDOR RESOURCES	2010	G. OF ST. LAWR/OFFSHORE W NFLD	COMPLETED	SHALLOW SEISMIC, SEABED SURVEY	18-Apr-16	N		MARITIMES BASIN (OLD HARRY PROSPECT) GEOHAZARD SURVEY COMPLETED 18-OCT-2010
8624-M003-017E	MOBIL OIL CANADA	1973	G. OF ST. LAWR/OFFSHORE W NFLD/ST. GEORGES BAY (NFLD)	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y	digital data available from the CNSOPB DMC	SURVEY OVER PORT AU PORT BLOCK
8921-E033-001P	ENCAL ENERGY LTD	1998	OFFSHORE W NFLD	COMPLETED	AEROMAGNETIC SURVEY	released	N		AIRBOURNE STRESS FIELD DETECTION SURVEY

Project	Company	Year	Area	Status	Geophysical Type	Approx. Release Date	Nav	Digital Data	Description
8921-H028-001E	HUNT OIL	1993	OFFSHORE W NFLD	COMPLETED	AEROMAGNETIC SURVEY	released	N		3300 KM AEROMAGNETIC SURVEY, PORT AU PORT PENINSULA
8924-B058-001E	BHP PETROLEUM	1991	OFFSHORE W NFLD	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y		OFFSHORE WEST COAST OF NEWFOUNDLAND, NORTHERN PENINSULA
8924-H028-001E	HUNT OIL	1990	OFFSHORE W NFLD	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y		4 LINES OFF WEST COAST OF NEWFOUNDLAND
8924-H028-002E	HUNT OIL	1991	OFFSHORE W NFLD	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y		OFFSHORE WEST COAST OF NEWFOUNDLAND, PORT AU PORT PENINSULA
8924-H028-003E	HUNT OIL	1992	OFFSHORE W NFLD	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	N		PORT AU PORT PENINSULA, OFFSHORE WEST NEWFOUNDLAND
8924-H028-004E	HUNT OIL	1996	OFFSHORE W NFLD	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	N		OCEAN BOTTOM CABLE SURVEY CONDUCTED IN PORT AU PORT BAY
8924-M003-001E	MOBIL OIL CANADA	1991	OFFSHORE W NFLD	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y		OFFSHORE WEST COAST OF NEWFOUNDLAND
8924-T057-001E	TALISMAN ENERGY IN	1995	OFFSHORE W NFLD	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	N		WESTERN NEWFOUNDLAND 2-D SEISMIC SURVEY
8924-W015-002P	VESTERN GEOPHYSICA	1991	OFFSHORE W NFLD	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	D		OFFSHORE WEST COAST OF NEWFOUNDLAND
8927-I015-001E	IMPERIAL VENTURE	1997	OFFSHORE W NFLD	COMPLETED	REPROCESS/REINTERPRET OF ACQUIRED DATA	released	N		2001 INTERPRETATION OF PURCHASED MOBIL DATA

Project	Company	Year	Area	Status	Geophysical Type	Approx. Release Date	Navy	Digital Data	Description
8927-T007-0001E,2E	TALISMAN ENERGY INC	1996	OFFSHORE W NFLD	COMPLETED	REPROCESS/REINTERPRET OF ACQUIRED DATA	released	N		PURCHASE AND INTERPRETATION OF 1996 AEROMAG AND LAND GRAVITY DATA
8920-M033-001E	MARATHON PETROLEU	1992	OFFSHORE W NFLD/ST. GEORGES BAY (NFLD)	COMPLETED	COMBINED GEOPHYSICAL SURVEY	released	N		2-D SEISMICS AND GRAVITY, ST. GEORGE'S BAY
8926-H028-001E	HUNT OIL	1996	OFFSHORE W NFLD/ST. GEORGES BAY (NFLD)	COMPLETED	SHALLOW SEISMIC, SEABED SURVEY	released	N		WELLSITE SEISMIC SURVEY FOR ST. GEORGE'S BAY A-36
8927-H028-001E	HUNT OIL	1996	OFFSHORE W NFLD/ST. GEORGES BAY (NFLD)	COMPLETED	REPROCESSING/REINTERPRETATION	released	N		REPROCESSING OF 8920-M033-001E (MARATHON 1992)
8924-T007-0006E	TEXACO CANADA	1970	SCOTIAN SHELF/G. OF ST. LAWR/CABOT STRAIT/OFFSHORE W NFLD	COMPLETED	SEISMIC REFLECTION SURVEY (2-D)	released	Y	digital data available from the CNSOPB DMC	MARINE VIBROSEIS SURVEY, CABOT STRAIT

Natural Resources Canada, Geological Survey of Canada, Geoscience Data Repository, BASIN Database (March 26, 2014)

NB: MANY OF THESE REPORTS ARE INTERNAL RESTRICTED CIRCULATION - SEE BASIN DATABASE FOR AVAILABILITY OF INDIVIDUAL REPORTS

Year	Ref. No.	Author	Study	Document
LONG POINT M-16				
2007	10263	CANADA-NEWFOUNDLAND OFFSHORE PETROLEUM BOARD	LITHOSTRATIGRAPHIC PICKS	SCHEDULE OF WELLS - NEWFOUNDLAND OFFSHORE AREA (MAR 2007)
1996	10275	GSC CALGARY (FOWLER,M.G.)	ROCK-EVAL AND TOC DATA	WELL HISTORY REPORT
1996	10275	STRICKLAND, ROLAND (STRIDE CONSULTING LTD)	GEOLOGICAL REPORT	WELL HISTORY REPORT
LONG RANGE A-09				
2007	10263	CANADA-NEWFOUNDLAND OFFSHORE PETROLEUM BOARD	LITHOSTRATIGRAPHIC PICKS	SCHEDULE OF WELLS - NEWFOUNDLAND OFFSHORE AREA (MAR 2007)
1996	10275	CORE LABORATORIES	CORE ANALYSIS REPORT (CONVENTIONAL CORE	WELL HISTORY REPORT
1996	10275	CORE LABORATORIES	CORE ANALYSIS REPORT (SIDEWALL CORE)	WELL HISTORY REPORT
1996	10275	CORE LABORATORIES	MUD FILTRATE ANALYSIS (DST#01)	WELL HISTORY REPORT
1996	10275	CORE LABORATORIES	WATER ANALYSIS (DST#01)	WELL HISTORY REPORT
1996	10275	DMA GEOLOGICAL CONSULTANTS LTD	GEOLOGICAL REPORT	WELL HISTORY REPORT
1996	10275	GEOCHEMISTRY ASSOCIATES	GEOCHEMICAL ANALYSIS REPORT (ROCKEVAL,T	WELL HISTORY REPORT
1996	10275	MILLENNIA STRATIGRAPHIC CONSULTANTS	BIOSTRATIGRAPHY OF THE INTERVAL 65-3665 M	WELL HISTORY REPORT
MAN O'WAR I-42				
2008	10263	CANADA-NEWFOUNDLAND OFFSHORE PETROLEUM BOARD	LITHOSTRATIGRAPHIC PICKS	SCHEDULE OF WELLS - NEWFOUNDLAND OFFSHORE AREA (OCT 2008)
1998	10275	LMX RESOURCES LTD (FOR INGLEWOOD RESOURCES)	WELL HISTORY REPORT	WELL HISTORY REPORT
PORT AU PORT NO. 1				
1996	10279	BURDEN,E.T. & WILLIAMS,H.S.	BIOSTRATIGRAPHY & THERMAL MATURITY REP	WELL HISTORY REPORT
1986	10279	CORE LABORATORIES	GAS ANALYSIS (DST#04)	WELL HISTORY REPORT
1986	10279	CORE LABORATORIES	HYDROCARBON LIQUID ANALYSIS (DST#04)	WELL HISTORY REPORT
1986	10279	CORE LABORATORIES	OIL ANALYSIS (DST#04)	WELL HISTORY REPORT
1986	10279	CORE LABORATORIES	WATER ANALYSIS (DST#01-04)	WELL HISTORY REPORT
1986	10279	DATALOG TECHNOLOGIES	HYDROCARBON SUMMARY (WELLSITE CHROMA	WELL HISTORY REPORT
1986	10279	FOWLER,M.G	REPORT ON OIL SAMPLE	WELL HISTORY REPORT
1986	10279	FOWLER,M.G	ROCKEVAL AND TOC SUMMARY	WELL HISTORY REPORT
1986	10279	STRICKLAND, ROLAND (STRIDE CONSULTING LTD)	FORMATION HYDROCARBON UNITS AND RATE	WELL HISTORY REPORT
1986	10279	STRICKLAND, ROLAND (STRIDE CONSULTING LTD)	FORMATION PERCENTAGE LOG (LITHOLOGIES A	WELL HISTORY REPORT
1986	10279	STRICKLAND, ROLAND (STRIDE CONSULTING LTD)	GEOLOGICAL WELL REPORT	WELL HISTORY REPORT
SHOAL POINT 2K-39				
2010	10263	CANADA-NEWFOUNDLAND OFFSHORE PETROLEUM BOARD	LITHOSTRATIGRAPHIC PICKS	SCHEDULE OF WELLS - NEWFOUNDLAND OFFSHORE AREA (DEC 2010)
2009	10275	DRAGON LANCE MANAGEMENT & SHOAL POINT ENERGY	WELL HISTORY REPORT	WELL HISTORY REPORT
SHOAL POINT 2K-39Z				
2010	10263	CANADA-NEWFOUNDLAND OFFSHORE PETROLEUM BOARD	LITHOSTRATIGRAPHIC PICKS	SCHEDULE OF WELLS - NEWFOUNDLAND OFFSHORE AREA (DEC 2010)

Year	Ref. No.	Author	Study	Document		
2009	10275	DRAGON LANCE MANAGEMENT & SHOAL POINT ENERGY	WELL HISTORY REPORT	WELL HISTORY REPORT		
SHOAL POINT K-39						
2008	10263	CANADA-NEWFOUNDLAND OFFSHORE PETROLEUM BOARD	LITHOSTRATIGRAPHIC PICKS	SCHEDULE OF WELLS - NEWFOUNDLAND OFFSHORE AREA (JUL 2003 & OCT 2008)		
1999	10275	ALPINE	DRILL STEM TEST REPORT	WELL HISTORY REPORT		
1999	10275	CORE LABORATORIES	GAS ANALYSIS (DST#01)	WELL HISTORY REPORT		
1999	10275	CORE LABORATORIES	WATER ANALYSIS (DST#01)	WELL HISTORY REPORT		
1999	10275	GSC CALGARY (FOWLER,M.G.)	ROCK-EVAL AND TOC DATA	WELL HISTORY REPORT		
1999	10275	OMNICHRON ASSOC (BURDEN,E. & WILLIAMS,H.)	BIOSTRATIGRAPHY AND THERMAL MATURITY R	WELL HISTORY REPORT		
1999	10275	STRICKLAND, ROLAND (STRIDE CONSULTING LTD)	GEOLOGICAL WELL REPORT	WELL HISTORY REPORT		
ST. GEORGE'S BAY A-36						
2007	10263	CANADA-NEWFOUNDLAND OFFSHORE PETROLEUM BOARD	LITHOSTRATIGRAPHIC PICKS	SCHEDULE OF WELLS - NEWFOUNDLAND OFFSHORE AREA (MAR 2007)		
1996	10275	ALLISON, CALVIN	FINAL WELL REPORT	WELL HISTORY REPORT		
1996	10275	BURDEN,E.T. & WILLIAMS,H.S.	BIOSTRATIGRAPHY & THERMAL MATURITY REP	WELL HISTORY REPORT		
1996	10275	CORE LABORATORIES	CORE ANALYSIS REPORT (CONVENTIONAL CORE	WELL HISTORY REPORT		
HARE BAY E-21						
2007	10263	CANADA-NEWFOUNDLAND OFFSHORE PETROLEUM BOARD	LITHOSTRATIGRAPHIC PICKS	SCHEDULE OF WELLS - NEWFOUNDLAND OFFSHORE AREA (MAR 2007)		
1994	927	GRADSTEIN, F.M. ET AL	CENOZOIC BIOSTRATIGRAPHY OF THE NORTH S	MICROPALEONTOLOGY, VOL 40, SUPPLEMENT, 152 P.		
1990	10300	GEOCHEM LABORATORIES	EAST NEWFOUNDLAND BASIN REGIONAL STUD	CNOPB NUMBER: 8933-G018-001E		
1989	1545	MOIR,P.N.	REVIEW AND TYPE SECTIONS	EAST COAST BASIN ATLAS SERIES: LABRADOR SEA		
1987	10264	WADE,J.A. & SHERWIN,D.F.	LITHOSTRATIGRAPHIC PICKS	SCHEDULE OF WELLS-COGLA		
1984	143	AVERY,M.P.	MATURATION INTERNAL REPORT - GSC(A)	EPGS-DOM-16-84MPA		
1984	10275	SHELL	GEOCHEMISTRY REPORT (VIT & ?)	WELL HISTORY REPORT & LOGS		
1982	10275	ROBERTSON RESEARCH LTD	GEOCHEMISTRY REPORT (VIT & ?)	WELL HISTORY REPORT & LOGS		
1980	2307	UMPLEBY,D.C.	LITHOSTRATIGRAPHIC INTERNAL REPORT - GSC	EPGS-STRAT-22-80DCU		
1979	16934	BP RESEARCH CENTRE	BIOSTRATIGRAPHY AND PALAEOENVIRONMENT	CNLOPB INFORMATION RESOURCES CENTRE		
1979	16947	BP RESEARCH CENTRE	PALYNOLOGICAL DATING OF SELECTED SWC AN	CNLOPB INFORMATION RESOURCES CENTRE		
1979	852	GRADSTEIN,F.M.	BIOSTRATIGRAPHIC INTERNAL REPORT - GSC(A)	EPGS-PAL-32-79FMG		
1979	10275	?	PALYNOLOGICAL DATING OF SELECTED SWC & (	WELL HISTORY REPORT & LOGS		
1979	10275	BP	DRILLING PROGRAM	WELL HISTORY REPORT & LOGS		
1979	10275	BP	FORMATION LEAK-OFF TEST RESULTS	WELL HISTORY REPORT & LOGS		
1979	10275	BP	GEOCHEMISTRY REPORT (TOC,VIT)	WELL HISTORY REPORT & LOGS		
1979	10275	FENCO LTD	OIL SLICK TRAJECTORY ANALYSIS	WELL HISTORY REPORT & LOGS		
1979	10275	SCHLUMBERGER	DIRECTIONAL SURVEY	WELL HISTORY REPORT & LOGS		
1979	10275	SHELL	SURVEY POSITIONING REPORT	WELL HISTORY REPORT & LOGS		
VERRAZANO L-77						
2007	10263	CANADA-NEWFOUNDLAND OFFSHORE PETROLEUM BOARD	LITHOSTRATIGRAPHIC PICKS	SCHEDULE OF WELLS - NEWFOUNDLAND OFFSHORE AREA (MAR 2007)		
1990	1377	WILLIAMS,G.L. ET AL	BIOSTRATIGRAPHY AND RELATED STUDIES	GEOL OF THE CONT. MARGIN OF E. CANADA NO. 2, CHAPTER 3		
1989	1545	MOIR,P.N.	REVIEW AND TYPE SECTIONS	EAST COAST BASIN ATLAS SERIES: LABRADOR SEA		
1987	10302	D'EON-MILLER & ASSOC LTD	LABRADOR SHELF PALEOENVIRONMENTS REPO	GSC OPEN FILE REPORT #1722		
1987	10264	(NOT GIVEN)	LITHOSTRATIGRAPHIC PICKS	SCHEDULE OF WELLS-COGLA		
1979	406	BARSS,M.S., BUJAK,J.P. & WILLIAMS,G.L.	PALYNOLOGICAL ZONATION AND CORRELATION	GSC PAPER 78-24		

Year	Ref. No.	Author	Study	Document		
1977	309	BARSS,M.S.	BIOSTRATIGRAPHIC INTERNAL REPORT - GSC(A)	EPGS-PAL-09-77MSB		
1977	10275	GEOCHEM LABORATORIES	HYDROCARBON SOURCE FACIES ANALYSIS (TOC	WELL HISTORY REPORT & LOGS		
1977	10275	SCHLUMBERGER	DIRECTIONAL SURVEY	WELL HISTORY REPORT & LOGS		
1977	10275	TOTAL-C.F.P.	CARBONATE MICROFACIES STUDY	WELL HISTORY REPORT & LOGS		
1977	10275	TOTAL-C.F.P.	GEOCHEMICAL STUDY (TOC,VIT,TAI)	WELL HISTORY REPORT & LOGS		
1977	10275	TOTAL-C.F.P.	PALYNOLOGICAL STUDY	WELL HISTORY REPORT & LOGS		
HERMINE E-94						
2007	10263	CANADA-NEWFOUNDLAND OFFSHORE PETROLEUM BOARD	LITHOSTRATIGRAPHIC PICKS	SCHEDULE OF WELLS - NEWFOUNDLAND OFFSHORE AREA (MAR 2007)		
2006	16846	WILLIAMS, G.L.	BIOSTRATIGRAPHIC REPORT	GSC OPEN FILE REPORT #4976		
2004	16828	THOMAS, F.C.	BIOSTRATIGRAPHIC INTERNAL REPORT - GSC(A)	M.R.G.-PAL.5-2004FCT		
2003	15212	WILLIAMS, G.L.	BIOSTRATIGRAPHIC REPORT	GSC OPEN FILE REPORT #1654		
2002		GSC CALGARY (FOWLER,M.G.)	ROCK-EVAL AND TOC DATA	N/A		
2000	16959	ROBERTSON RESEARCH INTERNATIONAL LTD	FRONTIER RESERVOIRS OF THE NORTH ATLANTI	CNSOPB SAMPLE REPORT NUMBER: SR1999-7		
1993	1440	MACLEAN,B.C. & WADE,J.A.	SEISMIC MARKERS AND STRATIGRAPHIC PICKS I	EAST COAST BASIN ATLAS SERIES		
1990	1377	WILLIAMS, G.L. ET AL	BIOSTRATIGRAPHY AND RELATED STUDIES	GEOL OF THE CONT. MARGIN OF E. CANADA NO. 2, CHAPTER 3		
1987	175	AVERY,M.P.	VITRINITE REFLECTANCE REPORT	GSC OPEN FILE REPORT #1804		
1987	10264	WADE,J.A. & SHERWIN,D.F.	LITHOSTRATIGRAPHIC PICKS	SCHEDULE OF WELLS-COGLA		
1985	10064	REITER,M. & JESSOP,A.M.	ESTIMATES OF TERRESTRIAL HEAT FLOW IN OFF	CAN. J. EARTH SCI., VOL. 22, P. 1503-1517		
1980	1720	THOMAS,F.C.	BIOSTRATIGRAPHIC INTERNAL REPORT - GSC(A)	EPGS-PAL-02-80FCT		
1980	1170	HOWIE,R.D.	LITHOSTRATIGRAPHIC INTERNAL REPORT - GSC(	EPGS-STRAT-01-74RDH		
1979	2075	WILLIAMS, G.L.	BIOSTRATIGRAPHIC INTERNAL REPORT - GSC(A)	EPGS-PAL-19-79GLW		
1979	406	BARSS,M.S., BUJAK,J.P. & WILLIAMS,G.L.	PALYNOLOGICAL ZONATION AND CORRELATION	GSC PAPER 78-24		
1978	588	BUJAK,J.P. & WILLIAMS,G.L.	CRETACEOUS PALYNOSTRATIGRAPHY OF OFFSH	GSC BULLETIN 297		
1977	2107	WILLIAMS,G.L. & BUJAK,J.P.	CENOZOIC PALYNOSTRATIGRAPHY OF OFFSHOR	(IN) AMER. ASSOC. STRATIGRAPHIC PALYNOLOGISTS, CONTR. SERIES, NO. 5A		
1976	503	BUJAK,J.P.	MATURATION INTERNAL REPORT - GSC(A)	EPGS-DOM-31-76JPB		
1975	2026	WILLIAMS, G.L.	BIOSTRATIGRAPHIC INTERNAL REPORT - GSC(A)	EPGS-PAL-12-75GLW		
1974	259	BARSS,M.S.	BIOSTRATIGRAPHIC INTERNAL REPORT - GSC(A)	EPGS-PAL-04-74MSB		
1973	16875	GRADSTEIN, F.M. ET AL (IMPERIAL OIL LTD)	STRATIGRAPHY AND MICROPALEONTOLOGY RE	IMPERIAL OIL LIMITED REPORT		
1972	10275	BARTLETT, G.A., QUEEN'S UNIV.	BIOSTRATIGRAPHIC SUMMARY REPORT	WELL HISTORY REPORT & LOGS		
1972	10275	ELF OIL	BIOSTRATIGRAPHIC STUDY	WELL HISTORY REPORT & LOGS		
1972	10275	SEISMOGRAPH SERVICE CORP	SEISMIC VELOCITY SURVEY	WELL HISTORY REPORT & LOGS		

Natural Resources Canada, Geological Survey of Canada, Geoscience Data Repository, BASIN Database

Date: March 26, 2014, 11:41 am EDT

Well Name	GSC #	Unique Well Identifier	Original Spud Year	Operator	Area	Basin	Status
HERMINE E-94	D038	300 E94 45300 54150	1971	ELF	Grand Banks	SCOTIAN BASIN	P&A
NORTH SYDNEY F-24	D163	300 F24 46400 59450	1976	SHELL PETRO CANADA ET AL	Nova Scotia (nearshore)	MARITIMES BASIN	P&A
NORTH SYDNEY P-05	D134	300 P05 46400 59450	1974	MURPHY ET AL	Nova Scotia (nearshore)	MARITIMES BASIN	P&A
ST. PAUL P-91	D235	300 P91 47200 60000	1983	PETRO-CANADA	Nova Scotia (nearshore)	MARITIMES BASIN	P&A
BIRCH GROVE NO. 1 (onshore)	D073	400 001 46100 59550	1968	MURPHY OIL COMPANY LTD.	Nova Scotia (onshore)	MARITIMES BASIN	P&A
BRADELLE L-49	D110	300 L49 48000 63000	1973	SHELL-SOQUIP-AMOCO	Gulf of St. Lawrence	MARITIMES BASIN	P&A
BRION ISLAND NO. 1	D037	300 O78 47500 61150	1970	SAREP-H.Q.	Gulf of St. Lawrence	MARITIMES BASIN	P&A
CABLEHEAD E-95	D230	300 E95 46500 62150	1983	IRVING-CHEVRON-TEXACO	Gulf of St. Lawrence	MARITIMES BASIN	P&A
CAP ROUGE F-52	D103	300 F52 47200 61000	1973	SHELL-AMOCO	Gulf of St. Lawrence	MARITIMES BASIN	P&A
CAPE BRETON NO. 1	D067	900 040 47200 60450	1965	PAN AM	Gulf of St. Lawrence	MARITIMES BASIN	ABAND
EAST POINT E-47	D188	300 E47 46400 61300	1980	HUDSON'S BAY ET AL	Gulf of St. Lawrence	MARITIMES BASIN	P&A
EAST POINT E-49	D014	300 E49 46400 61300	1970	HB-FINA	Gulf of St. Lawrence	MARITIMES BASIN	P&A
FATIMA NO. 1	L022		1999	CORRIDOR	Gulf of St. Lawrence	MARITIMES BASIN	P&A
GULF NO. 1	D063	900 036 48000 62000	1965	PAN AM-H.Q.	Gulf of St. Lawrence	MARITIMES BASIN	ABAND
GULF NO. 2	D064	900 037 47400 63000	1965	PAN AM-H.Q.	Gulf of St. Lawrence	MARITIMES BASIN	ABAND
GULF NO. 2A	D065	900 037 47400 63001	1965	PAN AM-H.Q.	Gulf of St. Lawrence	MARITIMES BASIN	ABAND
GULF NO. 4	D066	900 039 48200 63150	1965	PAN AM-H.Q.	Gulf of St. Lawrence	MARITIMES BASIN	ABAND
NORTHUMBERLAND STRAIT F-25	D015	300 F25 46100 62000	1970	HB-FINA	Gulf of St. Lawrence	MARITIMES BASIN	P&A
SANDTOP NO. 1	D128	400 001 49100 61450	1974	SOQUIP-SCURRY-RAINBOW	Gulf of St. Lawrence	ANTICOSTI BASIN	P&A
VERRAZANO L-77	D167	300 L77 52300 54000	1976	EASTCAN ET AL	Labrador Shelf	ST ANTHONY BASIN	P&A
HARE BAY E-21	D185	300 E21 51200 51000	1979	BP ET AL	Northeast Newfoundland Shelf	ST ANTHONY BASIN	P&A
LONG POINT M-16	N141	300 M16 48500 58450	1995	NFLD HUNT/PANCANADIAN	Newfoundland (West)	ANTICOSTI BASIN	P&A
LONG RANGE A-09	N142	300 A09 48300 59150	1996	TALISMAN ET AL	Newfoundland (West)	ANTICOSTI BASIN	P&A
MAN O'WAR I-42	N147	300 I42 48400 58450	1997	INGLEWOOD	Newfoundland (West)	ANTICOSTI BASIN	ABAND
PORT AU PORT NO. 1	L020		1994	HUNT/PANCANADIAN	Newfoundland (West)	ANTICOSTI BASIN	SUSP
PORT AU PORT NO. 1 ST	L031		2001	CANADIAN IMPERIAL	Newfoundland (West)	ANTICOSTI BASIN	ABAND
PORT AU PORT NO. 1 ST-2	L036		2002	CANADIAN IMPERIAL	Newfoundland (West)	ANTICOSTI BASIN	
PORT AU PORT NO. 2	L028		2001	CANADIAN IMPERIAL	Newfoundland (West)	ANTICOSTI BASIN	
SHOAL POINT 2K-39	N331	302 K39 48400 58450	2008	SHOAL POINT ENERGY ET AL	Newfoundland (West)	ANTICOSTI BASIN	ABAND
SHOAL POINT 2K-39Z	N336	302 K39 48400 58451	2008	SHOAL POINT ENERGY ET AL	Newfoundland (West)	ANTICOSTI BASIN	ABAND
SHOAL POINT 3K-39	N365	303 K39 48400 58450	2011	DRAGON LANCE MANAGEMENT ET AL	Newfoundland (West)	ANTICOSTI BASIN	ABAND
SHOAL POINT 3K-39Z	N372	303 K39 48400 58451	2012	DRAGON LANCE MANAGEMENT ET AL	Newfoundland (West)	ANTICOSTI BASIN	SUSP
SHOAL POINT K-39	N159	300 K39 48400 58450	1999	PANCANADIAN ET AL	Newfoundland (West)	ANTICOSTI BASIN	ABAND
ST. GEORGE'S BAY A-36	N143	300 A36 48300 59150	1996	NFLD HUNT/PANCANADIAN	Newfoundland (West)	ANTICOSTI BASIN	P&A
BEAR RIVER NO. 1	L025		2000	METEOR CREEK RESOURCES	Prince Edward Island	MARITIMES BASIN	P&A

Well Name	GSC #	Unique Well Identifier	Original Spud Year	Operator	Area	Basin	Status
GREEN GABLES NO. 1	L001	400 001 46300 63200	1972	HB FINA ET AL	Prince Edward Island	MARITIMES BASIN	P&A
GREEN GABLES NO. 2	L023		1997	CORRIDOR	Prince Edward Island	MARITIMES BASIN	SUSP
GREEN GABLES NO. 3	L039		2007	CORRIDOR	Prince Edward Island	MARITIMES BASIN	SUSP
HILLSBOROUGH NO. 1	L010	400 001 46100 63050	1943	ISLAND DEVELOPMENT	Prince Edward Island	MARITIMES BASIN	P&A
IRISHTOWN NO. 1	L002	300 L40 46300 63300	1972	HB FINA ET AL	Prince Edward Island	MARITIMES BASIN	P&A
IRISHTOWN NO. 2	L037		2003	RALLY ENERGY	Prince Edward Island	MARITIMES BASIN	P&A
NAUFRAGE NO. 1	D150	400 001 46300 62300	1975	SOQUIP ET AL	Prince Edward Island	MARITIMES BASIN	P&A
NEW HARMONY NO. 1	L040		2007	CORRIDOR-PETROWORTH	Prince Edward Island	MARITIMES BASIN	SUSP
SEAVIEW NO. 1	L038		2003	RALLY ENERGY AL ET	Prince Edward Island	MARITIMES BASIN	P&A
SPRING VALLEY NO. 1	L021		1997	PRINCE EDWARD GAS	Prince Edward Island	MARITIMES BASIN	P&A
TYRONE NO. 1	D143	400 001 46200 63200	1975	SOQUIP ET AL	Prince Edward Island	MARITIMES BASIN	P&A
WELLINGTON STATION NO. 1	L003	400 001 46300 64000	1958	IMPERIAL	Prince Edward Island	MARITIMES BASIN	P&A

Natural Resources Canada, Geological Survey of Canada, Geoscience Data Repository, BASIN Database							
Date: March 26, 2014, 1:38 pm EDT							
Well Name	GSC #	Unique Well Identifier	Original Spud Year	Operator	Area	Basin	Status
PORT AU PORT NO. 1	L020		1994	HUNT/PANCANADIAN	Newfoundland (West)	ANTICOSTI BASIN	SUSP
LONG POINT M-16	N141	300 M16 48500 58450	1995	NFLD HUNT/PANCANADIAN	Newfoundland (West)	ANTICOSTI BASIN	P&A
LONG RANGE A-09	N142	300 A09 48300 59150	1996	TALISMAN ET AL	Newfoundland (West)	ANTICOSTI BASIN	P&A
ST. GEORGE'S BAY A-36	N143	300 A36 48300 59150	1996	NFLD HUNT/PANCANADIAN	Newfoundland (West)	ANTICOSTI BASIN	P&A
MAN O'WAR I-42	N147	300 I42 48400 58450	1997	INGLEWOOD	Newfoundland (West)	ANTICOSTI BASIN	ABAND
SHOAL POINT K-39	N159	300 K39 48400 58450	1999	PANCANADIAN ET AL	Newfoundland (West)	ANTICOSTI BASIN	ABAND
PORT AU PORT NO. 1 ST	L031		2001	CANADIAN IMPERIAL	Newfoundland (West)	ANTICOSTI BASIN	ABAND
PORT AU PORT NO. 2	L028		2001	CANADIAN IMPERIAL	Newfoundland (West)	ANTICOSTI BASIN	
PORT AU PORT NO. 1 ST-2	L036		2002	CANADIAN IMPERIAL	Newfoundland (West)	ANTICOSTI BASIN	
SHOAL POINT 2K-39	N331	302 K39 48400 58450	2008	SHOAL POINT ENERGY ET AL	Newfoundland (West)	ANTICOSTI BASIN	ABAND
SHOAL POINT 2K-39Z	N336	302 K39 48400 58451	2008	SHOAL POINT ENERGY ET AL	Newfoundland (West)	ANTICOSTI BASIN	ABAND
SHOAL POINT 3K-39	N365	303 K39 48400 58450	2011	DRAGON LANCE MANAGEMENT ET AL	Newfoundland (West)	ANTICOSTI BASIN	ABAND
SHOAL POINT 3K-39Z	N372	303 K39 48400 58451	2012	DRAGON LANCE MANAGEMENT ET AL	Newfoundland (West)	ANTICOSTI BASIN	SUSP
NORTH SYDNEY P-05	D134	300 P05 46400 59450	1974	MURPHY ET AL	Nova Scotia (nearshore)	MARITIMES BASIN	P&A
NORTH SYDNEY F-24	D163	300 F24 46400 59450	1976	SHELL PETRO CANADA ET AL	Nova Scotia (nearshore)	MARITIMES BASIN	P&A
ST. PAUL P-91	D235	300 P91 47200 60000	1983	PETRO-CANADA	Nova Scotia (nearshore)	MARITIMES BASIN	P&A
VERRAZANO L-77	D167	300 L77 52300 54000	1976	EASTCAN ET AL	Labrador Shelf	ST ANTHONY BASIN	P&A
HARE BAY E-21	D185	300 E21 51200 51000	1979	BP ET AL	Northeast Newfoundland Shelf	ST ANTHONY BASIN	P&A

GOVERNMENT OF NEWFOUNDLAND AND LABRADOR – NATURAL RESOURCES - GEOLOGICAL SURVEY

ONSHORE NEWFOUNDLAND PERMITS AND LEASES (as of March 2014)

OBJECTID	PERMNUM	COMPANY	REGION_NAM	TYPE	SHAPE_LENG	AREA_HA	AREA	LEN
1	03-102	Nalcor Energy - Oil and Gas Inc.	Parsons Pond / onshore	Permit	0.61496160	16773.87965340	0.017993451	0.614961599
2	03-103	Nalcor Energy - Oil and Gas Inc.	Parsons Pond / onshore	Permit	0.65472234	15267.59892480	0.016404399	0.654722345
3	93-103	Deer Lake Oil and Gas	Deer Lake / onshore	Permit	0.93722190	33096.50299810	0.036092615	0.937221896
4	03-105	Deer Lake Oil and Gas	Deer Lake / onshore	Permit	1.03773862	41549.57695550	0.045419998	1.037738613
5	96-105	Investcan Energy Corporation	Flat Bay / onshore	Permit	1.18574803	37128.29929690	0.041226277	1.185748033
6	03-106	Investcan Energy Corporation	Flat Bay / onshore	Permit	0.95271045	41397.26194950	0.046057350	0.952710450
7	03-107	Investcan Energy Corporation	Flat Bay / onshore	Permit	0.90218557	27906.89284850	0.031062690	0.902185571
9	2002-01(A)	Enegi Oil Inc.	Port au Port / onshore	Lease	0.21361849	1956.98187864	0.002167633	0.213618486

rv.gov.nl.ca/resourceatlas/viewer.htm

ONSHORE SEISMIC LINES - WESTERN NEWFOUNDLAND (as of March 2014)							
LINE_NAME	COMPANY	ELNUM	LENGTH	REL_DATE	REL_YEAR	AREA	LEN
PastureRoad_1	CERR	89-101-01-rs	12.36340247	01/10/1994	1994	0.000000000	0.154705803
92-067	Labrador Mining & Expl	92-104-01-es	10.49217393	09/04/1998	1998	0.000000000	0.130486722
92-068	Labrador Mining & Expl	92-104-01-es	10.03097488	09/04/1998	1998	0.000000000	0.135777028
92-069	Labrador Mining & Expl	92-104-01-es	9.84009444	09/04/1998	1998	0.000000000	0.132434517
92-070	Labrador Mining & Expl	92-104-01-es	10.52156113	09/04/1998	1998	0.000000000	0.136605071
92-071	Labrador Mining & Expl	92-104-01-es	12.68086070	09/04/1998	1998	0.000000000	0.169903396
92-072	Labrador Mining & Expl	92-104-01-es	14.41994195	09/04/1998	1998	0.000000000	0.193900850
92-073	Labrador Mining & Expl	92-104-01-es	26.10256484	09/04/1998	1998	0.000000000	0.246836674
CAH-93-4A	Hunt Oil Company	93-106-02-es	9.46775432	02/04/1999	1999	0.000000000	0.104926692
CAH-93-4B	Hunt Oil Company	93-106-02-es	23.50962086	02/04/1999	1999	0.000000000	0.279946378
CAH-93-5	Hunt Oil Company	93-106-02-es	6.68685267	02/04/1999	1999	0.000000000	0.067871181
CAH-93-6	Hunt Oil Company	93-106-02-es	9.67641669	02/04/1999	1999	0.000000000	0.095278262
CAH-93-7	Hunt Oil Company	93-106-02-es	10.81447926	02/04/1999	1999	0.000000000	0.109010691
CAH-93-8	Hunt Oil Company	93-106-02-es	12.62019273	02/04/1999	1999	0.000000000	0.130210261
CAH-93-9	Hunt Oil Company	93-106-02-es	16.50924955	02/04/1999	1999	0.000000000	0.168789223
DL01_94	Vinland Petroleum Inc.	94-105-03-es	1.78951172	12/09/1999	1999	0.000000000	0.021143849
DL02_94	Vinland Petroleum Inc.	94-105-03-es	9.42602916	12/09/1999	1999	0.000000000	0.117737063
SC01-95	Vinland Petroleum Inc.	95-105-01-es	11.31834684	15/08/2000	2000	0.000000000	0.143931688
MG096-063	Talisman	96-110-01-es & 02	8.51100449	14/04/2001	2001	0.000000000	0.115194646
MG096-064	Talisman	96-110-01-es & 02	49.70024925	14/04/2001	2001	0.000000000	0.512803654
MG096-065	Talisman	96-110-01-es & 02	19.98192343	14/04/2001	2001	0.000000000	0.251830420
MG096-067	Talisman	96-110-01-es & 02	10.70951953	14/04/2001	2001	0.000000000	0.145753917
MG096-068	Talisman	96-110-01-es & 02	10.58897216	14/04/2001	2001	0.000000000	0.136885852
MG096-069	Talisman	96-110-01-es & 02	18.17639075	14/04/2001	2001	0.000000000	0.236383956
MG096-070	Talisman	96-110-01-es & 02	8.30836419	14/04/2001	2001	0.000000000	0.102027202
MG096-071	Talisman	96-110-01-es & 02	8.38457847	14/04/2001	2001	0.000000000	0.114318139
MG096-072	Talisman	96-110-01-es & 02	6.83622809	14/04/2001	2001	0.000000000	0.088536961
MG096-073	Talisman	96-110-01-es & 02	9.57806166	14/04/2001	2001	0.000000000	0.095147844
MG096-074	Talisman	96-110-01-es & 02	9.64315269	14/04/2001	2001	0.000000000	0.086946836
SR-3-96	Sandhurst Roxanna	96-109-01-es	32.98075434	21/06/2001	2001	0.000000000	0.383961870
SR-4-96	Sandhurst Roxanna	96-109-01-es	11.39721455	21/06/2001	2001	0.000000000	0.141430233

LINE_NAME	COMPANY	ELNUM	LENGTH	REL_DATE	REL_YEAR	AREA	LEN
SR-5-96	Sandhurst Roxanna	96-109-01-es	9.30930885	21/06/2001	2001	0.000000000	0.109697168
SR-6-96	Sandhurst Roxanna	96-109-01-es	18.56566992	21/06/2001	2001	0.000000000	0.225191953
SR-7-96	Sandhurst Roxanna	96-109-01-es	11.95527971	21/06/2001	2001	0.000000000	0.154862191
96-2033	Mobil Oil Canada	96-103-01-ES	13.09169078	01/12/2001	2001	0.000000000	0.149297550
96-2034	Mobil Oil Canada	96-103-01-ES	12.59816350	01/12/2001	2001	0.000000000	0.145597166
MB-01	International Frontier R	97-113-01-es	10.09646213	01/03/2002	2002	0.000000000	0.106751958
LINE 1	Inglewood Resources	97-114-03-es	10.67317811	19/08/2002	2002	0.000000000	0.128098850
LINE 1B	Inglewood Resources	97-114-03-es	7.33428133	19/08/2002	2002	0.000000000	0.091661886
LINE 2	Inglewood Resources	97-114-03-es	5.26406750	19/08/2002	2002	0.000000000	0.056869024
LINE 3	Inglewood Resources	97-114-03-es	10.15061059	19/08/2002	2002	0.000000000	0.095364641
LINE 4	Inglewood Resources	97-114-03-es	3.89170857	19/08/2002	2002	0.000000000	0.051045788
98-106	Vulcan Minerals	98-116-01-es	5.96922057	19/03/2003	2003	0.000000000	0.069026406
89-2	IEXCO	89-100-01-ns	9.94188839	20/10/2004	2004	0.000000000	0.127624869
89-3A	IEXCO	89-100-01-ns	32.04258447	20/10/2004	2004	0.000000000	0.407958682
89-5A	IEXCO	89-100-01-ns	8.15082476	20/10/2004	2004	0.000000000	0.097408043
FB-1	Vulcan Minerals Inc.	01-116-01-es	8.00348567	15/01/2007	2007	0.000000000	0.084922976
FB-2	Vulcan Minerals Inc.	01-116-01-es	3.99621575	15/01/2007	2002	0.000000000	0.050523633
FB-3	Vulcan Minerals Inc.	01-116-01-es	6.05351337	15/01/2007	2007	0.000000000	0.067844853
FB-4	Vulcan Minerals Inc.	01-116-01-es	0.96043765	15/01/2007	2007	0.000000000	0.010668076
FiveMileRoad_1	MUN	09-101-01-RS	4.36608458	14/06/2009	2009	0.000000000	0.057241916
VM-H-001-04	Vulcan Minerals Inc.	04-116-01-es	6.95282532	12/09/2009	2009	0.000000000	0.086225707
VM-H-002-04	Vulcan Minerals Inc.	04-116-01-es	2.84161220	12/09/2009	2009	0.000000000	0.037071171
VM-H-003-04	Vulcan Minerals Inc.	04-116-01-es	2.06255951	12/09/2009	2009	0.000000000	0.022155161
VM-H-004-04	Vulcan Minerals Inc.	04-116-01-es	4.35903979	12/09/2009	2009	0.000000000	0.049730263
VM-H-005-04	Vulcan Minerals Inc.	04-116-01-es	7.11479379	12/09/2009	2009	0.000000000	0.084563320
VM-H-006-04	Vulcan Minerals Inc.	04-116-01-es	3.00639885	12/09/2009	2009	0.000000000	0.036761138
VM-H-007-04	Vulcan Minerals Inc.	04-116-01-es	2.48853671	12/09/2009	2009	0.000000000	0.031089939
VM-H-008-04	Vulcan Minerals Inc.	04-116-01-es	1.88562292	12/09/2009	2009	0.000000000	0.019848079
VM-H-009-04	Vulcan Minerals Inc.	04-116-01-es	2.46766738	12/09/2009	2009	0.000000000	0.028661908
VM-H-010-04	Vulcan Minerals Inc.	04-116-01-es	2.74884661	12/09/2009	2009	0.000000000	0.032489770
VM-H-011-04	Vulcan Minerals Inc.	04-116-01-es	3.71324295	12/09/2009	2009	0.000000000	0.043332905
VM-H-012-04	Vulcan Minerals Inc.	04-116-01-es	2.96102244	12/09/2009	2009	0.000000000	0.032154345
VM-H-013-04	Vulcan Minerals Inc.	04-116-01-es	13.29328082	12/09/2009	2009	0.000000000	0.152521074

LINE_NAME	COMPANY	ELNUM	LENGTH	REL_DATE	REL_YEAR	AREA	LEN
VM-H-015-04	Vulcan Minerals Inc.	04-116-01-es	1.47507470	12/09/2009	2009	0.000000000	0.014232886
FlatBay_2010	MUN	10-101-01-RS	4.01711588	15/06/2010	2010	0.000000000	0.052942021
VUL-05-01-01	Vulcan Minerals Inc.	05-116-01-es	19.68807695	09/09/2010	2010	0.000000000	0.223803950
VUL-05-01-02	Vulcan Minerals Inc.	05-116-01-es	2.64516226	09/09/2010	2010	0.000000000	0.026700053
VUL-05-01-03	Vulcan Minerals Inc.	05-116-01-es	3.05688187	09/09/2010	2010	0.000000000	0.035139331
VUL-05-01-04	Vulcan Minerals Inc.	05-116-01-es	3.17708976	09/09/2010	2010	0.000000000	0.038068935
VUL-05-01-05	Vulcan Minerals Inc.	05-116-01-es	4.22504926	09/09/2010	2010	0.000000000	0.053056082
VUL-05-01-06	Vulcan Minerals Inc.	05-116-01-es	3.66325678	09/09/2010	2010	0.000000000	0.041870509
VUL-05-01-07	Vulcan Minerals Inc.	05-116-01-es	4.02412676	09/09/2010	2010	0.000000000	0.047478341
VUL-05-01-08	Vulcan Minerals Inc.	05-116-01-es	6.34824800	09/09/2010	2010	0.000000000	0.070279726
VUL-05-01-09	Vulcan Minerals Inc.	05-116-01-es	4.98060725	09/09/2010	2010	0.000000000	0.065475943
VUL-05-01-10	Vulcan Minerals Inc.	05-116-01-es	17.31237132	09/09/2010	2010	0.000000000	0.189181342
SL-01	BFR	96-108-01-ns	36.42540390	11/03/2011	2011	0.000000000	0.451516846
95-1	IEXCO	95-100-01-ns	62.49107738	14/03/2011	2011	0.000000000	0.798908741
95-11	IEXCO	95-100-01-ns	90.00686289	14/03/2011	2011	0.000000000	1.144272246
95-2	IEXCO	95-100-01-ns	55.17246763	14/03/2011	2011	0.000000000	0.667136977
95-7	IEXCO	95-100-01-ns	56.24544607	14/03/2011	2011	0.000000000	0.651837345
95-8	IEXCO	95-100-01-ns	12.22668253	14/03/2011	2011	0.000000000	0.137065480
Line 1	Vulcan Minerals	07-116-01-es	12.27294685	20/10/2012	2012	0.000000000	0.159524841
Line 2	Vulcan Minerals	07-116-01-es	12.21577975	20/10/2012	2012	0.000000000	0.147648431
Line 3	Vulcan Minerals	07-116-01-es	15.80623181	20/10/2012	2012	0.000000000	0.166776700
Line 4	Vulcan Minerals	07-116-01-es	15.93421672	20/10/2012	2012	0.000000000	0.168079583
Ln 01	Western Geophysical	00-119-01-ns	2.24483185	10/09/2015	2015	0.000000000	0.028449200
Ln 02	Western Geophysical	00-119-01-ns	2.69538929	10/09/2015	2015	0.000000000	0.034148171
Ln 03	Western Geophysical	00-119-01-ns	2.58400665	10/09/2015	2015	0.000000000	0.032752788
Ln 05	Western Geophysical	00-119-01-ns	4.21656190	10/09/2015	2015	0.000000000	0.055618525
Ln 07	Western Geophysical	00-119-01-ns	5.44150345	10/09/2015	2015	0.000000000	0.058334312
Ln_04	Western Geophysical	00-119-01-ns	3.03980618	10/09/2015	2015	0.000000000	0.038906630
Ln_06	Western Geophysical	00-119-01-ns	5.49295376	10/09/2015	2015	0.000000000	0.058032873
VIN-10-1	Vulcan Minerals Inc.	10-116-01-ES	7.74706229	12/11/2015	2015	0.000000000	0.104432458
VIN-10-10	Vulcan Minerals Inc.	10-116-01-ES	6.55935281	12/11/2015	2015	0.000000000	0.059551981
VIN-10-11	Vulcan Minerals Inc.	10-116-01-ES	5.54464013	12/11/2015	2015	0.000000000	0.061860460
VIN-10-12	Vulcan Minerals Inc.	10-116-01-ES	5.27881087	12/11/2015	2015	0.000000000	0.060736313

LINE_NAME	COMPANY	ELNUM	LENGTH	REL_DATE	REL_YEAR	AREA	LEN
VIN-10-13	Vulcan Minerals Inc.	10-116-01-ES	3.48608055	12/11/2015	2015	0.000000000	0.046864919
VIN-10-14	Vulcan Minerals Inc.	10-116-01-ES	6.85194634	12/11/2015	2015	0.000000000	0.073095457
VIN-10-2	Vulcan Minerals Inc.	10-116-01-ES	8.13132543	12/11/2015	2015	0.000000000	0.092102948
VIN-10-3	Vulcan Minerals Inc.	10-116-01-ES	16.75530250	12/11/2015	2015	0.000000000	0.214016144
VIN-10-4	Vulcan Minerals Inc.	10-116-01-ES	9.79055623	12/11/2015	2015	0.000000000	0.088913143
VIN-10-5	Vulcan Minerals Inc.	10-116-01-ES	7.82510399	12/11/2015	2015	0.000000000	0.072824224
VIN-10-6	Vulcan Minerals Inc.	10-116-01-ES	8.23088165	12/11/2015	2015	0.000000000	0.099993493
VIN-10-7	Vulcan Minerals Inc.	10-116-01-ES	11.40069350	12/11/2015	2015	0.000000000	0.107731531
VIN-10-8	Vulcan Minerals Inc.	10-116-01-ES	15.65252199	12/11/2015	2015	0.000000000	0.195951298
VIN-10-9	Vulcan Minerals Inc.	10-116-01-ES	16.10269032	12/11/2015	2015	0.000000000	0.158027514

Source: http://gis.geosurv.gov.nl.ca/resourceatlas/viewer.

OPERATOR	STATUS	RIG_REL	EP	MD	BASIN	UTMEAST	UTMNORTH	UTMZONE	DATUM	LONG_NAD27	LAT_NAD27	AREA	LEN
Vulcan Minerals Inc.	Abandoned	25/10/2004	03-106	845.400000	Bay St. George	386697	5359964	21	NAD27	-58.53027629	48.38462842	0.000000	0.000000
Vulcan Minerals Inc.	Suspended	05/12/2009	03-107	1965.000000	Bay St. George	370104	5347381	21	NAD27	-58.75040289	48.26827470	0.000000	0.000000
Investcan Energy Corp.	Completed	13/12/2012	03-106	604.000000	Bay St. George	384992	5357531	21	NAD27	-58.55263791	48.36244394	0.000000	0.000000
Vulcan Minerals Inc.	Suspended		96-105	286.000000	Bay St. George	384435	5360238	21	NAD27	-58.56089035	48.38668303	0.000000	0.000000
Vulcan Minerals Inc.	Abandoned	23/10/2004	03-106	175.000000	Bay St. George	386709	5359965	21	NAD27	-58.53027629	48.38462842	0.000000	0.000000
Vulcan Minerals Inc.	Suspended	14/10/2005	96-105	370.300000	Bay St. George	384422	5360085	21	NAD27	-58.56103024	48.38530270	0.000000	0.000000
Vulcan Minerals Inc.	Abandoned	01/10/2005	96-105	36.000000	Bay St. George	384410	5360084	21	NAD27	-58.56119056	48.38529368	0.000000	0.000000
Vulcan Minerals Inc.	Abandoned	18/12/2006	03-107	186.500000	Bay St. George	370116	5347385	21	NAD27	-58.75012622	48.26830992	0.000000	0.000000
American Reserves Energy (Canada) Corp.	Abandoned	25/10/2001	93-101	661.000000	Bay St. George	386625	5359990	21	NAD27	-58.53126002	48.38485032	0.000000	0.000000
Newfoundland Hunt Oil Company Inc.	Abandoned	01/08/1995	93-102	4689.800000	Anticosti	335490	5372856	21	NAD27	-59.22648642	48.48925178	0.000000	0.000000
Vulcan Minerals Inc.	Suspended	15/12/2005	03-107	935.000000	Bay St. George	375855	5347196	21	NAD27	-58.67289765	48.26776434	0.000000	0.000000
Mobil	Abandoned	19/12/1996	96-113	123.400000	Anticosti	398605	5438801	21	NAD27	-58.38890275	49.09567026	0.000000	0.000000
Mobil	Abandoned	06/01/1997	96-113	152.000000	Anticosti	396468	5439996	21	NAD27	-58.41847222	49.10606066	0.000000	0.000000
Vulcan Minerals Inc.	Suspended	18/11/2005	03-107	876.000000	Bay St. George	377162	5344650	21	NAD27	-58.65454686	48.24512696	0.000000	0.000000
Canadian Imperial Venture Corp.	Abandoned	03/01/2002	93-102	4698.800000	Anticosti	335490	5372856	21	NAD27	-59.22648642	48.48925178	0.000000	0.000000
Contact Exploration Inc.	Abandoned	12/04/2004	03-103	1062.000000	Anticosti	449723	5536408	21	NAD27	-57.70122478	49.97986175	0.000000	0.000000
Canadian Imperial Venture Corp.	Abandoned	21/08/2002	93-102	4698.800000	Anticosti	335491	5372857	21	NAD27	-59.22647746	48.48925729	0.000000	0.000000
Canadian Imperial Venture Corp.	Abandoned	03/01/2002	93-102	4053.500000	Anticosti	335491	5372857	21	NAD27	-59.22647746	48.48925729	0.000000	0.000000
Canadian Imperial Venture Corp.	Suspended	17/08/2002	93-102	37.500000	Anticosti	335498	5372863	21	NAD27	-59.22638735	48.48931410	0.000000	0.000000
Canadian Imperial Venture Corp.	Suspended	21/08/2002	93-102	500.200000	Anticosti	335505	5372869	21	NAD27	-59.22629754	48.48937074	0.000000	0.000000
Vulcan Minerals Inc.	Abandoned	09/09/2005	96-105	880.500000	Bay St. George	393461	5363638	21	NAD27	-58.43989325	48.41885325	0.000000	0.000000
Mobil	Abandoned	05/01/1997	96-113	299.300000	Anticosti	406350	5435750	21	NAD27	-58.28213457	49.06945952	0.000000	0.000000
Mobil	Domestic WW	10/12/1996	96-113	50.300000	Anticosti	399926	5434145	21	NAD27	-58.36966141	49.05401548	0.000000	0.000000
Vulcan Minerals Inc.	Abandoned	30/01/2002	96-105	605.200000	Bay St. George	386780	5361947	21	NAD27	-58.52969186	48.40247852	0.000000	0.000000
Deer Lake Oil and Gas Inc.	Suspended	04/06/2001	93-103	1879.000000	Deer Lake	482818	5456494	21	NAD27	-57.23614933	49.26294213	0.000000	0.000000
Delpet Resources Ltd.	Abandoned	18/08/1997	92-102	1396.000000	Anticosti	572180	5663981	21	NAD27	-55.96860163	51.12471180	0.000000	0.000000
Broken Hill Properties Petroleum	Abandoned		N/A	39.330000	Anticosti	477100	5617900	21	NAD27	-57.32435464	50.71442420	0.000000	0.000000
Vulcan Minerals Inc.	Suspended	25/11/2004	03-106	845.600000	Bay St. George	386697	5359964	21	NAD27	-58.53027629	48.38462842	0.000000	0.000000
Deer Lake Oil and Gas Inc.	Suspended	10/06/2005	93-103	1879.000000	Deer Lake	482818	5456494	21	NAD27	-57.23614933	49.26294213	0.000000	0.000000
Deer Lake Oil and Gas Inc.	Suspended	10/01/2003	93-103	1352.500000	Deer Lake	485022	5462724	21	NAD27	-57.20841996	49.31798152	0.000000	0.000000
Broken Hill Properties Petroleum	Abandoned	07/08/1991	N/A	25.000000	Anticosti	474200	5616750	21	NAD27	-57.36534889	50.70396104	0.000000	0.000000
Broken Hill Properties Petroleum	Abandoned	06/08/1991	N/A	26.120000	Anticosti	474200	5616750	21	NAD27	-57.36534889	50.70396104	0.000000	0.000000
Broken Hill Properties Petroleum	Abandoned	06/08/1991	N/A	28.050000	Anticosti	476800	5617750	21	NAD27	-57.32859432	50.71306338	0.000000	0.000000
Canadian Imperial Venture Corp.	Abandoned	08/02/2002	96-108	804.600000	Bay St. George	394845	5384012	21	NAD27	-58.42632351	48.60231806	0.000000	0.000000
Vulcan Minerals Inc.	Abandoned	18/11/2006	03-106	719.000000	Bay St. George	386152	5359952	21	NAD27	-58.53762925	48.38442705	0.000000	0.000000
Vulcan Minerals Inc.	Abandoned	09/11/1996	96-105	153.610000	Bay St. George	384388	5360263	21	NAD27	-58.56153459	48.38689661	0.000000	0.000000
London Resources Inc.	Suspended	11/09/1999	96-105	286.000000	Bay St. George	384435	5360238	21	NAD27	-58.56089035	48.38668303	0.000000	0.000000
PDI Production Inc.	Completed	24/12/2008	2002-01(A)	4256.000000	Anticosti	335491	5372856	21	NAD27	-59.22648274	48.48925002	0.000000	0.000000
Vulcan Minerals Inc.	Abandoned	22/02/2009	96-105	213.500000	Bay St. George	384337	5360126	21	NAD27	-58.56218388	48.38566212	0.000000	0.000000
Vulcan Minerals Inc.	Abandoned	27/02/2009	96-105	249.000000	Bay St. George	384485	5359954	21	NAD27	-58.56014834	48.38413930	0.000000	0.000000
Vulcan Minerals Inc.	Suspended	15/10/2009	03-106	3560.000000	Bay St. George	379783	5343074	21	NAD27	-58.61881264	48.23145405	0.000000	0.000000
Nalcor Energy Oil and Gas Inc.	Suspended	15/01/2011	03-103	3160.000000	Anticosti	449731	5536434	21	NAD27	-57.70111261	49.98008903	0.000000	0.000000
Deer Lake Oil and Gas	Suspended	31/03/2010	03-105	442.000000	Deer Lake	474810	5451555	21	NAD27	-57.34589951	49.21823472	0.000000	0.000000
Nalcor Energy Oil and Gas Inc.	Suspended	05/12/2010	03-102	3130.000000	Anticosti	456529	5549336	21	NAD27	-57.60776520	50.09469249	0.000000	0.000000
Vulcan Minerals Inc.	Abandoned	04/11/2011	96-105	300.000000	Bay St. George	383174	5360935	21	NAD27	-58.57812097	48.39271681	0.000000	0.000000
Vulcan Minerals Inc.	Abandoned	04/11/2011	03-106	184.000000	Bay St. George	383431	5359906	21	NAD27	-58.57435427	48.38351052	0.000000	0.000000
Vulcan Minerals Inc.	Abandoned	04/11/2011	03-106	220.000000	Bay St. George	384810	5357591	21	NAD27	-58.55510057	48.36294542	0.000000	0.000000
Vulcan Minerals Inc.	Abandoned	04/11/2011	03-106	150.000000	Bay St. George	384555	5358294	21	NAD27	-58.55873746	48.36922171	0.000000	0.000000
Vulcan Minerals Inc.	Abandoned	04/11/2011	96-105	159.000000	Bay St. George	383667	5360177	21	NAD27	-58.57125247	48.38599129	0.000000	0.000000
Vulcan Minerals Inc.	Abandoned	04/11/2011	96-105	184.000000	Bay St. George	385041	5360379	21	NAD27	-58.55275822	48.38806327	0.000000	0.000000

APPENDIX 2

GLOSSARY OF SEARCH WORDS WITH REGIONAL SIGNIFICANCE FOR STRATIGRAPHIC AND PETROLEUM GEOLOGY STUDIES, AND WITH NUMBERS OF CITATIONS ("HITS") FOR EACH SEARCH WORD.

APPENDIX 3

ACCESSING GOVERNMENT WEB SITES AND REPOSITORIES

ACCESSING WELL, DRILL HOLE AND DRILL CORE SAMPLE DATA

The western Newfoundland Paleozoic basins share international boundaries with France (St. Pierre and Miquelon) and provincial boundaries with Nova Scotia and Quebec. Well, drill hole and drill core sample data for these basins is archived by both federal and provincial agencies in Canada. Onshore and offshore exploratory wells are also administered by different administrative bodies. Some duplication of information is inevitable, and a complete record of information may require accessing several agency websites.

Appendix 1 of this report lists available core, sidewall core and cuttings from wells drilled in the western Newfoundland Paleozoic basins as well as basement cores from Notre Dame Bay, Placentia Bay and southwest of the Avalon Peninsula. Information on outcrop sections is not included in this Appendix but does form part of the ***References Database*** accompanying this report (see Appendix 2 – and use keywords for strata). The sections which follow describe the type of information provided by each agency and a brief summary of how to access the information from each site.

The Natural Resources Canada, Earth Sciences Sector, Basin Database

The Natural Resources Canada, Earth Sciences Sector, Basin Database provides a fairly comprehensive listing of samples from offshore and onshore wells which have penetrated Paleozoic strata in Newfoundland/Labrador and Nova Scotia, in addition to very limited information on Quebec wells. It also provides links to pertinent provincial regulatory boards (BASIN Database_Data Confidentiality). Well and government links can be accessed at the websites listed below.

Well data – http://basin.gdr.nrcan.gc.ca/wells/index_e.php
Provincial weblinks – http://basin.gdr.nrcan.gc.ca/disclaimer_e.php
Well data from this site (BASIN Database_Wells) can be searched under the following headings: (*the interactive mapping application is unavailable as of 15/08/2013)
For each well the following categories of information may be available

Area	Basin	Area and Basin
Field	Oil/Gas Status	Year
*Map		

Current wells		Production			
Location	Drilling	Testing	Reports	E-logs	Samples
Pressure	Geochem	Temperature	Maturity	Lithostrat	Biostrat

Sample data is available in Excel, ASCII text, or Print Version format. The site lists conventional core, sidewall core, and cuttings.

The Newfoundland and Labrador Department of Natural Resources Database

The Newfoundland and Labrador Department of Natural Resources Database provides information on mineral exploration drill cores from the island of Newfoundland. These cores are housed in one of the six core storage libraries located at St. John's, Springdale, Buchans, Baie Verte, Pasadena and Goose Bay. Information on all core samples in storage, including links to available reports, can be accessed through a searchable digital database. Just activate the information tool (i) on the interactive map at
GeoScience OnLine - http://gis.geosurv.gov.nl.ca/resourceatlas/viewer.htm

The Onshore Schedule of Wells (see Appendix 1) from the NLDNR site is a PDF file providing location and other information on onshore wells, but it does not include a list of core or cuttings samples. The site does provide links to downloadable final well reports which can include some sample information. Selected core samples from onshore wells drilled in Western Newfoundland are stored at the Mines Branch Core Storage Library in Pasadena, Newfoundland, and information on these wells is available from the Director of Petroleum Resources Development Division, Energy Branch.

Onshore Schedule of Wells - http://www.nr.gov.nl.ca/nr/energy/petroleum/onshore/onshore.html
Final Well reports at Energy_Petroleum_Publications_Petroleum- Onshore_Final Well Reports - http://www.nr.gov.nl.ca/nr/publications/energy/final_well_report.html

Deer Lake Geology and Geophysics data

Industry reports for petroleum geology and geophysics activities in the Deer Lake Basin are filed with the Provincial Government and available online at the following addresses:
http://www.nr.gov.nl.ca/nr/publications/energy/released_geological_geophysical_reports.html
http://www.nr.gov.nl.ca/nr/publications/energy/final_well_report.html
Cores and reports from many mineral exploration programmes in western Newfoundland are also identified online.

Cores are registered and stored at the Natural Resources building in Pasadena NL:

Pasadena Core Library

1A 10th Avenue, Pasadena, NL, A0L 1K0.

Some Petroleum exploration cores and cuttings are currently curated by ..... and housed at

ccccccccccccc GET ADDRESS FROM LARRY HICKS

The Canada Newfoundland and Labrador offshore Petroleum Board (CNLOPB)

The Canada Newfoundland and Labrador offshore Petroleum Board (CNLOPB) manages the core, drill cuttings, fluid samples, biostratigraphic slides and petrographic slides from over 370 wells drilled in the Newfoundland and Labrador Offshore Area. These are housed in the Core Storage and Research Centre in St. John's, Newfoundland. The following summation of inventory is from the Canada Newfoundland and Labrador ***Core Storage and Research Centre*** website:

- 5000 boxes of cutting samples
- 8000 metres of core
- 7500 sidewall core samples
- 40,000 geological slides
- 200 fluid samples

Information on individual wells, including a listing of conventional cores, can be accessed as PDF files under Information and Reports_Schedule of Wells at:
http://www.cnlopb.nl.ca/

It should be noted that the CNLOPB lists conventional core only, providing depth range and percentage recovered for each core unit. This differs from the Natural Resources Canada, Earth Sciences Sector, Basin Database which shows lists for sidewall core and cuttings, in addition to conventional core, which on the NRC site is described by depth range and amount of core recovered.

The Canada Nova Scotia Offshore Petroleum Board (CNSOPB)

The Canada Nova Scotia Offshore Petroleum Board (CNSOPB**)** manages geological samples in the form of washed cuttings, unwashed cuttings, sidewall core, conventional core, and well site samples as well as micropaleontology and palynology slides and recent fluid samples from 207 offshore wells drilled in the Nova Scotia Area (to February, 2013). Core and cuttings from the Nova Scotia Sydney Basin wells are stored at the CNSOPB Geoscience Research Centre facility in Dartmouth, Nova Scotia.

Basic well information (but not sample data) is given in two PDF files. The CNSOPB Data Management Centre, does however allow registered users to access available digital data including information on cores, cuttings, slides, well reports and seismic data without charge.

The following summation of inventory is from the CNSOPB website

- 139,746 bags of unwashed cuttings
- 166,182 vials of washed cuttings
- 11,549 bags of geochemistry samples
- 6,356.68 m of drill core
- 14,508 vials of sidewall core
- over 432 released geological and geophysical reports.

The CNSOPB site is - http://www.cnsopb.ns.ca/

Wells are listed under the Geoscience_Directory of Wells - http://www.cnsopb.ns.ca/geoscience/directory-of-wells and with Publications at - http://www.cnsopb.ns.ca/geoscience/geoscience-publications/geoscience-reports

Apply for a CNSOPB Digital Data Management Centre Internet Access Account by following the link to ***Visit the Data Management Centre*** at - http://www.cnsopb.ns.ca/geoscience/data-management-center

The Nova Scotia Department of Natural Resources (NSDNR), Mineral Resources Branch (MRB)

The Nova Scotia Department of Natural Resources (NSDNR), Mineral Resources Branch (MRB), maintains an extensive database covering most of the onshore drill holes and drill cores from Nova Scotia. The drill core is archived in the Nova Scotia Drill Core Library in Stellarton, Nova Scotia. Information on accessing these cores, and searching the Drill Hole Database, is provided on the NSDNR website. Reference reports, maps, and data files are also archived at their Core Library. Digital copies of some of these files are available on the NSDNR website. An interactive drill hole map can be downloaded or information can be downloaded in tabular form.
(Note: For this report, the drill hole map was accessed using the free ArcGIS Explorer application on the ARC Explorer website, not ArcExplorer 2 linked on the NSDMR site)

The Core Library also houses cores and cuttings from most onshore oil, gas and coalbed methane wells (from1959), and vials of cuttings samples from 136 offshore wells.
Information can be accessed by following the links given below or enquires can be addressed to the agency.

Drill holes – http://www.gov.ns.ca/natr/meb/download/dp003.asp
Drill cores – Nova Scotia Core Library (internal database only at this time)
Reports, maps, etc. – http://www.gov.ns.ca/natr/meb/pubs/pi_nvscn.asp

The following summation of inventory is from the Nova Scotia Core Library Website:

- 650,000 metres of core from about 7500 drill holes (Precambrian to Cretaceous)
- cores and cuttings from most onshore oil, gas and coalbed methane wells (from1959)
- holes drilled for coal in offshore Cape Breton
- approximately 72,600 samples of washed cuttings in vials from136 offshore hydrocarbon exploration wells (1967-1993)

The Nova Scotia Department of Energy

The Nova Scotia Department of Energy provides links to offshore information. In addition, its Onshore NS Petroleum Well Database is a PDF file with information on onshore wells (location etc.) in Nova Scotia. It does not include a listing of cores or cuttings. The NS Department of Energy site may give a slightly different listing for onshore wells (e.g. Sydney Basin) than the NRC Basin Database.

Wells - http://www.gov.ns.ca/energy/oil-gas/onshore/well-database.asp
Publications and reports - ***http://novascotia.ca/energy/publications-and-reports/***

Ressources Naturelles et Faune Québec

The Ressources Naturelles et Faune Québec maintains a database of core and cuttings from more than 800 wells drilled in Quebec, including Anticosti Island. These materials are housed in the Core Library in Quebec City, Quebec. Information can be accessed from the Oil and Gas Geoscience Information System at the website addresses given below. Reports in digital format can be ordered through the site.
Well data http **–** sigpeg.mrnf.gouv.qc.ca/gpg/classes/rechercheIGPG?url_retour=
Reports, maps, etc. **–** http://sigpeg.mrnf.gouv.qc.ca/gpg/classes/igpg

The following table provides information on accessing well, drill hole and drill core sample data by basin and agency

	Natural Resources Canada, Earth Sciences Sector, Basin Database	***Newfoundland and Labrador Department of Natural Resources***	***The Nova Scotia (A) Dept. of Natural Resources, Mineral Resources Branch (B) Dept. of Energy***	***Canada Newfoundland and Labrador Offshore Petroleum Board***	***Canada Nova Scotia Offshore Petroleum Board***	***Ressources Naturelles et Faune Québec***
St. Anthony Basin (+ White Bay Subbasin)	WELLS_ BASIN St. Anthony B.	interactive map of mineral exploration drill cores (online)		Schedule of Wells NE Nfld & Lab. Shelf		
Sydney Basin onshore Nfld (Burin Peninsula)						
Sydney Basin onshore NS	WELLS_ AREA Nova Scotia (onshore)		***A.*** (1) drill holes spreadsheet, or (2) downloadable interactive map (3) internal drill cores database. ***B.*** (4) Onshore NS Petroleum Well Database		Directory of Wells – Other Offshore Areas & Jurisdictions	
Sydney Basin offshore Nfld (+ peripheral wells)	WELLS_ AREA Grand Banks			Schedule of Wells_Grand Banks[1]		
Sydney Basin offshore NS	WELLS_ AREA Nova Scotia (nearshore)				(1) Directory of Wells - NS Offshore Area[3] (2) access to sample data: DMC account	
Deer Lake Basin		(1) interactive map of mineral exploration drill cores (online) (2) Onshore Schedule of Wells +(3) links to well reports				
Bay St, George Basin						
Anticosti Basin Nfld	WELLS_ BASIN Anticosti Basin			Schedule of Wells_Western Newfoundland[1]		
Anticosti Basin Quebec	WELLS_ BASIN Anticosti Basin					Petroleum & Natural Gas Information_ WELL

1

[1] Lists conventional core

ACCESSING SEISMIC DATA

The Natural Resources Canada, Earth Sciences Sector, Basin Database

The Natural Resources Canada, Earth Sciences Sector, Basin Database is an online resource providing petroleum exploration data, including location data for seismic surveys conducted mainly in offshore northern and eastern Canada.
http://basin.gdr.nrcan.gc.ca/index_e.php

Geophysical Surveys lists projects under the headings shown below. The seismic data itself is not available online. Coverage of older surveys is incomplete, and coordinates for recent surveys are not available.

The following information is shown in tabular form:

Project	Company	Year	Area	Status	Geophysical Type	Approx. Release Date	Nav	Digital Data	Description

Many projects are hyperlinked to additional details such as maximum-minimum latitude and longitude for seismic lines, shotpoint coordinates, an outline map of seismic lines, and project contact information. Project information can be saved as a table, coordinates and project lists can be exported to Excel, and maps can be saved.

The Basin Database gives links to the CNLOPB, CNSOPB and National Energy Board websites which provide additional data on seismic programs. It also provides information on the approximate release data for completed and ongoing projects not yet in the public domain (search by Area but not by Coordinates or Map). In this respect it appears to contain a more up to date

project list than the 2010 CNLOPB reports list described below The CNLOPB site does, however, provide information on completed and ongoing projects not yet in the public, elsewhere on their site.

The Newfoundland and Labrador Department of Natural Resources

The Newfoundland and Labrador Department of Natural Resources has two downloadable PDF files containing onshore seismic information under Petroleum Onshore Maps and Data

http://www.nr.gov.nl.ca/nr/energy/petroleum/onshore/onshore_maps.html

Map of western Newfoundland onshore seismic lines – *Reflection Seismic Lines*
Table of onshore seismic lines – *Reflection Seismic Lines (Table)*

The Canada Newfoundland and Labrador offshore Petroleum Board (CNLOPB)

The Canada Newfoundland and Labrador offshore Petroleum Board (CNLOPB) has a downloadable PDF file - *Released Geophysical Reports* (2010) - which lists released reports for Newfoundland and Labrador to December, 2010. Updates to this file may be available on request. Information shown includes maximum-minimum latitude and longitude for seismic lines, km acquired, and a brief description of the type of data. A second publication - *Seismic Data Coverage Offshore Newfoundland and Labrador* (2010) – includes maps showing the distribution of non-digital and digital seismic lines. For information on these and other reports, contact the CNLOPB at

information@cnlopb.nl.ca

The CNLOPB also provides online access to seismic project descriptions and other related documentation available on the public registry as downloadable PDF files which can be located by using the search function on the CNLOPB site.

The Canada Nova Scotia Offshore Petroleum Board (CNSOPB)

The Canada Nova Scotia Offshore Petroleum Board (CNSOPB***)*** Data Management Centre, provides registered users with access to available digital seismic data.

To apply for a CNSOPB Digital Data Management Centre Internet Access Account, follow the link to *Visit the Data Management Centre* at **–**

http://www.cnsopb.ns.ca/geoscience/data-management-center

The Nova Scotia Department of Natural Resources

The Nova Scotia Department of Natural Resources provides a limited amount of onshore digital data in the form of seismic lines and shot locations via the pathway DNR Library_Publications, Maps and Digital Products_Digital Products_Seismic Seismic Digital Products –

http://www.gov.ns.ca/natr/meb/pubs/pubs3gpsei.asp

The National Energy Board Frontier Information Office (FIO)

http://www.neb-one.gc.ca/clf-nsi/rthnb/nrthffshr/frntrnfrmtnff-eng.html

The National Energy Board Frontier Information Office (FIO) provides onsite access to well and geophysical data for frontier lands not regulated by joint federal/provincial accords. It is located at 444 Seventh Avenue SW, Calgary (5th Floor.). Appointments to view and copy information should be booked through the

FIO Data Coordinator

(403-292-4800 or 1-800-899-1265 toll-free).