Fueling the Future: Atlantic Canada’s Bioenergy Opportunities Project

Project Summary Report
APRI Project No. 200344
Acknowledgments

This report was produced by the Atlantic Council for Bioenergy Cooperative (ACBC) – under the leadership of Ken Magnus, Chief Executive Officer – in partnership with BioAtlantech New Brunswick, with funding from the Atlantic Canada Opportunities Agency.

The project team recognizes the work, cooperation, support, and assistance of:

- ACBC’s Executive and Board of Directors
- BioAtlantech
- Gardner Pinfold Consulting
- Dr. Gerrard Marangoni
- Interprovincial working groups in New Brunswick, Nova Scotia and PEI, including their respective departments of Energy, Agriculture and Economic Development.
- Atlantic Canada Opportunities Agency (ACOA)
- Cape Breton University Verschuren Centre for Sustainability in Energy and the Environment (CSEE)
- Collège communautaire du Nouveau-Brunswick (CCNB)

This report is based on information gathered between March 2012 and May 2013.

Disclaimer:
This report is funded by the Atlantic Canada Opportunities Agency (ACOA) under the Atlantic Policy Research Initiative, which provides a vehicle for the analysis of key socio-economic policy issues in Atlantic Canada. The views expressed in this study do not necessarily reflect the views of ACOA or of the Government of Canada. The author is responsible for the accuracy, reliability and currency of the information.
Introduction & Purpose

The biofuels sector provides Atlantic Canada with the opportunity to position its assets wisely, and to use them to build a sustainable biofuels industry in this region. With the development of initial and first generation biofuels production facilities across Canada and elsewhere in recent years, Atlantic Canada can capitalize on those experiences to determine how they may best apply here. With the regulatory push to spur industry at the federal level, the regional innovative capacity, recent and ongoing research, access to academia, and the availability of renewable resources, there is ample room for a large scale commercial biofuels industry development to take shape in Atlantic Canada.

Acting in the capacity of Atlantic Canada's lead bioenergy association, ACBC's mission is to educate and promote the development of a sustainable bioenergy industry in Atlantic Canada and to establish provincial and federal government policy and programming that will allow for the development of a bioenergy industry in the Atlantic region.

ACBC's vision statement is: a vibrant, sustainable bioenergy industry, producing in Atlantic Canada, for Atlantic Canada, with a near term outlook to export and supply outside of the region to meet the increasing demands of the United States biofuels market.

To this end, Atlantic Canada needs both federal and provincial government policy and programming (P&P) designed to meet its needs for growth. With this project, ACBC intends to clarify, assess and reveal the region's bioenergy; build a business case for a bioenergy sector in the region; identify the economic impact of that sector; and ultimately make recommendations for the necessary policy and programming.

This project is ground-breaking. This type of information is not currently readily available in Atlantic Canada; and, data and findings that do exist elsewhere cannot provide a realistic and accurate picture of this region's potential. This project and its findings will be an instrumental starting point to provide governments and industry players with an understanding of the potential for bioenergy in the Atlantic region and clear recommendations for moving forward to deliver the economic opportunity, jobs and environmental benefit for Atlantic Canadians.

Methodology

The information contained in this report is the result of in-person interviews; online surveys; research analysis; engagement and discussion with industry and government stakeholders – provincial and federal, elected and non-elected; and finally, significant analysis, deliberation and recommendation from the ACBC Board of Directors and its members.

Its findings are validated through the analytical work of Gardner Pinfold, one of Canada’s leading economic consultants, who were contracted to assess the feasibility of this sector, as well its economic impact. This firm’s background, expertise, and strong reputation for quality research and methodological reporting provide important credibility – and calculated proof – for the arguments and recommendations this project makes.
This project was delivered through methods including: an asset inventory, research analysis a feasibility model, an economic impact analysis and recommendations.

**Assets & Opportunity**

The biofuels industry in North America is driven mainly by the Renewable Fuels Standards (RFS) introduced by various levels of government in Canada and the U.S. To meet the RFS mandate in Atlantic Canada, the region would have to produce in excess of 250 ML of ethanol and approximately 75 ML of biodiesel. In fact, the potential biofuel opportunity is seen as significantly greater since fuel produced with energy beets and other potential feedstocks specific to this region would qualify as a blendstock under the U.S. RFS2. There is also a substantially larger export market opportunity not defined in this report but that could easily double demand.

Atlantic Canada is rich in natural resources and it is these natural resources where the biomass assets lie. The region’s provinces have a long history of agriculture, forestry and marine biomass and consumption. This, combined with the region's extensive technological research capacity (numerous academic and institutional research organizations) provides the right backdrop for the industry to grow and develop.

Agriculturally, there is sufficient crop acreage to produce a number of potential feedstocks – including corn, wheat, barley, soybean, canola and sugar / energy beet – as well as provide farmers the opportunity to develop new crops and rotations, putting underutilized land back into production. An emerging biofuels industry could create demand for suitable crops that are not currently grown, or not grown in sufficient quantities, at acceptable costs, to meet industry requirements. Cellulosic biomass crops (including marine and forestry sectors) also offer potential, once the production technology to support it is commercialized; new technologies and applications present significant opportunity in this region.

References in this report to biofuel production volumes in Atlantic Canada are represented by the numbers suggested above and demonstrated in the below table; it confirms that Atlantic Canada has and can produce the necessary feedstock to build a viable biofuels industry, and that stakeholders are ready and capable to support its development and growth, with the proper tools in place.
<table>
<thead>
<tr>
<th></th>
<th>L</th>
<th>5% Blend Ethanol</th>
<th>10% Blend Ethanol</th>
<th>2% Blend of Bio-diesel</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Atlantic Canada’s Bioenergy Opportunities Project</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td><strong>APRI No. 200344</strong></td>
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**Nova Scotia Fuel Energy**

<table>
<thead>
<tr>
<th></th>
<th>L</th>
<th>5% Blend Ethanol</th>
<th>10% Blend Ethanol</th>
<th>2% Blend of Bio-diesel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motor gasoline</td>
<td>1.195 BL</td>
<td>59 MML</td>
<td>118 MML</td>
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</tr>
<tr>
<td>Diesel Fuel Oil</td>
<td>889 MML</td>
<td></td>
<td></td>
<td>18 MML</td>
</tr>
<tr>
<td>Heating Oil</td>
<td>904 MML</td>
<td></td>
<td></td>
<td>18 MML</td>
</tr>
</tbody>
</table>

**New Brunswick Fuel Energy**

<table>
<thead>
<tr>
<th></th>
<th>L</th>
<th>5% Blend Ethanol</th>
<th>10% Blend Ethanol</th>
<th>2% Blend of Bio-diesel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motor gasoline</td>
<td>1.129 MML</td>
<td>56 MML</td>
<td>112 MML</td>
<td></td>
</tr>
<tr>
<td>Diesel Fuel Oil</td>
<td>1.189 MML</td>
<td></td>
<td></td>
<td>24 MML</td>
</tr>
<tr>
<td>Heating Oil</td>
<td>317 MML</td>
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<td>6 MML</td>
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**PEI Fuel Energy**

<table>
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<th>5% Blend Ethanol</th>
<th>10% Blend Ethanol</th>
<th>2% Blend of Bio-diesel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motor gasoline</td>
<td>230 MML</td>
<td>11.5 MML</td>
<td>23 MML</td>
<td></td>
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<tr>
<td>Diesel Fuel Oil</td>
<td>132 MML</td>
<td></td>
<td></td>
<td>3 MML</td>
</tr>
<tr>
<td>Heating Oil</td>
<td>192 MML</td>
<td></td>
<td></td>
<td>4 MML</td>
</tr>
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</table>

**Newfoundland Fuel Energy**

<table>
<thead>
<tr>
<th></th>
<th>L</th>
<th>5% Blend Ethanol</th>
<th>10% Blend Ethanol</th>
<th>2% Blend of Bio-diesel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motor gasoline</td>
<td>670 MML</td>
<td>33.5 MML</td>
<td>67 MML</td>
<td></td>
</tr>
<tr>
<td>Diesel Fuel Oil</td>
<td>521 MML</td>
<td></td>
<td></td>
<td>10.42 MML</td>
</tr>
<tr>
<td>Heating Oil</td>
<td>611 MML</td>
<td></td>
<td></td>
<td>12.22 MML</td>
</tr>
</tbody>
</table>
SWOT Analysis

Stakeholders have identified a number of internal and external factors that are favorable and unfavorable to building a bioenergy sector in Atlantic Canada.

The SWOT analysis is based on the following definitions:

- **Strengths** – characteristics that provide it an advantage.
- **Weaknesses (or Limitations)** – characteristics that create a disadvantage
- **Opportunities**: external factors in the environment that could improve performance (e.g. make greater profits)
- **Threats**: external factors in the environment that could cause trouble

**STRENGTHS**
- Significant & diverse biomass
- Open territory - development, policy and programming
- Renewable Fuels Standards
- Established lead agency
- Strong research and academic community
- Existing producers, plants
- Interested governments

**WEAKNESSES**
- Lack of awareness, understanding
- Perception that region cannot deliver volume
- Renewable Fuels Standards
- Behind industry pace
- Federal funding spent
- No strong government champion
- Lack of experience as a sector

**OPPORTUNITIES**
- Outside investment interest
- Cellulosic capacity
- Close proximity for export
- Shared desire to end imports
- Traditional industries (feedstocks) available to support sector
- Federal mandate for renewable fuels production
- Regional priority for economic development and employment

**THREATS**
- Current reliance on imported biofuels
- Global economic challenges
- Provincial governments face fiscal constraint
- Limited will for provincial mandates, policy and programming
- Resistance towards implementing RFS
Feasibility

To understand the true cost and potential return on investment for production facilities in Atlantic Canada, Gardner Pinfold Consultants Inc., were contracted to develop a tool that producers and lending agencies could use to analyze prospective ethanol and biodiesel fuel projects – an Atlantic Biofuels Feasibility Model.

The model is designed to help assess the financial viability of biofuels production options in Atlantic Canada, based on six key factors: feedstock types, plant scale, pre-construction and construction costs, financing, operating costs and revenues.

After entering information for each of these six areas, the Model calculates production results and financial indicators to assess the potential performance of a biofuel plant. The Model can evaluate up to six plants simultaneously and provide a summary of results for all six on a final comparison sheet, with a profile of the inputs for each plant. A side-by-side comparison gives operators the opportunity to evaluate the performance of plants that might have different feedstocks or different capacity. Additionally, model users could adjust any number of other variables – such as feedstock price, interest rates, % equity, revenue, or capital costs – to different levels, to see how they might impact the overall performance of a plant.

This ability to assess the impact of different variables can also help operators identify what they need to make a plant financially attractive to bank lenders or private investors. For instance, a potential plant may initially appear to have an 8-year payback period; but, a combination of variables like low-interest loans, capital cost assistance, feedstock subsidies, and salary rebates could be examined to determine what might bring the payback period down any number of years.

This model will allow industry proponents and their associated partners and investors to consider several options that may be applicable to their region, and their particular expertise, to help assess the financial viability of biofuels production options in Atlantic Canada.

Economic Impact

The firm of Gardner Pinfold Consulting Inc. was also engaged to assess the economic impact for the biofuels sector in Atlantic Canada, to provide industry and government with a tool to improve the understanding and further the development of a biofuels industry in this region. The study set out to answer the question: “If a bio-fuels industry were to develop in the Maritime Provinces, what would be its impact?” Because current biofuels production in this region is not operating on the scale needed to meet federal ethanol and bio-diesel mandates, there is no basis to document economic impacts.

The information in this study will provide prospective investors, lenders and governments with a better understanding of the scale of the industry and how its development and operation would affect the economies of each of the Atlantic Provinces, tracing the direct impacts of the bio-fuels industry itself, as well as the indirect impacts of those industries supplying it with goods and services.
The main objective of this study was to quantify both the direct and spin-off impacts of developing and operating a biofuels industry in the Atlantic Provinces; to do so, it uses the Statistics Canada Inter-provincial Input-Output Model, because it produces direct, indirect and induced impact results and it produces results at a high level of resolution. Normally, this model uses the gross value of the output, the revenues generated through sales of the final product, to measure economic impact. But, because there is no established biofuels industry in the Maritime Provinces, this study instead uses the value of the commodities used in the production process.

The report states that economic impact can be measured by four indicators: GDP, employment, labour income and tax revenue.

For the purpose of estimating economic impacts, this study used the above mentioned volumes – 250 ML ethanol and 75 ML biodiesel – as the basis for a biofuels industry in the Maritimes. The study also assumes that biofuels plants have a capacity of 25 ML. Accordingly, this region would require 13 plants to meet the full 325 ML capacity.

The analysis shows then, a one-time regional economic benefit of plant construction totalling approximately $373.1 M in GDP, over 5,000 FTEs, an average total income of $256.1 M and average total tax revenue of $81.9 M.

Once biofuels plants are operational, the region will see positive economic impact, year over year. Again, based on the operation of 13 plants to meet the full 325 ML capacity in this region, the annual economic impacts will total up to $244 M in GDP, nearly 5,000 FTEs, an annual income of $125 M and an annual tax revenue to federal and provincial governments of close to $50 M.

<table>
<thead>
<tr>
<th>New Brunswick</th>
<th>Nova Scotia</th>
<th>Prince Edward Island</th>
<th>Maritime Provinces</th>
</tr>
</thead>
<tbody>
<tr>
<td>(GDP, Income &amp; Tax in $000s Employment in FTE)</td>
<td>1 Plant</td>
<td>5 Plants</td>
<td>1 Plant</td>
</tr>
<tr>
<td><strong>GDP</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Direct</td>
<td>8,430</td>
<td>41,140</td>
<td>5,845</td>
</tr>
<tr>
<td>Indirect</td>
<td>8,145</td>
<td>41,855</td>
<td>9,455</td>
</tr>
<tr>
<td>Induced</td>
<td>2,804</td>
<td>12,883</td>
<td>2,708</td>
</tr>
<tr>
<td>Total</td>
<td>19,379</td>
<td>95,878</td>
<td>18,008</td>
</tr>
<tr>
<td><strong>Employment</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Direct</td>
<td>15</td>
<td>85</td>
<td>30</td>
</tr>
<tr>
<td>Indirect</td>
<td>224</td>
<td>1,210</td>
<td>240</td>
</tr>
<tr>
<td>Induced</td>
<td>104</td>
<td>510</td>
<td>95</td>
</tr>
<tr>
<td>Total</td>
<td>343</td>
<td>1,805</td>
<td>364</td>
</tr>
<tr>
<td><strong>Income</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Direct</td>
<td>930</td>
<td>5,270</td>
<td>1,845</td>
</tr>
<tr>
<td>Indirect</td>
<td>6,720</td>
<td>35,020</td>
<td>7,055</td>
</tr>
<tr>
<td>Induced</td>
<td>1,275</td>
<td>5,865</td>
<td>1,300</td>
</tr>
<tr>
<td>Total</td>
<td>8,925</td>
<td>46,155</td>
<td>10,200</td>
</tr>
<tr>
<td><strong>Tax revenue</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corporate</td>
<td>715</td>
<td>3,532</td>
<td>629</td>
</tr>
<tr>
<td>Personal</td>
<td>1,607</td>
<td>8,308</td>
<td>1,836</td>
</tr>
<tr>
<td>Sales &amp; excise</td>
<td>890</td>
<td>5,850</td>
<td>1,143</td>
</tr>
<tr>
<td>Total</td>
<td>3,211</td>
<td>17,690</td>
<td>3,608</td>
</tr>
</tbody>
</table>

Source: Tables 2 and 4.
Note: NB plants composed of three biodiesel and two sugar beet ethanol.
Finally, these figures represent annual impacts for an industry with a long-term life expectancy, of 25 years or more. Operating at its full potential, year over year, a biofuels industry will result in significant long-term economic impact for the Maritime provinces. Combining these two identified economic impacts for the region over a 5 to 10 year period, including the time and resources to build the plants and the overall operations of the plants could result in a $Billion economic impact, with potentially $300 to $500M in government tax revenue and thousands of jobs.

**Recommendations**

Throughout the duration of this project, ACBC worked with its industry association members, Atlantic bioenergy stakeholders, Maritime Canada production facility proponents, industry producers & refineries, industry distribution companies, research and academic professionals, provincial and federal government officials and bioenergy stakeholders at large.

The result, after 18 months of engagement and information sharing, are numerous findings, which lead to most importantly, the proposal of recommendations to support the development of a biofuels production industry in Canada and achieve the economic and environmental impacts the industry holds for this region. They present significant immediate impact, in addition to other short and long-term benefits for Atlantic Canada, demonstrating that support for this sector can result in jobs, economic development and opportunity for multiple other sectors in the region.

These recommendations are based on experiences and working solutions from other parts of Canada, North America and the world, with proven track records for government support and industry success, including a demonstrated return on investment. They are an initiative for government collaboration and industry cooperation, seeking commitment from both the Government of Canada and the provincial governments of New Brunswick, Prince Edward Island and Nova Scotia and will require an aggressive and committed plan of action from all parties.

The following four recommendations are proposed as the key public policy instruments required to set the stage and drive industry development for Atlantic Canada.

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**RECOMMENDATION #1**

**IMPLEMENTATION OF RENEWABLE FUELS REGULATIONS**

Specifically:

- The Government of Canada continue to finalize and implement the renewable fuels regulations as legislated.

- The Maritime Provinces adopt complimentary provincial renewable fuels legislation.

This report repeatedly suggests that a proposed and potentially successful biofuels industry for the Maritime region is based on the indented national implementation numbers, and would provide for an industry production scale of well above 300 ML of biofuels, produced locally, and providing local economic and environmental benefits. Implementing a Renewable Fuels Standard on a
provincial basis, that is equal to that already in place nationally, eliminates current gaps in policy, puts an end to the confusion, and solidifies the commitment to succeed in this arena.

**RECOMMENDATION #2**

**NATIONAL & CORRESPONDING PROVINCIAL CAPITAL ASSISTANCE PROGRAMMING**

Specifically:

- **Atlantic Biofuel Capital Development Initiative**: The introduction of a Government of Canada capital assistance program for Atlantic Canada creating the opportunity for equity investment by primary feedstock producers in the region.

- **Provincial Biofuel Capital Initiative**: The Provinces of NB, PEI, and NS introduce a corresponding and complimentary provincial capital assistance program, to expand on and to include the opportunity for equity investment by primary feedstock producers and / or other provincial residents, companies or organizations.

ACBC and its membership believe that it is important to create the best opportunity for local ownership of newly constructed biofuels production plants. Local production, in our opinion should be owned by local people whenever possible. Local ownership will help create more local jobs and economic spin-offs for local economies. Capital assistance programming can provide the opportunity for farmers, communities and local residents at large to participate in the value-added biofuel production industry in the region through investment ownership.

This recommendation is potentially of little or no cost to governments and taxpayers, as this is a repayable loan. Furthermore, these loans could be held by the lenders (provincial and federal) pending the completion of a feasibility study and overall “approved” financial package from its investors/stakeholders and all other lenders, thereby mitigating further government risk. All other approvals and commitments must be in place and both the federal government and the applicable provincial governments could present a set of criteria that must be met prior to approval.

**RECOMMENDATION #3**

**MATCHING FEDERAL & PROVINCIAL PRODUCTION INCENTIVES**

Specifically:

- **Atlantic Biofuel Production Initiative**: The Government of Canada introduces a production incentive program for qualifying regional producers. Program eligibility would expire after a regional production capacity of 325 million litres is met or upon a fixed date of program eligibility applications.

- **Provincial Biofuel Production Initiative**: The Provinces of NB, PEI and NS create and introduce a Provincial production program initiative, with compatible terms, conditions and time lines.
Atlantic Canada’s production of biofuels must be competitive with other production plants throughout Canada and North America. To compete, the region must first be on a level playing field. In order for the industry to succeed in this part of the country, it must be able to provide quality product, at a competitive price, and at a guaranteed production volume. The minimum production for domestic consumption within this region, based upon the blended amounts suggested in recommendation #1 is well over 300 million litres per year. Production incentives can secure the ability for local production to successfully meet its financial obligations, pay back its loans and compete in the marketplace for the long term.

Even though the industry here is just now getting its legs, an Atlantic specific program that provided a matching provincial / federal production incentive would be the final piece to ensure industry development in this region. It would result in a direct payout or cost to government; however, as identified through the Gardner Pinfold analysis, the economic impact of a biofuels industry of this scale, in this region, over a 5 year period, has the potential to exceed $1B. The contribution for this type of program would only be utilized if the industry builds to the recommended capacity – suggesting that the anticipated economic benefit of over $1B would be realized by our local communities. This has the potential to be a very good investment with great results.

RECOMMENDATION #4

ESTABLISH A REGIONAL WORKING GROUP COMPRISED OF INDUSTRY, GOVERNMENT AND ACADEMIC REPRESENTATIVES

Specifically, the working group would have the following responsibilities and tasks:

- Primarily, to consider the recommendations of this report and initiate a broader dialogue on the potential for development of this industry in this region;
  
  And further, to identify additional opportunities to participate in the national dialogues in this policy area;
  
  And continue to build relationships between, and across governments to further examine programs and incentives related to bioenergy.

- Seek to strengthen coordination, engagement and partnerships between industry, government and academia, in particular with the respect to research and development, and other technological innovation.

- Identify other project-specific items on an ongoing basis that could be initiated and implemented through the working group organization.

Atlantic Canada is a small region, both in terms of population and geographic proximity. To build an industry consisting of 8-15 plants, development on a regional scale – versus by individual province – just makes sense. An effective policy for industry development, on a regional scale, must come through collaboration among all players in the region. Interprovincial and federal/provincial relations will be not only valuable, but essential to this region’s success.
In this industry, like many others, one of the key pieces in the puzzle is adequate, appropriate, and applicable research and development. This is particularly true for this industry, at its current stage of development. As Atlantic Canada emerges into the biofuels production arena, the region must consider different technologies, feedstocks and overall applications to the future of this industry. The background research required for this report has reinforced ACBC’s understanding that industry and academia must work together in order to progress together. Our members and our stakeholders recognize that R&D is not only important, but essential, and when done in consultation and partnership with industry has the potential to yield impressive and economically beneficial results.

This recommendation could in fact be the most important; by bringing together government partners, facilitating research and development, and building a solid foundation for progress, this working group will be the catalyst to eventually drive forward all recommendations in this report and bring the Atlantic Canada biofuels industry to a whole new level.

ACBC and its membership are confident that these recommendations demonstrate the first collaborative effort of an organized and established pan-Atlantic industry group.

This report clearly indicates that accepting, approving and implementing all of these recommendations will provide the right circumstances to create exciting opportunities and positive change for this region of Canada.

**Conclusion**

This report is the result of a comprehensive project spanning 14 months of research, engagement and information sharing to the ACOA team and regional stakeholders. It details numerous findings and proposes four recommendations that hold great economic promise for Atlantic Canada and its stakeholders in the biofuels industry.

Together, the recommendations represent the first collaborative effort of an organized and established pan-Atlantic industry group – a long-term, committed and documented interaction with biofuels and bioenergy stakeholders throughout New Brunswick, Prince Edward Island and Nova Scotia, as well as national and regional input for an informed and dedicated community of industry leaders and supporters.

This report has been prepared by the Atlantic Council for Bioenergy Cooperative Limited (ACBC) in collaboration with BioAtlantech, New Brunswick’s lead bioscience agency, with all reasonable skill, care and diligence, and taking account of the resources devoted to it by agreement with the client.

Information reported herein is based on the interpretation of data collected and has been accepted in good faith as being accurate and valid.