# 2015–16
# ANNUAL REPORT

PUBLISHED SEPTEMBER 2016

## Alberta Innovates
## Bio Solutions

Alberta Innovates Bio Solutions

Alberta Canada

Funded by the Government of Alberta

ALBERTA INNOVATES BIO SOLUTIONS
2015–16 Annual Report

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# Contents


1. Executive Summary ..... 1
2. Accountability Statement ..... 4
3. Management's Responsibility for Reporting ..... 4
4. Message from the Board Chair ..... 5
5. Performance Measurement—Reporting on Results ..... 7
6. Management's Discussion and Analysis ..... 25
7. Operational Overview ..... 26
8. Public Interest Disclosure ..... 28
9. Audited Financial Statements ..... 29

# 1. Executive Summary

This annual report will show that the year 2015–16 was another period of strong progress for Alberta Innovates Bio Solutions (AI Bio), as the corporation continued to support growth and prosperity in Alberta's agriculture, food, and forest sectors.

The goal of AI Bio, and of the research and innovation system in general, has been to improve the lives of Albertans by creating a more diverse and resilient economy. With its emphasis on biological solutions, AI Bio has been uniquely positioned to contribute to both diversification and the expansion of sustainable practices. Since a departmental restructuring in the Alberta government occurred in 2015, three of the Alberta Innovates corporations have shifted their reporting responsibilities to the Minister of Economic Development and Trade. They are Alberta Innovates Bio Solutions, Alberta Innovates Energy and Environment Solutions and Alberta Innovates Technology Futures.

The year 2016 will mark a new beginning and create exciting opportunities as AI Bio and its three sister corporations in the Alberta Innovates system consolidate their operations into a single entity, along with a newly created applied research subsidiary. Until legislation is passed to create the new entity, AI Bio will continue to carry out its current mandate and role.

AI Bio's mandate is to meet the research and innovation priorities of the government by providing leadership and coordination for research and innovation that support the growth and diversification of Alberta's agriculture, forest, and life sciences sectors. Because AI Bio is a bridge between the private sector, research institutions, government, and others in the research system, we play a key role in fostering a rich innovation infrastructure and a research and development culture of excellence in the biosectors.

In delivering on the *2015–18 Business Plan* over the past year, AI Bio supported investments within six priority research and innovation areas: sustainable production, bioindustrial innovation, food innovation, ecosystem services and biodiversity, biological greenhouse gas (GHG) management, and management of prion and prion-like neurological diseases.

Over 2012–13, we developed performance measures for the effectiveness of our investments. These same measures have been used for 2013–14, 2014–15, and 2015–16. We evaluated AI Bio–supported projects, programs, or initiatives for which the final report was received by the end of 2015 or which were otherwise considered closed. Using the performance measures, we assessed our achievement of immediate outputs (results occurring directly due to our influence and support) and immediate outcomes (areas of impact to which we contributed).

These outcomes and outputs are summarized in a table for each priority area (beginning on page 7). Below each table, key achievements in that area are listed along with the long-term outcomes and initiatives each achievement supports. The following are examples of AI Bio's significant achievements during 2015–16:

- Grizzly bears are recognized as indicators of healthy ecosystems. Since 2010, grizzly bears in Alberta have been designated as a threatened species. To contribute to the successful recovery of grizzly bear populations, AI Bio and several industry partners supported a three-year project to develop new, accurate laboratory techniques to measure reproductive performance in grizzly bears, along with procedures to map, measure, and quantify the effects of habitat changes caused by humans. The results of this project provided science-based approaches to setting recovery targets for grizzly bears in Alberta.

- AI Bio and the Alberta Livestock and Meat Agency (ALMA) supported a study that assessed the effect that certain proteins have on sperm fertility in dairy bulls and developed a procedure to assess and predict the quality and fertility of frozen bull sperm. This procedure could potentially increase the value of and demand for Canadian bull semen.

- In March 2015, the Alberta Bio Future[1] (ABF) program was launched; Equipment Utilization was the first subprogram to begin taking in applications. ABF aims to accelerate growth of Alberta's bioindustrial sector, enhance the province's reputation as a bioproducts innovation hub, and increase the diversification of Alberta's economy. This $20.8-million, five-year program is co-funded by AI Bio and Economic Development and Trade and led by AI Bio.

- AI Bio partnered with Alberta Innovates Health Solutions and ALMA to support the Alberta Food Metabolome Project, a multi-year project aimed at characterizing the chemical composition of Alberta-grown produce.

- Alberta is one of Canada's major producers of potatoes and convenient processed potato products like potato chips and french fries. This project focused on adding value to waste potato peels and cull potatoes by exploring the development of biodegradable polymers for use in food packaging. These edible antimicrobial bioactive films could improve food product shelf life and safety.

- The Ecosystem Services Assessment is one of the foundational programs funded by AI Bio. Led by the Alberta Biodiversity Monitoring Institute (ABMI), the program continues to develop and apply simulation models and maps of ecosystem services and biodiversity supply from various landscapes provincially and regionally.

- The Bio Resource Information Management System, led by the Silvacom Group and funded by AI Bio, developed a working prototype for a credible open-source data and information management system to inform land-use and management decisions and trade-off choices. The project is in the final phase of a four-phased approach, with completion expected in 2017.

- In collaboration with the Canadian Oil Sands Innovation Alliance and Alberta Innovates Energy and Environment Solutions, AI Bio supports the Alberta Biodiversity Chairs program, a four-year program in its third year.

- An emerging opportunity area for Alberta is the production of biochar from cellulosic feedstock residues from the forest industry. Creating the biochar stabilizes biological carbon for long-term storage, thus eliminating emissions associated with natural degradation processes. The Biological GHG Program participates in a teamed effort through the Alberta Biochar Initiative to support the development of the biochar industry in Alberta.

- The Alberta Prion Research Institute received an additional investment of $27.5 million over five years from the Government of Alberta through a contract between Economic Development and Trade and AI Bio to continue to support fundamental and applied research in prion and prion-like diseases.

We have been able to establish valuable partnerships with provincial, national, and international agencies that align with our interests and the needs of our stakeholders. We have been careful stewards of the resources of our stakeholders, leveraging funding from industry, government, and Alberta Innovates partners. Alberta's $35-billion (2015 sales) agriculture, food, and forest sectors represent a remarkable economic engine that will continue to grow in the face of global interest in food security, green technology, environmental sustainability, water scarcity, and healthy societies.

In 2015–16, AI Bio's portfolio expanded to 182 active multi-year projects spanning the entire research and innovation continuum across its six widely diverse business lines. Investment totalled $61.5 million over the lifetime of the projects, and cash leveraging was $146.8 million, for a total portfolio value of $208.3 million. The

[1] Activities in support of the Alberta Bio Future Program are partially funded through a separate grant agreement that is outside of AI Bio's grant from Alberta Economic Development and Trade. A separate report specific to this funding agreement will be submitted to the department.

amount of leverage that AI Bio investment was able to achieve showed AI Bio's ability, skills, and connections to other groups.

In the 2015–16 financial statements, the Statement of Financial Position shows net assets of $8.8 million and cash of $22.9 million, which includes $6.4 million in cash for the Alberta Prion Research Institute and $6.0 million for the Alberta Bio Future Program. Because we are able to retain resources into other fiscal years, we can plan for longer-term opportunities in our areas of focus.

In the 2015–16 Statement of Operations, revenues of $20.0 million were earned and $19.9 million in expenses were incurred, resulting in a net operating surplus of $165,000, which slightly increased the accumulated surplus carried forward from previous years to $8.8 million.

AI Bio acknowledges the GOA's stated intent to continue to improve the relevance, effectiveness, and efficiency of the province's innovation system, and we continue to work with the GOA in pursuing this goal. Our programs and partnerships have demonstrated a history of good choices. We submit this annual report in the belief that it describes the initiatives and investments that Alberta's agriculture, food, and forest industries require to be profitable and competitive while increasing sustainability.

# 2. Accountability Statement

AI Bio's annual report for the year ended March 31, 2016, was prepared under the Board's direction in accordance with the Alberta Research and Innovation Regulation and the ministerial guidelines established pursuant to the *Alberta Public Agencies Governance Act* and the *Fiscal Planning and Transparency Act*. All material economic, environmental, or fiscal implications of which we are aware have been considered in the preparation of this report.

[Original signed by Judy Fairburn]

Judy Fairburn
CHAIR, BOARD OF DIRECTORS

# 3. Management's Responsibility for Reporting

Alberta Innovates Bio Solutions' management is responsible for the preparation, accuracy, objectivity, and integrity of the information contained in the annual report, including the financial statements, performance results, and supporting management information. Systems of internal control are designed and maintained to produce reliable information that meets reporting requirements and to ensure that transactions are executed in accordance with all relevant legislation, regulations, and policies; that reliable financial records are maintained; and that assets are properly accounted for and safeguarded. The annual report has been approved by the Board of Directors and is prepared in accordance with ministerial guidelines.

The Auditor General of Alberta, the corporation's external auditor appointed under the *Auditor General Act*, performs an annual independent audit of Alberta Innovates Bio Solutions' financial statements in accordance with Canadian generally accepted auditing standards.

[Original signed by Steve Price]

Steve Price
CHIEF EXECUTIVE OFFICER

# 4. Message from the Board Chair

The gains made this year by the four Alberta Innovates corporations—Energy and Environment Solutions, Bio Solutions, Health Solutions, and Technology Futures—help lay the foundation for future evolution within Alberta's research and innovation system, and will be carried forward and further refined as our system continues to mature.

A sampling of the past year's successes among the four corporations showcases our existing strengths and the potential to build on those strengths through the integrated approach that a single organization will enable - not only with each other but with many partners in the broader research and innovation system.

- Alberta Innovates Technology Futures has begun staged implementation of measuring outcomes generated by the funding support it provides to technology-based entrepreneurs and small business owners. For every dollar AITF invests, business owners raised another $9.50 from other investors, and grew net revenues by $4.50. Of the 157 AITF-supported companies, 53 per cent exported their products, compared to 10 per cent of similarly sized Canadian companies.

- Alberta Innovates – Health Solutions and Alberta Innovates – Technology Futures, in partnership with Economic Development and Trade, launched a 4 million dollar funding initiative to build, test and validate innovative technologies from local entrepreneurs in real world settings in the province. Under the health portion of the initiative, Alberta Health Services' Diabetes, Obesity and Nutrition Strategic Clinical Network was funded to test two products in the health system, a bandage to heal diabetic ulcers and a shoe insole to sense foot pressure to prevent diabetic ulcers from forming. Foot ulceration affects 15 to 20 per cent of people with diabetes at some point in their lives and is a leading cause of amputations. Early detection and new treatment promises to improve their health and wellbeing.

- Alberta Innovates Bio Solutions and Alberta Innovates Technology Futures have a partnership to fund researchers who use wood-based cellulose nanocrystals to create advanced materials for the fields of energy, health, industrial coatings, electronics and the environment. These advanced materials are biodegradable, non-toxic and robust. A recent applied research funding program, Cellulose Nanocrystals (CNC) Challenge 2.0 competition, launched by the partners aims to develop applications for CNC with commercialization potential. One of the eight successful applicants will use the $25,000 and 1 kilogram of material to explore CNC's suitability in the manufacturing of artificial heart valves. Other funding recipients will investigate the use of CNC for the treatment of wounds.

- In October 2015, Edmonton's Advanced Energy Research Facility (AERF) was named one of the Clean50 - Top15 Projects for 2016. Alberta Innovates -- Energy and Environment Solutions (AI-EES) partnered with the City of Edmonton to introduce and manage this facility. In 2015, eight organizations were at AERF testing feedstocks for gasification and production of clean biofuels and value-added products. AERF is associated with the Enerkem Waste to Biofuels and Chemicals plant, established through an AIEES, City of Edmonton and Enerkem partnership, which aims to process 90 per cent of Edmonton's residential waste into clean biofuels such as methanol and ethanol by next year. This will help Edmonton become an energy sustainable city and contributes to Alberta's Climate Leadership Plan.

I am honored to serve as the Chair of the Board of Directors that oversees all four of the Alberta Innovates corporations. The four corporations are entering a new era as we embark on consolidating into one entity. Guided by Alberta's priorities, we are committed to evolving Alberta's research and innovation system to be more

focused on outcomes and responsiveness. We will build on Alberta's strengths, creating a more diversified economy and delivering value for money while advancing our environmental and social well-being. We are motivated to enable researchers and innovators to accelerate their good ideas into impactful application and job growth.

As Chair, my responsibility is to ensure a strong strategic direction and demonstrable outcomes. It will be critical to ensure that consolidation into the single Alberta Innovates corporation is successfully accomplished by management - a catalyst for the future economic prosperity of Alberta. Transparent, accountable and effective governance of the corporations is also essential, as detailed in this annual report.

As a single, strengthened Alberta Innovates, we'll have the ability to capitalize on the knowledge, experience and brain power of our staff. We'll employ cross-sectoral approaches to big challenges, offer integrated services and supports that are easy to understand and access, forge increased partnerships and deploy a strengthened research base. Regular reporting on the outcomes achieved by the corporation will be a priority.

Thank you to the staff of all four corporations for their contributions over the past year. Their efforts in leveraging relationships with industry, entrepreneurs, academia and government have enabled us to continue to offer valuable services to advance a diverse and resilient economy. This will remain critical as we transition to the future.

I would also like to recognize and thank the outgoing board members of all four corporations. Their dedication and leadership have been invaluable in establishing a strong foundation for achieving the goals we set for the new Alberta Innovates.

[Original signed by Judy Fairburn]

Judy Fairburn, MSc, MBA
CHAIR, BOARD OF DIRECTORS

# 5. Performance Measurement—Reporting on Results

AI Bio's mandate is to meet the research and innovation priorities of the government by providing leadership and coordination for research and innovation that support the growth and diversification of Alberta's agriculture, forest, and life sciences sectors. Because AI Bio is a bridge between the private sector, research institutions, government, and others in the research system, we play a key role in fostering a rich innovation infrastructure and a research and development culture of excellence in the biosectors.

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In the following section, these results are summarized in a table for each priority area. Below each table, key achievements in that area are listed along with the long-term outcomes and initiatives each achievement supports.

In a number of instances, the achievements reported are the culmination of research programs and collaborations that were initiated in previous years, reflecting the legacy investments brought into AI Bio when it was formed in 2010.

# Business Line: Sustainable Production

## Goal 1: Sustainable Agriculture and Forest Production

**Long-Term Outcomes**

1. Market-driven traits and products
2. Sustainable production systems

**Initiatives**

1. Support research and innovation to:
    - 1.1 Increase the yields of Alberta's major crops by improving the efficiency of nutrient and water use and resistance to pests
    - 1.2 Identify and/or adapt new crops suited to Alberta's growing conditions
    - 1.3 Advance the adaptation of forest species to a changing climate
    - 1.4 Inform forest management practices for species at risk, pest control, and restoring disturbed boreal forest lands
    - 1.5 Optimize environmentally sustainable management in agriculture and forestry
2. Continue AI Bio investment in research, development, knowledge translation, and commercialization activities at two Alberta Innovates Centres, Livestock Gentec and Phytola, as well as in other AI Bio–supported initiatives

| Results Category | Performance Measure | Actual Results 2012–13 | Actual Results 2013–14 | Actual Results 2014–15 | Actual Results 2015–16 |
|---|---|---|---|---|---|
| **Projects** | The number of projects, programs, or initiatives supported by AI Bio for which the final report was received by the end of the calendar year or which were otherwise considered closed, and which were evaluated for achievement of outputs or outcomes as reported in the table below. | 11 | 15 | 7 | 10 |
| **Immediate Outcomes** | | | | | |
| Knowledge that is likely to lead to a new or improved product, process, or service, or improved market access. | The number of potential or actual patents, licence agreements, registrations, etc. (e.g., *Registered a new dry-bean cultivar*). | 18 | 14 | 12 | 18 |
| Knowledge that is likely to lead to practice change. | The number of ways a sector might change its practices as a result of knowledge gained through the project. | 2 | 4 | 3 | 6 |
| Knowledge that is likely to lead to policy or regulation change. | The number of potential or actual changes in policy or regulation. | | | | |

| | | | | | |
|---|---|---|---|---|---|
| Knowledge that resulted in significant new directions in science or innovation. | The number of confirmed proofs of concept, new avenues opened for exploration, new memoranda of understanding, etc. (e.g., *Identified 300 organic compounds residing in the soil throughout the growing season of wheat and canola, which may lead to new farming practices and products*). | 2 | 12 | 2 | 7 |
| **Immediate Outputs** | | | | | |
| Highly qualified personnel developed through our projects, programs, and initiatives. | The number of individuals involved on a project, program, or initiative who are supported by a grant or contract and who are undergraduate students, graduate students, post-doctoral fellows, or post-secondary graduates with a diploma or degree. | 127 | 262 | 46 | 55 |
| Knowledge management that occurred with industry, government, and others. | Over the life of a project, program, or initiative, the number of seminars or workshops coordinated, presentations delivered, articles published in non-academic publications, newsletter editions issued, active websites developed, crop walks or tours coordinated, etc. for which the audience was from industry, government, or other non-academic sectors. | 579 | 169 | 21 | 48 |
| Knowledge management that occurred with academia. | Over the life of a project, program, or initiative, the number of published peer-reviewed papers, abstracts, or book chapters; scientific conference program or poster presentations; or other endeavours for which the audience was mainly from academia. | 207 | 402 | 68 | 83 |

## Sustainable Production—Key Achievements in 2015–16

- In 2014-15, Alberta spent $169 million[2] on direct fire management to protect Albertans, their communities, forest resources, and other economic activities like oil and gas extraction. From 1961 to 2014, wildfires burned an average of 147,800 hectares in Alberta annually. In 2016, a wildfire burned more than 200,000 hectares in the Fort McMurray area and caused more than 80,000 people to leave their homes. Every spring, there is a period when Alberta's forests are particularly vulnerable to fire that occurs after snow melt but before vegetation green-up. AI Bio funded a three-year project that built a weather-based modelling system to determine the timing and length of the spring wildfire window in Alberta as well as the connection between fire occurrence and vegetation green-up dates. These models provided operational agencies with real-time forecasts for the location and timing of green-up across Alberta. This study has laid the groundwork for the development of improved fire management practices that will help reduce the likelihood and impacts of unwanted fires. (Relevant to long-term outcome 2 and initiatives 1.4 and 1.5)

- Grizzly bears are recognized as indicators of healthy ecosystems. Since 2010, grizzly bears in Alberta have been designated as a threatened species. Government decisions about the conservation and management of this species are under intense scrutiny by the public and the scientific community. To contribute to the successful recovery of grizzly bear populations, AI Bio and several industry partners supported a three-year project to develop new, accurate laboratory techniques to measure reproductive performance in

[2] *Annual Report 2014-15*. Alberta Environment and Sustainable Resource Development, June 2015. Page 21. http://aep.alberta.ca/about-us/corporate-documents/documents/ESRD-AnnualReport-2014-2015.pdf

grizzly bears and procedures to map, measure, and quantify the effects of habitat changes caused by humans. The results of this project provided science-based approaches to setting recovery targets for grizzly bears in Alberta. (Relevant to long-term outcome 2 and initiatives 1.4 and 1.5)

- AI Bio helped to purchase a piece of equipment to analyze genetic material. This equipment has been used to generate myriad genetic data for different living organisms, such as microbes, small mammals, agronomic crops, and trees. Having access to this technology has stimulated discussions around creation of a formal Environmental Genomics group, providing an important point of synergy for a number of researchers with existing strengths in genetics. (Relevant to long-term outcomes 1 and 2 and initiatives 1.3, 1.4, and 1.5)

- Livestock Gentec continued to make progress with its partners in increasing the adoption of genomics. Events such as the Field Day at the Lacombe Research Centre in August, in partnership with Agriculture and Agri-Food Canada, and the Livestock Gentec Conference ("Playing the Long Game: Capturing Value in Livestock Innovation") in Edmonton in October provided excellent showcases for the potential impact. Other activities showing the opportunities presented by genomics included participation in the McDonald's sustainability project, the Canadian Roundtable for Sustainable Beef, the Western Nutrition Conference, and work with Agriculture's extension team. The Faculty of Agricultural, Life and Environmental Sciences Old Country Fair (which formed part of the University of Alberta Alumni Weekend) saw more than a thousand students. Major new projects were initiated in dairy, beef, and swine with support from Genome Canada, Genome Alberta, the Alberta Livestock and Meat Agency, the Canadian Agriculture Adaptation Program, and industry. The network of research and industry partners continues to grow and includes Olds College, SAIT, and the University of Calgary Faculty of Veterinary Medicine in Alberta. Significant progress was made on the development of a Canadian Beef Improvement Network with the Canadian Beef Value Chain Round Table (Relevant to long-term outcomes 1 and 2 and initiatives 1.5 and 2)

- The cereal leaf beetle (CLB) is a recent alien invasive pest in Western Canada. CLB infests important cereal crops, including wheat, oats, and barley, causing decreased grain production. Its geographic distribution has been expanding and could spread further due to climate change. Biological control—the reduction of pests by natural enemies—has been the most successful control strategy for the beetle. For the last three years, AI Bio and the Alberta Crop Industry Development Fund funded a project that evaluated biologically based practices to control CLB using its principal natural enemy, the parasitic wasp *Tetrastichus julis*. Successful establishment of the parasitic wasp can naturally suppress up to 95% of CLB populations. This reduces the costs for insecticide applications, while promoting greater sustainability for cereal farms in Alberta and Western Canada. (Relevant to long-term outcomes 1 and 2 and initiatives 1.4 and 1.5)

- Frozen-thawed bovine semen has wide fertility variation. Semen fertility can be predicted by measuring certain newly discovered submicroscopic sperm characteristics. AI Bio and the Alberta Livestock and Meat Agency supported a study that assessed the effect that certain proteins have on sperm fertility in dairy bulls and developed a procedure to assess and predict the quality and fertility of frozen bull sperm. This procedure could allow the cattle industry to consider culling lower-fertility bulls if the fertility test can be taken soon after puberty. It could also potentially increase the value of and demand for Canadian bull semen. (Relevant to long-term outcomes 1 and 2 and initiatives 1.5)

- The Alberta Innovates Phytola Centre (Phytola) at the University of Alberta has made significant progress toward the production of punicic acid (PA), a bioactive fatty acid from pomegranate oil. There are many health benefits associated with PA, such as reducing the risk of diabetes and obesity and helping to prevent and protect against prostate, breast, and skin cancers. Currently, the only commercial source of PA is pomegranate seed oil, which is quite expensive. One of Phytola's projects involved applying some of

the pomegranate genes associated with PA production to other plants, including flax, safflower, and canola. The outcomes of this study have provided a solid foundation for the development of a commercial Canadian oilseed crop with a high-value PA for nutraceutical and industrial applications. (Relevant to long-term outcomes 1 and 2 and initiatives 1.5 and 2)

- Dry bean production in Alberta had traditionally focused on "prostrate" varieties grown as irrigated row crops using specialized seeding, cultivating, spraying, and harvesting equipment. However, recent advances in bean breeding have produced "upright growth" cultivars with improved tolerance to disease and higher yields. A four-year project was conducted to provide agronomic information to support solid seeded dry bean production. The results indicated that solid-seeding dry bean is a viable management practice in Alberta. This study will help bean growers to adopt new agronomic techniques and will lead to soil quality improvements by employing dry bean seeding or harvesting practices that reduce soil disturbance. (Relevant to long-term outcomes 1 and 2 and initiatives 1.1, 1.2, and 1.5)

As of March 31, 2016, the sustainable production team was managing 43 active projects, 11 of which were in the area of forest sustainability, and 32 in the area of agriculture sustainability.

# Business Line: Bioindustrial Innovation

## Goal 2: New Chemicals, Materials, and Energy from Biomass

**Long-Term Outcomes**

3. New bioindustrial products and processes
4. Bioindustrial sector growth
5. Green building materials and modular construction

**Initiatives**

6. Invest in advancements in science and innovation that lead to bioindustrial growth opportunities in three broad areas: biomaterials, biochemicals, and bioenergy
7. Provide data and analysis for science-based policy recommendations that will improve or reduce policy constraints that affect bioindustrial development in Alberta
8. Foster relationships and networks to spur cross-sector innovation between the agriculture, forest, and oil and gas sectors, and communities (e.g., BioEconomy Alberta, the Biorefining Conversions Network, the Modular Construction Network, the Canadian Bioenergy Association)
9. Support establishment of a bioindustrial cluster
10. Invest in science, innovation, and networks that are focused on developing green building materials and new approaches to construction, including modular construction, (e.g., the NewBuilds network, the NSERC Industrial Research Chair in Modular Construction)

| Results Category | Performance Measure | Actual Results 2012–13 | Actual Results 2013–14 | Actual Results 2014–15 | Actual Results 2015–16 |
|---|---|---|---|---|---|
| **Projects** | The number of projects, programs, or initiatives supported by AI Bio for which the final report was received by the end of the calendar year or which were otherwise considered closed, and which were evaluated for achievement of outputs or outcomes as reported in the table below. | 5 | 9 | 6 | 5 |
| **Immediate Outcomes** | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| Knowledge that is likely to lead to a new or improved product, process, or service, or improved market access. | The number of potential or actual patents, licence agreements, registrations, etc. | 3 | 3 | 26 | 8 |
| Knowledge that is likely to lead to practice change. | The number of ways a sector might change its practices as a result of knowledge gained through the project. | 1 | | 2 | |
| Knowledge that is likely to lead to policy or regulation change. | The number of potential or actual changes in policy or regulation. | 2 | 3 | | 1 |
| Knowledge that resulted in significant new directions in science or innovation. | The number of confirmed proofs of concept, new avenues opened for exploration, new memoranda of understanding, etc. (e.g., *Identified 300 organic compounds residing in the soil throughout the growing season of wheat and canola, which may lead to new farming practices and products*). | | 5 | 8 | 3 |
| **Immediate Outputs** | | | | | |
| Highly qualified personnel developed through our projects, programs, and initiatives. | The number of individuals involved on a project, program, or initiative who are supported by a grant or contract and who are undergraduate students, graduate students, post-doctoral fellows, or post-secondary graduates with a diploma or degree. | 53 | 76 | 26 | 13 |
| Knowledge management that occurred with industry, government, and others. | Over the life of a project, program, or initiative, the number of seminars or workshops coordinated, presentations delivered, articles published in non-academic publications, newsletter editions issued, active websites developed, crop walks or tours coordinated, etc. for which the audience was mainly from industry, government, or other non-academic sectors. | 263 | 30 | 13 | 4 |
| Knowledge management that occurred with academia. | Over the life of a project, program, or initiative, the number of published peer-reviewed papers, abstracts, or book chapters; scientific conference program or poster presentations; or other endeavours for which the audience was mainly from academia. | 83 | 84 | 11 | 1 |

## Bioindustrial Innovation—Key Achievements in 2015–16

- In March 2015, the Alberta Bio Future[3] (ABF) Program was launched; Equipment Utilization was the first subprogram to begin taking in applications. ABF aims to accelerate growth of Alberta's bioindustrial sector, enhance the province's reputation as a bioproducts innovation hub, and increase the

[3] Activities in support of the Alberta Bio Future Program are partially funded through a separate grant agreement that is outside of AI Bio's grant from Alberta Economic Development and Trade. A separate report specific to this funding agreement will be submitted to the department.

diversification of Alberta's economy. This $20.8-million, five-year program is co-funded by AI Bio and Economic Development and Trade and led by AI Bio. AI Bio developed program guidelines for ABF that focused on growing the bioindustrial sector in consultation with Alberta Innovates corporations and ministry partners. The program was designed to create synergies with our external partners and build upon their areas of focus for research and innovation. An international panel also reviewed the guidelines and provided expert advice on implementation. (Relevant to long-term outcomes 1 and 2 and initiatives 1 and 2)

- With a focus on research and development, new product commercialization, access to biomass testing equipment, and knowledge extension, ABF will help to build a more innovative and competitive Alberta. A general call for proposals in the Product and Technology Commercialization subprogram was issued in August 2015. The deadline for submission of proposals was September 2015. Proposals were reviewed by both internal and external specialists. A total of 44 submissions were received; five projects were selected for funding, and grant agreements were negotiated with successful proponents. The call for proposals under the Research and Innovation subprogram was issued in September. A total of 92 proposals were received, and 16 were accepted for funding. The Equipment Utilization subprogram is managed as a continuous intake process with five projects supported in 2015–16. (Relevant to long-term outcomes 1 and 2 and initiatives 1 and 3)

- The Driving Conversion of Alberta's Biomass to Advanced Materials and Chemicals Program (AMCP)[4] was launched in 2010 to provide assistance to Alberta companies looking to use Alberta biomass to commercialize new products for the marketplace. By 2015–16, one of the five funding recipients under the AMCP had completed its project, new processing facilities were constructed or were under construction, and new products had entered the marketplace. During 2015-16, a second project was completed, and project agreements with the other three funding recipients were amended to extend their end dates. Construction of the last two facilities was completed during 2015-16 (SBI BioEnergy and West Fraser). SBI's biorefinery officially opened in Edmonton at a ribbon-cutting ceremony attended by Premier Rachel Notley in March 2016. Installation of demo-scale equipment to produce biofuels from off-grade canola oil will continue into 2016–17. In the fifth project added to the AMCP, West Fraser began commissioning its new, state-of-the-art lignin recovery plant at its pulp mill in Hinton, Alta. Incremental funds will be used to construct a significant new lignin product line at the mill. (Relevant to long-term outcomes 1 and 2 and initiative 1.)

- In 2013, the Bioindustrial Research and Innovation Program was launched. This program focuses on adding value to agriculture and forest biomass through green building materials, components, and technologies, as well as other biomaterials based on cellulose, lignin, and hemicellulose. Projects funded under this program are well underway, with several in the process of completing final reports. Project activities include developing biochar adsorbents, agrifibre-based concrete additives, massive wood plate building components, cellulose nanocrystal–reinforced foams, polyolefin nanocomposites, and standards for building materials and systems. Final reports have been submitted on numerous projects. (Relevant to long-term outcomes 1 and 2 and initiatives 1 and 2)

- Research networks and research chairs focused on addressing the needs of Alberta industry are an excellent way to integrate new (leading) research at universities, highly qualified people, and Alberta companies. Several research networks are supported through AI Bio's bioindustrial innovation business line, including the Biorefining Conversions Network (University of Alberta), the NEWBuilds Network (University of New Brunswick), the Industrial Research Chair in the Industrialization of Building Construction (University of Alberta), the Industrial Research Chair in Energy and Environmental Systems Engineering (University of Alberta), and the Athena Chair in Life Cycle Assessment (University of Calgary).

[4] Activities in support of AMCP are funded through a separate grant agreement that is outside of AI Bio's core grant from Alberta Economic Development and Trade. A separate report specific to this funding agreement will be submitted to the department.

These networks provide opportunities for young researchers to work hand in hand with business people to identify issues and develop solutions. (Relevant to long-term outcomes 1 and 2 and initiatives 1 and 3)

- Several new projects were initiated, including new uses of cellulose nanocrystals (CNC), lignin, biobased plastics, supercapacitors, and nanofoams. Phase two of a major initiative focused on the use of biocomposites in automobile manufacturing was completed. Planning for follow-up projects involving the inclusion of CNC and/or lignin-based carbon fibre are under development. Alberta Innovates Technology Futures and AI Bio are working in partnership to solicit new CNC research proposals from the academic community. (Relevant to long-term outcomes 1 and 2 and initiative 1)

- AI Bio continued to play a leadership role through participation in numerous committees and boards, including BioEconomy Alberta, the Canadian Standards Association (CSA) Technical Committee on Sustainable Forest Management, several CSA wood products technical committees and the CSA Technical Committee for Cellulose Nanocrystals, International Energy Agency Task 39 and Task 43 Committees, and the Alberta Chamber of Resources. (Relevant to long-term outcome 2 and initiatives 3 and 4)

As of March 31, 2016, the bioindustrial innovation team was managing 33 active projects. Three of these were in the AMCP, and 30 focused on developing and advancing technology and products from biomass and increasing intellectual capacity.

# Business Line: Food Innovation

## Goal 3: Growth and Diversification of Alberta's Food Industry

**Long-Term Outcomes**

11. New food ingredients, food products, beverages, functional foods, or natural health products
12. Technologies, products, and processes to control food-borne pathogens

**Initiatives**

1. Invest in research and innovation leading to new or improved food ingredients, food products, beverages, functional foods, or natural health products that:
    - 1.1 Are competitive in the domestic and global marketplace
    - 1.2 Respond to domestic or international consumer demand
    - 1.3 Add value to Alberta livestock and crop commodities
    - 1.4 Promote wellness or prevent or treat chronic diseases

2. Invest in research and innovation that:
    - 2.1 Contributes to reducing pathogenic *E. coli*, *Salmonella spp.*, *Listeria spp.*, and *Campylobacter spp.* in Alberta livestock, crops, and food and beverage products
    - 2.2 Leads to new food safety policies and enhanced consumer confidence and market access

| Results Category | Performance Measure | Actual Results 2012–13 | Actual Results 2013–14 | Actual Results 2014–15 | Actual Results 2015–16 |
|---|---|---|---|---|---|
| **Projects** | The number of projects, programs, or initiatives supported by AI Bio for which the final report was received by the end of the calendar year or which were otherwise considered closed, and which were evaluated for achievement of outputs or outcomes as reported in the table below. | 6 | 8 | 6 | 13 |
| **Immediate Outcomes** | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| Knowledge that is likely to lead to a new or improved product, process, or service, or improved market access. | The number of potential or actual patents, licence agreements, registrations, etc. | 4 | 9 | 9 | 21 |
| Knowledge that is likely to lead to practice change. | The number of ways a sector might change its practices as a result of knowledge gained through the project. | | 3 | 2 | |
| Knowledge that is likely to lead to change in practice, policy, or regulation. | The number of potential or actual changes in practice, policy, or regulation. | | | | 3 |
| Knowledge that resulted in significant new directions in science or innovation. | The number of confirmed proofs of concept, new avenues opened for exploration, new memoranda of understanding, etc. (e.g., *Identified 300 organic compounds residing in the soil throughout the growing season of wheat and canola, which may lead to new farming practices and products*). | 3 | 4 | 4 | 4 |
| **Immediate Outputs** | | | | | |
| Highly qualified personnel developed through our projects, programs, and initiatives. | The number of individuals involved on a project, program, or initiative who are supported by a grant or contract and who are undergraduate students, graduate students, post-doctoral fellows, or post-secondary graduates with a diploma or degree. | 10 | 144 | 25 | 50 |
| Knowledge management that occurred with industry, government, and others. | Over the life of a project, program, or initiative, the number of seminars or workshops coordinated, presentations delivered, articles published in non-academic publications, newsletter editions issued, active websites developed, crop walks or tours coordinated, etc. for which the audience was from industry, government, or other non-academic sectors. | 64 | 250 | 20 | 55 |
| Knowledge management that occurred with academia. | Over the life of a project, program, or initiative, the number of published peer-reviewed papers, abstracts, or book chapters; scientific conference program or poster presentations; or other endeavours for which the audience was mainly from academia. | 22 | 248 | 58 | 139 |

## Food Innovation—Key Achievements in 2015–16

- "Ingredients for Success," Alberta's first conference focused on food innovation, took place in Calgary on May 26–27, 2015. The conference was hosted by AI Bio and held in conjunction with the Alberta Food Processors Association Food Awards. The conference brought together food businesses owners, food researchers, government stakeholders and others working in the agri-food industry to encourage collaboration, research, and innovation leading to the development of new ingredients for food or beverage products. The 162 attendees received information on a variety of topics, from market trends to cultivating a culture of food safety, and listened to success stories of their peers. The event received a high rating, with 85% indicating that they were either very satisfied or extremely satisfied. (Relevant to long-term outcomes 1 and 2 and initiatives 1.1, 1.2, 1.3, 1.4, and 2.2)

- AI Bio's food innovation team continues to implement strategies identified in the Alberta Innovates *Food Innovation Plan 2014–17*. Building on our strengths, the targeted call for the Accelerating Food Innovation in Alberta – 2015–16 Applied Research and Product Development Program required a researcher-primary applicant to collaborate with a food business to increase the chance that research results would be applied or that a new product would reach the marketplace. The food business was required to contribute 25 per cent of the cash costs of the project. A total of eight letters of intent were received. Of the six that were invited to submit a full proposal, four projects were selected for funding for a total investment by AI Bio of $479,000. Unfortunately one project was subsequently withdrawn due to restructuring in the host institution. (Relevant to long-term outcome 1 and initiatives 1.1, 1.2, 1.3, and 1.4)

- AI Bio partnered with Alberta Innovates Health Solutions (AIHS) and the Alberta Livestock and Meat Agency (ALMA) to support the Alberta Food Metabolome Project, a multi-year project aimed at characterizing the chemical composition of Alberta-grown produce. The chemical constituents of a given food (i.e., its metabolome) are primarily responsible for its taste, colour, and nutritional benefits. Standard food composition tables rarely provide much data on the lesser-known micronutrients or lower-abundance chemicals that are primarily responsible for the flavour, aroma, colour, and key health benefits. The project used advanced chemical analysis techniques to identify and quantify 500–1,000 different chemicals and micronutrients found in more than 40 major Alberta-grown foods, including meat, poultry, grains, fruits, and vegetables. This information is available through the Alberta Food Composition Database, an open-access web resource that gives Alberta food producers and consumers access to the world's most detailed information on food constituents, their abundance, their flavour or aroma characteristics, and their health benefits. (Relevant to long-term outcome 1 and initiatives 1.1, 1.3, and 1.4)

- Incorporating nutraceuticals into food systems is a convenient way to create novel functional foods. The objective of this study supported by AI Bio, Alberta Barley, and the Alberta Crop Industry Development Fund (ACIDF) was to address the lack of bioavailability of many nutraceutical compounds because of poor solubility, inability to transcend the intestinal wall, or instability in the gastrointestinal tract. In this project, nanoparticles made from barley or soy protein, without the use of organic solvents or crosslinking agents, proved to be stable and were able to carry a high payload of compounds like beta carotene or vitamin B12. The nanoparticles survived simulated gastric conditions and were absorbed by simulated small intestine. The results suggest that barley or soy protein nanoparticles could be used as delivery systems for bioactive compounds in food applications. Several food and nutraceutical companies that have already shown interest may participate in further collaborative research. (Relevant to long-term outcome 1 and initiatives 1.1, 1.2, 1.3, and 1.4)

- A similar project funded by AI Bio and ACIDF focused on the development of innovative plant protein microcapsules from oats, canola, and pulse crops. Because of the alkaline pH and strong mechanical properties, the canola gels were not suitable for food but could instead be used for other applications, such as scaffolds in tissue engineering, biosensors that respond to specific molecules, and dressings for healing of wounds. Microcapsules made from cold-set oat protein gels allowed probiotics and enzymes to bypass the stomach intact for release and absorption in the small intestine. These would be suitable for a variety of food (nutraceutical, food, or beverage products) and non-food (personal care) applications. The innovative plant-protein-based encapsulation system developed in this project could be used by industry to create novel functional foods that could contribute to reduced risk of chronic disease and improved public health. (Relevant to long-term outcome 1 and initiatives 1.3 and 1.4)

- Alberta is one of Canada's major producers of potatoes and convenient processed potato products like potato chips and french fries. This project focused on adding value to waste potato peels and cull potatoes by exploring the development of biodegradable polymers for use in food packaging. By using subcritical fluid (sCF) technology, researchers created novel starch-based bioactive films that have measurable properties (tensile strength, antimicrobial activity, etc.). This new sCF process generated uniform films that were stable over time. These edible antimicrobial bioactive films could improve food

product shelf life and safety and allow the Alberta potato industry to transform by-products that are currently disposed of at a cost into revenue from a value-added product. (Relevant to long-term outcome 1 and initiatives 1.3, 1.4, and 2.1)

- Barley is an ancient grain that has been a food staple for many centuries. As a result of the relationship between consumption of barley beta glucan and cholesterol reduction, Health Canada approved a health claim for barley in 2012. In an effort to increase barley consumption and improve the health of Canadians, AI Bio, Alberta Barley, and Western Grains Research Foundation supported a project to further explore the potential for co-milling hulless barley and wheat. Both waxy and non-waxy varieties of hulless barley were selected for their higher beta glucan content. Research results demonstrated that co-milling of both waxy and non-waxy barley varieties with wheat produces flours with acceptable analytical and nutritional properties. Only minor mill adjustments were needed to compensate for reduced mill extraction rates and coarse particle size. This work provides the information needed by commercial millers who wish to begin co-milling barley and wheat. (Relevant to long-term outcome 1 and initiatives 1.1, 1.3, and 1.4)

- Another project funded by AI Bio was designed to determine the optimum barley beta glucan or pea inclusion rates in bread or muffin flour for making tasty, healthier high-fibre products suitable for commercialization. The three flours tested produced bread products that contained sufficient barley beta glucan to be able to advertise the health claim for barley beta glucan as a means of lowering cholesterol (Health Canada, 2012). Bread quality varied from harder (hearth) types of breads to less-dense bread suitable for sale in traditional markets. Muffin recipes could only qualify for a *very high source of fibre* claim in the Canadian market. Different flour compositions could be used depending on the desired texture of the final product. Recipes would need to be optimized depending on the type of health claim sought, the fibre source, and the desired product and market. (Relevant to long-term outcome 1 and initiatives 1.1, 1.2, 1.3, and 1.4)

- AI Bio, AIHS, and Alberta Pulse Growers supported a project to assess the effects of yellow pea fibre intake on weight loss and glucose control in overweight and obese adults. Because dietary fibre consumption by Canadians falls short of the recommended intake levels, there is potential for dietary fibres to help with weight management and improve “gut health.” This randomized, double-blind, placebo-controlled study included overweight or obese male and female adults, approximately 30 to 60 years of age. Participants received equal calorie doses of either a placebo or pea fibre wafers for 12 weeks. Various measurements were taken throughout the test period. It was concluded that, in the absence of other lifestyle changes, incorporating 15 grams per day of yellow pea fibre may yield small but significant metabolic benefits and aid in obesity management. (Relevant to long-term outcome 1 and initiative 1.4)

- Reducing salt-associated health issues like hypertension has become a priority for Health Canada and the Canadian food industry. This project, aimed at developing particles that could impart a salty flavour without increasing sodium consumption, was supported by AI Bio and ALMA. A new process was developed for producing certain amino acids, peptides, and glycopeptides that enhance salt perception when added to food products. These molecules were tested as salt and flavour enhancers in processed meats and foods. Sensory evaluation of new products revealed an enhanced saltiness, savouriness, overall palatability, or accumulation of taste-active peptides. Glucosamine, a common treatment for osteoarthritis and joint problems, was also found to contain taste-active compounds—a novel discovery. The new salt-enhancer compounds produced in this project provide an option for food processors wishing to offer Canadian producers a healthier, tasty alternative. One company has expressed interest in commercializing one of the products. (Relevant to long-term outcome 1 and initiatives 1.2, 1.3, and 1.4)

- Studies have shown a link between maternal choline intake and fetal brain development. AI Bio, ALMA, and the Egg Farmers of Alberta partnered to support this research, which aimed to determine the best sources of choline in Alberta foods. Egg yolks, as well as low-fat meat and dairy products, were the best sources, while choline content in pulses was variable. Animal studies demonstrated the importance of

choline in the diet during lactation for immune health and immune development in the offspring. A study in Alberta that asked women to recall their diet during pregnancy found that women who consumed one egg or half a litre of milk per day were far more likely to meet requirements. To increase choline consumption and extend the shelf life of its source, egg yolks were used to prepare a choline-rich concentrate that, when incorporated into an extruded cereal product, provided the same choline content per serving. This research resulted in published guidelines for dieticians. (Relevant to long-term outcome 1 and initiatives 1.3 and 1.4)

For the 2015–16 fiscal year, the food innovation team managed 39 active projects, 14 of which were in the area of food safety, and 25 in the area of competitive food ingredients, food products, beverages and supplements, and innovative food processing and packaging.

# Business Line: Ecosystem Services and Biodiversity

## Goal 4: Integrated Land Use and Management

**Long-Term Outcomes**

1. Apply interdisciplinary science to inform policy, planning, programs, and management
2. Support measuring and monitoring of provincial biological resources
3. Demonstrate the use of market-based instruments to manage priority ecosystem services to stimulate diversification of Alberta's economy

**Initiatives**

3. Apply and demonstrate the science and tools required for successful market-based approaches, planning, and monitoring
   - 1.5 Lead development and delivery of multidisciplinary, cross-sector, applied proofs of concept (pilots) to test and evaluate the system components
   - 1.6 Invest in collaborative cross-sector interdisciplinary socioeconomic assessments to quantify the potential value to Alberta
   - 1.7 Implement the ecosystem services and biodiversity engagement and outreach strategy to catalyze knowledge exchange; support network information sessions, roundtables, websites, and other activities that grow the network and build common understanding and approaches across sectors

| Results Category | Performance Measure | Actual Results 2012–13 | Actual Results 2013–14 | Actual Results 2014–15 | Actual Results 2015–16 |
|---|---|---|---|---|---|
| **Projects** | The number of projects, programs, or initiatives supported by AI Bio for which the final report was received by the end of the calendar year or which were otherwise considered closed, and which were evaluated for achievement of outputs or outcomes as reported in the table below. | 2 | nil | 4 | 1 |
| **Immediate Outcomes** | | | | | |
| Knowledge that is likely to lead to a new or improved product, process, or service, or improved market access. | The number of potential or actual patents, licence agreements, registrations, etc. | 3 | | | 6 |

| | | | | | |
|---|---|---|---|---|---|
| Knowledge that is likely to lead to practice change. | The number of ways a sector might change its practices as a result of knowledge gained through the project. | 4 | | | |
| Knowledge that is likely to lead to policy or regulation change. | The number of potential or actual changes in policy or regulation. | 2 | | 3 | |
| Knowledge that resulted in significant new directions in science or innovation. | The number of confirmed proofs of concept, new avenues opened for exploration, new memoranda of understanding, etc. (e.g., *Identified 300 organic compounds residing in the soil throughout the growing season of wheat and canola, which may lead to new farming practices and products*). | 1 | | 5 | 2 |
| **Immediate Outputs** | | | | | |
| Highly qualified personnel are developed. | The number of individuals involved on a project, program, or initiative who are supported by a grant or contract and who are undergraduate students, graduate students, post-doctoral fellows, or post-secondary graduates with a diploma or degree. | | | 13 | 10 |
| Knowledge management that occurred with industry, government, and others. | Over the life of a project, program, or initiative, the number of seminars or workshops coordinated, presentations delivered, articles published in non-academic publications, newsletter editions issued, active websites developed, crop walks or tours coordinated, etc. for which the audience was mainly from industry, government, or other non-academic sectors. | 10 | | 7 | 15 |
| Knowledge management that occurred with academia. | Over the life of a project, program, or initiative, the number of published peer-reviewed papers, abstracts, or book chapters; scientific conference program or poster presentations; or other endeavours for which the audience was mainly from academia. | 3 | | 5 | 19 |

## Ecosystem Services—Key Achievements in 2015–16

AI Bio's priorities in the area of ecosystem services and biodiversity focus on creating the system, tools, and capacity necessary for effective and successful use of markets to manage and measure priorities. The foundational pieces include a data and information management system, biophysical and ecological science (ecosystem services assessment), and socioeconomics (market and market-based instrument design) with a major emphasis on case studies, proofs of concept, and pilots:

- The Ecosystem Services Assessment is one of the foundational programs funded by AI Bio. Led by the Alberta Biodiversity Monitoring Institute (ABMI), the program continues to develop and apply simulation models and maps of ecosystem services and biodiversity supply from various landscapes provincially and regionally. These tools also help to identify how this supply changes with various land management activities. This work will generate the knowledge to support the successful use of markets, land-use planning, and monitoring. It will establish simple yet credible systems for assessing ecosystem services and documenting environmental integrity. Phase 2 of the program began in summer of 2015. (Relevant to long-term outcome 1 and initiatives 1.1, 1.2, and 1.3)

- The Bio Resource Information Management System, led by the Silvacom Group and funded by AI Bio, developed a working prototype for a credible open-source data and information management system to

inform land-use and management decisions and trade-off choices. The project is in the final phase of a four-phased approach, with completion expected in 2017. (Relevant to long-term outcome 1 and initiatives 1.1, 1.2, and 1.3)

- AI Bio and Alberta Innovates Technology Futures continue to work on building capacity for the use of ecosystem services and biodiversity markets through diffusion of innovation, socioeconomic research, reports, and pilot projects. Working with the Alberta Livestock and Meat Agency, the Ecosystem Services in Agriculture pilot was initiated in southern Alberta. The second year of the Stakeholder Engagement and Outreach strategy was funded, and a report on natural capital was completed. A two-year pilot project was begun to collaboratively develop an exchange and clearinghouse for ecosystem services and biodiversity markets. (Relevant to long-term outcome 1 and initiatives 1.1, 1.2, and 1.3)

- The Algar Proof of Concept, led by the Silvacom Group and funded by AI Bio, looked at the changes in ecosystem services and the costs and benefits associated with restoration efforts taking place in the area of Algar, Alberta. This area is of particular importance in Alberta as a significantly disrupted habitat for woodland caribou. The second phase of the project currently underway includes a comprehensive socioeconomic analysis and review and improvement of the data, methodologies, and models, with a view to applying the methodologies to other regions. A detailed framework for engaging stakeholders in ecosystem services and biodiversity assessment was undertaken. This project will be completed in 2018. (Relevant to long-term outcome 1 and initiatives 1.1, 1.2, and 1.3)

- In early 2015, the Alberta Land Institute, with financial support from AI Bio, launched the Alberta's Living Laboratory Wetlands Project, which works in partnership with private landowners to better understand wetland restoration. This research project helps to address priorities in the provincial wetlands policy and advances ecosystem services approaches. The study will provide a better understanding of the functional values of wetlands—benefits such as flood mitigation and water purification—and address the practical question of compensation for landowners who agree to restore wetlands on their land using reverse auctions (a market-based instrument). The reverse auction was undertaken in the fall of 2015, with the results expected in 2016. (Relevant to long-term outcome 1 and initiatives 1.1, 1.2, and 1.3)

- In collaboration with the Canadian Oil Sands Innovation Alliance and Alberta Innovates Energy and Environment Solutions, AI Bio supports the Alberta Biodiversity Chairs Program, a four-year program in its third year. Under this program, two Biodiversity Conservation Chairs at the University of Alberta provide dedicated science capacity to link the monitoring of outcomes with policy development and strategic planning. (Relevant to long-term outcome 1 and initiatives 1.1, 1.2, and 1.3)

- The Waterton Biosphere Reserve Association, with financial support from AI Bio, led a project that looked at ecosystem-scale monitoring of population trends for grizzly bears and wolves in southwestern Alberta. Non-invasive monitoring techniques were used to track species distribution and population changes. This important data will help researchers understand the spatial variability of biodiversity intactness and the value of land management in biodiversity conservation. The project wrapped up in 2015, with a final report expected in 2016. (Relevant to long-term outcome 1 and initiatives 1.1, 1.2, and 1.3)

- A multi-year project on water management in Alberta is a collaborative effort among AI Bio, Alberta Innovates Energy and Environment, Environment and Sustainable Resource Development, and the University of Alberta. It will provide information required for the development of integrated source water management policies in Alberta, and the understanding of natural capital, ecosystem services, and green infrastructure in Alberta's economy. This project is in its final year, with the next phase of funding approved in early 2016. (Relevant to long-term outcome 1 and initiatives 1.1, 1.2, and 1.3)

- AI Bio, working with the ABMI, Alberta Innovates Technology Futures, the Land Stewardship Centre, Silvacom, and the Alberta Land Institute, provided leadership to the Ecosystem Services and Biodiversity Network. Its mandate is to collaboratively advance knowledge on the use of markets for enhancing ecosystem services and biodiversity. The Engagement and Outreach strategy was funded for a second

year. Its purpose is to increase understanding of ecosystem services and biodiversity and the use of markets, and create mechanisms to better link, share and collaborate, communicate, and coordinate across the various players. This year, major emphasis was placed on social media, the bimonthly newsletter, the Eco Earner game, and a number of information sessions. AI Bio co-hosted the Land Use 2016 conference with the Alberta Land Institute, held the Ecosystem Services and Biodiversity Network Open House, and launched the Ecosystem Services and Biodiversity Network website, https://ecoservicesnetwork.ca. The *Ecosystem Services and Biodiversity Markets* booklet was also completed. (Relevant to long-term outcome 1 and initiatives 1.1, 1.2, and 1.3)

AI Bio currently supports 32 active projects in the ecosystem services and biodiversity business line.

# Business Line: Biological GHG Management Program

## Goal 5: Effective Management of GHG Emissions Arising from Biological Systems

**Long-Term Outcomes**

4. Reduce emissions from agricultural production, forest operations, and municipal waste
5. Enhance biological carbon sequestration to reduce net GHGs in the province
6. Assess emission-reduction opportunities to determine where both environmental effectiveness and affordability can be achieved

**Initiatives**

1. Deliver a biological GHG management program and projects, in partnership with the Climate Change and Emissions Management Corporation (CCEMC), to reduce GHGs or increase sequestration of carbon
   - 1.1 Invest in research, development, and demonstration projects
   - 1.2 Establish credible data to inform industry and government decision-making
   - 1.3 Gather and disseminate relevant GHG management information

| Results Category | Performance Measure | Actual Results 2012–13 | Actual Results 2013–14 | Actual Results 2014–15 | Actual Results 2015–16 |
|---|---|---|---|---|---|
| **Projects** | The number of projects, programs, or initiatives supported by AI Bio for which the final report was received by the end of the calendar year or which were otherwise considered closed, and which were evaluated for achievement of outputs or outcomes as reported in the table below.<br><br>*Since the program's grant agreement had just started in 2012 no projects closed in 2012-13. | Nil* | 8 | 2 | 3 |
| **Immediate Outcomes** | | | | | |
| Knowledge that is likely to lead to a new or improved product, process, or service, or improved market access. | The number of potential or actual patents, licence agreements, registrations, etc. | | | 2 | 2 |

| | | | | | |
|---|---|---|---|---|---|
| Knowledge that is likely to lead to practice change. | The number of ways a sector might change its practices as a result of knowledge gained through the project. | | 8 | 1 | 3 |
| Knowledge that is likely to lead to policy or regulation change. | The number of potential or actual changes in policy or regulation. | | 3 | | 2 |
| Knowledge that resulted in significant new directions in science or innovation. | The number of confirmed proofs of concept, new avenues opened for exploration, new memoranda of understanding, etc. (e.g., *Identified 300 organic compounds residing in the soil throughout the growing season of wheat and canola, which may lead to new farming practices and products*). | | 2 | 2 | 3 |
| **Immediate Outputs** | | | | | |
| Highly qualified personnel are developed. | The number of individuals involved on a project, program, or initiative who are supported by a grant or contract and who are undergraduate students, graduate students, post-doctoral fellows, or post-secondary graduates with a diploma or degree. | | | 1 | |
| Knowledge management that occurred with industry, government, and others. | Over the life of a project, program, or initiative, the number of seminars or workshops coordinated, presentations delivered, articles published in non-academic publications, newsletter editions issued, active websites developed, crop walks or tours coordinated, etc. for which the audience was from industry, government, or other sectors. | | 7 | 4 | 5 |
| Knowledge management that occurred with academia. | Over the life of a project, program, or initiative, the number of published peer-reviewed papers, abstracts, or book chapters; scientific conference program or poster presentations; or other endeavours for which the audience was mainly from academia. | | 5 | 2 | 5 |

## Biological GHG Management Program—Key Achievements in 2015–16

- In November 2015, the program hosted the workshop Accounting for GHGs in collaboration with the AI Bio/Bioconversions Network International Conference. More than 65 participants attended a series of talks on the basis of carbon accounting and case studies to illustrate real-life applications. (Relevant to long-term outcome 1 and initiative 1.3)

- In collaboration with Viresco Solutions, a pre-feasibility calculator was developed to assess the GHG and economic impacts of energy system choices for greenhouse operators in the province of Alberta. This calculator aids current greenhouse operators and also assists in project development where industrial waste heat and $CO_2$ enrichment opportunities are available for greenfield projects. (Relevant to long-term outcomes 1 and 3 and initiatives 1.1, 1.2, and 1.3)

- The Farming 4R Land project, which was funded in two phases beginning in 2013, has attracted global attention as the world seeks to resolve the challenge of intensifying food production without adding to $N_2O$-based GHG emissions through the use of nitrogen fertilizers. The Global Alliance for Climate-Smart Agriculture is promoting the "4Rs" approach refined through the Farming 4R Land project with widespread adoption in North America and rapidly increasing uptake in seven developing nations. To learn more about the 4Rs, see the CCEMC annual report at http://annual-report-

2015.ccemc.ca/#completed-project-profiles. (Relevant to long-term outcomes 2 and 3 and initiatives 1.1, 1.2, and 1.3)

- An emerging opportunity area for Alberta is the production of biochar from cellulosic feedstock residues from the forest industry. Creating the biochar stabilizes biological carbon for long-term storage, thus eliminating emissions associated with natural degradation processes. Further, the biochar may be used to address emissions in remediation applications and may serve to improve soil health overall. The program participates in a teamed effort through the Alberta Biochar Initiative to support the development of the biochar industry in Alberta, and expects to fund additional projects in this area in 2016. (Relevant to long-term outcomes 2 and 3 and initiatives 1.1, 1.2, and 1.3)

- Landfill emissions may be controlled by the use of biocovers or captured to produce valuable landfill gas. But understanding the degradation of biological materials deep in the landfill body is essential to predicting the behaviour and nature of expected emissions over time. The Lethbridge Landfill project, which will be completed in 2016, has characterized more than 150 samples that represent the 40-year lifespan of this urban landfill site. In addition to providing valuable information about the degradation processes and rate of decay, data from this project will support landfill management strategies. (Relevant to long-term outcome 1 and initiatives 1.1, 1.2, and 1.3)

- An analysis report completed in 2016, *Biomass Innovation*, considers approaches for using biomass as a compliance tool for heavy industry. This report is contributing to the provincial and national dialogues on meeting our GHG emission-reduction targets. (Relevant to long-term outcome 3 and initiative 1.3)

With funding from the CCEMC, the Biological GHG Management Program, which is managed by AI Bio, has funded 17 projects to date, with a total project cash value of $4.8 million.

# Business Line: Alberta Prion Research Institute

## Goal 6: Effective Management of Prion and Prion-Like Neurological Diseases

**Long-Term Outcomes**

1. Reduce risk management costs of prion diseases in livestock industries and wild cervid management
2. Provide research leadership in prion and human neurodegenerative diseases

**Initiatives**

1. Improve understanding of the processes involved in prion diseases to inform risk management and policy around managing these diseases
2. Target investment toward the problems of livestock industries and wildlife managers to reduce industry costs, more effectively control disease in the wild, and develop new products
3. Build on Alberta's strengths and opportunities to develop new insight into prion-like neurodegenerative diseases, with the potential for long-term application in prevention, treatment, and products
4. Build on Alberta's expertise in prion and protein misfolding research to strengthen Alberta's position as an international leader in these fields
5. Attract additional funding to leverage AI Bio's investment in prions

| Results Category | Performance Measure | Actual Results 2012–13 | Actual Results 2013–14 | Actual Results 2014–15 | Actual Results 2015–16 |
|---|---|---|---|---|---|

| | | | | | |
|---|---|---|---|---|---|
| **Projects** | The number of projects, programs, or initiatives supported by AI Bio for which the final report was received by the end of the calendar year or which were otherwise considered closed, and which were evaluated for achievement of outputs or outcomes as reported in the table below.<br><br>*Since APRI's new grant agreement had just started April 1, 2015 not many projects closed in 2015-16. | 14 | 11 | 14 | 3* |
| **Immediate Outcomes** | | | | | |
| Knowledge that is likely to lead to a new or improved product, process, or service, or improved market access. | The number of potential or actual patents, licence agreements, registrations, etc. | 1 | 5 | 21 | 2 |
| Knowledge that is likely to lead to practice change. | The number of ways a sector might change its practices as a result of knowledge gained through the project. | 3 | 4 | 4 | 3 |
| Knowledge that is likely to lead to policy or regulation change. | The number of potential or actual changes in policy or regulation. | 1 | 4 | 4 | 1 |
| Knowledge that resulted in significant new directions in science or innovation. | The number of confirmed proofs of concept, new avenues opened for exploration, new memoranda of understanding, etc. (e.g., *Identified 300 organic compounds residing in the soil throughout the growing season of wheat and canola, which may lead to new farming practices and products*). | | 5 | 16 | 3 |
| **Immediate Outputs** | | | | | |
| Highly qualified personnel developed through our projects, programs, and initiatives. | The number of individuals involved on a project, program, or initiative who are supported by a grant or contract and who are undergraduate students, graduate students, post-doctoral fellows, or post-secondary graduates with a diploma or degree. | 102 | 118 | 106 | 10 |
| Knowledge management that occurred with industry, government, and others. | Over the life of a project, program, or initiative, the number of seminars or workshops coordinated, presentations delivered, articles published in non-academic publications, newsletter editions issued, active websites developed, crop walks or tours coordinated, etc. for which the audience was from industry, government, or other sectors. | 96 | 20 | 8 | 2 |
| Knowledge management that occurred with academia. | Over the life of a project, program, or initiative, the number of published peer-reviewed papers, abstracts; book chapters, or scientific conference program or poster presentations; or other endeavours for which the audience was mainly from academia. | 187 | 138 | 54 | 40 |

## Prion and Prion-Like Neurological Diseases—Key Achievements in 2015–16

- The Alberta Prion Research Institute (APRI) received an additional investment of $27.5 million over five years from the Government of Alberta through a contract between Economic Development and Trade and AI Bio to continue to support fundamental and applied research in prion and prion-like diseases. Specifically: "The investment will be used to support the continuum of fundamental to applied science, the operations of essential infrastructure, the training of young people and the exchange of knowledge with stakeholders." (Relevant to long-term outcomes 1 and 2 and initiatives 1 through 5)

- A summative evaluation of APRI was completed in 2015–16 by a third party consultant to assess the impact of the institute. The evaluation highlighted the important positive effects that APRI has had on building capacity for prion and protein misfolding research in Alberta, including on recruiting world-class researchers to the province, training young people, and building physical infrastructure for support of prion research. It also assessed the institute's outreach and knowledge translation activities. (Relevant to long-term outcome 2 and initiatives 3, 4, and 5)

- APRI supports prion research in the province through a variety of research and development programs. After rigorous external international review, in fiscal 2015–16 the institute committed to investing $8,021,904 over three years in 21 prion and prion-related research projects and laboratories in the province. The APRI funding attracted an additional $2.4 million toward 15 of the projects from funding partners, for a total investment of $10.4 million. (Relevant to long-term outcomes 1 and 2 and initiatives 1, 2, and 5)

- In February 2016, the institute held its Annual Scientific Meeting for recipients of its funding and their collaborators to present on their ongoing findings. At the meeting, 21 investigators presented highlights of 45 projects. APRI's International Research Advisory Council was in attendance, and council members were impressed by the quality of the science being done, and the evolution of the science toward more applied and critical targets, such as the development of potential vaccines, the potential for prions to cross-infect species, and potential treatments and diagnostics for diseases. (Relevant to long-term outcome 2 and initiatives 1, 3, and 4)

In 2015–16, APRI managed 55 research projects totalling $16.3 million.

## Separate Grant Agreements

Activities in support of the Driving Conversion of Alberta's Biomass to Advanced Materials and Chemicals Program (AMCP), the Alberta Bio Future Program, the Biological GHG Management Program, and the Alberta Prion Research Institute (APRI) are funded via separate grant agreements that are outside of AI Bio's grant from Economic Development and Trade. Separate reports will be submitted to the department specific to the AMCP, the Alberta Bio Future Program, and APRI. For the Biological GHG Management Program, a separate detailed annual report will be submitted to the Climate Change and Emissions Management Corporation (CCEMC).

# 6. Management's Discussion and Analysis

The results presented in AI Bio's audited financial statements are shaped by our mandate from the Government of Alberta: to provide leadership and coordination for research and innovation that support the growth and diversification of Alberta's agriculture, forest, and related life sciences sectors. In our sixth full year of operation, the wide-ranging expertise of our Board has guided our allocation of research funding in our priority areas of sustainable production, food innovation, bioindustrial innovation, ecosystem services and biodiversity, and prion

and protein misfolding diseases. AI Bio continues to operate in alignment with its corporate bylaws, code of conduct policy, conflict of interest policy, and intellectual property practice.

We have been able to establish valuable partnerships with provincial, national, and international agencies that align with our interests and the needs of our stakeholders. We have been careful stewards of the resources of our stakeholders, leveraging funding from industry, government, and Alberta Innovates partners. Alberta's $35-billion (2015 sales) agriculture, food, and forest sectors represent a remarkable economic engine that will continue to grow in the face of global interest in food security, green technology, environmental sustainability, water scarcity, and healthy societies.

In the 2015–16 financial statements, the Statement of Financial Position shows net assets of $8.8 million and cash of $22.9 million, which includes $6.4 million in cash for the Alberta Prion Research Institute and $6.0 million for the Alberta Bio Future program. Because we are able to retain resources into other fiscal years, we can plan for longer-term opportunities in our areas of focus.

In the 2015–16 Statement of Operations, revenues of $20.0 million were earned and $19.9 million in expenses were incurred, resulting in a net operating surplus of $165,000, which slightly increased the accumulated surplus carried forward from previous years to $8.8 million.

The recent announcement of the consolidation of the four Alberta Innovates corporations means significant changes will occur for each of the corporations in the coming year. In 2016–17, the single Alberta Innovates corporation will be developing its structure and operations to deliver on its mandate to generate economic, social and health benefits to Alberta. Centralized access to the new corporation's streamlined services, funding and supports will result in greater opportunities to enhance delivery of services, reduce redundancies and redirect resources to underserviced areas of Alberta's innovation system.

The impact on our stakeholders, partners and clients of the combined 2016–17 base budget reduction of $45 million for the four Alberta Innovates corporations will be mitigated through various strategies specific to the programs of service, funding and support offered.

# 7. Operational Overview

Since 2010, Alberta Innovates has been the province's only group of organizations with a pan-Alberta legislative mandate to fund and perform research, innovation, and commercialization across multiple sectors. During this time, the Alberta Innovates group has comprised one advisory board, the Alberta Research and Innovation Authority, and four research corporations: Alberta Innovates Bio Solutions, Alberta Innovates Energy and Environment Solutions, Alberta Innovates Technology Futures, and Alberta Innovates Health Solutions.

Since a departmental restructuring in the Government of Alberta (GOA) occurred in 2015, three Alberta Innovates corporations have shifted their reporting responsibilities to the Minister of Economic Development and Trade. They are Alberta Innovates Bio Solutions, Alberta Innovates Energy and Environment Solutions and Alberta Innovates Technology Futures. In 2016, the GOA made a decision to consolidate the four corporations into a single Alberta Innovates entity and an applied research subsidiary. The new Alberta Innovates will align with government direction and focus on our province's strengths in emerging technologies, environment, energy, food, fibre/bio industry, and health.

Until legislation is passed to create the new entity, AI Bio will continue to carry out its current mandate and role, growing prosperity in Alberta's agriculture, food, and forest sector.

The current downturn in oil prices reconfirms the importance of a diverse economy. In 2015, the province's agriculture, food, and forest industries contributed more than $35 billion in sales to Alberta's diversified economy, which is up from $33 billion in 2014 (source: Statistics Canada and EDT, 2015). AI Bio believes that through research and innovation, these sectors can contribute in an even more significant way.

AI Bio focuses on supporting research in the areas of bioindustrial innovation, food innovation, sustainable production in agriculture and forestry, ecosystem services and biodiversity, and management of biological greenhouse gas emissions. AI Bio has also contributed to the goal of better human and animal health by advancing knowledge in the area related to prion disease and by supporting applied research that will enhance food safety practices in industry.

AI Bio's 24 staff have evaluated technologies and emerging opportunities, funded projects according to rigorous criteria, facilitated connections, and worked to create or expand networks and advance knowledge.

Highlights for AI Bio during 2015–16 include:

- Implementation of Alberta Bio Future (ABF), the province's flagship bioindustrial initiative, with the launch of calls for proposals in three ABF program areas: product and technology commercialization, research and innovation, and Equipment Utilization
- A new five-year funding agreement for the Alberta Prion Research Institute
- A new three-year funding agreement for the Biological Greenhouse Gas Management Program
- Active public outreach and strong emphasis on external communications activities

Over the last year, we had changes in staffing, welcoming Fulton Smyl and Rebecca Bruce. We also said goodbye to Board members whose term had expired: Art Froehlich, Ray Price, Neil Cashman, Brian Hesje, and Paul Schmidt.

An initiative to integrate Genome Alberta into AI Bio carried into the 2015–16 fiscal year, with continued discussions and legal review. An agreement was reached in principle, but further activities were put on hold pending the Alberta Innovates consolidation.

In 2015–16, AI Bio's portfolio expanded to 182 active multi-year projects spanning the entire research and innovation continuum across its six widely diverse business lines. Investment totalled $61.5 million over the lifetime of the projects, and cash leveraging was $146.8 million, for a total portfolio value of $208.3 million. The amount of leverage that AI Bio investment was able to achieve showed AI Bio's ability, skills, and connections to other groups.

AI Bio's base funding from the Ministry of Economic Development and Trade for core business lines continued in 2015–16 with an allocation of $10.7 million. Base funding from EDT supports a broad range of investments within four core business lines: sustainable production, bioindustrial innovation, food innovation, and ecosystem services and biodiversity.

Restricted funding supported several initiatives and business lines in addition to AI Bio's core business lines. This type of funding is dedicated to a specific purpose that is complementary to activities supported by AI Bio base funding. It is administered by individual grant agreements for each restricted funding stream, with specific requirements for reporting to its funding partners.

No changes were made in 2015–16 to AI Bio's corporate bylaws, code of conduct policy, conflict of interest policy, or intellectual property practice.

AI Bio has followed the guidance provided by the GOA on appropriate policies and procedures for transparency in reporting expenses for both its Board of Directors and senior management. AI Bio has voluntarily disclosed travel, hospitality, and working session expenses for Board members and executive team members in alignment with the

GOA policy on public disclosure of travel, meal, and hospitality expenses. AI Bio is also compliant with the GOA policy on salary disclosure.

AI Bio acknowledges the GOA's stated intent to continue to improve the relevance, effectiveness, and efficiency of the province's innovation system, and we continue to work with the GOA in pursuing this goal. Our programs and partnerships have demonstrated a history of good choices. We submit this annual report in the belief that it describes the initiatives and investments that Alberta's agriculture, food, and forest industries require to be profitable and competitive while increasing sustainability.

# 8. Public Interest Disclosure

Section 32 of the Public Interest Disclosure Act requires Alberta Innovates Bio Solutions, an agency of the Government of Alberta, to report annually on the following parts of the Act:

a) The number of disclosures received by the designated officer of the Public Interest Disclosure Office, the number of disclosures acted on and the number of disclosures not acted on by the designated officer;
b) The number of investigations commenced by the designated officer as a result of disclosures;
c) In the case of an investigation that results in a finding of wrongdoing, a description of the wrongdoing and any recommendations made or corrective measures taken in relation to the wrongdoing or the reasons why no corrective measure was taken.

In 2015–16 for Alberta Innovates Bio Solutions, there were no disclosures of wrongdoing filed with the Public Interest Disclosure Office.

# 9. Audited Financial Statements

**ALBERTA INNOVATES – BIO SOLUTIONS**

**FINANCIAL STATEMENTS**

**MARCH 31, 2016**


Management's Responsibility for Reporting

Auditor's Report

Statement of Operations

Statement of Financial Position

Statement of Change in Net Financial Assets

Statement of Cash Flows

Notes to the Financial Statements

Schedule 1 – Expenses Directly Incurred Detailed by Object

Schedule 2 – Salary and Benefits Disclosure

Schedule 3 – Related Party Transactions

Schedule 4 – Allocated Costs

## MANAGEMENT'S RESPONSIBILITY FOR REPORTING

Responsibility for the integrity and objectivity of the financial statements for Alberta Innovates – BIO Solutions (AI-Bio) rests with the Board of Directors. Under the direction of the Board of Directors, we oversee the preparation of AI-Bio's financial statements. The financial statements include amounts that are based on estimates and judgments. The financial statements are prepared in accordance with Canadian public sector accounting standards.

AI-Bio's management is responsible for the preparation, accuracy, objectivity and integrity of the information contained in the annual report including the financial statements, performance results and supporting management information. Systems of internal control are designed and maintained to produce reliable information that meet reporting requirements, and to ensure that transactions are executed in accordance with all relevant legislation, regulations and policies, reliable financial records are maintained, and assets are properly accounted for and safeguarded.

The Auditor General of Alberta, the corporation's external auditor appointed under the *Auditor General Act*, performs an annual independent audit of AI-Bio's financial statements in accordance with Canadian generally accepted auditing standards.

[Original signed by Steve Price]

Steve Price – Chief Executive Officer
Alberta Innovates – Bio Solutions

[Original signed by Howard Wong]

Howard Wong – Executive Director, Finance and Administration
Economic Development and Trade

AUDITOR GENERAL *Alberta*

# Independent Auditor's Report

To the Board of Directors of Alberta Innovates—Bio Solutions

## Report on the Financial Statements

I have audited the accompanying financial statements of Alberta Innovates—Bio Solutions, which comprise the statement of financial position as at March 31, 2016, and the statements of operations, change in net financial assets, and cash flows for the year then ended, and a summary of significant accounting policies and other explanatory information.

## Management's Responsibility for the Financial Statements

Management is responsible for the preparation and fair presentation of these financial statements in accordance with Canadian public sector accounting standards, and for such internal control as management determines is necessary to enable the preparation of financial statements that are free from material misstatement, whether due to fraud or error.

## Auditor's Responsibility

My responsibility is to express an opinion on these financial statements based on my audit. I conducted my audit in accordance with Canadian generally accepted auditing standards. Those standards require that I comply with ethical requirements and plan and perform the audit to obtain reasonable assurance about whether the financial statements are free from material misstatement.

An audit involves performing procedures to obtain audit evidence about the amounts and disclosures in the financial statements. The procedures selected depend on the auditor's judgment, including the assessment of the risks of material misstatement of the financial statements, whether due to fraud or error. In making those risk assessments, the auditor considers internal control relevant to the entity's preparation and fair presentation of the financial statements in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the entity's internal control. An audit also includes evaluating the appropriateness of accounting policies used and the reasonableness of accounting estimates made by management, as well as evaluating the overall presentation of the financial statements.

I believe that the audit evidence I have obtained is sufficient and appropriate to provide a basis for my audit opinion.

## Opinion

In my opinion, the financial statements present fairly, in all material respects, the financial position of Alberta Innovates—Bio Solutions as at March 31, 2016, and the results of its operations, its remeasurement gains and losses, its changes in net financial assets, and its cash flows for the year then ended in accordance with Canadian public sector accounting standards.

[Original signed by Merwan N. Saher FCPA, FCA]

Auditor General

May 31, 2016

Edmonton, Alberta

## ALBERTA INNOVATES - BIO SOLUTIONS
## STATEMENT OF OPERATIONS
## FOR THE YEAR ENDED MARCH 31, 2016

| | 2016 Budget (Note 3) | 2016 Actual | 2015 Actual |
|---|---|---|---|
| | | (in thousands) | |
| **Revenues** | | | |
| Government Transfers | | | |
| Government of Alberta Grants | $ 22,026 | $ 18,692 | $ 20,115 |
| Investment Income | 200 | 225 | 282 |
| Other Revenue | 930 | 1,115 | 860 |
| | 23,156 | 20,032 | 21,257 |
| **Expenses - Directly Incurred** (Note 2, Schedules 1 and 4) | | | |
| Administration | 1,655 | 986 | 1,448 |
| Alberta Prion Research Institute | 5,301 | 5,293 | 5,684 |
| Sustainable Production | 3,727 | 2,100 | 4,270 |
| Bioindustrial Innovation | 8,764 | 5,705 | 4,652 |
| Food Innovation | 2,617 | 2,269 | 2,376 |
| Ecosystem Services | 3,006 | 3,027 | 1,893 |
| Biological GHG Management Program | 830 | 487 | 603 |
| New Investments | 175 | - | 175 |
| | 26,075 | 19,867 | 21,101 |
| **Annual Surplus (Deficit)** | $ (2,919) | $ 165 | $ 156 |
| **Accumulated Surplus, Beginning of year** | | 8,639 | 8,483 |
| **Accumulated Surplus, End of year** | | $ 8,804 | $ 8,639 |

The accompanying notes and schedules are part of these financial statements.

## ALBERTA INNOVATES - BIO SOLUTIONS
## STATEMENT OF FINANCIAL POSITION
## AS AT MARCH 31, 2016

| | 2016 | 2015 |
|---|---|---|
| | (in thousands) | |
| **Financial Assets** | | |
| Cash (Note 4) | $ 22,932 | $ 23,067 |
| Accounts Receivable | 176 | 110 |
| | 23,108 | 23,177 |
| **Liabilities** | | |
| Accounts Payable and Accrued Liabilities | 982 | 1,232 |
| Deferred Revenue (Note 5) | 13,322 | 13,306 |
| | 14,304 | 14,538 |
| **Net Financial Assets** | 8,804 | 8,639 |
| **Net Assets** | | |
| Accumulated Surplus | $ 8,804 | $ 8,639 |

Contractual obligations (Note 7)

The accompanying notes and schedules are part of these financial statements.

Approved by the Board of Directors:

[Original signed by Judy Fairburn] — May 31, 2016

Director — Date

[Original signed by Douglas Gilpin] — May 31, 2016

Director — Date

## ALBERTA INNOVATES - BIO SOLUTIONS
## STATEMENT OF CHANGE IN NET FINANCIAL ASSETS
## FOR THE YEAR ENDED MARCH 31, 2016

| | 2016 Budget | 2016 Actual | 2015 Actual |
|---|---|---|---|
| | | (in thousands) | |
| Annual Surplus (Deficit) | $ (2,919) | $ 165 | $ 156 |
| **Increase in Net Financial Assets in the year** | | 165 | 156 |
| **Net Financial Assets, Beginning of year** | | 8,639 | 8,483 |
| **Net Financial Assets, End of year** | | $ 8,804 | $ 8,639 |

The accompanying notes and schedules are part of these financial statements.

## ALBERTA INNOVATES - BIO SOLUTIONS
## STATEMENT OF CASH FLOWS
## FOR THE YEAR ENDED MARCH 31, 2016

| | 2016 | 2015 |
|---|---|---|
| | (in thousands) | |
| **Operating Transactions** | | |
| Annual Surplus | $ 165 | $ 156 |
| Non-Cash item: | | |
| Deferred Revenue recognized as revenue | (8,483) | (9,240) |
| (Increase) Decrease in Accounts Receivable | (66) | 4,112 |
| Decrease in Accounts Payable and Accrued Liabilities | (250) | (44) |
| Increase in Deferred Revenue | 8,499 | 11,428 |
| Cash (Applied to) Provided by Operating Transactions | (135) | 6,412 |
| **(Decrease) Increase in Cash** | (135) | 6,412 |
| **Cash, Beginning of Year** | 23,067 | 16,655 |
| **Cash, End of Year** | $ 22,932 | $ 23,067 |

The accompanying notes and schedules are part of these financial statements.

# ALBERTA INNOVATES – BIO SOLUTIONS

## NOTES TO THE FINANCIAL STATEMENTS

## MARCH 31, 2016

### NOTE 1 AUTHORITY AND PURPOSE

Alberta Innovates – Bio Solutions (the Corporation) is a Provincial Corporation, as defined in the *Financial Administration Act*, that was established on January 1, 2010 and operates under the authority of the *Alberta Research and Innovation Act*. The objectives of the Corporation are to support, for the economic and social well-being of Albertans, bio-industries research and innovation activities aligned to meet Government of Alberta priorities, including, without limitation, activities directed at the development and growth of the bio-industries sector, the discovery of new knowledge and the application of that knowledge.

The Corporation is exempt from income taxes under the *Income Tax Act*.

### NOTE 2 SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES AND REPORTING PRACTICES

These financial statements are prepared in accordance with Canadian Public Sector Accounting Standards.

**a) Basis of Financial Reporting**

**Revenue**

All revenues are reported on the accrual basis of accounting. Cash received for which goods or services have not been provided by year end is recorded as deferred revenue.

Government Transfers

Transfers from the Government of Alberta, federal and other governments are referred to as government transfers.

Government transfers and the associated externally restricted investment income are recorded as deferred revenue if the eligibility criteria for use of the transfer, or the stipulations together with the Corporation's actions and communications as to the use of the transfer, create a liability. These transfers are recognized as revenue as the stipulations are met and, when applicable, the Corporation complies with its communicated use of the transfer.

All other government transfers, without stipulations for the use of the transfer, are recorded as revenue when the transfer is authorized and the Corporation meets the eligibility criteria (if any).

Other Revenue

Other revenue includes the reimbursement of expenses from other organizations.

## NOTE 2 SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES AND REPORTING PRACTICES (Cont'd)

Investment Income
Investment income is recorded on the accrual basis where there is reasonable assurance as to its measurement and collection. Investment income earned from restricted sources is deferred and recognized when the terms imposed have been met.

**Expenses**

Expenses are reported on an accrual basis. The cost of all goods consumed and services received during the year are expensed.

Transfers include grants and transfers under shared cost agreements. Grants and transfers are recorded as expenses when the transfer is authorized and eligibility criteria have been met by the recipient.

Incurred by Others
Services contributed by other related entities in support of the Corporation's operations have not been recorded in the financial statements and are disclosed in Schedule 4.

**Valuation of Financial Assets and Liabilities**

The Corporation's financial assets and liabilities are generally measured as follows:

| Financial Statement Component | Measurement |
|---|---|
| Cash | Cost |
| Accounts Receivable | Lower cost or net recoverable value |
| Accounts Payable and Accrued Liabilities | Cost |

The Corporation has no assets or liabilities in the fair value category, has not engaged in foreign currency transactions and has no remeasurement gains or losses. Consequently, no statement of remeasurement gains or loss has been provided.

**Financial Assets**

Financial assets are the Corporation's financial claims on external organizations and individuals, and inventories for resale at the year end.

Cash
Cash comprises of cash on hand and demand deposits.

Accounts Receivable
Accounts receivable are recorded at the lower of costs or net recoverable value. A valuation allowance is recorded when recovery is uncertain.

## NOTE 2 SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES AND REPORTING PRACTICES (Cont'd)

### Liabilities

Liabilities represent present obligations of the Corporation to external organizations and individuals arising from transactions or events occurring before the year end. They are recorded when there is an appropriate basis of measurement and management can reasonably estimate the amount.

### Financial Risk Management

The Corporation is exposed to a variety of financial risks. These financial risks include credit risk, market risk and liquidity risk. Credit risk relates to the possibility that a loss may occur from the failure of another party to perform according to the terms of a contract. Market risk is the risk of loss from unfavourable change in fair value or future cash flows of a financial instrument causing financial loss. Market risk is comprised of currency risk, interest rate risk and price risk, but the corporation is not exposed to any currency or price risk. Liquidity risk is the risk the fund will not be able to meet its obligations as they fall due

1) Credit Risk
   Credit risk relates to the possibility that a loss may occur from the failure of another party to perform according to the terms of a contract. The Corporation's accounts receivable are exposed to credit risk. Management manages this risk by continually monitoring the creditworthiness of counterparties and by dealing with counterparties that it believes are creditworthy.

2) Market Risk
   The Corporation is exposed to interest rate associated with the underlying interest-bearing securities held in the investment funds. Interest rate risk relates to the possibility that the fair value of investments will change due to future fluctuations in market interest rates. The Corporation's cash is exposed to interest rate risk. Management manages this risk by continually monitoring the Corporation's deposits in the Consolidated Cash Investment Trust Fund (CCITF) and their corresponding rate of return.

3) Liquidity Risk
   Liquidity risk is the risk that the Corporation will not be able to meet its obligations as they fall due. The Corporation's accounts payable and accrued liabilities are exposed to liquidity risk. Management manages this risk by continually monitoring cash flows.

It is management's opinion that the Corporation is not exposed to significant credit risk, market risk and liquidity risk arising from its financial instruments.

### Measurement Uncertainty

The measurement of certain assets and liabilities is contingent upon future events; therefore, the preparation of these consolidated financial statements requires the

## NOTE 2 SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES AND REPORTING PRACTICES (Cont'd)

use of estimates, which may vary from actual results. Management uses judgment to determine such estimates. In management's opinion, the resulting estimates are within reasonable limits of materiality and are in accordance with the significant accounting policies.

### b) Change in Accounting Policy

**Adoption of the Net Debt Presentation**
The net debt presentation (with reclassification of comparatives) has been adopted for the presentation of financial statements. Net debt or net financial assets is measured as the difference between the Corporation's financial assets and liabilities.

The effect of this change results in changing the presentation of the Statement of Financial Position and adding the Statement of Change in Net Financial Assets.

### c) Future Accounting Changes

In June 2015 the Public Sector Accounting Board issued the following accounting standards:

- **PS2200 Related Party Disclosures and PS 3420 Inter-Entity Transactions (effective April 1, 2017)**

PS 2200 defines a related party and establishes disclosures required for related party transactions; PS 3420 establishes standards on how to account for and report transactions between public sector entities that comprise a government's reporting entity from both a provider and recipient perspective. Management is currently assessing the impact of these standards on the financial statements.

- **PS 3210 Assets, PS 3320 Contingent Assets, and PS 3380 Contractual Rights (effective April 1, 2017)**

PS3210 provides guidance for applying the definition of assets set out in FINANCIAL STATEMENT CONCEPTS, Section PS 1000, and establishes general disclosure standards for assets; PS 3320 defines and establishes disclosure standards on contingent assets; PS 3380 defines and establishes disclosure standards on contractual rights. Management is currently assessing the impact of these standards on the financial statements.

- **PS 3430 Restructuring Transactions (effective April 1, 2018)**

This standard provides guidance on how to account for and report restructuring transactions by both transferors and recipients of assets and/or liabilities, together with related program or operating responsibilities. Management is currently assessing the impact of these standards on the financial statements.

## NOTE 3 BUDGET
(in thousands)

A business plan with a budget deficit of $2,919 was approved by the Board on March 26, 2015 and the full financial plan was submitted to the Minister of Advanced Education, the Minister responsible for the Corporation. This responsibility was transferred to the Minister of Economic Development and Trade effective April 1st 2015 as announced on October 22nd, 2015.

## NOTE 4 CASH
(in thousands)

Cash in the amount of $22,932 (2015 - $23,067) include deposits in the Consolidated Cash Investment Trust Fund (CCITF) of the Province of Alberta. The CCITF is administered by the Ministry of Treasury Board and Finance with the objective of providing competitive interest income to depositors while maintaining appropriate security and liquidity of depositors' capital. As at March 31, 2016, $13,355 of the cash balance is restricted as it represents grants received that have restrictions on their use (2015 - $13,296).

The portfolio is comprised of high-quality short-term and mid-term fixed-income securities with a maximum to maturity of three years. As at March 31, 2016, securities held by the Corporation had a time-weighted return of 0.8% per annum (2015: 1.2% per annum). Due to the short-term nature of CCITF investments, the carrying value approximates fair value.

## NOTE 5 DEFERRED REVENUE
(in thousands)

Deferred revenue represents unexpended, externally restricted funds.

| | 2016 | | | | 2015 |
|---|---|---|---|---|---|
| | Prion Research Fund | AB Bio Futures Program | Other | Total | Total |
| Balance, beginning of year | $ 5,889 | $ 4,554 | $ 2,863 | $ 13,306 | $ 11,118 |
| Grants received - Government of Alberta | 5,500 | 2,625 | 100 | 8,225 | 10,964 |
| Grants received - Other | 225 | - | - | 225 | 415 |
| Investment Income | 49 | - | - | 49 | 49 |
| Recognized as Revenue | | | | | |
| Investment Income | (49) | - | - | (49) | (49) |
| Grants from Government of Alberta | (4,784) | (1,211) | (1,996) | (7,991) | (9,047) |
| Grants from other | (443) | - | - | (443) | (144) |
| Balance, end of year | $ 6,387 | $ 5,968 | $ 967 | $ 13,322 | $ 13,306 |

## NOTE 6 BENEFIT PLANS
(in thousands)

The Corporation participates in the multi-employer pension plans: Management Employees Pension Plan (MEPP), the Public Service Pension Plan (PSPP), as well as, a Supplementary Pension Plan (SRP) for Public Service Managers. The Corporation does not have sufficient plan information on MEPP, PSPP or the SRP to follow the standards for defined benefit accounting and therefore follows the standard for defined contribution accounting. Accordingly, pension expense recorded for the PSPP/SRP/MEPP is comprised of employer contributions to the plan that are required for its employees during the year, which are calculated based on actuarially pre-determined amounts that are expected to provide the plan's future benefits.

At December 31, 2015, the Management Employees Pension Plan reported a surplus of $299,051 (2014 – surplus $75,805), the Public Service Pension Plan reported a deficiency of $133,188 (2014 – deficiency $803,299) and the Supplementary Retirement Plan for Public Service Managers reported a deficiency of $16,305 (2014 – deficiency $17,203). The Corporation is not responsible for future funding of the plan deficit other than through contribution increases.

## NOTE 7 CONTRACTUAL OBLIGATIONS
(in thousands)

Contractual obligations are obligations of the Corporation to others that will become liabilities in the future when the terms of those contracts or agreements are met.

| | 2016 | 2015 |
|---|---|---|
| Obligations under contracts and grants | $ 12,113 | $ 16,961 |

Estimated payment requirements for each of the next four years are as follows:

| | Contracts | Grants | Total |
|---|---|---|---|
| 2016-17 | $ 435 | $ 7,038 | $ 7,473 |
| 2017-18 | 318 | 2,832 | 3,150 |
| 2018-19 | 226 | 1,048 | 1,274 |
| 2019-20 | 216 | - | 216 |
| | $ 1,195 | $ 10,918 | $ 12,113 |

## NOTE 8 SUBSEQUENT EVENT

On April 14, 2016, the Government of Alberta announced the amalgamation of the four Alberta Innovates corporations, Bio Solutions, Technology Futures, Energy and Environmental Solutions, and Health Solutions into one, along with a wholly owned subsidiary corporation to provide specialized applied research services. Government will introduce legislation later in 2016 to legally create the new entity. Until then, each of the four existing corporations will retain their legal identity.

## NOTE 8 SUBSEQUENT EVENT (Con't)

As the four Alberta Innovates corporations are still legal entities until legislation to create the new corporation is passed and in force in fiscal year 2016 - 2017, the Lieutenant Governor in Council has appointed a new Board of Directors to serve for all four of the Alberta Innovates corporations.

This amalgamation will have a significant financial impact on future operations of the four Corporations but an estimate of the financial impact cannot be made at this time.

## NOTE 9 APPROVAL OF FINANCIAL STATEMENTS

These financial statements were approved by the Board of Directors of Alberta Innovates – Bio Solutions.

## ALBERTA INNOVATES - BIO SOLUTIONS
## SCHEDULES TO THE FINANCIAL STATEMENTS
## FOR THE YEAR ENDED MARCH 31, 2016

**Schedule 1 - Expenses Directly Incurred Detailed by Object**

| | 2016 | | 2015 |
|---|---|---|---|
| | Budget | Actual | Actual |
| | (in thousands) | | |
| Grants | $ 19,904 | $ 15,136 | $ 16,102 |
| Salaries, Wages and Employee Benefits | 3,360 | 3,190 | 3,053 |
| Supplies and Services | 2,811 | 1,541 | 1,946 |
| | $ 26,075 | $ 19,867 | $ 21,101 |

**Schedule 2 - Salary & Benefits Disclosure**

Year ended March 31, 2016

| | 2016 | | | | 2015 |
|---|---|---|---|---|---|
| | Base Salary [1] | Other Cash Benefits [2] | Other Non-Cash Benefits [3] | Total | Total |
| | (in thousands) | | | | |
| Chairman of the Board | $ - | $ 22 | $ 1 | $ 23 | $ 43 |
| Board Members | - | 13 | 1 | 14 | 31 |
| Chief Executive Officer [4] | 226 | - | 61 | 287 | 274 |
| Executives: | | | | | |
| Executive Director, Ecosystem Services | 190 | - | 55 | 245 | 234 |
| Executive Director, Sustainable Production & Food Innovation | 198 | - | 56 | 254 | 258 |
| Executive Director, Prion [5] | 181 | - | - | 181 | 169 |
| Executive Director, Bioindustrial Innovation [6] | - | - | - | - | 124 |
| Executive Director, GHG Management Program | 201 | - | 4 | 205 | 203 |
| Director, Operations | 132 | - | 42 | 174 | 166 |

(1) Base salary includes regular salary.

(2) Other cash benefits include honoraria for Board Members, car allowance for Chief Executive Officer, lump sum payments, and vacation payouts. No bonuses were paid in 2015 or 2016.

(3) Other non-cash benefits include employee benefits and contributions or payments made on behalf of employees including pension and supplementary retirement plan, health care, dental coverage, group life insurance, short and long term disability plans, Workers Compensation Board premiums, accomodations, learning account items, health spending account items and professional memberships.

(4) This position includes a lump sum payment of $9 and vacation payout of $42 in 2015. The position was vacant from August 1, 2014 to October 13, 2014. The CEO responsibility was rotated between Executive Directors during that time. As of October 14, 2014, this position is also responsible for the Bioindustrial Innovation program.

(5) Base compensation is estabished through contractual agreement. No other cash or non cash benefits are provided.

(6) As of October 14, 2014, the CEO position is also responsible for the Bioindustrial Innovation Program.

**Schedule 3 - Related Party Transactions**

Year ended March 31, 2016

Related parties are those entities consolidated or accounted for on a modified equity basis in the Government of Alberta's financial statements.

As a result of government reorganization on October 22, 2015, responsibility for the Corporation was transferred from the Ministry of Advanced Education to the Ministry of Economic Development and Trade. Comparatives for 2015 have been restated as if the Ministry had always been assigned its current responsibilities.

Alberta Innovates - Bio Solutions had the following transactions with related parties which are recorded on the Statements of Operations and the Statements of Financial Position at the amount of consideration agreed upon between the related parties:

| | Entities in the Ministry | | Other Entities Outside of the Ministry | |
|---|---|---|---|---|
| | 2016 | 2015 (Restated) | 2016 | 2015 (Restated) |
| | (in thousands) | | | |
| **Revenues** | | | | |
| Grants | $ 17,795 | $ 18,137 | $ 897 | $ 1,978 |
| Other | 6 | - | 46 | 14 |
| | $ 17,801 | $ 18,137 | $ 943 | $ 1,992 |
| **Expenses – Directly Incurred** | | | | |
| Grants | $ 324 | $ 348 | $ 8,841 | $ 10,499 |
| Other Services | 84 | 12 | 74 | 133 |
| | $ 408 | $ 360 | $ 8,915 | $ 10,632 |
| **Receivables from** | $ 4 | $ - | $ 52 | $ 28 |
| **Payables to** | $ 13 | $ - | $ 195 | $ 698 |
| **Deferred Revenue** | $ 12,673 | $ 11,571 | $ 353 | $ 1,220 |
| **Contractual Obligations** | $ 198 | $ 422 | $ 5,021 | $ 8,504 |

The above transactions do not include support service arrangement transactions disclosed below.

The Corporation also had the following transactions with related parties for which no consideration was exchanged. The amounts for these related party transactions are estimated based on the costs incurred by the service provider to provide the service.

These amounts are not recorded in the financial statements. Accommodation expenses incurred by others are disclosed in Schedule 4.

| | Other Entities Outside of the Ministry | |
|---|---|---|
| | 2016 | 2015 |
| | (in thousands) | |
| **Expenses – Incurred by Others** | | |
| Accommodation [1] | $ 242 | $ 241 |
| | $ 242 | $ 241 |

(1) The Corporation's share of accommodation costs is based on the proportion of space occupied compared to the total space occupied by all Ministries.

**Schedule 4 - Allocated Costs**

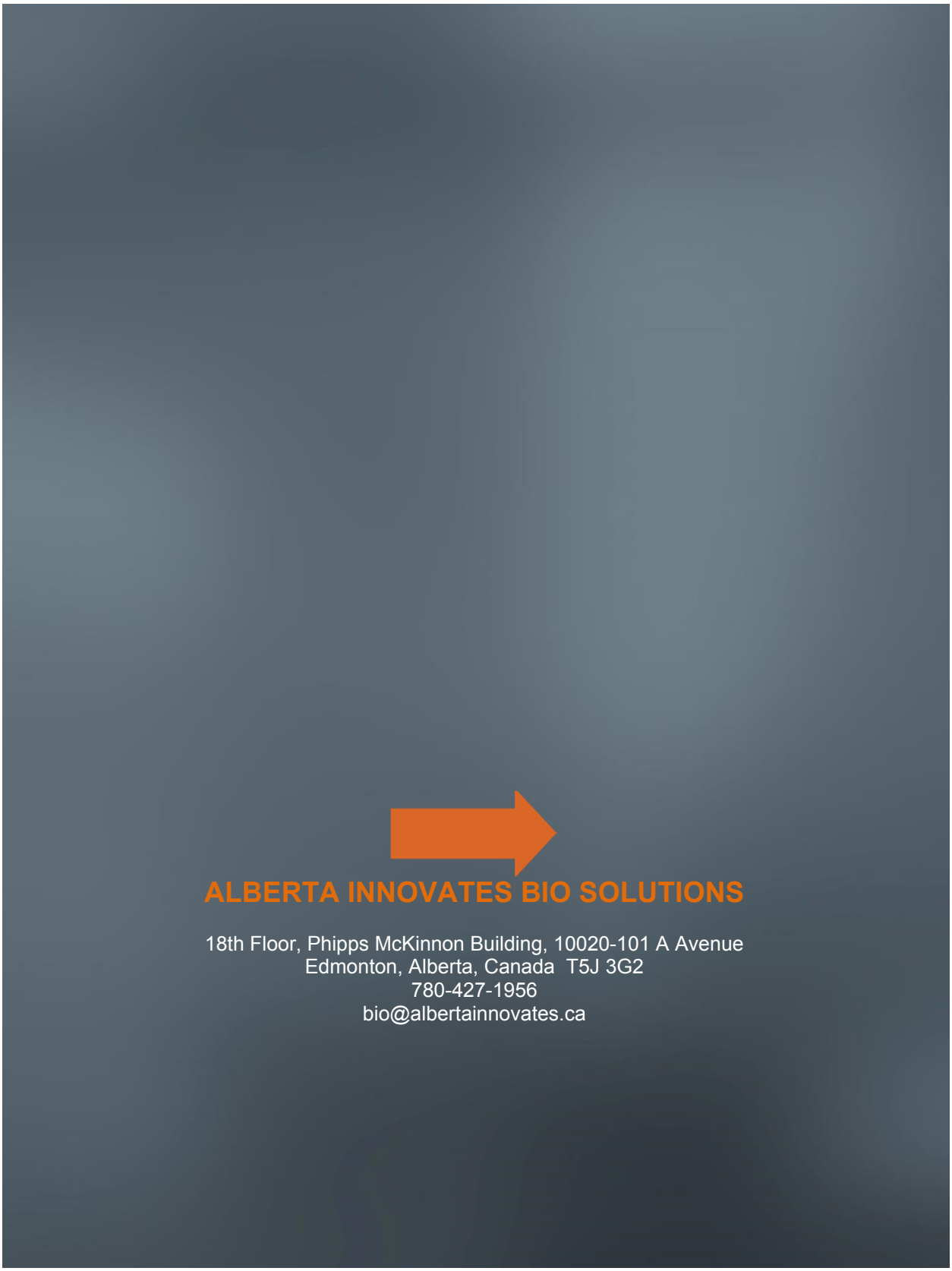
Year ended March 31, 2016

*(in thousands)*

| | 2016 | | | 2015 |
|---|---|---|---|---|
| | Expenses [1] | Expenses incurred by others [2] Accommodation Costs | Total Expenses | Total Expenses |
| **Program** | | | | |
| Administration | $ 986 | $ 242 | $ 1,228 | $ 1,689 |
| Prion & Protein Misfolding Diseases | 5,293 | - | 5,293 | 5,684 |
| Sustainable Production | 2,100 | - | 2,100 | 4,270 |
| Bioindustrial Innovation | 5,705 | - | 5,705 | 4,652 |
| Food Innovation | 2,269 | - | 2,269 | 2,376 |
| Ecosystem Services | 3,027 | - | 3,027 | 1,893 |
| Biological GHG Management Program | 487 | - | 487 | 603 |
| New Investments | - | - | - | 175 |
| | $ 19,867 | $ 242 | $ 20,109 | $ 21,342 |

[1] Expenses – Directly Incurred as per Statement of Operations.

[2] During the year, the Corporation received financial processing and reporting services from the Department of Economic Development and Trade and the Department of Advanced Education at no cost. The dollar value of these services cannot be accurately determined.

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