Supplementary Information Tables:
2015–16 Departmental Performance Report

National Research Council of Canada

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Departmental Sustainable Development Strategy

Target 7.2: Green Procurement

As of April 1, 2014, the Government of Canada will continue to take action to embed environmental considerations into public procurement, in accordance with the federal *Policy on Green Procurement.*

Performance Measurement

Expected result

Environmentally responsible acquisition, use and disposal of goods and services.

Performance indicator	Performance level achieved
Number and percentage of procurement and/or material management specialists who completed the Canada School of Public Service Green Procurement course (C215) or equivalent, in fiscal year 2015-16.	5 staff (100%) All new staff hired during 2015 – 16 completed the requisite Canada School of Public Service Green Procurement course (C215).
Number and percentage of managers and functional heads of procurement and material whose performance evaluation includes support and contribution toward green procurement, in fiscal year 2015-16	14 managers (100%) Every manager, in his her Performance appraisal has a commitment that stated: “Manage and conduct daily Procurement and/or Materiel Management (MM) operations in accordance with NRC, Treasury Board (TB) and PSPC policies and regulations in effect.” Implied in this commitment is an awareness of, and support of green procurement.
Number and percentage of procurement and/or material management specialists who completed the Canada School of Public Service Green Procurement course (C215) or equivalent, in fiscal year 2015-16.	5 staff (100%) All new staff hired during 2015 – 16 completed the requisite Canada School of Public Service Green Procurement course (C215).

Departmental green procurement target

By March 2016, NRC will ensure all new and or leased multifunctional devices/copier incorporate energy saving criteria

Performance indicator	Performance level achieved
Percentage of use of PSPC procurement tools that support provision of energy efficient criteria.	100%

Departmental green procurement target

In 2015-16, where feasible, NRC will ensure all vehicles purchased are “right sized” for specific use, and are the most fuel efficient vehicles in their class, based on the Government of Canada (GOC) contract regulations.

Performance indicator	Performance level achieved
Reports that indicate efficient fleet management based on best use, fuel considerations and effective procurement.	NRC has assessed its fleet requirements on a continual basis to ensure that what we bought is efficient from both a size and energy perspective. At present, there is an increase in demand for electric vehicles and determinations are on-going to assess if they are a cost effective solution for NRC. NRC is doing this while seeking support/direction from NRCan who are leading a GOC wide initiative related to electric vehicles.

Departmental green procurement target

By March 2016, 80% of janitorial service contracts will include the use of environmentally preferable products, equipment and processes that minimize the environmental impact.

Performance indicator	Performance level achieved
Contracts that are awarded meet the target criteria, issued by NRC, or PSPC.	The targeted performance level of 75% defined in the 2015-16 Report on Plans and Priorities (RPP) was achieved.

Implementation strategy element or best practice	Performance level achieved
7.2.1.5. Leverage common-use procurement instruments where available and feasible.	Achieved. This ongoing objective was met through the use of mandatory PSPC and Shared Services Canada (SSC) procurement tools.
Best Practice 7.2.4. Increase awareness of the *Policy on Green Procurement* among managers.	Achieved, NRC has worked with our staff to ensure they were mindful of environmental considerations.

Transfer Payment Programs of $5 Million or More

General Information

Name of transfer payment program	International Astronomical Observatories Program (voted)
Start date	1978
End date	ongoing
Fiscal year for terms and conditions	2014-15
Strategic Outcome	SO 2: R&D Infrastructure for an innovative and knowledge-based economy
Link to department's Program Alignment Architecture	Sub-Program 2.1.1: National Science Infrastructure
Description	Astronomy is a global science. The increasing cost of leading-edge observatories and the scarcity of ideal observation sites have engendered international collaborations for large-scale astronomy projects leading to advances in our knowledge and understanding of the universe. NRC, in collaboration with other international bodies, provides financial contributions to support the pre-construction, construction, management and operations of offshore ground-based observatories and their related facilities, including the Canada-France-Hawaii Telescope (CFHT, commissioned in 1979), the twin telescopes of the Gemini Observatory (GEMINI, 1993), and the Atacama Large Millimeter Array (ALMA, 2008). NRC also participates in the oversight and direction of these facilities and their science programs. NRC represents Canada in the Square Kilometre Array (SKA) Organisation for the pre-construction phase of the telescope. International agreements governing these observatories are long-term commitments that specify contributions to support pre-construction design and development, construction, operations and maintenance, capital improvements (e.g., development of new astronomical instruments and other facility upgrades) and decommissioning of the observatories and their related facilities. In addition, they include commitments to support user communities to ensure a fair and progressive use of these observatories. NRC participates in the governance of these international facilities on behalf of the Canadian astronomy research community and provides support, including sophisticated data management services and the development of instrumentation. Through NRC's financial contribution as well as in-kind contributions, the Canadian astronomy community is assured merit-based access to these facilities. The Transfer Payment Program (TPP) currently has no repayable contributions.

Results achieved	• In 2015, the Canadian Astronomy Data Centre (CADC) delivered 48.5 million individual files, comprising 1,649 Terabytes of data to roughly 7000 professional astronomers. • 234 users accessed Canada's share of three international optical telescopes. Gemini and CFHT both either implemented or extended a large program initiative which awards large amounts of time to a small number of users. These changes resulted in a decrease in the number of distinct users of these facilities from past year. • 19% of astronomers requesting time from CFHT and Gemini were student researchers, highlighting the continuing demand for access to these telescopes by qualified student researchers. • 354 scientific papers were published by users based on data obtained using CFHT and Gemini. 147 scientific papers were published based on data obtained using ALMA. • Demand by astronomers for telescope access continued to be high as demonstrated by high subscription rates for Canada's international telescopes (CFHT: 2.17; Gemini: 2.13, and Alma: 4.07[1]). • $2.6M in service contracts with industry partners in support of astronomy technology R&D activities
Comments on variances	The Planned Spending amount of $10.0M represents the authorities reflected in the Main Estimates. The Total Authorities of $18.9M includes the Planned Spending of $12.9M, $21.0M of new funding less the approved reprofile of $15.0M from 2015-16 to 2016-17. The net difference between the Planned Spending and the Actual Spending is $5.4M. Of this total, $3.5M is principally attributed to exchange rate losses on agreements which are in foreign currencies (mostly US). . As well, in 2015-16, NRC entered into a new international funding agreement in support of a new Thirty Meter Telescope (TMT). The remaining $1.9M of the difference is due to spending under the new funding received during the year for this new observatory.
Audits completed or planned	Based on level of risk, no audits were planned. Audit activity will be assessed again as part of the next fiscal year risk-based audit plan.
Evaluations completed or planned	An evaluation is currently underway and will be completed in 2016-17.
Engagement of applicants and recipients	NRC's International Astronomical Observatories Program is guided by the Long Range Plan for Astronomy and Astrophysics in Canada (LRP2010), a strategy developed by the research community that receives NRC services. To ensure alignment with Canadian priorities, NRC participates on the Boards of ALMA, CFHT, Gemini, TMT and SKA (pre-construction stage), providing

[1] Canada participates in ALMA as part of a North American partnership, so this rate reflects North American demand.

	input to both science programs and instrumentation development. The high subscription rates for Canada's international telescopes and the continued delivery of data through the CADC highlights the relevance and demand for the support that NRC provides to the user community. NRC regularly engages with ACURA, working closely with university representatives to keep abreast of new developments and to mutually share information of importance to Canada's astronomy initiatives.

Performance Information (millions)

Type of Transfer Payment	2013–14 Actual spending	2014–15 Actual spending	2015–16 Planned spending	2015–16 Total authorities available for use	2015–16 Actual spending (authorities used)	Variance (2015–16 actual minus 2015–16 planned)
Total grants	0	0	0	0	0	0
Total contributions	10.7	11.3	10.0	18.9	15.4	5.4
Total other types of transfer payments	0	0	0	0	0	0
Total program	10.7	11.3	10.0	18.9	15.4	5.4

General Information

Name of transfer payment program	TRIUMF (voted)
Start date	1 April 1977
End date	ongoing
Fiscal year for terms and conditions	2014-15
Strategic Outcome	SO 2: R&D Infrastructure for an innovative and knowledge-based economy
Link to department's Program Alignment Architecture	Sub-Program 2.1: Science Infrastructure and Measurement
Description	TRIUMF is Canada's national laboratory for nuclear and particle physics, and one of Canada's key investments in large-scale research infrastructure. It provides world-class facilities for research in sub-atomic physics, accelerator science, nuclear medicine and materials science. A consortium of 19 Canadian universities (12 full members and 7 associate members) owns and operates TRIUMF. TRIUMF receives its federal funding through NRC in five-year allocations via a Contribution Agreement. NRC plays an important oversight and stewardship role for TRIUMF on behalf of the Government of Canada. TRIUMF was allocated $222.3M in Budget 2014 for base operation for the 2015 – 2020 period which represents flat funding since 2005; in consequence the level of outcomes has been adjusted based on available resources. This TPP does not currently administer any repayable contributions.
Results achieved	• With the additional $45M in funding (over five years) provided in the 2015 Federal Budget, TRIUMF was able to maintain regular operating levels, stabilize staffing, and continue to enable research excellence across the laboratory's core programs. • TRIUMF continued work on the Advanced Rare IsotopE Laboratory (ARIEL) facility and Canadian Foundation for Innovation (CFI) approved funding for the second phase of the project, which will triple the production of rare isotope beams for science, medicine and business. The proposal, involving a consortium of all 19 TRIUMF member universities, is led by the University of Victoria. • TRIUMF hosted 574 scientific visitors, students, and users (of which 385 came from an international institution). • TRIUMF trained 243 highly qualified personnel, including undergraduate and graduate students, and post-doctoral researchers. • In 2015, 310 manuscripts were published in scientific journals. • TRIUMF's involvement in major international projects was highlighted with the announcement of the 2015 Nobel Prize in Fundamental Physics and the 2016 Breakthrough Prize, as

	these awards recognized experiments – including the Sudbury Neutrino Observatory (SNO) (and Tokai to Kamioka (T2K), to which TRIUMF made significant contributions. Nuclear Science and Particle Physics: • The PIENU experiment released its first results from the analysis of a part of the full dataset, improving the limit for the test of lepton universality to approximately 0.1%, roughly twice the precision of previous measurements. • At the Isotope Separator and Accelerator (ISAC), the new ISAC Charged Particles Spectroscopy Station (IRIS) experiment for the study of nuclear reactions of exotic nuclei published its first physics result in *Physical Review Letters*. The work provided the first conclusive evidence of a "soft dipole resonance" in the halo nucleus 11Li where the charged core oscillates against the halo neutron cloud. • The TRIUMF UK Detector Array (TUDA) experiment published two articles in *Physical Review Letters* on the production and destruction of 26Al, a target isotope for gamma-astronomy satellites, in massive stars. • The ALPHA Collaboration once again pushed the boundaries of antihydrogen research with a publication in the prestigious journal *Nature* on their work improving the precision of antihydrogen's charge, essentially zero, by a factor of 20. In addition, Canada Foundation for Innovation (CFI) funding was approved for the construction of the ALPHA-gravity experiment, which will test for a difference in the gravity acting on anti-hydrogen vs. hydrogen. • Utilizing the shallow implantation capability of the beta-NMR facility, TRIUMF enabled the probing of within 100nm of the free surface of a single crystal sample of alpha-Fe2O3. The results have been published in *Physical Review Letters*. • CFI funding was approved for the detector upgrades for the ATLAS detector at CERN, which includes the construction of modules for the Muon New Small Wheel and electronics upgrades for the Liquid Argonne Calorimeter. This multi-institutional project of the ATLAS-Canada collaboration is led by Carleton University. • New CFI funding was approved for a project that will add Bismuth germanium oxide (BGO) anti-Compton shield detectors to the completed, CFI funded GRIFFIN detector. This upgrade will further enhance the sensitivity of the GRIFFIN spectrometer for beta decay studies of exotic nuclei. This project is jointly led by the University of Guelph and Simon Fraser University. Nuclear Medicine and Life Sciences: • Following completion of the project funded under the Natural Resources Canada Isotope Technology Accelerator Program (ITAP), TRIUMF's team received Health Canada approval for the clinical trial of cyclotron-produced Tc-99m at sites in Vancouver and London; the trial is currently underway.

	• TRIUMF continues to demonstrate novel production routes for astatine-209 (At-209) and astatine-211 (At-211) using the laboratory's 500 MeV ISAC Isotope Separation On-Line technology. • Building from the success of the At-209/211 work, the Life Sciences team was successful in demonstrating the implantation and isolation of radium-225 (Ra-225) from the ISAC ISOL facility. Ra-225 is a strategic parent isotope of two important therapeutic isotopes - actinium-225 (Ac-225) and bismuth-213 (Bi-213). • TRIUMF and the British Columbia Cancer Agency (BCCA) have successfully developed and implemented 'salt target' production of gallium-68 (Ga-68), zirconium-89 (Zr-89), scandium-44 (Sc-44) and yttrium-86 (Y-86). All of these isotopes are now being produced routinely using salt mixtures of the appropriate starting material in adapted liquid targets on TRIUMF's TR13 and the BCCA's TR19 cyclotrons. These isotopes are being utilized in pre-clinical oncology studies. <u>Other:</u> • Advanced Applied Physics Solutions (AAPS), TRIUMF's commercialization arm, exited the federal Centre of Excellence for Commercialization and Research program to become a not-for-profit company that will oversee the TRIUMF's business arrangements and commercial partnerships • In December 2015, TRIUMF and KEK (Japan's High-Energy Accelerator Research Organization) signed a Memorandum of Understanding (MOU) to open branch offices at each other's respective institutions. This agreement is the first of its kind for TRIUMF, and will deliver significant support to Canadian collaborators working at KEK.
Comments on variances	The Planned Spending amount of $19.3M represents the authorities reflected in the Main Estimates. Total Authorities (50.8M) available for 2015-16 include the Planned Spending, the new funding announced for TRIUMF in Budgets 2014 ($25.2M) and 2015 ($5.9M), as well as a transfer from NSERC of $443K. The net difference between the Planned Spending and the Actual Spending of $31.5M is a result of this increase in Total Authorities.
Audits completed or planned	Based on level of risk, no audits were planned. Audit activity will be assessed again as part of the next fiscal year risk-based audit plan.
Evaluations completed or planned	An evaluation of NRC's contribution to TRIUMF was completed in 2013-14. The next evaluation is scheduled for 2018-19.
Engagement of applicants and recipients	As part of NRC's oversight of the contribution agreement funding TRIUMF's operations, NRC convenes the Advisory Committee on TRIUMF (ACOT) twice a year in order to monitor progress against goals and to enable interchanges with TRIUMF Management. As part of this mechanism, each meeting has a community portion which invites feedback from the Institute of Particle Physics, the NSERC Subatomic Physics Evaluation Section and the Canadian

	Institute of Nuclear Physics. The Committee is thereby apprised of how TRIUMF's initiatives are aligning with community priorities. TRIUMF's Strategic five-year Plan included input from the community of researchers who use the facility and TRIUMF's Board of Management (BoM). TRIUMF BoM is composed of the member and associate member universities who are the primary users of TRIUMF; key issues are brought to TRIUMF Management through regular meetings of this body. TRIUMF also manages a Policy and Planning Advisory Committee, which includes one member from each of the full member universities. To ensure representation from all areas of scientific interest to the laboratory a limited number of members from the larger TRIUMF community may also be appointed to the Committee. The TRIUMF User Group meets every few months and with TRIUMF's Director a few times annually to provide feedback on TRIUMF services. The research community therefore has a range of avenues to provide feedback to the facility.

Performance Information (millions)

Type of Transfer Payment	2013–14 Actual spending	2014–15 Actual spending	2015–16 Planned spending	2015–16 Total authorities available for use	2015–16 Actual spending (authorities used)	Variance (2015–16 actual minus 2015–16 planned)
Total grants	0	0	0	0	0	0
Total contributions	44.3	45.0	19.3	50.8	50.8	31.5
Total other types of transfer payments	0	0	0	0	0	0
Total program	44.3	45.0	19.3	50.8	50.8	31.5

General Information

Name of transfer payment program	Industrial Research Assistance Program (voted)
Start date	April 1, 1965
End date	Ongoing
Fiscal year for terms and conditions	2012-13
Strategic Outcome	SO1: Canadian businesses prosper from innovative technologies
Link to department's Program Alignment Architecture	Program 1.2: Industrial Research Assistance Program
Description	The Program contributes to the growth and prosperity of Canadian small and-medium sized enterprises (SMEs) by stimulating innovation, adoption and/or commercialization of technology-based products, services, or processes in Canada. This is done through: 1) technical and related business advice and networking facilitated by a cross-Canada network of field professional staff; 2) cost-shared merit-based contributions; and 3) contributions supporting employment of post-secondary graduates. This Program uses funding from the following transfer payments: Contributions to Firms; Contributions to Organizations; Youth Employment Program (YEP); and Canadian HIV Technology Development Program (CHTD). Through its CHTD component, NRC IRAP supports SMEs that participate in the development of an HIV vaccine and other technologies related to the prevention, treatment and diagnosis of HIV. As well, NRC IRAP supports the placement of graduates in SMEs through its participation in the delivery of YEP sponsored by Employment and Social Development Canada's Youth Employment Strategy (YES). NRC IRAP's Concierge Service provides a single access point where Canadian SMEs, seeking to innovate, can find information on funding, expertise, facilities and equipment to help grow through innovation. This initiative is delivered by NRC IRAP and supported by partner organizations across the country. The program does not currently administer repayable contributions.
Results achieved	• In 2015-16, IRAP provided SMEs with technical and business advice and funding by way of IRAP, the Youth Employment Program (YEP) and the Canadian HIV Technology Development Program (CHTD). IRAP also provided financial contributions to not-for-profit organizations offering services to SMEs. • In 2015-16, IRAP served 2,341 unique SMEs through direct financial contributions, with 10,980 jobs supported including 1,213 for graduates. • The Concierge Service continued to grow and assisted 4,865

	clients, surpassing its 2015-16 target of clients served by 22%, which represents a 36% year over year growth. For more information, see Program 1.2 Industrial Research Assistance Program.
Comments on variances	The Planned Spending amount of $194.4M represents the authorities reflected in the Main Estimates. The Total Authorities of $206.8M includes the Planned Spending, conversion of $10.0M of IRAP Operating funds to Contributions funds, a transfer of $2.248M from ESDC for the Contributions to Youth Employment Strategy provided through the supplementary estimates process, in addition to an internal transfer of $2.0M from the Canada Accelerator and Incubator Program (CAIP)to IRAP Contributions to Firms less a transfer of $1.8M from IRAP Contributions to Firms to the Business Innovation Access Program (BIAP). The net difference between the Planned Spending and the Actual Spending of $10.9M is a result of this increase in Total Authorities and $1.5M of lapsed funds.
Audits completed or planned	An internal audit of IRAP under an Interim Operating Environment (IOE), following the July 2014 cyber intrusion, was completed in 2015-16 and found that overall, the interim environment controls were sufficient to demonstrate due diligence in the awarding of contribution funding and in the management of contribution claims. IRAP has since resumed normal operation.
Evaluations completed or planned	An evaluation of IRAP is underway and will be completed in 2017-18.
Engagement of applicants and recipients	Applicant and recipient engagement information is available in the body of NRC's 2015-16 Departmental Performance Report.

Performance Information (millions)

Type of Transfer Payment	2013–14 Actual spending	2014–15 Actual spending	2015–16 Planned spending	2015–16 Total authorities available for use	2015–16 Actual spending (authorities used)	Variance (2015–16 actual minus 2015–16 planned)
Total grants	0	0	0	0	0	0
Total contributions	192.5	191.0	194.4	206.8	205.3	10.9
Total other types of transfer payments	0	0	0	0	0	0
Total program	192.5	191.0	194.4	206.8	205.3	10.9

General Information

Name of transfer payment program	Canada Accelerator and Incubator Program (CAIP) (voted)
Start date	October 1, 2013
End date	March 31, 2019
Fiscal year for terms and conditions	2013-14
Strategic Outcome	SO1: Canadian businesses prosper from innovative technologies
Link to department's Program Alignment Architecture	Program 1.2: Industrial Research Assistance Program
Description	The CAIP is a five-year non-repayable contribution program, aimed at establishing a critical mass of outstanding business incubators and accelerators that can develop innovative, high-growth firms, which themselves represent superior early-stage investment opportunities. In support of the Government's efforts to strengthen venture capital in Canada, Budget 2013 announced new initiatives to complement the Venture Capital Action Plan and promote the broader venture capital system. The CAIP was included as one of the initiatives.
Results achieved	• In 2015-16 the CAIP continued to provide funding to 15 organizations and signed a new contribution agreement with a sixteenth organization. • Continued development of collaborative linkages, among the supported organization and other key players of the incubator/accelerator ecosystem. • By virtue of the program, early stage firms are being provided with increased access to innovation support services, including services aimed at improving their investment readiness. For more information, see Program 1.2 Industrial Research Assistance Program in NRC's 2015-16 Departmental Performance Report.
Comments on variances	The Planned Spending amount of $20.6M represents the authorities reflected in the Main Estimates. The Total Authorities of $18.6M includes the Planned Spending of $20.6M less a transfer of $2.0M to IRAP Contributions to Firms. The net difference between the Planned Spending and the Actual Spending of $2.4M is a result of the decrease in Total Authorities of $2.0M and $0.4M of lapsed funds.
Audits completed or planned	An audit of IRAP (risk-based scope to be determined) will be launched in 2016-17.CAIP agreements could be scoped in.
Evaluations completed or planned	A mid-term evaluation of the program is underway and will be completed in 2016-17 and a final evaluation is scheduled to be completed in 2018-19.
Engagement of applicants and recipients	Applicant and recipient engagement information is available in the

	body of NRC's 2015-16 Departmental Performance Report.

Performance Information (millions)

Type of Transfer Payment	2013–14 Actual spending	2014–15 Actual spending	2015–16 Planned spending	2015–16 Total authorities available for use	2015–16 Actual spending (authorities used)	Variance (2015–16 actual minus 2015–16 planned)
Total grants	0	0	0	0	0	0
Total contributions	N/A	10.6	20.6	18.6	18.2	2.4
Total other types of transfer payments	0	0	0	0	0	0
Total program	N/A	10.6	20.6	18.6	18.2	2.4

General Information

Name of transfer payment program	Business Innovation Access Program (BIAP) (voted)
Start date	1 April 2014
End date	31 March 2016
Fiscal year for terms and conditions	2013-14
Strategic Outcome	SO1: Canadian businesses prosper from innovative technologies
Link to department's Program Alignment Architecture	Program 1.2: Industrial Research Assistance Program
Description	BIAP will enable SMEs, including those in rural areas, to access expertise beyond their local communities and tap into a Canada-wide network of technical and business expertise at universities, colleges and non-profit research institutions, operating in Canada, as well as, publicly funded research facilities where SMEs require access to their unique abilities or due to proximity challenges. With the dedicated funds for the BIAP, NRC IRAP will be able to enhance the support it provided to firms. Contribution funding could be used to help firms in an early development phase of a typical NRC IRAP project (i.e. “pre-project”) so that they can engage a service provider to undertake business-related initiatives, including a market study or a supply chain analysis, or to carry out a technical-related initiative, including applied research to solve a particular technical hurdle. Contribution funding could also help firms with activities at later stages, closer to commercialization, (i.e. “post-project”), to pay for access to specialized facilities to conduct various tests such as prototype performance under extreme environmental conditions.
Results achieved	A total of 296 BIAP Contribution Agreements were signed in 2015-16. While the program sunset at the end of 2015-16, it achieved its overall objective to enable more SMEs to commercialize their products or services more effectively by providing them with funding to acquire business or technical services. For more, see Program 1.2 Industrial Research Assistance Program in NRC’s 2015-16 Departmental Performance Report.
Comments on variances	The Planned Spending amount of $9.8M represents the authorities reflected in the Main Estimates. The Total Authorities of $11.6M includes the Planned Spending of $9.8M plus a transfer of $1.8M from IRAP Contributions to Firms. The net difference between the Planned Spending and the Actual Spending of $1.8M is a result of this increase in Total Authorities.
Audits completed or planned	An internal audit of IRAP under an Interim Operating Environment (IOE), following the July 2014 cyber intrusion, was completed in 2015-16 and found that overall, the interim environment controls were sufficient to demonstrate due diligence in the awarding of contribution funding and in the management of contribution claims. IRAP has since resumed normal operation.

Evaluations completed or planned	An evaluation of BIAP was completed in 2015-16.
Engagement of applicants and recipients	Applicant and recipient engagement information is available in the body of NRC's 2015-16 Departmental Performance Report.

Performance Information (millions)

Type of Transfer Payment	2013–14 Actual spending	2014–15 Actual spending	2015–16 Planned spending	2015–16 Total authorities available for use	2015–16 Actual spending (authorities used)	Variance (2015–16 actual minus 2015–16 planned)
Total grants	0	0	0	0	0	0
Total contributions	N/A	8.2	9.8	11.6	11.6	1.8
Total other types of transfer payments	0	0	0	0	0	0
Total program	N/A	8.2	9.8	11.6	11.6	1.8

Horizontal Initiatives

General Information

Name of horizontal initiative	Genomics R&D Initiative (GRDI)
Name of lead department(s)	National Research Council Canada (NRC)
Federal partner organization(s)	Agriculture and Agri-Food Canada (AAFC), Fisheries and Oceans Canada (DFO), Environment Canada (EC), Health Canada (HC), National Research Council (NRC), Natural Resources Canada (NRCan), Public Health Agency of Canada (PHAC), Canadian Food Inspection Agency (CFIA). Canadian Institutes for Health Research (CIHR) received a one-time allocation in 1999-2000
Non-federal and non-governmental partner(s)	Not applicable
Start date of the horizontal initiative	Phase I: 1999-2002; Phase II: 2002-2005; Phase III: 2005-2008; Phase IV: 2008-2011; Phase V: 2011-2014; Phase VI: 2014-2019
End date of the horizontal initiative	March 2019
Total federal funding allocated (start to end date) (dollars)	$393.8M
Funding contributed by non-federal and non-governmental partners (dollars)	Not applicable
Description of the horizontal initiative	GRDI supports genomics research inside federal government laboratories. It focuses on mandates and priorities of participating departments and agencies. Research supported by the GRDI covers areas such as health care, food safety and global food security, sound management of natural resources, a sustainable and competitive agriculture sector, and environmental protection, with collaboration with university and private sectors. Since the implementation of the GRDI in 1999, participating departments and agencies have built a solid genomics research capacity and have gone a long way to deliver on the Initiative's stated objectives, as confirmed by two independent evaluations (2006 and 2011) and an audit by the Office of the Comptroller General (2012). Additional information may be found on the **GRDI web site**.
Shared outcome(s)	The Initiative's Performance Measurement Strategy was updated in 2014. It presents three intermediate outcomes: 1) Federal science departments and agencies are positioned as genomics research leaders, 2) Research results are used to inform government regulatory, policy, and/or resource management decisions, and 3) Research results are used by stakeholders to support innovation in Canada; contributing to Government of Canada Outcomes: Healthy Canadians, Strong economic growth, an innovative and knowledge-based economy, and a clean and healthy environment.

Governance structures	An interdepartmental Assistant Deputy Minister Coordinating Committee (ADMCC) has been established to oversee collective management and coordination of the federal GRDI. It is chaired by the lead agency (NRC) with membership at the ADM-level from each of the organizations receiving funding and guest representatives from Innovation, Science and Economic Development Canada and Genome Canada. It is responsible for the overall strategic direction for the GRDI and approval of investment priorities. It ensures that effective priority setting mechanisms are established within departments and agencies, and that government objectives and priorities are addressed. The Committee also ensures that common management principles are implemented and collaborations between organizations are pursued wherever relevant and possible. It typically meets three times a year at the call of the Chair, more often when warranted by specific needs for decision-making. An Interdepartmental working group (WG) supports the work of the committee. It is chaired by the lead agency (NRC) with membership at the Director level from all participating departments/agencies, and Innovation, Science and Economic Development Canada. The mandate of the working group is to provide recommendations and strategic advice to the ADM CC regarding strategic priority setting and overall management of the GRDI. The WG is responsible for providing direction to GRDI program activities related to operational delivery, implementation planning and investment priority setting. The WG also supports evaluation and reporting requirements related to the Initiative. It meets about every two months, more often when warranted by specific needs for recommendations and advice, as well as to develop and approve the GRDI Annual Performance Report. A Coordination Function, housed at NRC, provides GRDI-wide program coordination, communication, networking and outreach support. This includes support to the ADM CC and the GRDI WG, transparent and effective communication to departments of the planning cycle, process requirements, financial administration and other project management requirements, and support for interdepartmental shared project planning and implementation. This function is also responsible for conducting studies and analyses to serve as input to determination of GRDI-wide research priorities, and providing management and administration support, as well as support for performance management, reporting, evaluation, and communications.
Performance highlights	Performance information is presented below this table.
Comments on variances	
Results achieved by non-federal and non-governmental partners	Not applicable
Contact information	Roman Szumski, Vice President, Life Sciences, National Research Council Canada, 613-993-9244

Performance Information

Federal organizations	Link to departmental Program Alignment Architectures	Contributing programs and activities	Total allocation (from start to end date) (millions)	2015–16 Planned spending (millions)	2015–16 Actual spending (millions)	2015–16 Expected results	2015–16 Actual results against targets
AAFC	Science, Innovation, Adoption and Sustainability	Canadian Crop Genomics Initiative (CCGI)	108.50	4.44	4.44	ER1 ER2	T1 T2
CFIA	Food Safety Program, Animal Health and Zoonotics Program, Plant Resources Program	GRDI	3.60	0.72	0.72	ER3	T3
DFO	Biotechnology and Genomics	National Aquatic Biotechnology and Genomics R&D Strategy	16.50	0.72	0.72	ER4	T4
ECCC	Climate Change and Clean Air	Strategic Technology Applications of Genomics in the Environment (STAGE)	18.55	0.80	0.80	ER5	T5
HC	Canadian Health System Policy Health System Priorities	GRDI	53.12	0.11	0.09	ER6	T6
	Health Products Biologics & Radiopharmaceuticals	GRDI	2.14	0.39	0.39	ER6	T6
	Food Safety and Nutrition Food Safety	GRDI	0.93	0.33	0.33	ER6	T6

	Environmental Risks to Health Health Impacts of Chemicals	GRDI	2.91	0.77	0.77	ER6	T6
	Total for all Program Alignment Architecture	GRDI	59.10	1.60	1.58	ER6	T6
NRC	Technology Development and Advancement	GRDI	108.5	4.44	4.44	ER1 ER7	T1 T7
		Shared Priorities	28.86	3.98	3.98	ER8	T8
NRCan	Innovation for New Products and Processes	GRDI	36.10	1.60	1.60	ER9	T9
PHAC	Public Health Infrastructure	GRDI	13.10	1.60	1.60	ER10	T10
CIHR	N/A	N/A	0.50	0	0	N/A	N/A
Total for all federal organizations			**393.30**	**19.90**	**19.90**	Not applicable	

ER1

Using genomics to significantly increase Canada's share of global wheat production

T1

NRC continues to support the Canadian Wheat Improvement Program in the areas of tolerance to disease and abiotic stress, genomics-assisted breeding, and seed development. This initiative is NRC's contribution to the Canadian Wheat Alliance, a large-scale research alliance to improve the yield, sustainability, and profitability of Canadian wheat for the benefit of Canadian farmers and the economy. AAFC supports the objectives of the Alliance through its Canadian Crop Genomics Initiative. The Alliance also includes significant contributions by the University of Saskatchewan, and the Government of Saskatchewan. This initiative has developed strong expertise relevant to performance and yield in wheat. Highlights of 2015-2016 progress include automated wheat DNA extraction and genotyping platforms available to wheat breeders; molecular markers for major disease resistance factors; genetic markers for drought, heat, and cold tolerance; and a gene expression atlas for genes involved in wheat seed development, including for embryo development stages and photosynthetic efficiency.

ER2

Using genomics to improve the value of Canadian crops and agri-products

T2

Scientists at AAFC are using the latest genomic tools to help give farmers an edge in the race to feed the planet, with activities to develop value-added traits, maximize opportunities offered by genomics research, and enhance the efficiency of plant breeding. For example, they are playing a key part in the international effort to control a disease known as *Fusarium graminearum*, the causal fungus of fusarium head blight (FHB), which is a threat to wheat producers in Canada, the United States and around the world. This disease makes wheat unfit for human or animal consumption and is now considered the biggest problem facing Canadian wheat producers. Over the past 20 years, scientists have focused on developing disease-resistant wheat cultivars; however, now they are tackling the problem from several different angles. AAFC scientists working in several FHB-related genomics projects funded by the GRDI have gained insight into how the fungus infects the wheat plant, producing harmful toxins, and helped to identify elements of the wheat genome that play a role in FHB resistance.

ER3

Using genomics for food safety, animal health and plant protection

T3

Genomics research funded by the GRDI is increasing the genomics capability and capacity within the CFIA to support on-site diagnostic tools development and surveillance capabilities. Research projects are resulting in the development of tools and knowledge to support risk management of zoonotic disease and reportable and emerging animal diseases; formation of whole genome sequencing databases for food-borne pathogens, detection and identification of plant pests. The ongoing development of infrastructure and bioinformatics networks, tools and capacity at CFIA are supporting the use of genomics evidence in CFIA's Food, Plant and Animal Business Lines.

ER4

Genomics knowledge and advice for the management of fisheries and oceans

T4

Genomics research supports fisheries management and the protection of fish and seafood products through the development and application of tools and techniques. These instruments enable Fisheries and Oceans to study the genetic population structure of aquatic species and the functional genomics

underlying interactions between those aquatic species and their environment; to detect, monitor and minimize the impact of pathogens of aquatic animals and apply this information to assess and improve the health of aquatic animals; to develop and apply genomics tools to enable assessment, mitigation and restoration of aquatic ecosystems. Research milestones (including marker development and testing, genotyping, genome sequencing and characterization, microsatellite panel optimization and application, analysis of differential gene expression profiles, and statistical analysis) are ongoing for 7 projects to: understand the population genetics and structure of commercially important fish species and marine mammals (Redfish, Atlantic Salmon, Narwhal); determine the effects of aquaculture escapees and enhancement programs on the health of wild salmon populations; detect and monitor the impacts of stressors on salmon to inform sound management decisions; use genomic markers in the management of marine ecosystems and resources (Green Crab, Sea Scallops).

ER5

Genomics-based tools and technologies for responsible decision-making

T5

Genomics research supports ECCC for decision-making related to: the risk assessment of chemicals; the management of wildlife and migratory birds; and monitoring of Canada's ecosystems. Environment Canada carries out its genomics research through the Strategic Technology Applications of Genomics in the Environment (STAGE) program. ECCC developed genomic tools and approaches to better determine and predict the effects of industrial chemicals of high priority for environmental risk assessments; to monitor populations of wildlife exposed to stressors in areas of concern such as the Hamilton Harbour and St. Lawrence River; and to better predict cumulative impacts on ecosystem health from multiple stressors interacting over time. Research also focused on developing DNA fingerprints for key species of wildlife in Canada in support of conservation management and the *Species at Risk Act*.

ER6

Genomic knowledge for the Canadian health regulatory system

T6

Genomics research supported knowledge development relating to the assessment and regulation of therapeutics and biologics, food safety and nutrition, environmental contaminants and consumer products. Developments in the respective HC research programs are well on track to deliver anticipated research outcomes. For example, HC is making progress on the development and characterization of mesenchymal stem cells cultures from cancer patients, and successfully concluded a pilot animal study which monitored lung toxicity of respiratory syncytial virus. HC also developed genomic-based regulatory tools to assess allergic responses to chemicals; this tool is being used to examine whether select food additives contribute to allergies. HC completed an animal study, supported by genome sequencing, to evaluate the impacts of fermentable carbohydrates, found in infants’ formula, on the microbiome; based on this research, HC regulators have been provided with guidance on the potential long-term safety concerns related to microbiome changes occurring early in life. Also using genomics methods, researchers analyzed the expressions of microRNA in blood and mother’s milk in order to measure the health effects of fungal toxins and chemical contaminants in food. HC also completed a case study on multiwalled carbon nanotubes to demonstrate the application of a toxicogenomics mechanism-based approach to derive acceptable levels of exposure to nanomaterials. A newly developed genome sequencing method was applied to characterize mutations in the DNA of sperm, induced by the chemical, benzo[a]pyrene, to investigate the potential transmission of hazardous genetic effects from parents to their offspring. HC also collaborated with the Health and Environmental Sciences Institute's Genomics Technical Committee to request qualification of a genomic biomarker by the US Food and Drug Administration's biomarker qualification program. This critical validation will enable uptake and implementation of this biomarker, an important tool to identify potentially hazardous chemicals for use by North American regulatory agencies.

ER7

Commercially-relevant advances in genomics R&D related to human health

T7

Antibody–drug conjugates (ADCs) are revolutionizing the field of cancer chemotherapy. NRC is leveraging its target discovery, antibody screening and production platforms and adapting them for ADCs. In addition, the antibody components of these ADCs are being manufactured using NRC's Chinese hamster ovary (CHO) cell production platform, creating a full development pipeline for therapeutic candidates. NRC is partnering with Canadian SME's to advance these ADCs through pre-clinical development and biomanufacturing and ultimately to human clinical trials. By working with the different actors of the Canadian biopharmaceutical ecosystem, including contract research and manufacturing organizations, NRC is enabling the advancement of this next generation of biotherapeutics. These interactions are stimulating the growth of the sector thereby creating jobs and increasing Canada's return on its innovation investments.

ER8

Concerted interdepartmental research along shared priorities and common goals on issues that are beyond the mandates of single departments

T8

The shared priority project *Protection of Canadian biodiversity and trade from the impacts of global change through improved ability to monitor invasive alien and quarantine species* (the Quarantine and Invasive Species project) is a collaborative effort by six departments and agencies (AAFC, CFIA, DFO, ECCC, NRCan, NRC) to protect Canada from introductions of unwanted species through the design of innovative protocols and a DNA barcode reference database that will provide the capacity to anticipate and respond quickly to potential introductions. Project objectives and goal have all been completed or nearly completed as per the five-year project plan. Numerous multidisciplinary interdepartmental success stories, collaborations, publications and knowledge transfer to end-users have occurred as a result of this project, confirming the economic impact of this research.

The shared priority project *Strengthening Food and Water Safety in Canada through an Integrated Federal Genomics Initiative* (the Food and Water Safety project) is a collaborative effort by six Federal departments and agencies (AAFC, CFIA, ECCC, HC, NRC, and PHAC) to address food and water safety by controlling and/or preventing contamination with microbial pathogens. This is achieved through the development of tools and infrastructure to support applying genomics-based methods for pathogen isolation, detection and characterization from a variety of food matrices and water, focusing on verotoxigenic strains of *Escherichia coli* and *Salmonella* Enteritidis bacteria. A significant number of improved sample preparation methodologies, new and rapid detection tools, microbial genomics sequence data and bioinformatics tools are now available to all collaborators. The tools and publications generated by the Food and Water Safety project will significantly contribute to addressing knowledge gaps in the field and will provide essential information to assist in policy and regulatory decision-making. Such unprecedented and comprehensive resources will considerably support Canada's future foodborne and waterborne disease surveillance and outbreak response efforts.

ER9

Genomic knowledge for forest generation and protection

T9

Genomics research at NRCan focuses on the development of applications in support of Canada's forest sector competitiveness. 2015-16 was the first year in a new cycle of projects at NRCan. Molecular markers were developed for desired characteristics, such as insect and pathogen resistance, in spruce

and pine trees, respectively. Close to 1000 spruce budworm samples from 20 sites were processed, providing essential data for an estimation of the spruce budworm population at time “0” which will in turn be used in an outbreak forecasting model. When negotiating agreements with our trading partners, the origin of unwanted pests is important information. Markers were developed to identify the geographic origin of unknown gypsy moths found on marine vessels.DNA metabarcoding of soil samples from oil sand mining disturbed, reclaimed and natural sites was completed. Differences in microorganism communities showed that sites reclaimed with peat moss have lower levels of certain organisms important for sustainable tree development.

ER10

Genomics knowledge to strengthen public health programs and activities related to infectious and chronic disease

T10

The genomic study of pathogens and their traits associated with infectious diseases generates rapid and cost effective new approaches to disease surveillance, prevention, and control (e.g. molecular tools to better identify organisms associated with disease outbreaks). GRDI research activities at PHAC applied “-omics” technologies to generate new knowledge to support public health decision making, and to create new tools to enhance disease prevention and control. These technologies are providing methods to enhance: 1) the prevention and control of priority pathogens; 2) the response to antimicrobial resistant pathogens; 3) infectious disease surveillance; and 4) public health security measures. The knowledge generated from genomic approaches is supporting more detailed risk analyses, as well as the identification and development of new intervention points for the control and prevention of infectious diseases.

Internal Audits and Evaluations

[A.]Internal Audits Completed in 2015–16

Title of Internal Audit	Internal Audit Type	Completion Date
Audit under the Interim Operating Environment - Expenditure Management (Travel, Hospitality and Relocation)	Financial Management and Controls	August 2015
Audit under the Interim Operating Environment - Acquisition Cards	Financial Management and Controls	August 2015
Audit under the Interim Operating Environment - Procurement and Contracting	Financial Management and Controls	August 2015
Audit under the Interim Operating Environment - IRAP	Transfer Payment Program	August 2015
Audit of Revenue Management	Financial Management and Controls	March 2016

[B.]Evaluations in Progress or Completed in 2015–16

Link to Department's Program Alignment Architecture	Title of the Evaluation	Status	Deputy Head Approval Date
Measurement Science and Standards	Evaluation of NRC Measurement Science and Standards	Completed	June 2015
National Science Infrastructure	Evaluation of National Institute of Nanotechnology	Completed	February 2016
IRAP	Evaluation of the Business Innovation Access Program (BIAP)	Completed	August 2016
Internal Services	Evaluation of NRC Grants to International Affiliations	Completed	October 2015
Genomics R&D Initiative	Evaluation of the Genomics R&D Initiative	In progress	
Ocean, Coastal and River Engineering Portfolio	Evaluation of NRC Ocean, Coastal and River Engineering Portfolio	In progress	
IRAP	Midterm Evaluation of the Canadian Accelerator Incubator Program (CAIP)	In progress	
National Science Infrastructure	Evaluation of NRC Herzberg Astronomy and Astrophysics	In progress	

Aquatic and Crop Resource Development Portfolio	Evaluation of NRC Aquatic and Crop Resource Development Portfolio	In progress	
Information and Communication Technologies Portfolio	Evaluation of NRC's Initiative under the Roadmap for Canada's Official Languages	In progress	

Response to Parliamentary Committees and External Audits

Response to parliamentary committees
NRC made three appearances before Parliamentary Committees in 2015-16: • April 1, 2015 Senate Standing Committee on Aboriginal Peoples; Study on challenges relating to First Nations Infrastructure on reserves. John McDougall, Philip Rizcallah and Mike Swinton. • May 7, 2015 House of Commons Standing Committee on Industry, Science and Technology (INDU); The State of Disruptive Technologies in Canada, Dr. Danial Wayner, Duncan Stewart. • June 2, 2015 House of Commons Standing Committee on Industry, Science and Technology (INDU); The State of Disruptive Technologies in Canada, Dr. Marie D'Iorio.
Response to the Auditor General (including to the Commissioner of the Environment and Sustainable Development)
There were no performance audits completed by the Auditor General in 2015-16 that implicated NRC.
Response to external audits conducted by the Public Service Commission of Canada or the Office of the Commissioner of Official Languages
NRC participated in the Office of the Commissioner of Official Languages (OL) Report Card Exercise covering the period of 2014-2016. NRC received results from the OL Report Card Exercise[2] in May 2016 and will adjust the NRC OL Action Plan according to the recommendations.

[2] Report available at http://www.clo-ocol.gc.ca/en/publications/report-cards/2014-2016

Status Report on Projects Operating with Specific Treasury Board Approval

Project Name and Project Phase	Original Estimated Total Cost (dollars)	Revised Estimated Total Cost (dollars)	Actual Total Cost (dollars)	2014–15 Main Estimates (dollars)	2014–15 Planned Spending (dollars)	2014–15 Total authorities (dollars)	2014–15 Actual Spending (dollars)	Expected Date of Close-Out
Link to department's Program Alignment Architecture:								
There were no such projects planned in the RPP for 2015-16 to report.								

Status Report on Transformational and Major Crown Projects

Project name	No such projects were underway in 2015-16.

Up-Front Multi-Year Funding

General Information

Strategic Outcome	No such funding was provided in 2015-16.

User Fees, Regulatory Charges and External Fees

Reporting on the *User Fees Act*

General and Financial Information by Fee

General Information

Fee name	Access to Information and Privacy (ATIP)
Fee type	Other products and services
Fee-setting authority	*Access to Information Act*
Year introduced	1983
Year last amended	2016
Performance standard	Response provided within 30 days following receipt of request; the response time may be extended pursuant to Section 9 of the *Access to Information Act*. Notice of extension to be sent within 30 days after receipt of request. NRC's web site provides additional information on the Access to Information Act requirements and NRC's ATIP services, in addition to NRC's Annual Reports to Parliament.
Performance results	NRC received 23 access to information requests and 62 consultations from other government departments.
Other information	

Financial Information, 2015–16 (dollars)

Forecast revenue	Actual revenue	Full cost
500	70	113,532

Financial Information, 2016–17, 2017–18 and 2018–19 (dollars)

Planning year	Forecast revenue	Estimated full cost
2016-17	100	275,000
2017-18	100	275,000
2018-19	100	275,000

Reporting on the *Policy on Service Standards for External Fees*

General Information by Fee

General Information

Fee name	Certified Reference Material (CRM) Program
Service standard	Orders are processed and shipped within five business days of receiving all the required information from purchaser – temperature sensitive products may require longer processing time due to carrier shipping schedules.
Performance results	• 666 of 676 orders (98.5%) of Biotoxin CRMs were shipped within five business days of receiving all required information from the client. • 613 of 633 orders (96.8%) of Inorganic/Organic CRMs were shipped within five business days of receiving all required information from the client.
Stakeholder consultation in 2015–16 or prior fiscal years	Physical comment forms for feedback were provided to all North American customers with shipments as per quality system protocol, and links to the online comment form were provided to all clients outside of North America. No major issues were identified.
Other information	

Fee name	Sale of National Code Documents and other documents
Service standard	Orders processed (shipped) 1-14 days after receipt of all required information
Performance results	80.5% of orders were shipped within the target of 14 days. There were a total of 7,330 orders processed via both the virtual store and manually from Publication Sales. Of these, 6,858 orders were for paper copies delivered to the client (of which there were 119 exchanges or refunds) and 2,578 were electronic format orders (of which there were 136 exchanges or returns). (See Notes 1 – 2.)
Stakeholder consultation in 2015–16 or prior fiscal years	Internal stakeholders consulted annually (March-April of each year) and benchmarked against delivery standards for similar products.
Other information	April 2016 is planned as the next date for consultation and revision of the delivery standard, to account for delivery times associated with on-line sales and the growing predominance of electronic products.

NOTES:

1. Data for Codes delivery after the cyber intrusion is variable. Orders were filled (product delivered) on time, however entry of the order in the system was itself often delayed. Prior to the cyber intrusion, the service delivery was approximately 99% of orders within target. The Virtual Store was out of

service until November 2015, which affected the service delivery as the orders were being created only through Publication Sales manually.

2. The number of orders compared to last fiscal year doubled. This had an impact on the service delivery as the Virtual Store was out of service up to July 2015.