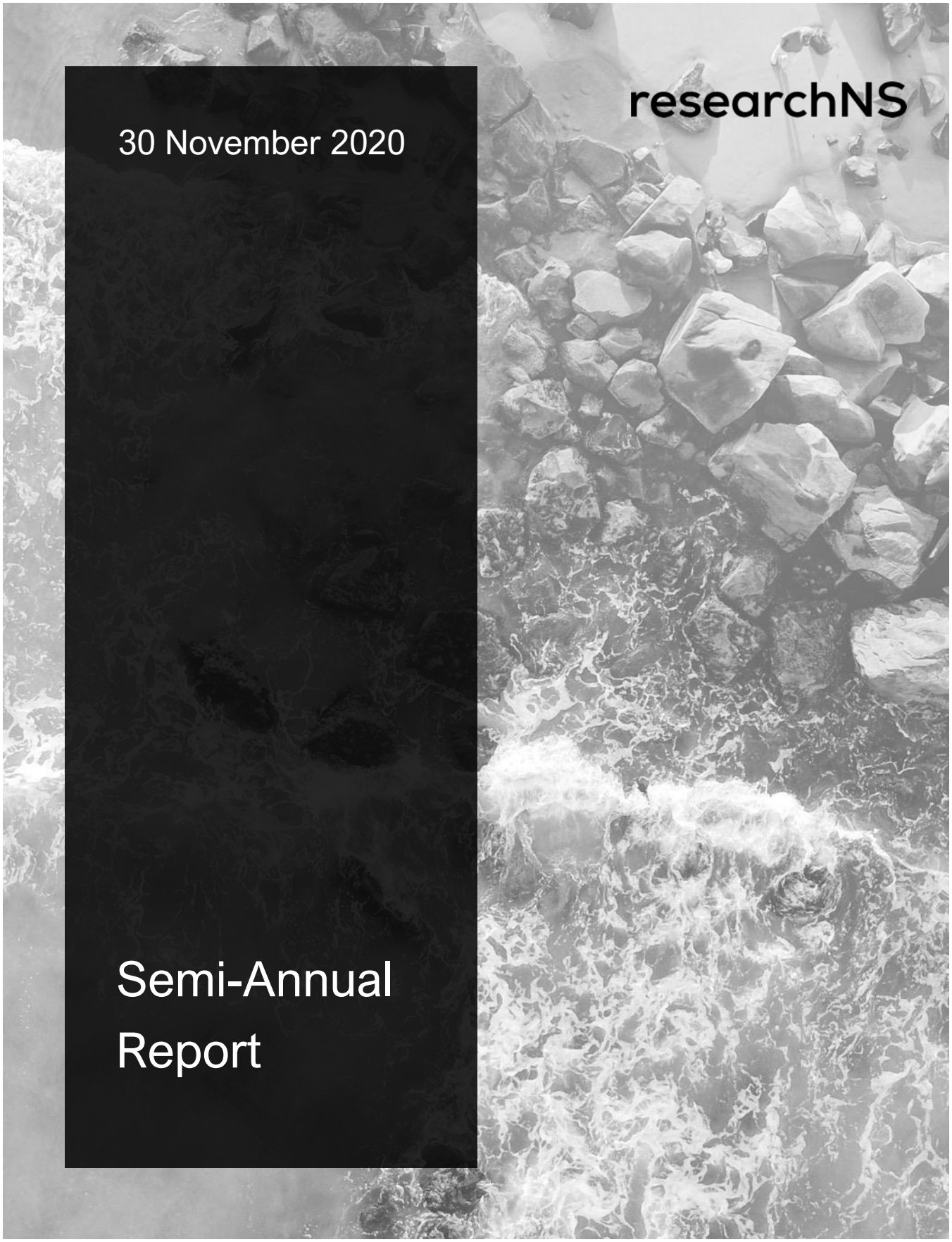

researchNS

30 November 2020

Semi-Annual Report

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Executive Summary

This semi-annual report covers the activities of the Research Nova Scotia Corporation (RNS) for the period of 1 April 2020 to 30 September 2020.

This period was one of significant change and opportunity. We focused on two areas: contributing to the substantial research response to COVID-19, and the development and adoption of the organization's strategy, establishing our direction for the coming years.

The global COVID-19 pandemic necessitated a nationwide shut-down, which deeply affected universities and research organizations and interrupted research activities across the country. At the same time, the research community enthusiastically mobilized to respond to the pandemic with COVID-related research on the disease, its potential treatments, vaccine development, and its impacts on the health care system, economy and society.

When Nova Scotia's government offices and universities pivoted to remote work in March 2020, research and granting organizations quickly came together to provide funds for COVID-19 research. RNS joined a coalition of funders to support 40 projects studying COVID and its effects, and partnered with federal organizations to fund additional projects that will benefit Nova Scotia. This included nationally recognized work by Dr. Scott Halperin (Dalhousie University) and his team at the Canadian Centre for Vaccinology, which Prime Minister Trudeau highlighted in May 2020, as well as the team led by Dr. David Kelvin (Dalhousie University) working on biomarker prediction of COVID severity.

Through the pandemic, RNS has played a key role in convening like-minded organizations, research teams and partners to quickly address the challenges faced by the province. For example, to help mitigate potential personal protective equipment (PPE) shortages, RNS funded Dr. Christa Brosseau (St. Mary's University) to examine the possibilities of creating Nova Scotia-sourced medical-grade pulp, and Dr. Beth Mason (Verschuren Centre and Cape Breton University) to develop anti-viral coatings for plastic-based packaging. Beyond providing funding to researchers, the convening and coordinating role is of significant added value, leading to more leveraged funding and opportunities for collaborations between researchers, institutions and provinces. The research community's willingness and ability to respond to the pandemic with creativity and expertise is a model for how research can support provincial, national and international efforts on other challenges, such as climate change, cancer research or equity, diversity and inclusion.

The period of 1 April to 30 September 2020 also covers a milestone in the development of our mission-oriented strategy and the ongoing transition into the organization's strategic direction, with the Board of Directors adopting the "Mission-Oriented Approach to Research" strategy and implementation plan on 30

June 2020 (see Appendix B). The document lays out Research Nova Scotia's approach to supporting, coordinating and organizing research in the province, and identifies sets of missions within each of the four mission areas identified by the Board earlier in 2020. The missions and their relevant mission areas (sustainable bioeconomy; climate change adaptation and resilience; healthy people and health care systems; improved quality of life for Nova Scotians) lay out tangible challenges that will help connect the research community's expertise with the needs of the province. In this way, we are operationalizing and giving meaning to the provincial priorities outlined in our legislation and regulations.

The adoption of the strategy lays the groundwork for the public communication of the missions and the diversity of mechanisms open to researchers, governments and partners to engage with the challenges and work together to find made-in-Nova Scotia solutions.

We continue to manage and evaluate the projects funded under our predecessor organizations, the Nova Scotia Health Research Foundation and the Nova Scotia Research and Innovation Trust, as well as those projects funded under the Research Nova Scotia Trust. In this semi-annual report, we have profiled the impacts of projects from these legacy programs. We continue to work with researchers to find opportunities for knowledge mobilization, capacity building and collaborations even as we orient our support toward our provincial missions.

During this reporting period, RNS committed $4.05 million across 30 new projects, leveraging an additional $11.1 million (cash) and $3.8 million (in-kind) from partners. In addition, 46 student projects ($776 k) were supported through the Scotia Scholar program.

Board of Directors

The current members of the Research Nova Scotia Board are:

Dr. Alice Aiken (Chair), Vice-President, Research and Innovation, Dalhousie University

Dr. Mary Bluechardt (Vice Chair), President and Vice-Chancellor, Mount Saint Vincent University

Mr. Don Bureaux, President, Nova Scotia Community College

Ms. Ava Czapalay, Associate Deputy Minister, Department of Labour and Advanced Education

Mr. David Dingwall, President, Cape Breton University

Ms. Jeannine Lagassé, Associate Deputy Minister, Department of Health and Wellness

Ms. Denise LeBlanc, Director General, Aquatic & Crop Resource Development, National Research Council

Mr. Bernie Miller, Deputy Minister, Department of Business

Dr. Nicholas Nickerson, Chief Scientist and Co-Founder, Eosense

Dr. Jeffrey Norrie, Chief Science Officer, Breathing Green Solutions

Mr. Allister Surette, Président, Université Sainte-Anne

Dr. David Woolnough, retired researcher

Considering Our Impact

As Research Nova Scotia transitions to implementing its strategic direction, we continue to administer and evaluate the impact of research supported by our predecessor organizations. While these projects were funded using previous sets of criteria, we also consider their impact through our mission-oriented research lens to ensure that our future activities will address gaps, build upon strengths, and generate benefits for Nova Scotia. At the same time, we have moved quickly to incorporate mission-oriented research into our programs, funding support mechanisms and approaches to partnerships. As legacy projects continue to wrap up, the Research Nova Scotia portfolio will increasingly reflect the new organization's strategic direction.

Response to COVID-19:

Making an Impact by Responding to Challenges

The COVID-19 pandemic demonstrates mission-oriented research in action. Research Nova Scotia mobilized quickly to support projects, partnerships, and the research community, focusing particularly on using our resources to fill gaps and increase capacity where possible. Our activities demonstrated the value of this kind of approach: by clearly setting out the challenge and encouraging researchers and institutions to respond with their creativity and expertise, we were able to support ground-breaking, vital and collaborative research in a wide variety of subjects connected to the pandemic and its broader effects. Pursuing more nimble approaches than traditional research funding processes allowed us to respond quickly to the needs of Nova Scotia and connect leading research teams to funding opportunities without delay.

COVID-19 Health Research Coalition

Research Nova Scotia joined a group of partners including Nova Scotia Health, Dalhousie University, Dalhousie Medical Research Foundation, the QEII Health Sciences Centre Foundation, the IWK Foundation, the IWK Health Centre, and the Dartmouth General Hospital Foundation, to fund more than $1.5 million of COVID-related research in Nova Scotia. The coalition selected 40 research teams from 262 applications working in clinical sciences, discovery sciences, health systems improvement and social sciences. In the first half of fiscal year 2021, Research Nova Scotia contributed $223,926 to six projects.

Beyond increasing the funding envelope, our participation in the coalition yielded two important benefits:

1) We designated our funding contribution for researchers outside of Dalhousie University and the health research centres to increase the number of institutions eligible to participate. This

ensured that Nova Scotia's broader research excellence would be brought to bear on the COVID-19 challenges, complementing the strong research representation at Dalhousie University and HRM-based hospitals.

2) RNS included criteria around key issues such as underrepresented groups in COVID-19 research, to help ensure an equitable, diverse, and inclusive approach to the coalition's funding call. This led to a diversity of projects supported by the coalition that included vaccine trials and life sciences research, along with fields such as aging care, mental health, and artificial intelligence.

Regional, disciplinary, and institutional diversity is a significant element of our mission-oriented research approach, as part of our goal is to increase the access to and opportunity for all Nova Scotians in the research endeavour. By participating in the coalition and using our funding to augment the partnership's complement of research, RNS broadened the research location and subject matter covered by the funding call to incorporate opportunities that otherwise would not qualify.

Along with funding, RNS provided in-kind administrative and communications support to promote the coalition funding call, help with the review process, and publish the award winners on our website.

Rapid Response COVID-19 Funding

Research Nova Scotia partnered with Canadian Institutes of Health Research (CIHR), Genome Atlantic, and the Atlantic Canada Opportunities Agency to quickly fund projects that were necessary, urgent, and beneficial to Nova Scotia. This nimble and responsive approach to research funding was particularly useful for a fast-changing pandemic, and enabled projects to get up and running as soon as possible.

Through this rapid response process, RNS funded nine projects to explore different aspects of the pandemic and Nova Scotia's ability to respond, contain and reduce its negative effects. Projects include:

- World-leading life sciences research to study ways to predict the severity of COVID-19 infections, and develop rapid point-of-care detection systems;
- Health systems research on the impact of COVID on primary care providers and vulnerable patients, and factors that contribute to adoption of public health measures;
- The impacts of the pandemic on mental health in workers and people with mental illness; and,
- Exploring solutions to packaging and the production of personal protective equipment.

In the current fiscal year, RNS contributed $507,848 to rapid response projects at six research institutions or organizations. In many of the above cases, research was able to proceed immediately because RNS came in as the first funding partner. In an urgent situation, this ability to mobilize provincial resources quickly and efficiently is critical.

While the COVID pandemic has created a significant shock to our economy and society, our convening, organizing, and funding support mandate enabled us to help support Nova Scotia's research community in responding to the challenge.

Watch Dr. David Kelvin's Researcher Spotlight video at researchns.ca/researcher-stories/.

COVID-19 + Research Nova Scotia Podcast

Learn more about the work of Drs. David Kelvin, Kyly Whitfield, Christa Brosseau, Jessie-Lee MacIsaac, and Scott Halperin on the Research Nova Scotia Podcast. Listen on Apple, Google, Spotify, or on the RNS website at researchns.ca/podcast.

Impact Through Funding Research

Making an Impact Through a Variety of Projects

Alongside support for COVID-19 research, RNS continues to as provide matching funds for federal grants as appropriate for our budget and mandate administer, and to support projects funded under preceding organizations and programs. These projects contribute to the province's research ecosystem and will increasingly form part of our missions portfolio as we follow our strategy.

The following section highlights three ongoing projects, selected to demonstrate different ways RNS-supported research is having an impact on Nova Scotia.

Project: Bringing Nova Scotia Wines to the Next Level

Making an Impact by Funding Infrastructure

Principal Investigators	Karine Pedneault & Gustavo Leite
Institution	Université Ste-Anne
RNS funding contribution	$256,700
Leveraged funding	$258,282
Sector	Agriculture
Number of jobs supported	1
Number of training opportunities	5 (to date)
Funding agency	Agriculture & Agri-Food Canada

The Wine Growers of Nova Scotia identify more than 90 grape growers who collectively employ almost 1,000 Nova Scotians. With an annual economic impact of $218 million and tourism revenue of $43 million in 2019, Nova Scotia's wine industry is generating significant revenue for the province. Additional growth in the province's wine industry is challenged by our climate, which impacts the ability to grow grapes to their optimal quality and to harvest them at just the right time to ensure a quality product.

Impact to Date

Research Nova Scotia and Agriculture & Agri-Food Canada funded Drs. Karine Pedneault and Gustavo Leite to build a research winery at Université Ste-Anne where they are working on two related projects: learning about the relationship between grape ripening and wine quality and improvement in the fermentation process. They partnered with researchers at Acadia University, the Nova Scotia Community College, and the Centre de recherche agro-alimentaire de Mirabel (Quebec) to bring additional expertise, while also involving a number of Nova Scotia grape growers and wineries.

The variable, cool climate on Canada's East Coast limits the growing time for grapes needed for a quality wine. For example, a late spring frost in 2019 affected wine growers by killing young vines and drastically shortening the time grapes had to ripen. Learning more about how to keep growing grapes until they reach just the right age and quality could lead to a more lucrative industry.

While work in this project was delayed by Hurricane Dorian in 2019 and the COVID-19 pandemic in 2020, the researchers have made headway in understanding how the amount of time the grape stays on the vine impacts wine made with the grapes. In addition, they are working on a rapid, non-destructive method to accurately measure grape maturity prior to harvest, which would help growers make decisions that could impact wine quality and prevent costly mistakes related to premature harvesting.

Another goal of the project is to train the next generation of scientists to work in the grape growing and wine industries. Dr. Pedneault is currently mentoring students at Université Ste-Anne to continue in agri-food research.

Plans for 2021 include more work on the link between the ripening stage of the grape and wine quality, including using panels of experts to test the hypothesis.

Watch Drs. Karine Pedneault and Gustave Leite's Researcher Spotlight video at [researchns.ca/researcher-stories/.](researchns.ca/researcher-stories/)

Project: Advanced Energy Conversion and Electronic Materials Lab

Making an Impact by Supporting R&D

Principal Investigator	Michael Freund
Institution	Dalhousie University
RNS funding contribution	$400,000
Leveraged funding	$601,688
Sector	Energy
Number of jobs supported	1
Number of training opportunities	10 (to date)
Funding agency	Canadian Foundation for Innovation

While the production and use of renewable energy has been steadily growing in Canada over the past 10 years, solar energy has lagged behind other sources such as hydro, biomass, and wind. Energy capture and storage is a growing area of research in Nova Scotia, which could improve the province's ability to pursue clean energy technology toward its goal of Net Zero emissions by 2050. Dalhousie's Dr. Michael Freund and his team are working to improve the use of solar energy by studying technologies that will facilitate the production of solar fuels.

Impact to Date

Research Nova Scotia provided funding to create the lab in which Dr. Freund and his team are developing advanced bipolar membranes (BPMs) that will be part of standalone artificial photosynthetic devices to directly produce solar fuels. If successful, an integrated system using these membranes would directly convert light to fuel, and could be used to improve semiconductor arrays and advanced electronics memory, both of which would contribute to reducing energy use.

Despite the pandemic, Dr. Freund continues to advance the artificial photosynthesis work. He and his colleagues have published a number of papers on their work to date, and have refined the design for increased stability for long-term operation. The team has also constructed microwire arrays at Dalhousie,

and will spend the next several months integrating the arrays into the bipolar membrane systems to continue his exploration of solar fuel production.

Watch Dr. Michael Freund's Researcher Spotlight video at [researchns.ca/researcher-stories/.](researchns.ca/researcher-stories/)

Project: Optimization and Validation of Novel Emergency Department Point-of-Care MRI

Making an Impact with Investments in Partnerships

Principal Investigator	Steven Beyea
Institution	Biomedical Translational Imaging Centre (BIOTIC) / Nova Scotia Health
RNS funding contribution	$1,260,160
Leveraged funding	$1,877,390
Sector	Health
Number of jobs supported	2
Number of training opportunities	4 (to date)
Funding agency	Atlantic Canada Opportunities Agency, Synaptive Medical (industry partner)

Dr. Steven Beyea's project involved situating a novel MRI system developed by Canadian medical technology company, Synaptive Medical Inc., in the emergency department (ED) for screening potential brain injuries such as stroke. This point-of-care (POC) approach could provide emergency room doctors with vital information when and where they need it. With stretched health care budgets, innovation is sometimes impractical to pursue even when there is potential for better patient outcomes; Dr. Beyea's research seeks to improve quality of life and limit damage by significantly speeding up diagnoses.

Impact to Date

Research Nova Scotia's funding helped to procure the POC neuro MRI, which is situated in a specially designed suite adjacent to the ED at the QEII Health Sciences Centre, an international first in installation. Side by side trials using the Synaptive MRI and traditional screening methods have generated data, which will be fed into artificial intelligence to develop clinical use protocols for rapid diagnosis.

Significant progress has been made on this project. The quality of images has so impressed radiologists and clinicians that they are pursuing its use for additional conditions: For example, to diagnose a specific tumor which is notoriously difficult to find with traditional imaging equipment. The equipment procurement has thus given rise to additional research across different disease fields, with several clinician scientists either receiving or in the process of applying for traditional research grants to conduct studies using the equipment.

While development of diagnoses protocols continues, Synaptive Medical has entered into a collaborative research agreement with Nova Scotia Health, with the potential for additional partnerships. When Synaptive launches its POC MRI technology on the international market later this fall, the BIOTIC team will be featured as key opinion leaders.

Projects Approved by the Corporation

Over the last six months, RNS supported 76 research projects through its Research Opportunities Fund and the Scotia Scholars Awards program.

From 1 April 2019 to 30 September 2020, the following commitments were made:

RNS Commitments

Program	Type	# Funded	Total Investment
Research Opportunities Fund	Matching Funds	17	$3,317,567
Research Opportunities Fund	COVID-19 Related Research Support	13	$731,774
Scotia Scholars	Capacity Building	46	$776,000
		76	**$4,825,381**

Appendix 1 details each project approved by the Corporation during the reporting period, including the following information on each research project:

1. Name of the lead applicant
2. Name of the lead institution or organization
3. Name of the project
4. Amount of funding approved
5. Research sector
6. Estimated number of jobs in Nova Scotia that will be supported by the funding awarded to the project
7. Estimated number of training opportunities for students and others in Nova Scotia that will be supported by the funding awarded to the project
8. Information about any funding that the project received from other sources, including the following:
    a. The name of each source,

b. The amount received from each source and whether it was in the form of cash or an in-kind contribution.

In addition, RNS invested a total of $776,000 in future researchers through its Scotia Scholars Awards program. Scotia Scholars supports trainees at the undergraduate, Masters and PhD levels to work on a specific research project with faculty mentors. Awards range from $10,000 to $47,500 and the funding term can run from one to four years.

As of September 30, funds were allocated to 46 students at Acadia University, Dalhousie University, Mount Saint Vincent University, NSCAD University, Saint Mary's University, and Université Ste-Anne for Masters and/or Doctoral level awards. An Undergraduate Scotia Scholars competition is taking place at Cape Breton University, Nova Scotia Community College, and Saint Francis Xavier University in Fall 2020.

Financial Forecast

The following section includes:

1. The current balance in the Research Opportunities Fund and the amount anticipated to be paid from the Fund over the next 6 months;

2. The amount spent on operations from April to September 2020, and the amount anticipated to be spent on operations over the next 6 months;

3. The proposed Research Opportunities Fund and Operations budget for the 01 April 2021 to 31 March 2022.

	Expended 1 April – 30 Sept 2020	Current Balance	Anticipated Spending 1 Oct – 31 March	Anticipated spending 1 April 2021 – 31 March 2022
Research Opportunities Fund (ROF)	$4.66 million	$32.7 million	$17.9 million	$11.3 million
Operations	$0.70 million	N/A	$0.83 million	$2.2 million

The anticipated $17.9 million of spending for 1 October 2020 – 31 March 2022 is composed of expenditures from the ROF for projects identified in previous years, and expected projects to be approved in the next six months.

The anticipated $11.3 million of spending for 1 April 2021 - 31 March 2022 is composed of matching grants to federal opportunities (e.g. Canada Foundation for Innovation, tri-council, Genome Canada), convened projects (including both funding from third parties and Research Opportunities Fund), New Health Investigator Grants, and student awards (Scotia Scholars).

Operating Plan

Over the 12 months since submitting our previous operating plan, RNS has developed its mission-oriented strategy and completed the review of all legacy activities. With our organization's new direction firmly established, the strategy document, appended for your information as Appendix B, guides the implementation of our mandate to support, organize, and coordinate the funding of research in Nova Scotia.

The strategy was adopted by our Board in June 2020, and released to the public and stakeholders in October and November 2020. This positions us to transition out of our legacy operations and into our direction as a strategically focused organization, while maintaining our ongoing commitments and overseeing past grants.

To implement our mandate with efficiency and effectiveness, all research funding decisions will consider whether the proposed research activity or infrastructure will address a challenge identified within the mission areas, which map onto the provincial priorities outlined in our legislation and regulations. Those opportunities that fall outside may be considered for funding should resources permit, but the opportunities must be extraordinary and vital to the research community to receive consideration.

The following are the mechanisms through which we will fulfill our mandate using mission-oriented research:

Support the strengths of the research ecosystem: Through matched and traditional project funding, RNS will support research funding on projects, training, and infrastructure. Given limited funding, preference will be given to projects that best fulfill the missions.

Convene intentional partnerships, coalitions and commissioned activity: RNS will convene project teams to address gaps in current research, take advantage of fast-moving opportunities, or commission research in important areas that are excluded from, not suitable for, or are too small for existing funding opportunities. These may be competitive, non-competitive or a hybrid.

Operate funding opportunities and partnerships in collaboration with other organizations: RNS will develop co-funded collaborative research opportunities to increase funding envelopes and take advantage of alignments with other organizations' mandates. These opportunities would be competitive, with Research Nova Scotia leading or participating in the shaping of parameters.

Build capacity, training, support services and grant response coordination for the research ecosystem: RNS will work with the research community to identify, support and grow research capacity in the province.

This includes both competitive opportunities such as Scotia Scholars and partnership seed grants, and non-competitive or hybrid opportunities like training and coordinating responses to federal opportunities.

Develop non-traditional, innovative, rapid response or extraordinary activity to meet the challenges: This category is where the most creative solutions take place. This might include competitive opportunities like hackathons, challenge prizes, fellowships, centres of excellence, exchanges, and new, experimental or exciting ideas that could help fill gaps in the missions and engage non-academic participants.

Extraordinary opportunities: We will strive to keep some flexibility in our funding to allow for a too-good-to-ignore opportunity, in which our involvement is integral to the success of Nova Scotia's research endeavour, while not depriving our missions of appropriate resources.

The depiction of the mission portfolio below uses colour and box size to illustrate the role of RNS. A darker colour corresponds to greater direction or management by RNS, while lighter colours represent programs and initiatives controlled elsewhere for which we provide support. A larger box suggests greater funding and resource requirements from RNS, while a smaller box requires fewer resources.

In addition to the above, we have overhead costs required to support the RNS Corporation itself, including salaries, O&M, and capital assets. Because of the nature of the expenditure type, overhead is a relatively fixed cost of approximately $2.2 million per year.

Our policies allow flexibility in allocating our funding, with the Board of Directors approving recommended allocations at regular intervals throughout the year.

For more information, please see **Appendix B: A Mission-Oriented Approach to Research.**

Capital Plan

Research Nova Scotia is a non-for-profit without capital assets. As such, the corporation has not produced a capital plan.

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