UNIVERSITY of GUELPH

OFFICE of RESEARCH
AGRI-FOOD PARTNERSHIP

OMAFRA/UofG Agreement Consolidated Annual Report Year 3, 2020/21

Version 3

September 22, 2021

Office of Research (Agri-Food Partnership)
University of Guelph

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1 INTRODUCTION

This Consolidated Annual Report is submitted to the Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) in accordance with the terms and commitments under the OMAFRA/University of Guelph (UofG) Agreement. This is the third annual report under the Agreement that operates for the period of April 1, 2018 to March 31, 2023.

The University of Guelph has complied with all material provisions of the Agreement and managed the transfer payment funds provided under the Agreement effectively and efficiently, and with due regard to obtaining appropriate value for money expended.

The reporting period of this Annual Report is the UofG's 2020/21 fiscal year (May 1, 2020 to April 30, 2021). The report covers the activities, budgets, expenditures and performance measures for each of the five program areas of the Agreement: Research Program, Veterinary Capacity Program (VCP), Animal Health Laboratory (AHL), the Agriculture and Food Laboratory (AFL) and the Property Management Program.

After approval, this report will be posted at The Atrium, UofG's digital repository.

COVID-19

Unlike other Ontario universities that completely shut down research, the University of Guelph has sustained substantial research activities during the COVID-19 pandemic, including during the state of emergency, lockdowns and stay at home orders. This reflects the province's identification of 'research' and 'agriculture and food' as essential activities. Since the beginning of the pandemic, hundreds of UofG research projects have been identified as critical and/or time-sensitive, enabling more than 400 faculty members to pursue research, engaging more than 1,700 highly qualified personnel (i.e., undergraduate, graduate, and post-doctoral researchers and research staff).

Some 350 Office of Research staff, most employed as part of the OMAFRA/UofG Agreement, have continued to work in place during the pandemic, running the substantial research facilities, as well as sustaining provincial testing that ensures Ontario's food supply is robust, safe, healthy and nutritious, and that livestock and other animals are well-cared for.

This exceptional level of research-related activities sets the University of Guelph apart from other Ontario universities, and underscores its unique, research-intensive, impactful, real-world-relevant nature.

More details about the impact of COVID-19 on the Agreement are outlined in each of the Program sections.

1.1 Report Structure

The structure of the third Consolidated Annual Report is consistent with the two previous annual reports and reflects the order of the 2020/21 Business Plan. Section 1 is this Introduction. Section 2 is a Financial Summary. Sections 3 through 7 are reports on each of the Agreement's Programs. These sections include highlights, updates and performance information. Throughout the report, when numeric metrics are available, summary tables have been provided to display the metric over the term of the Agreement.

In addition to the formal Consolidated Annual Report, the University is also producing *Growing Ontario Solutions,* which delivers a visual summary of how the programs are integrated and their outputs amplified to meet the Agreement's strategic objectives. The vision of this document is to reaffirm UofG's commitment to demonstrating how the Agreement delivers value for Ontario and how the UofG leverages the province's investment to make Ontario a global leader in agri-food innovation. *Growing Ontario Solutions 2020/21* will be available in September 2021.

1.2 About Us

The UofG and OMAFRA strive to be a world-renowned model of government-university collaboration. By working together, the UofG and OMAFRA enable the research, innovation, laboratory science, training and infrastructure necessary to keep Ontario's agri-food sectors and rural communities vital, competitive and sustainable. Agri-food is one of Ontario's largest industries, worth $46.3 billion to the province's economy and directly employing more than 723,000 people[1]. The agri-food sector is evolving and tasked with providing innovative solutions to a growing number of challenges, from producing more food while protecting the environment to making greater contributions to human health.

The University of Guelph is a natural leader in addressing these challenges. The long-standing partnership with OMAFRA, known as the Ontario Agri-Food Innovation Alliance (the Alliance), is fueled by a shared commitment to support the growth and prosperity of Ontario's agri-food sectors and the vitality of rural communities. By working together, the Alliance has become more than an example of government-university collaboration; it is also producing Ontario Solutions with Global Impact.

[1] Agri-Food Industries, Ontario: 2009-2019 excel, "Gross Domestic Product, Economic Indicators, Ministry of Agriculture, Food and Rural Affairs, last modified February 12, 2021. http://www.omafra.gov.on.ca/english/stats/economy/index.html

1.3 Strategic Focus

The University of Guelph works with OMAFRA and partners to support the success of Ontario's agriculture, food and bioproduct sectors. The University also focuses on supporting the vibrancy of rural communities, and the health and well-being of the province, its environment and its citizens. The University's work includes:

- Advancing a world-class research and innovation system;
- Training the next generation of agri-food innovators;
- Designing a unique platform for collaboration and innovation;
- Creating a transparent agri-food sector you can trust;
- Establishing a safe and secure agri-food sector; and
- Constructing an enhanced system for research data access and storage.

As will be obvious from the report that follows this Introduction, the Alliance is a complex system of programs and activities, and joint governance, in order to deliver on its strategic focus for Ontario. This rich complexity of stakeholder engagement, field-scale platforms for research and surveillance, peer-reviewed research, and training of technical capacity, ensures that Alliance programming is relevant, timely and ultimately will result in benefit to all of Ontario. Without any one component of this research and innovation ecosystem, the relevance of the Alliance for Ontario's agri-food sector would be weakened.

1.4 Approach

The OMAFRA/UofG Agreement invests in the people, places and programs that support the Agreement's strategic focus to strengthen Ontario's agriculture, food, bioproduct and rural sectors for the benefit of Ontario and Ontarians. The University of Guelph administers and leverages this investment to make Ontario a global leader in agri-food innovation. It is making a difference across Ontario by achieving assurance in food safety, supporting a competitive and sustainable agri-food sector, and building healthier communities and a healthier environment.

1.5 Version Control and Approvals

This section outlines the changes that have been made in each version of the Consolidated Annual Report. It also highlights the approval dates by the governance committees.

Version 3

Approval by Agreement Leadership Committee on November 18, 2021

Submitted to the Research and Innovation Branch, OMAFRA on September 22, 2021

The following change has been made to Version 2:

- Correction of the Total–Out of Scope Programs and Total–All Programs rows in Table 3.43. The data rows in the table are accurate but were not totaled correctly. The KPI related to Highly Qualified Personnel is not impacted.

Version 2

Approval by Executive Committee on September 17, 2021

Confirmation of Review by Coordinating Committee on September 15, 2021

Submitted to the Research and Innovation Branch, OMAFRA on August 24, 2021

Feedback was received by the Research and Innovation Branch on August 23, 2021. The following changes have been made to Version 1, both in response to the feedback, as well as due to corrections/changes determined following the original submission:

- Adjusted the date in Section 1.1 to reflect that *Growing Ontario Solutions 2020/21* will be available in September 2021.
- Renamed Section 1.5 to Version Control and Approvals. This section will now include the date and location of the document's submission. It will also include the approval statuses.
- Updated Table 3.6 Research Program Directors (RPDs), to show additional research priority areas associated with specific RPDs.
- Added a missing status (Complete) to Table 3.8.
- Made changes in response to the feedback provided by the Research and Innovation Branch, as described in the excel spreadsheet labelled "Alliance Annual Report Review".

Minor editorial changes (e.g., capitalization, punctuation, spelling, spacing, justification, etc.) have not been included in this list.

Version 1

Submitted to the Research and Innovation Branch, OMAFRA on June 30, 2021

This report was prepared and submitted one month early to accommodate OMAFRA's mid-term review of the Agreement. Even with the earlier submission date, the University was able to provide all the required data.

2 FINANCIAL SUMMARY AND ANALYSIS

2.1 Definitions

Tables 2.1, 2.2 and 2.3 provide the definitions for the terms used in many of the financial tables in this section of the report.

Table 2.1: Revenue Definitions

Revenue	Definition
OMAFRA Agreement	The portion of the total Agreement funding recognized for eligible expenses, (net of program revenues) in the current University fiscal year (May 1, 2020 to April 30, 2021).
OMAFRA Other	This revenue includes OMAFRA funding, outside of the Agreement, designated for specific activities (e.g., $500K in support of equipment purchases in AHL and AFL).
Sales of Goods and Services	Sales of goods and services, from Agreement operations, provided to external organizations and clients. This category includes revenues for testing services provided by AHL and AFL and sale of produce from the Research Centres.
Investment Income	Interest earned on the Agreement Account (as per Section 10.7 of the Agreement) and recognized in the period. Investment income will only be recognized when there are approved expenditures by the Executive Committee.
Other Revenue	Miscellaneous revenues generated from Agreement operations. The major component is facility rental income for space managed within the Property Management program. It may also include sponsorships, recoveries from the disposal of surplus equipment or other miscellaneous program revenues. Other Revenues are typically irregular items that do not necessarily recur annually.

Table 2.2: Expense Definitions

Expense	Definition
Salary and Wages	All salary and wage costs for University of Guelph employees excluding transfers for Research and VCP faculty costs (refer to Faculty Pool Costs definition).
Non Salary Benefits	This includes non salary costs for statutory and negotiated employee benefit programs and eligible pension costs. Non Salary Benefits are allocated using the standardized pooled costing method applied to all University sponsors and funding sources.
Faculty Pool Costs	Agreement funds transferred to the University in support of the salary and benefits costs of University faculty effort toward Agreement priorities. Two “pools” have been established for the Research and Veterinary Capacity Programs.
Travel	Eligible expenditures for approved travel on Agreement supported program activities.
Operating	Expenses for all costs other than salary, benefits, and travel. Operating expenses include utilities, fuel, and energy costs; equipment lease costs; contracts for services (e.g., janitorial, garbage disposal, etc.); maintenance and

Expense	Definition
	repairs costs; laboratory supplies; research supplies; farm supplies (e.g., feed and bedding for animals, seeds, pesticides, fertilizer, etc.); telephone and computer costs; animal purchases; and scholarships.
Internal Recoveries	Recovery of costs between units within the University for goods and services provided such as lab testing performed by AHL or AFL or Research Centre recoveries from researchers. The charges for these recoveries are normally approved as 'invoices' for services between the specific unit requisitioners and providers within the University. Internal charges are recorded under Operating.
Budget Adjustment	This is the difference between the Annual Maximum Funds and the sum of the program budgets as approved by the Executive Committee. It only applies to the General and Inflation Reserve.

Table 2.3: Column Definitions

Column	Definition
2020/21 Results	Actual revenue or expenses recorded for the period of May 1, 2020 to April 30, 2021.
2020/21 Budget	2020/21 Annual Budget allocated for each category, excluding carry forwards.
Variance	Difference between Budget and Results.
% Variance > 5%	Where the Results differ from the Budget by greater than 5% and the variance is greater than $10K.

2.2 Agreement Financial Summary

Table 2.4 provides the Agreement Financial Summary which includes all revenues and expenditures by Standard Accounts for the Agreement. The table includes the 2020/21 Results, 2020/21 Budget, Variance, and Percentage Variance when greater than 5%. This summary does not include ARIO Minor Capital.

In 2020/21, the net Agreement result was a negative balance of $416K. This was due to increases in committed carry forwards in several programs, offset by an intentional draw down of $4,379K from the uncommitted carry forward.

Table 2.4 Agreement Financial Summary for 2020/21 (in thousands of dollars)

Standard Accounts	2020/21 Results	2020/21 Budget	Variance	% Variance >5%
Revenue				
OMAFRA Agreement	(66,516)	(66,100)	416	
OMAFRA Other (Lab. Equip.)	(500)	(500)	0	
Sales Goods and Services	(21,290)	(20,814)	476	
Investment Income	0	0	0	
Other Revenue	(1,066)	(944)	122	13%
Revenue Total	**(89,372)**	**(88,357)**	**1,014**	
Expenses				
Salary and Wages	34,118	35,301	1,184	
Non Salary Benefits	8,771	9,251	480	5%
Faculty Pool Costs	13,045	13,045	0	
Travel	291	910	619	68%
Operating	37,723	38,507	783	
Internal Recoveries	(4,577)	(4,278)	299	7%
Budget Adjustment	0	(4,379)	(4,379)	
Expenses Total	**89,372**	**88,357**	**(1,014)**	
Grand Total	**0**	**0**	**0**	

Carry Forward into 2020/21	39,252
Change in Carry Forward	(416)
Carry Forward into 2021/22	38,837

Figure 2.1 illustrates the Agreement Revenue by Standard Accounts, while Figure 2.2 shows the Agreement Expenses.

Figure 2.1: Agreement Revenue by Standard Accounts for 2020/21 (in thousands of dollars)

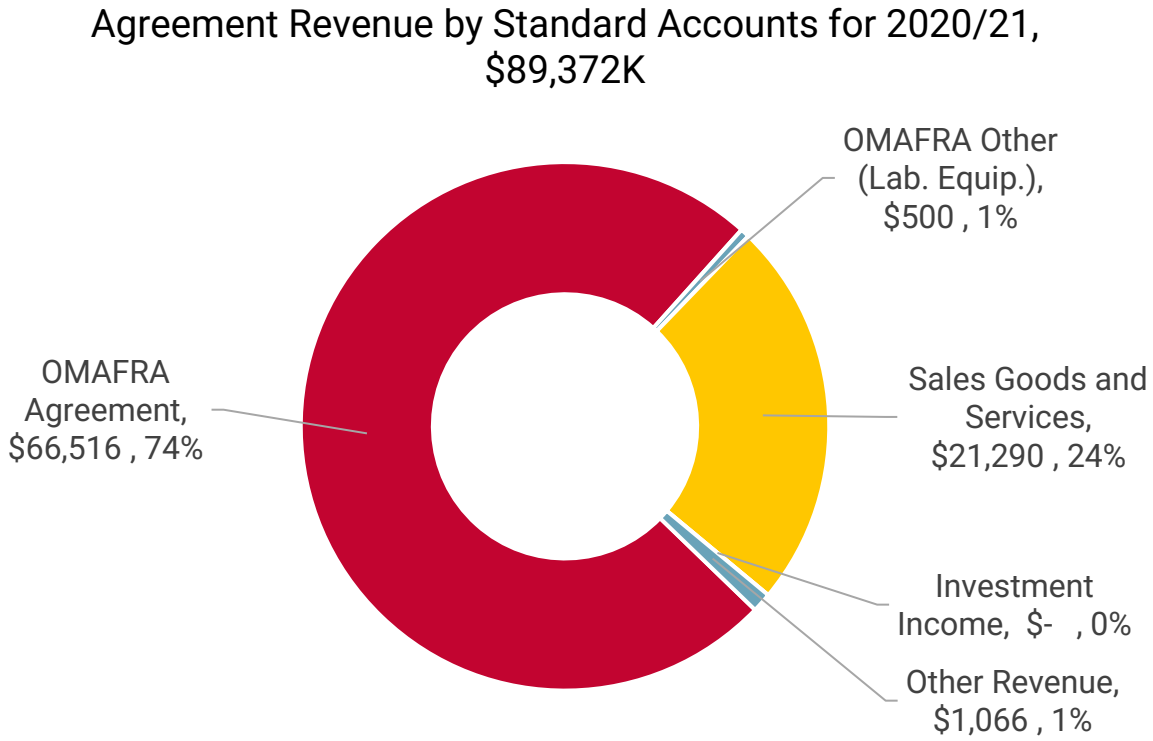


Figure 2.2: Agreement Expenses by Standard Accounts for 2020/21 (in thousands of dollars)

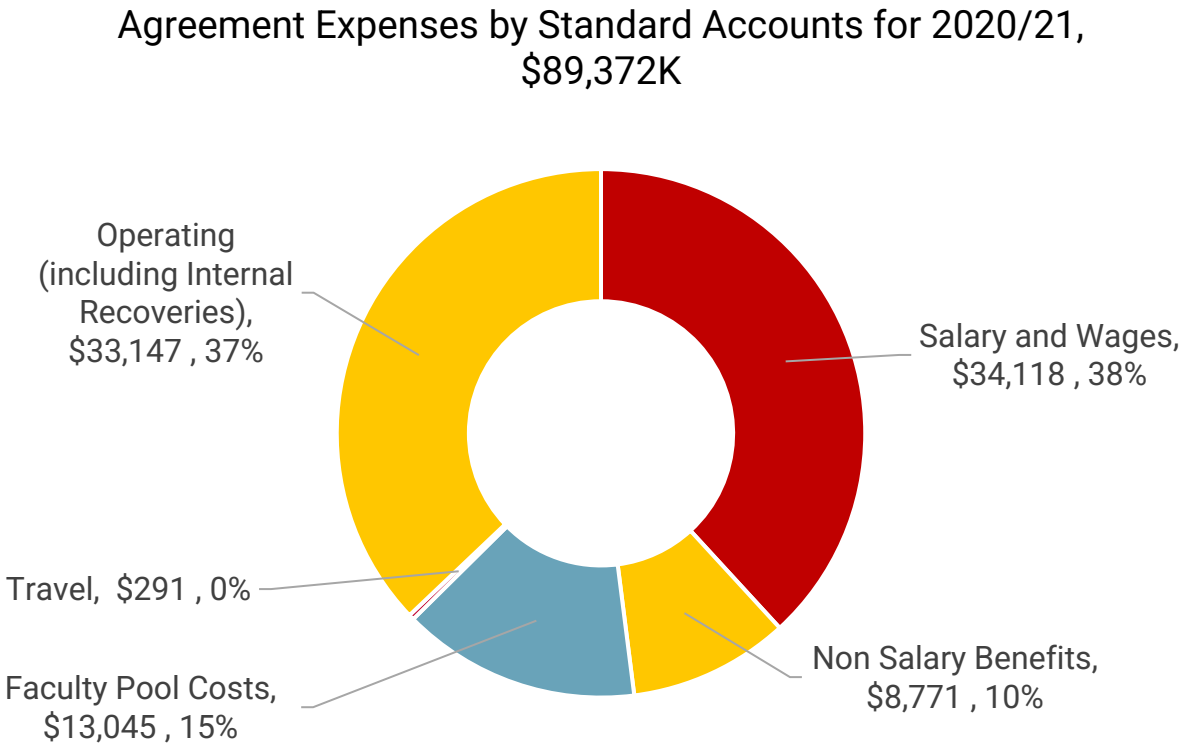


Table 2.5 shows the Agreement Financial Summary by Program for 2020/21.

Table 2.5: Agreement Financial Summary by Program for 2020/21 (in thousands of dollars)

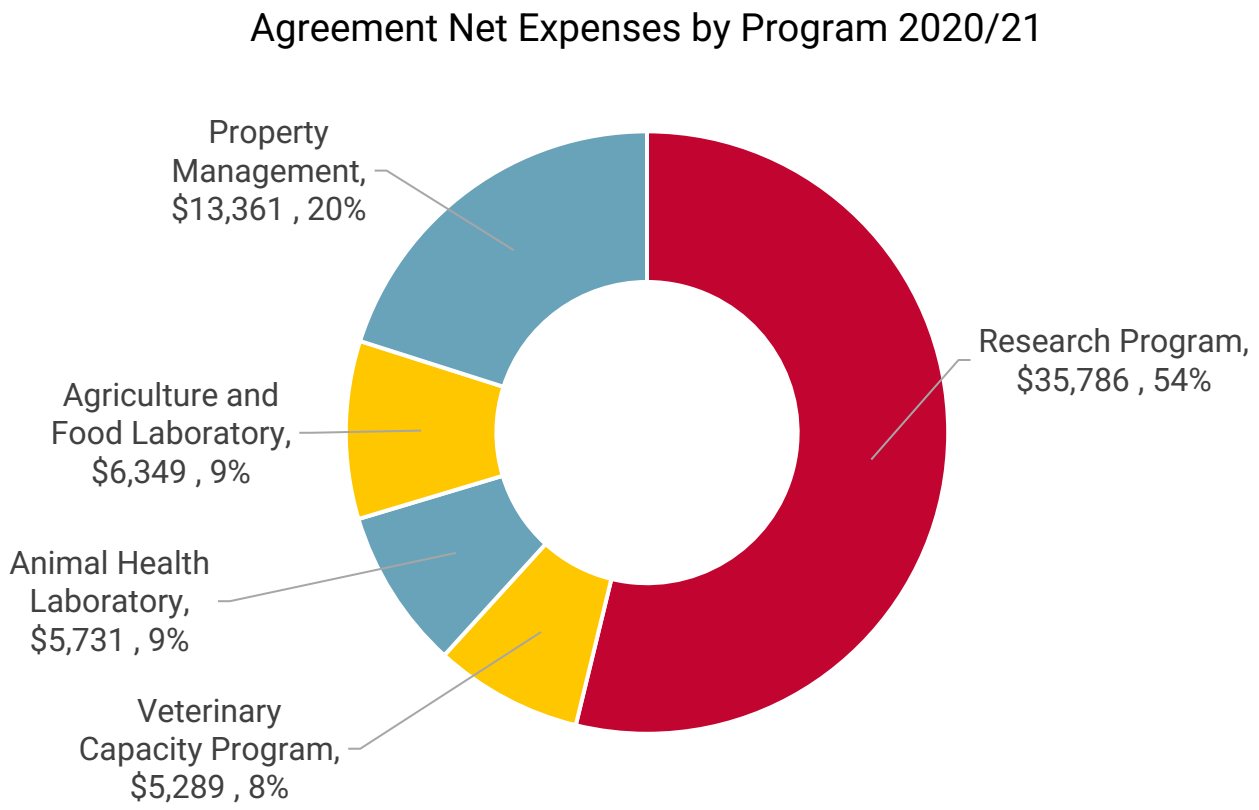
Standard Accounts	Research Program	Veterinary Capacity Program	Animal Health Laboratory	Agriculture and Food Laboratory	Property Management	General & Inflation Reserve	Exigency Fund (Recognized)	Total
Revenue								
OMAFRA Agreement	(35,786)	(5,289)	(5,731)	(6,349)	(13,361)			**(66,516)**
OMAFRA Other (Lab. Equip.)				(500)				**(500)**
Sales Goods and Services	(111)		(8,593)	(7,917)	(4,669)			**(21,290)**
Investment Income								**0**
Other Revenue	(32)		(1)	(4)	(1,029)			**(1,066)**
Revenue Total	**(35,929)**	**(5,289)**	**(14,325)**	**(14,770)**	**(19,059)**	**0**	**0**	**(89,372)**
Expenses								
Salary and Wages	9,623	149	8,058	8,428	7,860			**34,118**
Non Salary Benefits	1,888	24	2,212	2,504	2,142			**8,771**
Faculty Pool Costs	11,145	1,900						**13,045**
Travel	63	199	9	11	9			**291**
Operating	14,351	3,016	5,943	4,134	10,279			**37,723**
Internal Recoveries	(1,142)	0	(1,897)	(307)	(1,231)			**(4,577)**
Expenses Total	**35,929**	**5,289**	**14,325**	**14,770**	**19,059**	**0**	**0**	**89,372**
Grand Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
2020/21 Budget	**38,142**	**5,292**	**7,774**	**5,837**	**13,434**	**(4,379)**	**0**	**66,100**
Change in Carry Forward (Budget - OMAFRA Agreement)	**2,356**	**3**	**2,043**	**(512)**	**73**	**(4,379)**	**0**	**(416)**
Carry Forward into 2020/21	**18,706**	**4**	**3,127**	**1,543**	**418**	**15,454**	**0**	**39,252**
Carry Forward into 2021/22	**21,063**	**7**	**5,170**	**1,030**	**491**	**11,075**	**0**	**38,837**

Table 2.6 illustrates the results (net expenses) by program for 2020/21 compared to budget. Figure 2.3 shows the net expenses in a visual format. It does not include the General & Inflation Reserve or the Exigency Fund (Recognized).

Table 2.6 Net Expenses by Program for 2020/21 (in thousands of dollars)

Program Schedule	2020/21 Results	2020/21 Budget	Variance	% Variance >5%
Research Program	35,786	38,142	2,356	6%
Veterinary Capacity Program	5,289	5,292	3	
Animal Health Laboratory	5,731	7,774	2,043	26%
Agriculture and Food Laboratory	6,349	5,837	(512)	-9%
Property Management	13,361	13,434	73	
General & Inflation Reserve	0	(4,379)	(4,379)	
Exigency Fund (Recognized)	0	0	0	
Grand Total	**66,516**	**66,100**	**(416)**	

Figure 2.3: Agreement Net Expenses by Program for 2020/21 (in thousands of dollars)



2.3 Program Financial Summaries

The program financial summaries are presented in the five subsections below. They include an analysis of the significant variances against budget, as well as a description of any surpluses or shortfalls.

2.3.1 Research Program

The Research Program summary is presented in Table 2.7. The 2020/21 results of $35,786K were $2,356K less than the 2020/21 budget of $38,142K, a variance of 6%. This positive variance was largely related to the Research Project Operating program activity, which was 22% under budget. While a portion of this was attributed to the way call-based programs operate (balance between the commitments and the drawdowns), much of the variance was due to research delays/slowdowns because of COVID-19. As these funds are committed to researchers, it is expected that they will be spent as the projects ramp back up, post-COVID.

Revenue had a positive variance of $96K. In Sales, this variance was related to testing services at the Ridgetown Campus in the Research Support program activity. In Other Revenue, the variance was due to an increased number of external recoveries for student labour in the Research Project Operating program activity. Both vary widely from year to year, so are difficult to budget for.

Salary and Wages were $852K or 8% under budget. This was related to delayed expenditures in the Tier I and Special Initiatives programs, as some research projects were paused/slowed due to the COVID-19 pandemic. Non Salary Benefits were also 6% under budget which related to the under expenditure in Salary and Wages. Travel costs were 87% under budget. Travel was reduced in a number of ways due to the COVID-19 pandemic. Many Knowledge Translation and Transfer (KTT) events, industry meetings and academic conferences were converted to virtual, no longer requiring faculty members to attend them in person, reducing travel costs. In addition, the University did not host as many KTT events as normal, limiting hospitality costs as well. Also, the number/frequency of trips made by research teams to either the Research Centres or to offsite field sites (e.g., cooperator farms) were also reduced due to COVID-19 protocols. It is anticipated that researchers will have modified their project plans to delay travel to future years or shifted expenditures to avoid the need to travel. Internal recoveries were $529K over budget, a positive variance of 86%. This is mainly due to the HQP Scholarship Program and the additional support provided from Food from Thought, as well as increased testing revenue (internal clients) at the Ridgetown Campus.

Table 2.7: 2020/21 Research Program Financial Summary (in thousands of dollars)

Standard Accounts	2020/21 Results	2020/21 Budget	Variance	% Variance >5%
Revenue				
Sales Goods and Services	(111)	(30)	81	270%
Other Revenue	(32)	(17)	15	84%
Revenue Total	**(143)**	**(47)**	**96**	**202%**
Expenses				
Salary and Wages	9,623	10,475	852	8%
Non Salary Benefits	1,888	2,018	129	6%
Faculty Pool Costs	11,145	11,145	0	
Travel	63	486	422	87%
Operating	14,351	14,679	328	
Internal Recoveries	(1,142)	(613)	529	86%
Expenses Total	**35,929**	**38,189**	**2,261**	**6%**
Grand Total	**35,786**	**38,142**	**2,356**	**6%**

Carry Forward into 2020/21	18,706
Carry Forward into 2021/22	21,063

Table 2.8 provides the 2020/21 results for the program activities in the Research Program, as well as the related carry forwards.

Table 2.8: 2020/21 Results for the Program Activities in the Research Program (in thousands of dollars)

Standard Accounts	Research Faculty	Research Support	HQP Scholarship Program	Research Project Operating	Research Innovation Office	Gryphon's LAAIR	KTT Program	Indirect Costs	Total
Revenue									
Sales Goods and Services	0	(111)	0	0	0	0	0	0	**(111)**
Other Revenue	0	(13)	0	(18)	0	0	0	0	**(32)**
Revenue Total	**0**	**(124)**	**0**	**(18)**	**0**	**0**	**0**	**0**	**(143)**
Expenses									
Salary and Wages	0	5,221	0	3,878	202	98	224	0	**9,623**
Non Salary Benefits	0	1,498	0	320	34	7	29	0	**1,888**
Faculty Pool Costs	11,145	0	0	0	0	0	0	0	**11,145**
Travel	0	4	0	53	0	3	3	0	**63**
Operating	0	981	804	1,734	13	188	131	10,500	**14,351**
Internal Recoveries	0	(557)	(540)	(32)	0	(9)	(4)	0	**(1,142)**
Expenses Total	**11,145**	**7,147**	**263**	**5,954**	**249**	**288**	**383**	**10,500**	**35,929**
Grand Total	**11,145**	**7,023**	**263**	**5,935**	**249**	**288**	**383**	**10,500**	**35,786**
2020/21 Budget	**11,145**	**7,479**	**250**	**7,618**	**250**	**400**	**500**	**10,500**	**38,142**
Variance	**0**	**456**	**(13)**	**1,683**	**1**	**112**	**117**	**0**	**2,356**
Carry Forward into 2020/21	**0**	**3,096**	**257**	**14,413**	**0**	**335**	**606**	**0**	**18,706**
Carry Forward into 2021/22	**0**	**3,552**	**244**	**16,095**	**1**	**447**	**723**	**0**	**21,063**

The opening carry forward for the Research Program was $18,706K. The closing carry forward for 2020/21 was $21,063K. More details about the program activity carry forwards can be found in Section 2.5.

2.3.1.1 Components of the Research Project Operating Program Activity

Table 2.9 provides the breakdown of the components of the Research Project Operating program activity, as well as the related carry forwards.

Table 2.9: 2020/21 Results for the Components of the Research Project Operating Program Activity
(in thousands of dollars)

Standard Accounts	Research Project Operating - Tier I	Research Project Operating - Special Initiatives	Research Project Operating - USEL	Research Project Operating - Total
Revenue				
Sales Goods and Services	0	0	0	0
Other Revenue	(18)	0	0	(18)
Revenue Total	**(18)**	**0**	**0**	**(18)**
Expenses				
Salary and Wages	3,267	539	73	3,878
Non Salary Benefits	239	75	7	320
Faculty Pool Costs	0	0	0	0
Travel	49	2	1	53
Operating	1,965	(230)	0	1,734
Internal Recoveries	(32)	0	0	(32)
Expenses Total	**5,487**	**386**	**81**	**5,954**
Grand Total	**5,468**	**386**	**81**	**5,935**
2020/21 Budget	**7,073**	**453**	**92**	**7,618**
Variance	**1,605**	**67**	**11**	**1,683**
Carry Forward into 2020/21	**11,062**	**3,349**	**1**	**14,413**
Carry Forward into 2021/22	**12,667**	**3,417**	**12**	**16,095**

2.3.1.2 Components of the Research Support Program Activity

Table 2.10 provides the breakdown of the components of the Research Support program activity, as well as the related carry forwards.

Table 2.10: 2020/21 Results for the Components of the Research Support Program Activity
(in thousands of dollars)

Standard Accounts	Research Support - General	Research Support - Long Term Trials	Research Support - Total
Revenue			
Sales Goods and Services	(111)	0	(111)
Other Revenue	(13)	0	(13)
Revenue Total	**(124)**	**0**	**(124)**
Expenses			
Salary and Wages	5,157	65	5,221
Non Salary Benefits	1,493	4	1,498
Faculty Pool Costs	0	0	0
Travel	3	1	4
Operating	865	116	981
Internal Recoveries	(550)	(7)	(557)
Expenses Total	**6,968**	**179**	**7,147**
Grand Total	**6,844**	**179**	**7,023**
2020/21 Budget	**7,279**	**200**	**7,479**
Variance	**435**	**21**	**456**
Carry Forward into 2020/21	**3,085**	**11**	**3,096**
Carry Forward into 2021/22	**3,520**	**32**	**3,552**

2.3.2 Veterinary Capacity Program

The Veterinary Capacity Program (VCP) financial summary is presented in Table 2.11. The 2020/21 results of $5,289K were slightly less than the 2020/21 budget, with a few minor variances by category. There was a slight variance of $17K in the Salary and Wages category, which was related to the delayed hiring of a staff member in the Centre for Public Health and Zoonosis (CPHAZ) due to COVID-19. The vacancy savings were redirected to fund the purchase of replacement equipment components to support zoonotic disease modelling and food safety and security.

Table 2.11: 2020/21 Veterinary Capacity Program Financial Summary
(in thousands of dollars)

Standard Accounts	2020/21 Results	2020/21 Budget	Variance	% Variance >5%
Expenses				
Salary and Wages	149	167	17	10%
Non Salary Benefits	24	28	4	
Faculty Pool Costs	1,900	1,900	0	
Travel	199	198	(2)	
Operating	3,016	2,999	(17)	
Internal Recoveries	0	0	0	
Expenses Total	**5,289**	**5,292**	**3**	
Grand Total	**5,289**	**5,292**	**3**	

Carry Forward into 2020/21	4
Carry Forward into 2021/22	7

Table 2.12 provides the 2020/21 results for the program activities in the Veterinary Capacity Program, as well as the related carry forwards. The opening carry forward for VCP was $4K. The closing carry forward for 2020/21 was $7K.

Table 2.12: 2020/21 Results for the Program Activities in the Veterinary Capacity Program
(in thousands of dollars)

Standard Accounts	VCP HSC Staff, Veterinarians, Operations	VCP Faculty	VCP Externships; Summer Student Experience Placements	VCP Internships; Residency Programs	VCP Doctoral Programs	Total
Expenses						
Salary and Wages	117	0	0	32	0	**149**
Non Salary Benefits	19	0	0	5	0	**24**
Faculty Pool Costs	0	1,900	0	0	0	**1,900**
Travel	0	0	199	0	0	**199**
Operating	2,388	0	0	133	495	**3,016**
Internal Recoveries	0	0	0	0	0	**0**
Expenses Total	**2,525**	**1,900**	**199**	**170**	**495**	**5,289**
Grand Total	**2,525**	**1,900**	**199**	**170**	**495**	**5,289**
2020/21 Budget	**2,532**	**1,900**	**195**	**170**	**495**	**5,292**
Variance	**7**	**0**	**(4)**	**0**	**0**	**3**
Carry Forward into 2020/21	**0**	**0**	**4**	**(0)**	**0**	**4**
Carry Forward into 2021/22	**7**	**0**	**0**	**0**	**0**	**7**

2.3.2.1 Transfers to the OVC Health Sciences Centre

Table 2.13 provides a breakdown of the transfers to the Ontario Veterinary College (OVC) Health Sciences Centre (HSC) by resource type. The transfers make up a significant portion of the Operating costs in the VCP HSC Staff, Veterinarians, Operations program activity.

Table 2.13: 2020/21 Transfers to the Ontario Veterinary College Health Sciences Centre (OVC-HSC)

Resource	FTE	Total (in thousands of dollars)
Veterinarians	**1.00**	**155**
Large Animal Medicine Clinic - Ruminant Service	1.00	155
Animal Housing Staff	**8.00**	**644**
Large Animal Housing	8.00	644
Technical Staff	**17.00**	**1,438**
Large Animal Medicine Clinic - Ruminant Service	1.00	89
Large Animal Wards	16.00	1,349
Administrative Staff	**1.25**	**109**
Medical Records	0.25	12
Operations & Service Management	1.00	97
Total	**27.25**	**2,346**

2.3.3 Animal Health Laboratory

The Animal Health Laboratory (AHL) financial summary is presented in Table 2.14. The 2020/21 results of $5,731K were $2,043K less than the 2020/21 budget of $7,774K, a variance of 26%.

In AHL, Sales were $1,168K over budget, with a positive variance of 16%. This was primarily related to the continuation of increased testing levels in the Virology laboratory to support the export of swine products. COVID-19 had a minimal impact on external revenues in 2020/21.

Non Salary Benefits were under budget by 6%. This was mainly due to the savings in the Salary and Wages category generated from time lags in filling vacancies. It was also partially due to the utilization of temporary full-time staff, who have a lower benefit rate, to cover absences of the regular incumbents. In addition, Travel expenses were 93% under budget, due to the COVID-19 pandemic. Operating expenses were under budget by 7%. While there are multiple factors at play, this was primarily connected to a recovery of $608K from the Canada Research Continuity Emergency Fund (CRCEF) program which helped to sustain the research enterprise at universities that have been affected by COVID. It also related to savings in Central Administration, the former Bee and Apiary Health Testing program and slower than normal expenditures in OAHN Projects. This was coupled with equipment reinvestment costs of $647K. This included equipment approved in the 2020/21 Business Plan ($463K), as well as two items deferred from 2019/20 ($184K). Finally, Internal Recoveries were $187K short of the budget. This was due to the reduction of research activities at the University and healthcare activities in OVC-HSC, because of the COVID-19 pandemic.

Table 2.14: 2020/21 Animal Health Laboratory Financial Summary (in thousands of dollars)

Standard Accounts	2020/21 Results	2020/21 Budget	Variance	% Variance >5%
Revenue				
OMAFRA Other	0	0	0	
Sales Goods and Services	(8,593)	(7,425)	1,168	16%
Other Revenue	(1)	(2)	(1)	
Revenue Total	**(8,594)**	**(7,427)**	**1,167**	**16%**
Expenses				
Salary and Wages	8,058	8,461	403	
Non Salary Benefits	2,212	2,342	130	6%
Travel	9	122	113	93%
Operating	5,943	6,360	417	7%
Internal Recoveries	(1,897)	(2,084)	(187)	-9%
Expenses Total	**14,325**	**15,201**	**876**	**6%**
Grand Total	**5,731**	**7,774**	**2,043**	**26%**

Carry Forward into 2020/21	3,127
Carry Forward into 2021/22	5,170

Table 2.15 delivers the 2020/21 Results for the program activities in the Animal Health Laboratory, as well as the related carry forwards.

Table 2.15: 2020/21 Results for the Program Activities in the Animal Health Laboratory (in thousands of dollars)

Standard Accounts	AHL Testing/Programs	Bee and Apiary Health Testing	AHL LSD Central Administration	OAHN Operations	OAHN Projects	Total
Revenue						
OMAFRA Other	0	0	0	0	0	**0**
Sales Goods and Services	(8,593)	0	0	0	0	**(8,593)**
Other Revenue	0	0	(1)	0	0	**(1)**
Revenue Total	**(8,593)**	**0**	**(1)**	**0**	**0**	**(8,594)**
Expenses						
Salary and Wages	6,769	0	882	408	0	**8,058**
Non Salary Benefits	1,858	0	259	95	0	**2,212**
Travel	7	0	1	1	0	**9**
Operating	5,208	0	559	41	134	**5,943**
Internal Recoveries	(1,896)	0	(1)	0	0	**(1,897)**
Expenses Total	**11,947**	**0**	**1,700**	**544**	**134**	**14,325**
Grand Total	**3,354**	**0**	**1,699**	**544**	**134**	**5,731**
2020/21 Budget	**5,083**	**0**	**1,804**	**637**	**250**	**7,774**
Variance	**1,729**	**0**	**105**	**93**	**116**	**2,043**
Carry Forward into 2020/21	**2,657**	**0**	**0**	**187**	**282**	**3,127**
Carry Forward into 2021/22	**4,386**	**0**	**105**	**281**	**398**	**5,170**

The opening carry forward for AHL was $3,127K. The closing carry forward for 2020/21 was $5,170K. The AHL LSD Central Administration carry forward will be consolidated to AHL Testing/Programs for the start of 2021/22. The funds in AHL Testing/Programs will be used to support future equipment purchases.

2.3.3.1 OAHN Projects

Table 2.16 provides the details for the OAHN Projects program activity. This program activity functions similarly to the project-based activities in the Research Program. Awards are provided to investigators to aid in the completion of a surveillance project throughout the year. Expenditures are made against the project, and they may or may not occur in the same fiscal year as the award.

The budget for OAHN Projects was $250K in 2020/21. There were 12 projects awarded with a total value of $185K. The remaining $65K will be carried forward to future years.

With respect to 2019/20 OAHN Projects, of the 14 projects awarded, six projects have been completed with eight projects remaining active. For the 2018/19 OAHN Projects, of the 15 projects awarded, 13 projects have been completed with two projects still underway.

In total, there are $131K in unallocated funds in this program activity. They will be used to offset the reductions incurred through the multi-year scenario planning process.

Table 2.16: 2020/21 OAHN Projects Program Details (in thousands of dollars)

	Previous Results	2020/21 Results	Balance in Project Accounts	Committed to Future Years	Total	Number of Projects Awarded	Number of Projects Completed
2020/21 Projects	**0**	**59**	**126**	**65**	**250**	**12**	**0**
OAHN Projects		59	126	0	**185**	12	0
Unallocated				65	**65**		
2019/20 Projects	**68**	**60**	**107**	**25**	**261**	**14**	**6**
OAHN Projects	68	60	107	0	**235**	14	6
Unallocated				25	**25**		
2018/19 Projects	**166**	**15**	**34**	**41**	**256**	**15**	**13**
OAHN Projects	166	15	34	0	**215**	15	13
Unallocated				41	**41**		
Total	**234**	**134**	**267**	**131**	**766**	**41**	**19**

2.3.4 Agriculture and Food Laboratory

The Agriculture and Food Laboratory (AFL) summary is presented in Table 2.17. The 2020/21 results of $6,349K were $512K more than the 2020/21 budget of $5,837K, a negative variance of 9%.

AFL fell $1,067K short of their revenue target. This shortfall was attributed to COVID-19 which reduced testing levels. The greatest variances were seen in the Soil and Nutrient Lab (down 47%), Chemistry (down 21%) and Food Microbiology (down 15%).

Lower sample numbers translated into less efficient batch sizes, generally requiring the same number of staff to run the tests, which limited the potential for savings in Salary and Wages. Non Salary Benefits were under budget by 6%, due to the utilization of temporary full-time staff to cover absences of the regular incumbents, which have a lower benefit rate, as well as small savings in the Salary and Wages category. Travel expenses were 86% under budget due to the COVID-19 pandemic. Operating expenses were $482K or 10% under budget. This related to cost savings due to reduced testing, savings of $289K in the Central Administration program activity and a recovery of $628K from the Canada Research Continuity Emergency Fund (CRCEF) program. This was coupled with equipment reinvestment costs of $921K ($500K is part of the budget (OMAFRA CAPEX program), so only $421K impacted the variance). The $921K included $753K approved as part of the 2020/21 Business Plan, $36K for an emergency replacement of an analytical balance and $132K for cannabis testing equipment approved by the AFL PMC on June 4, 2020. Finally, Internal Recoveries had a negative variance of 41%. As with AHL, the reduction/slowdown of research activities at the University, due to the COVID-19 pandemic, had a negative impact on Internal Recoveries.

Table 2.17: 2020/21 Agriculture and Food Laboratory Financial Summary (in thousands of dollars)

Standard Accounts	2020/21 Results	2020/21 Budget	Variance	% Variance >5%
Revenue				
OMAFRA Other	(500)	(500)	0	
Sales Goods and Services	(7,917)	(8,983)	(1,067)	-12%
Other Revenue	(4)	(6)	(2)	
Revenue Total	**(8,420)**	**(9,489)**	**(1,069)**	**-11%**
Expenses				
Salary and Wages	8,428	8,491	63	
Non Salary Benefits	2,504	2,660	157	6%
Travel	11	77	66	86%
Operating	4,134	4,616	482	10%
Internal Recoveries	(307)	(518)	(211)	-41%
Expenses Total	**14,770**	**15,326**	**556**	
Grand Total	**6,349**	**5,837**	**(512)**	**-9%**

Carry Forward into 2020/21	1,543
Carry Forward into 2021/22	1,030

Table 2.18 provides the 2020/21 Results for the program activities in the Agriculture and Food Laboratory, as well as the related carry forwards.

Table 2.18: 2020/21 Results for the Program Activities in the Agriculture and Food Laboratory (in thousands of dollars)

Standard Accounts	AFL Program Testing/Programs	AFL LSD Central Administration	Total
Revenue			
OMAFRA Other	(500)	0	**(500)**
Sales Goods and Services	(7,871)	(45)	**(7,917)**
Other Revenue	0	(4)	**(4)**
Revenue Total	**(8,371)**	**(49)**	**(8,420)**
Expenses			
Salary and Wages	7,034	1,394	**8,428**
Non Salary Benefits	2,090	414	**2,504**
Travel	7	4	**11**
Operating	3,561	573	**4,134**
Internal Recoveries	(303)	(4)	**(307)**
Expenses Total	**12,389**	**2,381**	**14,770**
Grand Total	**4,018**	**2,331**	**6,349**
2020/21 Budget	**3,130**	**2,708**	**5,837**
Variance	**(889)**	**376**	**(512)**
Carry Forward into 2020/21	**1,543**	**0**	**1,543**
Carry Forward into 2021/22	**654**	**376**	**1,030**

The opening carry forward for AFL was $1,543K. The closing carry forward for 2020/21 was $1,030K. The AFL LSD Central Administration carry forward will be consolidated to AFL Testing/Programs for the 2021/22 year. These funds are committed to future equipment purchases. They will also help to offset operational deficits related to any ongoing impacts of the COVID-19 pandemic.

2.3.4.1 Third-Party Revenue

Table 2.19 illustrates the amount and percentage of revenue generated by source on an annual basis in the Agriculture and Food Laboratory. In 2020/21, 56.9% of AFL's revenue came from third-party testing contracts, which compares to 56.2% in 2019/20.

Table 2.19: 2020/21 Revenue Generated by Source in AFL (in thousands of dollars)

	Revenue	Percentage
Revenue from the OMAFRA Agreement (shown as budget)	5,837	42.4%
Testing for OMAFRA outside of the Agreement	84	0.6%
Third-Party Testing Contracts	7,832	56.9%
Total	**13,754**	

2.3.5 Property Management Program

The Property Management program summary is presented in Table 2.20. The original 2020/21 Property Management schedule budget was $13,134K. The net budget was increased to $13,434K for 2020/21 to account for the delayed sale of the main campus portion of the Alfred Property. The 2020/21 results of $13,361K were $73K under the revised 2020/21 budget.

Sales were 7% over budget. This was related to stronger than expected sales of crops, milk, and animals, across many of the Research Centres. Other Revenue was 12% over budget. This was due to external student labour recoveries, as well as other miscellaneous revenue which is difficult to budget for.

Travel was 66% under budget due to the COVID-19 pandemic. Finally, Internal Recoveries were 16% over budget. This was due to higher than expected labour recoveries, including recovery of a salary line due to a union leave.

Table 2.20: 2020/21 Property Management Program Financial Summary (in thousands of dollars)

Standard Accounts	2020/21 Results	2020/21 Budget	Variance	% Variance >5%
Revenue				
Sales Goods and Services	(4,669)	(4,376)	294	7%
Other Revenue	(1,029)	(919)	111	12%
Revenue Total	**(5,698)**	**(5,294)**	**404**	**8%**
Expenses				
Salary and Wages	7,860	7,708	(152)	
Non Salary Benefits	2,142	2,203	61	
Travel	9	27	18	66%
Operating	10,279	9,852	(426)	
Internal Recoveries	(1,231)	(1,063)	168	16%
Expenses Total	**19,059**	**18,728**	**(331)**	
Grand Total	**13,361**	**13,434**	**73**	

Carry Forward into 2020/21	418
Carry Forward into 2021/22	491

Table 2.21 delivers the 2020/21 results for the program activities in the Property Management program, as well as the related carry forwards.

Table 2.21: 2020/21 Results for Program Activities in the Property Management Program
(in thousands of dollars)

Standard Accounts	Operations and Maintenance	Personnel and Operating	Vineland Employees	Vineland Operations and Maintenance	Total
Revenue					
Sales Goods and Services	0	(4,669)	0	0	**(4,669)**
Other Revenue	(832)	(197)	0	0	**(1,029)**
Revenue Total	**(832)**	**(4,867)**	**0**	**0**	**(5,698)**
Expenses					
Salary and Wages	744	6,837	279	0	**7,860**
Non Salary Benefits	206	1,848	89	0	**2,142**
Travel	1	9	0	0	**9**
Operating	4,856	4,631	8	783	**10,279**
Internal Recoveries	(243)	(982)	(6)	(0)	**(1,231)**
Expenses Total	**5,563**	**12,343**	**370**	**782**	**19,059**
Grand Total	**4,732**	**7,476**	**370**	**782**	**13,361**
2020/21 Budget	**4,913**	**7,354**	**361**	**807**	**13,434**
Variance	**181**	**(123)**	**(9)**	**24**	**73**
Carry Forward into 2020/21	**(133)**	**544**	**12**	**(4)**	**418**
Carry Forward into 2021/22	**48**	**421**	**2**	**20**	**491**

The opening carry forward related to Property Management was $418K. The closing carry forward for 2020/21 was $491K.

2.3.5.1 Revenues and Expenditures by ARIO Property

Table 2.22 provides the annual financial breakdown of the total revenues and expenditures for each of the ARIO Properties – Research Centres. A discussion follows for the Research Centres that had a variance of more than 5% of the 2020/21 expenses and greater than $15K.

Table 2.22: 2020/21 Financial Breakdown by ARIO Property – Research Centres (in thousands of dollars)

Research Centres	2020/21 Expenses	2020/21 Revenue	2020/21 Results	2020/21 Budget	2020/21 Balance
Alma	**741**	**(93)**	**648**	**624**	**(24)**
Ontario Aquaculture Research Centre	741	(93)	648	624	**(24)**
Arkell	**2,099**	**(207)**	**1,891**	**1,937**	**46**
Equine Research Facility	297	(0)	296	282	**(14)**
Feed Mill Facility	74	0	74	72	**(2)**
Ontario Poultry Research Centre	660	(207)	453	490	**37**
Swine Research Facility	1,067	0	1,067	1,093	**25**
Bradford	**328**	**(25)**	**303**	**287**	**(16)**
Ontario Crops Research Centre	328	(25)	303	287	**(16)**

Research Centres	2020/21 Expenses	2020/21 Revenue	2020/21 Results	2020/21 Budget	2020/21 Balance
Cedar Springs	**50**	**0**	**50**	**46**	**(4)**
Ontario Crops Research Centre	50	0	50	46	**(4)**
Elora	**3,934**	**(1,918)**	**2,016**	**2,001**	**(16)**
Ontario Beef Research Centre	907	(8)	899	917	**18**
Ontario Crops Research Centre	341	0	341	367	**25**
Ontario Dairy Research Centre	2,685	(1,910)	776	717	**(59)**
Emo	**51**	**(13)**	**38**	**43**	**5**
Ontario Crops Research Centre	51	(13)	38	43	**5**
Guelph	**366**	**(11)**	**356**	**278**	**(78)**
Guelph Research Station	366	(11)	356	278	**(78)**
Huron	**102**	**(78)**	**24**	**54**	**30**
Ontario Crops Research Centre	102	(78)	24	54	**30**
New Liskeard	**1,167**	**(270)**	**896**	**916**	**19**
General	559	(0)	558	579	**21**
Ontario Beef Research Centre	495	(180)	315	303	**(12)**
Ontario Crops Research Centre	113	(90)	23	33	**10**
Ponsonby	**531**	**0**	**531**	**526**	**(5)**
General Animal Facility	221	0	221	228	**6**
Ontario Sheep Research Centre	310	0	310	299	**(11)**
Research Station Operations	**2,512**	**(408)**	**2,103**	**1,990**	**(113)**
Ridgetown	**2,231**	**(540)**	**1,691**	**1,800**	**109**
Beef Facility	19	(32)	(12)	(5)	**8**
Dairy Facility	402	(341)	62	2	**(59)**
General	1,773	(168)	1,606	1,772	**167**
Swine Facility	36	0	36	31	**(5)**
Simcoe	**912**	**(83)**	**829**	**742**	**(87)**
Ontario Crops Research Centre	912	(83)	829	742	**(87)**
University	**648**	**(87)**	**561**	**493**	**(68)**
Growth Facilities	296	(87)	209	188	**(21)**
Isolation Unit	352	0	352	305	**(46)**
Winchester	**346**	**(135)**	**211**	**203**	**(8)**
Ontario Crops Research Centre	346	(135)	211	203	**(8)**
Woodstock	**213**	**(120)**	**93**	**105**	**12**
Ontario Crops Research Centre	213	(120)	93	105	**12**
Total Research Centres	**16,231**	**(3,989)**	**12,242**	**12,046**	**(195)**

The Ontario Poultry Research Centre - Arkell had a surplus of $37K, with a positive variance of 6%. This was due to a combination of higher than expected Sales, coupled with stronger than budgeted Internal Recoveries (research centre fees). These budgets will be adjusted upwards in 2021/22 to account for the strong performance.

The Ontario Crops Research Centre - Elora had a surplus of $25K, with a positive variance of 8%. This is due to higher than expected research centre fee recoveries, coupled with operating savings, specifically in utilities.

The Guelph Research Station was over budget by $78K, with a negative variance of 21%. The majority of this was related to costs of establishing and operating the new turfgrass site in addition to the original site. The extraordinary costs are expected to drop substantially in 2021/22.

The Ontario Crops Research Centre - Huron had a surplus of $30K, with a positive variance of 30%. This was due to higher than expected crops sales.

The Ridgetown Dairy Facility had a deficit of $59K, with a negative variance of 15%. This was on a $2K budget with gross expenditures of $502K. The variance was related to higher than expected feed and supply costs, as well as some unexpected equipment repair/replacement costs. The University continues to make changes to address the deficit in the Ridgetown Dairy Facility, however it continues to be a challenge with its current allocation and structure.

Ridgetown General had a surplus of $167K, with a positive variance of 9%. This was a significant change from the 2019/20 deficit of $103K. This item includes both the Farm, as well as the Operations and Maintenance (O&M) costs of the Ridgetown Campus. Most of the surplus related to savings in O&M costs that occurred on Campus, due to COVID-19. For instance, utilities were down $92K in 2020/21 compared with 2019/20 values and repairs and maintenance costs were down $56K. These savings are not expected to occur in 2021/22.

The Ontario Crops Research Centre - Simcoe had a deficit of $87K, with a negative variance of 10%. This deficit was fully in the Operations and Maintenance (O&M) program activity. There was a $38K increase in hydro costs compared to the previous year, related to the facility changes. This will be an ongoing cost of operating, so the budget will need to be adjusted. Also, there continued to be significant budget overruns in the maintenance and repairs area. The University is working closely with the Research Centre Manager to address these challenges.

The University Growth Facilities had a deficit of $21K, with a negative variance of 7%. This was predominately due to investments in upgrades to equipment reaching end of life, as noted in Table 2.47. These upgrades were funded from previous carry forwards generated by the facilities.

Finally, the University Isolation Unit had a deficit of $46K, with a negative variance of 13%. The deficit was a result of lower recoveries, coupled with higher staffing and operating costs. This was due, in part, to the COVID-19 pandemic. The deficit was funded from previous carry forwards generated by the Isolation Unit. The University is working closely with the Central Animal Facility Manager to “right size” the staffing required by the unit and to ensure that it has appropriate budgets for the future.

Table 2.23 shows the revenues and expenditures directly related to ARIO and University Tenants.

Table 2.23: 2020/21 Financial Breakdown by Tenants (in thousands of dollars)

Tenant Type	2020/21 Expenses	2020/21 Revenue	2020/21 Results	2020/21 Budget	2020/21 Balance
Tenants - ARIO					
Alfred	**317**	**(22)**	**295**	**300**	**5**
Elora/Arkell	**8**	**(6)**	**2**	**0**	**(2)**
Guelph	**6**	**(7)**	**(1)**	**0**	**1**
Kemptville	**132**	**(139)**	**(7)**	**0**	**7**
New Liskeard	**376**	**(421)**	**(45)**	**0**	**45**
Education Centre	315	(368)	(53)	0	53
OPP	61	(53)	8	0	(8)
Ridgetown	**17**	**(19)**	**(2)**	**0**	**2**
Simcoe	**24**	**(22)**	**3**	**0**	**(3)**
Vineland	**6**	**(9)**	**(3)**	**0**	**3**
Total Tenants - ARIO	**886**	**(646)**	**240**	**300**	**60**
Tenants - University					
New Liskeard	5	(3)	3	0	(3)
Research Station Operations	38	(46)	(8)	0	8
Ridgetown	9	(25)	(16)	0	16
Total Tenants - University	**52**	**(74)**	**(21)**	**0**	**21**
Total Tenants	**938**	**(719)**	**219**	**300**	**81**

Finally, Table 2.24 delivers a summary by property type, including Vineland, which corresponds to the overall financial summary for the Property Management program.

Table 2.24: 2020/21 Financial Breakdown by Property Type (in thousands of dollars)

Property Type	2020/21 Expenses	2020/21 Revenue	2020/21 Results	2020/21 Budget	2020/21 Balance
Research Centres	16,231	(3,989)	12,242	12,046	(195)
Tenants - ARIO	886	(646)	240	300	60
Tenants - University	52	(74)	(21)	0	21
Vineland	1,153	0	1,153	1,167	15
Other[2]	737	(990)	(252)	(80)	172
Total	**19,059**	**(5,698)**	**13,361**	**13,434**	**73**

[2] Other includes the Livestock Research Fund (LRF), the Veterinary Field Services account and all other central management accounts.

2.3.5.2 ARIO Properties Revenue

Table 2.25 provides a report on all revenues and recoveries resulting from the activities of the ARIO Properties, including the sales of farm products, rental revenues, and recoveries for research centre usage. It is presented by year over a five-year period.

Table 2.25: Research Centre Revenues and Recoveries by Year (in thousands of dollars)

	2016/17	2017/18	2018/19	2019/20	2020/21
Revenues (External)	**4,787**	**6,199**	**5,965**	**5,465**	**5,698**
Sales of Animals, Farm Products	3,634	4,777	4,600	4,266	4,669
Miscellaneous	70	102	183	215	192
Facility Rentals	1,084	1,319	1,182	985	837
Recoveries (Internal)	**808**	**786**	**893**	**963**	**758**
Sales (net) of Animals, Farm Products	239	40	151	202	101
Research Centre Fees	289	549	417	426	406
Facility Usage (net)	280	197	325	334	251
Total	**5,596**	**6,985**	**6,858**	**6,428**	**6,457**

There are two notable elements in the 2020/21 values. Internal Sales of Animals, Farm Products were down significantly from the year before, due to the COVID-19-related closure of the Meat Science Laboratory. Animals were still sold, but as external revenue instead. External Facility Rentals have continued to decrease year over year. This trend will continue in the future as more of the ARIO Properties are disposed of fully (e.g., Kemptville Farm, Alfred Campus, New Liskeard, etc.).

Table 2.26 provides the summarized revenues and recoveries by property type for 2020/21. In addition, Table 2.27 illustrates the revenues and recoveries by type for each of the Research Centres.

Table 2.26: 2020/21 Revenues and Recoveries by Property Type (in thousands of dollars)

Property Type	Sales	Misc.	Facility Rentals	Total Revenues (External)	Sales (net)	Res. Centre Fees	Facility Usage (net)	Total Recoveries (Internal)	Grand Total
Research Centres	3,791	81	118	**3,989**	47	406	251	**704**	**4,693**
Tenants - ARIO	0	0	646	**646**	0	0	0	**0**	**646**
Tenants – Univ.	0	0	74	**74**	0	0	0	**0**	**74**
Other	878	112	0	**990**	54	0	0	**54**	**1,044**
Total	**4,669**	**192**	**837**	**5,698**	**101**	**406**	**251**	**758**	**6,457**

Table 2.27: 2020/21 Revenue and Recoveries for the Research Centres (in thousands of dollars)

Research Centres	Sales	Misc.	Facility Rentals	Total Revenues (External)	Sales (net)	Research Centre Fees	Facility Usage (net)	Total Recoveries (Internal)	Grand Total
Alma	**78**	**15**	**0**	**93**	**0**	**3**	**0**	**3**	**97**
Ontario Aquaculture Research Centre	78	15	0	**93**	0	3	0	**3**	**97**
Arkell	**207**	**0**	**0**	**207**	**11**	**172**	**0**	**182**	**390**
Equine Research Facility	0	0	0	**0**	0	9	0	**9**	**9**
Ontario Poultry Research Centre	207	0	0	**207**	3	137	0	**140**	**347**
Swine Research Facility	0	0	0	**0**	8	25	0	**34**	**34**
Bradford	**17**	**9**	**0**	**25**	**0**	**7**	**0**	**7**	**32**
Ontario Crops Research Centre	17	9	0	**25**	0	7	0	**7**	**32**
Elora	**1,910**	**8**	**0**	**1,918**	**11**	**124**	**0**	**135**	**2,052**
Ontario Beef Research Centre	0	8	0	**8**	11	34	0	**45**	**53**
Ontario Crops Research Centre	0	0	0	**0**	0	31	0	**31**	**31**
Ontario Dairy Research Centre	1,910	0	0	**1,910**	0	58	0	**58**	**1,968**
Emo	**0**	**13**	**0**	**13**	**0**	**0**	**0**	**0**	**13**
Ontario Crops Research Centre	0	13	0	**13**	0	0	0	**0**	**13**
Guelph	**0**	**11**	**0**	**11**	**0**	**3**	**0**	**3**	**14**
Guelph Research Station	0	11	0	**11**	0	3	0	**3**	**14**
Huron	**61**	**1**	**16**	**78**	**0**	**0**	**0**	**0**	**78**
Ontario Crops Research Centre	61	1	16	**78**	0	0	0	**0**	**78**
New Liskeard	**259**	**11**	**0**	**270**	**0**	**19**	**0**	**19**	**289**
General	0	0	0	**0**	0	0	0	**0**	**0**
Ontario Beef Research Centre	173	7	0	**180**	0	19	0	**19**	**199**
Ontario Crops Research Centre	86	4	0	**90**	0	0	0	**0**	**90**
Ponsonby	**0**	**0**	**0**	**0**	**0**	**15**	**0**	**15**	**15**
General Animal Facility	0	0	0	**0**	0	9	0	**9**	**9**
Ontario Sheep Research Centre	0	0	0	**0**	0	5	0	**5**	**5**
Research Station Operations	408	0	0	**408**	25	7	0	**32**	**440**
Ridgetown	**536**	**4**	**0**	**540**	**0**	**16**	**0**	**16**	**556**
Beef Facility	32	0	0	**32**	0	0	0	**0**	**32**
Dairy Facility	337	4	0	**341**	0	0	0	**0**	**341**

Research Centres	Sales	Misc.	Facility Rentals	Total Revenues (External)	Sales (net)	Research Centre Fees	Facility Usage (net)	Total Recoveries (Internal)	Grand Total
General	167	1	0	**168**	0	16	0	**16**	**183**
Swine Facility	0	0	0	**0**	0	0	0	**0**	**0**
Simcoe	**71**	**0**	**12**	**83**	**0**	**21**	**15**	**36**	**119**
Ontario Crops Research Centre	71	0	12	**83**	0	21	15	**36**	**119**
University	**0**	**0**	**87**	**87**	**0**	**11**	**237**	**248**	**335**
Growth Facilities	0	0	87	**87**	0	0	192	**192**	**279**
Isolation Unit	0	0	0	**0**	0	11	45	**56**	**56**
Winchester	**128**	**7**	**0**	**135**	**0**	**0**	**0**	**0**	**135**
Ontario Crops Research Centre	128	7	0	**135**	0	0	0	**0**	**135**
Woodstock	**117**	**0**	**3**	**120**	**0**	**8**	**0**	**8**	**129**
Ontario Crops Research Centre	117	0	3	**120**	0	8	0	**8**	**129**
Total	**3,791**	**81**	**118**	**3,989**	**47**	**406**	**251**	**704**	**4,693**

2.4 Agreement Fund Balances

2.4.1 Agreement Carry Forward Funds

Table 2.28 shows the Committed and Uncommitted Agreement Carry Forward Funds. On April 30, 2021, there was $27,761K in Committed Carry Forward Funds and $11,075K in Uncommitted Carry Forward Funds, for a total Carry Forward of $38,837K.

Table 2.28: Agreement Carry Forward Funds (in thousands of dollars)

Program	Carry Forward, May 1, 2020	2020/21 Results	Carry Forward, April 30, 2021
Research Program	18,706	2,356	21,063
Veterinary Capacity Program	4	3	7
Animal Health Laboratory	3,127	2,043	5,170
Agriculture and Food Laboratory	1,543	(512)	1,030
Property Management Program	418	73	491
Total Committed Funds	**23,798**	**3,963**	**27,761**
General and Inflation Reserve	15,454	(4,379)	11,075
Exigency Fund (Recognized)	0	0	0
Total Uncommitted Funds	**15,454**	**(4,379)**	**11,075**
Total Agreement Carry Forward Funds	**39,252**	**(416)**	**38,837**

2.4.2 Agreement Account

The University receives and holds quarterly cash advances for the Agreement on the provincial year basis. The cash balances are drawn down, as expenses for each month are processed, net of any program revenues received. The monthly cash balance is then credited with interest, per the Agreement. The amount of cash held is reported in the notes of the Quarterly Financial Reports and in the Audited Financial Statements. The balance in the Agreement Account on April 30, 2021 is $50,760K, as shown in Table 2.29. This is higher than expected, as five quarterly payments were recorded in 2020/21 instead of the typical four, as the year included the first payment for 2021/22. This will correct itself in 2021/22. If the additional payment had not been received during 2020/21, the Agreement Account Balance would have been $34,235K as of April 30, 2021.

Table 2.29 also provides the estimated Agreement Account balances for the next two years, based on the expected budgeted net agreement (as per the 2021/22 Business Plan) and the estimated change in committed carry forward (updated as of April 30, 2021).

Table 2.29: Balance in the Agreement Account (in thousands of dollars)

Fiscal Year	Opening Balance, May 1	Budgeted Advances	Budgeted Net Expenses	Budgeted Net Agreement	Change in Committed Carry Forward	Total Change	Ending Balance, April 30
2018/19 (actual)	35,242	71,300	69,310	1,990	524	2,514	**37,756**
2019/20 (actual)	37,468	66,100	70,317	(4,217)	1,399	(2,818)	**34,651**
2020/21 (actual)	34,651	82,625	70,479	12,146	3,963	16,109	**50,760**
2021/22 (estimated)	50,760	49,575	70,554	(20,979)	(6,342)	(27,321)	**23,439**
2022/23 (estimated)	23,439	66,100	71,318	(5,218)	(2,606)	(7,824)	**15,615**

It is important to note that there is a difference in the total cash balance in the Agreement Account compared to the total carry forward balance, which is a result of the quarterly advances being received for the provincial year (April 1 to March 31) and the approved budget expenditures recorded on the University's fiscal year (May 1 to April 30). The timing difference between the budget carry forward and the cash account typically approximates one month of net budget. If the Agreement were to be terminated, the cash would run out at the provincial year end, one month before the University's fiscal year end, on which these figures are based. For 2020/21, the Agreement Account holds approximately two months more (rather than one month less) of net budget than the carry forward, due to the extra quarterly payment.

Finally, unspent revenue, as per Note 3 of the Audited Financial Statements included in Appendix A, is the sum of the balances in the Agreement Account and the Exigency Fund.

2.4.2.1 Interest Earned on Agreement Account

The University allocates the Agreement interest based on the monthly cash balance in the Agreement Account at the 91 Day Treasury Index Rate. The interest is held in the Exigency Fund which is part of the Uncommitted Central Reserve.

Due to an accounting change in 2019/20, interest is no longer being recognized when it is allocated. Therefore, it does not appear in the Agreement Financial Summary. Instead, it is accrued and reported in a separate account (Exigency Fund). Revenue recognition of the interest will occur when the Executive Committee approves expenditures related to its use.

Table 2.30 summarizes the interest earned for 2020/21, as well as provides an estimate of interest in the future years of the Agreement. COVID-19 impacted interest rates significantly this fiscal year. It is expected that interest rates will slowly begin to increase over the next two years.

Table 2.30: Interest Earned on the Agreement Account (in thousands of dollars)

Fiscal Year	Average Monthly Cash Balance	Average Interest Rate	Interest
2018/19 (actual)	36,499	1.62%	629
2019/20 (actual)	34,297	1.47%	529
2020/21 (actual)	39,813	0.12%	47
2021/22 (estimated)	28,837	0.35%	101
2022/23 (estimated)	19,527	0.60%	117

2.4.3 Uncommitted Central Reserve

The Uncommitted Central Reserve quantifies the total value of uncommitted funds, held centrally, within the overall Agreement. It includes funds held in the General and Inflation Reserve and in the Exigency Fund. Table 2.31 illustrates the balance in the Uncommitted Central Reserve. It is expected that the Uncommitted Central Reserve will fall to $2,478K at the end of 2022/23. This has been reduced by $26K from the estimate in the 2021/22 Business Plan, due to the impact of COVID-19 on interest rates.

Table 2.31: Uncommitted Central Reserve (in thousands of dollars)

Fiscal Year	General and Inflation Reserve, April 30	Exigency Fund, April 30	Total, April 30
2018/19 (actual)	19,670	287	**19,958**
2019/20 (actual)	15,454	810	**16,264**
2020/21 (actual)	11,075	857	**11,932**
2021/22 (estimated)	6,621	958	**7,579**
2022/23 (estimated)	1,403	1,075	**2,478**

2.4.3.1 General and Inflation Reserve

The General and Inflation Reserve is comprised of the uncommitted carry forward funds, predominately accrued over the term of the Previous Agreement, held centrally within the Agreement Account. Currently, the funds are being utilized to cover the deficit between the Annual Maximum Funds and amounts allocated to the Programs.

Table 2.32 provides the balance in the General and Inflation Reserve. With the budgets identified in the 2021/22 Business Plan and assuming no other changes, the General and Inflation Reserve is expected to fall to $1,403K at the end of 2022/23.

Table 2.32: General and Inflation Reserve (in thousands of dollars)

Fiscal Year	Opening Balance, May 1	Budgeted Advances	Budgeted Net Expenses	Budgeted Net Agreement	Ending Balance, April 30
2018/19 (actual)	17,680	71,300	69,310	1,990	**19,670**
2019/20 (actual)	19,670	66,100	70,317	(4,217)	**15,454**
2020/21 (actual)	15,454	66,100	70,479	(4,379)	**11,075**
2021/22 (estimated)	11,075	66,100	70,554	(4,454)	**6,621**
2022/23 (estimated)	6,621	66,100	71,318	(5,218)	**1,403**

2.4.3.2 Exigency Fund

The Exigency Fund is comprised of funds held separately from the Agreement Account, which are the result of investment income earned and accumulated on the average monthly cash balances in the Agreement Account. It is expected to be used for the purposes as directed and approved by the Executive Committee.

Table 2.33 illustrates the balances in the Exigency Fund on April 30, 2021, and beyond. Assuming interest rates act as predicted, including the COVID-19 impacts, the Exigency Fund is anticipated to grow to $1,075K at the end of 2022/23. At this point in time, there are no anticipated or approved expenditures from the Exigency Fund.

Table 2.33: Exigency Fund (in thousands of dollars)

Fiscal Year	Opening Balance, May 1	Interest Allocated	Approved Expenses	Change	Ending Balance, April 30
2018/19 (actual)	0	629	342	287	**287**
2019/20 (actual)	287	529	6	523	**810**
2020/21 (actual)	810	47	0	47	**857**
2021/22 (estimated)	857	101	0	101	**958**
2022/23 (estimated)	958	117	0	117	**1,075**

2.5 Costs of Research Projects

Research Project costs, both spent and committed, are presented in the sections below by program activity.

2.5.1 Research Project Operating – Tier I

Table 2.34 shows the final division of the Research Project Operating budget into the Tier I, Special Initiatives and Undergraduate Student Experiential Learning (USEL) programs.

Table 2.34: Final Division of the Research Project Operating Budget (in thousands of dollars)

Research Project Operating Components	2020/21 Budget Distribution
Tier I Projects	7,073
Special Initiatives Projects	453
USEL Program	92
Total	**7,618**

The final 2020/21 budget for Tier I Projects was $7,073K, which provided funding for 50 projects. Table 2.35 shows the breakdown by research priority area. In 2020/21, the research priority areas were utilized instead of research themes.

Table 2.35: Research Project Operating -Tier I Budget

Research Priority Area	Number of Projects	2020/21 Budget
Animal Health & Welfare	15	1,861,660
Competitive Production Systems	11	1,472,313
Food Safety	1	59,278
Plant Health & Protection	6	899,950
Productive Land Capacity	2	280,680
Soil Health	1	209,750
Sustainable Production Systems	12	1,897,686
Water Quality & Quantity	2	391,567
Total	**50**	**7,072,884**

Table 2.36 illustrates the amount spent in 2020/21 by research priority area/theme, the balance in the project accounts, and the amounts committed to future years.

Table 2.36: Research Project Operating - Tier I Financial Details
(in thousands of dollars)

Year 3 - 2020/21	Previous Results	2020/21 Results	Balance in Project Accounts	Committed to Future Years	Total	Number of Projects Awarded	Number of Projects Completed
2020/21 Projects	**0**	**728**	**1,569**	**4,775**	**7,073**	**50**	**0**
Animal Health & Welfare		151	672	1,039	**1,862**	15	
Competitive Production Systems		115	355	1,003	**1,472**	11	
Food Safety		0	59	0	**59**	1	
Plant Health & Protection		259	(21)	662	**900**	6	
Productive Land Capacity		21	28	232	**281**	2	
Soil Health		8	71	130	**210**	1	
Sustainable Production Systems		148	302	1,448	**1,898**	12	
Water Quality & Quantity		28	104	260	**392**	2	
2019/20 Projects	**976**	**1,510**	**1,502**	**1,800**	**5,788**	**48**	**2**
Agri-Food and Rural Policy	110	106	278	80	**574**	6	1
Bioeconomy – Industrial Uses	104	268	150	254	**776**	6	
Emergency Management	22	72	85	62	**240**	4	
Environmental Sustainability	122	391	414	571	**1,498**	7	
Food for Health					**0**	0	
Products and Value Chains	47	79	70	121	**318**	2	
Production Systems - Animals	284	253	193	160	**890**	11	1
Production Systems - Plants	286	342	312	552	**1,491**	12	
2018/19 Projects	**2,832**	**1,539**	**1,512**	**99**	**5,983**	**54**	**17**
Agri-Food and Rural Policy	445	209	190		**843**	8.0	2.0
Bioeconomy – Industrial Uses	316	205	275	75	**871**	6.3	1.8
Emergency Management	123	41	27	0	**190**	2.3	0.8
Environmental Sustainability	407	237	306		**950**	7.0	1.0
Food for Health	215	121	186		**522**	4.0	1.0
Products and Value Chains	270	112	183		**565**	3.0	
Production Systems - Animals	387	231	112		**730**	11.5	4.5
Production Systems - Plants	669	210	234	24	**1,136**	11.0	6.0
Unallocated		175			**175**	1.0	
Subtotal - Current Agreement	**3,808**	**3,778**	**4,584**	**6,674**	**18,844**	**152**	**19**

Year 3 - 2020/21	Previous Results	2020/21 Results	Balance in Project Accounts	Committed to Future Years	Total	Number of Projects Awarded	Number of Projects Completed
Previous Agreement					**(12,585)**		
Agri-Food and Rural Policy	1,291	322	339	56	**2,008**	14.0	
Bioeconomy – Industrial Uses	972	141	81		**1,194**	11.7	
Emergency Management	786	190	59		**1,035**	10.0	
Environmental Sustainability	1,154	122	122		**1,399**	13.6	
Food for Health	797	190	223		**1,210**	8.5	
Products and Value Chains	932	66	87		**1,084**	5.5	
Production Systems - Animals	1,762	328	316		**2,406**	20.8	
Production Systems - Plants	1,791	102	126		**2,019**	13.0	
Unallocated		230		0	**230**		
Subtotal - Other	**9,485**	**1,690**	**1,353**	**56**	**0**	**97**	**0**
Grand Total	**13,293**	**5,468**	**5,937**	**6,730**	**18,844**	**249**	**19**

Table 2.36 illustrates the total amount awarded by year in the current Agreement ($7,073K in 2020/21, $5,788K in 2019/20 and $5,983K in 2018/19) and how those funds are currently distributed (spent, in project accounts or committed to future years of the project (held in the Office of Research (Agri-Food Partnership)). It also shows the total spending for 2020/21 ($5,468K) which is consistent with the results for the Research Project Operating – Tier I program activity in Table 2.9. Within the Research Project Operating – Tier I, there are currently no unallocated funds (i.e., all Unallocated lines are showing $0 in the Committed to Future Years Column), as they have been moved to Research Project Operating - Special Initiatives during 2020/21. Finally, the carry forward can be determined by combining the balance in the project accounts with the amounts committed to future years. For Tier I Projects, the carry forward is $12,667K ($5,937K + $6,730K), which also matches Table 2.9.

Table 2.36 also identifies the Number of Projects Awarded. This is accurate for projects within the Current Agreement. For projects from the Previous Agreement, it represents the number of projects still active. It can be a fractional number as researchers were allowed to divide their project across research themes. In 2019/20, researchers were asked to pick a primary theme and thus, projects were no longer split. The Number of Projects Completed identifies the cumulative total number of projects from that call cycle that have been completed/ended in 2020/21. It is based on the projects' current end date.

The tables in the following sections can be read in the same fashion. Several of them contain an "Inter-Year Project Adjustment". This adjustment relates to the timing differential in spending compared to the budget allocations. A positive adjustment indicates an underspend related to budget, while a negative adjustment shows an overspend related to budget. These will approach zero by the completion of the Agreement, as demonstrated in the Business Plan. There is no Inter-Year Project Adjustment for Research Project Operating – Tier I, as the under/overspend is recorded in Research Project Operating – Special Initiatives each year.

2.5.2 Research Project Operating – Special Initiatives

The final Special Initiatives (SI) budget for 2020/21 was $453K. In addition, there was a cumulative balance from prior years of $1,261K (2019/20 Inter-Year Project Adjustment). Also, throughout 2020/21, an additional $404K of unallocated funds were added from Research Project Operating – Tier I. This was combined with the existing $161K in unallocated funds, related to underspent projects awarded under the previous Agreement, for a total of $566K of unallocated funds available.

Twelve Special Initiatives projects were approved in 2020/21, totalling $1,667K. Another project, $60K, was placed on hold, for a total allocation of $1,727K. An additional project was approved mid-year at the December 15, 2020 R/PM PMC for $86K. At the same PMC, an amendment was approved for the 2018/19 SI project which increased its funding amount by $50K. Both changes were drawn from the unallocated funds. Table 2.37 shows the amount spent in 2020/21 by activity, the balance in the project accounts, and the amounts committed to future years.

Table 2.37: Research Project Operating - Special Initiatives Financial Details (in thousands of dollars)

Year 3 - 2020/21	Previous Results	2020/21 Results	Balance in Project Accounts	Committed to Future Years	Total	Number of Projects Awarded	Number of Projects Completed
2020/21 Projects	**0**	**216**	**273**	**1,324**	**1,813**	**14**	**0**
Projects		174	316	1,237	**1,727**	12 (+1 on hold)	0
Amendments/Out of Cycle		43	(43)	86	**86**	1	0
2019/20 Projects	**37**	**302**	**236**	**871**	**1,447**	**11**	**1**
Projects	37	302	236	871	**1,447**	11	1
Amendments/Out of Cycle					**0**		
2018/19 Projects	**99**	**100**	**58**	**93**	**350**	**1**	**0**
Projects	99	100	58	43	**300**	1	0
Amendments/Out of Cycle				50	**50**	0	0
Inter-year Project Adjustment				(12)	**(12)**		
Impact Case Study	28	152	145	0	**325**		
Unallocated	(161)	(404)		429	**(136)**		
Subtotal - Current Agreement	**2**	**367**	**711**	**2,705**	**3,786**	**26**	**1**
Other Projects (non-Agreement)	(19)	19	0	0	**0**	2	2
Subtotal - Other	**(19)**	**19**	**0**	**0**	**0**	**2**	**2**
Grand Total	**(16)**	**386**	**711**	**2,705**	**3,786**	**28**	**3**

Table 2.38 shows the current and planned usage of the unallocated funds. As of June 30, 2021, there is a balance of $33K available in unallocated funds.

Table 2.38: Current and Planned Usage of the Unallocated Funds within the Research Project Operating - Special Initiatives
(in thousands of dollars)

Item	Total
Unallocated Funds, as of April 30, 2020	161
Unallocated Funds, added during 2020/21	404
Total Unallocated Funds Available	**566**
2020/21 Special Initiatives Project - UG-SI-2020-100740 (Thevathasan), approved by R/PM PMC on December 15, 2020	86
2018/19 Special Initiatives Project Amendment - UofG2018-3319 (Ker), approved by R/PM PMC on December 15, 2020	50
Total Allocations Actioned in 2020/21	**136**
Balance, as of April 30, 2021	**429**
COVID-19 Project Support	44
2019/20 Tier I Project Amendment - UofG2018-3196 (Gillespie), approved by R/PM PMC on December 15, 2020	22
2017/18 Tier I Project Amendment - UofG2016-2732 (Grodzinski), approved by R/PM PMC on January 8, 2021	22
LRIC Research Centre Access Fee Subsidy (estimated), approved by R/PM PMC on May 6, 2021	50
2021/22 Tier I Project - UG-T1-2021-100944 (Lauzon), approved by R/PM PMC on May 31, 2021	133
2021/22 Tier I Project - UG-T1-2021-101114 (Mohanty), approved by R/PM PMC on May 31, 2021 ($227K less balance in remaining in 2021/22 Tier I budget $58K)	169
Total Other Approved Allocations, to be Actioned in 2021/22	**396**
Balance, as of June 30, 2021	**33**

The remaining unallocated funds will be reallocated to new projects in the coming years or used to support amendments, which are requested for a variety of reasons.

2.5.3 Highly Qualified Personnel Scholarship Program

The Highly Qualified Personnel (HQP) Scholarship Program has a net activity budget of $250K per year. This amount must be matched by the University of Guelph from third-party funds. Thus, the total value of scholarships awarded is expected to be $500K per year. The expenditures related to each scholarship occur over one to four years, with the matching funds being recorded over the same time frame.

In 2020/21, the University was able to award an additional $435K in scholarship support, beyond the required matching funds, through a strategic collaboration with the Canada First Research Excellence Fund (CFREF) Food from Thought project. This significantly increased the number of scholarships that were awarded. Table 2.39 shows the financial details related to the HQP Scholarship Program. There were 19 scholarships awarded in 2020/21. The actual expenditures in 2020/21, related to awards from the current Agreement, was $769K. This generated $540K in matching funds from Food from Thought. In addition, $35K was paid to scholarship recipients from the Previous Agreement. There is $228K (net) committed to future scholarship payments.

In 2020/21, the Alliance provided COVID-19 support payments totalling $40K to six students. A further $44K was committed to six additional students for 2021/22 for COVID-19 related delays. These costs will be covered by the unallocated funds of $16K in the HQP Scholarship Program, a $40K transfer of unallocated funds from the Research Support program activity in 2020/21 and $28K in additional unallocated funds from the Research Support program in 2021/22. This fully depletes the unallocated funds in the HQP Scholarship Program.

Table 2.39: HQP Scholarship Program Financial Details (in thousands of dollars)

Year 3 - 2020/21	Previous Results	2020/21 Results	Committed to Future Years	Total	Number of Scholarships Awarded	Number of Scholarships Completed
2020/21 Award Winners		330	605	**935**	19	2
2019/20 Award Winners	365	335	253	**953**	20	7
2018/19 Award Winners	397	104	0	**501**	12	10
Matching Requirement	(467)	(540)	(631)	**(1,638)**		
COVID-19 Support		12	44	**56**		
Unallocated		(29)	(28)	**(57)**		
Subtotal - Current Agreement	**295**	**211**	**244**	**750**	**51**	**19**
Previous Agreement				**(256)**		
Previous Award Winners	*204*	*35*	*0*	***239***	*5*	*5*
COVID-19 Support		*28*	*0*	***28***		
Unallocated		*(11)*		***(11)***		
Subtotal - Other	**204**	**52**	**0**	**0**	**5**	**5**
Grand Total	**499**	**263**	**244**	**750**	**56**	**24**

2.5.4 Gryphon's LAAIR

The Gryphon's LAAIR budget is fixed at $400K per year and includes funding for an event, as well as project-based activities.

Table 2.40 shows the amount spent in 2020/21 by activity, the balance in the project accounts, and the amounts committed to future years. In 2020/21, one Market Validation project with a total funding of $20K, and three Product Development projects with a total funding of $280K, were awarded. Within Gryphon's LAAIR, there is currently $61K in unallocated funds, predominately due to two terminated projects. $45K of these funds were specifically allocated to other uses in the 2021/22 award cycle, as per the Decision Note approved by R/PM PMC on February 5, 2021. The 2021/22 projects still have a funding shortfall of $27K, which was intended to be drawn from the 2022/23 budget. It is recommended that that remainder of the unallocated funds be used to offset this shortfall, increasing the amount available for project funding in 2022/23 from $309K to $325K.

Table 2.40: Gryphon's LAAIR Financial Details (in thousands of dollars)

Year 3 - 2020/21	Previous Results	2020/21 Results	Balance in Project Accounts	Committed to Future Years	Total	Number of Projects Awarded	Number of Projects Completed
2020/21 Projects		**95**	**92**	**113**	**300**	**4**	**0**
Market Validation		18	2	0	**20**	1	
Product Development		77	90	113	**280**	3	
2019/20 Projects	**214**	**46**	**83**	**96**	**440**	**10**	**5**
Market Validation	70	28	26	0	**124**	7	4
Product Development	144	19	57	35	**255**	3	1
Unallocated				61	**61**		
2018/19 Projects	**195**	**95**	**44**	**0**	**334**	**9**	**7**
Market Validation	87	11	22	0	**120**	6	5
Product Development	108	84	22	0	**214**	3	2
Inter-Year Project Adjustment				(24)	**(24)**		
Impact Pitch Event	56	52	42		**150**		
Subtotal - Current Agreement	**465**	**288**	**261**	**185**	**1,200**	**23**	**12**
Unallocated	(0)			0	**0**		
Subtotal - Other	**(0)**	**0**	**0**	**0**	**0**	**0**	**0**
Grand Total	**465**	**288**	**261**	**186**	**1,200**	**23**	**12**

2.5.5 Knowledge Translation and Transfer Program

The Knowledge Translation and Transfer (KTT) budget is fixed at $500K per year and includes allocations for the Agri-Food and Rural Link program, the KTT Funding program and KTT Initiative projects.

Table 2.41 shows the amount spent in 2020/21 by activity, the balance in the project accounts, and the amounts committed to future years. In 2020/21, eight Mobilization projects with a total funding of $266K, and one Research project with a total funding of $70K, were awarded. In addition, two new KTT Initiative projects were funded. Within the KTT Funding program, there is currently $13K in unallocated funds. The unallocated funds will be reallocated to new projects in future years.

Table 2.41: KTT Program Financial Details (in thousands of dollars)

Year 3 - 2020/21	Previous Results	2020/21 Results	Balance in Project Accounts	Committed to Future Years	Total	Number of Projects Awarded	Number of Projects Completed
2020/21 Projects		**48**	**128**	**160**	**336**	**9**	**0**
Mobilization		34	110	122	**266**	8	0
Research		14	18	38	**70**	1	0
2019/20 Projects	**81**	**143**	**177**	**2**	**402**	**10**	**5**
Mobilization	44	80	88	2	**213**	6	3
Research	37	63	89	0	**189**	4	2
Unallocated	0	0	0	0	**0**		
KTT Initiative Projects	**13**	**7**	**13**	**57**	**90**	**9**	**5**
2020/21		3	3	24	**30**	2	0
2019/20	11	5	10	5	**30**	6	4
2018/19	2	0	0	28	**30**	1	1
Inter-Year Project Adjustment				102	**102**		
Agri-Food and Rural Link	313	185	72		**570**		
Subtotal - Current Agreement	**407**	**383**	**389**	**321**	**1,500**	**28**	**10**
Unallocated	(13)			13	**0**		
Subtotal - Other	**(13)**	**0**	**0**	**13**	**0**	**0**	**0**
Grand Total	**394**	**383**	**389**	**334**	**1,500**	**28**	**10**

2.6 ARIO Properties - Special Projects

Information about special projects, such as major renovations, repairs or capital projects/needs of ARIO Properties can be found in Section 7.1.

2.7 Allocation of Shared Services for the Laboratory Services Division

Table 2.42 shows the allocation of shared services for the Laboratory Services Division (LSD) including a breakdown by laboratory.

Table 2.42: 2020/21 Allocation of Shared Services for LSD (in thousands of dollars)

Area	Total	AHL %	AHL Amount	AFL %	AFL Amount
Human Resources	186	50%	93	50%	93
Facility Management	907	25%	227	75%	680
Sample Reception	317	5%	16	95%	302
Information Technology	1,210	64%	780	36%	431
Business Development	255	0%	0	100%	255
Sales	(14)	0%	0	100%	(14)
Customs	1	50%	1	50%	1
Finance	573	50%	286	50%	286
Co-Executive Directors' Offices	9	50%	4	50%	4
Quality Assurance	588	50%	294	50%	294
Staff Activities	1	0%	0	100%	1
Reinvestments	(2)	50%	(1)	50%	(1)
Total	**4,031**		**1,699**		**2,331**

2.8 Summary of Third-Party Funding Obtained

Third-party funding and revenues generated by the University in support of the Programs under this Agreement are critical for ensuring that enough capacity exists so that the Alliance is successful in developing solutions to real-world agri-food issues. Table 2.43 provides a summary of all third-party funding and revenues in 2020/21. The University was able to leverage the province's $66.1M investment, attracting $78.8M in third-party funding and revenue.

Table 2.43: 2020/21 Summary of Third-Party Funding and Revenue (in thousands of dollars)

Program	Description	Total
Agriculture and Food Laboratory	Testing Revenue	7,920
Animal Health Laboratory	Testing Revenue	8,594
Property Management	Sales of Farm Products and Rental Revenues	5,698
Research Program	Miscellaneous Revenue	143
	Subtotal External Revenues	**22,356**
Agriculture and Food Laboratory	Internal Testing Revenue (net)	119
Animal Health Laboratory	Internal Testing Revenue (net)	1,652
Property Management	Internal Revenue for Animal Purchases, Growth Facility Usage and Research Centre Access Fees (net)	758
	Subtotal Internal Revenues (Recoveries from Outside of the Agreement)	**2,529**
Research Program	HQP Scholarship Program Matching (cash)	540
Research Program	HQP Scholarship Program Course Support	86
Research Program	Third-Party Funding for Research Projects (cash)	6,035
Research Program	Third-Party Funding for Tier II and III Projects	11,574
Research Program	Support for Data Initiatives	137
Research Program	External Research Dollars Awarded to the University related to Ministry Priorities[3]	35,543
	Subtotal Leverage Funding	**53,915**
	Total Third-Party Funding and Revenue	**78,800**

[3] The total value of External Research Dollars Awarded to the University related to Ministry Priorities is $55,269K. The HQP Scholarship Program Matching, HQP Scholarship Program Course Support, the Third-Party Funding for Research Projects, the Third-Party Funding for Tier II and III Projects, the Support for Data Initiatives and a portion of the Internal Recoveries are subsets of the External Research Dollars. To prevent double counting, the External Research Dollars have been reduced by those amounts. However, $1,174K of the Internal Testing Revenue in AHL is related to the Health Sciences Centre in OVC and is funded through the Ministry of Colleges and Universities (MCU). This is not included in the External Research Dollars and, therefore, has not been removed.

2.9 Asset Inventory Changes

Changes in the Asset Inventory for each program are described in the following sections. This includes purchases, sales, leases, and dispositions of assets with a value of $10K or more.

2.9.1 Research Program

Table 2.44 shows the Asset Inventory changes in the Research Program.

Table 2.44: 2020/21 Asset Inventory Changes for the Research Program (in thousands of dollars)

Lead Applicant, Project, Program and Location	Description	Amount	Action	Notes
M. Kalischuk, UG-SI-2020-100764, Special Initiatives, Ontario Crops Research Centre - Simcoe	Li-Cor Plant Canopy Analyzer	10	Purchase	50% paid by Agreement Funds. Equipment was noted in the project budget.

2.9.2 Veterinary Capacity Program

No assets with a value over $10K were purchased, sold, leased, or disposed of in 2020/21.

2.9.3 Animal Health Laboratory

Table 2.45 shows the Asset Inventory changes, over $10K, for the Animal Health Laboratory.

Table 2.45: 2020/21 Asset Inventory Changes for the Animal Health Laboratory (in thousands of dollars)

Area	Description	Amount	Action	Notes
Toxicology	Inductively Coupled Plasma Mass Spectrometer (ICP-MS)	247	Purchase	Purchase approved in the Business Plan. Replacement of the older of the two ICP-MSs, more than ten years old.
Molecular Biology	Magna Pure 96 System (first)	102	Purchase	Purchase approved in the 2019/20 Business Plan. Replacement of an aged unit.
Virology	Biorad Precellys Evolution Homogenizer - TSE prep	84	Purchase	Purchase approved in the Business Plan. Replace aging instrument (2003) which is breaking down and requiring recurring repair.
Molecular Biology	Magna Pure 96 System (second)	83	Purchase	Purchase approved in the 2019/20 Business Plan. Replacement of an aged unit.
Information Technology	Computer upgrades, backup replacement, additional storage and VM for Oracle	34	Purchase	Purchase approved in the Business Plan. Includes 50% of division wide expenditures shared with AFL plus any specific purchases for the AHL.
Postmortem Room	Ion Auto Disk Scrubber	23	Purchase	Purchase approved in the Business Plan under “Miscellaneous Items”.
Mycoplasmology	Liquidator	21	Purchase	Purchase approved in the Business Plan under “Miscellaneous Items”.
Virology	Upright Freezer	16	Purchase	Purchase approved in the Business Plan under “Miscellaneous Items”.
Virology	Flow Flex System (warranty)	10	Purchase	Purchase approved in the Business Plan under “Miscellaneous Items”.

2.9.4 Agriculture and Food Laboratory

Table 2.46 shows the Asset Inventory changes, over $10K, for the Agriculture and Food Laboratory.

Table 2.46: 2020/21 Asset Inventory Changes for the Agriculture and Food Laboratory
(in thousands of dollars)

Area	Description	Amount	Action	Notes
Chemistry	LC-MS/MS (replace Sciex 4000)	555	Purchase	Purchase approved in the Business Plan. Replacement of a key instrument for testing chemical residues in food.
Chemistry Research & Development	Waters UPLC, TUV, Sample Organizer-Cannabis	99	Purchase	Equipment needed to launch new testing service for the Cannabis Industry. Approved by the AFL PMC on June 4, 2020.
Information Technology	Computer upgrades, backup replacement, additional storage and VM for Oracle	42	Purchase	Purchase approved in the Business Plan. Includes 50% of division wide expenditures shared with AHL plus specific purchases for the AFL.
Chemistry	Workstation upgrades for all LC\MS to Windows 10	37	Purchase	Mandatory upgrade of software to Windows 10 for all LC\MS machines, as the previous software was no longer supported by equipment vendor. The estimated cost was less than $30K, so it was included as per the Business Plan under “Miscellaneous Items”. However, it came in higher than the estimate.
Chemistry	Analytical Balance	36	Purchase	Emergency replacement of a required unit which broke down and became unrepairable.
Chemistry Research and Development	Freezer Mill-Cannabis	28	Purchase	Equipment needed to launch new testing service for the Cannabis Industry. Approved by AFL PMC on June 4, 2020.
Facility	Replace LE-045 (HVAC repair for 95 Stone Road)	18	Purchase	Purchase approved in the Business Plan under “Miscellaneous Items”.
Pest Diagnostic Clinic	SpectraMax ABS Plus	16	Purchase	Purchase approved in the Business Plan under “Miscellaneous Items”.
Pest Diagnostic Clinic	SpectraMax ABS Plus	10	Purchase	Purchase approved in the Business Plan under “Miscellaneous Items”.

2.9.5 Property Management Program

Table 2.47 shows the Asset Inventory changes in the Property Management Program.

Table 2.47: 2020/21 Asset Inventory Changes for the Property Management Program (in thousands of dollars)

ARIO Property	Description	Amount	Action	Notes
Ponsonby General Animal Facility	2021 Chevrolet Silverado 1500 Crew LT	41	Purchase	Lifecycle replacement of an existing unit.
Ridgetown Dairy Facility	Manure Gutter Cleaner	14	Purchase	Replacement of required equipment which ceased to work.
Bovey Growth Facility	Jamesway 28 Coolers Pro Series, Receptacles and Motors	41	Purchase	Replacement of end of life equipment.

Table 2.48 provides the total asset value, value of acquisitions and value of dispositions for the ARIO Properties. Most equipment is purchased using ARIO Minor Capital funds and, thus, is not listed in Table 2.47. Actual inventory lists by ARIO Property are available on request.

Table 2.48: Total Asset Value, Acquisitions, and Dispositions for each of the ARIO Properties (in thousands of dollars)

ARIO Property	Opening Balance (May 1, 2020)	Acquisitions in 2020/21	Dispositions in 2020/21	Closing Balance (April 30, 2021)	Value for Dispositions
Alma - Ontario Aquaculture Research Centre	**456**	**0**	**0**	**456**	
Arkell	**3,498**	**35**	**0**	**3,533**	
Equine Research Facility	37	0	0	37	
Feedmill Facility	832	0	0	832	
Ontario Poultry Research Centre	1,435	0	0	1,435	
Swine Research Facility	1,194	35	0	1,229	
Bradford - Ontario Crops Research Centre	**249**	**0**	**0**	**249**	
Elora	**13,682**	**519**	**703**	**13,498**	
Ontario Beef Research Centre	5,632	229	567	5,295	0 (scrap, salvage)
Ontario Crops Research Centre	3,042	0	0	3,042	
Ontario Dairy Research Centre	5,008	290	136	5,161	9 (sold at auction)
Emo - Ontario Crops Research Centre	**70**	**0**	**0**	**70**	

ARIO Property	Opening Balance (May 1, 2020)	Acquisitions in 2020/21	Dispositions in 2020/21	Closing Balance (April 30, 2021)	Value for Dispositions
Guelph Research Station	**236**	**0**	**0**	**236**	
New Liskeard Research Station	**1,182**	**0**	**0**	**1,182**	
Office of Research	**31**	**0**	**0**	**31**	
Ponsonby	**406**	**41**	**0**	**447**	
Dairy Facility	254	0	0	254	
General Animal Facility	77	41	0	117	
Ontario Sheep Research Centre	76	0	0	76	
Research Station Operations	**3,832**	**33**	**89**	**3,776**	**23 (trade-in)**
Ridgetown Campus	**6,033**	**92**	**78**	**6,047**	**0 (scrap and stolen)**
Simcoe - Ontario Crops Research Centre	**547**	**0**	**0**	**547**	
Vineland	**895**	**0**	**125**	**770**	**2 (sold and scrap)**
Winchester - Ontario Crops Research Centre	**1,056**	**0**	**0**	**1,056**	
Woodstock - Ontario Crops Research Centre	**431**	**0**	**24**	**407**	**0 (scrap)**
Total	**32,605**	**719**	**1,018**	**32,306**	

2.10 Non Salary Benefits

For the purposes of allocating Non Salary Benefits, the Ministry acknowledges that the University uses a pooled costing method, whereby all costs associated with an activity or cost type are aggregated and subsequently allocated to users of the activity or cost type using consistent methods or bases for all users.

Employer benefit costs for employees are charged to departments and programs using standard benefit allocation rates that are fixed for each fiscal year. Adjustments are not made to individual rates if they are relatively minor and reflect annual variances that are not considered structural or material in nature. Annual variances between recovered (allocated costs) and actual costs in the benefit cost pool are absorbed centrally to avoid relatively minor changes being made in the rates each year. Historically, these allocations have been very accurate, and the carry forward adjustment is relatively small.

Table 2.49 shows the Salary and Wages and Non Salary Benefits by Program for 2020/21.

Table 2.49: Salary and Wages and Non Salary Benefits by Program (in thousands of dollars)

Program	Salary and Wages	Non Salary Benefits
Research Program	9,623	1,888
Veterinary Capacity Program	149	24
Animal Health Laboratory	8,058	2,212
Agriculture and Food Laboratory	8,428	2,504
Property Management Program	7,860	2,142
Grand Total	**34,118**	**8,771**

Table 2.50 provides the total Salary and Wages, the Benefit Allocation Rate and the Non Salary Benefits by Object Code.

Table 2.50: Salary and Wages and Non Salary Benefits by Object Code (in thousands of dollars)

Object Code	Salary and Wages	Benefit Allocation Rate	Non Salary Benefits
61103-P&M - RFT	6,091	28.00%	1,705
61108-OVERTIME - RFT	403	6.50%	26
61109-SHIFT PREMIUMS - RFT	74	6.50%	5
61112-FACULTY - VETERINARIANS - RFT	2,277	23.25%	529
61130-USW - RFT	10,703	33.30%	3,564
61133-EXEMPT- RFT	75	33.80%	25
61134-HONORARIUMS FACULTY (FULL TIME)	96	3.60%	3
61135-OSSTF - RFT	6,210	32.00%	1,987
61203-P&M - TFT	911	17.00%	155
61204-Grant Trust Admin Tech - TFT	783	15.70%	123
61205-Grant Trust Professional - TFT	520	17.00%	88
61207-SUPPORT STAFF - TFT UNREPRESENTED	(32)	15.70%	(5)
61210-SESSIONAL LECTURER - CUPE 3913	27	15.00%	4
61221-POST DOCTORAL - TFT	49	17.20%	8
61230-USW-TFT	751	15.70%	118
61234-HONORARIUMS TEMPORARY (PART TIME)	7	3.60%	0
61235-OSSTF - TFT	326	15.70%	51
61252-VETERINARIAN - TEMPORARY	135	16.05%	22
61253-CONTRACTUALLY LIMITED P&M	182	17.00%	31
61304-Grant Trust Admin Tech - TPT	108	14.70%	16
61307-SUPPORT STAFF - TPT UNREPRESENTED	428	14.70%	63
61335-OSSTF - TPT	119	14.70%	17
61417-STUDENT LABOUR - TPT	1,043	9.15%	95
61419-GRADUATE RESEARCH ASSISTANT	792	0.50%	4
61420-GRADUATE SERVICE ASSISTANT	76	8.25%	6
61431-GRA - DOCTORAL- DOMESTIC	259	0.50%	1
61433-Student Labour - Undergrad - Foreign	8	9.15%	1
61435-GRA - MASTERS- DOMESTIC	616	0.50%	3
61436-GSA - MASTERS- DOMESTIC	20	8.25%	2
61438-GRA - DOCTORAL- FOREIGN	184	0.50%	1
61441-GRA - MASTERS - FOREIGN	68	0.50%	0
61442-GSA - MASTERS - FOREIGN	5	8.25%	0
61443-POST DOCTORAL - DOMESTIC	125	17.20%	21
61444-POST DOCTORAL - FOREIGN	227	17.20%	39
61445-STUDENT LABOUR - UNDERGRAD - DOMESTIC	202	9.15%	19
61522-NON-UOFG PERSONNEL COST CHARGE	22	0.00%	0
61552-LUMP SUM PAYMENTS	227	various	40
Grand Total	**34,118**		**8,771**

2.11 Summary of Intellectual Property Costs

Intellectual Property (IP) costs, expenditures related to IP development and revenues are reported on separately by the Research Innovation Office (RIO) to ARIO.

2.12 Attestation by a Duly Authorized Signing Authority

I confirm that the University of Guelph has followed its internal financial controls when managing the OMAFRA/UofG Agreement.

David Hargreaves
Associate Vice-President, Finance
University of Guelph

2.13 Audited Financial Statements

The financial statements were audited by Ernst & Young and are provided in Appendix A of this document.

3 RESEARCH PROGRAM

As described in the Agreement, the Research Program is responsible for developing and managing a research and innovation system that:

a) Sustains and generates new, core capacity needed to undertake world class research and scientific, economic and data analysis;
b) Maximizes the use of research infrastructure in a manner that provides benefits to all of Ontario's regions;
c) Informs evidence-based public policy and drives public awareness and fact-based dialogue;
d) Supports the commercialization of new technologies;
e) Fosters frequent and quality collaboration among the agri-food and rural research community, the University, the agri-food sector and rural Ontario; and
f) Increases access and sharing of data to facilitate new agri-food and rural research and data analytics to inform decision making.

The Agreement's Research Program achieves these goals by addressing the innovation continuum comprehensively, from funding market-driven innovative research, to mobilizing these research results into both the public domain and marketplace. Together with research partners along the continuum, the program delivers new knowledge and technologies that support industry competitiveness and provide positive social benefits, subsequently maximizing the return on public investment.

3.1 Program Activities and Achievements from 2020/21

Research Leadership

The University of Guelph leads the country in all of agriculture, agri-food, veterinary and rural sciences programs:

- UofG ranked first in Canada and fifth in the world for veterinary sciences.[4]
- UofG ranked first in Canada and twenty-first in the world for agricultural sciences.[5]
- UofG ranked first in Canada and eighteenth in the world for food science and technology.[6]
- UofG ranked first in the amount of research income it attracts from the private sector as a percentage of total research income.[7]
- UofG ranked fifteenth among all universities nationally and second among Canadian comprehensive universities in an annual national survey of top research institutions.[8]
- UofG ranked sixteenth in Canada for its scientific impact in all fields. For impact in life and earth sciences, UofG ranked third in Canada, and 46th in the world from a field of 985 universities. UofG

[4] https://www.topuniversities.com/university-rankings/university-subject-rankings/2021/veterinary-science
[5] https://www.usnews.com/education/best-global-universities/canada/agricultural-sciences
[6] http://www.shanghairanking.com/rankings/gras/2021/RS0219
[7] UofG Ranks Among Top Canadian Research Universities - UofG News (uoguelph.ca)
[8] UofG Ranks Among Top Canadian Research Universities - UofG News (uoguelph.ca)

ranked third in Canada for proportion of papers by women authors in life and earth sciences, and fourth in Canada for collaboration with other organizations or with other countries.[9]

The University maintains its commitment to agricultural and associated sciences through its Strategic Research Plan (SRP). Seven of the eight research signature areas identified in the plan directly support OMAFRA Priorities. These areas differentiate UofG's research focus relative to other institutions and include food, agriculture and the bioeconomy, veterinary medicine, One Health, environmental stewardship and biodiversity, community-engaged scholarship, and data science and informatics.

The SRP has been partially operationalized through the recent establishment of three research institutes at the University, each of which will enhance the delivery of new knowledge which addresses the Ministry's research priorities.

Centre for Advancing Responsible and Ethical Artificial Intelligence

The Centre for Advancing Responsible and Ethical Artificial Intelligence (CARE-AI) fosters partnerships among UofG researchers and experts in private and public organizations, all looking to address real-world issues and challenges of implementing artificial intelligence (AI) using a range of applications. With a focus on humanistic aspects of AI, it is an excellent example of how UofG looks to Improve Life. The Centre involves almost 90 researchers and scholars from across the University. It focuses on applying machine learning and AI to UofG strengths, including human and animal health, environmental sciences, agri-food, and the bioeconomy.

CARE-AI's advisory board includes Heather Evans, Project Coordinator, CDL Rapid Screening Consortium; Anthony de Fazekas, Head of Technology and Innovation – Canada, Norton Rose Fullbright; Saadia Muzaffar, CEO/Founder, TechGirls; Lara O'Donnell, Executive Director, Weston Family Foundation; Ofer Shai, Senior Director, Machine Learning & Analytics Governance at Loblaw Companies Limited; and Steve Woods, Senior Engineering Director and Site Lead, Google. The board counsels on strategy and direction for CARE-AI to ensure alignment with industry needs.

CARE-AI and the One Health Institute have launched a collaborative SEED FUND to enhance the competitiveness of new external operating grant applications submitted by UofG faculty members and promote student learning across multiple research disciplines. In 2020/21, CARE-AI hosted three virtual seminar events and announced the addition of four new affiliate faculty members at the University of Guelph. These faculty come from a variety of disciplines and are tackling AI research from diverse perspectives.

One Health Institute

The One Health Institute (OHI) advances an interdisciplinary approach to promoting health and curbing infectious diseases. One Health tackles problems at the intersection of people, animals and the environment. Looking at how those three components interact is key to stemming many emerging vector-borne ailments such as Lyme disease or combatting the growing health threat posed by drug-resistant microbes. This occurs through professionals working together, bringing their perspectives on animals, humans and environmental sciences.

OHI has been extremely active over the past year, launching Faculty Focus Articles, delivering a seminar series, and supporting student research assistantships. In addition, the advent of COVID-19, with a suspected origin at

[9] https://news.uoguelph.ca/2020/07/u-of-g-recognized-for-international-scientific-impact/

the human–environment–animal interface and its rapid explosion as a result of human interconnectivity, mobility, and global trade, has cemented the importance and critical nature of research in One Health.

OHI offers a Collaborative Specialization in One Health for Doctoral and Masters students and is working on launching a One Health undergraduate program – the first of its kind – designed to focus on giving students the skills and confidence to create multidisciplinary teams, analyze systems, and to solve complex issues. This undergraduate degree in One Health will provide students with knowledge, skills and abilities that are highly valued and essential to solving today's complex health issues – as well as the necessary background to pursue graduate work or enter into professional schools such as animal or human medicine.

Guelph Institute for Environmental Research

The Guelph Institute for Environmental Research (GIER) is expected to stimulate and support interdisciplinary research, foster a sense of community among UofG researchers and raise the profile of environmental research at Guelph. GIER has over 112 Faculty Affiliate Members (from 25 departments/schools), 21 Early Career Affiliate Members (from 14 departments/schools) and has engaged in over 25 meetings with stakeholders. In April 2021, GIER announced their partnership with the EchoNetwork, a new interdisciplinary platform that aims to change how science is embedded in society.

In 2019/20, GIER introduced a Small Grants Program. It continues to be a success with seven interdisciplinary research projects awarded in in 2020/21that tackle human-environmental crises with scientific rigour, creativity, and empathy. This funding will support key areas of research including many that are critical to agri-food and environmental sustainability.

Bibliometric Study

The University of Guelph contracted Science-Metrix to assess the performance of the UofG in the field of Agriculture during the period from 2008 to 2019. This bibliometric study was commissioned as a part of the research impact case study project and followed the same methodology as an analysis performed for the Association of Canadian Faculties of Agricultural and Veterinary Medicine (CFAVM). The bibliometric analysis encompassed many aspects of research performance. Research outputs and impacts were measured at the country, institutional and researcher levels, and the University of Guelph's performance was benchmarked against that of other top publishing institutions in Canada and abroad. Collaboration networks were also drawn to better visualize the dynamics between the major stakeholders. Analyses of citations in patents and of mentions in non-conventional media were also conducted in order to better assess the impact of the University of Guelph on innovation and on the field in general.

The University is currently digesting the study and will share the results of it with OMAFRA in Summer 2021. In general, the study found that the scientific performance of the University of Guelph in agriculture between 2008 and 2019 was among the highest in Canada and was also noticeable at the world level. The University accounts for a large share of Canada's output in the field, and publishes high impact research, making the University a major hub in the Canadian agricultural research community.

Third-Party Leverage

The UofG works hard to leverage the OMAFRA/UofG Agreement to grow agri-food research and innovation in Ontario. The Arrell Food Institute and Food from Thought both continue to contribute to the $55.3M in non-Agreement funding awarded to UofG for Research Projects that are supportive of OMAFRA priorities. Together, these investments enhance Guelph's position as a nexus of agri-food innovation, where academia, government and industry come together to support the provincial, national, and international agri-food sectors, and rural communities.

The University has also been working to identify third-party incremental leverage for the research programs and in support of infrastructure projects. This is being accomplished through allocation of some of the University's Canada Foundation for Innovation (CFI) envelopes to purchase equipment for the Guelph and Ridgetown Campuses, as well as the ARIO Research Centres. This enhances UofG's research capacity in support of Ministry Priorities. These awards to researchers are adjudicated on the basis of excellence of the researcher, novelty and leading-edge nature of the proposed research, and the benefit to civil society. Thus, these sources of funding are complementary to the ARIO Minor Capital Program and Research Centre operational funding received from OMAFRA.

A submission from the University of Guelph to the 2020 Canada Foundation for Innovation – Infrastructure Fund (CFI-IF) competition requested a state-of-the art sensor network for livestock and agronomy research at the Elora Research Station, with a project budget of approximately $19M with $7.5M requested from CFI-IF. The proposed research was to optimize efficiency of feed conversion by cattle, to assess transfer of nutrient and pathogens from cattle production to and within coupled watersheds, and to create decision support system for advance analytics relevant to livestock operations. Agriculture 5.0 (Ag 5.0) is the next revolution in agriculture. Under Ag 5.0, precision agriculture technologies are harnessed to simultaneously boost production and enhance environmental sustainability. As Canada's Food University, the UofG is working with government and industry partners to usher in this next agricultural revolution. Work will couple the promise of technology with the practice of social responsibility, making Canada a global leader in safe, responsible, efficient food systems to feed a growing world.

The vision for the Ag 5.0 Observatory at the Elora Research Station is to create a closed-loop, on-farm laboratory where precision agriculture practices in the barn are connected to impacts on the wider ecosystem. The Observatory will allow researchers to harness unprecedented quantities of data to enhance the sustainability and productivity of the beef and dairy sectors, making Canada and its farmers global leaders in agricultural innovation. The data from these sensors will become part of the Agri-Food Data Canada platform (which is being developed in Food from Thought), allowing unprecedented scales, degrees of resolution, speed and complexity of enquiry previously not available. This platform will train HQP to meet Ontario's labour needs in the agricultural-high-tech sector, as well as support the development of innovative technologies that will provide jobs for Ontarians.

While this submission was not successful in the 2020 CFI-IF competition, the University received thoughtful and constructive comments from the reviewers. They noted that the innovative experimental design, namely the fate of nutrients through two whole different systems, would create a unique research opportunity to improve understanding of indirect GHG emissions, nutrient processes at the soil-water interface, and fate of antibiotics and pathogens. The committee recognized the innovative aspect of this project as the effort to link all data collected from the research farm's barn and field operations to create an observatory and decision support system for sustainable animal agriculture. It deemed the focus on cattle production inputs/outputs and its effects on air, soil, and water characteristics as highly-innovative. Data collection, management and sharing will support modeling and multi-disciplinary research efforts to optimize dairy (primary focus) and beef (secondary focus) production systems. **The project's innovative aspect is the collection of data across the systems to build the decision support system.** Further development of data collection methodologies across the lifetime of the project, as well as the methods for integrating and sharing data were recommended by the reviewers. The University is currently pursuing these steps in the formation of Agri-Food Data Canada, under the leadership of Food from Thought.

In addition, researchers from the University have received numerous research grants and gifts in areas relevant to the Ministry's priorities, further leveraging Ontario's investment. Some examples of these are listed below.

- $10M in NSERC Discovery funding. Fifity-three UofG projects will receive a total of $10M over five years from the federal agency. The funding spans five colleges and nearly 20 departments. UofG faculty members also received 13 NSERC Discovery Launch Supplements for early career researchers worth a total of $162.5K, as well as four Discovery Accelerator Supplements worth $480K.
- Over $4M received in NSERC Alliance funding to help ensure safer food and drinking water, enhanced crop and food animal production, and higher-quality medicinal cannabis.
- Genome Canada provided $6.5M toward a University of Guelph led project aiming to refine genomic detection of food-borne pathogens by monitoring sewage and social media technologies. The team aims to provide information and tools to improve food-borne surveillance programs run by the Public Health Agency of Canada (PHAC) and various partners.
- Genome Canada provided $4M toward a University of Guelph led International Dairy Farming genomics project. This four-year project will be the first large-scale project integrating novel genetic traits for fertility, health and feed efficiency into a national database to help farmers and breeders. The project is expected to revolutionize breeding in Canada's dairy farming industry.
- Four University of Guelph researchers aiming to improve food, health, sustainability and cybersecurity received $3.1M in funding from the Canada Research Chair (CRC) program. New chairs were awarded to Drs. Manju Misra (Tier 1 CRC), School of Engineering; Heather Murphy (Tier 2 CRC), Department of Pathobiology; and Ali Dehghantanha (Tier 2 CRC), School of Computer Science. An existing chair was renewed for Dr. Trevor DeVries (Tier 2 CRC), Department of Animal Biosciences. Prof. Heather Murphy and Prof. Ali Dehghantanha will also receive infrastructure funding through the John R. Evans Leaders Fund, developed by the CFI in collaboration with the CRC program.
- $750K from the federal New Frontiers in Research Fund (NFRF) supported three University of Guelph research projects. Projects supported included fostering Inuit youth environmental leadership, developing new treatments for microbial infections and examining how human behaviour impacts the rate of climate change and vice versa.
- Over $740K from CFI - John R. Evans Leaders Fund. The federal government is investing in five University of Guelph research projects, ranging from disease resistance to food safety to drug addiction.
- Prof. Todd Gillis and adjunct faculty member Dr. Sarah Alderman, both in UofG's Department of Integrative Biology, received $350K over two years from the National Contaminants Advisory Group of Fisheries and Oceans Canada to determine how bitumen, a type of crude oil, affects developing fish.

COVID-19

Consistent with public health policy, the UofG urged a significant scale back of research activities due to COVID-19, beginning in March 2020. There was a recognition that the pandemic would impact the progress of Alliance-funded projects, as well as all other research projects across the University. To mitigate the impact, the UofG implemented an "exemption" process for faculty members to identify critical and time sensitive research that should proceed. Many of the research projects granted exemptions were in the agri-food space and included utilization of the Research Centres. Thus, the impact on the Alliance Research Program was less than it might otherwise have been. As of the report date, there has been no research workplace outbreak of COVID-19 at the University of Guelph. Throughout the crisis, the University successfully demonstrated that it has the capacity and governance structures in place to nimbly manage issues, at both the operational and at the strategic levels.

In general, the COVID-19 pandemic has led to delays/slowdowns in research activity and productivity due to researcher fatigue, limitations in access to facilities/equipment, restrictions on face-to-face interactions, and/or challenges experienced by graduate students and staff. Many research technicians have been able to continue their work, as the Ontario Agri-Food Research Centres and many laboratories have been operational,

though at reduced levels to accommodate physical distancing. Slower research activity and limitations on physical gatherings have translated into fewer research outputs and less collaboration and knowledge translation in the short-term. The Alliance continued to adjust its operations to support researchers as effectively as possible.

Researchers were provided options for support, including:

- Allowance for no-cost project extensions;
- Opportunity to identify concerns with meeting project objectives or deliverables, within the current project design or budget;
- Opportunity to change dates and timelines for new projects;
- Ability to delay report submission by up to three months; and
- Additional support for HQP Scholarship recipients, including the potential for funding an additional semester for students late in their program if progress was delayed due to COVID-19.

COVID-19 has directly led to a number amendments from researchers, including:

- Tier I
    - 65 lead applicants requested changes to their timelines, milestones or project designs, with the vast majority of the requests being extensions.
    - Two lead applicants have been granted additional funds, $44K in total, to allow them to complete their deliverables.
    - One additional lead applicant has requested additional funds, to allow completion of deliverables.
- Special Initiatives
    - Four lead applicants requested changes to their timelines, milestones or project designs, with all requests involving extensions.
- KTT
    - Six lead applicants requested changes to their timelines, milestones or project designs.
- Gryphon's LAAIR
    - Six lead applicants requested changes to their timelines, milestones or project designs, with all requests involving extensions.
- HQP Scholarship Program
    - Five students delayed their start dates.
    - Twelve students have been approved for an additional semester of funding to offset delays related to the pandemic.

It is expected that some researchers may still identify the need for additional support to meet the deliverables of their projects. Additional funding is expected to come from unallocated carry forwards and will not affect current or future year allocations in the Research Program.

Regular virtual meetings of the Research/Property Management Program Management Committee (R/PM PMC) continued throughout 2020/21. Program staff have supported the needs of researchers through the pandemic and have made significant progress on the 2020/21 activities.

At present, University staff are attending the workplace only where their work cannot be done remotely. The UofG is following government and public health directives and working to make the campuses ready for returning students, staff and faculty. Research productivity is expected to remain reduced for the first part of 2021/22. It is expected to return to more normal levels as 2021/22 progresses, depending on the length of the pandemic, vaccine uptake and the success of reopening the province.

In 2020/21, the University was able to achieve the majority of its metrics, despite the COVID-19 pandemic. In general, the impact of COVID-19 on the Research Program has been diffuse and is expected to continue as an endemic into the future.

Finally, in support of COVID-19 research, many faculty members applied to external funding agencies and were successful with COVID-19 related-research projects. In addition, the University operated its own COVID-19 Research Development & Catalyst grant program to provide support for small-scale, time-sensitive research projects focused on contributing to the global response to the COVID-19 pandemic. This program was outside of the Alliance, however many of the projects were complementary to OMAFRA's areas of interest. The UofG awarded nearly $700K to researchers for 51 projects designed to support the battle against the COVID-19 pandemic and mitigate its impacts.

Alliance Programming

The Tier I Research Program switched to a single-stage call process, which allowed for earlier notification of awards, provided additional planning time for summer field seasons, and supported more effective graduate student recruitment. The single-stage call will decrease the elapsed time between the Ministry identifying a particular line of research as a priority, and the delivery of new knowledge to address that priority. Overall, the single-stage call process has been a resounding success, resulting in greater efficiency, both for the researcher and the program administrators, and time-savings for award notifications of approximately three months. The single-stage call process will continue to be utilized in the future.

Several other initiatives aimed at continuous improvement for efficient and high-quality research program administrative systems and processes were also accomplished in 2020/21, including: improvement of the report review process, development of a completion and compliance check process, enhancements to the program guides and initiation of the Issue Resolution process.

The continued development of the Research Management System (RMS), the database used to administer all Research Projects, was a significant focus for 2020/21. The implementation process provided an excellent opportunity to document processes and procedures, as well as look at ways to improve efficiency. Substantial amounts of time were invested in system development, improvements, and remediation. While considerable work remains to be completed in the implementation and continuous improvement of RMS, much was accomplished in 2020/21.

In addition, 2020/21 saw the second round of award allocations for the Special Initiatives program. Projects funded under the Special Initiatives program respond to a specific issue or need of the Ontario agri-food sector that has been identified by OMAFRA. These science and research needs are important for the Ministry and agri-food stakeholders but, for various reasons, do not fit well into the annual Tier I call for proposals cycle or under another Alliance program.

The inaugural HQP Scholars Event - Cultivating Business, Innovation, & Leadership in Agri-food Research was held on December 3, 2020. The event celebrated the partnership with Food from Thought, highlighted the achievements of the 2019/20 HQP Scholars and recognized the 2020/21 HQP Scholars. The event was attended by 71 people and was deemed a success.

The Industry Liaison team also helped to successfully leverage OMAFRA funding in projects, where OMAFRA is a partner on the team, with the NSERC Alliance program. Two projects were successful in 2020/21, led by Dr. Lee-Ann Huber and by Dr. Lewis Lukens, creating additional value for the agri-food sector. Further opportunities to leverage funding with the NSERC Alliance program are being actively pursued.

The University of Guelph and SVG Ventures' THRIVE partnered in 2020/21 to accelerate innovation in the Canadian agri-food sector by creating a platform for agri-food entrepreneurs and start-ups to gain access to

impactful, technology-driven research. The University hopes to see the benefits of this partnership in the future.

Another major initiative in 2020/21 was the preparation of the Impact Case Studies, which is a reporting requirement under the Agreement. The Impact Case Studies are a qualitative assessment and accompanying narrative which illustrates the longer-term cumulative impact of Alliance research and KTT activities on the end-user audience. The Impact Case Studies completed to date will be important resources in the mid-term review of the overall Agreement. The first case study on Dairy was submitted with the 2019/20 Annual Report, the second case study on Breeding and Genetics was submitted in March 2021 and the third case study on Innovation will be submitted alongside this Annual Report.

The successes of the Research Program are clearly demonstrated in Tables 3.1 to 3.3, which provide a summary of key performance metrics. More details about the achievements and outcomes of the Research Program follow.

Table 3.1: Key Performance Metrics for the Research Program – Intellectual Capacity

Metric	2018/19	2019/20	2020/21	2021/22	2022/23	Target
Faculty FTEs in Research Projects	77.7	75.5	**76.6**			67.8
Number of Faculty Involved in Agreement-funded Research	246	263	**257**			N/A
Research Technician FTEs	87.6	96.7	**108.1**			42.4
Number of Technicians Involved in Agreement-funded Research	164	183	**192**			N/A
Research Support FTEs	22.8	22.5	**22.8**			22.5
Faculty FTEs Engaged in Research Supportive of Ministry Priorities	153.0	152.1	**149.6**			97
Number of Faculty Involved in Research Supportive of Ministry Priorities	364	385	**393**			N/A
Number of HQP per $1M Invested	17.1	17.0	**17.1**			14.0
HQP Employment in the Agri-Food or Rural Sectors	N/A	76% (HQP)	**96% (USEL)**			75%

Table 3.2: Key Performance Metrics for the Research Program – Leverage and Partnerships

Metric	2018/19	2019/20	2020/21	2021/22	2022/23	Target
Ratio of Third- Party Funding and In-Kind Contributions in Research Projects	1.00:1	0.93:1	**1.02:1**			1.00:1
Value of Third- Party Funding and In-Kind Contributions in Research Projects	$6.32M	$6.31M	**$8.05M**			N/A
Ratio of Third-Party Funding for Research Supportive of Ministry Priorities to Agreement Investment	1.05:1	1.03:1	**1.07:1**			0.7:1
Value of Third-Party Funding for Research Supportive of Ministry Priorities	$53.4M	$53.1M	**$55.3M**			N/A
Number of Co-Funders per $1M Invested	19.2	22.3	**19.6**			20.0
Number of Collaborators per $1M Invested	41.5	38.8	**31.7**			35
Third-Party Funding Directed at Tier II and III Research Projects	$7.62M	$2.79M	**$11.57M**			N/A

Table 3.3: Key Performance Metrics for the Research Program – Commercialization

Metric	2018/19	2019/20	2020/21	2021/22	2022/23	Target
Number of Patents Filed	10	20	**20**			17
Number of Patents Issued	4	12	**3**			5
Number of Licenses	22	20	**35**			19
License Revenue Generated	$1.67M	$1.56M	**$1.73M**			$1.50M
Number of Intellectual Property Disclosures	183	154	**171**			N/A

3.1.1 Research Faculty

Ontario needs a critical mass of world-class researchers to ensure the agri-food sector is poised to address current challenges and meet future opportunities. The University leverages investments made through the Agreement to ensure Ontario has the intellectual capacity to support a sustainable, globally competitive agri-food sector, and vibrant rural communities.

In 2020/21, the UofG attracted external investments and recruited research leaders to faculty positions, enhancing capacity to meet Ministry priorities and position Ontario as a global leader in agri-food innovation. Over the last year, 12 new faculty members began in agri-food or agri-food-related positions at the University. This was a decrease from the 25 faculty members hired in 2019/20. Much of the decline can be related to a "hiring pause" that occurred at the University during the COVID-19 pandemic. This has been lifted for 2021/22 and faculty hiring appears to be occurring at a more normal rate.

- Two named positions, made possible through external support
    - Dr. Helen Booker - Grain Farmers of Ontario Professorship in Wheat Breeding
    - Dr. Jess Haines - Helderleigh Foundation Professorship in Food Literacy (existing faculty member)
- Additional positions, either new capacity or replacement capacity for resignations/retirements
    - Dr. Cris Bravo Monge – Entrepreneurship and Business Management
    - Dr. Clara Cho – Precision Nutrition
    - Dr. Digeo Gomez Nieto – Large Animal Internal Medicine
    - Dr. Jacqueline Goordial - Environmental Microbiology
    - Dr. David Huyben - Aquaculture
    - Dr. Heather Murphy – One Health
    - Dr. Jesse Popp – Indigenous Environmental Stewardship
    - Dr. Courtney Schott – Anatomic Pathology
    - Dr. Claire Tugault-Lafleur – Human Nutrition
    - Dr. Samuel Workenhe – Virology
    - Dr. Andrew Young - Systematic Entomology

The UofG also named one faculty member as a Research Chair. **Dr. Jesse Popp** was named the OAC Chair in Indigenous Environmental Stewardship.

In addition, there were a number of Canada Research Chair (CRC) appointments, new and renewal, in areas of interest to the Ministry.

Dr. Manju Misra was named as a new Tier 1 CRC in Sustainable Biocomposites. This will enable her to develop next-generation materials from sustainable resources such as recycled plastics, plants, and farm and food wastes. By creating innovative materials, she aims to reduce petroleum-based plastics in landfills, rivers and oceans, and reduce greenhouse gas emissions. Her research will help in achieving a circular economy that eliminates waste and encourages resource reuse.

Dr. Heather Murphy will hold a Tier 2 CRC in One Health. An expert in water and wastewater treatment and environmental health, Dr. Murphy has worked for UNICEF in Africa, developed a water-borne disease estimate as a researcher with the Public Health Agency of Canada and recently worked in the United States on water and sanitation. Murphy heads the Water, Health and Applied Microbiology Laboratory in the Ontario Veterinary College, where she will support UofG's One Health Institute. She also belongs to a campus-wide research project launched this year to test wastewater on university campuses for the virus that causes COVID-19.

As the holder of a new Tier 2 CRC in Cyber Security and Threat Intelligence, **Dr. Ali Dehghantanha** will use computing and artificial intelligence to help protect critical Canadian infrastructure from cyber attacks. Robust defences are needed to prevent hackers from compromising data and systems used in such applications as pipelines, turbines, smart transportation, finance and smart farming. Those are all important elements of Canada's national cybersecurity action plan for 2019-24, intended to protect Canadians from cyber crime, defend public- and private-sector systems, and foster research and education.

Dr. Trevor DeVries' Tier 2 CRC in Dairy Cattle Behaviour and Welfare was renewed to 2025. By understanding the behaviour of dairy cattle, Dr. DeVries aims to recommend optimal feeding, housing and management strategies. Those recommendations are intended to improve animal welfare, enhance production and ensure quality milk products for consumers. Having studied production responses in animals over the past five years, he now plans to zero in on the individual behavioural and nutritional needs of dairy cows. This example of precision agriculture echoes the wider goal of sustainable food production shared by UofG's Food from Thought program and Arrell Food Institute.

Finally, the 2020 Weston Family Ecosystem Innovation Award was presented to **Dr. Amy Newman**, Department of Integrative Biology, for excellence and innovation in scientific research helping to balance environmental protection and agricultural production for the broader public good.

Other activities in the Research Faculty program activity that occurred during 2020/21 are outlined in Table 3.4.

Table 3.4: Status Update on the 2020/21 Business Plan Activities – Research Faculty

Business Plan Activity	Status
Acting as an enabler between Faculty Members and OMAFRA staff, helping them make connections and establish quality collaborations	In progress. The Office of Research (Agri-Food Partnership) assists faculty members in making connections with OMAFRA staff, either through the Research & Innovation Branch (RIB) or directly with the program areas. This is especially important for new faculty members, as well as for faculty members who are new to the Alliance.
Linking Faculty Members from different disciplines and encouraging them to consider forming interdisciplinary teams to address OMAFRA priorities	In progress. One key example of this occurred with the 2020/21 Special Initiatives (SI) program. Dr. Sara Epp, School of Environmental Design and Rural Development and Dr. David Kelton, Department of Population Medicine, were connected to discuss an SI project. They ultimately formed an interdisciplinary team to address the problem. The University hopes to do more of this once public health restrictions ease and more face-to-face meetings can be arranged.
Mapping Faculty Members' expertise to the new OMAFRA priority areas, noting areas of untapped capacity and areas where additional capacity may be required	In progress. As the University develops a better understanding of OMAFRA's new priority areas, the topics where additional capacity may be required are becoming more evident. In the next call cycle, the University will be focusing effort on the underrepresented priorities and will be reaching out to underutilized areas of the University

Business Plan Activity	Status
	with the disciplinary expertise to address those research needs.
Engaging with OMAFRA Leaders to discuss emerging areas that may require new capacity	On hold. This activity was limited due to COVID-19.
Continuing to work with the Deans to advance the University of Guelph's primacy as "Canada's Food University" through strategic hiring to maintain capacity and through the pursuit of major gifts/grants in support of the agri-food continuum	In progress. The Office of Research (Agri-Food Partnership) has strong working relationships with each of the seven Colleges, which are leveraged to support capacity planning. In addition, the Associate Vice-President Research (Agri-Food Partnership) works closely with the Deans to continue to advance the University of Guelph's primacy as Canada's Food University through strategic hiring and the pursuit of major gifts/grants in support of the agri-food continuum.

3.1.2 Research Support

Research Support provides the critical mass of technicians and other support personnel to provide knowledge and expertise which optimize the use of intellectual capacity and research infrastructure to achieve Agreement outcomes. This provides benefits to all of Ontario's regions and increases access to and sharing of data to facilitate new agri-food and rural research and data analytics to inform decision-making. Research Support, as a program activity, remains relatively stable year to year.

Table 3.5 provides a list of all the Tier II, III and IV projects approved as part of the Agreement in 2020/21. In the past, these projects were not listed in the Consolidated Annual Report, as they do not receive direct operating funding. However, it is important to recognize OMAFRA's support for the Tier II and III projects, in the form of technical support as well as subsidized access to the Research Centres. Without that support, these projects would not be possible. The Tier IV projects have been included for completeness, as they occur at a Research Centre. The projects are performed on a full cost recovery basis.

Table 3.5: 2020/21 Tier II, III and IV Research Projects

Lead Applicant	Project Title	Research Priority	Type
Luis Arroyo	A calf-specific multi-strain probiotic for prevention of diarrhea in dairy calves: An experimental safety study.	Animal Health & Welfare	Tier II
Christine Baes	Integrating genomic approaches to improve dairy cattle resilience	Sustainable Production Systems	Tier II
Renee Bergeron	Development of novel biomarkers for stress in pigs	Animal Health & Welfare	Tier II
Nicholas Bernier	Non-lethal transcriptional profiling of growth in rainbow trout	Animal Health & Welfare	Tier II
Benjamin Bohrer	Investigation of alternatives to ionophore/antibiotic management strategies in finishing cattle and the inherent effect on beef shelf life	Innovative Products & Product Improvement	Tier II

Lead Applicant	Project Title	Research Priority	Type
Helen Booker	Development of Winter Wheat Cultivars for Ontario: A Multi-Disciplinary Approach	Sustainable Production Systems	Tier II
Tracey Chenier	The role of mast cells in equine persistent breeding induced endometritis.	Animal Health & Welfare	Tier II
Katie Clow	Determining the prevalence of and risk factors for exposure to Cache Valley virus in Ontario sheep in the context of climate change	Animal Health & Welfare	Tier II
Trevor DeVries	Supplementing glycerol to transition dairy cows to improve metabolic status and productivity	Animal Health & Welfare	Tier II
Mehrzad Eskandari	Soybean Cultivar & Germplasm Development: Focusing on Seed Yield, Quality and Disease Resistance	Sustainable Production Systems	Tier II
Chris Gillard	Dry bean agronomy and pest management	Plant Health & Protection	Tier II
Alexandra Harlander	Understanding underlying mechanisms for feather-pecking behaviour in laying hens	Animal Health & Welfare	Tier II
Lee-Anne Huber	Protein and non-protein methionine requirements for first parity gestating and lactating sows	Competitive Production Systems	Tier II
David Huyben	Effects of lipid:protein ratio and insect larvae on growth performance, nutrient utilization and gut microbiome of lake whitefish (Coregonus clupeaformis)	Competitive Production Systems	Tier II
Simon Lachance	Natural products extracted from agri-food wastes for disease and insect management in organic greenhouse production	Plant Health & Protection	Tier II
Steven Loewen	Breeding to protect plant health for Ontario's processing tomato industry 2020-21	Sustainable Production Systems	Tier II
Ira Mandell	Sustaining the legume component of grazed pasture mixtures for stockpiling complex mixtures in Ontario	Sustainable Production Systems	Tier II
Wendy Pearson	Combined effects of diet and physiological stressors (transport and exercise) on gastrointestinal permeability (ie 'Leaky Gut Syndrome') in horses	Animal Health & Welfare	Tier II
Wendy Pearson	Effects of Camelina oil on serum fatty acids and inflammatory response and skin and coat condition in horses.	Animal Health & Welfare	Tier II
Darren Robinson	Weed Control in Processing Vegetables	Plant Health & Protection	Tier II

Lead Applicant	Project Title	Research Priority	Type
Kim Schneider	Optimizing environmental and economic outcomes for Ontario forage cropping systems	Sustainable Production Systems	Tier II
Michael Steele	Improving calf gut health by probiotic supplementation during the preweaning period	Animal Health & Welfare	Tier II
Michael Steele	The Impact of Maternal Prepartum Starch Intake on Colostrum Quality and Cow-Calf Performance	Animal Health & Welfare	Tier II
Clarence Swanton	Integrated Weed Management Studies for Vegetables Grown on High Organic Matter Soils	Plant Health & Protection	Tier II
Ljiljana Tamburic-Ilincic	Development of high-yielding winter wheat cultivars and germplasm with increased resistance to FHB and leaf diseases and good agronomic and quality performance	Plant Health & Protection	Tier II
Cheryl Trueman	Insect and disease management in fruiting vegetables	Plant Health & Protection	Tier II
Rene Van Acker	Vegetable Crop Management and Variety Evaluation	Plant Health & Protection	Tier II
David Wolyn	Analysis of rubber yield selection gain in Russian Dandelion	Innovative Products & Product Improvement	Tier II
Katie Wood	Determining the minimum fibre requirement for feedlot cattle and improving the empirical prediction of ruminal pH: Starch fermentability and uNDF source	Animal Health & Welfare	Tier II
Sarah Wootton	Analysis of adeno-associated virus (AAV) vectored immunoprophylaxis for protection against emerging infectious diseases	Animal Health & Welfare	Tier II
John Barta	Evaluation of the anticoccidial efficacy of a newly developed combination product in broiler chickens	Animal Health & Welfare	Tier IV
Marcia Chiasson	Efficacy of Ammonia Control 250 (AC250) as a growth promotant in rainbow trout from hatching to fingerling size	Animal Health & Welfare	Tier IV
Marcia Chiasson	Commercial Aquaculture Diets for Lake Whitefish	Animal Health & Welfare	Tier IV
Marcia Chiasson	Effect of Aquanat SynergyTM on the feed intake, gut histology and gut microbiome of rainbow trout	Animal Health & Welfare	Tier IV
Marcia Chiasson	Efficacy of Ammonia Control 250 (AC250) to control fungal and bacterial growth during the incubation of rainbow trout eggs	Animal Health & Welfare	Tier IV

Research Program Directors (RPDs) play a vital leadership role in the delivery of the research program and the achievement of KPIs. Specifically, RPDs help to ensure that Agreement-funded research meets the priorities set by OMAFRA, that research results are disseminated, and that partnerships are built with stakeholders. As leaders in their field of research, RPDs also act as ambassadors for the Ontario Agri-Food Innovation Alliance,

both locally and globally. Promoting Alliance priorities to UofG researchers, while encouraging and fostering collaboration with leading researchers from around the world, helps ensure that the University can develop and maintain the capacity to respond to emerging agri-food related research problems and opportunities. In 2020/21, there were no changes to the slate of RPDs. However, to accommodate the changes in research priority areas, RPDs were assigned to new areas based on their expertise and disciplinary knowledge. This was necessary to facilitate the Tier I review process. RPDs are expected to continue to provide leadership in the old thematic areas, while projects in those areas are completed. Table 3.6 provides a list of the RPDs with their original thematic appointments, as well as their new research priority areas. As all the RPD appointments expire in 2021/22, the University will be reviewing the roles and making any necessary adjustments.

Table 3.6: Research Program Directors

Theme	Research Priority Area	Name	Department	Term
Agri-Food and Rural Policy	Productive Land Capacity; Trade, Market, Targeted Sector Growth; Strong Rural Communities	Kate Parizeau	Department of Geography, Environment and Geomatics	September 1, 2018 to August 31, 2021
Bioeconomy – Industrial Uses	Innovative Products and Product Improvement; Trade, Market, Targeted Sector Growth; Competitive Production Systems (Bioeconomy)	Manjusri Misra	School of Engineering	September 1, 2018 to August 31, 2021
Emergency Management	Animal Health and Welfare; Food Safety	Zvonimir Poljak	Department of Population Medicine	September 1, 2018 to August 31, 2021
Environmental Sustainability	Soil Health; Water Quality and Quantity; Sustainable Production Systems	Laura Van Eerd	School of Environmental Sciences, Ridgetown	July 1, 2018 to June 30, 2021
Food for Health	Knowledge Translation and Transfer Program	Alison Duncan	Department of Human Health and Nutritional Sciences	July 1, 2018 to June 30, 2021
Products and Value Chains	Innovative Products and Product Improvement	Paul Spagnuolo	Department of Food Science	July 1, 2018 to June 30, 2021
Production Systems – Animals	Animal Health and Welfare; Competitive Production Systems	Stephen LeBlanc	Department of Population Medicine	July 1, 2018 to June 30, 2021
Production Systems - Plants	Plant Health and Protection; Competitive Production Systems	Mary Ruth McDonald	Department of Plant Agriculture	July 1, 2018 to June 30, 2021
Data	Data Strategy	Rozita Dara	School of Computer Science	September 1, 2018 to August 31, 2021

Theme	Research Priority Area	Name	Department	Term
HQP Scholarship Program	Highly Qualified Personnel (HQP) Scholarship Program	Keith Warriner	Department of Food Science	July 1, 2018 to June 30, 2021

Other activities in Research Support that occurred during 2020/21 are outlined in Table 3.7.

Table 3.7: Status Update on the 2020/21 Business Plan Activities – Research Support

Business Plan Activity	Status
Mapping technical expertise to existing and emerging OMAFRA priorities	In progress. A comprehensive exercise to classify the technical expertise within the Agreement is occurring. The results of this will be available in 2021/22 as part of the renewal process.
Ensuring appropriate levels of technical capacity exist to effectively use the Ontario Agri-Food Research Centres	In progress. As part of the review mentioned above, the appropriate levels of technical capacity will be determined to effectively support the Research Centres, now and in the future. In the interim, the University continues to invest in key areas of technical need, such as hiring a data technician to support the Ontario Dairy and Beef Research Centres in Elora.
Continuing to work with Departments to identify and address changes that would impact Agreement staffing levels	In progress. The Office of Research (Agri-Food Partnership) works directly with Departments to identify and address upcoming retirements or staffing changes which would impact the Agreement.
Improving the methods of recording Research Technician involvement in Tiers II, III and IV Projects, using RMS	Complete. Research Technicians can be effectively recorded in RMS on Tier II, III and IV projects as members of the Team. Researchers who do not utilize the Research Centres but have access to technical capacity have been asked to record this support in Tier II projects. Guidelines on recording Research Technicians will be included in the program guides which are being developed.
Continuing to develop the policies and processes for Tiers II, III and IV with the goals of improving accountability and reporting capacity	In progress. Policies and program guides are being developed for each of Tiers II, III and IV. These are expected to be complete in 2021/22.
Updating the allocations of support staff relative to research faculty FTE engaged in research projects	In progress. The methodology for support staff allocations relative to research faculty FTE engaged in Research Projects has been reviewed. It is expected that the revised support staff allocations will be implemented for the 2021/22 year.
Reviewing other aspects of the Research Support program activity, including the Superior Plant Upgrading and Distribution (SPUD) Unit at the New Liskeard Agricultural Research Station (NLARS)	In progress. The results of this review will be available in 2021/22 as part of the renewal process.

Business Plan Activity	Status
Expanding the student ambassador program, which engages UofG graduate students working in agri-food to deliver tours of the research facilities, to include the Ontario Beef Research Centre	On hold. The Ontario Agri-Food Research Centres have been closed to all non-essential personnel since March 2020 due to the COVID-19 pandemic. The student ambassador program will be resumed as soon as public health protocols allow, and no earlier than January 2022. At that point, expansion of the program will be reviewed.
Refining established biosecurity protocols for the ARIO Research Centres, starting with dairy and beef, to continue providing tours while ensuring the safety of tour participants and animals	On hold. The Ontario Agri-Food Research Centres have been closed to all non-essential personnel since March 2020 due to the COVID-19 pandemic. Public Health and University of Guelph guidelines have superseded existing biosecurity protocols during the pandemic. The University will revisit the biosecurity protocols in advance of tours resuming at the research centres.

3.1.2.1 Long-Term Trials

Long-term trials are also a component of the Research Support program activity. A Long-Term Trials Advisory Group was formed, and the first meeting was held on October 15, 2020. The Advisory Group contained representation from the UofG, OMAFRA (both RIB and ADB) and Industry (Grain Farmers of Ontario). There was an excellent discussion on a number of topic areas, including current issues and challenges. One of the most significant challenges identified by the group was management of the long-term trial data.

As a first step to address the data management issue, Dr. Rozita Dara and her team worked closely with a technician from the Department of Plant Agriculture to incorporate a portion of the long-term trial data into the existing Data Portal. This was an excellent first step in addressing the data need associated with the long-term trials.

To support the long-term trials in 2020/21, researchers were reimbursed for operating costs. Prior to reimbursement, researchers were required to submit a long-term trials report outlining the key findings from their work. These will be brought to the Advisory Group in 2021/22. Ideally, in the future, these reports will be completed using RMS.

Other activities in Long-Term Trials that occurred during 2020/21 are outlined in Table 3.8.

Table 3.8: Status Update on the 2020/21 Business Plan Activities – Long-Term Trials

Business Plan Activity	Status
Meeting regularly with the Advisory Group to discuss optimal operation and management of long-term trials	In progress. The first meeting was held on October 15, 2020. The frequency of meetings during 2020/21 was impacted by COVID-19. Regular meetings, ideally three times per year, will be established for 2021/22.
Managing the new staff member hired in support of long-term trials at Elora	Cancelled. The Advisory Group recommended moving away from a dedicated long-term trials staff member at Elora. It was felt that faculty members could more effectively manage the long-term trials with

Business Plan Activity	Status
	support to their programs and that there was greater need in the data science area.
Creating a policy document relating to the governance of long-term trials, specifically addressing questions of trial creation and dissolution	In progress. An outline of the policy document has been drafted based on the first meeting of the Advisory Group. Subsequent meetings in 2021/22 will be used to complete the policy document.
In conjunction with Soils at Guelph, highlighting 40 years of long-term trials at the University of Guelph	Complete. The team worked with Soils at Guelph and OMAFRA to produce a series of infographics entitled Crop Rotation Counts, which farmers can confidently use to make decisions related to crop rotation, tillage systems and nitrogen management. The infographics represent four key messages distilled from 65 years of crop rotation research at the Ontario Crops Research Centres in Ridgetown and Elora. The series was launched at Canada's Digital Farm Show and promoted throughout the fall of 2020 at the Royal Agricultural Virtual Experience and through the Soils at Guelph and Alliance newsletters, yearbook, websites and social media channels.

3.1.3 Highly Qualified Personnel Scholarship Program

The Agreement supports the next generation of agri-food innovators by providing training opportunities for graduate students dedicated to Ontario's agri-food sector through the Highly Qualified Personnel (HQP) Scholarship Program. The number of HQP applications continues to grow, with demand from 111 applicants in 2020/21 and a total ask of $5.0M, an increase of 18% over 2019/20.

There were 19 HQP Scholarships awarded in 2020/21. Ten of these scholarships were provided to Masters students (eight Entrance and two In-Course) and nine to Doctoral students (five Entrance and four In-Course). Table 3.9 outlines information about the new award winners. These 19 new students add to the 11 continuing Masters and 20 continuing Doctoral students, bringing the total cohort participating in the program in 2020/21 to 50 students.

Over its existence, the HQP Scholarship Program has supported the development of more than 200 students who are the future researchers, policymakers and innovators in government, academia, the agri-food sector and rural economic development.

Under the Agreement, the University has an annual requirement to find $250K in matching funding for the HQP Scholarship Program. To meet this requirement, a partnership was developed with the Canada First Research Excellence Fund (CFREF) Food from Thought Program. Food from Thought committed the $250K in matching funds for 2020/21, as well as provided an additional $435K in scholarship support. This significantly increased the number of scholarships that were awarded in 2020/21. The matching funds, as well as some additional support, will be available until 2023. This novel partnership provides significant benefits to both parties, including attraction and retention of the best and brightest talent for the agri-food sector and mobilization of knowledge for the benefit of both society and the economy.

Table 3.9: 2020/21 HQP Scholarship Program Award Winners

Student Name	Project Title	Faculty Advisor	Department Name	Degree, Scholarship Type
Emma Chappell	Quantifying the Impact of Climate Change on Soil Organic Matter in Ontario	Asim Biswas	School of Environmental Sciences	Masters, In-course
Kasra Ghasemi	Microencapsulated phase change materials (PCMs): A Promising technology for smart food packaging	Syeda Tasnim	School of Engineering	Doctoral, Entrance
Jake Gregory	Field testing of biocontrol agents against Fusarium head blight in wheat for reduced vomitoxin	Manish Raizada	Department of Plant Agriculture	Masters, Entrance
William Helps	Policy Solutions for Labour Shortages in the Ontario Agri-Food Sector: An International Comparative Review	Ryan Gibson	School of Environmental Design and Rural Development	Doctoral, Entrance
Hiral Jariwala	Carbon-sequestering technology for offsetting greenhouse gas emissions and reducing fertilizer requirements	Emily Yi Wai Chiang	School of Engineering	Doctoral, In-course
Patty Kedzierski	Estimating energy balance and providing individualized nutrient supplementation to dairy cattle using automated technology	John Cant	Department of Animal Biosciences	Doctoral, In-course
Busayo Kodaolu	Impacts of organic and inorganic amendments on chemical behaviour of phosphorus in a complex soil system	James Longstaffe	School of Environmental Sciences	Doctoral, Entrance
Puja Lamichhane	The role of soil health and soil phosphorus source in determining soil phosphorus recommendations for forage crops species.	Kim Schneider	Department of Plant Agriculture	Masters, Entrance
Hannah May	Climate Change Effects on Nutrient Dynamics in the Hydrosystem of a Great Lakes Clay Plain Setting	Andrew Binns	School of Engineering	Masters, Entrance
Brooke McNeil	Supplementing glycerol to transition dairy cows to improve metabolic status, health and productivity	Trevor DeVries	Department of Animal Biosciences	Masters, Entrance

Student Name	Project Title	Faculty Advisor	Department Name	Degree, Scholarship Type
Deus Mugabe	Genomic Analysis of Sclerotinia Stem Rot (caused by Sclerotinia sclerotiorum) Resistance in Canadian Soybean Germplasm	Istvan Rajcan	Department of Plant Agriculture	Doctoral, In-course
Luis Eduardo Peña Barrena	Exploring the potential of plant-derived flavonoids to improve crop performance in response to abiotic and biotic stress	Gale Bozzo	Department of Plant Agriculture	Masters, Entrance
Caroline Reisiger	Investigating protein complexes associated with starch synthesis in cereals: A proteomic approach using Blue-Native PAGE	Ian Tetlow	Department of Molecular and Cellular Biology	Masters, Entrance
Emily Robinson	Plastic Makes Perfect: A Value Chain Analysis of Single-Use Plastics in the Agri-Food Sector	Simon Somogyi	School of Hospitality, Food and Tourism Management	Masters, Entrance
Lautaro Rostoll Cangiano	Probiotic supplementation to dairy calves to improve animal health and performance while reducing antimicrobial use	Michael Steele	Department of Animal Biosciences	Doctoral, In-course
Livia Sente	Business Risk Management Policy, Yield Resiliency and On-Farm Climate Change Adaptation Efforts	Alan Ker	Department of Food, Agricultural and Resource Economics	Masters, In-course
Aarsha Surendren	Development of Biopolymeric Composites made with Ontario Biomass for Engineering Multi-Layer Cast Film in Packaging Applications	Amar Mohanty	Department of Plant Agriculture	Doctoral, Entrance
Saeid Tabatabaei	Role of Abnormally Regulated Inflammatory Responses in Development of Bovine Respiratory Disease	Jeff Caswell	Department of Pathobiology	Doctoral, Entrance
Vanessa Zak	Methylated cell free DNA in human and bovine seminal plasma as a biomarker of fertility	Jonathan LaMarre	Department of Biomedical Sciences	Masters, Entrance

In 2020/21, a policy was drafted to mitigate the impacts of COVID-19 on HQP Scholarship recipients. The policy recognized the importance of graduate students in supporting the Ontario Agri-Food Innovation Alliance Research Program and maintaining the University's reputation for research excellence. It also provided flexibility, certainty and supported the health and safety of the HQP Scholarship Recipients. The policy had non-financial supports (e.g., deferral of start date, leave of absence, allowance for other locations, etc.), which five students utilized, and financial supports, which twelve students will have used by Summer 2021. Specifically, the Alliance provided COVID-19 support payments to six students worth $40K (total) in 2020/21. A further $44K (total) was committed to six additional students in 2021/22 for COVID-19 related delays. This has been a critical policy in supporting the HQP Scholarship recipients.

The inaugural HQP Scholars Event - Cultivating Business, Innovation, & Leadership in Agri-food Research was held on December 3, 2020. The event celebrated the partnership with Food from Thought, highlighted the achievements of the 2019/20 HQP Scholars and recognized the 2020/21 HQP Scholars. The 2019/20 HQP Scholars had an opportunity to present their industry-partner work and to network with OMAFRA staff and key industry partners that recognize the HQP Scholarship Program's role in supporting the development of tomorrow's agri-food leaders. The event was attended by 71 people and was deemed to be a success.

Table 3.10 contains a comparative summary of activities in the HQP Scholarship Program identified in the 2020/21 Business Plan, relative to the activities that took place in 2020/21.

Table 3.10: Status Update on the 2020/21 Business Plan Activities – HQP Scholarship Program

Business Plan Activity	Status
Improving advertising of the HQP Scholarship Program, both within the University of Guelph and external to it, with the goal of improving the quality of applications, finding students who are oriented to the importance of business in science and increasing the diversity of research areas of significance to the agri-food sector	In progress. The HQP Scholarship Program was advertised in a number of venues and through several communication channels (e.g., Townhalls, Research Alerts, direct emails to Department Administrators, Graduate Program Assistants, and Undergraduate Program Counsellors for distribution, etc.) at the University of Guelph. To generate additional entrance scholarship applicants from other universities, the University will continue to reach out to other post-secondary institutions with relevant feeder programs.
Maintaining the broader College and Department participation in the program through additional communication and outreach	Complete. The 2020/21 HQP Scholarships recipients span five UofG Colleges and 11 different Departments, and address all OMAFRA priority areas, except Productive Land Capacity.
Working closely with Food from Thought staff to ensure that the collaboration continues to provide benefit for both parties	In progress. Staff from the Office of Research (Agri-Food Partnership) frequently interacts with staff from Food from Thought to discuss program requirements and desires.
Continuing to develop the policy manual for the HQP Scholarship Program, which formalizes many of the policies applied to HQP Scholarship holders	In progress. The HQP Scholarship Program Guide acts as the policy manual for the HQP Scholarship Program. It is available on the website for students and faculty advisors. It is continuously being updated to include new policies and procedures, especially those related to the use of RMS by scholarship holders. The program guide has been an effective way of communicating policies to HQP Scholarship holders.

Business Plan Activity	Status
	Policies around transcript requirements, post-award reporting, and degree transfers were developed for inclusion in the program guide. Additionally, the application review process was streamlined this year in collaboration with OMAFRA. For efficiency, the OMAFRA HQP lead evaluates only if the student's research project fits with the research priorities.
Improving the use of RMS for the application, tracking and reporting aspects of the HQP Scholarship program	In progress. RMS is fully functional for the application aspect of the HQP Scholarship Program. The HQP reports were developed and implemented in the RMS during 2020/21. A new HQP Scholarship Program Reporting and Review Procedure was developed and jointly approved. It has also been implemented in RMS. The University will utilize the new procedure for the first round of reporting in RMS in Summer 2021. A tip sheet specific to HQP reports is being created for the students. The only outstanding item in RMS is the creation and implementation of several tracking fields required for monitoring the program.
Continuing to refine the HQP course and work experience components of the program, with input from UofG Faculty, OMAFRA staff and key industry partners	In progress. Several refinements were made to the HQP course in 2020/21. Students contributed to the course-based Research Ethics Board (REB) application by reviewing documents on four types of data collection they may not have been familiar with before the course: surveys, focus groups, interviews, and research workshops. Faculty in the course conducted lectures on policy brief and opinion editorial writing, allowing students to use their thesis topic and area of expertise in new, persuasive ways of writing. Students also participated in a workshop on KTT and learned innovative ways to get their research out of the university / lab and into the hands of the community / industry.
Ensuring HQP students continue to receive exposure to leadership opportunities in the agri-food sector during their involvement in the program	In progress. The virtual format of the HQP course allowed for students to utilize the course contacts across Canada to do presentations on food systems topics, further expanding the students' awareness of food and agriculture leaders across the sector. The HQP course continued to give students the opportunity to manage a project from start to finish in interdisciplinary groups, establishing roles and a work contract with milestones and metrics to measure progress and success. This course demands collaboration across silos and as such, increases the opportunities for students to lead in different ways and at different times.
Creating mechanisms to monitor the career progression of HQP scholars following graduation	On hold. While implementing the employment survey, a number of privacy concerns were identified. These need to be explored further prior to creating mechanism for monitoring career progression of graduates.

Business Plan Activity	Status
Utilizing the HQP employment survey results to improve students' experience in the program	In progress. Employment survey data has been passed to the HQP Director, as well as the instructors of the HQP course for analysis. Opportunities for continuous improvement of the program are being discussed.
Holding the first HQP Scholars recognition event	Complete. As noted above, the first HQP Scholars event was held on December 3, 2020.

3.1.4 Research Projects

3.1.4.1 Research Project Operating – Tier I

Committed to excellence in research and guided by the core values of impartiality, fairness, and integrity, the processes supporting the research funding programs administered by the University of Guelph provide rigor and accountability in proposal review, according to best practices in research program administration.

In an effort towards continuous improvement and efficiency, the Tier I Research Cycle was changed to a one-stage call (Full Proposals only) for the 2020/21 funding cycle, as approved by R/PM PMC in August 2019. This new process omitted the Letter of Intent (LOI) stage that had been included in previous years. This change has the potential to result in earlier award notifications which better align with the needs for graduate recruitment and field season preparation. In general, it will lead to efficiency gains for researchers, review committee members, and program staff, without any significant impacts on proposal quality.

Upon receipt of OMAFRA's research priorities for 2020/21, the University launched the one-stage call for proposals in October 2019. Nine review committees were assembled that were comprised of OMAFRA staff (including the OMAFRA Research Director or alternate, OMAFRA manager or alternate and RIB Research Analyst), academics (including the UofG Research Program Director), and representatives from industry. The response to the call generated 127 Full Proposals (FPs), with at total ask of $19.5M. The number of proposals was a slight decrease from the previous year where 144 Letters of Intent were received, but still more than the 79 proposals that were selected to move to the Full Proposal stage.

The proposals were evaluated against defined criteria that included alignment with research priorities, benefits to Ontario, value for money, quality of the science, sector engagement and the research team. Of the 127 FPs that were received and reviewed, 50 projects were recommended for funding by the review committees. The Ministry supported all 50 projects, resulting in the total amount awarded of $7,072,884. Table 3.11 provides the breakdown of proposals by status and research priority. A list of the 50 research projects awarded in 2020/21 is included in Table 3.12.

Table 3.11: Number of Proposals by Status and Research Priority Area

Research Priority	Number of Proposals Submitted	Number of Proposals Recommended	Number of Proposals Awarded	Amount Awarded
Animal Health & Welfare	32	15	15	$1,861,660
Competitive Production Systems	35	11	11	$1,472,313
Food Safety	2	1	1	$59,278
Innovative Products & Product Improvement	7	0	0	$0
Plant Health & Protection	13	6	6	$899,950
Productive Land Capacity	3	2	2	$280,680
Soil Health	4	1	1	$209,750
Sustainable Production Systems	24	12	12	$1,897,686
Trade, Market & Targeted Sector Growth Opportunities	2	0	0	$0
Water Quality & Quantity	5	2	2	$391,567
Total	**127**	**50**	**50**	**$7,072,884**

Table 3.12: 2020/21 Tier I Research Projects

Lead Applicant	Project Title	Ministry Priority	Amount Awarded
Angela Canovas	Applying genomics to identify markers associated with genetic resistance of sheep gastrointestinal nematode parasite infection	Animal Health & Welfare	$238,000
Brandon Gilroyed	Ambient Alkaline Hydrolysis: a biosecure swine mortality and processed hide management tool	Animal Health & Welfare	$96,250
Cathy Bauman	Penicillin Depletion Study in Dairy Sheep: determining milk withholding time for an on-label claim	Animal Health & Welfare	$41,100
Charlotte Winder	Improving the care and management of down dairy cows through developing evidence-based best management practices	Animal Health & Welfare	$94,840
David Kelton	Development, implementation and evaluation of a bulk tank milk surveillance program for infectious and emerging diseases on Ontario dairy farms	Animal Health & Welfare	$167,700
David Renaud	Describing and characterizing neonatal dairy calf mortality in Ontario	Animal Health & Welfare	$116,000

Lead Applicant	Project Title	Ministry Priority	Amount Awarded
David Renaud	Evaluating the efficacy of a non-antimicrobial therapy, colostrum, as a therapy for neonatal dairy calves	Animal Health & Welfare	$96,450
Jeff Caswell	Understanding how bovine respiratory disease risk factors promote development of pneumonia as a strategy to develop novel methods to prevent disease	Animal Health & Welfare	$234,484
Jessica Gordon	Pain control using various dosing regimens of meloxicam for band castration of newborn bull calves	Animal Health & Welfare	$77,560
John Barta	Identifying the Eimeria species causing coccidiosis in young sheep and goats: On-farm epidemiology and anticoccidial sensitivity	Animal Health & Welfare	$47,777
Julang Li	Characterization and validation of a potential probiotic with novel desired traits for animal application	Animal Health & Welfare	$193,659
Michael Steele	The Impact of Oral Antimicrobial Use in Calves	Animal Health & Welfare	$149,100
Renee Bergeron	Airflow patterns and animal welfare in pigs transported at different space allowances in an actively ventilated vehicle in summer and winter	Animal Health & Welfare	$103,140
Robert Friendship	Investigation of alternative control measures for post-weaning E. coli diarrhea in pigs	Animal Health & Welfare	$66,500
Todd Duffield	Herd level transition cow management and cow level genetic markers for determining ketosis risk in lactating dairy cattle	Animal Health & Welfare	$139,100
Adam Gillespie	A fundamentally new approach to determining soil N mineralization potential through pyrolysis-based thermal cracking.	Competitive Production Systems	$238,785
Eduardo De Souza Ribeiro	Supplementation of omega-3 fatty acids as a nutraceutical strategy to control postpartum inflammation and enhance production efficiency and fertility in dairy cows	Competitive Production Systems	$159,273
Jennifer Ellis	Optimization of pellet quality at the mill level using machine learning	Competitive Production Systems	$128,077
Jennifer Ellis	Hybridization of artificial intelligence and mechanistic models to create 'intelligent'	Competitive Production Systems	$103,034

Lead Applicant	Project Title	Ministry Priority	Amount Awarded
	precision nutrition models for next generation dairy production		
John Cline	Improving outcomes for Ontario apple producers though precision agriculture and labour efficiency strategies	Competitive Production Systems	$189,443
Jonathan LaMarre	Evaluation and potential augmentation of bovine fertility using small non-coding RNAs	Competitive Production Systems	$91,900
Joshua Nasielski	Developing best management practices for late nitrogen applications in corn	Competitive Production Systems	$151,866
Lee-Anne Huber	Development of evidence-based feeding strategies for lactating sows using novel and evolving feeding technologies.	Competitive Production Systems	$82,717
Medhat Moussa	Improved operational efficiency and enhanced farm management decision making for fruit tree and ornamental nurseries using automation and precision agriculture tools.	Competitive Production Systems	$154,900
Rene Van Acker	Evaluating the impact of pollination on cannabinoid production in industrial hemp	Competitive Production Systems	$48,378
Syeda Tasnim	Heat Storage and Improved Thermal Management to Reduce Energy Use and Improve Growing Conditions in Ontario Commercial-scale Greenhouses	Competitive Production Systems	$123,940
Ron Johnson	Depletion of Dexamethasone in Cattle: Food Safety Study in Dairy and Beef Cattle	Food Safety	$59,278
Art Schaafsma	Management and Mitigation of Bt Resistance in European corn borer in Canada	Plant Health & Protection	$228,550
Cynthia Scott-Dupree	Development of a sustainable pest management program for the box tree moth - a pest of the nursery and landscape industry	Plant Health & Protection	$174,000
François Tardif	Herbicides and cover crops for improved corn establishment	Plant Health & Protection	$50,000
Mary Ruth McDonald	Solving Stemphylium: Enhanced integrated pest management of Stemphylium leaf blight and other foliar diseases of onion	Plant Health & Protection	$137,400
Mehrzad (Milad) Eskandari	Genetic Dissection of the Resistance to Soybean Cyst Nematode (SCN) using Advanced	Plant Health & Protection	$100,000

Lead Applicant	Project Title	Ministry Priority	Amount Awarded
	Functional Genomic Tools and Developing Ontario-Adapted SCN-Resistant Cultivars		
Peter Sikkema	Herbicide-resistant weeds in Ontario - surveys, mechanism of resistance, and development of integrated management strategies	Plant Health & Protection	$210,000
Dave Guyadeen	Rural Non-Farm Development: Assessing the impacts of Ontario's Provincial Policy Statement lot creation (severance) policies, 2010-2019.	Productive Land Capacity	$142,500
Sara Epp	Assessing Land Use Planning Tools to Mitigate Odour and Lighting Nuisances Related to Cannabis Production	Productive Land Capacity	$138,180
Asim Biswas	Effect of land conversion on soil carbon and nutrient dynamics in the Great Clay Belt of Northern Ontario: Digital soil mapping approach	Soil Health	$209,750
Claudia Wagner-Riddle	Evaluating the resilience of diversified crop rotations to extreme weather events	Sustainable Production Systems	$240,000
David Hooker	Optimizing winter wheat for increasing crop rotation diversity	Sustainable Production Systems	$181,000
Edward McBean	Evaluation of Cannabis Advanced Odour Management Technologies	Sustainable Production Systems	$233,800
Erica Pensini	Natural materials as alternatives to plastic bale wraps	Sustainable Production Systems	$112,000
Ira Mandell	Effects of Pasture Management Strategies on Carbon Sequestration, Soil Health, and Forage Productivity for Optimizing Cow-Calf Performance using Sustainable Production Practices	Sustainable Production Systems	$240,000
Joshua Nasielski	Increasing lodging resistance in oats for enhanced quality and yield	Sustainable Production Systems	$59,131
Joshua Nasielski	Do winter-hardy cover crops improve field trafficability?	Sustainable Production Systems	$12,330
Kate Parizeau	Innovating for Organics Recycling and Improving Food Rescue and Recovery in the Industrial, Commercial and Institutional Sectors	Sustainable Production Systems	$211,600
Manish Raizada	Identifying the heritable contribution of the microbiome to hybrid vigour and field-level	Sustainable Production Systems	$100,750

Lead Applicant	Project Title	Ministry Priority	Amount Awarded
	variation in corn to improve yield stability including Fusarium/vomitoxin resistance		
Manjusri Misra	Biodegradable and Compostable Bale Wrap for Ontario Agriculture	Sustainable Production Systems	$197,500
Michael von Massow	Developing Best Practices for Food Waste Reduction in Food Service	Sustainable Production Systems	$105,075
Tongzhe Li	Using Behavioral Economics to Promote Best Management Practices Adoption: Experimental Evidence on the Effectiveness of Nudges, Framing, and Messenger Selection	Sustainable Production Systems	$204,500
Genevieve Ali	Development of risk indicators for crop fields prone to extreme weather, flooding and hydrologic connectivity in the Lake Erie Basin	Water Quality & Quantity	$193,389
Genevieve Ali	Dominant soil water flow processes and associated agricultural nutrient leaching under different management practices in southern Ontario	Water Quality & Quantity	$198,178
Total			**$7,072,884**

In addition to administering the 50 new projects addressing important Ministry research priorities in 2020/21, the University continued to manage the post-award compliance and reporting requirements of 199 continuing Tier I research projects.

An *Impact of COVID-19 on the Alliance Research Programs* document was created in response to the COVID-19 pandemic. It outlined a variety of methods being used to support researchers in enabling Alliance research projects to meet their objectives and deliverables. In situations where the original project objectives or deliverables may not be achievable within the project design or budget, an opportunity for the researcher to develop alternative options, which could include revisions to the deliverables, changes to the project design or additional funding were to be discussed, subject to OMAFRA approval. Two requests were identified where the original project objectives or deliverables were not achievable within the project budget due to COVID-19. These two projects received support for the additional costs, approved by R/PM PMC on December 15, 2020 and January 8, 2021.

Table 3.13 contains a comparative summary of activities for Research Project Operating – Tier I proposed in the 2020/21 Business Plan, relative to the activities that took place in 2020/21.

Table 3.13: Status Update on the 2020/21 Business Plan Activities – Research Project Operating – Tier I

Business Plan Activity	Status
Continuing to support the Research Management System implementation, including work on process development, integration with other University Systems, and testing	In progress. While much progress has been made with the Research Management System in 2020/21, there remains a number of gaps in implementation that must be addressed in the short-term. These include: • Project Close-Out; • KTT Transactions; • Post-Project Verification; • Research Centre Manager Portal; • Research Program Director Portal; • KTT Initiatives (implemented, testing underway); and • Implementation of the UofG's financials. There are several other issues which can be addressed as part of continuous improvement. Finally, there needs to be documentation developed for system users explaining how the system is intended to function. The University remains ready to support the continued development in RMS in any way that it can.
Working actively on Research Project policy development and implementation	In progress. A number of policies are at different stages of development, including a Lead Applicant and Co Applicant policy and a policy on Project Close-Out. Once drafts have been completed, they will be shared with OMAFRA for discussion and ultimately approval.
Continuing to improve the efficiency and quality of the application process, the proposal evaluation scorecard, the proposal review process and the report review process for all Research Projects	In progress. This is a continuous improvement activity that will be ongoing throughout the Agreement. Several key changes were made in 2020/21, which are outlined in the next four rows. The hiring of the Manager, Research Program Compliance, has led to an ongoing positive impact on the efficiency and quality of the application process and the report review process.
Adding value to the process through completion and compliance checks for both proposals and reports	Complete. A rubric for compliance checks has been developed and implemented for both proposals and reports. This has significantly improved the quality of the proposal data in RMS, which has led to higher confidence in data for annual reporting. In addition, compliance checks for reports have improved the completeness of reports advanced for review by RIB Research Analysts, which has also resulted in fewer revision requests.
Improving the quality of the program guide and the training provided to faculty members to support them in the application process	In progress. The program guide was updated to make it more comprehensive and relevant to researchers. It directly addresses a number of the common issues that researchers experience during the application process. In 2020/21, the

Business Plan Activity	Status
	scorecard for the review process was also made available to researchers to support their application development. In addition, the University hosted a training session specifically for approvers (typically Chairs/Directors and Associate Deans/College Research Managers), to support them in their review and approval of the OR5 information in RMS. There is still more work planned to support researchers through the application process.
Developing rubrics for the report review process to assist with timeliness and consistency and reduce the delays in providing feedback to Faculty Members	In progress. A Report Review Policy has been drafted and is in its last stages of review/revision. Its purpose is to support the timely review of annual and final research progress reports that appropriately balance information needs with the reporting expectations placed on lead applicants. It contains rubrics and timelines for each stage of the review process and outlines how decisions are made on reports. It is expected to be jointly approved in Summer 2021. More details on report review can be found in Section 3.2.2.1.
Clarifying the amendment process and ensuring expedient review and response	Complete. The Amendment Policy was jointly approved on April 27, 2021. It identifies when an amendment or minor change request is required, and outlines the request, review and project revision process. More details on amendments can be found in Section 3.2.2.2.
Developing policy for the Issue Resolution process and implementing it for effective administration of projects that are experiencing difficulties	In progress. An Issues Resolution Policy has been drafted and is in the last stages of review and revision. It is expected to be complete in Summer 2021. Two Issues Resolution meetings were held in 2020/21, where a total of 14 projects were discussed. Consensus was achieved on the outcomes for each of the projects, which has been actioned by the University. More details on issues resolution can be found in Section 3.2.2.4.
Analyzing the potential for a formal industry review process, similar to peer review	On hold. An informal industry review process was utilized by the Livestock Research Innovation Corporation (LRIC) for both the 2020/21 and 2021/22 calls. The potential for a formal industry review process will be discussed with RIB staff in 2021/22.
Enhancing the method of recording Knowledge Translation and Transfer activities (KTT Tracker) and promoting its use among Faculty, even post final report	In progress. There continues to be significant issues with the KTT Tracker in RMS which prevent both fulsome reporting from researchers and program-level analysis of KTT. In the interim, the University has ensured KTT activities are identified during reporting, but until these issues are resolved the University cannot broadly promote its use to researchers.

Business Plan Activity	Status
Collecting Equity, Diversity, Inclusion (EDI) information for applications to all Research Projects to better understand who the applicants are and determine if there are any systemic barriers that exist	On hold. Capacity limitations with respect to RMS changes have paused any collection of EDI information from applicants. As EDI has been identified as an important element of the Agreement renewal, this activity will be prioritized in 2021/22.
Promoting and creating opportunities for productive research collaborations that connect colleagues, disciplines, and a diversity of partners to better address the new research priority areas	On hold. Due to COVID-19, many of the collaboration-building activities were deferred. These will be resumed in 2021/22, assuming public health restrictions allow for face-to-face meetings.
Working with the Ministry, to address the asynchrony between the Ministry's provision of research priorities and the research call cycle, as well as the timeliness of program decisions	In progress. There has been a substantial amount of discussion over the past year on research priority timing, as well as the timeliness of project approval. The launch of call for the 2021/22 funding year was delayed as priorities were not provided until October. There is still work to be done on aligning the provision of research priorities to the optimal research call cycle timing. Given that the delivery of new knowledge addressing the priorities arises towards the end of multi-year projects, a good question is whether the annual priorities-setting and research call processes can proceed without synchrony, with no significant impact on the relevance of the research. However, the timeliness of project approval was much improved, and program decisions were received as promised. This was due to the significant efforts of the leaders and staff in RIB.
Identifying third-party incremental leverage opportunities for Research Projects through external relationship building with industry and potential donors	In progress. The NSERC Alliance Program has been identified as a significant third-party incremental leverage opportunity for Tier I Research Projects. The Office of Research (RIO, Agri-Food Partnership and Research Services), with support from OMAFRA, has promoted this opportunity to researchers and developed processes and documentation to allow for smooth application and award processes. The COVID-19 pandemic limited other external relationship building during 2020/21.
Improving the effectiveness of communications related to Research Project outcomes and the impact research is having on the end users	In progress. Significant advances were made in designing and delivering new communications tools to expand reach and awareness of Alliance-funded research (see Section 3.1.7 for more information). A new 'Impact' area of the Alliance website is underway and expected to launch in Fall 2021, further enhancing the effectiveness of communications related to Research Project outcomes and sector impact.

3.1.4.2 Research Project Operating - Special Initiatives

Projects funded under the Special Initiatives (SI) program respond to a specific issue or need of the Ontario agri-food sector that has been identified by OMAFRA. These science and research needs are important for the Ministry and agri-food stakeholders but, for various reasons, do not fit well into the annual Tier I call for proposals cycle or under another Alliance or OMAFRA program. Special Initiatives include breeding research, medium-term trials, synthesis, modelling work, and other Ministry science needs.

In 2020/21, thirteen SI projects were defined by OMAFRA and provided to the University. Unlike Tier I, SI projects have a designated budget amount and duration, which has been pre-approved by the Ministry. The University held a call for proposals, which was open for just 31 days, closing on May 1, 2020. Collaborative submissions were highly encouraged so that the best expertise at the UofG was brought forward to address OMAFRA's research needs. Despite the COVID-19 pandemic, the University delivered proposals for each of the SI projects. All proposals were reviewed by a Research Analyst in RIB, the OMAFRA Lead and a UofG Research Program Director. Funding recommendations were made to R/PM PMC.

Ultimately, twelve SI projects were awarded funding. The final SI project "Swine Small Herd Postmortem Project" was placed on hold, until the related OAHN project is finished. Following the completion of the OAHN project, OMAFRA, in consultation with the UofG, will assess the viability of continuing with the SI based on the results of the OAHN project. This project remains on hold at the present time.

At the R/PM PMC meeting on December 15, 2020, an SI project on Agroforestry was approved, based on a proposal submitted by Dr. Naresh Thevathasan to complete the third objective of the long-term agroforestry research occurring at the Guelph Research Station. The third objective was to evaluate the economics of tree-based intercropping systems, which could only be completed by harvesting the trees. This was a time-limited opportunity, which needed to be completed before the Station's final sale and disposition.

The fourteen 2020/21 Special Initiatives Projects are shown in Table 3.14 below.

Table 3.14: 2020/21 Special Initiatives Projects

Lead Applicant	Project Title	Research Priority	Amount Awarded
Asim Biswas	Enhancing Soil Health Knowledge with the Ontario Topsoil Sampling Program	Sustainable Production Systems	$103,000
Sara Epp	Examining need, capacity, and barriers to accessing food animal veterinary services in underserved areas of rural Ontario	Animal Health & Welfare	$147,714
Glenn Fox	An Inventory of Rural Municipal Drainage Infrastructure in Ontario	Sustainable Production Systems	$59,962
Brandon Gilroyed	Market Conditions for Small Scale On-Farm Anaerobic Digestion	Trade, Market & Targeted Sector Growth Opportunities	$60,000
Thomas Graham	Characterization of Nuisance Stray Light, and Evaluation of Abatement Strategies on Crop Productivity, in Year-round Greenhouse Production	Sustainable Production Systems	$150,000

Lead Applicant	Project Title	Research Priority	Amount Awarded
Rebecca Hallett	Garlic Germplasm and Clean Seed Production	Plant Health & Protection	$101,960
Melanie Kalischuk	Potential for re-introduction and commercial wild-simulated production of ginseng in Ontario forests	Trade, Market & Targeted Sector Growth Opportunities	$250,000
William Lubitz	Investigating Noise Impacts of Grain Dryers on Neighbouring Land Uses	Sustainable Production Systems	$90,000
Erica Pensini	Bio-Based Sorbents for the Removal of Zinc from Agricultural Water Collection Ponds	Water Quality & Quantity	$147,000
Darren Robinson	Assessing Cover Crop Herbicide Tolerance for Adverse Weather Response	Sustainable Production Systems	$60,000
Kim Schneider	Requirements for increasing pasture utilization and developing benchmarked targets for ruminant production systems for Ontario	Competitive Production Systems	$407,160
Naresh Thevathasan	Agroforestry-based marketable timber volume and carbon sequestration assessment and allometric equation development for 5 tree species	Sustainable Production Systems	$86,371 (out of cycle)
Claudia Wagner-Riddle	Towards a Comprehensive Framework for Economical, Social and Environmental Sustainability Evaluation of Ontario's Agriculture	Sustainable Production Systems	$90,000
Total	**Awarded**		**$1,753,167**
Josepha Delay	Swine Small Herd Postmortem Project	Animal Health & Welfare	$59,908 (on hold)
Total	**Awarded and On Hold**		**$1,813,075**

Also, at the R/PM PMC meeting on December 15, 2020, a scope change and additional funding was approved for the first Special Initiatives project, awarded in 2018/19, *Commodity-Specific Economic Modeling*. Dr. Alan Ker submitted a proposal to OMAFRA to extend the Ontario Pork model to Quebec and the West to better account for the interprovincial implications of an African Swine Fever (ASF) outbreak. The resulting model would significantly increase the understanding of how Ontario's pork industry would be impacted by regional capacity constraints and would provide a granular level of detail not available in any other Canadian model. The expansion of scope was handled as an amendment to the original SI project and increased the award amount by $50,000.

Table 3.15 contains a comparative summary of activities for Research Project Operating – Special Initiatives identified in the 2020/21 Business Plan, relative to the activities that took place in 2020/21.

Table 3.15: Status Update on the 2020/21 Business Plan Activities – Research Project Operating – Special Initiatives

Business Plan Activity	Status
Continuing to develop policies and processes to support Special Initiative Projects	Complete. SI projects have been fully implemented in the RMS. A program guide has been developed to support researchers in their understanding of the program and the proposal process.
Supporting and improving the timeliness of Special Initiative award allocations	On hold. OMAFRA has flagged to the University that the SI program has been paused for the 2021/22 year.
Implementing an equitable and transparent approach for identifying recipients of Special Initiative Projects	Complete. An open call approach was utilized for the 2020/21 projects. All faculty members were invited to respond to the open call, ensuring equity and transparency. Collaborative submissions were highly encouraged so that the best expertise at the UofG was brought forward. In one situation, where two faculty members applied to the same project, a meeting was organized, and the faculty members ultimately submitted a joint proposal.
Ensuring Special Initiative Projects undergo the appropriate reviews for quality during the application process	Complete. Special Initiatives proposals underwent a fulsome review in 2020/21. Proposals were evaluated by the OMAFRA Lead, a RIB Research Analyst and the relevant UofG Research Program Director. In addition, proposals also underwent a KTT review. In the future, if time allows, the peer review process should be considered for SI proposals.
Working with OMAFRA to clearly identify the differences between Special Initiative Projects and Tier I Projects	On hold. It is expected that this activity will occur during the renewal discussions.
Considering opportunities to use Special Initiative funds as leverage to other programs on an individual basis to improve likelihood of success, multiply the impact of Agreement funds and address OMAFRA priorities	In progress. The University is on the look out for opportunities to use SI funds to leverage other programs for the benefit of the agri-food sector. When a clear opportunity arises, it will be brought forward to R/PM PMC for discussion.
Discussing the use of Special Initiatives to address specific research questions at the Research Centres to drive utilization rates	On hold. OMAFRA has flagged to the University that the SI program has been paused for 2021/22. If the program restarts, this activity will be resumed.

3.1.4.3 Undergraduate Student Experiential Learning Program

The University of Guelph is responsible for administering and managing the Undergraduate Student Experiential Learning (USEL) Program which supports students in the development of leadership skills, enhanced written and verbal communication skills, applied research and project planning and management to better equip them to engage in effective agri-food knowledge mobilization.

The USEL Program gives third-year undergraduate students work experience in the agri-food sector. Students are partnered with mentors to complete an agri-food research project that supports producers and rural communities. In 2020/21, the USEL Program included eight students, including one from the Environmental Management Branch and one from the Food Safety Systems Development Branch, which participated in the program for the first time. Table 3.16 shows the student names, project titles, and mentors for 2020/21.

Table 3.16: 2020 USEL Program Students and Projects

Student Name	Project Title	UofG Mentor(s)	OMAFRA Mentor(s)
Olivia Willoughby	Measuring and Integrating Composted Bedding Pack Management on Cow Behaviour, Health and Performance	Renee Bergeron, Department of Animal Biosciences	Christoph Wand, Greg DeVos, Tom Wright – Agriculture Development Branch
Natalia Savor	Immunity and Environmental Management for Improved Goat Kid Survival (GKM)	Cathy Bauman, Department of Population Medicine; Niel Karrow, Department of Animal Biosciences	Marlene Paibomesai, Greg DeVos – Agriculture Development Branch; Andrew Jamieson, John Van de Vegte – Environmental Management Branch
Laura Currie	Adapting LED Lighting in the Greenhouse	Thomas Graham, School of Environmental Sciences	Chevonne Dayboll, Holly Dolan– Agriculture Development Branch
Bailey Fleet	Phosphorus Use Efficiency in Winter Wheat	Istvan Rajcan, Department of Plant Agriculture	Joanna Follings, Deanna Nemeth– Agriculture Development Branch
Mariaelisa Polsinelli	Expansion of the Vegetable Crop Report (VCR) to Improve Pest and Disease Forecasting in Southwestern, Central and Eastern Ontario	Mary Ruth McDonald, Department of Plant Agriculture	Travis Cranmer, Dennis van Dyk, Jessica MacKinnon – Agriculture Development Branch
Jordan Dalicandro	Investigating Impacts and Alternatives of Agricultural Plastics Use On-Farm	Erica Pensini, School of Engineering	James Dyck– Agriculture Development Branch; Dan Carlow - Environmental Management Branch
Sarah Kirilenko	StoryMaps as a KTT Method to Communicate Predictive	Adam Gillespie, School of Environmental Sciences	Jim Warren, Ross Kelly, Daniel Saurette – Environmental Management Branch

Student Name	Project Title	UofG Mentor(s)	OMAFRA Mentor(s)
	Digital Soil Maps Process to the Agriculture Sector		
Jenna Alessandrini	Validation of Microbial Intervention Effectiveness in Provincially Licensed Meat Plants	Keith Warriner, Department of Food Science	Jeanine Boulter-Bitzer, Troy Jenner, Sarah Wilson - Food Safety Systems Development Branch

Students led the agri-food research projects from start to finish and participated in virtual industry and/or OMAFRA events to present project findings (e.g., OMAFRA Vegetable IPM Scouting Workshop, 2020 Ontario Virtual Diagnostic Days Series). Project results were also shared at the 2020 Ruminant Feed Day held in October 2020 and the Ontario Fruit and Vegetable Convention held in February/March 2021. In addition, most students developed several KTT products, such as articles, posters, infosheets/factsheets, infographics, radio reports, blog postings, etc.

The USEL 2020 exit survey was completed by all eight students. The survey showed:

- 87.5% of participants were very satisfied with the overall USEL program;
- 87.5% indicated that they actually know quite a bit about KTT compared to 25% at the beginning of the program;
- 100% strongly agreed/agreed that they have a better understanding of the Ontario agri-food system;
- 75% indicated the USEL program would definitely influence their academic prospects or future career plans; and
- 100% strongly agreed/agreed that the USEL program met their agriculture and food work experience goals.

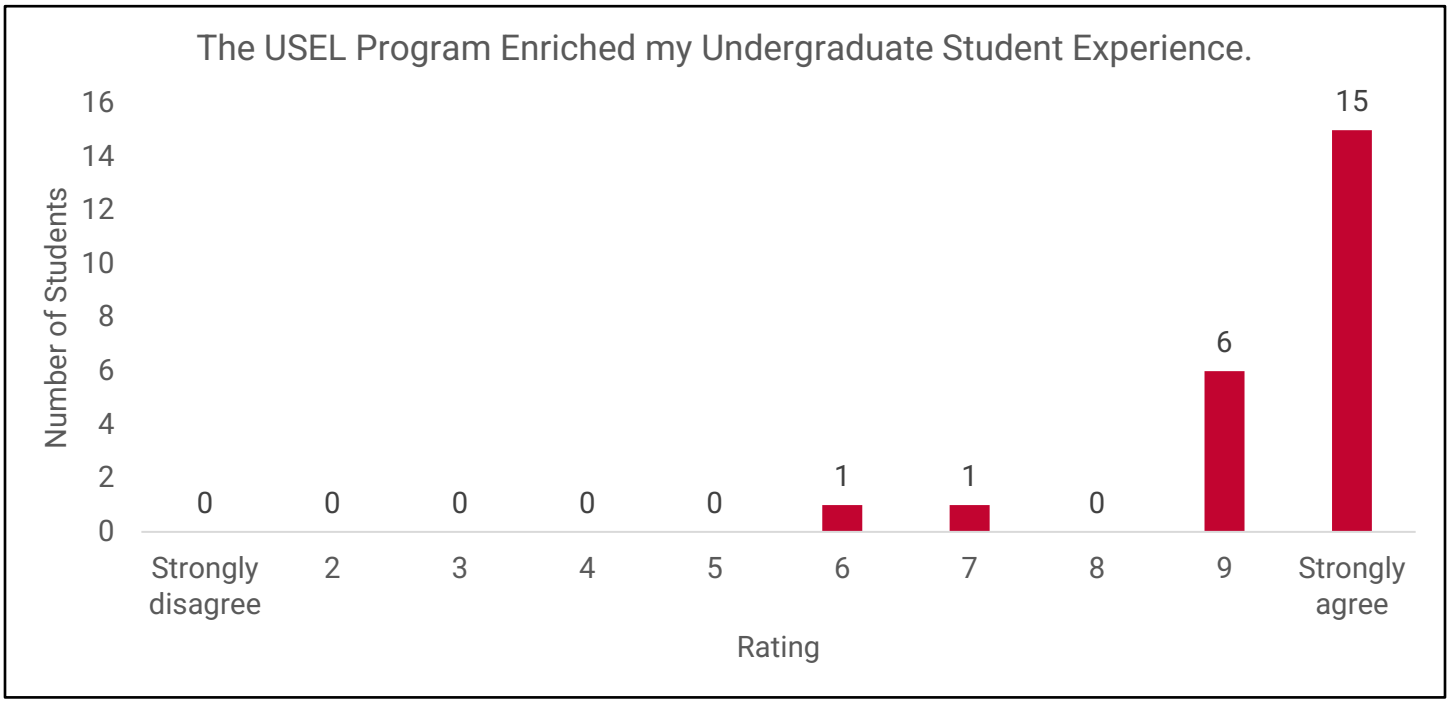
USEL students indicated some of the benefits from participating in the program included:

- Expanded networking relationships (industry stakeholders, OMAFRA staff, other government (AAFC), other UofG researchers);
- Working closely with an OMAFRA and UofG mentor, who provided insight and advice on academia and career opportunities;
- Strengthened data analysis and research skills (e.g., experimental design; R software, GIS, etc.);
- Improved or strengthened project planning and management skills;
- Improved plain language writing skills (public audience versus scientific community), and expanded professional writing/communications skills (e.g., reports, presentations, speaking with industry stakeholders/OMAFRA staff); and
- Improved time management skills and discipline, including working independently.

Several of the USEL students indicated the program was excellent and would highly recommend it to future students.

In addition to the exit survey of current USEL participants, the USEL Employment Survey of all USEL participants was also completed in 2020/21. The results can be found in Section 3.3.3. In addition to employment status, a number of other questions were asked about the impact of the USEL Program. In addition to ratings, respondents were also asked to provide comments. Of those responding, 100% somewhat agreed or strongly agreed that the USEL Program enriched their undergraduate student experience, as shown in Figure 3.1.

Figure 3.1: Influence of the USEL Program on Enriching Student Experience (N = 23)



91% of survey participants agreed that the USEL Program was useful in preparing them for the workforce, as demonstrated in Figure 3.2, while 96% would be likely or extremely likely to recommend the USEL Program to others, as exhibited in Figure 3.3.

Figure 3.2: Preparation for the Workforce According to USEL Participants (N = 23)

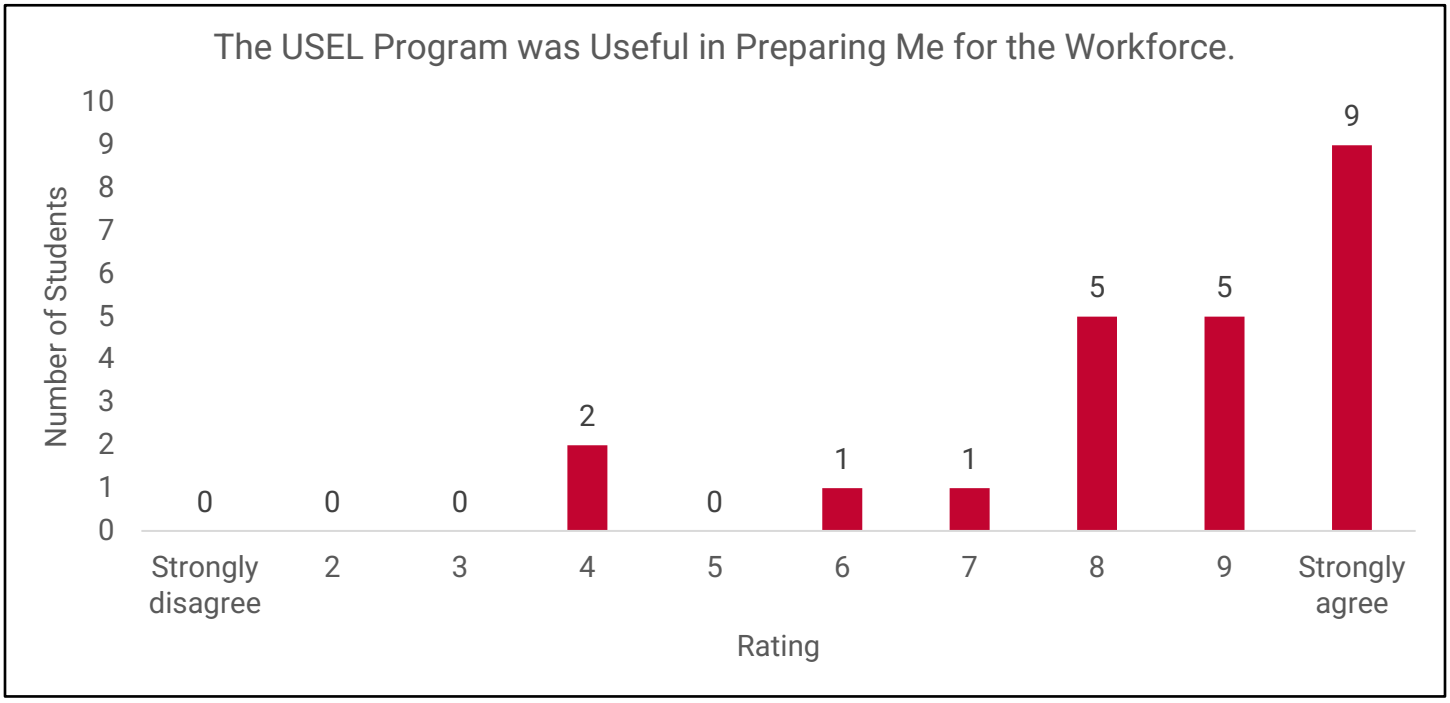


Figure 3.3: Likelihood that USEL Participants Would Recommend the Program to Other Students (N = 22)

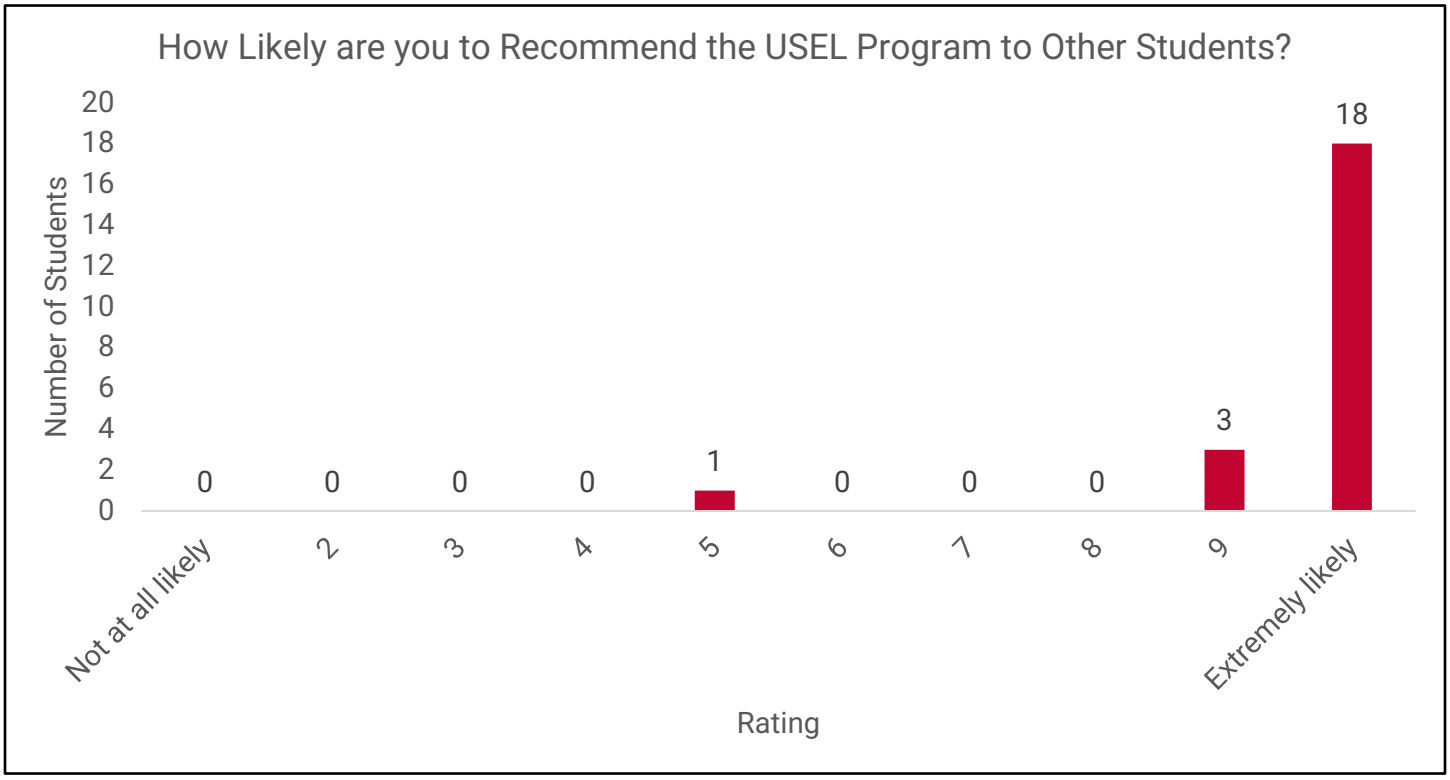


Table 3.17 provides the status of each of the activities related to the USEL Program identified in the 2020/21 Business Plan.

Table 3.17: Status Update on the 2020/21 Business Plan Activities – USEL Program

Business Plan Activity	Status
Evaluating the employment outcomes determined through the Highly Qualified Personnel (HQP) survey performed on USEL graduates during year two	Complete. The survey was originally delayed due to COVID-19. It was completed in Spring 2021. The results can be found in Section 3.3.3. In brief, the survey demonstrated that 96% of survey respondents are involved in the agri-food or rural sectors, of which 62% are employed, 29% are pursuing further education, and 9% are seeking employment.
Analyzing the entrance and exit survey results to assess changes in the USEL student's understanding of KTT activities and OMAFRA, as well as to understand the student's overall satisfaction with the USEL program and potential areas of improvement	Complete. See information above for more details.
Entering new USEL projects directly into RMS, following selection, in accordance with the appropriate guidelines	In progress. There have been a number of delays in the implementation of the USEL application and reporting templates in RMS which limited the University's ability to ensure all projects were entered appropriately in a timely manner.

Business Plan Activity	Status
	All 2021/22 projects have been entered into RMS. The OMAFRA mentor will be responsible for completing the final report in RMS for the first time, following the summer work experience. Final reports will be due on September 30, 2021. The University is exploring how RMS can be further utilized to support the USEL Program in the future.
Recording historical USEL project data into RMS, so that all projects that are part of the current OMAFRA/UofG Agreement are in the system	In progress. The core data upload was successfully completed in April 2021, after the delays mentioned above. The next step will be to append the final reports, as .pdfs for all completed USEL projects. This is expected to be complete in Summer 2021.
Continuing to encourage additional faculty member involvement in the USEL program	On hold. Due to the COVID-19 pandemic and the additional burdens experienced by faculty members during 2020/21, the University attempted to minimize additional requests of faculty members' time. However, some occurred naturally, as the program expanded to include a faculty member from the College of Engineering and Physical Sciences (CEPS). This activity will recommence in 2021/22, when the University will continue to look at strategies for involving additional faculty members in the USEL Program and building enhanced working relationships between OMAFRA specialists and UofG faculty.

3.1.5 Research Innovation Office

The Ontario Agri-Food Innovation Alliance supported UofG inventions that had impact across the agri-food sector. The Research Innovation Office (RIO) is responsible for managing and administering research innovation and commercialization programming for the University of Guelph. Despite some challenges (COVID-19 kept staff away from campus for the entire reporting period), RIO had a successful year in the development, commercialization and advancement of technologies and projects that will benefit the Ontario agri-food economy.

Products reaching the market have an opportunity to disrupt a number of industries in new ways. For example, the 'In the Know' mental health literacy training program for farmers and the agricultural community was licensed for use in five provinces and is helping to improve life in rural communities.

Ford Motor company started using biobased resins in the headlamp housing of the Ford Lincoln; these resins were made by Ontario company Competitive Green Technologies after development at the UofG. UofG start-up company and former Gryphon's LAAIR participant, FloNergia, released unique air flow pumps onto the market that are improving performance in aquaculture and hydroponics facilities in Ontario, with distribution expanding into several countries.

The germplasm portfolio had a very strong year, with both revenue and new license agreements substantially higher than last year, including the University's first license of a crab apple variety ('Providence'), to be used for cider-making.

New reports of invention outside of germplasm were down this year, at least partly due to a decreased presence on campus. However, the quality of the disclosures was high and will likely lead to patent applications and a strong chance of commercialization.

The Gryphon's LAAIR program, administered by RIO, continued to help faculty work with industry to de-risk commercially viable early-stage technologies. A Gryphon's LAAIR award to Dr. Max Jones led to the creation of the start-up company, We Vitro, for the sale of new tissue culture vessels. We Vitro has since been acquired by Magenta LLC and the vessels are being sold globally.

Due to COVID restrictions, RIO moved its successful Gryphon's LAAIR pitch competition to an online format. As a result, attendance increased to 475 in 2020, compared to 120 in 2019, and the creation of video content enabled continued exposure through the year.

The Industry Liaison (IL) team had a good year with 34 funded projects receiving more than $6.7M despite restrictions due to COVID. The IL team also helped to successfully leverage OMAFRA funding in projects, where OMAFRA is a partner on the team, with the Federal NSERC Alliance program. Two projects were successful in 2020/21, led by Dr. Lee-Ann Huber and by Dr. Lewis Lukens. There is strong interest in building off that success in 2021/22. More details can be found in Section 3.4.2.

With an ongoing priority to build capacity and develop programming that promotes and supports a culture of innovation and entrepreneurship, RIO has continued to develop partnerships on and off campus to bolster the service offerings to the University's research enterprise. Specific focus has been applied to IP education opportunities for faculty, graduate students, and staff. During this reporting period, in collaboration with the University of Toronto, RIO acquired a framework for an online education module on IP Foundations. Through leadership from the Technology Transfer team, RIO has adapted the framework to be University of Guelph-centric. This module will be available on CourseLink by the second quarter of 2021/22.

In 2021/22, RIO looks forward to building on a strong foundation and leveraging support from the Alliance to both increase and communicate research impact. With the onboarding of a new Assistant VP, Research Innovation and Knowledge Mobilization, RIO plans to review and evaluate strategic and tactical plans related to operations, data management and reporting mechanisms, and commercialization support programs such as Gryphon's LAAIR. RIO also aspires to scope and initiate development of a second IP education module focused on IP Strategy and Application, with a goal of increasing IP literacy of researchers, students, and support staff and facilitating informed strategic decision-making around IP generation and commercialization. This activity will require additional funding support and will be a critical consideration in strategic planning to position RIO for success against the Commercialization Mandate Agreement and IP-related performance metrics expected to be implemented by the province.

Table 3.18 contains a comparative summary of RIO's activities proposed in the 2020/21 Business Plan, relative to the activities that took place in 2020/21.

Table 3.18: Status Update on the 2020/21 Business Plan Activities – Research Innovation Office

Business Plan Activity	Status
Completing the search for a new position of Assistant Vice President, Research Innovation and Knowledge Mobilization, which is expected to elevate the	Complete. Jessica Bowes began her role with the University of Guelph on February 1, 2021. She is a seasoned leader in the research and innovation ecosystem, with almost a decade of leadership experience at Bioenterprise, one of Canada's leading agri-food business accelerators. She has also served as a Director-at-Large for BioTalent Canada, a catalyst for growth of Canada's bioeconomy, and as a

Business Plan Activity	Status
University's efforts to promote research innovation	member of the Industry Advisory Committee for the Canadian Wine and Food Institute – bringing her real-world experience to the advancement of competitive business enterprises founded on strong R&D value propositions.
Reviewing and possibly implementing any relevant recommendations from the Expert Panel on Intellectual Property	In progress. RIO is awaiting further outcomes from the panel, but implementing some initial recommendations in the meantime, such as enhancements to IP education, data collection/management, and collaboration strategy with Ontario's innovation ecosystem stakeholders (e.g., Linamar).
Cultivating relationships with Venture Capital (VC) investors in support of both new IP and start-up companies	In progress. RIO is in regular discussions with VCs. Recent examples include a MOU to collaborate with SVG Thrive, and participation in a Scout Camp that enabled RIO to pitch technologies and start-ups directly to 13 different VCs or corporate investment arms.
Improving the utilization of tools, including PatSnap, a patent search and analytics tool, and In-Part, a match-making service for universities and companies	In progress. RIO has renewed subscriptions to both PatSnap and In-Part and are undertaking periodic training. RIO is also anticipating a major update to the database system Inteum in Summer 2021.
Enhancing and focusing on communication, including developing guides and presentations to help streamline messages to different audiences and add value	In progress. RIO has also been recording presentations to make them available to a wider audience.
Increasing collaboration with ARIO, including working together to evaluate all aspects of communication and governance	In progress. This is being achieved through regular meetings, shared folders and reporting for continuous improvement.

3.1.6 Gryphon's Leading to Accelerated Adoption of Innovative Research

In 2020/21, Gryphon's Leading to Accelerated Adoption of Innovative Research (Gryphon's LAAIR) Funding was used to provide grants to de-risk technology and to support a pitch and showcase event designed to assist UofG research-based start-ups to mobilize their technology into industry's hands.

In 2020/21, the Gryphon's LAAIR Program funded four new projects to advance the commercial development of new technologies, totalling $300K. Full details about these Gryphon's LAAIR projects are shown in Table 3.19 and 3.20.

One early-stage project with a Technology Readiness Level 3 was funded to validate its market opportunity and to determine the optimal implementation strategy for an engineering design of a new water treatment process. Market research and customer feedback will be used to better understand the product-market fit in the agricultural waste-water treatment and greenhouse water recycling space. This Market Validation project will help researchers determine a Minimum Viable Product (MVP) based on the needs of end-users in Ontario.

In addition, three Product Development projects, with Technology Readiness Levels 4-6, were funded to support the development, building and optimization of industry-useable prototypes or MVPs, which will be used in collaboration with Ontario industry partners for developing potential commercial products. One additional project was offered funding but declined the award due to complications because of COVID-19.

Table 3.19: 2020/21 Gryphon's LAAIR Projects – Market Validation

Lead Applicant	Project Title	Research Priority	Amount Awarded
Thomas Graham	Market and Engineering Implementation Evaluations for a Regenerative in situ Electrochemical Hypochlorination System for Agricultural Water Treatment	Competitive Production Systems	$20,000
Total			**$20,000**

Table 3.20: 2020/21 Gryphon's LAAIR Projects – Product Development

Lead Applicant	Project Title	Research Priority	Amount Awarded
Thomas Koch	Standardization of equine cord blood-derived mesenchymal stromal cells for clinical trials and research	Animal Health & Welfare	$100,000
Bonnie Mallard	Immunity+ Colostrum: Building a State-of-the-Art Colostrum Product for Better Calf Health	Animal Health & Welfare	$100,000
George van der Merwe	Breeding stress tolerant beer yeast strains for enhanced fermentation capacity and product consistency	Innovative Products & Product Improvement	$80,000
Total			**$280,000**

Past Project Updates

Several past LAAIR projects have seen success in Ontario's agri-food industry. For instance, a past project funded by LAAIR to design, build, and sell airlift pumps for aquaculture is continuing to show very positive results. The industry collaborator, FloNergia, is now selling pumps in Canada, US, UK, India, Chile, and Costa Rica, with plans to enter Germany and Australia shortly. The partner was also a finalist in the UK Global Water Dragons competition in March 2021 which drew significant attention to a new use for the technology.

The continued growth of ongoing LAAIR industry partner Escarpment Labs, a corporation who created their company based on the founding research conducted by Dr George van der Merwe in 2015, is worth noting. Escarpment Labs is a local Ontario start-up company that manufactures specialty brewers' yeast. It was founded by three University of Guelph students who saw a commercial opportunity in research first generated by the University. Escarpment Labs has grown from two employees in 2016 to 26 in 2021. They have expanded manufacturing capacity four-fold and now hold a dominant market position locally while their sales grow globally. This company is a model of how a corporation led by people who know how to use science and commercially viable research to deliver profitable products to their customers can succeed. Escarpment Labs are the industry partner on another LAAIR project this year as they continue to use innovation based on research generated at the University of Guelph as the fuel to power their business growth.

We Vitro, a local plant propagation equipment company and former LAAIR industry partner was created in 2018. The founder credits his company's growth to the support of the Gryphon's LAAIR funding and pitch programs. Using research and designs generated at the University of Guelph and funded in part by the LAAIR Program, We Vitro developed superior products that threatened the market share of the market leader Magenta. As a result, in early 2021, We Vitro was acquired by Magenta, the global leader in plant tissue culture tools and containers. During the takeover, We Vitro's CEO, a University of Guelph MSc graduate, was hired as Magenta's global scientific advisor to assist with the global distribution and sales of the We Vitro product line.

2020/21 Pitch Competition and Showcase

The Gryphon's LAAIR Showcase and Pitch competition strives to give industry and investors a 'first look' at emerging value propositions that have high potential for achieving commercial impact, transferring technology into the economy and creating jobs. The budget provides incentives directly to the companies in the form of prize money and also provides critical training opportunities for the teams.

Before the onset of COVID-19, an in-person event was planned. Five start-up companies with roots in University of Guelph laboratories were recruited and given business pitch and related training to be prepared to present their businesses at a live event to be held in May 2020. Likewise, four participants in past LAAIR funding projects were also recruited and prepped to deliver case studies at the event to demonstrate the learnings and value of the Gryphon's LAAIR funding program.

Due to COVID-19 and because of the anticipated positive economic impact expected from these companies, the University made the decision to pivot and move the event online. The decision proved to be a successful one with attendance growing from about 120 in 2019 to over 475 in 2020. The creation of video content also allowed for many follow-on views and opportunities to share stories and messages throughout the year. Likewise, the teams supported by the pitch event have gone on to have success that they may not otherwise have had without the Gryphon's LAAIR platform. Specifically, Neophyto Functional Foods is now in market both online and at retail and is expanding into the US. Harvest Genomics has gained many partners, including the Ontario Greenhouse Vegetable Growers, Genome Canada, and Rancho Nexo. More details are available in the case study *Return to the LAAIR* in Appendix B.1.

Table 3.21 provides the status of each of the activities identified in the 2020/21 Business Plan relating to Gryphon's LAAIR.

Table 3.21: Status Update on the 2020/21 Business Plan Activities – Gryphon's LAAIR

Business Plan Activity	Status
Fully implement RMS for Gryphon's LAAIR projects, which will enhance reporting, compliance and applicant satisfaction. Adjustments will be made on an on-going basis as the system matures	Complete. Gryphon's LAAIR has been fully implemented into RMS. There are a number of continuous improvement items and minor changes that need to be addressed to enhance the functionality and useability.
Evaluate the LAAIR Program in Summer 2020 to seek adjustments and improvements to maintain the effectiveness of the funds.	Complete. The step-structure of funding has been adopted to accurately mirror the critical steps taken during industrial commercialization. Market Validation projects continue to provide an important screening step to ensure new technologies have a suitable product-market fit, before investing multiple years and significantly more funding to build an MVP with an

Business Plan Activity	Status
	industry partner. This approach of providing financial support at two strategic stages of technology maturity continues to successfully move new research and technologies into the hands of industry. Feedback from past project leaders and current award recipients indicates the current format is effective and requires no changes. Thus, the University recommends continuing to offer these two types of grants which enable researchers to conduct critical and timely market research within a stage-gate process.
Focus Gryphon's LAAIR programming on supporting projects with later-stage MVPs with a Technology Readiness Level (TRL) of 3-5 using Market Validation grants and follow on projects with TRL 4-6 using Product Development grants, with other non LAAIR programs planning to support projects with a TRL of 1-3	Complete. 2020/21 was the third year that a combination of Market Validation (TRL 3-5) and Product Development (TRL 4-6) grants were offered.
Continue collaborations with University of Guelph's Food from Thought Initiative, which is also funding projects to support market research and product development. This amplifies and leverages the Alliance's support for the commercialization of research in Ontario and Canada	In progress. These projects are closely aligned and are frequently directly supportive of Ontario agriculture. The Food from Thought program will occasionally support technologies prior to the researcher's application to the Gryphon's LAAIR Program.
Continue to build bridges between academic entrepreneurs and investors interested in commercializing research for agriculture, food and rural affairs	In progress. RIO has and will continue to assist all UofG start-ups to make connections with investors and strategic partners for the benefit of the sector.

3.1.7 Knowledge Translation and Transfer Program

The Knowledge Translation and Transfer (KTT) program and Agri-Food and Rural Link (AFRL) are complementary programs designed to enable, enhance, and communicate the impact of Alliance research.

In 2020/21, the KTT and AFRL programs delivered targeted activities to advance the programs' objectives and support Ontario's agri-food and rural sectors. Below is a description of 2020/21 program activities and achievements organized by objectives, as detailed in the OMAFRA/UofG Agreement.

Objective 1: Explore the science of KTT and provide end-user focused services and advice on best practices designed to create positive impact for research and innovation.

Core to this objective is the delivery of a flexible, nimble KTT Funding program to support researchers in creating additional impact from their completed research and advancing the science of KTT through research.

In 2020/21, the KTT Funding program supported nine new projects, totalling $335,698. One project was in the research stream and eight were in the mobilization stream. Project titles and award amounts are shown in Tables 3.22 and 3.23.

In addition, two projects were funded under the KTT Initiatives program, which provides financial support of up to $5,000 for a product that translates and transfers research that benefits Ontario's agri-food sector or rural communities. KTT Initiatives projects are listed in Table 3.24.

Table 3.22: 2020/21 KTT Projects – Research

Lead Applicant	Project Title	Research Priority	Amount Awarded
Todd Duffield	Look before she leaves: Improving cull dairy cow welfare through better on-farm decisions	Animal Health & Welfare	$70,000
Total - Research			**$70,000**

Table 3.23: 2020/21 KTT Projects – Mobilization

Lead Applicant	Project Title	Research Priority	Amount Awarded
Cathy Bauman	Small Ruminant Research Forum 2020	Animal Health & Welfare	$10,000
Prasad Daggupati	Development of Interactive Table-Top Tools and Digital-Products to Illustrate the Principles of Water Movement and Soil Function in Natural/Tile Drained Lands	Soil Health	$35,000
Sara Epp	Overcoming Agricultural Barriers in Northern Ontario: Demystifying the North through Education, Promotion and Engagement	Productive Land Capacity	$39,000
Jessica Gordon	Enhancing the dissemination of beef research through development of a beef research network for more effective knowledge translation and transfer	Animal Health & Welfare	$40,000
Naresh Thevathasan	Knowledge transfer on long term influence of Ontario biomass crops on soil carbon, health and GHG emissions in several grower fields	Sustainable Production Systems	$36,000
Rene Van Acker	Development of nutrient deficiency pictorial guides for hops and industrial hemp	Competitive Production Systems	$39,998
Laura Van Eerd	Cover crops: moving the strategy forward for Ontario.	Soil Health	$35,000
Charlotte Winder	Delivering training to dairy producers for disbudding pain control, and improving our understanding of barriers to adoption	Animal Health & Welfare	$30,700
Total - Mobilization			**$265,698**

Table 3.24: 2020/21 KTT Initiatives Projects

Lead Applicant	Project Title	Research Priority	Amount Awarded
Rich Moccia	Aquaculture Production Statistics Factsheet for Ontario	Competitive Production Systems	$2,250
Leith Deacon	Rural Response to COVID-19: KTT Activities	Strong Rural Communities	$5,000
Total - Initiatives			**$7,250**

During 2020/21, the University worked to deliver a modernized call process with the goal of soliciting high-quality applications to the KTT funding program and conducting a robust and efficient review process. Dr. Alison Duncan continued to act as the Research Program Director to support the application and review process. The KTT team utilized a modern communications strategy to promote the 2020/21 call for applications cycle, including a combination of social media and web-based communications tactics that target engagement with key audiences via virtual one-on-one meetings and online townhall meetings. The one-on-one or small group meetings included the College Research Managers (CRMs), who were identified as a target communications audience. Emails were also sent to 77 individual researchers who were identified by the CRMs as having a potential interest in the program. As a result of this targeted outreach, one-on-one meetings were conducted with an additional ten researchers to discuss the program and project ideas. These efforts resulted in new researcher engagement with the funding program (for example, a new researcher from the Lang School of Business submitted an application). However, these new engagements did not offset the reduced number of applications compared to the 2019/20 call cycle. It is believed that the COVID-19 pandemic likely impacted the number of KTT funding program applications. Successful applications to the 2020/21 call cycle will be reported as awarded projects in the 2021/22 Consolidated Annual Report.

Objective 2: Drive knowledge into action by advancing the synthesis, exchange, application and dissemination of knowledge resulting from Agreement-funded research.

Core to this objective is providing advice, training and opportunities for skills development among UofG researchers, graduate students, and members of the wider agri-food and rural community in Guelph-Wellington. The following targeted activities were designed and deployed in 2020/21 to help stakeholders improve on the skills and networks necessary to enhance research impact.

Knowledge Exchange Events

Exploring Research at Ontario's Agri-Food Research Centres (October 2020 – March 2021): Four webinars were held over six months to demonstrate how Ontario's Agri-Food Research Centres provide a platform for innovative research and collaboration that benefit Ontario's agri-food sector.

- Featured webinars included the Ontario Crops Research Centre -Simcoe, the Ontario Crops Research Centre - Elora, the Ontario Beef Research Centre - Elora, and the Ontario Aquaculture Research Centre.
- Each webinar showcased a UofG researcher and an industry partner speaking about the value of the Research Centre from both an academic and commodity organization perspective.
- In a post-event follow-up, 88% of respondents (N=17) agreed that the webinar demonstrated the value of the respective Research Centre and that it furthered their understanding of current research being conducted.

- Attendance for each webinar was 52, 44, 52, and 85, respectively.

Advancing the Science of KTT in Agri-Food (October 2020): Delivered in partnership with OMAFRA, this event was designed to profile Alliance-funded KTT-Research projects and build capacity around advancing the science of KTT.

- 163 individuals from all sectors attended the event.
- Three University of Guelph faculty presented on their KTT-Research projects.
- Keynote speaker was Dr. L. Klerkx, Professor at the Knowledge, Technology and Innovation Group of Wageningen University.
- In a post-event follow-up survey, 96% of respondents (N=28) agreed the event was informative, 86% agreed that it was useful, and 83% agreed that the information shared was relevant to help inform their knowledge and business needs.

Soil Health Research Event (December 2020): UofG supported this OMAFRA-led event by providing logistical and day-of support. This event was designed to share recent soil-health research findings and promote knowledge-sharing between researchers and decision-makers.

- 227 individuals from academia, government, agri-business, farm organizations, farming, and conservation authorities attended.
- 54 post-event survey responses favorably reflected that the event was useful to attendees.
- Six University of Guelph faculty and one University of Waterloo faculty spoke to projects spotlighting implementation of Ontario's soil strategy.
- Keynote speaker was Dr. J. Arbuckle, Professor and extension rural sociologists at Iowa State University.

Rural Symposium (February 2021): This event was led by the School of Environmental Design and Rural Development. Support was offered on an as needed basis. This event is an annual opportunity for University of Guelph graduate students to showcase their rural research to OMAFRA staff.

- 15 students presented on their projects, five of which were funded through the Ontario Agri-Food Innovation Alliance.
- The Alliance promoted this event and shared the presentations post-event via social media channels and the monthly Alliance Innovations newsletter.

Pathways to Commercialization (May 2021): Delivered in partnership with OMAFRA, this event profiled innovative technology and commercialization activities funded through the Gryphon's LAAIR Program. Though the event was delivered slightly outside the scope of the report (May 4, 2021), the bulk of the work was completed during the 2020/21.

- Over 90 individuals attended the event.
- Four University of Guelph faculty presented on their story of how Gryphon's LAAIR funding has played a role in moving research to product commercialization.
- Two industry partners from Gryphon's LAAIR-research based start-ups presented on the importance of this funding to entrepreneurs.

KTT Skills Series

From October 2020 to March 2021, the Office of Research (Agri-Food Partnership) partnered with the Research Innovation Office (RIO), and the Community Engaged Scholarship Institute (CESI) to deliver the second year of the Skills for Research Impact workshop series. This series was offered in both the fall and winter semesters to faculty, research staff and graduate students to enhance their skills related to designing and delivering KTT plans and ultimately enhancing the impact of their research. Please see the case study *Skills for Research Impact* in Appendix B.2 for more information.

Objective 3: Evaluate and use KTT methods and best practices to support awareness and impact of research among end users.

A two-pronged approach is employed to address this key objective: deploy targeted communications activities to increase awareness of the Alliance and its research among key audiences; and evaluate and promote KTT best practices to help researchers enhance the impact of their Alliance-funded research.

2020/21 Communications Activities

In 2020/21, communications and marketing activities were adapted to digital platforms because of COVID-19. Working collaboratively with partners across UofG and OMAFRA, the team delivered a variety of digital publications, web and social media content and virtual exhibits to reach target audiences and increase awareness of how Alliance-funded research and programming supports Ontario Solutions with Global Impact.

Started in June 2020, *Alliance Innovations* is a monthly newsletter distributed to more than 700 contacts at the UofG and OMAFRA, as well as industry partners and the members of the public who have signed up to receive it. The open rate has remained over 30%, surpassing the industry average (supplied by the e-newsletter software company Constant Contact) for government agencies (29%) and higher education (20%). The average click rate is about 24%, which is also above the government and education industry averages of 11% and 8%, respectively.

The team worked with Soils at Guelph and OMAFRA to produce a series of infographics entitled Crop Rotation Counts, which farmers can use to confidently make decisions related to crop rotation, tillage systems and nitrogen management. The infographics represent four key messages distilled from 65 years of crop rotation research at the Ontario Crops Research Centres in Ridgetown and Elora. The series was launched at Canada's Digital Farm Show and promoted throughout the Fall of 2020 at the Royal Agricultural Virtual Experience and through the Soils at Guelph and Alliance newsletters, websites and social media channels. The Alliance Crop Rotation Counts web page received 627 views and the infographics were downloaded from the site 491 times.

On Twitter, program staff increased the frequency of posts from the @AgInnovationON account from 141 tweets in the previous year to 224 tweets in 2020/21. Through this Twitter account, staff shared research findings/updates, Yearbook stories, events, news and more, while amplifying and building on content published by partners within the UofG and OMAFRA. The account continued to add followers, building on the previous year's 4.6% growth by adding an additional 278 followers (an increase of 7.6%).

Notable increases in impressions (tweet views), engagements, retweets, likes and URL clicks accompanied the growth of followers and tweets. Table 3.25 provides several Twitter metrics for @AgInnovationON.

Table 3.25: Twitter metrics for @AgInnovationON

Metric	2018/19	2019/20	2020/21	Percentage Change from Prev. Year
Tweets		141	224	+58.9%
Followers	3,504	3,665	3,943	+7.6%
Impressions	173,975	126,659	277,596	+119%
Engagements	2,091	2,119	4,818	+127%
Average Engagement Rate	1.3%	1.7%	1.6%	-0.1%
Retweets	256	236	579	+145%
Likes	334	429	927	+116%
URL Clicks	388	376	713	+89%
@DairyFacility Followers	1,543	1,739	1,891	+8.7%

During the same period, the @DairyFacility Twitter account attracted 152 new followers, an increase of 12.7%.

In the prior year, the Alliance's LinkedIn page was transitioned from a legacy page type to a new organization page type, resetting the number of followers to zero. Since then, the number of followers has grown steadily to 98 and work to re-build an engaged audience will continue in 2021/22.

The Alliance and Alliance-funded research were profiled at the University's Royal Agricultural Virtual Experience exhibit. Content will remain publicly available until the 2021 Royal Agricultural Winter Fair/Experience.

Evaluate and Promote KTT Best Practices

To help improve the quality of KTT plans submitted at Full Proposal to the Alliance Tier I Research and KTT Funding Programs, a review of the efficacy of the KTT materials developed in 2019/20 was conducted. These resources include: a series of example KTT plans; a KTT plan checklist; and an evaluation tips checklist. A survey was developed and distributed to all applicants to the Tier I Research Program. Of the 51 respondents to the survey, 63% indicated the KTT Resources were "very useful" in building a KTT plan with no respondents indicating the resources were "not useful". The majority of respondents gained some (63%) and many (31%) new insights after using the KTT Resources. The results of this survey will be used to continue to support researchers in developing meaningful and achievable KTT plans through continuous resource improvement.

Update on Business Plan Activities

Table 3.26 contains a comparative summary of the KTT activities identified in the 2020/21 Business Plan, relative to the activities that took place in 2020/21.

Table 3.26: Status Update on the 2020/21 Business Plan Activities – KTT Program

Business Plan Activity	Status
Administer third KTT Funding Call (KTT Research and KTT Mobilization streams)	Complete.
Promote KTT funding using a combination of online and in-person advertisements and information sessions	Complete. This activity is detailed above.
Administer KTT Initiative Grants	Complete. Two projects were approved in the 2020/21 year.
Create campaign to promote awareness of program to faculty members	Complete. Meetings were held with all seven College Research Managers (CRMs). Targeted emails were sent to 77 researchers identified by the CRMs.
Enable application and reporting for KTT Initiative Grants to occur online in RMS	In progress. An application and reporting template was provided to support the development of the KTT Initiative Grants in RMS. Testing is currently underway. It is expected that RMS will be used for KTT Initiatives Grant applications beginning in Summer 2021. Once the system is fully enabled, the University will ensure that the core data from previous KTT Initiatives Grants is entered for completeness.
Support delivery of two information exchange events	Complete. Advancing the Science of KTT in Agri-Food (October 2020) and Pathways to Commercialization (May 2021) were delivered in partnership with OMAFRA. Both events profiled Alliance-funded research through the KTT Funding Program and Gryphon's LAAIR respectively.
Deliver KTT skills workshop	Complete. The series was rebranded and moved to a five-part series delivered across both the fall and winter semesters. The series was delivered with financial support from the Office of Research (Agri-Food Partnership and Research Innovation Office) and in collaboration with RIO and the Community Engaged Scholarship Institute.
Provide one-on-one support to UofG researchers to complete KTT plans	Complete. An outreach strategy was developed to inform faculty about the availability of consultation services including Alliance website updates and meetings with CRMs. As a result of this outreach, one-on-one support was offered to two applicants to the Tier I program and to two applicants to the KTT funding program. UofG will continue to explore this service as part of its commitment to support researchers in designing and executing KTT plans.
Review the efficacy of KTT materials developed in 2019/20	Complete. A KTT Appraisal Tool was developed in collaboration with stakeholders to support review panels in assessing KTT plans in Tier I proposals. A survey was also sent to all lead applicants to Tier I funding to evaluate the efficacy of the example KTT plans, KTT plan checklist, and evaluation tips checklist.

Business Plan Activity	Status
Profile and promote Alliance Programs and outcomes using the Alliance website, Twitter and LinkedIn	Complete. See full social media and communications report in Table 3.25.
Deliver online repository of project summaries in collaboration with the University of Guelph Library	In progress. In collaboration with the University of Guelph Library, Office of Research staff have created a template to ingest data from the data management plans and project applications to create meta-data records for funded projects. Next steps include OMAFRA and faculty consultations, to take place during 2021/22.
Deliver new edition of research magazine focused on the Ontario Agri-Food Innovation Alliance (Yearbook)	Complete. Magazine was completed during 2020/21. The final review and approvals process pushed publication into 2021/22. It will be distributed via Ontario Farmer and promoted at Canada's Outdoor Farm Show.
Support outreach related to Ontario's Agri-Food Research Centres	Complete. Activities included: building and maintaining a list of current research activities at the Ontario Agri-Food Research Centres, delivering four webinars profiling specific research facilities, and featuring Research Centre projects in the Alliance Monthly Newsletter. A virtual tour of both the Ontario Beef Research Centre – Elora and Ontario Dairy Research Centre were conducted in collaboration with OAC with a pre-filmed video tour of the facility followed by a live Q&A with the Research Centre Outreach Coordinator. Given the COVID-19 pandemic, the Research Centre tour mandate was put on hold. Opportunities to reassess this strategy are underway.
Develop and deploy initiative profiling findings/outcomes of long-term field trials at the Ontario Crops Research Centre - Elora	Complete. Launched at Canada's Outdoor Farm Show, profiled on the Alliance and Soils @ Guelph website and featured in the new edition of the Agri-Food Yearbook.

3.1.8 Indirect Costs

Indirect costs are funds provided for the centralized research program support services of the University, including finance and human resources functions, along with campus physical plant infrastructure, information technology/systems, information resources/library, etc. necessary for the University to fulfil its obligations under the Agreement.

Table 3.27 provides the status of each of the activities identified in the 2020/21 Business Plan.

Table 3.27: Status Update on the 2020/21 Business Plan Activities – Indirect Costs

Business Plan Activity	Status
Participating in the evaluation of the "full-cost" of research study, as it relates to the allocation of indirect costs, which is ongoing at the University and will be shared with OMAFRA once complete	In progress. The external consultants have been working diligently on the "full-cost" of research study, with participation from various areas of the University, including the Alliance. The University has received a draft report and is currently examining it. More details will be shared with OMAFRA in 2021/22.

3.1.9 Data Initiatives

3.1.9.1 Data Management Plans

Data Management Plans (DMPs) are an important tool to help enhance data stewardship, with the goal of improving the sharing and reuse of research data. Under the Agreement, DMPs are required for all Research Projects. The DMPs detail how data acquired during the research project will be stored, shared, and maintained.

Table 3.28 contains a comparative summary of the Data Management Plan activities identified in the 2020/21 Business Plan, relative to the activities that took place in 2020/21.

Table 3.28: Status Update on the 2020/21 Business Plan Activities – Data Management Plans

Business Plan Activity	Status
Fully implementing the data management plan (DMP) requirement across all relevant Research Programs	In progress. The DMP requirement has been fully implemented across all relevant Research Programs. The University is working diligently to ensure full compliance with the requirement for existing projects. More details can be found in Section 3.2.2.3.
Continuing to deliver data management training sessions in collaboration with the University of Guelph Library	Complete. See the *Evaluation of DMP tools* section below for details.
Designing and deploying new data management training sessions for OMAFRA staff	In progress. An update on data management plans and planning was delivered to interested OMAFRA staff in Summer 2020. Additional programming will be provided during 2021/22.
Reviewing and evaluating the DMP roll-out in collaboration with the Library to inform new program and service delivery	Complete. See the *Evaluation of DMP tools* section below for details.

Evaluation of DMP tools

In 2020/21, the Office of Research and UofG Library collaborated to assess the design and delivery of tools/resources to support researchers in completing their DMPs. These tools/resources were released between 2018 and 2020 to support the new DMP requirement in the Agreement.

In 2020/21, Carol Perry, Acting Head of Research and Scholarship at the McLaughlin Library, Rebecca Moore, Senior Manager, Communications & Knowledge Mobilization, Office of Research (Agri-Food Partnership), and Michelle Edwards, Statistics Consultant, Ontario Agricultural College, completed an evaluation of tools designed to support the new DMP requirements for agri-food based research at the University of Guelph, including both the Alliance and Food from Thought programs. The resulting report provided a summary of findings from a case study involving a review of local research data management (RDM) and DMP programs and services at the University of Guelph based agri-food funded research initiatives. This local case study was undertaken in tandem with a scan of national and international RDM programs. These two investigations provided the basis for recommendations for enhancements to research data management supports over 2020/21.

Based on these recommendations, the University implemented the following activities and processes in 2020/21 to support DMP training and compliance and enhance RDM at the Alliance:

- DMPs are now a condition of award. Thus, a Research Project will not be awarded until a DMP has been reviewed and endorsed by a University of Guelph Librarian.
- The Alliance/Food from Thought DMP template (i.e., DMP questions) and template guidance language were revised to improve the quality of the DMPs and help clarify expectations. The new template (UofG Agri-Food Funding Template) was added to the Portage Network's DMP Assistant 2.0.
- The Alliance DMP Website was updated to reflect new DMP processes, resources and services. There were 1,262 page views of the Alliance DMP website between May 1, 2020 and April 30, 2021.
- The DMP Manual was updated in 2021 to reflect new processes, resources and services. The DMP Manual outlines procedures for completing and uploading a DMP and is available to researchers. The manual was downloaded 99 times during 2020/21.
- DMP Tutorial Video. This video, presented by Research and Scholarship Librarian Wayne Johnston, provides step-by-step directions for completing a DMP for Research Projects funded by the Ontario Agri-food Innovation Alliance and Food from Thought. This video has had 20 views since April 2021.
- Five DMP Workshops were hosted by a Research and Scholarship Librarian and 52 Alliance researchers attended those workshops. These workshops outlined the process for completing and uploading a DMP as well as situated research data management within the national and international contexts. The workshops helped to enhance data management capacity at the University of Guelph.
- The Research and Scholarship Librarian hosted virtual "office hours" every Tuesday and Thursday in April 2021 for researchers who had questions about completing their DMP.
- One-on-one consultations with Librarians were available throughout the year for all UofG researchers.
- Two exemplar DMPs were developed as resources for researchers. The example plans were downloaded 46 times during 2020/21.
- A Research and Scholarship Librarian reviewed 111 unique Alliance DMPs and provided expert feedback to researchers between May 1, 2020 and April 30, 2021.
- The UofG continues to build relationships with colleagues at the Portage Network to identify opportunities to enhance interoperability between the Portage DMP Assistant tool with other databases. The goal of enhanced interoperability is to allow information from the DMP Assistant tool (data management plan fields) to be exported to other databases.
- The UofG Library maintains a DMP log to track the DMP review, endorsement and submission process.
- More details are available in the case study *Data Management Planning* in Appendix B.3.

3.1.9.2 Research Centre Data Access Portal

In 2020/21, the UofG continued to enhance the organization of data generated at the Ontario Dairy Research Centre and the Ontario Beef Research Centre, and make off-site access to these data easier. Dr. Rozita Dara continued to act as the Data Strategy Director for the Alliance. In this capacity, her main focus remained delivering on the objectives of the Data Access Portal project.

The objectives of the Data Access Portal are: 1) clean and aggregate data produced/collected at the Research Centres; and 2) enable remote access to Research Centre data.

Data generated at the dairy and beef facilities are stored on an on-site station server and uploaded to secured servers hosted by the UofG's Computing & Communications Services (note: these servers are located at the University of Guelph; at no point are data sent to servers outside of Canada). The portal is available online at https://eloradairyportal.uoguelph.ca/#/.

This project is part of the UofG's commitment to enhance service delivery to researchers who use the Research Centres. While data aggregation and online access to project-specific data will be leveraged by Agri-Food Data Canada, this project was designed to ease researcher access to data as part of a service commitment. Currently, public access to this portal is outside the scope of this particular project.

A webinar entitled "Harvesting Data at the Ontario's Agri-Food Research Centres" was planned for 2020/21, but was delivered on June 8, 2021 due to the COVID-19 impacts on project delivery timelines.

- The event focused on the new Research Centre Data Access Portal at the Elora Research Station and discussed how new data resources are being used to inform and advance dairy and beef research.
- Panelists included: Dr. Beverley Hale, Professor and Associate Vice-President Research (Agri-Food Partnership); Dr. Christine Baes, Associate Professor and Canada Research Chair in Livestock Genomics, Department of Animal Biosciences; Dr. Katie Wood, Assistant Professor, Department of Animal Biosciences; and Dr. Rozita Dara, Associate Professor, School of Computer Science.
- 196 people from OMAFRA, University of Guelph and industry attended the event. Additional details about the webinar will be included in the 2021/22 Annual Report.

Table 3.29 contains a comparative summary of the Data Access Portal activities identified in the 2020/21 Business Plan, relative to the activities that took place in 2020/21.

Table 3.29: Status Update on the 2020/21 Business Plan Activities - Research Centre Data Access Portal

Business Plan Activity	Status
Developing, refining and implementing data governance policies and procedures to streamline researcher access to project-specific data and maintain data security	In progress. Existing governance policies and practices allow researchers access to project-specific data from both the dairy and beef research centres, and these policies and procedures will continue to be enhanced. Early work is complete on establishing data governance to ensure secure access to sensitive research trial data. Data security continues to be enhanced with next steps focused on enhancing wireless data collection and transfer.
Improving the existing platform to ensure ease of use, advance data access control, and	Complete. Back-end functionality of the platform has been improved. A database called Postgres (PSQL for short) has been used for back-end website storage. A Javascript scripting language that allows for easy

Business Plan Activity	Status
enhance reliability and code quality	requests and responses to be made was used for the communication between a user's computer and the database.
Refining and testing the online data access portal to enable and ease researcher access to project-specific dairy data	Complete. Front-end functionality of the platform has been improved. The front-end of the website has been created using a mixture of HTML and Javascript, as well as CSS libraries that facilitate quick development of new views on the webpage. In addition, website accessibility has been improved. The accessibility standards that the website features include Alt text for all sections and buttons and using contrasting colours. Additionally, the functionality of the site has been updated to allow screen readers to navigate and select different items within the page.
Establishing project scope, timelines and requirements for expanding online access to data generated at the Ontario Beef Research Centre	Complete. Data from the Ontario Beef Research Centre has been added to the data platform and the addition of historical beef research data are in progress. In addition to data from the Ontario Beef Research Centre, data continues to be added from other sources and the portal is being used by more researchers: • Long-term crop trial data has been added to the data platform. • 15 new active users have been added to the data platform. • Data from Dairy Farmers of Ontario and A&L Canada Laboratories Inc. has been added to the platform. Legacy (historical) beef data has also been added to the platform.
Updating system architecture to make it expandable for future data sources	Complete. Initially the project began harvesting data from 10 sensors at one facility and it now collects data from over 50 sensors across three separate facilities. With the current configuration of the software platform, it can add new sources of data at an exponential rate as it does not require technical programming knowledge to create new streams of data.
Continuing to work closely with Agri-Food Data Canada architects to identify opportunities for enhancement of data capture to support cross-University integration	In progress. Office of Research staff are collaborating to ensure integration of developed systems. The Research Centre Data Access portal is a scalable prototype for Agri-Food Data Canada.
Establishing and hiring a new position to support agri-food data management at the Research Centres	In progress. After a lengthy delay due to COVID-19, the position profile was developed, and the hiring process began. The first search did not bring any qualified candidates. A second search is currently underway.

3.1.9.3 Metadata Database

One desired outcome of the Agreement is "Increasing access and sharing of data to facilitate new agri-food and rural research and data analytics to inform decision-making." The Agreement also requires that "[…] research results are made available for public access in accordance with the Data Management Plan, unless otherwise agreed to by the Parties."

Since 2019, the Office of Research (Agri-Food Partnership) has been working with the Library to explore options for creating a metadata repository that would house information about Alliance projects including information from their Data Management Plans. In addition, this repository would offer researchers the option to append project data if desired. The database was planned to complement, but not duplicate, the OMAFRA project search database.

Table 3.30 contains a comparative summary of the Metadata Database activities proposed in the 2020/21 Business Plan, relative to the activities that took place in 2020/21.

Table 3.30: Status Update on the 2020/21 Business Plan Activities – Metadata Database

Business Plan Activity	Status
Implementing a meta-data database for projects funded by the Ontario Agri-Food Innovation Alliance	In progress. In 2020/21, a pilot project was outlined to establish and test a workflow process for entering Alliance project-level metadata in the Agri-environmental Research Data Repository. The following activities were completed as part of the pilot project: • A process was developed to capture metadata required in the appropriate format to be ingested into the Dataverse repository at the University of Guelph Library. Dataverse is an open-source research data repository software. At the UofG, Dataverse is used to host the Agri-Environmental Research Data Repository. Visit the Agri-Environmental Research Data Repository for more information. • Metadata ingest templates were completed. Metadata templates include fields from project applications, annual/final reports and data management plans. These fields will be combined to create a unique record for each funded project. • A technical guide was developed for the ingest process. This guide outlines "quick steps" on how to generate the CSV file from RMS, and the JSON (JavaScript Object Notation) from those CSVs. JSON format allows for the easy ingest of information from the RMS into the Agri-Environmental Research Data Repository. • The ingest process was piloted with a sample project record. The ingest was successful meaning that automation of this process is possible. Additional work to improve the process is still required and will be reported on in the 2021/22 Consolidated Annual Report.

3.2 Mandatory Compliance Requirements

3.2.1 Human Capacity

3.2.1.1 Research Faculty

Ontario needs a critical mass of world-class researchers to ensure its agri-food sectors and rural communities are poised to address current challenges and meet future opportunities. The Agreement contributes $11.145M for the research faculty pool which supports a minimum of 67.8 faculty full-time equivalent (faculty FTE) positions, with the expectation that at least that many FTEs will be engaged in Research Projects funded through the Agreement's Research Program, projects which respond directly to OMAFRA Priorities. The University's performance varies from year-to-year depending on the number and type of projects funded.

In 2020/21, the University of Guelph exceeded its target of delivering 67.8 faculty FTEs dedicated to Agreement-funded research by 13%. The 76.6 faculty FTEs is the cumulative effort of 257 faculty members in six Colleges leading and collaborating on Agreement-funded projects. This is slightly more than the 75.5 faculty FTEs reported in the 2019/20 Consolidated Annual Report.

Table 3.31 provides the total cumulative engagement of faculty in Research Projects, reported on at the College and Department level.

Table 3.31: 2020/21 Engagement of Faculty in Research Projects, reported by College and Department

College and Department	Faculty FTEs in Research Projects
College of Biological Science	**3.4**
Department of Human Health and Nutritional Sciences	0.8
Department of Integrative Biology	1.5
Department of Molecular and Cellular Biology	1.1
College of Engineering and Physical Sciences	**6.2**
Department of Physics	0.2
School of Computer Science	0.1
School of Engineering	5.9
College of Social and Applied Human Sciences	**2.3**
Department of Family Relations and Applied Nutrition	0.4
Department of Geography, Environment and Geomatics	1.4
Department of Sociology and Anthropology	0.5
Gordon S. Lang School of Business & Economics	**1.6**
Department of Management	0.1
Department of Marketing and Consumer Studies	1.0
School of Hospitality, Food and Tourism Management	0.6
Ontario Agricultural College	**49.3**
Department of Animal Biosciences	12.8
Department of Food Science	2.6
Department of Food, Agricultural and Resource Economics	3.8
Department of Plant Agriculture	11.4
Ridgetown Campus	7.8
School of Environmental Design and Rural Development	2.5

College and Department	Faculty FTEs in Research Projects
School of Environmental Sciences	8.4
Ontario Veterinary College	**13.8**
Department of Biomedical Sciences	0.8
Department of Clinical Studies	1.1
Department of Pathobiology	4.9
Department of Population Medicine	7.1
Total	**76.6**

Table 3.32 provides faculty FTEs in Research Projects over the term of the Agreement. The University has surpassed the target in each of the last three years.

Table 3.32: Faculty FTEs in Research Projects over the Term of the Agreement

Metric	2018/19	2019/20	2020/21	2021/22	2022/23	Target
Faculty FTEs in Research Projects	77.7	75.5	**76.6**			67.8

3.2.1.2 Research Technicians

The Agreement also supports technical capacity which is critical to the success of the University in fulfilling the outcomes of the Research Program.

The University reports on the engagement of scientific and technical FTE allocations (non-faculty) against all Research Projects, as well as any additional technical support capacity in the Research Support program activity beyond the Research Projects (e.g., technical support assigned to a Research Centre).

In 2020/21, the University of Guelph exceeded its minimum target of 42.4 research technical FTEs and experienced a 12% increase from 2019/20. The total of 108.1 technical FTEs reported on is the cumulative effort of 192 people working on Agreement-funded research.

Table 3.33 provides the total cumulative engagement of research technician FTEs, reported on by program.

Table 3.33: 2020/21 Engagement of Research Technician FTEs by Program

Program	Research Technician FTEs
Tier I Research	41.3
Gryphons LAAIR	1.3
KTT Program	2.1
Special Initiatives	3.6
Tier II and III Research	29.3
Other Technical Support (not Research Project specific)	30.5
Total	**108.1**

Table 3.34 provides research technician FTEs over the term of the Agreement. The University has exceeded the target in each of the last three years.

Table 3.34: Research Technician FTEs over the Term of the Agreement

Metric	2018/19	2019/20	2020/21	2021/22	2022/23	Target
Research Technician FTEs	87.6	96.7	**108.1**			42.4

3.2.1.3 Research Support

The Agreement funds administrative support within the academic units who ensure the efficient and effective operation of the Research Program.

In 2020/21, the University of Guelph met the minimum target of 22.5 research support FTEs. Table 3.35 provides the total cumulative engagement of research support FTEs, reported on by type.

Table 3.35: 2020/21 Engagement of Research Support FTEs, by Type

Type	Research Support FTEs
Administrative Support	16.9
Ridgetown Campus Support	5.9
Total	**22.8**

Table 3.36 provides the Research Support FTEs over the term of the Agreement. The University has achieved the target in each of the last three years.

Table 3.36: Research Support FTEs over the Term of the Agreement

Metric	2018/19	2019/20	2020/21	2021/22	2022/23	Target
Research Support FTEs	22.8	22.5	**22.8**			22.5

3.2.2 Research Project Requirements

The University confirms that it is working towards administering all Research Projects as per the research project requirements outlined in the Agreement.

3.2.2.1 Report Review

As mentioned in Section 3.1.4.1, a new Report Review policy has been drafted and is in its last stages of review/revision. Its purpose is to support the timely submission and review of annual and final research progress reports that appropriately balance information needs with the reporting expectations placed on lead applicants. It is expected to be jointly approved in Summer 2021.

The first stage of the report review cycle is the submission of the report by the researcher. The hiring of the Manager, Research Program Compliance has had a substantial and continuing positive impact on reducing the number of overdue reports, thus increasing the number of reports ready for OMAFRA review.

There were 249 reports due between May 1, 2020 and April 30, 2021. Of these, 12 remain outstanding to date, which is less than 5%. This is a significant improvement over the overdue rates experienced in previous years.

The UofG is continuing to actively work with researchers to encourage timely reporting and following up vigorously when that is not the case.

At the end of 2020/21, there were 113 reports in the review cycle. This is a 34% decrease from the 170 reports in the review cycle at the end of 2019/20.

There were 246 reports approved in 2020/21. The average number of days from submission to approval was 244 days, with 44% of reports reviewed in 120 days or less and 24% of reports reviewed in 56 days (the recommended time frame in the Report Review policy). The average number of days from submission to approval increased by 42% over the 2019/20 value of 172 days, a worrying trend.

Currently, due to RMS limitations, it is not possible to identify the time spent at each stage of the review cycle for reports that have been approved. However, it is possible to illustrate the average number of days those reports have been at the current stage for reports currently in review. While this tends to overestimate the average time that a report spends in review, it provides useful information. In some stages of the process, reports can be held up for various compliance reasons (e.g., obtaining additional information from the researcher outside of a revision workflow) or while a project is being addressed in Issues Resolution, which lengthens the average number of days in the specific stage. In addition, the average number of days does not include reports that are approved quickly.

Table 3.37 shows the number of reports currently under review and the average number of days that they have spent at the current stage in the review cycle (as of June 21, 2021).

Table 3.37: Number and Stage of the Reports in the Review Cycle, as of June 21, 2021

Stage in the Review Cycle	Number of Reports	Average Number of Days in Current Stage	Target Number of Days in Each Stage
UofG Compliance Review	7	11.9	10
UofG Financial Review	6	8.3	4
OMAFRA IKM-RA Review	61	32.0	14
OKMAFRA RPC-RA Review	91	118.0	14
UofG Program Sponsor Review and Decision	33	35.3	14
Revisions for UofG Review	9	5.8	
Total	**207**		**56**

While all stages are falling short of the targets, there are several significant bottlenecks in the review cycle, which are evident when considering the number of reports and the average number of days. This will need to be addressed by OMAFRA, as timely report review is critical for maintaining appropriate oversight on the research projects and providing useful feedback to researchers. In addition, as the UofG has worked extensively to improve compliance in terms of report submission, it is critical that the Alliance provide feedback in a timely fashion, as a matter of credibility. Delays in report review also impact the transfer of budgetary installments and the approval of amendments.

The UofG is working closely with RIB to address the roadblocks. Changes are needed to mitigate delays in the report review cycle and the growing backlog of report reviews.

Finally, the UofG has created a "Reporting Tips and Guidelines" document that provides best practice information and addresses common feedback from the process. This will assist the researchers in submitting high-quality reports the first time, create efficiencies for the reviewers, limit the number of reports in the a requires revisions status and ultimately, reduce the average number of days from report submission to approval. This will be posted in 2021/22.

3.2.2.2 Amendments

An Amendment policy document was developed and jointly approved in 2020/21. It identifies when an amendment or minor change request is required, and outlines the request, review and project revision process. The University utilizes the amendment process to notify the Ministry of any timeline variance being requested and to receive the Ministry's consent prior to the University approving the variance.

In 2020/21, 115 amendments were submitted. 109 amendments have been approved, while six are still under review. The average time to approval was 40 days. Table 3.38 shows the distribution of amendment requests by type, noting that more than one type can be selected on an amendment request. 87% of the amendment requests involved a project extension.

Table 3.38: Distribution of 2020/21 Amendment Requests by Type

Type of Amendment Request	Number of Amendment Requests
Project Extension	91
Project Extension and Change in Lead Applicant	2
Project Extension and Other	9
Change in Lead Applicant	1
Other	12
Total	**115**

When selecting project extension as the type of amendment request, researchers were asked to identify the reason(s) (researchers have the option to identify more than one). Table 3.39 provides the distribution of the project extension requests by reason. In 2020/21, 84% of project extension requests listed COVID-19 as a reason, while 44% cited that the completion of milestones took longer than expected and 28% indicated that the extension was related to the timing of graduate student hiring.

Table 3.39: Distribution of 2020/21 Project Extension Requests by Reason

Reason for Extension	Frequency	Frequency as a Percentage of the Total Number of Extension Requests (102)
COVID-19	86	84%
Completion of milestones took longer than expected	45	44%
Timing of Grad student hiring	29	28%
Other	22	22%

Reason for Extension	Frequency	Frequency as a Percentage of the Total Number of Extension Requests (102)
Additional KTT to be completed	13	13%
Mid-project staff changes	8	8%
Weather/growing season issues	4	4%
Changes to Lead Applicant availability	4	4%
Timing of Research Centre access	3	3%

It is expected that the number of project extension requests will return to more typical levels, once the impacts of the COVID-19 pandemic subside.

3.2.2.3 Data Management Plans

The University is required to ensure that a Data Management Plan (DMP) is in place for each Research Project and that it is fully executed. To address some challenges attaining full compliance with the requirement, the University updated the DMP process in 2020/21 to require the completion of a library-endorsed DMP as a condition of award. This means that all new Research Projects starting in 2021/22 will require a library-endorsed DMP prior to being awarded any funding. This will ensure 100% compliance going forward.

Compliance checks for DMPs on older projects are ongoing and the current compliance rates by program are as follows:

- Tier I is 84% (47 out of 53 for 2018/19 projects, 42 out of 47 for 2019/20 projects, and 32 out of 44 for 2020/21 projects).
- Gryphon's LAAIR is 71% (8 out of 9 for 2018/19 projects, 6 out of 8 for 2019/20 projects, and 1 out of 4 for 2020/21 projects).
- KTT Research is 100%. KTT Mobilization projects do not require a DMP.
- Special Initiatives is 40% (4 out of 10 for 2019/20 projects and 4 out of 10 for 2020/21 projects).
- Tier II is 66% (8 out of 8 for 2018/19 projects, 12 out of 17 for 2019/20 projects, and 9 out of 19 for 2020/21 projects).

Total project numbers exclude those for which the DMP is not yet due (e.g., project is within 90 days of the start date), or which are terminated.

The UofG is actively following up with researchers who have not yet submitted their DMP and expects to be fully compliant before the end of 2021/22.

3.2.2.4 Issues Resolution

An Issues Resolution Policy has been drafted and is in the last stages of review and revision. It is expected to be complete in Summer 2021.

OMAFRA and the UofG held two joint Issues Resolution Meetings in 2020/21, where 14 projects were discussed. Several of the projects were historical in nature and needed a resolution in RMS before they could be ended. Consensus was achieved on the outcomes for each of the projects, which have been actioned by the

University. Of the projects identified below, 29% were related to a faculty member leaving the University. The Office of Research (Agri-Food Partnership) is examining an existing faculty member exit policy and will be updating it to try to mitigate the negative outcomes of an exit on the Alliance. Table 3.40 briefly outlines the outcome for each of the projects discussed.

Table 3.40: Outcome for the Projects Discussed at the 2020/21 Issues Resolution Meetings

Outcome	Tier I	Tier II	Gryphon's LAAIR	Total
Project is ongoing. Return to In Progress status.				**0**
Project is ongoing. Maintain in Issues Resolution status.	1			**1**
Close project. Met expectations.	1			**1**
Close project. Partially met expectations.	4	1		**5**
Close project. Did not meet expectations.		1		**1**
Terminate project. Partially met expectations.	1			**1**
Terminate project. Did not meet expectations.	2		2	**4**
Award refused by applicant.		1		**1**
Total	**9**	**3**	**2**	**14**

3.2.2.5 Post-Project Verification

A risk-based approach has been developed to select and validate completed Research Projects for Post-Project Verification (PPV). The methodology includes verification of Research Faculty FTE effort and Agreement FTE effort, level of third-party funding, timelines, project objectives, execution of Data Management Plans and KTT Plans, and compliance with requirements of the Agreement. PPV templates and processes are still being incorporated into RMS. Once PPV functionality is operational in RMS, the University and the Ministry will confirm the process and proceed with the Post-Project Verification.

3.2.3 USEL/HQP Projects

The University confirms that it is working towards administering the USEL/HQP Projects as per the Ministry's reporting requirements as outlined in the Agreement. Delays in the implementation of the required templates and processes in RMS have continued to impact the University's ability to effectively meet this requirement. As many of the issues have recently been addressed, the University expects to be fully compliant by Fall 2021. In addition, it is the University's intention to ensure that data are entered for all past USEL/HQP Projects, to the start of the current Agreement.

3.2.4 Research Call Process

The University confirms that it has advised the Ministry at least ten Business Days in advance of the University's intent to launch a call for proposals and has administered the calls through a process determined by the Ministry, which includes Ministry approval of all successful proposals or applications where all or part of the proposals or applications will be funded in whole or in part using Research Funds.

3.2.5 Third-Party Funding for the HQP Scholarship Program

The University confirms that it secured third-party funding of $685,000 in 2020/21 to meet the objectives of the HQP Scholarship Program from Food from Thought – Agricultural Systems for a Healthy Planet program under the Canada First Research Excellence Fund (CFREF). This funding will flow as the scholarships to the award winners are paid out. This significantly exceeds the minimum funding required of $250,000.

3.2.6 Research Project Administration

The University confirms that it is working towards administering all Research Projects listed within RMS consistent with Section C.11 of the Program Schedule. Continued issues in the implementation and improvement of RMS have impacted the University's ability to meet this requirement. However, with the implementation of the KTT Initiatives program in RMS, the University will be fully compliant. This is expected to be complete in Summer 2021.

3.2.7 Website

The University confirms that a public facing, up to date website for the Agreement exists at: https://www.uoguelph.ca/alliance/. The website is undergoing a refresh to better serve the needs of the Agreement and tell the stories of its impact. The impact aspects are expected to be complete by Fall 2021.

3.2.8 Capacity Strategy Plan Acknowledgement

The University maintains a Capacity Strategy Plan to ensure that the necessary faculty and staff resources are available to support the capacity needs of the Research Program. The University's strategy to address continued capacity in OMAFRA's priority areas, and to manage emerging issues, is congruent with its institutional goal of remaining the top-ranked agriculture and veterinary medicine university in Canada. The Colleges and the academic units therein have strategic plans that identify discipline priorities for faculty hiring, which map onto the demographics of the faculty. These College priorities reflect emerging issues in Ontario's agri-food sector, which also reflect Ministry priorities. In general, the University strives to be an employer of choice, demonstrated by their fourth place finish in the Canada's Best Employers ranking released on January 26, 2021 by Forbes Magazine. The University offers competitive salary and start-up funding for new researchers and has made achieving equity and diversity throughout the ranks of employees a priority.

3.2.9 Resources to Administer the Research Program

The University confirms that the necessary resources, including faculty and support staff, are available to administer the Research Program. Dr. Beverley Hale continues to provide outstanding leadership in support of the governance structure as a R/PM PMC Co-Chair.

The Office of Research (Agri-Food Partnership) directly supports the Research Program. In 2020/21, the University maintained its full complement of staff to assist with the delivery of the Agreement, albeit working remotely due to the COVID-19 pandemic. There have been a few staffing changes over the year, however the Office is currently at full capacity and has the resources needed to effectively administer the Research Program.

3.2.10 Mitigation of Labour Dispute, Emergency or Force Majeure

The Agreement requires that the University take all necessary actions to mitigate the effects of a force majeure, labour dispute or emergency to ensure that it can continue to fulfil its obligations, covenants and responsibilities to the greatest extent possible under this Program Schedule and the Agreement.

In 2020/21, the COVID-19 pandemic continued to provide an excellent example of a force majeure. The University was able to successfully mitigate most of the impacts of COVID-19 on the Research Program through the dedication of researchers and their teams, as well as the significant work of the Office of Research. The University successfully demonstrated that it has the capacity and governance structures in place to manage issues at both the operational and at the strategic levels. While some specific Research Projects continued to experience delays due to COVID-19, many projects were considered time sensitive or critical, allowing them to continue with the appropriate safety precautions in place.

3.3 Key Performance Indicators

3.3.1 Faculty Engaged in Research Supportive of Ministry Priorities

The University leverages investments made through the Agreement to ensure Ontario has the intellectual capacity to support a sustainable, globally competitive agri-food sector, and vibrant rural communities.

In 2020/21, there were 149.6 faculty FTEs engaged in research supportive of Ministry Priorities. This significantly exceeded the target of 97 research faculty FTEs. It involved 393 individuals (46.8% of all UofG faculty[10]) conducting research supportive of Ministry Priorities. This was a slight decrease from the 152.1 faculty FTEs engaged in research supportive of Ministry Priorities in 2019/20, but a 2% increase in the total number of faculty members engaged.

[10] 839 Full-Time Faculty at the University of Guelph on October 1, 2020 as per the Office of Institutional Research and Planning (https://irp.uoguelph.ca/full-time-faculty-reports).

Table 3.41 provides a listing by College of the number and total FTEs of faculty engaged in research supportive of Ministry Priorities.

Table 3.41: 2020/21 Faculty Engaged in Research Supportive of Ministry Priorities by College

College	Number of Faculty Members	Total FTEs Engaged in Research Supportive of Ministry Priorities
College of Arts	1	0.2
College of Biological Science	48	16.1
College of Engineering and Physical Sciences	50	15.1
College of Social and Applied Human Sciences	22	5.8
Gordon S. Lang School of Business & Economics	18	3.2
Ontario Agricultural College	180	82.6
Ontario Veterinary College	73	26.6
Total	**393**	**149.6**

Table 3.42 shows the FTEs engaged in research supportive of Ministry priorities over the term of the Agreement. The University has surpassed the target in each of the last three years.

Table 3.42: Research Faculty FTEs Engaged in Research Supportive of Ministry Priorities

Metric	2018/19	2019/20	2020/21	2021/22	2022/23	Target
Faculty FTEs Engaged in Research Supportive of Ministry Priorities	153.0	152.1	**149.6**			97

3.3.2 Highly Qualified Personnel

The Agreement supports the future agri-food workforce through a variety of programs. This investment allows undergraduate students, graduate students, and postdoctoral fellows to contribute to Ontario's agri-food and rural sectors while also building the future agri-food workforce. Table 3.43 below illustrates the number of Masters students, Doctoral students and Post-Doctoral Fellows engaged in research projects by program and research priority. A target of 14 HQP per $1M invested has been set. In 2020/21, the University exceeded the target by 22% and reached 17.1 HQP per $1M invested for all in scope programs. This metric appears very stable, as the 2020/21 value was similar to 2019/20, where there were 17.0 HQP per $1M invested.

The University has identified, from market analysis, that there are currently four jobs in Ontario for every agri-food graduate.[11] Overall, the number of graduate students across the University with projects addressing Ministry priorities is increasing. This growth reflects the University's added financial support for programs that demonstrate market need, as planned in the University's Strategic Mandate Agreement (SMA) with the Government of Ontario.

Table 3.43: 2020/21 Number of Highly Qualified Personnel Engaged in Research Projects by Program and Research Priority

Program and Research Priority	Masters Students	Doctoral Students	Post-doctoral Fellows	Total	Agreement Investment	HQP per $1M Invested
Tier I Research	**66**	**31**	**22**	**119**	**$7,072,884**	**16.8**
Animal Health & Welfare	9	13	6	**28**	$1,861,660	15.0
Competitive Production Systems	14	8	2	**24**	$1,472,313	16.3
Food Safety	0	0	0	**0**	$59,278	0.0
Plant Health & Protection	6	3	4	**13**	$899,950	14.4
Productive Land Capacity	6	0	0	**6**	$280,680	21.4
Soil Health	4	1	1	**6**	$209,750	28.6
Sustainable Production Systems	21	6	7	**34**	$1,897,686	17.9
Water Quality & Quantity	6	0	2	**8**	$391,567	20.4
Gryphon's LAAIR	**1**	**3**	**2**	**6**	**$300,000**	**20.0**
KTT	**4**	**1**	**2**	**7**	**$335,698**	**20.9**
Total–In Scope Programs	**71**	**35**	**26**	**132**	**$7,708,582**	**17.1**
Special Initiatives	**2**	**3**	**7**	**12**	**$1,753,167**	**N/A**
Tier II and III Research	**24**	**18**	**5**	**47**	**$0**	**N/A**
Total–Out of Scope Programs	**26**	**21**	**12**	**59**	**$1,753,167**	**N/A**
Total–All Programs	**97**	**56**	**38**	**191**	**$9,461,749**	**N/A**

Table 3.44 shows number of HQP per $1M invested over the term of the Agreement. The University has exceeded the target in each of the last three years.

[11] https://www.uoguelph.ca/oac/about/planning-tomorrow-20-report

Table 3.44: Number of HQP per $1M Invested over the Term of the Agreement

Metric	2018/19	2019/20	2020/21	2021/22	2022/23	Target
Number of HQP per $1M Invested	17.1	17.0	**17.1**			14.0

Table 3.45 provides the number of undergraduate students engaged in research projects by program and research priority for the 2020/21 projects. The 141 undergraduate students involved in 2020/21 is a 41% increase over the 100 engaged in 2019/20.

Table 3.45: 2020/21 Number of Undergraduate Students Engaged in Research Projects by Program and Research Priority

Program and Research Priority	Undergraduate Students
Tier I Research	**90**
Animal Health & Welfare	16
Competitive Production Systems	21
Food Safety	0
Plant Health & Protection	12
Productive Land Capacity	1
Soil Health	2
Sustainable Production Systems	33
Water Quality & Quantity	5
Gryphon's LAAIR	**1**
KTT	**6**
Total–In Scope Programs	**97**
Special Initiatives	**14**
Tier II and III Research	**30**
Total–Out of Scope Programs	**44**
Total–All Programs	**141**

3.3.3 HQP Employment

The HQP Employment performance metric helps to assess the impact of the HQP Scholarship Program and the USEL Program in preparing students for future careers in government, academia or industry upon graduation. It is the percentage of HQP Scholarship Program or USEL Program graduates employed by the agri-food sector or directly related industries or in rural economic development at post-program/post-graduation.

The first survey of USEL Program participants was completed in 2020/21. The results from this survey are reported below. The second survey for HQP Scholarship Program and USEL Program participants will be completed jointly in 2022/23, with the results to be reported in the 2022/23 Consolidated Annual Report. Surveys will continue every three years as per the frequency identified in the Agreement.

This survey included USEL Program graduates who participated in the program between 2012 and 2020. Twenty-four of the 43 students who received the survey responded to some or all of the survey questions, representing a 56% response rate. Of the twenty-four students, two were still completing their undergraduate degrees. Data from these individuals were removed from the employment analyses since the intent of this metric is to focus on graduates. Therefore, data from 22 respondents, in total, were utilized in the analysis. Survey response rates and results may have been impacted slightly by the COVID-19 pandemic.

Most respondents were from the Ontario Agricultural College (91%, or 20 out of 22). There was one respondent in each of the College of Biological Science and the College of Social and Applied Human Sciences.

Table 3.46 provides the employment status of the respondents and the sector in which they are currently participating. 64% of respondents are currently employed, 9% are seeking employment and 27% are pursuing further education. Of the 22 respondents to this portion of the survey, 21 are involved with the agri-food or rural sectors, which equates to 96%.

Table 3.46: Employment Status and Sector of USEL Program Respondents

Employment Status	Agri-Food or Rural Sectors	Other Sectors	Total
Enrolled in Further Education	6	0	**6**
Employed	13	1	**14**
Seeking Employment	2	0	**2**
Total	**21**	**1**	**22**
Percentage by Sector	**96%**	**4%**	**100%**

The target for this metric was set at 75% of program respondents employed in the agri-food or rural sector post-program/post-graduation in 2019/20, based on the results of the HQP Program Employment Survey. Similar to 2019/20, respondents who were continuing their education or seeking employment in an agri-food or rural sector were also included in the calculation.

With 96% of program respondents remaining in the sector post-program, which is well above the target of 75%, it appears that the USEL Program creates a strong affinity for the sector.

Table 3.47 shows the HQP employment metric over the term of the Agreement. The University has achieved the target for both the HQP and USEL Programs.

Table 3.47: HQP Employment Metric over the Term of the Agreement

Metric	2018/19	2019/20	2020/21	2021/22	2022/23	Target
HQP Employment in the Agri-Food or Rural Sectors	N/A	76% (HQP)	**96% (USEL)**	N/A		75%

The 13 respondents employed in the agri-food or rural sectors work in a variety of roles. Table 3.48 illustrates which part of the agri-food or rural sectors the respondents are currently employed in.

Table 3.48: Part of the Agri-Food or Rural Sectors that Respondents are Employed In

Sector	Total
Research or Teaching	4
Government (OMAFRA)	1
Other Government (Federal, Provincial other than OMAFRA or Municipal)	2
Private Sector – Agricultural Inputs or Equipment	1
Private Sector - Agri-Food Processing, Distribution, or Retailing	1
Private Sector - Agri-Food Advisory Services	2
Private Sector – Veterinary Medicine/Science	2
Total	**13**

3.3.4 Ratio and Value of Third-Party Funding and In-Kind Contributions

OMAFRA's investment in the Agreement's Research Program is leveraged through external third-party funding. This leverage enables a larger critical mass of resources to be directed to a specific line of enquiry, which speeds delivery of results in response to OMAFRA's Priorities. The leverage validates the importance of the research to stakeholders including industry, other government agencies and civil society. Through the leveraging of relationships, KTT is more targeted and timelier. Finally, the leveraging partners often become engaged with the HQP that are part of the project, thus providing valuable training opportunities and relationship building.

In 2020/21, OMAFRA's $7.71M of research operating funding leveraged $7.89M of third-party contributions. Table 3.49 below illustrates the amount of cash and in-kind leverage, as well as the ratio, by program and research priority. A target ratio of 1:1 has been set. The University achieved that target in Tier I Research Projects with a ratio of 1.03:1, as well as reaching the target overall for in scope programs with a ratio of 1.02:1. Compared to 2019/20 with a ratio of 0.93:1, there was an increase in cash leverage of $1.69M and in-kind leverage of $0.05M. There continues to be significant differentials based on research priority, with some priorities attracting considerable leverage and others attracting very limited or no leverage.

Table 3.49: 2020/21 Ratio and Value of Third-Party Funding and In-Kind Contributions for Research Projects

Program and Research Priority	Cash Leverage	In-Kind Leverage	Total Leverage	Agreement Investment	Leverage Ratio
Tier I Research	**$5,839,162**	**$1,460,192**	**$7,299,354**	**$7,072,884**	**1.03:1**
Animal Health & Welfare	$1,610,129	$569,988	$2,180,117	$1,861,660	1.17:1
Competitive Production Systems	$836,030	$263,148	$1,099,178	$1,472,313	0.75:1
Food Safety	$24,700	$0	$24,700	$59,278	0.42:1
Plant Health & Protection	$1,411,654	$168,000	$1,579,654	$899,950	1.76:1
Productive Land Capacity			$0	$280,680	0.00:1
Soil Health	$40,940	$4,000	$44,940	$209,750	0.21:1
Sustainable Production Systems	$1,892,209	$455,056	$2,347,265	$1,897,686	1.24:1
Water Quality & Quantity	$23,500	$0	$23,500	$391,567	0.06:1
Gryphon's LAAIR	**$10,000**	**$428,332**	**$438,332**	**$300,000**	**1.46:1**
KTT	**$69,700**	**$87,071**	**$156,771**	**$335,698**	**0.47:1**
Total–In Scope Programs	**$5,918,862**	**$1,975,595**	**$7,894,457**	**$7,708,582**	**1.02:1**
Special Initiatives	**$115,745**	**$37,672**	**$153,417**	**$1,753,167**	**N/A**
Total–Out of Scope Programs	**$115,745**	**$37,672**	**$153,417**	**$1,753,167**	**N/A**
Total–All Programs	**$6,034,607**	**$2,013,267**	**$8,047,874**	**$9,461,749**	**N/A**

Table 3.50 provides the ratio of third-party funding and in-kind contributions for research projects over the term of the Agreement. The University achieved the target in 2020/21, after falling below it in 2019/20.

Table 3.50: Ratio of Third-Party Funding and In-Kind Contributions over the Term of the Agreement

Metric	2018/19	2019/20	2020/21	2021/22	2022/23	Target
Ratio of Third- Party Funding and In-Kind Contributions	1.00:1	0.93:1	**1.02:1**			1.00:1

3.3.5 Total Third-Party Funding of University Research Supportive of Ministry Priorities but not funded by the Agreement

The University works hard to leverage the OMAFRA/UofG Agreement to grow agri-food research and innovation in Ontario.

In 2020/21, Agreement investments helped researchers attract another $55.3M in non-Agreement funding for research projects supportive of Ministry priorities. This leveraged value involves 827 projects. This funding enhances Guelph's position as a nexus of agri-food innovation, where academia, government and industry come together to support the provincial, national and international agri-food sectors, and rural communities.

Table 3.51 shows the value of non-Agreement funding in research supportive of Ministry priorities by type and College. With the Ministry's investment of $51.6M to support research, the leverage ratio for 2020/21 was 1.07:1. This exceeded the target ratio of 0.7:1, by 53%. This was also 4% higher than the 2019/20 value of 1.03:1.

Table 3.51: 2020/21 Value of Third-Party Funding for Research Supportive of Ministry Priorities by Type and College (in thousands of dollars)

College	Academic / Research	Business / Industry / NGOs	Govern-ment	Total Investment
College of Arts	$15	$16	$0	$31
College of Biological Science	$200	$1,005	$7,036	$8,241
College of Engineering and Physical Sciences	$112	$1,105	$2,876	$4,093
College of Social and Applied Human Sciences	$88	$551	$1,491	$2,131
Gordon S. Lang School of Business & Economics	$47	$304	$185	$535
Ontario Agricultural College	$890	$13,733	$13,693	$28,317
Ontario Veterinary College	$575	$2,051	$2,008	$4,634
University	$0	$0	$7,287	$7,287
Total	**$1,926**	**$18,766**	**$34,577**	**$55,269**
Agreement Investment in Research				**$51,576**
Leverage Ratio				**1:07:1**

Table 3.52 provides the ratio of third-party funding for research supportive of Ministry priorities to Agreement investment in research over the term of the Agreement. The University has surpassed the target in each of the last three years.

Table 3.52: Ratio of Third-Party Funding to Agreement Investment over the Term of the Agreement

Metric	2018/19	2019/20	2020/21	2021/22	2022/23	Target
Ratio of Third-Party Funding for Research Supportive of Ministry Priorities to Agreement Investment	1.05:1	1.03:1	**1.07:1**			0.7:1

3.3.6 Number and Type of Third-Party Organizations Supporting Research Projects

Financial support comes from a variety of third-party organizations in the agri-food sector (co-funders). Their interest in the University's research demonstrates the value of the research outcomes to the agri-food sector.

Table 3.53 below illustrates the number and type of third-party organizations supporting research projects, by program and research priority. A target of 20 co-funders per $1M invested has been set. In 2020/21, the University fell 2% short of the target with 19.6 co-funders per $1M for all in scope programs. This represents an increase from 148 co-funders in 2019/20 to 151 in 2020/21. While the number of co-funders is an important metric, it needs to be considered in context with the value of the third-party contributions to the research projects which exceeded the investment by OMAFRA (Section 3.3.4). In essence, there are fewer co-funders, but they are, on average, providing more funding. It is also notable that most of the financial partners

are of the Business / Industry / NGOs type, which clearly indicates that the University is addressing the needs and economic prosperity of the agri-food sector.

Table 3.53: 2020/21 Number and Type of Third-Party Organizations Supporting Research Projects

Program and Research Priority	Academic / Research	Business / Industry / NGOs	Govern-ment	Total	Agreement Investment	Co-Funders per $1M Invested
Tier I Research	**22**	**81**	**24**	**127**	**$7,072,884**	**18.0**
Animal Health & Welfare	8	26	4	38	$1,861,660	20.4
Competitive Production Systems	2	17	4	23	$1,472,313	15.6
Food Safety	0	2	0	2	$59,278	33.7
Plant Health & Protection	3	18	5	26	$899,950	28.9
Productive Land Capacity				0	$280,680	0.0
Soil Health	2	1	2	5	$209,750	23.8
Sustainable Production Systems	6	17	7	30	$1,897,686	15.8
Water Quality & Quantity	1	0	2	3	$391,567	7.7
Gryphon's LAAIR	**3**	**6**	**1**	**10**	**$300,000**	**33.3**
KTT	**1**	**10**	**3**	**14**	**$335,698**	**41.7**
Total–In Scope Programs	**26**	**97**	**28**	**151**	**$7,708,582**	**19.6**
Special Initiatives	**2**	**3**	**7**	**12**	**$1,753,167**	**N/A**
Total–Out of Scope Programs	**2**	**3**	**7**	**12**	**$1,753,167**	**N/A**
Total–All Programs	**28**	**100**	**35**	**163**	**$9,461,749**	**N/A**

Table 3.54 provides number of Co-Funders per $1M invested over the term of the Agreement. The University fell below the target in 2020/21, after surpassing it last year.

Table 3.54: Number of Co-Funders per $1M Invested over the Term of the Agreement

Metric	2018/19	2019/20	2020/21	2021/22	2022/23	Target
Number of Co-Funders per $1M Invested	19.2	22.3	**19.6**			20.0

3.3.7 Number and Type of Collaborations

The Alliance brings together academia, government, and industry to address a common goal – advancing the health, sustainability and productivity of the agri-food and rural sectors in an increasingly complex world. The Alliance fosters collaboration, investment, and engagement for the benefit of Ontario.

Table 3.55 illustrates the number and type of research collaborators engaged in Agreement-funded research by program and research priority. A target of 35 collaborators per $1M invested has been set. In 2020/21, the University fell short of the target by 9% with an outcome of 31.7 collaborators per $1M invested for all in scope programs. This was a notable decrease from the 2019/20 value of 38.8 collaborators per $1M invested. The total number of collaborators fell from 257 to 244. This decline has been attributed to two factors. The invitation process in RMS was utilized for the first time with the 2020/21 Research Projects and acted as a disincentive to larger teams. Researchers struggled with the process, as did many of the team member

invitees. Another factor became evident with further analysis of the data. In general, for Tier I, the average number of collaborators per project only differed slightly between the two years, from 4.3 collaborators per project in 2019/20 to 4.1 collaborators per project in 2020/21. In the same time frame, the average project award increased from $121K to $141K. The $20K increase in award value did not translate into larger teams, nor would it be expected to based on research team design. However, the metric of collaborators per $1M invested considers both parameters, causing a more substantial drop than either indicates. If the average award value remained the same between 2019/20 and 2020/21, then the collaborators per $1M invested for Tier I would have been 33.9, which is much closer to the target. As this metric was set based on data from the original RMS and with the inflation of award amounts, it may need to be adjusted going forward. To address the shortfall, the University will be encouraging researchers to verify that their teams contain the appropriate expertise to successfully complete the project, as well as ensure broad representation from different sectors so that the project's results are relevant and shared appropriately.

Table 3.55: 2020/21 Number and Type of Research Collaborations by Program and Research Priority

Program and Research Priority	Academic / Research	Business / Industry / NGOs	Govern-ment	Total	Agreement Investment	Collab. per $1M Invested
Tier I Research	**118**	**23**	**62**	**203**	**$7,072,884**	**28.7**
Animal Health & Welfare	34	6	10	**50**	$1,861,660	26.9
Competitive Production Systems	22	6	18	**46**	$1,472,313	31.2
Food Safety	1	0	0	**1**	$59,278	16.9
Plant Health & Protection	13	2	16	**31**	$899,950	34.4
Productive Land Capacity	2	0	3	**5**	$280,680	17.8
Soil Health	6	0	2	**8**	$209,750	38.1
Sustainable Production Systems	36	7	11	**54**	$1,897,686	28.5
Water Quality & Quantity	4	2	2	**8**	$391,567	20.4
Gryphon's LAAIR	**4**	**4**	**0**	**8**	**$300,000**	**26.7**
KTT	**17**	**4**	**12**	**33**	**$335,698**	**98.3**
Total–In Scope Programs	**139**	**31**	**74**	**244**	**$7,708,582**	**31.7**
Special Initiatives	**38**	**10**	**25**	**73**	**$1,753,167**	**41.6**
Tier II and III Research	**38**	**1**	**13**	**52**	**$0**	**N/A**
Total–Out of Scope Programs	**76**	**11**	**38**	**125**	**$1,753,167**	**N/A**
Total–All Programs	**215**	**42**	**112**	**369**	**$9,461,749**	**N/A**

Table 3.56 provides the number of collaborators per $1M invested over the term of the Agreement. The University fell below the target in 2020/21, after surpassing it in the first two years.

Table 3.56: Number of Collaborators per $1M Invested over the Term of the Agreement

Metric	2018/19	2019/20	2020/21	2021/22	2022/23	Target
Number of Collaborators per $1M Invested	41.5	38.8	31.7			35

3.3.8 Intellectual Property

The Research Innovation Office supports the Agreement through its management of Intellectual Property (IP) generated from the commercialization of Agreement-funded program activities. The 2020/21 performance metrics for the commercialization of Agreement-funded program activities are illustrated in the tables below.

Table 3.57 illustrates patent filings and allowances, including plant breeders' rights, related to Agreement-funded program activities, broken out by research priority. A target of 17 patents filed has been set, which was exceeded in 2020/21. Three patents were issued, slightly fewer than the target of five. This metric can be highly variable, as RIO does not have control over the schedule of evaluations/issuances by the Canadian Intellectual Property Office (CIPO), the United States Patent and Trademark Office (USPTO), or other patent offices around the world.

Table 3.57: 2020/21 Patents Filed and Issued by Research Priority

Research Priority	Number of Patents Filed	Number of Patents Issued
Bioeconomy	7	1
Products and Value Chains	7	1
Production Systems - Animals	0	1
Production Systems - Plants	6	0
Total	**20**	**3**

Table 3.58 provides the number of patents filed and issued over the term of the Agreement.

Table 3.58: Number of Patents Filed and Issued over the Term of the Agreement

Metric	2018/19	2019/20	2020/21	2021/22	2022/23	Target
Number of Patents Filed	10	20	**20**			17
Number of Patents Issued	4	12	**3**			5

Table 3.59 provides the number of OMAFRA-related licenses granted in 2020/21, broken out by research priority. The target is 19 licenses granted. The University exceeded the annual target with 35 licenses granted. The total number of licenses entered into for 2020/21 was unusually high and speaks to the dedication of the technology transfer staff and their ability to pursue opportunities in a difficult year.

Five of the agreements relate to non-exclusive licenses to a mental health literacy training program for farmers and the agricultural community, developed by Dr. Andria Jones-Bitton, Ontario Veterinary College. The program was licensed to providers in five provinces and is actively being used to improve lives in rural communities. In Ontario, 'In the Know' is offered by the Canadian Mental Health Association (CMHA). CMHA has been working with the Ontario Federation of Agriculture to ensure broad reach and benefit to Ontario's agricultural community.

There were 25 agreements related to plant varieties, spanning seven different crop species. This included the UofG's first licensing of a crab apple variety, 'Providence', licensed to an Ontario nursery.

Table 3.59: 2020/21 Licenses and Amending Agreements Granted by Research Priority

Research Priority	Number of Licenses
Products and Value Chains	8
Bioeconomy	1
Production Systems - Plants	26
Total	**35**

Table 3.60 illustrates the number of licenses granted over the term of the Agreement. The University has surpassed the annual target in each of the last three years.

Table 3.60: Number of Licenses Granted over the Term of the Agreement

Metric	2018/19	2019/20	2020/21	2021/22	2022/23	Target
Number of Licenses	22	20	**35**			19

Table 3.61 shows the total dollar value of revenue generated from licenses associated with OMAFRA-supported research. A total of $1.73M was generated, which exceeds the target of $1.5M, and is a substantial increase from 2019/20. The upturn in total revenues resulted from increased revenue from the germplasm portfolio, which is described in more detail in Section 3.4.10. Three individual varieties had revenues exceeding $100,000: soybean variety OAC Strive; dark red kidney bean Dynasty; and asparagus inbred G24. On the technology side, the Immunity+ High Immune Response technology (Semex) accounted for most of the revenue generated.

Table 3.61: 2020/21 License Revenue Generated by Type

Type of License Revenue	License Revenue Generated
Non-seed	$385,973
Seed	$1,346,310
Total	**$1,732,283**

Table 3.62 provides the licence revenue generated over the term of the Agreement. The University has exceeded the target in each of the last three years.

Table 3.62: License Revenue Generated over the Term of the Agreement

Metric	2018/19	2019/20	2020/21	2021/22	2022/23	Target
License Revenue Generated	$1,675,704	$1,562,888	**$1,732,283**			$1,500,000

Table 3.63 identifies the number of new inventions reported to RIO in 2020/21 from Agreement-funded research. The inventions are broken out by research priority. There is no specific target because the numbers are highly variable from year-to-year, with the majority being new plant varieties.

Table 3.63: 2020/21 Intellectual Property Disclosures by Research Priority

Research Priority	Number of Intellectual Property Disclosures
Bioeconomy	1
Products and Value Chains	1
Production Systems - Plants	169
Total	**171**

Table 3.64 shows the number of intellectual property disclosures over the term of the Agreement. The 2020/21 value of 171 is a 11% increase over 2019/20.

Table 3.64: Number of Intellectual Property Disclosures over the Term of the Agreement

Metric	2018/19	2019/20	2020/21	2021/22	2022/23
Number of Intellectual Property Disclosures	183	154	**171**		

3.4 Reporting Requirements

3.4.1 KTT Activities

The purpose of Knowledge Translation and Transfer (KTT) Activities is to advance knowledge into action through synthesis, exchange, application and dissemination. Activities build on a foundation of agricultural extension to support collaboration, technology transfer, and implementation of research results. KTT activities result from interactions among one or more of the University, University researchers, the Ministry, various internal and external stakeholders, and members of the public.

Table 3.65 provides the number and type of KTT activities in research projects by program, while Table 3.66 shows the number and type of publications in research projects by program. This metric was changed from a Key Performance Indicator to a Reporting Requirement, so no target has been set. In 2020/21, 991 unique KTT activities were reported on by researchers. This is an 8% decrease from the 1,083 KTT activities reported in 2019/20.

This decrease in reported KTT activities can be attributed to three main causes. The first is the COVID-19 pandemic. With limitations on face-to-face meetings and the increased burden that the pandemic placed on faculty members, many KTT activities were postponed. It is expected that there will be a surge in KTT activities in 2021/22, assuming public health measures allow. The second reason for the decrease in KTT activities is the Research Management System. The KTT Tracker is difficult for faculty members to use and the full functionality of it has yet to be implemented. This is expected to improve in 2021/22. Finally, with the Consolidated Annual Report being submitted one month early, many faculty members had not yet submitted their final reports, typically due on June 30, when the data was pulled.

Table 3.65: 2020/21 Number and Type of Knowledge Translation and Transfer Activities by Program

Program	Mobile Apps, Social Media, Web	Workshops, Tradeshows, Conferences	Committees, Consultations, Networks	Courses / Training Tools	Brochures, Multimedia, Factsheets	Other	Total
Tier I Research	48	205	60	8	67	34	**422**
Gryphons LAAIR	1	4	1		1		**7**
HQP Scholarship Program	1	19	2	2	4	2	**30**
KTT Program	8	27	2	4	9		**50**
Special Initiatives		6	18			1	**25**
Tier II/III Research	12	46	2	1	4	6	**71**
Total	**70**	**307**	**85**	**15**	**85**	**43**	**605**

Table 3.66: 2020/21 Number and Type of Publications by Program

Program	Journal Article	Magazine/ Newspaper Article	Report	Thesis	Trade Publication	Web Article	Other	Total
Tier I Research	137	17	55	29	7	10	17	**272**
Gryphons LAAIR	8		1		1			**10**
HQP Scholarship Program	1							**1**
KTT Program		1	2	1		10	1	**15**
Special Initiatives	2			1				**3**
Tier II/III Research	45	1	16	5	6	7	5	**85**
Total	**193**	**19**	**74**	**36**	**14**	**27**	**23**	**386**

Table 3.67 provides the number of KTT activities over the term of the Agreement.

Table 3.67: Number of KTT Activities over the Term of the Agreement

Metric	2018/19	2019/20	2020/21	2021/22	2022/23
KTT Activities	920	1,083	**991**		

3.4.2 Research Innovation Office – Liaison Activity

The Industry Liaison (IL) team had a productive year helping industry partners and University researchers engage in successful projects, despite several external challenges. Restrictions and closures related to COVID-19 had an impact on IL's business development activities, namely limiting introductions and in-person meetings that are critical components of developing a project pipeline and overall research activity. Although the IL team continues to deal with capacity limitations associated with operating as a small team, they were able to adapt to supporting the research enterprise virtually and have had a successful year.

Despite challenges, the IL team saw increases in both the quantity and value of awarded projects. More than half of the projects that the IL team were engaged with related to OMAFRA priorities, representing more than 80% of the total value of awarded projects for 2020/21.

Table 3.68 delivers quantitative data for clients helped, projects initiated, deals made, and the value of closed projects. Table 3.69 shows the number and value of closed projects over the term of the Agreement. Finally, Table 3.70 provides a project listing of all closed projects in 2020/21.

Table 3.68: 2020/21 Industry Liaison Activity Details

Activity	Results
Number of Clients Helped (Total)	109
Inquiries	53
Introductions Made	33
Number of Projects Initiated	61
Number of Projects Closed (Awarded)	34
Value of Closed Projects	$6,728,602

Table 3.69: Number and Value of Closed Projects over the Term of the Agreement

Metric	2018/19	2019/20	2020/21	2021/22	2022/23
Number of Closed Projects	31	25	**34**		
Value of Closed Projects	$7,155,690	$5,652,738	**$6,728,602**		

A project led by Dr. Lee-Anne Huber, Department of Animal Biosciences, is an example of how the IL team helps to advance OMAFRA priorities in research. Dr. Huber's research program explores the use of computerized feeding technologies to generate and apply precision feeding programs for lactating sows. It also explores the effects of precision feeding on sow and offspring productivity and develops evidence-based recommendations for feeding sows during the pre-farrowing (transition) and lactation periods. In addition to

financial support provided by OMAFRA and Ontario Pork, this project incorporated contributions from Wallenstein Feed & Supply Ltd., Molesworth Farm Supply Ltd., and Jyga Technologies Inc. The IL team helped Dr. Huber and her partners navigate the NSERC Alliance application process and clarify requirements needed to leverage OMAFRA's contributions to the project. Ultimately, the project was awarded an additional $226,023 from NSERC, significantly leveraging both OMAFRA and Ontario Pork's contributions.

Table 3.70: 2020/21 Project Listing for Closed Projects (Deals Made)

Lead Applicant	Project Title	Industry Partner	Program	Total (All Sources)
Andrew Hamilton-Wright	Thermal Imaging Data for Biosignal Analysis	IRIS R&D Group	UofG - COVID-19 Research Development & Catalyst Fund	$7,500
Ali Dehghantanha	A Cyber Threat Hunting and Intelligence System for Smart Grid	IS5 Communications	OCE VIP	$198,400
Joshua Nasielski	Reducing lodging in Ontario milling oats for more consistent yield and grain quality	Pepsico	Research Grant	$36,000
Jibran Khokhar	Harnessing the Power of Cannabinoids to Reverse Cannabis-induced Toxicosis in Pets.	Avicanna Inc	NSERC Alliance	$222,784
Rebecca Hallett	Mitigation and management of Cry1F resistance in European corn borer in Canada	Grain Farmers of Ontario	NSERC Alliance	$1,086,715
Manish Raizada	Understanding the contribution of the inherited microbiome to corn yield and immunity-suppressing vomitoxin	Grain Farmers of Ontario	NSERC Alliance	$503,615
Eran Ukwatta	Computer-Aided Detection of Non-Alcoholic Fatty Liver Disease (NAFLD), Steatosis and NASH, using Raw Signals	Oncoustics	Mitacs Accelerate/SOSCIP	$53,333
Amir Aliabadi	Thermal Energy Integration and Storage	Blue Valley Building	Mitacs Accelerate	$125,000
George van der Merwe	Engineered genetic traceability solution for commercial ale yeasts and methodology for rapid detection and identification of diastatic yeast contamination in beer fermentation	Index Biosystems; Escarpment Labs	Mitacs Accelerate	$30,000

Lead Applicant	Project Title	Industry Partner	Program	Total (All Sources)
Istvan Rajcan	Natto Soybean Variety Project	Huron Commodities Inc.	Research Contract	$31,500
Jennifer Geddes-McAlister	Proteomics of medicinal mushrooms	Wake Network Inc.	Service Contract	$4,500
Jennifer Geddes-McAlister	Mass spectrometry analysis of beneficial compound profiles of medicinal mushrooms	Wake Network Inc.	Mitacs Accelerate International	$15,000
Mike Steele	The unexplored bioactivity of colostrum	Saskatoon Colostrum Company Ltd, Bayer Animal Health, Land O'Lakes	NSERC Alliance	$1,500,000
Lee-Anne Huber	Evidence-based feeding strategies for lactating sows using computerized precision feeding technologies	OMAFRA, Ontario Pork, JYGA Technologies, Wallenstein Food & Supply Ltd	NSERC Alliance	$380,393
Lewis Lukens	Applying quantitative genomics to Ontario barley improvement.	OMAFRA, Cerela	NSERC Alliance	$333,000
Vahab Farzan	Pig Gut Microbiome	Cargill Animal Health and Nutrition Division	Research Contract	$50,000
Gordon Kirby	Blood Purification Model in Sheep	Qidni Labs	Service Contract	$127,000
Emily Chiang	Reducing chemical input and increasing soil health	UofG	Grants4Ag	$12,915
Amin Komeili	Machine learning-based quality control of canine thoracic radiographs	Intelius Analytics	NSERC Alliance	$171,000
Mike Steele	Finding Innovations to Improve Calf Gastrointestinal Health	Lallemand Health Solutions	NSERC Alliance	$200,000

Lead Applicant	Project Title	Industry Partner	Program	Total (All Sources)
Herman Eberl	Multiscale Modeling of Hybrid CSTR/Biofilm Based Multi-Vessel Reactors for Anaerobic Digestion Processes	CH4 Biogas	NSERC-OCE Alliance	$60,000
Bill Van Heyst	Commercial GermStopSQ HVAC Filter Development	Envision SQ	OCE VIP	$225,000
Gisele LaPointe	To obtain genomic mapping of yogurt starter cultures and development of molecular tools to improve consistency in yogurt	Lactalis Canada	Mitacs Accelerate	$120,000
Laima Kott	Propagation of High Rosmarinic acid mint clones for industry	Sensient Natural Extraction Inc.	Industry Contract	$10,000
Eran Ukwatta	Fully automated end to end analysis of non-small-cell lung carcinoma using deep learning techniques.	Atlas Labs Inc.	Mitacs Accelerate	$45,000
Loong-Tak Lim	Development of ready-to-cook/serve active packaging system for microwave potato products	Earth Fresh	NSERC Alliance	$360,000
Bernard Grodzinski	Integrated management strategies for daily use of artificial lighting for year-round greenhouse vegetable production of vining Crops: tomatoes and mini-cucumbers.	BASF Vegetable Seeds	OMAFRA Alliance Tier 1	$344,800
Xiaodong Lin	Malicious/phishing Website Detection	Arctic Wolf Networks	Mitacs Accelerate	$15,000
Hassan Khan	Identification of anomalous DNS traffic through behavioural analysis of network packet inspection data	eSentire	Mitacs Accelerate	$15,000
Ali Dehghantanha	Detection of malicious documents by extracting and interpreting macros in Microsoft Office files	eSentire	Mitacs Accelerate	$15,000
Rozita Dara	SIEM Aggregation	Farm Credit Canada	Mitacs Accelerate	$15,000
Charlie Obimbo	Automation and Orchestration	ISA Cybersecurity	Mitacs Accelerate	$15,000

Lead Applicant	Project Title	Industry Partner	Program	Total (All Sources)
Elijah Kiarie	Functional feedstuffs to bolster immunocompetence of pullets: Impact on performance and health in pullets and hens	Egg Farmers of Canada	NSERC Alliance	$370,147
Andrew Gadsden	Development of an Automated Waste Collection System for Compostable Goods	Eagle Vision Systems	NSERC Alliance	$30,000
Total				**$6,728,601**

3.4.3 Intended Benefit

The Intended Benefit reporting requirement identifies, from an end-user perspective, the primary beneficiary and benefit or impact of a Research Project. For Intended Benefit, Research Projects are classified as: 1) Adoption of New Technologies, Products, Practices and Processes; 2) Applied Research – Technology Assessment; 3) Applied Research – Technology Demonstration; 4) Applied Research – Technology Development; 5) Applied Research – Not Involving Technology Development; 6) Discovery Research; 7) IP Protection; 8) Knowledge Translation and Transfer; and 9) Public Policy Research. Table 3.71 below provides the Intended Benefit for the 2020/21 Research Projects.

Table 3.71: 2020/21 Intended Benefit by Program and Research Priority

Program and Research Priority	Adoption of New Tech.	Applied Res. - New Tech. Assess.	Applied Res. - New Tech. Demo.	Applied Res. - New Tech. Develop.	Applied Res. – Not New Tech.	Discovery Res.	KTT	Public Policy Res.	Total
Tier I Research	**1**	**8**	**2**	**14**	**16**	**7**		**2**	**50**
Animal Health & Welfare		2	1	2	8	2			15
Competitive Production Systems		2		4	3	2			11
Food Safety					1				1
Plant Health & Protection		1		3	2				6
Productive Land Capacity								2	2
Soil Health					1				1
Sustainable Production Systems	1	3	1	5	1	1			12
Water Quality & Quantity						2			2
Gryphon's LAAIR			**1**	**3**					**4**
KTT							**9**		**9**
Special Initiatives	**1**	**3**		**4**	**1**			**4**	**13**
Tier II Research	**2**	**6**	**1**	**10**	**5**	**2**	**1**		**27**
Grand Total	**4**	**21**	**4**	**31**	**23**	**9**	**10**	**6**	**108**

3.4.4 Impact Case Study

The Impact Case Study is a qualitative assessment and accompanying narrative that illustrates the cumulative impact of research and KTT activities on the end-user audience. The Impact Case Study is expected to be an important contributor to the mid-term review of the Agreement. The case study approach involves assessment across multiple elements and requires the use of mixed methodologies (e.g., document review (research proposals and reports, grey literature - government and industry reports, academic presentations, statistical data sources), media scans, interviews with researchers and end users etc.).

Impact, for this purpose, is defined as any type of output of research activities which can be considered a net "positive return" for the scientific community, end users (government policy and program development, business and industry etc.) or civil society. Five broad categories have been identified for the case studies to assess and describe impact, which recognize the multi-dimensional nature of the benefits of research - from traditional knowledge generation and capacity building through to broader sector and societal benefits. These categories are advancing knowledge; capacity building; informing decision-making; sector benefits; and broad socio-economic benefits.

Three discrete case studies were completed in time for the mid-term review of the Agreement. Each case study covers a reasonably broad topic area to illustrate the diversity of funded research, with more specific topic areas (“vignettes”) selected for deeper assessment to demonstrate longer-term impact.

The first case study on Dairy was submitted with the 2019/20 Consolidated Annual Report on July 31, 2020. The second case study on Breeding and Genetics was submitted on March 19, 2021. The third case study on Innovation has been submitted with this Consolidated Annual Report on June 30, 2021. This is the last case study that will be completed during the first term of this Agreement.

3.4.5 Agri-Food and Rural Link – KTT Activity

Agri-Food and Rural Link (AFRL) is the program delivery and training arm of the Alliance’s KTT program. AFRL programming is designed to improve KTT capacity among researchers, graduate students and regional agri-food partners to enhance the impact of research. Program staff, in collaboration with OMAFRA and UofG partners, also design and execute targeted communication strategies and events to enhance knowledge exchange and dissemination. Table 3.26 in Section 3.1.7 contains a comparative summary of KTT activities noted in the 2020/21 Business Plan, relative to the activities that took place in 2020/21.

3.4.6 Agri-Food and Rural Link and Research Innovation Office Outcomes

Both Agri-Food and Rural Link and the Research Innovation Office deliver programming to enhance the impact of research outside academia. Three case studies are included in Appendix B to illustrate the impact of effective knowledge mobilization / innovation / commercialization activities delivered by AFRL and RIO. Taken together, these case studies profile the breadth of activity to increase capacity of both researchers and stakeholders to extend and receive research results and demonstrate how program capacity enhances the impact of Research Projects on the target audiences.

Appendix B.1 – Gryphon’s LAAIR Pitch Event: On May 28, 2020, the Research Innovation Office hosted the second annual Gryphon’s LAAIR Pitch Competition. This event showcased agri-food start-ups who will help kickstart post-pandemic prosperity in Ontario. This case study profiles the Gryphon’s LAAIR program and

specifically the importance of this funding in bridging the gap between research and developing a marketable product. Also featured are the corporations that won both the juried and people's choice prizes.

Appendix B.2 – Skills for Research Impact: Skills for Research Impact is a workshop series for University of Guelph faculty, research staff and graduate students interested in enhancing the impact of their research. Following a successful pilot in 2019/20, the curriculum was updated, and a new brand identity was developed. This case study profiles the sessions offered, the resources developed, and the value of the series in filling a training need on campus.

Appendix B.3 – Data Management Plans: As of 2018, researchers awarded funding through the Alliance research program must complete a data management plan (DMP) for their awarded project(s). A new DMP template was released in 2021. This case study profiles the Alliance DMP requirements, the new DMP template and tools, and the importance of DMPs to data preservation and sharing.

3.4.7 Third-Party Investment in Tier II and III Projects

Tier II and III projects have operating funding from non-Agreement programs for research that supports Ministry priorities. These projects receive support from the Agreement through subsidized Research Centre Access Fees and/or use of OMAFRA Technicians. Table 3.72 shows the number of co-funders, as well as the value of third-party research operating funding directed at Tier II and III Research Projects by type. Only cash contributions have been utilized in calculating the third-party investment, as well as the number of co-funders.

For projects beginning in 2020/21, the total third-party operating funding for Tier II and III projects was $11.6M. This was a substantial increase from the $2.8M recorded in 2019/20. This was due to improved reporting of Tier II projects in RMS, as well as the awarding of two significant projects, one with leverage of $7.3M and the other with leverage of $1.3M. Government continued to be the largest source of third-party investment, representing 69% of the total leveraged funds in 2020/21.

Table 3.72: 2020/21 Third-Party Operating Funding Directed at Tier II and III Research Projects

Research Priority	Academic		Business / Industry / NGOs		Government		Total	
	#	Amount	#	Amount	#	Amount	#	Amount
Animal Health & Welfare	5	80,035	7	609,650	7	335,287	**19**	**1,024,972**
Competitive Production Systems	2	33,910	3	138,258	2	197,430	**7**	**369,598**
Innovative Products & Product Improvement	1	39,117	1	100,000			**2**	**139,117**
Plant Health & Protection	1	546	13	362,350	4	669,406	**18**	**1,032,302**
Sustainable Production Systems	1	40,000	7	2,129,053	5	6,839,223	**13**	**9,008,276**
Total	**10**	**193,608**	**31**	**3,339,311**	**18**	**8,041,346**	**59**	**11,574,265**

Table 3.73 provides the number of co-funders and the value of third-party operating funding directed at Tier II and III projects over the term of the Agreement.

Table 3.73: Number of Co-Funders and Value of Third-Party Funding for Tier II and III Research Projects over the Term of the Agreement

Metric	2018/19	2019/20	2020/21	2021/22	2022/23
Number of Co-Funders	46	39	**59**		
Value of Third-Party Operating Funding	$7,623,824	$2,786,280	**$11,574,265**		

3.4.8 HQP Scholarship Program and USEL Program

The HQP Scholarship Program provides scholarships for University of Guelph graduate students to enhance their skills and knowledge of the agri-food sector. This has a direct benefit to the students, their future employers and the agri-food sector. In 2020/21, scholarships were awarded to ten new Masters and nine new Doctoral students. In addition, there were 11 continuing Masters and 20 continuing Doctoral students, for a total complement of 50 students.

The USEL Program supports the mobilization of agri-food research findings and the Ministry's ability to source qualified talent for branch positions, leveraging resources to deliver on industry and Ministry priorities. In 2020/21, the USEL Program supported eight students who completed their projects during Summer 2020.

3.4.9 Status of the University's Project to Create a Platform for Agri-Food Data in Accordance with D.2 of the Program Schedule

Agri-Food Data Canada (ADC) is envisioned to be a national data platform that connects nodes of existing agri-food research data across Canada.

As detailed in the 2019/20 Consolidated Annual Report, the development of ADC will require an iterative, phased approach to achieve its mandate to bring agri-food research data together with advanced analytics to create new opportunities for the agri-food sector. In 2020/21, this iterative process led to the development of a new approach to ADC as a federated data platform that strives to connect agri-food data nodes from research data-centres across Canada, including the Research Centre Data Access Portal.

In 2020/21, the Agri-Food Data Canada portfolio experienced a period of staffing transition. Dr. Karen Hand stepped down as Director of Research Data Strategy in June 2020. Jairo Melo joined the Office of Research in November 2020 in the new position of Senior Manager, Agri-Food Data Strategy. The Senior Manager, Agri-Food Data Strategy is the next iteration of the Director of Research Data Strategy role, with increased emphasis on engaging partner organizations to advance the ADC mandate. Activities in 2020/21 focused on liaising with possible partner organizations, culminating in the newest iteration of ADC as a federated model joining multiple research data nodes.

While this is a modified approach to ADC, the goal remains to create a robust data ecosystem by addressing issues of data standards, data interoperability, data governance and data security. In doing this, ADC will amplify the value of the University's existing data and information assets, including the work of Dr. Rozita Dara to enhance data capture and off-site data access for researchers via the Research Centre Data Access Portal (see Section 3.1.9.2 for details on this initiative).

3.4.10 Administration of the Germplasm Bank

The total revenue for the Germplasm Bank was $1.35M for 2020/21, an increase of approximately $165K compared to last year. For the purposes of this report, germplasm revenues have been reported based on a March 31 year end to maintain consistency with previous years. Table 3.74 provides additional revenue details by crop.

Dry bean revenues continue to grow, up 53% compared to 2019/20, largely on the strength of red kidney variety Dynasty, as well as some growth in several other smaller varieties.

Licensed cereal varieties had a strong year despite several varieties being older. New varieties are expected in the coming years, so sustained licensing revenues are anticipated.

For soybean, overall royalties are up slightly. OAC Strive was by far the top performer, contributing more than 10% of the total germplasm revenue. It is a strong variety with a reputation for providing dependable yields even with erratic weather conditions. OAC Bruton from the Ridgetown program also saw strong growth this year.

Asparagus had a strong rebound year in 2020/21, reversing two years of declines to post its highest year ever, increasing 63% compared to the previous year. The licensee Fox Seeds continues to make efforts to expand markets.

It should be noted that the significant declines in strawberry and tomato were due to licensee payments arriving after the end of the reporting period. The actual amounts for those crops are comparable to previous years.

Finally, the University has seen a continued interest from licensees to seek Plant Breeders' Rights (PBR) protection for new varieties. In 2020/21, four new PBR applications were made, in addition to one US plant patent application and one US trademark application.

Table 3.74: 2020/21 Germplasm Revenue by Crop Type

Crop Type	Germplasm Revenue
Field Crops	**$1,114,675**
Beans - white and coloured	$260,953
Canola	$693
Cereals - Guelph	$22,790
Cereals - Ridgetown	$41,448
Forages	$5,565
Maize	0
Soybean - Guelph	$519,731
Soybean - Ridgetown	$263,495
Horticultural Crops	**$231,634**
Apple rootstocks	$7,771

Crop Type	Germplasm Revenue
Asparagus	$212,002
Hemp	$5,697
Strawberries	0
Tomatoes	$3,513
Tree fruits	$2,652
Total Germplasm Revenue	**$1,346,310**

Table 3.75 provides the Germplasm Revenue over the term of the Agreement.

Table 3.75: Germplasm Revenue over the Term of the Agreement

Metric	2018/19	2019/20	2020/21	2021/22	2022/23
Germplasm Revenue	$1,320,716	$1,180,520	**$1,346,310**		

4 VETERINARY CAPACITY PROGRAM

The Veterinary Capacity Program (VCP) supports the development of future skilled capacity to be ready for employment opportunities offered by the agri-food sector and rural Ontario, including having highly qualified veterinary capacity in place to meet Ontario's needs.

4.1 Program Activities and Achievements from 2020/21

VCP is a well-established, stable program, which contributes to the development of Ontario's veterinary capacity, providing students with the knowledge and skills needed to meet the needs of the Ministry, the agri-food sector, veterinary public health, and rural economic development. VCP funding enables hands-on, experiential learning in an innovative, clinical environment at the Ontario Veterinary College (OVC) Health Sciences Centre and supports 11 faculty FTEs, a subset of the 52 OVC faculty that engage in areas of interest to OMAFRA.

Congruent with OMAFRA priorities, in year three of the program, OVC continued to enhance partnerships and networks with health authorities, industry and academia to expand capacity in One Health research. OVC also continued efforts to influence societal change by increasing involvement in relevant government and industry discussions and decisions related to veterinary medicine and One Health. This important work is highlighted on the UofG's One Health website. In addition, OVC has been investigating opportunities to address the veterinary capacity shortage in remote, rural, and northern communities in Ontario.

The VCP continues to provide all Doctor of Veterinary Medicine (DVM) students with:

- Experience with and exposure to Priority Species;
- Knowledge of livestock production practices at the intersection of animal and human health as part of the University of Guelph's One Health agenda;
- Opportunities to develop practical competency through experiential learning and field experience; and
- Opportunities to gain awareness in emerging animal health issues; and
- Awareness of veterinarians' roles in areas of practice beyond primary care, including government, public health, public policy and regulatory roles.

Candidates for the Doctor of Veterinary Science (DVSc) or Doctor of Philosophy (PhD) degrees and other post-graduate trainees are provided with research opportunities for priority species and Ministry priorities.

This year, once again, OVC is celebrating a top ten ranking among veterinary schools in the world through the Quacquarelli Symonds (QS) university rankings. The QS World University Rankings by Subject 2021 ranked OVC fifth worldwide (the same as last year), as well as first in Canada and third in North America.[12] OVC has consistently placed in the top ten since QS first included veterinary science in their rankings in 2015. Ranking is based on academic and employer reputation, as well as how often faculty research is cited within academic publications.

[12] Quacquarelli Symonds (QS) World Rankings, https://www.topuniversities.com/university-rankings/university-subject-rankings/2021/veterinary-science

COVID-19

Since the beginning of the COVID-19 pandemic and throughout the reporting period, OVC conducted academic activities in a modified format compliant with public health directives. Teaching and research were actively pursued throughout the pandemic. As a result, there were no material impact to the activities in VCP under the Agreement.

The external Phase 4 rotations were delayed from May 2020 to August 2020 and were offered in a shortened format. In Fall 2020 and Winter 2021, the DVM program was delivered in a hybrid structure, with clinical labs and exercises taking place on campus with proper protocols and precautions in place. For 2021/22, OVC will continue to adjust its operational plans in accordance with the evolving epidemiological situation and public health directives.

4.2 Mandatory Compliance Requirements

4.2.1 OVC Accreditation

Veterinary colleges in Canada, the United States, and all of the top schools throughout the rest of the world, are accredited by the Council on Education (COE) of the American and Canadian Veterinary Medical Associations (AVMA; CVMA). During its March 2021 meeting, the COE reviewed OVC's 2020 interim report and voted to grant continued full accredited status for the next year. The accreditation status of OVC is reviewed annually based on the annual report submission. OVC is actively preparing for the accreditation site visit scheduled to take place in October 2022.

4.2.2 Capacity Strategy Plan Acknowledgement

OVC maintains a Capacity Strategy Plan to ensure that they have the faculty and staff necessary to service VCP and support capacity needs for priority species and Ministry priorities. The recruitment and retention of faculty and staff is of critical importance. In fact, OVC's strategic plan identifies a key objective to attract and retain the very best talent. When hiring, OVC continues to reflect on the priority species and Ministry priorities.

Four new faculty members started their appointments in 2020/21 in Ministry priorities and/or emerging areas:

- Large Animal Medicine – Dr. Diego Gomez-Nieto
- Canada Research Chair (Tier 2) in One Health – Dr. Heather Murphy
- Anatomic Pathology – Dr. Courtney Scott
- Virology – Dr. Samuel Workenhe

In addition, the following faculty members will be starting their appointments in 2021/22:

- Anatomic Pathology – Dr. Emma Borkowski
- Large Animal Surgery – Dr. Marie Soleil Dubois
- Qualitative Research Methods and Knowledge Synthesis – Dr. Basem Gohar
- Community Medicine (Veterinary) – Dr. Laura Van Patter
- Veterinary Anatomy – Dr. Samantha Payne
- Epidemiology and One Health – Dr. Kelsey Spence

4.2.3 Resources to Administer VCP

OVC confirms that the necessary resources, including faculty and support staff, are available to administer the program. Ilya Bogorad, Executive Director, Strategy and Planning, Ontario Veterinary College, plays a leadership role as the VCP PMC Co-Chair.

4.3 Key Performance Indicators

4.3.1 NAVLE Results

The North American Veterinary Licensing Exam (NAVLE) is the standardized licensing test that graduates of accredited schools can take in the final year of their program. Success allows OVC graduates to obtain licensure to practice anywhere in the world. As noted in Table 4.1, OVC graduates continue to demonstrate a high success rate for the NAVLE, based on the percentage who pass and in the score obtained, which are both consistently higher than the average outcomes for the entire North American cohort. In 2020/21, 96% of OVC soon-to-be graduates passed the test compared to 90% of the North American cohort.

It is important to note that NAVLE results clearly demonstrate the very tangible value of the Veterinary Capacity Program. Graduates of OVC consistently outperform graduates of other veterinary schools on questions related to OMAFRA's priority species. On questions related to food animals, the OVC cohort scored a full six percentage points higher than the North American average.

Table 4.1: NAVLE Results

Graduation Year	OVC Student Exam Score[13]	North American Cohort Exam Score	% Pass Rate for OVC	% Pass Rate for North American Cohort
2021	528	504	96%	90%
2020	511	501	93%	89%
2019	525	507	99%	94%
2018	515	509	97%	95%

4.3.2 Student Alignment with Priorities

This key performance indicator measures the number of students enrolled in post graduate studies aligned with Ministry priorities. The target is fifteen graduate students. OVC achieved the target in 2020/21. Table 4.2 provides the project titles for the fifteen doctoral students receiving stipend support. Table 4.3 shows the number of students enrolled in post graduate studies aligned with Ministry priorities over the term of the Agreement. The University has achieved the target in each of the last three years.

[13] Exam is scored out of 800.

Table 4.2: Project Titles and Status of Students receiving VCP Funding

Project Title	Ministry Priority	Student Type	Entry Semester	Status
Crimean-Congo hemorrhagic fever DNA vaccine trial: pilot safety and toxicity study in cattle and sheep	Animal Health	DVSc	S17	
Effect of prevention of hypocalemia on health and performance in dairy cows	Animal Health	DVSc	F17	Graduated
Exercise-induced pulmonary hemorrhage in horses	Animal Health	DVSc	F16	
Investigating kid mortality in Ontario dairy goat farms	Animal Health	DVSc	F16	Graduated
Saccharomyces boulardii: a potential biotherapy for horses with acute enterocolitis	Animal Health	DVSc	F18	
Characterisation and investigation of bronchopneumonia with interstitial pneumonia in beef feedlot cattle	Animal Health	DVSc	S19	
Investigation of astrovirus as an emerging cause of previously undiagnosed neurologic disease in Ontario cattle	Animal Health	DVSc	F19	
Electroencephalographic and behavioural evaluation of physical methods for on-farm euthanasia of poultry	Animal Welfare	DVSc	F17	Graduated
Bioavailability and efficacy of NSAIDs when compounded (mixed) with iron dextran on pain relief following castration in piglets	Animal Welfare	DVSc	F18	Graduated
A prudent approach to antibiotic treatment of high-risk calves	Public Health	DVSc	W18	
Evaluating the knowledge, attitudes, and behaviours toward radiation safety in the veterinary field and the impact of specific training methods on improving current practices	Public Health	PhD	W19	Graduated
Radiation safety practises among large animal veterinarians	Public Health	DVSc	F20	
Exploring neonatal calf mortality in Ontario dairy farms	Animal Health	DVSc	W21	

Project Title	Ministry Priority	Student Type	Entry Semester	Status
Transmission pathways of aquatic bird bornavirus for poultry species.	Animal Health	DVSc	F19	
Potomac Horse Fever - pathogen surveillance and investigation of intermediate hosts.	Animal Health	DVSc	W21	

Table 4.3: Students in Post Graduate Studies Aligned with Ministry Priorities over the Term of the Agreement

Metric	2018/19	2019/20	2020/21	2021/22	2022/23	Target
Number of Students in Post Graduate Studies Aligned with Ministry Priorities over the Term of the Agreement	15	15	**15**			15

4.4 Reporting Requirements

4.4.1 Graduate Survey

This metric includes data from three surveys: the Graduate Survey, which studies new program graduates six months to one year after graduation (i.e., OVC 2020 cohort – students who graduated in June 2020), the Employer Survey, which studies employers of new graduates six months to one year after graduation, and the Alumni Survey, which studies alumni five years after graduation (i.e., OVC 2016 cohort – students who graduated in June 2016). To facilitate comparisons across years, percentages are reported as a function of survey respondents, not total students in the cohort.

4.4.1.1 Results of Graduate and Employer Surveys

Forty-eight of the 112 graduates in OVC 2020 responded to some or all of the survey questions, representing a 43% response rate. Responses were received from 29 employers representing a 26% response rate. Response rates varied for each survey question, and the number of respondents for each question is indicated in brackets after the table or figure title.

Table 4.4 displays the practice category and type that new OVC graduates are employed in six months to one year after graduation.

Table 4.4: Practice Category and Type that New Graduates (OVC 2020) are Employed In (N=47)

Practice Category	Practice Type	Number of Respondents (%)
Clinical Practice	Equine	0 (0%)
Clinical Practice	Food Animal	5 (11%)
Clinical Practice	Rural Community Practice/Mixed	3 (6%)
Clinical Practice	Small Animal	24 (51%)
Clinical Practice	Other Private Clinical Practice	0 (0%)
Non-Clinical Practice	Graduate School	1 (2%)
Non-Clinical Practice	Internship	13 (28%)
Non-Clinical Practice	Not-for-Profit Clinical	1 (2%)

Table 4.5 illustrates the streams that new OVC graduates, completing the Graduate Survey, participated in during fourth year.

Table 4.5: Stream that New Graduates (OVC 2020) Participated in During Fourth Year (N =42)

Stream	Number of Respondents (%)
Equine	1 (2%)
Food Animal	7 (17%)
Rural Community Practice	4 (10%)
Small Animal	30 (71%)

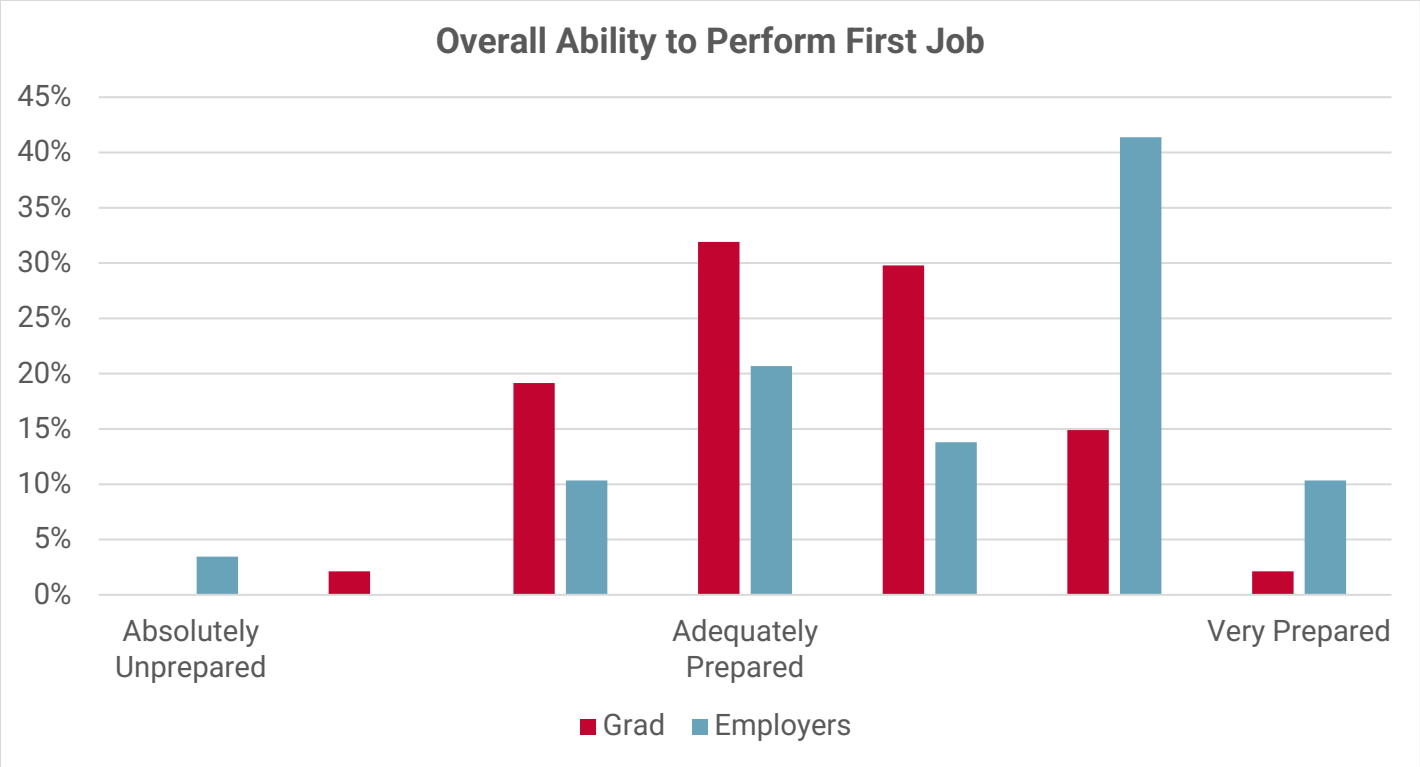
Readiness for Employment Upon Graduation

Graduates (N=47) and employers (N=29) rated the graduates' overall preparation for their first job using the following 7-point scale:

- 1 – Absolutely unprepared
- 4 – Adequately prepared
- 7 – Very prepared

Figure 4.1 demonstrates how graduates and employers rate the graduates' overall preparation to perform their first job. The majority of graduates feel that they are adequately prepared, while the majority of employers believe the graduates are much closer to very prepared.

Figure 4.1: Preparation to Perform First Job According to Graduates (N=47) and Employers (N=29)



Finally, Table 4.6 illustrates the employment location of the graduates in the OVC 2020 cohort. Responses in this table are based on the Graduate Survey data, as well as a number of searches, including the CVO "Find a Veterinarian" database, Google, Facebook, and LinkedIn. One hundred of the 112 graduates were located.

Table 4.6: Employment Location for New Graduates (OVC 2020) (N=100)

Employment Location	Number of Graduates (%)
Central East - Ontario	13 (13%)
Central West – Ontario	20 (20%)
Central South – Ontario	8 (8%)
East – Ontario	11 (11%)
North – Ontario	2 (2%)
South West – Ontario	8 (8%)
Toronto - Ontario	14 (14%)
Canada - Not Ontario	6 (6%)
United States	18 (18%)

Feedback Provided in Comments from Students

Strengths of the Program

Thirty students provided written feedback about the strengths of the DVM program at the Ontario Veterinary College. Several students listed more than one strength. Qualitative comments were coded and the most commonly occurring of these are listed below, with quotations to illustrate each theme.

Effective Instruction of Hands-On Skills

Fourteen students commented that the hands-on experience practicing clinical and technical skills is a strength of the OVC program. Students highlighted the effectiveness of labs for developing their skills, especially physical exam labs and surgery labs. Students also mentioned the Phase 4 rotations as an effective way to gain hands-on skills.

- "Small animal surgery 3rd year and the labs leading up to it were great as well. more hands on labs wherever possible should be encouraged (ophtho labs in particular were very fun and worthwhile!)"
- "Hands-on physical exam labs and surgery labs were helpful"
- "Surgery and other hands on labs are done well."

Effective Instruction of Communication Skills

Five students commented that they received helpful training in communications skills at OVC.

- "Although they were difficult/awkward at the time, in hindsight I do appreciate the opportunity to have done the simulated interviews throughout the years to work on client communication."

Other Strengths of the Program

Other strengths of the program listed by respondents included the Primary Healthcare Centre rotation (N=5), the lectures (N=2), the teaching of pathology (N=1), and the rigorous testing (N=1).

Recommendations to Improve the DVM Program

Thirty-seven students provided recommendations to improve the DVM program at the Ontario Veterinary College. Some students provided more than one suggestion. Qualitative comments were coded and the most commonly occurring are listed below, with quotations to illustrate each theme.

Increase Focus on Practical Everyday Skills and Reduce Focus on Specialized Skills

Most suggestions focused on graduates' perceptions of a need for an increased focus on skills that are used in general practice, such as dentistry (N=14) or dermatology (N=4) and a reduced focus on specialized skills. Students also requested more hands-on opportunities to practice clinical and surgery skills (*N*=9).

- "Less focus on specialized procedures/diagnostics, more focus on common conditions we see as in GP."
- "I think adding in a bigger lecture and lab component dedicated to building dentistry and oral surgery skills is vital to ensuring that OVC graduates have the appropriate skills for practice."

Increase Use of Case Examples and Case-Based Learning

Seven students requested more use of case-based learning to help them practice working through cases from start to finish.

- "Working through cases with little-no diagnostics. Reviewing common presentations and approaches (vomiting/diarrhea, ear infections, anal gland issues, increased liver values, etc.)."
- "More case based approaches. Like here is a patient with these signs or this bloodwork. What are your differentials, what are the next diagnostic steps you would do and what is your treatment plan."

Feedback Provided in Comments from Employers

Strengths of the Program

Fifteen employers described strengths of OVC's DVM program. Several employers listed more than one strength. Qualitative responses were coded and the most commonly occurring themes are listed below.

Good Base of Veterinary Knowledge

Five employers described a strong knowledge base as a core strength of the OVC program.

- "Knowledge base and overall professional proficiency is excellent"
- "Knowledge base is great, most students have a decent understanding and application when they graduate."

Effective Instruction of Client Communication Skills

Four employers described the teaching of client communication skills as a strength of the OVC program. Several employers specifically described skills taught in the "Art of Veterinary Medicine " (AVM) courses, including client communication and interpersonal skills.

- "The AVM course helped my employee a lot during her practice to build connection/ rapport with the clientele."
- "I believe the client communication skills are being established well through the AVM courses."

Other Strengths of the Program

Other strengths listed by employers included: clinical skills (N=1), diagnostic imaging (N=1), and internal medicine (N=1).

Recommendations to Improve the Program

Eighteen employers provided recommendations to improve the program. Some respondents offered more than one recommendation. Qualitative responses were coded and the most commonly occurring themes are listed below.

Increase Training in Resilience, Motivation, Growth Mindset

Five employers suggested that some graduates need additional training in resilience, independence, and motivation. They suggested that some OVC graduates have difficulty recovering from interactions with difficult clients and need encouragement to look up information on their own.

- "Improve graduates ability to work and learn independently. They seem to rely excessively in knowledge to be transferred from senior clinicians as opposed to self-development."
- "A disproportionate number of graduates are 'Fixed' mindsets and have great difficulty with 'failure', a client declining gold standard treatment, patients that die despite their treatment plan, inability to be flexible with schedules, handle the unexpected, inability to handle normal stress, willingness to shift at the last minute."

More Hands-On Training, Especially Dentistry, Dermatology, and Surgery

Seven survey respondents indicated that the program could be improved by adding more opportunities for students to gain hands-on experience, especially with dentistry (N=4), dermatology (N=1) and surgical skills (N=2).

- "Anesthesia and surgery needs improvement. The student doesn't feel [they] can manage anesthesia and perform surgery with ease."
- "Dental Technical schooling is paramount. Dentistry is a priority in small animal hospitals. It would be beneficial if they could receive more during their time at OVC."

4.4.1.2 Results of Alumni Survey

Twenty-seven of the 113 graduates responded to some or all of the survey questions in the Alumni Survey of the OVC 2016, representing a 24% response rate. Table 4.7 displays the type of practice that alumni were first employed in after graduation. 33% were employed in equine, food animal or rural community/mixed practices.

Table 4.7: Type of Practice from the Alumni Survey (OVC 2016) – First Position After Graduation (N=27)

Practice Category	Practice Type	Number of Respondents (%)
Clinical Practice	Equine	2 (7%)
Clinical Practice	Food Animal	3 (11%)
Clinical Practice	Rural Community Practice/Mixed	4 (15%)
Clinical Practice	Small Animal	18 (67%)
Clinical Practice	Other Private Clinical Practice	0 (0%)
Non-Clinical Practice	Graduate School	0 (0%)
Non-Clinical Practice	Internship	0 (0%)
Non-Clinical Practice	Not-for-Profit Clinical	0 (0%)

Feedback Provided in Comments from Alumni

Eleven alumni provided recommendations to improve the DVM program at the Ontario Veterinary College. These suggestions largely echoed the comments from the Graduate Survey. Qualitative comments were coded and the most commonly occurring are listed below, with quotations to illustrate each theme.

Increase Hands-on Practice, Especially for Skills like Dentistry Commonly Seen in General Practice

The most commonly occurring feedback was the suggestion to increase hands-on practice of general practice skills such as dentistry and dermatology. Two alumni commented that they would have liked more preparation for working with swine. A sample comment from an alumni is included below:

- "Medical conditions and procedures were taught, but a lot of 'everyday' concerns were not well-covered, such as anal gland disease, limited dentistry, common non-pathological issues. Also, how to make use of limited client resources."

Increased Instruction and Modelling How to Discuss Costs with Clients, Especially for Clients with Limited Financial Resources

Two alumni commented that once they entered private practice, they found it difficult to discuss costs with clients. They also requested more training in working with clients with limited financial resources. For example, one respondent wrote:

- "Communication with clients, especially surrounding costs and money, was challenging after graduation. Choosing alternative options when recommended treatments/diagnostics were declined by clients was also a challenge."

4.4.2 Curricular Requirements (Years 1 to 3) and Examples of Co-Curricular Opportunities

The DVM curriculum is managed by the OVC Curriculum Committee and addresses changes to the program in an evolving, on-going basis with input from external stakeholders (including OMAFRA), students and faculty.

4.4.2.1 DVM Program Core Curricular information

Phase 1:

Health Management I

The overall goal of this course is to present the students with an integrated approach to the disciplines of medicine, epidemiology, ethology, public health and animal husbandry. This course will also provide the foundation for more in-depth coverage of these topics in subsequent courses (Phase 2-Health Management II and Phase 3- Health Management III).

Clinical Medicine I

The Clinical Medicine courses presented in Phases 1, 2 and 3 represent a continuum of learning intended to foster student mastery of seven main learning outcomes by the end of Phase 3 of the DVM program: animal handling and restraint, history taking, physical examination of common domestic species, diagnosis, clinical problem solving, treatment and planning, medical records.

Phase 2:

Health Management II

Emphasis will be placed on relevant epidemiological tools for understanding disease causation, evidence-based medicine and critical appraisal of the literature, surveillance, and outbreak investigation. Animal behaviour, and animal welfare issues, will be presented in a species/ industry context. The public health section will focus on regulatory matters, food safety, and zoonotic disease issues.

Clinical Medicine II

The course is a continuation of Clinical Medicine I. It will contribute to students' achievement of selected elements of graduating competency in the areas of clinical examination of specific organ systems of various species.

Theriogenology

A lecture and laboratory course covering the normal and abnormal reproductive systems of domestic animals. The course will include mammalian reproductive physiology and histology, diagnosis and treatment of

reproductive disorders, including infertility, and management of breeding programs of the common domestic species.

Phase 3:

Health Management III

The course will contribute to students' achievement of greater depth in the context of health management in species of their choice. The primary emphasis is directed towards developing species-specific skills, knowledge and attitudes that will permit the entry-level veterinarian to assess and advise on animal production and performance and evaluate the necessity for, and implementation of, health management programs. The course is a series of species-based modules including beef, companion animals, dairy, equine, laboratory animals, poultry, small ruminants, swine, and wildlife.

Clinical Medicine III

The overall objective of Clinical Medicine III is to facilitate the integration of course material from all phases into a practical approach to case evaluation.

Food Animal Medicine and Surgery

The goal of this course is to introduce the student to the diagnosis and management of common diseases (and the recognition of uncommon diseases) of ruminants and swine.

Equine Medicine and Surgery

The goal of this course is to introduce the student to the diagnosis & management of common diseases (and the recognition of uncommon diseases) of horses.

Comparative Medicine

This course will cover strategies to deal with common and uncommon diagnoses in the context of pet birds, commercial poultry and non-traditional species (fish, amphibians, reptiles, rabbits, rodents, ferrets, non-domestic carnivores and non-domestic ungulates).

4.4.2.2 DVM Co-Curricular Opportunities

Examples provided through the OVC Food Animal Club include:

- Small Ruminant reproduction (seminar);
- Lambing assisting (supervised on-farm experience);
- Poultry euthanasia (wet lab);
- Calf disbudding (supervised on-farm experience);
- Perinatal care of beef calves (seminar); and
- Swine pregnancy exams and back fat ultrasounds (wet lab).

4.4.3 Curricular Requirements (Year 4)

Phase 4:

The stream counts for the OVC 2021 cohort are shown in Table 4.8. 30% of students are involved in the food animal, rural community practice and equine streams. Table 4.9 provides the number of students involved in those streams over the term of the Agreement. The number has remained relatively stable over the last three years.

Table 4.8: Stream Counts for the OVC 2021 Cohort

Stream	Number of Students	Percentage of Students
Food Animal	7	6%
Rural Community Practice	14	12%
Equine	15	12%
Small Animal	84	70%
Total	**120**	

Table 4.9: Number of Students involved in the Food Animal, Rural Community Practice and Equine Streams over the Term of the Agreement

Metric	2018/19	2019/20	2020/21	2021/22	2022/23
Number of Students in the Food Animal, Rural Community Practice and Equine Streams	37	37	**36**		

The curricular requirements for the streams relevant to VCP are presented below.

Food-Animal Stream

Students in the Food-Animal Stream will have the following rotations:

Core:

- Veterinary Externship (8 weeks)
- NAVLE Study Week (1 week)
- Anatomic Pathology (1 week)
- Diagnostic Pathology & Laboratory Medicine (1 week)
- Small-Animal Primary Veterinary Care (3 weeks)
- Theriogenology (1 week)
- Ruminant Health Management I (2 weeks)
- Swine Health Management (2 weeks)
- Approved External Practices, Food Animal (6 external weeks)

Stream-Priority: (4 of the following 10 rotations)

- Dairy Cattle Welfare: 1

- Heartland Dairy Practice: 1 external
- Poultry Health: 2
- Ruminant Health Management II, Beef: 2
- Ruminant Health Management II, Small Ruminants: 1
- Ruminant Health Management II, Dairy: 2
- Ruminant Health Management III, Dairy Nutrition: 1
- Ruminant Health Management III, Dairy-Herd Problem Solving: 2
- Ruminant Surgery: 2
- Swine Health Management, Production: 1

Electives:

- Variable (internal or external rotations)[14]: 4-8

Total = 38

Rural Community Practice Stream

Students in the Rural Stream will have the following rotations:

Core:

- Veterinary Externship (8 weeks)
- NAVLE Study Week (1 week)
- Anatomic Pathology (1 week)
- Diagnostic Pathology & Laboratory Medicine (1 week)
- Small-Animal Primary Veterinary Care (3 week)
- Theriogenology (1 week)
- Anesthesia (2 week)
- Radiology (2 week)
- Small-Animal Internal Medicine (2 weeks)
- Large-Animal Medicine (2 weeks)
- Ruminant Health Management I (2 weeks)
- Swine Health Management (1 week)
- Approved External Practices, Rural mixed species (4 external weeks)

Electives:

- Variable (internal or external rotations) (8 weeks)

Total = 38

[14] External rotations for DVM 2021 graduates were delayed from May to August 2020 as a result of COVID-19 pandemic.

Equine Stream

Students in the Equine Stream will have the following rotations:

Core:

- Veterinary Externship: (8 weeks)
- NAVLE Study Week: (1 week)
- Anatomic Pathology: (1 week)
- Diagnostic Pathology & Laboratory Medicine: (1 week)
- Small-Animal Primary Veterinary Care: (3 weeks)
- Theriogenology: (1 week)
- Anesthesia: (2 weeks)
- Radiology: (2 weeks)
- Neurology: (1 week)
- Large-Animal Medicine I: (2 weeks)
- Large-Animal Surgery I: (2 weeks)
- Large-Animal Medicine II or Large-Animal Surgery II: (2 weeks)

Stream-Priority: (2-3 of the following 3 rotations)

- Equine Anesthesia & Surgery: 1
- Equine Lameness: 2
- Equine Primary Care: 1

Electives:

- Variable (internal or external rotations): 8-10

Total = 38

4.4.4 Faculty and Staff Capacity

Table 4.10 shows the key faculty and veterinarian positions in the Ontario Veterinary College contributing to the Veterinary Capacity Program.

Table 4.10: Faculty and Veterinarians in OVC contributing to the Veterinary Capacity Program

Name	Rank and Department	Specialty
Arroyo, Luis	Associate Professor, Clinical Studies	Large Animal Medicine
Barta, John	Professor, Pathobiology	Parasitology
Bauman, Cathy	Assistant Professor, Population Medicine	Epidemiology and Applied Clinical Research
Beeler-Marfisi, Janet	Assistant Professor, Pathobiology	Clinical Pathology

Name	Rank and Department	Specialty
Bienzle, Dorothee	Professor, Pathobiology	Clinical Pathology
Boerlin, Patrick	Associate Professor, Pathobiology	Bacteriology
Bridle, Byram Wayne	Associate Professor, Pathobiology	Anatomic Pathology
Caswell, Jeffrey	Professor, Pathobiology	Anatomic Pathology
Chenier, Tracey Sue	Associate Professor, Population Medicine	Theriogenology
Clow, Katie	Assistant Professor, Population Medicine	One Health
Cote, Nathalie	Assistant Professor, Clinical Studies	Large Animal Surgery
Deckert, Anne	Veterinarian, Health Sciences Centre	Veterinarian. DOE does not apply.
Dubois, Marie-Soleil	Assistant Professor, Clinical Studies	Large Animal Surgery
Duffield, Todd	Professor, Population Medicine	Ruminant Health Management
Foster, Robert	Professor, Pathobiology	Anatomic Pathology
Friendship, Robert	Professor, Population Medicine	Swine Health Management
Gomez-Nieto, Diego	Assistant Professor, Clinical Studies	Large Animal Medicine
Gordon, Jessica L	Assistant Professor, Population Medicine	Ruminant Health Management
Guerin, Michele T.	Associate Professor, Population Medicine	Epidemiology
Haley, Derek	Associate Professor, Population Medicine	Animal Welfare
Hewson, Joanne	Associate Professor, Clinical Studies	Large Animal Medicine
Jardine, Claire	Associate Professor, Pathobiology	Comparative Pathology
Johnson, Ronald	Associate Professor, Biomedical Sciences	Pharmacology/Toxicology
Kelton, David	Professor, Population Medicine	Epidemiology
Kenney, Daniel	Veterinarian, Health Sciences Centre	Veterinarian. DOE does not apply
Koch, Thomas G.	Associate Professor, Biomedical Sciences	Cellular/Molecular Biology
Koenig, Judith	Associate Professor, Clinical Studies	Large Animal Surgery
LeBlanc, Stephen	Professor, Population Medicine	Ruminant Health Management

Name	Rank and Department	Specialty
Lillie, Brandon	Associate Professor, Pathobiology	Anatomic Pathology
Lissemore, Kerry	Associate Professor, Population Medicine	Ruminant Health Management
Lumsden, John Sanderson	Professor, Pathobiology	Anatomic Pathology
Madan, Pavneesh	Associate Professor, Biomedical Sciences	Reproductive Biology
Mallard, Bonnie	Professor, Pathobiology	Immunology
Nykamp, Stephanie	Professor, Clinical Studies	Radiology
O'Sullivan, Terri	Associate Professor, Population Medicine	Swine Health Management
Papadopoulos, Andrew	Associate Professor, Population Medicine	Public Health (incl. CPHAZ)
Peregrine, Andrew Seaton	Associate Professor, Pathobiology	Parasitology
Poljak, Zvonimir	Associate Professor, Population Medicine	Public Health (incl. CPHAZ)
Rau, Jeffrey Allen	Veterinarian, Health Sciences Centre	Veterinarian
Renaud, David	Assistant Professor, Population Medicine	Ruminant Health Management
Ricker, Nicole	Assistant Professor, Pathobiology	Pathogenomics and Disease Informatics
Sargeant, Janice	Professor, Population Medicine	Public Health (incl. CPHAZ)
Sharif, Shayan	Professor, Pathobiology	Immunology
Susta, Leonardo	Assistant Professor, Pathobiology	Avian Virology
Thomason, Jeffrey	Professor, Biomedical Sciences	Anatomy
Trout, Donald	Associate Professor, Clinical Studies	Large Animal Surgery
Valverde, Alexander	Professor, Clinical Studies	Anesthesiology
Weese, Jeffrey Scott	Professor, Pathobiology	Public Health (incl. CPHAZ)
Winder, Charlotte	Assistant Professor, Population Medicine	Ruminant Health Management
Wood, Geoffrey	Associate Professor, Pathobiology	Anatomic Pathology
Wood, Robert Darren	Associate Professor, Pathobiology	Anatomic Pathology
zur Linden, Robin	Associate Professor, Clinical Studies	Radiology

In addition to the faculty and veterinarians, there are a number of key support staff who contribute to VCP through their appointments in the Health Sciences Centre. These include:

- 17 FTEs in Large Animal Veterinary Technicians;
- 8 FTEs in Large Animal Agricultural Assistants; and
- 1.25 FTEs in Administrative Support Staff.

These represent a total of 26.25 FTEs, which is approximately 17% of all Health Sciences Centre staff.

5 ANIMAL HEALTH LABORATORY

The Animal Health Laboratory (AHL) has demonstrated capabilities and capacities (expertise, diagnostic testing and analysis, test development, surveillance data, information, and resources) to be prepared for and respond to animal disease outbreaks.

AHL is a long-standing program under the Agreement that continues to evolve, providing high-value analytical and diagnostic services and animal health expertise to local communities, industry, Canadian universities, and provincial and federal government organizations. Further to the transformation of the Veterinary Laboratory Services Branch of OMAFRA into the Animal Health Laboratory within the Laboratory Services Division (LSD), Office of Research, AHL continues to serve Ontario as the provincial veterinary reference laboratory and to act as a central source for provincial animal disease trend information and timely dissemination of knowledge to veterinarians, producers and industry groups.

5.1 Program Activities and Achievements from 2020/21

The AHL diagnostic system provides valuable and timely information that enables Ontario to remain competitive in national and international trade. Through accessions from veterinarians, AHL provides data on new and emerging diseases affecting the health of livestock, poultry, and the public across the province. Many diseases are first recognized in Ontario through postmortem examinations and ancillary testing carried out at AHL in Guelph and Kemptville. Because of the laboratory infrastructure and expertise needed to detect disease hazards, AHL is Canada's premier platform for efficient and effective early warning for a wide variety of diseases.

- AHL sent 114 samples to the Canadian Food Inspection Agency (CFIA) for confirmatory testing in suspect cases of reportable disease (African Swine Fever (ASF), Influenza, *Mycobacterium* spp (Bovine tuberculosis), SARS-CoV-2, Classical Swine Fever, Newcastle Disease Virus (Avian paramyxovirus), Pseudorabies (Aujesky's disease) and Rabies).
- AHL plays an important role in public health by identifying pathogens common to animals and people. Over 1,250 cases that identified zoonotic pathogens were diagnosed by AHL in 2020/21.
- AHL received approximately 39 medicolegal cases, including several from the Ontario Ministry of the Solicitor General under the 2019 Provincial Animal Welfare Services (PAWS) Act, as part of investigations into animal neglect and abuse. AHL also performed 41 equine postmortems submitted by the Alcohol and Gaming Commission of Ontario (formerly the Ontario Racing Commission). Through testing at AHL, AGCO can assure Ontarians participating in the horse racing industry that it is closely scrutinized, and that animal welfare is a priority.

AHL monitors trends in existing diseases and sends electronic real-time alerts to OMAFRA, enabling the Ministry to respond rapidly and efficiently to health threats to the livestock and poultry industries. By providing information on disease trends, policy or decision makers have information readily available to perform risk assessments, evaluate control strategies, identify research needs, and facilitate planning.

COVID-19

The Animal Health Laboratory has focused on one important program activity during 2020/21: maintaining full operational capacity during the COVID-19 pandemic in order to meet client testing requirements, and to ensure surge capacity in the event of an animal disease emergency or outbreak. AHL is considered an essential service as per the Government of Ontario guidelines related to the agricultural sector, and therefore, had to find a way to continue receiving samples, performing laboratory tests and reporting results. Modified work processes, to ensure staff safety, included splitting a laboratory section into two teams that each worked a separate shift during an expanded workday. Split teams accomplished two important goals: they enhanced physical distancing and reduced the risk that the entire laboratory section would be required to self-isolate in the event of a COVID-19 positive staff member, since the two teams did not interact. During the early period of the pandemic, AHL was challenged with delivery disruptions, back-ordered supplies, and sourcing sufficient personal protective equipment (PPE) to protect staff. It is a testament to the dedication of all AHL staff members that operations continued safely and to the satisfaction of all stakeholders. Moreover, the AHL Virology section was able to meet the surge demand for equid herpesvirus-1 testing from horses at the Woodbine Racetrack over the May long weekend in 2020, thus supporting diagnostic and quarantine functions that resolved the outbreak. Despite earlier predictions that AHL would not be able to meet the required mandatory compliance requirement of 3.0% revenue growth due to reduced business in the early stages of the pandemic and anticipated recessionary effects on economic activities, AHL, in fact, exceeded this revenue target in 2020/21.

Laboratory Information Management System

Ongoing upgrades of the Lab Information Management System (LIMS) ensure the utility and protection of data used for disease surveillance purposes. Examples include: i) installation and configuration of new tape backup solution to replace existing outdated and unsupported hardware; ii) installation of SSL Web certificates into the production LIMS to ensure secure connections when users log into the website; iii) adding the ability to receive and manage samples across list pages which enables users to better manage cases consisting of more than 100 samples; iv) reformatting the Summary Report to reduce the number of report formats and make the report easier for clients to read; and most importantly, v) switching from mailing to electronic delivery of monthly statements to clients. Not only did the latter result in a significant savings in materials and personnel time, but also, it was an important environmental initiative.

Client feedback has identified areas for continuous improvement in relation to LIMS functionality and tools, such as smartphone accessibility and formatting reports. Significant improvements in 2020/21 included: i) revision and streamlining of bacteriology reports, especially bovine mastitis results; and ii) LIMS mobile functionality. Large volume clients, such as the amalgamated swine veterinary clinics, have requested a greater ability to access their clients' data, as data mining and trending have become important tools for this population-based livestock sector. Therefore, a large-scale LIMS data management project (funded by a Food from Thought Digital Agriculture grant), improvements to the client portal, and a smartphone application are development projects that are in progress and will be priorities for AHL in 2021/22.

Disease Surveillance and Ontario Animal Health Network

OAHN has continued to share and receive information from other surveillance networks across the country through the Canadian Animal Health Surveillance System (CAHSS). The Equine, Swine, and Poultry networks have continued nationally, and additional networks such as Bovine and Small Ruminants are developing a critical mass. A notable development has been the translation of OAHN reports and products to French, and reciprocal translation from Quebec's RAIZO networks, allowing for much improved information sharing with a neighbouring province. Additionally, the translation of materials from OAHN, such as infographics, shows a growing national appreciation for the valuable work being produced by the OAHN network co-leads and members.

A successful Ontario Animal Health Network (OAHN) Annual Workshop was held on February 24th, 2021. Members of the species-specific expert networks participating in this workshop generated many surveillance proposals that were subsequently submitted and funded under the OAHN Projects program. Twelve projects, totalling $185K, were approved for 2020/21. More details about the OAHN Projects program are in Section 5.4.5.

Novel Technologies

AHL specialists continue to advance their expertise in novel technologies in order to ensure that AHL remains at the forefront of animal disease testing; the next generation of Whole Genome Sequencing (WGS) utilizing the Illumina MiSeq is one of these revolutionary technologies. All three AHL microbiologists (Ojkic, Slavic, Cai) have projects underway that provide training opportunities for technical staff and interactions with international colleagues that should position AHL to translate this platform, as it matures, into the diagnostic testing program. These projects include: i) identification of *Anaplasma* spp. infection by WGS; ii) routine WGS of *E. coli*, *Staphylococcus pseudintermedius* and *Salmonella* spp. isolates for the Veterinary Laboratory Investigation and Response Network (Vet-LIRN-USDA); iii) establishing the origin of *Salmonella* serotypes to determine which isolates originated from the same source and which did not, a valuable tool in tracing outbreaks; iv) detection of virulence factors and to determine the O and H types of *E. coli* isolated from poultry. WGS was also instrumental in confirming that *Streptococcus equi* subsp. *zooepidemicus* isolated from a recent swine case belonged to the more virulent ST194 strain known to cause disease outbreaks and mortalities in swine operations in Manitoba and the USA. Additional characterization of isolates may also have significant clinical application when it comes to vaccine production, as was shown in one of the cases. When vaccine isolates were compared to clinical isolates it was shown that they belong to different MLST types, explaining the clinical outbreaks of disease despite routine vaccination. These activities will position AHL at the leading edge of revolutionary diagnostic test platforms in the future.

Provide Animal Health Expertise

AHL veterinarians/supervisors participated in a host of regional, provincial, and national veterinary organizations to provide animal health expertise. In addition, AHL veterinarians/supervisors also produced a significant number of KTT publications, outlined in Section 5.4.7.

This expertise and knowledge base are used to alert OMAFRA about any potential health threats. Any occurrence of one of the 81 immediately notifiable diseases named in the provincial Animal Health Act, 2009, is reported to the Office of the Chief Veterinarian for Ontario (OCVO) electronically at 0900 and 1500 hours daily. Tables 5.1 to 5.5 illustrate the notifiable and alertable tests for the period of May 1, 2020 to April 30, 2021. New and emerging hazards are tabulated annually in an Impact Table, as provided in Table 5.6, and are reported in the quarterly AHL Newsletter. Disease trends are also discussed in detail in each of the OAHN expert network quarterly calls.

Table 5.1: Immediately Notifiable Hazards – Reportable Disease Tests 2020/21

Reportable Disease Tests	Number
African swine fever - PCR	4
African swine fever - CFIA	5
Avian influenza - CFIA	5
Avian paramyxovirus-1, fusion rt-RT-PCR	4
CFIA *Mycobacterium* spp.	6
CFIA SARS-CoV-2	7
Classical swine fever - CFIA	6
Classical swine fever virus - real-time RT-PCR	4
Influenza A, H5 PCR	7
Influenza A, H7 PCR	7
Koi herpesvirus real-time qPCR	3
Newcastle disease - CFIA	4
Pseudorabies - CFIA	2
Small Hive Beetle PCR	15

Table 5.2: Immediately Notifiable Hazards – Notifiable Tests Completed 2020/21

Notifiable Tests Completed	Number
African swine fever - PCR	32
African swine fever - CFIA	5
Avian influenza - CFIA	4
Avian paramyxovirus-1, fusion rt-RT-PCR	4
Brucellosis - CFIA	1
CFIA *Mycobacterium* spp.	4
CFIA SARS-CoV-2	7
Classical swine fever - CFIA	6
Classical swine fever virus - real-time RT-PCR	4
Influenza A, H5 PCR	7
Influenza A, H7 PCR	7
Koi herpesvirus real-time qPCR	3

Notifiable Tests Completed	Number
Newcastle disease - CFIA	4
Pseudorabies - CFIA	2
Rabies, CFIA - FA	29
Small Hive Beetle PCR	15

Table 5.3: Immediately Notifiable Hazards – Notifiable E-Code Cases 2020/21

Notifiable E-Code Cases	Number
Cache Valley Virus	1
Clostridium botulinum	1
Coxiella burnetii	20
Eastern equine encephalitis (EEE)	2
Listeria monocytogenes	14
Avian herpesvirus type 1 (AHV-1)/ ILT	22

Table 5.4: Immediately Notifiable Hazards – Notifiable Alerts 2020/21

Notifiable Alerts	Number
APMV-1 f rt-RT-PCR	2
APMV-1m rt-RT-PCR	5
Anaplasma ab cELISA	10
Anaplasma marginale	3
B. canis IFA	4
Botulism-Serum	1
C. burnetii ELISA	3
C. burnetii PCR v2	46
C. perf Enterotoxin	1
CFIA Avian Influenza	2
CFIA SARS-CoV-2	5
Culture Bact	266
EEEV IgM ELISA	2
EEEV rRt-PCR	2
EHV-1 A Non PCR	27

Notifiable Alerts	Number
EHV-1 G Neuro PCR	51
Echino Taenia PCR	4
HSFP Env Culture	23
HSFP Env Culture B	1
Heavy metals Scr ICP	10
IHC *Listeria* food an	3
ILV rt-RT-PCR	34
InfluA vir MultiS-sc	2
Influenza A H1 PCR	80
Influenza A H3 PCR	30
Influenza A N1 PCR	35
Influenza A N2 PCR	75
Influenza AmatrixPCR	134
L. mono Isol	4
Lead - blood	11
Por coronavirusPEDV	81
Por coronavirusTGEV	1
PorcoronavirusPDCoV	37
Public health Mycob	1
Rabies FA	5
Ranavirus rt-RT-PCR	2
S. enteritidis PCR	5
S. Pull-typh plate	31
SARS-E_CoV-2 PCR	7
SARS-R_CoV-2 PCR	5
SVV rt-RT-PCR	3
Salm Dub Ab ELISA	61
Salm Serotyping	684
Salmonella Dub ELISA	1

Notifiable Alerts	Number
SmallHiveBeetle PCR	12
Sucrose Wet Mount	7
Teschovirus PCR	1
VTEC PCR Geno	8
WNV IGM ELISA-IOWA	1
WNV rRT-PCR	27

Table 5.5: Immediately Notifiable Hazards – Reportable Disease Tests 2020/21

Reportable Disease Tests	Number
Anaplasmosis	3
Avian infectious laryngotracheitis	24
Brucellosis	2
Equid herpesvirus 1 (neurologic)	7
Fowl cholera	11
Influenza A virus (all)	5
Turkey viral rhinotracheitis/swollen head disease	2

Table 5.6: Impact Table 2020/21

Year identified; outbreak	Species or commodity	Disease, hazard, or pathogen	AHL/Clinical finding	Impact on animal health, public health, and/or trade
Every year	All species	**New, emerging, and re-emerging zoonotic pathogens**	Annual summary of ~26 diseases or pathogens > 1,000 events per year	*Selected zoonotic pathogens and diseases from Ontario identified at the AHL* – Murray Hazlett, et al. Reported in the March issue of the AHL Newsletter every year.
2021, Mar	Bovine	***Lead toxicosis***	Feedlot with 75 yearlings have three dead and four sick animals. Downer steers are somnolent and blind.	**21-019251 –** SO**.** Polioencephalomalacia noted on histologic exam of brain. Elevated liver lead consistent with lead toxicosis as the etiology. Battery source located in corroded concrete pen foundation. Subsequent blood testing of live animals identified elevated lead levels in 49 out of 112 samples. Ongoing monitoring will be required for food safety. AHL providing contract testing at 25% fee reduction.
2021, Feb	Bovine	***Anaplasma antibody cELISA positives***	Herd participating in OAHN herd introduction surveillance project had one of two cows test positive for *Anaplasma* antibodies.	**21-009691** – DO. Positive *Anaplasma* antibody test in one of two cows purchased and tested under the OAHN introduction project (negative Anaplasma PCR). **21-020463** – DO. 6 *Anaplasma* antibody positive Jersey cows in a herd of 88 animals. Serologic evidence of positive emerging anaplasmosis cases in Waterloo and Centre Wellington counties.
2021, Feb	Ovine	***BVDV hairy shaker***	Clinical history: Ten lambs have been born with tremors and weakness, four have died, a few are two weeks old. Tremors get worse when excited. Some of the stronger ones nurse, the weaker ones die.	**21-010829** – RE. Brain and spinal cord had diffuse white matter gliosis, axonal loss and hypomyelination, consistent with congenital pestivirus infection. PCR testing of pooled viscera detected BVDV type 1 (does not cross-react with closely-related Border Disease Virus). IHC detected BVDV in brain and multiple viscera, supporting persistent infection (does not differentiate from BDV).

Year identified; outbreak	Species or commodity	Disease, hazard, or pathogen	AHL/Clinical finding	Impact on animal health, public health, and/or trade
			Farmer also contract raises Holstein heifers, the heifers and sheep share the same air space, but no nose to nose contact.	In this herd, it is suspected that close contact between sheep and young cattle resulted in transmission of BVDV. Fortunately, the specificity of the BVDV PCR is able to rule out the possibility of BDV infection, a significant concern for the sheep industry.
2021, Feb	Caprine	***Neonatal chlamydial polyarthritis***	Herd of 700 mixed breed dairy goats. Kids born OK, become lame. Co-existing abortion losses.	**21-014351** – HS. Fibrinous and pleocellular arthritis in 2 week-old kids confirmed by PCR due to *Chlamydia abortus*; culture negative. Co-existing abortions (21-014352) also diagnosed as *Chlamyida abortus*. Novel manifestation of common abortifacient pathogen.
2020, Dec	Porcine	***Streptococcus equi* subsp. *zooepidemicus***	A number of sows off-feed with some mortality. Increased abortion rate. Fibrinous peritonitis on postmortem of one sow, lungs appeared congested and edematous.	**20-098340** – JD. Cause of death was septicemia due to *Streptococcus equi* subsp. *zooepidemicus.* Whole genome sequencing and multilocus sequence typing at the AHL identified a sequence type (ST194) similar to isolates from the recent Manitoba and US outbreaks. This is the first isolation of this more pathogenic variant of *Strep. zooepidemicus* in Ontario swine. *Strep. zooepidemicus* is also a potential zoonotic infection. AHL Newsletter article published Mar. 2021; Vol 25(1):11-12.
2020, Dec	Equine	***Anaplasma phagocytophilum***	Five day history of lethargy, inappetence, and weakness.	**20-094518 –** KR. Blood smear revealed numerous neutrophils containing *Anaplasma phagocytophilum* bacteria, the causative agent of Equine granulocytic anaplasmosis. In Ontario it is transmitted by the deer tick, *Ixodes scapularis* and is considered a rare emerging disease. Moderate to severe clinical signs including fever, limb edema, ataxia, jaundice vasculitis, thrombocytopenia and death can occur. Confirmed by PCR. AHL Newsletter article published Mar. 2021; Vol

Year identified; outbreak	Species or commodity	Disease, hazard, or pathogen	AHL/Clinical finding	Impact on animal health, public health, and/or trade
				25(1):15-17.
2020, Dec	Bovine	***Anaplasma marginale***	Bovine OAHN herd introduction surveillance project.	**20-096692 –** HC. 2 Holstein cows positive serologically and PCR for *Anaplasma marginale* causative agent of bovine anaplasomosis. Emerging tick-borne infection causing anemia, pyrexia, abortion and occasionally, death.
2020, Oct	Ovine	***Parelaphostrongylus tenuis***	The sheep was presented to OVC for ataxia and reluctance to stand. The owner has four more sheep with same symptoms. Sheep had bilateral horizontal nystagmus and multiple seizures. Euthanized.	**20-080268 -** HC. PCR for *P. tenuis* (meningeal brain worm of deer) was developed to identify the nematode noted in histologic sections of brain. AHL Newsletter article published Mar. 2021; Vol 25(1):8-9.
2020, Sep	Rainbow Trout	***Lactococcus garvieae***	Chronic ongoing losses through season. 50% + cumulative mortality - suspect bacterial (possible furunculosis).	**20-069450 –** HS. Lactococcosis is an emerging hyperacute hemorrhagic septicemic syndrome in fresh water rainbow trout aquaculture where it can lead to significant economic losses. This is the first documented outbreak of lactococcosis in Ontario farmed fish. AHL Newsletter article published Dec. 2020; Vol 24(4):15-16.
2020, Sep	Porcine	***Brachyspira hampsonii clade 1***	Three fecal samples from mature sows. Mucohemorrhagic diarrhea for the last seven days.	**20-065883** – DS. ***B hampsonii* Clade 1 positive,** tested negative for *B. hamp* Clade 2, *B. hyodysenteriae*, *B. pilosicoli*. First detection of *B. hampsonii* in Ontario, an emerging cause of swine dysentery. AHL Newsletter article published Dec. 2020; Vol 24(4):11-12.
2020, Jul	Equine	***Suspected monensin toxicosis***	Has lost six horses over the last few days. Somewhat recover, get back up and go down again. Only	**20-053706** – ER. No histologic diagnosis; suspected monensin toxicosis. Stomach content negative for monensin.

Year identified; outbreak	Species or commodity	Disease, hazard, or pathogen	AHL/Clinical finding	Impact on animal health, public health, and/or trade
			one pen affected.	**20-066418 –** ER. Feed sample positive for presence of monensin.
2020, Jun	Ovine	***Sheep myopathy – ionophore toxicosis +hypovitaminosis E***	Owner began losing 18-day-old lambs to diarrhea. Two others that had lost the use of their hind limbs, recently docked. Dx: ascending myelitis By the next day several more lambs had died. He has 10 or so that have lost the use of their hind legs.	**20-039466 –** ASB, FR. Elevated CK, AST and severe skeletal muscle necrosis and mineralization confirm myopathy. Serum vitamin E concentrations were suboptimal and monensin was present in the mineral mix at 58 ppm which was not supposed to be medicated. Losses stopped when the feed and mineral mix were replaced with a new ration. AHL Newsletter article published Dec. 2020; Vol 24(4):8-9.
2020, May	Equine	***Neuropathogenic EHV-1 outbreak***	Three horses were submitted to the OVC LAC from the Woodbine Racetrack with neurologic signs. The clinician suspected EHV-1 and requested stat testing on the long weekend.	**20-035558 –** DO. Two of three horses from index submission tested positive for neuropathogenic equid herpesvirus-1. To enable racetrack veterinarians to contain the outbreak, an additional 150 samples were submitted and tested on Sunday, May 17, 2020. Additional samples were submitted over the following week; of the 1,019 total samples that were tested during this outbreak, 88 samples were positive for neuropathic EHV-1 and 12 samples were positive for non-neuropathogenic EHV-1. This outbreak indicates the ability of AHL to mobilize resources to support the response to an animal health emergency.

Conduct Testing and Analysis

The Animal Health Laboratory accessioned 77,584 cases and performed 770,377 procedures in 2020/21 in support of disease surveillance. Compliance with published turnaround times from the AHL Laboratory Information Management Systems was 98.48%. Standards Council of Canada scope of accreditation was unchanged in 2020/21. Testing equipment in AHL's inventory was replaced in 2020/21 to improve efficiency and surge capacity of the lab. In addition, AHL developed or improved 24 tests in 2020/21.

Early Detection and Effective Response to Foreign Animal Diseases and/or other Diseases with Human/Animal Health and Economic Consequences

Three representative AHL pathology cases were submitted to OMAFRA for comment in order to monitor timeliness of testing, results, and communications. In the first case, OMAFRA felt that the communications and reports resulting from the submissions were excellent and that the case was an example of AHL's exemplary client service and commitment to animal health. OMAFRA felt the second case report summarized a timely and well coordinated diagnostic and communication effort by the herd veterinarian, the Animal Health Laboratory at the University of Guelph, and the Ontario Ministry of Agriculture, Food and Rural Affairs. Finally, the third case demonstrated the close collaboration between AHL and submitting veterinarians, when challenging cases require expert opinions and extended investigations to reach a satisfactory conclusion. The three cases are included in Appendix C.

5.2 Mandatory Compliance Requirements

5.2.1 Increase in Revenues

In 2020/21, AHL met the mandatory compliance requirement for a 3% annual increase in revenues by achieving revenue of $8.593M, which exceeded the 2019/20 AHL revenue of $7.762M by 10.7%.

5.2.2 Emergency Response Plan and Surge Capacity Plan

AHL has a comprehensive Emergency Response Plan and Surge Capacity Plan to ensure that AHL can fulfill the objectives of the Program Schedule. The Plan outlines business continuity procedures in the event of critical infrastructure outages, staff unavailability, pandemics, facility inaccessibility/evacuation or a surge in service requirement. It was heavily utilized in response to the COVID-19 pandemic.

The list of essential staff for LSD is updated every fall in order to identify which staff are expected to report to work in the case of a weather event or labour disruption.

Surge capacity is maintained year-round and has benefited from the acquisition of high-volume, leading-edge equipment. AHL performed 372,750 ELISA tests and 122,237 PCR reactions in 2020/21, in addition to ongoing development of new and improved tests. This is a 1.2% increase in ELISA tests and a 1.1% increase in PCR reactions since 2019/20. Given the current level of automation, AHL can easily accommodate additional testing in an emergency or surge capacity event.

5.2.3 Emergency Simulation Exercises

The University confirms that Emergency Simulation Exercises and Emergency Response Evaluations are typically planned for and performed annually in accordance with the Emergency Response Plan. Emergency exercises planned for 2019/20 were postponed due to the COVID-19 pandemic, with approval of the AHL Program Management Committee (AHL PMC). Postponed exercises were performed in 2020/21. More details are provided in Section 5.3.5.

5.2.4 Capacity Strategy Plan

Capacity planning is managed Division-wide in the LSD Essential Level Continuity Plan, v.3.0, 2020. Capacity for routine testing as well as for surge events is contingent on adequate staffing, which is an active process of needs assessment, recruitment, training, and retention. Human resource planning is supported by the various processes embedded in the Lab Services quality program.

5.2.5 Capital Strategy Plan

A capital expenditure program (CAPEX) is embedded in the operations of Laboratory Services Division. Equipment repair costs are closely monitored, and equipment is replaced prior to failure or when no longer supported by manufacturers. New OMAFRA program initiatives and client demands drive planning around the purchase of additional equipment to support new testing. Due to the uncertainty posed by the COVID-19 pandemic, equipment purchases in 2020/21 were limited to those required to maintain operations. Remaining planned equipment purchases were postponed to 2021/22. Computer hardware and software are replaced on a planned basis to keep pace with management of increased volumes of data.

5.2.6 Fee Schedule

The up-to-date AHL Fee Schedule is provided to the Ministry annually and is also available on request.

5.2.7 Coordination of the Ontario Animal Health Network

AHL is responsible for coordinating the Ontario Animal Health Network (OAHN), which was embedded in the OMAFRA/UofG Agreement with funding for OAHN Operations, as well as for OAHN Projects. Nine of the ten Ontario Animal Health Network (OAHN) expert networks were functional in 2020/21. The networks have continued regularly scheduled communications and information-sharing with the objective of baseline health monitoring and flagging of changes in disease trends, in order to mitigate the risk of epidemics before they arise. Most networks also complete projects aimed at filling a gap in disease surveillance in their commodity.

Work continued in 2020/21 on the integration of Ontario animal health surveillance data with national databases, such as the Canadian Animal Health Surveillance System (CAHSS). AHL is an active participant in CAHSS governance and in various CAHSS committees, including swine, poultry, equine, and bovine species. AHL continues to collaborate in building a ‘network of networks’ that will best serve provincial and national interests. Section 5.4.6 includes additional information on OAHN communications.

5.2.8 AHL Accreditation

The University maintains appropriate accreditations of the Animal Health Laboratory, including ISO/IEC 17025, CFIA, and AAVLD.

American Association of Veterinary Laboratory Diagnosticians (AAVLD) Accreditation

AHL is audited every five years to maintain full AAVLD accreditation, all species. The AAVLD audit was May 6-9, 2019 and the audit was successful with AHL retaining full accreditation, all species for the five year maximum. Due to COVID-19, AAVLD delayed audits and extended all labs' accreditation status for one additional year. AHL's new AAVLD certificates for Guelph and Kemptville sites now expire December 31, 2025.

Canadian Food Inspection Agency Accreditation

AHL is a Canadian Food Inspection Agency (CFIA) approved lab for equine infectious anemia (EIA) testing. CFIA will eliminate accreditation for EIA by February 9, 2022, as all labs must transition to SCC or CALA accreditation for EIA by this date. AHL has already obtained SCC accreditation for V-002 EIA test, therefore, SCC conducted the most recent audit in November 2019 as part of AHL's biennial assessment, rather than CFIA. SCC will conduct their next audit remotely the week of October 4, 2021.

ISO/IEC 17025 Accreditation

Laboratory Services Division, including AHL, is accredited by the Standard Council of Canada (SCC) to the ISO/IEC 17025 standard, for the specific tests listed on the scope of accreditation. LSD is audited biennially by SCC in order to maintain accreditation and the current scope of accreditation is available on their website. The next SCC audit will be conducted remotely the week of October 4, 2021.

LSD /AHL is accredited by SCC in the program specialty areas (PSAs): Agriculture Inputs, Food, Animal Health and Plant Protection (AFAP) and Test Method Development and Evaluation and Non-routing Testing (TMD/NRT). Based on the current June 6, 2021 SCC scope, LSD has 101 SCC accredited tests - 89 AFL tests and 12 AHL tests/SOP titles. For a method to be accredited, competence must be demonstrated by submitting the method, forms, training records, validation/verification records, proficiency testing results, and an internal audit report to SCC for inspection. Please note that in 2019/20, the SCC scope looked like it had significantly more AHL tests as SCC had counted hazards analyzed under V-002 ELISA and V-005 PCR as separate tests which SCC has now corrected. Last year, the Soil and Nutrient lab (SNL) tests were included in AHL counts as well; SNL has since been moved out of AHL into AFL. Since CALA accreditation only applies to SNL tests, CALA accreditation is not included in this report. In the past year, V-005 PCR - African swine fever virus was added to the SCC scope.

Since there are significant delays in applying for and adding a test to the SCC fixed scope, AHL uses the flexible scope to accredit tests more rapidly. AHL is accredited for five veterinary laboratory techniques: culture detection of microorganisms, inorganic analysis by inductively coupled plasma spectroscopy (ICP), enzyme linked immunosorbent assay (ELISA), agglutination, and PCR. Tests added to the AHL flexible scope in the past year are:

1. V-007 Agglutination - Brucella, Mycoplasma, Salmonella for *Salmonella* Pullorum*/Salmonella* Gallinarum
2. MOL-181 Real-time PCR of *Mycoplasma bovis*
3. MOL-197 PCR detection of avian mycoplasmas - *Mycoplasma synoviae*
4. MOL-218 *Chlamydia PCR - Chlamydia suis*
5. MOL-235 Real-time PCR detection of *Pseudogymnoascus destructans* (formerly *Geomyces destructans*) for *Pseudogymnoascus destructans* (formerly *Geomyces destructans*)

6. V-005 Polymerase chain reaction (PCR) Bluetongue virus (BTV) /Epizootic hemorrhagic disease virus (EHDV)
7. V-005 Polymerase chain reaction (PCR) Severe acute respiratory syndrome virus 2 (SARS-CoV-2) – E gene and (SARS-CoV-2) – RdRp gene

ISO/IEC 17025 Accredited Techniques (flexible scope)

AHL is accredited for veterinary laboratory testing techniques (flexible scope) as listed on LSD's SCC scope of accreditation webpage.

The test methods listed below are under AHL's flexible scope.

AHL identifies unknown hazards in a range of matrices, for example, animal samples, feed, soil, plants. Hazards include infectious agents (bacteria, mycoplasmas, yeasts, molds, viruses, and parasites), organic and inorganic elements and compounds. Infectious agents are detected directly or indirectly through various technologies listed under LSD' SCC scope of accreditation.

Techniques for which AHL is accredited are listed in Tables 5.7 to 5.11 below.

Table 5.7: Culture Detection of Microorganisms

Method Code	Method Name	Agent
MYC-100	*Mycoplasma* and *Ureaplasma* isolation	• *Mycoplasma*, *Ureaplasma*, *Acholeplasma* spp.

Table 5.8: Inorganic Analysis by Inductively Coupled Plasma – Mass Spectroscopy (ICP-MS)

Method Code	Method Name	Elements
CHEM-162	ICP-MS analysis of trace metals in serum, plasma and blood	• Manganese, iron, cobalt, copper, zinc, selenium, molybdenum, lead

Table 5.9: Enzyme Linked Immunosorbent Assay (ELISA)

Method Code	Method Name	Agent
V-002	ELISA	• *Coxiella burnetii* (Q fever) • Transmissible gastroenteritis virus (TGEV)

Table 5.10: Agglutination

Method Code	Method Name	Agent
V-008	Leptospira microscopic agglutination test (MAT)	• *Leptospira* spp.
V-007	Agglutination – *Brucella, Mycoplasma, Salmonella*	• *Salmonella* Pullorum/*Salmonella* Gallinarum

Table 5.11: Polymerase Chain Reaction

Method Code	Method Name	Agent
MOL-181	Mycoplasma bovis real-time PCR	• *Mycoplsama bovis*
MOL-197	PCR detection of avian mycoplasmas	• *Mycoplasma gallisepticum* • *Mycoplasma iowae* • *Mycoplasma synoviae*
MOL-218	*Chlamydia* PCR	• Chlamydia abortus • Chlamydia psittaci • Chlamydia suis
MOL-235	Real-time PCR detection of *Pseudogymnoascus destructans* (formerly *Geomyces destructans*)	• *Pseudogymnoascus destructans* (formerly *Geomyces destructans*)
MOL-251	Honey bee molecular testing	• Acute bee paralysis virus (ABPV) • Black queen cell virus (BQCV) • Chronic bee paralysis virus (CBPV) • Deformed wing virus (DWV) • Israeli acute paralysis virus (IAPV) • Kashmir bee virus (KBV) • Sacbrood virus (SBV) • *Crithidia mellificae* • *Spiroplasma apis* • *Spiroplasma melliferum* • *Tropilaelaps screening (T. clareae, T. koenigerum, T. mercedesae)* • *Varroa destructor haplotyping*
MOL-257	Chytrid PCR	• *Batrachochytrium dendrobatidis* • *B. salamandrivorans*
MOL-262	*Echinococcus* species PCR	• *Echinococcus multilocularis*
MOL-267	*Myxobolus cerebralis* (whirling disease pathogen) PCR	• *Myxobolus cerebralis*
V-005	Polymerase chain reaction (PCR)	• Bluetongue virus (BRV) / Epizootic hemorrhagic disease virus (EHDV) • Infectious bovine rhinotracheitis virus, bovine herpesvirus 1 (IBRV) • Infectious laryngotracheitis virus (ILTV gallid herpesvirus 1 [GaHV-1[) • Porcine circovirus 2 (PCV-2) • Porcine parvovirus (PPV) • Porcine respiratory coronavirus (PRCV) • Severe acute respiratory syndrome virus 2 (SARS-CoV-2) – E gene and (SARS-CoV-2) – RdRp gene

Based on AHL's current January 27, 2020 scope, LSD is also accredited by CALA for eight environmental tests (11 CALA appendices): one in AHL and seven in AFL.

2020/21 AHL Proficiency Testing Results Summary

Proficiency Testing (PT) programs

AHL received reports for participation in 71 different proficiency test (PT) programs in 2020/21. PT programs are divided into two main categories:

1. Biological programs – a panel of samples are tested, or identification agrees with consensus ID and results are usually pass / fail.
2. Chemical programs – produce numerical results and the results are usually categorized as satisfactory, questionable and unsatisfactory.

When a PT result is identified as questionable or unsatisfactory, the problem is investigated, and for unsatisfactory results corrective action is applied and documented.

Chemical PT programs

In 2020/21, the chemical sections of AHL, Clinical Pathology and Toxicology, participated in 20 different PT programs. Note that multiple sets of samples were tested within many of the PT programs. The Soil and Nutrient Lab PT programs including NAPT and OMAFRA soil PT are no longer reported under AHL, resulting in a lower number of PT results.

In 2020/21, AHL reported over 1,500 chemical PT results. A summary of chemical PT results is available for onsite review.

Overall, the chemistry results are as follows:

1. Satisfactory: 97.5% (satisfactory = 94.5% satisfactory and 3% questionable)
2. Unsatisfactory: 2.5%

Biological PT programs

In 2020/21, AHL reported 436 biological results or panels in 51 programs. The programs are listed in Table 5.12. The number of proficiency samples was lower than last year, in part due to the impacts of the global pandemic.

Overall, the biological results are as follows:

1. Pass: 99.8%
2. Fail: 0.2%

Table 5.12: 2020/21 AHL Biological Proficiency Results

Lab section	Proficiency program	Parameter	Scoring criteria	Results reported	Pass
Bacteriology (Bacti)	NVSL – Johne's direct PCR and pooled direct PCR	*Mycobacterium avium paratuberculosis* (Johne's disease)	Agreed with expected results	25	25

Lab section	Proficiency program	Parameter	Scoring criteria	Results reported	Pass
Bacti	VETQAS PT0088	Salmonella in poultry	Agreed with expected results	25	25
Bacti	VLA-QAP BACT1 (Mammalian Bacteriology)	Bacterial identification	Agreed with benchmark	2	2
Bacti	VETQAS PT0060	Mastitis	Agrees with expected results	3	3
Bacti	VETQAS PT0192	Brachyspira species	Agrees with expected results	5	5
Histotechnology	VETQAS PT0167	Staining techniques	Good (3 or above) or poor (2 or lower) performance	24	23
Molecular Biology (Mol Bio)	CFIA–OLF CWD genotyping by PCR	Prion protein (PrP) genotype	Agrees with expected results	10	10
Mol Bio	VETQAS PT0136	Koi herpesvirus	Agrees with expected results	5	5
Mol Bio	VETQAS PT0126	*Mycoplasma hyopneumoniae*	Agrees with expected results	5	5
Mol Bio	GD Animal Health VLDIA303	*M. gallisepticum, M. synoviae*	Agrees with expected results	8	8
Mol Bio	ILC with Prairie Diagnostic Services	*Chlamydia abortus*	Agreement between labs	5	5
Mol Bio	ILC with Animal Health Centre, BC	*Pseudogymnoascus destructans*	Agreement between labs	14	14
Mol Bio	North American Bsal Task Force, Diagnostics Working Group Round Robin ring test	*B. dendrobatidis, B. salamandrivorans*	Agrees with consensus	32	32
Mol Bio	ILC panel with University of Saskatchewan and Antech Diagnostics	*Echinococcus multilocularis*	Agreement between labs	1	1

Lab section	Proficiency program	Parameter	Scoring criteria	Results reported	Pass
Mol Bio	ILC with OVC and CFIA	SARS-CoV-2	Agreement between labs	10	10
Mol Bio	VLA-QAP BACT2 (Aquatic Bacteriology)	Bacterial identification	Agrees with benchmark	2	2
Mol Bio	VETQAS PT0150	*Mycoplasma hyopneumoniae*	Agrees with expected results	5	5
Mol Bio	ILC with Prairie Diagnostic Services	*Coxiella burnetti*	Agreement between labs	5	5
Parasitology	VLA-QAP Parasite Identification	Parasite ID	Agreed with benchmark	4	4
Pathology	VLA-QAP Mammalian Histopathology	Morphological diagnosis/ interpretation	Agreed with benchmark	4	4
Virology	USDA NVSL 2019 Anaplasmosis PT (ANP-CHK)	Anaplasma	Analyst passed panel	1	1
Virology	CFIA CAHSN panel, BTV ELISA (IDEXX)	BTV	Analyst passed panel	1	1
Virology	CFIA EIA ELISA panel	EIA	Analyst passed panel	1	1
Virology	CFIA CAHSN FMD-3ABC cELISA	FMD	Analyst passed panel	1	1
Virology	CFIA CAHSN AIV ELISA	AIV	Analyst passed panel	2	2
Virology	GD Animal Health VLDIA333	IBR	Agrees with expected result	8	8
Virology	CFIA CAHSN Inf-A/APMV RRT-PCR	Inf-A	Analyst passed panel	12	12
Virology	CFIA CAHSN Inf-A/APMV RRT-PCR	APMV	Analyst passed panel	12	12
Virology	CFIA CAHSN ASFV PCR	ASFV	Analyst passed panel	3	3

Lab section	Proficiency program	Parameter	Scoring criteria	Results reported	Pass
Virology	CFIA CAHSN CSFV RRT-PCR	CSFV	Analyst passed panel	2	2
Virology	CFIA CAHSN FMDV panel	FMDV	Analyst passed panel	1	1
Virology	ILC with Biovet	Porcine coronavirus (PEDV, PDCoV, TGEV)	Agreement between labs	9	9
Virology	GD Animal Health VLDIA290	PRRSV	Agreed with expected results	16	16
Virology	CFIA-OLF ELISA OIE and National Reference Laboratory for Scrapie and CWD	PrP Scrapie/CWD	Analyst passed certification	5	5
Virology	ILC with University of Montreal	*Coxiella burnetti* (Q fever)	Agreement between labs	8	8
Virology	ILC with Biovet and Prairie Diagnostic Services	TGEV, PRCV	Agreement between labs	28	28
Virology	ILC with University of Montreal	IBR	Agreement between labs	6	6
Virology	ILC with University of Montreal	PPV	Agreement between labs	6	2
Virology	ILC with University of Montreal	PRCV	Agreement between labs	6	6
Virology	VET-LIRN SARS-CoV-2 ILC	SARS-CoV-2	Agrees with expected results	19	19
Virology	International Leptospirosis Society PT	Leptospira	Agrees with expected results	5	5
Virology	ILC with Biovet	ILTV	Agreement between labs	8	8

Lab section	Proficiency program	Parameter	Scoring criteria	Results reported	Pass
Virology	GD Animal Health VLDIA285	PCV2	Agrees with expected results	8	7
Virology	GD Animal Health VLDIA233	Antibodies against *Salmonella* Pullorum, *S.* Gallinarum	Agrees with consensus	8	8
Virology	GD Animal Health VLDIA255	aMPV	Agrees with consensus	8	8
Virology	GD Animal Health VLDIA277	ARV (REO)	Agrees with consensus	8	8
Virology	GD Animal Health VLDIA225	IBV	Agrees with consensus	8	8
Virology	GD Animal Health VLDIA172	IBDV	Agrees with consensus	8	8
Virology	2020 NVSL (USDA) Johne's disease serologic ELISA	*Mycobacterium avium paratuberculosis* (MAP, Johne's disease)	Successful quantitative and qualitative diagnosis	30	30
Virology	GD Animal Health VLDIA235	SRL (MVV/CAEV) antibody	Agreed with consensus	12	12
Virology	VETQAS PT0074	toxA, gene encoding the PMT (*Pasteurella multocida* toxin)	Agree with expected results	4	4

5.2.9 AHL Testing Data

AHL Testing Data are held in compliance with Article 13.0 of the Agreement.

5.2.10 Resources to Administer AHL

The University confirms that it has the necessary resources, including technical and support staff, to administer AHL. Dr. Maria Spinato was appointed in Fall 2019 as the AHL Director and Co-Executive Director of Laboratory Services Division, as well as the AHL PMC Co-Chair. She is highly qualified and very capable of supporting the governance structure of the AHL PMC.

5.3 Key Performance Indicators

5.3.1 Biennial Client Satisfaction Survey

The Biennial Client Satisfaction Survey measures the level of satisfaction of AHL clients with the services provided and leads to actions needed to address areas for improvement. This performance measure includes assessment of the effective communication of test results to AHL clients. The target is 100% of action requests to be considered by the AHL PMC and, where appropriate, implemented by the University of Guelph within a year. The Biennial Client Satisfaction Survey was last completed in Fall 2019 and is due again in Fall 2021.

Dr. Jim Fairles (AHL Client Services Veterinarian) presented an update at the Feedback Group meeting (November 12, 2019) on the 2019 survey that was sent to 782 major clients with 79 responses for a 10% response rate (considered a good response rate for an email survey).

Overall level of satisfaction with AHL service was 94.8%.

Items suggested for client satisfaction improvement were in the areas of:

- Specific test turnaround times;
- Extended courier services;
- Use of diagnostic plans;
- Continuing to streamline reports;
- Communication of new tests, test use, and trends;
- Enhanced bacteriology susceptibility testing; and
- Continued enhancement of online submissions.

Overall, client feedback was that AHL provided excellent service. Figures 5.1 and 5.2 provide examples illustrating the results from the 2019 Biennial Client Satisfaction Survey.

The Biennial Client Satisfaction Survey overview of feedback and action taken were also addressed at the annual AHL Feedback Group meeting in November 2020.

Figure 5.1: Survey Results, 2008 to 2019, Average Overall Level of Satisfaction with AHL Service

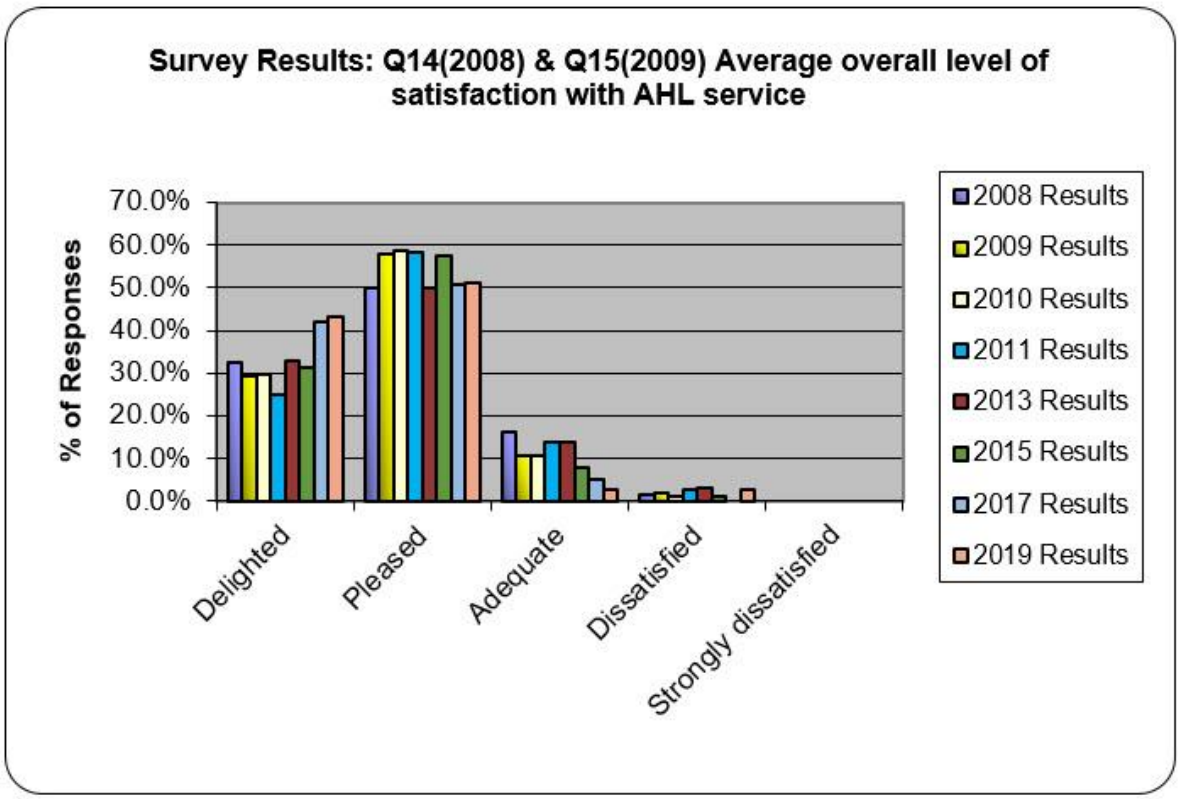
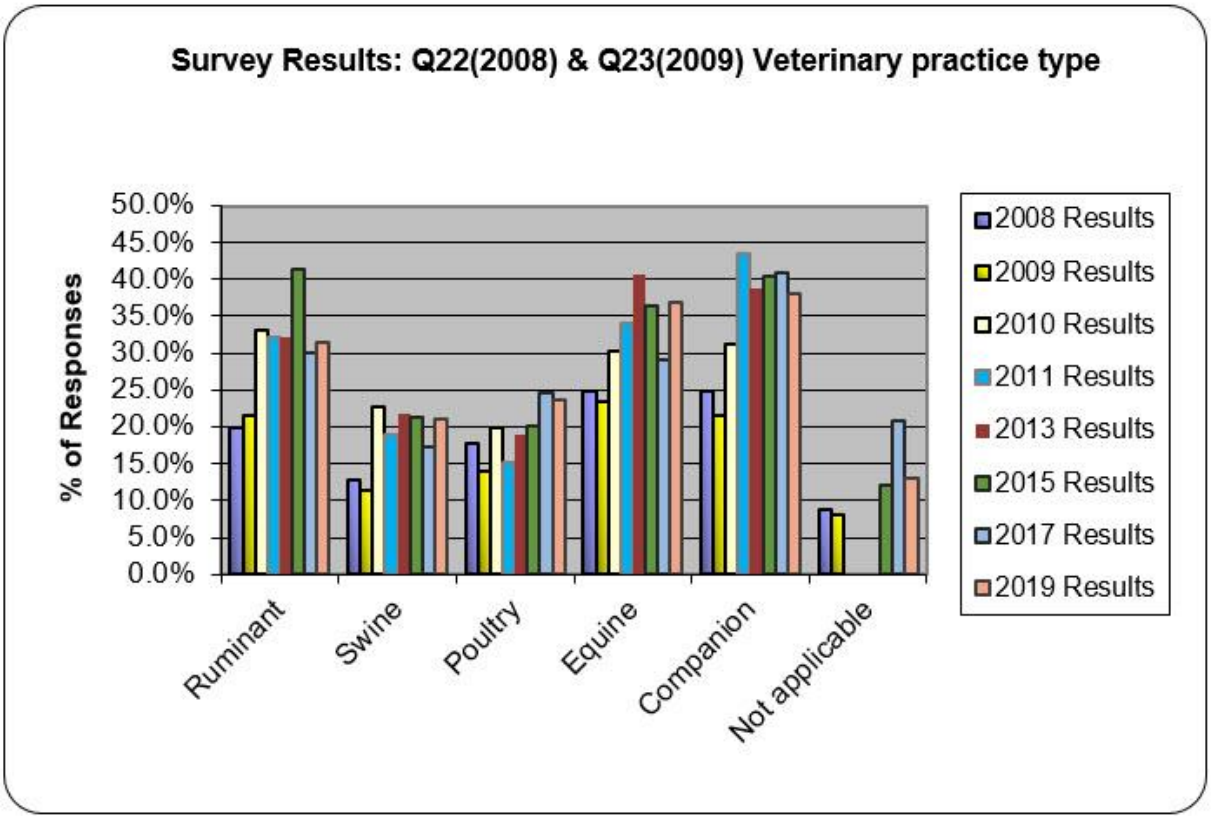


Figure 5.2: Survey Results, 2008 to 2019, by Veterinary Practice Type



Tables 5.13 to 5.16 identify the new and in progress action items and AHL's continuous improvement outcome responses for the 2017 and 2019 Biennial Client Satisfaction Survey Assessment, the 2018 Feedback Group meeting, the 2019 Feedback Group meeting and the 2020 Feedback Group meeting.

Table 5.13: 2017 and 2019 Biennial Client Satisfaction Survey Assessment Action Items and Outcomes

2017 and 2019 Action Items	AHL Improvement Outcome Response
Work on diagnostic plans, and vet education regarding test requests and other related client outreach (videos / webinars); training in lab techniques	Ongoing
Promote milk QA program, more clinics should be participating	Ongoing (low interest since user pay / voluntary) - continuing to provide info in newsletter and OABP

Table 5.14: 2018 Feedback Group Meeting Action Items and Outcomes

2018 Action Items	AHL Improvement Outcome Response
Milk culture results entered into DairyComp, any chance for blood, Johne's, BLV to be auto-added? How difficult to program?	Ongoing – discussion ongoing with CanWest DHI
Investigate expanding in-house culturing QA to urine	Ongoing - along with parasitology
A mobile app with a searchable list of tests would be fantastic – it is difficult to have the lab submission book with you on the road / it's not the easiest to search through (but this is being very picky)	App development initiated in June 2020 – ongoing – client portal being updated first

Table 5.15: 2019 Feedback Group Meeting Action Items and Outcomes

2019 Action Items	AHL Improvement Outcome Response
Check with IT re LabVantage compatibility with browsers other than Chrome	Works best on Chrome - investigating mobile functionality online access and app. June 2020
Work on improving functionality of LabVantage, investigate app., and allow more involved searches	Committee looking at mobile functionality / app. / enhanced data management protocols - ongoing
LabVantage - look at concern with more clicking needed to look up results (external OVC)	Committee looking at mobile functionality / app.
Check with IT re report formatting on mobile devices, app. mobile functionality	Committee looking at mobile functionality / app.
Goat Johne's Elisa (Prionics) - currently send out	Added to AHL new testing priority list - ongoing
BACT: working on Salmonella serotyping in-house	Ongoing - WGS
VIRO: titre mapping	Ongoing
Improvement on data mining services	Other action items involved – Food from Thought project in progress regarding data functionality and surveillance

2019 Action Items	AHL Improvement Outcome Response
VIRO: Suggest offering ELISA testing for hemorrhagic enteritis virus for turkeys - this may provide a more useful assessment of vaccine response by providing a GMT and CV versus only a positive/negative result provided by the current AGID	Discussion re AHL new testing priority list – requires business case
Suggest offering *Bordetella avium* PCR and *Ornithobacterium rhinotracheale* PCR; most useful for turkeys, and possibly useful for chickens.	Discussion re AHL new testing priority list - requires business case
Suggest offering *Pasteurella multocida* AGID or other form of serotyping, which is considered a standard follow-up to a culture positive by poultry veterinarians in other locations. Presently we must send samples to an American lab to have this testing performed.	Discussion re AHL new testing priority list – requires business case
Suggest creating a VN test or other serologic screening test for chicken astrovirus to screen broiler breeders. This would likely have very high usage if it were developed.	Discussion re AHL new testing priority list – requires business case
Suggest that further evaluation of viral sequencing would be useful in some cases, to supplement the use of Genbank reference virus evaluation.	Ongoing

Table 5.16: 2020 Feedback Group Meeting Action Items and Outcomes

2020 Action Items	AHL Improvement Outcome Response
Look into broadening Turkey reovirus testing options	Added to "AHL new testing priority list" database – ongoing discussion with poultry vets.
Co-ordinate CWD testing, attempt to batch sampling for efficiency	Coordination discussion with OMAFRA - Completed.
Look into expanding the susceptibility panels	Ongoing – draft Antimicrobial Susceptibility testing document completed, including MIC.
Results throughout the day, rather than at end of day	Results are approved and released when completed, usually end of day, unable to comply.
Develop Equine panels – diarrhea and respiratory	Ongoing – Equine foal and adult diarrhea panels completed May 2021. Equine respiratory panel under development.
Look into reporting options for patient bloodwork comparison	This is available in LIMS online by using multiple cases and combining in excel. Completed.
Explore Cadet_BRAF TAT	This is a send out – test is sent and then data entered as soon as possible by AHL – completed.

2020 Action Items	AHL Improvement Outcome Response
Bovine Respiratory PCR panels	Bovine Comprehensive Respiratory Panel developed and released - completed.
PCR Mastitis panels	Added to "AHL new testing priority list" database
PID promotion	Ongoing - AHL is updating the client portal. Once completed, clinic client database options will be offered which will have the option to include PID and automatically add to AHL online submissions.
Botulism inoculation test TAT	This is currently a send out – test has a long TAT – unable to improve TAT – completed.
IDvet ID SCREEN® ILT gI Elisa Biochek ND F-Elisa or IDvet ID Screen ND indirect IDvet ID SCREEN® IBD VP2 Elisa Synbiotic's PROFLOK Plus IBD	These are Poultry industry tests currently available as send outs – added to "AHL new testing priority list" database and ongoing discussion with poultry veterinarians re business case.

AHL Feedback Meeting, November 18, 2020

List of Participants:

OMAFRA

- Dr. Cathy Furness
- Dr. Tim Pasma

Species group presidents

- Dr. Dan Shock – President OABP
- Dr. Julie Ballinger – President OAEP
- Dr. Ben Schlegel – President OAPV

Large volume clients

- Mr. Andrew Sweet – Hendrix
- Dr. Cynthia Philippe - Hendrix
- Dr. Kevin Vilaca – SWOVS

Private practice

- Dr. Stacey Novy – Guelph Poultry

Ontario Veterinary College

- Dr. Maureen Barry – HSC OVC
- Dr. Robert Foster – HSC OVC Pathobiology
- Dr. Daniel Kenny – HSC OVC LA Internal Medicine

AHL

- Dr. Melanie Barham - OAHN Coordinator
- Ms. Josie Given - Client Outreach Technician
- Ms. Rina Pigozzo - Client Services Technicain
- Dr. Jim Fairles - Client Services Veterinarian
- Dr. Maria Spinato - Director

As a documented form of feedback on client service, minutes of the bi-monthly AHL/OVC-HSC/PBI liaison meetings (AHL, OVC Health Sciences Center, and Pathobiology) and the annual AHL Feedback Group meeting (of which a range of AHL clients attend) were reviewed. Meeting minutes are available upon request. Satisfaction is high with the timeliness of communications.

5.3.2 Relevant Test Results and Reporting Times

In 2020/21, AHL continued to provide excellence in meeting Service Level Standards and quality for routine tests, assessed through multiple measures: the number of tests, case and test load distribution by species, and compliance with Service Level Standards, specifically turnaround time (TAT).

Turnaround time is one of the most critical measures of a laboratory's effectiveness and efficiency. Client loyalty is often based on this one aspect of service. Given the large number of tests and services provided, it is often a challenge to maintain turnaround time and manage clients' expectations. AHL proactively measures and analyzes TAT performance to identify areas needing improvement. A component of the AHL's AAVLD accreditation is an analysis of adherence to quoted TAT expectations as published in the AHL User's Guide and Fee Schedule. A detailed explanation of the 2020/21 TAT statistics report is available upon request.

The target of 95% of routine AHL tests meeting the published Service Level Standards was set in 2018/19. The AHL Service Level Standards reporting includes service levels from external testing facilities in the target reporting, which are non-controllable. In 2020/21, AHL met the target, showing that 98.48% of tests met the expected Service Level Standards, based on calculation from LIMS. This achievement is remarkable given the challenges posed by the COVID-19 pandemic. Between May and August 2020, staffing levels were reduced due to the requirement for increased physical distancing (split teams), in addition to family and medical leaves associated with pandemic restrictions. The dedication of AHL staff ensured that target TATs were met throughout this period.

Table 5.17 shows the percentage of AHL tests achieving the published service level standards over the term of the Agreement. AHL has exceeded the standard in two of the last three years. The other year was heavily impacted by the COVID-19 pandemic.

Table 5.17: AHL Tests Achieving the Published Service Level Standards, over the Term of the Agreement

Metric	2018/19	2019/20	2020/21	2021/22	2022/23	Target
Percentage of AHL Tests Achieving the Published Service Level Standards	97.6%	93.48%	**98.48%**			95%

Table 5.18 and Figures 5.3 to 5.4 provide additional information on the caseload and procedure distribution by laboratory section and the caseload and procedure distribution by species. Table 5.19 shows the AHL caseload over the term of the Agreement.

Table 5.18: AHL Caseload Distribution, by Laboratory Section, 2020/21

AHL Function	Number of Cases	Number of Procedures[15]
Anatomic Pathology	2,083	2,110
Bacteriology	13,200	64,417
Clinical Pathology	23,284	58,863
External	2,808	6,206
Histotechnology	5,624	6,912
Mycoplasmology	2,546	8,841
Parasitology	3,458	6,207
Toxicology	4,058	12,491
Virology	20,523	604,330
Total Cases	**77,584**	**770,377**

Table 5.19: AHL Caseload over the Term of the Agreement

Metric	2018/19	2019/20	2020/21	2021/22	2022/23
Total Cases	75,788	72,111	**77,584**		
Total Procedures	846,972	798,358	**770,377**		

[15] Procedures such as biochemical profiles include multiple tests.

Figure 5.3: AHL Caseload Distribution, by Cases and Species, 2020/21

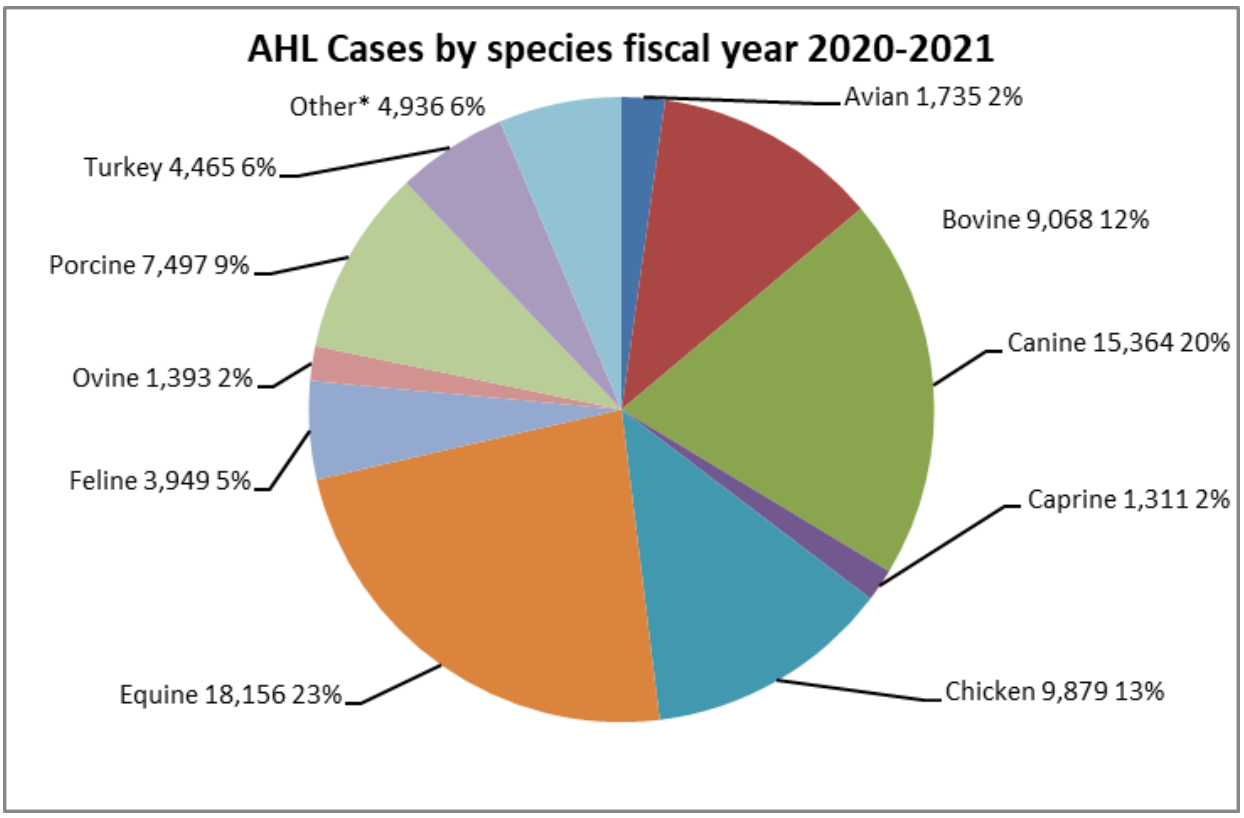
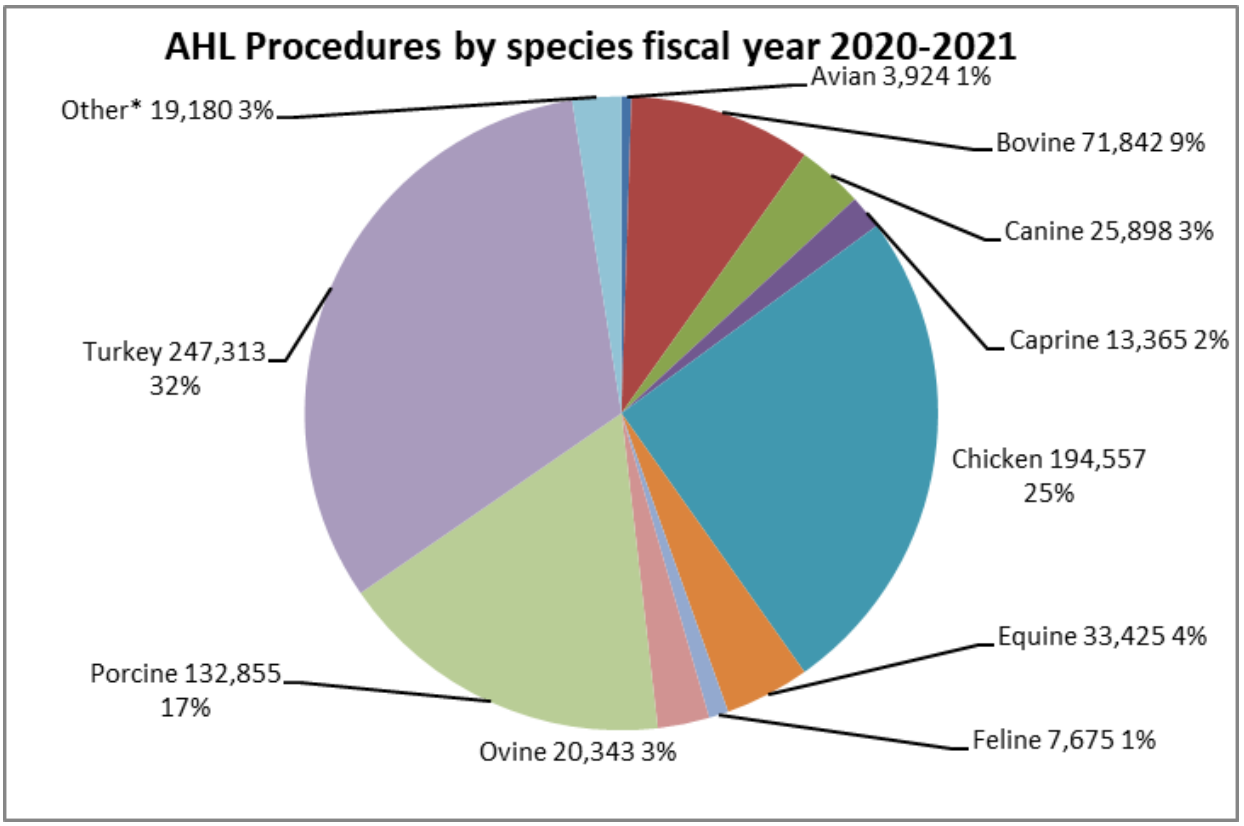


Figure 5.4: AHL Caseload Distribution, by Procedures and Species, 2020/21



*Other = bees, fish, other animals, and non-animal

5.3.3 Comprehensive Database

AHL is responsible for uploading accurate and accessible data. Results of testing of Ontario food animal submissions are housed in a data warehouse accessible to OMAFRA. AHL designs Web Intelligence (WebI) searches for OMAFRA to access disease events and disease trends within data stored in the warehouse. Dr. Tim Pasma, OMAFRA Epidemiologist, is an active member of the WebI Users Group.

The information below summarizes the number of cases reported by AHL where data was inaccessible or system issues were encountered, and the portion of issues resolved. The target for this metric is 100% of issues resolved. AHL met this target in 2020/21.

Various requests were made to IT regarding the LabVantage (LIMS) system.

A list of process improvements to the LIMS include:

- 2020-05 – Process improvement list has been entered into LIMS for easy access, updating – Completed.
- 2020-05 – Implemented an equipment module to provide a central location for tracking lab equipment, certification due dates and certification records – Completed.
- 2020-07-22 - SSL web certificates were installed into the production LIMS to ensure secure connections when users log into the website – Completed.
- 2020-08-17 - Installation and configuration of new tape backup solution to replace existing outdated and unsupported hardware – Completed.
- 2020-10-01 - Automation of "sample - no charge" based on lab section, test and result – Completed.
- 2020-10-11 - Set up functionality in the LIMS so that users will be able to see a copy of the report that is sent from the LIMS. A link to the report will be stored in the communication history and all LIMS users will be able to download a pdf copy of the report – Completed.
- 2020-10-11 - Add the ability to receive and manage samples across list pages. Users were unable to receive more than 100 samples at a time from the Receive Samples page. Users were unable to manage more than 100 samples at a time using Manage Samples functionality – Completed.
- 2020-10-11 - Request to add audit functionality at a submission level – Completed.
- 2020-12 - Redeveloped the mobile functionality – took client information and revamped to allow them to see it better on their mobile devices – Completed.
- 2020-12-16 – New databases set up and a network application server for the Bionumerics Instruments and software. This allows for multiple instances of the software to be installed. The licenses are now managed by a server. The data being stored on a central database allows for consistency of data – Completed.
- 2021-02-11 – Attached in the LIMS, exported VLIS data (1988-1977) (pdf format) so that all persons will have access to the information. Result information was exported from VLIS database by Murray Hazlett by species and attached in the LIMS on the Pathologist Query page – Completed.

5.3.4 Premises Identification

Premises Identification was removed as a key performance indicator as part of the Animal Health Laboratory's program outcomes and objectives and will be captured as a reporting requirement instead. This was approved by the Executive Committee on June 2, 2021. For more details on Premises Identification for 2020/21, please see Section 5.4.9.

5.3.5 Emergency Simulation, Exercise and Response

This performance indicator addresses AHL's ability to effectively carry out its responsibilities for emergency simulation, exercise and response to effectively support the Ministry. It also looks at AHL's ability to develop continuous improvement action requests through simulation/exercise evaluation report. Areas of improvement are identified by the Ministry and the University in response to AHL's participation in Incident Management System (IMS) simulation exercises.

The target is that 100% of action requests are implemented by the University within one year. Actions were developed, as agreed with the AHL PMC, to address recommendations in 2018/19, with an outcome of 100% of the action requests implemented by the University within the year, as reported below. Due to the postponement of the 2019/20 FAD exercises, completed action items for 2018/19 emergency exercises are reported herein.

5.3.5.1 Completed Action Items for 2018/19 FAD Emergency Exercises

5.3.5.1.1 AHL Guelph Tabletop Exercise - April 24, 2019

Participants:

- OMAFRA: C. Furness, C. Arsenault
- CFIA: C. Talwar, D. Orr
- OVC: B. Lillie, J. Hewson
- UofG Campus Control Group (EHS): J. Wesley
- AHL: G. Maxie, M. Spinato, E. Martin, M. MacAlpine, J. Fairles, J. Zoethout, K. Todd, A. Brooks

A tabletop exercise handbook was prepared for the emergency simulation and was supplied to participants in advance of the exercise. The exercise consisted of a PowerPoint presentation by G. Maxie, M. Spinato and E. Martin that followed the path of a suspected case of "bleeding pig disease" and "rattling chicken disease" and the procedures AHL has established to manage the risk of a FAD event. Each partner agency (OMAFRA, CFIA, OVC, and CCG) provided their anticipated response. Subsequently, the exercise was expanded to discuss potentially disruptive scenarios that included: quarantine of building 89, traceback/traceforward of potentially exposed external (producers, service providers) and internal (students, faculty, clinicians) personnel, in addition to communication strategies.

The following action items were identified in response to discussion arising from this tabletop exercise. The associated responses for each action item are included below and have been implemented.

1. Tracebacks and Containment:
   i. Who is Victoria Wentzell's back-up at the OVC-HSC for electronic key card records should we need to review who entered/exited the postmortem suite and determine who was exposed to an FAD? She can also alter access to critical zones such as FAD lab hallway to limit entry to critical personnel only. Also, who is the contact for PM suite ventilation should there be a need to alter airflow differentials? J. Wesley indicated that EHS also has access to swipe card records.
      - Action – AHL, OVC
        - **Response:** OVC security now has an email account to ensure uninterrupted response in the event of any required actions associated with electronic access and tracing: ovcea@uoguelph.ca.
        - Physical Resources contact: Steve Nyman, Director, Maintenance and Energy Services snyman@pr.uoguelph.ca ext. 52014.

ii. Clients may drop off samples and then go around the side of the building and enter the main high traffic areas to use the washroom or buy a coffee. How can this potential cross contamination be contained?
    - Action – AHL, OVC
        - **Response:** Refer to action item response iv). Clients will be encouraged to disinfect hands, footwear prior to using OVC cafeteria or facilities (note: currently locked down and inaccessible due to pandemic).

iii. The Ag assistants drop off cases after hours and then return to the clinics. Is there a disinfection procedure they should follow?
    - Action – OVC, AHL
        - **Response:** PPE supplies including plastic overshoes, gloves, lab coats and masks are available at the truck bay entry into the PM suite. These can be discarded upon exiting, and appropriate disinfection can be achieved with the use of the hands-free sink and boot bath.

iv. To improve biosecurity at AHL, is it feasible to promote use of boot baths, hand disinfection, and washing truck tires of producers and vets that arrive with samples obtained on farm?
    - Action – AHL
        - **Response:** Boot bath and sink are available at the truck bay entrance/exit to assist with disinfection. A large bucket of disinfectant linked to a submersible pump is available to decontaminate truck and delivery vehicle tires.

2. Notifications:

i. CFIA has requested that AHL ensure that the full address of the owner is entered into the case record before sending notification via LIMS. If low risk FAD suspect, CFIA won't necessarily contact vet or producer. They will contact District Vet of submitting farm to provide a heads-up when case is sent for confirmatory negative testing.
    - Action – AHL
        - **Response:** AHL staff has been advised to include complete owner address when entering contact information into LIMS report. If details are absent, the referring veterinarian/clinic should be contacted to provide them.

ii. CFIA indicated upon review of AHL-OMAFRA-CFIA-OMHLTC Animal Health Incident Reporting Protocol that it requires updating: Ontario Operational Specialist manager, Guelph Dr. Scott Barden needs to be replaced with Janine McLearon.
    - Action – AHL
        - **Response:** AML-OMAFRA-CFIA-OMHLTC Animal Health incident Reporting Protocol is updated whenever contact details have changed, or at a minimum, annually. Revised January 30, 2020 to replace Dr. Barden with Dr. McLearon.

iii. Dr. Talwar has promised that he will ensure that a back-up is identified on his e-mail message when his is out of the office.
    - Action – CFIA
        - **Response:** Dr. Talwar confirmed that his email has a back-up person listed when he is unavailable.

iv. CFIA indicated that when arranging for pick-up of samples, their notification system includes a different list of contacts depending on the disease involved. Important to also notify the CFIA FAD specialist.
    - Action – CFIA, AHL
        - **Response:** AHL-OMAFRA-CFIA-OMHLTC Animal Health Incident Reporting Protocol includes the contact details for the Ontario Operational Specialist Manager and Ontario

Operational Specialist (FAD specialists). These will be added to the AHL notification protocol in the event of a FAD suspect case.

v. OMAFRA emphasized that Ministry of Health and Long- Term Care needs to be notified in the event of an exposure to a potential zoonotic pathogen, such as high path avian influenza or novel influenza strains. This requirement is already included in the AHL-OMAFRA-CFIA-OMHLTC Animal Health Incident Reporting Protocol – **No Action Required.**

vi. OMAFRA staff indicated that Leslie Woodcock is not informed via OCVO notification; OMAFRA Animal Health Vets will inform her based upon risk assessment.
- Question: Is the e-mail notification of OMAFRA Animal Health Vets sufficient in the event of a rapidly occurring FAD emergency? Any option of telephone access? Currently, only Dr. Woodcock's phone number is provided in the Reporting Protocol.
- Action – OMAFRA
  - **Response:** Dr. Furness (current CVO) has been added to the OCVO-reportable-notifiable list group. Dr. Furness has also requested a direct telephone call in the event of a disease alert: telephone contact information has been added to the AHL-OMAFRA-CFIA-OMH Animal Health Incident Reporting Protocol.

vii. OMAFRA has a flow chart indicating chain of command. It would be useful to draft a similar flow chart for communication within the University.
- J. Wesley of the Campus Control Group (CCG) indicated that there is an internal communications tree for the CCG so that information can be distributed quickly across campus. Once there is awareness of an outbreak on campus there will be concerns regarding Human Health and Safety (in-contact staff and ancillary workers), and that having messaging prepared in advance would aid in speed of information distribution. There is an incident command system on campus that would ramp up in emergency situations. Ministry of Health is another partner that would talk to exposed students and staff.
- Action - AHL, OVC, CCG
  - **Response:** MTS contacted David Pringle, the Emergency Management Coordinator for the Campus Control Group. He indicated that the appropriate communication strategy is to contact Police Dispatch and notify him (DP) of the FAD event. He would dispatch a Sergeant to AHL to protect the scene and limit entry, if necessary. The risk to the campus community would be assessed (contagious zoonotic pathogen vs. non-zoonotic pathogen), and David Lee, the Director of Campus Community Police would notify the relevant members of the Campus Control Group and determine next steps.

viii. Once a FAD is confirmed, OMAFRA provides support to CFIA in a joint incident command. Recommend that CFIA and OMAFRA work on drafting FAD message so it is ready in the event of an outbreak.
- Action – CFIA, OMAFRA
  - **Response:** Resolution will require ongoing negotiation with UofG, OMAFRA and CFIA partners to define jurisdictional responsibilities and appropriate communication messages.

ix. How to find an AHL on-call person? Phones are answered Mon-Fri 8:00-18:00 and Sat/Sun/Holidays 9:00-17:00. Does AHL require additional on-call capability in the event of an FAD emergency?
- Action – AHL
  - **Response:** AHL does not have staff on-call outside of the aforementioned hours (min. availability eight hours every day) due to limited resources. However, the Client Services Veterinarian, Virologist and Director are informally available by email and personal cell

numbers to industry members and veterinarians requiring a rapid response to an animal health emergency.

x. Control of rumours spread via social media will be difficult.
   - In the event of a FAD occurrence that has potential University-wide impact, the Campus Control group would take the lead on communications. Jane Dawkins is the local OVC social media contact who will address questions specific to OVC. OMAFRA advised working on a blanket message in advance that can be immediately available for dissemination when rumours are spreading due to yellow-taped quarantine zones. These messages will need to be approved by CFIA prior to release and might need to be tailored to the specific disease (i.e., level of risk to same or other animal species, as well as zoonotic potential).
   - Action – AHL, OVC, CCG, CFIA
     - **Response:** Resolution will require ongoing negotiation with UofG, OMAFRA and CFIA partners to define jurisdictional responsibilities and appropriate communication messages.

3. Postmortem Risk Assessment:
   i. Dr. Lillie indicated that it is unlikely that the Department of Pathobiology (PBI) would be involved in primary FAD identification, except perhaps for the higher risk posed by backyard poultry and pet pigs which are both increasing in popularity. Therefore, it may be advisable to perform postmortems on PBI backyard poultry cases in one of the restricted PM rooms to facilitate containment, if feasible and space is available.
      - Action – OVC, AHL
        - **Response:** All OVC backyard poultry postmortems are now performed in biosafety cabinets to ensure appropriate biocontainment.

   ii. B. Lillie and J. Hewson both agreed that PBI's primary focus should be on managing risk of exposure of students, clinicians, faculty and researchers to FADs in the PM suite. Training for first year students entering the PM suite for labs should emphasize infection control, appropriate decontamination protocols. This training should be repeated in subsequent years to instill these critical principles.
      - Action – OVC
        - **Response:** First year students entering PM suite for labs will be provided with a tutorial that outlines infection control and appropriate decontamination protocols in the PM suite.

4. Business Continuity:
   i. Concern was expressed by OVC regarding the impact on teaching function if the PM suite, Building 89 and/or OVC-HSC were closed due to quarantine because of an FAD outbreak. Closures that impact the curriculum would adversely affect the image of OVC and therefore, the Dean or Associate Dean should be informed ASAP should this occur.
      - Action – OVC, AHL
        - **Response:** AHL Director will inform OVC Dean and Associate Dean ASAP should the PM suite and/or Building 89 be closed/quarantined due to an FAD occurrence. Virtual training options have also now been developed due to COVID-19 pandemic restrictions.

5. Miscellaneous:
   i. B. Lillie indicated that additional discussions will be required with Canadian Wildlife Health Cooperative (CWHC) as this is a separate entity (not involved in PBI operational discussions) whose staff use the postmortem suite daily.
      - Action – AHL

- **Response**: CWHC pathologist will be invited to participate in the 2021 highly pathogenic avian influenza FAD exercise.

ii. J. Hewson indicated that representatives from OVC-HSC should be involved in future FAD emergency management discussions, as its mandate differs from that of the Dean's administrative office.

- Action – AHL, OVC
  - **Response:** Representatives from OVC-HSC will be invited to participate in the 2021/22 FAD emergency exercise, which will involve DVM students in the PM suite.

5.3.5.1.2 AHL Kemptville Tabletop Exercise - August 21, 2018

AHL-Kemptville Participants:

- Andrew Brooks (Pathologist/Lab Head)
- Jan Shapiro (Pathologist)
- Tom McLean (Client Service Representative/PM Technician)
- Debbie Scissons (Client Service Representative/PM Technician)

External Evaluators:

- Dr. Ines Walther, National and OIE Reference Laboratory for Scrapie and CWD, Ottawa Laboratory Fallowfield, CFIA
- Dr. Maria Pienkowski, Operations Branch, Ottawa District Office, CFIA

On August 21, 2018, the eighth annual foreign animal disease exercise was held at AHL- Kemptville. The simulated disease was bovine foot and mouth disease and the objective was to evaluate the ability of AHL-Kemptville personnel to conduct the appropriate sampling, decontamination and reporting following SOP AHL-K-016- *Post mortem room and general laboratory procedures for handling a foreign animal disease suspect,* and to identify areas for improvement of the SOP. The exercise was successful and the objectives were completed. The exercise was a valuable training experience for AHL- Kemptville staff. The evaluators provided detailed and useful feedback.

The following action items were identified in response to discussion arising from this tabletop exercise. The associated responses for each action item are included below and have been implemented.

Action 1: Determine if specific instructions are required in AHL-002 Postmortem procedures manual for situations where the pathologist suspects a reportable disease some time after the postmortem has been completed.

- **Response:** Action closed. No specific instructions are required. Once a reportable disease is suspected the pathologist will follow the reporting procedures outlined in *AHL - OMAFRA - CFIA - OMH Animal Health Incident Reporting Protocol* and *AHL-002 Postmortem procedures manual.* Once the disease has been reported, AHL will follow guidance provided by CFIA.

Action 2: Repair as required the cracks in the wall near the PM room sink.

- **Response:** Action closed. Cracks in wall near PM sink have been repaired.

Action 3: Investigate options for disease reporting and communications if the AHL- Kemptville PM phones are not working or if there is an interruption of internet service.

- **Response:** Action closed. No action is required. Interruption of phone or internet service is very rare at AHL- Kemptville but could occur if there was a temporary power outage due to inclement weather. In

the event phone or internet services were temporarily unavailable, preliminary notification to CFIA could be achieved by cell phone.

Action 4: Review procedures for disinfection of the small stock room (containing supplies and electronic equipment) in the AHL- Kemptville postmortem room and revise SOP accordingly.

- **Response:** Action closed. No specific action is required. The small stock room and contents would be disinfected, or contained, in a similar manner to materials in the main postmortem room in accordance with *AHL-002 Postmortem procedures manual*.

Action 5: Investigate replacing Virkon™ with a peroxide disinfectant at AHL- Kemptville.

- **Response:** Action closed. Accelerated peroxide disinfectants are available for use at AHL- Kemptville.

Action 6: Review procedures for transferring sample containers out of the PM room and evaluate whether additional practice is required (i.e., more often than the annual exercise).

- **Response:** Action closed. Procedures for transferring sample containers out of the postmortem room are adequately described in *AHL-002 Postmortem procedures manual*. AHL- Kemptville personnel (only four staff members) have been practicing this procedure annually since 2011 and are considered proficient. Any new staff that join AHL- Kemptville will participate in future exercises.

Action 7: Investigate whether a work instruction is required in the AHL- Kemptville postmortem room to aid preparation of disinfectants at various concentrations and volumes.

- **Response:** Action closed. No specific action is required. Measuring containers and disinfectant containers with volume gradations are in use at AHL- Kemptville to assist with preparation of disinfectants. A separate work instruction is not required.

Action 8: Ensure filled soap dispensers are present at laboratory sinks.

- **Response:** Action closed. No specific action is required. Soap dispensers are kept full at laboratory sinks.

Action 9: Verify that all AHL pathologists are aware of how to report diseases to CFIA within the LIMS.

- **Response:** Action closed. AHL pathologists follow the reporting procedures outlined in *AHL - OMAFRA - CFIA - OMH Animal Health Incident Reporting Protocol* and *AHL-002 Postmortem procedures manual.* In addition, further clarification for reporting to CFIA was relayed to AHL Pathologists by Dr. Spinato (see accompanying email dated January 7, 2020 to AHL pathologists).

5.3.5.2 Summary Reports for the Postponed 2019/20 FAD Emergency Exercises

With approval from the AHL PMC, the 2019/20 emergency exercises (including the responses from the 2018/19 exercises), initially scheduled for March/April 2020, were postponed due to the COVID-19 pandemic. The postponed exercises were conducted in November 2020 and involved a suspected case of African Swine Fever.

5.3.5.2.1 AHL- Guelph Foreign Animal Disease Exercise - November 4, 2020

Background:

A foreign animal disease emergency exercise was held at AHL - Guelph, November 4, 2020, simulating a suspected case of *African Swine Fever***.**

External Evaluators:

- Dr. Christa Arsenault (OMAFRA)
- Dr. David Orr (CFIA)

Overall Assessment:

The exercise was successful; all objectives were completed.

Evaluator Feedback:

Dr. Christa Arsenault (OMAFRA): Below is a summary of the feedback that I documented from the FAD exercise that took place November 2020. Thank you for the opportunity of being involved.

1. Suggestion: Make a record of approved disinfectants and concentrations for different FAD's working with CFIA and post in the PM room for reference. Eliminates the risk of having to redo disinfectant if things do not match up with CFIA recommendations.
2. Action: Find a better way to affix disease alert- simulation signs to the outside of the building to prevent them from blowing off in the wind.
3. Suggestion: Any exercise geared toward a suspicion of ASF should also be conducted for CSF, as both are indistinguishable without confirmatory testing.
4. Suggestion: Expand the list under objective 3 to include all that the AHL director does in the notification process. A lot was missing from the exercise sheet so could not evaluate in its entirety. Add Jim's notifications to this list as well.
5. Action: Ensure that barrels marked with "FAD and HOLD" do not have any risk of being picked up by contracted company until negative testing results are known and communicated by CFIA to prevent them from crossing Canada-USA border as was discovered is the destination of these barrels for incineration.
6. Action: Work with CFIA on a possible location locally that may be able to help with incineration if a suspicious or a positive test result is received from NCFAD in advance of need.
7. Action: Make note in the SOP that in freezing temperatures that C & D of truck bay should be completed with the door closed to prevent water and disinfectant from freezing.
8. Suggestion: It might be handy to purchase a few timers for the PM room that can be set to monitor when recommended contact times with disinfection are met.
9. Suggestion: Consider rotating disinfectants routinely used in the PM room to prevent any resistance from developing over time.
10. Action: Redo tapeline in the shower room indicating dirty and clean areas for visual aid with biosecurity.
11. Action: Review listserv requirements so all pathologists can send FAD simulation notifications out through listserv when needed.

Dr. David Orr (CFIA): I do not think that I can make any comment on the recent FAD exercise, especially anything that is critical. I can reiterate that your FAD preparedness plan must be commended. For you to carry out an exercise to test your plan has to be complemented as well. I think that CFIA has mentioned that this is something they will try with other labs across the country. Truthfully, I do not have anything to say that is critical at all about your exercise. I believe that all will go very well at AHL during a true FAD and that the likelihood of spread of a pathogen out of AHL is very low.

Action Items Arising from the Exercise:

Action 1: Make a record of approved disinfectants and concentrations, that match with CFIA recommendations, for different foreign animal diseases in the PM room.

Action 2: Find a better way to affix disease alert signs to the outside of the building to prevent them from blowing off in the wind.

Action 3: Expand the list under exercise objective 3 to include all tasks performed by the AHL director in the notification process. Include notification of the CVO.

Action 4: Ensure that barrels marked with "FAD and HOLD" do not have any risk of being picked up by the contracted company until negative testing results are known and communicated by CFIA to prevent them from crossing the Canada-USA border.

Action 5: Work with CFIA on a possible location locally that may be able to help with incineration if a suspicious or a positive test result is received from NCFAD in advance of need.

Action 6: Make note in the SOP that in freezing temperatures that C & D of truck bay should be completed with the door closed to prevent water and disinfectant from freezing.

Action 7: Purchase timers for the PM room that can be set to monitor when recommended contact times with disinfection are met.

Action 8: Consider rotating disinfectants routinely used in the PM room to prevent any resistance from developing over time.

Action 9: Redo tapeline in the shower room indicating dirty and clean areas for visual aid with biosecurity.

Action 10: Review email listserv requirements so all pathologists can send FAD simulation notifications out through the email listserv.

Action 11: Clarify plans for handling a FAD suspect that is detected in the regular PM room (while busy and with other occupants) or detected after the postmortem is over (e.g., detected at histopathology or culture).

Action 12: Invite a biosecurity expert from Ottawa (CFIA) to attend your next FAD exercise at the AHL.

Action 13: Inquire about AHL pathologists participating in future FAD training courses at NCFAD in Winnipeg.

Action 14: Inquire about a position or role for AHL at the FAD discussion table on the Ontario FAD team during a real FAD.

Action 15: Provide AHL pathologists at Guelph a review of the FAD procedure during the interval between annual exercises.

5.3.5.2.2 AHL- Kemptville Foreign Animal Disease Exercise - November 18, 2020

Background:

On November 18, 2020, the ninth annual foreign animal disease exercise was held at AHL- Kemptville. The simulated disease was *African Swine Fever* (ASF).

External Evaluators:

- Dr. Ines Walther, National and OIE Reference Laboratory for Scrapie and CWD, Ottawa Laboratory Fallowfield, CFIA

- Dr. Nicole Schaefer, Veterinary Program Specialist and Supervisory Veterinarian, Ottawa District Office, CFIA

Overall Assessment:

The exercise was successful and the objectives were completed. The exercise was a valuable training experience for AHL - Kemptville staff as well as evaluators. The evaluators provided useful and constructive feedback.

Evaluator Feedback:

Dr. Walther (CFIA): Staff at the Animal Health Laboratory – Kemptville Campus are to be commended for their thorough preparation and provision of required documentation for the external reviewers/participants. Staffing changes at the AHL- Kemptville welcomed two new staff members (Laboratory Head and second pathologist) and for both it was the first practical experience of these QA documents within their new setting.

As per the Exercise and Evaluation Guide – objective one through six were observed in the PM room and were all completed - with modification due to the restraints of the training exercise - within their allotted time frame given that some steps overlapped between objectives. No major findings were identified.

Minor recommendations and/or suggestions from this external reviewer are being provided as guidance to the team at AHL- Kemptville and may be considered if the team finds them beneficial as they continue to look for areas of refinement with respect to these QA documents within their work setting.

Thank you for providing me with the opportunity to participate as an external reviewer/participant. If there are any other questions or concerns regarding this summary, please do not hesitate to connect with me.

Dr. Schaefer (CFIA): This was a good exercise and useful for myself to know what is expected and needs to be communicated from the CFIA district office.

Action Items Arising from the Exercise:

Action 1: Add additional laminated disease alert sign to be located in loading bay for posting on loading bay entrances.

Action 2: Review *AHL-002-WI-5* and *AHL - OMAFRA - CFIA - OMH Animal Health Incident Reporting Protocol* with updated contact numbers.

Action 3: Consider running a notification only exercise in addition to the annual FAD exercise.

Action 4: Review procedures for disinfection and transferring sample containers out of the PM room and evaluate whether additional practice or revised instructions are required.

Action 5: Investigate the use of pre-packaged FAD prep-kits for PM room supplies as well as enclosure of minimal daily PM room supplies in clear snap lid Tupperware containers to better facilitate decontamination of the PM room and limiting the possible discard of supplies.

5.3.5.3 Summary Reports for the 2020/21 FAD Emergency Exercises

5.3.5.3.1 AHL- Guelph Foreign Animal Disease Exercise - March 11, 2021

Background:

On Thursday March 11, 2021, the annual foreign animal disease exercise was held at AHL - Guelph. The simulated disease was avian influenza.

AHL - Guelph Participants:

- Dr. Maria Spinato (AHL Director)
- Dr. Andrew Brooks (AHL Postmortem Supervisor)
- Dr. Emily Martin (AHL Pathologist and exercise coordinator) – Conducted postmortem
- Abiran Sritharan (AHL Postmortem technician) – Assisted postmortem
- Megan MacAlpine (AHL Postmortem technician) – Postmortem Team Lead
- Lauren Gatrell (AHL SR and Postmortem technician) – Truck bay disinfection
- Jennifer Zoethout (AHL Specimen Reception Technical Supervisor) and SR staff

External Evaluators:

- Dr. Tim Pasma, OMAFRA
- Dr. David Orr, Guelph District Office, CFIA

Overall Assessment:

The exercise was successful, and the objectives were completed. The exercise was a valuable training experience for AHL - Guelph staff. The evaluators provided useful feedback.

Evaluator Feedback:

Dr. Tim Pasma: The AHL Postmortem Emergency Exercise, conducted on March 11, 2021, tested the capacity of AHL to respond to a postmortem for a foreign animal disease. All the staff worked in a professional and coordinated manner and all protocols were followed diligently. Both OMAFRA and the CFIA, as partners in an emergency response, were notified in a timely manner and communications were maintained throughout the exercise. In the debriefing meeting, the protocols for swabbing of samples, entry into the internal postmortem room and disposal of samples were discussed and these protocols will be further reviewed and refined. Overall, the exercise demonstrated that the AHL is well prepared to respond to a foreign animal disease and continually works towards improvement of its response.

Dr. David Orr: On March 11, 2021, the AHL held a FAD simulation. The exercise involved avian influenza as the suspected disease. The exercise activities included recognition of the disease, compulsory reporting to CFIA, postmortem evaluation and sample collection and preparation for delivery to CFIA. Evaluation of the exercise involved biosecurity, but also included time objectives, communications and physical resources. AHL staff met all the time objectives, CFIA was notified and provided directions, samples were collected and prepared for delivery to NCFAD. The receiving area and postmortem room were decontaminated as part of the exercise. Biosecurity was a priority throughout the exercise. It is my opinion that the exercise was a success. Significant biosecurity concerns that would allow the AI virus to escape from the lab did not occur. Samples were collected safely and quickly for confirmatory testing at NCFAD.

Action Items Arising from the Exercise and Evaluator Comments:

Action 1: Conduct a simulation of clearing personnel from the postmortem room when a high-risk FAD suspect is identified in postmortem.

Action 2: Check with Dr. Davor Ojkic if the VTM swabs used at AHL would have concerns re: preservatives if the swabs are left in the container for long periods of time.

Action 3: Investigate how the doffing room and shower should be disinfected after shower-out procedures. Put a protocol in place for how to disinfect this area.

5.3.5.3.2 AHL- Kemptville Foreign Animal Disease Exercise- April 6, 2021

Background:

On April 6, 2021, the tenth annual foreign animal disease exercise was held at AHL - Kemptville. The simulated disease was Highly Pathogenic Avian Influenza (HPAI).

AHL-Kemptville Participants:

- Dr. Maria Spinato (AHL Director)
- Dr. Heindrich Snyman (AHL Kemptville Laboratory Head)
- Dr. Emily Rätsep (AHL Kemptville Pathologist)
- Mr. Thomas McLean (AHL Kemptville Client Service Representative and Postmortem Technician)
- Ms. Debbie Scissons (AHL Kemptville Client Service Representative and Postmortem Technician)

External Evaluators:

- Dr. Benjamin Henderson (CFIA - Supervisory Veterinarian, Brockville and Belleville Animal Health Office, Ontario Operations, North East Region)
- Mrs. Sheila Smiley (CFIA - Health and Safety Coordinator, Ottawa Laboratory Fallowfield)

Objective:

To evaluate the ability of AHL - Kemptville personnel to conduct the appropriate sampling, decontamination and reporting following SOP *AHL-002 Postmortem procedures* manual and *AHL-002WI-5 Work Instruction for handling a foreign animal disease suspect* at AHL - Kemptville – Action Summary, and to identify areas for improvement of the SOP or WI.

Overall Assessment:

The exercise was successful and the objectives were completed. The exercise was a valuable training experience for AHL - Kemptville staff as well as evaluators. The evaluators provided useful and constructive feedback.

Evaluator Comments:

Dr. Henderson
Areas of strength:

- Emergency plan is well laid out.
- All employees involved understand their respective roles as well as others, which allows for efficient completion of the objectives and expected actions.
- Required contact numbers are easily accessible within the Postmortem area.

- Pathologist knew which information need to be given and collected and gave out her contact number if any additional information was needed.
- Postmortem was conducted quickly and efficiently.
- Samples were disinfected thoroughly for the appropriate contact time and transferred appropriately outside the contaminated PM room.
- The procedure for appropriate disinfection of the PM room was known along with mixing of an appropriate disinfectant.

Areas for improvement:

- Physical wiping of potential contact surfaces by the producer.
- Use of paper plates for sample disinfection – Tupperware would be more readily disinfected.
- An additional privacy layer of clothing under coveralls to permit transfer to the shower area.
- Shower shoes to move from PM room to shower area that are able to be sanitized.
- Avian sample collection:
    - I have confirmed cloacal swabs should be collected.
    - Swirl samples around five times in UTM and squeeze excess liquid against side of the container and discard swab.

Mrs. Smiley: I observed this mock emergency exercise on the clean-side as a non-exposed observer. The exercise began at 9:05am and work in the postmortem room was completed around 10:10am, with the pathologist exiting the PM room. Decontamination of the PM room may have still been ongoing but was not observed. On the clean-side, I shadowed the AHL Lab Head (Dr. Heindrich Snyman). The time objective of 30 minutes for these conversations (pathologist and AHL Laboratory Head; pathologist and CFIA District Office) seem short for a real-life scenario.

- The AHL Head waited 30 minutes (to hear back from the pathologist, who was still talking with CFIA) and decided to disinfect the specimen and trim room using the assumed disinfection procedure. It was mentioned that if CFIA changed disinfection procedures, the disinfection would be performed a second time. The disinfection of the reception area and the specimen and trim room took about 20 minutes. All the floors were mopped and surfaces (doors, handrails) were disinfected with wipes. During a real-life scenario, this step would benefit from a discussion to plan to disinfect. Some surfaces like the table in the reception area and the cart at the top of the stairs were missed. A disinfection plan would help ensure that all potentially contaminated surfaces were treated. I also noticed that a large mop bucket was used and had to be carried down the stairs to the reception area. This is an awkward space to be carrying a large, heavy object filled with disinfectant (possible spill risk). A suggestion would be to use an orchard sprayer to apply disinfectant, especially in the reception area. The orchard sprayer would also eliminate the need to change the dirty mop bucket water.
- One of my concerns is maintaining up-to-date emails for all relevant regulatory agencies. For example, CFIA Brockville did not have a generic email account. If there is staff turn-over, especially during the COVID-19 pandemic, it can be difficult to keep up-to-date distribution lists and the right emergency contact information. This is not the sole responsibility of the Kemptville lab, but it is a topic that might require discussion with the other agencies.

Action Items Arising from the Exercise and Evaluator Comments:

Action 1: Ensure disinfectant wipes (e.g., Prevail wipes) or paper towel that can be soaked in appropriate disinfectant is available for use for cleaning soiled surfaces and wiping high contact points in both the PM room and specimen reception area prior to spraying down with disinfectant.

Action 2: Review AHL-002-WI-5 to include a step to ensure discussion of approved disinfection protocol with non-contaminated lab personnel prior to commencing postmortem evaluation and sampling. General review of all steps for this work instruction to be included at the same time.

Action 3: Review specimen reception and trim area disinfection plan and create a tabulated disinfection plan of surfaces to be included in the disinfection process.

Action 4: Review equipment used for application of disinfectant in the specimen reception, trim areas, and acquire necessary additions.

Action 5: Notify by email all AHL Kemptville and AHL Guelph avian pathologists of swab handling and inclusion of cloacal swabs in the sampling protocol as per feedback from the NCFAD lab.

Action 6: Review procedures for disinfection of sample containers in the PM room and evaluate whether additional practice or revised instructions are required.

Action 7: Review options for improving privacy when transitioning from the postmortem room to the change room and shower.

Action 8: Review options for including disinfectable outer footwear and an additional layer of clothing for transitioning form the postmortem room to the change room and shower.

Action 9: Review AHL - OMAFRA - CFIA - OMH Animal Health Incident Reporting Protocol and AHL-002-WI-5 with updated contact details.

5.3.6 Emergency Response – After Action

AHL continued to support the Ministry effectively, carrying out responsibilities under the emergency simulations through the development of new tests required to address urgent incidents and improving response capability in the future. Additionally, AHL provides responses to serious food safety events using existing testing methods, as well as working to improve response capabilities in the future.

The Ministry will evaluate AHL's response to, and management of, significant, unanticipated, or urgent situations or events of animal health emergencies. This includes any requirement for the development of new tests or test methods, against criteria, including timeliness, effective diagnoses, communication of test results, monitoring and reporting. Areas of improvement are identified by the Ministry and the University in response to evaluation. The target is set at 100% of action requests meet implementation targets set by the AHL PMC.

In 2020/21, there were no major emergency incidents requiring an AHL response. Thus, there were no required after action evaluations, lessons learned or action requests after a major emergency incident. AHL continues to engage in effective scanning surveillance for animal health risks, as well as emergency simulation exercises and simulation response evaluation, ensuring readiness for emergency response to a major incident.

5.4 Reporting Requirements

5.4.1 Biennial Client Satisfaction Survey

Biennial Client Satisfaction Survey information is provided in Section 5.3.1.

5.4.2 Emergency Simulation Exercise and Response Report

Reporting on the annual simulation exercises conducted at the AHL and response evaluation is provided in Section 5.3.5.

5.4.3 Emergency Response - After Action Report

Reporting on the Emergency Response – After Action report is provided in Section 5.3.6.

5.4.4 OAHN Reports

The OAHN expert networks report annually, with AHL PMC Co-Chairs in attendance. The reports are archived with the meeting minutes and are available on request.

5.4.5 OAHN Projects

Each of the ten OAHN expert networks can apply for approximately $25,000 annually to conduct a project on an identified gap in surveillance in their commodity. Table 5.20 lists the OAHN Projects funded in 2020/21. Results of some of these projects were presented at various industry meetings, published in journals, and posted on the OAHN website.

Table 5.20: 2020/21 OAHN Projects

OAHN Expert Network	Project Title	Start Date	Project Leader	Amount
Companion animals	Prevalence of seroconversion to SARS-CoV-2 among dogs, cats and ferrets in close contact with humans with confirmed or probable COVID-19	01-Jun-20	Bienzle	$19,665
Fish	Prevalence and Antimicrobial Resistance of Bacterial Pathogens in Ontario Aquaculture	01-Jun-20	Chiasson	$6,000
Equine	Investigation of a respiratory disease outbreak in the Ontario harness racing industry and the economic impact on industry participants	01-Jul-20	Arroyo	$11,000
Bovine	Disease testing for newly introduced cattle	01-Jul-20	Gordon/Renaud/ Fairles	$27,137

OAHN Expert Network	Project Title	Start Date	Project Leader	Amount
Bees	Investigation of the role of varroa mites (Varroa Destructor) in Ontario honey bee health using next generation sequencing (NGS) technology	01-Jul-20	Cai	$44,677
Small ruminants	Investigation of Ovine herpesvirus-2 as the cause of an idiopathic fatal vasculitis syndrome in Ontario sheep	01-Aug-20	Brooks	$1,374
Fish	Development of Biosecurity Resources for Aquaculture Producers	15-Sep-20	Chiasson	$13,447
Bovine	Investigation of Elevated Number of Condemnations for Septicemia in Veal	14-Dec-20	Renaud	$10,883
Small ruminants	Comparison of maedi visna serological tests including the VMRD ELISA	17-Dec-20	Bauman/Crawford	$3,332
Wildlife	Identifying changes in *Leptospira interrogans* prevalence and serovars in wildlife in Ontario	01-Mar-21	Jardine	$24,689
Equine	Investigation of the molecular prevalence of EHV-1 in placentas from health mares	18-Mar-21	Arroyo	$9,555
Fish	*Salmonicola* sp. surveillance	15-Apr-21	LePage	$13,178
Total				**$184,937**

5.4.6 OAHN Communications

During 2020/21, AHL continued to facilitate an integrated and collaborative disease surveillance system in Ontario, through OAHN.

Objectives of the Ontario Animal Health Network Strategic Plan are:

1. Provide a communications hub/platform for topics concerning animal health and welfare issues within Ontario;
2. Identify existing or emerging animal health and welfare issues and trends; and
3. Contribute expertise to prevention, detection, and response activities.

Most networks consist of an expert from each of OMAFRA, AHL, OVC, and between one and four private practitioners in support of disease surveillance in all of the major animal sectors in Ontario. “Clinical impression” surveys of private veterinarians are conducted quarterly by most networks, combined with AHL and private laboratory data, plus OMAFRA abattoir condemnation data. These data are discussed in teleconferences of the expert networks.

During 2020/21, all networks, except the alternative species network, were active. Networks include:

- Small Ruminants - also serving as the Ontario node for the national Canadian Animal Health Surveillance System's Small Ruminant Network;
- Swine – also serving as the Ontario node in the Canadian Swine Health Information Network (CSHIN);
- Poultry - also serving as the Ontario node for the national Canadian Animal Health Surveillance System's Poultry Network;
- Equine - also serving as the Ontario node for the national Canadian Animal Health Surveillance System's Equine Network;
- Bovine - also serving as the Ontario node for the national Canadian Animal Health Surveillance System's Bovine Network;
- Fish - also serving as the Ontario node for the national Canadian Animal Health Surveillance System's Aquatic Animals Network;
- Honeybees;
- Companion Animals;
- Wildlife, in collaboration with the Canadian Wildlife Health Cooperative (CWHC); and
- Alternative Species/Fur-Bearing Animals – inactive due to decreased activity within these industries.

The majority of networks met on a quarterly basis in 2020/21 for their regularly scheduled communications and information sharing. The exceptions included the bee network, which meets twice annually (working groups of the network meet more frequently on specific topics), the small ruminant network (meeting every six months this year), and the alternative species network, which did not meet due to industry slowdowns in recent years.

Meetings were held every three to six months with OMAFRA co-leads to share and participate in educational programing to enhance network functionality. As well, each of the OMAFRA network co-leads provided an annual report at one of the monthly meetings with the Co-Chairs of the AHL PMC present. The OAHN Coordinator also provided bimonthly updates to the OAHN Admin Team on OAHN activities as well as providing financial reporting as requested to the AHL PMC.

The OAHN website has both a public/producer side and a password-protected veterinary side. Documents on the public side, such as quarterly producer/owner reports, are freely accessible on the web. Quarterly veterinary reports are posted on the private side of the website for veterinarians and registered veterinary technicians to access.

Page views on the OAHN website totaled 50,143, with 160 new registered users this year. OAHN newsletter subscribers include 850 Ontario veterinarians, 270 other veterinarians, and 1,700 subscribers in total (down from last year, as each list was scrubbed for organization, emails were tested to ensure they were current, and each and every subscriber was verified). There were more than 275,000 social media post impressions (160,000 - Facebook, 115,000 - Twitter), seven new podcasts, and 4,000 podcast listens this year. Resources created by the networks were viewed 21,000 times on the website. Veterinary medical listservs (bee, fish, and small flock poultry) had 35 new veterinarian members this year, and a total of 172 members.

Selected impact statistics are included below:

- 1,500 downloads of the Infection Prevention Control guidelines (3,900 page views)
- 3,800 page views of OAHN infographics
- 3,000 page views of COVID-related resources
- 7,000 engagements over Twitter/FB (clicks, comments, likes)
- 3,500 views on YouTube
- 350 followers on the new Instagram account

Integration with National Surveillance

OAHN contributed to CAHSS, which is a 'network of networks', in the following ways:

- Maria Spinato (AHL) and Tim Pasma (OMAFRA) were members of the Directors Group and the Core Team.
- Several staff from AHL (Maria Spinato, Melanie Barham, and Jim Fairles) rated pings for CEZD (Community for Emerging and Zoonotic Disease), which is now included under the CAHSS umbrella.
- Both OMAFRA and AHL participated in various CAHSS committees – swine, poultry, equine, bovine, web development, infectious disease reporting, vector-borne diseases – that are under development, and are discussing next steps.
- Network Coordinator and equine network co-lead participated in regular disease surveillance calls with Equestrian Canada industry group to share OAHN information and support the initiative.
- Network Coordinator communicated with other provincial surveillance networks every two months throughout the year.
- Network projects were reviewed at CPHAZ conference and network members and co-leads attended to develop connections with public health and other medical professionals.

5.4.7 KTT and Learning Opportunities

AHL continues to engage in committee and scientific meetings, which contributes to increased knowledge and expertise and a One Health approach to animal health.

The KTT and Learning Opportunities information illustrates the knowledge and expertise gained by AHL staff throughout the 2020/21 year. The measure for the reporting requirement outlines the number of opportunities for engagement and knowledge transfer that took place during the year.

AHL maintains a record of staff participation in national and provincial committees and scientific meetings. It includes information regarding officer roles in these organizations held by staff. Two international organizations are included: American Association of Veterinary Laboratory Diagnosticians (AAVLD) and the American College of Veterinary Pathologists (ACVP), given that participating in these organizations contributes to international and thus national policy. This tabulation is otherwise limited to national and provincial bodies or committees to which AHL veterinary staff members belong. Many AHL staff are also regular members of various international and local organizations, which have not been included.

Participation in the large number of provincial and national veterinary organizations provides an opportunity to interact with both private practitioner colleagues, as well as industry, and brings a laboratory perspective to the issues of the day that impact or inform policy development. OMAFRA representatives are usually present at these meetings as well, and both AHL and OMAFRA staff participate in and share information within all the OAHN expert networks.

KTT and Learning Opportunity Highlights

- 17 of 20 AHL veterinarians/supervisors participated in 89 meetings of 35 international and 125 national organizations (total 861 hours) and participated in 175 meetings of 21 provincial organizations (total 507 hours).
- All 20 AHL veterinarians/supervisors participated on federal and/or provincial animal health strategy committees and 17 attended meetings or conferences for these committees in 2020/21.
- Average of 83.8 meeting hours per year spent on relevant committees per staff member, equivalent to 4.8% of available personnel time (4.4% in the previous year).

- Veterinarians/supervisors attended two court appearances, had 40 publications, 12 peer-reviewed articles, 74 scientific newsletter articles, 18 podcasts, 31 oral presentations, five poster presentations, and provided ten tours of AHL.
- Quarterly AHL Newsletter published seven Ruminant, eleven Swine, ten Avian/Fur/Exotic & Fish species, eight Equine, eight Companion Animal articles, as well as four general/updates /announcements/OAHN items in 2020/21.

Participation in the Canadian Animal Health Surveillance Network (CAHSN) has been most useful in helping to train and equip AHL staff to deal with a foreign animal disease event at an enhanced level of preparedness, also a key requirement of the OMAFRA/UofG Agreement. AHL and OMAFRA exchange and integrate information from many sources through vehicles such as OAHN, and hence serve as a cornerstone for the larger Ontario Animal Health System and related public health bodies.

Cross-Canada representation is gained through participation in the Canadian Animal Health Laboratorians Network (CAHLN) annual meeting. Given the escalation in COVID-19 cases, the CAHLN executive made the decision to cancel the 19th annual CAHLN meeting that was to be held June 1-3, 2020, in Calgary. The 2021 CAHLN meeting is scheduled to be held virtually from Calgary, AB on June 7-9, 2021.

This meeting will include participants from national (CFIA), provincial and university-based laboratories, in addition to industry representatives serving these organizations. Other annual meetings held concurrently are the Canadian Association of Veterinary Pathologists (CAVP), the Canadian Animal Health Surveillance Network (CAHSN), and the transmissible spongiform encephalopathy (TSE) Lab Network.

AHL staff members are also regular participants at numerous conferences, for example the Ontario Veterinary Medical Association (OVMA) and the Ontario Association of Veterinary Technicians (OAVT) annual conferences, both as exhibitors and as guest speakers or expert panel members. Dr. Fairles (supported by Ms. Josie Given and Ms. Rina Pigozzo) actively markets the services of AHL and is in regular contact with clients. The AHL was not involved in either of these events in 2020/21 due to the COVID-19 pandemic.

5.4.8 New Tests and/or Method Development

New tests and methods are developed and/or adapted in response to industry needs, as approved by the AHL PMC. Table 5.21 provides a list of the new tests developed, the adoption of tests developed by other laboratories and any AHL PMC approved in-year modifications to tests and methods for 2020/21.

Table 5.21: New or Improved Tests in 2020/21

Test Name - Method	Code	Species
Anaplasma marginale and *A. centrale* - duplex qPCR	anapcr	Bov, Oth
Avian metapneumovirus (AMPV) – ELISA	ampve	Av, Turk
Bacterial count, total viable, fish feces	fishfc	Oth
Bacterial culture - *Campylobacter fetus* sbsp *venerealis*	cultcfv	Bov
Bacterial culture, *Salmonella* enrichment	saladd	Av, Bov, Cap, Ch, Ov, Porc, Turk
Bismuth – ICPMS	biicpms	Oth

Test Name - Method	Code	Species
Bovine astrovirus – PCR	boastpc	Bov
Chicken proventricular necrosis virus - PCR	cpnvpcr	Av, Ch
Comprehensive Bovine Respiratory Disease Panel	brsppnl	Bov
Cryptosporidium species – PCR	crypto	Av, Bov, Can, Cap, Ch, Eq, Fel, Ov, Porc, Turk, Oth
Hatchery, excess mortality - S. pullorum / S. gallinarum culture	hsfem	Av, Ch, Turk
Hatchery, reactor - *Salmonella* culture	hsfre	Av, Ch, Turk
Renibacterium salmoninarum - qPCR (Bacterial Kidney Disease)	bkdpcr	Oth
Rotavirus, group A - Sequencing	rotaAse	Can, Oth, Porc
Rotavirus, group B - Sequencing	rotaBse	Can, Oth, Porc
Rotavirus, group C - Sequencing	rotaCse	Can, Oth, Porc
Salmonella Dublin - PCR	sdpcr	Bov
Severe acute respiratory syndrome coronavirus 2 - E - PCR	sarsepc	Can, Fel, Oth
Severe acute respiratory syndrome coronavirus 2 - E - PCR Surveillance	sarsesu	Oth
Severe acute respiratory syndrome coronavirus 2 - R - PCR	sarsrpc	Can, Fel, Oth
Severe acute respiratory syndrome coronavirus 2 - R - PCR Surveillance	sarsrsu	Oth
Swine dystrophin - genotyping	dystype	Porc
Ureaplasma culture, semen	uculs	Bov, Cap, Eq, Ov, Porc, Oth
WGS - Whole Genome Sequencing	wgs bac	Av, Bov, Can, Cap, Eq, Fel, Ov, Porc, Ch, Turk, Oth

5.4.9 Premises Identification

The Premises Identification Number (PID) is a unique number used to register parcels of land in Ontario associated with agri-food activities with the Provincial Premises Registry. The PID is used for the purposes of tracing sample source when necessary. The PID performance indicator has been converted into a reporting requirement, as approved by Executive Committee on June 2, 2021.

Premises Identification Numbers are reported as the percentage of PIDs available in the AHL database by commodity. Table 5.22 illustrates the PID results, by year and commodity, over the term of the Agreement. There has been an increase in the percentage of PIDs for three of the six commodities over the past year, with significant growth in swine and moderate growth in cattle and avian.

PID numbers fluctuate as new clients are added to the AHL database. While AHL Client Services staff encourage all clients to enroll and obtain a PID, compliance is voluntary and therefore, improvements in participation are largely outside of AHL's control. OMAFRA is investigating other potential avenues to increase PID use.

Table 5.22: Percentage of PIDs Available by Year and Commodity Over the Term of the Agreement

Metric	2018/19	2019/20	2020/21	2021/22	2022/23
PIDs Available - Swine	53.7%	73.6%	**80.9%**		
PIDs Available - Cattle	11.2%	11%	**11.4%**		
PIDs Available - Small Ruminant	4.4%	1.9%	**1.9%**		
PIDs Available - Camelids Cervids Rabbits	0.4%	0.0%	**0.0%**		
PIDs Available - Avian (Chicken, Turkey, Other)	0.0%	0.9%	**1.1%**		
PIDs Available - Fish / Bees	0.0%	0.0%	**0.0%**		

6 AGRICULTURE AND FOOD LABORATORY

The Agriculture and Food Laboratory's (AFL) vision is to be a laboratory partner of choice for governments and universities in Canada, in support of agriculture, food safety, and animal health testing. In addition, AFL is a leader in providing high-value laboratory services to the academic and private sectors in selected niche markets. AFL's mission is "Working together toward a healthier future … providing high-value analytical and diagnostic services for the agricultural, food and veterinary sectors." As part of the Laboratory Services Division (LSD), along with the Animal Health Laboratory, AFL continues to optimize the leveraging of services offered within the OMAFRA/UofG Agreement to other government, commercial and academic clients, while maintaining its status as a self-sustaining division of the UofG. Taking a steady path strategically, AFL will continue to leverage both its reputation and services, while aggressively containing costs and taking a targeted approach to increasing third-party revenue generation. AFL's advanced-level technological expertise will continue to differentiate it from the competition. Leveraging of AFL services benefits both AFL and OMAFRA, through means such as:

i. **Introducing Efficiencies in Economies of Scale**

   Scope expansion provides a cost-effective approach to residue detection methods in both veterinary drug and pesticide residues and allows OMAFRA to maintain current sampling intensity, while improving detection limits and increasing the number of analytes provided in the data. This supports the Foods of Plant Origin monitoring program (OH0001), as well as the Meat Inspection programs (i.e., 1045, 1002, 1001). In addition, expanding AFL's current expertise through projects with third-party clients allows for this new expertise and/or technology, for example whole genome sequencing, to be readily applied to OMAFRA programs.

ii. **Timely Delivery of Laboratory Test Results to Allow for Optimal Regulatory Response**

   AFL has more than 20 years of experience meeting performance indicator targets. Key aspects of the results reporting process ensures that a strategic OMAFRA staff member receives notification of any alertable results obtained by the laboratory, including outside of normal working hours.

As AFL enters the fourth year of the current Agreement, insights gained by accomplishments and challenges from the past year will contribute to future directions. Facing the need to adjust to a global pandemic while maintaining key OMAFRA programs, AFL was able to sustain regulatory and food safety initiatives, while preserving high-level service delivery to all clients. Over the next year, AFL will continue to focus on client service excellence as a means to securing its current market share and reputation. AFL will also pursue targeted marketing activities to build revenue in identified niche areas, with the goal of building external revenues for reinvestment and sustainability. Finally, AFL will continue to develop and maintain partnerships with regulatory partners and private sector organizations to secure its role as a "laboratory partner of choice" across Canada.

6.1 Program Activities and Achievements from 2020/21

AFL is an active, contributing partner to OMAFRA in helping achieve the protection of public health and food safety, plant health, the environment, and the Ontario economy. Through the provision of in-house scientific expertise, high-value laboratory services, applied research, method development, and provincially aligned emergency response programs, AFL aims to support OMAFRA in securing public confidence in the quality and safety of the agriculture, environment, and food sectors in Ontario.

AFL accredited testing and other activities help to ensure that OMAFRA receives reliable laboratory data, while supporting compliance to the regulatory standards and requirements of various Food Safety legislation (e.g., Provincial Milk Act, the Food Safety and Quality Act, 2001). In 2020/21, AFL exceeded the requirement to ensure that all "alertable" test results were reported quickly and accurately to allow rapid response by OMAFRA for situations requiring regulatory action.

In 2020/21, 99.9% of all tests were reported accurately (44,356 out of 44,407). This high success rate is reflective of a very strong quality system and constant monitoring of AFL's processes and systems to ensure the highest standards of accuracy are met. AFL also exceeded the 98% performance target in effectively communicating all actionable test results to OMAFRA.

In February 2021, AFL, as part of LSD, successfully underwent its biennial Standards Council of Canada (SCC) GLP audit and remains the primary GLP-recognized laboratory in Canada. This recognition allows AFL to provide strong support to OMAFRA and the growers of Ontario. AFL will undergo its regular biennial Standards Council of Canada (SCC) and Canadian Association for Laboratory Accreditation Inc. (CALA) audits again in October 2021. Every two years, AFL is audited by SCC and CALA in order to maintain its accreditation to the International OIE Standard ISO/IEC 17025:2017.

AFL's method development activities are designed to meet the changing regulatory standards and requirements that OMAFRA faces in each of its program areas as well as to ensure access to new and improved methods in support of a variety of needs. AFL continues to improve and provide updated methods for OMAFRA in all sections. In 2020/21 the following methods were verified and are available for future testing needs:

- The customized Multiple Target Analyte (MTA) method, which was installed in 2019/20, was further expanded to increase the number of analytes and species applications significantly. This priority list item was successfully implemented by May 1, 2021 and is now available to provide an enhanced meat surveillance and monitoring program for the 2021/22 testing year.
- A sensitive and specific method for the determination of chlorate and perchlorate in milk was developed and validated and is now available for any future testing that may be requested by OMAFRA.
- Verification and installation of CHEM-346 - Potentially mineralizable nitrogen in soil (Cornell soil health method) occurred in the Soil & Nutrient Laboratory. Request from OMAFRA (Daniel Saurette, Land Resource Specialist, Environmental Management Branch) to process approximately 900 samples by April 1, 2021.
- Insect identification method was developed using DNA barcoding in the Pest Diagnostic Clinic (method PDC-124).
- Improvements were made to the method for Handling and Confirmation of Thermophilic *Campylobacter (*MID-241).
- A new protocol was installed for Semi-Quantitative Detection of Spotted Wing Drosophila (SWD) (*Drosophila suzukii*) in Trap Samples by the Polymerase Chain Reaction (PCR) Technology (MOL-277) (Research Grant 2019-2020).
- A protocol was installed for Subtyping of *Listeria innocua* using Multiple Locus Variable Number of Tandem Repeat Analysis (MLVA) (MOL-278).
- A new protocol was installed for Detection of *Ginkgo biloba* in Natural Health Products by PCR Technology (MOL-291).

In addition, the following new methods are ready to be installed as needed. These methods were validated by AFL and approved by the Microbiology Method Committee (MMC), Health Canada.

- MFLP-98 Detection of *E. coli* O157:H7 in Food Products by the VIDAS® UP *E. coli* O157 (including H7) Method - Nov 2020.
- MFLP-100 Detection of *Salmonella* spp. in Foods Using the 3M™ Molecular Detection System Test Kit Version 2 - May 2020.
- MFLP-110 Detection of *Listeria monocytogenes* in dairy products using the ANSR® for *Listeria monocytogenes* test kit - August 2020.

AFL also completed several OMAFRA baseline studies including:

- Project code 5020 - Beef microbiological baseline study (October 2019 – March 2021).
- Project code 5021 - Poultry carcass anti-microbial intervention study (November 2019 - March 2021).
- Project code 5022 - Non-bovine red meat anti-microbial intervention study (November 2019 - March 2021).
- FS2017-3246 - Microbiological Survey of Sushi Sold in Ontario (via OMAFRA Food Safety Research Program).
- Project OH0001 - Glyphosate residue in Ontario-grown fresh produce.
- Project OH0004 - Glyphosate residue in Ontario honey.

An opportunity for new third-party revenue was identified in the emerging cannabis testing market in 2019/20. AFL successfully became an Analytical Testing licence holder under the Cannabis Act in 2020. Since this time, all operational units have been actively installing methods and processes required to support testing in this new, highly-regulated industry. AFL anticipates launching testing services for the Cannabis industry in Summer 2021. This industry will require services extending across all operational units in AFL.

Collaborative research and other projects also expand services available to OMAFRA. Analysis for the development and the expansion of the composition test panel delivered to the Dairy Farmers of Ontario (DFO) demonstrates AFL's commitment to OMAFRA to support any program issues that may arise periodically in this industry. AFL is pleased to be entering its sixth year of a contract extension with DFO and the Ontario Dairy Council (ODC), processing more than 800,000 samples annually.

In the 2020/21 Business Plan, AFL identified that it would be responding to CFIA's Standing Offer for analytical services for chemical residue testing. Because of the COVID-19 pandemic, this bid has been delayed and is now due in September 2021, with an anticipated start date in 2022/23. In the meantime, AFL received a one year extension on their current agreement with CFIA for the testing, covering 2021/22. When awarded, the contract will be for at least two years, and possibly as many as four.

AFL staff provide high value, impactful scientific support to OMAFRA and UofG researchers. AFL staff are actively involved in Knowledge Translation and Transfer (KTT) activities, completing research projects, and publishing in peer-reviewed journals. This instils public confidence in AFL and ensures it remains on the cutting edge of new developments in laboratory research and testing. A full list of KTT activities is provided in Appendix D. A few key examples are included below:

1. Atinuke M. Olajide, Shu Chen, and Gisèle LaPointe. Markers to rapidly distinguish *Bacillus paralicheniformis* from the very close relative, *B. licheniformis*. Frontiers in Microbiology. 2021. 11:596828.

2. Atinuke M. Olajide, Shu Chen, and Gisèle LaPointe. Draft genome sequences of five *Paenibacillus* species of dairy origin. Microbiology Resource Announcement. 2020. 9(37): e00971-20.

3. Linton N.F., Machado P.V.F., Deen B., Wagner-Riddle C., Dunfield K.E. Long-Term Diverse Rotation Alters Nitrogen Cycling Bacterial Groups and Nitrous Oxide Emissions After Nitrogen Fertilization. Soil Biology and Biochemistry, 149: 107917, 2020.

AFL continues to work with stakeholders and external groups, such as DFO, to protect industry competitiveness in Ontario. AFL provides and responds to emerging information on new methods of interest to the dairy sector (e.g., chlorate/perchlorate detection in raw milk (cow and goat)).

AFL prioritizes maintaining an advanced level of technology in instruments, capacity and expertise, thus is well positioned to respond to all of OMAFRA's needs. These include: urgent or emergency situations such as the COVID-19 pandemic; food-borne pathogen outbreaks and investigations (STEC testing protocol, replacement of PFGE with WGS); detection of newly developed pesticides (AFL continues to add to the current list of over 500 compounds); or off-label veterinary drug use, MTA method). For more than twenty years, AFL has consistently met testing and service performance measures including those laid out in the Agreement.

Finally, AFL continues to provide comprehensive and successful management of activities occurring during the global COVID-19 pandemic while maintaining services essential to the release and sale of safe food and beverages in Ontario. This is discussed further below.

COVID-19

In the fourth quarter of 2019/20, the COVID-19 pandemic resulted in emergency measures being implemented across the Laboratory Services Division starting March 17, 2020. The pandemic continued throughout the entire 2020/21 testing year and may extend throughout 2021/22.

At the start of the pandemic, AFL implemented operational changes to meet recommendations from Public Health Ontario. Incident Management System (IMS) communications occurred with OMAFRA and other clients as required. Significant planning for business continuity and the prioritization of food safety testing also happened.

During the pandemic, communications with AFL PMC members occurred electronically to identify any operational changes required at AFL and OMAFRA. All actions taken by AFL were sanctioned by the AFL PMC.

In keeping with national and provincial emergency measures, AFL reduced the occupancy at 95 Stone Road by approximately 50% and staff began working various rotating schedules. This facilitated physical distancing while in the laboratories and enabled other work to be completed remotely. AFL returned to full on-site staffing in the operational laboratories by August 2020. AFL support staff continue to work virtually, as well as in the lab as needed.

Reduction of staffing for the first five months of the pandemic required the prioritization of testing and extension of some turnaround times (TAT). In a series of electronic meetings, emails and telephone discussions, OMAFRA identified their top priority projects; these were mainly surveillance projects aimed at detecting veterinary drug residues in raw meat, raw milk testing, water testing and any food safety issues identified across Ontario. Routine monitoring projects for meat, dairy, foods of plant origin, and agricultural development programs were maintained to the extent that AFL's reduced capacity allowed. Raw milk testing for cow and goat milk is a service that is essential to the continued sale of milk in Ontario. AFL was able to continue full testing capacity for milk producers, while supporting this regulatory requirement and maintaining on-call and after-hour confirmation of positive milk loads identified in field testing. Due to COVID-19 impacts, over the first three quarters of 2020/21, OMAFRA was able to collect 84% of its allotted samples, as compared to the typical five-year rolling average of 94%. Regular status updates on lab capacity and protocols were provided to AFL PMC and DFO. This provided the opportunity to address concerns with delivery of services, or receipt of samples in real time.

Despite the on-going pandemic and reduction of staff, and in tandem with changes in OMAFRA and other clients' workflows, AFL continued to meet the prioritized testing needs of OMAFRA, as well as dairy testing for the Dairy Farmers of Ontario, and other food safety related testing identified as essential to the continued flow

of food throughout the province. AFL is proud of its staff who have continued to work throughout the emergency to provide essential testing, in order to support the supply and sale of food and beverage products in Ontario.

6.2 Mandatory Compliance Requirements

6.2.1 Increase in Revenues

AFL achieved third-party revenue of $7.917M in 2020/21, a reduction of 9.2% over the 2019/20 third-party revenue of $8.715M. Thus, AFL did not meet the Agreement's mandatory compliance requirement for a 2.5% annual increase in revenues. This shortfall can be attributed to the COVID-19 pandemic which resulted in lost external revenue. AFL saw a significant overall decline in large projects and in sample numbers coming from external sources during 2020/21, causing AFL to miss its revenue growth target.

It is expected that AFL will achieve the mandatory compliance requirement of 2.5% revenue growth over the 2020/21 third-party revenue of $7.917M in 2021/22. Sample and test numbers from all sources appear to be returning to pre-COVID levels. This trend is expected to continue, barring any new or resurgent COVID-19 restrictions.

In the coming year, AFL will be leveraging opportunities for growth in pesticide GLP testing, microbiology, and agricultural soil and plant disease testing. Identifying niche market opportunities, along with applied research projects with industry and government partners, are vital elements of the growth strategy. Ongoing success for AFL relies on increased and diversified revenues from third-party organizations.

6.2.2 Emergency Response Plan and Surge Capacity Plan

AFL has an Emergency Response and Surge Capacity Plan in place. Both are comprehensive and ensure that AFL can fulfill the objectives of the Program Schedule. The plan outlines business continuity procedures in the event of critical infrastructure outages, staff unavailability, pandemics, facility inaccessibility/evacuation or a surge in service requirements. The Emergency Response Plan continues to be used to respond to the emergency measures implemented in Ontario in March 2020, in response to the COVID-19 pandemic. AFL rapidly mobilized a comprehensive and successful Incident Management Plan (IMP), maintaining services to clients essential to their businesses and to the release of safe food and beverages in Ontario. The majority of services continued to be provided at AFL, including managing 100% of dairy samples. This was achieved through strategic rotation of staff through on-site shifts.

6.2.3 Emergency Simulation Exercises

Emergency Response procedures at AFL have been developed to mirror the OMAFRA Emergency Response program. This Incident Management Plan (IMP) is aligned with OMAFRA to further protect OMAFRA's need for continuity in laboratory services in difficult times. AFL is committed to ongoing development in the areas of staff training, continuous updating and improvement of programs, and documentation.

Although no formal exercises were performed in 2020/21, testing interruptions from COVID-19 and sporadic maintenance issues required AFL to regularly communicate and adapt testing situations with OMAFRA.

6.2.4 Capacity Strategy Plan

To address requirements for expertise in existing and emerging areas, AFL maintains a staff complement with advanced scientific training, develops in-house knowledge and skills, and provides further education and experience opportunities where feasible.

By maintaining very high-quality testing and program delivery, including emergency preparedness, AFL Program outcomes are achieved, thus ensuring that these services continue to meet the changing needs of the agriculture, food processing, horticulture, and plant health sectors in Ontario.

6.2.5 Capital Strategy Plan

As outlined in the AFL Business Plan, a capital expenditure program (CAPEX) has been a long-term activity of the Laboratory Services Division. Equipment and instruments are closely monitored, identifying requirements for repair or replacement. Also, the need for additional equipment for testing to support new methods is considered. The Division follows a scheduled plan to replace computer hardware and software as the organization faces growing volumes of data. This equipment is necessary for the ongoing operation of AFL.

In 2020/21, the AFL effectively met the annual challenge of maintaining capital intensive technology and infrastructure. AFL continues to reinvest in those capital items, strategically identified by its management team, in keeping with the available financial resources. Ongoing support from OMAFRA's Capital Expenditure Fund for equipment purchases is a critical part of this process, given the challenges in securing external funds for reinvestment. In 2020/21, OMAFRA's capital investment of $500,000 was used to replace a Liquid Chromatography – Mass Spectrometer (LC-MS/MS). This unit supports multiple testing programs throughout Schedule D.

Other equipment purchases required for the ongoing support of OMAFRA programs and third-party testing needs are funded from operating income in excess of budget and from program carry forwards. In 2021/22, the lab anticipates replacing a Milkoscan/Somatic Cell Counter (dairy) instrument that is beyond its lifespan and critical to the ongoing operation of the Dairy Analysis Lab. The lab will be replacing it with a CombiFoss unit, which will provide stability for dairy testing.

6.2.6 Resources and Capacity to Administer AFL

The University confirms that it has the necessary resources, including technical and support staff to administer AFL. Linda Lissemore, Co-Executive Director of Laboratory Services Division and Director of AFL continued to provide outstanding leadership and support of the governance structure as an AFL PMC Co-Chair. The Director of Finance plus two additional positions are dedicated to managing all AFL activities related to the OMAFRA/UofG Agreement.

AFL cross-trains within a discipline where possible to allow for leveraging of staff skills for OMAFRA and third-party testing. This approach protects the organization from the risk of losing specific skills through staff turnover. Table 6.1 provides the highest degree earned for AFL's staff complement.

Table 6.1: 2020/21 AFL Staff Complement by Highest Degree Earned

Doctoral (e.g., PhD)	Advanced (e.g., MSc)	Undergraduate	Other	Total
10	28	72	29	139

The flexibility afforded in using cross-trained technicians and/or adding temporary positions, in cases of sudden or short-term capacity demands, allows AFL to meet OMAFRA's needs when additional testing is required beyond the annual testing plan.

Each case for cross-training is considered individually and includes an assessment of its impact on delivery of the annual testing plan.

6.2.7 Annual Summary of the ISO 17025 Accreditation Report

LSD, including the AFL, is accredited by both of Canada's internationally recognized accrediting bodies, the Standards Council of Canada (SCC) and the Canadian Association for Laboratory Accreditation (CALA) to the ISO/IEC 17025 standard, for specific tests listed on the scopes of accreditation. LSD is accredited by SCC in two program specialty areas:

- Agriculture Inputs, Food, Animal Health and Plant Protection (AFAP); and
- Test Method Development and Evaluation and Non-Routine Testing (TMD/NRT).

In addition, AFL is recognized as a GLP test facility/test site by the SCC.

Based on the June 6, 2021 SCC scope, LSD has 101 accredited tests listed on their SCC scope, 89 AFL tests and 12 AHL tests. For a method to be accredited, competence must be demonstrated by submitting the method, forms, training records, validation/verification records, proficiency testing results, and an internal audit report to SCC for inspection. SCC will conduct their next biennial audit of LSD virtually in Fall 2021.

Since June 2020, AFL removed accreditation for test *MLG 4C.07 (MID-219) FSIS Procedure for the Use of a Polymerase Chain Reaction (PCR) Assay for Screening Salmonella in Meat, Poultry, Egg, and Siluriformes (Fish) Products and Carcass and Environmental Sponges* and added accreditation for the following six tests:

1. CHEM-714 Daminozide in fresh and processed fruits and vegetables by LC-MS/MS
2. MFHPB-18 Determination of the Aerobic Colony Counts in Foods (MID-101)
3. MFHPB-22 Enumeration of yeasts and moulds in foods (MID-129)
4. MFHPB-27 Enumeration of *Escherichia coli* in Foods by a Direct Plating (DP) Method (MID-258)
5. MFHPB-31 Determination of coliforms in foods using Violet red bile agar (MID-285)
6. MOL-198 Plant, animal, and fish species ID determination by DNA barcoding

Based on the current December 11, 2020 scope, AFL is accredited by CALA for eight environmental tests (11 CALA appendices) – one molecular test, three chemistry pesticide tests, one soil and nutrient lab test and three microbiological tests. Three CALA accredited microbiology tests are also licensed under the Ontario Safe Drinking Water Act (OSDWA).

Schedule D – Accreditation

In 2020/21, under Schedule D, LSD/AFL provides testing service for three programs within the Food Inspection Branch. The majority of these tests are accredited to the ISO/IEC 17025 quality standard. Table 6.2 summarizes the accreditation status of tests used for OMAFRA Food Inspection Branch. Note that some methods are used to analyze multiple parameters (e.g., CHEM-337 MTA is used to analyze samples for multiple drug classes).

Table 6.2: Accreditation Status of Tests used for OMAFRA Food Inspection Branch

Branch	Number of Tests	SCC accredited	CALA accredited
Meat Inspection Program	27	20	2
Dairy Food Safety Program	50	40	2
Food of Plant Origin Program	40	25	1
Total	**117**	**85**	**5**

In addition, LSD/AFL performs 49 tests for the Horticulture and Agriculture Land Use program and the Environmental Management program, 13 of the tests are accredited by SCC, CALA or OMAFRA soil fertility program.

6.2.8 AFL Program Sample Testing Data

Quarterly reports are provided by AFL to OMAFRA demonstrating compliance with the performance indicators for sample testing data. AFL and OMAFRA have integrated their information management systems to allow for seamless transfer of data between organizations. Please see Section 6.3.3 for the annual summary of the performance data.

6.2.9 Changes to Methods or Testing Protocols Used in Ministry Samples

AFL acknowledges that communication to the Ministry of any program method changes is a mandatory requirement of the Agreement. Changes to methods/testing protocols within the OMAFRA program samples are verified and documented differently dependent on the required level of approvals at OMAFRA. The following verification methods are accepted by OMAFRA and AFL to enact a change:

- Authorized interface protocol document;
- Authorized memo from the Director of the Food Safety Systems Development Branch;
- Officially distributed annual Sampling and Testing Requirements document; and
- Decisions documented in meeting minutes.

AFL remained in compliance with this requirement throughout 2020/21.

6.2.10 Notifications to the Ministry

The OMAFRA Annual Sample and Testing Plan and the Sample and Testing Requirements documents provide AFL with the number of tests allocated and the methods required, as well as test result thresholds at which the Ministry wishes to be contacted. OMAFRA and AFL follow a standard operating procedure for making notifications for “alertable” results.

AFL exceeds the requirement to ensure that all “alertable” test results are reported quickly and accurately to allow rapid response by OMAFRA for situations requiring regulatory action.

While the Ministry tracks the number of samples that it has provided each fiscal quarter, AFL also tracks the number of samples received that are suitable for testing, unsuitable for testing or that have insufficient volume for testing. AFL notifies the Ministry for further direction in the case of unsuitable or insufficient samples.

AFL and the Ministry collaborate to ensure that only high integrity samples are used for Ontario's regulatory testing program. In 2020/21, the impacts of the pandemic added another level of complexity to OMAFRA's sample delivery system. Due to COVID-19, couriers faced reduced staffing and significant increases in the demand for package delivery. Courier companies were no longer meeting their agreed upon expedited shipping times and sample quality started to degrade in transit. This resulted in a higher number than normal of OMAFRA samples arriving at AFL as unsuitable for testing. The need for OMAFRA to provide substitute samples increased costs for sample collection. In addition, the warm summer months caused a higher risk of sample deterioration since samples sat even longer in unrefrigerated warehouses and courier trucks. The problem was eventually resolved, as the pandemic progressed, and couriers re-established service times.

The implementation of automated "time in transit" recording in the AFL LIMS, in 2018/19, provides additional data to consider when assessing the quality of the test sample that is reported by AFL. This allows OMAFRA to adjust the sampling training and/or collection process as needed to ensure the highest quality samples are obtained for testing. It has proven to be a highly useful tool during the pandemic in assessing sample integrity when courier services are suboptimal.

6.3 Key Performance Indicators

6.3.1 Emergency Preparedness

AFL is prepared for future emergencies requiring laboratory services related to food, plant and environment, and implements recommendations for improvement made by IMS during emergency simulation exercises.

The COVID-19 pandemic continues to provide a real-time application of the AFL's Emergency Preparedness protocols. AFL achieved the target for 100% of action requests meeting implementation targets set by the AFL Program Management Committee.

AFL continues to meet the Ministry's requirements during the pandemic for prioritizing samples and providing ongoing services within a modified workplace.

6.3.2 Emergency Situations

AFL continues to successfully support the Ministry in response to, and management of, significant, unanticipated, or urgent incidence of food safety, environmental, health and plant/pest emergencies. This includes any requirement for the development of new tests or test methods and against criteria including timeliness, effective diagnoses, communication of test results, monitoring and reporting of test results, monitoring and reporting of surveillance data, and participation with stakeholders. AFL appropriately carries out its responsibilities under Emergency Situations to support the Ministry effectively through: 1) the development of new tests required to address urgent incidents and to improve response capability in the future; and 2) response to serious food safety events using existing testing methods and improving future response capabilities.

Any emergency situations are reported on a quarterly basis at the AFL PMC meetings. The University was able to reach the expectation that 100% of action requests met the implementation targets set by PMC.

6.3.3 High Quality Reliable Laboratory Results

Tables 6.3 to 6.5 show performance measures for the percentage of completed tests that comply with the quality and service level standards and requirements, as detailed in the Annual Testing Plan Agreement, related to turnaround times for screening and confirmation, corrected reports, and samples that are unsuitable for testing. These parameters are used to assess the proportion of completed tests that meet quality, sample integrity and service level standards. This parameter is reported quarterly at the AFL PMC meeting.

The performance measures are the percentage of completed tests that comply with turnaround times, the percentage of corrected reports, and the percentage of samples which are unsuitable for testing. The targets require the compliance with turnaround times to exceed 98% and both corrected reports and unsuitable samples for testing to be less than 2%. The Food Safety Program and 2020/21 Summary are expressed as weighted averages.

In 2020/21, there was 99.0% compliance for the Food Safety Program with respect to turnaround times, exceeding the service standard of 98%. There was a 0.11% rate of corrected reports for the Food Safety Program, which met the requirement that corrected reports be less than 2%. Finally, in 2020/21, there was a 0.26% rate of samples unsuitable for testing in the Food Safety Program. This exceeded the service standard that samples unsuitable for testing be less than 2%. Table 6.6 shows these performance metrics over the term of the Agreement.

Table 6.3: 2020/21 Compliance with Turnaround Times in the Food Safety Program

Program	Q1	Q2	Q3	Q4	2020/21
Meat Inspection Program	99.9%	99.1%	95.2%	99.2%	**98.5%**
Foods of Plant Origin	100%	99.9%	91.1%	99.3%	**99.9%**
Dairy Food Safety Program	100%	99.9%	98.4%	99.7%	**99.5%**
Food Safety Program (Total)	**99.9%**	**99.5%**	**98.8%**	**99.4%**	**99.0%**
Agriculture Development Branch	98.8%	99.8%	98.3%	100%	**99.2%**

Table 6.4: 2020/21 Compliance with Corrected Reports in the Food Safety Program

Program	Q1	Q2	Q3	Q4	2020/21
Meat Inspection Program	0.02%	0.06%	0.04%	0.37%	**0.12%**
Foods of Plant Origin	0.04%	0.04%	0.71%	0.00%	**0.07%**
Dairy Food Safety Program	0.13%	0.15%	0.06%	0.15%	**0.12%**
Food Safety Program (Total)	**0.06%**	**0.08%**	**0.07%**	**0.28%**	**0.11%**
Agriculture Development Branch	0.00%	0.34%	0.00%	0.00%	**0.12%**

Table 6.5: 2020/21 Compliance with Samples Unsuitable for Testing in the Food Safety Program

Program	Q1	Q2	Q3	Q4	2020/21
Meat Inspection Program	0.80%	0.24%	0.45%	0.07%	**0.39%**
Foods of Plant Origin	0.04%	0.00%	0.71%	0.00%	**0.02%**
Dairy Food Safety Program	0.03%	0.20%	0.14	0.24%	**0.15%**
Food Safety Program (Total)	**0.41%**	**0.18%**	**0.14%**	**0.13%**	**0.26%**
Agriculture Development Branch	0.00%	0.00%	0.33%	0.00%	**0.00%**

Table 6.6: High Quality Reliable Laboratory Results in the Food Safety Program over the Term of the Agreement

Metric	2018/19	2019/20	2020/21	2021/22	2022/23	Target
Turnaround Times	99.6%	99.9%	**99.0%**			98%
Corrected Reports	0.52%	0.22%	**0.11%**			≤2%
Samples Unsuitable for Testing	0.08%	0.22%	**0.26%**			≤2%

6.3.4 Effective and Timely Communication of Violative or Actionable Test Results

AFL's Corrective Action Preventative Action (CAPA) database provides an effective tool for tracking performance incidents and continuous improvements. Within the database, AFL documents incidents of erroneous laboratory results, false positive or negative results, samples which are unsuitable for testing, and spoiled samples (including "OMAFRA sampler error"). All incidents are classified into one of three categories: administrative, technical or force majeure.

Table 6.7 provides a performance measure for the consistency with which AFL provides timely test results to OMAFRA, in case an actionable response is required. All incidents of inconsistency in providing, or potentially not providing, timely test results require an actionable response. The measurement of this performance metric is, in practice, how AFL demonstrates compliance by documenting prevention and resolution (as available) of these incidents and the performance target is set as continuous improvement and resolution of incidents based on review of incident reports. This parameter is reported quarterly at the AFL PMC meeting.

Table 6.7: 2020/21 Corrective and Preventative Actions by Quarter for 2020/21

CAPA Classification	Q1	Q2	Q3	Q4	2020/21
Administrative	2	4	5	3	**14**
Technical	0	2	1	1	**4**
Force Majeure	0	0	0	0	**0**
Total (Schedule D)	**2**	**6**	**6**	**4**	**18**

In 2020/21, the University was able to meet the target of ensuring continuous improvement and resolving incidents based on review of the incident reports.

Table 6.8 shows the corrective and preventative actions by year over the term of the Agreement. The number of reportable incidents fell from 28 in 2019/20 to 18 in 2020/21, a 36% improvement. In addition, all CAPAs from 2020/21 were deemed low risk. Many incidents were administrative in nature, due to data entry errors. These types of incidents are flagged by the quality checks within the OMAFRA and AFL information systems and do not pose a risk to the public or to AFL's reputation, key criteria considered when assigning risk.

Table 6.8: Corrective and Preventative Actions by Year Over the Term of the Agreement

Metric	2018/19	2019/20	2020/21	2021/22	2022/23
Corrective and Preventative Actions	27	28	**18**		

6.3.5 Effective Response to Incidents

In 2020/21, AFL delivered excellence in regard to compliance with communication protocols, providing effective response to food contamination and other serious plant and environmental hazards with potentially grave human health or economic consequences.

The performance measure is the percentage of tests requiring an actionable report from AFL that met communication criteria, Sampling and Testing Plan, or Standard Operating Procedure for adverse results notification. The performance target is set at 98% and, in 2020/21, the AFL met the performance target, with appropriate communication 100% of the time. All actionable results were reported to OMAFRA per 95S-028. Overall, the AFL LIMS adverse result alert program generated 449 alert emails, reporting 1,278 alertable, adverse or presumptive positive test results for 886 samples.

The proportion of test results that were alertable, adverse or presumptive positive versus the total number of tests reported was 2.88% this year, an increase from 1.25% in 2019/20.

This parameter is reported quarterly at the AFL PMC meeting.

6.3.6 Development of New/Improved Detection Methods

The performance metric for the development of new and improved detection methods is an estimate of timelines based on a list of methods requested by the Ministry. There were two priority methods listed for completion in 2020/21. The first was a revised scope of analytes and species to be included in the multi-residue drug method used to support the meat program for projects 1045, 1002 and 1001. The second method was developed and validated for testing of chlorate and perchlorate residues in milk. Performance of this test method exceeded the mandatory requirements outlined in the priority memo. Both priority methods were delivered on time and are available for use in the 2021/22 testing year. Progress with method development timelines is reported quarterly at the AFL PMC meeting.

6.4 Reporting Requirements

6.4.1 Summary of the ISO 17025 Report

See Section 6.2.7 for the summary of the ISO 17025 Report.

7 PROPERTY MANAGEMENT PROGRAM

The Property Management program supports the day-to-day operations and maintenance, repairs and use of ARIO Research Centres for research and innovation that grow and improve Ontario's agri-food sector and stimulate economic development in Ontario. The University and OMAFRA have the shared goals of continuous improvement and maximized use of research infrastructure available at the ARIO Research Centres in a manner that provides benefits to all of Ontario's regions.

7.1 Program Activities and Achievements from 2020/21

The Agreement supports a network of research centres across the province that enable field-scale discovery and validation that support Ontario's agri-food sector. The centres are owned by the Agricultural Research Institute of Ontario (ARIO) and managed by the University of Guelph through the Agreement. When considered in combination with the University's state-of-the-art research infrastructure, ranging from controlled environment facilities to leading-edge laboratories, these places create a provincial platform for excellence in agri-food research and innovation.

Ontario's Agri-Food Research Centres enable research that is field-tested at a commercial scale. The centres are also key outreach spaces where researchers and staff welcome producers, policy makers, international visitors, students, and industry partners.

In 2020/21, there were significant infrastructure development activities under ARIO's Infrastructure Strategy. These developments are detailed in Section 7.1.1.

The University continues to support the province's efforts to prepare surplus properties for sale at Alfred, Kemptville, New Liskeard, and Guelph. With the majority of capital initiatives associated with dispositions completed in 2019/20, 2020/21 focused on supporting the province's due diligence activities, clearing out vacant spaces and managing vacant buildings and spaces. In 2021/22, the University looks forward to winding up Agreement-related involvement at these locations.

COVID-19

Although the legislated response to the COVID-19 pandemic allowed for the continuation of research operations at the ARIO Locations, mitigation and safety measures impacted the Property Management program and research output during 2020/21. Consistent with public health policy, the University required that research be limited to critical and/or time-sensitive activities only, in order to minimize the number of people that needed to attend the Research Centres in person. Researchers were permitted to resume projects by the second quarter of 2020/21, as long as the policies related to pandemic response could be adhered to (e.g., physical distancing, enhanced sanitization of surfaces, use of masks, etc.). This suspension of research did impact a number of livestock projects as they take time to plan and restart. Crop projects were less affected, due to their timing and the fact that many of them were deemed time-sensitive.

It is expected that activities will return to more normal levels in 2021/22, subject to the local prevalence of the COVID-19 virus.

During 2020/21, virtual meetings of R/PM PMC occurred regularly to provide updates on the status of operations, construction and plans for managing research projects through the pandemic.

7.1.1 ARIO Properties Infrastructure Update

UofG is working closely with its partners to execute ARIO's Infrastructure Strategy, as major construction projects are underway across the province according to the long-term research objectives of the strategy. Although funded outside of the Agreement, the implementation of the Infrastructure Strategy requires considerable allocation of UofG staff resources and impacts research capacity in the short term through construction and transition.

7.1.1.1 Major Capital

In 2020/21, work continued and, in some cases, neared completion on several major capital projects across the research centre portfolio. Major capital projects are funded and managed through project-specific Transfer Payment Agreements (TPAs) between ARIO and the University which provide funding outside of the Agreement and have separate reporting requirements. Project summaries are included below.

Ontario Beef Research Centre - Elora

The Ontario Beef Research Centre (OBRC) - Elora is currently under construction through separate agreements with ARIO and funded in part by Beef Farmers of Ontario. The $15.5M initial phase of the project, which included the construction of a new cow-calf housing and handling facility, plus new office and research spaces, was completed in 2019/20. The construction of a new feed-lot facility commenced in 2020/21 and was approximately 75% complete at the end of the fiscal year. The completion of the feedlot facility by Summer 2021 will allow for the expansion of the herd housed at the OBRC, consolidating all breeding activities at one location.

The expansion and redevelopment of the pasture facilities associated with the OBRC were also ongoing throughout the year, funded through the Minor Capital program. The expansion portion of the pasture project, providing approximately 50 hectares of new managed pasture with a central handling facility, was completed in 2019/20. The redevelopment aspect of the project, improving approximately 60 hectares of existing pasture with updated handling facilities, fencing and utilities, commenced in 2020/21 and was approximately 75% complete at the end of the fiscal year.

Precision Feed Preparation and Storage Facility - Elora

The existing feed storage facility at the Elora Research Station for the Ontario Dairy Research Centre and the Ontario Beef Research Centre is being replaced with a new Precision Feed Preparation and Storage Facility. This $9.45M facility will provide new capacity for the preparation of precise and consistent research rations for the dairy and beef herds, as well as expanded feed storage capacity, in anticipation of the expansion of the beef research herd due to the transfer of cattle from the Ontario Beef Research Centre – New Liskeard. The Precision Feed Preparation portion of the project was completed and put into operation in January 2021. The storage portion of the project was approximately 80% complete at the end of the fiscal year and will be completed in time for harvest through the Summer and Fall of 2021.

Ontario Swine Research Centre - Elora

ARIO and the University executed a $15M TPA in December 2018 for the construction of a new swine research centre at the Elora Research Station. This facility will replace the existing, aged facility at the Arkell Research Station. A design and construction committee, including UofG faculty and staff, industry (Ontario Pork) representatives and OMAFRA staff, have met regularly through 2020/21 with the design consultants to determine the scope of the project given the budget available. A schematic design package summarizing the scope and preliminary plans was completed late in 2019/20. The development of final design plans and tender

documents was completed in April 2021. The tender for construction will be completed in the first quarter of 2021/22, with completion of the project expected in the second quarter of 2022/23.

Guelph Turfgrass Institute

Construction of the Guelph Turfgrass Institute administration building, which will replace the existing building at the Guelph Research Station, neared completion in 2020/21. This $15M project will allow the University to vacate the current Guelph Research Station, as directed by Infrastructure Ontario to OMAFRA / ARIO, and relocate to a new site on the Guelph campus of the UofG. The University expects to take possession of the new facility in the first quarter of 2021/22 and will begin relocating from the current site. The University was required to operate both the original and new research sites simultaneously in 2020/21, creating a short-term budget pressure. Maintenance of the original research site will cease in 2021/22, as will operations of the building once the property has been sold.

Ontario Crops Research Centre - New Liskeard - Agronomy Service Building

Construction of new agronomy research service facilities, similar in design to the ones completed in 2019/20 at the Ontario Crop Research Centre - Winchester, was ongoing through 2020/21. Site preparations, including preloading of the site to consolidate unstable clay soil, were completed in 2019/20 and the construction tender for site services and structures was completed in July 2020. However, bids received were well above the available budget. ARIO provided additional project funding through a Transfer Payment Agreement Amendment, raising the overall project budget to $7.1M from the original $4.0M. The original project budget was established several years earlier and did not account for the soil conditions and final scope of the project. With sufficient funds available, construction commenced in November 2020 and continued through the balance of 2020/21. Completion of the project is scheduled for the fourth quarter of 2021/22 and will allow the University to consolidate field research operations on the eastern portion of the New Liskeard property.

Ontario Crops Research Centre – Ridgetown - Field Crop Service Building

Construction of the $6.5M Field Crop Service Building commenced in September 2020 and was approximately 40% complete at the end of the fiscal year. The tender was initially delayed to Summer 2020 due to uncertainties related due to the COVID-19 pandemic and associated provincial response. The project is scheduled to be complete by the fourth quarter of 2021/22.

7.1.1.2 Minor Capital

Under the Minor Capital program, $4.5M was recovered from ARIO, outside of the Agreement, for 19 projects supporting state of good repair and program capacity improvements. In addition, $369K was recovered for projects associated with the Kemptville Campus in preparation for disposal of the property. An updated five-year Minor Capital program priority list was submitted to OMAFRA in February 2021 focusing on the following areas:

- Health & safety;
- Code compliance;
- Animal care;
- Building integrity;
- Life cycle replacement;
- Efficiency and conservation; and
- Program capacity (maintain or improve).

The Minor Capital program is an essential source of funds to maintain the state of good repair and research capacity (equipment and built infrastructure) at the ARIO Properties. Significant projects funded in 2020/21 include:

- Laboratory and storage cooler upgrades at the Ontario Crops Research Centre - Simcoe;
- Beef pasture expansion and redevelopment at the Ontario Beef Research Centre - Elora;
- Quarantine and isolation facility upgrades at the Ontario Aquaculture Research Centre; and
- Field drainage tile replacement at Ontario Crops Research Centres at Ridgetown and New Liskeard.

An updated five-year priority list (covering the fiscal years 2022/23 to 2027/28) will be submitted in December 2021.

7.1.2 Update on Business Plan Activities

There were several activities identified in the 2020/21 Business Plan related to the Property Management program. Table 7.1 provides a comparative summary of activities proposed in the Business Plan, relative to the activities that took place. In addition, several activities from the Research Support program activity in the Research Program have been repeated here as they are relevant to both programs.

Table 7.1: Status Update on the 2020/21 Business Plan Activities

Business Plan Activity	Status
Sustaining/growing revenues, finding efficiencies and opportunities for cost containment associated with Property Management program activities	In progress. Several meetings have been held with the Research Centre Managers to discuss opportunities for further revenue generation, cost containment and efficiencies. A number of ideas were generated which are being explored further to determine their viability.
Analyzing Research Centre use in detail to ensure all research related uses are accounted for and emphasizing the use of Tier II, III and IV project reporting in RMS for all work that takes place	In progress. The University started by ensuring that Tier II Projects were reported in RMS for 2020/21, including those at the Ontario Crops Research Centres at Ridgetown and Huron. In addition, there has also been a significant amount of work done to begin appropriately recording Tier IV work in RMS. The Manager at the Ontario Aquaculture Research Centre actively supported the development of the Tier IV proposals and reports processes, as the Centre is providing critical services to industry and have had to utilize the system. The Research Centre Manager portal in RMS will be a critical component of managing details around Research Centre utilization. The portal has experienced a number of delays in its development; however, it is expected to be available in 2021/22.
Developing strategies to increase Research Centre utilization where data suggests there is capacity for growth, and to sustain activity levels where current utilization rates suggest the Research Centre is operating at or near capacity	In progress. The University is pursuing opportunities to improve utilization rates through efficiency (e.g., allowing more trials to occur concurrently), infrastructure improvements (e.g., improved tile drainage allowing a greater number of agronomy trials to take place at a Research Centre), encouraging additional research projects at underutilized research centres (e.g., in the North and the East) and other actions to streamline

Business Plan Activity	Status
	research program administration. A specific plan for underutilized Research Centres will be developed over the next few years, with input from the Ministry and the Research Centre Advisory Committees.
Establishing Research Centre Advisory Committees to bring together centre management and researchers to identify any barriers that may prevent new research opportunities, to support infrastructure planning and priority setting, and to address any operational issues associated with project implementation, animal care, equipment needs and staffing challenges	On hold. The Research Centre Advisory Committees were placed on hold in 2020/21 due to the COVID-19 pandemic. Centre Managers needed to focus their resources on ensuring effective and safe operations. Committees will be established in 2021/22.
Ensuring appropriate levels of technical capacity exist to effectively use the Ontario Agri-Food Research Centres *(From Research Support)*	In progress. As part of the review of technical staff in the Research Support program activity, the appropriate levels of technical capacity will be determined to effectively support the Research Centres, now and in the future. In the interim, the University continues to invest in key areas of technical need, such as hiring a data technician to support the Ontario Dairy and Beef Research Centres in Elora.
Continuing to develop the policies and processes for Tiers II, III and IV with the goals of improving accountability and reporting capacity *(From Research Support)*	In progress. Policies and program guides are being developed for each of Tiers II, III and IV. These are expected to be complete in 2021/22.

7.2 Mandatory Compliance Requirements

None.

7.3 Key Performance Indicators

7.3.1 Research Centre Revenue

Table 7.2 provides a summary of all revenues resulting from the activities within the Property Management program, including the sales of farm products, rental revenues and recoveries for research centre/facility usage and animal purchases. Property specific information can be found in Section 2.3.5.2. In 2020/21, the five-year rolling average for all revenues and recoveries related to the Research Centres was $6,465K. This exceeded the target in the Agreement of $4,871K by 33%. This was a 0.3% increase from the 2019/20 five-year rolling average of $6,444K.

Table 7.2: Research Centre Revenues and Recoveries by Year (in thousands of dollars)

	2016/17	2017/18	2018/19	2019/20	2020/21
Revenues (External)	**4,787**	**6,199**	**5,965**	**5,465**	**5,698**
Sales of Animals, Farm Products	3,634	4,777	4,600	4,266	4,669
Miscellaneous	70	102	183	215	192
Facility Rentals	1,084	1,319	1,182	985	837
Recoveries (Internal)	**808**	**786**	**893**	**963**	**758**
Sales (net) of Animals, Farm Products	239	40	151	202	101
Research Centre Fees	289	549	417	426	406
Facility Usage (net)	280	197	325	334	251
Total	**5,596**	**6,985**	**6,858**	**6,428**	**6,457**

Table 7.3 shows the five-year rolling average of Research Centre revenues and recoveries over the term of the Agreement. The University has surpassed the target, in each of the last three years.

Table 7.3: Five-Year Rolling Average of Research Centre Revenues and Recoveries over the Term of the Agreement (in thousands of dollars)

Metric	2018/19	2019/20	2020/21	2021/22	2022/23	Target
Five Year Rolling Average of Research Centre Revenues and Recoveries	6,518	6,444	**6,465**			4,871

Although Research Centre revenues and recoveries remain well above the target established, there has been a general decline in total revenue since the peak in 2017/18. This is mainly attributed to two factors: reductions in cropping revenue at the Ontario Crops Research Centre - Elora and reductions in facility rentals revenues due to the loss of the ARIO tenant share of operations and maintenance (O&M) costs. Elora cropping revenue peaked in 2017/18 when the UofG was given full access to newly acquired lands purchased by ARIO. Since that year, lands have been allocated for pasture expansion, new construction and increased feed production areas as planned, reducing the acreage available for cash cropping. The areas for cash cropping and the associated revenue have stabilized and will remain generally static until other ARIO real estate initiatives are implemented that further impact lands available. The budget effect of reduced cash cropping is mitigated in part by a reduction in input and harvest costs. Tenant facility rental revenues from ARIO for O&M costs are directly related to the number of ARIO tenants and the amount of space they occupy. As ARIO sells tenant-occupied properties, like New Liskeard and Kemptville, corresponding tenant facility rental revenues are also reduced. In general, however, there is no net budget impact associated with the reductions, as there is also an equal decrease in O&M cost.

7.3.2 Research Centre Capacity and Utilization

ARIO Property Capacity and Use is measured through the calculation of a utilization rate for each Research Centre, with the 2018/19 utilization rates used as targets. For the Livestock Research Centres, the unit of tracking is an Animal Research Day (ARD). Animal use is strictly controlled by Animal Use Protocols (AUPs) required under the Animals for Research Act and Canadian Council on Animal Care (CCAC). Research Centre Managers report on actual number of days each animal is used under each trial. It is possible for animals to be used on concurrent trials if the parameters of the trial do not interfere with each other. For Crops Research Centres, the unit of tracking is land area used for plots (hectares (ha)). Area is allocated on a seasonal basis, and there is generally no overlap of trials.

The utilization rate is calculated by adding research utilization to the research preparation requirements and dividing the total by the capacity of the Research Centre. The research preparation requirement accounts for the need for crop rotation, replacement animals or cycle time in space-based animal facilities.

In general, the utilization rates for the Crops Research Centres are higher than those of the Livestock Research Centres. Crop trials, to some extent, can better expand to utilize available research plot area by increasing replications or increasing the number of varieties being tested or evaluated for breeding or performance determination. Livestock trials, on the other hand, are more limited to the nature of the resident herd or available housing spaces or types, and therefore cannot be easily scaled to increase usage. For example, in the beef cow-calf facilities at the Ontario Beef Research Centres at Elora and New Liskeard, calving occurs once per year in early spring. Trials looking at a short period of a calf's development can only occur for the short duration post calving. It is not possible to bring in additional calves into the closed herd throughout the year, even though space may be available to conduct this type of work.

The Research Centre capacity and utilization rates for 2020/21 are shown in Tables 7.4 and 7.6. Tables 7.5 and 7.7 illustrate the average Livestock Research Centre utilization rates and the average Crops Research Centre utilization rates over the term of the Agreement.

The Livestock Research Centres had an average utilization rate of 44.3% in 2020/21, which is a 12% decrease from 2019/20 and 10% below the target of 49%. The primary driver behind the reduction was the deferral of some animal-based projects due to COVID-19. In addition, the redevelopment of beef research infrastructure continued to impact utilization rates at Elora and New Liskeard. The planned move of the breeding herd scheduled for Fall 2021 limited the opportunity to start any cow-calf or feedlot trials at the New Liskeard site. Utilization at OBRC – Elora increased from 25.8% in 2019/20 to 39.5% in 2020/21 due to a resumption of some research work in the recently opened facility.

Table 7.4: 2020/21 Ontario Livestock Research Centre Capacity and Utilization

Ontario Livestock Research Centres	Capacity (ARD)	Research Utilization (ARD)	Research Preparation (ARD)	Utilization Rate (%)
Equine Research Facility - Arkell	11,680	8,017	365	71.8%
General Animal Facility - Ponsonby	100,375	15,097	21,900	36.9%
Ontario Aquaculture Research Centre	111,690	10,581	28,105	34.6%
Ontario Beef Research Centre – Elora	206,995	42,799	38,895	39.5%
Ontario Beef Research Centre – New Liskeard	164,250	0	27,375	16.7%
Ontario Dairy Research Centre	173,010	38,082	83,950	70.5%
Ontario Poultry Research Centre	3,923,750	1,696,346	335,800	51.8%
Ontario Sheep Research Centre	102,200	11,968	10,950	22.4%
Swine Research Facility – Arkell	156,950	71,461	14,600	54.8%
Total	**4,950,900**	**1,894,351**	**561,940**	**44.3%**[16]

Table 7.5: Average Ontario Livestock Research Centre Utilization Rates over the Term of the Agreement

Metric	2018/19	2019/20	2020/21	2021/22	2022/23	Target
Average Livestock Research Centre Utilization Rate	48.9%	50.5%	**44.3%**			49%

The Crops Research Centres had an average utilization rate of 78.1% in 2020/21, exceeding the target of 78%, but slightly below the 2019/20 rate of 80.7%. The Crops Research Centres did see some reduction in activity due to COVID-19, albeit less than the Livestock Research Centres. Total research plot area across all locations was 240.57 ha compared to 253.13 ha in 2019/20. Although restrictions and modifications to activity levels have continued into 2021/22, a return to previous levels of field-based research is anticipated as research teams have adapted to the current conditions.

[16] Average of the Utilization Rates for each Research Centre.

Table 7.6: 2020/21 Ontario Crops Research Centre Capacity and Utilization

Ontario Crops Research Centres	Capacity (Plot Area - ha)	Research Utilization (Plot Area – ha)	Research Preparation (Plot Area - ha)	Utilization Rate (%)
Guelph Research Station	76.89	51.80	0.00	67.4%
Ontario Crops Research Centre - Bradford	2.06	1.46	0.00	70.6%
Ontario Crops Research Centre - Cedar Springs	7.28	6.47	0.00	88.9%
Ontario Crops Research Centre - Elora	154.35	55.12	95.51	97.6%
Ontario Crops Research Centre - Emo	17.85	5.87	1.82	43.1%
Ontario Crops Research Centre - Huron	42.90	14.57	25.90	94.3%
Ontario Crops Research Centre - New Liskeard	51.31	7.89	17.93	50.3%
Ontario Crops Research Centre - Ridgetown	96.32	39.66	52.61	95.8%
Ontario Crops Research Centre - Simcoe	46.78	23.51	17.40	87.5%
Ontario Crops Research Centre - Winchester	40.51	17.93	18.53	90.0%
Ontario Crops Research Centre - Woodstock	58.88	16.29	27.11	73.7%
Total	**595.13**	**240.57**	**256.81**	**78.1%**[17]

Table 7.7: Average Ontario Crops Research Centre Utilization Rates over the Term of the Agreement

Metric	2018/19	2019/20	2020/21	2021/22	2022/23	Target
Average Crops Research Centre Utilization Rate	78.1%	80.7%	**78.1%**			78%

Opportunities to implement strategies to increase utilization at the Research Centres were limited in 2020/21 as management of the pandemic response required considerable staff effort. In 2021/22, the University will be pursuing infrastructure improvements at the Research Centres, through the Minor Capital program (e.g., new equipment purchases, tile drainage improvements, etc.) to support increases in utilization. As well, the

[17] Average of the Utilization Rates for each Research Centre.

University will be encouraging additional faculty involvement with the northern and eastern Research Centres. New research areas related to pasture and forage production should also help to drive utilization. A specific plan for underutilized Research Centres will be developed over the next few years, with input from the Ministry and the Research Centre Advisory Committees.

7.4 Reporting Requirements

7.4.1 University Tenants at ARIO Research Centres

University Tenants at ARIO Research Centres are limited to private residents in houses located at the research stations. As of April 30, 2021, tenants include:

- Ontario Aquaculture Research Centre (Station Residence): Wesley Chase;
- Arkell Research Station (Cottage Residence): Jake Henry;
- Arkell Research Station (Duplex upper): Duncan Wey;
- Arkell Research Station (Duplex lower): Tom VanDusen;
- Ontario Crops Research Centre – Cedar Springs (Station Residence): Greg Watt;
- Ontario Crops Research Centre – Elora (Station Residence): Chuck Endaman;
- Ontario Dairy Research Centre (Station Residence): Paul Cleghorn;
- Ontario Beef Research Centre – Elora (Station Residence): Mark Randall;
- Kemptville Campus (Farm Residence): Vacant;
- Ontario Beef Research Centre – New Liskeard (Duplex North): Vacant;
- Ontario Beef Research Centre – New Liskeard (Duplex South): Melinda Drummond;
- Ontario Sheep Research Centre (Staff Residence): Monique Leveque;
- Ontario Crops Research Centre – Ridgetown (Duplex North): Chris McNaughton;
- Ontario Crops Research Centre – Ridgetown: (Duplex South): Tracy Burnett;
- Ontario Crops Research Centre – Ridgetown (Wilson Farmhouse Upper): Connie Reynolds;
- Ontario Crops Research Centre – Ridgetown (Wilson Farmhouse Lower): Christina Lockerbe; and
- Ontario Crops Research Centre – Simcoe (Station Residence): To Be Decommissioned (Vacant).

7.4.2 Repair Priority List

The University develops and submits, typically annually, an updated Repair Priority List for each ARIO Property for the subsequent fiscal year, plus an outlook for the four years beyond that. The last list was submitted to OMAFRA in February 2021. The next list will be submitted in December 2021.

8 CONCLUSION

The 2020/21 Consolidated Annual Report highlights the impact the Agreement has on sustaining and advancing the world-class collaboration between OMAFRA and the University of Guelph. This report demonstrates the continued growth and investment in the body of knowledge, data, and innovation necessary to: achieve assurance in food safety; protect animal, plant and public health and the environment; grow Ontario's capacity to produce food; and support a globally and domestically competitive agri-food sector.

This Annual Report illustrates how the University and OMAFRA will continue to work jointly to achieve the modernization goals inherent in this Agreement and deliver the programs efficiently and effectively. Through growth and continuous improvement, the Alliance will validate the substantial impact of the Agreement. Together, the Agreement outcomes continue to be attained, ensuring that the partnership strengthens Ontario’s agriculture, food, bioproduct and rural sectors for the benefit of Ontario.

APPENDIX A AUDITED FINANCIAL STATEMENTS

University of Guelph

OMAFRA Agreement

Financial information
Year ended April 30, 2021

Independent auditor's report

To the management of the
University of Guelph

Qualified opinion

We have audited the accompanying Statement of Revenue and Expenses [the "Statement"] for the year ended April 30, 2021 and notes to the Statement, including a summary of significant accounting policies.

In our opinion, except for the possible effects of the matter described in the Basis for qualified opinion section of our report, the accompanying Statement is prepared, in all material respects, in accordance with the basis of accounting described in note 2.

Basis for qualified opinion

Our verification of the actual total revenues and expenses is limited to the amounts recorded in the records of the **University of Guelph**, the completeness of which is not susceptible to satisfactory audit verification. We are, therefore, not able to determine whether any adjustments might be necessary that may result in an increase to total revenues and expenses for the year ended April 30, 2021.

We conducted our audit in accordance with Canadian generally accepted auditing standards. Our responsibilities under those standards are further described in the *Auditor's responsibilities for the audit of the Statement* section of our report. We are independent of the **University of Guelph** in accordance with the ethical requirements that are relevant to our audit of the Statement in Canada, and we have fulfilled our other ethical responsibilities in accordance with these requirements. We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our qualified opinion.

Emphasis of matter – basis of accounting and restriction on use

We draw attention to note 2 to the Statement, which describes the basis of accounting. This statement is prepared to assist the **University of Guelph** to meet the reporting provisions of the agreement between the **University of Guelph** and the Ontario Ministry of Agriculture, Food and Rural Affairs ["OMAFRA"] effective April 1, 2018 [the "Agreement"]. As a result, this report may not be suitable for another purpose. Our report is intended solely for OMAFRA and the **University of Guelph** and should not be distributed to or used by parties other than OMAFRA and the **University of Guelph**. Our opinion is not modified in respect of this matter.

Other information included in the Annual Report

Other information consists of the information included in OMAFRA/UofG Agreement Consolidated Annual Report Year 3, 2020/21. Management is responsible for the other information. Our opinion on the Statement of Revenue and Expenses does not cover the other information and will not express any form of assurance conclusion thereon.

In connection with our audit of the Statement of Revenue and Expenses, our responsibility is to read the other information identified above when it becomes available and, in doing so, consider whether the other information is materially inconsistent with the Statement of Revenue and Expenses or our knowledge obtained in the audit of the Statement, or otherwise appears to be materially misstated.

The OMAFRA/UofG Agreement Consolidated Annual Report Year 3, 2020/21 is expected to be made available to us after the date of auditor's report. If, based on the work we will perform on this other information, we conclude that there is a material misstatement of this other information, we are required to report that fact to those charged with governance.

A member firm of Ernst & Young Global Limited

Responsibilities of management for the Statement

Management is responsible for the preparation of the Statement in accordance with the basis of accounting described in note 2; this includes determining that the basis of accounting is an acceptable basis for the preparation of the Statement in the circumstances, and for such internal control as management determines is necessary to enable the preparation of the Statement that is free from material misstatement, whether due to fraud or error.

Auditor's responsibilities for the audit of the Statement

Our objectives are to obtain reasonable assurance about whether the Statement as a whole is free from material misstatement, whether due to fraud or error, and to issue an auditor's report that includes our opinion. Reasonable assurance is a high level of assurance, but is not a guarantee that an audit conducted in accordance with Canadian generally accepted auditing standards will always detect a material misstatement when it exists. Misstatements can arise from fraud or error and are considered material if, individually or in the aggregate, they could reasonably be expected to influence the economic decisions of users taken on the basis of this Statement.

As part of an audit in accordance with Canadian generally accepted auditing standards, we exercise professional judgment and maintain professional skepticism throughout the audit. We also:

- Identify and assess the risks of material misstatement of the Statement, whether due to fraud or error, design and perform audit procedures responsive to those risks, and obtain audit evidence that is sufficient and appropriate to provide a basis for our opinion. The risk of not detecting a material misstatement resulting from fraud is higher than for one resulting from error, as fraud may involve collusion, forgery, intentional omissions, misrepresentations, or the override of internal control.
- Obtain an understanding of internal control relevant to the audit 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 **University of Guelph**'s internal control.
- Evaluate the appropriateness of accounting policies used and the reasonableness of accounting estimates and related disclosures made by management.

We communicate with management regarding, among other matters, the planned scope and timing of the audit and significant audit findings, including any significant deficiencies in internal control that we identify during our audit.

Ernst & Young LLP

Chartered Professional Accountants
Licensed Public Accountants

Waterloo, Canada
June 30, 2021

University of Guelph
Ontario Ministry of Agriculture, Food and Rural Affairs Agreement

Statement of revenue and expenses

[in thousands of dollars]

For the year ended April 30

	Research $	Veterinary Capacity Program $	Animal Health Laboratory $	Agriculture and Food Laboratory $	Property Management $	Exigency Fund (recognized) $	Total OMAFRA 2021	Total OMAFRA 2020
Revenue								
Provincial	35,786	5,289	5,731	6,849	13,361	—	67,016	69,418
Sales of Goods and Services	111	—	8,593	7,917	4,669	—	21,290	20,823
Investment Income	—	—	—	—	—	—	—	6
Other	32	—	1	4	1,029	—	1,066	1,276
Total Revenue	**35,929**	**5,289**	**14,325**	**14,770**	**19,059**	**—**	**89,372**	**91,523**
Expenses								
Salaries	9,623	149	8,058	8,428	7,860	—	34,118	33,786
Non Salary Benefits	1,888	24	2,212	2,504	2,142	—	8,770	8,639
Support for Faculty Costs	11,145	1,900	—	—	—	—	13,045	13,045
Travel	63	199	9	11	9	—	291	755
Operating	14,352	3,017	5,943	4,134	10,279	—	37,725	40,616
Internal Recoveries	(1,142)	—	(1,897)	(307)	(1,231)	—	(4,577)	(5,317)
Total Contract Expenses	**35,929**	**5,289**	**14,325**	**14,770**	**19,059**	**—**	**89,372**	**91,523**
Net Income (Expense)	—	—	—	—	—	—	—	—

See accompanying notes

University of Guelph
Ontario Ministry of Agriculture, Food and Rural Affairs Agreement

Notes to financial statements

[in thousands of dollars]

April 30, 2021

1. Authority and purpose

The University of Guelph operates as a not-for-profit entity under the authority of the *University of Guelph Act (1964)*. The University is a comprehensive, research-intensive university offering a range of undergraduate and graduate programs. With the exception of academic governance, which is vested in the University's Senate, the University is governed by the Board of Governors. The University is a registered charity [#10816 1829 RR0001] and is therefore exempt from income taxes under section 149 of the *Income Tax Act*.

In April 2018, a five-year agreement [the "Agreement"] was signed between the University and OMAFRA [Ontario Ministry of Agriculture, Food and Rural Affairs], replacing the agreement signed between the University and OMAFRA in 2008. This financial statement has been prepared under the terms of the Agreement, which requires an audited financial statement of revenues and expenses summarized by program.

2. Summary of significant accounting policies and reporting practices

[a] Fund accounting

The accounts of the University are maintained in accordance with the principles of fund accounting in order to observe the limitations and restrictions placed on the use of available resources. Under fund accounting, resources for various purposes are classified for accounting and reporting purposes into separate funds in accordance with specified activities or objectives.

[b] Recognition of revenue

The University accounts for revenue in accordance with the deferral method whereby externally restricted contributions are recognized as revenue in the year in which the related expenses are incurred. Unspent revenue is deferred until the goods or services are provided.

Unrestricted revenue is recognized as revenue when received or receivable if the amount to be received can be reasonably estimated and collection is reasonably assured.

Notes to financial statements

[in thousands of dollars]

April 30, 2021

3. Unspent revenue

The Agreement provides revenue restricted for use in approved research and service programs. Funds that were received but unspent during the year will be recognized as revenue in future years as eligible expenses are incurred.

	2021 $	2020 $
Opening balance	**35,461**	37,756
Funds received – Current fiscal year	**66,147**	66,628
Funds received – Next fiscal year	**16,525**	—
Expenditure	**(66,516)**	(68,923)
Ending balance	**51,617**	35,461

4. Minor capital repairs

The University operates facilities designated under the Agreement located across Ontario. These facilities are either owned by the Province or Agricultural Research Institute of Ontario ["ARIO"].

For ARIO owned properties, the cost of minor capital projects for facilities are funded through separate funds held by ARIO. Provincial and other revenues recognized during the year totaled $2,744 [2020 – $9,857] and $9 [2020 – nil] respectively, and operating expenses totaling $2,753 [2020 – $9,857] were incurred during the year.

APPENDIX B AGRI-FOOD AND RURAL LINK AND RESEARCH INNOVATION OFFICE CASE STUDIES

B.1 Return to the LAAIR: Supporting academic entrepreneurs through the COVID-19 pandemic

B.1.1 At a Glance

Focus of Case Study

On May 27, 2020, the Research Innovation Office (RIO), in partnership with the Ontario Agri-Food Innovation Alliance, hosted the second annual Gryphon's LAAIR (Leading to the Accelerated Adoption of Innovative Research) Pitch Competition. This event showcased agri-food start-ups who will help kickstart post-pandemic prosperity in Ontario. Five corporations with roots in the UofG research community competed during an online pitch event to win a total of $20,000 that can be used to help grow their businesses.

This case study profiles how event organizers pivoted in the early days of the COVID-19 pandemic to deliver a fully online Gryphon's LAAIR pitch competition and leverage the opportunity to engage participants from across the country and around the world.

Goal

The Gryphon's LAAIR pitch competition is an annual event that provides a platform for researchers to share their success stories and initiate new conversations with possible partners and funders, all while demonstrating how the Alliance helps de-risk promising agri-food innovations for further commercialization.

The Gryphon's LAAIR funding program provides gap funding so that researchers can turn their inventions into innovations that have economic impact. The funds are provided by the Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) via the Ontario Agri-Food Innovation Alliance and are used to accelerate the development of new products, processes and technologies which will benefit the Ontario agri-food and rural sectors.

In addition to connecting researchers with partnership opportunities, key objectives of this event were to share the real-world impact that UofG innovators have on the Ontario economy with the wider community and to inspire the wider campus community to adopt an impact-focused mindset.

Strategy

Originally intended to be held before a live audience with presentations by innovative researchers, a high stakes pitch competition, and a celebratory afterparty, the COVID-19 pandemic necessitated a change in how the Gryphon's LAAIR Showcase and Pitch event moved forward. Over the course of three weeks, RIO quickly pivoted to proceed with the event in a new online format that would continue to deliver high-quality programming that benefits the Alliance and broader agri-food sector. An all-in-one live event was modified to be delivered as videos and a live online event engaging new community connections. Participating teams took part in the pitch competition training program to strengthen the skills needed to take their start-ups to the next level. Expert success story videos of the Showcase presenters were shared with the audience, followed by a

live, interactive event that combined live pitches, pre-taped interviews, and online voting. The event also included a fireside chat, hosted by improv comedian and entrepreneur Jay Reid of The Making Box, about the history of the Gryphon's LAAIR program with Dr. David J. Hobson, Manager, Technology Transfer & Entrepreneurship.

Benefits to Agri-food

The Ontario Agri-Food Innovation Alliance administers the Gryphon's LAAIR innovation and commercialization programming. This program benefits the agri-food sector by supporting researchers as they transform inventions and lab discoveries into commercially viable innovations, thereby bringing economic growth and development to the Ontario's agri-food sector. In addition to funding the pitch event, the program provides grants to help researchers identify target markets and test concepts with industry and consumers. Given the importance of innovation, this event provides a crucial platform for entrepreneurs to gain valuable pitch experience while continuing to foster ongoing business and research partnerships, even during the COVID-19 pandemic and virtual delivery.

B.1.2 Advancing Knowledge and Capacity Building

The Numbers

- **489 attendees from five countries**

  The new online format of the Gryphon's LAAIR Pitch Competition attracted an audience of almost 500, of which 260 were identified as industry partners. It reached viewers in the USA, France, Hungary, and Netherlands. The broadcast introduced five teams of UofG innovators who are putting knowledge into action in ways that will have an impact on the Ontario economy today and tomorrow, while facing extraordinary challenges presented by COVID-19.

- **Five Pitch Competition Teams; $20,000 in funding**

  Five corporate founders presented their business pitches to a panel of three industry judges who chose a $10,000 grand prize winner. Online audience members were invited to vote for a people's choice winner of $7,000 used to invest in the growth of their venture. Three additional prizes of $1,000 each were presented to the remaining pitch teams.

B.1.3 Behind the Numbers: Agri-Food Sector Benefits

Gryphon's LAAIR event showcases five innovative agri-business start-ups

Winner: $10,000
Harvest Genomics
Developing and deploying DNA technologies for the agricultural industry, Harvest Genomics combines innovative genetic testing and leading-edge big data analysis for food production and food security. From plant and animal breeding to rapid testing for herbicide resistance weeds and invasive pest identification, this team harvests the power of genomics for the Ontario Ag industry and beyond.

People's choice: $7,000

Neophyto Foods

Neophyto Foods strives to make it easier for everyone to choose foods that are delicious as well as kind to the planet. When the plant-based cheese products at the grocery store failed to meet the founders' own cheese loving standards, they created their own. The results were so good they decided to share them with others! Today, Neophyto uses food science ingenuity to make plant-based versions of everyone's favourite foods without compromising on taste, texture or sustainability.

emendWELL

emendWELL Inc. is a boutique research consultancy based in Guelph that specializes in advancing science faster and more easily, ethically and responsibly than ever before. Founder Simone Holligan, PhD has created a unique online platform called SUBJECTMATTERS where academic researchers can find the right people to participate in their world changing studies and clinical trials.

Green Feet Ecosystems Services

Using drone technology and analytics software in a completely new way, Green Feet is an ecosystem service company. By creating customized processes that complement the existing expertise of farmers and land stewards, Green Feet helps agricultural businesses to access new markets and appeal to ecology focused customers.

Psigryph Inc.

Psigryph Inc. is redefining how bioactive molecules are delivered across cell membranes with a patent pending Nanopect™ nano delivery system. Suitable for transporting large numbers of molecules across the cell membranes of plants, animals and humans this technology increases the bioavailability of nutrients. Psigryph Inc.'s plant-derived nanostructures and food powders have been researched extensively in the lab and are ready to enter the market to improve the health of humans, animals and the environment.

Testimonial from Chris Grainger

"We are thrilled to have been selected the winning pitch in this year's LAAIR competition. Given the extraordinary challenges facing entrepreneurs currently, having a platform such as this is crucial for making people aware of the innovative start-ups that can help be a part of creating new jobs for a recovering economy."

Chris Grainger is the CEO and a co-founder of Harvest Genomics.

Testimonial from Dana McCauley

"I'm thrilled not just for our winning teams, but for the effect programs like the Gryphon's LAAIR have on our research community. As UofG produces more academic entrepreneurs, others on campus realize that their inventions have value and potential beyond academia. It's exciting to see how these incredibly smart people can improve lives and the economy by using their knowledge and insight in new ways."

Dana McCauley is the Director, New Venture Creation, Research Innovation Office at the University of Guelph.

B.2 Skills for Research Impact: A collaborative approach to building knowledge mobilization capacity

B.2.1 At a Glance

Focus of Case Study

The Ontario Agri-Food Innovation Alliance supports KTT training and resource development to equip researchers with the tools they need to enhance the impact of their research. Skills for Research Impact is a collaborative workshop series developed and organized by the Alliance, the Community Engaged Scholarship Institute (CESI) and the Research Innovation Office (RIO). The series is offered to University of Guelph faculty, research staff and graduate students interested in enhancing the impact of their research. Following a successful pilot in 2019/20, the curriculum was updated and a new brand identity was developed in 2020/21 to expand offerings and awareness of the program.

This case study profiles the delivery of the Skills for Research Impact Series in 2020/21 with a focus on new resources.

Goal

Skills for Research Impact was created to build capacity for knowledge mobilization (KMb) among the research community at the University of Guelph to accelerate the impact of research. The interdepartmental collaboration involved in developing the series reflects the need for knowledge mobilization training across all research disciplines. Cross-department collaboration also ensures the Skills Series exposes agri-food researchers and graduate students to new interdisciplinary methods to enhance research impact. The program is intended to provide both researchers and students with practical skills for preparing knowledge mobilization plans and developing, executing and evaluating KMb activities, which are core activities to Alliance-funded research projects.

The goal of the organizers was to enhance Skills for Research Impact programming to provide offerings to individuals who completed the previous year's series. New, 'advanced' training opportunities were created as the series continued to grow and diversify its offerings.

Strategy

Skills for Research Impact offers a curriculum of sessions that cover a variety of practical knowledge mobilization and research communications topics. After a successful year of delivering monthly in-person workshops to interested graduate students and UofG staff, the series was modified and redeployed for 2020/21 to:

- Offer a Core Skills Series during each of the fall and winter semesters;
- Offer an Advanced course each semester that focuses on a different specialized topic; and
- Offer all workshops online.

This new structure offered a curriculum of five core sessions delivered in both the fall and winter semesters with alternating additional "advanced" topic sessions. This is a modification from the original design of

offering eight different sessions across an entire academic year. A series of infographics and other resources were also created to support participants' learning.

Sessions were facilitated by knowledge mobilization professionals and communications experts at the University of Guelph and from the Guelph community.

Benefits to Agri-food

Knowledge mobilization connects academic research with the 'next user', be they individuals or organizations, to help enhance research impact. KMb plans are required for all applicable Alliance funding programs to ensure there is a plan for engaging the next user.

The Skills for Research Impact series provides faculty, research staff, and graduate students working on Alliance funded projects with the knowledge and skills to plan and execute KMb activities. Based on the feedback data, 55% of attendees were affiliated with the agri-food and rural sectors.

B.2.2 Advancing Knowledge and Capacity Building

Putting Knowledge into Action

Based on participant feedback and the needs of the Alliance, RIO, and CESI, a core curriculum of topics key to effective research communications and engagement of non-academic audiences, including policy, industry and community stakeholders was developed. Advanced sessions were created as a way to offer diverse topics and to engage audiences that are familiar with the basics of knowledge mobilization.

The eight core sessions offered in the 2019/20 year were streamlined into the following five sessions:

1. Planning for Research Impact
2. Stakeholder Engagement
3. Clear Language Writing
4. KTT Strategies and Dissemination
5. Evaluating KTT Activities

The advanced sessions included the following topics which were selected based on participant feedback.

Arts-Based Research and Storytelling
Elizabeth Jackson, director at CESI, presented an advanced session focused on understanding arts-based research methods and storytelling as powerful tools for research and knowledge mobilization. Attendees learned about a range of arts-based and storytelling approaches including the unique processes, outputs, and impacts of arts-based research methods that can provide new strategies for agri-food researchers to connect with the next user.

Data Visualization
This workshop provided an introduction to data visualization for non-technical users. Attendees learned about the importance of data visualization, were familiarized with key best practices, and introduced to a variety of methods and tools that allow non-technical users to integrate data visualization into their work.

Infographic Development and Design
This advanced session provided an introduction to various best practices for designing engaging and visually appealing infographics and research visualizations beyond standard academic posters. Attendees were

presented with the principles of visual design, a wide variety of resources for creating accessible visual layouts, and an opportunity to develop their practical design skills through an interactive activity.

The Numbers

Session	Fall 2020 Attendees	Winter 2021 Attendees	Average Change from 2019/20
Planning for Research Impact	57	56	+200%
Stakeholder Engagement	43	44	+132%
Clear Language Writing	58	55	+214%
KTT Dissemination Strategies	57	39	+45%
KTT Evaluation	41	28	+44%
Advanced Sessions	Art-Based Research: 23	Data Visualization: 61 Infographics: 60	NA

Fall 2020

- Six sessions were delivered over the Fall 2020 semester, with one advanced session offered in addition to the core curriculum.
- 47 participants attended each session on average (194% increase in average attendance from 2019/20).
- 80 individuals attended one or more sessions.

Winter 2021

- Seven sessions were delivered over the Winter 2021 semester including two new advanced sessions.
- 49 participants attended each session on average (206% increase in average attendance from 2019/20).
- 194 individuals attended one or more sessions.

B.2.3 Behind the Numbers: Agri-Food Sector Benefits

Participant feedback was collected after each session. Key evaluation metrics include:

- 56% of attendees rated the workshops as excellent and 24% as very good;
- 76% of attendees reported that the workshops prepared them to apply the material in their work;
- 76% of attendees strongly agreed that the workshops were informative;
- 71% of attendees strongly agreed that the workshops were engaging; and
- 66% of attendees strongly agreed that the workshops were practical.

Testimonial from Hannah Sweett

"I have been passionate about KTT since I was a summer student with OMAFRA where I was able to see KTT in action. All the workshops were so engaging and made me think outside the academia bubble I sometimes find myself in. The core sessions laid out steps to follow and questions to ask yourself, and recently I incorporated lessons from an advanced session into my research presentation. I've attended some sessions multiple times and always take something new away that helps me clearly communicate my research to my target audience."

Hannah Sweett is a Ph.D. candidate in the department of Animal Biosciences at the Ontario Agricultural College studying animal breeding and genetics under the supervision of Prof. Angela Cánovas.

Testimonial from Eugene Enriquez

"This series was an invaluable resource for knowledge mobilization on campus. The sessions covered the full range of topics spanning the KTT lifecycle of a research project and provided important guidance on the various supports available to develop and deliver KTT activities. The practical skills provided by the advanced sessions will help enhance the impact of our research as we develop new unique methods of getting the innovative work coming out of the BDDC to people that need it."

Eugene Enriquez is the Outreach and Project Coordinator for the Bioproducts Discovery & Development Centre at the University of Guelph. He supports the research portfolios of Dr. Amar Mohanty and Dr. Manjusri Misra.

B.3 Data Management Planning: On the cutting-edge of essential skill development

B.3.1 At a Glance

Focus of Case Study

A data management plan (DMP) summarizes how data generated over the course of a research project will be stored, shared and maintained. It can help improve the effectiveness, efficiency and organization of a research project as well as help ensure data are ready for preservation or sharing at the end of a project. Developing a DMP ensures that every aspect of best practices in data management have been thought through at the beginning of the project.

In 2020/21, a new DMP template was designed and released after a comprehensive review of existing DMP tools and resources. The updated DMP template is part of the University of Guelph's commitment to continuous improvement and is designed to streamline the creation of high-quality DMPs.

Goal

Among Canadian funding agencies, the Ontario Agri-Food Innovation Alliance was an early adopter of DMPs as a requirement of funded projects (2018).[18] As an early adopter of DMPs, the University of Guelph Library and the Office of Research piloted a program to deliver training and resources to Ontario Agri-Food Innovation Alliance researchers as they maneuvered the new requirement.

Beginning in 2019, the Office of Research collaborated with the Library to design a data management plan template as well as tools and resources to support researchers in completing their plans. The goal was to ensure researchers had access to consistent, high-quality resources and guidance that aligned with emerging national and international data management planning best practices.

As part of the UofG commitment to continuous improvement, in 2020/21, the Office of Research and the Library collaborated on a comprehensive review of the pilot program, including data management plans and resources. Based in-part on the findings of this review, the Alliance DMP template was updated to clarify the planning questions to enhance the quality of DMPs and reduce Library review time. This collaboration with the Library provided researchers with the knowledge and skills to plan for data preservation and sharing as research projects were developed

Strategy

The Office of Research (Agri-Food Partnership) and the Library collaborated on a comprehensive review of research data management resources, including DMP templates and supporting resources. The review included results from a researcher survey, interviews with relevant program and service personnel, findings from a review of national DMP practices and resources, an international case study and review of DMPs submitted to the Library.[19]

Based on the early recommendations of the review, Wayne Johnston, Research & Scholarship Librarian, worked with the KTT and Communications unit to develop a simplified version of the national, online, bilingual DMP tool offered by the Portage Network. The template was re-designed with short, specific questions to clarify expectations, and complemented with enhanced guidance resources and prompts throughout the template. All Alliance DMPs continue to be reviewed by the Library to provide recommendations to strengthen them as well as feedback for continued improvement.

In addition to the Library's review of each DMP, workshops, one-on-one consultations, office hours, and DMP resources were also developed and delivered with the Research and Scholarship team at the University of Guelph Library.

[18] The Tri-Agency released its new national policy on research data management in Spring 2021. The new policy indicates DMPs will be required by some Tri-Agency programs within two years.

[19] C. Perry, R. Moore, A. M. Edwards, "Sowing Seeds Case Study Report: A case study of new RDM requirements for agri-food based research at the University of Guelph, April 2021.

Benefits to Agri-food

DMPs articulate how data generated during a research project will be stored, shared and maintained. They are an essential part of mitigating risk related to the loss of data. Appropriate data storage and back up strategies ensure data are not lost due to unforeseen errors, disasters, or technical failures. They also create efficiencies in organizing data for future use ensuring that redundant and expensive data collection can be avoided by subsequent projects. Ensuring that data are part of the scholarly record allows for proper attribution and citation in data reuse. Given the vast amounts of data being generated by Alliance projects, DMPs are a valuable tool to ensure investment into agri-food research will have ongoing use and value for as long as possible.

B.3.2 Advancing Knowledge and Capacity Building

Alliance DMP Template

Through the Portage Network, a national, online DMP template exists to facilitate the development of comprehensive DMPs. This template, which is customizable for individual organizations, guides researchers through targeted questions, the responses to which become a DMP. The downloadable DMP is then available to be submitted to funding agencies.

Based on researcher feedback, the existing Alliance DMP template was revised and re-released in early 2021 for use on projects funded in the 2020/21 call cycle. This updated template was well-received and researchers noted that it was easier to work with. The simplified template ensures that researchers are quickly and easily able to complete comprehensive data management plans. The Research and Scholarship team also connects researchers with Computing and Communications Services (CCS) on campus for consultations about data storage options.

The Numbers

Between May 1, 2020 – April 30, 2021 there were:

- 111 unique Alliance DMP's reviewed and endorsed by a Research and Scholarship Librarian;
- 1,262 page views of the Alliance DMP website;
- 99 downloads of the updated DMP manual;
- 20 views on the DMP tutorial video presented by Research & Scholarship Librarian Wayne Johnston, providing step-by-step directions for completing a DMP for research projects;
- 5 DMP Workshops attended by 52 Alliance researchers hosted by a Research and Scholarship Librarian; and
- 46 downloads of two exemplar DMPs developed as resources for researchers.

B.3.3 Behind the Numbers: Agri-Food Sector Benefits

Testimonial from Wayne Johnston

”The original DMP template was revamped in order to more effectively serve researchers needs. The consensus has been that it’s much better and easier to work with. With the new template, the DMPs coming in have been higher quality and require less review. We’ve seen a really good improvement and clearer understanding from researchers around what we’re asking for and why.”

Wayne Johnston is a Research & Scholarship Librarian at the Library.

Testimonial from K. Peter Pauls

“Researchers collect huge amounts of data that can become orphaned over time, because of changes in data storage formats. By depositing primary data in a centrally managed space with library support ensures it remains accessible for a long time, particularly for large retrospective data compilations.

We were concerned at first that completing a DMP would be difficult and take a lot of time, however, with the updated DMP template and the technical support from the library - the process works quite well. Technology doesn’t always work flawlessly so having the library staff available to navigate issues is a significant support.”

K. Peter Pauls is a professor in the Department of Plant Agriculture

APPENDIX C EARLY DETECTION AND EFFECTIVE RESPONSE TO FOREIGN ANIMAL DISEASES

Three representative AHL pathology cases were submitted to OMAFRA for comment in order to monitor timeliness of testing, results, and communications. OMAFRA comments are included below in italics. OMAFRA feedback on Case 3 was not available at the report deadline.

C.1 Case 1: Avian infectious laryngotracheitis virus outbreak in Niagara region

The case was handled by Dr. Emily Martin and Dr. Davor Ojkic.

G21-006794, G21-006833

Friday January 22, 2021: G21-006794

Late Friday afternoon, Dr. Jess Walkey was called out to a farm located in an infectious laryngotracheitis (ILT) virus risk zone that had a minor increase in mortality on the bottom floor. Clinical signs were consistent with ILT. This property was immediately adjacent to one of the first cases of ILT in the risk zone. The barn was empty when the neighbouring farm was diagnosed; therefore, the birds were given an ILT vaccination at the hatchery and the normal vaccination program. Samples were dropped off at AHL at 21:00 Friday January 22, 2021. Dr. Walkey emailed the above information to Dr. Emily Martin and Dr. Davor Ojkic later that evening at 23:23. Dr. Emily Martin replied at 23:29 asking if histology was included, and indicating that Dr. Ojkic would need to organize weekend virology testing. Dr. Emily Martin also forwarded the original email to Joanna Sawicki (Virology Team Lead).

Saturday January 23, 2021: G21-006794

Dr. Davor Ojkic sent an email at 10:09 to Dr. Walkey and Dr. Martin to indicate the PCR testing would be performed on Saturday by the Virology Technical Supervisor.

Dr. Emily Martin came into the lab on Saturday to trim the formalin-fixed tissues for this case and arranged with the Histology Supervisor (Dr. Josepha DeLay) for the Histology Technical Supervisor to load the cassettes on Sunday morning for the slides to be processed on Monday.

Saturday January 23, 2021: G21-006833

At 17:39 on Saturday, Dr. Walkey emailed again re: second case of suspect ILT. She was called out to a farm earlier in the afternoon to a flock experiencing a mortality spike. This farm was not connected to the first farm. Increased mortality was noted late Friday night and only on the bottom floor. Birds were not vaccinated for ILT virus. The clinical presentation and postmortem findings were consistent with ILT. None of the surrounding farms had been diagnosed or vaccinated for ILT (to her knowledge). Samples were dropped at AHL at 17:30. Dr. Walkey did not request weekend virology testing but requested priority testing for Monday. Dr. Martin came into AHL Sunday evening to trim the tissues to make sure they came through with the first case on Monday. The histology cassettes were loaded into the processor on Sunday by the Histology Technical Supervisor.

Results reporting and turnaround times

Case G21-006794

A. ILT virus rt-RT-PCR: Date authorized: 2021-Jan-25, 14:02

   Result: lung 1 – positive; trachea 1 – positive; lung 2 – positive; trachea 2 – positive

B. Infectious bronchitis virus rt-RT-PCR: Date authorized: 2020-Jan-23, 17:02

Result: lung 1 – positive; trachea 1 – positive; lung 2 – positive; trachea 2 - positive

C. Histopathology: Date authorized: 2021-Jan-25, 13:48

TRACHEA. The 9 sections examined are congested and there is epithelial attenuation. There are scattered to mild heterophils and mononuclear cells in the lamina propria as well as heterophil transmigration across the epithelium. In 2 sections there is moderate accumulation of cellular debris and heterophils in the lumen. In 5 sections the lumen contains moderate accumulations of cellular debris, heterophils, erythrocytes and syncytial cells compatible with herpesvirus.

LUNG. In the 5 sections examined there is moderate congestion. In 4 sections there is mild to marked accumulation of mononuclear cells in the lamina propria of the secondary bronchus. In 2 of these sections there is also marked accumulation of mononuclear cells in the adjacent parabronchi. The lumen of the secondary bronchus and surrounding parabronchi are filled with fibrin, heterophils and syncytial cells consistent with herpesvirus. In 1 section there are mild multifocal clusters of mononuclear cells adjacent to the parabronchial smooth muscle.

EYELID. In 1 of 2 sections examined there is hyperplasia of the conjunctival epithelium, transmigration of heterophils, and multiple syncytial cells consistent with herpesvirus. There is also a parasite noted over the surface of the epidermis. In the remaining section there is multifocal epidermal necrosis and moderate to marked accumulation of edema, heterophils and mononuclear cells throughout all layers of the eyelid.

LIVER. In the single section examined there is congestion and there are mild multifocal to coalescing areas of hepatocyte necrosis with scattered heterophilic infiltrates. There are scattered intranuclear inclusion bodies consistent with adenovirus.

KIDNEY. In the single section examined there is congestion and 1 small interstitial cluster of mononuclear cells.

Histologic diagnoses:

Necrotizing tracheitis (inclusion bodies consistent with ILT)
Bronchitis
Blepharitis/Conjunctivitis
External parasitism
Inclusion body hepatitis (Fowl Adenovirus)

Comments / interpretation: On histopathology, there are lesions of ILT and IBH. There are also lesions suspicious for IBV. The ILT and IBV PCRs are positive.

Case G21-006833

A. ILT virus rt-RT-PCR: Date authorized: 2021-Jan-23, 17:44

Result: lung 1 – positive; trachea – positive

B. Infectious bronchitis virus rt-RT-PCR: Date authorized: 2020-Jan-23, 17:44

Result: lung 1 – positive; trachea 1 – positive

C. Histopathology: Date authorized: 2021-Jan-25, 20:50

TRACHEA. The 7 sections examined have varying degrees of exudate within the lumen. This exudate is composed of erythrocytes, heterophils, cellular debris and fluid. The epithelium is attenuated and there are transmigrating heterophils as well as mild to moderate accumulations of heterophils and mononuclear cells in the lamina propria. In 2 sections there are syncytial cells in the luminal debris that are consistent with herpesvirus. In 2 sections there are individual cells within the attenuated epithelium that contain intranuclear inclusion bodies.

EXUDATE: In 3 sections there is accumulation of fibrin, erythrocytes, heterophils as well as multiple large syncytia compatible with herpesvirus.

LUNG. In the 8 sections examined there is moderate (4 sections) to marked (3 sections) congestion. Four sections have moderate to marked accumulation of mononuclear cells in the lamina propria of the secondary bronchus. In 1 of these sections there is also marked accumulation of mononuclear cells in the adjacent parabronchi as well as multiple large syncytial cells consistent with herpesvirus. In another section, along one margin, there is approximately 1/3 of the section that has marked expansion of the parabronchial interstitium with mononuclear cells. The lumens are filled with fluid, fibrin, heterophils, cellular debris and multifocal syncytia consistent with herpesvirus. Two sections have multiple syncytia in the epithelium lining the secondary bronchus.

EYELID. In 2 of 3 sections examined there is edema within the central connective tissue layer. In 1 section there is hyperplasia of the conjunctival epithelium, as well as subepithelial accumulation of edema and heterophils. There are multifocal accumulations of erythrocytes, heterophils and cellular debris over the epidermis.

KIDNEY. In the 3 sections examined there are small multifocal clusters of mononuclear cells in the interstitium.

BURSA. The single section examined is well populated with lymphoid tissue.

NOTE: Significant findings are not evident in sections of spleen and tendon examined.

Histologic diagnoses:

Necrotizing hemorrhagic tracheitis
Bronchitis
Eyelid edema
Interstitial nephritis (mild)

Comments / interpretation: On histopathology, there are lesions consistent with ILT.
There are changes in the tracheas and kidneys that could be considered suspicious for IBV.

Communications – internal (AHL) and with other agencies (OMAFRA and CFIA)

- 2021-Jan-23, 14:04: Dr. Ojkic sent an email to Dr. Walkey with an attached PDR file of results indicating that both the ILTV and IBV rt-RT-PCR tests were positive. A notification to REPORT-NOTIFY-DISEASE was sent at the same time.
- 2021-Jan-23, 15:05: An alert email was sent to OMAFRA and CFIA through LIMS.

- 2021-Jan-25, 13:51: Dr. Martin reported the histology results for 21-006794 and sent a notification to REPORT-NOTIFY-DISEASE shortly after releasing these results.
- 2021-Jan-25 17:46: Dr. Ojkic sent out a notification to REPORT-NOTIFY-DISEASE at 17:46 and the PCR results (positive ILTV and IBV) were released at 17:51.
- 2021-Jan-25, 20:51: Dr. Emily Martin released the histology results at and sent a notification to REPORT-NOTIFY-DISEASE at 20:54.
- 2021-Jan-26, 9:05: An alert email was sent to OMAFRA and CFIA from LIMS.

Communication with AHL clients

Email communication from Dr. Walkey: 'Thank you so very much for your assistance with these cases. I truly appreciate your mentorship and efforts over the weekend here. This has gone a long way for me providing updates, value, and emotional reassurance to the producers & supports teams.'

Follow-up required from diagnostic conclusion

Standard follow-up procedure on an ILTV positive result is to genotype the virus in order to differentiate between a wild field strain and a vaccine strain.

G21-006794

ILTV sequencing: Date authorized: 2021-Jan-27, 16:33

Result: Vaccine-like ILTV

G21-006833

ILTV sequencing: Date authorized: 2021-Jan-29, 15:58

Result: Vaccine-like ILTV

Final resolution from the AHL perspective

This case demonstrates how collaboration between a referring DVM and AHL veterinarians and technical staff provided timely information and testing results on weekends and evenings to support veterinarians dealing with stressful field outbreak situations.

Review of Case 1: Avian infectious laryngotracheitis virus outbreak in Niagara region – Dr. Emily Martin and Dr. Davor Ojkic

Lead Veterinarian, Animal Health and Welfare Branch, OMAFRA

May 21, 2021

This pathology report summarizes a case of avian infectious laryngotracheitis (ILT) diagnosed in samples sent from a farm involved in an outbreak in the Niagara region during January 2021.

The communications and reports resulting from the submission were excellent. The initial samples were dropped off late Friday evening and the submitting veterinarian emailed AHL diagnosticians well into the evening. AHL staff worked throughout the weekend to coordinate and conduct the required laboratory testing.

ILT certainly was the main differential diagnosis given the history, clinical signs and risk of the disease in the area, but the report leaves the reader wondering if other differentials, particularly

foreign animal diseases (FAD), were considered and ruled out, if appropriate. Having participated in many AHL FAD simulation exercises, OMAFRA staff is confident that FADs are always considered by pathologists, but perhaps there should be a statement that based on a risk assessment, differentials for FADs were not likely or not a consideration.

Under the section "Communications – internal (AHL) and with other agencies (OMAFRA)", CFIA could be added as ILT is a federally notifiable disease. This is stated in the text but for clarity could be added to the section heading (done).

Under the section "Follow up required from diagnostic conclusion", it could be added that OMAFRA pays for the sequencing as part of its commitment to poultry disease surveillance in Ontario.

The report includes an email from the submitting veterinarian thanking the AHL for their work and support to the veterinarian, especially over the weekend. This case is an example of the AHL's exemplary client service and commitment to animal health.

C.2 Case 2: Porcine *Streptococcus equi* ssp *zooepidemicus* septicemia

The case was handled by Dr. Josepha DeLay and Dr. Durda Slavic. It was the first case of Porcine *Streptococcus equi* ssp *zooepidemicus* septicemia reported in Ontario.

G20-098340

Referring DVM reported a number of sows off-feed, with some mortality, in a gilt / sow operation of 250 sows. He performed on on-farm postmortem and noted fibrinous peritonitis, congested and edematous lungs. Abortion rate was also increased and therefore, also submitted placenta and fetus from fresh abortion for culture and histology.

December 15, 2020, 12:48

Samples received: formalin-fixed tissues; fresh lung x3, spleen, kidney, placenta (amnion), fetus (5 cm crown-rump length).

Testing requested: Histopathology (sow tissues as submitted in formalin, fetal samples collected at the time of sample receipt), bacterial culture (lung, spleen, kidney, placenta), PRRSV PCR (sow lung), CanSpot ASF PCR (sow spleen).

Sample receipt confirmation report sent to client: 2020-Dec-15, 13:25.

Results reporting and turnaround times

A. Bacterial culture:

Date authorized: Interim report 2020-Dec-16, 13:58, final report 2020-Dec-18, 15:18.

Lung: *Streptococcus equi* ssp *zooepidemicus* 2+
Spleen: *Streptococcus equi* ssp *zooepidemicus* 3+
Kidney: *Streptococcus equi* ssp *zooepidemicus* 1+
Placenta: *Escherichia coli* 3+ isolated in mixed culture
Susceptibility (*S.equi* ssp *zooepidemicus* / spleen): Sensitive to ampicillin, ceftiofur, trimethoprim / sulfa; resistant to spectinomycin, tetracycline
2021-Jan-05: *S.equi* ssp *zooepidemicus* isolate sent to Gallant Labs for freeze and hold, at rDVM's request.

B. Histopathology:

Date authorized: 2020-Dec 17, 13:30.

LUNG (1): Alveolar capillaries and interstitial blood vessels are severely congested, and there is scattered mild alveolar hemorrhage. Low numbers of interstitial venules and alveolar capillaries contain partially or completely occlusive luminal fibrin thrombi. Proteinaceous edema floods approximately 25% of alveoli and is occasionally mixed with small fibrin clumps.

SPLEEN (2): Red pulp is severely congested. Splenic capsule is covered by a thin layer of fibrin variably mixed with neutrophils, degenerate leukocytes, and small clusters of bacterial cocci. Several small aggregates of fibrin and leukocytes are scattered in red pulp.

KIDNEY (2): Few cortical and medullary interstitial blood vessels contain clumps of homogeneously eosinophilic to orange-red debris.

PLACENTA (3): Few large aggregates of saprophytic bacilli are present in chorionic stroma.

FETAL TISSUES (4): No significant lesions are evident in fetal liver, lung, heart, intestine, skeletal muscle, or spinal cord.

Histologic diagnoses:
1. Severe pulmonary congestion with mild microvascular thrombosis, alveolar edema and fibrin exudation, and mild alveolar hemorrhage
2. Fibrinosuppurative peritonitis (perisplenitis) with intralesional bacterial cocci
3. Splenic congestion

Comment / interpretation: Lesions in lung and spleen are compatible with septicemia as the cause of the sow's death. Culture of *Streptococcus equi* ssp *zooepidemicus* (*S. zooepidemicus*) in low to moderate numbers from multiple filtering organs (lung, spleen, kidney) support this organism as the cause of sepsis. Gross lesions described in the sow, microscopic lesions identified, and the clinical scenario described are consistent with findings reported in other cases of *S. zooepidemicus* septicemia in swine. *S. zooepidemicus* is an opportunistic pathogen and is a commensal organism of the upper respiratory tract in some swine. Characterization of isolates from recently reported outbreaks suggest that specific strains of the organism may be more virulent, contributing to these events. Further characterization (whole genome sequencing) will be carried out on the isolate from this sow. Updated reports will follow when these results are available (likely several weeks).

References:
de Costa MO, Lage B. Emerging Infectious Diseases. 2020: 26(10):2522-2524.
Sitthicharoenchai P et al. Journal of Veterinary Diagnostic Investigation. 2020: 32(4): 565-571.

C. Whole genome sequencing: Date authorized: 2021-Feb-10, 13:21.

2021-Feb-10. AHL performed a whole genome sequencing (WGS) of *S. zooepidemicus* from this case. WGS results revealed that this isolate is very similar to *S. zooepidemicus* ATCC 35246 strain that was isolated from a septicemic pig in Sichuan province in China in 1976. Multilocus sequence typing (MLST) established that AHL isolate belongs to sequence type (ST) 194. This sequence type is shared with ATCC 35246 strain as well as other isolates of *S. zooepidemicus* that were isolated from recent

outbreaks of septicemia in pigs caused by *S. zooepidemicus* in Manitoba, Pennsylvania, Ohio, and Tennessee.

References:
de Costa, O.M., and B. Lage. 2020. *Streptococcus equi* subsp. *zooepidemicus* and sudden deaths in swine, Canada. Emerg. Infect. Dis. DOI: 10.3201/eid2610.191485
Chen et al. 2020. Genetic characterization of *Streptococcus equi* subsp. *zooepidemicus* associated with high swine mortality in the United States. Transbound Emerg. Dis. 67:2797- 2808.

D. PRRSV, North Am / Eur rt-RT-PCR: Date authorized: 2020-Dec-16, 17:16

Result: lung – negative.

E. African Swine Fever PCR (CanSpotASF): Date authorized: 2020-Dec-23, 17:02.

Result: spleen – negative.

FINAL DIAGNOSIS**:** Septicemia – *Streptococcus zooepidemicus*

Case finalized: 11-Feb-2021, 13:28.

ADDENDUM, 2021-02-11: Whole genome sequencing results for the *S. zooepidemicus* isolate are provided in the bacteriology section of the report below. ASF PCR was carried out for surveillance purposes through the CanSpot ASF program.

Communications – internal (AHL) and with other agencies (OMAFRA, OASV, OAHN)

- 2020-Dec-16, 13:19: Email from D. Slavic, AHL to M. Spinato, J. Fairles, J. DeLay alerting to isolation of *S. zooepidemicus* from 3 separate tissues, requesting follow-up when histopathology results available. WGS of isolate requested by M. Spinato.
- 2020-Dec-16, 14:15: Email from rDVM to J. DeLay (OAHN Swine Network representative) requesting call to discuss bacterial culture results. Phone conversation followed – rDVM recognized significance of this bacterial isolate and understood that results would be reported to OMAFRA as an emerging pathogen. Discussed zoonotic potential of pathogen.
- 2020-Dec-16, 15:24: J. Fairles added OCVO to the case for reporting, due to occurrence of an unusual diagnosis affecting an Ontario herd.
- 2020-Dec-16, 15:38: J. DeLay emailed OCVO, cc to C. Arsenault / OMAFRA, M. Spinato / AHL, AHL surveillance team to alert that potential emerging pathogen (*S. zooepidemicus*) had been identified in porcine case by bacterial culture – histopathology report to follow.
- 2020-Dec-17, 13:35: J. DeLay emailed OCVO, cc to C. Arsenault / OMAFRA, M. Spinato / AHL, AHL surveillance team, to inform that histopathology results support septicemia due to *S. zooepidemicus*. AHL Bacteriology will carry out whole genome sequencing (WGS) to assess bacterial strain. (LIMS communication log entry delayed until 2020-Dec-20, 09:19).
- 2020-Dec-17, 14:27: Email from rDVM to J. DeLay with update on clinical situation – sow deaths continuing and moving through barn (geographically). Currently 10 deaths, 15 sows off feed. Discussed necropsy of at least 1 additional affected sow to confirm etiologic diagnosis of *S. zooepidemicus* in multiple (at least 2) animals. Also obtained permission from rDVM to proceed with CanSpot ASF test.

- 2020-Dec-17, 15:29: Phone call with C. Arsenault/ OMAFRA to discuss case, including potential OMAFRA funding to test additional sows from the herd.
- 2020-Dec-18, 12:32: Email from J.DeLay to AHL pathologists alerting of *S. zooepidemicus* case – BOLO for this pathogen.
- 2020-Dec-18, 15:35: OASV listserv *S. zooepidemicus* disease alert email originating from C. Arsenault / OMAFRA (see below for full content of email).
- 2020-Dec-22, 09:20: Email from rDVM to J. DeLay requesting *S. zooepidemicus* isolate forwarding to Gallant Labs for potential autogenous bacterin.
- 2021-01-21, 11:48: Email from H.Cai, AHL to M. Spinato, D. Slavic, J.Fairles, J. DeLay with preliminary WGS results – sequence of isolate is similar to that from outbreaks in Manitoba and China.
- 2021-Jan-21, 12:50: J.DeLay emailed rDVM to provide preliminary WGS results. Obtained permission from rDVM to share sequencing results with researchers to compare with US and Manitoba outbreak results.
- 2021-Jan-21, 13:26: J.DeLay emailed C. Furness / OMAFRA, C. Arsenault / OMAFRA, M. Spinato / AHL to inform of preliminary WGS results.
- 2021-Feb-10, 13:27: J.DeLay emailed C. Furness / OMAFRA, C. Arsenault / OMAFRA, M. Spinato / AHL to inform of final WGS results - pathogenic strain of *S. zooepidemicus* confirmed based on similarity to isolate from other outbreaks in China, Manitoba, and US.

Communication with Ontario swine veterinarians

2021-Dec-18, 15:35: Disease alert email from OMAFRA (C. Arsenault) through Ontario Association of Swine Veterinarians (OASV) listserve (written in consultation with the rDVM and AHL pathologists):

Dear OASV Colleagues,

The Animal Health Laboratory recently identified *Streptococcus equi* subspecies *zooepidemicus* (*S. zooepidemicus*) in a sow unit in Ontario. **To our knowledge, this is the first confirmed case of *S. zooepidemicus* septicemia and sudden death in Ontario pigs.**

The attending veterinarian reported that clinical signs of the disease began on Dec 12, 2020. Affected sows presented with inappetence and an increase in sudden sow mortality was seen. This herd is being treated with antibiotics. The source of this infection is unknown to date, but an investigation is on-going.

This pathogen has caused similar clinical signs within a swine breeding herd in Western Canada. The Canadian Swine Health Intelligence Network (CSHIN) summarized the cases seen to date in the western provinces and reported in the 2019 Q4 report that *S. zooepidemicus (Strep. zoo)* is a potential emerging disease threat in North America. "If swine herds are experiencing sudden deaths, investigate to see if *Strep. Zoo* is the cause and rule out foreign animal diseases. Hold pigs whenever possible until a diagnosis can be made and do not ship pigs to other barns, assembly yards or processing plants. *S. zooepidemicus* has zoonotic potential like other more commonly isolated *Strep e.g., S. suis*. **It is important to note that no transfer to humans has occurred to date**. Whole genome sequencing has provided insight that this is a new isolate/clone of this pathogen never before detected in North America".

The United States Department of Agriculture (USDA) put out the following Emerging Risk Notice: https://www.aphis.usda.gov/animal_health/downloads/streptococcus-zooepidemicus-notice.pdf in November 2019 that states that in September, 2019 a high mortality event occurred in a

cull sow processing plant in Tennessee that reported over 40% of 2,222 sows in holding pens died or were euthanized on antemortem inspection. Samples taken detected *Strep. zoo*. Similar events may have occurred at other locations in the U.S.A. Reports indicated both feeder swine and cull sows were affected.

In cases where *S. zooepidemicus* is suspected, tissue samples of lung and spleen can be sent to the Animal Health Laboratory for bacterial culture. Formalin-fixed tissue samples from multiple organs are also recommended to confirm septicemia.

Since this is the first time that this pathogen has been detected in Ontario as the causative agent for sudden mortality seen in swine, we are notifying veterinarians to be on the lookout for clinical signs that may be associated with it. Strict biosecurity practices will be the main prevention tactic for swine producers.

Communication with AHL clients

AHL Newsletter article, March 2021;25(1):11

Streptococcus equi spp *zooepidemicus* septicemia: First confirmed case in Ontario swine
https://www.uoguelph.ca/ahl/streptococcus-equi-subsp-zooepidemicus-septicemia-first-confirmed-case-ontario-swine

Follow-up required from diagnostic conclusion

G20-010106 and G21-028005: As recommended by the AHL to the rDVM, a field postmortem was done in late December 2020 on a second affected sow to attempt confirmation of the diagnosis of *S. zooepidemicus* septicemia, to increase confidence that this agent was the common pathogen responsible for illness and deaths in the herd. Although histologic lesions in the second sow were compatible with septicemia, *S. zooepidemicus* was not isolated, likely due to recent antibiotic therapy in this animal (G20-10106). Repeat cultures from field necropsy samples were carried out in April 2021 due to ongoing losses in the sow herd, and *S. zooepidemicus* was isolated in large numbers from pooled tissues (G21-028005).

S. zooepidemicus septicemia remains a topic of discussion at quarterly OAHN meetings, and the rDVM continues to provide follow-up information on the status of the disease in this herd.

Final resolution from the AHL perspective

This is the first report of *S. zooepidemicus* septicemia in an Ontario swine herd. Sequencing confirmed involvement of a pathogenic strain of the organism, similar to isolates from recent disease outbreaks in Manitoba and the US. Ontario swine veterinarians have been alerted to the occurrence of this emerging disease in the province.

A PCR test for identification of *S. zooepidemicus* pathogenic strain(s) is currently under development at the AHL (May 2021). Validation of the test will be completed in the next few weeks, and the target date for implementation of the test is June 2021.

Review of Case 2: Porcine *Streptococcus equi* ssp *zooepidemicus* septicemia; first case reported in Ontario – Dr. Josepha DeLay and Dr. Durda Slavic

Tim Blackwell DVM; Animal Health and Welfare Branch

May 19, 2021

This case report summarizes a timely and well coordinated diagnostic and communication effort by the herd veterinarian, the Animal Health Laboratory at the University of Guelph, and the Ontario Ministry of Agriculture, Food and Rural Affairs.

The gross lesions identified by the herd veterinarian through the field postmortem as well as the histologic lesions identified by the AHL pathologist represented typical septicemia lesions. The identification of Streptococcus equi ssp. zooepidemicus by the bacteriologist indicated that this was the first case in Ontario of this recently identified septicemia syndrome in adult swine. The herd veterinarian should be recognized for submitting appropriate tissues to ensure an accurate diagnosis. This included spleen which allowed CFIA to rule out African Swine Fever, which without the isolation of S. equi would have been stood higher on the differential list and with much graver consequences for the Canadian swine industry.

Also to be recognized was the outstanding and on-going open communications between the pathologists, bacteriologists, gene sequencing personnel, the Ontario Association of Swine Veterinarians, OMAFRA, and the Ontario Animal Health Network. This open and timely communication ensured that all relevant parties were aware of the diagnosis as well as on-going developments with strain identification over the following several weeks.

In summary, this diagnostic submission by the herd veterinarian was handled in an efficient and professional manner beginning with the preliminary diagnosis of septicemia, through the identification of the causative organism, strain determination, and continuous industry communications.

C.3 Case 3: Severe myopathy in lambs due to suspected ionophore toxicosis and hypovitaminosis E

Case was handled by Dr. Andrew Brooks and Dr. Felipe Reggeti.

G20-039466

Referring DVM reported that the owner of a 120 Cheviot crossbred ewe flock began losing lambs to diarrhea beginning at about 18 days of age. Treated with single dose oral Amprol, then gave all lambs 7 days of Baycox. Continued losing lambs (20 in total). DVM examined lambs May 29, looked at 2 others that had lost the use of their hind limbs, recently docked. Dx ascending spinal cord inflammation - assumed problem was separate from diarrhea. By the next day several more lambs had died. Treated sick looking lambs with Resflor. Today, owner reports that diarrhea appears to have stopped but many lambs are lethargic. In addition, he has 10 or so that have lost the use of their hind legs. Decided to submit 2 that can't use hind legs and 2 that are lethargic (all have been treated with antibiotics and Baycox).

June 1, 2020, 15:05

Samples received: 3 live lambs A, B, C.

Testing required: Postmortem, histopathology, bacterial culture (A- intestine), sucrose wet mount (feces – A), trace element analysis (liver B, C), vitamin E serum, feed additive screen (stomach content, textured starter, pelleted feed and mineral mix).

Tissues held: Fixed tissues. Liver, spleen, kidney, lung, right, intestine.

Sample receipt confirmation report sent to client: 2020-June-01, 15:05.

Results reporting and turnaround times

A. Postmortem: Date authorized: 2020-Jun-01, 17:16.

AHL case number: 20–039466
Specimen received: 3 live lambs A, B, C
Postmortem performed by: Dr. Brooks
Postmortem start: June 1, 2020 3:00 PM
Postmortem end: June 1, 2020 4:30 PM
Photographs: yes

EXTERNAL FINDINGS:
A- diarrheic fecal soiling perineum
Body weight: A-10.6 kg, B-7.2 kg, C-8.0 kg
Body condition: Normal
Hydration: Normal
Fat stores: Normal
Muscle mass: Normal

INTERNAL FINDINGS:
A: There is liquid content within the rectum, yellow watery liquid, semi-liquid. The entire large intestine and small intestine lumen. No overt gross lesions in the intestine mucosa. No lesions in the upper gastrointestinal tract. No lesions in the heart, lungs, spleen, liver, kidneys, brain.
B: There are multifocal lesions in skeletal muscle: muscle is pale, white, with streaks and irregular patches of pallor. Several large muscle groups affected. No overt lesions in the heart. No other discernible lesions.
C: Same as B – myopathy in skeletal muscle.

POSTMORTEM DIAGNOSIS: A: Undifferentiated diarrhea B, C: Myopathy - suspect white muscle disease
Comment / interpretation: Lamb A has lesions typical of undifferentiated diarrhea; bacterial culture and parasitology are pending. B and C have gross lesions of myopathy, I am suspicious of white muscle disease.

B. Histopathology:

Date authorized: 2020-Jun-04, 19:38

Animal A: Large intestine: Crypts appear mildly hyperplastic. Mild exfoliation of surface epithelial cells with rounding of exfoliated cells. Some areas have overgrowth of bacilli in the lumen.
Small intestine: Areas with villous atrophy, with rounded or attenuated epithelial cells on villi. Many areas have marked increased eosinophils in lamina propria with a few neutrophils.
Liver: Mild scattered accumulations of neutrophils in sinusoids.

No specific lesions in rumen, heart, abomasum, skeletal muscle, lung, kidney.
Animal B:
Skeletal muscle: Very severe extensive necrosis, diffuse. All sections affected. Severe myofiber necrosis with fragmentation of mineralization. Satellite stromal cells are reactive. One section has more extensive myofiber loss with replacement with reactive stromal cells.
Heart: Sporadic mineralization of myofibers.
Kidney: Few granular casts in the medulla.
No lesions observed in lung, spinal cord, sciatic nerve, large intestine, small intestine, liver, brain.
Animal C:
Skeletal muscle: Similar to B. Very severe extensive skeletal muscle necrosis and mineralization. All sections affected.
Kidney: Few granular casts the medulla.
No lesions observed in heart, large intestine, spinal cord, sciatic nerve, lung, liver, brain.

Histologic diagnoses:
Lamb A: Eosinophilic enteritis with mild villous atrophy
Lambs B, C: Severe skeletal muscle necrosis

Comment: In animal A I am suspicious of parasitic enteritis – I don't see coccidia in the intestine but I wonder if this animal was treated for coccidiosis and is in the healing phase. The eosinophilic inflammation suggests parasitic infection. **The main lesion in animals B and C is very severe skeletal muscle necrosis.** Since the liver selenium is in normal range, ionophore toxicosis is a possible cause. I reviewed this case with our toxicologist/clinical pathologists and the lesions and clinical chemistry would fit with ionophore toxicosis.

C. Bacterial culture: Date authorized: 2020-Jun-05, 16:28

Result: SI: *Clostridium perfringens* 3+, no *Salmonella* spp. isolated from enrichment.

D. Complete blood count (CBC): Date authorized: Jun 1, 2020, 16:55
Animal A: mild neutrophilic leukocytosis, mild normocytic hypochromic anemia and mild thrombocytosis. Mild hypoproteinemia.
Animal B: slight normocytic hypochromic anemia, mild segmented neutrophilia and moderate thrombocytosis.
Animal C: similar to animal B.

Comment: Inflammatory leukogram. Thrombocytosis is likely reactive. Slight hypochromic anemia may be somewhat regenerative (basophilic stippling noted on smears)

E. Biochemistry profile: Date authorized: Jun 1, 2020 17:54
Tested samples: Serum from animals A, B and C

Comments: most significant findings are markedly increased activity of muscle enzymes (AST and CK), and increased haptoglobin concentration, in particular in animals B and C. Elevated BHBA consistent with negative energy balance.

F. Fecal flotation: Date authorized: 2020-Jun-05, 14:22
Result: no parasites identified.

G. Sucrose wet mount: Date authorized: 2020-Jun-02, 14:12
Result: no parasites identified.

H. Feed additive screen - HPLC (monensin, salinomycin, narasin): Date authorized: 2020-Jun-10, 17:16
Results: Stomach Content (animal B): Monensin 5.8 ug/g
Mineral (Feed): Monensin 58 ug/g

I. Trace element tissue screen: Date authorized: 2020-Jun-02, 16:53
Results: Liver selenium in lambs B, C of 0.34 ug/g and 0.35 ug/g respectively were within normal reference intervals (0.25-1.5 ug/g).

J: Toxicology: Date authorized: 2020-Jun-25, 14:16
Results: Vitamin E was undetectable in serum samples tested from lambs A,B,C.
Normal reference interval 3.5-7.0 umol/L.

FINAL DIAGNOSIS: Severe skeletal muscle necrosis

Case finalized: 2020-Jul-7, 16:51

The main lesion in lambs B and C is very severe skeletal muscle necrosis. Since the liver selenium is in normal range, ionophore toxicosis is a possible cause.

Communications with referring veterinarian

- June 11, 2020 14:55: Email communication from Dr. Brooks with Dr. Dykeman: significance of monensin levels identified in rumen content.
- June 11, 2020 16:03: Email communication from Dr. Reggeti with Dr. Dykeman: discussion on limitations of interpreting monensin in rumen content alone. Recommended analysis of feed and mineral mix.
- June 12, 2020 9:11: Email communication from Dr. Dykeman to Dr. Reggeti: additional details on feeding management in the farm.
- July 2, 2020 9:54: Email communication from Dr. Reggeti to Dr. Dykeman: interpretation of significance on monensin levels identified in mineral mix and rumen contents in the context of anatomical lesions and clinical pathology results.

Communication with AHL clients

AHL Newsletter article, December 2020;24(4):8 Severe myopathy in lambs
https://www.uoguelph.ca/ahl/severe-myopathy-lambs

Follow-up required from diagnostic conclusion

We found monensin in the mineral supplement (not listed on the label), but the significance depends on the amount in the final ration, which needs to be calculated. The possibility of overconsumption due to animals getting into the feed/supplements should be considered. Levels in the ruminal content only indicate exposure, although toxicity is of concern, given the markedly elevated CK and AST. The problem might be multifactorial: young age, combination of ionophores and possible low Vit E. It might be a good idea to check Vit E in other animals to assess herd status.

Final resolution from the AHL perspective

In summary, testing at AHL detected muscle lesions compatible with ionophore toxicosis, possibly complicated by low Vitamin E status. Selenium deficiency was ruled out. Monensin was detected in rumen content of one affected animal and in the mineral supplement; however, the significance depends on the amount in the final ration, which needs to be calculated. The possibility of overconsumption due to animals getting into the feed/supplements should be considered. Levels in the ruminal content only indicate exposure, although toxicity is of concern, given the markedly elevated CK and AST. The problem might be multifactorial: young age, combination of ionophores and possible low Vitamin E.

This case demonstrates the close collaboration between AHL veterinarians and submitting veterinarians, when challenging cases require expert opinions and extended investigations in order to reach a satisfactory conclusion.

OMAFRA Feedback

Not available at the report deadline.

APPENDIX D AFL KTT AND HQP CONTRIBUTIONS

The list of AFL's publications, presentations, research projects, contributions, and training of HQP in 2020/21 is provided below. It offers evidence of AFL's competence and willingness to further develop its technical capacity, adding to the public confidence in the Agriculture and Food Laboratory.

D.1 KTT Contributions

D.1.1 Journal Publications

Atinuke M. Olajide, Shu Chen, and Gisèle LaPointe. Markers to rapidly distinguish *Bacillus paralicheniformis* from the very close relative, *B. licheniformis*. Frontiers in Microbiology. 2021. 11:596828.

Atinuke M. Olajide, Shu Chen, and Gisèle LaPointe. Draft genome sequences of five *Paenibacillus* species of dairy origin. Microbiology Resource Announcement. 2020. 9(37): e00971-20.

Linton N.F., Machado P.V.F., Deen B., Wagner-Riddle C., Dunfield K.E. Long-Term Diverse Rotation Alters Nitrogen Cycling Bacterial Groups and Nitrous Oxide Emissions After Nitrogen Fertilization. Soil Biology and Biochemistry, 149: 107917, 2020.

Balamurugan, S., Gemmell, C., Lau, A. Arvaj, L., Strange, P., Gao, A., Barbut, S. 2020. High pressure processing during drying of fermented sausages can enhance safety and reduce time required to produce a dry fermented product. Food Control 113:107224. https://doi.org/10.1016/j.foodcont.2020.107224.

Wroblewski, C.; Volford, T.; Martos, B.; Samoluk, J.; Martos, P. High Yield Synthesis and Application of Magnetite Nanoparticles (Fe3O4). Magnetochemistry 2020, 6, 22. https://doi.org/10.3390/magnetochemistry6020022.

M Melzer and X Shan. Diseases diagnosed on plant samples submitted to the Plant Disease Clinic, University of Guelph in 2020. Canadian Plant Disease Survey, 2021. https://doi.org/10.1080/07060661.2020.1752524.

D.1.2 Oral Presentations

Katie Matheis – The Role of Strategic Partnerships – Introduction of the Agriculture and Food Laboratory, specific to dairy analysis. Online *Dairy Processing Course,* Department of Food Science, University of Guelph. November 24, 2020.

Looknauth Ramsahoi – The Role of Dairy Analyses for producer payments, milk safety, quality, authenticity and herd status/health. Online *Dairy Processing Course,* Department of Food Science, University of Guelph. November 24, 2020.

Carlos Leon-Velarde – Food Microbiology specific to dairy analysis, resolving quality issues, supporting outbreak investigations, and applied research. Online *Dairy Processing Course,* Department of Food Science, University of Guelph. November 24, 2020.

Nick Schrier – Toxicology - ICPMS methods for the detection of iodine, selenium and heavy metals such as lead in raw milk. Online *Dairy Processing Course,* Department of Food Science, University of Guelph. November 24, 2020.

Shu Chen – Molecular Biology; DNA tests for safety and quality of dairy products, and other applicable methodologies, techniques and analyses. Online *Dairy Processing Course,* Department of Food Science, University of Guelph. November 24, 2020.

Carolina Varilla – Chemistry Methods for rapid testing and confirmation for the presence of antibiotics in raw goat and cow milk. Online *Dairy Processing Course,* Department of Food Science, University of Guelph. November 24, 2020.

Andrew Moore – The Role of Analytical Microscopy & Immunochemistry for the Examination of milk and milk products. Online *Dairy Processing Course,* Department of Food Science, University of Guelph. November 24, 2020.

Elizabeth King, "Maintaining Quality During a Pandemic", AALVD Quality Assurance Committee Meeting, October 14, 2020, Virtual.

Katie Matheis, Contributor, Working Group 2, Task Group A - Principles, Risk Assessment, and Administrative Controls, ISO International Workshop Agreement (ISO IWA 37), Safety, Security and Sustainability of Cannabis Facilities and Operations with UL Canada (Dec 2020 – present). https://canada.ul.com/iso-iwa-37/

D.1.3 Poster Presentations

Carlos G. Leon-Velarde, Jeanine Boulter-Bitzer, Susan Lee, Nicola Linton, Kelly Shannon, Jiping Li, Saleema Saleh-Lakha, Shu Chen. Microbiological Survey of Sushi Sold in Ontario. IAFP 2020, Oct 26-28.

Saleema Saleh-Lakha, Carlos G. Leon-Velarde, Jennifer Fischer-Jenssen, Emily Wilson, Anli Gao, Shu Chen, Ana Lozano. Validation of the 3M™ Petrifilm™ Rapid E. coli/Coliform Count Plate for the enumeration of coliform in a Variety of Foods against the Canadian Reference Method (MFHPB-31). IAFP 2020, Oct 26-28.

Saleema Saleh-Lakha, Carlos G. Leon-Velarde, Jennifer Fischer-Jenssen, Emily Wilson, Anli Gao, Shu Chen, Ana Lozano. Validation of the 3M™ Petrifilm™ Rapid E. coli/Coliform Count Plate for the enumeration of *Escherichia coli* in a Variety of Foods against the Canadian Reference Method (MFHPB-27). IAFP 2020, Oct 26-28.

Carlos Leon-Velarde, Mohamed Mohamed, Divyang Bhatt, Saleema Saleh-Lakha and Kathy L. Wilson. Evaluation of the BAX® System Real-time PCR Assay for Vibrio for the Detection of Vibrio Cholerae, Vibrio Vulnificus, and Vibrio Parahaemolyticus in Raw Seafood Products. IAFP 2020, Oct 26-28.

Carlos G. Leon-Velarde, Saleema Saleh-Lakha, Nathan Larson, Zheng Wu, Ryan Lee, Sophie Canobio. Evaluation of the GENE-UP® Salmonella 2 Real-time PCR Assay for the Detection of Salmonella Species in a Variety of Environmental Surfaces. IAFP 2020, Oct 26-28.

Carlos G. Leon-Velarde, Saleema Saleh-Lakha, Nathan Larson, Zheng Wu, Ryan Lee. Christian A. Blyth. Evaluation of the 3M™Molecular Detection Assay 2 for the Detection of *Escherichia coli* O157 (including H7) in a Variety of Foods. IAFP 2020, Oct 26-28.

Nisha Corrigan, Carlos Leon-Velarde, Saleema Saleh-Lakha, Kathy L. Wilson. Independent Evaluation of the Real-time BAX® PCR Assay for *Listeria monocytogenes* in Food Samples for Health Canada Compendium Inclusion. IAFP 2020, Oct 26-28.

D.1.4 Research Projects (Grants)

Shu Chen (PI), Carlos Leon Velarde (Co-PI). Team members: Jeanine Boulter-Bitzer, Susan Lee, Nicola Linton, Kelly Shannon, Jiping Li, Saleema Saleh-Lakha. Microbiological Survey of Sushi Sold in Ontario. OMAFRA Food Safety Research Program. Aug 2018 - Mar 2021 (completed).

Wendy McFadden-Smith (PI), Justin Renkema, Shu Chen, Jay Subramanian. Development of a novel method for quantifying spotted wing drosophila (SWD) in a monitoring program in stone fruit, grapes and berries and determination of impact of SWD on stone fruit and grape varieties. Niagara Peninsula Fruit & Vegetable Growers' Association (NPFVGA). Apr 2018 – Mar 2021 (completed).

Shu Chen (PI), Team members: Susan Lee, Saleema Saleh-Lakha, Carlos Leon-Velarde, Mythri Viswanathan, Nicola Linton. Comprehensive evaluation of a high throughput culture-independent diagnostic test (CIDT) against standard methods for simultaneous detection of common food-borne pathogens in foods. Ontario Agri-Food Research Initiative Program (OMAFRA). Dec 2020 - present.

Shu Chen (PI), Carlos Leon Velarde (Co-PI) and Nicola Linton (Team member). Evaluation of a High Throughput CRISPR Sequence-Based Method for Identification of Multiple *Salmonella* Serovars in a Sample from Poultry Production Environments. Ontario Agri-Food Research Initiative Program (OMAFRA). Dec 2020 – present.

D.1.5 Additional Scientific Contributions

Official methods validated by AFL and approved by Microbiology Method Committee (MMC), Government of Canada

1. MFLP-98 Detection of E. coli O157:H7 in Food Products by the VIDAS® UP E. coli O157 (including H7) Method - November 2020.
2. MFLP-100 Detection of Salmonella spp. in Foods Using the 3M™ Molecular Detection System Test Kit Version 2 – May 2020.
3. MFLP-110 Detection of Listeria monocytogenes in dairy products using the ANSR® for Listeria monocytogenes test kit – August 2020.

D.2 Highly Qualified Personnel (HQP) Training

AFL contributed to the training of five HQP in 2020/21.

Highly Qualified Personnel (HQP)

1. Shu Chen served on graduate committees for PhD candidate, Atinuke Olajide (Department of Food Science, University of Guelph), and FSQA candidate Iyabo Ojebiyi (Department of Food Science, University of Guelph).
2. Carlos Leon-Velarde served on graduate committee for FSQA MSc. candidate Manika Singh (Department of Food Science, University of Guelph).

3. Shu Chen / Nicola Linton provided orientation/training for MSc candidate Sujani Rathnayake (Department of Integrative Biology, University of Guelph) for fish species analysis of sushi samples by next generation sequencing (on-going).
4. Charles Wroblewski, PhD candidate in Biomedical Engineering (School of Engineering, University of Guelph), advisor Dr. Ashutosh Singh (on-going).
5. Linda Lissemore, Special Faculty Status Appointment with the University of Guelph, School of Environmental Sciences.