# TRENT UNIVERSITY'S BATA RESEARCH & INNOVATION CLUSTER

A Proposal to the Post-Secondary Institutions Strategic Investment Fund

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## **1. INTRODUCTION/EXECUTIVE OVERVIEW**

Trent University is submitting one proposal to the federal government's Strategic Investment Fund. It will facilitate the transformation of two floors of the iconic Thomas J. Bata Library, creating the **Bata Research & Innovation Cluster**. The Bata Cluster will house seven centres of research, innovation and commercialization at the same time that it creates three collaborative interactive spaces to facilitate research, development and entrepreneurship. The transformation will be carried out in a way that maintains and enhances a historically-significant building that was designed by one of Canada's most renowned architects, Ron Thom. The project will demonstrate ways to combine a commitment to nationally-important architecture with a contemporary need for digital infrastructure, and for sustainable design that furthers Canada's climate change agenda.

## 1.1 The Three Components of the Bata Research & Innovation Cluster

The proposed project has three components (Figure 1).

**COMPONENT A** will be located on the second floor of the Bata Library. It will house three centres – the **Entrepreneurship & Social Innovation Centre**, **Educational Research Design Studio**, and the **Trent Community Research Centre**. These centres will occupy a floor with a MakerSpace and Public Ideation Area designed to promote the generation of new projects, and a Service Point that provides support and assistance to users seeking information, research assistance and/or technological help.

The plan for the new *Entrepreneurship & Social Innovation Centre* has been developed in partnership with community agencies, the City of Peterborough, and other partners. Over the last three years, the University has worked with the Trent Central Student Association (Trent's principle student union) to develop a new Student Centre. The need for an Entrepreneurship Centre was a recurring theme in those discussions. Locating such a centre in the Bata Cluster will allow faculty, students, and partners to develop skills that promote research and innovation. This project is driven by the shared conviction that the path to prosperity in Peterborough, Ontario and Canada lies in startups, entrepreneurship and innovative research.

The *Trent Community Research Centre* is a well-established entity that connects the University to the community through research projects carried on in partnership with community groups and agencies. It is a catalyst for community action through research. A redesign of the Centre to promote social innovation, career-related experiential learning and entrepreneurship is planned for the near future. Every year the Centre provides opportunities for students to gain hands-on experience and connect to community organizations through research projects that it oversees.

The new *Educational Research Design Studio* will foster the development of new methods of learning, training and teaching that include innovative methods, practices and technological aids. The Studio will promote the teaching of the skills needed for research and entrepreneurship at the same time that it is involved in these pursuits.

**COMPONENT B** of the Bata Research & Innovation Cluster will be located on the third floor of the Bata Library. It will house four centres for research – the **Canadian Environmental Modelling Centre**, **Indigenous Environmental Studies Research Centre**, **Trent Centre for Aging & Society**, and the **Visualization & Creativity Lab**. This floor will share a **Training & Discourse Room** that accommodates 40 people at tables, open space, and "hot desks" available for general use. The hot desks will be arranged to take full advantage of the spectacular views of the Otonabee River that inspired Ron Thom's design of the library.

The relocation of the *Canadian Environmental Modelling Centre* to the Bata Cluster will enhance its long-standing and wellknown expertise in environmental modelling. This relocation will improve the Centre's capacity, efficiency and effectiveness in model development which has a special focus on movement of toxic and environmentally-impactful chemicals and compounds around the globe.

The *Indigenous Environmental Studies Research Centre* is the only one of its kind in Canada. It focusses on research and innovation projects that promote healthy, sustainable Indigenous communities. Areas of interest include environmental protection, responsible resource development which promotes economic development, inter-cultural understanding, and improvements in health and education for Indigenous residents in rural and remote communities.

The *Trent Centre for Aging & Society* has a well-established reputation for its work on the social determinants of health, and the development of social and economic policies and initiatives that support aging. Proximity to the Bata Cluster centres and spaces will inspire opportunities for new social and economic enterprises serving senior markets, and allow the study of policies and practices relevant to demographic advantages/challenges for all of Canada, and for Indigenous communities.

The Visualization & Creativity Lab will promote an emerging focus on visualization among Trent researchers who are developing ways of analyzing visual images, geometric transformations, perspective taking, creative thinking, data analytics, computer gaming and film visualization. Some of the work in the lab will study their effects on users. The Lab will advance human connections with the visual, and facilitate interactions among researchers, students and collaborators across all the Bata centres.

**COMPONENT C** of the Bata Research & Innovation Cluster is the infrastructure that will ensure that Components A and B are able to operate in the best way possible. It will incorporate the digital and high performance computing infrastructure needed for advanced research and building design elements that will achieve sustainability and environmental goals of both Trent and the Government. The latter will be introduced in a way that respects and enhances the elements of a widely recognized architectural masterpiece.

## Figure 1. Overview of the Bata Research & Innovation Cluster

#### COMPONENT A

ENTREPRENEURSHIP & SOCIAL INNOVATION CENTRE Inspiring, engaging, and supporting new entrepreneurs, with a special focus on students and aboriginal youth

#### EDUCATIONAL RESEARCH DESIGN STUDIO Researching and developing innovative pedagogies,

curriculum, practices and learning tools

#### TRENT COMMUNITY RESEARCH CENTRE

Supporting local and experiential student research projects

#### MAKERSPACE AND PUBLIC IDEATION AREA Open zones of interaction that facilitate prototyping, idea generation and animated discussions to promote all activities in the Cluster

#### SERVICE POINT

Supporting clients seeking information, research assistance and technology service

#### COMPONENT B

CANADIAN ENVIRONMENTAL MODELLING CENTRE In partnership with the private and public sector, investigates critical chemical and physical environmental issues of high global and Canadian interest

#### INDIGENOUS ENVIRONMENTAL STUDIES RESEARCH CENTRE Working to address Indigenous environmental and sustainability issues

TRENT CENTRE FOR AGING & SOCIETY Promoting community initiatives and

enterprises on aging

VISUALIZATION & CREATIVITY LAB Projects on visual data, visualization, augmente reality and visual learning structures

#### **TRAINING & DISCOURSE ROOM** Shared space, fully equipped with AV & Media used for workshop/training, with flexible configurations

#### INFRASTRUCTURE

#### DIGITAL

and data analytics in support of research and innovation for faculty, staff, students and industry

#### HERITAGE

Maintain heritage of the Bata building including essential Ron Thom architecture

#### GREEN

Sustainability through HVAC system, energy efficient windows, new roofing, green wall, book relocation and storage



## **1.2 Trent University**

Trent is one of Canada's premier small universities. It leads the way in the development of a personal, interactive approach to university education, offering a comprehensive range of undergraduate programs and strong graduate programs in a number of key disciplines (with M.A., M.Sc., M.Ed. and Ph.D. degrees). *Maclean's Magazine* ranks Trent as the number one primarily undergraduate University in Ontario and as number two in Canada. Trent students consistently report higher than average levels of satisfaction and engagement in the National Survey of Student Engagement (NSSE). Research Info\$ource places Trent third in its ranking of research at small universities in Canada. Research productivity and return on investment at Trent is superior to that of many other institutions which are twice its size.

Trent has always emphasized active learning. This is one of the reasons it has embraced a decision to remain a small University in which undergraduate and graduate students can directly connect and collaborate with faculty, staff and their peers. At Trent, this happens in diverse communities that span residential colleges, classrooms, disciplines, hands-on research groups, and co-curricular and community-based activities. Across all disciplines, Trent aims to bring critical, innovative, 'outside-the-box' thinking to life.

Trent University is characterized by strong research in all its undergraduate and graduate program areas. Some areas of special strength are the Study of Canada; Indigenous Studies (Trent established the first undergraduate Indigenous studies program in 1969, and the first PhD in Indigenous Studies in 1999); Environmental Studies (with research and programs in Biomaterials, Sustainable Agriculture, Environmental and Resource Science, Water Quality, and Indigenous Environmental Studies); the Study of Aging; International Programming; Social Justice; and Health and Nursing.

Trent's Peterborough campus (the Symons campus) boasts award-winning architecture on a 1450-acre campus in a breathtaking natural setting that spans both sides of the Otonabee River. With the recent extension of Highway 407, the campus is less than 90 minutes from downtown Toronto. The University's Durham campus, located in Oshawa, Ontario, delivers programming in the east Greater Toronto Area. The proposed Bata Research & Innovation Cluster would be located on the second and third floors of the Bata Library, located on the Symons campus.



## 1.3 The Bata Library

The Bata Library will celebrate its 50th birthday in 2019. An iconic and unique example of modernist architecture, it is the geographical and the intellectual heart of Trent's Peterborough campus. It is a building of national and international architectural importance. A 2013 article in *The Walrus* describes Thom and his rival, Arthur Erickson, as "nation builders" who "defined our aesthetic."

Currently, the Bata Library already functions as a key component of research infrastructure at Trent. It provides access to over a million print and electronic documents. They include books, maps, photograph collections, journals and databases. The library also houses an active archive, many special collections and a Maps, Data & Government Information Centre (MaDGIC) which serves as the campus centre for geospatial and statistical data, offering technical support to students and researchers using Geographic Information Systems (GIS) technologies. MaDGIC manages the site licence for ESRI software and coordinates a number of data partnerships with the public and private sectors.

Trent University librarians and archivists are active participants in research projects, as well as two academic library consortia. The national Canadian Research Knowledge Network and the provincial Ontario Council of University Libraries missions actively support research and scholarship. These connections allow Trent to combine its research expertise with that of other institutions. The University's subject and specialist librarians and archivists provide in-depth research support through a number of channels, assisting faculty, students and researchers in navigating the increasingly complex world of scholarly information. The role of our librarians is expanding to support research into patents, intellectual property (and the associated commercialization issues), and text and image-mining research projects.



## 1.4 Trent's Strategic Directions and the Bata Research & Innovation Cluster

The Strategic Investment Fund program provides Trent with an opportunity to complete a project which will serve federal and provincial priorities. Trent is proposing \$14 M in funding to accomplish the Bata Research & Innovation Cluster transformation: \$7M from the Strategic Investment Fund; \$1.1 M from the provincial government; \$2 M from a fundraising campaign (\$1.1 M has already been raised); and the remainder from debt financing. The Board of Governors and the President of Trent have approved the current submission. Trent is ready to begin work on it immediately.

The proposed Cluster would transform two floors of the Thomas J. Bata Library into a twenty-first century research, innovation and entrepreneurship hub in a way that would respect the historical and architectural importance of the building, prepare it for another fifty years of active life, and further the innovation and economic agendas of Trent, Peterborough, Ontario and Canada.

The Bata Library remains an impressive architectural achievement, but it was built at a time when environmental responsibility, sustainability and digital communication played little role in architectural design. During its first fifty years of life, the building has not been renovated, and its basic systems – mechanical electrical, structural – and building envelope need to be upgraded.

## \$14M IN FUNDING TO ACCOMPLISH THE BATA RESEARCH & INNOVATION CLUSTER TRANSFORMATION

In order to provide better support for research, learning, innovation and commercialization projects, the Bata Library needs more open space for collaborative use; improved digital infrastructure; high performance computing; areas dedicated to specific research activities and interactive spaces. By providing Trent with two floors upgraded in this way, the Bata Cluster can provide researchers (students, faculty and University partners) with state-of-the-art research facilities inside the existing library. Two developments have culminated in the proposal to create a Bata Cluster:

- One is a library decision to remove 50% of its print collection as a result of the increased use of electronic resources. This move will remove parts of the collection which are not used (some of it will be maintained in storage space) and open up space that the University will make available for research, innovation and entrepreneurship activities.
- A second development that has led to this proposal is Trent's commitment to a research program that will make it an even more important catalyst in the development of the economy of Peterborough and Eastern Ontario. Current plans include the development of a Trent Research and Innovation Park which will commercialize research relating to a range of green technologies such as: water quality treatment, green chemistry, sustainable agriculture and other forms of environmental business (See Supporting



Documents: Appendix 1 – Trent Research Innovation Park ). The land needed for the Research and Innovation Park has been designated by the Board. To facilitate its development, the University and the City of Peterborough have formed a partnership which will provide approximately \$5 million of basic infrastructure (most significantly, water and sewage) to the Park. Three prospective tenants have already expressed interest in the possibility of locating their businesses in the park.

To fully develop Trent's research and commercialization infrastructure requires more space for research and innovation, and for the development of entrepreneurs who will develop economic and social enterprises that reflect and leverage Trent research. Trent aims to develop a hub for research and innovation that will bring together existing and emerging centres of research and innovation in a way that enhances their operations and provides space for new ventures. Some of these ventures will produce commercial applications that will be developed in Trent's research park. The emphasis in the current project is initiatives that bring together researchers and students who approach related issues and problems from different methodological perspectives. Thus, as a compliment to other elements found across the campus (i.e. business incubator in DNA building, the new Research and Innovation Park) the Bata Research & Innovation Cluster fills in crucial pieces of the ideation/incubation/innovation/ commercialization spectrum.

## ENVIRONMENTAL STEWARDSHIP, SUSTAINABILITY, ENERGY CONSERVATION, AND CLIMATE CHANGE ABATEMENT

The Bata Cluster will provide key research, entrepreneurship/commercialization space at the same time that it addresses the need to retrofit the Bata Library in a way that employs principles of LEED design. In the process, Trent aims to marry its longstanding commitment to environmental stewardship, sustainability, energy conservation, and climate change abatement to its aim to be Canada's best small research University.

The Cluster will create many possibilities for cross-disciplinary research. The Centre for Environmental Modelling will, for example, be able to easily collaborate with the Indigenous Environmental Studies Research Centre; the Centre for Aging & Society will be able to work in the Visualization & Creativity Lab on visual representations of aging; and the Entrepreneurship & Social Innovation Centre will be able to work with all the centres in the Cluster. All the spaces will have access to new digital infrastructure and high performance computing to enhance their research and innovation efforts.

The need for Bata renewal, and for research and innovation space, has been noted in Trent's planning for some time. In 2007 a Facilities Renewal Strategy identified the need for a new student information commons and the need to repatriate space at the Bata library. This precipitated planning for a Student Centre which is currently under construction. It has been widely recognized that the next step in Trent's renewal must focus on the Bata Library, a building the University needs to reimagine and upgrade. In keeping with this, the University has included the library building in deferred maintenance projects submitted to the provincial government. Detailed planning has been going on for over a year.

(See Supporting Documents: Appendix 2 – Capital Inventory/SIF Provincial Template; Appendix 3 – Board Approval; Appendix 4 – Certification; Appendix 5 – Priority Designation; Appendix 6 – Letters of Support).

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## 2. THE BATA RESEARCH & INNOVATION CLUSTER IN DETAIL

The Bata Research & Innovation Cluster will relocate some existing centres of research and innovation and establish others. The result will be intensely-interactive spaces that encourage and foster interdisciplinary discussion and collaborative research initiatives, and that involve researchers and students working with the different centres.

## **COMPONENT A of the Bata Cluster**

Component A on the second floor of the Bata Library will house three centres (the Entrepreneurship & Social Innovation Centre, the Educational Research Design Studio, the Trent Community Resource Centre) as well as a MakerSpace, Public Ideation Area, and an integrated Service Point. We discuss them each in more detail below.

#### 1. Entrepreneurship & Social Innovation Centre

Inspiring, engaging, and supporting new entrepreneurs, with a special focus on students and aboriginal youth

#### 2. Educational Research Design Studio

Researching and developing innovative pedagogies, curriculum, practices and learning tools

#### 3. Trent Community Research Centre

Supporting local and experiential student research projects

#### 4. Makerspace & 5. Public Ideation Area

Open zones of interaction that facilitate prototyping, idea generation and animated discussions to promote all activities in the Cluster

#### 6. Service Point

Supporting clients seeking information, research assistance and technology service



## 2.1 Entrepreneurship & Social Innovation Centre

#### **Executive Summary:**

The new Entrepreneurship & Social Innovation Centre will demonstrate how students and others can turn their ideas into new enterprises. Its location in the Bata Library, a prime spot where students naturally congregate, will trigger curiosity and invite investigation. The Centre's proximity to the Public Ideation Area, the MakerSpace, and the research centres in the Bata Cluster will make it an ideal place for student and other entrepreneurs to meet and interact with mentors and prospective collaborators. One of the projects the Centre will sponsor is a distance-learning program focussed on aboriginal youth entrepreneurship, leveraging University contacts with 133 Indigenous communities in Canada. Table 1 summarizes the current partners, student involvement, and major outcomes for the Centre.

In May 2014, a Trent working group was established to consider ways to support and encourage students who might consider entrepreneurship as a career. The 15-member working group included staff, faculty, students, alumni and members of the local business community. The group toured other entrepreneurship centres, reviewed reports by the Council of Ontario Universities, the Higher Education Quality Council of Ontario and other bodies, and engaged local experts in discussion. The working group's final report in September 2014 recommended an extracurricular student entrepreneurship program that would address the needs of both commercial start-ups and social entrepreneurship, and the establishment of an entrepreneurship education/ideation centre. This new centre, called the Entrepreneurship & Social Innovation Centre, would be anchored in a desire to inspire and support student entrepreneurs in particular, helping them address the pressing socio-economic needs of our region. The Centre would be designed to equip students with skills that would allow them to contribute to the prosperity of Ontario and Canada.



The plans for the Entrepreneurship Centre are based on a partnership model which leverages existing networks, expertise, and assets in surrounding communities of entrepreneurs, investors and organizations. Locating the centre on the 2nd floor of the Bata Cluster will address the biggest challenge identified by the working group: exposing as many Trent students as possible to extracurricular programming that teaches social and commercial innovation and entrepreneurship. As a gathering place for Trent's students, the library location will meet this critical need, facilitating impromptu exposure to entrepreneurism for students across all disciplines, as it promotes events and cross-department programming.

Fostering the development of a vibrant culture of entrepreneurship at Trent, the Entrepreneurship & Social Innovation Centre will support faculty who incorporate principles of entrepreneurship in their courses; provide experiential and co-curricular learning opportunities for students; and create access to mentorship, partnership, resources, and funding opportunities to enable and grow student-led initiatives, start-ups and change projects. The Centre will help innovators at Trent commercialize their ideas. The Centre will provide students with resources and support that will help them transition successfully to the workforce. The University will make the Centre available to Trent alumni and community members who wish to explore entrepreneurship as a career and access support for their business and innovation ideas. As the City of Peterborough pursues a plan to focus on entrepreneurship to spur economic development, the Centre will actively engage the local community in entrepreneurship initiatives.

## Activities of the Entrepreneurship & Social Innovation Centre

The activities of the Centre will build on Trent's current initiatives and partnerships that support entrepreneurship and innovation, making them available to many more students. They include:

- **FastStart** a youth entrepreneurship program funded by the Ontario Centres of Excellence, delivered through the Greater Peterborough Innovation Cluster and administered by the Trent Office of Research in partnership with Fleming College, University of Ontario Institute of Technology, and Durham College;
- Entrepreneurship Society a new student club at Trent focussed on mentorship, guidance and support of young aspiring entrepreneurs;
- Greater Peterborough Innovation Cluster a partnership among Trent University, Fleming College and the Peterborough Region Angels Network that supports innovation, entrepreneurship, commercialization, and start-ups;
- The Cube a business incubator located at Trent University in partnership with the Greater Peterborough Innovation Cluster and that is designed to be a "onestop-shop" to help start-up technology companies find their best path to market by linking together talented people, ideas, resources and know-how;
- Kawartha Backcountry Entrepreneurship Experience

   a transformative FastStart initiative that combines
   survival wilderness training with programming on how
   to start a business;
- Trent Business Council a committee of community business leaders and Trent University faculty and staff that connects our business students to the community, provides internship opportunities and brings business leaders into the classroom for real-world learning;





- Trent Alumni Association Mentorship Program a program that connects students with alumni mentors across all fields and sectors;
- Junior Achievement of Canada a two-year partnership that includes hosting the Next Generation Leadership Forum at Trent University where young entrepreneurs from around the world attend workshops led by faculty from Trent University's Business Administration and Masters in Sustainability Studies programs, as well as local entrepreneurs.

#### Benefits of the Entrepreneurship & Social Innovation Centre for Students, Faculty and the Local and Regional Communities

- The leverage and growth of existing networks of investors, alumni, mentors and other community assets
- New enterprises contributing to economic prosperity and social development in the Peterborough region and beyond
- An expanding pipeline of investment-ready entrepreneurs
- Student participation in extracurricular activities that build leadership, organization, and communication skills
- Much-needed study space and a gathering place for students
- Collaboration among students, faculty and others in disparate disciplines
- Promotion of entrepreneurship as a career
- Support for youth and others who wish to develop the skills needed to be a successful entrepreneur and change agent
- Alignment with Ontario's existing investments in innovation, commercialization and entrepreneurship, as well as the surrounding community of entrepreneurs, investors and businesses

Table 1. Entrepreneurship & Social Innovation Centre Outcomes	
Expected Partners at Trent	Office of Research, Student Transitions & Career Centre; Trent Business Council; Community Relations & Advancement; Alumni Affairs; First Peoples House of Learning, Business Administration Department; School of the Environment; Masters in Sustainability Studies program; the Trent Youth Entrepreneurship Society; Trent Library and Archives; Bata Cluster Centres
Potential Partners External to Trent	Ontario Network of Entrepreneurs; Greater Peterborough Innovation Cluster; our three FastStart partners (Fleming College, UOIT, and Durham College); Peterborough Economic Development; the Spark Centre; Peterborough Chamber of Commerce; Start-up Peterborough; the Peterborough Regional Angel Network; Junior Achievement; Lakefield College Entrepreneurship Club; Futurpreneur/CFDC

#### Goals

- Targeting creation of 10 new companies per year
- Targeting information and awareness reach to at least 1,000 students annually (Twitter, Instagram and Facebook followers)
- Indigenous Youth Entrepreneurship Program

## 2.2 Educational Research Design Studio

#### **Executive Summary:**

The Educational Research Design Studio will be a new state-of-the-art research laboratory where faculty, students and partners can co-design research projects on learning, training, and innovation, producing programs, learning aids and technological innovations. The location of the Design Studio within the Bata Cluster will allow it to complement the research activities in other parts of the Cluster, providing training and teaching that will enrich the work of students, faculty and collaborators and/or use it as the basis for educational design. Table 2 summarizes the current partners, student involvement, and major outcomes for the Centre.

The Bata Cluster will include a highly-visible educational research design studio – a space within the Bata Library that offers all students, innovators, teachers, and partners a place to research and design projects aimed at improving learning and developing marketable curriculum products. Instructors will be able to use the studio with the support of knowledgeable staff and colleagues. They will be invited to undertake research on curriculum design and training pedagogies with an eye toward novel and transformative educational change.



The Educational Research Design Studio will be an active research environment where faculty and students can collaboratively pursue research projects about teaching and learning. In this way, the Studio will aim to be a radical and constructive space for developing best practices. Illustrative examples of research and development within the Educational Research Design studio would include:

- i. Professors in the Trent Physics department are developing a scaffolding method which can support students and others, guiding their thinking, not only in the classroom, but in testing contexts as well. The method employs an answer system which provides the user with feedback at each stage of their problem solving. The research team would like to digitize the method and apply it across disciplines and institutions. Industry partners such as Desire2Learn have expressed interest. Furthering the development of the method requires collaboration space that is not specific to physics teaching. The Bata Educational Research Design Studio will house the project and support the professors, furthering product development and testing.
- ii. The Design Studio will be a space where Trent brings together Indigenous and non-Indigenous scholars to develop new curriculum that responds to the Truth and Reconciliation Commission recommendations and calls to action. The infusion of Indigenous Knowledge across the University will include teaching about treaties, residential schools, youth and marginalized women, languages, economic and legal contexts, racism and storytelling as core Knowledge. This endeavour will aim to include Indigenous Knowledge in a full range of disciplines including the sciences, humanities, education, business and nursing. The curriculum in the Design Studio will be field tested in pilot studies, and then refined. It will be a key component of education at Trent, but also beyond Trent, through resource and curriculum distribution.

To best further these and other projects, the Design Studio will be equipped with a state of the art research laboratory with Interactive high-tech and low tech whiteboards, modular furniture, SmartKapps, assistive devices that support all learners (including SmartPens and touch screens), video equipment in a video suite, and computers for researching (recording, viewing and analyzing) teaching innovations.

Table 2. Educational Research Design Studio Outcomes	
Expected Partners at Trent	Faculty across departments, programs and disciplines; the First Peoples House of Learning; the Centre for Teaching & Learning; Deans; Trent alumni; Award winning faculty at Trent; Experiential Learning Coordinator; Trent Library and Archives; Bata Cluster Centres
Potential Partners External to Trent	Desire2Learn; Blackboard or other Learning Management Systems; industry partners; other University faculty and departments; LearnStyle; curriculum publishing houses; Trent Community Research Centre
Students involved	Up to 8,000 University students within Trent University will benefit from the pedagogies, tools and technological innovations developed; broader efforts working with partner institutions may lead to many more students across the system that benefit from curriculum and pedagogy research and developments

#### Goals

- Annual summer teaching development program to rejuvenate teachers through a refresh program, introduction to new pedagogical practices, and revamping of course syllabi (open to Trent faculty and once proof-of-concept is in place, open to Ontario teachers and faculty, and eventually Canada-wide); facilitated by the Centre for Teaching & Learning and housed in the Design Studio
- Development, testing and marketing of Indigenous curriculum and pedagogy (print and non-print dynamic curriculum tool development in the Design Studio)
- Work on policies on tertiary education curriculum informed/changed/modified to incorporate Indigenous Knowledge and ways of knowing
- Initiation of at least two interdisciplinary and intergenerational projects each year on innovative curriculum design, research and implementation (in conjunction with the research centres of the Bata hub and community partners in secondary schools and community care facilities for seniors)
- Knowledge development on innovative pedagogies in tertiary education through fellowship research programs
- Design, development, and validation of novel physical and virtual learning products
- Dedicated web space on best-teaching practices including video clips of these practices in action
- Web-based knowledge mobilization of research findings for wide dissemination in scholarly, popular and market literature
- Partnerships that will allow us to combine our efforts with those of at least five partner institutions

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#### **Executive Summary:**

Trent University partners with the Trent Community Research Centre, a globally-recognized collaboration working with faculty and students to create innovative solutions to research questions identified by local non-profit community organizations, government agencies and social enterprises. Students receive academic credit and on-the-job experience while performing research in a community setting. The projects undertaken promote social and economic development in the local community, and a culture of social engagement, entrepreneurship and innovation. Relocating the principal office of the Trent Community Research Centre within the Bata Cluster and in close proximity to other research centres will allow it to expand its operations to include more students, agencies and host organizations, and to develop a greater range of projects and collaborations. Table 3 summarizes some of the current partners, students affected, and major outcomes for the Centre.

The Trent Community Research Centre, formerly known as the Trent Centre for Community Based Education, was established in 1996. It operates as a non-profit corporation with a separate Board of Directors and staff. Funding is provided through a partnership agreement with Trent University and funding arrangements for specific research projects. The focus of the Centre

has been work with community agencies to identify and develop research projects that serve agency and community needs. Students complete academicallyrigorous research projects under the supervision of Trent faculty and the Centre's own coordination staff. This model supports the community and provides meaningful experiential learning for senior undergraduate and graduate students who learn how to apply their research skills and knowledge to community development. In the process, students gain academic credit and on-the-job experience. Once completed, projects are presented to the community agency.

The Community Research Centre oversees many different kinds of projects. A Trent undergraduate student may conduct a discrete research project for credit, focusing on a particular problem for a single agency or work with a local collaborator. Teams of undergraduate students may work on short-term or long-term research tasks co-ordinated by the Centre staff. A team of undergraduate and graduate students may participate in a faculty research program connected to a multi-year, funded project. The Trent Community Research Centre supports collaboration with employers, community partners and regions to foster social and economic development, promote a culture of social engagement, entrepreneurship, and provide opportunities for workintegrated and blended learning environments.

This Centre already boasts a wide range of projects in the humanities, social sciences, and sciences, with a particular emphasis on culture, healthy communities, the environment and sustainability. Notable recent projects include: a partnership with Peterborough-Lakefield Police Victims Services to research the





development of a volunteer program; a review of local youth programming needs and services in the Peterborough Community; an analysis of the effectiveness of two social housing grant programs in the City of Peterborough; and a project to prepare local environmental groups for the arrival of the Emerald Ash Borer.

In relocating the principal office of the Trent Community Research Centre to the Bata Research & Innovation Cluster a greater proportion of Trent students will have opportunities to engage in community-based research and community engagement in a way that allows for a greater diversity of projects. The Centre's proximity to other research centres in the Bata Cluster will generate additional research questions and opportunities and collaborations. Access to technology and other types of research practices will enhance Trent's role as a leader in experiential education and community-focussed research.

Table 3. Trent Community Research Centre Outcomes	
Expected Partners at Trent	Departments and Schools at Trent; Bata Cluster Centres
Potential Partners External to Trent	U-Links Centre for Community-Based Research in Haliburton County; Peterborough Local Community Advisory Committee (CBR Peterborough) in Peterborough City and County; Greater Peterborough Chamber of Commerce; Peterborough GreenUp; Community First: Impacts of Community Engagement; Regional Human Service and Justice Coordinating Committee; Peterborough City and County Health Unit; Ministry of Natural Resources; New Canadians Centre, Peterborough; Community Based Research Canada
Students involved directly	In 2014/15, 60 projects were completed, (including individual, team and course projects), involving 245 students, 37 host community organizations, 17 faculty members and eight academic departments
Students involved more broadly	We anticipate that the Bata space will double the number of students currently impacted, increasing community research and development partnerships and experiences.

#### Goals

- Increased student research projects that respond to community needs
- Broadened interest in community campus engagement
- Trent will continue to be a leader in community-focussed and community-based research
- More community-based research and community engagement opportunities available to a greater proportion of the Trent students
- Strong pathways from service learning opportunities in the early years of University
- Community focussed undergraduate research, graduate theses, and dissertation work
- Establish pathways from successful undergraduate community based research work to graduate study at Trent and elsewhere
- Develop better follow-up and reporting on community based research to establish the case for employment and community benefits
- Enhance community liaison work



## 2.4 MakerSpace & Public Ideation Area

The MakerSpace and Public Ideation Area in the Bata Research & Innovation Cluster will form a new creative commons which brings together, students, collaborators and innovators to discuss ideas and conceivable solutions to critical issues impacting our community, our country and the world. As open-concept, welcoming spaces, they will be the first point of contact for anyone entering the cluster. These spaces will invite both Trent and external community members to stroll through, spontaneously converse, or settle in at ad-hoc workspace such as: stand-up bars, couches, modular tables, and drawing board pods. As a central open area it is intended to be a hive of interaction which physically transitions naturally into the more specialized, surrounding zones including: the Entrepreneurship & Social Innovation Centre, Educational Research Design Studio, Trent Community Research Centre, and Service Point. As such, the MakerSpace and Public Ideation Area will make these zones a unified whole and channel developing activities to more specialized areas as they naturally progress. Conversely, these spaces will facilitate spill-out activity from these other zones as larger groups may want to convene discussions in spaces more conducive to animated, louder or larger group discussions.



## 2.5 Service Point

#### **Executive Summary:**

Located on the 2nd floor of the Bata Library, the Service Point will be staffed by a user support team of full-time expert staff and trained student assistants. This will be a new service area for users seeking general information, customized research assistance, or Information Technology support. The organization of the service point will be based upon Trent's current, successful integrated Information Technology/Library service desk model, which works extremely well. Service Point staff will be trained to refer users to the different research centres and learning support units nested within the Bata Research & Innovation Cluster (or elsewhere on campus, as appropriate). The three components of the service points – Information Technology, Library Research Service, and Career Service – are described below.

#### Information Technology

The Information Technology (IT) Service Desk will be staffed by a team of service technicians that provide technical support for IT issues. A service request can be initiated in-person, by phone, online request form or email. As part of the Service Point for the Bata Cluster, the IT service desk will provide the following services:

- Student Computing Support: Students and other cluster users will be able to access assistance with Trent-supported software, wireless connectivity, advice on virus and spyware removal, and basic hardware diagnostics. Remote desktop support is also available to assist in troubleshooting problems, accessing Trent-hosted web applications such as the student portal - myTrent, and related services such as the LearningSystem and Academic Record.
- Faculty and Staff Support: IT Services will provide additional technical support for faculty and staff and users of Trent-supported software. This will include automated software installation of Trent's standard operating system, which includes Windows 7, Microsoft Office, Anti-virus, and Novell network client.
- 3. Classroom/Lab/Public Computing Space Support: Service Desk staff will provide the first line of support for any classroom, lab, or public computing space technology issue. Faculty and staff have access to a classroom emergency line that would allow them to reach the service desk for quick troubleshooting or dispatch of a technician.



4. Loaner Equipment: A variety of multimedia equipment will be available to support projects and special events. Such equipment includes but is not limited to digital video cameras, tripods, data projectors, laptops, conference phones, loudspeakers, wireless microphones and web cameras.

### Library Research Service

The location of the Research Cluster in the Bata Library building will allow support from the library in a way that melds together library research and innovation services. Highly-trained library staff will be available at the Service Point to provide library research information and reference support that can play a vital role in the work of researchers and innovators working in the Bata Cluster. Trent's professional librarians will provide in-depth research support; outreach to faculty, researchers and students; instruction in the discovery and use of scholarly research information; and assistance with research data management and curation, spatial data management, data reproduction and visualization, etc.

### **Career Services**

Trent's Career Services is interested in playing a role in the new organization of two floors of the Bata Library. It plans to hold events and make career information available to students working in the Entrepreneurship Centre. It will use the Service Point as a contact point where it can interact with students interested in learning more about careers.

## **COMPONENT B** of the Bata Cluster

Component B on the third floor of the Bata Library brings together four centres (Canadian Environmental Modelling Centre, Indigenous Environmental Studies Research Centre, Trent Centre for Aging & Society, Visualization & Creativity Lab) as well as a Training & Discourse Room. We discuss them each in more detail below.

#### **1. Canadian Environmental Modelling Centre** In partnership with the private and public sector, investigates critical chemical and physical environmental issues of high global and Canadian interest

**2. Indigenous Environmental Studies Research Centre** Working to address Indigenous environmental and sustainability issues

#### 3. Trent Centre For Aging & Society

Promoting community initiatives and enterprises on aging

#### 4. Visualization & Creativity Lab

Projects on visual data, visualization, augmented reality and visual learning structures

#### 5. Training & Discourse Room

Shared space, fully equipped with AV & Media used for workshop/training, with flexible configurations for up to 40 people







### 2.6 Canadian Environmental Modelling Centre

#### **Executive Summary:**

One of the greatest concerns about climate change and the movement of chemical toxins is the high degree of uncertainty that characterizes their likely impacts on populations and ecosystems. This has created an urgent need for predictive environmental modelling. Trent's Canadian Environmental Modelling Centre has a role to play in meeting this need. Its move to the Bata Cluster will provide ready access to key High Performance Computing & Data Analytics. These benefits will improve the capacity, efficiency and effectiveness of model development, including modelling that addresses the movement of toxic and climate change chemicals and compounds. Proximity to the Indigenous Environmental Studies Research Centre will enhance the Modelling Centre, allowing them to work collaboratively on the impacts on Indigenous communities. Table 4 summarizes the current partners, student involvement, and major outcomes for the Centre.

The Canadian Environmental Modelling Centre focusses on multi-disciplinary research and model development across the Sciences and Social Sciences. It is affiliated with three graduate programs – Environment & Life Sciences, Applications for Modelling, and Sustainability Studies. The work of the Centre has evolved from its outstanding, internationally-acclaimed research on the tracking of chemical compounds in the environment ("the Mackay models") to a broader focus on the interface of human & industry impacts on ecosystems. This Centre's connection to Trent's CFI-sponsored micro-environment laboratories allows a verification of researcher-computer generated models with field simulations of conditions that replicate predicted future climate change impacts on air, water and soil in local ecosystems. The Strategic Investment Fund infrastructure funding will elevate the Centre's ability to access high-performance computing capacity and to participate in cross disciplinary research activities, enabling knowledge mobilization to all Trent students, and to Canadian and international audiences.

## *Environmental Modelling at Trent University: Its Historic Role, National & Global Significance*

The Canadian Environmental Protection Act, (CEPA 1999) is aimed at preventing pollution and protecting the environment and human health. It is administered jointly by Environment Canada and Health Canada. The Act contains specific requirements for the assessment and management of chemical substances in our aquatic ecosystem. There are literally hundreds of thousands of commercial chemicals in use, with thousands of new commercial chemicals appearing each year. The result is synthetic chemical pollutants that are used in everyday life and ultimately enter the natural environment. These chemicals can have a spectrum of consequences ranging from benign effects to complete toxicity.

Some of these chemicals have accumulated at alarming rates in living organisms and are directly toxic to life. Others may result in climate change or acidification of lakes. Chemicals may impact the local environment while others may be transported many thousands of kilometres to pristine remote regions such as the Canadian High Arctic, harming our Indigenous populations. The laboratory assessment of all these diverse chemical types and their environmental impact is not feasible. For these reasons, government agencies and industry alike have turned to the power of computation-based, chemical-environmental modelling to assess environmental risk potential.

For over two decades Trent University has housed an internationallyrenowned Canadian Environmental Modelling Centre which serves as the central hub of an international network - the Network of Environmental Modelling Centres. The Centre has routinely partnered with Provincial and Federal Government agencies including Environment and Health Canada, the Ontario Ministry of the Environment, as well as with international agencies including the US environmental protection agency and European agencies.



Trent's Canadian Environmental Modelling Centre has also collaborated with many high-profile national and international companies including 3M, DuPont, Exxon-Mobile, Esso, P&G and Unilever. Through these collaborations it created many computer-based models that are open to the public through dissemination via Trent's website. These models have been downloaded in over 150 countries and are used both as educational tools and as tools for governments and industry for risk assessment. While showing great success, the models and methodologies are but a tip of the iceberg required for risk assessing all types of chemicals entering into our environment.

## The Canadian Environmental Modelling Centre Approach

Trent's Centre has existed within and grown largely from the foundations of chemical engineering, mathematical modelling and environmental sciences. It is now recognized that the attempt to understand and develop models of the environment requires a much larger, integrated and holistic multidisciplinary approach which involves, not only the sciences, but the sciences and the humanities. The future and evolution for modelling must involve growth in numerous areas and integrate more disciplines. An example that can illustrate this evolution is the attempt to fully understand the movement and ultimate fate of a pharmaceutical chemical which enters into the aqueous environment, is then exposed to sunlight and weathering, and is ingested by a fish. To produce a computer-based model for such a chemical requires the collaborative efforts and expertize of no less than a chemist, a fish biologist, a hydrologist, a mathematician, a computer scientist, a physicist, and a geographer. Understanding the impact of the results and the ethics of how to deal with them - with regard to risk and how to advise the public - requires further collaboration among scientists and social scientists, philosophers as so forth. The new Bata Research & Innovation Cluster will allow Trent to bring together this diverse sets of scholars, building on Trent's strategic development of collaboration between experimentalists and theoretical modellers. At Trent, our analytical facilities have already integrated experimental work into the fabric of model design and testing.

#### Trent's Current Experimental Facilities for Model Design and Testing

- 1. A complete development of an atmospheric chamber facility (capable of looking at smog events, acid rain, climate change etc.)
- 2. Micro-environment facilities that allow the controlled study of the effect of chemicals in a real-world environment
- 3. A wind tunnel facility designed to measure and model the transport of pollutants on particles in our air
- 4. A world-class mass spectrometry chemical analysis facility

The Bata Cluster will be a centralizing home for the Canadian Environmental Modelling Centre to access the computational power required to realize the multidisciplinary environmental models of the future. These models will allow the theoretical predication of chemical

behaviour to be computed and combine it with and integrated experimental network for validation. A consolidating multi- and inter-disciplinarybased modelling centre of this nature, fusing theorists and experimentalists, would be a first for Canada and would lead the way internationally on the development of environmental risk assessment tools required for chemical development. One of the many benefits that will stem from this novel approach is work with industry which will allow the Centre to design and create chemicals with the least possible environmental impact.



Table 4. Canadian Environmental Modelling Centre Outcomes		
Expected Partners at Trent	<ul> <li>Graduate programs – Environment &amp; Life Sciences (PhD, MSc); Applications in Modelling (MSc and MA); Sustainability Studies (MA)</li> <li>Research Centres – the Trent Water Quality Centre; the Institute of Watershed Sciences; the Trent Micro- environment Laboratories; the Trent Centre for Biomaterials research; Indigenous Environmental Studies Research Centre</li> <li>Faculties – Chemistry, Biology, Physics, Mathematics, Geography, Environmental Sciences, Indigenous Environmental Studies</li> </ul>	
Potential Partners External to Trent	<ul> <li>Industry – Unileverl 3Ml Procter &amp; Gamble; Dow Chemical; Imperial Oil/Exxon/Mobil; BAS;Dupont Canada; Mills Consulting</li> <li>Associations – Canadian Network of Toxicology centres; Chlorine Chemistry Council; Canadian Chemical Producers Association; Canadian Chlorine Chemistry Council; International Life Sciences Institute/Health &amp; Environmental Sciences Institute; CEPA; American Chemistry Council</li> <li>Government – Health Canada; Environment Canada; Indigenous &amp; Northern Affairs Canada; Ontario Ministry of the Environment</li> </ul>	
Cash		

#### Goals

- Dissemination of findings (3 x per year) through the Canadian Environmental Network news bulletins
- Assessment of a minimum of 250 new chemical compounds per year information published into public domain
- Development of an annual carbon modelling and management symposium

## 2.7 Indigenous Environmental Studies Research Centre

#### **Executive Summary:**

The Indigenous Environmental Studies Research Centre is the only research centre of its kind in Canada, and only one of a handful in the world. This new Centre aims to play a crucial role in the creation of healthy, sustainable Indigenous communities. Its research role includes environmental protection, responsible resource development leading to community economic development, inter-cultural understanding, and social innovations that will improve the health and education for Indigenous residents in rural and remote communities. The Bata Cluster location will help ensure that Trent students, faculty, staff and visitors are actively involved in critical issues impacting Indigenous communities. Table 5 summarizes the current partners, student involvement, and major outcomes for the Centre.

The Indigenous Environmental Studies Research Centre is a unique marriage of western science and Indigenous traditional knowledge which focusses on environmental changes and their impacts on communities. One focus is the environmental impact to human health, especially in Canada's far northern and Arctic communities. The faculty research has a broad and powerful inter-disciplinary reach, reflected in funding from each of Canada's Tri-Council agencies (NSERC, SSHERC, CIHR). One of the applied research projects is the development of a comprehensive "Duty to Consult & Accommodate" program which brings together leaders and elders in Indigenous communities with executives from the resource, mining and energy sectors. This policy link between Indigenous and non-Indigenous communities addresses an area in which a broad lack of expertise has stalled economic development linked to resource extraction in areas such as the Ring of Fire in Northern Ontario.

The Centre's valuable expertise grew naturally from Trent University's longstanding relationship with the Indigenous community in Canada and is a centrepiece of its mandate and of its history: over 50 years ago, the Mississaugas of Curve Lake First Nation blessed the lands where the Bata Library is situated on the Otonabee River. In 1969, Trent was the first University in Canada to introduce an Indigenous Studies undergraduate degree and 30 years later, in 1999, Trent introduced Canada's first PhD program in Indigenous Studies. Today, Trent is the only Canadian University with an Indigenous Environmental Studies program. The Indigenous Environmental Studies Research Centre will have a cross-cultural heritage impact: it will facilitate ongoing dialogue across cultures, and age groups, and since the 1970s the programs have supported research and study on Indigenous societies, including the development of an Indigenous Studies collection that focusses on all aspects of the history and culture of the world's Indigenous peoples.





The Bata Library is home to an earlier nascent, small, dedicated space supporting Indigenous studies. In the mid-1990s, the Library, in close collaboration with Trent's Department of Indigenous Studies, created a discrete space to house the special collections and selected artefacts pertaining to Indigenous Studies. This area, which overlooks the Otonabee River, is located on the third floor of the Bata Library. It not only uses a tepee-like fixture to divide the space from the general stacks and study space, but also contains clever built-in shelves to house a part of the Indigenous Studies research collection, and space for storing archival documents related to Indigenous Knowledge. However, the Indigenous Environmental Studies Research space has grown significantly and currently has no true research home. It needs a dedicated fully-fledged suite to provide a research focus for its members, where it can fully benefit from interaction with the Canadian Environmental Modelling Centre (impact of industrial airborne contaminants, heavy metals etc.), the Trent Centre for Aging

& Society (role of elders, aging and demographic impact), and with resources such as the Training & Discourse Room and High Performance Computing & Data Analytics.

The new Indigenous Environmental Studies Research Centre will be constructed in consultation with Indigenous communities. It will face eastward to directly overlook Enweying/Peter Gzowski College on the east bank of the Otonabee River. Currently occupying 770 sq. ft., the Indigenous study space in the Bata Library will be expanded and converted into a research innovation space supporting innovation and applied research in Indigenous environmental studies, as well as other relevant research initiatives. Locating the Indigenous Environmental Studies Research Centre in the Bata Research & Innovation Cluster will not only promote interdisciplinary research but also knowledge mobilization of this research to Indigenous communities, industry and the general public.

Table 5. Indigenou	s Environmental Stud	lies Research Centre Outcomes	
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Expected Partners at Trent	Department of Indigenous Studies; School of the Environment; the Business Administration Department; the First Peoples House of Learning; the Kawartha World Issues Centre; the Indigenous Studies PhD program; the Frost Centre; the Masters in Sustainability Studies graduate program; the Environment & Life Sciences graduate program; Aboriginal Education Council at Trent University; the School of Nursing; the School of Education & Professional Learning; Bata Cluster Centres
Potential Partners External to Trent	Within the Mississauga territory - Curve Lake First Nation; Hiawatha First Nation; Alderville First Nation; Mississaugas of Scugog Island First Nation; Haudenosaunee First Nations; the Assembly of First Nations; the Chiefs of Ontario; Akwesasne Task Force on the Environment; Canadian Centre for Indigenous Environmental Resources; Indigenous Environmental Network; National Aboriginal Forestry Association; First Nations Environmental Network; National Aboriginal Lands Managers Association; Peterborough Green-Up; Cambium Aboriginal Inc., Cambium Environmental Inc; Metis Nation of Ontario; Peterborough and District Wapiti Metis Council; the Aboriginal Health Research Networks-Nasivvik Centre for Inuit health and changing environments; Indigenous Health Mentorship Network
Students involved directly	100 with research projects – undergraduate and graduate
Students involved more broadly	400 – engaged in seminars and attending guest lectures and experiential research opportunities

#### Goals

- 2017 Introduction of the Duty to Consult & Accommodate program
- A total of 50 researchers in the Indigenous Environmental Studies Research Centre (graduate students, research associates, faculty)
- Sustainability of the Trent Aboriginal Cultural Knowledge and Science (TRACKS) youth outreach initiative
- Partnership with the nine Matawa First Nations, Confederation College and Fleming College on environmental assessment education (and education & training on environmental assessment & monitoring jobs training related to future Ring of Fire developments)



### 2.8 Trent Centre for Aging & Society

#### **Executive Summary:**

The Trent Centre for Aging & Society has a well-established reputation for its work in three areas: (i) the social determinants of health, and the root causes of detrimental health conditions which may accompany aging; (ii) seniors potential contributions to healthy, sustainable communities (with a positive focus on the value that seniors contribute); and (iii) partnerships which support aging. Locating the Centre in the Bata Research & Innovation Cluster will enhance it by attracting the attention of internal and external stakeholders, and its proximity to the Public Ideation Area and the Entrepreneurship Centre will inspire opportunities for creating new social enterprises that serve senior markets. Also, locating close to the Indigenous Environmental Studies Research Centre will allow the study of policies and practices relevant to demographic advantages/challenges for Indigenous communities. Table 6 summarizes the current partners, student involvement, and major outcomes for the Centre.

In a very short time, Trent University has become a recognized global leader in interdisciplinary aging studies (critical gerontology) and a vital source of leadership and social and economic capacity building around aging issues in the Peterborough region. The prominent location of the Trent Centre for Aging & Society within the Bata Research & Innovation Cluster will enhance these strengths and advance the outreach potential for applied aging research in Peterborough, across Ontario and Canada.

Creating supportive environments for healthy aging is a crucial 21st century challenge for communities across Canada. Leveraging its strategic location in one of the country's most rapidly aging communities and its second largest retirement destination, Trent University's Centre for Aging & Society represents a new strategic direction tied to pressing demographic change, which demands innovative, rigorous, solution-oriented research. Drawing on Trent's stellar emphasis on interdisciplinary studies and innovations in community-based research and teaching (linking to the Trent Community Research Centre), the Trent Centre for Aging & Society was established to address the challenges and opportunities facing older people and aging communities in the Peterborough region and beyond. By engaging faculty, students, older residents and community leaders the Centre brings a critical perspective to debates about our aging society and a much needed intergenerational perspective to research, learning and innovation.

Attracting leading University scholars from across Trent's humanities, social sciences and professional programs like business and nursing, the Trent Centre for Aging & Society draws together an interdisciplinary team of more than 30 faculty, students and community stakeholders to do what no other centre can do: build meaningful dialogue and seed innovative changes that take into account the diversity of experiences of older people to debunk the myths about aging, old age and older people.

The Bata Cluster provides an opportunity to develop linkages with new partners and enhance the work of the Centre and bolster Trent's impact in the community. Sharing collaborative space with the Canadian Environmental Modelling Centre and Indigenous Environmental Studies Research Centre will lead to new ways of interdisciplinary thinking about pressing societal issues, including the policy implications of Canada's aging population. Strong linkages will also develop with the Educational Research Design Studio and Entrepreneurship & Social Innovation Centre, where the Trent Centre for Aging & Society will contribute to intergenerational training and mentorship opportunities via its commitment to bringing older residents to Trent campus. Entrepreneurship and commercialization would take on an intergenerational dimension (i.e. mentorships as well as new career paths for older workers) with the Trent Centre for Aging & Society acting as facilitator. In addition, the very nature of the Visualization & Creativity Lab and High Performance Computing & Data Analytics infrastructure lend themselves to obvious synergies with Trent's aging studies researchers engaged with arts-based approaches, such as media and film, and with statistical approaches to population demography.

Trent Centre for Aging & Society will contribute to the broader vision of Bata Library as the hub of University life. As part of a cluster of research centres, the Trent Centre for Aging & Society would draw a new generation of people to the University – older people – as well as those who care about them. This would add a fresh dimension of diversity to a transformed Bata Library designed to facilitate the cross-pollination of ideas within the Bata Research & Innovation Cluster, and would further imbed Trent University at the centre of critical debate and knowledge mobilization in the community. It would also highlight Peterborough as a community that tackles aging issues seriously and creatively, and offers other communities a model to follow.

Table 6. Trent Centre for Aging & Society (TCAS) Outcomes		
Expected Partners at Trent	Undergraduate programs in Humanities, Social Sciences, School for the Study of Canada, School of the Environment, School of Education and School of Nursing; Graduate programs in Canadian Studies and Indigenous Studies, English (Public Texts), Psychology and Sustainability Studies; Bata Cluster Centres – Indigenous Environmental Studies Research Centre; Entrepreneurship & Social Innovation Centre; Frost Centre for Canadian Studies and Indigenous Studies; Trent Community Research Centre; Administrative units: School of Graduate Studies, Office of Advancement and External Relations, Office of Research	
Potential Partners External to Trent	Peterborough Council on Aging; Age-Friendly Peterborough; Peterborough municipalities (city, county, townships); healthcare institutions and agencies (regional hospital, health unit, regional health authority); seniors service providers (community care); community development partners; national research partners (Canadian Association on Gerontology, McMaster University Gilbrea Centre for Studies in Aging, York University Centre for Aging Education and Research); international research partners (North American Network for Aging Studies, Irish Centre for Social Gerontology, La Trobe University John Richards Initiative); international visiting scholars	
Students involved	200+ students enrolled in – Aging Studies Emphasis Program, team-taught interdisciplinary courses on critical aging studies; community-based placements with Age-friendly Peterborough; graduate supervision in humanities and social science programs (Canadian Studies and Indigenous Studies, Psychology, Sustainability Studies); and professional certificate programs in Elder Abuse Awareness and Prevention. More broadly, up to 8,000 University students within Trent University will benefit from interdisciplinary curriculum development in critical aging studies and outreach opportunities to provide service-learning experiences and professional certifications with partner agencies and organizations in the region	

#### Goals

- Dedicated space for collaborative partnerships among faculty, students and community members
- The Bata Research & Innovation Cluster "living laboratory" for community-based outreach with older residents
- Enhanced opportunities for intergenerational leadership and innovation on campus
- Aging studies emphasis, community placement opportunities and professional certificate program
- New research funding via CIHR and SSHRC operating, connections and partnership grant programs
- Hosting international conference of North American Network for Aging Studies
- New partnerships with national, provincial and local stakeholders
- Pilot study of National Ballet of Canada seniors outreach program
- Development and implementation of Age-Friendly Peterborough plan
- Hosting symposium on age-friendly planning for Trent's proposed sustainable village
- Hosting annual Peterborough Council on Aging Seniors Summits

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## 2.9 Visualization & Creativity Lab

**Executive Summary:** The new Visualization & Creativity Lab will enhance the emerging focus on visualization among Trent researchers who continue to develop new ways of analyzing visual images, geometric transformations, perspective taking, creative thinking, data analytics, computer gaming and film visualization, and the study of their effects on users. The Lab will work within the Bata Research & Innovation Cluster to advance human connections with the visual, and facilitate interactions among researchers, students and collaborators across all the centres situated in the Cluster. Table 7 summarizes the current partners, student involvement, and major outcomes for the Centre.

The rise of digital communication and an extraordinary explosion of data on almost everything have made images and visual depictions (photographs, diagrams, video, maps, data visualization, etc.) an increasingly pervasive feature of the ways in which we communicate; so much so that many have proclaimed a move from a print culture to a visual culture. Further steps in this direction will accompany the development of more sophisticated forms of images, virtual reality, and powerful visual learning aids.

Recent findings on the importance of visual-spatial reasoning support the idea that innovative research and study of the visual will play a key role in future social and economic developments. In particular, they will highlight the development of new approaches to spatial reasoning and visual communication and learning. Trent's Visualization & Creativity Lab will include state-of-the-art visual technology (including



immersive visualization spaces) and will provide an environment that allows researchers to study, explore, develop and commercialize visual phenomena (for a myriad of purposes, including planning, policy development, entertainment, teaching and learning, mathematical reasoning, creative thinking, data analysis and storytelling).

Fundamental research in the Visualization & Creativity Lab will include the development of ways of analyzing visual images, geometric transformations, perspective taking, creative thinking, data analytics, computer gaming and film visualization, and the study of their effects on users. Students and faculty will collaborate to deconstruct and reconstruct human interaction with the visual, and to further its importance in communication of all sorts, and its use for economic and social purposes. The Lab will work with other research centres in the Bata cluster, and be available to researchers, students and others using the Entrepreneurship Centre.

#### Required Equipment for Visualization & Creativity Lab

- Virtual reality studio and eye tracking equipment
- Computers with video editing suite and graphics software as well as video gaming and sketchpad software
- Research software including SPSS and NVivo
- Flexible collaboration space with moveable and varied furniture
- Range of arts-based materials

- Audio and video recording equipment Interactive whiteboards and tablets
- Fixed large display screen data wall
- Electrical and IT upgrades
- Large write and draw-abled surfaces
- 3D printer

The Visualization & Creativity Lab will foster and enhance an emerging focus on visualization among Trent researchers. A number of significant projects are already underway. Trent Forensics faculty, students and members of the Centre for Teaching & Learning are, for example, developing a synthetic blood that is colour-coded for the construction and deconstruction of crime scenes for Bloodstain Pattern Analysis. This product could reduce the need to use real blood in training, teaching, and analysing the forensic techniques for the analysis of blood splatter. Forensic blood substitutes offer a range of advantages over the use of human or animal blood including, but not limited to, increased storage life, known and reproducible physical properties, minimized health and safety risks, decreased material and shipping costs, and applications for improved pedagogy.

The development of synthetic blood requires visual analysis because a successful synthetic blood must produce visual patterns that match those made by real blood. The Visualization & Creativity Lab would support and facilitate related research and materials production by allowing researchers to study and test, in a detailed way, such patterns in the case of real and synthetic blood. (The image to the right shows impact patterns created with the new forensic blood substitute. In white light, the impacts look the same colour. In dark light or UV conditions, one can see that each impact pattern was created with forensic blood substitute that has a different phosphofluorescent filler included in its formulation.)



Other visualization is being carried out in Education, where researchers are investigating the use of and impact of spatial reasoning on learning in the STEAM (Science, Technology, Engineering, Arts, and Math) fields. An emerging consensus highlights spatial thinking as fundamental to school and career success. Researchers in the Trent Mathematics Education Research Collaborative are studying the role of spatial reasoning, including mental rotations, perspective taking, coding and mapping in learning. One project involves the design and testing of a new three-dimensional mental rotation task for assessing the use and effects of mental rotations on learning. Performance on the measure has been highly related to success on a measure of 2D mental rotation, and proved predictive of arithmetic skills. The ability to perform tests using virtual reality technologies would advance the current federally-funded research program in a way that may ultimately produce new learning technologies and practices.

Table 7. Visualization & Creativity Lab		
Expected Partners at Trent	A multidisciplinary group of faculty and groups have already expressed interest in the use of the lab: Forensics, Education, Philosophy, English i.e. faculty, staff and librarians who have interests in a range of topics (in forensics, mathematics education, logic and visual argument, critical thinking, English and literature, art, IT, and other disciplines); The Centre for Teaching & Learning; and the Research and Innovation Office; Bata Cluster Centres	
Potential Partners External to Trent	The Spatial Reasoning Study Group (international organization); Robertson Foundation of the Jackman Institute for Child Studies; Canada Research Chairs from University of Calgary and Simon Fraser University; Pearson publishing house; SSHRC; and researchers in other universities in Canada and internationally	
Students involved directly	Local research project work with approximately 200 undergraduate and 35 graduate students	

#### Goals

- New knowledge development on the role of visualization in thinking and learning
- Design, development, and validation of novel visualization techniques, technologies and products
- Web-based resource sharing of tools and measures for assessing visualization on a dedicated web-space (intellectual products for broad sharing)
- Development and testing instruments (Kindergarten through to University) and pedagogies that highlight visual communication, gaming learning theories, teaching and learning (policy influence at the provincial level)
- Web-based knowledge mobilization of research findings from 3-5 projects per year
- Target of a minimum of 10 peer-reviewed articles per year and 10 peer-reviewed conference papers published through the Visualization & Creativity Lab
- Visualization & Creativity conference to be hosted at Trent University (bi-annual basis) to bring researchers together with industry leaders for Think-Tank on collaborative research and development projects
- Community outreach projects with interested groups (including school boards and elementary and secondary teachers) to share best practices that support visual and spatial learning and reasoning (accounting for equity, gender and abilities)

## 2.10 Training & Discourse Room

Located on the third floor of Bata Research & Innovation Cluster, the Training & Discourse Room will feature a shared space for utilization by the research groups, and their external partners. The Training & Discourse Room is a workshop/training room, fully-equipped with AV & Media, with movable tables and chairs which can be set up in multiple configurations from round-tables to board room style, holding up to 40 people. This space will be ideal for small symposia or large brainstorming sessions. The Indigenous Environmental Studies Research Centre is planning to use the room for three-day intensive training sessions for its Duty to Consult & Accommodate training program, which will have 15 leaders from Indigenous communities, 15 executives from resource sector companies, 1 Environmental Assessment facilitator, 1 traditional knowledge teacher, and 4-7 graduate student observers.



## **COMPONENT C** – Infrastructure

Component C addresses the sustainable infrastructure and heritage design elements that will be required to complete the Bata Research & Innovation Cluster project. These are discussed in more detail below.



#### 1. Digital

High performance computing & data analytics infrastructure in support of research and innovation to faculty, staff, students and industry

#### 2. Heritage

Maintaining heritage of the Bata Library building, including essential Ron Thom architecture

#### 3. Green

Sustainability through HVAC system, energy efficient windows, new roofing, and green wall.

### 2.11 Digital: High Performance Computing & Data Analytics

Entrepreneurship, visualization, educational design, environmental modelling, and Indigenous environmental research are an integral part of this proposal. These activities will generate complex questions that need to be answered and modelled from a computational perspective and that require high performance computing to resolve. Currently, Trent does not have a High Performance Computing & Data Analytics service and access to computational resources is becoming scarcer, even for activities submitted through SharcNet or for other existing activities at Federal and Provincial High Performance Computing Centres.

The mission of Trent's High Performance Computing & Data Analytics service would be to provide high performance computing infrastructures in support of research and innovation to its faculty, staff, students and industry, and also to provide support and training to researchers in areas of code development for high performance computing, code optimization, numerical methods, and any other assistance that can help researchers exploit high performance computing more efficiently.

While most centres of this kind utilize a central approach to the design of their models, with most processing available through a supercomputer, Trent's High Performance Computing & Data Analytics will utilize a different model of high performance computing to allow for a significant expansion of processing power by tapping into the spare processor cycles of idle staff and faculty desktops and laptops across the University. This is known as a Distributed Computing model. Currently, Trent has over 1,400 managed individual desktops and laptops across the University that can be utilized as processing nodes when idle. A major advantage of utilizing a distributed model is cost. While supercomputers can be very expensive, a distributed model is much more cost effective. In fact, a 2013 HP Study found that the hourly cost of renting a processor on a dedicated supercomputer was approximately 2-3 times as great as on a comparable distributed cloud-based system.

Trent's High Performance Computing & Data Analytics would not only provide access to advanced computational systems, but would also provide access to high performance storage to support the needs of the Bata Cluster faculty, staff, students, and industry partners. This approach would also support large-scale data analytics. Additionally, this service will provide advanced technical support, and consulting and training for high performance computing & data analytics. These activities require that the space be available in a centralized location. Trent's High Performance Computing & Data Analytics service will be key to the enablement of research, innovation and downstream commercialization.

## 2.12 Heritage & Sustainability

The Bata Building is 50 years old. Although originally well constructed and properly maintained, it is now in great need of updating and upgrade in a holistic or systems-based approach. Most of the existing mechanical, electrical and envelope infrastructure is original to the building and has reached or exceeded its life expectancy. In order to effect the required upgrades, significant demolition and replacement of other building components will have to take place, as well.

The proposed repurposing of this building cannot take place unless the current major mechanical, electrical and building envelope infrastructure is addressed. The proposed areas to be addressed include:

- Replace air handling and exhaust systems
- Redesign of variable air volume (VAV) systems
- Heating & Cooling System replacement
- Full Building Automation (BAS) control system
- Replace domestic hot water system
- Replace all Washroom Fixtures
- Humidification System
- Redesign and replacement of electrical switchgear and distribution system
- Installation of LED lighting
- Replace windows, skylight and exterior doors
- Replace roofing membrane and insulation
- Roof mounted photo-voltaic energy generation



Based upon engineering assessments, Trent has exhausted all "low hanging fruit" energy reduction possibilities for this building. The proposed initiatives, above, not only replace building infrastructure that is well past it's useful life, but results in reduced energy consumption, cost and greenhouse gas emissions (Table 8).

Table 8. Alterations & Upgrades to the Bata Library		
Exterior Energy Performar	nce Alterations	
Roofing	Remove all existing roofing and flashing. Replace with SBS 2-ply modified-bitumen membrane complete with R40 insulation, air vapour barrier & flashings. Roof to be protected with a low albedo pre-cultivated vegetated green roof assembly.	
Window glazing & Exterior doors	Remove all existing windows, entrances & doors. Replace all exterior glazing with new high performance curtain wall glazing system. System to be complete with thermally broken aluminium mullion, insulating double-glazed sealed units with argon filled low-e coating & warm edge spacers. Glass to be low iron clear to enhance visible light transmission. Non-vision spandrel panels to be constructed of metal air barrier back-pans, R-16 insulation & glass with ceramic frit. Exterior entrances/doors to be replaced with thermally broken aluminium frames, double glazing & weather seals.	
Skylight glazing	Remove all existing skylight framing & glazing. Provide new high performance skylight glazing system. System to comprise of thermally-broken mullion framing, insulating double glazed units with argon filled low-e coating & warm edge spacers. Glass to tempered laminated clear with ceramic frit to reduce solar heat gain.	
Exterior walls	Remediate all existing stone wall cladding with water & air leakage issues. Upgrade thermal & moisture performance with new R20 insulation & air vapour barrier at accessible ceiling plenum locations. Replace all joint sealants & flashing to eliminate air & moisture leakage.	
Interior Upgrades & Alterations		
Flooring		
Level 02	Retain existing linoleum flooring (approx. 1/3 of floor area, recently installed). Remove all carpets and tile. Provide new carpet and linoleum flooring.	
Level 03	Remove and replace all existing carpets.	

 Feature Stair
 Remove existing rubber/carpet stair treads. Replace with new rubber treads complete with non-slip tactile/visual warning strips.



Table 8. Alterations & Upgrades to the Bata Library (con't.)		
Ceiling	Remove all existing wood access tiles in wood ceiling. Allow for treating existing wood to meet flame spread ratings or replace with FSC certified cedar planks should reusing the existing not be feasible. Reinstate or replace tiles complete with new panel framing and acoustic backing materials. Allow for refurbishment of existing ACT and GWB ceilings.	
Interior Partitions	Remove all existing interior partitions. Provide new gypsum board acoustic partitions per new planning. Paint refinish all existing partitions to remain.	
Doors & frames	Hollow metal frames with wood veneer solid core doors.	
Glazed screens	Structural glass screens. Frameless tempered low iron glass. Tempered glass doors with patch fittings. 2x frameless tempered glass sliding doors at MakerSpace and visualization lab.	
Vegetated Green Wall	Install approx. 40m <sup>2</sup> (8mx5m) green wall on existing face of elevator core. Provide for irrigation, drainage, and wall mounted grow lights.	
Hazardous substances	Allowance required for potential concealed asbestos in ceiling plenums.	
Mechanical & Electrical	Alteration and replacement of existing HVAC, lighting and heating systems. Installation of full building automation system.	

## Trent University – Bata Research & Innovation Cluster Regulatory Requirements

The work associated with the Bata Research & Innovation Cluster focusses primarily on interior architecture and systems; the roof, atrium skylight and exterior window shade structures are to be replaced and repaired as required. The scope of regulatory requirements for this project will be smaller than if a new structure or change in footprint of a structure were contemplated. Consultants have already researched the approvals and consultations that need to take place. The majority of the approvals and permits will be finalized when the design drawing phase is complete in October 2016 (See Supplementary Documents: Appendix 7 – Engineering Designs & Regulatory Approvals).

A list of permits and approvals includes, but may not be limited to:

- Zoning assessment review existing institutional use is already compliant
- Site Plan Approval not required as alterations do not revise site
- Building Permit when design drawings complete
- Otonabee River Conservation Authority courtesy review only
- Ministry of the Environment renew all existing certificates; Certificate of Air (ECA) determined to already be in place
- Review by Architectural Preservation Society
- Review by Trent University Heritage Committee





### 2.13 Green Walls

One of the features contemplated in the Bata Research & Innovation Cluster project is a green, or 'living' wall. The building is blessed with a stone-rubble column that rises from the floor to the top of the atrium. Although its primary purpose is to house the main elevator shaft, the exposed side presents as a very impressive stone column rising towards the skylight.

Green walls can be green facades, where the growing medium is located at the base and the plants grow up a supporting structure. Alternatively, or in combination, a living wall can be created which sees plants embedded in growing medium fastened to vertical assemblies on the wall.

Benefits of Green and/or Living Walls

- Green Walls in buildings help improve air quality as the plants installed naturally filter contaminants from the air.
- Plants that are part of Green Walls can help reduce indoor noise by absorbing acoustic energy.
- Green Walls are often attributed to greater building user satisfaction, productivity and an overall improved sense of health and well-being.
- Green Walls enhance the human indoor experience by lowering blood pressure, increasing productivity, creativity, idea generation, and problem-solving capabilities.
- Green Walls are a symbol of "Green Building" and will enhance the staff/student perception of Trent being a sustainable institution.
- A Green Wall could support Trent's on-going commitment to sustainable agriculture and incorporate growing small fruit, vegetables and/or herbs.

## **3. PROJECT GOVERNANCE**

The Bata Research & Innovation Cluster project will follow the current procedure for all major capital projects at Trent University (Figure 2). In Reporting Stream 1, a report is provided by the Associate Vice President, Facilities Management, to the Vice President, Finance & Administration for presentation to the Finance & Property Committee of the Board of Governors. This report is then brought to the next full Board of Governors' meeting. The report provides a summary of activities to-date, cost-to-date and forecasted final project costs. Forecasted final project costs are compared to Board-approved budget, forecasted variances explained, and mitigating strategies, if required, explained. In addition to Reporting Stream 1, tied to the Board of Governors' meetings, in Reporting Stream 2, the project status is discussed regularly among the Vice President, Finance & Administration, AVP, Facilities Management and the relevant Project Manager.







## **4. RISKS AND MITIGATION STRATEGIES**

As the Bata Library undergoes renovations that include the two-floor transformation into the Bata Research & Innovation Cluster, and a complete retrofit of the building with a goal to meet LEED standards, a number of risks have been identified as potentially impacting project completion. These risks and the strategies to mitigate them are identified in Table 9. In the face of an everchanging environment, the identification of risks and the planning for their mitigation will improve the chance of successfully completing this project. As the renovation evolves, we will continue to update the risks, refine the mitigation strategies, and implement steps to manage and reduce further risks.

TRENT UNIVERSITY'S BATA RESEARCH & INNOVATION CLUSTER A Proposal to the Post-Secondary Institutions Strategic Investment Fund

Table 9. Project Risks and Mitigation	
RISKS	MITIGATION STRATEGIES
1. Inability to attract matching funds	Secure guarantee from Board, fund-raising and/or borrowing to ensure matching capabilities
2. Unexpected building conditions that arise during the 2-floor transformation and retrofitting of the Bata library and increase costs	<ul> <li>Ensure that an appropriate contingency fund is planned to allow for the coverage of such eventualities including time delays within construction schedule</li> <li>Ensure that architects and construction teams have knowledge and skills to renovate heritage buildings</li> <li>Ensure that architects understand specialized use of a 21st century library and the library experience</li> </ul>
3. Unrealistic cost and timeline estimates	<ul> <li>Ensure reliable and timely costing information to support decision making</li> <li>Review budget regularly to make adjustments</li> <li>Monitor timelines regularly to maintain schedule and adjust for financial and human costs</li> </ul>
4. Building disruptions that reduce library use, limit study space during exams, delay or reduce access to materials and space, or decrease access to technology	<ul> <li>Consultation - work closely with library staff, other administrative units, Deans, students and faculty to identify the impact of construction, (including time and access)</li> <li>Concentrate on what is doable and within budget</li> <li>Prepare good communications plan, give occupants time to compensate for loss of services, let users know how the renovations will affect their use of the library, and access to collections</li> <li>Update information on progress</li> <li>Limit construction to times that have less disruptions – concentrate construction to off-peak periods</li> <li>Identify temporary accommodations as necessary to ensure that activities can continue with minimal disruptions</li> </ul>
5. Exposure of environmental risks during building process (e.g., presence of asbestos and other substances that endanger the health and safety of workers and the building occupants)	<ul> <li>Contain environmental hazards while under construction (built into cost estimates and contingencies) to reduce building's impact on the environment</li> <li>Ensure healthy/safe physical environment for those occupying the building during renovations</li> </ul>
<ol> <li>Accessibility for Ontarians with Disabilities standards compromised during construction</li> </ol>	Include cost estimates to reflect necessary contingencies plans for ensuring Accessibility for Ontarians     with Disabilities accessibility
<ol> <li>Increased physical risk to occupants and site during renovations</li> </ol>	<ul> <li>Ensure that security, fire and other critical systems are operational for adequate protection</li> <li>Update emergency plan to accommodate construction</li> <li>Have higher than typical contingency funds to allow changes to existing systems (e.g., greater human security)</li> </ul>
8. Changing the heritage value of the building as the functionality changes	<ul> <li>Engagement of the Heritage Advisory Committee throughout all stages of the project</li> <li>Include information on the building history as planning documents are developed to establish the basis for the work</li> <li>Emphasize protection of the heritage value of the building through final planning and transformation phases</li> <li>Integrate such risks into cost estimates and contingencies</li> </ul>
9. Damage to collection, books, computers, etc. during construction	<ul> <li>Determine collection removal and/or protection in advance</li> <li>Assign reasonable collection protection responsibilities to library staff</li> <li>Determine collection circulation processes for floors under construction through library support staff</li> </ul>
10. Catastrophic event causing a disruption in the supply chain	<ul><li>Awareness of events and the effects</li><li>Include cost estimates of sourcing secondary sources for supplies and/or labour</li></ul>
<ol> <li>Underutilization of Entrepreneurship &amp; Social Innovation Centre, Visualization &amp; Creativity Lab and Educational Research Design Studio</li> </ol>	<ul> <li>Ensure that communications, training and programming are available to demonstrate the value of these centres</li> <li>Encourage utilization of these centres by demonstrating opportunities within both academic and extra-curricular programming</li> <li>Positive engagement with on-campus entrepreneurship student club &amp; programming through Peterborough Innovation Cluster</li> </ul>
12. Two-floor transformation of current building may not sustain future research and development needs	• Plan for physical and technological maintenance and upgrades in the space plan to ensure current and relevant research and development can flourish on a sustainable future basis

## **5. DETAILED PROJECT SCHEDULE WITH MILESTONES**

The Bata Research & Innovation Cluster project will take 533 days in total to complete. Pre-design and approvals began January 25, 2016, the official start date for the project (SIF Funding Approval) will be July 1, 2016, ending April 29, 2018. Table 10 below details each phase of the project, the numbers of days to complete and the estimated dates. (Please see Supplementary Documents: Appendix 8 – Approved Project Schedule; and Appendix 9 – Contractor Proposals and Start Dates.

							20	16											20	17								20	18		
Project Phase	Days	01	02	03	04	05	06	07	08	09	10	11	12	01	02	03	04	05	06	07	08	09	10	11	12	01	02	03	04	05	06
Pre-Design & Approvals	114																														
Commencement of Functional Space study plan	0																														
Consultation (user groups, workshops, interviews)	21																														
Space plan options	7																														
Functional Program masterplan	22																														
SIF funding application documentation	12																														
Trent University approval	0																														
SIF funding review & approval	41																														
Program detailed development	39																														
Schematic Design	22																														
Project start (SIF Funding approved)	0																														
Workshop 1 - Design Charrette	0																														
Schematic design documentation development	20																														
SD design Cost estimate	0																														
SD design presentation & review	0																														
Trent University approval of SD submission	0																														
Design Development	66																														
Workshop 2 - Design Charrete	0																														
Design Development documentation	63																														
Workshop 3 - Design Charrete	0																														
DD design Cost estimate	0																														
DD design presentation & review	0																														
Trent University approval of DD submission	0																														
Construction Documents	105																														
Exterior Envelope & Roofing construction documents	22																														
Focus group 1 (Envelope)	0																														
Focus group 2 (M&E systems)	0																														

## Table 10. Bata Research & Innovation Cluster Schedule



## Table 10. Bata Research & Innovation Cluster Schedule (con't)

	_	2016													2017 2018																
Project Phase	Days	01	02	03	04	05	06	07	08	09	10	11	12	01	02	03	04	05	06	07	08	09	10	11	12	01	02	03	04	05	06
M&E equipment brief & specifications	23																														
Architectural, M & E 65% CD development	63																														
Focus group 3 (Detailing & finishes)	0																														
Construction Documents 100% submission to Trent	40																														
Construction document cost estimate	5																														
Trent Facilities review of 100% CD submission	5																														
Focus group 4 (pretender review)	0																														
University approval of CD submission	0																														
Tender Packages	110																														
Exterior Envelope & Roofing	20																														
M & E equipment	19																														
Interior alterations & ME systems	22																														
Approvals & Permits	87																														
City of Peterborough pre-application review meeting	0																														
Otonabee River Conservation (ORCA) review	10																														
MOE application (ECA) (REA) (EASR)	364																														
Building Permit application (Exterior Envelope)	24																														
Building Permit application (Interior Alterations & M/E systems)	56																														
Building Construction	411																														
Construction Mobilization	0																														
Shop Submittals/material/ equipment delivery	35																														
Roof & Skylight installation	32																														
Floor Level 3 alterations	75																														
Floor Level 2 alterations	86																														
M&E distribution systems Level 1 & 4	89																														
Service Plant M&E equipment installation	97																														
Exterior envelope installation & remediation	97																														
Commissioning & Final Balancing of systems	26																														
Substantial Performance	0																														
Project Completion	533																														

## **6. PROJECT COSTS**

The requested funding from the Strategic Investment Fund is critical to the completion of the Bata Research & Innovation Cluster. Below we summarize the budget, financial information and sources of funding integral to this project.

## 6.1 Budget Summary

The estimated eligible cost associated with this project is \$14M. The construction cost alone is estimated at \$11.7M. Total project costs exclude, in all cases, ineligible costs as identified in Annex D of the SIF Program Guide. This particular project focusses on repurposing and revitalizing pre-existing University space. It is expected that if any ineligible costs are incurred, they will be immaterial.

Table 11. DETAILED BUDGET INFORMATION										
Breakdown of Capital Projects	Requested Program Funding	Total Costs								
Capital Costs	\$5,850,000	\$11,700,000								
Engineering and Environmental Planning & Reviews	\$525,000	\$1,050,000								
Audit & Project Evaluation	\$5,000	\$10,000								
Eligible IT Infrastructure, Consulting, Commissioning, Moving, Signage etc.	\$620,000	\$1,240,000								
Ineligible Costs		\$0								
Total	\$7,000,000	\$14,000,000								

## 6.2 Financial Information Summary

This project involves the renewal and repurposing of an existing building space. Therefore, 100% of the eligible costs relate to renovations, repairs or maintenance.

The funding profile will see approximately \$500k SIF grant required in fiscal 2016/2017 relating to architectural design and planning.

Fiscal 2017/2018 will be the year in which the main body of work will take place with an estimated funding requirement of \$6.0M. Finally, fiscal 2018/2019 will require funding of approximately \$500k, related primarily to release of final holdbacks after the work is complete.

Table 12. FINANCIAL INFORMATION SUMMARY	
What percentage of your project is for:	Percentage (must total 100%)
New Construction or Expansion: %	0%
Renovations, Repairs or Maintenance: %	100%
Total Percentage	100%
Expected Funding Profile:	Amount
Expected Funding Profile: Year 1 (by 2017-03-31)	<b>Amount</b> \$500,000
<b>Expected Funding Profile:</b> Year 1 (by 2017-03-31) Year 2 (from 2017-04-01 to 2018-03-31)	<b>Amount</b> \$500,000 \$6,000,000
Expected Funding Profile:           Year 1 (by 2017-03-31)           Year 2 (from 2017-04-01 to 2018-03-31)           Year 3 (from 2018-04-01 to 2018-04-30)	Amount \$500,000 \$6,000,000 \$500,000

## 6.3 Sources of Funding

In addition to the \$7M grant requested from the Strategic Investment Fund, Trent will dedicate its Provincial Facilities Renewal Program (FRP) funding for 2016/2017 and 2017/2018 (See Supplementary Documents: Appendix 10 – Approved Sources of Funding). This diverted funding totals \$1.1M over the two years. The balance of the required \$14M in funding will come from a combination of internally-generated resources and debt financing.

Table 13. SOURCES OF FUNDING									
	Amount								
SIF Requested Funding	\$7,000,000								
Other Sources of Funding									
Applicant (Debt Financing)	\$3,900,000								
Fundraising	\$2,000,000								
Provincial/Territorial	\$1,100,000								
Total Other Sources of Funding	\$7,000,000								

## 6.4 Ineligible Costs

All cost estimates presented above exclude those deemed as ineligible.



## 7. OUTCOMES: THE RESULTS OF SIF SUPPORT

The development of the Bata Research & Innovation Cluster will address pressing space constraints at Trent, but this will be only one of the important outcomes. Trent faculty, students and our partners will have the opportunity to tackle real world problems in a way that can play a major role building the economies of Peterborough, Ontario and Canada. The educational, social and economic benefits of such development are outlined in more detail below.

## 7.1 Introducing Students to Entrepreneurship

The plans for the Bata Research & Innovation Cluster investment dovetail with Trent University's strategic research plan and its strategic mandate agreement (with the provincial government) in a number of important ways. Building on other entrepreneurship developments at Trent, the Bata Cluster will introduce students to entrepreneurship as a career, allowing them opportunities to enhance their skills in presentation, networking, financial management, project planning and creative problem solving. The Public Ideation Area and the MakerSpace will provide creative spaces that allow students to work with potential collaborators and innovators.

The Cluster will bring heightened attention to the Trent Community Research Centre, increasing its profile and accessibility, and broadening the opportunities for undergraduate students to do research and work on problem-solving projects with public and private organizations, and to obtain course credits while they do so. The centres located in the Cluster will expose students to ground-breaking research on, among other things, the impact of global warming and pollutants, traditional knowledge and Indigenous points of view, visualization in many different guises, and on the potential benefits and opportunities that accompany an aging society.

There is ample evidence that early awareness of entrepreneurship as a career goal, hands-on learning experiences and the development of relevant skillsets (creativity, risk management, business and financial planning for example) will prepare young people for a rapidly-changing society and workforce where they can be successful change agents as innovators, entrepreneurs or intrapreneurs. Futurpreneur Canada has stated that "Youth cannot become entrepreneurs unless they know that entrepreneurship is an option for them and understand what it entails." They identify limited student access to post-secondary entrepreneurial courses, especially across multiple disciplines, as a key challenge in fostering an entrepreneurial mindset amongst Canadian youth.

With this understanding, Trent University has created a working group, comprising faculty, students and local entrepreneurs, to advise on the creation of an extra-curricular student entrepreneurship program. One result has been an Entrepreneurship Club which has become the largest student club on campus. The Bata Research & Innovation Cluster will foster and encourage the development of a vibrant culture of entrepreneurship at Trent, supporting faculty who want to incorporate principles of entrepreneurship in their courses; providing experiential and co-curricular learning opportunities for students; creating opportunities for mentorship and partnerships; and securing seed funding to enable and grow student-led initiatives, start-ups and change projects.

Within the University, the location of the Research Cluster will illustrate the adage that the best property investments take advantage of 3 attributes: "location, location, and location". In this case, converting two floors of the library into the Research Cluster will root it in the building with the most visits and the most traffic at the University. This space will bring together a diverse range of backgrounds and placing the Cluster here will give it maximum visibility in a way that will build curiosity, encourage investigation, and (in the words of Trent's tagline) "challenge the way we think" about a wide range of multi-disciplinary issues and concerns.

## 7.2 Faculty and Graduate Research

The Bata Cluster will have added benefits for faculty and graduate researchers, and community and industry partners who will be able to pursue research, innovation and commercialization opportunities within state of the art research facilities. Projects within the Cluster will be able to access research talent in multiple Trent graduate programs which include Canada's largest Indigenous Studies PhD program (with 30 students) and an Environment & Life Sciences graduate program (170 students), which is one of the largest in North America. We expect research in the Cluster to inspire the development of new programs at the graduate level. The Cluster will also provide the spark, space and support to increase Trent's impact through successfully graduating students with an innovation mind-set, work-force ready skills, and in some cases, ideas and businesses already underway.

Research in the Bata Cluster will also generate intellectual property in a variety of areas and permit a broad range of leadingedge research projects which will include, to take only a few examples, the evaluation of the environmental impacts of new nano-particle compounds; work with companies in the resource, mining, and energy sectors who want to establish and maintain positive relationships with Indigenous communities; the development of educational programs and technology; and ground-breaking work on the uses and potential of virtual reality.

## 7.3 Local, Provincial, and National Economic Benefits

Trent University plays a crucial role in the reputation and success of the City of Peterborough and the surrounding area, serving as a major regional economic engine. The University is already the second largest employer in Peterborough and has a significant impact in Durham, having an annual economic impact of \$500 million and contributing almost 8% of the Peterborough region's GDP. In partnership with the City of Peterborough, Fleming College, and private investors in the city, Trent has committed itself to the development of a Peterborough entrepreneurship eco-system which will spur economic development for the area (See Supporting Documents: Appendix 1: Trent Research Innovation Park).

The development of the regional economy is a priority in an area which has suffered through a post-industrial transition era as many large companies have either downsized, gone out of business, or left the area. The Peterborough Economic Development 2015-2019 Strategic Plan aims "to shift from a low-growth, under-performing economy to a high-growth, over-performing economy over the long-term". The plan is to do so through creativity, innovation and entrepreneurship, with a focus on a culture of start-ups and entrepreneurship which takes advantage of Peterborough's location (close to Toronto), the low cost of living and conducting business in the area, and the exceptional quality of life in the Kawarthas. (See Supplementary Documents: Appendices 11 – Trent University Bata Research & Innovation Cluster Vision, Perkin+Will; Appendix 12 – Trent University's 2015 Report to the Community and Appendix 13 - 2015-2019 Strategic Plan Summary, City of Peterborough).

Trent is already leading much of this development, with an established incubation centre ("The Cube") and a Research and Innovation Park which is currently being developed with the city. Discussions have begun with Venture North, a group of investors, on how we might work together to ensure that Peterborough enjoys a vibrant economy. The development of Peterborough as a region dedicated to entrepreneurship and new enterprise, with a special emphasis on green technology and the environment, will establish a niche that will grow positive economic impacts provincially and nationally.

## 7.4 Understanding Demographic Changes

A key issue for all of Canada is our changing demographic. As the population ages this creates a need for social and economic innovation that will address the realities of an aging population. Trent's Centre for Aging & Society in the Bata Cluster will address this need in a manner that takes into account local, provincial and national issues. The location of the Centre for Aging in close proximity to the Entrepreneurship Centre, Indigenous Environmental Centre, and the other research centres in the Cluster will foster collaborative projects that will positively address the demographic challenges of an aging population in Ontario and Canada.

## 7.5 Provincial Mandate

Under the Provincial Strategic Mandate Agreements, the Ministry and the University are committed to work together to drive creativity, innovation, knowledge, and community engagement through teaching and research. Trent's Strategic Mandate Agreement places special emphasis on research activities focussing on the environment, community health (aging), Indigenous Knowledge and sustainability. The Bata Cluster will strengthen our research and innovation in these and other areas. In keeping with our Strategic Mandate Agreement, the Cluster will provide an entrepreneurship and social innovation hub that will assist students in pursuing businesses and social innovation, allowing us to expand our partnerships with local and regional organizations, converting innovation and research into jobs and economic development.

The Bata Cluster will also enhance education in Ontario by creating a teaching and research environment for Trent students and faculty that is accessible, high quality and sustainable. It will at the same time address a significant number of deferred maintenance issues which have been already recognized in our submissions to the provincial government (See Supplementary

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Documents: Appendix 2). They include maintenance and upgrading in the form of roof, skylights, interior finishes and mechanical/electrical systems. Many of these repairs and replacements will increase the energy efficiency of the building.

## 7.6 National Cultural Implications

The Bata Library is an architectural masterpiece designed by award-winning architect, Ron Thom. The building is an excellent example of a modernist, functional building which exemplifies Thom's conviction that a building should "make love" to its natural setting. Though primarily motivated by its research, innovation and economic impact, the development of the Bata Research & Innovation Cluster – completed shortly after Canada celebrates its 150th birthday – will transform the Bata Library in a LEED-inspired retrofit which will result in a long-overdue energy-saving, sustainable renovation, preserving and enhancing a 50-year old iconic building with significant cultural, historic and architectural significance for Canada.

## 7.7 Aboriginal Impacts

Trent has an exceptional track record of work with Indigenous people. It includes the ties to Curve Lake First Nation (which played a role in the creation of the University), the lead it has taken developing Indigenous Studies programs in Canada, the Elders Gathering it has held annually for forty years, and its recent launch of a new BEd program designed for Indigenous students and communities. The Bata Research & Innovation Cluster emphasizes the University's program in innovative and groundbreaking Indigenous Environmental Studies.

The new Indigenous Environmental Studies Research Centre will have immediate and far-reaching impacts. For example, the Centre's work with a majority-owned aboriginal environmental services company to develop a new "Duty to Consult & Accommodate" program is designed to educate executives in resource and energy sector companies, and engage leaders and elders in Indigenous communities. This program will be a model for expediting the environmental assessment process that resource, mining and energy sector companies need to follow should their development projects require consultation with Indigenous communities. An expedited environmental assessment will provide economic benefits to both industry and Indigenous communities.

The Trent Indigenous Environmental Studies group has a network of 133 Indigenous communities in Canada. The group is supported by a number of graduate programs including our Indigenous Studies PhD program. The Bata Cluster will enable a broader outreach program related to addressing Indigenous community issues. The starting point will be resource/mining/ energy developments, but the relationships with Indigenous communities can be leveraged to include youth entrepreneurship training/mentorship, research and educational symposia related to addressing major issues such truth and reconciliation, land and territory claims, cultural and language preservation, and serious concerns impacting youth in Indigenous communities. (See Supplementary Documents: Appendix 14 – Indigenous Consultations).

## 7.8 Advancing Canada's Climate Change and Sustainability Goals

The Bata Cluster will advance Canada's climate change and sustainability goals in a variety of ways. It will keep Trent at the forefront of climate change abatement. It will demonstrate how heritage values can be incorporated into sustainable design. And it will emphasize research and innovation which will address significant environmental challenges. The entrepreneurship and commercialization aspects of the Bata Cluster's development will ensure that this research and innovation is tied to industry partnerships and initiates change in private and public enterprise. Above all else, the Bata Cluster will be a further catalyst for the development of Trent as a University that specializes in sustainable and environmentally-conscious development.

# 8. PROJECT READINESS FACTORS: Appendices (Attached as Supporting Documents)

Appendix 1: Trent Research Innovation Park

- Appendix 2: Capital Inventory/SIF Provincial Template
- Appendix 3: Approval in Principle of the Bata Research & Innovation Cluster by Chair of the Governing Board of Trent University
- Appendix 4: Certification and Authorization of the Bata Research & Innovation Project
- Appendix 5: Priority Designation by Trent University
- Appendix 6: Letters of Support: Maryam Monsef (MP, Peterborough-Kawartha); Jeff Leal (MPP, Peterborough); Daryl Bennett (Mayor, City of Peterborough); J. Murray Jones (Warden of County of Peterborough)
- Appendix 7: Engineering Designs & Regulatory Approvals
- Appendix 8: Approved Project Schedule with Milestones
- Appendix 9: Contractor Proposals and Start Dates
- Appendix 10: Approved Sources of Funding
- Appendix 11: Trent University Bata Research & Innovation Cluster Vision & Proposal, prepared by Perkin+Wills
- Appendix 12: Trent University's 2015 Report to the Community
- Appendix 13: 2015 2019 Strategic Plan Summary (City of Peterborough)
- Appendix 14: Indigenous (First Nations, Metis, Inuit) Consultations

