# > Health Sciences Centre for Advanced Simulation

## CONCEPT PLAN REPORT >

April 2016

CITY SPACES

# > Table of Contents


BCIT

# > Executive Summary

The proposed new **Health Sciences Centre for Advanced Simulation (HSCAS)** is designed to be a four-storey, leading-edge building (111,460 sf/10,355 $m^2$ gross area), with construction expected to start in August 2018, and occupancy by March 2020 (18 months).

Simulation has become a major feature of healthcare education in North America, offering many benefits, including opportunities for healthcare students to repeatedly practice in safe and realistic environments. Several new centres have been developed across North America. Most in Canada are small, but Ontario alone has more than 50 centres and programs. BCIT's HSCAS would be among the largest in the country, and be unique in its ability for reconfiguration into different simulated healthcare workflows and environments.

BCIT already uses its existing teaching spaces in an efficient manner, exceeding the Ministry's target for FTEs, with a 113 % utilization rate in 2014/15. However, the Institute is unable to deliver new and innovative simulation labs and inter-professional education without an appropriately serviced new building.

Designed to not only provide healthcare training through technology and practice, the new building will also enable the simulation of different health care environment workflows, and configurations. This environmental simulation capability will be a unique feature of the building, as will the incorporation of flexibility in the design to meet future changes in education practices. To date the immersion and workflow experience for students has been the domain of BCIT's clinical partners. The critical imperative in developing health care professionals is that practice education must be effective. But that education model is proving difficult to sustain. Meeting the objective of effective practice education is increasingly difficult as clinical environments (primarily hospitals) become more complex and the workforce adjusts to increased productivity expectations. Therefore limiting access to students.

This new HSCAS building will:

- Provide training for BC's key *in demand* health professionals consistent with *BC's Skills for Jobs Blueprint;*
- Significantly increase healthcare training opportunities, and provide the capability of future expansion. The facility will be used by the majority of SoHS programs and be utilized by approximately 1,949 students.
- Relieve pressure on a healthcare system in which applied practicum training is difficult to obtain within busy hospital settings;
- Position BC as a national leader in healthcare simulation education;
- Design for inter-professional education and interaction across all programs;
- Act as a *resource hub* to an emerging provincial network, with capacity to assist in post-graduate competency assessment/training, international competency assessment, operational workflow assessment, and applied research; and
- Enable BCIT to provide enhanced simulation-based education – a growing and significant teaching strategy for healthcare education.

## BCIT's Role in Healthcare Education in BC

BCIT's SoHS is the primary contributor of health science professionals to the BC healthcare system, providing instruction to approximately 2,298 students (FTEs) across 31 health-related programs each year. Key aspects of the School's leadership role in healthcare education are:

- **Diagnostic Technologies.** SoHS currently supplies **100%** of all Sonography, Nuclear Medicine, and Radiation Therapy graduates in BC.
- **Specialty Nursing.** SoHS delivers **88%** of the specialty nursing certificates in the province.
- **Medical Laboratory Technology & Medical Radiography.** SoHS delivers almost **80%** of all BC graduates.
- **Nursing.** SoHS delivers the **largest number** of BC nursing graduates annually.
- **Allied Health Programs.** SoHS delivers **100%** of Electroneurophysiology, Prosthetics and Orthotics, and Clinical Genetics graduates in the province.
- The **Biomedical Engineering** program is the **only one of its kind** in BC, and the only one in Canada specifically targeted to both hospital and medical device industries.

## BCIT Campus Renewal

Apart from the recently completed *Gateway Project,* the Burnaby campus has undergone limited capital renewal during the past two decades. Over the next ten years, the deferred maintenance value of the buildings is very large, with a total value of **$700 million** of work required to keep existing buildings operational (VFA Study, Burnaby Campus).

Two-thirds of the Burnaby campus' buildings (29 of 43) are rated within the **High Seismic Risk** categories (H1, H2, H3). All the Schools that occupy these buildings experience, to some degree, functionally inadequate teaching spaces in fragmented locations, which increasingly challenge the ability to advance the state of practice consistent with BCIT's mission.

SoHS programs/course are located in seven locations across the campus. The HSCAS project is part of a long-term plan to consolidate the SoHS via an integrated multi-year renewal project involving SW03 and SW01. These two buildings are the largest in BCIT, and are the core of its Burnaby campus.

## Capital Costs, Cash Flow & Fundraising

The total project cost for the new HSCAS is $66.566 million. In addition, specialized simulation equipment (SSE) has been estimated at $11.7 million. Therefore the combined total project value is estimated at $78.266 million.

BCIT notes the provincial government expectation that the Institute contribute to the capital cost for this project. Making a significant capital contribution is challenging because the typical student alumnus profile for BCIT involves a much higher ratio of students that attend short-term educational programs (less than 2 years in duration), whereas typical university student alumnus programs are longer term (4 years or more).

The BCIT Foundation indicates that supporters are keen to engage in fundraising, as outlined in the HSCAS Fundraising Plan (See Appendix H), which was approved by the BCIT Board of Governors on March 1, 2016.

If BCIT is to move towards a capital campaign for this initiative, it is of paramount importance that the Institute initiate a Fundraising Resources Feasibility Study to obtain a clear picture of what might be possible. Conducting such a study will provide BCIT with data and essential feedback with respect to the case (fundraising priorities), target goal, strategy, and campaign timeline.

**BCIT is prepared to undertake a fundraising campaign with a target of $11.7 million from industry and other sources, representing 15% of the total capital project budget of $78.266 million ($66.566 million + $11.7 million (SSE).**

*Cash Flow Summary Table*

| Project | Construction Start Date | Occupancy Date | Total Project Budget 2013 Dollars (millions) | Cash Flow (fiscal years, in millions) | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | 2015/16 | 2016/17 | 2017/18 | 2018/19 | 2019/20 |
| HSCAS | 08/18 | 03/20 | $66.57 | $0 | $0.57 | $6.00 | $30.00 | $30.00 |
| SSE | | | $11.70 | | | | | $11.70 |
| **TOTAL** | | | **$78.27** | **$0** | **$0.57** | **$6.00** | **$30.00** | **$41.70** |

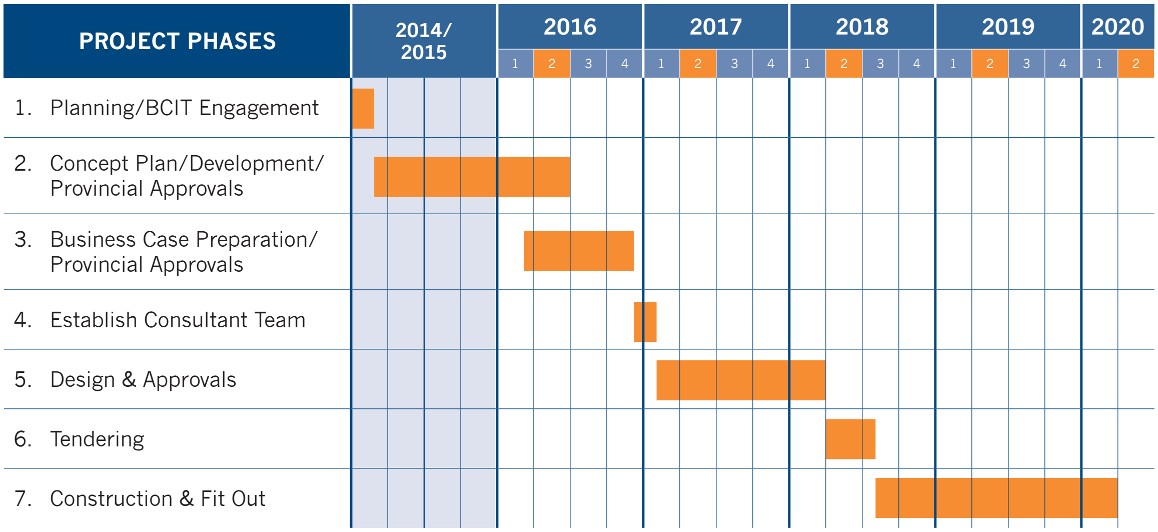
| Contributions | | | | | | |
|---|---|---|---|---|---|---|
| BCIT Contribution | $11.70 | | | | | $11.70 |
| Provincial Contribution | $66.57 | $0 | $0.57 | $6.00 | $30.00 | $30.00 |
| **TOTAL** | **$78.27** | **$0** | **$0.57** | **$6.00** | **$30.00** | **$41.70** |

## Evaluation of Alternatives

Five alternatives are identified in this *Concept Plan: Option 1 – New HSCAS Building; Option 2 – Status Quo; Option 3 – Renewal of Existing Buildings; Option 4 – Complete Replacement of SoHS; and Option 5 – Long-term Facility Lease.*

**Option 1: New HSCAS Building** is considered to best meet the objectives of BCIT and the Province, including cost-effectiveness and risk. It is the least expensive of the development options, and offers savings estimated at $29 million in capital costs over the next viable option. *Option 1* also minimizes disruption to faculty and students, and enables program continuity.

## Preliminary Construction Schedule




*Rendering of New HSCAS Building (prepared by Stantec)*

## Governance, Project Management & Procurement

BCIT has a *Project Charter* and governance structure in place to oversee this project. Responsibilities for the project are clearly identified, ensuring accountability, transparency, design, and cost control. Included in this structure are specialist advisory committees to provide advice as required, and these committees will draw upon health sector and industry expertise.

BCIT has experienced senior project management staff with a proven track record of delivering capital projects valued greater than $50 million. The *BCIT Project Management Framework* closely aligns with CAMF and CARG guidelines to ensure project procurement follows a competitive process. The BCIT facilities management team recommends a *Design Bid Build* procurement process as the most cost effective and timely delivery model (as this early stage of analysis). *(See Table 15)*

As the HSCAS project value is greater than $20 million, Partnerships BC (PBC) undertook a *Preliminary Procurement Screen* in 2016. As outlined in Appendix G, PBC confirmed that *Design Bid Build (DBB)* is appropriate as it would provide earlier project completion than *Design Build (DB)*.

# > Overview

In accordance with the *Concept Plan* template, as set out in the Ministry of Advanced Education *Capital Asset Reference Guidelines (CARG)*, this *Concept Plan* report provides a recommendation for the construction of a new Health Sciences Centre for Advanced Simulation (HSCAS) at BCIT's Burnaby Campus.

## Simulation in Health Education

Simulation has become a major feature of healthcare education in North America, offering many benefits, including opportunities for healthcare students to repeatedly practice in safe and realistic environments. Although not an alternative to clinical experience, simulation is a powerful complementary teaching and learning tool.

Traditionally, health care students attend abstract lectures and labs and move into a practical setting trying to apply this decontextualized learning with real patients. Simulation-based education creates the opportunity for content integration during student learning. They are given an opportunity to master higher-level decision making and clinical application of skills in the simulated setting, better preparing students for safer care of higher acuity patients and the technological healthcare setting that is their practicum experience.

Simulation recreates a set of conditions, with complex physical and psychological interactions, that attempt to present the patient authentically. In this manner simulation is more than just technology it is a technique. While this technique offers many advantages over traditional methods of teaching, there are several challenges that must be addressed to ensure its effective use. Part of this challenge is the accurate replication of simulated work settings and workflows, involving active role-playing, such as simulated emergency response and care for disease and illness, all within adequately programmed space. Debriefing spaces have to be created with appropriate equipment to review scenarios. Debriefing is a crucial step in learning with simulation as the engagement and review of the scenario create deeper learning for students and increases the potential for transfer of new knowledge to the healthcare setting.

Properly programmed environments that provide sufficient space for specialized equipment, work flows involving team-based interaction, and observation and evaluation is integral to the success of this unique education delivery model.

Flight training is the best-known use of simulation. However, now a wide range of sophisticated experiences are available in the healthcare field. Human-like manikins are the primary pieces of equipment or tools utilized in simulation to recreate authentic patient care, however, 3D technology provides further opportunities for outcomes-based simulation education. High fidelity manikins are now extremely realistic, offering experiences across the healthcare continuum, from trauma to birthing, with automatic or instructor-controlled responses. These manikins can speak, their chests rise and fall, and provide vital cues such as heart and palpable pulses and breath sounds. In addition, the manikins have monitors that can display EKG, pulse oximeter, blood pressure, arterial wave forms, pulmonary artery wave forms, anesthetic gases, etc. Procedures can be performed on the simulators such as bag-mask ventilation, intubation, defibrillation, chest tube placement, cricothyrotomy and others, that when connected to monitors, provide real-time virtual feedback to students.

Simulation centres typically mimic healthcare environments with supporting software to digitally stream patient responses, monitoring/control rooms, and debriefing rooms for playback. Several new simulation centres have been developed across North America. Most in Canada are small, but Ontario alone has more than 50 centres and programs. For a centre to be effective, there needs to be an appropriate variety and level of simulation modalities (e.g. standardized patients, manikins, virtual reality, task trainers, etc.) and human resources. The goal for BCIT and surrounding healthcare partners is to ensure the environment is conducive to accomplish assessment, education, research and/or systems integration activities. BCIT's HSCAS would be among the largest in the country, and be unique in its ability for reconfiguration into different simulated healthcare workflows and environments.

BCIT participated in the Provincial Simulation Coordination Committee, which submitted a BC Simulation Current State Report to AVED in November 2013.

The report concluded that simulation technology have been implemented by various institutions and is increasingly becoming a significant teaching strategy for healthcare education. The report notes that funding, space, simulation expertise and leadership were identified as the most common barriers to expanding simulation.

The proposed HSCAS project would clearly represent the creation of the Province's first large-scale facility integrated into BCIT's core health sciences curriculum and could provide a leadership role in supporting collaboration among health professional educators in simulation-based curricula.

## Why a New Building?

BCIT already uses its existing teaching spaces in an efficient manner, exceeding the Ministry's target for FTEs, with a 113% utilization rate in 2014/15 with AVED base funding.

SoHS courses and programs are scattered across seven locations on the Burnaby campus. Many teaching spaces are spatially constrained and functionally inadequate, both in terms of equipment and teaching space. A small simulation facility is currently located in SE12 – a building that cannot be economically or functionally converted to accommodate ongoing simulation education. In very poor condition, the building is rated a High Seismic Risk. Its renewal is estimated to cost 80% of the building's replacement value, or $52 million. An estimated 94% of SE12's space requires functional mitigation.

SoHS's two other main locations (SW03 and SW01) are both more than 40 years old, and at High Seismic Risk. Together, they have a 10-year deferred maintenance backlog of $174.4 million (2016). There is no existing space available to create a simulation centre without a major relocation of current programs, and there is no swing space to make such relocation feasible. As with SE12, building configurations do not lend themselves to conversion to a simulation centre.

Without new simulation facilities, overtime the School of Health Sciences at BCIT will not be able to achieve the level of education readiness of its graduates as expected by our clinical partners. The health environments, particularly acute care, are increasingly complex and challenging for student participation. In addition, access to appropriate clinical sites is restricted due to their limited capacity to provide student preceptorships. This requires a new approach to preparing students for clinical practice and to do so through simulation applications which allow students to practice procedures and workflow in a manner which deepens the learning experience. This will reduce the clinical site requirements and reserve the precious resource for high quality clinical rotations.

Due to the current space constraints and inability to co-locate programs BCIT can not achieve this necessary reconfiguration within programs. As such the organization will need to reconsider the size, scope and breadth of health programming offered. In turn reducing the necessary number of graduates for the health system.

**A new HSCAS building** will be more than the replacement of old and unsatisfactory facilities. It will represent an opportunity for a fundamental change in education delivery for health professionals. Through the sophisticated simulation environment and a technology-based learning experience, graduates will be more effectively prepared to move into their clinical roles. The facility will be a critical hub within the province and allow other educational partners and care providers to take advantage of, and build upon, these new technologies. The proposed HSCAS would truly provide the foundation for better healthcare in BC.

Practice education is an essential component to effectively prepare students for the health care system. But significant pressures to increase efficiency and contain costs within the health system make it increasingly difficult to complete practice education requirements to the level of quality necessary. Through inter-professional simulation, the proposed new HSCAS will meet the critical need by establishing alternative approaches to practice education, thereby increasing quality and providing capacity to train additional students as required. It is important to state: this is not to replace practice education but to augment and ensure the time in the clinical environment is effective.

The SoHS is creating a new, progressive vision for health education delivery. This new vision incorporates an inter-professional theme across all programs, and is delivered within a facility that has the look and feel of a health delivery environment. The breadth of relevant programs offered

*Figure 1: Cross-Section Rendering of New HSCAS Building (prepared by Stantec)*

at BCIT gives us the capacity to create comprehensive learning experiences within simulated environments, such as a hospital or a home care situation. Health programs such as Nursing, Radiography, Sonography, Nuclear Medicine or Medical Laboratory, coupled with partnerships including the Faculty of Medicine at the University of British Columbia, allow us to create an environment that is truly representative of the health system.

The HSCAS represents an important catalyst for health system transformation in British Columbia and is a critical government priority. Addressing challenges related to quality, cost-effectiveness and cost-containment will require alignment of all key stakeholders in the province. Tighter coordination of health education with the health system is a foundational element of the necessary transformation, as achieving the desired outcomes will require coordination across a wide network of resources. The HSCAS will become a critical "hub" to an emerging provincial network of resources, with capacity to assist in additional areas such as: post-graduate competency assessment/training, international competency assessment/training, operational workflow assessments and applied research.

A new health sciences simulation building will maintain BCIT's key role in healthcare education, and it will position the Institute at the forefront of innovative simulation technologies and teaching practice.

## The Project

The proposed new Health Sciences Centre for Advanced Simulation (HSCAS) is a four-storey, leading edge building (111,460 sf/10,355 $m^2$ gross area), and is top priority for BCIT.

Designed to not only provide healthcare training through technology and practice, the new building will also enable the simulation of different healthcare environment workflows, and configurations. This environmental simulation capability will be a unique feature of the building, as will include the incorporation of flexibility in the design to meet future changes in education practices.

Simulation is very much a part of applied learning and teaching environments and is represented across a wide spectrum technology, actors and laboratory configurations. Many program disciplines have simulation related experiences within their curriculum where students may practice procedures. The positive benefits of simulation as a tool for teaching are clear and certainly a very obvious example is the commitment seen within the aviation industry.

However, simulation in health care must embrace a more robust and broader approach. Moving from simulation of specific procedures to one of interdisciplinary and workflow immersion. The root cause of patient safety issues often relate to elements of patient/client handover from one discipline to another, misunderstanding of limitations and/or challenges of the patient environments, misunderstanding of technology interfaces etc. Seldom is it specifically the procedure being done inaccurately. Therefore health education programming must be refocused beyond procedural competencies and embrace a more comprehensive learning experience of how workplace elements relate to each other (i.e. workflow), interdisciplinary interaction, information and technology interfaces (human factors and design) and then ultimately the implications of all on the patient or client care process.

The challenge of creating advanced simulation solutions is the fact it relates to physical space and design, not technology pieces. Existing education environments do not easily provide the flexibility and co-location of key education program activities. Poor program proximity, space allocation and design restrict conversion to a high quality of inter-professional education and simulation as a central core teaching and learning framework.

A new simulation complex at BCIT will provide the opportunity to create sufficient and effective space for high quality simulation activities. As noted the high quality simulation delivery arises from creating real-life environments within which students can practice safely and thereby deepen the learning experience. The high quality result being sought is to have the simulation tools, whether they be technology or actors as patients, immersed within an environment designed to replicate critical workflow across/between health disciplines.

To date the immersion and workflow experience for students has been the domain of BCIT's clinical partners. The critical imperative in developing health care professionals is that practice education must be effective. But that education model is proving difficult to sustain. Meeting the objective of effective practice education is increasingly difficult as clinical environments (primarily hospitals) become more complex and the workforce adjusts to increased productivity expectations. As a result, students often find themselves standing to the side in clinical situations as safety concerns and time constraints override the practice education opportunities.

Less prepared students do disrupt a high-paced, complex workflow. They require supervision, and it will take a student longer to work through a procedure or clinical assessment. Maintaining current and future student volumes is proving difficult and, therefore, a new model for practice education is required.

## BCIT Renew

Established in 1964, the British Columbia Institute of Technology (BCIT) comprises six Schools of study that operate at five campus locations, including its main campus in Burnaby. With 21,025 FTE in 2014/15, BCIT is the third largest post-secondary education institution in the province.

Apart from the recently completed SW01 *Gateway Project* (2012), the Burnaby campus has undergone limited capital renewal over the past two decades. BCIT's ability to advance the state of practice consistent with its mission is now increasingly challenged because:

- Two-thirds of the Burnaby campus' academic buildings (30 of 43) are more than forty years old;
- The deferred maintenance value of the buildings for the next ten years has a total value of $700 million (VFA Study, Burnaby Campus);
- Two-thirds of the Burnaby campus' buildings (29 of 43) are rated within the *High Seismic Risk* priority category;
- Numerous buildings have functionally inadequate layouts, as well as inappropriate teaching and social spaces for modern learning and research;
- Building systems and infrastructure are obsolete and inefficient;
- Many buildings are unattractive and negatively impact BCIT's image and recruitment; and
- The locations of the Schools' teaching spaces are dispersed across various buildings on the Burnaby campus, creating operational issues for education programs.

*BCIT Renew* is a program of capital renewal, and the focus of the Institute's *Five-Year Capital Plan*. A cost-effective mix of projects, the program blends new construction with building renewal and upgrades. **Aligned with the Provincial Government's *BC Skills for Jobs Blueprint*, this investment will benefit programs for the occupations projected to experience growth in the province, and where training is most needed.**

The *Health Sciences Renewal Project* focuses on the top three priorities of the BCIT *Five-Year Capital Plan*. These interdependent components will be delivered in a multi-phase, multi-year approach. The priority ratings identified are those utilized in the *Capital Asset Review Guideline*.

### PHASE 1: New Health Sciences Centre for Advanced Simulation (HSCAS)

*(New Priority Project Investment – Ministry Category 1)*

This new building (approx. 111,460 sf/10,355 m$^2$) will accommodate Health Sciences programs currently located in functionally unsatisfactory spaces. Its construction will facilitate consolidation of the SoHS from seven buildings into a compact precinct of three. The provision of new space in HSCAS will enable subsequent phased renewal of buildings SW03 and SW01.

### PHASE 2: Renewal of Existing SW03

*(Whole Asset Replacement & Renewal – Ministry Category 2)*

This project will result in a totally renewed building of approximately 139,800 sf/13,000 m$^2$. Deferred maintenance for this building totals $72.8 million (estimated by VFA for the next 10 years as of 2016).

### PHASE 3: Renewal of Existing SW01

*(Whole Asset Replacement & Renewal – Ministry Category 2)*

This project will result in a totally renewed building of approximately 271,000 sf/25,200 m$^2$. Deferred maintenance for this building totals $101.6 million (estimated by VFA for the next 10 years as of 2016).

This *Concept Plan* has been informed by BCIT's own internal project management process, and the due diligence undertaken to date. BCIT's process identifies potential capital projects, evaluates their feasibility, develops business cases and, where appropriate, develops plans through to construction (See Section 7.0). The process broadly parallels the Provincial Government's planning process, as set out in the *Capital Asset Reference Guide*.

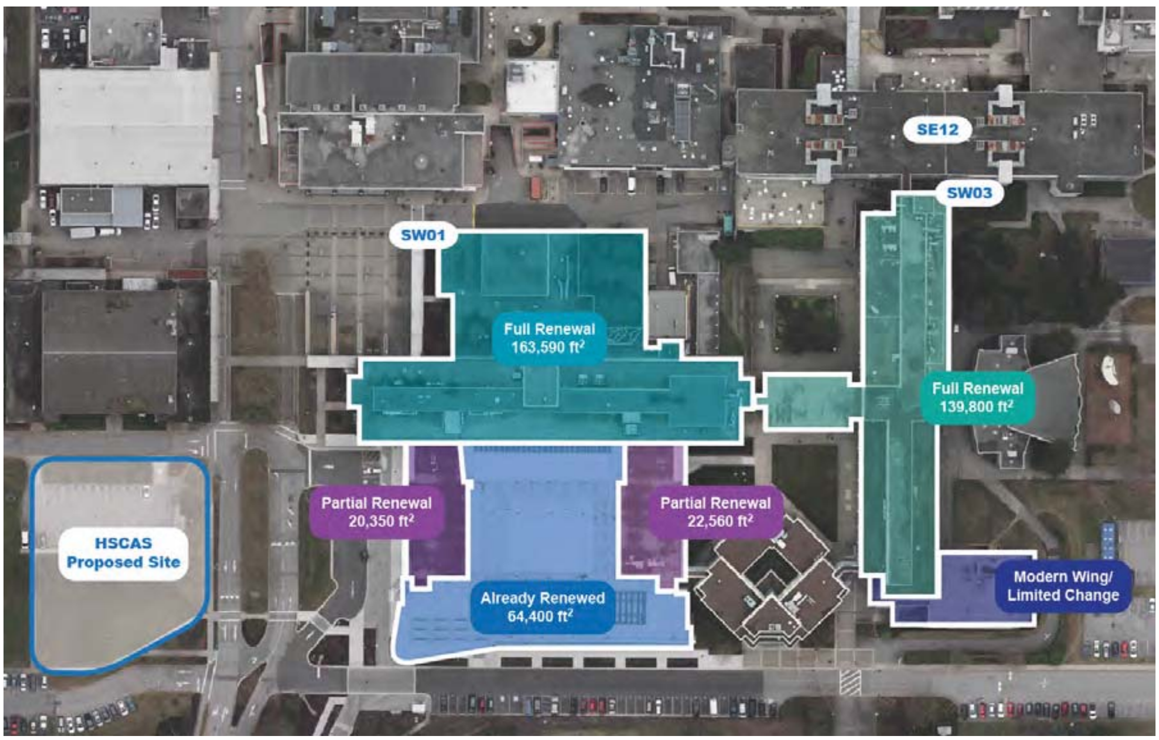
# 1 > Project Description

The top priority for BCIT is a new Health Sciences Centre for Advanced Simulation (HSCAS).

This integrated and comprehensive building will advance the delivery of healthcare education through the utilization of sophisticated simulation, modern classroom technology, and inter-professional practice.

Completion of the HSCAS will enable subsequent phased renewal of SW03 and SW01, which form the core of the Burnaby campus. Construction of the HSCAS will facilitate eventual consolidation of the SoHS into a cluster of three buildings (reduced from the current situation of SoHS programs being dispersed in seven buildings).

*Figure 2: Context Map - To Be Renewed vs. Already Renewed*



## 1.1 Project Objectives

### OBJECTIVES

1. Provide modern and adaptive 21st century learning and research facilities that meet the educational needs of the School of Health Sciences, and the labour market demands for healthcare professionals.
2. Ensure best use of capital funds, and maintenance of cost controls for financial viability.
3. Provide flexibility in design to enable future changes to learning environments.
4. Consolidate School department locations, and encourage inter-professionalism and interdepartmental/inter-School cooperation.
5. Create an attractive building and learning environment that will improve the quality of experience, and the image of BCIT for faculty and students.
6. Create modern building services and technologies in a sustainable building that reduce energy use and operating costs.
7. Ensure program continuity, and minimize the impact of renewal on School operations and student learning by:
    i. Maintaining continued operation of School programs;
    ii. Limiting moves and disruption; and
    iii. Ensuring safety and security during renewal.
8. Involve program representatives in a consultative and integrated design process.
9. Implement components of the *Burnaby Campus Development Plan*.
10. Provide opportunities for industry partnerships.

## 1.2 Project Scope

The completion of the HSCAS will enable BCIT to keep pace with other North American institutions in its development of advanced simulation technology training. This will allow for future increased capacity, and ensure sustainability of existing programs, positioning BCIT to address future healthcare priorities.

### Health Sciences Centre for Advanced Simulation (HSCAS) > Category 1: New Priority Project

Currently, the SoHS has 2,298 student FTEs, taught in seven locations across the campus. This new building is expected to provide learning space for approximately 1,949 students.

Simulation is a critical part for the transformation of healthcare education. Although not a substitute for direct clinical experience, simulation provides students with high-quality practice, prepares them to enter the high-pressure clinical environment, and relieves stress on a healthcare system where applied practicums are increasingly difficult to schedule in hospital settings.

It is anticipated that BCIT will be one of the leading institutions in Canada in its ability to reconfigure and simulate different healthcare workflows and environments, e.g., hospital, community clinic, home care.

The new HSCAS building will enable instructors (and graduates) to transform professional practice with their knowledge, skills, and judgments, improving patient care and outcomes across the province. High quality healthcare education will bring high quality patient care.

This new building will be designed to:

> Provide training for BC's key *in demand* health professionals, in which BCIT is the sole or lead educational provider in the Province;
> Place BC in a leadership role in healthcare simulation technologies and teaching practice;
> Uniquely replicate hospital workflows, simulating different configurations, and incorporating flexibility for future changes in education practices;
> Significantly increase training opportunities, and the capability for future program expansion;
> Encourage inter-professional education and interaction across all programs;
> Embrace new competencies and health sector demands; and
> Act as a *resource hub* to an emerging provincial network, with capacity to assist in post-graduate competency assessment/training, international competency assessment, operational workflow assessment, and applied research.

### Student Numbers

This plan does not envisage staffing additions at this time. Existing health spaces in a number of programs are undersized and inefficient, and the HSCAS will address these deficiencies. If left as they are, existing facilities limit the ability of programs to adopt new technologies, instructional equipment, and techniques. Current SoHS enrolments are 2,298 FTEs, and approximately 85% of these students will take programs in the new HSCAS.

The actual assignment of space in the HSCAS will be documented in more detail as part of the *Business Case Study*. Table 1 provides a summary of future Health Sciences FTEs considered for inclusion in the new simulation centre.

"Being able to... practice skills on the Terry dolls gives me more confidence when entering the hospital."

> Aimee, *SoHS Student*

*Table 1: HSCAS FTE Considerations*

| Program | 2015 FTE (Total) |
|---|---|
| Biomedical Engineering | 41 |
| Cardiology | 82 |
| Clinical Genetics | 11 |
| Diagnostic Medical Sonography | 80 |
| Electroneurophysiology | 17 |
| Medical Imaging | 23 |
| Medical Laboratory | 182 |
| Medical Radiography | 189 |
| Nuclear Medicine | 29 |
| Nursing (BSN) | 632 |
| Prosthetics & Orthotics | 11 |
| Radiation Therapy | 33 |
| Specialty Nursing | 619 |
| **TOTAL** | **1,949** |

**Course-by-Course FTE:** *These programs are not cohort based; students can enter and advance at their own pace to graduation.*

**NOTE:** *This table excludes SoHS FTEs not receiving instruction in the new building.*

## 1.3 Project Concept

### DESIGN GUIDELINES

The following Design Guidelines have been established for the new and renewed buildings:

> Ensure flexibility for the simulation of a variety of healthcare environments, and to economically respond to future changes in healthcare education.

> Express innovation through the use of building materials that demonstrate technology, and showcase applied learning and living laboratories.

> Improve the quality of learning and research spaces to support recruitment and improve BCIT's image.

> Ensure cost-effectiveness and reduced deferred maintenance risk.

> Support Burnaby Campus development plan strategies, such as improving pedestrian connections and architectural articulation of the Goard Way streetscape.

> Create a strong sense of place within learning commons and outdoor plaza areas.

> Ensure seismic safety and security.

> Adopt sustainable building standards that attain a minimum LEED® Gold standard, incorporate energy efficient building systems, and feature *Wood First* building elements (HSCAS).

*Figure 3: New HSCAS Building Rendering (prepared by Stantec)*

## SITING

The first component of the *Health Sciences Renewal Project* utilizes a surface parking lot (0.35 hectares/0.865 acres) located on the north side of Goard Way at the entrance to BCIT. This flat site has been confirmed satisfactory for the project by a geotechnical analysis (See Appendix B). Some reconfiguration of existing underground service lines will be required to align with utility renewal planned for Goard Way.

The provision of replacement parking for existing parking impacted by this development will be assessed further as part of the Business Case report. The existing stalls will need to be replaced as part of the project to comply with City of Burnaby permitting requirements. Concept design has verified underground parking as viable at this site. The precise number of parking stalls achievable will be confirmed at the Design Development stage. The annual revenue generated from parking levies is used to offset the depreciation expense associated with parking capital investment, and ongoing annual maintenance expenses for parking infrastructure on campus.

*Figure 4: New HSCAS Building will be located right across from the Gateway Renewal Project*

### PRELIMINARY SPACE PROGRAM

The new HSCAS is designed to be a flexible building that allows for simulation of different hospital/ healthcare workflows, while remaining adaptable to future innovations in health education. The four-storey facility will contain three types of spaces (all areas approximate at this time):

1. *Teaching/Simulation Labs* (40,000 sf) are the primary teaching tools that can be reconfigured into a variety of different healthcare environments, including hospitals, community clinics, and home care This capacity is a unique feature of the centre, and permits a range of flexibilities for changes in the demand for programs, care environments, workflows, and testing different configurations. This adaptability addresses the general lack of flexibility in health and education buildings to changes in technology, teaching methods, and building systems.
2. *Learning Spaces* (35,000 sf) provide seminar, meeting, and student project rooms.
3. *Service, Support and Storage* (10,000 sf) are the *back of house* technical support for the building, and are important requirements for simulation.
4. *Circulation and "Gross-up"* (15,000 sf) includes normal corridors, stairways, elevators, electrical, and mechanical.

### PROGRAMS

Of the 13 programs identified for inclusion in the HSCAS, 11 occupy space that is *most unsatisfactory* and/ or *in need of mitigation**. Refer to Appendix C for functional inadequacies of the program spaces (2012):

> Biomedical Engineering*
> Cardiology*
> Clinical Genetics Technology*
> Diagnostic Medical Sonography*
> Electroneurophysiology
> Medical Imaging
> Medical Laboratory*
> Medical Radiography*
> Nuclear Medicine*
> Nursing (RN)*
> Prosthetics Orthotics*
> Radiation Therapy*
> Specialty Nursing*

## 1.4 Project Outcomes

The *Health Sciences Renewal Project* will deliver the following key outcomes:

> Provision of new space that can accommodate innovative team-based simulation technologies;
> Delivery of trained professionals consistent with labour market requirements identified by the *BC Skills for Jobs Blueprint*;
> Improved healthcare education program delivery, ensuring long-term sustainability of BCIT's existing programs;
> Position SoHS to address future provincial healthcare priorities;
> Provision of modern, high performance educational facilities that also facilitate the consolidation, and rationalization of program space for the SoHS;
> Improved program utilization through more efficient, flexible, and functional design;
> Provision of flexible space that can adapt to changes in healthcare education; and
> Implementation of BCIT's *Burnaby Campus Development* planning objectives.

# 2 > Background Information

## 2.1 Current Situation

A number of key studies were undertaken for this Concept Plan:

1. *Functional Adequacy (2012)* included locations and relationships for existing and future school programs. This work was derived from the respective Schools, translated into a room-by-room database, analyzed, and mapped. More detailed follow-up will be required as part of the *Business Case*.

   The programs operated by the School of Health Sciences in SW01, SW03 and SE12 have significant problems with both the functional inadequacy of the teaching spaces, and the ad hoc distribution of School locations/programs on campus.

   *Table 2: SoHS Space Conditions*

   | SoHS Space* | Major Mitigation | Some Mitigation | No Mitigation |
   |---|---|---|---|
   | SW01 & SW03 | 29% (13,890 sf/1,290 m²) | 9% (4,520 sf/420 m²) | 62% 29,790 sf/2,768 m²) |
   | SE12 | 26% (7,277 sf/676 m²) | 68% (19,033 sf/1,768 m²) | 6% (1,680 sf/156 m²) |

   *figures rounded*

   The School of Health Sciences has evolved through a series of incremental changes, which have resulted in program spaces being scattered in seven buildings throughout the campus. In total, the School occupies approximately 86,000 sf (8,000 m²) of building space, just over a third of which is classified as *completely unsatisfactory.*

   Because of these scattered, unsuitable spaces, SoHS lacks a distinct identity on campus, and spatial opportunities to facilitate inter-professionalism are non-existent. In general, 23,250 sf (2,160 m²), or 27%, of the total SoHS space is considered a priority for major mitigation, with about 30% requiring some mitigation, and only 43% requiring no mitigation.

2. *Structural Conditions* focused on the seismic characteristics of SW03, SW01 and SE12, and the analysis was based on a series of reports by engineering consultants: Bush Bohlman & Partners, RJC, and Ausenco Sandwell.

3. *Physical Building Conditions* included review of mechanical and electrical systems. This work was undertaken by VFA Inc., in collaboration with the Ministry of Advanced Education.

4. *Hazardous Materials* included detailed materials testing surveys of SW03 and SW01 by PHH Arc Environmental.

5. *Geotechnical Soil Testing* for the proposed HSCAS construction site was undertaken by Centennial Geotechnical Engineers (CGE).

   The geotechnical survey of the proposed HSCAS building site is provided in Appendix B pg. 18. Based on the findings of the soils report, CGE developed preliminary recommendations for site class, earthworks, drainage control, foundation design, slab-on-grade preparation, and lateral earth pressures. Field test boreholes indicate the presence of random fill, and organic matter ranging in depth from three to 16.5 feet. As removal of the random fill is required, the provision of one level of underground parking is cost effective.

## 2.2 Demand & Supply

The *BC Skills for Jobs Blueprint* provides a context for labour market demand in the province. Between 2010-2020, more than one million job openings are expected in BC, of which 78% will require some post-secondary education training or a degree, and 43% will need trades or technical training.

Within this context, *Health Care (with Social Assistance)* was BC's second largest employer in 2011, with 261,300 people employed in the industry. Over 102,000 employees work in the six health authorities, plus Providence Health Care.

Between 2011 and 2012, there was an employment gain of 5.1% in the healthcare sector, adding a further 13,200 jobs. This trend is expected to continue as *Health Care* professions are forecasted to be *high opportunity occupations in British Columbia* by the Ministry of Jobs, Tourism and Skills Training.

More specifically, jobs in Nursing (RN), Specialty Nursing, Medical Laboratory, Diagnostic Medical Sonography, Medical Radiography, Nuclear Medicine, Cardiology, and Radiation Therapy are expected to be in high demand, as workers entering retirement years vacate these positions. These specific programs will be supported with the development of the HSCAS.

Appendix A presents letters of support for this project from:

- Vancouver Coastal Health
- Fraser Health
- Interior Health;
- BC Patient Safety & Health Council
- College of Registered Nurses of BC
- BC Alliance on Telehealth Policy & Research
- University of Victoria School of Nursing
- University of British Columbia (UBC) School of Medicine
- UBC Department of Urologic Sciences
- Providence Health Care

BCIT consistently exceeds the Ministry's target for FTEs for the Institution overall, and the annual utilization rate in Nursing and Allied Health Programs has ranged from between 116-121% in recent years, standing at **103%** in 2014/15.

## School of Health Sciences (SoHS)

The SoHS is a primary contributor of health science professionals to the BC healthcare system, and current enrolments are 2,298 FTEs. These students acquire the education and skills necessary to be job-ready. Key aspects of the School's leadership role in healthcare education are:

> **Diagnostic Technologies**. SoHS currently supplies **100%** of all Sonography, Nuclear Medicine, and Radiation Therapy graduates in BC.

> **Specialty Nursing.** SoHS delivers **88%** of the specialty nursing certificates in the province.

> **Medical Laboratory Technology & Medical Radiography.** SoHS delivers almost **80%** of all BC graduates.

> **Nursing.** SoHS delivers the **largest number** of BC nursing graduates annually.

> **Allied Health Programs.** SoHS delivers 100% of Electroneurophysiology, Prosthetics and Orthotics, and Clinical Genetics graduates in the province.

> The **Biomedical Engineering** program is the **only one of its kind** in BC, and the only one in Canada specifically targeted to both hospital and medical device industries.

# 3 > Strategic Alignment

As indicated in its *Institutional Accountability Plan*, BCIT is committed to real world industry needs, and is strongly aligned with *BC's Skills for Jobs Blueprint*.

## 3.1 Stakeholder Identification

BCIT and the Schools involved in this renewal initiative have many long-standing stakeholder relationships/partnerships. These are strengthened through Program Advisory Committees that provide guidance and counsel to the respective programs. The SoHS recognizes the need to have the *Health Sciences Renewal Project* supported by the healthcare system, and to ensure the rationale to support the project is sound. Letters from Health Authority leaders, and the Chair of the *Health Quality Network* demonstrate the need and level of support (See Appendix A pg. 20). Also, the emerging relationship with UBC Nursing, and the UBC Faculty of Medicine will provide a further opportunity for future inter-professional activities involving both organizations. A letter of support from Dr. Gavin Stuart is also included in Appendix A.

In addition to the support offered directly to BCIT, the Ministry of Advanced Education has reviewed the operational aspects of the project with Ministry of Health (MoH) representatives. The MoH has indicated its support for the direction and assumptions made within this *Concept Plan*.

This project responds to a number of institutional and government priorities and strategies. Key areas of strategic alignment are:

- Healthcare occupations, as a group, are projected to have the strongest growth in the province over the next ten years, with an annual rate of 2.4% (*BC Labour Market Outlook 2010-2020*).
- *Ministry of Health 2012/2013 & 2014/2015 Service Plan* – Particularly "Goal 4: Improved innovation, productivity, and efficiency in the delivery of health services".
- BCIT *Strategic Vision* and *Campus Development Plan*.

"BCIT is a good school because you get hands-on training."

> Deana, *SoHS Student*

## 3.2 Stakeholder Alignment

BCIT has always worked with stakeholders to achieve goals. Currently, BCIT is developing a new e-learning strategy, and will be highlighting technological innovations throughout all the Schools. The new HSCAS will allow BCIT to grow its partnerships and innovations. The following are examples of what has been achieved:

- Biomedical Engineering students, working with ALS clients, invented portable devices that allow the clients to send texts with a simple touch, operate a computer with eyebrow movement, and manipulate a computer mouse using eye movements and special glasses than contain an innovative camera. BCIT students won the top four prizes awarded by the ALS Society of BC for their innovations: http://bit.ly/1M3mtXY.
- Prosthetics and Orthotics students use the latest 3D printing software to scan patients, and create inexpensive prosthetics. This program has also developed an interactive, web-based video repository as a learning and teaching tool for clinical assessment of normal and pathological human gait (walking and posture). When the project was initiated, no such multimedia resource existed. Students are able to add new patient videos, review existing videos, use a number of interactive tools to help with gait assessment and clinical decision-making.

*Table 3: Province of British Columbia*

| Goal | Support for Provincial Goals | Impact |
|---|---|---|
| 1. *BC Skills for Jobs Blueprint*<br>> A head start to hands-on learning in our schools.<br>> A shift in education and training to better match with jobs in demand<br>> A stronger partnership with industry and labour to deliver training and apprenticeships. | > Provides an advanced learning environment that supports students in accelerated dual credit programs for high-demand skilled labour markets, such as healthcare.<br>> Recreates work environments – the classrooms of the future.<br>> Provides hands-on learning and simulates modern work experiences and environments.<br>> Provides state-of-the-art modern teaching infrastructure and equipment. | HIGH |
| 2. *BC Climate Change Action Plan* | > LEED® Gold Building standard<br>> Renovation focused on energy savings<br>> Estimated 30% reduction in energy consumption | MEDIUM |
| 3. *BC Wood First Policy* | > New building construction will feature wood products. | MEDIUM |

*Table 4: Ministry of Advanced Education, Innovation & Technology*

| Goal | Support for Ministry Goals | Impact |
|---|---|---|
| 1. BC's post-secondary education system is relevant & responsive in meeting the needs of the economy & society. | > Flexible learning spaces that allow for changing technology & education practices.<br>> State-of-the-art facilities, while reflecting current economic conditions & attitudes.<br>> BCIT is provincial leader in sustainable research. | HIGH |
| 2. A collaborative, innovate & dynamic education sector, built on common vision & strong partnerships. | > BCIT's success record & strong ongoing partnerships.<br>> HSCAS will foster partnering with health authorities & universities. | HIGH |
| 3. BC's public & private education systems work with families, business & communities to support student-centred experiences. | > Innovative & flexible space design emphasizes changing role of informal program space & student-oriented common areas. | HIGH |

*Table 5: Ministry of Health*

| Goal | Support for Ministry Goals | Impact |
|---|---|---|
| 1. Effective health promotion, prevention & self-management to improve health & wellness of British Columbians. | > HSCAS provides a comprehensive & integrated facility to study, research & apply solutions to improve & save lives | HIGH |
| 2. British Columbians have majority of their health needs met by high quality primary & community-based health care & support services. | > BCIT delivers 88% of specialty nursing certificates & most nursing graduates in BC to provide acute care in both hospitals & community health settings. | HIGH |
| 3. British Columbians have access to high quality hospital services, when needed. | > Project will ensure BCIT maintains its leadership role in providing job-ready graduates in a wide-range of health care specialties. | HIGH |
| 4. Improved innovation, productivity & efficiency in delivery of health services. | > Creation of sophisticated, simulated health system delivery environment will enhance learning & promote inter-professional interaction. | HIGH |

*Table 6: Health Services Employers*

| Goal | Support for Partner Goals | Impact |
|---|---|---|
| 1. Well-trained, job-ready graduates with experience in inter-professionalism & modern technology. | > New facilities for continuation & enhancement of BCIT's role as a provider of job-ready graduates. | HIGH |
| 2. Replacement of health care retirees by appropriately trained graduates with a good understanding of the health profession. | > Programs focused on areas requiring replacement workers. | HIGH |
| 3. Innovative & collaborative health care practitioner training that is relevant & responsive to the health care industry & community. | > Provision of simulation facilities to provide students with high quality practice & preparation for the clinical environment. | HIGH |

*Table 7: Students*

| Goal | Support for Partner Goals | Impact |
|---|---|---|
| 1. 21st century learning environment with simulation facilities & instructors supporting excellence in innovation in health education. | > Commitment to state-of-the-art facilities & equipment – 21st century learning environment to attract excellence in instructors & learners. | HIGH |
| 2. Strong employment opportunities based on BCIT's reputation for job-ready graduates. | > New & expanded facilities enable BCIT to build on reputation for job-ready graduates.<br>> Living lab & applied learning space. | MEDIUM |
| 3. Opportunity for future-focused, interdisciplinary learning. | > Integration of health care programs in modern simulation complex that enhances inter-professionalism.<br>> 21st century learning environment in four of BCIT's Schools. | HIGH |

# 4 > Environment Analysis

Selected new comparable, post-secondary education institution initiatives were examined in this analysis. These include some large new health and science buildings, and new simulation facilities, with the largest simulation facilities mainly found in the US. An overview of simulation initiatives was also undertaken.

Flight training is the best-known use of simulation. However, a wide range of sophisticated experiences are now available in the healthcare field. Human-like manikins are the primary focus, although simulation is also offered through 3D technology. *High fidelity* manikins are now extremely realistic, offering experiences across the healthcare continuum, from trauma to birthing, with automatic or instructor-controlled responses.

Simulation centres typically mimic healthcare environments with supporting software to digitally stream patient responses, monitoring /control rooms, and debriefing rooms for playback.

Several new simulation centres have been developed across North America. Most in Canada are small, but Ontario alone has more than 50 centres and programs. BCIT's HSCAS would be among the largest in the country, and be unique in its ability for reconfiguration into different simulated healthcare workflows and environments

The Michener Institute for Applied Health Sciences in Toronto has created the *Centre for Advanced Simulation and Education (CASE)*, and provides a Canadian comparison.

*Cross-Section Rendering of New HSCAS Building (prepared by Stantec)*

## .4.1 Environment Scan

*Table 8: Comparable Post-Secondary Education Institution Initiatives*

| Institution/ Project | Project Type | Programs | Scope | Cost |
|---|---|---|---|---|
| BCIT<br>*Gateway Project* | Demolition/ Renovation | | SW01 west wing demolition, seismic & physical upgrades. Enclosure/conversion of large courtyard. | $39.1 M |
| UBC Okanagan<br>*Health Sciences Centre* | New Build | Health Sciences | New high-tech classrooms, lecture theatre, small group teaching rooms, research & teaching labs, admin. & faculty offices, & linkage to campus infrastructure.<br>45,918 sf/4,266 m$^2$ | $32 M |
| Columbia University<br>*Medical Centre*<br>(New York) | New Build | Health Sciences/ Dentistry | Technologically enhanced classrooms, collaboration spaces, modern simulation centre, social & public spaces, multi-purpose outdoor spaces & terrace.<br>100,000 sf/9,290 m$^2$ | $70 M |
| NYU Langone<br>*Medical Centre*<br>(New York) | New Build | Health Sciences | Simulation training centre, collaborative spaces, operating rooms, wet room/disaster training room, ICU/trauma room, examination rooms, class & conference spaces. | $21 M |
| Methodist Institute for Technology, Innovation & Education (Houston) | New Build | Health Sciences | State-of-the-art education & research space, advanced image-guided technology, virtual hospital, procedural skills lab, inanimate skills lab, medical robotics & high fidelity operating room simulation. | $100 M |
| Solomont Center for Clinical Simulation & Nursing Education (Boston) | Conversion | Health Sciences | State-of-the-art learning centre for nursing education & multidisciplinary training. Hands-on collaborative training spaces.<br>4,000 sf/370 m$^2$ | +$1.5 M |
| Michener Institute<br>*Centre for the Advancement of Simulation & Education*<br>(Toronto) | Conversion | Health Sciences | State-of-the-art, multi-modality centre. Simulation & staging studios, flexible spaces, scenario monitoring control rooms, debrief, multi-purpose & breakout rooms, 300-seat auditorium.<br>20,000 sf/1,860 m$^2$ | NA |
| Southern Alberta Institute of Technology (SAIT)<br>*Centre for Advanced Patient Care Simulation*<br>(Calgary) | New Build | Respiratory Therapy, Emergency Medical Technology, Paramedic & other Health/Public Safety programs. | Modern laboratory facilities, clinical spaces & observation hallway. | $1.4 M |

## SELECTED SIMULATION INITIATIVES

### Columbia University Medical Center (CUMC)

The new *Medical and Graduate Education Building (MGEB)* at the CUMC is a high-tech state-of-the-art 100,000 sf complex located in New York. Currently under construction, this $70 million, 14-storey glass tower incorporates technologically advanced classrooms, collaboration spaces, and a modern simulation centre.

The design centralizes all social and public spaces in a vertical stack, emphasizing vertical movements of students and work flow configurations. Despite the constrained layout, the site provides a new auditorium and event areas with integrated technology, centralized student support services, student lounges and cafés, and multiple-purpose outdoor spaces, including a terrace with views of the Hudson River. The building's design and layout emphasizes team-based, hands-on learning in realistic settings.

*Medical and Graduate Education Building at CUMC*
*Architect: Diller Scofidio + Renfro, Source: TheSuperSlice.com*

### Michener Centre for the Advancement of Simulation and Education (CASE)

CASE is a state-of-the-art centre, equipped with 20,000 sf of inter-professional simulation space, and high-tech AV equipment for integrated healthcare team training. CASE offers simulation and staging studios, flexible spaces, scenario monitoring control rooms, debrief, multi-purpose and breakout rooms, and a 300-seat auditorium. The simulation studios are flexible spaces that can simulate a wide variety of medical procedures, as well as patient rooms, triage units, and operating rooms for discipline-specific scenarios.

*Michener Centre for the Advancement of Simulation and Education Lecture Theatre, Source: Michener Centre website brochure*

## 4.2 Lessons Learned

In conducting the environment scan, the following themes emerged in response to the question of lessons learned:

1. Other institutions across North America have recently, or are in the process of developing simulation-based learning facilities.
2. Simulation technologies are rapidly changing, and have become more affordable and sophisticated.
3. Sufficient breakout space for team-based learning is important.
4. Adequate floor plates allow for maximum flexibility and efficient movement of students, staff and equipment.
5. Integrating technology with building design is important – AV equipment, control rooms, and digital communications.
6. Ceiling heights need to accommodate AV equipment, and the flexibility of technology.
7. Ample storage and *back of house* space for equipment storage is essential.
8. Value in having an auditorium to perform a resource role within the province.
9. Visibility into teaching spaces is important.
10. Changes in technology drive change in lab and classroom space design.

# 5 > Program Delivery Options Analysis

## 5.1 Option Identification

Planning work for the School of Health Sciences, and the renewal of SW03 and SW01, has been ongoing for more than four years. During this time, five program delivery options have been considered:

> **Option 1.** A *new Health Sciences building* (and option for phased renewal of existing SW03 and SW01).

> **Option 2.** *Status Quo*. No new building construction or change to the existing buildings.

> **Option 3.** *Renewal of existing buildings only* (SW03, SW01 and SE12); provision of off-campus swing space.

> **Option 4.** *Complete replacement of the SoHS*, with no upgrades to SW03 and SW01.

> **Option 5.** *Long-term facility lease.*

As part of the cost analysis of these options, the complete replacement cost of each building was estimated to determine if renewal was economically viable.

### OPTION 1 | NEW HEALTH SCIENCES BUILDING

This option, as outlined in Section 1.3, involves the construction of the new HSCAS building.

Construction of the new building meets the immediate needs of the SoHS as identified in this Concept Plan, and creates 111,460 sf (10,355 m$^2$) of new space on campus. This additional square footage permits future sequential, staged upgrades of SW03 and SW01 because significant areas of SoHS labs would move into the new building. As well, the new space enables consolidation of SoHS programs within a compact precinct of three buildings.

The estimated total capital cost of the new building is $66.566 million + $11.7 million for specialized simulation equipment (SSE) (cost allowances are escalated to a 2016 start date – costing performed February 2015). Costing will be updated at the Business Case stage when the design is refined.

### OPTION 2 | STATUS QUO

*(No New Building Construction or Change to Existing Buildings)*

As the name suggests, this option offers no changes to the existing SW03 and SW01 buildings, or their occupancy. This option is not viable, as it does not allow the SoHS to provide modern simulation facilities at a scale and configuration required to sustain the quality of healthcare education standards. Additionally, the ability of BCIT to maintain the current programs is increasingly at risk as the buildings approach end-of-life, as signaled by the high degree of deferred maintenance.

## OPTION 3 | RENEWAL OF EXISTING BUILDINGS ONLY

*(With Provision of Off-Campus Swing Space)*

This option involves renovation of SW03, SW01, and SE12, with no new building construction. Building SE12 is in very poor condition, and is rated with High Seismic Risk. A project identification report, submitted to the Ministry of Advanced Education in 2012, indicated that renewal of SE12 would approach 80% of building replacement value.

Sufficient swing space to accommodate displaced programs during construction does not currently exist on campus. This is a major challenge, because swing space is necessary to avoid closure of programs – one of the mandatory criteria for renewal.

This option would require the lease of 100,000 sf of off-site commercial space in order to vacate classroom areas for phased renewal construction. It is assumed that alternative accommodation will most likely be within a technology/office park space, requiring substantial tenant improvements to relocate the required specialty labs and classrooms. An initial exploration of the market, in close proximity to the Burnaby Campus, suggests suitable space will be very difficult to find and secure prior to construction start-up.

Option 3 involves a phased move to swing space and, following renovations, a move back. It is estimated this option involves multiple move-outs and returns. However, because of the potential for various lease locations, the total number of moves is difficult to estimate. Due to the considerable disruption to programs, associated operational issues, and unpredictability of appropriate lease space in close proximity to the Burnaby Campus, this option is not deemed to be operationally viable for ongoing education programming.

The estimated total capital cost of Option 3 is $194 million ($224 million, including FF & E). With an allowance for inflation to construction start dates, this figure will be $215 million ($249 million, including FF & E).

## OPTION 4 | COMPLETE REPLACEMENT OF THE SCHOOL OF HEALTH SCIENCES

*(With No Upgrades to SW03 and SW01)*

This option was developed between 2008-10. An extensive exercise was undertaken with Partnerships BC for the complete replacement of multiple School of Health Science spaces with one new building. Allied health research and office spaces, training clinics, and other related space would also be included.

This option includes a substantial expansion of space beyond current capacity, and incorporated commercial space. A complete replacement of the SoHS is envisaged as part of a P3 project with the following components:

| | |
|---|---|
| *Academic Component* | |
| Health Sciences building | $260 million (escalated to 2015, will be $280.8 million) |
| Equipment | $50 million |
| *Leveraged PPP* | |
| Professional/Clinical Component | $41 million |
| Multi Use component | $162 million |
| Parking | $47 million |
| *OVERALL TOTAL** | $560 million, estimated in 2010 |

** Note: With current construction escalation factored in, this total project would exceed $600 million.*

## OPTION 5 | LONG-TERM FACILITY LEASE

The potential for procuring a new HSCAS facility through a long-term property lease was examined. As outlined Option 3, a 100,000 sf facility capable of accommodating laboratory and post-secondary tenant improvements would be required. A lease facility would need to be situated adjacent to the Burnaby Campus (within a 5 minute walk distance) because students attending the HSCAS facility would also need to attend other program classes accommodated in buildings SW01 and SW03, and have access to student services provided at the Burnaby Campus.

City of Burnaby zoning and building code requirements for public post-secondary institutional use would also be a condition for occupancy by BCIT. In order to comply with civic requirements and HSCAS program requirements, it is assumed that typical vacant lease space near the Burnaby Campus (currently zoned for Manufacturing or Office land uses) would require very costly tenant and servicing improvements and rezoning processes.

Over the past 3 years, BCIT has monitored lease opportunities in close proximity to the Burnaby Campus and there have been no lease vacancies in the 100,000 sq ft (or greater) range that would be potentially suitable for the specific laboratory and educational program requirements identified for the HSCAS facility.

As outlined, the most important restriction on exploring Option 5 is related to facility location. The simulation labs accommodated in the HSCAS facility are integral to the health sciences program delivery model, which still also involves more traditional classroom instruction that are currently accommodated in Buildings SW01 and SW03. Therefore, an off-campus lease facility that is not located in close proximity to the Burnaby Campus is deemed operationally *unviable*.

### MANDATORY EVALUATION CRITERIA

Five key criteria, drawn from the objectives of *BCIT Renew*, are considered mandatory in evaluating these options:

1. Provide modern facilities for the School of Health Sciences;
2. Maintain programs during renewal, and minimize disruption;
3. Minimize deferred maintenance risk;
4. Minimize seismic safety risk;
5. Ensure cost effectiveness, and efficient construction project management; and
6. Provide simulation facilities in the most timely manner.

These criteria remove the Option 2 (*Status Quo*), Option 4 (*Complete Replacement of SoHS*) and Option 5 (*Long-term Lease Facility*) from further review as they are operationally and fiscally unviable:

> *Option 2 (Status Quo)* only meets one of the criteria. Having no new facilities and no building renewal, this option is not considered cost effective relative to the need for new space, and the management of the functional and structural inadequacies, and building conditions. Additionally, there are significant operating cost premiums that result from aging buildings, relative to modern sustainable buildings.

> *Option 4 (Complete Replacement of SoHS)* meets the criteria for new facilities, but does not renew SW03 and SW01. The option puts all funding into one School and one project. This is not considered cost effective with the capital cost originally estimated at $260 million, with escalation totaling approximately $280.8 million, substantially exceeding both Options 1 and 3.

> *Option 5 (Long-term Lease Facility)*. This option would not be cost effective or be provided in a timely manner. The cost of this option, along with the limited potential in acquiring adequate space from the scarce building stock within close proximity to BCIT, makes this option unviable, as it does not satisfy criteria 5 and 6.

## 5.2 Viable Option Identification

### 5.2.1 QUANTITATIVE ANALYSIS

The quantitative analysis undertaken for the two options that meet the mandatory criteria – *Options 1* and *3* – is primarily focused on a comparison of capital costs. A net present value analysis, taking into account revenue streams, was not undertaken. BCIT does not identify program revenue by building – there are no revenue streams. Capital funding is not proposed to be through debt financing. Projected building operating costs have, however, been estimated and compared with projected existing operating costs. A net present value analysis has been undertaken, comparing renewal with new construction, based on cumulative operating costs.

Capital cost estimates have been prepared for *Options 1* and *3*. (see Appendix H), and are summarized in Tables 9 and 12. The full budget for Option 1 is included in Appendix D.

## OPTION 1: NEW BUILDING & OPTION FOR RENEWAL OF SW03 & SW01

*Option 1* has an estimated capital cost of $66.566 million, with escalation. Moving costs are significantly smaller than those in *Option 3*, because all moves are within the campus, and will be planned to avoid any interim moves. A logistics objective is to move the SoHS from the old space directly to the new space.

*Table 9: Option 1 Summary – New Health Sciences Building ( & Option for Renewal of SW03 & SW01)*

| | Phase | Description | Area (sf/$m^2$) | Cost | Replacement/ Renovation Ratio | Construction Timeline | Comments |
|---|---|---|---|---|---|---|---|
| **HSCAS >** | 1 | New HSCAS | 100,600/ 9,350 | $66.566 M | — | 2018/19 | — |
| | 2 | SW03 (3 stages) | 139,800/ 13,000 | $54.34 M[2] | 55% | 2019/20 | — |
| | 3 | SW01 (3 stages) | 206,500/ 19,200[3] | $66.6 M[2] | 65% | 2020/21 | — |
| | Moving costs | | | | | | Anticipated to be mainly one move from old to new/renovated facilities |
| | **Sub-total** | | | **$187.5 M** | | | |
| | FF&E | | | $34.5 M | | | |
| | **TOTAL** | | **446,900/ 41,5500** | **$222.0 M** | | | |

[1] *Excluding FF&E*
[2] *Renovation*
[3] *64,400 sf/6,000 $m^2$ of SW01 has already been renewed as part of the Gateway Project. Upon completion, there will be 511,500 sf/47,550 $m^2$ of renewed space.*

Table 11 is a more complete budget summary for *Option 1*, using the Ministry budget model. This is based on order of magnitude estimates prepared by James Bush & Associates. A complete breakdown is available in Appendix D.

### HSCAS Long-Term Operating Costs

The total projected annual operating costs for the HSCAS building are included in Table 10 below.

*Table 1: Projected Operating Budget*

| Service | Total 2015 Concept Plan Estimate |
|---|---|
| SoHS Staff | $372,045 |
| Electricity | $174,000 |
| Natural Gas | $34,000 |
| Custodial | $129,955 |
| Maintenance | $240,434 |
| Security | $25,000 |
| IT Support | $291,250 |
| AV Support | $66,500 |
| **TOTAL** | **$1,333,184** |

*Table 11: Option 1 Capital Budget*

**POST-SECONDARY INSTITUTIONS - OPTION 1: HSCAS PROJECT BUDGET (Opportunity Assessment Report)**

| | |
|---|---|
| PROJECT NAME: | HSCAS |
| CAMPUS: | |
| FACILITY NAME: | British Columbia Institute of Technology |
| FACILITY TYPE: | Polytechnic |
| FACILITY LOCATION: | Burnaby |
| LOCATION FACTOR: | |
| ANTICIPATED END DATE: | |
| ANTICIPATED COMPLETION DATE: | |
| NET ASSIGNABLE AREA: | 6,550m² |
| GROSS AREA: | 10,355m² |
| NET TO GROSS: | 1.581 |

| | |
|---|---|
| DATE PREPARED: | |
| PREPARED BY: | |
| DATE UPDATED: | |
| UPDATED BY: | |
| DATE UPDATED: | February 15, 2015 |
| UPDATED BY: | Jim Bush |

| CATEGORY | BUDGET |
|---|---|
| **PLANNING & DESIGN:** | |
| PRE-PLANNING | $375,000 |
| PLANNING & DESIGN FEES | $5,618,000 |
| PROJECT MANAGEMENT | $1,168,000 |
| OTHER (SPECIFY) | $0 |
| **CONSTRUCTION:** | |
| BUILDING | $40,366,800 |
| RENOVATIONS | $0 |
| SUPPLEMENTARY BUILDING COSTS | $1,650,000 |
| SITE DEVELOPMENT | $1,675,000 |
| SUPPLEMENTARY SITE COSTS | $950,000 |
| OFF-SITE COSTS | $300,000 |
| **RESERVES:** | |
| CONSTRUCTION (FIELD) CONTINGENCY | $1,348,000 |
| PROJECT & SOFT COSTS CONTINGENCY | $1,399,000 |
| **COMPLETION COSTS:** | |
| FURNITURE & EQUIPMENT | $2,500,000 |
| PERMITS, DCC's | $640,000 |
| LEGAL | $0 |
| INSURANCE | $674,000 |
| COMMISSIONING | $60,000 |
| OTHER (SPECIFY) | $0 |
| SITE ACQUISITION | $0 |
| PAYABLE GST (excluding land) | $969,000 |
| **CURRENT DOLLAR PROJECT BUDGET:** | $59,692,800 |
| **ESCALATION ALLOWANCE:** | |
| CONSTRUCTION ESCALATION | $6,873,200 |
| SPECIALIZED SIMULATION EQUIPMENT | $11,700,000 |
| **END COST PROJECT BUDGET:** | $78,266,000 |

| SUPPLEMENTARY COSTS (PROVIDE DETAILS IN NOTES BOX BELOW) | |
|---|---|
| **SUPPLEMENTARY BUILDING:** | |
| UNSTABLE SOIL/BEARING CAPACITY | |
| STEEPLY SLOPING SITE | |
| DEMOLITION OF EXISTING STRUCTURES | |
| OTHER | |
| OTHER | |
| TOTAL COSTS | |
| **SUPPLEMENTARY SITE:** | |
| UNSTABLE SOIL CONDITIONS (Overburden) | |
| STEEPLY SLOPING SITE | |
| MAJOR SERVICE RELOCATION | 600,000 |
| ADDITIONAL MUNICIPAL REQUIREMENTS | |
| ADDITIONAL LEED PREMIUMS | |
| OTHER (Replacement Parking - BCIT funded) | 350,000 |
| OTHER | |
| TOTAL COSTS | 950,000 |

| | |
|---|---|
| | per m² |
| | per m² |
| | per m² |

### OPTION 3: RENEWAL OF EXISTING BUILDINGS WITH OFF-CAMPUS SWING SPACE

With an estimated capital cost of $194 million, excluding FF&E, $48 million would be for the renovation of SE12, and $16 million for the costs of temporary accommodation, including incremental travel costs. A number of programs have specialty equipment that is costly to move and temporarily establish in new locations.

*Table 12: Option 3 Summary – Renewal of Existing Buildings with Off-Campus Swing Space*

| Phase | Description | Area (sf/m²) | 2013 Cost[1] | Cost | Replacement/ Renovation Ratio | Construction Timeline |
|---|---|---|---|---|---|---|
| 1 | Private lease | 100,000/ 9,290 | $16 M[4] | $16 M | | |
| | Building preparation (5 buildings) | | $20 M | $21.6 M | | |
| 2 | SE12 (2 stages) | 95,500/ 8,900 | $48 M[2,5] | $51.84 M[2] | 80% | 2016/17 |
| 3 | SW01 (3 stages) | 206,500/ 19,200[3] | $58.05 M[2] | $66.6 M[2] | 65% | 2018/19 |
| 4 | SW03 (3 phases) | 139,800/ 13,000 | $47.4 M[2] | $54.34 M[2] | 55% | 2019/21 |
| All moving costs | 6 phases by five locations | | $3.5 M | $3.5 M | | |
| Additional | Security/ faculty travel | | $1 M | $1M | | |
| **Sub-total** | | | **$193.95 M** | **$214.88 M** | | |
| FF&E | | | $30 M | $34.5 M | | |
| **TOTAL** | | **541,800/ 50,390** | **$223.95 M** | **$249.38 M** | | |

1 *Renovation costs*
2 *Excluding FF&E*
3 *64,400 sf/6,000 m² of SW01 has already been renewed as part of the Gateway Project*
4 *Lease calculated using $32/sf for 5 years (approx. $20-22 base rent, plus $10-12 for gross up costs)*
5 *SE12 is based on 2012 estimate.*

## 5.2.2 QUALITATIVE ANALYSIS

Each option was further examined using key evaluation criteria drawn from the *Project Objectives* (see Section 1.1). The following table provides an evaluation of each of the options relative to these evaluation criteria.

*Table 13: Options Evaluation Summary*

| OPTION | 1<br>New HSCAS & SW03/ SW01 Renewal | 2<br>Status Quo | 3<br>Existing Building Renovation | 4<br>Replacement SoHS Only |
|---|---|---|---|---|
| **21st century education** | 21st century learning environment for SoHS (HSCAS). Long-term upgrades/renewal of all Schools | Stagnant learning environment | 21st century learning environment for all Schools | 21st century learning environment for SoHS only |
| **Cost effectiveness (Million $)** | Most cost-effective. Funding focused on highest need. $66.56 M for SoHS | Continued increasing structural & deferred maintenance costs | Includes uneconomical upgrade of SE12 & large temporary off-site "sunk" costs | Large costs to replace all of SoHS, but no budget devoted to BCIT's largest buildings |
| **Flexibility** | Flexible spaces for SoHS & future change/growth of all Schools. | Inflexible & constrained spaces | Flexible spaces for all Schools | Creates flexible spaces for SoHS only |
| **Schools' consolidation** | Provides consolidation for SoHS & long-term for other Schools | Schools remain scattered throughout the campus | Provides improved consolidation for all Schools | Consolidates SoHS only; no consolidation of other Schools |
| **Attractive buildings & outdoor spaces** | Attractive design & improved pedestrian space | Unattractive, dated design with poor pedestrian environments | Attractive design & improved pedestrian space | Attractive design & improved pedestrian space |
| **Sustainability: energy use & operating costs** | New & renovated LEED® Gold buildings | Existing inefficient energy systems | Additional off-campus moves & travel costs; carbon footprint increase | New LEED® Gold building only; existing buildings "as is" |
| **Seismic safety** | HSCAS built to new seismic standards (60% of SoHS students take programs here). Longer term will see upgrades to SW02 & SW03 | No seismic remediation | Seismic remediation of SW01, SW03 & SE12 | No seismic mitigation of existing buildings; SoHS spaces mitigated through new building |
| **Program continuity** | Program continuity maintained. School move on-site only | Full program continuity | Involves temporary, phased, off-campus locations & extensive travel for Schools | Full program continuity |
| **Consultative design** | Integrated design process | No changes in design | Integrated design process | Integrated design process |
| **Supports Campus Plan** | Supports Campus Plan | Does not support Campus Plan | Supports Campus Plan | Supports Campus Plan |
| **Partnership opportunities** | Simulation a major resource for partnership opportunities with other education institutions/ health authorities | Does not support partnerships | Does not support partnerships | Supports partnership opportunities |
| **Comments** | Most cost effective | Inability to keep pace with changing education practices – no simulation centre; continued structural risks & increasing maintenance costs | Least expensive, but large interim capital, operating & travel costs; involves uneconomical renovation of SE12 | Most expensive option; no renovation of existing buildings; School consolidation for SoHS only |

*Note: Option 5 is excluded and deemed unviable because there are no opportunities for leasing a 100,000 sf facility in close proximity to the Burnaby Campus.*

### 5.2.3 PRELIMINARY PROPOSED FINANCING

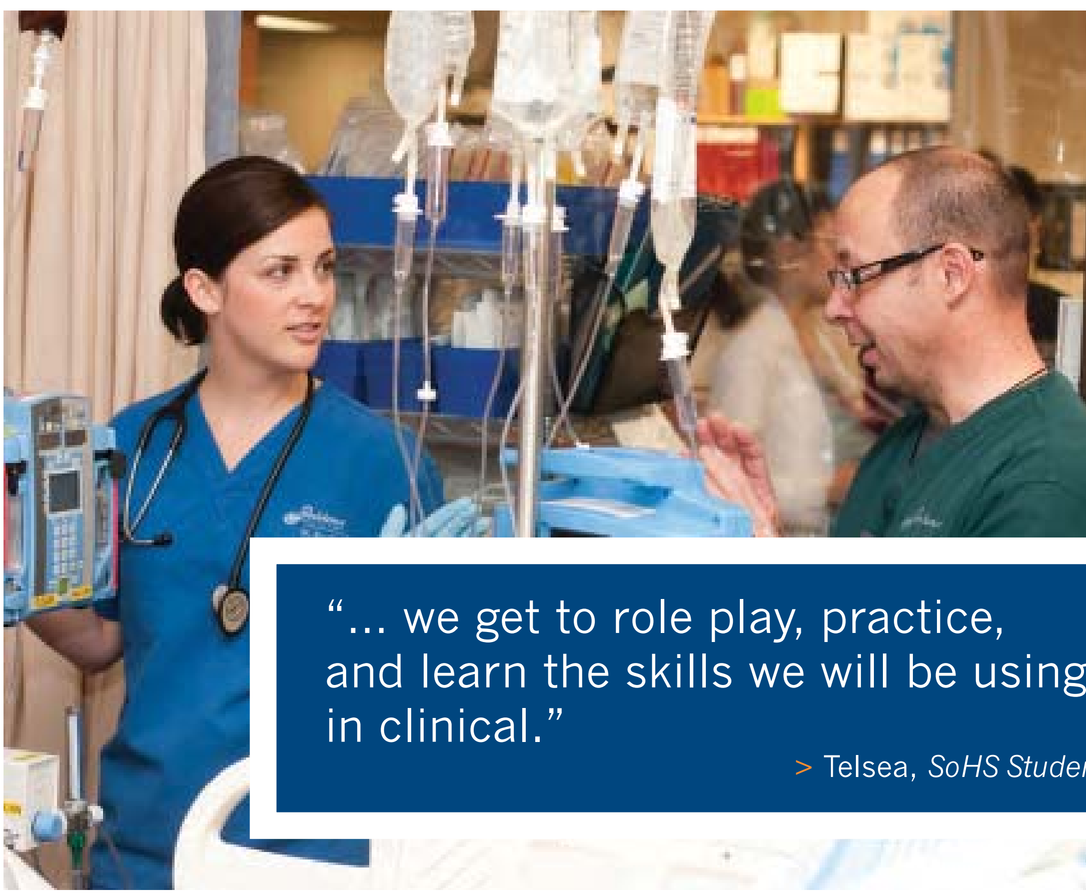
The total project cost for the new HSCAS is $66.566 million. In addition, specialized simulation equipment (SSE) has been estimated at $11.7 million. Therefore, the combined total project value is estimated at $78.266 million.

BCIT notes the provincial government expectation that the Institute contribute to the capital cost for this project. Making a significant capital contribution is challenging because the typical student alumnus profile for BCIT involves a much higher ratio of students that attend short term educational programs (less than 2 years in duration) whereas typical university student alumnus programs are longer term (4 years or more).

The BCIT Foundation indicates that supporters are keen to engage in fundraising, as outlined in the HSCAS Fundraising Plan (See Appendix H), which was approved by the BCIT Board of Governors on March 1, 2016.

If BCIT is to move towards a capital campaign for this initiative, it is of paramount importance that we initiate a Fundraising Resources Feasibility Study to obtain a clear picture of what might be possible. Conducting a feasibility study will provide the institution with data and the essential feedback with respect to the case (fundraising priorities), target goal, strategy, and timeline for a campaign.

**BCIT is prepared to undertake a fundraising campaign with a target of $11.7 million from industry and other sources, representing 15% of the total capital project budget of $78.266 million ($66.566 million + $11.7 million (SSE).**



> "... we get to role play, practice, and learn the skills we will be using in clinical."
>
> > Telsea, *SoHS Student*

## MULTI-YEAR CASH FLOW PROJECTIONS

The project schedule targets completion of *Option 1* in the third quarter of fiscal 2017/18, with occupancy in the fourth quarter. The following table provides a budget for the completion of the business plan, and Table 15 is a cash flow projection for the planning, design, and construction of the HSCAS.

*Table 14: Business Plan Budget*

| Consultants | Business Case |
|---|---|
| Architect | $75,000 |
| Project Manager | $60,000 |
| Mechanical | $15,000 |
| Electrical | $15,500 |
| Simulation Technologist | $25,000 |
| Space Programming | $30,000 |
| Structural | $5,000 |
| CM Advisor | $5,000 |
| Quantity Surveyor | $15,000 |
| Hazmat | na |
| Geotechnical | $5,000 |
| Civil | $5,000 |
| BCIT Foundation | $30,000 |
| Educational Coordination & Communications | $60,000 |
| Disbursements | $5,000 |
| Contingency Miscellaneous | $0 |
| **Sub-total** | **$350,000** |
| Net Tax @ 8.67% | $30,345 |
| **TOTAL** | **$380,345** |

The following table provides a preliminary cash flow analysis over the projected period for *Option 3*.

*Table 15: Preliminary Cash Flow (Option 1)*

| Project | Construction Start Date | Occupancy Date | Total Project Budget 2013 Dollars (millions) | Cash Flow (fiscal years, in millions) | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | 2015/16 | 2016/17 | 2017/18 | 2018/19 | 2019/20 |
| HSCAS | 08/18 | 03/20 | $66.57 | $0 | $0.57 | $6.00 | $30.00 | $30.00 |
| SSE | | | $11.70 | | | | | $11.70 |
| **TOTAL** | | | **$78.27** | **$0** | **$0.57** | **$6.00** | **$30.00** | **$41.70** |
| **Contributions** | | | | | | | | |
| BCIT Contribution | | | $11.70 | | | | | $11.70 |
| Provincial Contribution | | | $66.57 | $0 | $0.57 | $6.00 | $30.00 | $30.00 |
| **TOTAL** | | | **$78.27** | **$0** | **$0.57** | **$6.00** | **$30.00** | **$41.70** |

### 5.2.4 PRELIMINARY RISK ASSESSMENT

A Risk Register (CARG Template 9), and a Risk Screening Tool (CARG Template 8) have been completed, and are included in Appendices E and F.

## 5.3 SUMMARY OF OPTIONS

**Two of the five identified options meet the mandatory criteria and, of these two, OPTION 1 is preferred.**

# 6 > Conclusions & Recommendations

## 6.1 Conclusions

From the results of the *Program Delivery Options Analysis* (see Section 5.0), *Option 1: New Health Sciences Centre for Advanced Simulation (and option for phased renewal of existing SW03 and SW01)* best meets the objectives of *BCIT Renew*, those of the Province of British Columbia, and the outcomes identified in Section 1.4.

**OPTION 1 (RECOMMENDED)**

> Delivers a new Health Sciences Centre for Advanced Simulation that will be utilized by 60% of the SoHS's student FTEs.

> Provides complete alignment with the *BC Skills for Jobs Blueprint*, targeting training for health sector jobs identified in this initiative.

> Provides new accommodation to replace functionally unsatisfactory accommodation for the School of Health Sciences, enabling the School to maintain its leadership role and standards of practice throughout its range of programs.

> Enables consolidation of the SoHS.

> Provides a 21st century learning environment.

> Offers the most cost effective option.

> Manages disruption to existing programs and minimizes temporary program moves.

> New construction carries less risk than *Option 3* renovation work.

### OPTION 3 (NOT RECOMMENDED)

This option is not cost effective, therefore not recommended for this and for the following reasons:

> Does not deliver modern space for the School of Health Sciences, limiting its ability to deliver the fully flexible teaching environment required.

> Requires renewal of SE12 because no replacement space is planned for SoHS, and 94% of SoHS's space in SE12 is functionally inadequate. Additionally, the building has significant seismic issues, deferred maintenance items, and will cost 80% of its replacement value to renew.

> Market review suggests difficulty finding the 100,000 sf of off-campus, leased swing space needed for temporary lab, and teaching space within a reasonable distance of the existing campus (1 km). Finding the space in one location is also unlikely – multiple sites might be required.

> Temporary and appropriate accommodation will be costly. These expenditures are unrecoverable.

> Temporary building use will require rezoning and code compliance verification.

> Temporary buildings will require capital improvements to retrofit commercial lease space suitable for applied technology education.

> Costs, inefficiencies, and issues will be associated with establishing up to five sub-campus locations, including staff and student travel time between classes, and accessibility of the temporary spaces. There is also significant cost risk in providing this temporary space, which would pose additional risks to construction procurement schedules.

## 6.2 Recommendation

Based on the analysis outlined in this report, that *Option 1,* the preferred option, undergo further design development, in accordance with the Ministry of Advanced Education, Innovation and Technology's *Capital Asset Reference Guide Business Plan* framework.

# 7 > Implementation Strategy

## 7.1 Project Delivery Models

### PROCUREMENT METHOD

The procurement methods considered for delivering this project are:

1. Design Bid Build
2. Design Build
3. Construction Management
4. Construction Management at Risk
5. P3 with Design Build

BCIT is conscious that it needs to meet the CARG Guidelines of:

- Fairness, openness and transparency;
- Competition;
- Allocation and management of risk; and
- Value for money and protecting the public interest.

Criteria used to evaluate these methods, relative to the new HSCAS building were:

- Complexity;
- Design control;
- Cost control;
- Overall costs;
- Risk for BCIT;
- Ability to meet the schedule; and
- Appropriateness to the construction environment

Table 16 provides a summary comparison of these procurement methods, using the provincial procurement scoring system (Template 13). See Appendix G for a more elaborate summary of procurement options.

BCIT has consulted with Partnerships BC (PBC) who have reviewed the project. As outlined in Appendix G, **PBC has concluded that a Design Bid Build approach is the most appropriate for this project.** *Design Bid Build* is considered the best technique in this instance for the following reasons (For detailed analysis, please see the PBC report found in Appendix G):

- **Complexity and Meeting Time Lines.** The technique is less complex (contractually and procedurally) than *Design Build* or a *P3*. *Design Bid Build* is faster than the *Design Build*.
- **Design Control.** *Design Bid Build* offers the most design control (as does *Construction Management at Risk*). This innovative facility will not be a standard building form, which best suits *Design Build* and *P3*. *Design Bid Build* will allow for the high degree of faculty consultation required for the specialized design of this building.

- **Cost Control.** *Design Bid Build*, or *Construction Management at Risk*, with the owner controlling design to the time of tender, will permit the best-cost control. With *Design Build*, the uniqueness of this design form will need to be determined early for costing as part of the *Building Statement of Requirements* and specifications

  BCIT has experienced project managers and an established governance structure that ensures scope and cost control under the *Design Bid Build* technique.

  Over the next three years, BCIT projects a competitive market for competitive tendering through *Design Bid Build* or *Construction Management at Risk* that should also provide pricing benefits to BCIT. The *Design Bid Build* technique provides for a number of bidders during tender.

- **Risk.** *Design Build* brings a major benefit of risk allocation since the developer will assume risk in the event of errors and omissions in drawings. However the Design Builder also builds contingencies into their own price so that risk is costed. A properly managed *Design Bid Build* project should mitigate design errors.

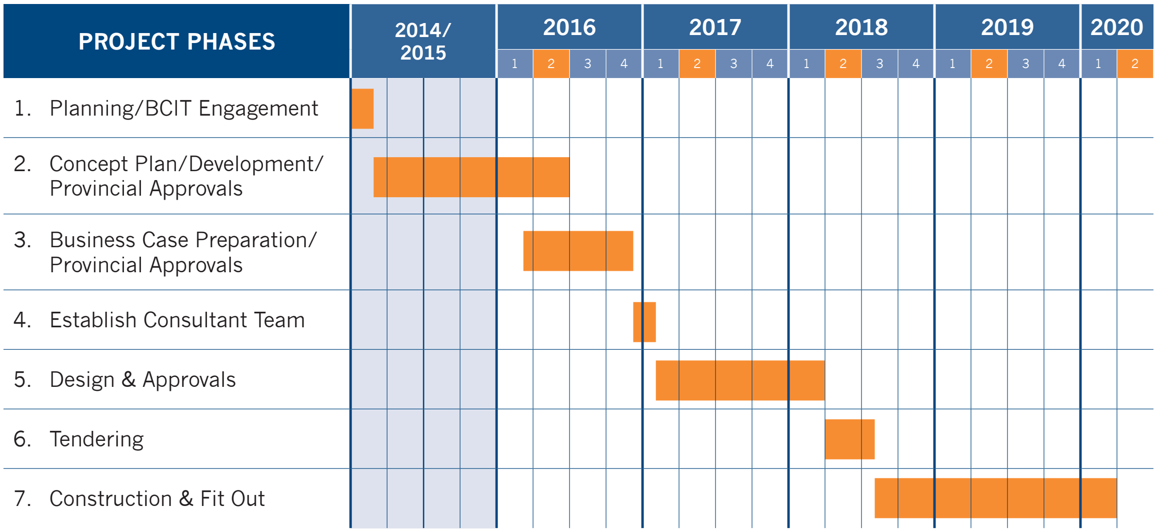
Table 16: Project Delivery Option Comparisons

| | Factor | Assessment | Design-Bid Build | Design Build | Construction Manager (Fixed Fee, CM as Agent) | Construction Manager At Risk (GMP) |
|---|---|---|---|---|---|---|
| | | Rated 1 to 5 | Comparative Weighting Factors (1 to 10) | | | |
| OWNER | Cost/Risk Tolerance of Owner | 5 | 10 | 8 | 4 | 6 |
| | Relative Need for Owner Resources/Expertise | 5 | 8 | 3 | 4 | 4 |
| | Sophistication of Client's Procurement Group/Processes | 5 | 8 | 2 | 6 | 5 |
| COST | Contractor Contingency Buried in Bid Price (not available to Owner) | 3 | 4 | 3 | 6 | 5 |
| | Ability to Control Cost & Schedule Growth | 5 | 4 | 10 | 5 | 7 |
| | Cost of Design Changes After Construction Start | 4 | 5 | 6 | 7 | 5 |
| | Predictability of Final Cost | 5 | 8 | 6 | 2 | 4 |
| | Ability to Manage & Control Scope | 5 | 9 | 7 | 2 | 5 |
| DESIGN | Complexity of Project/Design | 5 | 7 | 4 | 9 | 8 |
| | Potential for Contractor Input into Design | 3 | 1 | 10 | 6 | 6 |
| | Degree of Design Completion Required at Construction Start | 4 | 1 | 10 | 6 | 6 |
| | Owner Control of Design | 5 | 10 | 4 | 7 | 6 |
| MARKET/CONTRACT | Marketplace Conditions/Scarcity of Contractors | 3 | 3 | 6 | 7 | 7 |
| | Potential Adversarial Relationship with Builder | 4 | 4 | 3 | 7 | 6 |
| | Potential for Construction Related Claims | 4 | 4 | 4 | 7 | 6 |
| | Number of Contractor Interfaces/ Points of Responsibility | 3 | 8 | 10 | 6 | 6 |
| SCHEDULE | Time Requirement During RFP/Bid Process | 4 | 6 | 4 | 9 | 8 |
| **FINAL OVERALL RATING** | | | **448** | **415** | **414** | **421** |

## 7.2 Preliminary Schedule

A series of schedules has been prepared for this project, proposing a 2016 start for the new HSCAS building. Final completion of the entire project is estimated to be in July 2021.

*Figure 5: Schedule for New HSCAS Building*




## 7.3 Project Governance

### PROJECT MANAGEMENT & GOVERNANCE FRAMEWORK

BCIT has a Department of Facilities and Campus Planning, whose staff has extensive experience in building planning, design, and renovation – including several large seismic upgrade and new construction projects valued at over $50 million. The Department is responsible for managing 2.3 million sf (213,000 $m^2$) of facilities.

The department has a capital project delivery planning, approval, and management system that uses tried and tested project management, and risk management approaches. All capital projects proceed through this framework, which approximates the approval framework adopted as part of the *Provincial Capital Planning, Approval and Reporting Process*.

The department has a Project Services Division that is responsible for managing all approved capital projects. The division is headed by a Director and staffed by project managers and project coordinators with extensive experience in the management of complex capital projects. The division's recent work resulted in upgrades, within time schedules and approved budgets, for several complex renewal projects.

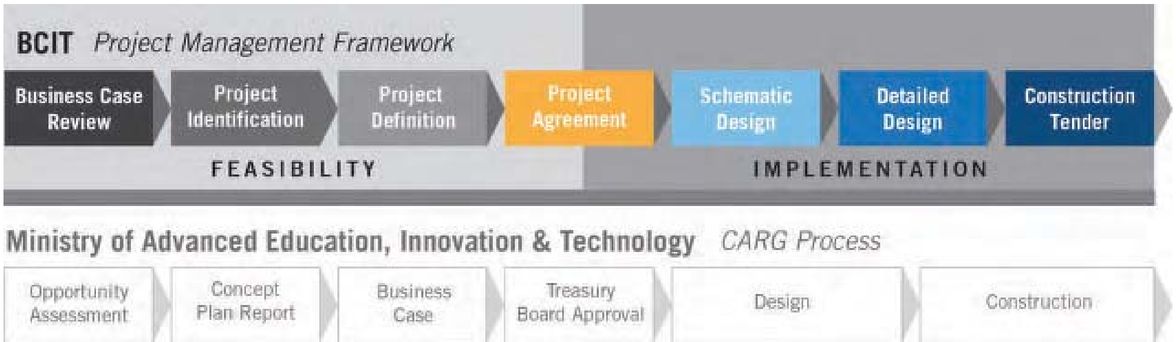
### GUIDING PRINCIPLES

BCIT's *Project Management Framework* adheres to five main principles:

1. Confirm project rationale and program, and financial viability.
2. Ensure capital and operating cost control.
3. Ensure accountability.
4. Ensure transparency.
5. Incorporate engagement though planning and design.

The figure below demonstrates the increasing level of detail as the rationale and viability of the project are established, and how the form of the project is developed through design, approvals, and construction. The first three stages approximate the *Provincial Opportunities Analysis*, *Concept Plan*, and *Business Case*, respectively.

*Figure 6: Project Management Framework*

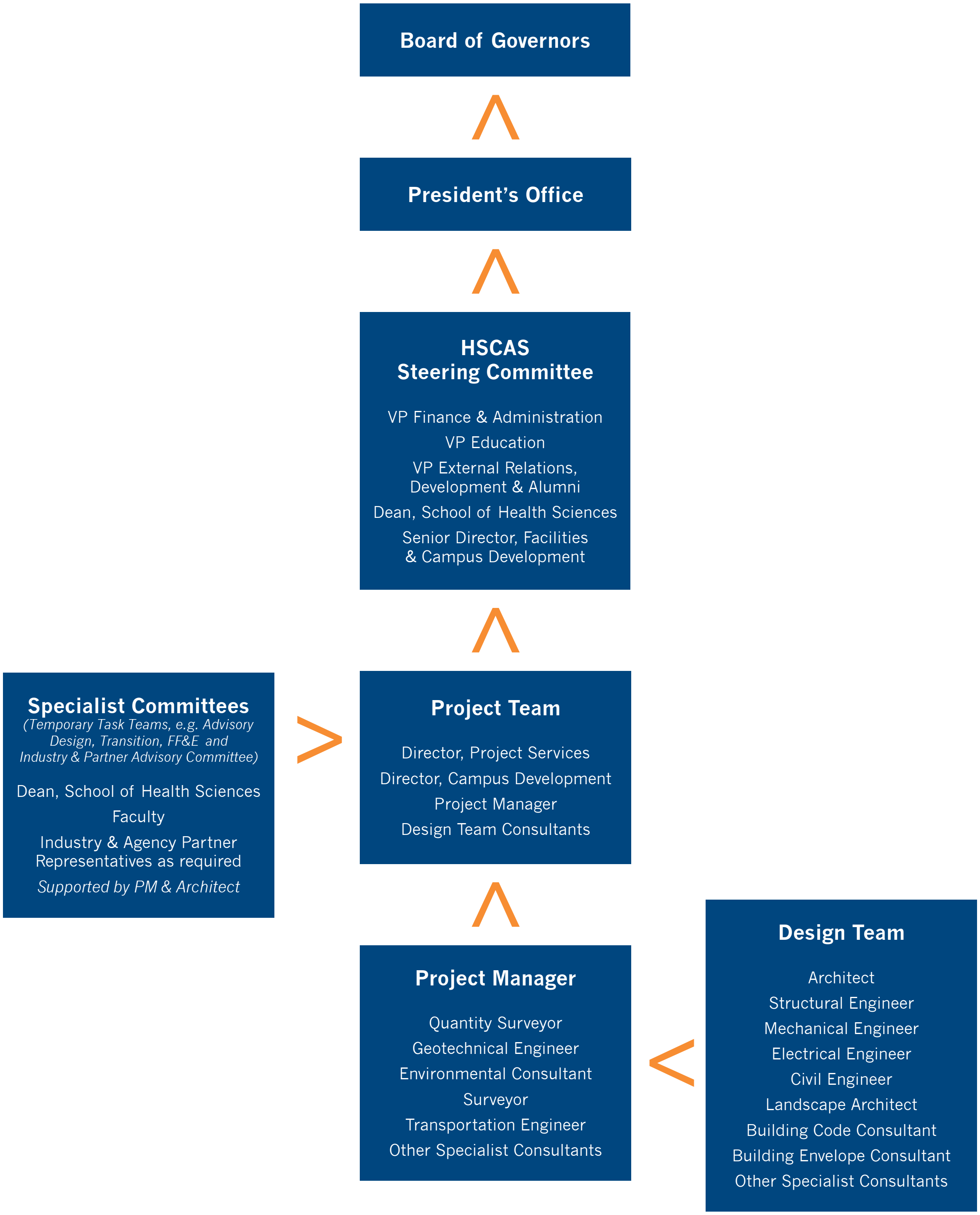



## GOVERNANCE STRUCTURE

The Project Management process is subject to a governance system that provides oversight and approvals, and ensures the *Guiding Principles* are met. The *Governance and Project Management* system will be embedded in an overall *Project Charter*.

The following diagram illustrates the proposed governance structure for the Health Sciences Centre for Advanced Simulation building, and the renewal of SW01 and SW03.

*Figure 7: Proposed Governance Chart*



## 7.4 Steering Committee

### COMMITTEE MANDATE

The mandate for the Steering Committee is to:

> Provide overall accountability for the project within BCIT;

> Oversee the progress of the Project Team relative to the *Project Charter*, schedule, and budget;

> Provide advice as required to the Project Team on plans for the project as they evolve;

> Ensure BCIT's overall interests are met by the project and its planning process;

> Provide strategic decisions, including approval of submissions to the Provincial Government and other funding sources, project plans at milestones, and award of the construction contracts;

> Assist in the resolution of strategic issues should they arise; and

> Approve strategic communications.

### MEMBERSHIP

The Steering Committee will comprise:

> Vice President, Finance and Administration;

> Vice President, Education;

> Vice President, External Relations, Development and Alumni;

> Dean, School of Health Sciences; and

> Senior Director, Facilities and Campus Development.

## 7.5 Project Team

The Project Team will report to the Steering Committee, and include the Director of Campus Development, Director of Project Services, other Facilities and Campus Development staff (as required), and a designated Project Manager.

This team will:

> Oversee the planning, design, approval, and construction stages of the project;

> Monitor and ensure the project is within budget, and its approved schedule;

> Oversee and approve change orders;

> Oversee and approve monthly claims for payment;

> Ensure design input from faculty and students; and

> Provide support for media and campus communications.

## 7.6 Specialist Committees

A series of special committees/teams will be established during the project planning, design, and construction phases. These committees will provide advice on detailed design, phasing, planning, FF & E acquisition, and the logistics of move-ins, as well as input into the inclusion of students, faculty, and staff in the planning process.

The SoHS will set up an *Industry and Partner Advisory Committee* that includes key participants from health authorities, and other educational institutions, and continue to build on consultations (e.g., UBC Faculty of Medicine) already underway. This committee will ensure the building design, technology, and courses are completely current, are in alignment with the requirements of the healthcare system, are flexible for future change, and have a provincial focus. This committee will also form the basis for cooperation and partnering when the HSCAS opens.

### Consulting Team

The project will have a Consulting Team, comprising all the design professionals, that reports to the Project Team. This team may be lead by a designated Project Manager.

### Communications Plan

BCIT's Communications Department is fully engaged with this project, and will work in cooperation with the Province.

## 7.7 Review & Approval Process

The project will be planned, designed, and constructed under a *Project Charter* and a project governance structure to ensure effective controls for avoiding delays, scope creep, and cost overruns, while providing accountability throughout. BCIT's project management record attests to well-structured, and successful project delivery.

In terms of municipal planning and building approvals, project lands are already zoned for *Institutional Use*.

# 8 > APPENDICES

# A >

# Letters of Support

Vancouver CoastalHealth

*Promoting wellness. Ensuring care.*

Medicine, Quality & Safety

601 West Broadway, 11th floor
Vancouver, BC V5Z 4C2

November 19, 2014

Ms. Bernice Budz
Dean (interim)
School of Health Sciences
BC Institute of Technology
3700 Willingdon Avenue
Burnaby, BC V5G 3H2

Dear Ms. Budz:

**Re: Support of a BCIT Health Sciences Centre for Advanced Simulation**

I would like to apologize that you have not received this letter by your November 14th deadline as I just received your letter today.

First let me state that Vancouver Coastal Health and our academic partners, including yourselves and the University of British Columbia, are committed to simulation training. It is our future both in initial individual clinical training and, importantly, team training, as well as our future in practice enhancement and assessment of in practice professionals. We wholeheartedly support the development and use of simulation training centres.

CESEI has been and remains a premiere training facility and national innovation centre for simulation training and research (including team training for all personnel on the Canadian medical mission in Afghanistan) and ongoing team training at VCH/UBC for trauma, operative, undergraduate, postgraduate and resuscitation teams. Given its current and projected future demands, it also needs to expand on our campus as UBC expands its simulation training on its multiple health care training campuses.

We wholeheartedly support a team based multi-professional training centre. We would like to see these centers integrated and coordinated across all of our educational partners and health organizations, as it will take more than one centre and more than one organization to effectively implement team training in both preclinical and in practice training and evaluation systems.

We are currently working with UBC and our foundation funding partners to develop plans and funding projections for a larger centre on our VGH campus in a proposed renovation of Heather Pavilion built in 1903. This would convert our legacy building with a modern building extension, which we are committed to the City of Vancouver to leave in place and renovate as a heritage building, into a multi-use educational centre building housing education and, in particular, simulation and research functions.

While the latter may not appeal immediately to BCIT, we would support your involvement in those plans, as well as integration of simulation training centers at some of your sites which we are already working towards for centers at the distributed health training sites for UBC.

*Promoting wellness. Ensuring care. Vancouver Coastal Health Authority*

I hope you view this letter as wholehearted support for the implementation of simulation training in health care and at BCIT and, in addition, as an invitation to start to think about how the health organizations and our important educational institutions work together under our current affiliation agreements to improve training to individuals and increasingly importantly to multidisciplinary teams.

Yours sincerely,

J. Patrick O'Connor, MD, FRCP(C)
Vice-President, Medicine, Quality & Safety
Vancouver Coastal Health

cc. Ms. M. Ackenhusen
Dr. F. Mikelberg,

fraserhealth Better health. Best in health care.

November 14, 2014

To Whom It May Concern:

Fraser Health is pleased to support the BC Institute of Technology's proposal for the development of an advanced simulation centre that would support work taking place throughout the province.

With a workforce of over 22,000, Fraser Health is reliant on appropriately trained health care professionals to meet the needs of our patients, residents and clients. We are eager to support interdisciplinary training and to work collaboratively with our academic and research partners to ensure health care professionals have the best preparation possible to begin their careers, as well as ongoing training in emerging technologies. Access to a simulation centre to support practice education would be a significant benefit to our organization, our staff, and the population we serve. Additionally, the use of mobile access and mobile technology to offer simulation training would be of great value in meeting the needs of our geographically dispersed work force.

The simulation environment and practice education envisioned by BCIT would most certainly assist Fraser Health in meeting our goals of supporting new models of interprofessional training and education, and of developing networks to support care and service oriented research. I would be pleased to provide any other information regarding our support of this initiative that may be helpful.

Sincerely,

Colleen Hart
Chief Operating Officer (Interim)

CH/tls

Cc: Dr. Andrew Webb, Vice President Medicine

**Fraser Health Authority**
Office of the President and CEO

Suite 400, Central City Tower
13450 102nd Avenue
Surrey, BC
V3T 0H1 Canada

Tel (604) 587-4625
Fax (604) 587-4666
www.fraserhealth.ca

Interior Health

Corporate Administration
Interior Health Authority
#220 – 1815 Kirschner Road
Kelowna, B.C. V1Y 4N7
Web: www.interiorhealth.ca

**Dr. Robert Halpenny**
**President & Chief Executive Officer**
Phone: (250) 862-4205
Facsimile: (250) 862-4201
e-mail: robert.halpenny@interiorhealth.ca

November 14, 2012

Mr. Bill Dow
Dean, School of Health Sciences
BC Institute of Technology
3700 Willingdon Avenue
Burnaby, BC V5G 3H2

Dear Mr. Dow:

At Interior Health, we rely each and every day on our more than 18,000 health professionals to provide the highest possible quality care to our patients, residents and clients across the Southern and Central Interior of British Columbia. Quality is our Board of Directors' organizing principle and as we strive to continuously improve quality in everything we do, having quality staff is critical to our success.

Whether it is in the area of nursing, medical imaging technologies, laboratory sciences, biomedical engineering, or the many other areas of health professions, we rely on post-secondary institutions such as the British Columbia Institute of Technology to provide the health professionals necessary to serve our region. For many years our communities and facilities have benefited from your facilities health professional graduates.

I understand BCIT is in the midst of establishing a new vision for the School of Health Sciences. It is an admirable objective. Interior Health is in complete support of your efforts to position your organization as a leader in meeting the future needs of health care delivery agencies for years to come. I wish you the best in your journey. If Interior Health can help you as you progress through this journey please do not hesitate to contact me.

Sincerely,

Dr. Robert Halpenny
President & Chief Executive Officer

/vm
cc Norman Embree, Chair, Board of Directors
John Johnston, Vice President, People & Clinical Services

BC PATIENT SAFETY & QUALITY COUNCIL

November 17, 2014

Bernice Budz
Dean, School of Health Sciences (interim)
British Columbia Institute of Technology Building
3700 Willingdon Avenue
Burnaby, BC
V5G 3H2

Dear Ms. Budz

Thank you for introducing me to the concept of a simulation environment for multi-disciplinary education on the BCIT Campus. There are a number of areas where such an environment would be extremely helpful to the British Columbia health system and would provide definite cost benefits.

The education of your students when they get to the work environment does not end. Orientation occurs in all of the facilities in British Columbia with a total estimated cost of $45,000 to $60,000 per new staff member. These are the costs that are incurred by the health system after formal education to ready new staff to work. I think that an organized simulated environment for nurses, technicians and non-medical disciplines would be very helpful as these costs could be decreased by pre-placement exposure of students and teams to their work environment. A foundation of consistency in policy, care processes, equipment and team behaviours across the health authorities is necessary for this to be successful. If students were trained in a consistent environment, much of the additional training time required for new staff inside the health system could be eliminated.

As we discussed, the health system is highly dependent on technology, whether it is technology to be used in the community or in the acute sector. The evaluation of this technology from the perspective of usability is not done rigorously in British Columbia. As a result, major purchase errors have been made over the years where technology has not met the expectation intended nor has it been found usable by staff, and is not used.

Having a facility where health care providers can be trained on and where health system staff can evaluate technology would, reap cost savings in the intermediate and long run. Not only would the individuals be trained to use the tools that they will use in the workplace, but they would also be able to input, based on their clinical expertise, into the purchase decisions and in the case of technology development, the designs of technology that would be used in the health system. This would be part of a general effort to standardize documentation, information processes and equipment.

Cont'd./2...

As well, with the move to greater health care in the community and the development of personal physiological monitoring devices, there is a new world to be developed in the next few years where the assessment and the usability of technology by patients in the home will expand dramatically. This will be accompanied by new clinical practices based on remote monitoring and care. Having a rigorous environment where the technology can be evaluated in the appropriate patient population and having a comprehensive approach to the monitoring of such patients in real time, are opportunities that have yet to be fully explored.

With the current government's interest in development of innovation and business in British Columbia, such a facility would be able to provide some of the technical and human factors assessments for new technology industry requires. At the current time, most organizations do not require vendors at the time of purchase decision to provide evidence of the usability and efficiency of technology. I see this changing in the intermediate and near future so that organizations, large vendors and small, will need to provide this data in the RFI and RFP stages of technology selection. Some vendors will have in-house capability to do this work, but others will need to engage a third party such as you are proposing. This, of course, opens the avenue for non-health care related funding for such a facility.

Being able to stimulate health care, whether it be using high or low fidelity techniques for human factors and team and technology interactions, will be of significant value for British Columbia. As you are aware, the ward of the 21st Century is an example of similar facility in Calgary. It is a current example to which one might turn to get a snapshot of what the future might truly encompass.

I strongly support the development of such a facility. Should you have any other questions or if we can be of help and assistance to you, please do not hesitate to call.

Yours sincerely,

DCochrane

D. Douglas Cochrane, M.D., FRCSC, FAAP
Provincial Patient Safety & Quality Officer and
Chair, B.C. Patient Safety & Quality Council

DDC/kp

(2014/November/Dow-Simulation Facility-Nov-17

University of Victoria
Nursing

November 24, 2014

Bernice Budz, Dean (Interim)
School of Health Sciences
BC Institute of Technology
3700 Willingdon Avenue
Burnaby, British Columbia V5G 3H2

Dear Dean Budz:

**Re: Development of a BCIT Health Sciences Centre for Advanced Simulation**

On behalf of the School of Nursing at the University of Victoria I am writing to offer strong support for the plan to construct an advanced simulation centre at BCIT. I understand that this proposed centre will be designed with capacity to serve all areas of the province so that we could work collaboratively in using simulation for our nursing students and graduates.

As we move to prepare nurses for what is an increasingly technological work environment, there is little doubt that we need access to advanced simulation equipment and technology that would enhance student learnings. Particularly, our students would benefit from technologies that support interprofessional practice and would permit simulated experiences with varying work environments, workflows and configurations. We would also benefit from experiences that also provided access to simulated electronic health records.

I believe that development of a simulation resource hub at BCIT makes good sense. A hub that is centrally located with outreach plans would give educational partners across the province (like ourselves) ability to collaborate and make use of technologies that cannot be provided to each educational institution. Further, BCIT has been a leader in use of simulation and technology and has faculty/staff committed to technology use, pedagogy, and educational research.

Lastly, I would like to mention that the faculty/staff at BCIT have been most collaborative in their work with our School and have a background and reputation that promotes strong relationships across educational partners. I have no hesitation recommending that BCIT become the simulation hub for BC.

Sincerely,

Noreen Frisch, PhD, RN, FAAN
Professor and Director, School of Nursing
University of Victoria
PO BOX 1700 STN CSC
Victoria, BC V8W 2Y2

BC Alliance on Telehealth Policy and Research
Simon Fraser University, Harbour Centre
2600 - 515 West Hastings Street
Vancouver, BC V6B 5K3
tel: 778 782 7739 | fax: 778 782 7766

British Columbia Alliance on Telehealth Policy and Research

January 5, 2015

Bernice Budz
School of Health Sciences
BC Institute of Technology
3700 Willingdon Avenue
Burnaby, BC V5G 3H2

Dear Ms. Budz,

The British Columbia Alliance on Telehealth Policy and Research (BCATPR) is pleased to support your proposal in building a BCIT Health Sciences Centre for advanced simulation that would have the capacity to reach out to all areas of the province and work collaboratively with those using simulation.

The BCATPR is a multi-disciplinary research team working in the area of health-related services using telecommunications technologies. This alliance is a joint partnership consisting of academic institutions and provincial health authorities committed to providing relevant evidence and capacity building for integration of sustainable telehealth care services into routine health care practices within British Columbia.

We feel that the concept for a major new facility that will represent the opportunity for a fundamental change in education delivery for health professionals will be great for BCATPR in particular and the province in general. The Centre, which will create a sophisticated simulation environment and technology based learning experience, will help BCIT graduates be more effectively prepared to move into their clinical roles. The centre will also be a critical resource hub within the province and would allow other educational partners and care providers to take advantage of and build upon these new technologies.

We find BCIT's desire to promote collaborative multidisciplinary approaches that are reflected in the working world of health professionals an exciting undertaking. The new simulation building will allow students to work with each other across disciplines in simulated situations. The use of simulation approaches to enhance distance learning and the use of videoconferencing will further allow students and practitioners from other parts of the province to participate.

The BCATPR is excited to collaborate with you on this endeavor. We look forward to a great working relationship with you.

Sincerely,

Team Leader, BCATPR
Pfizer / Heart and Stroke Foundation Chair in Cardiovascular Prevention Research at St. Paul's Hospital
Professor, Faculty of Health Sciences, Simon Fraser University
Member, Division of Cardiology, Providence Health Care, Healthy Heart Program, St. Paul's Hospital

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COLLEGE OF
REGISTERED NURSES
OF BRITISH COLUMBIA

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November 29, 2014

Bernice Budz, Dean
School of Health Sciences
BC Institute of Technology
3700 Willingdon Avenue
Burnaby, BC V5G 3H2

Dear Bernice,

I am writing on behalf of the College of Registered Nurses of BC in response to your letter calling for support for BCIT's Health Sciences Centre for Advanced Simulation.

Given the College's role in nurse education program review and approval at the provincial level, we recognize BCIT's interest in the development of an advanced simulation centre to be a significant advancement in the collaborative nature of health science education in BC. CRNBC has no objection to BCIT's intention to develop the Centre and encourages decision makers to consider the recent research completed by Hayden et al (2014) that supports the use of simulation as a relevant and appropriate educational tool for preparing safe, competent nursing students.

CRNBC is also pleased to hear that the Centre will support inter-professional practice and that it will allow other educational partners and care providers to access the Centre and to build on your learning and research.

Bernice, if we can be of further assistance or support, please let us know.

Sincerely,

Cynthia Johansen
Registrar/Chief Executive Officer

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UROLOGIC SCIENCES

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3 December 2014

Bernice Budz, PhD

Dean (Interim), School of Health Sciences,

B.C. Institute of Technology,

3700 Willingdon Avenue,

Burnaby, B.C. V5G 3H2

Dear Dr. Budz:

Connie Evans has requested my support for the BCIT business case for government for building the Advanced Simulation Centre. I am very pleased to have the opportunity to lend my support to this very important initiative that you have undertaken and can only hope for success in this proposal to the B.C. government.

As the Provincial Coordinator for Health Simulation Education I am very aware of the extensive application of simulation-based health professional education already active in this province. Similarly, from the survey done by the Provincial Simulation Coordination Committee, and summarized in the B.C. Simulation Current State Report November 2013, I am also very cognizant of the increasing interest and need for advanced simulation-based health professional education in the province. In British Columbia there are unique educational demands given our distributed UGME programs, commitment of the various Health Authorities to high quality health professional education including simulation-based education, rapidly developing simulation programs throughout various post-secondary institutions provincially and anticipated requirement of simulation-based educational experience in the certification and CME process of health professionals. The BCIT Advanced Simulation Centre could help address many of these needs for the province.

With the extensive experience and expertise that you and your health professional team of educators at BCIT already have I believe your leadership in this domain of advanced simulation education is intuitive and logical. I echo the support of Dr. Gavin Stuart, Dean, and Dr. David Snadden, Executive Associate Dean Education, of the UBC Faculty of Medicine in our commitment to collaborate with BCIT in this new development. I personally would welcome the opportunity to work with your team and support your vision for provincial collaboration in an effort to provide excellent advanced simulation-based health profession education for B.C. The future of improved patient care will be dependent on skillful team communication to create more effective and efficient patient transfers and handovers. In this regard, inter-professional and inter-disciplinary practice of these important team skills will make this future ideal a reality. An Advanced Simulation Centre would be the most appropriate venue to bring these high-reliability teams together to practice technical and non-technical skills necessary for safe and effective patient management and handover. The development of efficient communication between these health care professionals will improve patient outcomes, reduce potential adverse events and expand the excellence of health care for all British Columbians.

Yours sincerely,

Elspeth M. McDougall

Elspeth M. McDougall, M.D., FRCSC, MHPE,
Professor of Urologic Science
Provincial Coordinator for Health Simulation Education
University of British Columbia
Chair, AUA Office of Education

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December 11, 2014

Bernice Budz
Dean (Interim)
School of Health Sciences
British Columbia Institute of Technology
3700 Willingdon Avenue
Burnaby, BC V5G 3H2

Dear Ms. Budz,

**Re: Support for a BCIT Health Sciences Center for Advanced Simulation**

Providence Health Care is pleased to provide this letter of support for a Center for Advanced Simulation. We understand that the proposed center will be a resource hub within the Province and will work collaboratively with us to support our simulation needs.

Providing an advanced technological environment for learning and research will be an exciting opportunity for students, health care providers and researchers.

We look forward to working with you on this business case for the proposed advanced simulation center

Yours truly,

Dianne Doyle

Dianne Doyle
President and Chief Executive Office
Providence Health Care

In affiliation with: THE UNIVERSITY OF BRITISH COLUMBIA

**Sites:** St. Paul's Hospital | Holy Family Hospital | Mount Saint Joseph Hospital | Youville Residence | St. John Hospice
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November 14, 2014

Dr. Bernice Budz
Dean (Interim), School of Health Sciences
British Columbia Institute of Technology
3700 Willingdon Avenue
Burnaby, BC V5G 3H2

Dear Dr. Budz,

**Re: Support for a BCIT Health Sciences Centre for Advanced Simulation**

I am writing in support of your business case for building an Advanced Simulation Centre at BCIT. I understand that this Centre will create a sophisticated Simulation environment with technology practice based learning experiences to help graduates be effectively prepared to move into their clinical roles. The Faculty of Medicine (FoM) at the University of British Columbia (UBC) would be very supportive of this proposal.

As you are aware through our earlier discussions, within the FoM we have aspired to build a Provincial platform of Simulation that can benefit health professional education and training. Recognizing that such a platform will require different levels of technology and fidelity, I would assume that the Advanced Simulation Centre at BCIT would be a critical resource hub within BC to allow other educational partners and care providers to take advantage of these new technologies. I anticipate that there would be a synergy with the existing facilities in capacity within UBC and other partners.

Furthermore, I am sure you are aware the evolving practice within the Health Authorities is to require many healthcare professionals to demonstrate continued competence through Simulation based experiences. As such, there is an urgent need within the healthcare system to ensure this capacity is developed to best support patient safety and improved health outcomes.

Overall, UBC FoM remains very supportive of your proposal and looks forward to you achieving this goal.

Yours sincerely,

Gavin C.E. Stuart, MD, FRCSC
Dean, Faculty of Medicine
Vice Provost Health, UBC

Cc: Dr. David Snadden, Executive Associate Dean, Education, Faculty of Medicine, UBC

GS/my

# B >

# Geotechnical Study

**Centennial Geotechnical Engineers Ltd.**
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Suite 106, 2780 E. Broadway, Vancouver, B.C. V5M 1Y8
Phone : (604) 255-0828 Fax : (604) 255-0817

# PRELIMINARY GEOTECHNICAL INVESTIGATION
# PROPOSED HEALTH SCIENCES BUILDING, BCIT
# 3700 WILLINGDON AVENUE, BURNABY, BC.

**Prepared for:**

**Facilities and Campus Development, BCIT**
**3700 Willingdon Avenue**
**Burnaby, BC. V5G 3H2**

**Our File: V12-114**
**August 23rd, 2012**

**Centennial Geotechnical Engineers Ltd.**

Centennial Geotechnical Engineers Ltd.
Suite 106, 2780 E. Broadway, Vancouver, B.C. V5M 1Y8
Email: cge@telus.net
Phone : (604) 255-0828 Fax : (604) 255-0817

August 23rd, 2012

File: V12-114

Facilities and Campus Development, BCIT
3700 Willingdon Avenue
Burnaby, BC. V5G 3H2

Attention: Mr. Craig Sidjak

Dear Mr. Sidjak,

**RE: PRELIMINARY GEOTECHNICAL INVESTIGATION
PROPOSED HEALTH SCIENCES BUILDING, BCIT
3700 WILLINGDON AVENUE, BURNABY**

## 1.0 INTRODUCTION

Further to the authorization of Mr. Craig Sidjak of BCIT, Centennial Geotechnical Engineers Ltd. (CGE) has completed a preliminary geotechnical investigation for a proposed Health Sciences building at the northwest corner of English Street and Goard Way on the BCIT Burnaby Campus, as shown in Figure 1.

The scope of the geotechnical investigation was presented in our proposal, dated July 29th, 2012. The purpose of the investigation was to identify subsurface conditions at the location of the proposed building site. Based on the findings, CGE developed preliminary recommendations for site class, earthwork, drainage control, foundation design, slab-on-grade preparation and lateral earth pressures. This soils report presents the findings of the investigation, and our preliminary recommendations for the geotechnical aspect of the project.

Based on information provided by BCIT, CGE understands that the proposed Health Sciences building will be a 4-storey structure with one level of underground parking. The new building would have a total gross area of about 100,000 square meters. The plan dimension of the underground parking structure is about 41.5m by 70m (136 feet by 230 feet). Access to the underground parking structure is from the northeast corner of the building, off English Street.

## 2.0 SITE DESCRIPTION

Based on information provided by BCIT, CGE understands that the location of the proposed Health Sciences building has not been finalized. However, it would be located in an area bounded by English Street on the east, Goard Way on the south, White Avenue on the west and the Administration Building (NW1) for the BC Vocational School on the north, as shown in Figure 2.

A parking lot (P16) and a landscaped area currently occupy the proposed building site. Based on visual observations, it appears that the existing ground surface of the proposed building site at the north end is approximately 1m (3 feet) lower than the south side.

BCIT utilities' records have indicated that existing underground services including fibre optics/telephone cables, Hydro cables, sanitary pipes, storm pipes, water lines and gas lines are on and in the general vicinity of the proposed building site. A series of drain pipes are shown beneath the landscaped area and the parking lot. In addition, there is a 900mm (3-foot) diameter combined sanitary and storm sewer pipe located along the west side of the site. The approximate location of the combined sewer pipe is shown in Appendix A, Figure A1.

CGE understands that the as-built information of the combined sewer pipe is not available. CGE measured the invert elevations of the combined sewer pipe in the upstream and downstream manholes of the proposed building site. According to the field measurements, the invert of the sewer pipe at the upstream manhole (south) is about 3m (10 feet) below the existing ground surface. The invert of the pipe at the downstream manhole (north) is about 3.3m (11 feet) below the existing ground surface.

## 3.0 FIELD INVESTIGATION

The field investigation program was conducted at the proposed building site using an auger drill rig provided by On-track Drilling of Coquitlam, under the supervision of our field engineer on August 1st, 2012.

The field investigation program included completion of six test boreholes and six dynamic cone penetration (DCP) tests at the approximate locations as shown in Figure 2. The test boreholes were completed to the depths of about 5.2m to 7.6m (17 feet to 25 feet) below existing ground surface, and/or to the refusal of the auger. The DCP test was completed adjacent to each borehole to similar depths by advancing a 57mm (a 2-1/4 inch) dia. cone attached to a string of 25mm (1-inch) dia. drill rods, using a 75kg (140-pound) hammer falling 750mm (30 inches) to refusal. The test results provided an indication of the relative density/consistency of soils.

Stratigraphy observed in the test boreholes was logged by our field engineer. Representative grab soil samples were obtained from the test boreholes for visual examination, and later returned to our laboratory for moisture content tests.

The logs of the test boreholes and the results of the moisture content tests are presented in Appendix B, Figures B1 to B6 of this report.

## 4.0 GEOLOGY

According to a Surficial Geology Map of Vancouver, 1486A compiled by Geological Survey of Canada, the general area is underlain by Vashon drift and Capilano deposits including lodgement and minor flow till, lenses and interbeds of substratified glaciofluvial sand and gravel, and lenses and interbeds of glaciolacustrine laminated stony silts up to about 25m (75 feet) thick, overlain by glaciomarine and marine stony to stoneless silt to clay loam with minor sand and silt, normally less than 3m (10 feet) thick. Bedrock may be founded more than 10m (30 feet) below surface.

## 5.0 SUBSURFACE CONDITIONS

### 5.1 Soil Conditions

The proposed building site is generally underlain by a layer of random fill overlying a stratum of silt, sand and till-like soils. However, the actual soil conditions may vary across the site and between the test boreholes. For a detailed description of subsurface conditions, refer to Appendix B, Figures B1 to B6.

Two soil profiles were developed based on test boreholes information along the west and east sides of the proposed building site. The soil profiles are presented in Figure 3 and 4.

A summary of the general subsurface conditions encountered at the test boreholes is presented below.

FILL (SU1) A layer of random fill was encountered in all the test boreholes, except at test borehole A2. The thickness of the random fill is not uniform, varying from about 2.9m to 5m (9.5 feet to 16.5 feet) below the existing ground surface on the west side to about 0.9m to 3m (3 feet to 10 feet) on the east side. The thickness of fill appears to be greater along the west side of the site, probably corresponds to the backfill of the combined sewer pipe.

The matrix of the random fill also varies with depth. Along the west side, the random fill in the upper 1.5m to 1.6m (5 feet to 6 feet) generally consists of silty sand with some gravel of till-like characteristics. Below the surficial zone, the fill material consists of dark brown silty sand with a lot of organic matter. The organic random fill was encountered at test boreholes A4, A5 and A6 (near the combined sewer pipe). Along the east side, the organic-rich random fill was not encountered below the upper fill material. The relative density of the fill layer varies from loose to compact.

At test borehole A2, random fill was not encountered.

SILT (SU2) Beneath the ground surface of test borehole A2 and the fill material (SU1) at test borehole A3, a layer of tannish brown, non-plastic, very fine sandy silt was encountered. This layer varies from about 1.2m to 2m (4 feet to 6.5 feet) in thickness. The relative density of the silt layer is compact.

SAND (SU3) Underlying the fill (SU1) at test borehole A1 and the sandy silt (SU2) at A2, a layer of tannish brown silty very fine-grained sand was encountered. This layer of sand varies from about 1.5m to 2.1m (5 feet to 6.5 feet) in thickness. The relative density of the sand layer is dense.

W. TILL (SU4) Below either the sandy silt (SU2) or the silty sand (SU3) at test boreholes A3, A4 and A6, a layer of tannish brown silty sand with occasional small pebbles, weathered till-like soil was encountered. This layer varies from about 0.76m to 2m (2.5 feet to 6 feet) in thickness. The relative density of the weathered till layer varies from compact to dense.

UNW. TILL (SU5) Underlying either the sand (SU3) or the weathered till (SU4) at all the test boreholes, a layer of grey clayey/silty sand with occasional small pebbles, unweathered till-like soil was encountered extending to the termination of the test boreholes. The relative density of the unweathered till layer is typically very dense.

Within the unweathered till stratum, layers of coarse sand with some gravel, mica and interbeds of silt and clay were also encountered.

## 5.2 Groundwater Conditions

A perched water table was encountered in every test borehole during the soils investigation. The depth with which groundwater was encountered varying from about 3.3m to 4.9 (11 feet to 16 feet) below the existing ground surface. However, it is expected that the perched water level could fluctuate as much as a few feet with seasonal precipitation.

## 6.0 SEISMIC DESIGN

### 6.1 Seismic Design Criteria

The design earthquake motions considered in the 2006 BC Building Code (BCBC) have a 2% probability of exceedance in 50 years or a 2475-year return period.

The 2006 BCBC provides Peak Ground Acceleration (PGA) and design response spectrum for near the surface including Site Class A to E for structural design. According to the 2006 BCBC, 'Firm Ground' is defined by shear wave velocity in the range of 360m/sec to 760m/sec and N60 greater than 50. Very dense till-like or soft bedrock sites would classify as 'Firm Ground' – Site Class C.

For the Greater Vancouver area, the PGA for near surface 'Firm Ground – Site Class C' is 0.47g. The inferred earthquake magnitude for this event is M7.

### 6.2 Liquefaction Analysis

Based on the soil conditions encountered in the test boreholes and at the level of shaking discussed above, it is our opinion that the native soils including the native silt, sand and the very dense till-like soils are not susceptible to liquefaction under the current design criteria.

### 6.3 Site Class

The 2006 BCBC provides guidelines for classification of sites (Site Class). In accordance with the 2006 BCBC where the subgrade consists of very dense soils with average SPT resistance (N60) greater than 50 blows per foot in the top 100 feet, the code classifies it as a Site Class C (Table 4.1.8.4.A).

Based on information from the surficial geology map and the results of the soils investigation, the native soils would have an average SPT resistance (N60) more than 50 blows per foot up to a depth of 100 feet. This indicates that the subject property falls into '**Site Class C'**.

# 7.0 DISCUSSIONS AND RECOMMENDATIONS

## 7.1 General

Based on design information of the proposed building and our findings from the subsurface investigation, CGE provides preliminary recommendations for site preparation, earthwork, drainage control, foundation design, slab-on-grade preparation and lateral earth pressures.

For the proposed building with one-level of underground parking structure, a convention shallow foundation system consisting of spread footings at columns and strip footings at load-bearing walls is feasible. The foundation of the proposed building shall be founded in the very dense unweathered clayey/silty till-like soils (SU5).

## 7.2 Site Preparation

All existing underground utilities located within the proposed building site shall be disconnected and relocated, prior to any construction activities. As discussed in Section 3 of this report, the combined sanitary and storm sewer pipe traverses across the west side of the proposed building site, which will require relocation, prior to construction.

Initial site preparation will include demolition of the existing asphalt concrete pavement structure, stripping of grass, topsoil, on-site fill and other unsuitable materials to expose the dense weathered till (SU4), and/or the unweathered till (SU5). All materials removed shall be disposed in approved landfill facilities.

The fine-grained weathered (SU4) and unweathered till (SU5) are sensitive to disturbance by construction traffic when saturated and in wet weather condition. The subgrade surface must be dry, free of ponding water, snow, ice and frozen soils, prior to placement of any structural fill materials. CGE recommends that a layer of Type 2 fill, minimum 150mm (6 inches) thick be placed on the final approved subgrade surface for protection against disturbance or softening by construction traffic.

## 7.3 Earthwork

### 7.3.1 Excavation

Based on the results of the subsurface investigation, excavation would be carried out through fill, native silt, sand, and weathered till. It is anticipated that it will be possible to excavate these soils using conventional methods, ripping and excavating with a large excavator. However, large boulders are known to be presence in the till soils, and may require drilling/splitting.

Any excavation deeper than 1.2m (4 feet) must be carried out in accordance with the Industrial Health and Safety Regulations prepared by Worksafe BC. As a safety measure, hoardings should be installed around the perimeter of the excavation. Figure 5 presents general recommendations for excavation and underpinning.

In general, for temporary slopes of bulk excavation completed above the groundwater table including compact fill, native silt and sand strata, cut slopes should not be steeper than 1H:1V (horizontal to vertical). For excavation in dense to very dense till-like soils, temporary slopes of excavation should not exceed 1H:2V. The above recommended slope configurations should be flattened where seepage is encountered. In addition, heavy equipment and stockpile of excavated soils shall be kept at least 5m (15 feet) away from the edge of the bulk excavation.

The excavated slopes should be protected by plastic sheet and welded wire meshes to minimize erosion due to surface runoff and precipitation.

### 7.3.2 Shoring

In the general vicinity of the proposed building site are active underground utilities' services to the west, south and east; and to the north is the Administration building (NW1), which shall all remain functional during the course of construction. If the open-cut excavation of the proposed building interferes with the services and/or the adjacent building, vertical cut slope with shoring would be an option to provide temporary support for construction of the underground parking structure and the foundation of the proposed building.

A shoring system commonly used by local practitioners involves a layer of shotcrete about 100mm (4 inches) in thickness supported laterally by rows of metal tie-back soil anchors.

CGE will provide shoring design for the excavation of the underground parking structure.

### 7.3.3 Structural Fill

For backfilling over-excavated areas beneath the concrete slab-on-grade of the underground parking structure shall consist of clean, free draining, minus 75mm (3-inch) dia. crushed gravel (Type 1) containing less than 5% passing the No.200 sieve, and in compliance with the gradation of 'Crushed Granular Subbase' of the current edition of the Master Municipal Contract Document (MMCD).

For any backfill below groundwater table, CGE recommends that structural fill shall consist of clean, import 19mm (¾-inch) dia. clear crushed gravel (Type 2).

CGE recommends that the foundation of the proposed building shall be founded in the very dense unweathered clayey/silty till-like soils (SU5). For footings placed in undisturbed unweathered till (SU5) soils, CGE recommends that a maximum allowable soil bearing pressure of 190kPa (4,000 pounds per square foot) may be used for design. The factored ultimate capacity may be taken as 1.5 times the maximum allowable soil bearing pressure discussed above, ie. 285kPa (6,000psf) under seismic condition.

### 7.6 Foundation Subgrade Preparation

For the anticipated depth of excavation of at least 4m (12 feet) below existing ground surface, foundation subgrade preparation shall include excavation and removal of all unsuitable materials (construction debris, random fill, very fine-grained sandy silt, very fine-grained sand, and weathered till) to expose the unweathered till (SU5). As a result, overexcavaton shall be required for foundation subgrade preparation of footings to reach the unweathered till. CGE recommends that areas of overexcavation beneath footings be backfilled with mass concrete.

To prevent softening of the foundation subgrade of footings, CGE recommends that a minimum 50mm (2-inch) thick blinding coat shall be placed on the final approved subgrade surface.

### 7.7 Slab-on-grade Preparation

For slab-on-grade preparation of the proposed building, CGE recommends that loose random fill (SU1), sandy silt (SU2) and silty sand (SU3) be excavated to expose the dense weathered till (SU4). The final stripped surface should be proof-rolled to determine presence or absence of loose soils. Where soft/loose soils are encountered, these materials should be overexcavated and replaced with Type 1 fill compacted to at least 95% MPMDD.

Directly beneath the floor slab of the proposed building, CGE recommends that Type 2 fill at least 300mm (12 inches) thick be placed either on compacted Type 1 fill or weathered till (SU4). The gravel blanket should be compacted with a minimum of 6 passes of a 1000-pound plate tamper, and hydraulically connected to the perimeter drain pipes.

A heavy vapor barrier should be placed directly on the gravel drainage blanket to minimize upward migration of moisture and dampness to the floor slab. Any significant tears or punctures in the vapor barrier should be patched with appropriate sealing tape prior to pouring the slab.

### 7.8 Lateral Earth Pressures for Subgrade Wall Design

The subgrade walls of the underground parking structure shall be designed to withstand lateral pressures due to static, seismic, hydrostatic pressure and surcharge loads from vehicles' traffic on the adjacent roadways.

Lateral earth pressures' diagrams for restrained condition (subgrade walls) under static and seismic conditions are presented in the top panel of Figure 6.

Restrained versus unrestrained conditions depend upon the degree of wall movement. Partial movements of the wall may result in lateral pressures somewhat less than the restrained condition; however, it is not possible to predict intermediate cases with any degree of certainty.

### 7.7.1 Static Condition

For rigid (non-yielding) subgrade walls, where practically no wall movement is possible, the static earth pressure (triangular distribution) should be computed using an 'at-rest' pressure coefficient, $K_o$ value of 0.5 corresponding to a friction angle of 30 degrees for granular backfill. A total unit weight ($\gamma_T$) of 1,920kg/m3 (120pcf) may be assumed for typical granular backfill.

Backfill behind subgrade walls shall consist of Type 2 fill. If backfill materials behind subgrade walls are not free draining, full hydrostatic pressure should be included in the design of the walls.

### 7.7.2 Seismic Condition

For rigid (non-yielding) subgrade walls, the seismic lateral pressure (invert triangular) per unit length of wall equals to $2\gamma_T HA_h/g$, where $\gamma_T$ is the average total unit weight of the backfill soils (120pcf), H is the wall height, and $A_h$ is the peak horizontal ground acceleration, 0.47g. The dynamic thrust acts at a height of 0.58H above the base of the wall.

### 7.7.3 Surcharge Loads

Surcharge loads including vehicles' traffic and compaction of backfill should be considered for design of subgrade walls.

CGE recommends that an additional uniform lateral pressure of 3.kPa (75psf) due to the typical vehicles' traffic load 7.2 kPa (150psf) should be included in the design of subgrade walls, where the walls are located adjacent to parking lot and driveway.

Compaction of backfill adjacent to subgrade walls will induce a transient load to the walls. If a 230kg (500-pound) compactor is operating at a distance of at least 600mm (2 feet) from the subgrade wall, an additional uniform lateral pressure of 4.8kPa (100psf) extending to a depth of 1.5m (5 feet) would be induced to the adjacent subgrade walls.

## 8.0 CLOSURE

This preliminary soils report was prepared for the exclusive use of BCIT, and the team of consultants involved in the proposed Health Sciences building at the corner of English Street and Goard Way, BCIT Burnaby campus. It should be made available to prospective contractors and/or the Contractor for information on factual data only and not as a warranty of subsurface conditions, such as those interpreted from the test boreholes' logs and discussions of subsurface conditions included in this report.

Any use which a third party makes of this soils report, or any reliance on or decisions to be made based on this report, are the responsibilities of such third parties. CGE accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

When the final architectural design and structural loading conditions for the proposed building are available, CGE shall review our preliminary geotechnical recommendations, and provide revisions, if necessary. If there is a substantial lapse of time between the submission of this report and the start of construction, or if conditions have changed due to construction operations at or near the site, it is recommended that this report be reviewed to determine the applicability of the conclusions and recommendations considering the changed conditions and time lapse.

The scope of our services does not include environmental assessments or evaluations regarding the presence or absence of wetlands or hazardous or toxic substances in the soil, subsurface water, groundwater, on or below this site.

The attached 'Interpretation and Use of Study and Report' forms an integral part of this report, and must be included with any copies of this report.

If there are any questions regarding this preliminary soils report, please do not hesitate to contact me directly.

Yours very truly,

**CENTENNIAL GEOTECHNICAL ENGINEERS LTD.**

Per:

Louis W. H. Lui, P. Eng.
Principal

### 7.4 Drainage Requirements

#### 7.4.1 Construction Dewatering

Temporary dewatering including the uses of interceptor ditches and sumps will be required during excavation and construction of the proposed Health Science building in wet winter months to control surface runoff.

Based on our experience in the general area, automatic sump pumps should be installed to control ground seepage and precipitation during construction.

#### 7.4.2 Foundation Drainage of Building

Perimeter drains shall consist of a minimum 150mm (6-inch) dia. perforated rigid PVC pipes placed at or below the footing level of the proposed building; and where there is change in footing grade with the underground parking structure. The drain pipes should be placed in a minimum 150mm (6-inch) surround of Type 2 fill and a minimum surround of 150mm (6 inches) of ‘pea’ gravel. The drain pipes should be designed to flow by gravity where possible, and connected to a sump, which should be connected to the storm sewer of the City of Burnaby with their permission.

#### 7.4.3 Under-slab Drainage of Building

CGE recommends that an underslab drainage system shall include a gravel drainage blanket consisting of Type 2 fill minimum 300mm (12 inches) thick, and at least two lines of 150mm (6-inch) dia. drain pipe installed at a maximum 10m (30-foot) equal spacing beneath the slab-on-grade of the underground parking structure. The subfloor drain pipes should be installed in an east to west direction to remove water that could otherwise pond under the slab. The drain pipes should be bedded in a minimum of 300mm (12-inch) surround of Type 2 fill. Clean-outs should be provided to allow for periodic flushing of the underslab drains.

The drain pipes should be installed such that the top is located within the gravel drainage blanket. The drain pipes should discharge into a sump, which should be designed so as to prevent the possibility of water backing into the pipe. Permission from the City of Burnaby for discharge of storm water to the storm sewer is required.

### 7.5 Foundation Design

For frost protection, the foundation of the proposed building shall be located at least 450mm (18 inches) below the final adjacent site grade.

## INTERPRETATION AND USE OF STUDY AND REPORT

### 1.0 STANDARD OF CARE

This study and report have been prepared in accordance with generally accepted engineering practices in this area. No other warranty, expressed or implied, is made. Engineering studies and reports do not include environmental assessment and/or consulting unless specifically stated in the engineering report.

### 2.0 COMPLETE REPORT

All documents, records, data and files, whether electronic or otherwise, generated as part of this assignment are a part of the report which is of a summary nature and is not intended to stand alone without reference to the instructions given to us by the Client, communications between us and the Client, and to any other reports, writings, proposals or documents prepared by us for the Client relative to the specific site described herein, all of which constitute the Report.

IN ORDER TO PROPERLY UNDERSTAND THE SUGGESTIONS, RECOMMENDATIONS AND OPINIONS EXPRESSED HEREIN, REFERENCE MUST BE MADE TO THE WHOLE OF THE REPORT. WE CANNOT BE RESPONSIBLE FOR USE BY ANY PARTY OF PORTIONS OF THE REPORT WITHOUT REFERENCE TO THE WHOLE REPORT.

### 3.0 BASIS OF REPORT

The report has been prepared for the specific site, development, design objectives and purpose that were described to us by the Client. The applicability and reliability of any of the findings, recommendations, suggestions, or opinions expressed in the document are only valid to the extent that there has been no material alteration to or variation from any of the said descriptions provided to us unless we are specially requested by the Client to review and revise the Report in light of such alternation or variation.

### 4.0 USE OF THE REPORT

The information and opinions expressed in the Report, or any document forming part of the Report, are for the sole benefit of the Client. NO OTHER PARTY MAY USE OR RELY UPON THE REPORT OR ANY PORTION THEREOF WITHOUT OUR WRITTEN CONSENT. WE WILL CONSENT TO ANY REASONABLE REQUEST BY THE CLIENT TO APPROVE THE USE OF THIS REPORT BY OTHER PARTIES AS “APPROVED USERS”. The contents of the Report remain our copyright property and we authorize only the Client and Approved Users to make copies of the Report only in such quantities as are necessary for the use of the Report by those parties. The Client and Approved Users may not give, lend, sell, or otherwise make the Report, or any portion thereof, available to any party without our written permission. Any use which a third party makes of the Report, or any portion of the Report, is the sole responsibility of such third party. We accept no responsibility for damages suffered by any third party resulting from unauthorized use of the Report.

### 5.0 INTERPRETATION OF THE REPORT

5.1 Nature and Exactness of Description: Classification and identification of soils, rocks, geological units have been based on investigations performed in accordance with the standard set out in Section 1.0. Classification and identification of these factors are judgemental in nature and even comprehensive sampling and testing programs, implemented with the appropriate equipment by experienced personnel, may fail to locate some conditions. All investigations utilizing the standards of Section 1.0 will involve an inherent risk that some conditions will not be detected and all documents or records summarizing such investigation will be based on assumptions of what exists between the actual points sampled. Actual conditions may vary significantly between the points investigated and all persons making use of such documents or records should be aware of, and accept, this risk. Some conditions subject to change over time and those making use of the Report should be aware of this possibility and understand that the Report only presents the conditions at the sampled points at the time of sampling. Where special concerns exist, or the Client has special considerations or requirements, the Client should disclose them so that additional or special investigations may be undertaken which would not otherwise be within the scope of investigations made for the purpose of the Report.

5.2 Reliance on Provided Information: The evaluation and conclusions contained in the Report have been prepared on the basis of conditions in evidence at the time of site inspections and on the basis of information provided to us. We have relied in good faith upon representations, information and instructions provided by the Client and other concerning the site. Accordingly, we cannot accept responsibility for any deficiency, misstatement or inaccuracy -

contained in the Report as a result of misstatements, omissions, misrepresentations, or fraudulent acts of persons providing information.

5.3 To avoid misunderstandings: CGE should be retained to work with the other design professionals to explain relevant engineering findings and to review their plans, drawings and specifications relative to engineering issues pertaining to consulting services provided by us. Further, CGE should be retained to provide field reviews during construction, consistent with building codes guidelines and generally accepted practices. Where applicable, the field services recommended for the project are the minimum necessary to ascertain that the Contractor's work is being carried out in general conformity with CGE's recommendations. Any reduction from the level of services normally recommended will result in CGE providing qualified opinions regarding adequacy of the work.

**6.0 RISK LIMITATION**

Geotechnical engineering and environmental consulting projects often have the potential to encounter pollutants or hazardous substances and the potential to cause an accidental release of those substances. In consideration of the provision of the services by us, which are for the Client's benefit, the Client agrees to hold harmless and to indemnify and defend us an dour directors, officers, servants, agents, employees, workmen and contractors (hereinafter referred to as the "Company") from and against any and all claims, losses, damages, demands, disputes, liability and legal investigative costs of defence, whether for personal injury including death, or any other loss whatsoever, regardless of any action or omission on the part of the Company, that result from an accidental release of pollutants or hazardous substances occurring as a result of carrying this Project. This indemnification shall extend to all Claims brought or threatened against the Company under any federal or provincial statute as a result of conducting work on this Project. In addition to the above indemnification, the Client further agrees not to bring any claims against the Company in connection with any of the aforementioned causes.

**7.0 SERVICES OF SUBCONSULTANTS AND CONTRACTORS**

The conduct of engineering studies frequently requires hiring the services of individuals and companies with special expertise and/or services which we do not provide. We may arrange the hiring of these services as a convenience to our Clients. As these services are for the Clients' benefit, the Client agrees to hold the Company harmless and to indemnify and defend us from and against all claims arising through such hirings to the extent that the Client would incur had he hired these services directly. This includes responsibility for payment for services rendered and pursuit of damages for errors, omissions or negligence by those parties in carrying out their work. In particular, these conditions apply to the use of drilling, excavation and laboratory testing services.

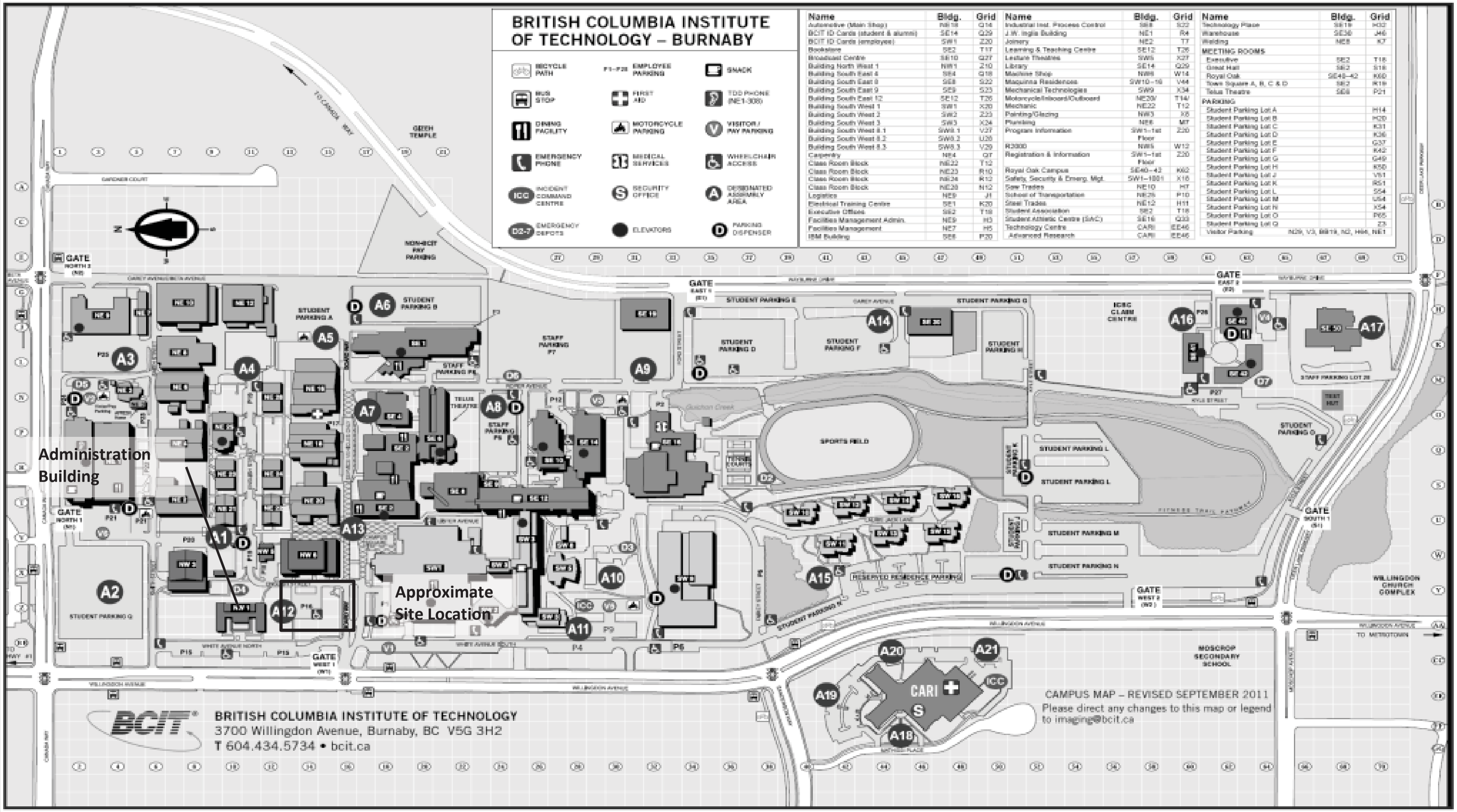
**8.0 CONTROL OF WORK AND JOBSITE SAFETY**

We are responsible only for the activities of our employees on the jobsite. The presence of our personnel on the site shall not be construed in any way to relieve the Client or any contractors on site from their responsibilities for site safety. The Client acknowledges that he, his representatives, contractors or others retain control of the site and that we never occupy a position of control of the site. The Client undertakes to inform us of all hazardous conditions, or other relevant conditions of which the Client is aware. The Client also recognizes that our actives may uncover previously unknown hazardous conditions or materials and that such a discovery may result in the necessity to undertake emergency procedures to protect our employees as well as the public at large and the environment in general. The Client agrees to pay us for any expenses incurred as the result of such discoveries and to compensate us through payment of additional fees and expenses for time spent by us to deal with the consequences of such discoveries. The Client also acknowledges that in some cases the discovery of hazardous conditions and materials will require that certain regulatory bodies be informed and the Client agrees that notification to such bodies by us will not be a cause of action or dispute.

**9.0 INDEPENDENT JUDGEMENTS OF CLIENT**

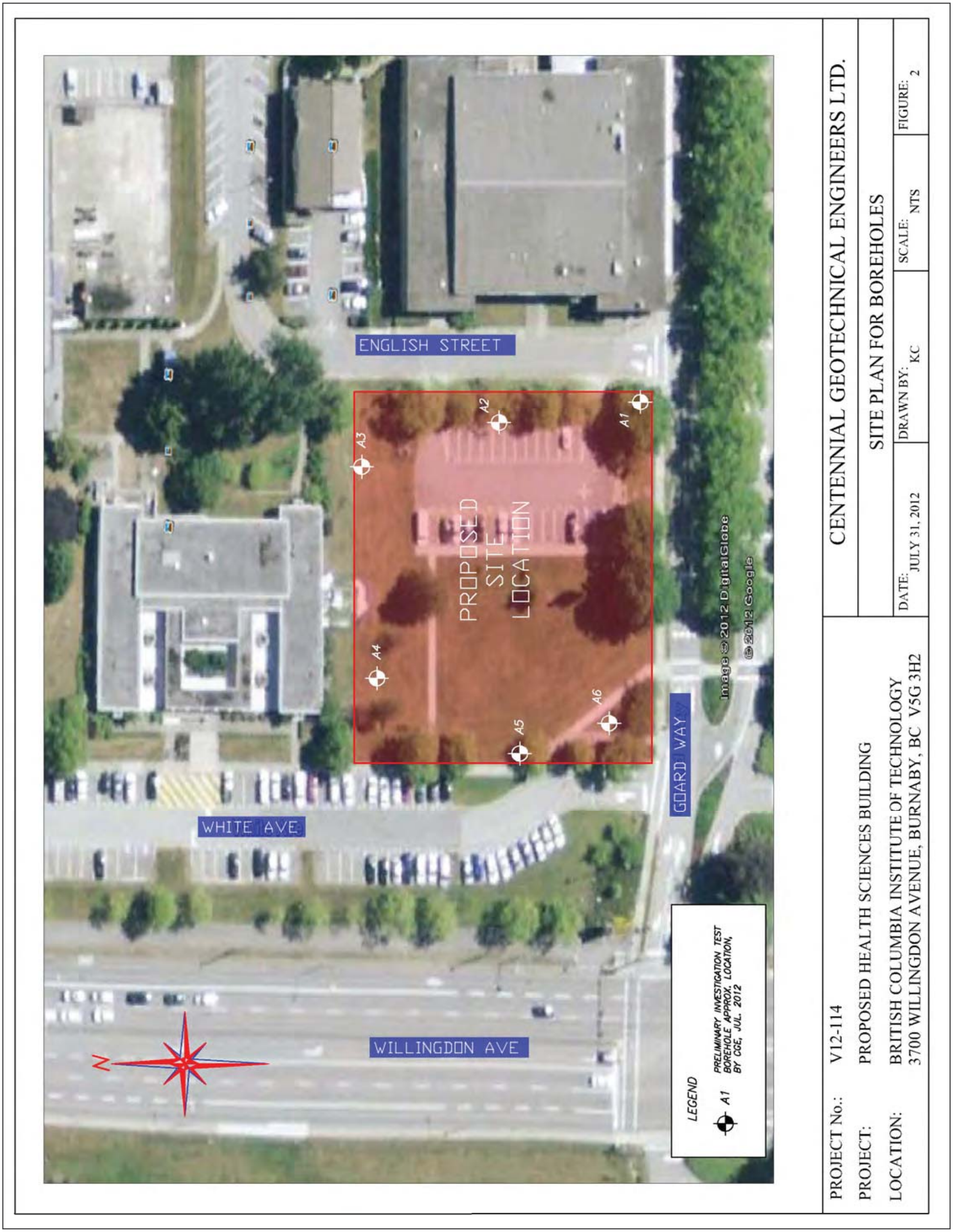
The information, interpretations and conclusions in the Report are based on our interpretation of conditions revealed through limited investigation conducted within a defined scope of services. We cannot accept responsibility for independent conclusions, interpretations, interpolations and/or decisions of the Client, or others who may come into possession of the Report, or any part thereof, which may be based on information contained in the Report. This restriction of liability includes decisions made to either purchase or sell land.

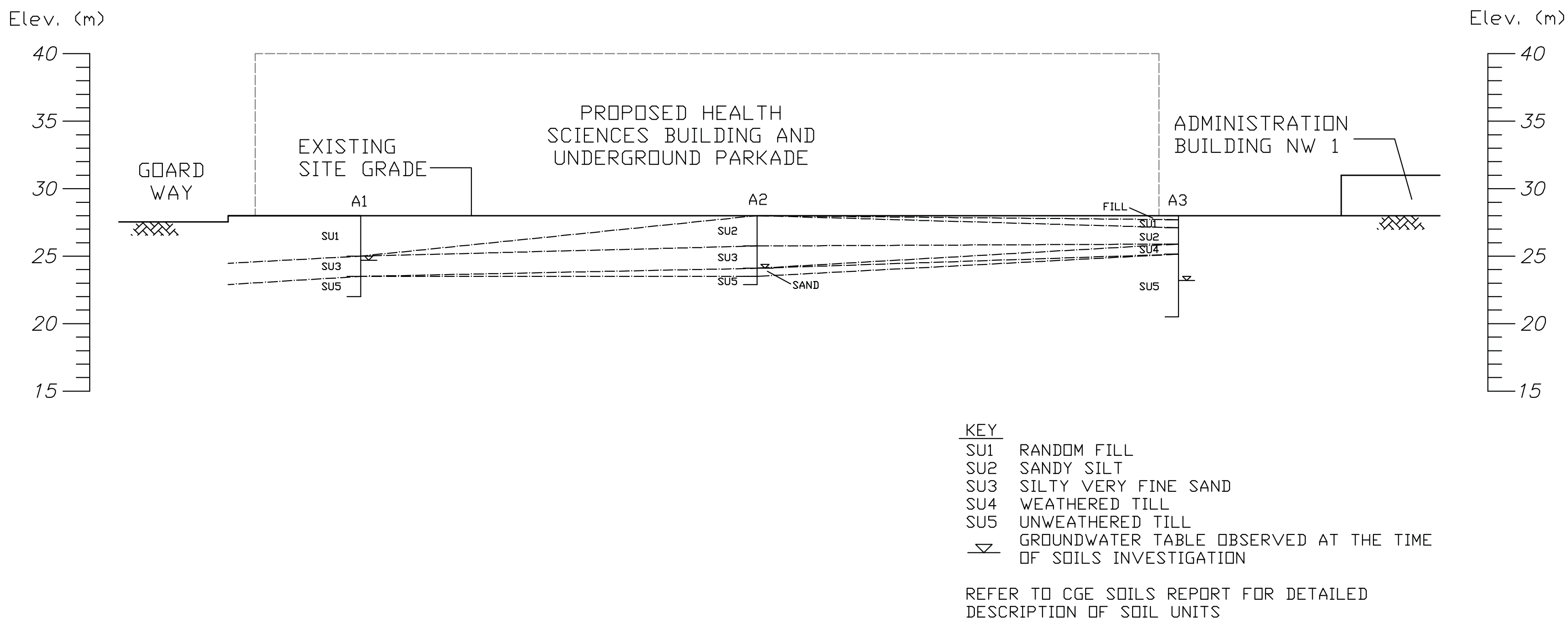
**Centennial Geotechnical Engineers Ltd.**




Reference: British Columbia Institute of Technology Site Map

| | | | | | |
|---|---|---|---|---|---|
| PROJECT NO: | V12-114 | CENTENNIAL GEOTECHNICAL ENGINEERS LTD. | | | |
| PROJECT: | Porposed Health Sciences Building | Vicinity Map | | | |
| LOCATION : | British Columbia Institute of Technology<br>3700 Willingdon Avenue, Burnaby, BC | DATE:<br>8-Aug-12 | DRAWN BY:<br>NC | SCALE:<br>NTS | FIGURE:<br>1 |


ENGLISH STREET
WHITE AVE
GOARD WAY
WILLINGDON AVE
PROPOSED SITE LOCATION
A1
A2
A3
A4
A5
A6
N
Image © 2012 DigitalGlobe
© 2012 Google
LEGEND
A1 PRELIMINARY INVESTIGATION TEST BOREHOLE APPROX. LOCATION, BY CGE, JUL. 2012
CENTENNIAL GEOTECHNICAL ENGINEERS LTD.
SITE PLAN FOR BOREHOLES
PROJECT No.: V12-114
PROJECT: PROPOSED HEALTH SCIENCES BUILDING
LOCATION: BRITISH COLUMBIA INSTITUTE OF TECHNOLOGY
3700 WILLINGDON AVENUE, BURNABY, BC V5G 3H2
DATE: JULY 31, 2012
DRAWN BY: KC
SCALE: NTS
FIGURE: 2

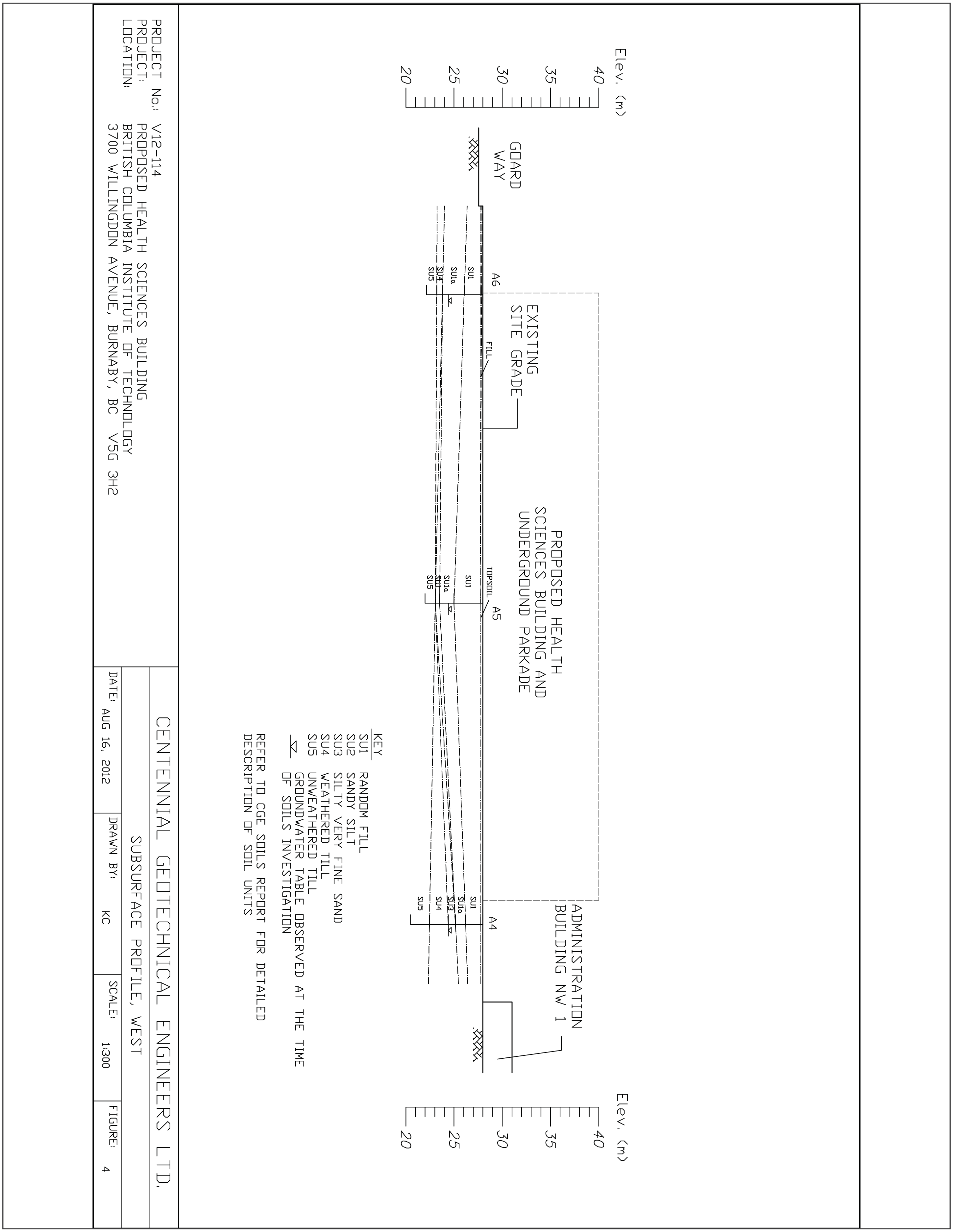


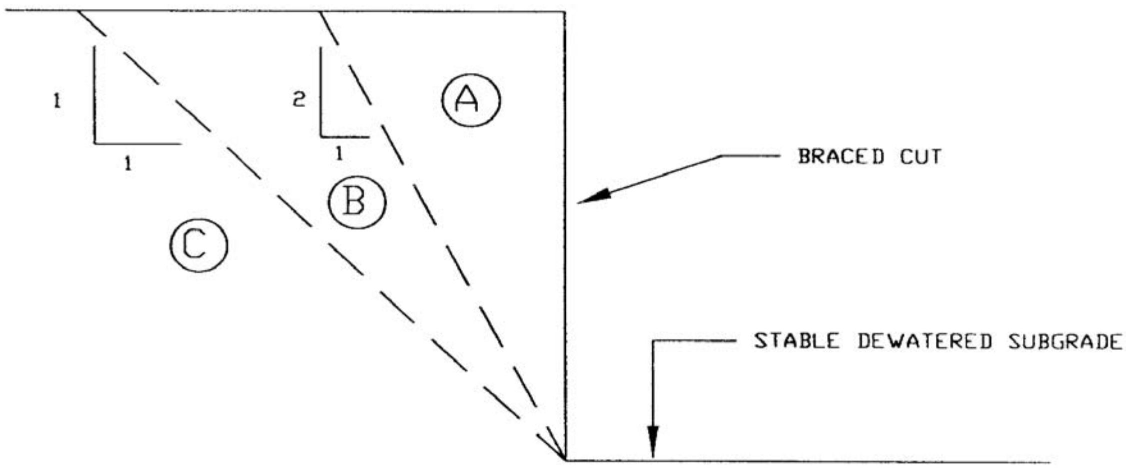

| | |
|---|---|
| PROJECT No.: | V12-114 |
| PROJECT: | PROPOSED HEALTH SCIENCES BUILDING |
| LOCATION: | BRITISH COLUMBIA INSTITUTE OF TECHNOLOGY<br>3700 WILLINGDON AVENUE, BURNABY, BC V5G 3H2 |

CENTENNIAL GEOTECHNICAL ENGINEERS LTD.

SUBSURFACE PROFILE, EAST

| DATE: | DRAWN BY: | SCALE: | FIGURE: |
|---|---|---|---|
| AUG 16, 2012 | KC | 1:300 | 3 |


Elev. (m)
40
35
30
25
20
GOARD WAY
A6
SU1
SU1a
SU4
SU5
EXISTING SITE GRADE
FILL
PROPOSED HEALTH SCIENCES BUILDING AND UNDERGROUND PARKADE
TOPSOIL
A5
SU1
SU1a
SU5
A4
SU1
SU1a
SU3
SU4
SU5
ADMINISTRATION BUILDING NW 1
Elev. (m)
40
35
30
25
20
KEY
SU1 RANDOM FILL
SU2 SANDY SILT
SU3 SILTY VERY FINE SAND
SU4 WEATHERED TILL
SU5 UNWEATHERED TILL
GROUNDWATER TABLE OBSERVED AT THE TIME OF SOILS INVESTIGATION
REFER TO CGE SOILS REPORT FOR DETAILED DESCRIPTION OF SOIL UNITS
PROJECT No.: V12-114
PROJECT: PROPOSED HEALTH SCIENCES BUILDING
LOCATION: BRITISH COLUMBIA INSTITUTE OF TECHNOLOGY
3700 WILLINGDON AVENUE, BURNABY, BC V5G 3H2
CENTENNIAL GEOTECHNICAL ENGINEERS LTD.
SUBSURFACE PROFILE, WEST
DATE: AUG 16, 2012
DRAWN BY: KC
SCALE: 1:300
FIGURE: 4

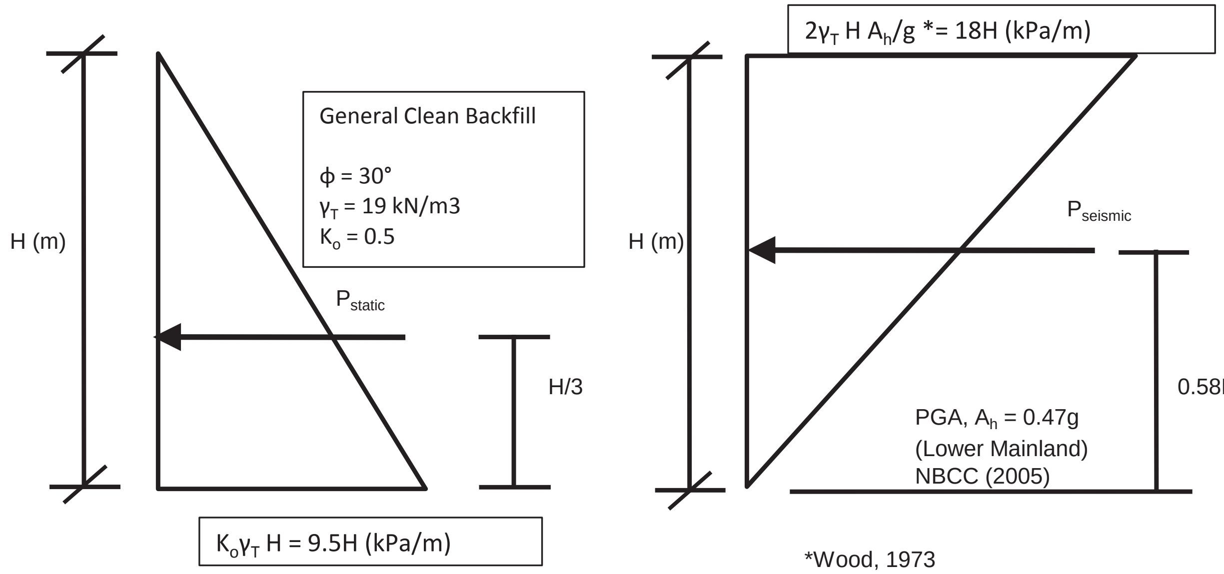



| | |
|---|---|
| (A) | FOUNDATIONS OF IMPORTANT STRUCTURES IN THIS ZONE GENERALLY MUST BE UNDERPINNED. |
| (B) | FOUNDATIONS IN THIS ZONE GENERALLY NOT TO BE UNDERPINNED EXCEPT WHERE UNDERLAIN BY WEAKER CLAYS, OR STRUCTURE IS ESPECIALLY SENSITIVE. |
| (C) | UNDERPINNING ELEMENTS TO RECEIVE THEIR SUPPORT IN THIS ZONE OR BELOW SUBGRADE LEVEL. |

| | | | | |
|---|---|---|---|---|
| PROJECT NO: | V12-114 | CENTENNIAL GEOTECHNICAL ENGINEERS LTD. | | |
| PROJECT: | Proposed Health Sciences Building | GENERAL GUIDELINE FOR SHORING/UNDERPINNING | | |
| LOCATION : | British Columbia Institute of Technology<br>3700 Willingdon Avenue, Burnaby, BC | DATE:<br>8-Aug-12 | SCALE:<br>NTS | FIGURE:<br>5 |

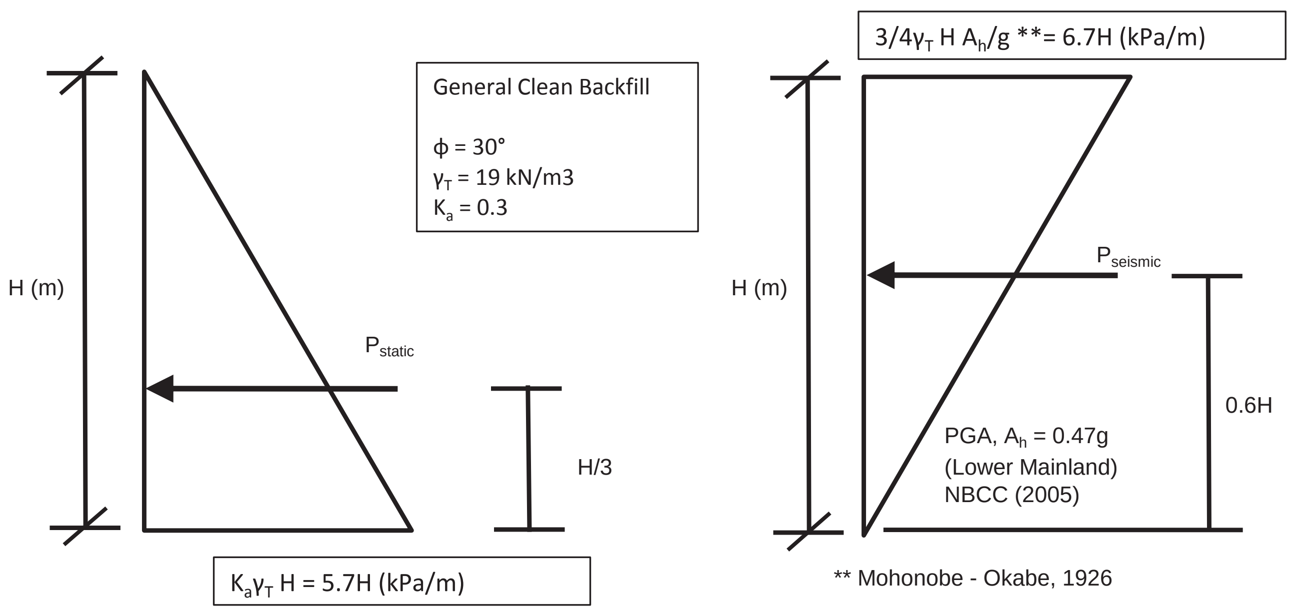
## BASEMENT WALL (RESTRAINED)

**Static Condition** / **Sesimic Condition**




## RETAINING WALL (UNRESTRAINED, movement 0.004H is allowed)

**Static Condition** / **Seismic Condition**

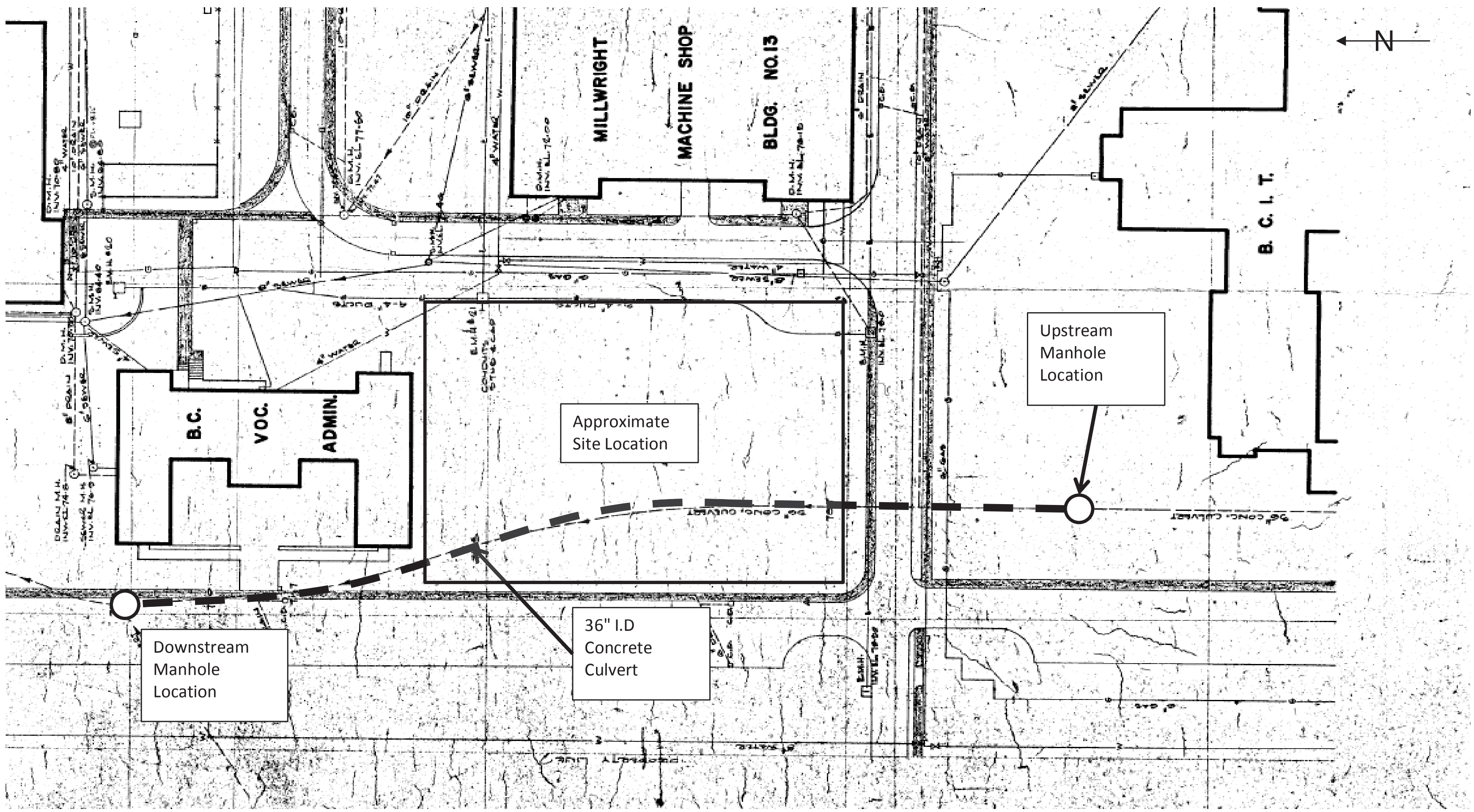



Restrained versus unrestrained conditions depend upon the degree of wall movement. Partial movements of the wall may result in pressures somewhat less than the restrained condition; but it is not possible to predict intermediate cases with any degree of certainty.

| | | | | |
|---|---|---|---|---|
| PROJECT NO: | V12-114 | **CENTENNIAL GEOTECHNICAL ENGINEERS LTD.** | | |
| PROJECT: | Proposed Health Sciences Building | Lateral Earth Pressures, Restrained and Unrestrained Conditions | | |
| LOCATION : | British Columbia Institute of Technology<br>3700 Willingdon Avenue, Burnaby, BC | DATE:<br>8-Aug-12 | SCALE:<br>NTS | FIGURE:<br>6 |

# APPENDIX A

Underground Utilities' Services




LEGEND

○ Approximate Manhole location

Reference: BSITE_1969-03_UndergroundUtilities_M1, drawn by ARD, on Mar 1969

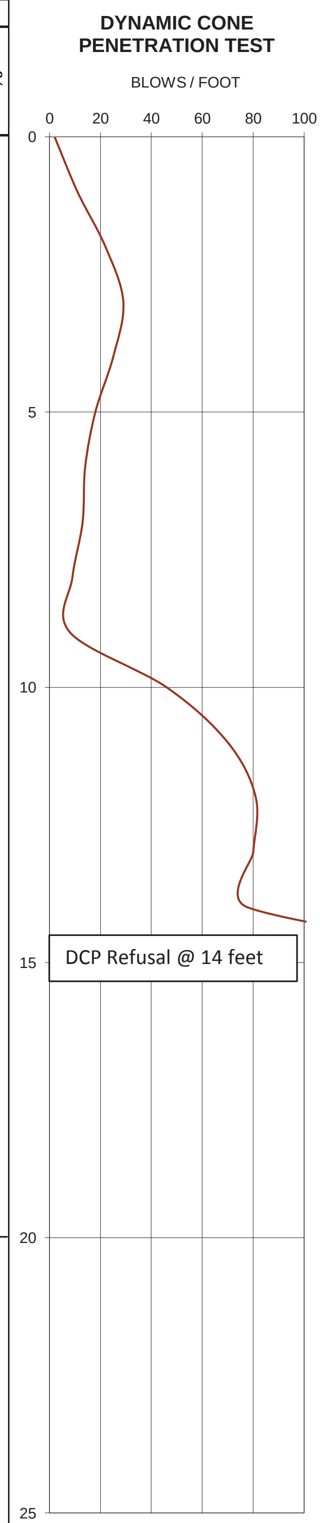
| | | | | | |
|---|---|---|---|---|---|
| PROJECT NO: | V12-113 | **CENTENNIAL GEOTECHNICAL ENGINEERS LTD.** | | | |
| PROJECT: | Proposed Health Sciences Building | Existing Culvert Location | | | |
| LOCATION : | British Columbia Institute of Technology<br>3700 Willingdon Avenue, Burnaby, BC | DATE:<br>8-Aug-12 | DRAWN BY:<br>NC | SCALE:<br>NTS | FIGURE:<br>A1 |

# APPENDIX B

Test Boreholes Logs

| DATE DRILLED: | August 1, 2012 | INSPECTOR: | K.C. | AUGER HOLE | A1 |
|---|---|---|---|---|---|
| DRILL METHOD: | AUGER | SURFACE ELEVATION: | 28.0m ± | SHEET 1 OF 1 | |

| DEPTH (ft) | DESCRIPTION OF SOIL AND OBSERVATIONS | Soil Class. Symbol | SAMPLE: Sample Type | SAMPLE: Moisture Content % |
|---|---|---|---|---|
| 0 | **FILL** (SU1) - Tan brown mottled, silty fine sand, till-like (loose to compact) | SM | | |
| 2 | | | X | 17.0 |
| 5 | | | | |
| 6 | | | X | 17.6 |
| 7.5–8 | - grades to grey brown, loose | | X | 18.5 |
| 10 | **SAND** (SU3) - Grey, silty, very fine grained, saturated (very dense) | SM | X | 22.2 |
| 11 (water table ▽) | | | | |
| 13 | | | X | 23.5 |
| 15 | **SAND** (SU5) - Grey, silty, fine grained, with 1/4" to 1/2" dia. pebbles, unweathered till-like (very dense) | SM | X | 14.7 |
| 19 | | | X | 21.3 |
| 20 | End of Borehole @ 20 feet | | | |
| 25 | | | | |




GRAB SAMPLE [X]    WATER TABLE ▽

| | |
|---|---|
| PROJECT No: | V12-114 |
| PROJECT: | Proposed Health Sciences Building |
| LOCATION: | British Columbia Institute of Technology<br>3700 Willingdon Avenue, Burnaby, BC |

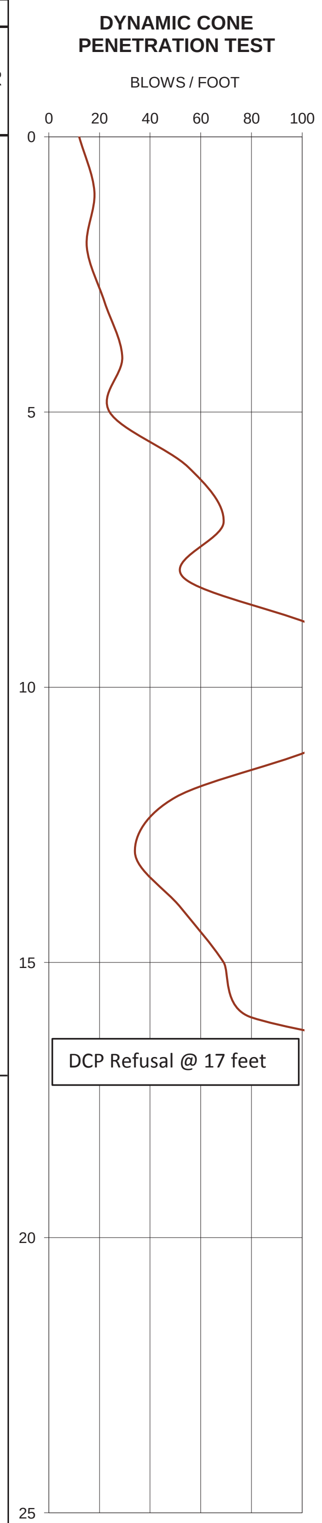
**Centennial Geotechnical Engineers Ltd.**
Suite 106, 2780 E. Broadway, Vancouver, B.C. V5M 1Y8

BOREHOLE LOG

| DATE: | DRAWN BY: | FIGURE: |
|---|---|---|
| August 2, 2012 | KC | B1 |

| DATE DRILLED: | August 1, 2012 | INSPECTOR: | K.C. | AUGER HOLE | A2 |
|---|---|---|---|---|---|
| DRILL METHOD: | AUGER | SURFACE ELEVATION: | 27.0m ± | SHEET 1 OF 1 | |

| DEPTH (ft) | DESCRIPTION OF SOIL AND OBSERVATIONS | | Soil Class. Symbol | SAMPLE: Sample Type | SAMPLE: Moisture Content % |
|---|---|---|---|---|---|
| 0 | **SILT** (SU2) | - Tan brown mottled, very fine grained, sandy, occ. pebbles, till-like (compact) | ML | | |
| 2 | | | | x | 26.4 |
| 6 | | | | x | 11.8 |
| 7 | **SAND** (SU3) | - Tan brown, silty, very fine grained (dense) | SM | | |
| 10 | | | | x | 16.1 |
| 13 (water table) | **SAND** | - Grey, fine to medium-grained, trace silt, saturated (dense) | SM | x | 19.0 |
| 15 | **SAND** (SU5) | - Grey, silty, fine grained, occ. 1/4" to 1/2" pebbles, unweathered till-like (very dense) | SM | x | 18.8 |
| 17 | | End of Borehole @ 17 feet | | | |
| 20 | | | | | |
| 25 | | | | | |



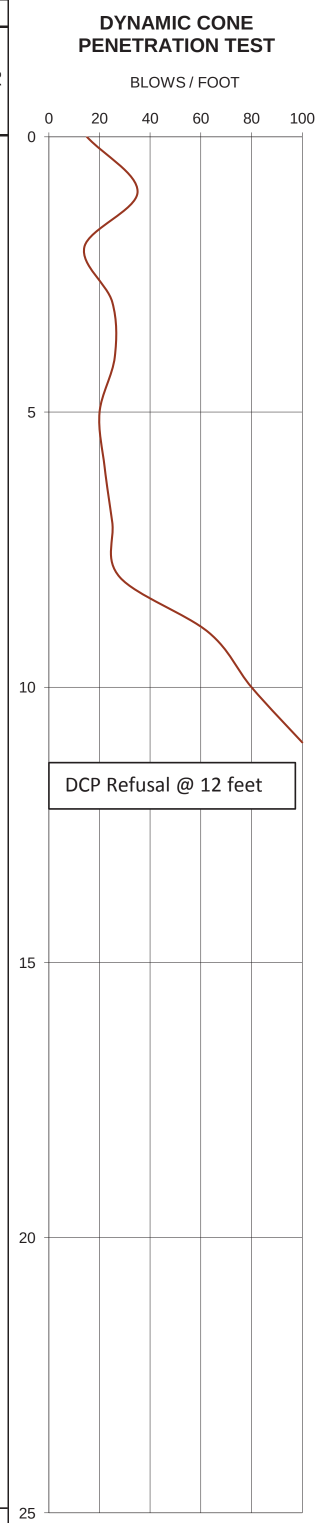

GRAB SAMPLE [x] WATER TABLE ▽

| | | | |
|---|---|---|---|
| PROJECT No: | V12-114 | Centennial Geotechnical Engineers Ltd. Suite 106, 2780 E. Broadway, Vancouver, B.C. V5M 1Y8 | |
| PROJECT: | Proposed Health Sciences Building | BOREHOLE LOG | |
| LOCATION: | British Columbia Institute of Technology<br>3700 Willingdon Avenue, Burnaby, BC | DATE: August 2, 2012 | DRAWN BY: KC — FIGURE: B2 |

| | | | | | |
|---|---|---|---|---|---|
| DATE DRILLED: | August 1, 2012 | INSPECTOR: | K.C. | AUGER HOLE | A3 |
| DRILL METHOD: | AUGER | SURFACE ELEVATION: | 25.0m ± | SHEET 1 OF 1 | |

| DEPTH (ft) | DESCRIPTION OF SOIL AND OBSERVATIONS | Soil Class. Symbol | SAMPLE: Sample Type | SAMPLE: Moisture Content % |
|---|---|---|---|---|
| 0 | **TOPSOIL** | | x | 12.0 |
| 1.5–3 | **FILL** (SU1) - Tan grey, silty, fine grained sand, occ. gravel (compact) | SM | x | 13.0 |
| 3–7 | **SILT** (SU2) - Tan brown mottled, very fine grained, sandy (very stiff) | ML | x | 22.0 |
| 7–9.5 | **SAND** (SU4) - Tan grey, silty, very fine grained, with occ. 1/4" dia. pebbles, weathered till-like (compact) - grades to dense | SM | x | 12.1 |
| 9.5–15.5 | **SAND** (SU5) - Grey, silty, fine grained, with occ. 1/4" dia. pebbles, unweathered till-like (very dense) | SM | x | 11.0 |
| | - grades more silty | | x | 14.5 |
| 15.5–22 | **SAND** (SU5a) - Grey, silty, fine grained, with mica (very dense) | SM | x | 16.3 |
| | - grades cleaner, saturated | | x | 16.2 |
| 22–25 | **SAND** (SU5b) - Grey, clayey, fine grained, occ. 1/4" to 1/2" dia. pebbles, unweathered till-like (very dense) | SC/SM | x | 17.0 |
| | - grades silty, lens of brown | | x | 12.3 |
| | | | x | 12.8 |
| 25 | End of Borehole @ 25 feet | | | |

Water table indicated at approximately 16 ft.




GRAB SAMPLE [x] WATER TABLE ▽

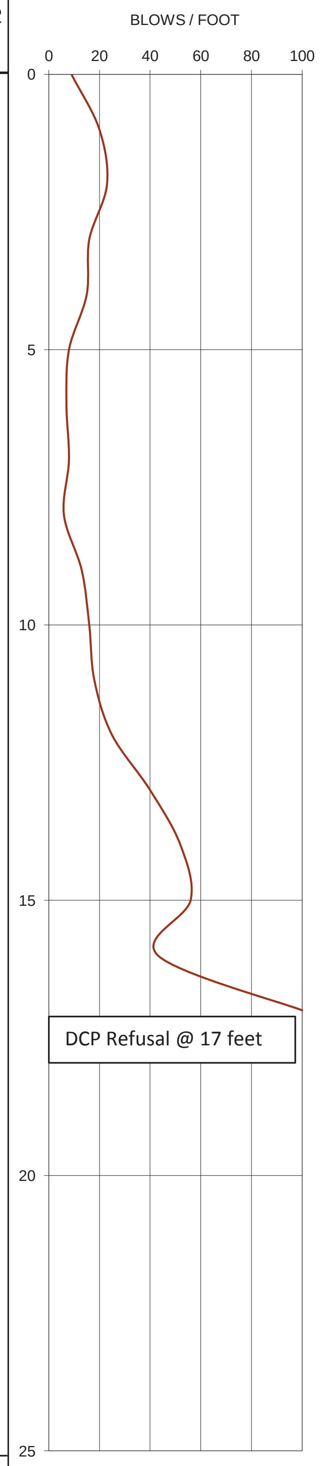
| | | | | |
|---|---|---|---|---|
| PROJECT No: | V12-114 | Centennial Geotechnical Engineers Ltd. Suite 106, 2780 E. Broadway, Vancouver, B.C. V5M 1Y8 | | |
| PROJECT: | Proposed Health Sciences Building | BOREHOLE LOG | | |
| LOCATION: | British Columbia Institute of Technology 3700 Willingdon Avenue, Burnaby, BC | DATE: August 2, 2012 | DRAWN BY: KC | FIGURE: B3 |

| | | | |
|---|---|---|---|
| DATE DRILLED: | August 1, 2012 | INSPECTOR: | K.C. |
| DRILL METHOD: | AUGER | SURFACE ELEVATION: | 27.0m ± |

AUGER HOLE A4
SHEET 1 OF 1

| DEPTH (ft) | DESCRIPTION OF SOIL AND OBSERVATIONS | | Soil Class. Symbol | Sample Type | Moisture Content % |
|---|---|---|---|---|---|
| 0 | **TOPSOIL** | | | [x] | 22.0 |
| | **FILL** (SU1) | - Tan brown, silty sand, with some gravel, till-like (loose to compact) | SM | [x] | 18.5 |
| | | | | [x] | 14.3 |
| 5 | | | | | |
| | **FILL** (SU1a) | - Random, dark brown, silty sand with organic matter (loose) | SM | [x] | 43.8 |
| 10 | **SAND** (SU3) | - Grey, clayey/silty, fine grained, with some organic matter and gravel, till-like (compact) | SC/SM | [x] | 26.2 |
| ▽ | | | | | |
| | **SAND** (SU4) | - Grey, silty, fine grained with some 1/4" to 1/2" dia. pebbles, weathered till-like, saturated (dense) | SM | [x] | 15.5 |
| | | - grades to silty, medium-grained, some 1/2" dia. gravel | | [x] | 30.2 |
| 15 | | - grades sand lens with some 1/4" to 1/2" dia. gravel | | [x] | 23.3 |
| | **SAND** (SU5) | - Grey, clayey, fine grained, with occ. 1/4" dia. pebbles, unweathered till-like (very dense) | SM | [x] | 15.7 |
| 20 | | - grades brown lens, coarse grained, mica, with some organic matter | | [x] | 9.1 |
| | | | | [x] | 15.9 |
| | | - grades silty | | [x] | 13.9 |
| 25 | | End of Borehole @ 25 feet | | | |

**DYNAMIC CONE PENETRATION TEST**




GRAB SAMPLE [x]  WATER TABLE ▽

| | |
|---|---|
| PROJECT No: | V12-114 |
| PROJECT: | Proposed Health Sciences Building |
| LOCATION: | British Columbia Institute of Technology<br>3700 Willingdon Avenue, Burnaby, BC |

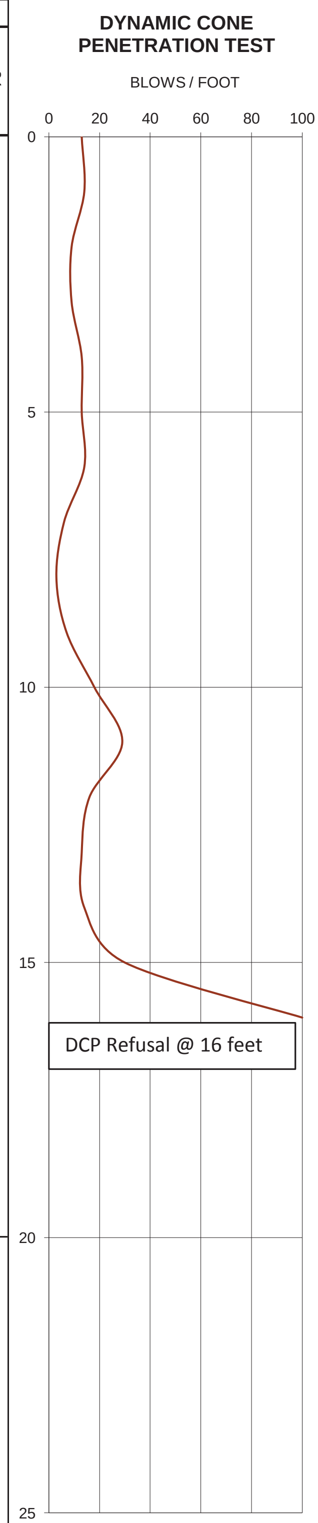
Centennial Geotechnical Engineers Ltd.
Suite 106, 2780 E. Broadway, Vancouver, B.C. V5M 1Y8

BOREHOLE LOG

| DATE: | DRAWN BY: | FIGURE: |
|---|---|---|
| August 2, 2012 | KC | B4 |

| | | | |
|---|---|---|---|
| DATE DRILLED: August 1, 2012 | INSPECTOR: K.C. | AUGER HOLE | A5 |
| DRILL METHOD: AUGER | SURFACE ELEVATION: 30.0m ± | SHEET 1 | OF 1 |

| DEPTH (ft) | DESCRIPTION OF SOIL AND OBSERVATIONS | | Soil Class. Symbol | SAMPLE Sample Type | SAMPLE Moisture Content % |
|---|---|---|---|---|---|
| 0 | **FILL** | - Tan brown, fine grained sand (compact) | SM | | |
| | **FILL** (SU1) | - Tan brown, silty sand, with occ. gravel, till-like (loose) | SM | x | 19.4 |
| | | - grades to tannish grey | | x | 10.7 |
| 5 | | - grades clayey, with some organic matter | | x | 22.1 |
| | | - grades saturated | | x | 21.6 |
| 10 | **FILL** (SU1a) | - Random, dark brown with abundant organic matter (loose) | SM | x | 58.0 |
| ▽ (water table) | | | | | |
| 15 | **FILL** (SU1) | - Grey, clayey/silty, fine grained, some pebbles and organics (compact) | SM | x | 25.3 |
| | **SAND** (SU5) | - Grey, silty, fine-grained, some 1/4" dia. pebbles, unweathered till-like (very dense) | SM | x | 17.8 |
| 20 | | End of Borehole @ 20 feet | | | |
| 25 | | | | | |

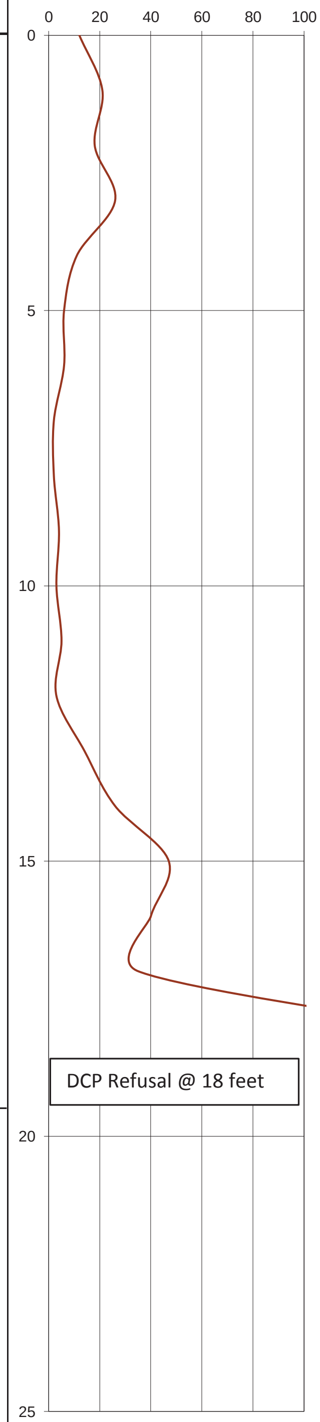



GRAB SAMPLE [x] WATER TABLE ▽

| | | | | |
|---|---|---|---|---|
| PROJECT No: | V12-114 | Centennial Geotechnical Engineers Ltd. Suite 106, 2780 E. Broadway, Vancouver, B.C. V5M 1Y8 | | |
| PROJECT: | Proposed Health Sciences Building | BOREHOLE LOG | | |
| LOCATION: | British Columbia Institute of Technology 3700 Willingdon Avenue, Burnaby, BC | DATE: August 2, 2012 | DRAWN BY: KC | FIGURE: B5 |

| | | | | | |
|---|---|---|---|---|---|
| DATE DRILLED: | August 1, 2012 | INSPECTOR: | K.C. | AUGER HOLE | A6 |
| DRILL METHOD: | AUGER | SURFACE ELEVATION: | 29.0m ± | SHEET 1 OF 1 | |

| DEPTH (ft) | DESCRIPTION OF SOIL AND OBSERVATIONS | Soil Class. Symbol | SAMPLE: Sample Type | SAMPLE: Moisture Content % |
|---|---|---|---|---|
| 0 | **TOPSOIL** | | | |
| | **FILL** - Tan brown, silty fine sand (compact) | SM | | |
| | **FILL** (SU1) - Grey, silty, fine grained sand, with occ pebbles, till-like (loose to compact) | SM | X | 9.0 |
| 5 | | | | |
| | **FILL** (SU1a) - Random, dark brown, some organic matter (loose) | | X | 44.0 |
| 10 | | | X | 39.0 |
| ▽ | | | | |
| | **SAND** (SU4) - Tan brown, silty, fine grained, with occ. 1/4" to 1/2" dia. pebbles, weathered till-like (dense) | SM | X | 12.5 |
| 15 | | | | |
| | **SAND** (SU5) - Grey, clayey, fine grained, with occ. 1/4" to 1/2" dia. pebbles, unweathered till-like (very dense) | SC | X | 16.5 |
| | | | X | 18.3 |
| 20 | End of Borehole @ 19.5 feet | | | |
| 25 | | | | |




GRAB SAMPLE [x] WATER TABLE ▽

| | | | |
|---|---|---|---|
| PROJECT No: | V12-114 | Centennial Geotechnical Engineers Ltd. Suite 106, 2780 E. Broadway, Vancouver, B.C. V5M 1Y8 | |
| PROJECT: | Proposed Health Sciences Building | BOREHOLE LOG | |
| LOCATION: | British Columbia Institute of Technology 3700 Willingdon Avenue, Burnaby, BC | DATE: August 2, 2012 | DRAWN BY: KC / FIGURE: B6 |

# C >

# School of Health Sciences Profile Summary – Functional Adequacy

*(as reported by the Schools)*

School of Health Sciences

| DEPARTMENT | # OF SETS | # of STUDENTS per set | TOTAL | Program Length (yrs) | Program Length (mos) | Total Students |
|---|---|---|---|---|---|---|
| Biomedical Engineering | 2 | 16 | 32 | 2 | 24 | 64 |
| BSN Nursing | 4 | 24 | 96 | 3 | 36 | 576 |
| Cardiology | 0 | 25 | 0 | | | 0 |
| Clinical Genetics | 1 | 12 | 12 | 1 | 13.5 | 12 |
| Critical Care | 3 | 40 | 120 | | | 120 |
| Emergency | 3 | 30 | 90 | | | 90 |
| ENPY | 1 | 12 | 12 | 2 | 24 | 12 |
| High Acuity | 3 | 30 | 90 | | | 90 |
| Medical Laboratory Science | 4 | 20 | 80 | 2.5 | 30 | 200 |
| Medical Radiation | 4 | 20 | 80 | 2 | 24 | 160 |
| Neonatal | 3 | 16 | 48 | | | 48 |
| Nephrology | 3 | 12 | 36 | | | 36 |
| Nuclear Medicine | 1 | 16 | 16 | 2 | 24 | 32 |
| Pediatrics | 3 | 8 | 24 | | | 24 |
| Perfusion | 1 | 7 | 7 | 2 | 24 | 0 |
| Perinatal | 3 | 20 | 60 | | | 60 |
| Perioperative | 3 | 12 | 36 | | | 36 |
| Prosthetics & Orthotics | 1 | 12 | 12 | 2 | 24 | 24 |
| Radiation Therapy | 1 | 22 | 22 | 2.75 | 33 | 66 |
| Sonograpghy | 4 | 12 | 48 | 2 | 24 | 96 |
| Total | 47 | | 909 | 21.25 | 256.5 | 1746 |

## School of Health Sciences

| Description | Building | Floor | Room | Room Area ($m^2$) | Converted Area (sf) | BCIT Room Standard | Division Code | Org Code | Q#2 - Department using Space | Q#3 - Specialty Equipment/ Single Use | Q#4 - Existing Need/Condition: Completely unsatisfactory, Unsatisfactory or Satisfactory | Q#5 - Future Need | Q#7 - # of Students Using Space at one time (capacity) | #8 - Space Utilization | Additional Comments | FIS Code |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lecture Theatre (General Use) | SW01 | 01 | 1021 | 116.72 | 1255.91 | LECTURE | Unassigned Classroom Seminar | 461003 | MLSC; MRAD; NURS | Yes | Satisfactory | Meets | 93 | high>75% | 3D4600 - 461003 | BT2868 |
| Lecture Theatre (General Use) | SW01 | 01 | 1025 | 116.71 | 1255.80 | LECTURE | Unassigned Classroom Seminar | 461003 | MLSC; MRAD; | Yes | Satisfactory | Meets | 94 | high>75% | | BT2873 |
| Lecture Theatre (General Use) | SW01 | 01 | 1205 | 255.33 | 2747.35 | LECTURE | Unassigned Classroom Seminar | 461003 | MLSC | Yes | Satisfactory | Meets | 233 | high>75% | 3D4600 - 461003 | BT2922 |
| Food Tech Lab | SW01 | 01 | 1225 | 91.34 | 982.82 | LAB-LSCI-G | 3D1400 | 142211 | Food Technology | Yes | Satisfactory | Meets | 15 | high>75% | | BT2931 |
| Autoclave room | SW01 | 01 | 1229 | 8.92 | 95.98 | STOR-GEN | 3D1400 | 142211 | Food Technology | Yes | Satisfactory | Meets | n/a | n/a | | BT2932 |
| Storage | SW01 | 01 | 1220 | | | STOR-GEN | 3D1400 | | Occupational Health & Safety | Yes | Satisfactory | Meets | n/a | n/a | | |
| Storage | SW01 | 01 | 1224 | | | STOR-GEN | 3D1400 | | Occupational Health & Safety | Yes | Satisfactory | Meets | n/a | n/a | | |
| | SW01 | 01 | 1230 | 73.40 | 789.78 | LAB-LSCI-S | 3D1400 | 141302 | Occupational Health & Safety | Yes | Satisfactory | Meets | 10 | high>75% | | BT2933 |
| Classroom | SW01 | 01 | 1239 | 65.37 | 703.38 | Classroom | 3D1400 | 142211 | Food Technology | Yes | Satisfactory | Meets | 13 | high>75% | | BT2934 |
| | SW01 | 01 | 1240 | 79.09 | 851.01 | LAB-LSCI-S | 3D1400 | 141302 | Occupational Health & Safety | Yes | Satisfactory | Meets | 11 | high>75% | | BT2935 |
| Storage | SW01 | 01 | 1245 | 3.55 | 38.20 | STOR-GEN | 3D1400 | 142211 | Food Technology | Yes | Satisfactory | Meets | n/a | n/a | | BT2939 |
| | SW01 | 01 | 1249 | 70.62 | 759.87 | Lab | 3D1400 | 142211 | Food Technology | Yes | Satisfactory | Meets | 16 | high>75% | | BT2940 |
| Computer Lab | SW01 | 01 | 1250 | 15.60 | 167.86 | Computer lab | 3D1400 | 141201 | Environmental Health | Yes | Satisfactory | Meets | 2 | high>75% | | BT2941 |
| Balance room | SW01 | 01 | 1262 | 2.60 | 27.98 | SUPP-INST | 3D1400 | 142211 | Environmental Health | Yes | Satisfactory | Meets | n/a | n/a | | BT2946 |
| Freezer | SW01 | 01 | 1265 | 9.05 | 97.38 | FOOD-CLDST | 3D1400 | 142211 | Food Technology | Yes | Satisfactory | Meets | n/a | n/a | | BT2947 |
| Cooler | SW01 | 01 | 1275 | 8.25 | 88.77 | FOOD-CLDST | 3D1400 | 142211 | Food Technology | Yes | Satisfactory | Meets | n/a | n/a | | BT2948 |
| Pilot Plant | SW01 | 01 | 1285 | 160.52 | 1727.20 | FOOD-PREP | 3D1400 | 142211 | Food Technology | Yes | Satisfactory | Meets | 24 | medium 25-50% | | BT2950 |
| Storage | SW01 | 01 | 1289 | | | STOR-GEN | 3D1400 | | Food Technology | Yes | Satisfactory | Meets | n/a | n/a | | |
| Storage | SW01 | 01 | 1295 | | | STOR-GEN | 3D1400 | | Food Technology | Yes | Satisfactory | Meets | n/a | n/a | | |
| Generally timetabled classroom | SW01 | 02 | 2004 | 55.94 | 601.91 | CLASS | 3D4600 | 461003 | BIOT; BMET; ENVI; MLSC; NMED; OCHS | Yes | Satisfactory | Meets | 24 | high>75% | 3D4600 - 461003 | BT3038 |
| Generally timetabled classroom | SW01 | 02 | 2005 | 112.26 | 1207.92 | CLASS | 3D4600 | 461003 | BMET; OCHS; | Yes | Satisfactory | Meets | 70 | high>75% | 3D4600 - 461003 | BT3039 |
| Generally timetabled classroom | SW01 | 02 | 2009 | 105.41 | 1134.21 | CLASS | 3D4600 | 461003 | BIOT; BMET; ENVI; OCHS; | Yes | Satisfactory | Meets | 60 | high>75% | | BT3040 |
| Generally timetabled classroom | SW01 | 02 | 2016 | 84.90 | 913.52 | CLASS | 3D4600 | 461003 | BIOT; BMET; ENVI; MLSC | Yes | Satisfactory | Meets | 40 | high>75% | 3D4600 - 461003 | BT6694 |
| Generally timetabled classroom | SW01 | 02 | 2020 | 97.72 | 1051.47 | CLASS | 3D4600 | 461003 | BIOT; BMET; ENVI; FOD; MLSC; NMED | Yes | Satisfactory | Meets | 60 | high>75% | 3D4600 - 461003 | BT3044 |
| Generally timetabled classroom | SW01 | 02 | 2030 | 114.49 | 1231.91 | CLASS | 3D4600 | 461003 | BMET; ENVI; FOOD; NMED | Yes | Satisfactory | Meets | 70 | high>75% | 3D4600 - 461003 | BT3049 |
| Pilot Plant - mezzanine storage | SW01 | 02 | 2250 | 34.23 | 368.31 | STOR-GEN | 3D1400 | 142217 | | Yes | Satisfactory | Meets | n/a | n/a | | BT3110 |
| Pilot Plant - mezzanine storage | SW01 | 02 | 2280 | 21.13 | 227.36 | STOR-GEN | 3D1400 | 142217 | Food Process Resource Centre | Yes | Satisfactory | Meets | n/a | n/a | | BT3112 |
| Generally timetabled classroom | SW01 | 02 | 2590 | 51.59 | 555.11 | CLASS | Unassigned Classroom Seminar | 461003 | BIOT; ENVI; FOOD; MLSC; NMED; OCHS | Yes | Satisfactory | Meets | 27 | high>75% | 3D4600 - 461003 | BT3185 |
| Generally timetabled classroom | SW01 | 03 | 3005 | 57.05 | 614.11 | CLASS | Unassigned Classroom Seminar | 461003 | ENVI; OCHS | Yes | Satisfactory | Meets | 30 | high>75% | 3D4600 - 461003 | BT4833 |
| | SW01 | 03 | 3021 | 112.82 | 1214.40 | LAB-LSCI-G | 3D1400 | 141302 | Occupational Health & Safety | Yes | Satisfactory | Meets | 18 | high>75% | | BT4831 |
| Storage | SW01 | 03 | 3115 | 33.36 | 359.07 | STOR-GEN | 3D1400 | | Environmental Health | Yes | Satisfactory | Meets | n/a | n/a | | BT4837 |
| Generally timetabled classroom | SW01 | 03 | 3150 | 65.90 | 709.41 | CLASS | Unassigned Classroom Seminar | 461003 | BIOT; BMET; FOOD; MLSC; NMED; RADT | Yes | Satisfactory | Meets | 40 | high>75% | 3D4600 - 461003 | BT4823 |
| Generally timetabled classroom | SW01 | 03 | 3170 | 66.56 | 716.47 | CLASS | Unassigned Classroom Seminar | 461003 | BIOT; BMET; ENVI; FOOD;NMED; RADT | Yes | Satisfactory | Meets | 40 | high>75% | 3D4600 - 461003 | BT4824 |
| Generally timetabled classroom | SW01 | 03 | 3190 | 65.90 | 709.40 | CLASS | Unassigned Classroom Seminar | 461003 | BIOT; BMET | Yes | Satisfactory | Meets | 38 | high>75% | 3D4600 - 461003 | BT6638 |
| Clinical Genetics | SW01 | 03 | 3155 | 54.37 | 585.30 | LAB-LSCI-G | 3D1400 | 142202 | Clinical Genetics | Yes | Satisfactory | Meets | 7 | high>75% | | BT4822 |
| | SW01 | 03 | 3175 | 67.02 | 721.45 | LAB-LSCI-G | 3D1400 | 142202 | Clinical Genetics | Yes | Satisfactory | Meets | 9 | high>75% | | BT6426 |
| | SW01 | 03 | 3185 | 32.94 | 354.62 | SUPP-INST | 3D1400 | | Clinical Genetics | Yes | Yes | Meets | 15 | medium 25-50% | | BT4817 |
| Generally timetabled classroom | SW01 | 03 | 3195 | 32.28 | 347.50 | CLASS | Unassigned Classroom Seminar | 461003 | RADT | Yes | Satisfactory | Meets | 14 | high>75% | 3D4600 - 461003 | BT6639 |
| VERT lab | SW01 | 03 | 3550 | 66.50 | 715.82 | LAB-COMP-G | 3D1400 | 142210 | Radiation Therapy | Yes | Satisfactory | Meets | 19 | high>75% | Renovated in 2010 to accommodate VERT Equipment | BT4845 |
| VERT lab | SW01 | 03 | 3560 | 33.27 | 358.11 | LAB-LSCI-G | 3D1400 | 142207 | Radiation Therapy | Yes | Satisfactory | Meets | 4 | high>75% | Renovated in 2010 to accommodate VERT Equipment | BT645 |
| Generally timetabled classroom | SW01 | 03 | 3570 | 44.68 | 480.96 | CLASS | Unassigned Classroom Seminar | 461003 | ENVI; FOOD; MRAD; RADT | Yes | Satisfactory | Meets | 24 | high>75% | 3D4600 - 461003 | BT4849 |
| Microbiology Lab | SW01 | 04 | 4002 | 147.04 | 1582.76 | LAB-LSCI-S | 3D1400 | 142201 | Medical Laboratory | Yes | Satisfactory | Meets | 21 | high>75% | | BT3228 |
| | SW01 | 04 | 4004 | 3.89 | 41.90 | SUPP-INST | 3D1400 | | Medical Laboratory | Yes | Unsatisfactory | No | n/a | n/a | Requires additional office space (currently 3 AI staff are in SW01-3535 somewhat removed from the program). Program will require simulation space as per functional program document. | BT3229 |

| Description | Building | Floor | Room | Room Area ($m^2$) | Converted Area (sf) | BCIT Room Standard | Division Code | Org Code | Q#2 - Department using Space | Q#3 - Specialty Equipment/ Single Use | Q#4 - Existing Need/Condition: Completely unsatisfactory, Unsatisfactory or Satisfactory | Q#5 - Future Need | Q#7 - # of Students Using Space at one time (capacity) | #8 - Space Utilization | Additional Comments | FIS Code |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Histology Lab | SW01 | 04 | 4005 | 137.16 | 1476.38 | LAB-LSCI-G | 3D1400 | 142201 | Medical Laboratory | Yes | Satisfactory | Meets | 19 | high>75% | | BT3230 |
| | SW01 | 04 | 4006 | 16.10 | 173.27 | SUPP-INST | 3D1400 | | Medical Laboratory | Yes | Satisfactory | Meets | n/a | n/a | | BT3231 |
| Storage | SW01 | 04 | 4007 | 3.30 | 35.49 | STOR-GEN | 3D1400 | | Medical Laboratory | Yes | Satisfactory | Meets | n/a | n/a | | BT6134 |
| Wash Up area | SW01 | 04 | 4008 | 18.18 | 195.70 | WASHUP | 3D1400 | | Medical Laboratory | Yes | Satisfactory | Meets | ? | high>75% | | BT3233 |
| Transfusion Lab | SW01 | 04 | 4009 | 136.56 | 1469.97 | LAB-LSCI-G | 3D1400 | 142201 | Medical Laboratory | Yes | Satisfactory | Meets | 19 | high>75% | | BT3234 |
| | SW01 | 04 | 4012 | 15.25 | 164.17 | SUPP-INST | 3D1400 | | Medical Laboratory | Yes | Satisfactory | Meets | n/a | n/a | | BT3237 |
| | SW01 | 04 | 4014 | 14.98 | 161.29 | SUPP-INST | 3D1400 | | Medical Laboratory | Yes | Satisfactory | Meets | n/a | n/a | | BT3239 |
| Chemistry Lab | SW01 | 04 | 4015 | 141.92 | 1527.68 | LAB-LSCI-G | 3D1400 | 142201 | Medical Laboratory | Yes | Satisfactory | Meets | 20 | high>75% | | BT6387 |
| | SW01 | 04 | 4016 | 16.12 | 173.49 | SUPP-INST | 3D1400 | | Medical Laboratory | Yes | Satisfactory | Meets | n/a | n/a | | BT3240 |
| | SW01 | 04 | 4018 | 15.05 | 162.01 | SUPP-INST | 3D1400 | | Medical Laboratory | Yes | Satisfactory | Meets | n/a | n/a | | BT3241 |
| Storage | SW01 | 04 | 4019 | 14.58 | 156.94 | STOR-GEN | 3D1400 | | Medical Laboratory | Yes | Satisfactory | Meets | n/a | n/a | | BT3242 |
| | SW01 | 04 | 4020 | 14.67 | 157.92 | SUPP-INST | 3D1400 | | Medical Laboratory | Yes | Satisfactory | Meets | n/a | n/a | | BT3243 |
| Storage | SW01 | 04 | 4022 | 5.81 | 62.56 | STOR-GEN | 3D1400 | | Medical Laboratory | Yes | Satisfactory | Meets | n/a | n/a | | BT3246 |
| | SW01 | 04 | 4023 | 36.52 | 393.07 | SUPP-INST | 3D1400 | | Medical Laboratory | Yes | Satisfactory | Meets | n/a | n/a | | BT3247 |
| Food storage | SW01 | 04 | 4024 | 5.55 | 59.79 | FOOD-CLDST | 3D1400 | | Medical Laboratory | Yes | Satisfactory | Meets | n/a | n/a | | BT3248 |
| | SW01 | 04 | 4025 | 27.27 | 293.57 | SUPP-INST | 3D1400 | 142206 | Medical Radiography | Yes | Satisfactory | Meets | n/a | n/a | Painted in 2011 | BT3249 |
| Storage | SW01 | 04 | 4026 | 3.68 | 39.59 | STOR-GEN | 3D1400 | | Medical Laboratory | Yes | Satisfactory | Meets | n/a | n/a | | BT3250 |
| | SW01 | 04 | 4033 | 28.27 | 304.30 | SUPP-INST | 3D1400 | 142206 | Medical Radiography | Yes | Satisfactory | Meets | n/a | n/a | Painted in 2011 | BT3254 |
| Hemotology Lab | SW01 | 04 | 4034 | 138.98 | 1495.97 | LAB-LSCI-G | 3D1400 | 142201 | Medical Laboratory | Yes | Satisfactory | Meets | 19 | high>75% | | BT3255 |
| | SW01 | 04 | 4035 | 43.75 | 470.94 | LAB-LSCI-G | 3D1400 | 142206 | Medical Radiography | Yes | Satisfactory | Meets | 6 | high>75% | Painted in 2011 | BT3256 |
| | ~~SW01~~ | ~~04~~ | ~~4037~~ | ~~9.68~~ | ~~104.24~~ | ~~SUPP-INST~~ | ~~3D1400~~ | | ~~Medical Radiography~~ | ~~Yes~~ | ~~Satisfactory~~ | ~~Meets~~ | ~~n/a~~ | ~~n/a~~ | ~~This was a darkrooms which was removed summer 2011. Room 4037 no longer exists.~~ | ~~BT3258~~ |
| Computer Lab | SW01 | 04 | 4042 | 37.02 | 398.49 | LAB-LSCI-S | 3D1400 | 142206 | Medical Radiography | Yes | Satisfactory | Meets | 12 | high>75% | Computer Lab | BT3263 |
| | SW01 | 04 | 4044 | 14.67 | 157.92 | SUPP-INST | 3D1400 | 142206 | Medical Radiography | Yes | Satisfactory | Meets | n/a | n/a | Painted in 2011 | BT3265 |
| | SW01 | 04 | 4045 | 17.46 | 187.90 | SUPP-INST | 3D1400 | 142206 | Medical Radiography | Yes | Satisfactory | Meets | n/a | n/a | Painted in 2011 | BT3262 |
| | SW01 | 04 | 4046 | 1.81 | 19.50 | LAB-LSCI-S | 3D1400 | 142206 | Medical Radiography | Yes | Satisfactory | Meets | ? | high>75% | Painted in 2011 | BT3267 |
| | SW01 | 04 | 4047 | 17.61 | 189.52 | SUPP-INST | 3D1400 | 142206 | Medical Radiography | Yes | Satisfactory | Meets | n/a | n/a | Painted in 2011 | BT3266 |
| | SW01 | 04 | 4048 | 17.83 | 191.96 | SUPP-INST | 3D1400 | 142206 | Medical Radiography | Yes | Satisfactory | Meets | n/a | n/a | Painted in 2011 | BT3269 |
| | SW01 | 04 | 4049 | 15.46 | 166.46 | SUPP-INST | 3D1400 | 142206 | Medical Radiography | Yes | Satisfactory | Meets | n/a | n/a | Painted in 2011 | BT3264 |
| Storage & Dark room | SW01 | 04 | 4050 | 15.87 | 170.86 | SUPP-INST | 3D1400 | | Med Rad; Clinical Genetics; Bio Med | Yes | Satisfactory | Meets | n/a | n/a | Storage rooms shared by these program including a Dark room | BT3272 |
| | SW01 | 04 | 4051 | 15.59 | 167.83 | SUPP-INST | 3D1400 | | Medical Radiography | Yes | Satisfactory | Meets | n/a | n/a | Painted in 2011 | BT3268 |
| Storage | SW01 | 04 | 4052 | 15.29 | 164.56 | STOR-GEN | 3D1400 | | Medical Laboratory | Yes | Satisfactory | Meets | n/a | n/a | | BT3274 |
| | SW01 | 04 | 4053 | 18.91 | 203.60 | SUPP-INST | 3D1400 | 143202 | Prosthetics Orthotics | Yes | Unsatisfactory | No | n/a | n/a | Ventilation needs to be done in this area. | BT3275 |
| Lunch room | SW01 | 04 | 4054 | 14.56 | 156.76 | STAFF | 3D1400 | 142206 | Medical Radiography | Yes | Satisfactory | Meets | n/a | n/a | | BT3276 |
| | SW01 | 04 | 4055 | 20.96 | 225.62 | LOBBY | 3D1400 | 143202 | Prosthetics Orthotics | Yes | Unsatisfactory | No | n/a | n/a | Ventilation needs to be done in this area. | BT3278 |
| Classroom | SW01 | 04 | 4057 | 42.88 | 461.56 | Classroom | 3D1400 | 143202 | Prosthetics Orthotics | Yes | Satisfactory | Meets | 3 | high>75% | | BT3280 |
| | ~~SW01~~ | ~~04~~ | ~~4059~~ | ~~7.43~~ | ~~79.93~~ | ~~STOR-GEN~~ | ~~3D1400~~ | | | | ~~n/a~~ | | | | ~~Room no longer exists~~ | ~~BT4708~~ |
| Computer Lab | SW01 | 04 | 4060 | 68.90 | 741.67 | LAB-LSCI-G | 3D1400 | 142206 | Medical Radiography | Yes | Satisfactory | Meets | 20 | high>75% | | BT6388 |
| Assessment Room | SW01 | 04 | 4061 | 27.75 | 298.75 | Lab | 3D1400 | 143202 | Prosthetics Orthotics | Yes | Satisfactory | Meets | ? | high>75% | | BT3282 |
| Machine room | SW01 | 04 | 4063 | 29.64 | 319.00 | SUPP-INST | 3D1400 | 143202 | Prosthetics Orthotics | Yes | Satisfactory | Meets | n/a | n/a | | BT3284 |
| Storage | SW01 | 04 | 4064 | 25.55 | 274.99 | STOR-GEN | 3D1400 | | Prosthetics Orthotics | Yes | Satisfactory | Meets | n/a | n/a | | BT3285 |
| | SW01 | 04 | 4065 | 89.76 | 966.19 | LAB-LSCI-G | 3D1400 | 143202 | Prosthetics Orthotics | Yes | Satisfactory | Meets | 12 | high>75% | | BT3286 |
| Storage | SW01 | 04 | 4066 | 16.14 | 173.71 | STOR-GEN | 3D1400 | | Prosthetics Orthotics | Yes | Satisfactory | Meets | n/a | n/a | | BT3287 |
| | SW01 | 04 | 4067 | 21.95 | 236.24 | LAB-LSCI-G | 3D1400 | 143202 | Prosthetics Orthotics | Yes | Satisfactory | Meets | 16 | high>75% | | BT3288 |
| | SW01 | 04 | 4070 | 6.91 | 74.41 | SUPP-INST | 3D1400 | | Specialty Nursing | Yes | Satisfactory | Meets | n/a | n/a | | BT3290 |
| | SW01 | 04 | 4072 | 58.23 | 626.85 | LAB-LSCI-G | 3D1400 | | Specialty Nursing | Yes | Satisfactory | Meets | 8 | high>75% | Painted in 2011 | BT3291 |
| Classroom | SW01 | 04 | 4076 | 84.50 | 909.60 | Classroom | 3D1400 | | Specialty Nursing | Yes | Satisfactory | Meets | 12 | high>75% | | BT3292 |
| | ~~SW01~~ | ~~04~~ | ~~4216~~ | ~~10.80~~ | ~~116.22~~ | ~~STOR-GEN~~ | ~~3D1400~~ | | ~~Medical Radiography~~ | | ~~n/a~~ | | | | | ~~BT3300~~ |
| Lecture Theatre (General Use) | SW03 | 01 | 1710 | 140.15 | 1508.01 | LECTURE | Unassigned Classroom Seminar | 461003 | MLSC; MRAD | Yes | Satisfactory | Meets | 112 | High >75% | 3D4600 - 461003 | BT3566 |
| Lecture Theatre (General Use) | SW03 | 01 | 1750 | 147.25 | 1584.41 | LECTURE | Unassigned Classroom Seminar | 461003 | MLSC; MRAD | Yes | Satisfactory | Meets | 110 | High >75% | 3D4600 - 461003 | BT3570 |
| Classroom | SW03 | 02 | 2605 | 120.53 | 1297.40 | CLASS | 3D1400 | | Specialty Nursing | Yes | Satisfactory | Meets | 80 | High >75% | | BT3616 |
| Classroom | SW03 | 02 | 2620 | 35.67 | 383.96 | CLASS | 3D1400 | | Food Technology | Yes | Satisfactory | Meets | 10 | High >75% | | BT3624 |
| Lab area | SW03 | 02 | 2624 | 30.04 | 323.37 | STOR-GEN | 3D1400 | | Food Technology | Yes | Satisfactory | Meets | n/a | n/a | | BT3625 |
| ~~Classroom~~ | ~~SW03~~ | ~~02~~ | ~~2630~~ | ~~26.33~~ | ~~283.42~~ | ~~CLASS~~ | ~~3D1400~~ | | ~~Food Technology~~ | | | | ~~?~~ | | ~~could not locate room~~ | ~~BT3628~~ |
| | SW03 | 02 | 2660 | 96.94 | 1043.54 | LAB-LSCI-G | 3D1400 | | Food Technology | Yes | Satisfactory | Meets | 16 | High >75% | Shared use with BioTech and Fish Wildlife programs | BT3635 |
| | SW03 | 02 | 2680 | 97.31 | 1047.47 | LAB-LSCI-G | 3D1400 | | Food Technology | Yes | Satisfactory | Meets | 16 | High >75% | | BT3637 |
| Classroom | SW03 | 02 | 2684 | 11.42 | 122.95 | CLASS | 3D1400 | | Food Technology | Yes | Satisfactory | Meets | ? | High >75% | | BT3638 |
| Storage | SW03 | 02 | 2688 | 12.64 | 136.04 | SUPP-INST | 3D1400 | | Food Technology | Yes | Satisfactory | Meets | n/a | n/a | | BT3639 |
| Storage | SW03 | 02 | 2690 | 7.08 | 76.22 | STOR-GEN | 3D1400 | | Food Technology | Yes | Satisfactory | Meets | n/a | n/a | | BT3640 |
| Classroom | SW03 | 02 | 2715 | 68.77 | 740.28 | CLASS | 3D1400 | | Specialty Nursing | Yes | Satisfactory | Meets | 35 | High >75% | | BT3649 |
| Storage | SW03 | 02 | 2725 | 29.83 | 321.07 | STOR-GEN | 3D1400 | | Specialty Nursing | Yes | Satisfactory | Meets | n/a | n/a | | BT3647 |
| Generally timetabled classroom | SW03 | 02 | 2745 | 48.35 | 520.45 | CLASS | 3D3490 | | ENVI | Yes | Satisfactory | Meets | 32 | High >75% | 3D4600 - 461003 | BT3651 |
| Generally timetabled classroom | SW03 | 02 | 2765 | 59.46 | 640.07 | CLASS | 3D3490 | | BIOT; FOOD; NMED | Yes | Satisfactory | Meets | 29 | High >75% | 3D4600 - 461003 | BT3655 |
| Generally timetabled classroom | SW03 | 03 | 3615 | 120.72 | 1298.95 | CLASS | 3D3490 | | ENVI; NMED | Yes | Satisfactory | Meets | 17 | High >75% | 3D4600 - 461003 | BT3723 |
| Storage | SW03 | 03 | 3716 | 0.66 | 7.10 | STOR-GEN | 3D1400 | | Dean's office | Yes | Satisfactory | Meets | n/a | n/a | | BT3742 |

| Description | Building | Floor | Room | Room Area ($m^2$) | Converted Area (sf) | BCIT Room Standard | Division Code | Org Code | Q#2 - Department using Space | Q#3 - Specialty Equipment/ Single Use | Q#4 - Existing Need/Condition: Completely unsatisfactory, Unsatisfactory or Satisfactory | Q#5 - Future Need | Q#7 - # of Students Using Space at one time (capacity) | #8 - Space Utilization | Additional Comments | FIS Code |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Classroom | SW03 | 04 | 4675 | 63.00 | 678.19 | CLASS | 3D1400 | | Nursing RN | Yes | Unsatisfactory | No | 16 | High >75% | Classrooms require upgrading and capacity is not sufficient for 96 students. | BT7941 |
| Classroom | SW03 | 04 | 4695 | 74.05 | 797.10 | CLASS | 3D1400 | | Nursing RN | Yes | Unsatisfactory | No | 16 | High >75% | Classrooms require upgrading and capacity is not sufficient for 96 students. | BT3827 |
| Generally timetabled classroom | SW03 | 04 | 4725 | 59.63 | 641.87 | CLASS | Unassigned Classroom Seminar | 461003 | BIOT; BMET; FOOD; NURS; OCHS; RADT | Yes | Satisfactory | Meets | 30 | High >75% | 3D4600 - 461003 | BT3836 |
| Generally timetabled classroom | SW03 | 04 | 4785 | 51.97 | 559.47 | CLASS | Unassigned Classroom Seminar | 461003 | NURS | Yes | Satisfactory | Meets | 24 | High >75% | | BT3842 |
| office | SW01 | 01 | 1235 | 10.32 | 111.04 | OFFICE | 3D1400 | 142211 | Food Technology | Yes | Satisfactory | Meets | n/a | n/a | | BT6374 |
| office | SW01 | 01 | 1255 | 13.44 | 144.61 | OFFICE | 3D1400 | 142211 | Food Technology | Yes | Satisfactory | Meets | n/a | n/a | | BT2942 |
| Environmental Health | SW01 | 03 | 3130 | 59.16 | 636.76 | OFFICE | 3D1400 | | Environmental Health | Yes | Satisfactory | Meets | n/a | n/a | used to be 3120, 3124, 3126, 3130, 3140 | BT4816 |
| office | SW01 | 03 | 3135 | 14.22 | 153.07 | OFFICE | 3D1400 | | Radiation Therapy | Yes | Satisfactory | Meets | n/a | n/a | | BT4827 |
| office | SW01 | 03 | 3145 | 14.46 | 155.64 | OFFICE | 3D1400 | | Clinical Genetics | Yes | Satisfactory | Meets | n/a | n/a | | BT4825 |
| office | SW01 | 03 | 3149 | 11.17 | 120.25 | OFFICE | 3D1400 | | Clinical Genetics | Yes | Satisfactory | Meets | n/a | n/a | | BT4826 |
| office | SW01 | 03 | 3520 | 16.28 | 175.25 | OFFICE | 3D1400 | | Biomedical Engineering | Yes | Satisfactory | Meets | n/a | n/a | Newly renovated in 2011 | BT3220 |
| office | SW01 | 03 | 3525 | 59.37 | 639.10 | OFFICE | 3D1400 | | Med Lab; Rad Therapy; Clinical Genetics | Yes | Satisfactory | Meets | n/a | n/a | Consolidated space 3509, 3525, 3535 and 3545 | BT4839 |
| office | SW01 | 03 | 3530 | 22.10 | 237.91 | OFFICE | 3D1400 | | Biomedical Engineering | Yes | Satisfactory | Meets | n/a | n/a | Newly renovated in 2011 | BT3294 |
| office | SW01 | 03 | 3540 | 19.10 | 205.59 | OFFICE | 3D1400 | | Prosthetics & Orthotics | Yes | Satisfactory | Meets | n/a | n/a | | BT4854 |
| office | SW01 | 04 | 4028 | 6.70 | 72.09 | OFFICE | 3D1400 | | Medical Laboratory | Yes | Satisfactory | Meets | n/a | n/a | | BT3252 |
| office | SW01 | 04 | 4030 | 10.12 | 108.91 | OFFICE | 3D1400 | | Medical Laboratory | Yes | Satisfactory | Meets | n/a | n/a | | BT3253 |
| office | SW01 | 04 | 4056 | 41.29 | 444.50 | OFFICE | 3D1400 | 142206 | Medical Radiography | Yes | Satisfactory | Meets | n/a | n/a | Was combined with 4058 to create faculty office space | BT3279 |
| office | SW01 | 04 | 4058 | 1.00 | 10.73 | OFFICE | 3D1400 | 142206 | Medical Radiography | Yes | Satisfactory | Meets | n/a | n/a | Was combined with 5056 to create office space for faculty | BT3281 |
| office | SW03 | 02 | 2075 | 280.47 | 3017.86 | OFFICE | 3D1400 | | Food Technology | Yes | Satisfactory | Meets | n/a | n/a | | BT3601 |
| office | SW03 | 02 | 2644 | 32.33 | 347.99 | OFFICE | 3D1400 | | Food Technology | Yes | Satisfactory | Meets | n/a | n/a | | BT3632 |
| office | SW03 | 03 | 3081 | 15.85 | 170.55 | OFFICE | 3D1400 | | Medical Laboratory | Yes | Satisfactory | Meets | n/a | n/a | Recarpeted in 2011 | BT3700 |
| office | SW03 | 03 | 3083 | 26.07 | 280.51 | OFFICE | 3D1400 | | Basic Health Sciences | Yes | Satisfactory | Meets | n/a | n/a | | BT3701 |
| office | SW03 | 03 | 3085 | 26.07 | 280.51 | OFFICE | 3D1400 | | Basic Health Sciences | Yes | Satisfactory | Meets | n/a | n/a | | BT3702 |
| office | SW03 | 03 | 3086 | 15.85 | 170.55 | OFFICE | 3D1400 | | Basic Health Sciences | Yes | Satisfactory | Meets | n/a | n/a | | BT3703 |
| office | SW03 | 03 | 3087 | 26.07 | 280.51 | OFFICE | 3D1400 | | Occupational Health & Safety | Yes | Satisfactory | Meets | n/a | n/a | | BT3704 |
| office | SW03 | 03 | 3088 | 26.07 | 280.51 | OFFICE | 3D1400 | | Medical Laboratory | Yes | Satisfactory | Meets | n/a | n/a | | BT6402 |
| Medical Laboratory | SW03 | 03 | 3089 | 26.07 | 280.51 | OFFICE | 3D1400 | | | | n/a | | | | | BT3705 |
| office | SW03 | 03 | 3090 | 26.07 | 280.51 | OFFICE | 3D1400 | | Basic Health Sciences | Yes | Satisfactory | Meets | n/a | n/a | | BT3706 |
| Medical Laboratory | SW03 | 03 | 3091 | 16.30 | 175.39 | OFFICE | 3D1400 | | Occupational Health & Safety | Yes | Satisfactory | Meets | n/a | n/a | | BT3707 |
| Medical Laboratory | SW03 | 03 | 3092 | 26.07 | 280.51 | OFFICE | 3D1400 | | | | n/a | | | | | BT3708 |
| Medical Laboratory | SW03 | 03 | 3093 | 8.33 | 89.63 | OFFICE | 3D1400 | | Medical Laboratory | Yes | Satisfactory | Meets | n/a | n/a | | BT3709 |
| Health Care Mngt, Medical Imaging, Program Asst, Nuclear Med | SW03 | 03 | 3094 | 26.07 | 280.51 | OFFICE | 3D1400 | | | | n/a | | | | | BT3710 |
| office | SW03 | 03 | 3705 | 52.68 | 566.84 | OFFICE | 3D1400 | | Dean's Office | Yes | Satisfactory | Meets | n/a | n/a | | BT3738 |
| office | SW03 | 03 | 3711 | 14.46 | 155.59 | OFFICE | 3D1400 | | Dean's Office | Yes | Satisfactory | Meets | n/a | n/a | Repainted and recarpeted in recent years | BT3740 |
| office | SW03 | 03 | 3715 | 25.98 | 279.54 | OFFICE | 3D1400 | | Dean's Office | Yes | Satisfactory | Meets | n/a | n/a | Repainted and recarpeted in recent years | BT3741 |
| office | SW03 | 03 | 3721 | 14.54 | 156.45 | OFFICE | 3D1400 | | Dean's Office | Yes | Satisfactory | Meets | n/a | n/a | | BT3743 |
| office | SW03 | 03 | 3725 | 22.13 | 238.12 | OFFICE | 3D1400 | | Dean's Office | Yes | Satisfactory | Meets | n/a | n/a | | BT3744 |
| office | SW03 | 03 | 3731 | 14.54 | 156.45 | OFFICE | 3D1400 | | Dean's Office | Yes | Satisfactory | Meets | n/a | n/a | | BT3746 |
| office | SW03 | 03 | 3735 | 13.48 | 145.04 | OFFICE | 3D1400 | | Dean's Office | Yes | Satisfactory | Meets | n/a | n/a | | BT3748 |
| | SW03 | 03 | 3745 | 22.51 | 242.21 | MEETING | 3D1400 | | Dean's Office | Yes | Satisfactory | Meets | n/a | n/a | | BT3750 |
| | SW03 | 03 | 3755 | 13.25 | 142.57 | RESOURCE | 3D1400 | | Dean's Office | Yes | Satisfactory | Meets | n/a | n/a | | BT3752 |
| office | SW03 | 03 | 3765 | 18.57 | 199.81 | OFFICE | 3D1400 | | Dean's Office | Yes | Satisfactory | Meets | n/a | n/a | | BT3756 |
| office | SW03 | 03 | 3771 | 9.77 | 105.13 | OFFICE | 3D1400 | | Dean's Office | Yes | Satisfactory | Meets | n/a | n/a | | BT3757 |
| office | SW03 | 03 | 3775 | 28.02 | 301.50 | OFFICE-OPN | 3D1400 | | Dean's Office | Yes | Satisfactory | Meets | n/a | n/a | | BT3758 |
| office | SW03 | 03 | 3785 | 11.65 | 125.35 | OFFICE | 3D1400 | | Dean's Office | Yes | Satisfactory | Meets | n/a | n/a | | BT3761 |
| office | SW03 | 04 | 4075 | 15.84 | 170.54 | OFFICE | 3D1400 | 143202 | Prosthetics Orthotics | Yes | Satisfactory | Meets | n/a | n/a | | BT3489 |
| office | SW03 | 04 | 4077 | 26.07 | 280.60 | OFFICE | 3D1400 | 142206 | Medical Radiography | Yes | Satisfactory | Meets | n/a | n/a | Painted in 2011 | BT3788 |
| Computer Lab | SW03 | 04 | 4080 | 15.84 | 170.54 | OFFICE | 3D1400 | 142206 | Medical Radiography | Yes | Satisfactory | Meets | n/a | n/a | | BT3790 |
| Lab | SW03 | 04 | 4084 | 35.26 | 379.51 | OFFICE | 3D1400 | 144206 | Medical Radiography | Yes | Satisfactory | Meets | n/a | n/a | | BT3793 |
| office | SW03 | 04 | 4086 | 16.83 | 181.14 | OFFICE | 3D1400 | | Medical Imaging | Yes | Satisfactory | Meets | n/a | n/a | | BT3796 |

## School of Health Sciences

| DEPARTMENT | # OF SETS (for all levels) | # of STUDENTS per set | TOTAL | Program Length (yrs) | Program Length (mos) | Total Students | |
|---|---|---|---|---|---|---|---|
| ENPY | 1 | 12 | 12 | **2** | **24** | 12 | September intake every even year. |
| Sonograpghy | 4 | 12 | 48 | 2 | 24 | 96 | |
| Radiation Therapy | 1 | 22 | 22 | 2.75 | 33 | 66 | |
| Cardiology | 0 | 25 | 0 | | | 0 | will schedule within a lab and do not require dedicated space |
| Perfusion | 1 | 7 | 7 | 2 | 24 | 0 | January intake every odd year. |
| Med Rad | 4 | 20 | 80 | 2 | 24 | 160 | |
| BioMed | 2 | 16 | 32 | 2 | 24 | 64 | Intake every year |
| Nuclear Medicine | 1 | 16 | 16 | 2 | 24 | 32 | September intake every year |
| Med Lab Science | 4 | 20 | 80 | 2.5 | 30 | 200 | January intake every year |
| Clinical Genetics | 1 | 12 | 12 | 1 | 13.5 | 12 | September intake every year |
| Prosthetics & Orthotics | 1 | 12 | 12 | 2 | 24 | 24 | September intake every even year. |
| BSN Nursing | 4 | 24 | 96 | 3 | 36 | 576 | August and September intakes of 96 students every year |
| Critical Care | 3 | 40 | 120 | | | 120 | |
| High Acuity | 3 | 30 | 90 | | | 90 | |
| Emergency | 3 | 30 | 90 | | | 90 | |
| Perinatal | 3 | 20 | 60 | | | 60 | |
| Neonatal | 3 | 16 | 48 | | | 48 | |
| Pediatrics | 3 | 8 | 24 | | | 24 | |
| Nephrology | 3 | 12 | 36 | | | 36 | |
| Perioperative | 3 | 12 | 36 | | | 36 | |
| **Total** | **47** | | **909** | **21.25** | **256.5** | **1746** | |

**Other programs in SoHS that will need to be addressed outside of the new building:**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| BioTech | 1 | 22 | 22 | 2 | 24 | 44 | September intake every year |
| Food Tech | 1 | 23 | 23 | 2 | 24 | 46 | |
| Occupational Health & Safety | 1 | 24 | 24 | 2 | 24 | 48 | September intake every year |
| | | | | | | 1884 | |

* programs highlighted in red schedule labs in other labs and do not require dedicated space.

# D >

# Preliminary Cost Estimate

**BCIT - Health Sciences Centre for Advanced Simulation**
Business Case for New Building
for CitySpaces Consulting Ltd & Stantec Architecture

February 6, 2015

## PROJECT BUDGET ESTIMATE SUMMARY

| | NEW HS BUILDING |
|---|---|
| **Building Areas (m2)** | |
| NET ASSIGNABLE AREA : | 6,549.5 |
| GROSS AREA: | 10,355.0 |
| NET TO GROSS: Ratio | 1.581 |
| Area of NEW Space | 10,355.0 |
| Area of Renovation | |
| **Unit Rate for Construction ($/m2)** | |
| New | $3,898.29 |
| Renovations | |
| **Budget Calculation** | |
| **PLANNING & DESIGN:** | |
| PRE-PLANNING | $375,000 |
| PLANNING & DESIGN FEES | $5,618,000 |
| PROJECT MANAGEMENT | $1,168,000 |
| OTHER (SPECIFY) | |
| **CONSTRUCTION:** | |
| BUILDING | $40,366,800 |
| RENOVATIONS | $0 |
| SUPPLEMENTARY BUILDING COSTS | $1,650,000 |
| SITE DEVELOPMENT | $1,675,000 |
| SUPPLEMENTARY SITE COSTS | $950,000 |
| OFF-SITE COSTS | $300,000 |
| TEMPORARY ACCOMMODATION | |
| **RESERVES:** | |
| CONSTRUCTION (FIELD) CONTINGENCY (3% NEW) | $1,348,000 |
| PROJECT & SOFT COSTS CONTINGENCY (5%) | $1,399,000 |
| | |
| **COMPLETION COSTS:** | |
| FURNITURE & EQUIPMENT (Excl. Simulation Equip) | $2,500,000 |
| PERMITS, DCCs | $640,000 |
| LEGAL | |
| INSURANCE | $674,000 |
| COMMISSIONING | $60,000 |
| LEED DESIGN & CERTIFICATION | Included |
| **SITE ACQUISITION** | |
| **PAYABLE TAXES** (Payable GST 1.65%) | $969,000 |
| **TOTAL PROJECT COST** Current Dollars | **$59,692,800** |
| ESCALATION TO START OF CONSTRUCTION (Oct 2016) | $6,873,200 |
| **TOTAL PROJECT COST** Oct 2016 Dollars | **$66,566,000** |
| **SIMULATION EQUIPMENT (Not Included in Above)** | **$11,700,000** |
| **TOTAL PROJECT COST (Incl. Simulation Equip)** Oct 2016 Dollars | **$78,266,000** |

James Bush & Associates Ltd.,
Professional Quantity Surveyors

**FEASIBILITY STAGE**

JBA|QS

## BCIT - Health Sciences Centre for Advanced Simulation

February-06-15

Business Case for New Building
for CitySpaces Consulting Ltd & Stantec Architecture

| CLASS D - ORDER OF MAGNITUDE ESTIMATE | | | NEW HS BUILDING |
|---|---|---|---|
| **SUMMARY OF GROSS FLOOR AREAS (m2)** | | BGSM | NASM |
| Basement | | 493 | |
| Main Floor | | 2,213 | |
| 2nd Floor | | 2,546 | |
| 3rd Floor | | 2,504 | |
| 4th | | 2,099 | |
| Mechanical | | 500 | |
| TOTAL BUILDING GROSS FLOOR AREA (M2) | | 10,355 | |
| SoHS PROGRAM | NASM | | 6,550 |
| NET : GROSS RATIO | | | 1.581 |

| PLANNING & DESIGN | | $7,161,000 |
|---|---|---|
| PRE-PLANNING FEES | | $375,000 |
| DESIGN FEES | 12.5% | $5,618,000 |
| PROJECT MANAGEMENT | 2.6% | $1,168,000 |

| CONSTRUCTION | | | | | | $44,941,800 |
|---|---|---|---|---|---|---|
| **NEW BUILDING CONSTRUCTION** | 10,355 | m2 | $3,898.29 | /m2 | | $40,366,800 |
| (refer to detailed Class D Estimate) | 111,461 | SF | $362.16 | $/SF | | |
| 1. SUBSTRUCTURE | 2,213 | m2 | $470.04 | | $1,040,200 | |
| 2. STRUCTURE | 8,142 | m2 | $690.97 | | $5,625,900 | |
| 3. EXTERIOR CLADDING | 7,560 | m2 | $797.48 | | $6,028,900 | |
| 4. INTERIOR PARTITIONS | | | | | $2,167,100 | |
| 5. VERTICAL MOVEMENT | | | | | $650,000 | |
| 6. INTERIOR FINISHES | 10,355 | m2 | $245.50 | | $2,542,200 | |
| 7. FITTINGS & EQUIPMENT | 10,355 | m2 | $293.38 | | $3,037,900 | |
| 8. ELECTRICAL | 10,355 | m2 | $392.07 | | $4,059,900 | |
| 9. MECHANICAL | 10,355 | m2 | $724.34 | | $7,500,500 | |
| DIRECT SITE OVERHEADS & SUPERVISION / GC FEE | 10,355 | m2 | $386.19 | | $3,999,000 | |
| CASH ALLOWANCES | | | | | $50,000 | |
| DESIGN & PRICING CONTINGENCY | | | 10% | | $3,665,200 | |
| **RENOVATIONS** | | | | | | $0 |
| **SUPPLEMENTARY BUILDING** | | | | | | $1,650,000 |
| LEED - Gold | | | | | Included | |
| Remove 3-5m Overburden, Replace with structural fill | 2,213 | m2 Bldg Ftpr | $338.91 | | $750,000 | |
| Emergency Power | | | | | $300,000 | |
| IT Infrastructure, Audio Visual | | | | | $600,000 | |

Prepared by: James Bush & Associates Ltd,
Professional Quantity Surveyors

**Order of Magnitude**
**Class D Cost Estimate**

JBA|QS

## BCIT - Health Sciences Centre for Advanced Simulation

February-06-15

Business Case for New Building
for CitySpaces Consulting Ltd & Stantec Architecture

| CLASS D - ORDER OF MAGNITUDE ESTIMATE | | NEW HS BUILDING | |
|---|---|---|---|
| **SITE DEVELOPMENT** | | | **$1,675,000** |
| Site Preparation, Demolition existing landscape | | $250,000 | |
| Site Development / Hard & Soft Landscaping | | $750,000 | |
| Building Services incl reallign/upgrade existing infrastructure | Allowance | $675,000 | |
| **SUPPLEMENTARY SITE** | | | **$950,000** |
| Replacement Parking (Funded by BCIT) | | $350,000 | |
| Electrical Service - new HV Service Feeders in Ducts and Tie in to New Substation | | $600,000 | |
| **OFFSITE COSTS** | | | **$300,000** |
| Offsite Development | | 300,000 | |

| | | | |
|---|---|---|---|
| **RESERVES** | | | **$2,747,000** |
| **CONSTRUCTION (FIELD) CONTINGENCY** | | 3.0% | **$1,348,000** |
| **PROJECT & SOFT COSTS CONTINGENCY** | | 2.5% | **$1,399,000** |

| | | | |
|---|---|---|---|
| **COMPLETION** | | | **$3,874,000** |
| **EQUIPMENT** (Assumed allowance for select renewal) | | | **$2,500,000** |
| **SIMULATION EQUIPMENT** | | | **Separately Funded** |
| **PERMITS & DCC'S** | Burnaby Permit $9.85/$1000 plus 15% for inspection, GVS & DD Levy $4.77/m2 | | **$640,000** |
| **LEGAL** | | | |
| **INSURANCE** | | 1.5% | **$674,000** |
| **COMMISSIONING** | | | **$60,000** |
| **LEED DESIGN** (enhanced energy efficiency and envelope) | | | **Included** |
| **Value Added Tax** (GST at Rebated amount 1.65%, PST is included in above rates) | | 1.65% | **$969,000** |

| | | | |
|---|---|---|---|
| **TOTAL PROJECT COST** (Including 1.65% Payable GST) | Current Dollars | $5,764.64 | **$59,692,800** |

| | | | |
|---|---|---|---|
| **CONSTRUCTION COST ESCALATION** | | 11.5% | **$6,873,200** |
| Assumed Schedule for construction October 2016 Start | | | |
| Escalation 2015-2016 - allow 5% pa | | | |
| Compounded Esclacation Rate (average over 2 years) | 11.5% | | |

| | | | |
|---|---|---|---|
| **TOTAL PROJECT COST** (Including 1.65% Payable GST) | OCT 2016 | $6,428.39 | **$66,566,000** |
| **SIMULATION EQUIPMENT ALLOWANCE (Not Included in above - Funded Separately)** | | | **$11,700,000** |
| **TOTAL PROJECT COST (incl. Simulation Equipment)** | | | **$78,266,000** |

Prepared by: James Bush & Associates Ltd,
Professional Quantity Surveyors

Order of Magnitude
Class D Cost Estimate

JBA|QS

## BCIT - Health Sciences Centre for Advanced Simulation

Date: 06-Feb-15

Business Case for New Building
for CitySpaces Consulting Ltd & Stantec Architecture

### BUILDING - ELEMENTAL COST SUMMARY

| | Ratio | Element Cost | | | | Rate per m2 | | |
|---|---|---|---|---|---|---|---|---|
| Element | to GFA | Quantity | Unit Rate | Sub-total | Total Cost | Sub-total | Total | % |
| **1. SUBSTRUCTURE** | | | | | **1,040,200** | | 122.90 | 2.6 |
| (a) Normal foundations | 0.214 | 2,213 m2 | 175.01 | 387,300 | | 37.40 | | |
| (b) Earthwork | 0.214 | 2,213 m2 | 159.47 | 352,900 | | 34.08 | | |
| (c) Special conditions | | | | 300,000 | | 28.97 | | |
| **2. STRUCTURE** | | | | | **5,625,900** | | 520.86 | 13.9 |
| (a) Slab on Grade | 0.214 | 2,213 m2 | 105.02 | 232,400 | | 22.44 | | |
| (b) Upper floor Construction | 0.786 | 8,142 m2 | 389.04 | 3,167,600 | | 305.90 | | |
| (c) Roof Construction | 0.253 | 2,623 m2 | 417.69 | 1,095,600 | | 105.80 | | |
| (d) Concrete Walls | 0.289 | 2,995 m2 | 377.37 | 1,130,300 | | 109.15 | | |
| **3. EXTERIOR CLADDING** | | | | | **6,028,900** | | 501.74 | 14.9 |
| (a) Roof finish | 0.253 | 2,623 m2 | 317.73 | 833,400 | | | | |
| (b) Walls below ground floor | | 600 m2 | 463.00 | 277,800 | | 26.83 | | |
| (c) Walls above ground floor | 0.187 | 1,941 m2 | 696.74 | 1,352,300 | | 130.59 | | |
| (d) Windows | 0.289 | 2,996 m2 | 989.79 | 2,965,400 | | 286.37 | | |
| (e) Exterior doors & screens | 0.002 | 20 No. | 6,100.00 | 122,000 | | 11.78 | | |
| (f) Exterior Screen Wall | | | | 0 | | 0.00 | | |
| (g) Sunshades & Projections | | 624 m | | 280,800 | | 27.12 | | |
| (h) Canopy Roofs | | | | 0 | | 0.00 | | |
| (i) Soffits | 0.032 | 333 m2 | 592.19 | 197,200 | | 19.04 | | |
| **4. INTERIOR PARTITIONS** | | | | | **2,167,100** | | 209.28 | 5.4 |
| (a) Permanent partitions | 1.000 | 10,355 m2 | 82.00 | 849,100 | | 82.00 | | |
| (b) Interior Windows | 1.000 | 10,355 m2 | 65.00 | 673,100 | | 65.00 | | |
| (c) Operable Walls | 0.010 | 102 m | 3,255.88 | 332,100 | | 32.07 | | |
| (d) Interior Doors | 0.016 | 170 Lvs | 940.00 | 159,800 | | 15.43 | | |
| (e) Finish Hardware | 0.016 | 170 lvs | 900.00 | 153,000 | | 14.78 | | |
| **5. VERTICAL MOVEMENT** | | | | | **650,000** | | 62.77 | 1.6 |
| (a) Stairs | 0.001 | 12 Flt | 20,000.00 | 240,000 | | 23.18 | | |
| (b) Ladders & Ramps | 0.000 | | | 0 | | 0.00 | | |
| (c) Elevators | 0.000 | 2 No. | 205,000.00 | 410,000 | | 39.59 | | |
| **6. INTERIOR FINISHES** | | | | | **2,542,200** | | 245.50 | 6.3 |
| (a) Floor finishes | 1.000 | 10,355 m2 | 92.00 | 952,700 | | 92.00 | | |
| (b) Ceiling finishes | 1.000 | 10,355 m2 | 95.00 | 983,700 | | 95.00 | | |
| (c) Wall finishes | 1.000 | 10,355 m2 | 58.50 | 605,800 | | 58.50 | | |
| **7. FITTINGS & EQUIPMENT** | | | | | **3,037,900** | | 293.38 | 7.5 |
| (a) Millwork | 1.000 | 10,355 m2 | 75.00 | 776,600 | | 75.00 | | |
| (b) Tackboards / Whiteboards | | | | 50,000 | | | | |
| (c) Miscell Specialties - access panels, fire extg | | | | 50,000 | | | | |
| (d) Miscell Metals | | | | 379,900 | | | | |
| (e) WC Accessories & Partitions | | | | 50,000 | | | | |
| (f) Laboratory Benching (Wet Lab) | | | | 426,400 | | | | |
| (g) Cubicle Curtains/Tracks | | | | 40,000 | | | | |
| (h) Walk off Mats | | | | 25,000 | | | | |
| (i) Signage - Building Graphics, Room/Entry Signage | | | | 60,000 | | | | |
| (j) Wall Protection | | | | 125,000 | | | | |
| (k) Rough Carpentry - Caulking & firestopping | | | | 35,000 | | | | |
| (l) Kitchen Equipment | | | | 200,000 | | | | |
| (m) Laboratory Equipment incl Fumehoods | | | | 200,000 | | | | |
| (n) Sim Lab Patient Headwall specialties/Bumpers | | | | 250,000 | | | | |
| (o) Radiation Sheilding | | | | 150,000 | | | | |
| (p) Window Coverings | | | | 220,000 | | 21.25 | | |
| **8. ELECTRICAL** | | 10355 m2 | 392.07 | | **4,059,900** | | 392.07 | 10.1 |
| (a) Service & Distribution | 1.000 | 10,355 m2 | 98.00 | 1,014,800 | | 98.00 | | |
| (b) Lighting | 1.000 | 10,355 m2 | 110.00 | 1,139,100 | | 110.00 | | |
| (c) Power | 1.000 | 10,355 m2 | 32.00 | 331,400 | | 32.00 | | |
| (d) Fire Alarm | 1.000 | 10,355 m2 | 11.00 | 113,900 | | 11.00 | | |
| (e) Tel / Data | 1.000 | 10,355 m2 | 25.00 | 258,900 | | 25.00 | | |
| (f) Security | 1.000 | 10,355 m2 | 22.00 | 227,800 | | 22.00 | | |
| (g) PA | 1.000 | 10,355 m2 | 4.00 | 41,400 | | 4.00 | | |
| (h) Simlation Systems Rough-in | 1.000 | 10,355 m2 | 59.18 | 612,800 | | | | |
| (i) Laboratory Systems | 1.000 | 10,355 m2 | 30.88 | 319,800 | | 30.88 | | |
| **9. MECHANICAL** | | | | | **7,500,500** | | 724.34 | 18.6 |
| (a) Plumbing & drainage | 1.000 | 10,355 m2 | 79.53 | 823,500 | | 79.53 | | |
| (b) Fire protection | 1.000 | 10,355 m2 | 42.00 | 434,900 | | 42.00 | | |
| (c) HVAC | 1.000 | 10,355 m2 | 512.81 | 5,310,100 | | 512.81 | | |
| (d) Controls | 1.000 | 10,355 m2 | 90.00 | 932,000 | | 90.00 | | |
| **10. EXISTING BUILDING TIE IN & INTERFACE** | | | | | **0** | | 0.00 | 0.0 |
| **11. OVERHEADS & PROFIT, GC FEE** | | | | | **3,999,000** | | 386.19 | 9.9 |
| **12. CASH ALLOWANCES** | | | | | **50,000** | | 4.83 | 0.1 |
| **13. DESIGN & PRICING CONTINGENCY** | | | | 10% | **3,665,200** | | 353.95 | 9.1 |
| **NET BUILDING COST** | | 10,355 m2 | | | **$40,366,800** | | 3,898.29 | 100.0 |

**BCIT - Health Sciences Centre for Advanced Simulation** February-06-15

Business Case for New Building

for CitySpaces Consulting Ltd & Stantec Architecture

## DETAILED COST ESTIMATE: CLASS D ESTIMATE

| Element | Element Cost: Quantity | Unit Rate | total | Sub-total | Total Cost | Rate per M2: Sub-total | Rate per M2: Total | Percent |
|---|---|---|---|---|---|---|---|---|
| **1. SUBSTRUCTURE** | | | | | **1,040,200** | | 100.45 | 2.6% |
| **(a) Foundations** | 2,213 m2 | 175.00 | | **387,300** | | 37.40 | | |
| Spread Footings | | | | | | | | |
| **(b) Earthwork for building** | 2,213 m2 | 75.00 | | **352,900** | | 34.08 | | |
| • Site Preparation, clearing, demol, extg paving etc. | 3,533 m3 | 15.00 | 53,000 | | | | | |
| • Bulk excavation, remove unsuitable organic soils to stockpile | | See Supplementary Site | | | | | | |
| • Bulk excavation for footprint, haul to stockpile | | See Supplementary Site | | | | | | |
| • Imported granular fill material - supply | | See Supplementary Site | | | | | | |
| • Imported granular slab base material - supply | 553 m3 | 85.00 | 47,000 | | | | | |
| • Compact in layers to structural spec. | 553 m3 | 15.00 | 8,300 | | | | | |
| • Detailed excavation for foundations | 976 m3 | 65.00 | 63,400 | | | | | |
| • Backfilling - fndns | 488 m3 | 75.00 | 36,600 | | | | | |
| • Backfilling - using on site material outside footprint | 1,056 m3 | 75.00 | 79,200 | | | | | |
| • Fine grade and compact slab base | 2,213 m2 | 6.00 | 13,300 | | | | | |
| • Civil work for buried conduits, drains etc. | | | 20,000 | | | | | |
| • Erosion & Sedimentation Control, Traffic control | | 10% | 32,100 | | | | | |
| **(c) Special Conditions** | | | | **300,000** | | 28.97 | | |
| • Piling | | | N/A | | | | | |
| • Preload | | | N/A | | | | | |
| • Shotcrete shoring with anchors / Underpinning Adj Structures | | | 300,000 | | | | | |
| • Soils Anchors for seismic | | | 0 | | | | | |
| • Dewatering / Pumping | | | N/A | | | | | |
| **2. STRUCTURE** | | | | | **5,625,900** | | 543.30 | 13.9% |
| **(a) Slab on Grade - 150mm reinf conc slab** | 2,213 m2 | 105.00 | | **232,400** | | 22.44 | | |
| **(b) Upper Floor Construction** | 8,142 m2 | 389.04 | | **3,167,600** | | 305.90 | | |
| Concrete Slab and Columns | 8,142 m2 | 389.04 | | | | | | |
| • Formwork - slab/columns, slab bands | 10,992 m2 | 130.00 | 1,428,900 | | | | | |
| • Rebar | 390,572 kg | 1.90 | 742,100 | | | | | |
| • Concrete Supply | 3,175 m3 | 195.00 | 619,200 | | | | | |
| • Concrete placing incl. Labour & pumping costs | 3,175 m3 | 65.00 | 206,400 | | | | | |
| • Slab finishing | 8,142 m2 | 21.00 | 171,000 | | | | | |
| **(c) Roof construction** | 2,623 m2 | 417.69 | | **1,095,600** | | 105.80 | | |
| Concrete Slab and Columns | 1,931 m2 | 365.92 | | | | | | |
| • Formwork - slab/columns, slab bands | 2,414 m2 | 130.00 | 313,800 | | | | | |
| • Rebar | 90,371 kg | 1.90 | 171,700 | | | | | |
| • Concrete Supply | 753 m3 | 195.00 | 146,900 | | | | | |
| • Concrete placing incl. Labour & pumping costs | 753 m3 | 60.00 | 45,200 | | | | | |
| • Slab finishing | 1,931 m2 | 15.00 | 29,000 | | | | | |
| Structural Steel/OWSJ Framing (Mech Penthouse) | 500 m2 | 298.00 | | | | | | |
| • Structural Steel, HSS, framing, bracing | 20,500 kg | 6.00 | 123,000 | | | | | |
| • Metal deck | 500 m2 | 52.00 | 26,000 | | | | | |
| Skylight | 192 m2 | 1,250.00 | | | | | | |
| • Structural framing | 192 m2 | 1,250.00 | 240,000 | | | | | |
| **(d) Structural Walls** | 2,995 m2 | 377.37 | | **1,130,300** | | 109.15 | | |
| Concrete walls (Shear Walls) | 2,659 m2 | 397.26 | | | | | | |
| • Formwork | 5,318 m2 | 135.00 | 718,000 | | | | | |
| • Rebar | 92,141 kg | 1.90 | 175,100 | | | | | |
| • Concrete Supply | 838 m3 | 195.00 | 163,300 | | | | | |
| Concrete block fire wall, elev shaft | 336 m2 | 220.00 | 73,900 | | | | | |

## DETAILED COST ESTIMATE: CLASS D ESTIMATE

| Element | Element Cost Quantity | Unit Rate | total | Sub-total | Total Cost | Rate per M2 Sub-total | Rate per M2 Total | Percent |
|---|---|---|---|---|---|---|---|---|
| **3. EXTERIOR CLADDING** | | | | | **6,028,900** | | 582.22 | 14.9% |
| **(a) Roof finish** | 2,623 m2 | 317.73 | | **833,400** | | 80.48 | | |
| • PVC Membrane roofing | 2,328 m2 | 225.00 | 523,800 | | | | | |
| • Membrane roofing - with deck pavers | 100 m2 | 275.00 | 27,500 | | | | | |
| • Skylight | 195 m2 | 1,200.00 | 234,000 | | | | | |
| • Roof hatch | 1 No. | 2,200.00 | 2,200 | | | | | |
| • Flashings - roof wall | 220 m | 55.00 | 12,100 | | | | | |
| • Flashings - perimeter detail of roof | 451 m | 75.00 | 33,800 | | | | | |
| **(b) Walls below ground floor** | | | | **277,800** | | 26.83 | | |
| • Concrete Retaining Walls | 600 m2 | 385.00 | 231,000 | | | | | |
| • Waterproofing, protection board, mir-drain | 600 m2 | 78.00 | 46,800 | | | | | |
| **(c) Exterior Wall Cladding** | 1,941 m2 | 696.74 | | **1,352,300** | | 130.59 | | |
| • Structural Backup - metal stud, sheathing | 1,941 m2 | 78.00 | 151,400 | | | | | |
| • AVB, spray insulation & drywall on inside | 1,941 m2 | 65.00 | 126,200 | | | | | |
| • Prefinished metal panel | 1,797 m2 | 550.00 | 988,300 | | | | | |
| • Wood panel - main level | 144 m2 | 600.00 | 86,400 | | | | | |
| **(d) Aluminum Windows & Glazed Wall Systems** | 2,996 m2 | 989.79 | | **2,965,400** | | 286.37 | | |
| SSG Glazed Wall System - lower level | 416 m2 | 1,100.00 | 457,600 | | | | | |
| SSG Glazed Wall System - L2 to roof | 929 m2 | 1,100.00 | 1,021,700 | | | | | |
| Curtainwall System - Level 2-Roof | 1,651 m2 | 900.00 | 1,486,100 | | | | | |
| **(e) Exterior doors & screens** | 20 Lvs | 6,100.00 | | **122,000** | | 11.78 | | |
| H/M Door and Frame solid doors | 8 Lvs | 2,500.00 | 20,000 | | | | | |
| Glazed Entrance door | 10 Lvs | 8,500.00 | 85,000 | | | | | |
| Overhead door - Loading | 2 No | 8,500.00 | 17,000 | | | | | |
| **(f) Canopies, Sunshades & Soffit** | | | | **478,000** | | 46.16 | | |
| Soffit finish - prefinished Alum panel system on Eng framing | 333 m2 | 480.00 | 159,800 | | | | | |
| Handrails to exterior deck | 19.0 m | 650.00 | 12,400 | | | | | |
| Mechanical Screens/Housekeeping | | Item | 25,000 | | | | | |
| Alum sunshades | 624 m | 450.00 | 280,800 | | | | | |
| **4. INTERIOR PARTITIONS** | | | | | **2,167,100** | | 209.28 | 5.4% |
| **(a) Permanent partitions** | 10,355 m2 | 82.00 | | **849,100** | | 82.00 | | |
| • Stud Partition wall with drywall both sides - Demising | (based on average cost - all parition type) | | | | | | | |
| • Stud Partition wall with drywall both sides - u/s ceiling | | | | | | | | |
| • Stud Partition wall with 2x drywall both sides - acoustic | | | | | | | | |
| • shaftwall - duct shafts etc. | | | | | | | | |
| • rough carpentry blocking, back framing walls | | | | | | | | |
| • Block walls | | | | | | | | |
| • Acoustic measures | | | | | | | | |
| **(b) Glazed Interior Windows & Frames** | 10,355 m2 | 65.00 | | **673,100** | | 65.00 | | |
| • Glazed walls | | | | | | | | |
| • Glazed sidelight | | | | | | | | |
| **(c.1) Operable Walls - Security Screen** | 22 m | 2,925.00 | | **64,400** | | 6.22 | | |
| **(c.2) Operable Walls - Glass Sliding Doors** | 60 m | 2,720.00 | | **163,200** | | 15.76 | | |
| **(c.3) Operable Walls - MPR** | 20 m | 5,225.00 | | **104,500** | | 10.09 | | |
| **(d) Interior Doors, frames - Supply/Install** | 170 lvs | 940.00 | | **159,800** | | 15.43 | | |
| • Interior door in PM frame - single | 130 Lvs | 420.00 | 54,600 | | | | | |
| • Ditto - double | 20 Lvs | 800.00 | 16,000 | | | | | |
| • H/M door in PM frame - exit | 10 Lvs | 415.00 | 4,200 | | | | | |
| • Glazed Doors - Vestibule | 10 Lvs | 8,500.00 | 85,000 | | | | | |
| **(e) Finish Hardware** | 170 lvs | 900.00 | | **153,000** | | 14.78 | | |
| **5. VERTICAL MOVEMENT** | | | | | **650,000** | | 62.77 | 1.6% |
| **(a) Stairs** | 12 Flt | 20,000.00 | | **240,000** | | 23.18 | | |
| • Interior exit stairs | 9 Flt | 15,000.00 | 135,000 | | | | | |
| • Main Stair | 3 Flt | 30,000.00 | 90,000 | | | | | |
| • Interior stairs - miscellaneous | | Item | 15,000 | | | | | |
| **(b) Elevator** | 2 No. | 205,000.00 | | **410,000** | | 39.59 | | |
| • Passenger elevator, traction, 3000lb, 200ft/min, 5 stops | 2 No. | 180,000.00 | 360,000 | | | | | |
| • Cab Finishes - Passenger elevator | 2 No. | 25,000.00 | 50,000 | | | | | |
| **(c) Ramps** | | | | **0** | | 0.00 | | |
| • Ramp strucutre/walls - main level | | | 0 | | | | | |
| • Exterior Exit Ramp | | | 0 | | | | | |
| • Glass Guardrail | | | 0 | | | | | |

**DETAILED COST ESTIMATE:** CLASS D ESTIMATE

| Element | Element Cost Quantity | Unit Rate | total | Sub-total | Total Cost | Rate per M2 Sub-total | Total | Percent |
|---|---|---|---|---|---|---|---|---|
| **6. INTERIOR FINISHES** | | | | | **2,542,200** | | 245.50 | 6.3% |
| **(a) Floor finishes & Rubber Base** | 10,355 m2 | 92.00 | | **952,700** | | 92.00 | | |
| • Exposed concrete, sealed | | | | | | | | |
| • Resilient Flooring - 2.5mm Lino, multi colour/pattern | | | | | | | | |
| • Chemical Resistant Resilient Flooring | | | | | | | | |
| • Safety Floor - Kitchen/Servery | | | | | | | | |
| • Ceramic Flooring - Washrooms | | | | | | | | |
| • Carpet Tile | | | | | | | | |
| • Porcelain Tile to Main Floor | | | | | | | | |
| • Rubber Base | | | | | | | | |
| **(b) Ceiling finishes** | 10,355 m2 | 95.00 | | **983,700** | | 95.00 | | |
| • Exposed structure unfinished | | | | | | | | |
| • Suspended Wood | | | | | | | | |
| • Acoustic Tile 2x4 | | | | | | | | |
| • Acoustic Tile 2x2 TE | | | | | | | | |
| • Washable Acoustic Tile | | | | | | | | |
| • Acoustic Tile / Feature Drywall | | | | | | | | |
| • Drywall on framing - dropped ceiling, ptd | | | | | | | | |
| • Drywall on framing - vertical bulheads | | | | | | | | |
| **(c) Wall finish** | 13,462 m2 | 45.00 | | **605,800** | | 58.50 | | |
| • Wall protection to 2.1m - Nursing areas | | | | | | | | |
| • Wood Panelling | | | | | | | | |
| • Ceramic Tile to washrooms | | | | | | | | |
| • Epoxy Paint | | | | | | | | |
| • Acoustic Panels | | | | | | | | |
| • Plywood to Storage rooms | | | | | | | | |
| • Paint Finish drywall | | | | | | | | |
| **7. FITTINGS & EQUIPMENT** | | | | | **3,037,900** | | 293.38 | 7.5% |
| **(a) Millwork** | 10,355 m2 | 75.00 | | **776,600** | | 75.00 | | |
| **(b) Tackboards / Whiteboards** | | | | **50,000** | | 4.83 | | |
| **(c) Miscell Specialties** - access panels, fire extg | | | | **50,000** | | 4.83 | | |
| **(d) Miscell Metals** | | | | **379,900** | | 36.69 | | |
| • General Miscell Metals | | Item | 25,000 | | | | | |
| • Atrium Railings | 150 m | 1,066.33 | 159,900 | | | | | |
| • Projector/Camera Mounts | | Item | 50,000 | | | | | |
| • Radiation Equipment - Ceiling Mtd | | Item | 40,000 | | | | | |
| • Patient Lift Support | | Item | 30,000 | | | | | |
| • Labortory Specialties, bottle racks, etc. | | Item | 75,000 | | | | | |
| **(e) WC Accessories & Partitions** | 30 Sets | 950.00 | | **50,000** | | 4.83 | | |
| • WC accessories | 30 No. | 650.00 | 19,500 | | | | | |
| • WC Partitions | 25 Sets | 1,100.00 | 27,500 | | | | | |
| • Showers | 2 No. | 1,500.00 | 3,000 | | | | | |
| **(f) Laboratory Benching (Wet Lab)** | 1,066 m2 | 400.00 | | **426,400** | | 41.18 | | |
| • Lab Benching - wall | | | | | | | | |
| • Lab Benching - island | | | | | | | | |
| **(g) Cubicle Curtains/Tracks** | | | Item | **40,000** | | 3.86 | | |
| **(h) Walk off Mats** | | | Item | **25,000** | | 2.41 | | |
| **(i) Signage - Building Graphics, Room/Entry Signage** | | | Item | **60,000** | | 5.79 | | |
| **(j) Wall Protection** | | | Item | **125,000** | | 12.07 | | |
| **(k) Rough Carpentry - Caulking & firestopping** | | | Item | **35,000** | | 3.38 | | |
| **(l) Kitchen Equipment** | | | Item | **200,000** | | 19.31 | | |
| **(m) Laboratory Equipment incl Fumehoods** | | | Item | **200,000** | | 19.31 | | |
| **(n) Sim Lab Patient Headwall specialties/Bumpers** | | | Item | **250,000** | | 24.14 | | |
| **(o) Radiation Sheilding** | | | Item | **150,000** | | 14.49 | | |
| **(p) Window Coverings** | 2,996 m2 | | Item | **220,000** | | 21.25 | | |

**BCIT - Health Sciences Centre for Advanced Simulation**
Business Case for New Building
for CitySpaces Consulting Ltd & Stantec Architecture

February-06-15

## DETAILED COST ESTIMATE: CLASS D ESTIMATE

| Element | Element Cost Quantity | Unit Rate | total | Sub-total | Total Cost | Rate per M2 Sub-total | Rate per M2 Total | Percent |
|---|---|---|---|---|---|---|---|---|
| **8. ELECTRICAL** | 10,355 m2 | $392.07 | | | **4,059,900** | | 392.07 | 10.1% |
| **(a) Distribution** | **10,355 m2** | **98.00** | | **1,014,800** | | **98.00** | | |
| **(b) Lighting** | **10,355 m2** | **110.00** | | **1,139,100** | | **110.00** | | |
| **(c) Power** | **10,355 m2** | **32.00** | | **331,400** | | **32.00** | | |
| **(d) Fire Alarm** | **10,355 m2** | **11.00** | | **113,900** | | **11.00** | | |
| **(e) Telephone, Data & communications** | **10,355 m2** | **25.00** | | **258,900** | | **25.00** | | |
| **(f) Security, PA** | **10,355 m2** | **22.00** | | **227,800** | | **22.00** | | |
| **(g) Public Address** | **10,355 m2** | **4.00** | | **41,400** | | **4.00** | | |
| **(h) Simlation Systems Rough-in** | **5,571 m2** | **110.00** | | **612,800** | | **59.18** | | |
| **(i) Laboratory Systems** | **1,066 m2** | **300.00** | | **319,800** | | **30.88** | | |
| **9. MECHANICAL** | 10,355 m2 | $724.34 | | | **7,500,500** | | 724.34 | 18.6% |
| **(a) Plumbing & drainage, gas piping, roof drains** | 10,355 m2 | 79.53 | | **823,500** | | 79.53 | | |
| Building Drainage | 2,623 m2 | 35.00 | 91,800 | | | | | |
| Standard Fixtures | 90 Fxt | 2,650.00 | 238,500 | | | | | |
| Laborary Fixtures | 1,066 m2 | 275.00 | 293,200 | | | | | |
| Other Systems - Comp Air/Gases etc | 10,355 m2 | 15.00 | 200,000 | | | | | |
| **(b) Sprinkler Fire protection** | 10,355 m2 | 42.00 | | **434,900** | | 42.00 | | |
| **(c) Heating and Ventilation** | 10,355 m2 | 512.81 | | **5,310,100** | | 512.81 | | |
| Air Handling | 10,355 m2 | 465.00 | 4,815,100 | | | | | |
| Fume Hoods (incl. MU Air/Cabinet) | 7 No. | 35,000.00 | 245,000 | | | | | |
| Miscell Systems/Exhaust | 10,355 m2 | 24.14 | 250,000 | | | | | |
| **(d) Controls** | 10,355 m2 | 90.00 | | **932,000** | | 90.00 | | |
| Assume DDC controls on equipment only. controls to equipment | 10,355 m2 | 90.00 | 932,000 | | | | | |
| **DIRECT SITE OVERHEADS & SUPERVISION** | | | | 9.6% | **3,130,400** | | 302.31 | 7.8% |
| General Contractor, Mobilization, Setup | | | | 50,000 | | | | |
| On going project overhead - Monthly, Supervision, LEED Docs | | | | 2,530,600 | | | | |
| Insurance | | | | 261,200 | | | | |
| Bonding | | | | 228,600 | | | | |
| Project close out., Warranty Work, Final Cleaning | | | | 60,000 | | | | |
| **GENERAL CONTRACTOR FEE** | | | | 2.5% | **868,600** | | 83.88 | 2.2% |
| **CASH ALLOWANCES** | As builts, Testing | | | Allow | **50,000** | | 4.83 | 0.1% |
| **DESIGN & PRICING CONTINGENCY** | | | | 10.0% | **3,665,200** | | 353.95 | 9.1% |
| **PAYABLE HST** | | | | | **excluded** | | 0.00 | 0.0% |
| **TOTAL NEW BUILDING CONSTRUCTION COST** | | | | | **$40,366,800** | | $3,898.29 | 100% |
| GROSS FLOOR AREA: (New) | 111,461 SF | **10,355** | **m2** | | | | $362.16 | /SF |

# E >

# Risk Register

**Ministry of Advanced Education: Capital Asset Reference Guide**

**Template 9: Risk Register**

Version 1.2 March 31, 2014

## Risk Register

Institution: B.C.I.T.

Project: Health Sciences Centre for Advanced Simulation

Revision Date: <enter revision date>

Date: Friday, 26 September, 14

| Risk Identification | | | | | | | | | Risk Response | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Risk ID | Life Cycle | Risk Event | Trigger / Root Cause | Consequence on Project Performance | Notes | Risk Probability | Risk Impact | Risk Ranking | Status | Risk Owner | Owner Organization | Risk Response | Expected Results of Risk Response | Response Cost | Due Date of Risk Response | Response Percentage Complete | Notes on Risk Response (progress, effectiveness, other notes) | Probability with Risk Response | Impact with Risk Response | Risk Ranking with Risk Response |
| 1 | Strategic Options | Capital funding not forthcoming | Funding withheld | Project delayed; standard of teaching impacted; potential loss of enrolment. | Swing space impacts for SW3 capital project. | 3 | 7 | 21 | Identified | Functional Lead | Consultant | Advocate for funding | Funding provided in timely manner | | 1-Nov-14 | | Approval of Concept Plan and move to Business Case in order to keep schedule | | | 0 |
| 2 | Strategic Options | Capital funding removed | Funding not granted by the Ministry. Procurement Plan cannot meet Minsitry time lines | Project does not happen. Consequences to program delivery and enrollment. | Swing space impacts for SW3 capital project. | 3 | 11 | 33 | Identified | Functional Lead | Consultant | Ensure correct procurement methodology; BCIT project management framework; Active communication with Ministry partners | Funding provided in timely manner | | | | | | | 0 |
| 3 | Design | Scope creep | Design changes and evolving simulation technologies | Project delayed impacts on phasing. Budget would be exceeded | | 2 | 5 | 10 | Planned Response | Project Manager | Internal | Ensure good project managementand implement project charter to clearly define project scope | Scope retained | | | | | | | 0 |
| 4 | Design | Pre-tender cost estimates exceed budget | Design changes and evolving simulation technologies | Change designs to meet budgets. Scope priortization and reduction. | | 3 | 5 | 15 | Identified | Project Director | University | Regular cost estimates by Quantity Surveyor; Value engineering and integrated design review | Budgets maintained | | | | | | | 0 |
| 5 | Design | Municipal approvals not forth coming | Delays in municipal processing. | Project delay | | 2 | 2 | 4 | Identified | Project Manager | Internal | Early discussions with municipality to scope civic requirements. | Budgets maintained | | | | | | | 0 |
| 6 | Design | Design does not meet functional requirements | Lack of input from stakeholders. | Functionally inadequate design. Possible post occupancy changes | | 1 | 5 | 5 | Planned Response | Project Director | University | Thorough Inclusionary design process and design sign-off procedures. | Approprate functional design | | | | | | | 0 |
| 7 | Construction / Commisioning | Construction market inflated | External economic factors. | Cost and timeline impacts. | | 2 | 5 | 10 | Identified | Functional Lead | Consultant | Regular cost estimates Quantity Surveyor. Possible change in procurement technique to CM at Risk/ Value engineering and integrated design review. | Budgets met | | | | | | | 0 |

| | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8 | Construction / Commisioning | Tenders exceed budget | Delays in construction. | Project delay and extended timelines, capital budget exceeded. | | 2 | 5 | 10 | Identified | Project Director | University | Regular Cost Estimates (eg @95%). Redesign elements/Post-tender addendums. Value engineering and integrated design | Budgets met | | | | | | | 0 |
| 9 | Construction / Commisioning | Building permit requires design changes | Municipal requirements. | Project delay and extended timelines, cost impacts | | 2 | 5 | 10 | Identified | Project Manager | Internal | Early design consultaion with municipality and submission of BP | Budgets met | | | | | | | 0 |
| 10 | Construction / Commisioning | Post-tender changes by the client | Inadequate time or process for fucntional programming, Building permit generates changes and obtained post | Project delay and cost impact | | 2 | 1 | 2 | Identified | Project Director | University | Ensure correct procurement process and inclusionary design process and design sign-off procedures. Carry adequate change-order contingency. | Meets budget | | | | | | | 0 |
| 11 | Construction / Commisioning | Soil conditions problematic | Existing soil conditions. | Cost impacts to foundation design; possible delays to project. | Soil study undertaken. No issue identified. | 2 | 2 | 4 | Implemented Response | Project Manager | Internal | Adequate geotech study to mitigate issue. Leverage knowledge from adjacent construction projects (SW1 Gateway & Goard Way | Budgets maintained | | | | | | | 0 |
| 12 | Construction / Commisioning | Environmental conditions problematic | Contaminated soil. | Project delay and extended timelines, capital budget exceeded | Environmental study undrtaken | 1 | 5 | 5 | Implemented Response | Project Manager | Internal | Undertake environmental study. | Budgets maintained | | | | | | | 0 |
| 13 | Construction / Commisioning | Contractor performance issues | Poor contractor | Project delay and extended timelines, capital budget exceeded | | 2 | 5 | 10 | Identified | Project Manager | Internal | Pre-qualification of contractors. Potential CM-at-Risk procurement option | Budgets met | | | | | | | 0 |
| 14 | Construction / Commisioning | Construction Delays | Poor contractor performance, extreme weather conditions | Project delay and extended timelines, capital budget exceeded | | 2 | 5 | 10 | Identified | Project Manager | Internal | Pre-qualification of contractor and try to time constrcution start | Budgets met | | | | | | | 0 |
| | | | | | | | | 0 | | | #N/A | | | | | | | | | 0 |
| | | | | | | | | 0 | | | #N/A | | | | | | | | | 0 |
| | | | | | | | | 0 | | | #N/A | | | | | | | | | 0 |

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# F >

# Risk Screen Tool

# TEMPLATE 8: CAPITAL PROJECT RISK SCREEN TOOL

Version 1.2 March 31, 2014

## PURPOSE

To perform a risk assessment of Category 1: New Priority Projects, Category 2: Whole Asset Replacement & Renewal Projects, and Category 3: Innovation Projects to determine the level of oversight (e.g., a project board[1]) and approval required by the Province.

The Capital Project Risk Screen Tool is required in addition to the completion of a risk register, which is updated throughout the project lifecycle.

## APPROACH

The risk assessment considers both organization-level (Part A) and project-level (Part B) risk factors. The level of residual risk remaining (after mitigation measures are taken) will help inform the level of approval required for:

- Concept Plan Reports and/or Business Cases
- Contract award/term sheets
- Reporting of project status/changes

## PART A: KEY ORGANIZATION-LEVEL RISK FACTORS

These factors include the following:

1. Organization's track record: achievement of the ministry's annual financial targets (operating and capital) and previous projects' budget, scope and schedule targets
2. Governance: effective governance structures/processes in place including clear accountabilities
3. Management Processes: appropriate capital planning and budgeting, project management, risk management, and asset management processes are in place

[1] This arises from best practices in managing capital projects and follows a structure that has been in place in other Ministries. Terms of reference will be project specific and membership will include Institution and government representatives. Project boards will be responsible for providing overall direction and key decision-making on scope, budget, schedule, procurement, communications and consultation.

## PART B: KEY PROJECT-LEVEL RISK FACTORS

Key factors include:

1. Expertise: Ministry/agency has recent experience managing similar types of projects and the project manager and team members have expertise/experience in the type of project being undertaken
2. Risk Management: Preliminary project risk assessment completed
3. Project Objectives: Objectives are clearly stated and align with the needs in the ministry's approved service plan
4. Scope/Readiness: Site selected/issues identified, early to mid-stage of design/scope and schedule development, and evidence of need for proposed capital solution
5. Financial: Magnitude of project cost and impact on fiscal plan, early to mid-stage of capital budget development and assumptions underlying budget are reasonable, ministry can manage operating costs within multi-year operating targets
6. Procurement: Ministry/agency has experience and achieved positive results with identified procurement options
7. Complexity/Profile: Confirm level of technical complexity in terms of design/scope, construction method and/or procurement method, clarify whether project impacts a large number and/or health/safety of citizens, multiple partners involved

## APPLICATION OF RISK SCREEN

Part A: Once initially completed, the organizational level risk assessment should be updated at least annually. The assessment will involve gaining an understanding of the management processes/structures at each level of the organization e.g. ministry and school district.

Part B: Project level risk assessment will be completed for each project, with a focus on the agency delivering the project.

Both assessments (Part A and B) will be conducted by Ministry of Finance with input from senior capital and financial managers within the ministry that is responsible for the particular capital project as well as input from agencies for the Part B - Project level risk assessment.

| Category | Risk Factor | Initial Risk Rating Low/Med/High | Ministry / Agency mitigation measures/ comments | Ministry of Finance Comments/ Rationale | Residual Risk Rating Low/Med/High |
|---|---|---|---|---|---|
| Part A: Organizational level risk assessment *(Assessment required to be completed annually, and updated for major changes)* | | | | | |
| 1. Track Record | Has the ministry/agency demonstrated success in meeting annual financial targets (capital and operating)? | Low | BCIT professional project management. Strong track record of meeting project budget, scope and timeline targets. Strong governance system in place.<br><br>BCIT/VCC Heavy Duty Commercial Transport Trades project: approved budget $44.5 million; actual cost $40 million. | | |

| | | | | | |
|---|---|---|---|---|---|
| | Does the ministry/agency have recent experience managing various types of capital projects (consider project size, complexity, procurement method, type of construction/scope, including new build, expansion of existing building, remediation/rehabilitation of building)?<br>If so, what have been the results achieved (e.g., level of success in meeting original project budget, scope and schedule targets)? | Low | Yes. BCIT has extensive experience. Recent Ministry funded capital projects delivered on time and within budget. Positive results in budget/scope control. Professional project management.<br><br>2014: $16.5 M Annacis Island Campus.<br><br>2013: $2.7 M NE8 Building – Welding Ventilation Renewal.<br><br>2012: $39.6 M SW1 Building Renewal & Expansion (Knowledge Infrastructure Program) | | |

| | | | | | |
|---|---|---|---|---|---|
| 2. Governance | Are appropriate project governance structures /processes established to oversee and monitor capital projects (e.g., project boards)? | Low | Project Charter and governance model in place. BCIT project management framework includes a development industry advisory committee. | | |

| Category | Risk Factor | Initial Risk Rating Low/Med/High | Ministry/Agency Mitigation Measures/ comments | Ministry of Finance Comments/ Rationale | Residual Risk Rating Low/Med/High |
|---|---|---|---|---|---|
| Part A: Organizational level risk assessment *(Assessment required to be completed annually, and updated for major changes)* | | | | | |
| 3. Management Processes | Are the ministry's/agency's capital plans aligned with:<br>a.) The needs identified in the ministry's approved service plan?<br>b.) Government's strategic plan and priorities? | Low | Yes. BCIT's Capital Plan aligns with all provincial plans and priorities, including the BC Skills for Jobs Blueprint. | | |
| | Are asset inventory and/or program/facility usage tracking systems (e.g. asset condition index and FTE and space utilization data) used to monitor and assess the need for capital investment? | Low | Yes. BCIT has fully implemented the VFA asset condition index. BCIT has completed a seismic risk assessment of all buildings. BCIT fully complies with Ministry annual FIS space utilization enrolment reporting. | | |
| | Is an appropriate risk management program in place to manage risk at the capital program and project levels?<br>Are performance measurement and reporting processes in place at the ministry and agency levels to oversee project progress? | Low | Risk register forms a part of the Project Charter and BCIT project management framework. | | |

| Category | Risk Factor | Initial Risk Rating Low/Med/High | Ministry/Agency Mitigation Measures/ comments | Ministry of Finance Comments/ Rationale | Residual Risk Rating Low/Med/High |
|---|---|---|---|---|---|
| Part B: Project level risk assessment *(assessment required for all projects o er million)* | | | | | |
| 1. Expertise | Does the ministry/agency have recent experience managing similar types of capital projects (consider project size, complexity, procurement method, type of construction/scope, including new build, expansion of existing building, remediation/rehabilitation of building)?<br>If so, what have been the results achieved (e.g., level of success in meeting original project budget, scope and schedule targets) | Low | Yes. BCIT management team has a high degree of experience managing large capital project scope, budget and schedule. | | |
| | Have project team members' roles and responsibilities been clearly defined?<br>Do project team members have the required qualifications/experience for the particular type of project? | Low | Yes.<br>Yes. | | |
| 2. Risk Management | Has Partnerships BC completed a "Preliminary Procurement Screen"? | Low | Yes. Partnerships BC "Preliminary Procurement Screen" procurement assessment undertaken. | | |

| | | | | | |
|---|---|---|---|---|---|
| 3. Project Objectives | Are the project objectives clear and well-defined?<br>Are the project objectives aligned with the needs identified in the ministry's approved service plan? | Low | Yes. Clear BCIT objectives, as outlined in the Concept Plan, are aligned with BC Skills for Jobs Blueprint. | | |

| Category | Risk Factor | Initial Risk Rating Low/Med/High | Ministry/Agency Mitigation Measures/ comments | Ministry of Finance Comments/ Rationale | Residual Risk Rating Low/Med/High |
|---|---|---|---|---|---|
| Part B: Project level risk assessment *(assessment required for all projects o er million)* | | | | | |
| 4. Scope/ Readiness | Has a site been selected? If a site has been selected, have the relevant site assessments (e.g. geotechnical assessment), zoning and site servicing requirements been confirmed?<br>If not, have potential sites been identified, including any relevant issues and areas where further review/assessment may be required (e.g. First Nations consultation and municipal zoning and other approvals required)? | Low | Rezoning not required – site is on-campus and all relevant site studies have been performed. | | |
| | Are the project scope features clearly defined?<br>What is the current level of design completion? | Low | Scope features clearly defined and concept plan design complete. | | |
| | Are the project schedule milestones clearly defined?<br>Is the construction schedule accelerated and/or multi-phased? | Low | Yes.<br>No. | | |

| | | | | | |
|---|---|---|---|---|---|
| | Does the relevant data from the asset inventory and/or program/facility usage tracking systems (e.g. asset condition index and FTE and space utilization data) support the need for the proposed capital solution? | Low | 2014/15 BCIT exceeded the Ministry's funded FTE target in Nursing/other Allied Health programs, with a 103% utilization rate. | | |
| | Are there sufficient contingencies included in the budget to address potential cost increases as design/scope details are further refined and confirmed? | Low | Yes. Project contains contingencies and projected cost escalation. | | |

| Category | Risk Factor | Initial Risk Rating Low/Med/High | Ministry/Agency Mitigation Measures/ comments | Ministry of Finance Comments/ Rationale | Residual Risk Rating Low/Med/High |
|---|---|---|---|---|---|
| Part B: Project level risk assessment *(assessment required for all projects o er million)* | | | | | |
| 5. Financial | Could the project have a significant impact on the Fiscal Plan? Need to consider the following:<br>• Ongoing maintenance and operating costs -<br>• Revenue generation and related risks (e.g., market risks) – | Low | Increased operating costs associated with the new building will be absorbed by BCIT within their existing operating budget. | | |

| | | | | | |
|---|---|---|---|---|---|
| | Has a draft project capital budget been developed? If so, are the key underlying assumptions clearly stated and reasonable (e.g., capital cost estimate reviewed by a Quantity Surveyor and based on either conceptual, indicative or detailed design drawings or based on unit costs for recently completed similar projects)? | Low | Yes, a comprehensive capital project cost estimate has been prepared by a Quantity Surveyor, including contingencies, cost escalation and taxes. | | |
| | Is funding for the capital project included within the ministry's approved capital plan? If so, what type of approval has been provided (e.g., notional approval)?<br>Life cycle costs: Can program/service delivery costs be accommodated within the ministry's approved multi-year operating targets? | Low | Yes. Notional approval.<br>Costs will be absorbed within BCIT's existing operating budget. | | |
| | If the project is dependent on 3rd party financing, has the 3rd party financing been committed/secured? Are there any specific conditions attached to this funding that may be difficult for the Province to address | Low | Project is not dependent on 3rd party financing. | | |

| Category | Risk Factor | Initial Risk Rating Low/Med/High | Ministry/Agency Mitigation Measures/ comments | Ministry of Finance Comments/ Rationale | Residual Risk Rating Low/Med/High |
|---|---|---|---|---|---|
| Part B: Project level risk assessment *(assessment required for all projects o er million)* | | | | | |
| 6. Procurement | Is the dollar value of the project such that it will attract scrutiny or interest from external stakeholders (e.g. contractors, public, OAG), which in turn could impact the level of oversight needed? | Low | Yes. | | |
| | Have potential procurement options been identified? Does the ministry/agency have recent experience with any of these procurement options? If so, what results were achieved for each of the procurement options (e.g., did the agency/ies meet original project budget, scope and schedule targets)? | Low | Yes: Design-Bid-Build.<br><br>Yes.<br>Partnerships BC "Preliminary Procurement Screen" procurement assessment undertaken | | |
| 7. Complexity/ Profile | Is the project's success, failure, or result likely to be of great interest to the public or specific groups of stakeholders?<br><br>Could the project be perceived as having a direct impact on a significant number of citizens (e.g. province-wide, regional or local service focus)?<br><br>Is the project likely to impact people to whom the government owes a particular duty of care (i.e. First Nations, children at risk, vulnerable populations) or will have a direct impact on health and safety? | Low | Yes, serves key nursing and health care technologist professions, several of which BCIT is the sole educational provider in the Province. Letters of support from Vancouver Coast Health, Fraser Health, Interior Health and UBC Faculty of | | |

| | | | | | |
|---|---|---|---|---|---|
| | | | Medicine have been provided in support of this project.<br><br>Project will not impact people for whom the government owes a duty of care. | | |

| Category | Risk Factor | Initial Risk Rating Low/Med/High | Ministry/Agency Mitigation Measures/ comments | Ministry of Finance Comments/ Rationale | Residual Risk Rating Low/Med/High |
|---|---|---|---|---|---|
| Part B: Project level risk assessment *(assessment required for all projects o er million)* | | | | | |
| 7. Complexity/ Profile (Continued) | Does the project have the potential to impact (positively or negatively) government mission-critical or business-priority operations or services? Is the project scope likely to change significantly due to stakeholder consultation/influence? | Low | Yes. BC Labour Market Outlook 2010-2020 forecasts Health occupations will experience annual average growth rate in BC of 2.4%, significantly higher than annual provincial average labour growth rate of 1.4%. Health occupations also identified as high opportunity occupations in the High Opportunity Occupations in BC. No. | | |
| | Does the project require new legislation, regulation, or policies, or amendments? If so, have the necessary Cabinet/legislative approvals been obtained? | Low | No. | | |

| | | | | | |
|---|---|---|---|---|---|
| | Is the project being completed in partnership with other agencies, or is it dependent on MOUs or agreements with other agencies? | Low | No. | | |
| 8. Other | Please identify any other significant risk factors | | See "Risk Register" for this project. | | |

## Overall Risk Assessment

| Final (Residual) Risk Rating | Approval Level | Rationale (including key considerations) |
|---|---|---|
| Mainly high | Ministry of Finance | |
| Mainly medium | Ministry of Finance | |
| Mainly low | Ministry and/or Project Board | |

## DEFINITIONS

Low Risk: Strong organizational track record delivering similar projects within original budget, scope and schedule targets, governance and monitoring processes/structures in place, experienced project team (including experience with proposed procurement method), low dollar value (e.g. below $10 million), well-developed design/scope, low public/political profile

Medium Risk: New/evolving governance and monitoring processes/structures, project team has some experience but not with the particular type of project (e.g., type of construction/scope), project team has limited experience in the type of procurement planned, moderate dollar value (e.g., $10m-30m), local rather than provincial profile, accelerated and/or multi-phased construction schedule

High Risk: Poor organizational track record, inexperienced project team, no or new governance and monitoring processes/structures, high dollar value (e.g. over $30 million), early stage of schematic design, alternative procurement method e.g. P3 and DB, high public/political profile, technically complex/unique scope, accelerated and/or multi-phased schedule

# G >

## Partnerships BC
## "Preliminary Procurement Screen" April 2016

BRITISH COLUMBIA INSTITUTE OF TECHNOLOGY

# BCIT – Health Science Center for Advanced Simulation Project

## Preliminary Procurement Screen

April 7, 2016

partnerships British Columbia

# TABLE OF CONTENTS

## 1 ENGAGEMENT OVERVIEW AND METHODOLOGY

The Ministry of Advanced Education (AVED, the Ministry) requires that provincially-funded post-secondary capital projects in excess of $20 million be reviewed by Partnerships BC (PBC) prior to the finalization of any concept plan and/or selection of a procurement method. British Columbia Institute of Technology (BCIT), at the direction of AVED, has engaged PBC to conduct a procurement screen for the development of the New Health Sciences Centre for Advanced Simulation (HSCAS, the Project).

Partnerships BC undertook the following activities to produce this preliminary procurement screen:

- Reviewed the material provided by BCIT, including the Concept Plan Report dated October 1, 2014;
- Discussed the Project with BCIT staff (Craig Sidjak, Director Campus Development; Mark Dale, Senior Director Facilities and Campus Development) through conference calls and email exchanges; and
- Examined the Project using the procurement screening process developed by PBC.

In combination with the Concept Plan Report, this preliminary procurement screen is provided to support the approval application process for the Project.

## 2 CONTEXT

The Province Capital A et ana ement Framework (CAMF) (brought into force by Treasury Board Directive 1/03) and Capital Standard (related policy) set out expected due diligence in capital planning including the analysis of procurement options and development of concept plans and business cases for capital projects. The Capital Standard indicates that projects with a capital value in excess of $100 million be screened to assess potential for delivery as a public private partnership; this screen is completed by the Ministry of Finance. At the concept plan phase, projects with a capital value between $20 million and $100 million should be reviewed for characteristics that would indicate their suitability for delivery as Design Bid Build (DBB), Construction Management (CM) or Design Build (DB). The results of the review should guide the procurement options selected for detailed analysis during business case development. The CAMF requires that a procurement options analysis be completed during business case phase to compare a traditional procurement model (e.g. DBB) to an alternative (e.g. DB) based on qualitative and quantitative analysis.

## 3 PROJECT SUMMARY

BCIT is planning a renewal of its Burnaby campus through a capital renewal program titled BCIT Renew . This proposed renewal consists of three phases:

- Phase 1: New Health Sciences Centre for Advanced Simulation;

- Phase 2: Renewal of Existing SW03; and
- Phase 3: Renewal of Existing SW01.

This project screen focuses on Phase 1, which is presently in the concept planning phase with the Ministry. Work on Concept Plans for Phases 2 & 3 are planned to occur concurrently with the construction of Phase 1.

The Project is a new building of approximately 100,600 sf/9,350 sm situated on BCIT  Burna y campu , on BCIT-owned land. The new facility will accommodate Health Sciences programs that are currently distributed across seven different buildings. Once the programs are consolidated in the new facility, BCIT will use the vacated areas of the existing buildings as swing space to enable the future phases of BCIT Renew to occur.

The new HSCAS facility will be a four-storey structure (with one level of underground parking) designed to enable simulation of a variety of health care environments, and to respond to future changes in health care education. This unique, complex facility will consist of classroom spaces, simulation spaces, lab spaces, equipment storage and service access spaces. Creating a strong school identity and sense of place on the campus, the HSCAS is intended to tren then BCIT  main campu entry  ith an innovative and sustainable design that animates the adjacent streetscape. While the functional program is to be determined during the business case phase of the Project, the HSCAS will accommodate eleven existing BCIT programs (for more information refer to BCIT Health Sciences Renewal Project: New Building Concept Plan Report, October 2014, by City Spaces).

The capital cost to deliver the Project, including an $11.7 million allowance for specialized simulation equipment (SSE), is estimated at $78.3 million[1] in 2016 dollars. (It should be noted that the cost estimate was prepared in October 2014 and the Concept Plan now reflects a construction start in the first quarter of 2018. As such, the escalation costs may not accurately reflect the proposed schedule in the Concept Plan).

BCIT has advised that planning and program development is currently in progress in parallel with finalization and approval of the Concept Plan. The current consultant team has been engaged to deliver the full business case to BCIT. Once approval has been received, BCIT will issue an RFP to procure the required technical advisors to provide support through the procurement and implementation stages of the Project.

## 4 PRELIMINARY PROCUREMENT SCREENING PROCESS

Projects may be procured using a variety of approaches including: Construction Management (CM); Design Bid Build (DBB); Design Build (DB); and public private partnership approaches. However, it is important to conduct appropriate analysis to identify the procurement approach that has potential to offer the best relative value for money for the public, while ensuring that the procurement model chosen

[1] Class D cost estimate by James Bush & Associates Ltd., dated October 1, 2014.

protects public interest in terms of issues such as health, safety, equality and sustainability. Appendix A attached includes an overview of procurement options.

At the Concept Plan stage, the preliminary project screening process includes the following steps that hould e applied a re uired y the project characteri tic

1. For projects with an estimated capital value in the order of $100M, provide any additional information that Ministry of Finance may require to enable completion of a public private partnership screen;

2. Complete a Construction Management screen if warranted (such as a significant renovation component and complex phasing); and

3. Complete a Design Build screen.

The estimated total project cost is approximately $78.3 million which is below the $100M threshold, at which Ministry of Finance typically requests additional information to enable completion of a public private partnership screen.

The project capital value i et een 20 million to 100 million and therefore the project hould e reviewed for characteristics that would indicate suitability for delivery as Construction Management (CM) or Design Build (DB) as alternatives to a Design Bid Build (DBB).

The Project does not have renovation component and there is no indication of complex phasing, therefore a CM approach is not an appropriate procurement approach for further consideration.

Typically an early project screen would be completed to assess the Project suitability for Design-Build (DB) procurement and whether more detailed procurement analysis of a DB option in comparison to a traditional DBB option is warranted during business case development. However, in this case doing so is un arranted a the City of Burna y permittin proce i not conducive to timely completion of a B

Enquiries made about permitting included a conference call with Burna y Chief Buildin In pector and BCIT representatives that confirmed submissions for a building permit application always require full construction drawings signed and sealed by all professionals with Letters of Assurance to demonstrate compliance with BC Building Code and City Bylaws. Burna y Buildin epartment may choose to issue partial permits on the basis of full construction drawings, however they would not accept a permit application for excavations or foundations based on stage drawing packages.

The City of Burna y unique process requirements have the effect of extending the schedule for a DB project delivery beyond that of a DBB. In this case, a DB delivery would result in a completion date in the later part of 2020 whereas BCIT could deliver the project as a DBB by spring-summer of 2020 on time for the September 2020 academic calendar.

## 5 CONCLUSION:

Given the Project characteri tic and the preliminary analy i conducted

- Further consideration of a public private partnership, subject to confirmation with the Ministry of Finance, and CM procurement are not warranted;
- Based on City of Burnaby permitting process, a DBB would provide an earlier project completion date than a DB;
- Although a DB typically provides risk and cost benefits over a DBB, the importance of timely occupancy to meet academic requirements results in a DBB delivery being recommended; and
- During business case phase, BCIT should develop a comprehensive plan and budget, with an appropriate risk reserve, and take steps to manage the risks associated with DBB delivery.

or future project , BCIT hould inve ti ate hether the City of Burna y permittin proce may have changed to accommodate timely delivery of a DB procurement.

## APPENDIX A - PROCUREMENT OPTIONS

### 1. DESIGN BUILD

In a Design Build (DB) model, the private partner is engaged through a competitive selection process to both design and construct the required infrastructure according to a set of output specifications. The owner would be the key contracting party procuring the project through a contract for design and construction. This model is effective for transferring a portion of the design and construction risks associated with developing the project. This model could be used to secure a relatively higher degree of schedule and cost certainty in comparison to DBB and CM.

### 2. DESIGN BID BUILD

Using a Design, Bid, Build model (DBB), the owner engages an architect to develop a detailed design (working drawings) for the facility. Once the working drawings are complete, a tender call for a construction contract is issued. The lowest qualified price must be selected and an industry standard fixed price construction contract is used. The construction contractor takes responsibility for constructing the building to the specifications detailed in the working drawings developed for the owner by the architect. The owner remains responsible for errors and omissions and makes monthly progress payments to the contractor.

### 3. CONSTRUCTION MANAGEMENT

Using a Construction Management (CM) approach, the owner engages a construction manager to implement the chosen design. The construction manager provides coordination services in lieu of a general contractor and provides design phase input and advice. Unlike a DBB or DB, there is no fixed price as the construction manager does not bid a fixed price for the project. The construction manager works to a budget and schedule, but cost and schedule risks remain with the owner. The full price of the project may not be well-known until the project is well underway, which may result in scope changes to achieve budget constraints.

### 4. PUBLIC PRIVATE PARTNERSHIP

Under the Design, Build, Finance, and Maintain (DBFM) model, the private partner is engaged through a competitive selection process to design, build, finance and maintain the project under a long term contract (e.g., 30 years). Payments cover the capital costs, as well as operations and maintenance costs, and are subject to deductions where performance criteria are not met.

BCIT

partnerships British Columbia

# H >

# Fundraising Plan

# HEALTH SCIENCES CENTRE FOR ADVANCED SIMULATION

# FUNDRAISING PLAN

February 2016

## TABLE OF CONTENTS

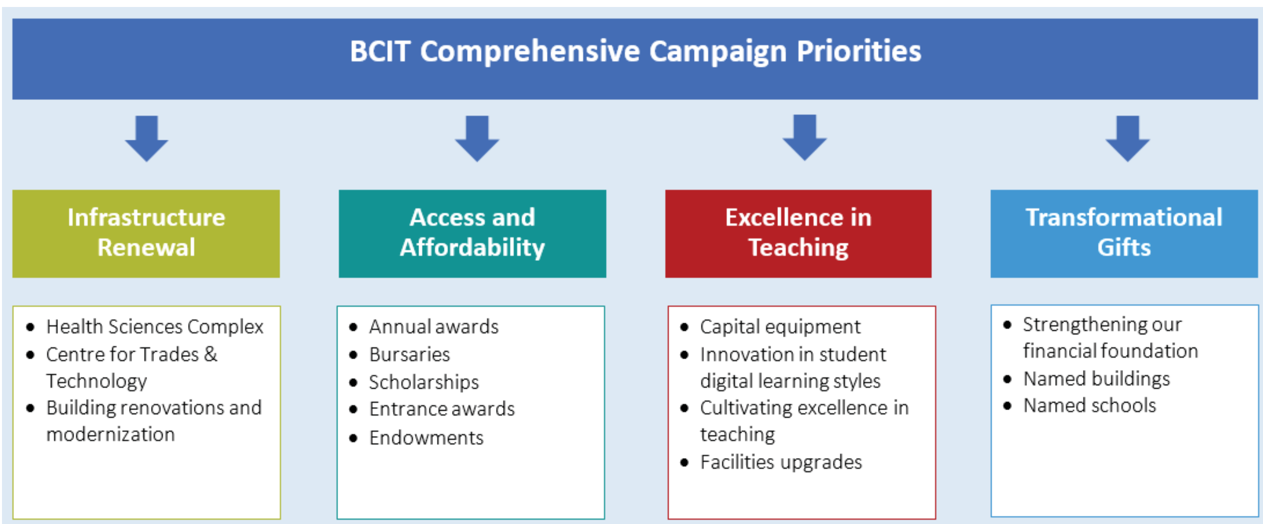
## 1. Background

BCIT has a solid 20-year track record of fundraising success. Millions of dollars are raised annually to support the facilities and equipment necessary for a quality education and also to endow and bolster need-based scholarships and achievement awards. Currently, over $25 million is endowed with the BCIT Foundation to support scholarships and awards.

Buoyed by this record of success and the strength of community support that exists for BCIT, management has every confidence that securing the required private sector support for the proposed BCIT Health Sciences Centre for Advanced Simulation ("HSCAS") project is both realistic and achievable.

## 2. Campaign Strategy

It is generally recognized that big ideas drive big donations and donors are increasingly looking to see significant impact from their contributions. As recommended by Compton Fundraising Consultants and, as supported by our peer reviews at McGill University, George Brown College, and Ryerson University, BCIT has developed a comprehensive campaign plan to raise $100 million through private sector support. Accordingly, the HSCAS project is included as an integral part of this larger comprehensive campaign strategy, set out below.




### 2.1 Implementation

Building on the strong 50th Anniversary celebrations, the campaign will powerfully evoke the enduring spirit of BCIT and the exciting direction BCIT is taking into the future. This core story will serve as the platform for the comprehensive campaign message from which the HSCAS project, and others, will emerge as key components. Early discussions of this fundraising strategy with volunteers, donor prospects, and the BCIT community have provided strong indications of support. A robust and comprehensive plan for this campaign has been developed to guide our development activities and ensure success. Appendix 1 provides a campaign plan timeline and management is on track on delivery of these key steps.

### 2.2 Campaign Cabinet

Appointing a well-placed campaign cabinet, who will support BCIT with advice, guidance, and a willingness to assist with solicitations for support will be integral to our success. A number of individuals are being approached and a campaign briefing will take place on April 7, 2016 with the objective to secure a volunteer campaign cabinet of 15-20 people. A number of individuals have already indicated an interest in participating.

### 2.3 Early Success

Management quietly launched the campaign strategy in April 2014 and has successfully secured contributions designated to the four comprehensive campaign areas. As of December 2015, $15.3 million has been raised in pledged contributions from over 1,500 donors. Based on indications of support from prospects in active cultivation, we anticipate reaching close to $20 million by December 2016.

## 3. Health Sciences Centre for Advanced Simulation Project Fundraising

The BCIT Board of Governors has identified the HSCAS project as a priority fundraising initiative for the BCIT Foundation with the following key elements:

| |
|---|
| Total projected cost - **$78.3 million**<br>(New building cost - $66.57 million, specialized simulation equipment cost - $11.70 million) |
| Required private sector support - **15% ($11.7 million)** |
| 20% of private sector support (**$2.3 million**) to be pledged by business case stage – **September 2016** |
| As of December 2015, $125,000 pledged and a further $750,000 is pending approval ($875,000) |
| Total private sector support to be pledged by project completion date - **2019/20** |

### 3.1 HSCAS Current Funding Status

- On December 15, 2015, BCIT secured $125,000 in pledged support ($50,000 received) designated to the HSCAS project;
- A $1 million proposal is being considered for approval by a donor on February 10, 2016. Of this funding, $750,000 will be designated to the HSCAS project. The donor has indicated that if this contribution is approved, they will assist BCIT in approaching four additional prospects for similar contributions;
- In mid-February, a long time individual donor to BCIT with the capacity for a $1 million plus gift has requested a “low-key” visit to BCIT School of Health to determine possible interest in involvement with the project; and,
- A donor who annually contributes an average of $130,000 to School of Health initiatives is being approached. Total contributions from this donor since 2005 amount to nearly $1.5 million and it is believed that targeting $1 million in designated support for the HSCAS project is realistic.

### 3.2 Fundraising Deliverables

Management is acutely aware of the need to secure $2.3 million in pledged contributions for the HSCAS project by September 2016. Based on commitments to date, indications from prospects in cultivation, and the support of the Foundation Board, management considers securing the required pledged support by September 2016 to be feasible.

A number of prospects have indicated an interest in providing funding support once the project receives all the necessary approvals for advancement. As the project moves to reality, experience suggests that a number of new donors will start to emerge.

Management is adopting the following four key strategies to build out the pool of prospects required to meet the $11.7 million goal for the HSCAS project:

1. **Advance Current Prospects**
   Within the next 180 days, the priority is to advance our top 10-15 prospects and donors already in the cultivation stage. These prospects all have the capacity to make an average gift of $500,000. This engagement strategy is actively being implemented as demonstrated in the examples provided within the HSCAS funding status above. The following tactics will be deployed:
   - Meet with these top prospects and donors to share the comprehensive campaign strategy and case for support for the HSCAS project;
   - Arrange a campus tour for each prospect and meet with School of Health leadership and faculty to clearly demonstrate the urgency of the need and the benefits of this project to students, BCIT, and the healthcare sector in BC; and
   - Publically acknowledge leading gifts as a mechanism to raise awareness and profile and generate further support for this project through the identification of new prospects.
2. **Alumni Support**
   From our database of 150,000 BCIT alumni, we will target key prospects with an affinity and demonstrated interest in supporting BCIT or the broader health sector. Specifically, our tactics will include:
   - Identifying the top 100 prospects with the capacity for a philanthropic gift of $50,000 or more;
   - From the top 100 prospects, advancing discussions with the top 20 who have a strong affinity and history of giving to BCIT; and,
   - Utilizing alumni engagement events and activities in an effort to expand the network of support among our alumni.
3. **Expanding Donor Base**
   By December 2016, the plan is to identify 100 corporations, individuals, and foundations that have demonstrated through their past philanthropic gifts an affinity to education and health related sectors. Tactics will include:
   - Review current and lapsed donors who can be re-engaged with BCIT or increase their current giving levels and have the capacity to support the project;
   - Steward existing donors to assist in identifying new prospects; and
   - Expanding engagement and networks through the tactical use of Foundation and BCIT events and also through Program Advisory Committees.

4. **Tactical Use of Board and Cabinet**
   Identify new prospects by leveraging relationships held by Foundation Board and campaign cabinet volunteers. Tactics will include:
   - Providing briefings and campaign materials to targeted audiences;
   - Meeting with each of these individuals and committees to seek their advice and guidance on prospects; and,
   - Prioritizing prospects by greatest affinity, capacity, and interest, and seeking support for cultivation and solicitation.

### 3.3 Cash & Pledge Projections

The timing of donation pledges and cash payments are difficult to project with accuracy, particularly at the early stages of a campaign, but as the project evolves, pledge payments become more robust and timing more predictable. The cash flow and pledge projections set out in Appendix 2 have been developed based on representations from prospects in cultivation, best practices, and the following key assumptions:

1. Typically four prospects must be identified for every successful solicitation;
2. All pledges for the HSCAS project will be made by the end of the 2019/20 fiscal year; and
3. The payment pledge period for large gifts will be 5 years.

### 3.4 Contingency Strategy

Based on the known prospects in development to date, securing the first 50% of the $11.7 million goal is considered to be a relatively low risk and the risk profile of the balance would dramatically reduce as the project matures through the development cycle and new prospects are cultivated.

It is our understanding that the Ministry of Advanced Education ("AVED") has reviewed BCIT's current and projected financial status, confirmed that BCIT's operating cash flow is over-subscribed, and the Institute cannot contribute directly to this project if the fundraising goal is not achieved. In the absence of any alternative funding source, BCIT will adopt the following contingency strategy to mitigate risks attached to the fundraising plan, which could arise due to circumstances beyond our control:

1. We will continually evaluate the fundraising progress throughout the campaign and make appropriate adjustments to the strategy where necessary to keep the campaign on target. In the event we do not meet the required goal by the end of construction, the campaign will be extended until such time as all the required funds have been secured;

2. BCIT would supplement the project by repurposing, for one fiscal year, our annual Institute Batch Capital Equipment funding (currently budgeted at $1.35M) towards the procurement of simulation equipment required for building occupancy. This would provide one time funding of approximately $1.35M if required. While the School of Health receives some of the annual $1.35 million annually from this fund, it represents a significant operational challenge for the other five schools and Applied Research if this funding is reallocated solely to health equipment; and

3. A phased procurement of simulation equipment would be extended until the funding has been secured. The phasing of simulation equipment procurement would be timed to minimize impacts on education programming planned for the building. It should be noted that any delay in procurement of some of the simulation equipment would not adversely impact the commissioning of the new HSCAS building.

## 4. Conclusion

This HSCAS project is a catalyst to achieving BCIT's bold and ambitious comprehensive campaign aspirations by 2021. With the support demonstrated to date, together with the clear roadmap outlining the necessary activity for the HSCAS project, BCIT is well positioned to secure support for this project and drive BCIT's vision for the future forward.

While there are external factors that could impact the timing of fundraising outcomes, the framework BCIT has established for this HCSAS campaign is sound and has a solid foundation. We consider achieving the pledged support for the $2.3 million qualification contribution by September 2016 and meeting the $11.7 million campaign target by 2020/21 to have a high probability of success and to be a realistic and achievable goal.

# Appendix 1 – Comprehensive Campaign Timeline

| | 2015 | | | | 2016 | | | | | | | | | | | | 2017 | | | | | | | | | | | | 2018 | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Action** | S | O | N | D | J | F | M | A | M | J | J | A | S | O | N | D | J | F | M | A | M | J | J | A | S | O | N | D | J | F | M | A | M | J | J | A | S | O | N | D |
| Project presented to A&F Committee | | | | | | ■ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Develop detailed Campaign Plan | | | | | ■ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Campaign Plan Endorsed by BCIT Foundation | | | | | | ■ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Project approved by BCIT BOG | | | | | | ■ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Develop Case for Support | | | | ■ | ■ | ■ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Develop Promotional Material | | | | ■ | ■ | ■ | ■ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Identification o Top Donor Prospects | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ongoing | | | | | | | | | | | | | | | | | | | | | | | |
| Review Case/Assign Financial Targets | | | | | ■ | ■ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Develop Named Recognition Opportunities | | | | | | | ■ | ■ | ■ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Develop Giving Policies & Board Approval | | | | | ■ | ■ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Campaign staff hiring/secondment | | | | ■ | ■ | ■ | ■ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Identification of Cabinet Prospects | | | | ■ | ■ | ■ | ■ | ■ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Recruit Cabinet and Evaluation Committee | | | | | | ■ | ■ | ■ | ■ | ■ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Hold Prospect Evaluation Sessions | | | | | | | ■ | ■ | ■ | ■ | ■ | ■ | ongoing | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Conduct Intensive Cultivation Program (one-on-one) | | | | | | | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | | | | | | | | | | | | | | | | | | | | | | |
| Solicitation of Top Prospects | | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ongoing | | | | | | | | | | | | | | | | | | | | | |
| Campaign Review | | | | | | | | | | | | | | ■ | ■ | ■ | | | | | | | | | | | | | | | | | | | | | | | | |
| Continue solicitation (largest best prospects first) | | | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Foundation Annual Programs | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |

## Appendix 2 – Development Plan Projections

### Health Sciences Centre for Advanced Simulation (HSCAS)
### Development Plan Projections

| DONOR DEVELOPMENT | 2015/2016 | 2016/2017 | 2017/2018 | 2018/2019 | 2019/2020 | 2020/2021 | 2021/2022 | 2022/2023 | TOTAL |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |
| **2015/2016 Activity** | | | | | | | | | |
| Prospect Cultivation | 3,750,000 | | | | | | | | |
| Active Solicitations | 1,875,000 | | | | | | | | |
| Commitments Pledged | 875,000 | 1,000,000 | | | | | | | |
| Commitments Received | 250,000 | 500,000 | 500,000 | 475,000 | 150,000 | | | | |
| **2016/2017 Activity** | | | | | | | | | |
| Prospect Cultivation | | 8,200,000 | | | | | | | |
| Active Solicitations | | 4,100,000 | | | | | | | |
| Commitments Pledged | | 2,500,000 | 1,500,000 | 100,000 | | | | | |
| Commitments Received | | 900,000 | 900,000 | 1,100,000 | 900,000 | 300,000 | | | |
| **2017/2018 Activity** | | | | | | | | | |
| Prospect Cultivation | | | 10,000,000 | | | | | | |
| Active Solicitations | | | 5,000,000 | | | | | | |
| Commitments Pledged | | | 2,500,000 | 2,400,000 | 100,000 | | | | |
| Commitments Received | | | 750,000 | 1,100,000 | 1,550,000 | 1,100,000 | 500,000 | | |
| **2018/2019 Activity** | | | | | | | | | |
| Prospect Cultivation | | | | 1,200,000 | | | | | |
| Active Solicitations | | | | 600,000 | | | | | |
| Commitments Pledged | | | | 500,000 | 100,000 | | | | |
| Commitments Received | | | | 90,000 | 120,000 | 210,000 | 120,000 | 60,000 | |
| **2019/2020 Activity** | | | | | | | | | |
| Prospect Cultivation | | | | | 250,000 | | | | |
| Active Solicitations | | | | | 125,000 | | | | |
| Commitments Pledged | | | | | 125,000 | | | | |
| Commitments Received | | | | | 75,000 | 50,000 | | | |
| **TOTAL DONATIONS PLEDGED** | **875,000** | **3,500,000** | **4,000,000** | **3,000,000** | **325,000** | **-** | **-** | | **11,700,000** |
| **TOTAL DONATIONS RECEIVED** | **250,000** | **1,400,000** | **2,150,000** | **2,765,000** | **2,795,000** | **1,660,000** | **620,000** | **60,000** | **11,700,000** |

FUNDRAISING PLAN