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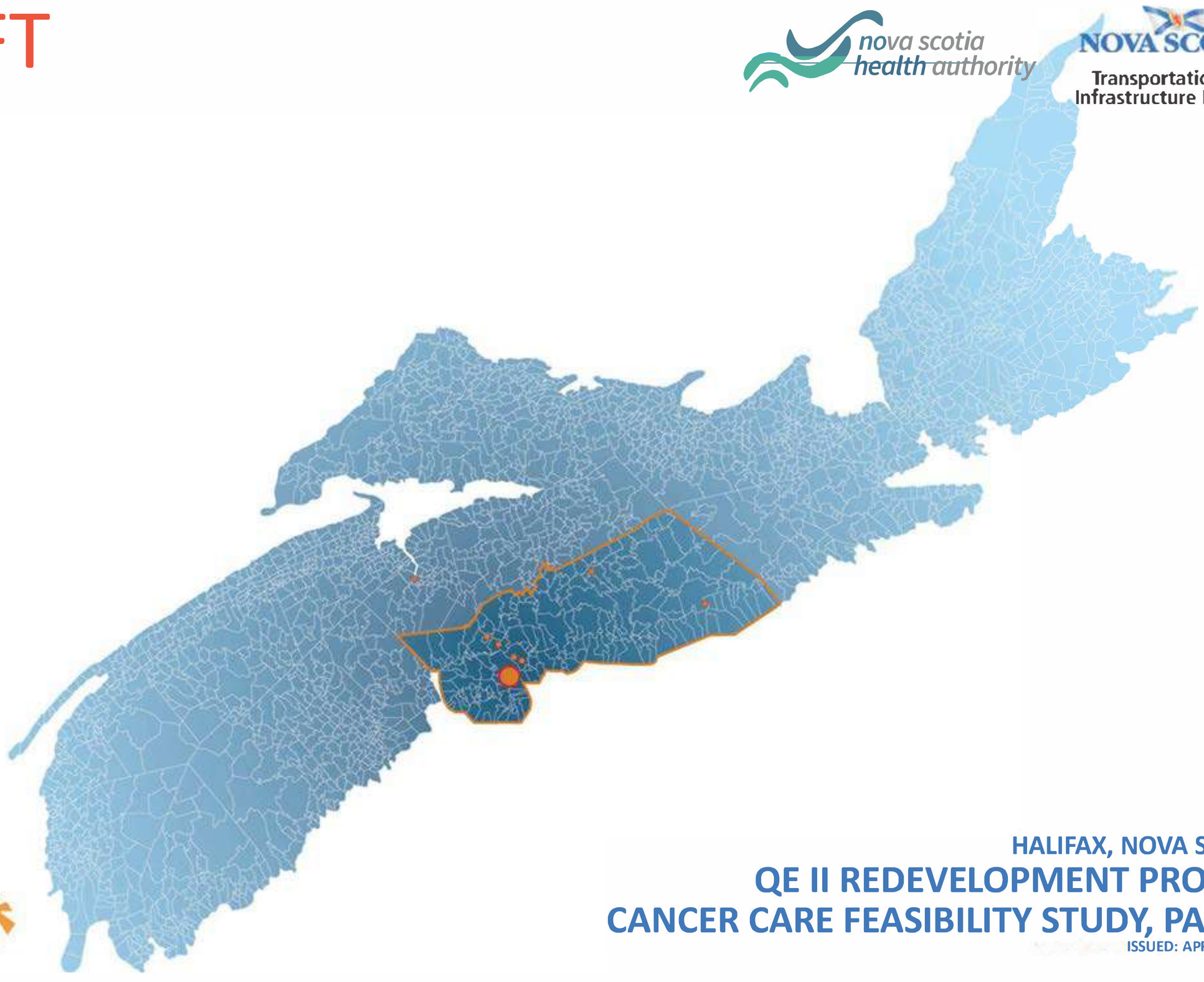
nova scotia health authority

NOVA SCOTIA
Transportation and Infrastructure Renewal



kasian

HALIFAX, NOVA SCOTIA

QE II REDEVELOPMENT PROJECT
CANCER CARE FEASIBILITY STUDY, PART A

ISSUED: APRIL 07, 2018

The one that's rolling toward the shore
The one that's drawing back across the sand
The one that's crashed around the rocks and is returning
The one that rippled down the sloping land.

It moves with ever one of them at once
No strife, no strain, no clash of time-
The calm absorbing of each motion passing through
Steady relaying of each arc of truth.

So love accommodates the waves -
Waves of feeling, waves of yearning.
*Waves of **hope** sent out beyond awareness*
*Waves of **care**, outgoing and returning.*

Pottery by Jennifer McCurdy, Poetry by Wendy Mulhern

Prepared for
Department of Transportation & Infrastructure Renewal (DTIR)
Johnson Building
1672 Granville St.
Halifax, Nova Scotia
www.novascotia.ca/tran/

In Coordination and Collaboration with
QEII Redevelopment Office
Halifax Infirmary - Rm 1128 (Summer St)
Halifax, NS
www.nshealth.ca

Prepared by
KASIAN Architecture Ontario Inc.
85 Hanna Avenue, Suite 300
Toronto, Ontario
www.kasian.com

The following professionals from Kasian have been engaged to form the Design Team to develop the master plan for QEII Health Sciences and have contributed to the report:

Principal in Charge: Ian Sinclair, *MHA, CHE*
Design Lead, Master Plan: Trevor X. Pereira, *OAA, NSAA, MRAIC, RIBA, Dipl.Arch*
Project Manager: Brenda Lee, *OAA, LEED AP BD+C, MRAIC, NSAA, BArch*
Designer: Aidan Ferriss, *M.Arch, BURPI, Dipl.Arch Tech, LEED AP*
Designer: Diana Velasquez, *M.Arch, B.A.S*
Designer: Natalia Bakaeva, *M.Arch, B.Arch, PGDip. Const Mgmt*
Constructability Advisor: Michael Paquette, *MAATO*
Production Support: Sunny Li, *OAA, LEED AP BD+C, M.Arch*
Production Support: Juan Cruz, *Bsc Arch*
Project Administrator: Maria Ng, *BArchSci*

Consultants
Kasian Architecture Ontario Inc., Prime Consultant
Agnew Peckham, Master Programmer
F.C. O'Neill, Scriven & Associates Ltd., Mechanical, Electrical & IT Engineering
Insight Health Tech Planning, Equipment Planner
Hanscomb Ltd., Cost
BA Consulting Group Ltd., Traffic

Project Team

Kasian is the prime consultant retained by DTIR to complete the Cancer Care Feasibility study on the HI Site. Kasian is collaborating with the following consultant team to develop a report that will document the feasibility of relocating cancer care to the Halifax Infirmary (HI) Site.

Prime Consultant:

KASIAN ARCHITECTURE ONTARIO INCORPORATED

85 Hanna Avenue, Suite 300
Toronto, Ontario
Canada, M6K 3S3

Master Programmer:

AGNEW PECKHAM HEALTH CARE PLANNING CONSULTANTS

4141 Yonge St
North York, Ontario
Canada, M2P 2A8

M + E + IT Engineer:

F.C. O'NEILL, SCRIVEN & ASSOC'S LIMITED

5450 Cornwallis Street
Halifax, Nova Scotia
Canada B3K 1A9

Equipment Planner:

INSIGHT HEALTH TECH PLANNING

1285 Eglinton Ave East., Unit 19
Mississauga, Ontario
Canada, L4W 1B9

Cost Consultant:

HANSCOMB LIMITED

40 Holly St
Toronto, Ontario
Canada, M4S 3C3

Traffic Consultant:

BA CONSULTING GROUP LTD

45 St Clair Ave W
Toronto, Ontario
Canada, M4V 1K9

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The design team would like to acknowledge the time, input and effort from DTIR & NSHA in delivering the master programming/ planning project. Extensive input was provided by a broad spectrum of stakeholders including; physicians and other clinicians, ancillary service providers, support services staff, the project management office, members of the executive team, the Board of the NSHA and officials and politicians from a variety of related government departments. This degree of consultation with both internal and external stakeholders will help to ensure that this master program and master plan for the long term redevelopment of the Halifax Infirmary and Victoria General Hospital sites that will enable the QEII HSC to achieve its clinical and community objectives; delivering Connected Care for all Nova Scotians.

The Master Programming/ Master Planning document is a result of a highly collaborative effort between many different participants. The Design & Programming team would like to thank the following for their contributions & efforts:

QEII Facility Renewal Executive Committee

Co-Chair: Paula Bond, VP, Integrated Health Services Program 1 Central Zone, NSHA
Co-Chair: John O'Connor, Executive Director - Major Infrastructure Projects, DTIR
DHW, Craig Beaton, Executive Director, Strategic Operations
DTIR, Brian Ward, Director of Major Infrastructure
NSHA, Victoria van Hemert, Senior Director, QEII/ DGH Redevelopment
NSHA, Allan Horsburgh, VP, Stewardship & Accountability and Chief Financial Officer
NSHA, Janice Johnston, Director- Infrastructure, QEII Redevelopment
NSHA, Dr. David Kirkpatrick, Department Head of Surgery
NSHA, Rita Morrison, Clinical Director, QEII Redevelopment
NSHA, Bill Levangie, Manager, Engineering and Facility Planning
NSHA, Rakesh Minocha, Senior Director, BIAM
NSHA, John Gillis, Director, Online Engagement and Community Relations
NSHA, Nicole de Gier, Communications Advisor
DTIR, Terry Smith-Lamothe, Lead Architect - Consultant
DTIR, Bryan Darrell, Director, Healthcare Project Services
DTIR, Tom Gouthro, Executive Director, Building Project Services
DTIR, Gary Porter, Executive Director - Corporate Initiatives
DTIR, Deborah Bayer, Communications Advisor
DTIR, Heather Cannon, Project Coordinator

QEII / DGH Facility Renewal (Steering) Committee

Co-Chair: Paula Bond, VP Integrated Health Services Program 1 Central Zone, NSHA
Co-Chair: John O'Connor, Executive Director - Major Infrastructure Projects, DTIR

QEII Facility Renewal Executive Committee and:
DHW, Samantha Aiton, Manager, Policy and Planning
DHW, Shelley Bonang, Finance - Physician Services and Capital Planning
DHW, Christine Gibbons, Executive Director, Corporate Policy, Planning & Process
ECO, Jacqueline Foster, Policy & Outreach Advisor
FTB, Allan Eddy, Executive Director, Corporate Strategic Initiatives
FTB, Gilles Melanson, Corporate Financial Analyst
ISD, Sandra Cascadden, Chief Information Officer
ISD, Chris Mitchell, Executive Director, Strategic Sourcing
NSHA, Vickie Sullivan, Operations Executive Director, Central Zone
NSHA, Dr. Mark Taylor, Medical Executive Director, Central Zone
NSHA, Tim Guest, VP, Integrated Health Services Program 2 & Chief Nursing Officer
NSHA, Dr. Todd Howlett, Chief of Staff, Dartmouth General Hospital
NSHA, Heather Hanson, Chief, Public Engagement & Communications
NSHA, Heather Francis, Health Services Director, Dartmouth General Hospital
NSHA, Bob Borden, Manager, Engineering & Construction

QEII Redevelopment Project Team

DTIR, Terry Smith-Lamothe, Senior Architect
DTIR, Brian Ward, Director of Major Infrastructure
DTIR, Bryan Darrell, Director, Healthcare Project Services
DTIR, Denis Pellichero, Manager, Healthcare Services Projects
NSHA, Victoria van Hemert, Senior Director- QEII/ DGH Redevelopment
NSHA, Janice Johnston, Director- Infrastructure, QEII Redevelopment
NSHA, Rita Morrison, Clinical Director, QEII Redevelopment
NSHA, Bill Levangie, Manager - Engineering & Facility Planning, QEII Redevelopment
NSHA, Bob Borden, Manager - Construction Services & Engineering, QEII Redevelopment
NSHA, Jim MacLean, IM/IT Manager, QEII Redevelopment
NSHA, Gerry Giffin, Project Manager, QEII Redevelopment
NSHA, Nicole de Gier, Communications Advisor
NSHA, Jessica Simms, Executive Assistant to Senior Director QEII Redevelopment

Acknowledgements

QEII Steering Committee

Co-Chair: Victoria van Hemert, Sr. Director- QEII/ DGH Redevelopment, NSHA (commencing Dec 15/17)
Co-Chair: Dr. David Kirkpatrick, Department Head of Surgery, NSHA

QEII Redevelopment Project Team and:
Executive Director Central Zone –Vickie Sullivan
Executive Medical Director Central Zone – Dr. Mark Taylor
Department of Surgery – Dr. David Bell/ Dr. Benjamin Davis
Department of Anesthesia – Dr. Romesh Shukla
Department of Medicine – Dr. Simon Jackson/ Dr. Short
Department of Critical Care – Dr. Tobias Witter/ Dr. Ward Patrick/ Debbie Hutchings
Clinical Support Services –Randi Monroe
Ambulatory Care – Dr. Marcelo Nicolela, Kim Munroe, Dr. Stephen Couban
Hants Community Hospital – Sherri Parker
Information Technology – Keltie Jamieson
Perioperative Services – Dr. James Bentley/ Dr. Adam Law/ Joanne Dunnington
Patient Flow – Brian Butt
Pharmacy – Ann Hiltz/ Roberta Baker
Primary Care – Shannon Ryan Carson/Graeme Kohler
Finance – Bob Kolanko/ Karen McDuff/Fred Colaiacovo
Building Infrastructure & Asset Management/ Support Services – Dennis Gillis
Human Resources/Labour Relations – Dave Collins
Occupational Health – Angela Keenan
QEII Foundation – Bill Bean (ex-officio)

Other Contributors:

Cancer Care – Dr. Drew Bethune/ Jill Flinn/ Erika Nicolson
Diagnostic Imaging – Brian Martell/ Dr. David Barnes

Staff Representatives, Halifax Regional Municipality (HRM)
Richard Harvey, Manager - Policy & Planning, Parks & Recreation
Mitch Dickey, Policy Coordinator, Parks & Recreation
Carolle Koziak Roberts, Landscape Architect, Policy & Planning, Parks & Recreation
Tanya Davis, Manager- Strategic Transportation Planning Program
Peter Duncan, Manager- Infrastructure Planning
Patricia Hughes, Manager- Halifax Transit

Consultation took place with the following user groups in the development of the master program and master plan:

- Diagnostic Imaging
- Cancer Care

Table of Contents

Cancer Care Feasibility Study

Note: Master Program (Support Services) and Functional Programs (Cancer and DI) to be submitted in a separate volume.

List of Illustrations

List of Illustrations

Background Documents

In order to fully understand all relevant historic & current issues, the team conducted a thorough evaluation of all documents provided. The following list of documents were reviewed by the design team as part of the master programming/ master planning process:

Rezoning
- *"Halifax Municipal Planning Strategy", November 26, 2016*
- *"Land use By-law - Halifax Peninsula", May 21, 2016*
- *"Peninsula Land Use By- Law, ZM-17 - Height Precincts", December 2014*
- *"City of Halifax - Halifax Common Background Report"*

MOU

"Signed MOU HRM_CDHA", Feb 12, 2010

Nova Scotia Health Authority
- *"Healthier Together - Introduction"*
- *"Healthier Together - Questions & Answers"*
- *"Healthier Together - 2016-19 Strategic Plan"*
- *"Healthier Together - Vision, Mission, Values"*
- *"Briefing Note: Physician and Academic - related Space Planning Principles applicable to QEII Redevelopment"*

Former School Information
- *"Phase II Environmental Site Assessment", Oct 29, 2008*
- *Certificate of Analysis: 11X515735", Aug 10, 2011*

RFP Annex Documents
- *"Annex A - Summary of Schematic Design Reports by Nycum & Associates"*
- *"Annex B - Master Planning Concept"*
- *"Annex C - NSHA Central Zone Facilities Summary"*
- *"Annex D - Nova Scotia Detailed Health Statistical Information"*

Strategic Plan
- *"Healthier Together: Introduction"*
- *"Healthier Together: Questions and Answers"*
- *"Healthier Together: 2016-19 Strategic Plan"*
- *"Vision, Mission, Values"*

Traffic
- *"Final Report Traffic Impact Study: St. Pat's / QEH School" , Jul 2005*
- *"Final Report Traffic Impact Study: St. Pat's / QEH School" , Jul 2005*
- *"Final Report Traffic Impact Study: St. Pat's / QEH School Appendices" , Jul 2005*

Radiotherapy
- *"Radiotherapy Facilities: Master Planning and Concept Design Considerations" , IAEA Human Health Reports No. 10, Aug 2014*

Definitions & Abbreviations

DEFINITIONS

BUILDING HEIGHT

Building Height is the vertical distance measured from grade to the roof level and excludes mechanical penthouses.

DEPARTMENTAL GROSS SQUARE FOOTAGE (DGSF)

Departmental Gross Area (Also referred to as component gross area) is the space required to house a whole department or functional area. It includes all the individual net areas required by the departmental functions, circulation space as necessary to link together the net spaces and area occupied by internal walls. It excludes all engineering spaces and interdepartmental circulation elements such as main corridors, stairways, elevators and dumbwaiters.

GROSS FLOOR AREA (GFA)

Gross floor area is the total of the horizontal areas of each floor of a building or structure, measured from the exterior face of the exterior walls or from the centerline of a common wall separating two buildings or structures, above the finished grade. The finished grade is the final level of the ground surface after grading.

NET SQUARE FOOTAGE (NSF)

Net Area is the usable space, usually comprising a single room or floor area, allocated to a function or group of related functions. It excludes the area occupied by walls, corridors and space for engineering installations including duct shafts and chases.

SITE COVERAGE

The portion of a building site that is occupied by any building or structure, typically expressed as a percentage of occupied footprint area to total site area.

SETBACKS

Setbacks are the distance from a property line within which building is prohibited. Setbacks are set in municipal ordinances or zoning by-laws.

GROSS TO NET RATIO

The Gross to Net Ratio is a factor which yields the departmental gross area when applied to a given net area or sum of net areas. Net to gross ratios are empirical and vary according to function and also by lesser amounts according to the individual programmer or designer applying them.

ABBREVIATIONS

HI	Halifax Infirmary
VG	Victoria General
COC	Community Outpatient Centre
AJLB	Abbie J Lane Building
VMB	Veterans Memorial Building
ED	Emergency Department
NSHA	Nova Scotia Health Authority
DTIR	Department of Transportation & Infrastructure Renewal
HRM	Halifax Regional Municipality
AMB	Ambulatory
INP	Inpatient/OR
DI	Diagnostic Imaging
DIC	Dickson Building
CCNS	Cancer Care Nova Scotia

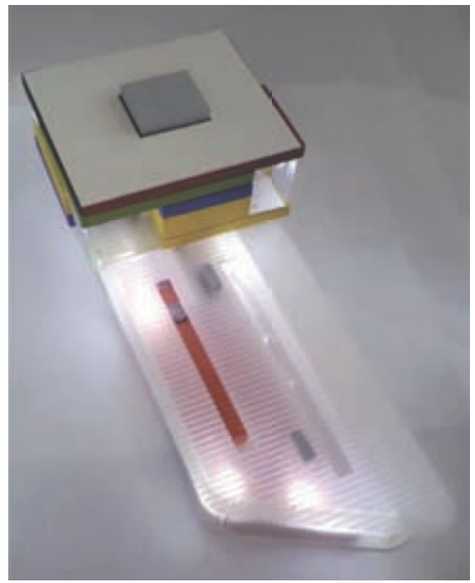
1

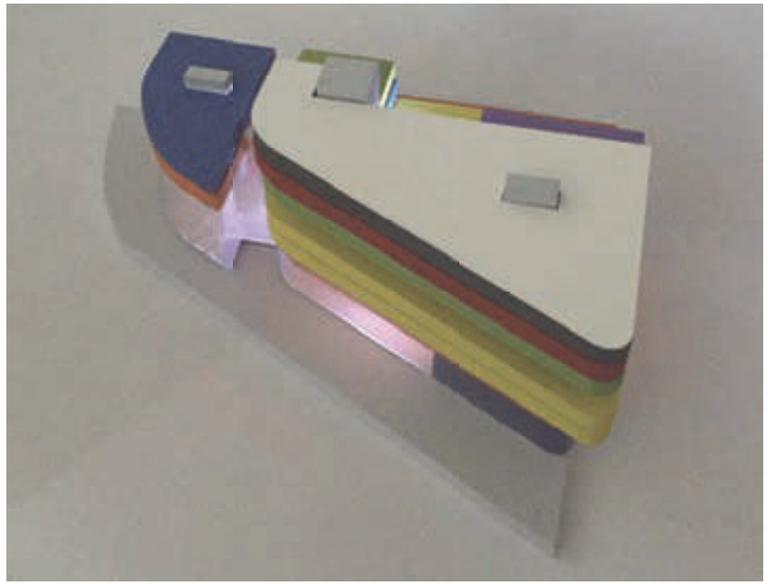
Introduction

1.0 Introduction

Following the completion of the master plan which generated two master plan concepts- The Willow Tree and The Commons, Kasian was asked to explore the potential to relocate the Cancer Care Centre currently housed in the Dickson Building at the VG site to the HI site. The intent of the study is to test, at a high level, the feasibility of relocating the Cancer Care Outpatient clinic and support services to the HI site, including site opportunities and constraints, key clinical adjacencies to other programs, transportation and parking, and mechanical and electrical infrastructure. This phase of the project also includes updates to the functional programs for Cancer Care and Diagnostic Imaging to capture the changes to space requirements with the consolidation of Cancer Care on the HI site. This study began with exploring multiple potential opportunities for Cancer Care on the HI site, including options for a stand alone Cancer Centre as well as an integrated model with Ambulatory Care. The result of the development to date are the two concepts presented in this report- The Garden Pavilion and The Beacon.

Ultimately, the master plan is a document that lays out a logical, achievable site development strategy that accommodates, not only the current facility priorities (Victoria General site) onto the Halifax Infirmary Site and a Community Outpatient Centre at Bayers Lake, but within the context of a longer-term site development plan that will help to enable the provision of Connected Care for Nova Scotians for the next 50 years.





1.0 Introduction

1.0.1 NSHA Mission & Vision Statement

Nova Scotia Health Authority (NSHA) provides health services to Nova Scotians & some specialized services to Maritimers & Atlantic Canada. NSHA operates hospitals, health centres & community based programs across the province, educates the health care professionals of tomorrow & conducts ground breaking research.

NSHA is a hub of cutting edge discovery & innovation. Partnerships with IWK Health Centre & other academic institutions including Dalhousie University create a world leading research environment.

Within NSHA there are 4 managements zones - Western, Northern, Eastern, and Central. The Central Zone (where the Queen Elizabeth II Health Sciences Centre is located) is made up of 10 locations including a number of community based centres that serve patients & citizens closer to where they live.

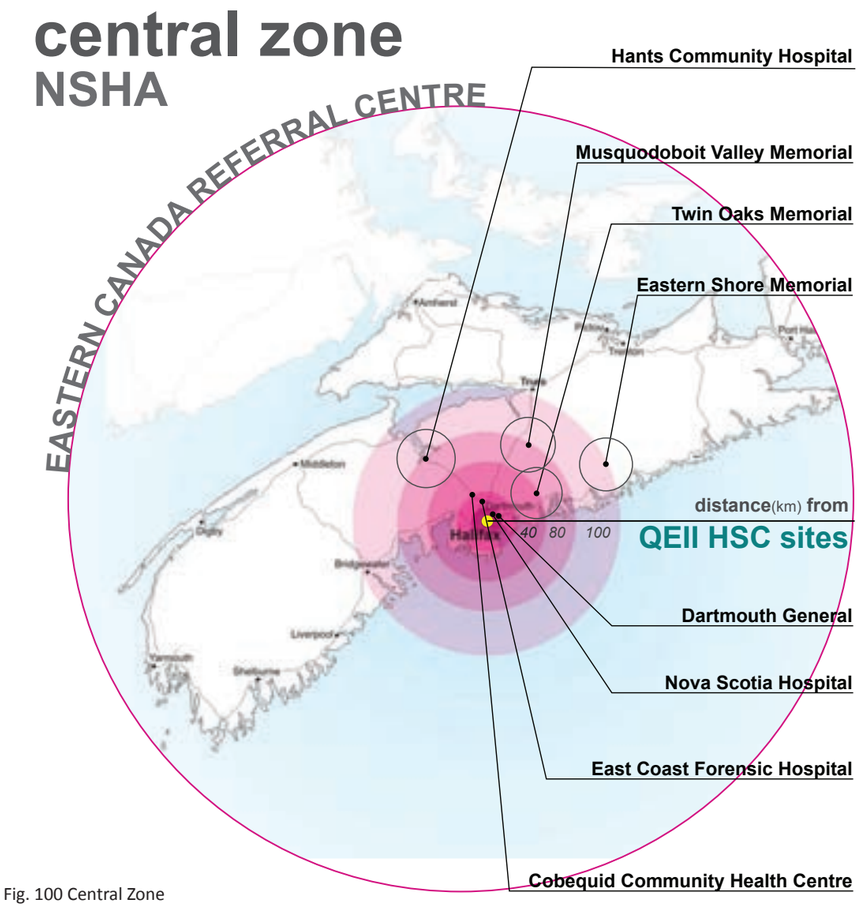


Fig. 100 Central Zone

The following is the Vision, Mission & Values statement of NSHA:

VISION	MISSION	VALUES
HEALTHY PEOPLE, HEALTHY COMMUNITIES — FOR GENERATIONS	TO ACHIEVE EXCELLENCE IN HEALTH, HEALING AND LEARNING THROUGH WORKING TOGETHER	RESPECT, INTEGRITY, INNOVATION, COURAGE, ACCOUNTABILITY

VISION
Healthy people, healthy communities - for generations.

MISSIONS
To achieve excellence in health, healing and learning through working together.

VALUES

Respect
Underlies our interactions with each other and the people we serve. It insists on caring, compassion and understanding, and embraces our diversity and differences to foster a positive environment for good health.

Integrity
Is at the heart of who we are and what we do. In a world that constantly challenges us, our integrity guides us to do what is honest and ethical.

Courage
Strengthens our resolve to do what is right for the health and wellness of Nova Scotians. We must, as an organization and as individuals, listen to others, have open and honest conversations, and make difficult decisions.

Innovation
Requires inquisitiveness, focused attention and creative solutions. We welcome and seize opportunities to create value. It is through our pursuit of excellence, individually and collectively, that new ideas and knowledge can emerge to advance health, healing and learning.

Accountability
Is our individual and organizational duty to be answerable to the people we serve and each other. It means our decisions and actions are transparent, based on evidence and focused on positive outcomes. We manage ourselves and our finite resources to ensure an effective and sustainable health and wellness system in Nova Scotia.

1.0 Introduction

1.0.2 QEII Health Sciences Centre Facilities and Program Overview

As one of only 17 academic health sciences networks in Canada, The Queen Elizabeth II Health Sciences Centre (QEII) provides primary and secondary care services to people in the zone, and specialized tertiary care - including heart surgery and cancer treatment - to residents from across Nova Scotia, New Brunswick and Prince Edward Island. At the most advanced level of health care, QEII provides quaternary care services in areas such as organ and stem cell transplantation to patients throughout Atlantic Canada.

The QEII Health Sciences Centre is made up of two sites located in downtown Halifax - Halifax Infirmary and Victoria General- situated within close walking distance of each other.

Currently, the QEII Health Sciences Centre's clinical services include:

- 26,000+ surgical visits
- 950+ inpatient beds
- 546,000+ outpatient visits
- 1,200+ active research projects
- 7,000+ staff
- 700+ medical doctors
- 1,200+ volunteers

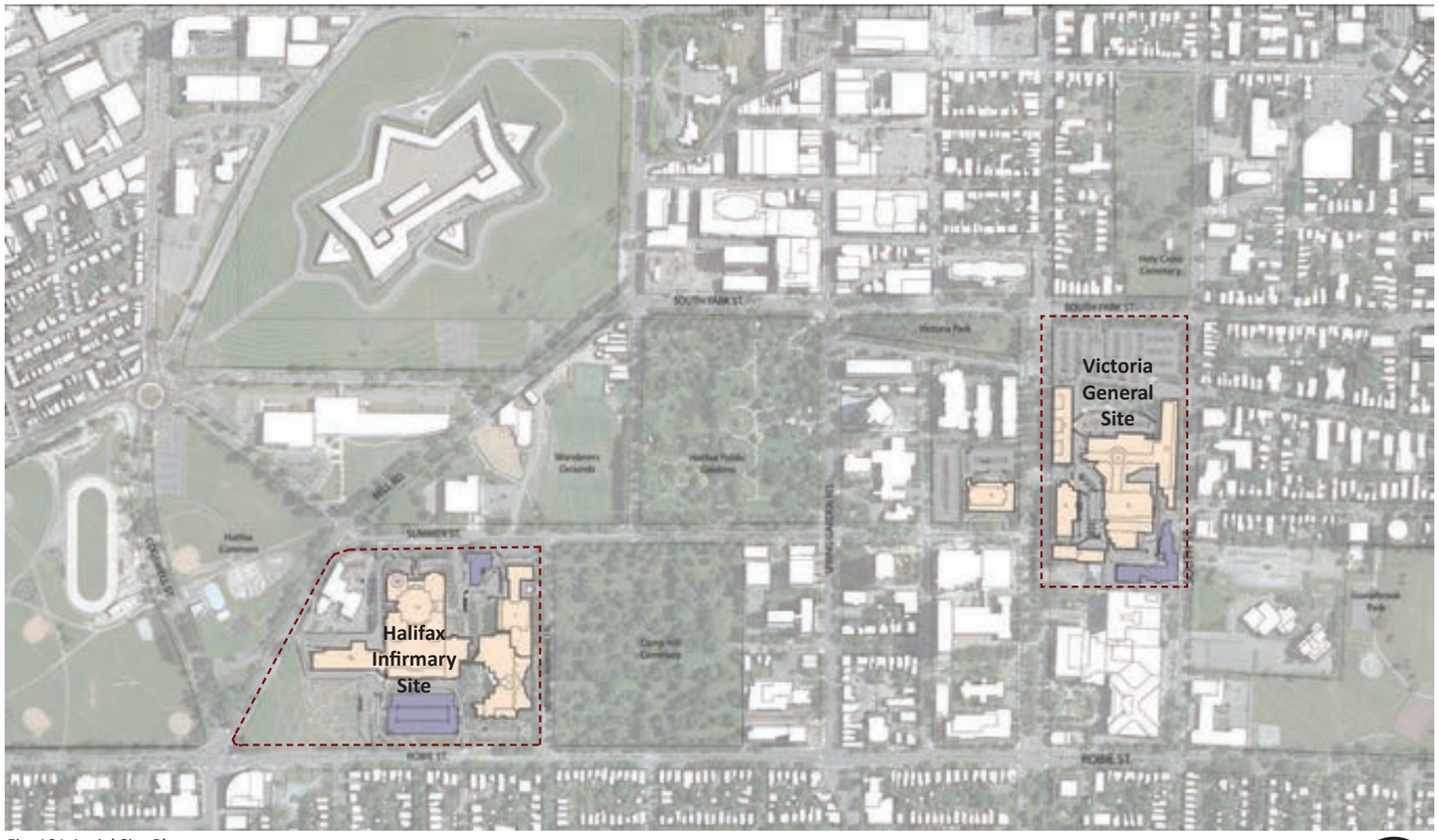
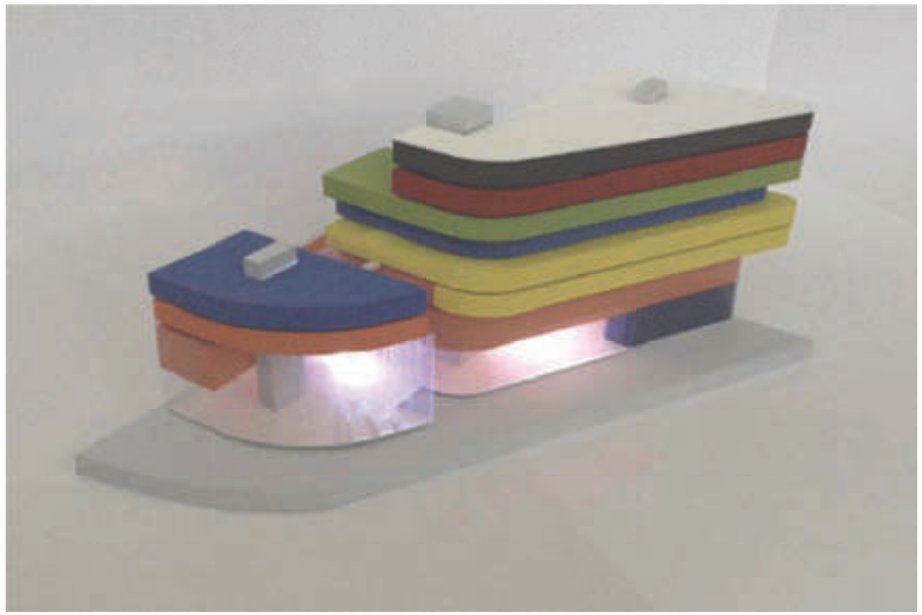


Fig. 101 Aerial Site Plan

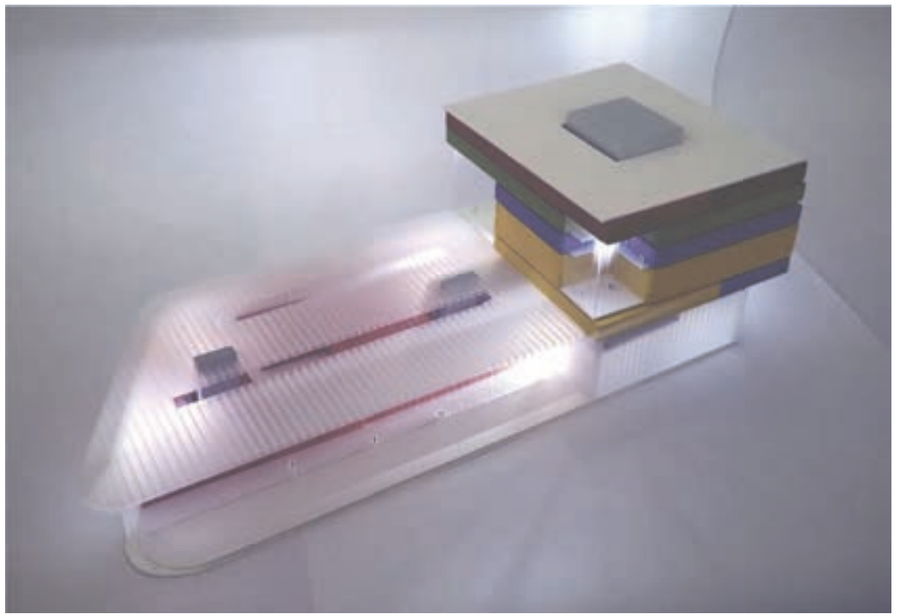
1.1 Project Scope



Established in 1998, Cancer Care Nova Scotia (CCNS) is a provincial program of the Department of Health and Wellness created to reduce the burden of cancer on individuals, families and the health-care system. The Nova Scotia Cancer Care Program is responsible for cancer programs and services across the province including: cancer prevention and early detection, treatment, follow-up, supportive care, palliative care and end-of-life care. Through prevention, screening, education and research. The Cancer Centres, located in Sydney and Halifax, provide a full range of cancer programs and services including: medical, radiation, gynecology, hematology, treatment and follow-up. Multi-disciplinary teams of dedicated professionals help patients and their families cope with the physical, emotional and financial impact of cancer and its treatment.

The QEII Cancer Care Centre is currently located at the Dickson Building on the VG site. In addition to cancer programs and services provided in Halifax, the centre also provides chemotherapy treatments, consultation and follow-up services at community cancer clinics in New Glasgow, Kentville and Yarmouth.

1.2 Methodology and Approach



This phase of the project followed the master planning phase that was completed with Cancer Care remaining at the VG site. The master plan key drivers and principles, developed at the beginning of the previous master planning phase (refer to Vol. 1 & 2 of the QEII Redevelopment Project Master Planning Report), are still applicable and have driven the direction of the Cancer Centre concept development to date. Further to the master planning principles, a series of design drivers specific to Cancer Care were developed in consultation with DTIR and NSHA. As well, a benchmarking tour to Credit Valley Cancer Centre was conducted with Dr. Drew Bethune- Medical Director of the Nova Scotia Cancer Care Program, Jill Flinn- Director, Cancer Care Program, and Rita Morrison- Clinical Director, QEII Redevelopment. The purpose of the tour was to allow the users to see a successfully operating Cancer Centre that shared similar opportunities, challenges and design driver and principles.

The concepts presented in this report evolved following a series of highly engaging design charrettes with DTIR and NSHA using large scale site and massing models where users were able to work through a variety of alternatives to better understand the implications, advantages and disadvantages of each option. Where preferred adjacencies were unachievable due to existing site constraints, users and consultants explored potential trade-offs to ensure patient safety and operational efficiency could still be achieved.

In parallel with these charrettes, a transportation and parking study, mechanical and electrical study complemented the development of the concepts.

1.3 Master Planning Key Drivers and Principles

The Master Plan is driven by various factors, including:

- **Reflect the values and vision of the hospital;**
- **Maximize site utilization** based on available land and site coverage restrictions;
- **Create a rational growth pattern**, while maintaining operational efficiencies and recognition of the existing facility condition and permitting long term development;
- Ensuring that the Master Plan is a framework for development with the ability to **permit flexibility, growth and change**;
- A **phased development**, ensuring that engineering facility capacity requirements are addressed;
- **Urban connectivity** with the City of Halifax and views adjacent parks;
- Create intuitive **wayfinding,** refine internal circulation;
- **Accommodate program growth** and decompression, based on volume growth projections and program priorities;
- **Continuous clinical functionality** at each phase to permit optimum service delivery;
- **Enhanced patient experience** within a healing environment, natural light and views to parks;
- **Optimized cost benefit**, with full recognition of existing facility condition and replacement needs;
- Reflect **environmental influences** & sustainable development approach;
- **Integration of academia & research**;
- **Co-locate** outpatient services;
- **Capitalize on amenity/commercial opportunities.**
- **Capitalize on innovative approaches to patient care and building infrastructure.**

Fig. 102 Environmental Influences

Fig. 103 Urban Connectivity

1.3 Master Planning Key Drivers and Principles

Cancer Care Key Drivers and Principles:

Beyond the key drivers for the overall master plan, a series of design drivers were developed for the Cancer Centre. This was important to the team because a Cancer Centre is not just another health care building. It is a place for those with a very unique disease- unlike any other illness. The journey of every cancer patient is personal; no two patients or diagnosis are exactly alike. Therefore, the criteria typically used to inform cancer centre design must be different. Above and beyond form and function, human empathy- the ability to understand and share the feelings of emotions of another, or more simply, "putting yourself in the shoes of the patient" should be a key driver in cancer centre design. Efficient, flexible and operationally sustainable design should simply be a given. The greater the degree to which a design team can internalize and empathize with these constituents, the more responsive and supportive the environment, the more successful the solution and the better the patient outcomes.

The relocation of the Cancer Centre on the HI site is influenced by and reflects a variety of key drivers and guiding principles, including:

- **Design to reflect a sense of hope and confidence.** Most cancer patients gravitate toward a need to find sources of hope. Views to nature, the seasons, and grand nature tend to evoke a sense of hope.
- **Design to support human dignity.** Cancer is a confusing journey which may involve many de-humanizing experiences along the care and treatment pathway. Care must be taken to ensure that design preserves a sense of dignity where possible. Privacy and confidentiality is important at times, while opportunities for collaboration and community that fosters a sense of "not being alone" is valued at other times.
- **Bring care to the patient.** Where possible, reduce the need for multiple appointments through collaborative, team based care approach.
- **Design for efficiency.** For cancer patients, time takes on a whole new meaning. Design elements that express or reflect a "waste of precious time", therefore, need to be avoided. Careful consideration about the need for waiting rooms (better registration processes using technology, apps, etc.) and reception desks (avoiding processes that repeat redundant questions) required.
- **Maximize natural light.** Benefits for both patients and staff. Many patients spend 8 hours at the cancer centre in order to receive systemic and radiation therapy during a single visit. Therefore, exposure to natural light helps to ensure circadian rhythms are not disrupted and our body's natural cycles remain in sync. Natural light in the on-deck waiting area outside the bunkers is important, as is design that allows for natural light in the bunkers, to humanize the space.
- **Access to amenities**. With many patients spending 8 hours a day in the cancer centre, convenient access to amenities for both patients and family members who attend with them becomes more important (pharmacy, coffee shops, restaurants, spiritual care etc.)
- **First impressions are important.** Given the higher degree of anxiety and fear carried by cancer patients, first impressions set the tone for all future interactions. Similarly, cancer still carries a certain degree of stigma. Positive distractions, (art, water features, open space, views to nature, music etc.) clarity of design, simple intuitive wayfinding help to achieve first impressions. Systemic therapy zones (chemotherapy) should include views to nature and maximize natural light (patients sit in infusion chairs for up to 4 hours a visit.)
- **Bring the outside in.**
- **Places of respite.** Meditation labyrinths or quiet healing gardens support patients, families and staff.
- Design spaces to **"heal the healers".** Unlike other diseases, cancer patient caregivers tend to become emotionally close to their patients. This can be emotionally taxing to staff and caregivers. Offering "off-stage" spaces that allow staff to relax or to reflect privately will help to nourish staff when they need it most.
- **Use of natural materials.** Creates a more supportive healing environment with materials that are acceptable to infection control.
- **Design for the needs of frail elderly.** Lighting, risk of falls, simplicity of wayfinding, appropriate seating should be carefully considered.
- **Design should emphasize access to information.** Cancer patients are desperate for information. Patient and family resource centres can serve as a beacon of hope to patients seeking answers.
- **Plan for growth.** Radiation therapy treatment bunkers are large, and an adequate footprint must be preserved for future expansion.
- **Image and Identity.** The Cancer Centre should have its own identity on the HI site, with its own front door.
- **Connectivity.** Design should promote connectivity between services to better connect related services and promote ambulation.

Fig. 104 Healing Environments

Fig. 105 Healing Environments

1.3 Master Planning Key Drivers and Principles

Infrastructure & Facility Focused Principles

- **Horizontal Integration.** Seamless transition and simplified circulation between components of Halifax Infirmary site, brings clarity in wayfinding. Same level links to the inpatient units and perioperative services in HI from Cancer Care Centre.

- **High efficiency systems and improved performance.** Use of sustainable and LEED standards for appliances and equipment, for instance heat recovery systems, low-flow plumbing, etc. Connectivity to central systems (like M&E) and availability to connect to central facility management centre (near Abby Lane). Possibility for a satellite material management distribution system at cancer building. Shared shipping and receiving between Cancer Care Centre and Inpatient Building.

- **Seamless habitat.** A seamless, stress-free parking experience for patients and understandable wayfinding. Efficient parking solutions and operation (consider valet parking for cancer patients); design does not add more frustration and anger to patients and families. Easy access for staff and patient. Navigation – unobstructed path - connectivity - independent entrances for staff and patients.

- **Organizational Clusters.** Activities are centered around them, individual clusters may be linked by atriums, interconnected spaces, open stairs etc. providing operational integration and link between them through functional vertical as well as visual connections. Each cluster may have a distinct identity that is related to clinical function or patient need. Interdepartmental connections play a key role in contemporary organizational examination and treatment process. Integration of research.

- **Maze layout for radiation bunkers.** It safely contains the radiation and created more patient-friendly environment (being locked behind doors can be psychologically traumatizing).

- **Radiotherapy above ground.** Based on patient feedback and research give more positive image and identity then in case of treatment bunkers being located underground.

- **Cutting-edge equipment.** Meeting critical technical demands of cancer treatment. Functional, efficient, safe and ergonomic treatment areas - maximining clinical gain in patient care.

- **Flexibility, adaptability of structure and service strategy.** Ability to create and update functional spaces in order to accommodate changes in demand and the new ways process is being organized based on operational requirements. Possibility of flexible working arrangement. Removal of department barriers. Finding balance in overlapping in program and spatial requirements.

- **Reinforcement of street frontage.** Gives identity to the building as well as gives a possibility for a additional source of revenue for cancer centre.

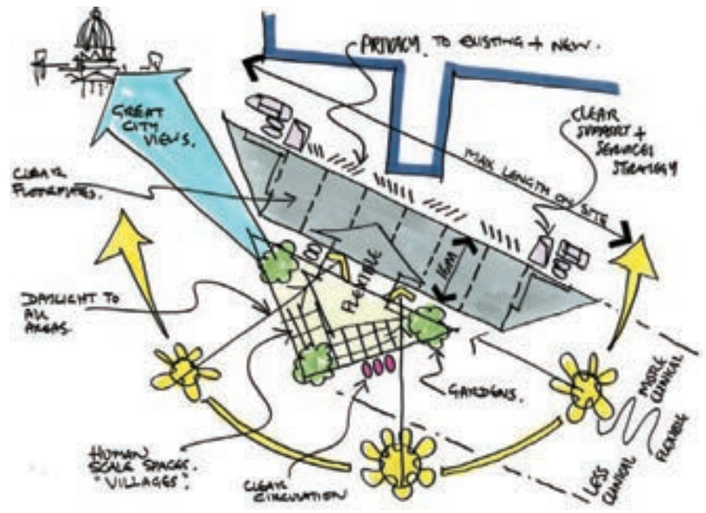


Fig. 106 Precedent Study: Integration

1.3 Master Planning Key Drivers and Principles

Design Elements Interior:

- **Break-out spaces.** Common areas in between for relaxation and engagement between patients or/and staff. **Spiritual Spaces. Support and wellness centre.**

- **Non-institutional healthcare environment.** Opportunity to meet other people in similar circumstances in a relaxed domestic atmosphere. Social space, central area as a social living space, communal table with domestic atmosphere, with a contrast of more intimate seating for private conversations. Variety of seating. Warm and welcoming environment around fully functional medical centre. Shift of focus distraction from the purpose of visit. Sense of community with private space.

- **Arrangement of activities.** Critical number of clinical activities on each level, possibly size of the floor plate is based on patient flow, gives a mix of clinical functions and interdepartmental connections.

- **Connection of spaces** by using transparent materials like glass, mostly in common areas like atriums, as well as connection to outside and surrounding.

- **Noise control, acoustic treatment.**

- **Use of natural materials supports** a more supportive healing environment. A cancer centre is not a bank and should not feel like a bank. **Colours and shapes.** Warm palette, art, studios for art therapy, fluid organic forms.

Design Elements Exterior:

- **Light.** Demystification of hospital environment. Airy space, to reduce psycological impact of waiting time. Direct versus diffused light. Deeply recessed openings - no glare. Natural light versus artificial light.

- **Engagement and context.** Integration to city environment and openness. Concept of “Urban Porch”. Responsive building orientation. Views and Orientation opportunities.

- **Garden Path.** Series of green spaces that defines the key elements of the building and helps with navigation. Gardens and green areas help to reduce psycological impact of waiting time. Wayfinding in entering the Cancer Centre, “building’s labyrinth of nature”. Visual and physical connections to nature. Zen Garden.

- **Colours and shapes.** Warm palette, art, studios for art therapy, fluid organic forms.

- **Embrace regional culture in design.** Local plants.

- **Gathering Plaza.**

Fig. 107 Precedent Study: Views and Nature

1.4 The Greening of Healthcare: LEED

Fig. 108 Precedent Study: Proton Therapy Center for Denmark, Aarhus Arkitekterne

Fig. 110 Precedent Study: Dell Children's Hospital of Central Texas, Karlsberger

Fig. 109 Precedent Study: Einstein Medical Centre Montgomery, Perkins+Will

Goal: LEED Silver

LEED (Leadership in Energy and Environmental Design) is an international rating system for green building. It is predicated on the fact that sustainability should be at the heart of the design, construction and operation of all buildings. Green buildings have a healthier indoor environment for all occupants through better air quality, less harmful products and finishes, and more natural light. They also reduce waste, conserve energy, and reduce water consumption.

LEED BD+C: Healthcare is the rating system which applies to Hospitals operating twenty-four hours a day, seven days a week, providing inpatient medical treatment, including acute and long-term care. Research has demonstrated that green healthcare facilities lead to faster healing, shorter hospital stays, and fewer return visits. This combined with 'evidence-based design' which is the process of basing decisions about the built environment on credible research, to achieve the best possible patient, staff and operational outcomes.

Healthcare projects are motivated to achieve LEED certification for several reasons, including risk management, employee retainment, keeping patients and staff healthier, and under the pretense that there is often a short payback to the bottom line of design/construction costs. Green healthcare provides an opportunity to reduce energy use and improve indoor environmental quality. LEED designed facilities can help meet efficiency goals and ensure patients have a healthy environment and provide a symbol to the system's commitment to quality and the environment to patients and staff alike.

1.4 The Greening of Healthcare: LEED

Pursuing LEED Silver requires 50-59 points of the 110 available. Points are divided into 8 Categories consisting of:

- Location and Transportation,
- Sustainable Sites,
- Water Efficiency,
- Energy and Atmosphere,
- Materials and Resources,
- Indoor Environmental Quality,
- Innovation, and
- Regional Priority

Additionally, commencing LEED certification from the onset of the Planning and Design stages is encouraged and can contribute in the awarding of a point (Integrative Process credit). This credit helps identify opportunities to achieve synergies across disciplines and will help form the projects requirements for certification. The LEED v4 BD+C: Healthcare Project Checklist outlines the credits available for a Healthcare Project. A preliminary evaluation of all available credits has been conducted, assessing credits which are possible or not.

LEED v4 for BD+C: Healthcare
Project Checklist

Project Name:
Date:

Y	?	N				
Y			Prereq	Integrative Project Planning and Design	Required
			Credit	Integrative Process	1

0	0	0	**Location and Transportation**		**9**
			Credit	LEED for Neighborhood Development Location	9
			Credit	Sensitive Land Protection	1
			Credit	High Priority Site	2
			Credit	Surrounding Density and Diverse Uses	1
			Credit	Access to Quality Transit	2
			Credit	Bicycle Facilities	1
			Credit	Reduced Parking Footprint	1
			Credit	Green Vehicles	1

0	0	0	**Sustainable Sites**		**9**
Y			Prereq	Construction Activity Pollution Prevention	Required
Y			Prereq	Environmental Site Assessment	Required
			Credit	Site Assessment	1
			Credit	Site Development - Protect or Restore Habitat	1
			Credit	Open Space	1
			Credit	Rainwater Management	2
			Credit	Heat Island Reduction	1
			Credit	Light Pollution Reduction	1
			Credit	Places of Respite	1
			Credit	Direct Exterior Access	1

0	0	0	**Water Efficiency**		**11**
Y			Prereq	Outdoor Water Use Reduction	Required
Y			Prereq	Indoor Water Use Reduction	Required
Y			Prereq	Building-Level Water Metering	Required
			Credit	Outdoor Water Use Reduction	1
			Credit	Indoor Water Use Reduction	7
			Credit	Cooling Tower Water Use	2
			Credit	Water Metering	1

0	0	0	**Energy and Atmosphere**		**35**
Y			Prereq	Fundamental Commissioning and Verification	Required
Y			Prereq	Minimum Energy Performance	Required
Y			Prereq	Building-Level Energy Metering	Required
Y			Prereq	Fundamental Refrigerant Management	Required
			Credit	Enhanced Commissioning	6
			Credit	Optimize Energy Performance	20
			Credit	Advanced Energy Metering	1
			Credit	Demand Response	2
			Credit	Renewable Energy Production	3
			Credit	Enhanced Refrigerant Management	1
			Credit	Green Power and Carbon Offsets	2

0	0	0	**Materials and Resources**		**19**
Y			Prereq	Storage and Collection of Recyclables	Required
Y			Prereq	Construction and Demolition Waste Management Planning	Required
Y			Prereq	PBT Source Reduction- Mercury	Required
			Credit	Building Life-Cycle Impact Reduction	5
			Credit	Building Product Disclosure and Optimization - Environmental Product Declarations	2
			Credit	Building Product Disclosure and Optimization - Sourcing of Raw Materials	2
			Credit	Building Product Disclosure and Optimization - Material Ingredients	2
			Credit	PBT Source Reduction- Mercury	1
			Credit	PBT Source Reduction- Lead, Cadmium, and Copper	2
			Credit	Furniture and Medical Furnishings	2
			Credit	Design for Flexibility	1
			Credit	Construction and Demolition Waste Management	2

0	0	0	**Indoor Environmental Quality**		**16**
Y			Prereq	Minimum Indoor Air Quality Performance	Required
Y			Prereq	Environmental Tobacco Smoke Control	Required
			Credit	Enhanced Indoor Air Quality Strategies	2
			Credit	Low-Emitting Materials	3
			Credit	Construction Indoor Air Quality Management Plan	1
			Credit	Indoor Air Quality Assessment	2
			Credit	Thermal Comfort	1
			Credit	Interior Lighting	1
			Credit	Daylight	2
			Credit	Quality Views	2
			Credit	Acoustic Performance	2

0	0	0	**Innovation**		**6**
			Credit	Innovation	5
			Credit	LEED Accredited Professional	1

0	0	0	**Regional Priority**		**4**
			Credit	Regional Priority: Specific Credit	1
			Credit	Regional Priority: Specific Credit	1
			Credit	Regional Priority: Specific Credit	1
			Credit	Regional Priority: Specific Credit	1

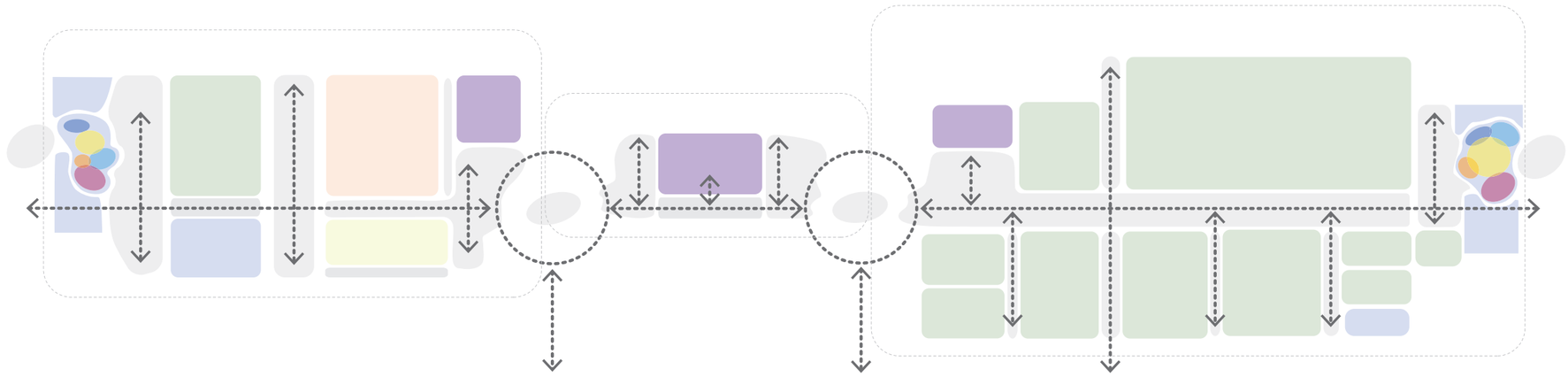
0	0	0	**TOTALS**	Possible Points:	**110**

Certified: 40 to 49 points, **Silver:** 50 to 59 points, **Gold:** 60 to 79 points, **Platinum:** 80 to 110

Fig. 111 LEED v4 BD+C: Healthcare Checklist

2

Cancer Care Explorations



The following diagrams chart the program analysis for the cancer and the ambulatory care centres. The object is to have a clear understanding of program components and to understand the program areas in relation to each other. Finalization of the functional program is in progress and final areas will be reflected in Phase B. As such, the series of area and program analysis diagrams reflects a work in progress and an understanding of the considerations in the conceptual massing. The areas and information reflected in this analysis drive components of the building foot prints, massing and connections.

The analysis extends to a detail of the component parts, naming the components and the net area requirements e.g. outpatient clinics, supportive care / clinical trials etc.

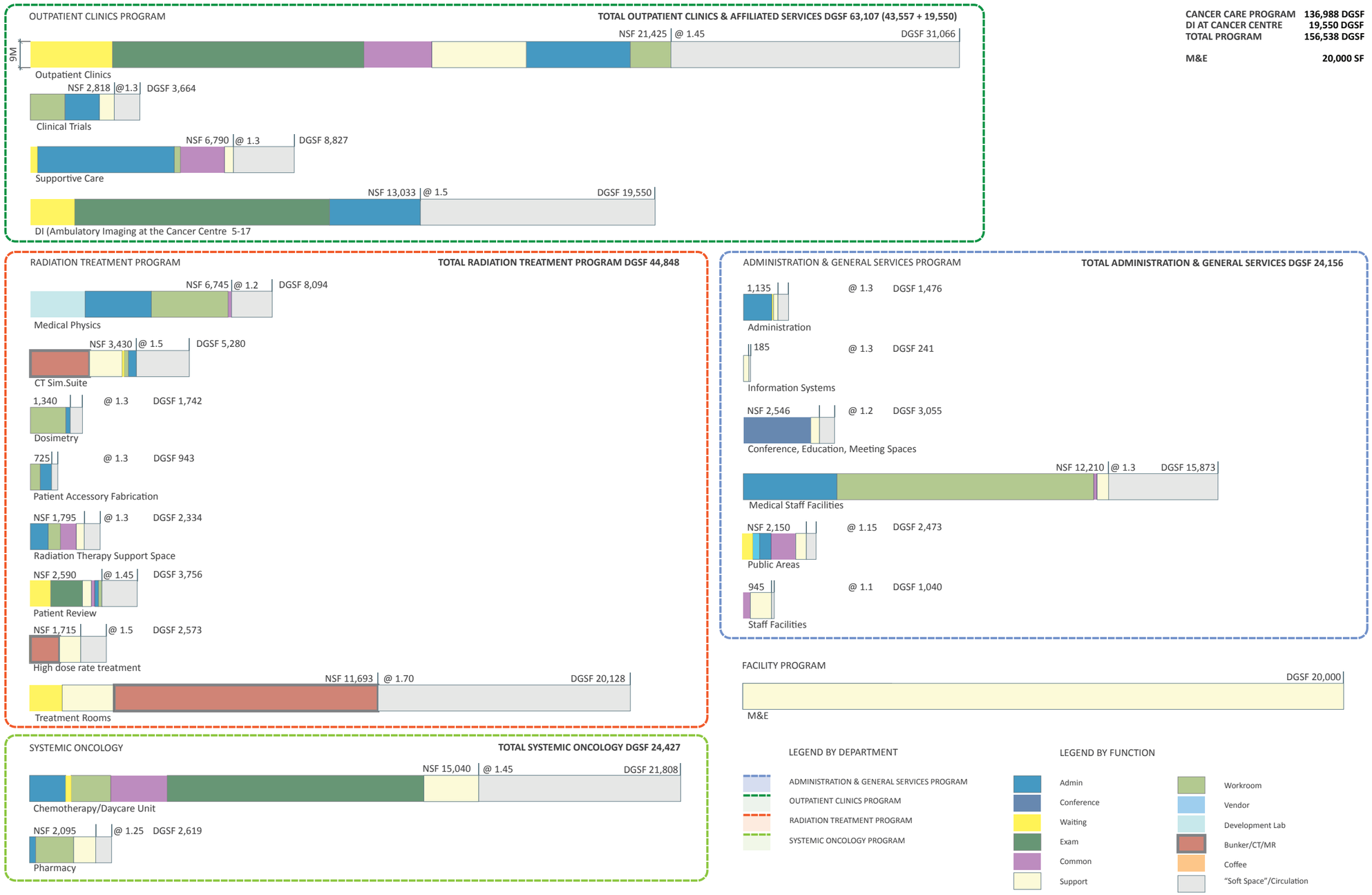
The flow diagrams demonstrate the link between cancer care, research, ambulatory care and existing components of the existing HI which are mapped, to demonstrate the connectivity between the buildings components. The series of diagrams in this section concludes with an adjacency matrix.

2.1 Program Analysis

2.1.1 Functional Program: Cancer Care

*Diagrams based on Cancer Care Space Projections August 21, 2017

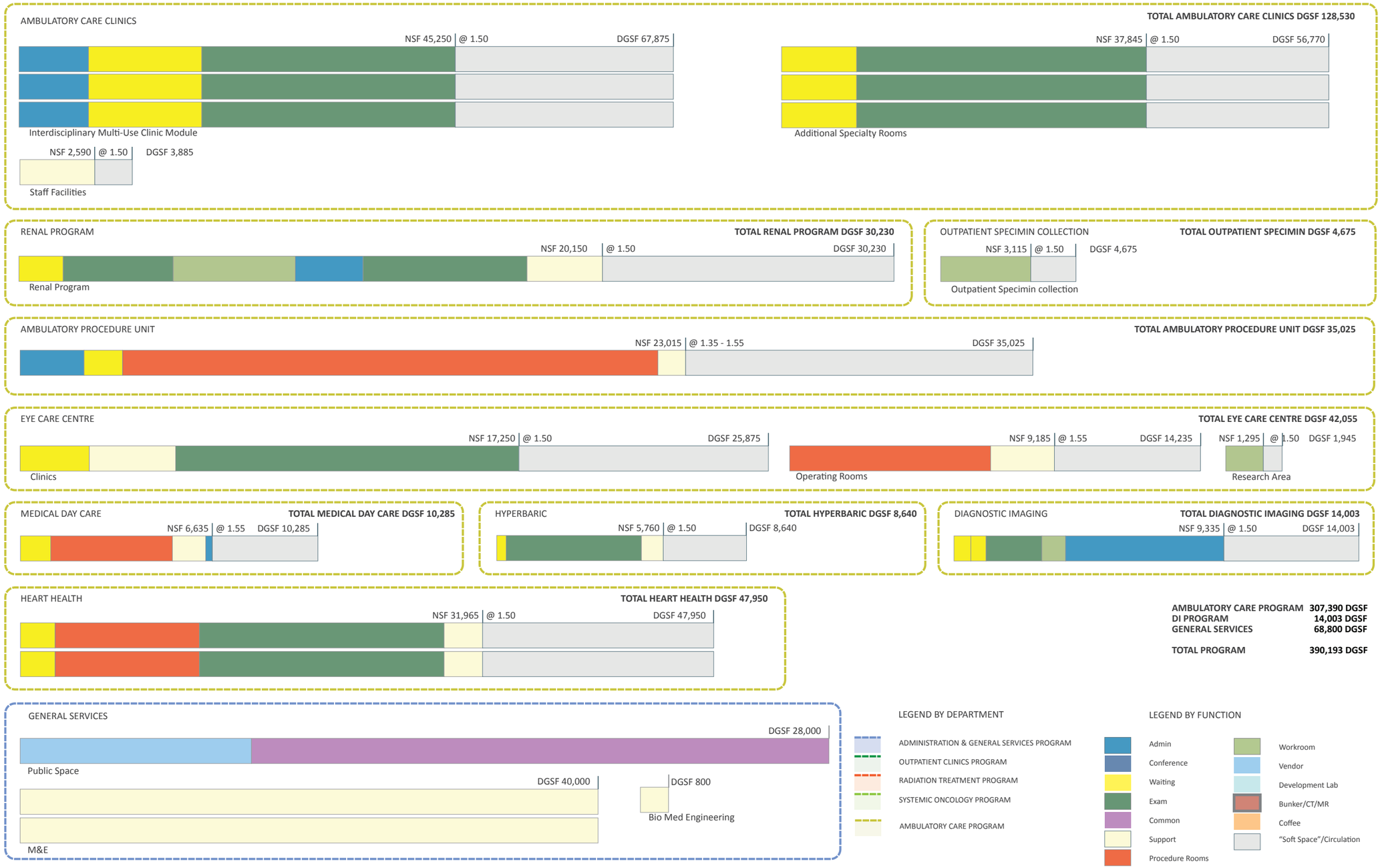
CANCER CARE PROGRAM	136,988 DGSF
DI AT CANCER CENTRE	19,550 DGSF
TOTAL PROGRAM	156,538 DGSF
M&E	20,000 SF



2.1 Program Analysis

2.1.1 Functional Program: Ambulatory Clinic

*Diagrams based on Functional and Master Program, August 23, 2017



2.1 Program Analysis

2.1.2 Departmental Components: Outpatient Clinics Program

*Diagrams based on Cancer Care Space Projections August 21, 2017

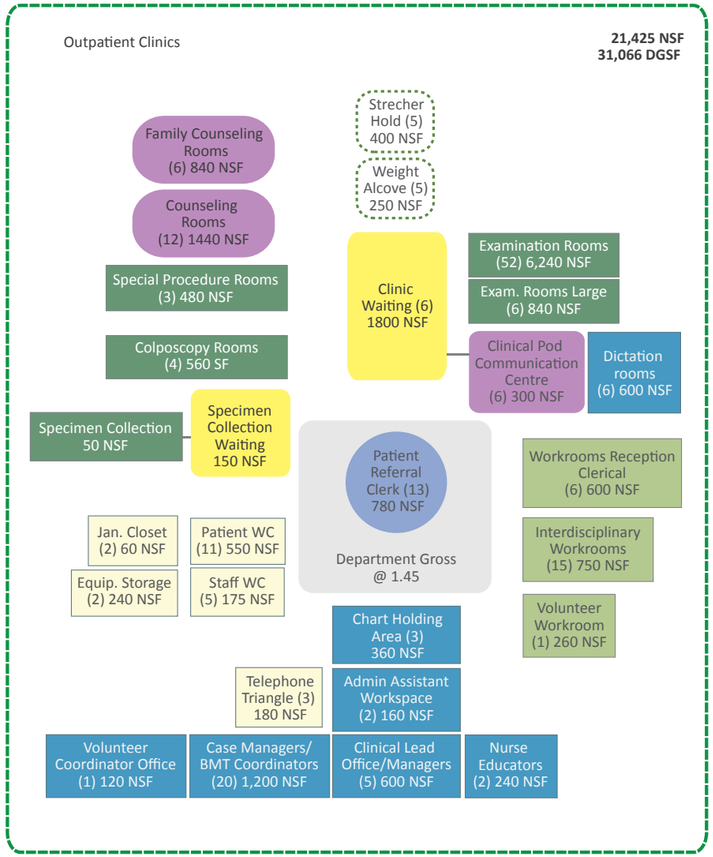
TOTAL OUTPATIENT CLINICS & AFFILIATED SERVICES DGSF 43,557

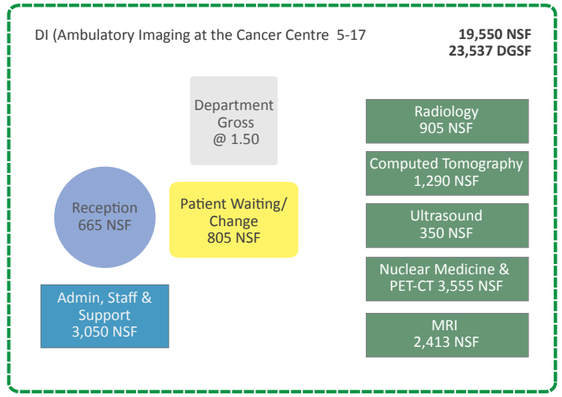
LEGEND BY DEPARTMENT

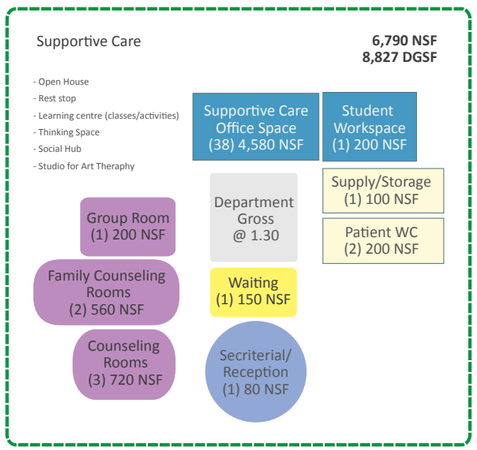
- ADMINISTRATION & GENERAL SERVICES PROGRAM
- OUTPATIENT CLINICS PROGRAM
- RADIATION TREATMENT PROGRAM
- SYSTEMIC ONCOLOGY PROGRAM

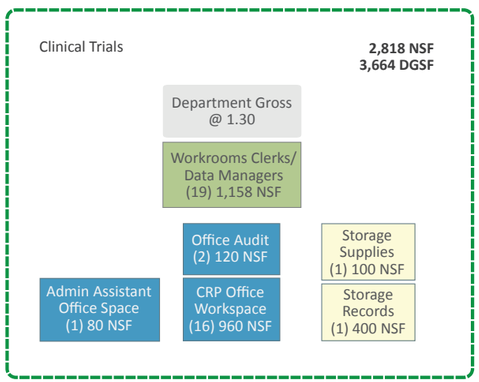
LEGEND BY FUNCTION

- Admin
- Reception
- Conference
- Waiting
- Exam
- Common
- Workroom
- Vendor
- Development Lab
- Bunker/CT/MR
- Support
- "Soft Space"/Circulation







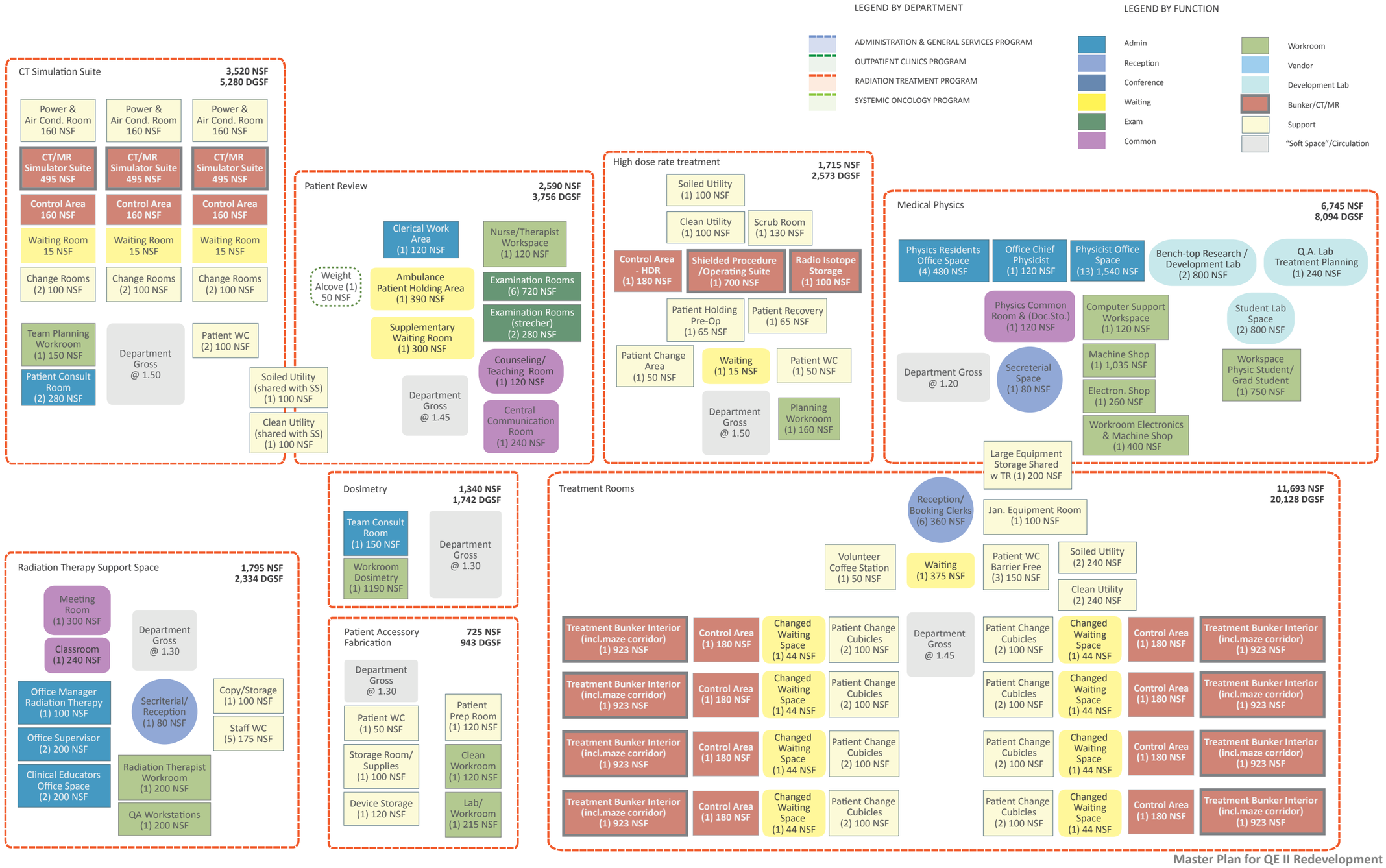


2.1 Program Analysis

2.1.2 Departmental Components: Radiation Treatment Program

*Diagrams based on Cancer Care Space Projections August 21, 2017

TOTAL RADIATION TREATMENT PROGRAM DGSF 44,848

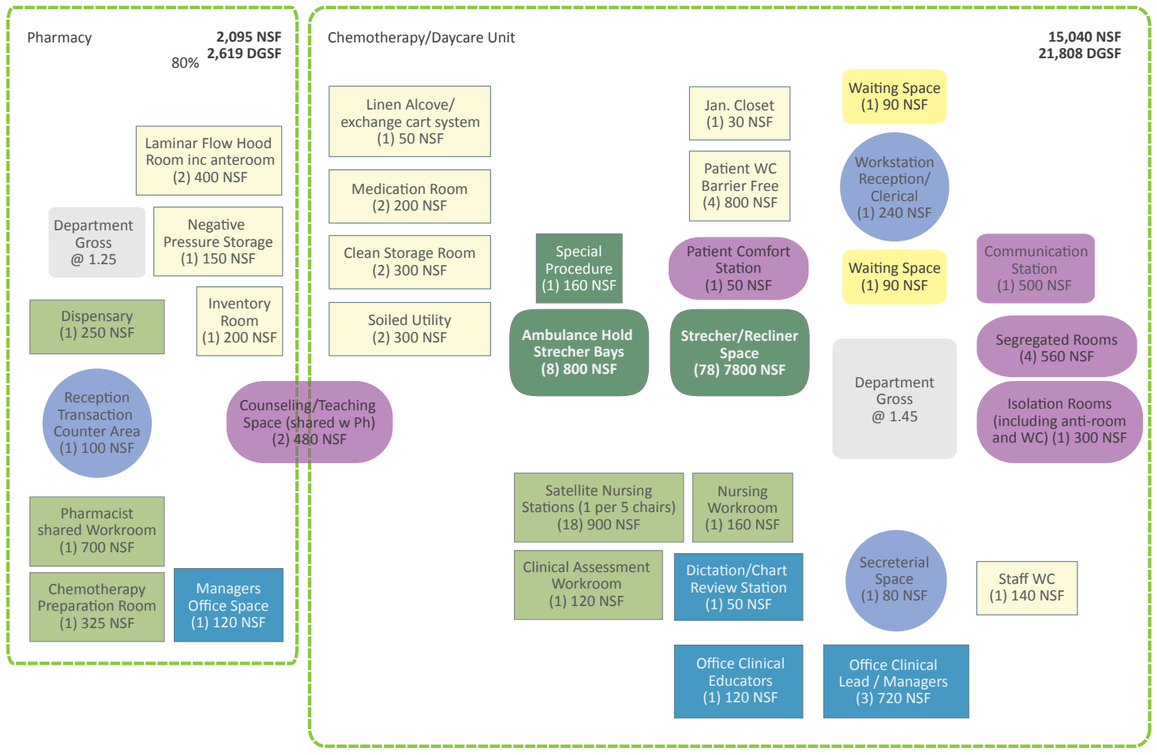


2.1 Program Analysis

2.1.2 Departmental Components: Systemic Oncology

*Diagrams based on Cancer Care Space Projections August 21, 2017

TOTAL SYSTEMIC ONCOLOGY DGSF 24,427



LEGEND BY DEPARTMENT

- ADMINISTRATION & GENERAL SERVICES PROGRAM
- OUTPATIENT CLINICS PROGRAM
- RADIATION TREATMENT PROGRAM
- SYSTEMIC ONCOLOGY PROGRAM

LEGEND BY FUNCTION

- Admin
- Reception
- Conference
- Waiting
- Exam
- Common
- Workroom
- Vendor
- Development Lab
- Bunker/CT/MR
- Support
- "Soft Space"/Circulation

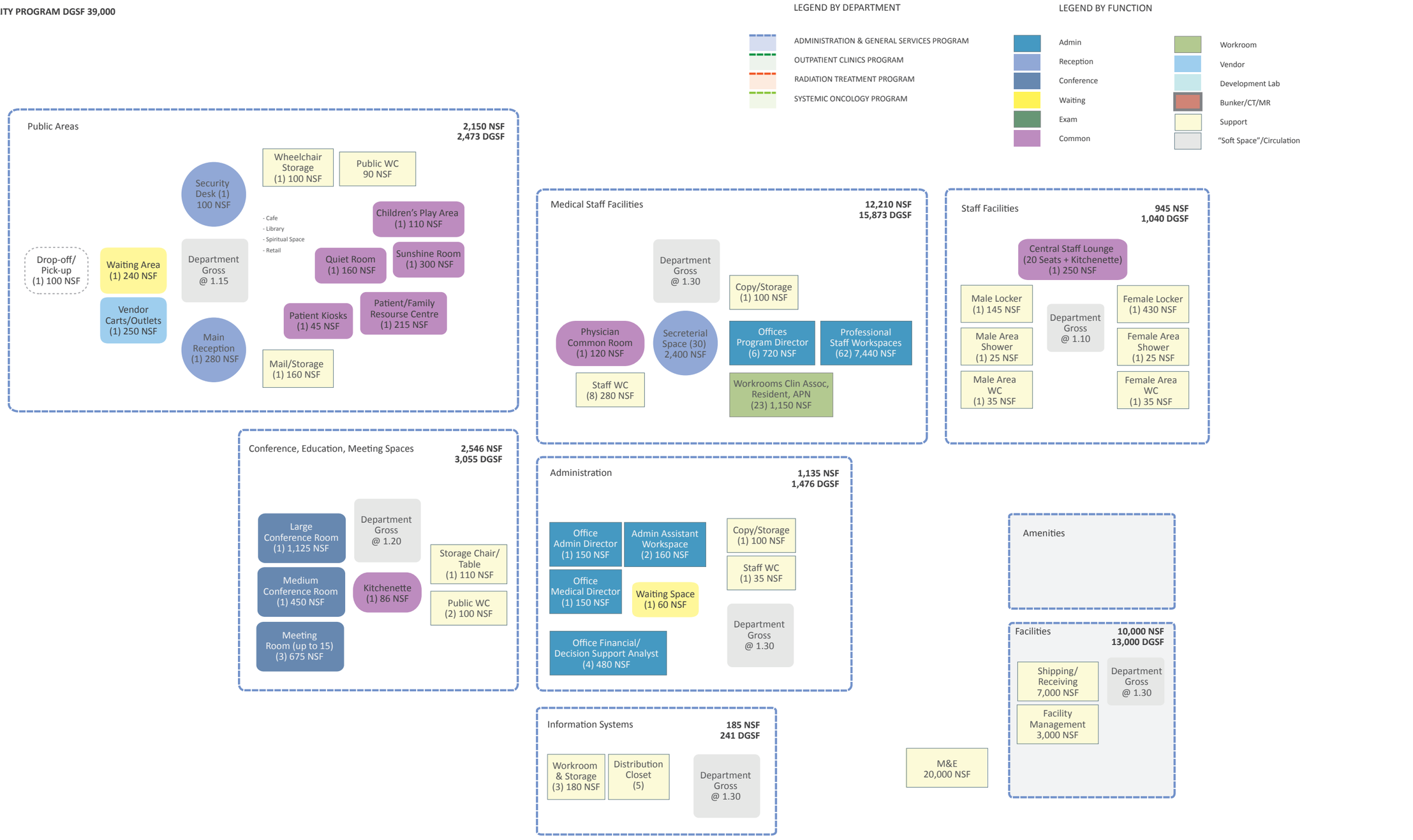
2.1 Program Analysis

2.1.2 Departmental Components: Administration and General Services

*Diagrams based on Cancer Care Space Projections August 21, 2017

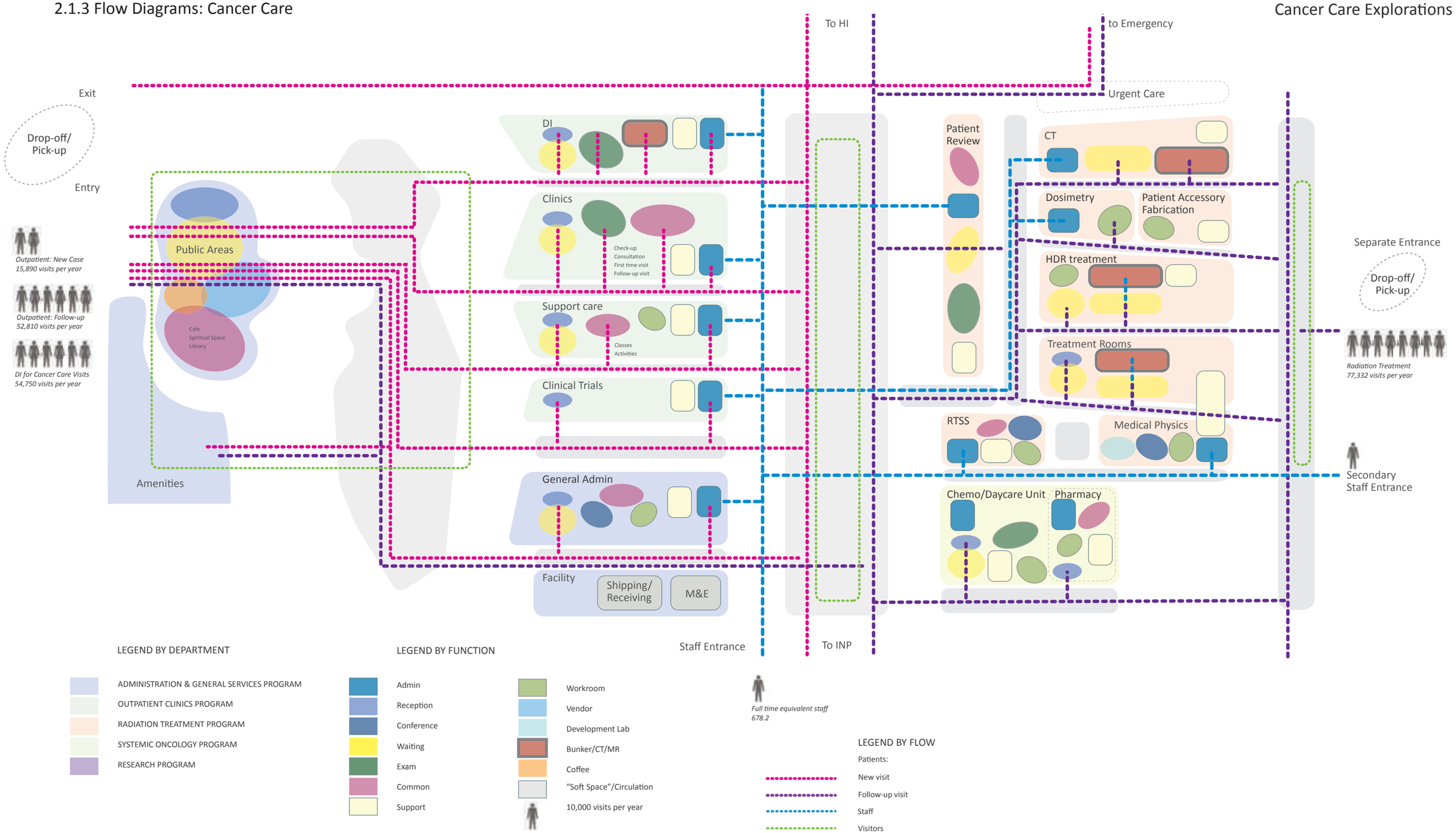
TOTAL ADMINISTRATION & GENERAL SERVICES DGSF 24,848

FACILITY PROGRAM DGSF 39,000



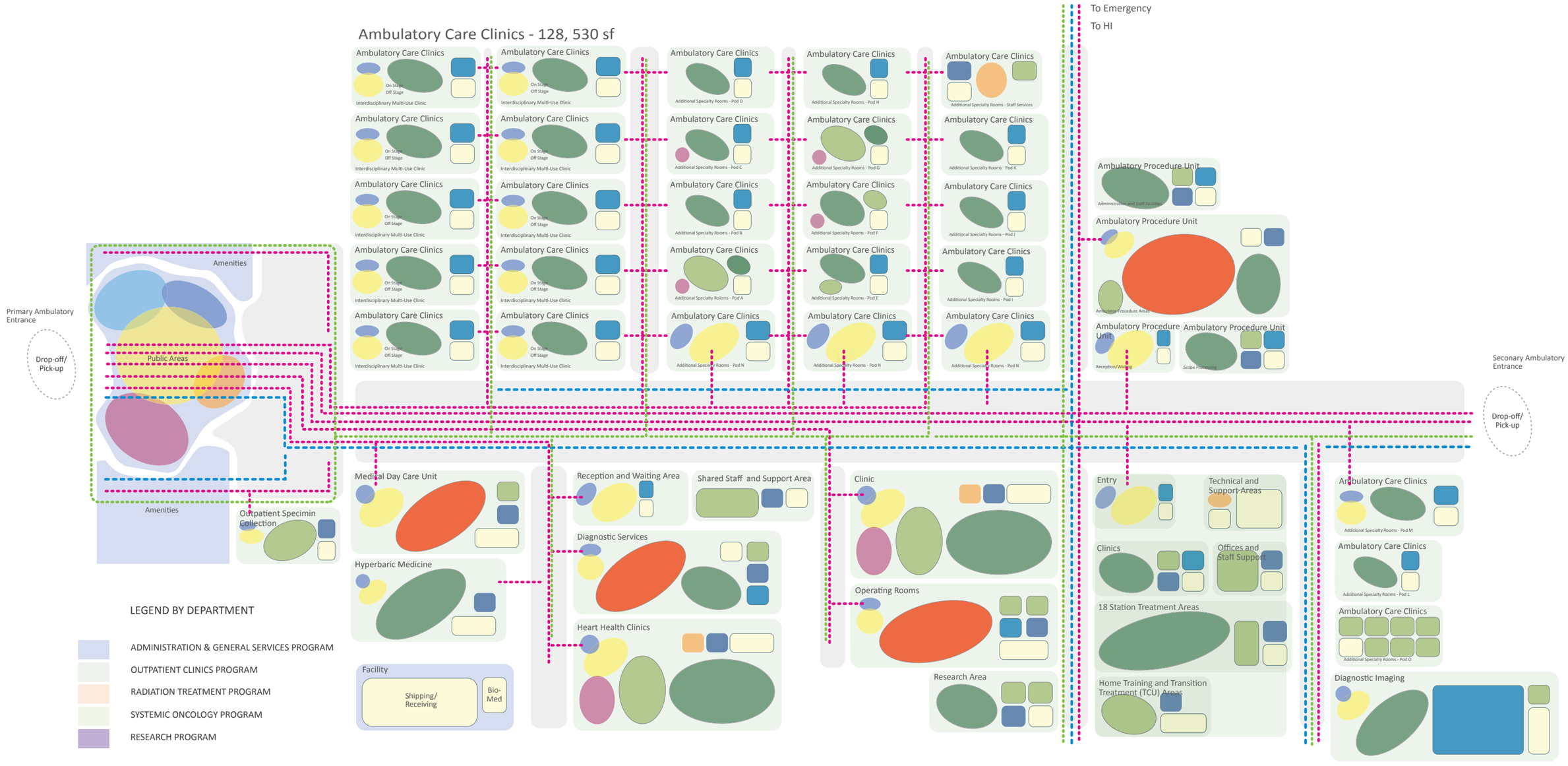
2.1 Program Analysis

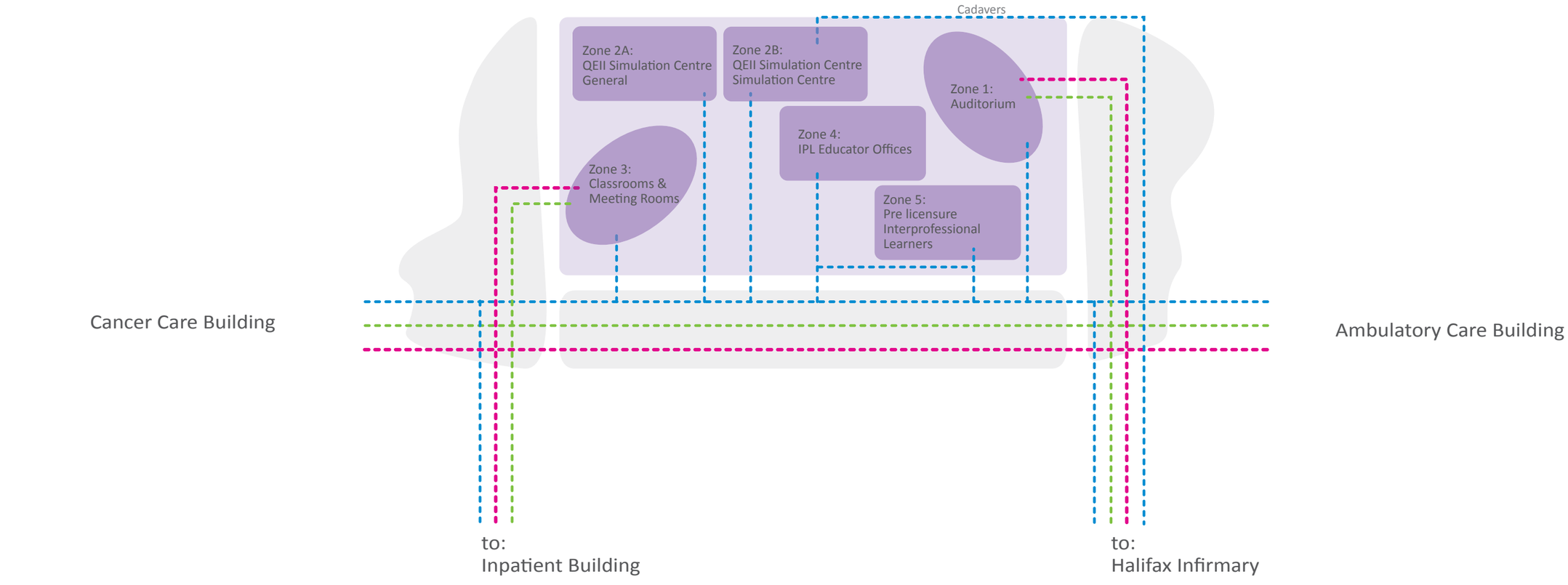
2.1.3 Flow Diagrams: Cancer Care



2.1 Program Analysis

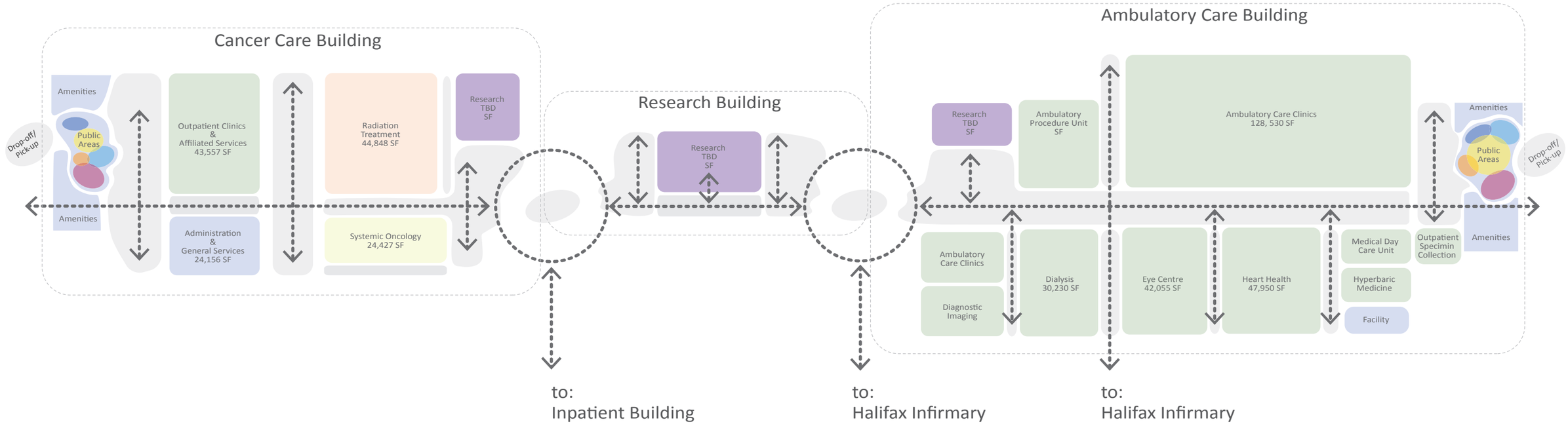
2.1.3 Flow Diagrams: Ambulatory Care




Cadavers
Zone 2A:
QEII Simulation Centre
General
Zone 2B:
QEII Simulation Centre
Simulation Centre
Zone 1:
Auditorium
Zone 4:
IPL Educator Offices
Zone 3:
Classrooms &
Meeting Rooms
Zone 5:
Pre licensure
Interprofessional
Learners
Cancer Care Building
Ambulatory Care Building
to:
Inpatient Building
to:
Halifax Infirmary
LEGEND BY DEPARTMENT
ADMINISTRATION & GENERAL SERVICES PROGRAM
OUTPATIENT CLINICS PROGRAM
RADIATION TREATMENT PROGRAM
SYSTEMIC ONCOLOGY PROGRAM
RESEARCH PROGRAM
LEGEND BY FLOW
Patients
Staff
Visitors

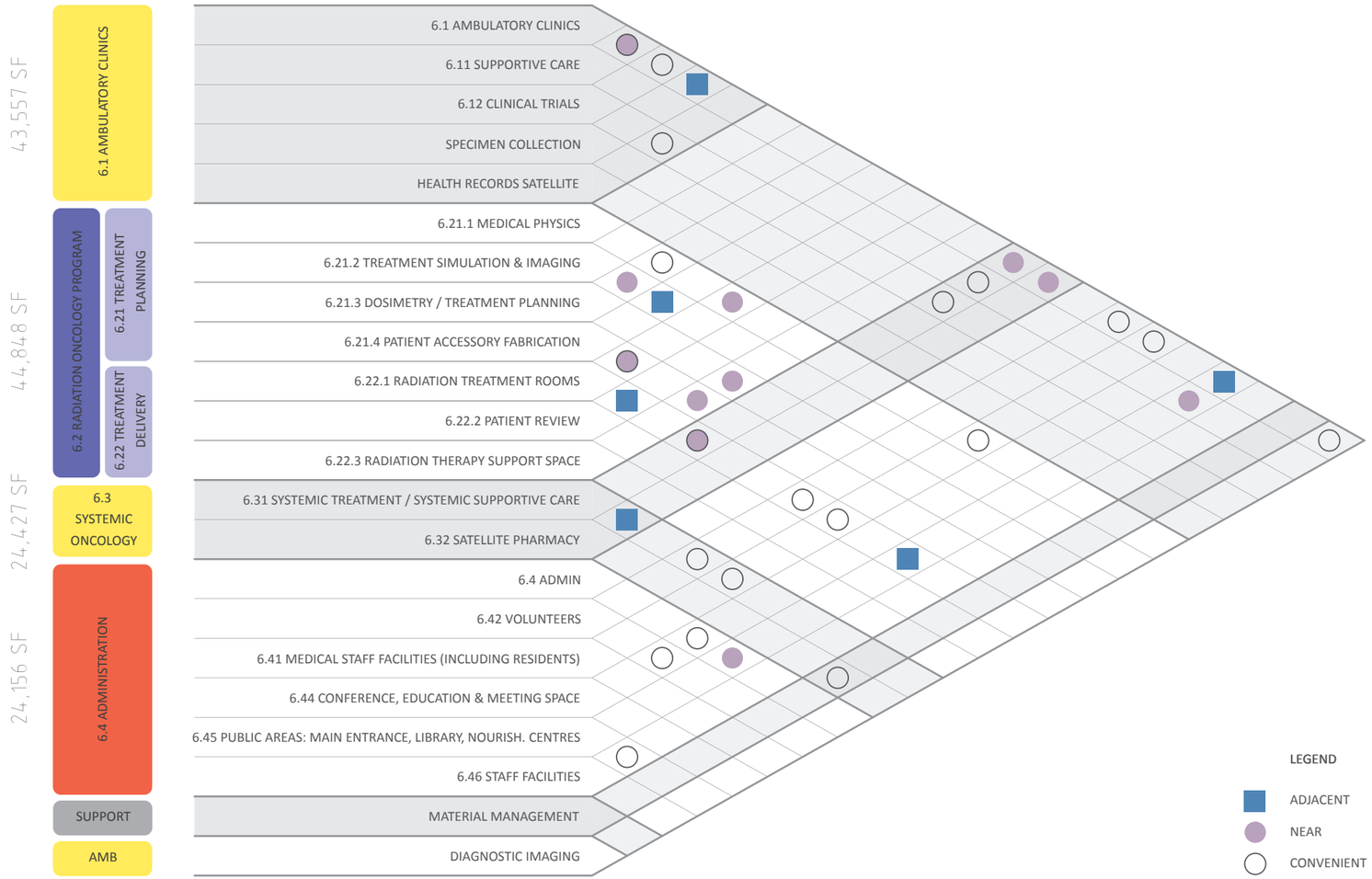
2.1 Program Analysis

2.1.3 Flow Diagrams: Integrated Programs



LEGEND BY DEPARTMENT

- ADMINISTRATION & GENERAL SERVICES PROGRAM
- OUTPATIENT CLINICS PROGRAM
- RADIATION TREATMENT PROGRAM
- SYSTEMIC ONCOLOGY PROGRAM
- RESEARCH PROGRAM
- PEOPLE FLOW



Adjacency Matrix

The adjacency matrix is an interpretation of the program and maps the relative importance of adjacencies to each of the program parts. In the process of design, it is a valuable tool used as an audit to check the viability of the design; it is also used in discussion with the various user groups. This will assist in obtaining agreement in terms of the design and to reinforce the viability of the design concept.

Diagnostic Imaging Analysis (Diagrams on adjacent page)

The diagrams reflect a program analysis illustrating the impact of moving cancer care from the existing Dickson location to HI. It maps out the areas defined in the 17 August 2017 Functional program with cancer care at Dickson against the 26 March 2018 updated functional program with cancer care at HI.

The key point to note are:

- The move of Cancer Care to HI, affords the opportunity to consolidate DI into two main areas, within the existing HI and in the proposed new ambulatory building. This consolidation allows for efficiencies in staffing needs and improved utilization of equipment.
- The connectivity between the new ambulatory care and cancer care as planned reinforces the integrated approach to the site design and allowing the opportunity to consolidate functions.
- The increased size of DI at the COC site at Bayer's Lake, will inevitable reduce the pressure of construction impact on the HI site which is a positive move. The diagram reflects this increase at the COC site.
- The move of cancer care from Dickson to HI will also enable DI to be in a state of the art facility in a built environment appropriate to the function.

FUNCTIONAL PROGRAM:
Based on Cancer Care at Dickson
2017-08-17

HI SITE

DI: Acute Care
at Infirmary
44,849 dgsf

DI: Ambulatory
Building
14,003 dgsf

VG SITE

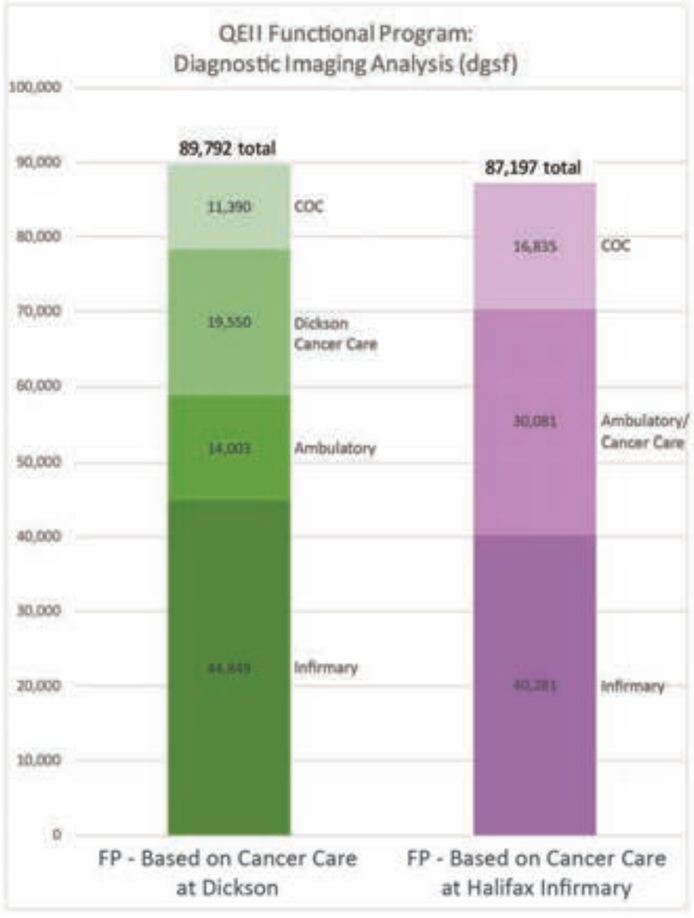
DI: Cancer Care
at Dickson
22,537 dgsf

COMMUNITY OUTPATIENT CENTRE

DI: COC
11,390 dgsf

Total Diagnostic Imaging = 89,792 dgsf

DIAGNOSTIC IMAGING COMPARISON



FUNCTIONAL PROGRAM:
Based on Cancer Care at HI
2018-03-26

HI SITE

DI: Acute Care
at Infirmary
40,281 dgsf

DI: Ambulatory
Care
33,821 dgsf

COMMUNITY OUTPATIENT CENTRE

DI: COC
16,835 dgsf

Total Diagnostic Imaging = 87,197 dgsf

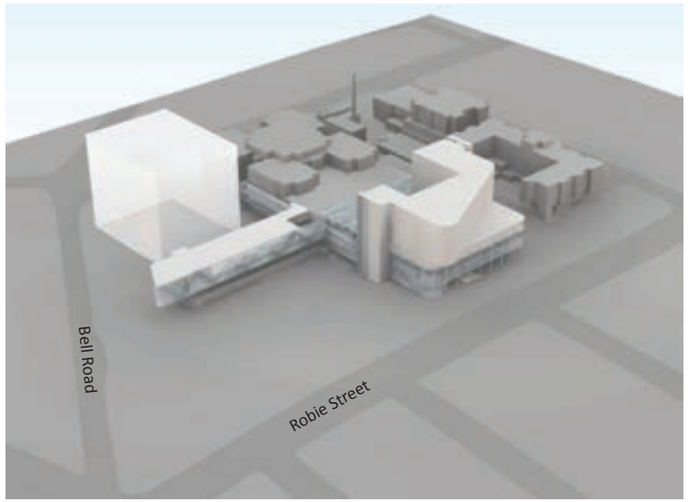
2.2 Site Opportunities and Constraints

As part of the process to conclude on the most viable site location for a cancer facility at the HI site, replacing the Dickson Building on the VG, the Kasian team looked at 6 possible locations. These are identified as A to F on the following pages. A to D and F are “free standing” possibilities, E and G were identified a “integrated possibilities”.

In the following pages opportunities and constraints were identified for each of the site locations. Following a review of all possibilities at a workshop dated January 15, 2018 it was concluded that the preferred sites are the CBC site and the urban garden site.

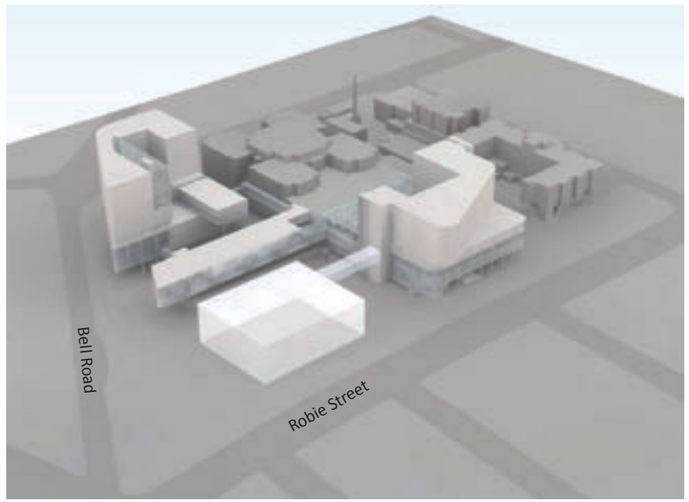
Cancer Care Option A

‘Integrated’ Cancer Centre with proposed ambulatory care centre with below grade parking**.**



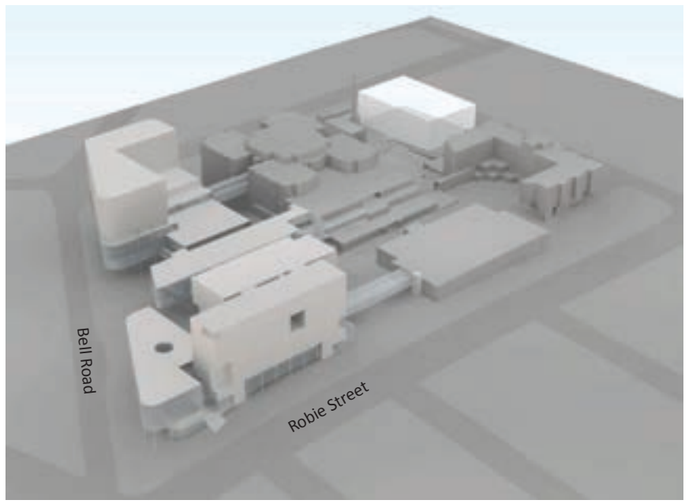
Cancer Care Option B

‘Free Standing’ Cancer Centre with below grade parking on the Urban Garden Site.



Cancer Care Option C

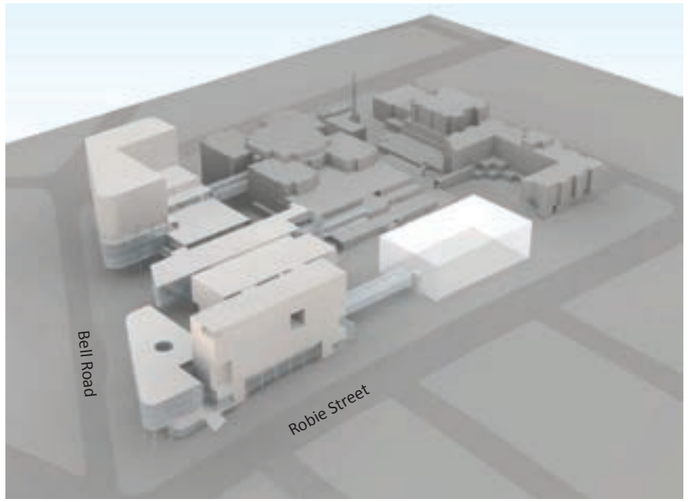
‘Free Standing’ Cancer Centre in the Abbie J. Lane location with below grade parking.



2.2 Site Opportunities and Constraints

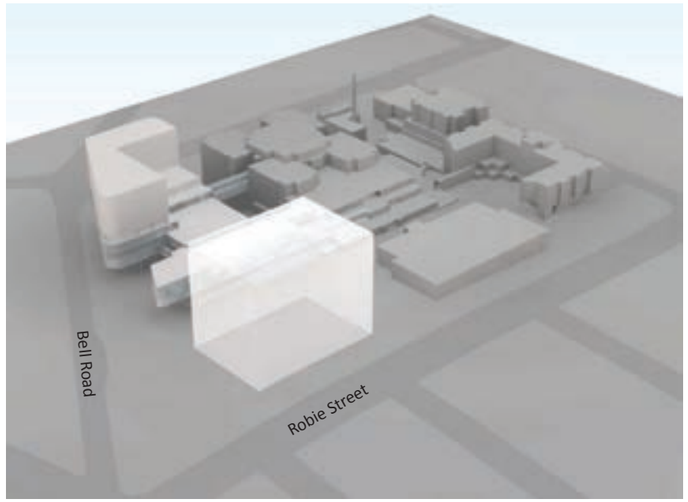
Cancer Care Option D

'Free Standing' Cancer Centre with below grade parking to replace existing parking structure.



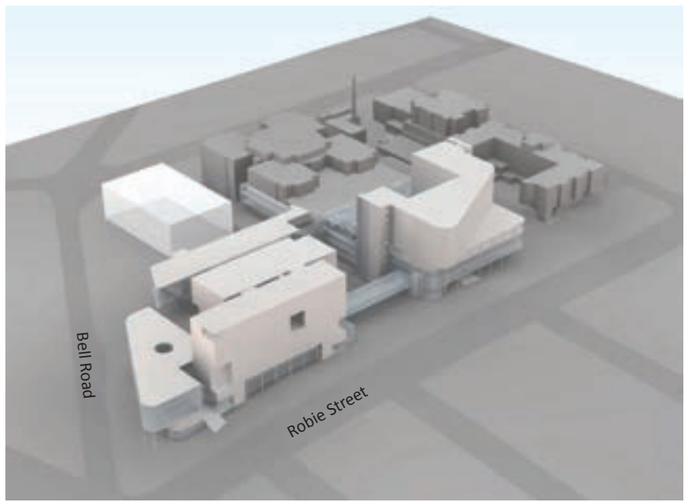
Cancer Care Option E

'Integrated' Cancer Centre with proposed ambulatory care centre on urban garden site with below grade parking.



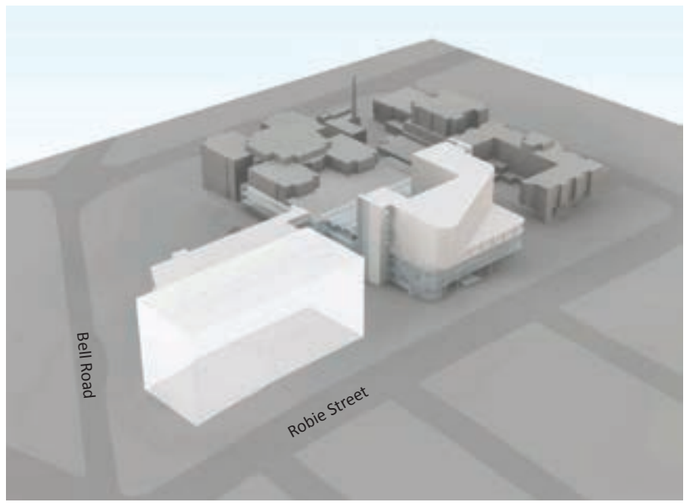
Cancer Care Option F

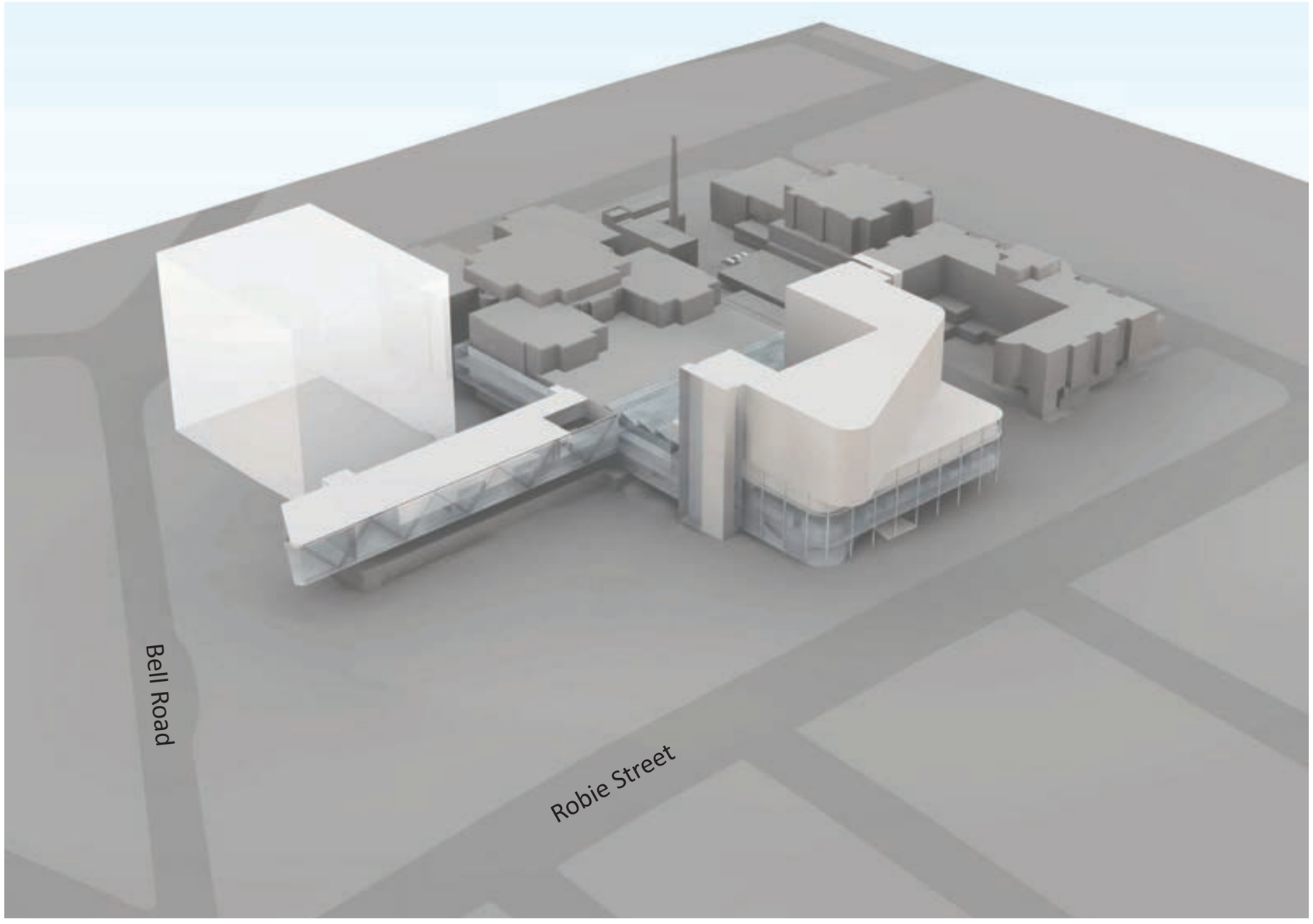
'Free Standing' Cancer Centre on CBC site with below grade parking.



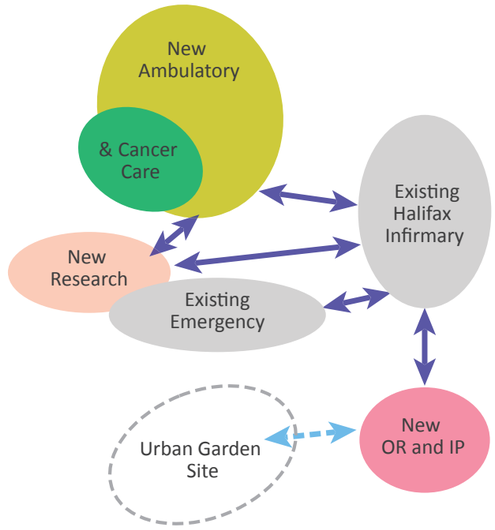
Cancer Care Option G

'Integrated' Cancer Centre with proposed ambulatory care centre on urban garden site with Inpatienr/OR on parking structure site.





Cancer Care Option **A**

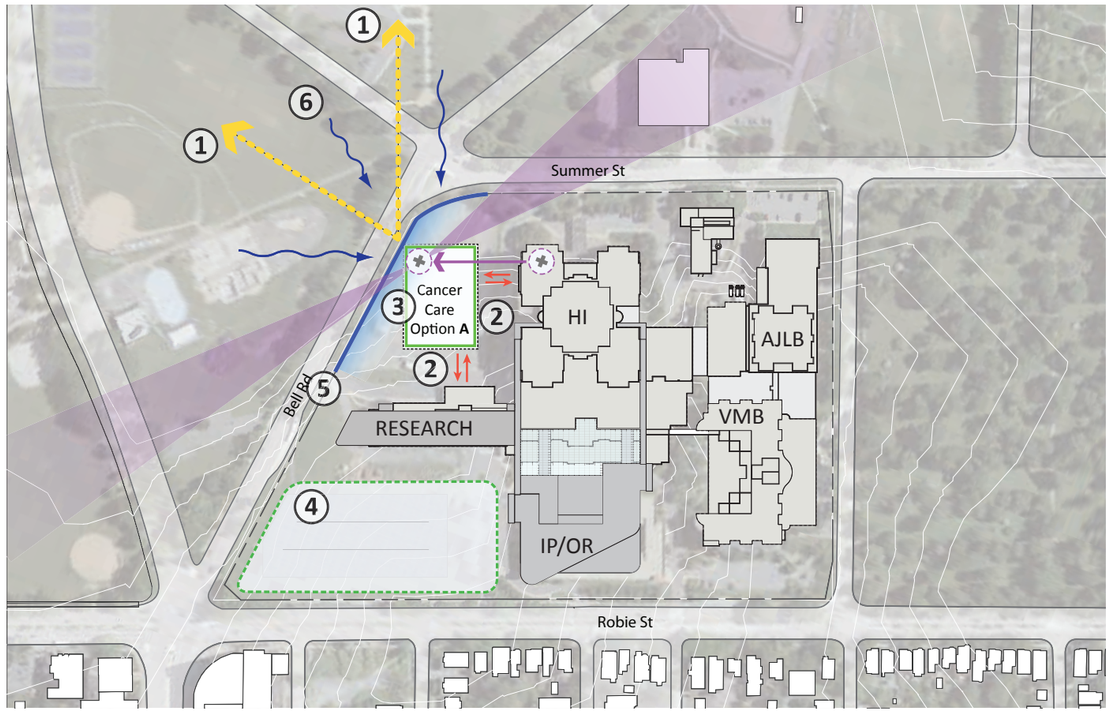


2.2 Site Opportunities and Constraints

Cancer Care Option **A** - Opportunities and Constraints

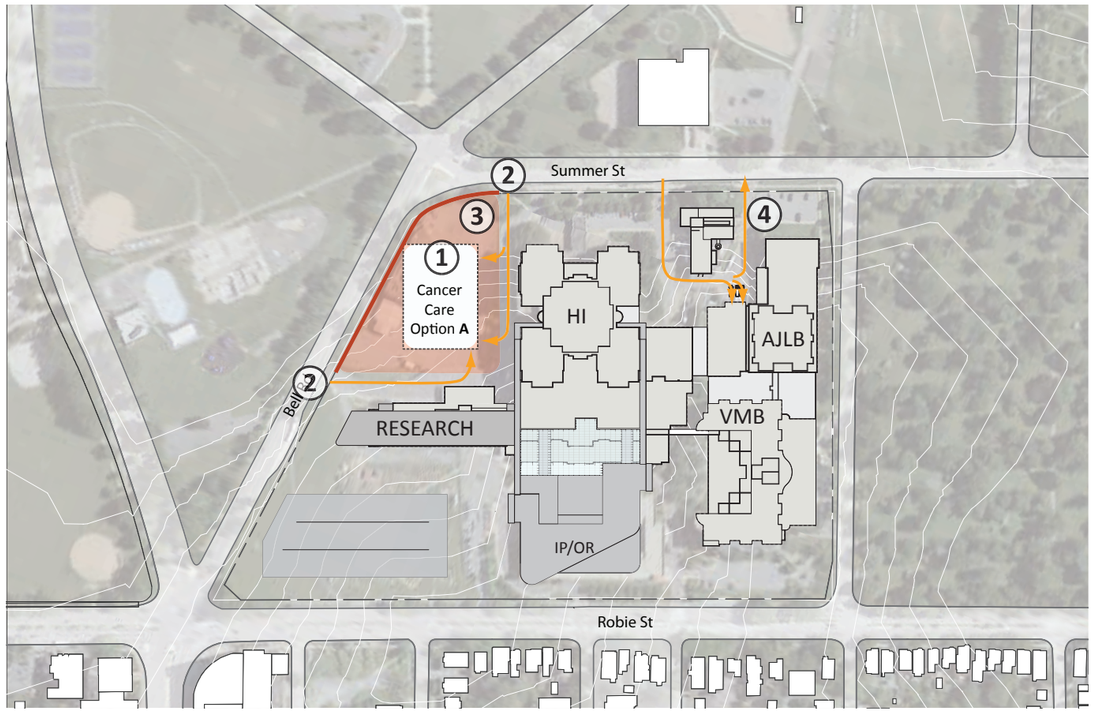
Integrated Cancer Centre with proposed Ambulatory Care Centre

Opportunities



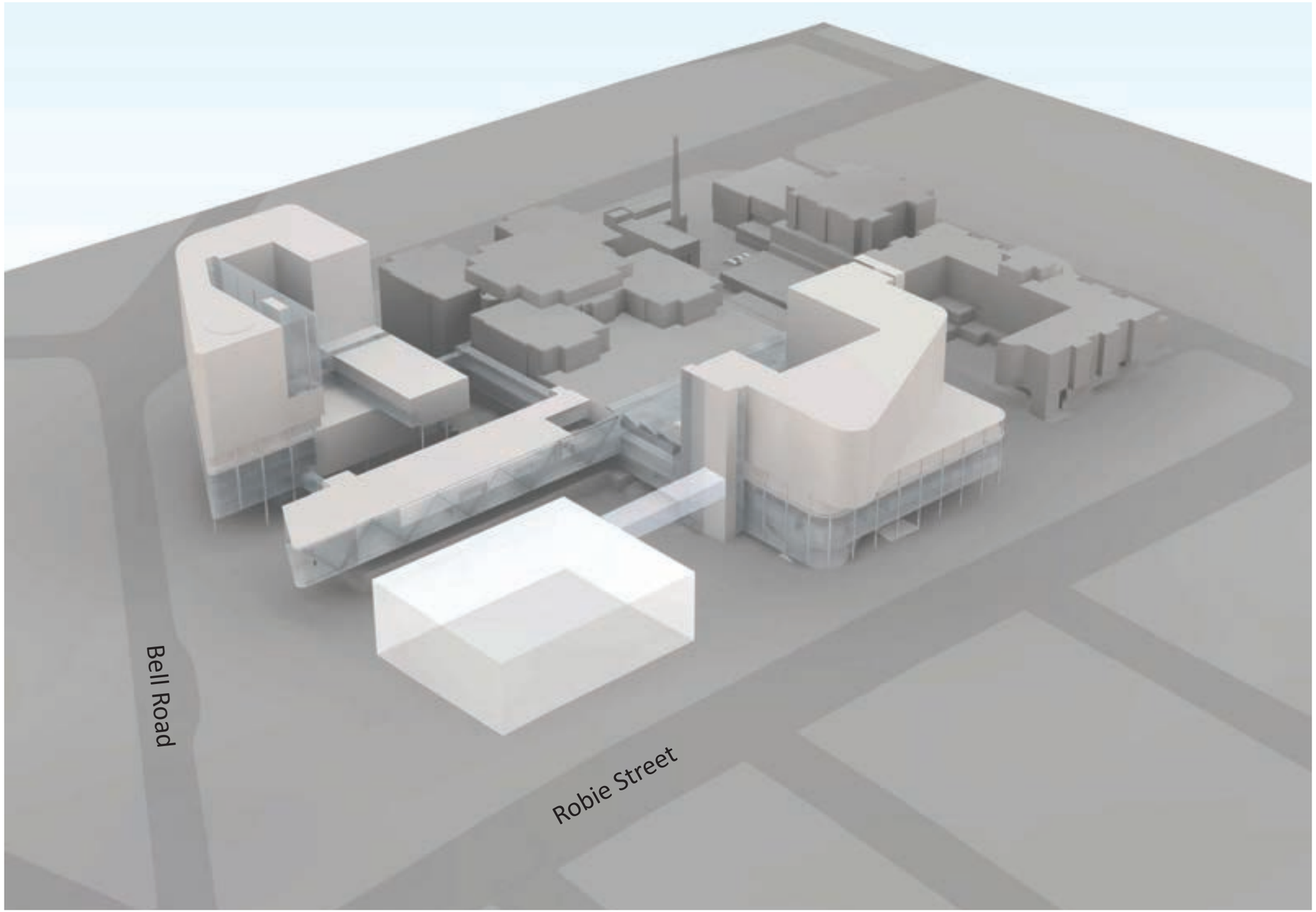
1. **Views and connections to the Halifax Commons.** The location of the Cancer Care building on the CBC site allows for views to the Commons to be maximized. Public/Green space surrounding the building can act as an extension of the Commons, creating a healing environment in a park-like setting for patients & family. The location also has the opportunity to maximize natural light.
2. **Connection to new research/ED building and existing HI buildings.** Locating the Cancer Care building on the CBC site will allow for Cancer Care to be adjacent to the HI building, especifically, to the inpatient units, minimizing the distance between inpatient units and ambulatory treatment areas. Above grade connections are possible to the Research/ED building and the HI building. A below grade connection is possible to the HI building for services.
3. **Integrated concept.** Recognizing that many cancer patients also deal with other chronic conditions, an integrated Cancer Care and Ambulatory care centre will promote & encourage collaboration between cancer and non-cancer physicians and clinicians in the diagnosis and treatment of cancer. Integration of cancer care and ambulatory care may also result in operational efficiencies as duplication of functions are not required (DI).
4. **Urban garden site remains available.** Future development and expansion on the HI site can be accommodated on the urban garden site. Building on the CBC site will not hinder future development. The Urban Garden site can be used for surface parking until future development is constructed.
5. **Street frontage and amenity space.** The building can be designed and configured to improve the streetscape along Summer Street and Bell Road. Furthermore, amenity space can be incorporated along the street capitalizing on residents visiting the Halifax Commons.
6. **Image and Identity.** The nature of the CBC site and density of the building provides an opportunity to develop a prominent/landmark building, however, careful consideration is required at the design stage to provide a unique image and identity for cancer care within the larger integrated building.

Constraints

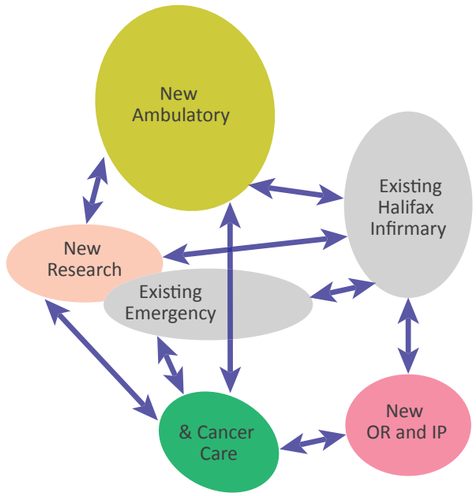


1. **Dense tall building.** Integrating the Cancer Care Centre with the new Ambulatory Care Centre will result in a significantly larger massing adjacent to open green space (the Commons) and may not be desirable from an urban design perspective. The larger massin would also have potential shadow implications.
2. **Vehicular Circulation/Access.** With the increased volumes of patient pick-up and drop-offs, for both cancer care and ambulatory care vehicular circulation around the site and access to entrances and parking will be challenging.
3. **Parking.** Providing sufficient parking stalls in close proximity to the integrated Cancer Care/Ambulatory care centre may be challengin considering the close proximity of the bedrock to the surface. There will be a high demand for parking on the site to accommodate both cancer and ambulatory care patients.
4. **Shipping and Receiving.** The existing shipping and receiving at Abbie J. Lane will remain and be enlarged; a satellite shipping and receiving is required at the new cancer care and ambulatory care centre.

N



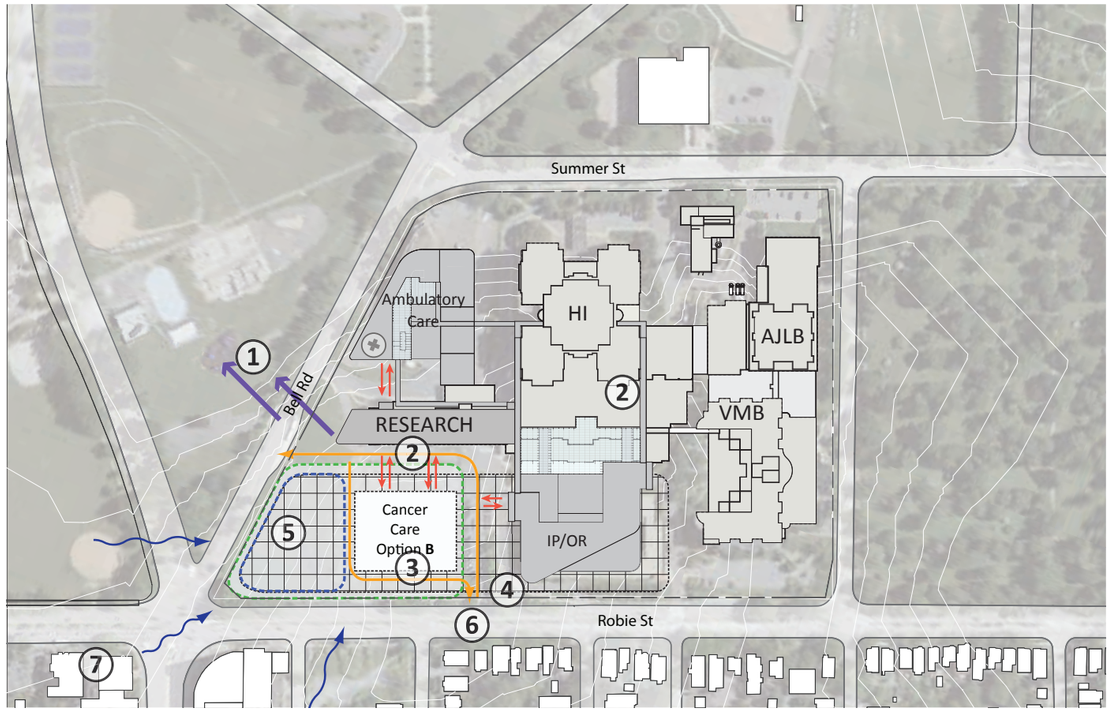
Cancer Care Option **B**



Cancer Care Option **B** - Opportunities and Constraints

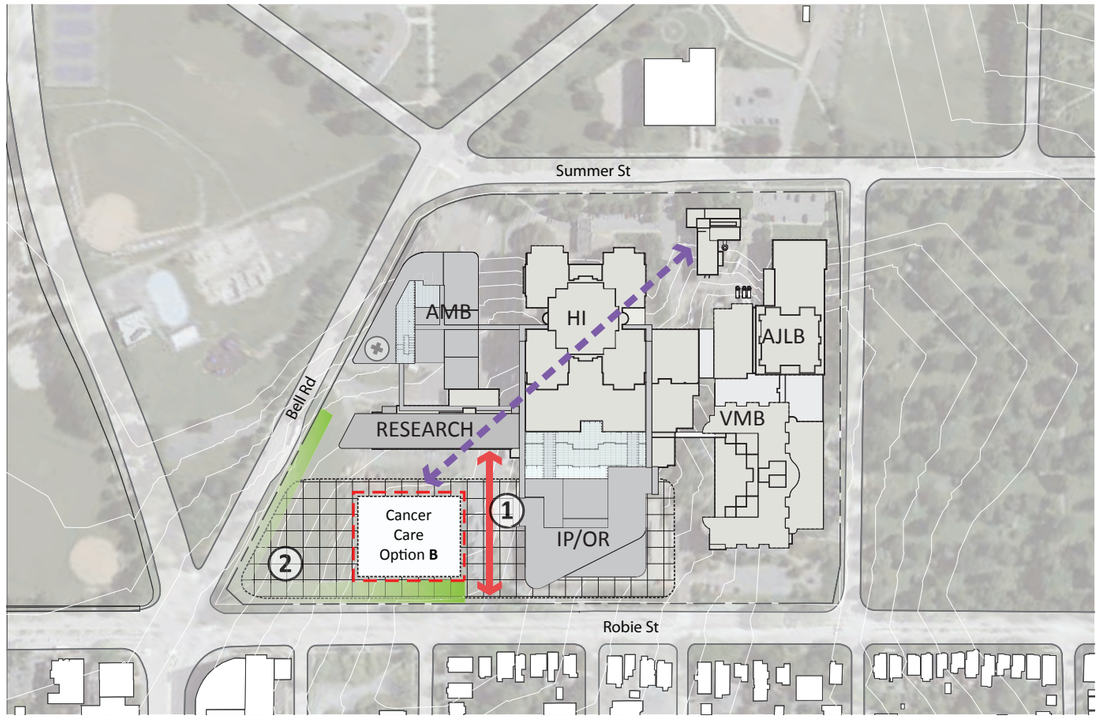
Free Standing Cancer Centre with below grade parking on the Urban Garden Site.

Opportunities

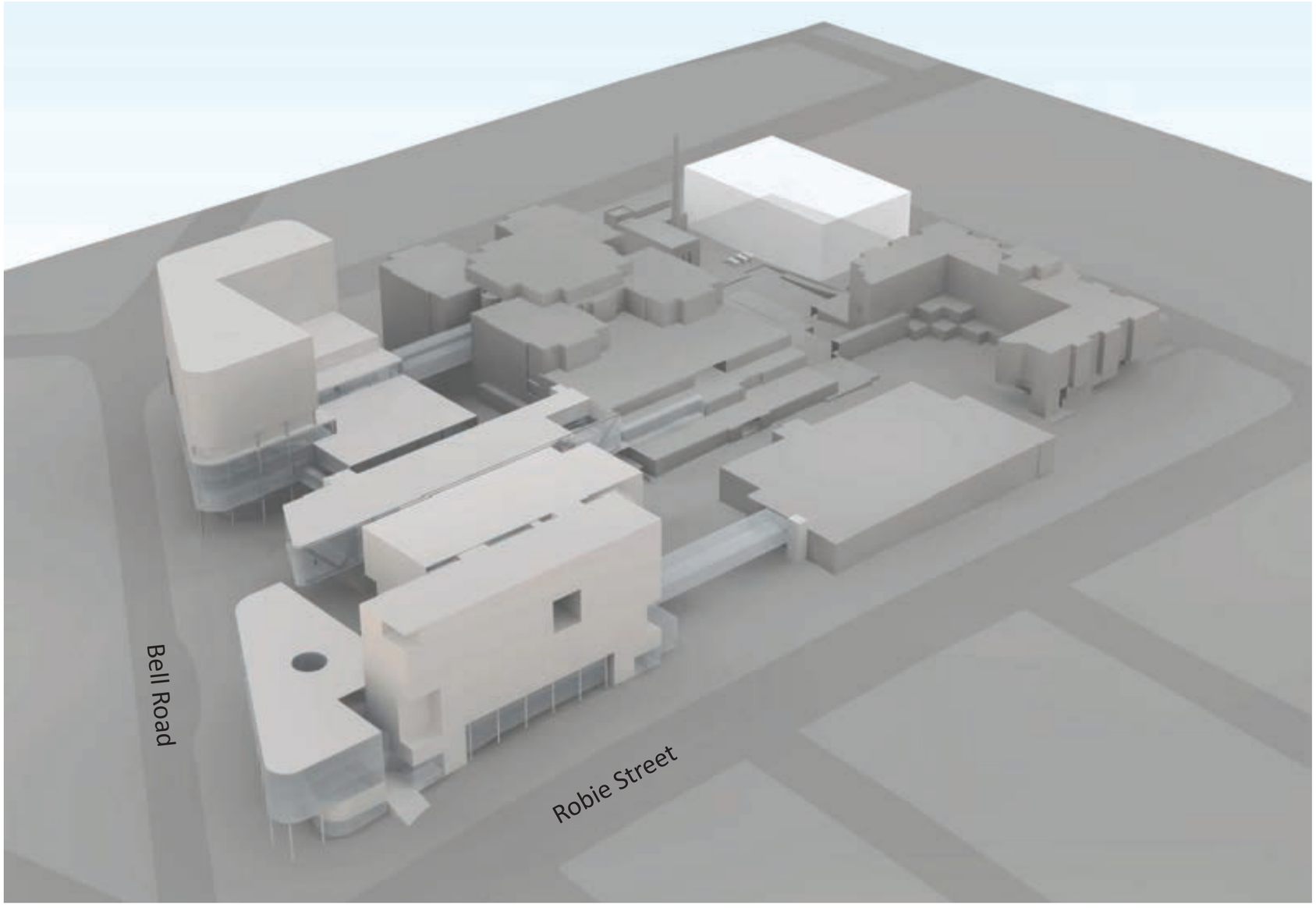


1. **Views to the Halifax Commons.** The location of the Cancer Care building on the Urban Garden created opportunities for views to the Commons. Public/Green space surrounding the building will create a healing environment within a park like setting.
2. **Connection to new Ambulatory care, ED/Research building and existing DI in the HI building.** Situating the Cancer Care building on the Urban Garden site will allow for Cancer Care to capitalize on adjacencies of nearby buildings. Above grade connections are possible to the Research/EDbuilding and the HI building, minimizing travel distance for patients between cancer care, inpatient units and DI, reinforcing QE II's mandate for patient-focused care.
3. **Lower Density.** A freestanding Cancer Care building on the urban garden site will be lower in scale and density compared to the other building on the site, allowing for more green/public space. The site size allows for a number of building typologies to be explored.
4. **Large below-grade parking.** A large below-grade parking lot could span between the urban garden site and below the proposed new OR/IP building. This could greatly relieve the parking constraints inherent on this site.
5. **Space for future expansion**. The smaller footprint of a free-standing Cancer Care building allows for future development/expansion on the urban garden site.
6. **Vehicular Circulation.** The larger nature of the urban garden site will pose less problems for vehicle and shipping/receiving circulation and access. The existing ER drop-off can remain.
7. **Image and Identity.** The location of the Urban Garden site provides an opportunity to develop a prominent/landmark building, creating a unique identity and front entrance to the Cancer Centre.

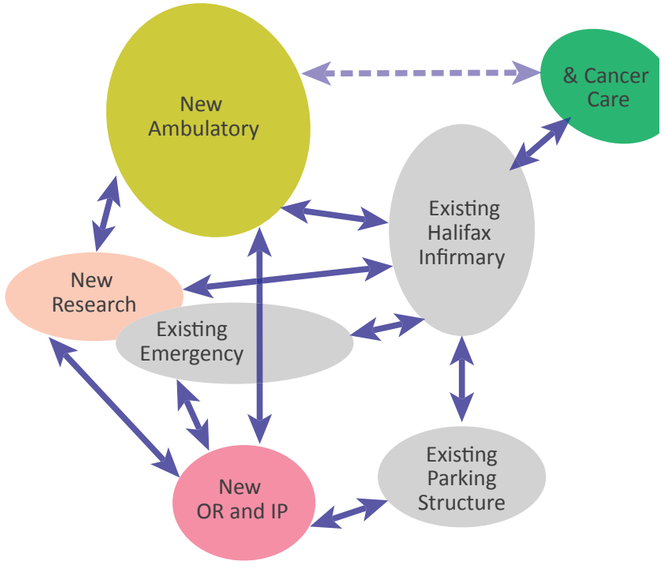
Constraints



1. **ED Vehicle drop-off.** Construction of the large below grade parking structure could impact the existing vehicle drop-off serving the ED building.
2. **Staging/Laydown area.** Finding space for staging could prove to be difficult with no open space available on the HI site.



Cancer Care Option **C**

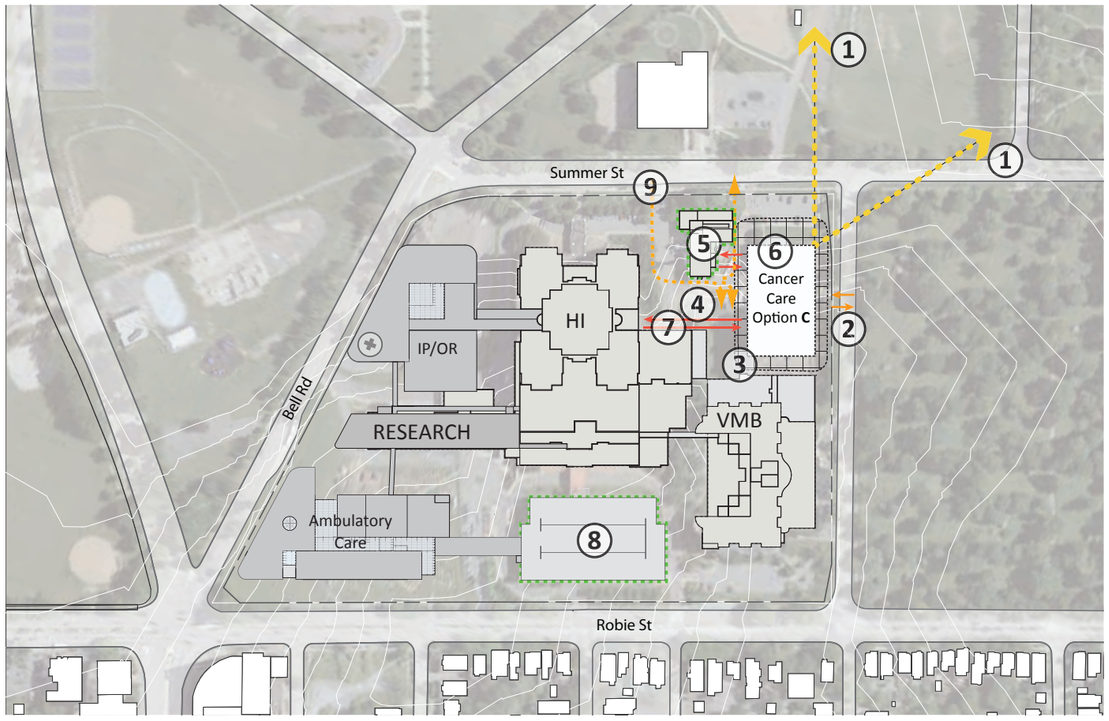


2.2 Site Opportunities and Constraints

Cancer Care Option **C** - Opportunities and Constraints

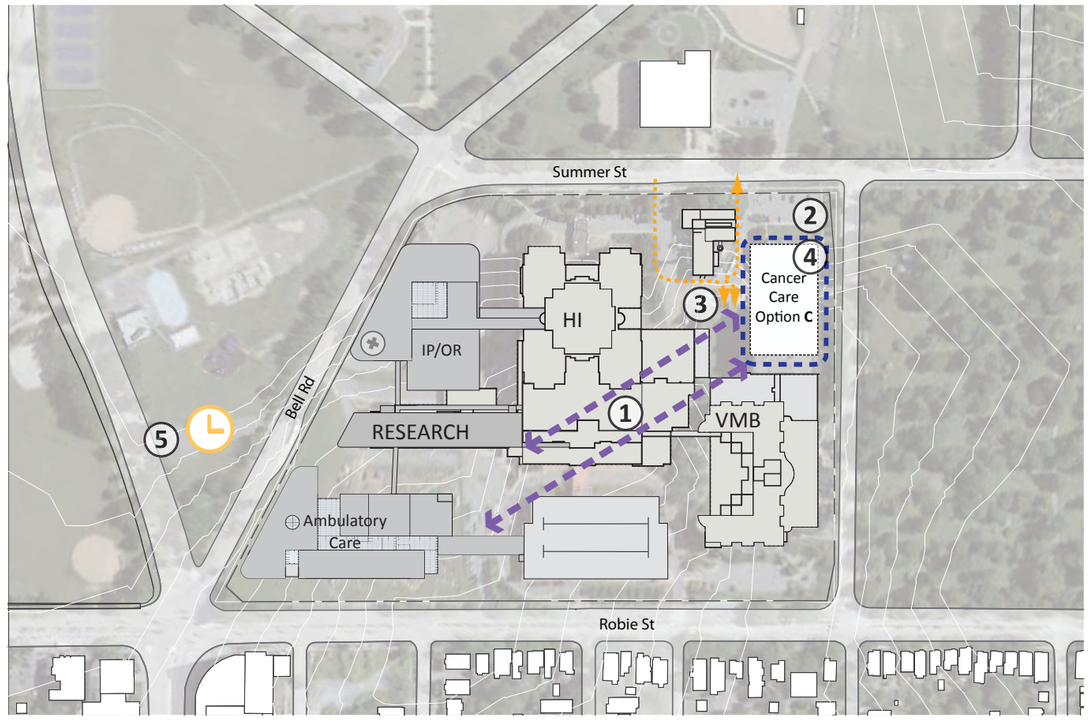
Free Standing Cancer Centre in the Abbie J. Lane location with below grade parking

Opportunities

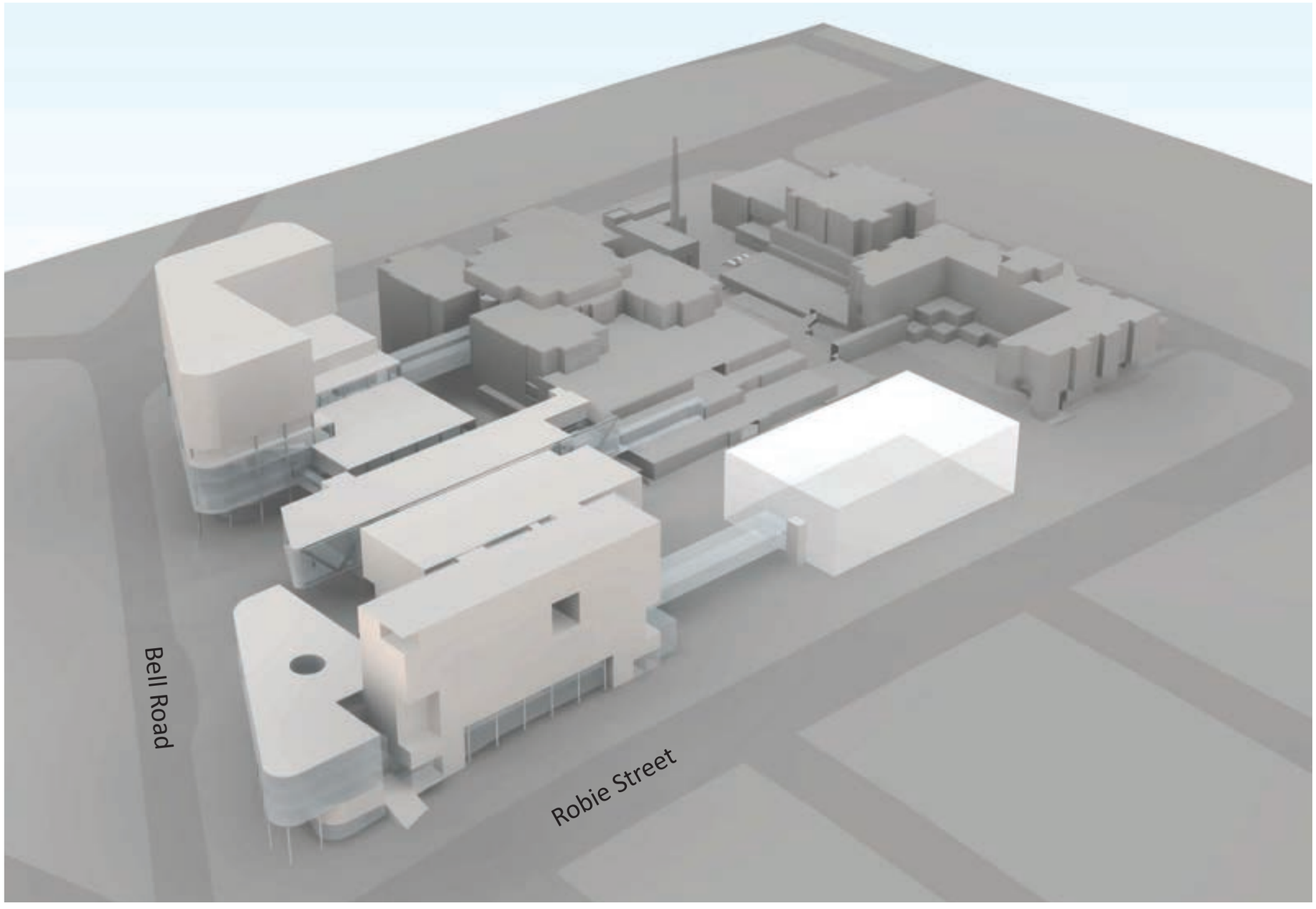


1. **Views and connections to the Wanderers Gounds and Halifax Public Gardens.** The location of the Cancer Care building on the Abbie J. Lane site allows for views to the nearby green space to be maximized.
2. **Image & Identity.** Situating the new Cancer Care building on the former site of the Abbie J. Lane building will allow for the building to have its own identity as well as a separate entrance for patients.
3. **Parking.** Dedicated Cancer Care parking will be provided below the building.
4. **New shipping and Receiving.** Replanning of the existing Shipping and Receiving will be undertaken.
5. **Relocation of Central Plant.** In the event that the Central Plant is relocated, site planning opportunities open up.
6. **Minimizes deferred maintenance investment.** By replacing Abbie J. Lane building considerable ongoing investment in an aging infrastructure is minimized.
7. **Direct link to HI building.** The Location of the Cancer Care on the Abbie Lane site creates opportunity for connections to the existing HI building, to create a connection between cancer care, inpatient units and DI.
8. **Existing Parking Structure is maintained.**
9. **Future Connections.** Potential to create connections to future inpatient units/OR expansion on the VMB site when the HI Building needs to be replaced.

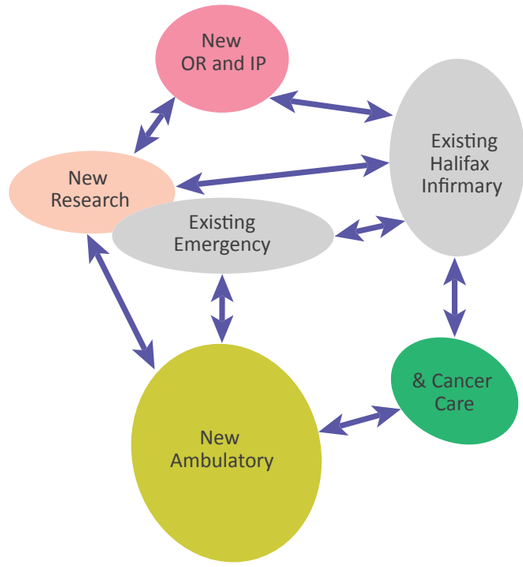
Constraints



1. **Links.** The Cancer Care building and Ambulatory care building are not adjacent. A direct connection is not possible, therefore some functions may have to be duplicated in order to limit travel distance for patients and avoid inefficiencies.
2. **Image and Identity.** The lower scale nature of the site and it's location may make it a less prominent site for identiy/branding compared to the denser/taller Ambulatory and IP/OR building.
3. **Replanning and Phasing Shipping and Receiving.** The phasing and replanning of the Shipping and Receiving may be challenging.
4. **Schedule Impacts.** Abbie J. Lane will need to be vacated, decommissioned and demolished to permit developing the Cancer Care building. This will have implications to the timing of the implementation of the project.
5. **Implications on Dickson.** An interim Cancer Center will need to be assessed.



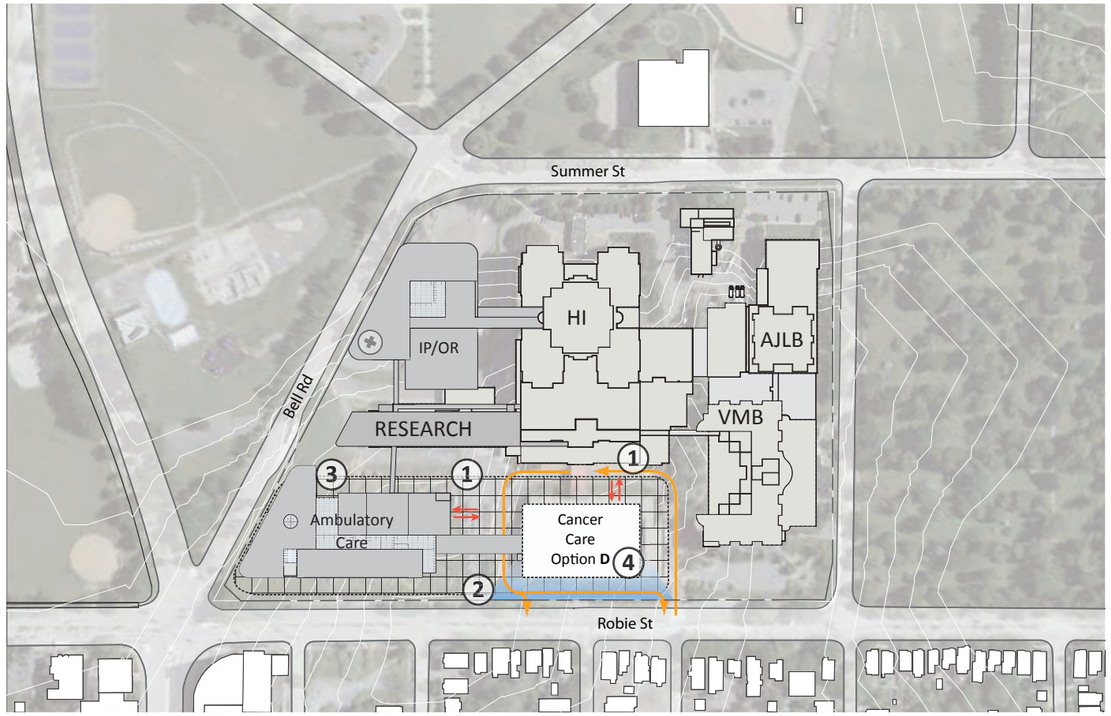
Cancer Care Option **D**



Cancer Care Option **D** - Opportunities and Constraints

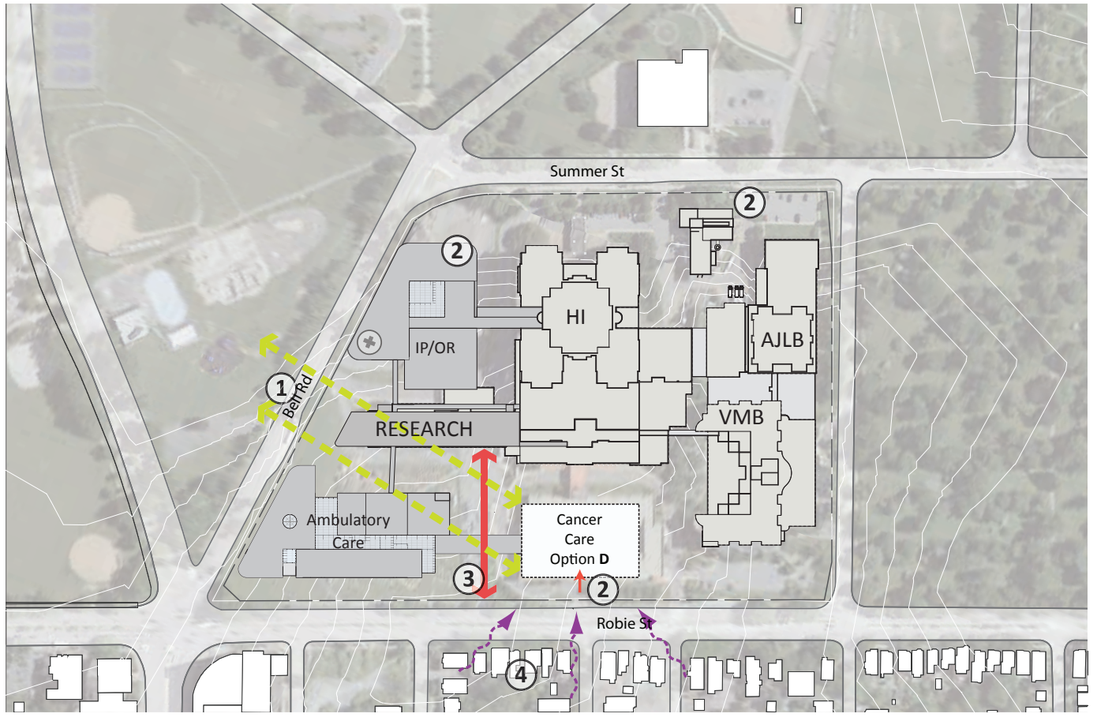
Free Standing Cancer Centre with below grade parking to replace existing parking structure

Opportunities

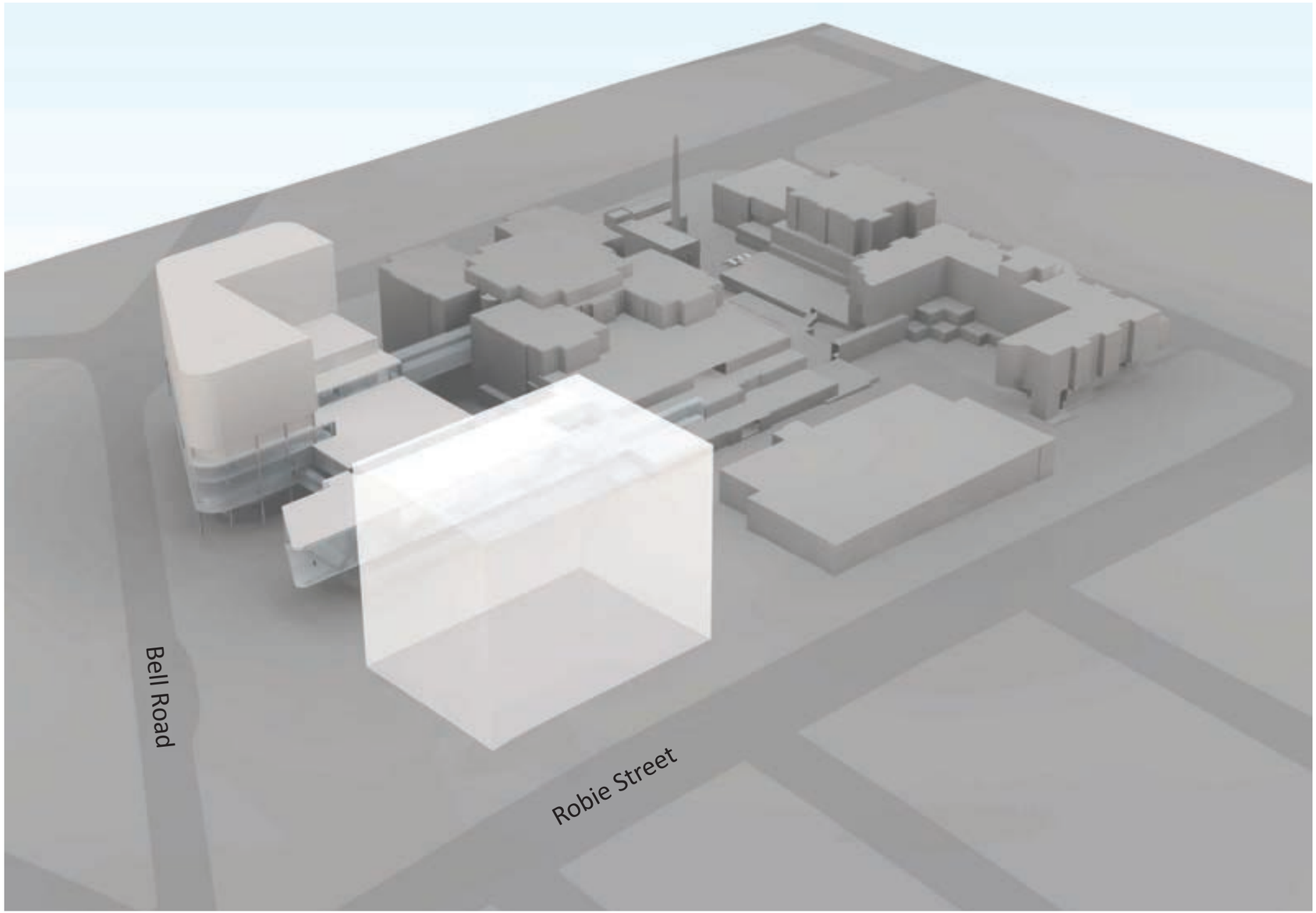


1. **Connections to adjacent buildings.** Situating the Cancer Care building on the site of the parking structure on Robie St will allow for Cancer Care to directly connect to the new Ambulatory building and the existing HI building minimizing travel distance for patients and reinforcing QE II's mandate for patient focused care.
2. **Improved streetscape.** Removal of the parking structure facing Robie street will improve the streetscape and pedestrian realm along Robie street.
3. **Below Grade Parking.** Below Grade parking will extend accross the Ambulatory Care building site and the proposed Cancer Centre, maximizing parking opportunities.
4. **Identity & Image.** Opportunity to create a unique identity and entry for cancer care.

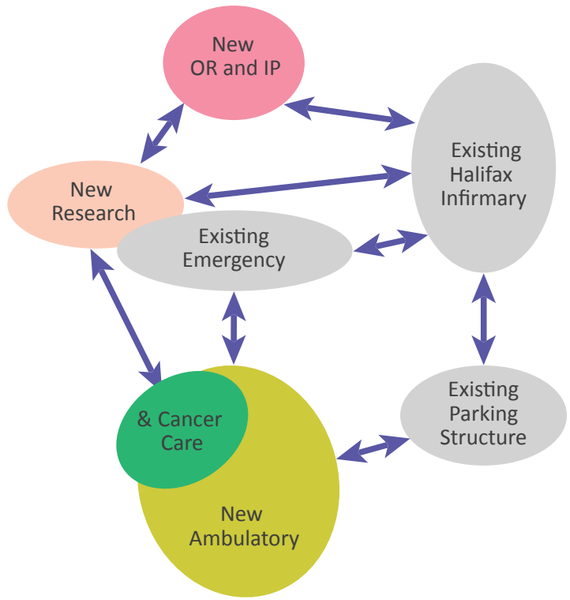
Constraints



1. **Views to green spaces.** Situating the Cancer Care building on the parking structure site will limit the building from capitalizing on viev and connections to the many green spaces surrounding the HI site.
2. **New Entry.** This option limits the opportunity of creating a new entry for the whole of the HI site in this location since this will becom a new Cancer Care entry.
3. **ED vehicle drop-off.** Construction of the large below grade parking structure could impact the existing vehicle drop off serving the ED building. This would need to be assessed.
4. **Entrance to HI.** Does not address the need for a main entrance into HI. Cancer care will in turn become the "de-facto" front door into HI.



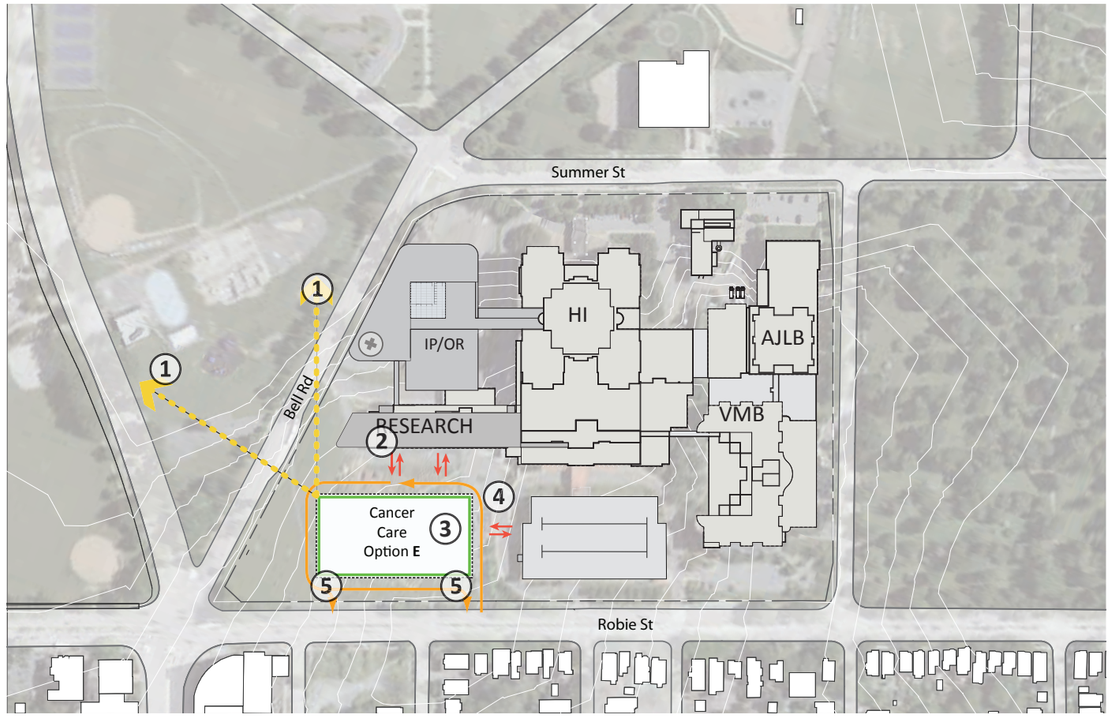
Cancer Care Option **E**



Cancer Care Option **E** - Opportunities and Constraints

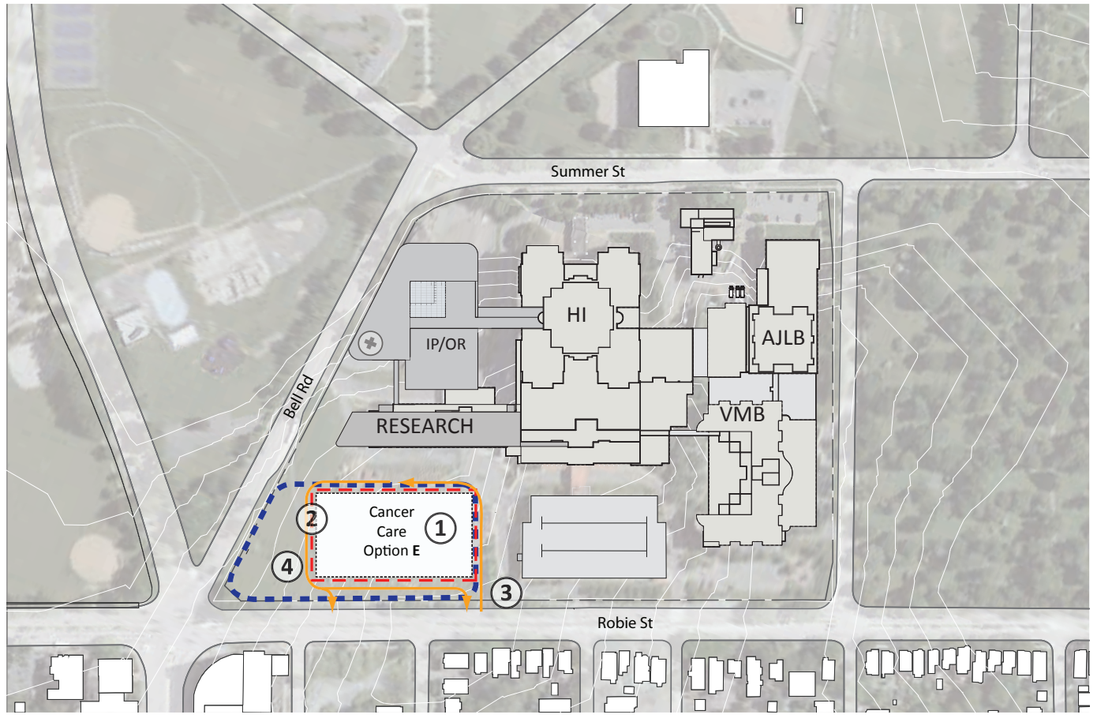
Integrated Cancer Centre with proposed ambulatory care centre on urban garden site with below grade parking.

Opportunities



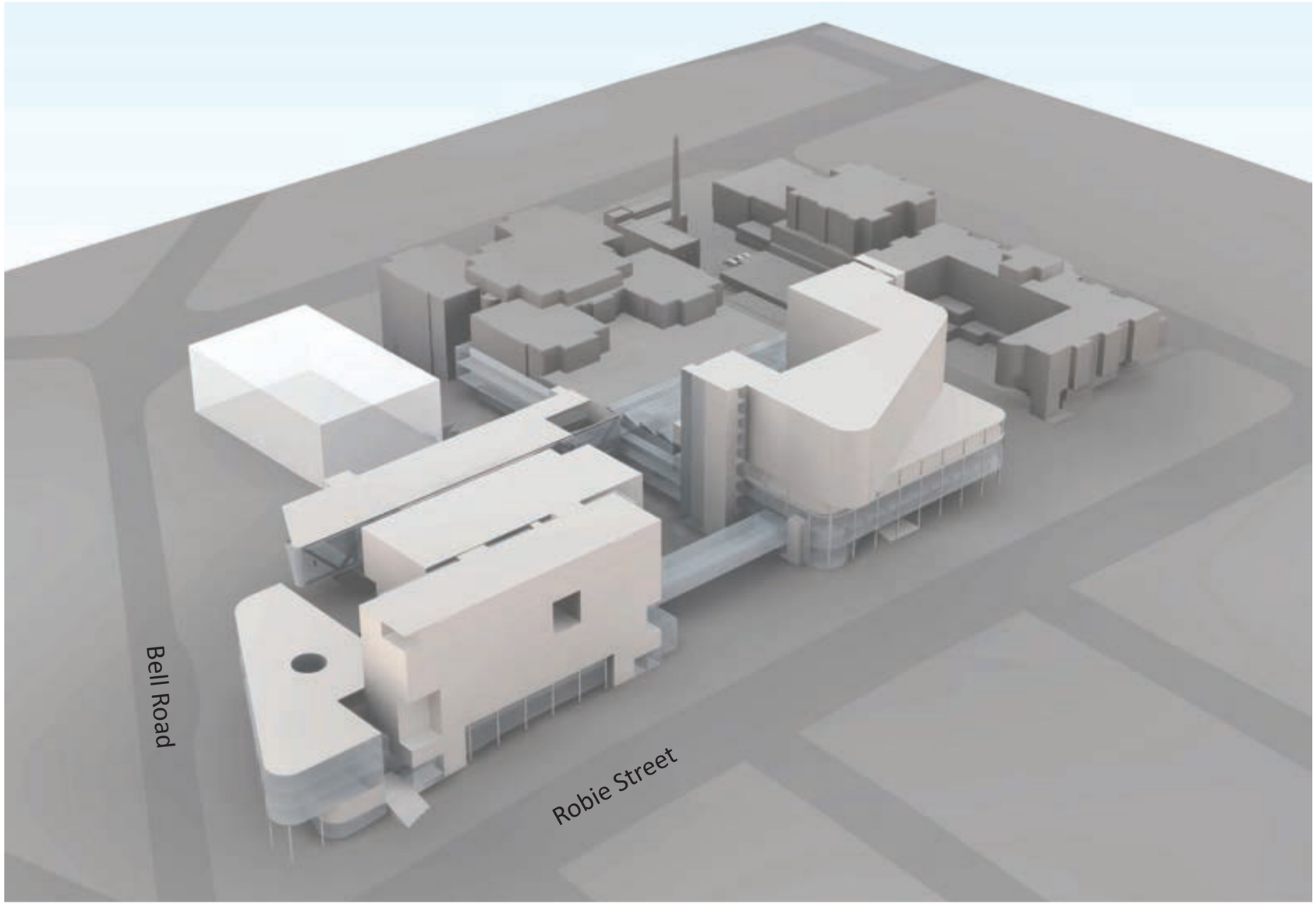
1. **Views to the Halifax Commons.** The location of the Cancer Care building on the Urban Garden created opportunities for views to the Commons. Public/Green space surrounding the building will create a healing environment within a park like setting and have a relation to the Commons.
2. **Connection to ED/Research building.** Above grade connections are also possible to the Research/ED building.
3. **Integrated concept.** Recognizing that many cancer patients also deal with other chronic conditions, an integrated Cancer Care and Ambulatory care centre will promote & encourage collaboration between cancer and non-cancer physicians and clinicians in the diagnosis and treatment of cancer. Integration of cancer care and ambulatory care may also result in operational efficiencies as duplication of functions are not required (DI).
4. **Direct connection to parking structure.** There will be a direct connection between the existing parking structure and the new building for Cancer Care and Ambulatory patients.
5. **Vehicular Circulation.** The larger nature of the urban garden site will pose less problems for vehicle and shipping/receiving circulation and access. The existing ED drop-off could potentially remain or be phased.

Constraints

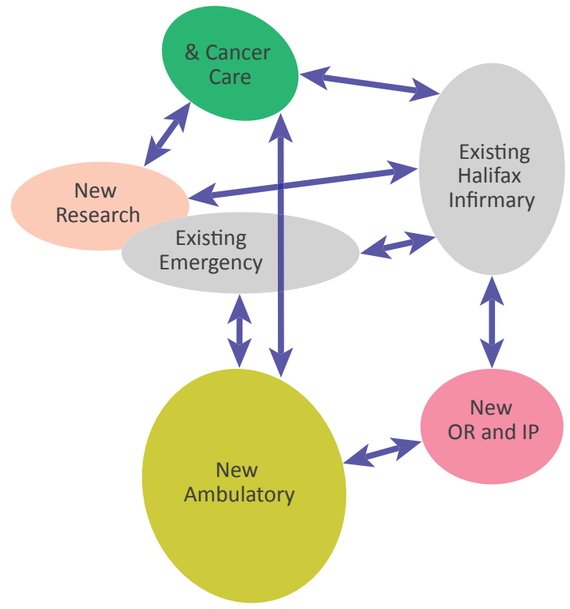


1. **Dense tall building.** Integrating the Cancer Care Centre with the new Ambulatory Care Centre will result in a significantly larger massing adjacent to open green space (the Commons) and may not be desirable from an urban design perspective. The larger massin would also have potential shadow implications.
2. **Parking.** Demand for parking will be high in a combined Ambulatory Care Building and Cancer Centre
3. **Vehicular Access.** Conflicting demands on providing seperate drop-off and pick-up points may result from co-locating the two programs in a single building.
4. **Image and Identity.** Careful consideration is required at the design stage to provide a unique image and identity for cancer care withi the larger integrated building.
5. **Future Development.** If future OR's & Inpatient units are developed on the existing parking structure site, to replace the programe in the HI building when that building needs to be replaced, it will be difficult to create connections to the proposed IP/OR building on th CBC site. A connection between Cancer Care and the future IP/OR building would be a positive aspect of this option.

N



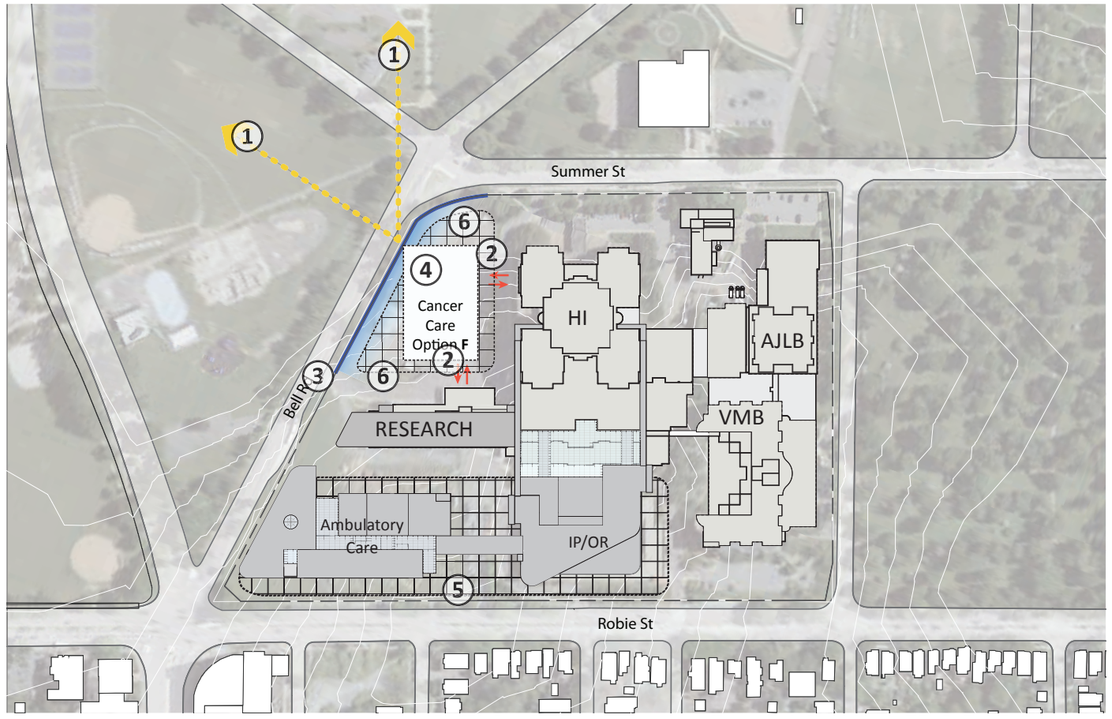
Cancer Care Option **F**



Cancer Care Option **F** - Opportunities and Constraints

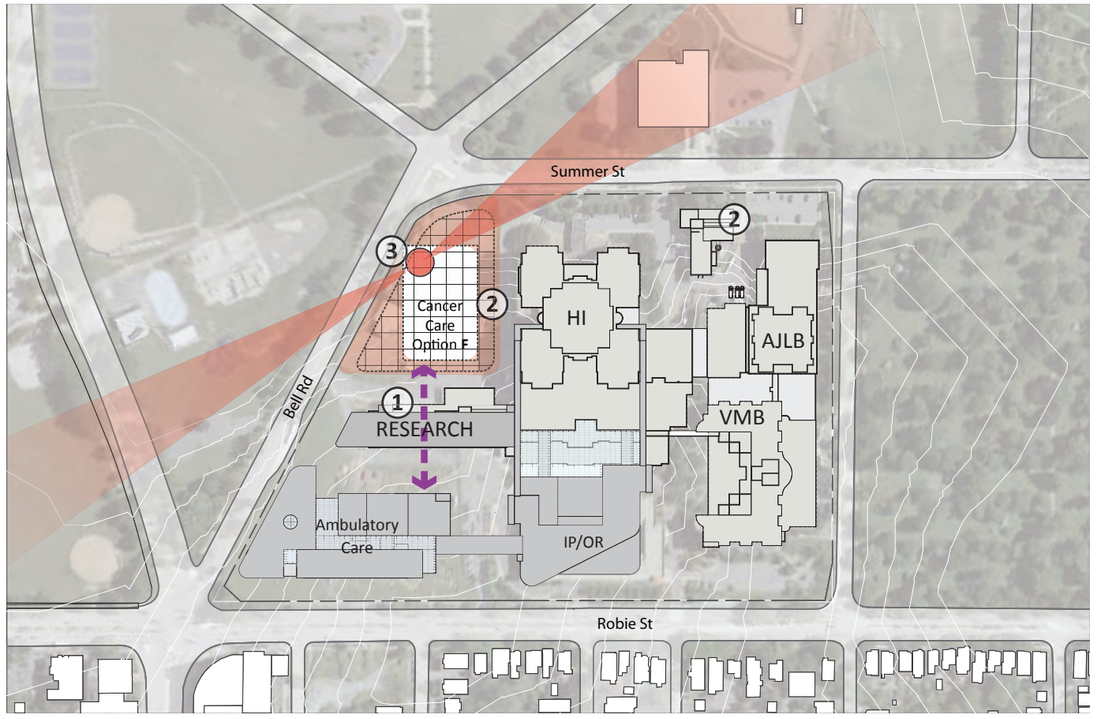
Freestanding Cancer Centre on CBC site with below grade parking.

Opportunities

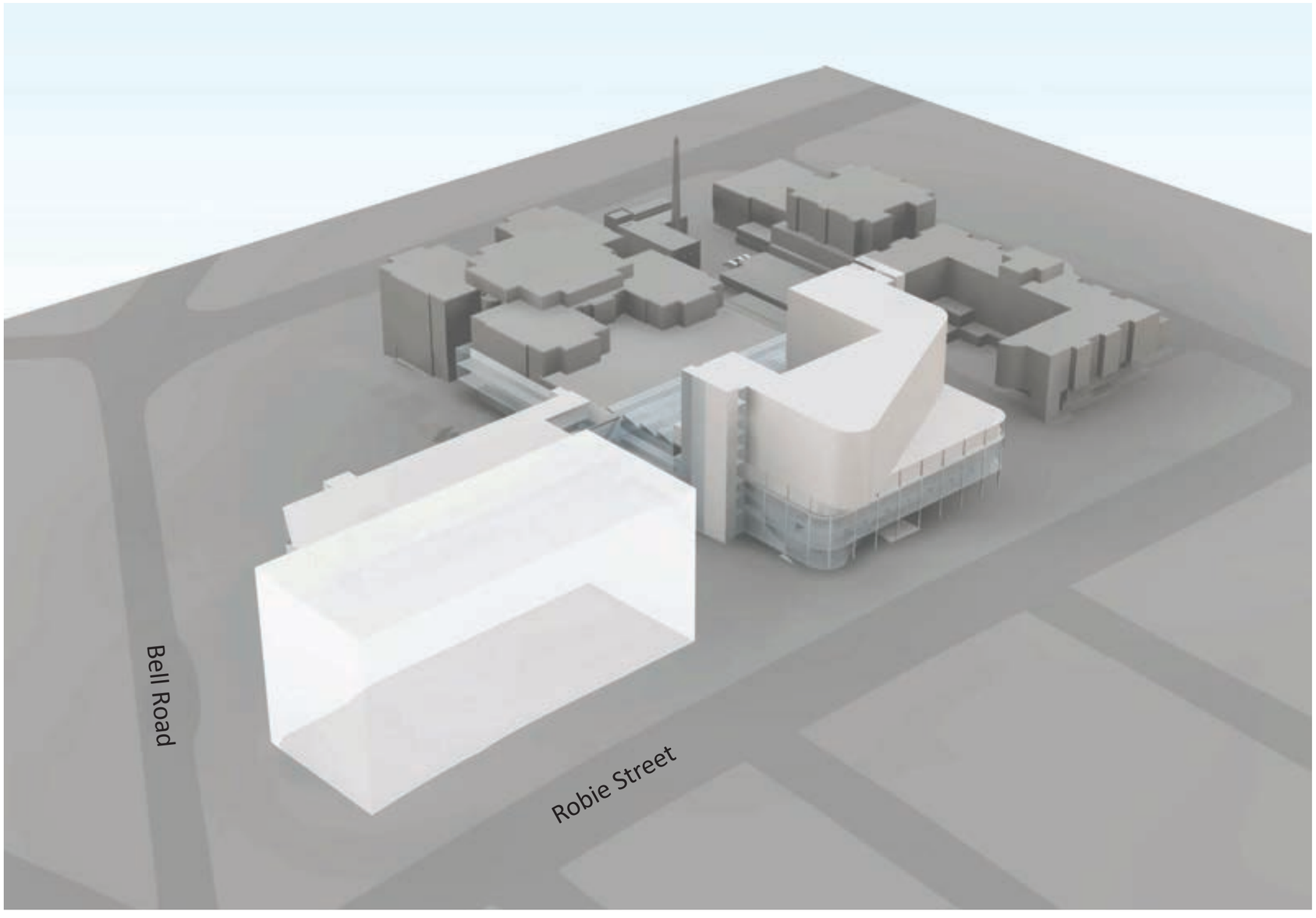


1. **Views and connections to the Halifax Commons.** The location of the Cancer Care building on the CBC site allows for views to the Commons to be maximized. Public/Green space surrounding the building can act as an extension of the Commons, creating a healing environment in a park-like setting for patients & family. The location also has the opportunity to maximize natural light.
2. **Connection to new research/ED building and existing HI buildings.** Locating the Cancer Care building on the CBC site will allow for Cancer Care to be adjacent to the HI building, especifically, to the inpatient units, minimizing the distance between inpatient units and ambulatory treatment areas. Above grade connections are possible to the Research/ED building and the HI building. A below grade connection is possible to the HI building for services.
3. **Street frontage and amenity space.** The building can be designed to improve the public realm along Summer Street and Bell Road. Retail and amenity space can be incorporated along part of the street edge.
4. **Image and Identity.** A freestanding Cancer Centre on the CBC site will provide a strong image and identity.
5. **Large below-grade parking.** A large below-grade parking lot could span between the urban garden site and the below the proposed new OR/IP building. This could greatly relieve the parking constraints inherent on this site.
6. **Cancer Centre Parking.** Below grade parking on the CBC site will be for the Cancer Centre only.

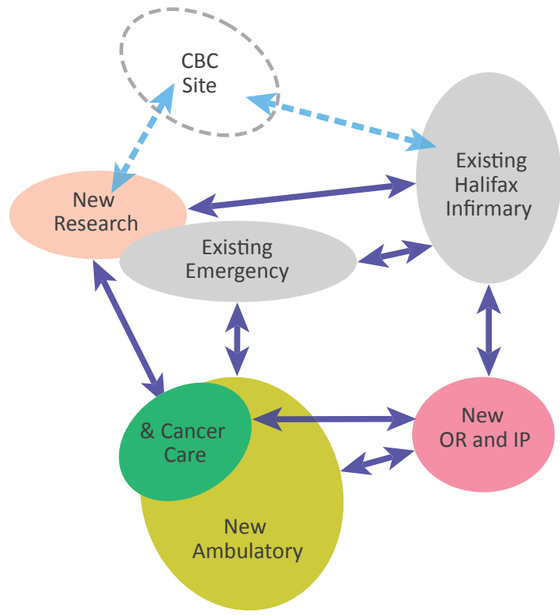
Constraints



1. **No direct connectivity to Ambulatory building.** The Cancer Care building and Willow Tree Ambulatory Care building are not directly adjacent, however a link can be provided.
2. **Parking.** Bedrock conditions will need to be addressed.
3. **Helipad remains at HI.** Lower building may not be able to accomodate the relocation of the helipad.



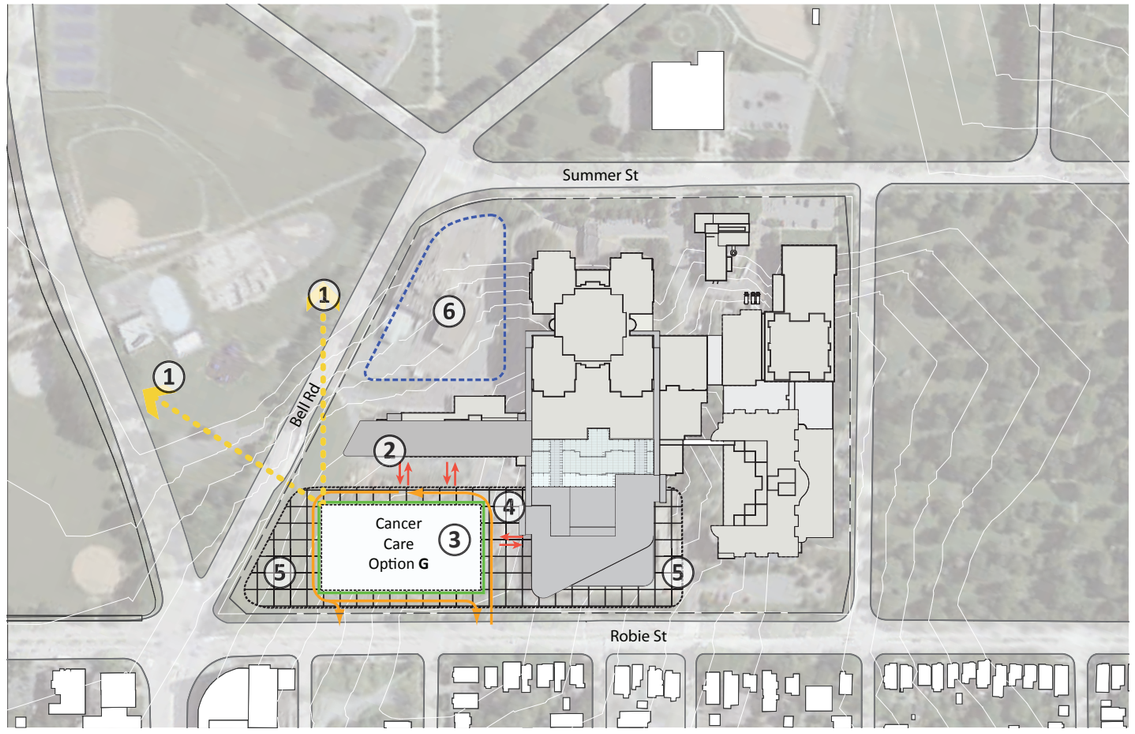
Cancer Care Option **G**



Cancer Care Option **G** - Opportunities and Constraints

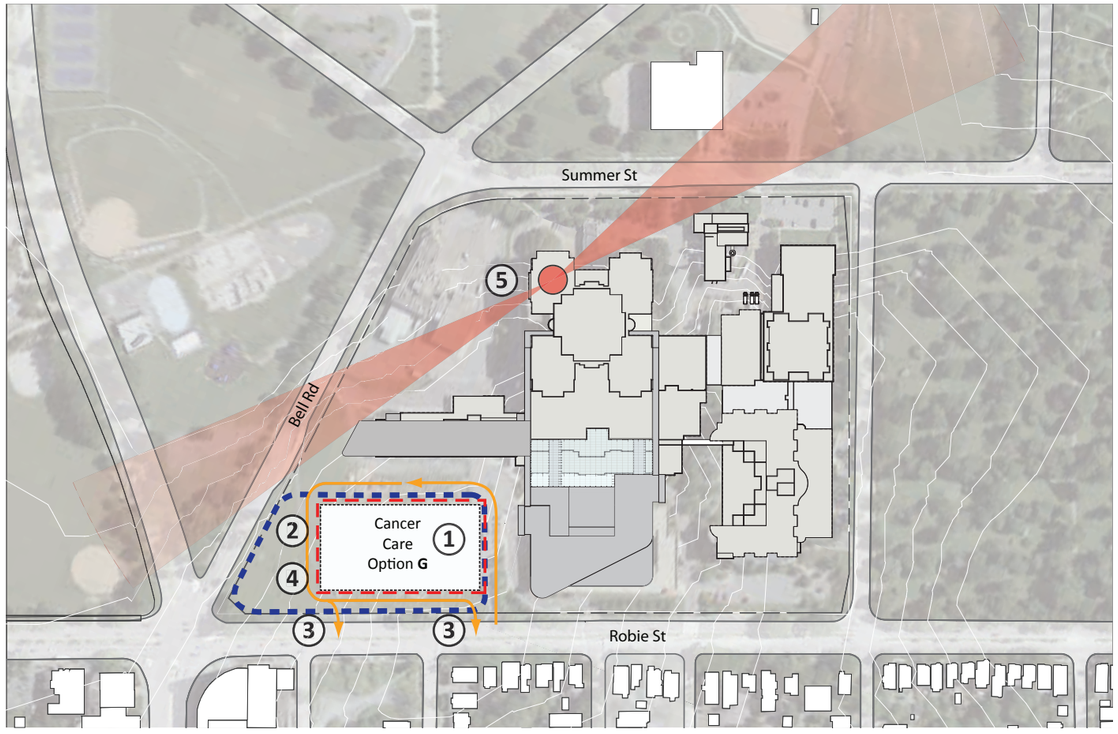
Integrated Cancer Centre with ambulatory care centre on urban garden site with Inpatient/OR on structured parking site

Opportunities



1. **Views to the Halifax Commons.** The location of the Cancer Care building on the Urban Garden created opportunities for views to the Commons. Public/Green space surrounding the building will create a healing environment within a park like setting and have a relation to the Commons.
2. **Connection to ED/Research building.** Above grade connections are also possible to the Research/ED building.
3. **Integrated concept.** Recognizing that many cancer patients also deal with other chronic conditions, an integrated Cancer Care and Ambulatory care centre will promote & encourage collaboration between cancer and non-cancer physicians and clinicians in the diagnosis and treatment of cancer. Integration of cancer care and ambulatory care may also result in operational efficiencies as duplication of functions are not required (DI).
4. **Direct connection to IP/OR.** Situating the Cancer Care building on the Urban Garden site will allow for Cancer Care to capitalize on adjacencies of nearby buildings. Above grade connections are possible to the OR in Inpatient Building, reinforcing QE II's mandate for patient-focused care.
5. **Large below-grade parking.** A large below-grade parking lot could span between the urban garden site and the below the proposed new OR/IP building. This could greatly relieve the parking constraints inherent on this site.
6. **Future Connections.** CBC site stays vacant.

Constraints



1. **Dense tall building.** Integrating the Cancer Care Centre with the new Ambulatory Care Centre will result in a significantly larger massing adjacent to open green space (the Commons) and may not be desirable from an urban design perspective. The larger massin would also have potential shadow implications.
2. **Parking.** Demand for parking will be high in a combined Ambulatory Care Building and Cancer Centre
3. **Vehicular Access.** Conflicting demands on providing seperate drop-off and pick-up points may result from co-locating the two programs in a single building.
4. **Image and Identity.** Careful consideration is required at the design stage to provide a unique image and identity for cancer care withir the larger integrated building.
5. **Helipad remains at HI.** CBC site remains vacant and therefore not able to accomodate relocation of the helipad.

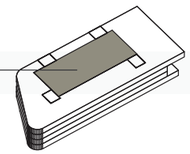
N

2.3 Concept Explorations
2.3.1 Stacking and Adjacency Explorations

These diagrams are part of an analytical process to understand the relationship between site, programs, areas, the number of visits to each program, the relation between the parts and program adjacencies. This will inform and help rationalise the evolution of the concept. It also explores various typologies in terms of massing; the diagrams are site specific to the urban garden location. The diagrams on page 58-59 explore a stand alone four-story Cancer Care building, while the diagrams on page 60-61 explore an eight-story stand alone Cancer Care building.

LEVEL PENTHOUSE
(HI OVERALL PLAN LEVEL 06)

FACILITY PROGRAM



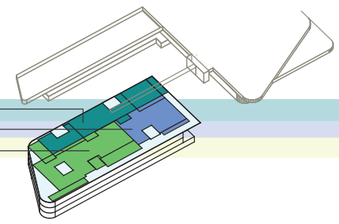
M&E

TOTAL M&E @ PENTHOUSE: 20,000 SF

LEVEL 3
(HI OVERALL PLAN LEVEL 05)

DI, SYSTEMIC ONCOLOGY & ADMIN PROGRAMS

TOTAL PROGRAM @ LEVEL 3: 59,800 DGSF



DI

TOTAL DI DGSF 19,500

Administration

TOTAL ADMIN & GENERAL SERVICES DGSF 44,848

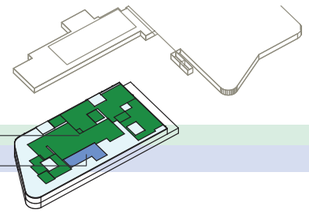
Systemic Oncology

TOTAL SYSTEMIC ONCOLOGY DGSF 24,427

LEVEL 2
(HI OVERALL PLAN LEVEL 04)

OUTPATIENT & ADMIN PROGRAMS

TOTAL PROGRAM @ LEVEL 2: 37,785 DGSF



Outpatient Clinics

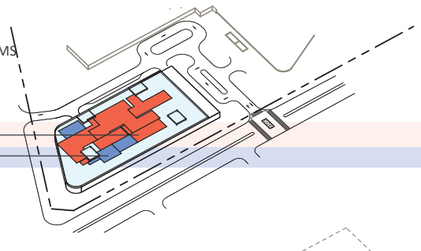
TOTAL OUTPATIENT CLINICS & SERVICES DGSF 43,557

Administration

LEVEL B1 & GROUND
(HI OVERALL PLAN LEVEL 03&02)

RADIATION TREATMENT & ADMIN PROGRAMS

TOTAL PROGRAM @ GROUND: 23,754 DGSF



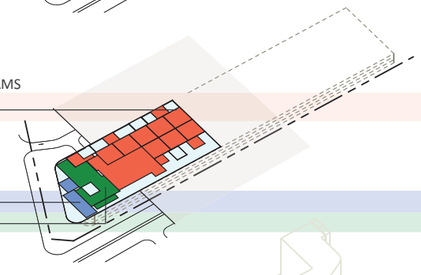
Radiation Treatment Department

Administration

RADIATION, ADMIN & OUTPATIENT PROGRAMS

TOTAL PROGRAM @ LEVEL B1: 35,153 DGSF

TOTAL RADIATION TREATMENT PROGRAM DGSF 44,848



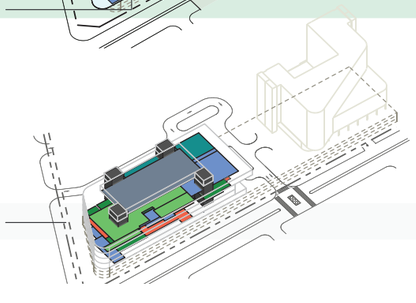
Radiation Treatment Department

Administration

Outpatient Clinics

PARKING B2
(HI OVERALL PLAN LEVEL 01)
PARKING B3
(HI OVERALL PLAN LEVEL B1)
PARKING B4
(HI OVERALL PLAN LEVEL B2)

TOTAL PROGRAM 136,988 DGSF
TOTAL M&E 20,000 SF



Line of 4m Setback from property line

2.3 Concept Explorations
Section Sub-Heading

LEVEL PENTHOUSE
(HI OVERALL PLAN LEVEL 06)

FACILITY PROGRAM

LEVEL 3
(HI OVERALL PLAN LEVEL 05)

DI & ADMIN PROGRAM

DI for Cancer Care Visits
54,750 visits per year

ADMIN PROGRAM

Full time equivalent staff
678.2

SYSTEMIC ONCOLOGY

Systemic Treatment Visits
27,199 visits per year

LEVEL 2
(HI OVERALL PLAN LEVEL 04)

OUTPATIENT CLINICS PROGRAM

New Case
15,890 visits per year

Follow-up
52,810 visits per year

LEVEL B1 & GROUND
(HI OVERALL PLAN LEVEL 03&02)

RADIATION TREATMENT PROGRAM

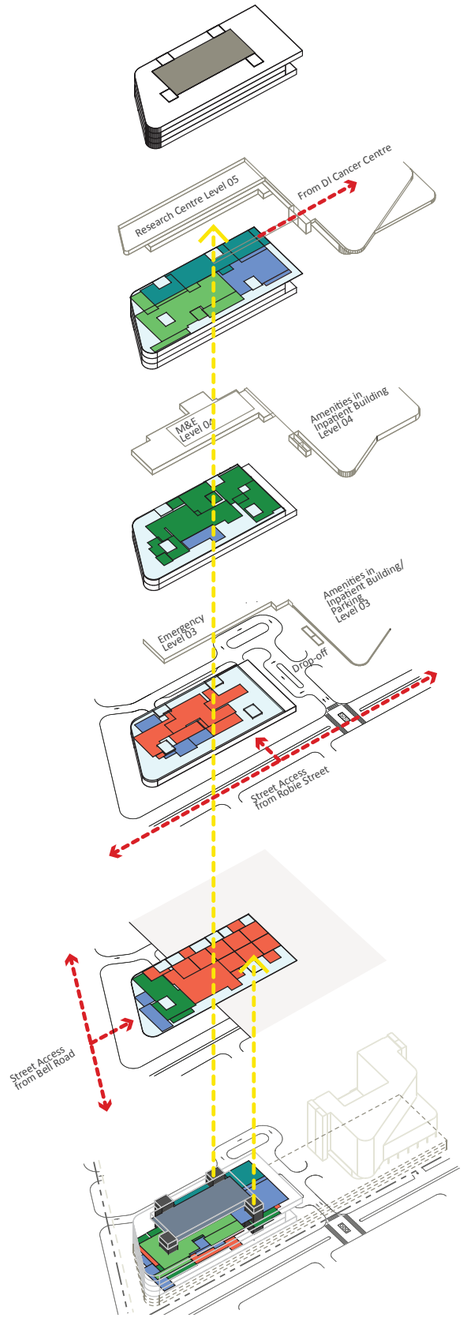
Radiation Treatment
77,332 visits per year

OUTPATIENT CLINICS PROGRAM

Supportive Care Visits
26,218 visits per year
(20-25% of New Cases)

PARKING B2
(HI OVERALL PLAN LEVEL 01)
PARKING B3
(HI OVERALL PLAN LEVEL B1)
PARKING B4
(HI OVERALL PLAN LEVEL B2)

TOTAL PROGRAM 136,988 DGSF
TOTAL M&E 20,000 SF



N

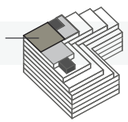
2.3 Concept Explorations
Section Sub-Heading

LEVEL PENTHOUSE
(HI OVERALL PLAN LEVEL 11)

FACILITY PROGRAM

M&E 8,000 SF

TOTAL M&E @ LEVEL 9 & PENTHOUSE: 28,000

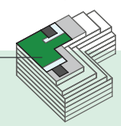


LEVEL 8
(HI OVERALL PLAN LEVEL 10)

OUTPATIENT CLINICS PROGRAM

TOTAL PROGRAM @ LEVEL 8: 8,827 DGSF

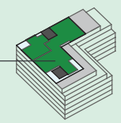
Outpatient Clinics



LEVEL 7
(HI OVERALL PLAN LEVEL 09)

TOTAL PROGRAM @ LEVEL 7: 14,710 DGSF

Outpatient Clinic

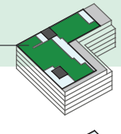


LEVEL 6
(HI OVERALL PLAN LEVEL 08)

TOTAL PROGRAM @ LEVEL 6: 20,000 DGSF

Outpatient Clinic

TOTAL OUTPATIENT CLINICS & AFFILIATED SERVICES DGSF 43,557



LEVEL 5
(HI OVERALL PLAN LEVEL 07)

SYSTEMIC ONCOLOGY & ADMIN PROGRAM

TOTAL PROGRAM @ LEVEL 5: 29,199 DGSF

Systemic Oncology

TOTAL SYSTEMIC ONCOLOGY DGSF 24,427

Administration

LEVEL 4
(HI OVERALL PLAN LEVEL 06)

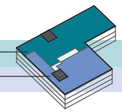
DI & ADMIN PROGRAM

TOTAL PROGRAM @ LEVEL 4: 35,373 DGSF

DI

TOTAL DI DGSF 19,500

Administration

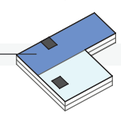


LEVEL 3
(HI OVERALL PLAN LEVEL 05)

FACILITY PROGRAM

TOTAL M&E @ LEVEL 3: 20,000 SF

M&E



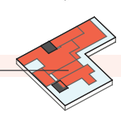
LEVEL 2
(HI OVERALL PLAN LEVEL 04)

RADIATION TREATMENT PROGRAM

TOTAL PROGRAM @ LEVEL 2: 23,779 DGSF

Radiation Treatment

TOTAL RADIATION TREATMENT PROGRAM DGSF 44,848



GROUND
(HI OVERALL PLAN LEVEL 03)

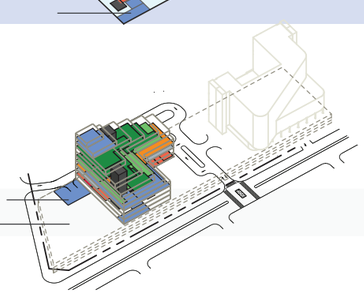
RADIATION TREATMENT & ADMIN PROGRAM

TOTAL PROGRAM @ GROUND LEVEL: 24,584 DGSF

Radiation Treatment

Administration

TOTAL ADMINISTRATION & GENERAL SERVICES DGSF 44,848



PARKING B1
(HI OVERALL PLAN LEVEL 02)

PARKING B2
(HI OVERALL PLAN LEVEL 01)

PARKING B3
(HI OVERALL PLAN LEVEL B1)

Facility Management

Parking

TOTAL PROGRAM 136,988 DGSF
TOTAL M&E 20,000 SF

N

2.3 Concept Explorations
Section Sub-Heading

LEVEL PENTHOUSE
(HI OVERALL PLAN LEVEL 11)

FACILITY PROGRAM

LEVEL 8
(HI OVERALL PLAN LEVEL 10)

OUTPATIENT CLINICS PROGRAM

Supportive Care Visits
26,218 visits per year
(20-25% of New Cases)

LEVEL 7
(HI OVERALL PLAN LEVEL 09)

New Case
15,890 visits per year

LEVEL 6
(HI OVERALL PLAN LEVEL 08)

Follow-up
52,810 visits per year

LEVEL 5
(HI OVERALL PLAN LEVEL 07)

SYSTEMIC ONCOLOGY & ADMIN

Systemic Treatment Visits
27,199 visits per year

LEVEL 4
(HI OVERALL PLAN LEVEL 06)

DI

DI for Cancer Care Visits
54,750 visits per year

LEVEL 3
(HI OVERALL PLAN LEVEL 05)

FACILITY PROGRAM

Full time equivalent staff
678.2

LEVEL 2
(HI OVERALL PLAN LEVEL 04)

RADIATION TREATMENT PROGRAM

Radiation Treatment
77,332 visits per year

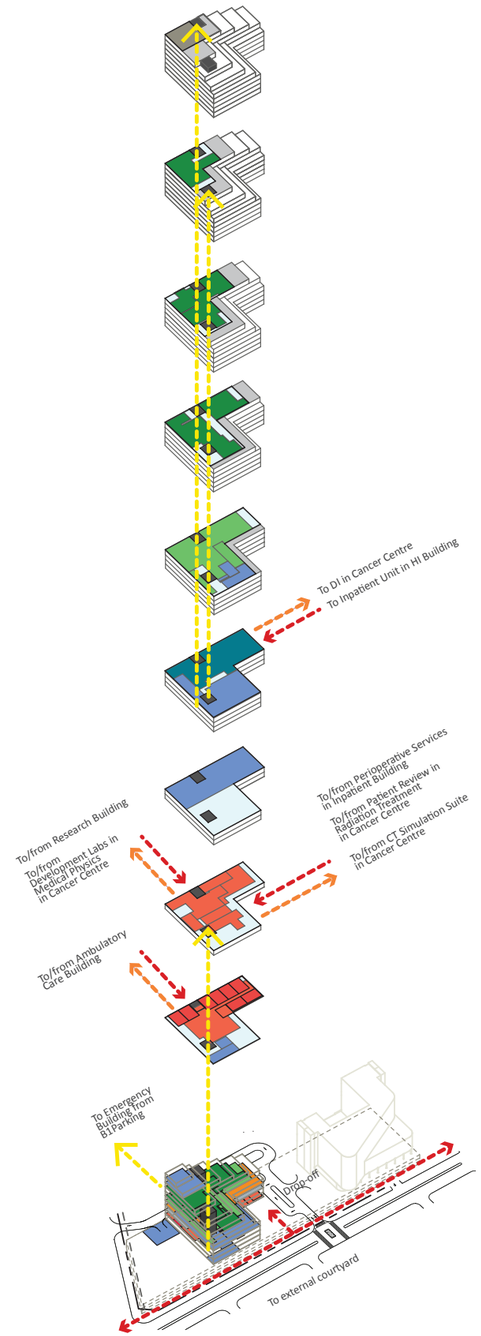
GROUND
(HI OVERALL PLAN LEVEL 03)

PARKING B1
(HI OVERALL PLAN LEVEL 02)

PARKING B2
(HI OVERALL PLAN LEVEL 01)

PARKING B3
(HI OVERALL PLAN LEVEL B1)

TOTAL PROGRAM 136,988 DGSF
TOTAL M&E 20,000 SF



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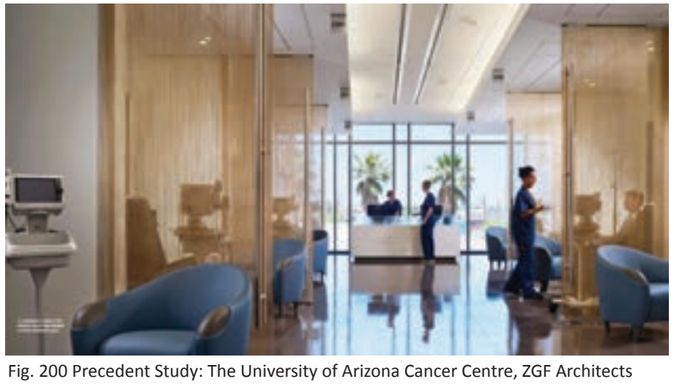


Fig. 200 Precedent Study: The University of Arizona Cancer Centre, ZGF Architects

Lessons Learned

- Built-in environmental shades that open and close depending on the movement of the sun
- Shell space for future expansion
- Efficient Floor Plan
- Gross Floor Area: 220,000 SF in 5 floors
- Average Floor ares: 55,000 SF
- Architect: ZGF Architects LLP, 2016

2.4 Test Fit Explorations

2.4.1 Design Precedents and Benchmarking
The University of Arizona Cancer Centre

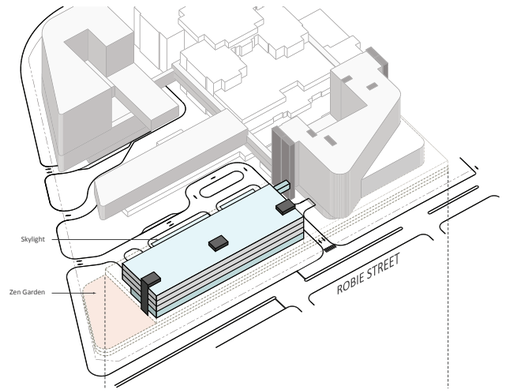
Fig. 201 Precedent Study: The University of Arizona Cancer Centre, Plans, ZGF Architects

2.4 Test Fit Explorations
2.4.2 Five Preliminary Test Fits

On conclusion that the preferred site on HI for the Cancer Care facility was either the CBC site or the Urban Garden site, the Kasian team explored a number of typologies that included freestanding cancer facility and an integrated cancer facility with ambulatory in a single building. A review of each of these explorations was reviewed with DTIR and QEII in a workshop dated February 21, 2018.

It should be noted, that these preliminary Test Fits were conducted before a finalized Cancer Care program was received. Therefore the areas may not reflect the concepts presented in Section 3.

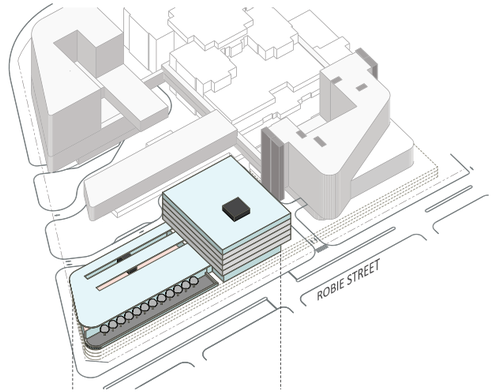
Cancer Care Option B.1
The Block



The Block

- Cancer care on Urban Garden site w/ bunkers at below grade (B1), Amb Care on CBC site, Inpatient/ OR building on parking structure site.
- 4 storey building stretching the entire urban garden site, with a garden at the end of the radiation treatment area to allow views and natural light to patients (due to slope in grade of site)
- Research and innovation building rotated 90° which will serve as a link between the Cancer Care and Amb Care building. (horizontally integrated option)
- Allows for entire below grade area of the urban garden and Inpatient building sites to be used for parking, maximizing on site parking. Direct access to the buildings can be provided through multiple vertical cores., making it more convenient for patients and visitors.
- Transportation access to site: splitting access points to Cancer care and Amb Care buildings is good from a traffic perspective.
- Shipping and receiving for both Cancer Care building and Inpatient/ OR building can be located below grade in the Cancer Care building
- Allows cancer care to have separate and distinct identity, while still achieving adjacency to Amb Care Building
- Link to new L5 Perioperative Dept expansion in new Inpatient/ OR building is ideal for cancer care

Cancer Care Option B.3
Garden Pavilion

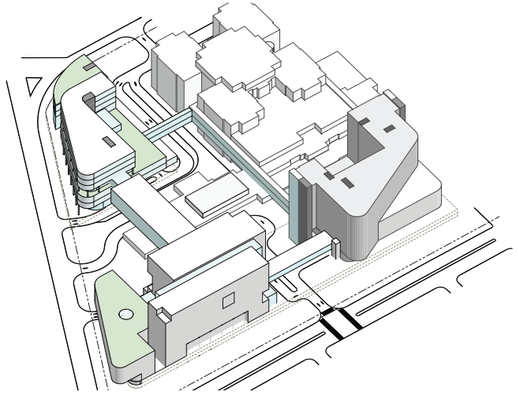


Garden Pavillion

- Cancer care on Urban Garden site w/ bunkers at grade, Amb Care on CBC site, Inpatient/ OR building on parking structure site.
- 1.5 storey garden pavilion for radiation treatment areas maximizing natural light and views, with a 6 storey tower for outpatient clinics, admin and general services
- Future cyclotron ideally located adjacent to the bunkers
- Research and innovation building rotated 90° which will serve as a link between the Cancer Care and Amb Care building. (horizontally integrated option)
- Allows for entire below grade area of the urban garden and Inpatient building sites to be used for parking, maximizing on site parking. Direct access to the buildings can be provided through multiple vertical cores., making it more convenient for patients and visitors.
- Transportation access to site: splitting access points to Cancer care and Amb Care buildings is good from a traffic perspective.
- Shipping and receiving for both Cancer Care building and Inpatient/ OR building can be located below grade in the Cancer Care building
- Allows cancer care to have separate and distinct identity, while still achieving adjacency to Amb Care Building
- Link to new L5 Perioperative Dept expansion in new Inpatient/ OR building is ideal for cancer care

2.4 Test Fit Explorations
2.4.2 Five Preliminary Test Fits

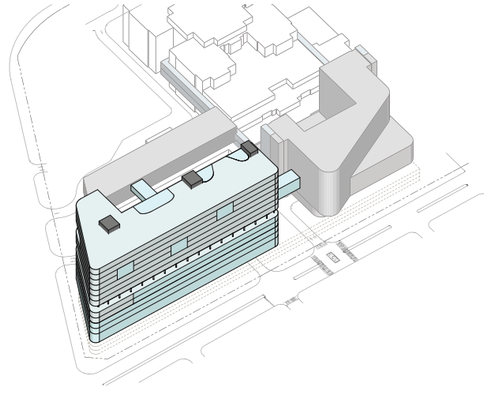
Cancer Care Option F.1
CBC Cancer Care



Cancer Care on CBC site

- 6-7 storey building on CBC site, bunkers located one level above grade
- Research and innovation building rotated 90° which will serve as a link between the Cancer Care and Amb Care building. (horizontally integrated option)
- Transportation access to site: splitting access points to Cancer care and Amb Care buildings is good from a traffic perspective.
- Allows cancer care to have separate and distinct identity, while still achieving adjacency to Amb Care
- Distinct garden pavilion can be created at the intersection of Bell Rd and Summer Street
- Link to L5 Perioperative Services in HI building is good for cancer care
- Location provides views to the commons from patient treatment areas

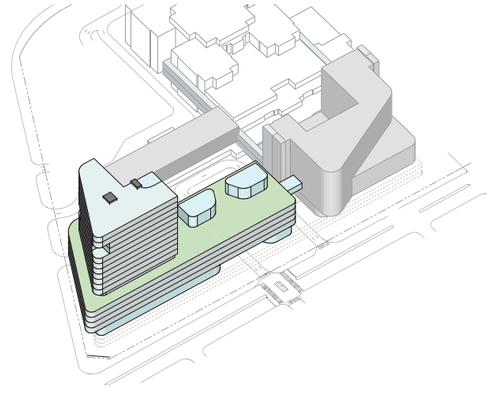
Cancer Care Option G.1
The Lookout



The Lookout

- Integrated (vertically) Amb Care and Cancer Care building on Urban Garden site- 5 storey podium + 8 storey tower, bunkers at grade.
- Allows for entire below grade area of the urban garden and Inpatient building sites to be used for parking, maximizing on site parking. Direct access to the buildings can be provided through multiple vertical cores., making it more convenient for patients and visitors.
- Shipping and receiving for both Cancer Care building and Inpatient/ OR building can be located below grade in the Cancer Care building
- Vehicular access to site is very challenging as all access point for Inpatients, Amb Care and Cancer Care will be from Robie Street and Bell Road. Concentration of volumes on one corner of the site is not ideal.
- One large building is potentially more confusing and stressful for patients, especially with one integrated entrance from Robie Street
- Preserves CBC site for future development
- 300+ parking spaces required for Cancer Care
- From an urban design perspective, a large massing on the urban garden site is not ideal

Cancer Care Option G.2
Sky Gardens



Skygarden

- Integrated (Vertically) Amb Care and Cancer Care building on Urban Garden site- 6 storey podium + 12 storey tower, bunkers at grade.
- Allows for entire below grade area of the urban garden and Inpatient building sites to be used for parking, maximizing on site parking. Direct access to the buildings can be provided through multiple vertical cores., making it more convenient for patients and visitors.
- Shipping and receiving for both Cancer Care building and Inpatient/ OR building can be located below grade in the Cancer Care building
- Vehicular access to site is very challenging as all access point for Inpatients, Amb Care and Cancer Care will be from Robie Street and Bell Road. Concentration of volumes on one corner of the site is not ideal.
- Separate cancer care and amb care drop off provides may be less confusing for patients. However, very small footprint available for an amb care building lobby space at grade, which may not be very welcoming to patients and visitors.
- One large building is potentially more confusing and stressful for patients
- Preserves CBC site for future development
- 300+ parking spaces required for Cancer Care
- From an urban design perspective, a large massing on the urban garden site is not ideal

2.4 Test Fit Explorations

2.4.3 Garden Pavilion Concept Precedents:

Fig. 203 Precedent Study: Nasher Sculpture Centre, Renzo Piano

Fig. 204 Precedent Study: Nasher Sculpture Centre, Renzo Piano

Fig. 205 Precedent Study: LSU Academic Medical Center, Blitch Knevel Architects

Fig. 206 Precedent Study: Kimbell Art Museum, Renzo Piano

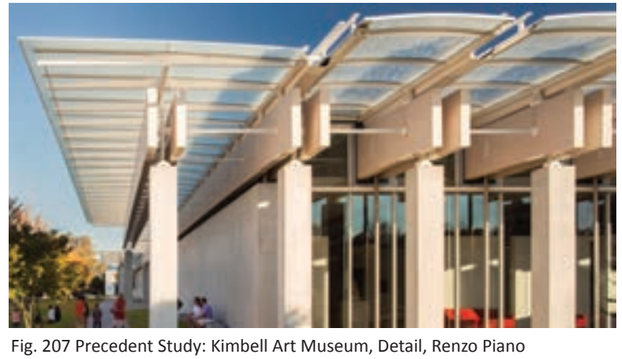
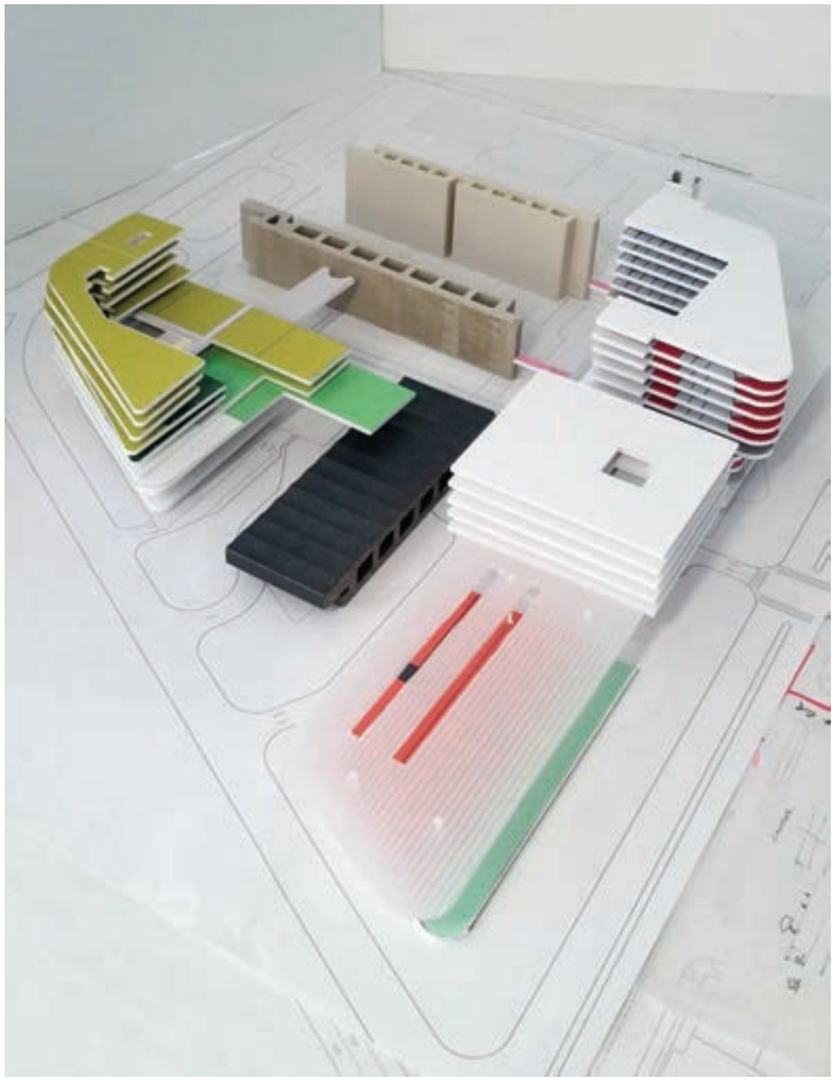
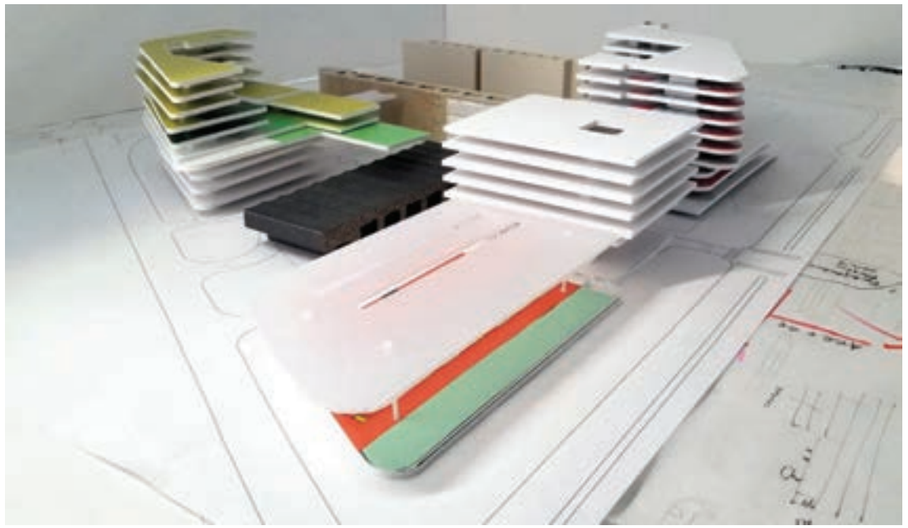
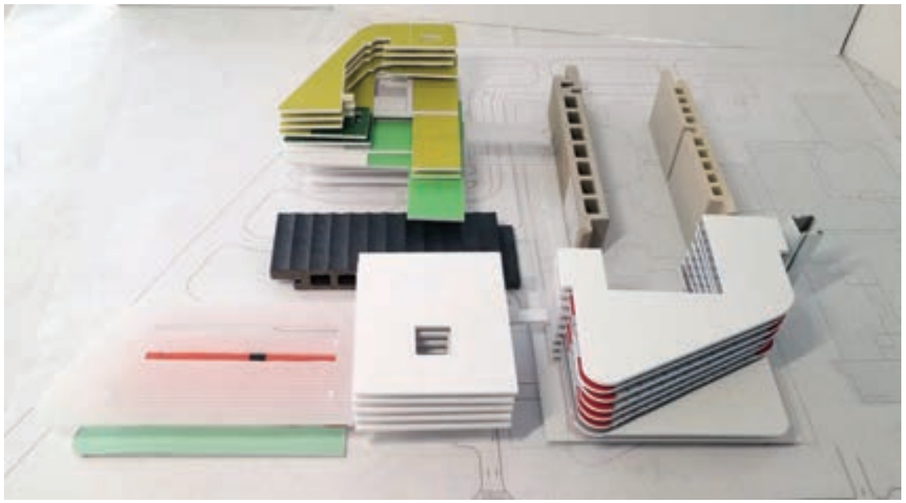


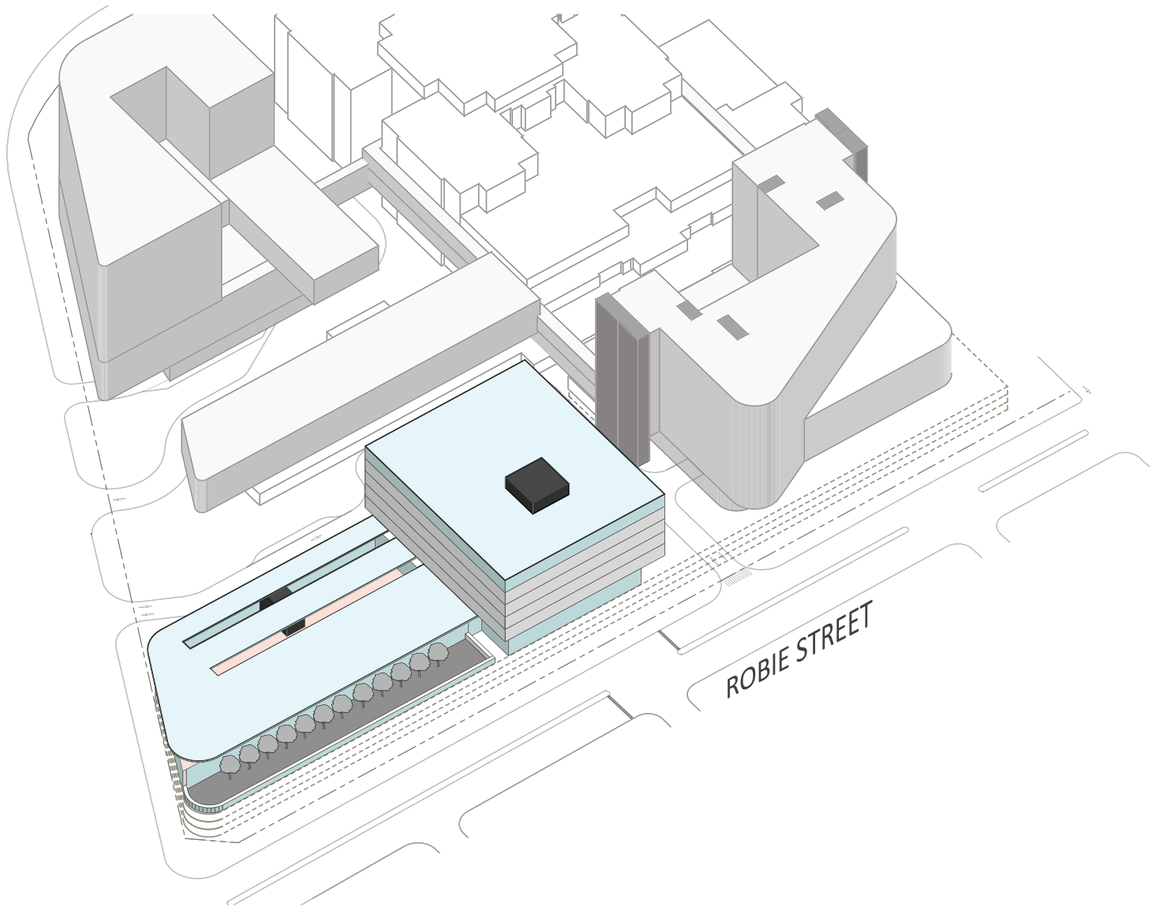
Fig. 207 Precedent Study: Kimbell Art Museum, Detail, Renzo Piano



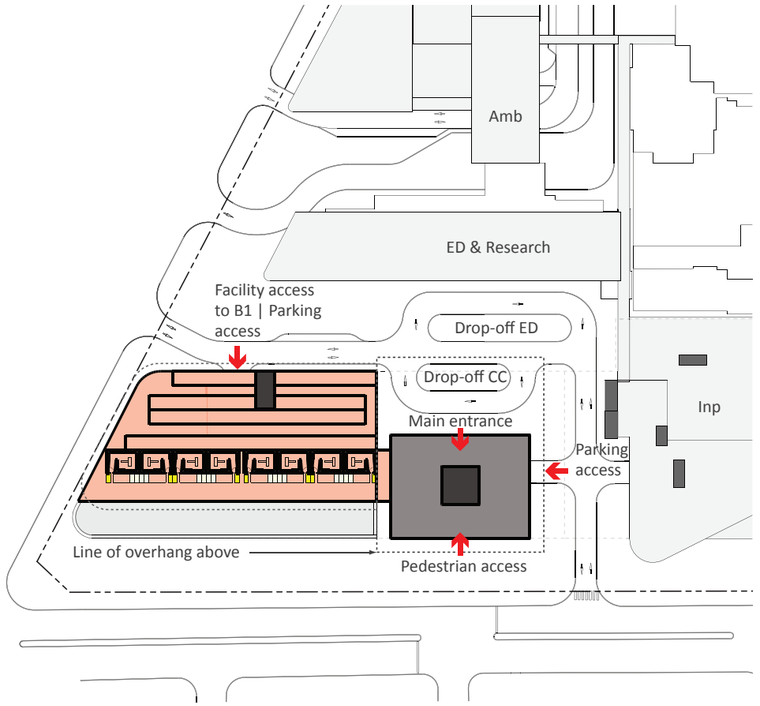




ISOMETRIC FROM BELL/ROBIE

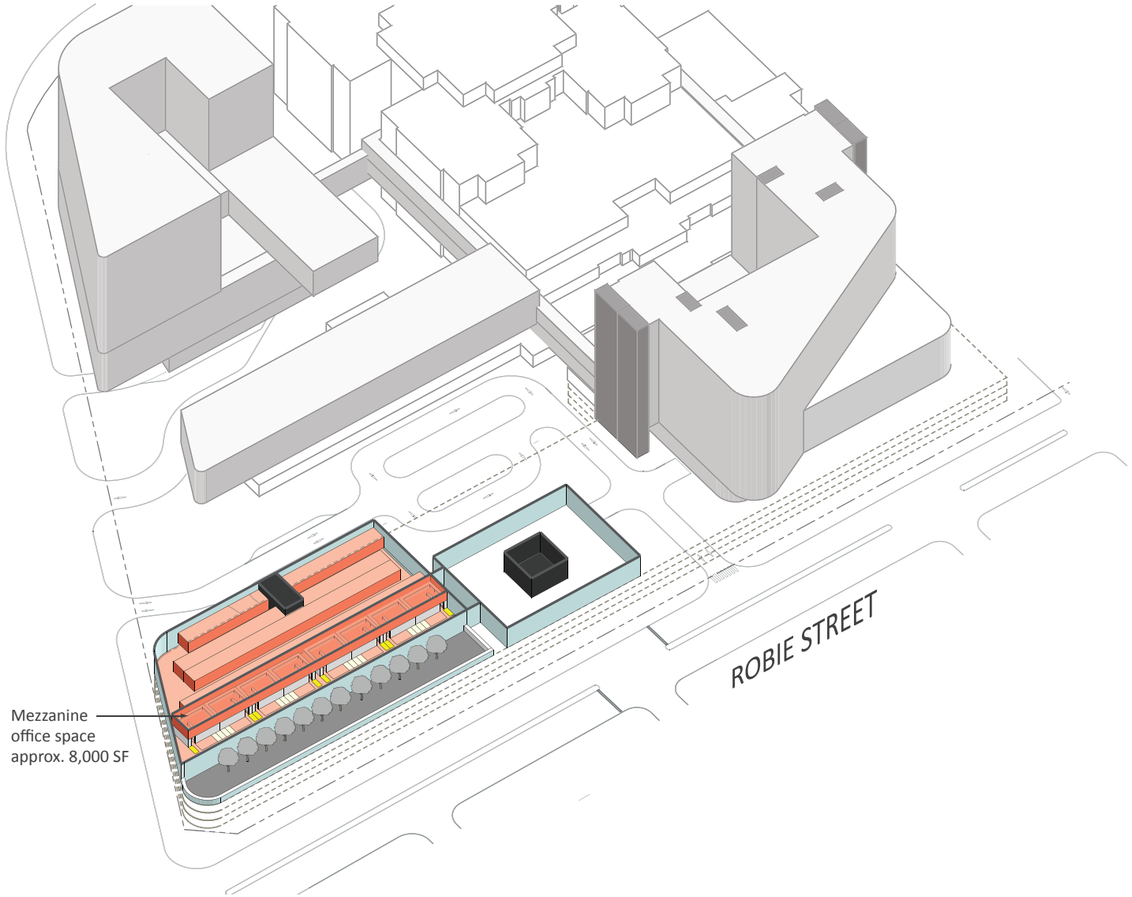


SITE PLAN

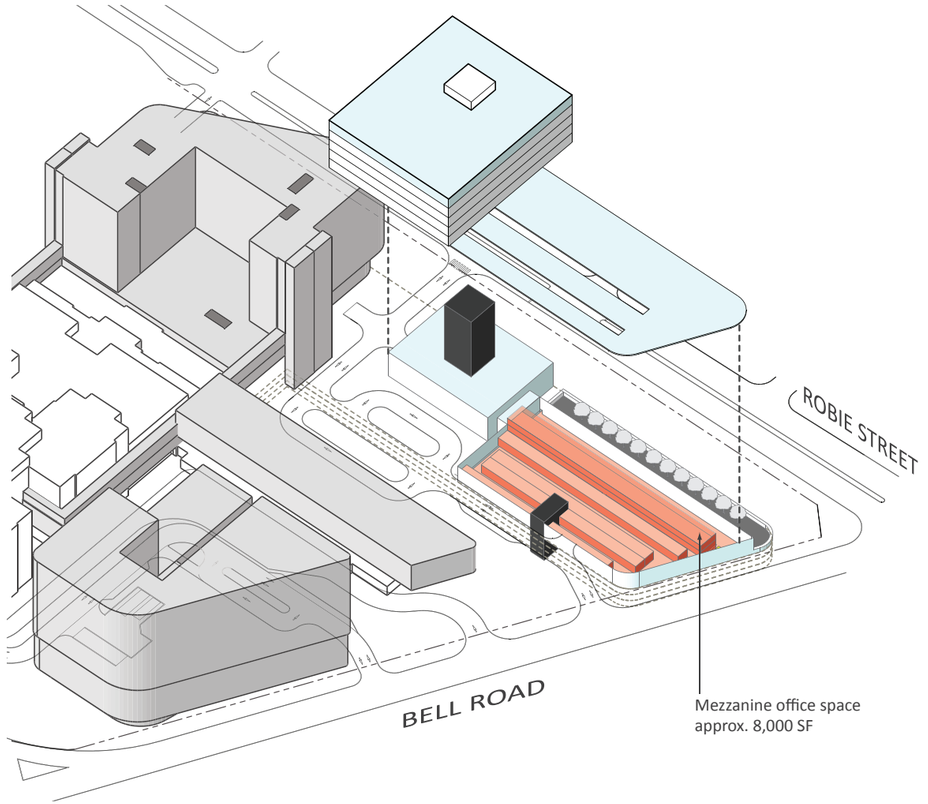


The Garden pavilion is a patient centric building, the treatment centre is on the ground level directly accessed from the patient drop off zone. The treatment zone will be a light filled area with a focus on creating a healing environment.

BUNKERS - GROUND FLOOR



ISOMETRIC FROM BELL/ROBIE - GROUND FLOOR



AREA SUMMARY

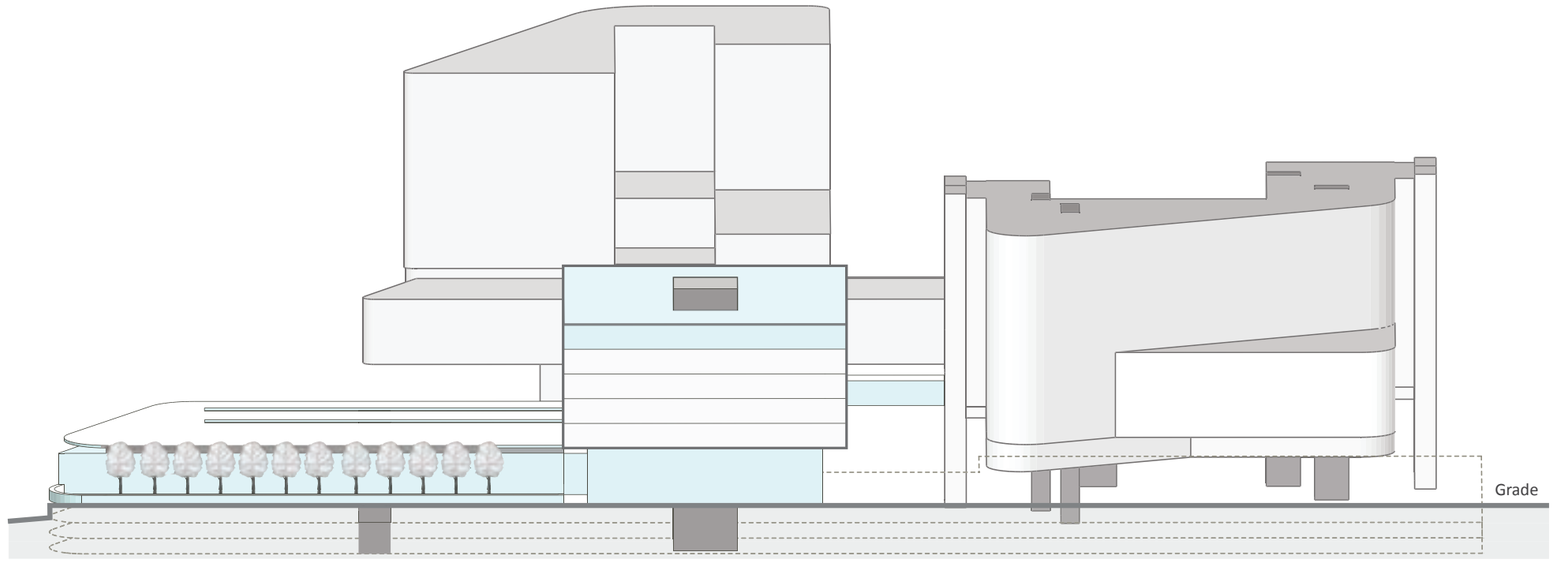
TOTAL GFA = 238,000 SF

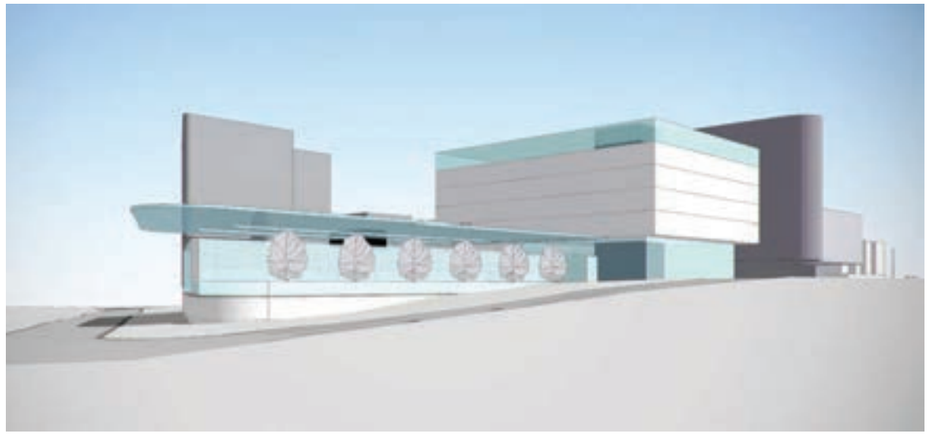
Level 2-6
36,000 X 5 = 180,000 SF

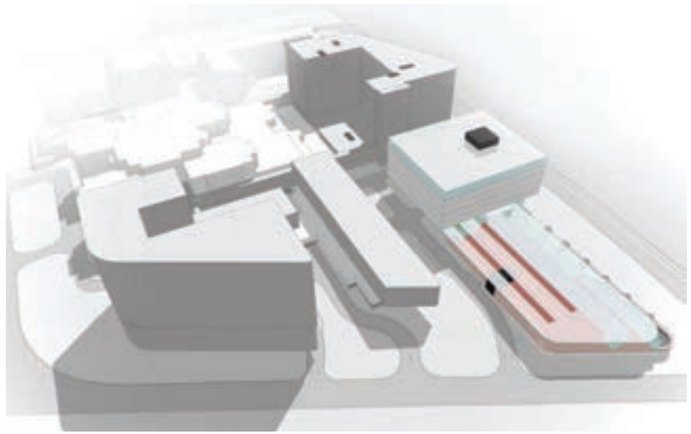
Level 1
13,000 SF

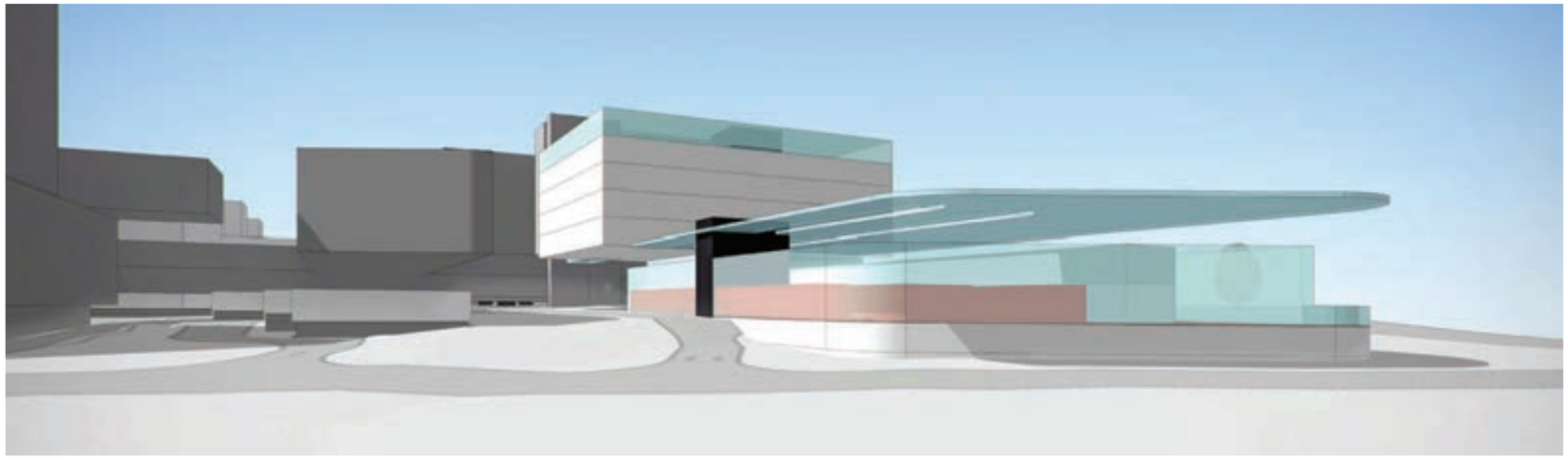
Pavilion
45,000 SF
(37,000 SF + 8,000 SF)

Level P1-P3
170,000 SF X 3 = 510,000 SF









2.4 Test Fit Explorations

2.4.4 The Block Precedents:

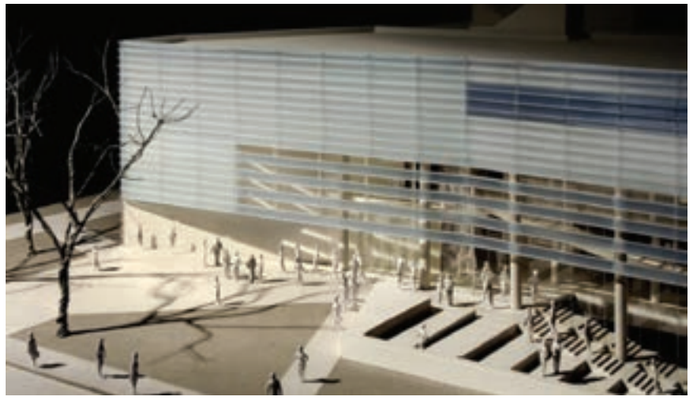


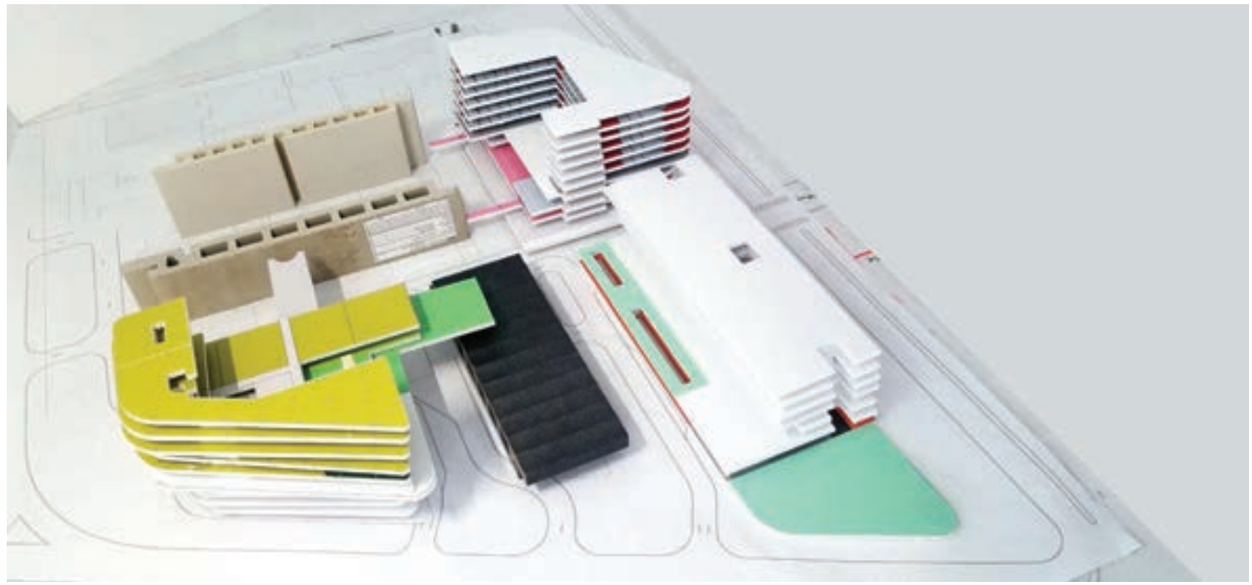
Fig. 208 Precedent Study: Centre for Music Art and Design, Patkau Architects

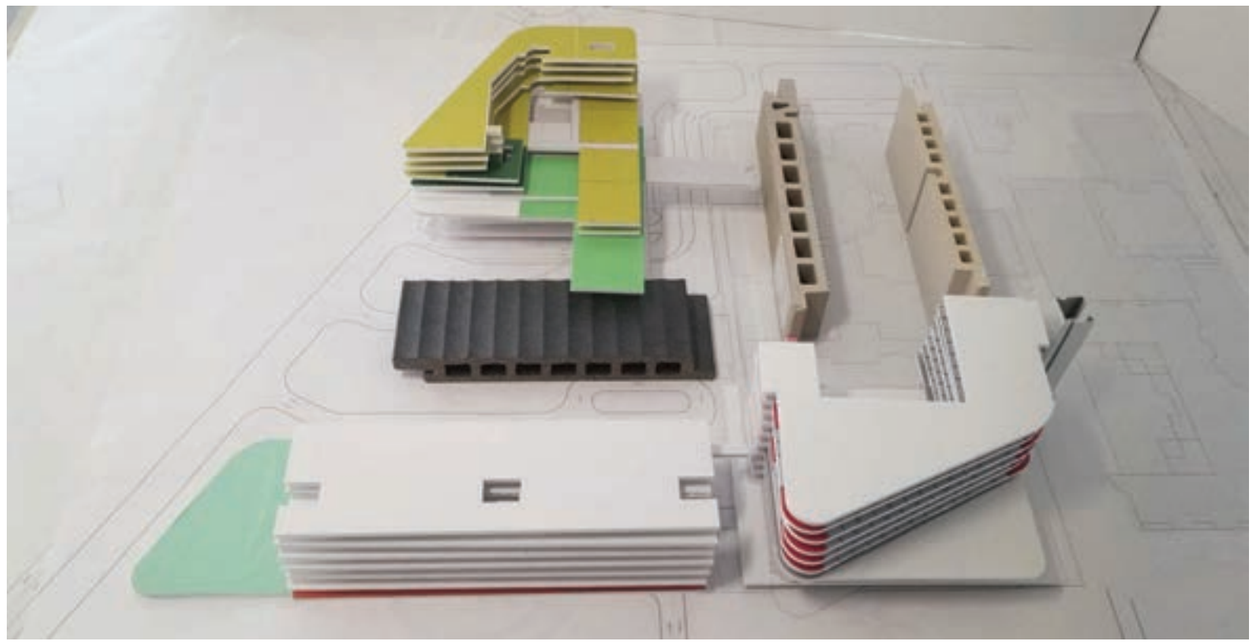
Fig. 209 Precedent Study: UH Seidman Cancer Center, Array Architects

Fig. 210 Precedent Study: Nelson Atkins Museum of Art, Steven Holl Architects

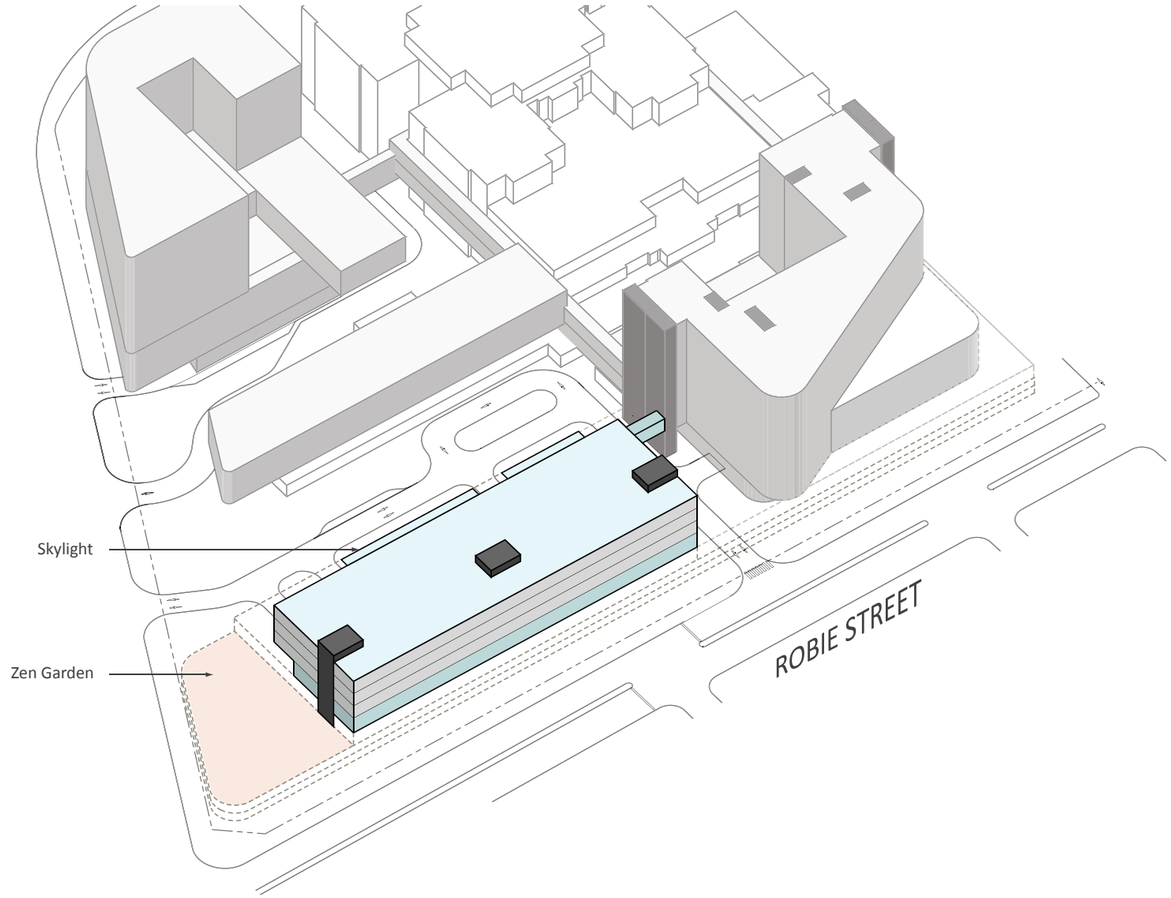
Fig. 211 Precedent Study: Cleveland Clinic Taussig Cancer Centre, William Rawn Associates

Fig. 212 Precedent Study: Cleveland Clinic Taussig Cancer Centre Interior, William Rawn Associates

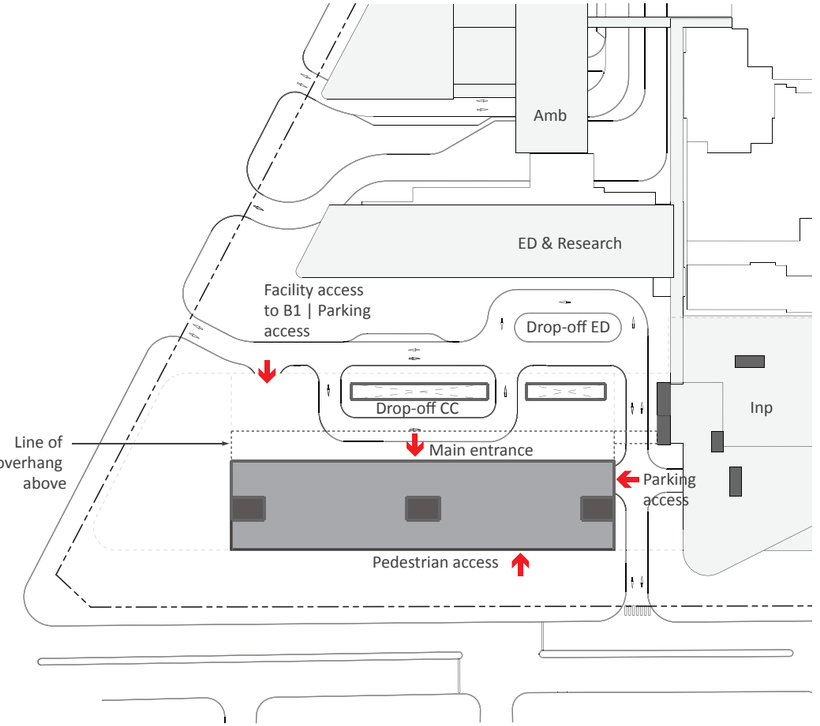




ISOMETRIC FROM BELL/ROBIE



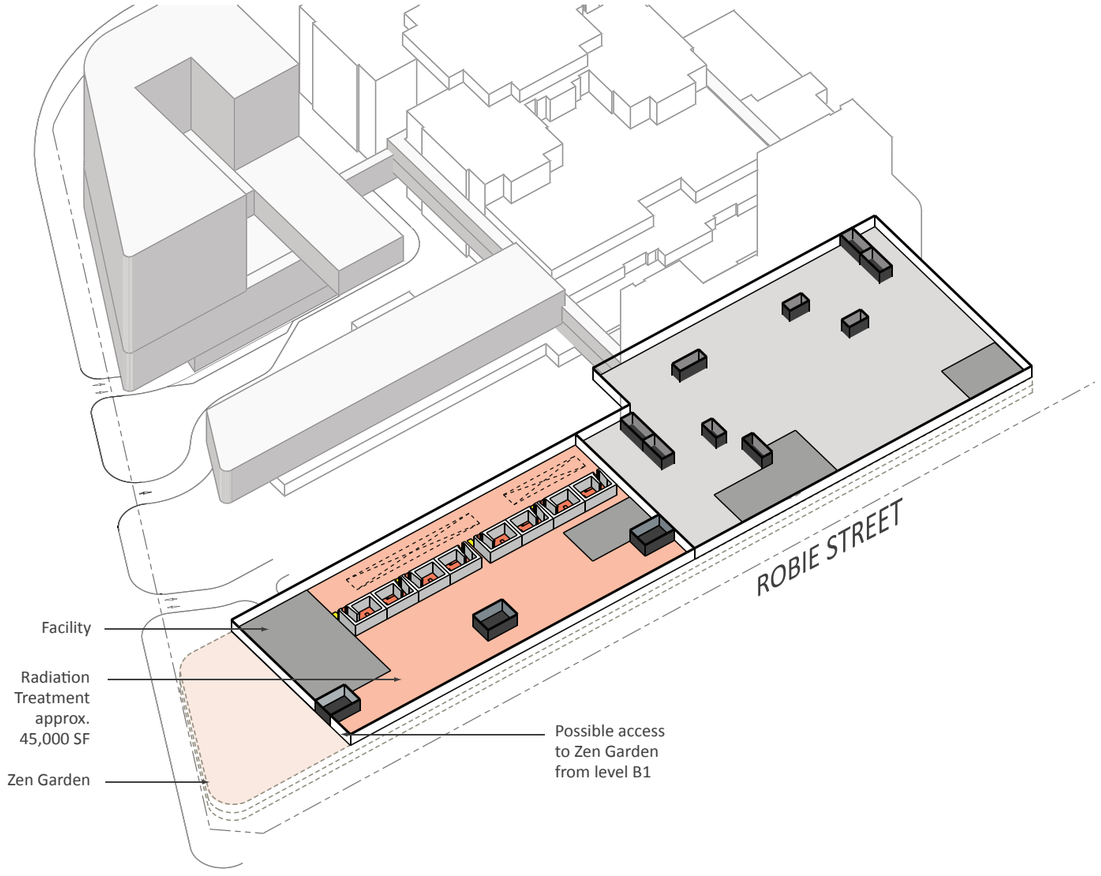
SITE PLAN



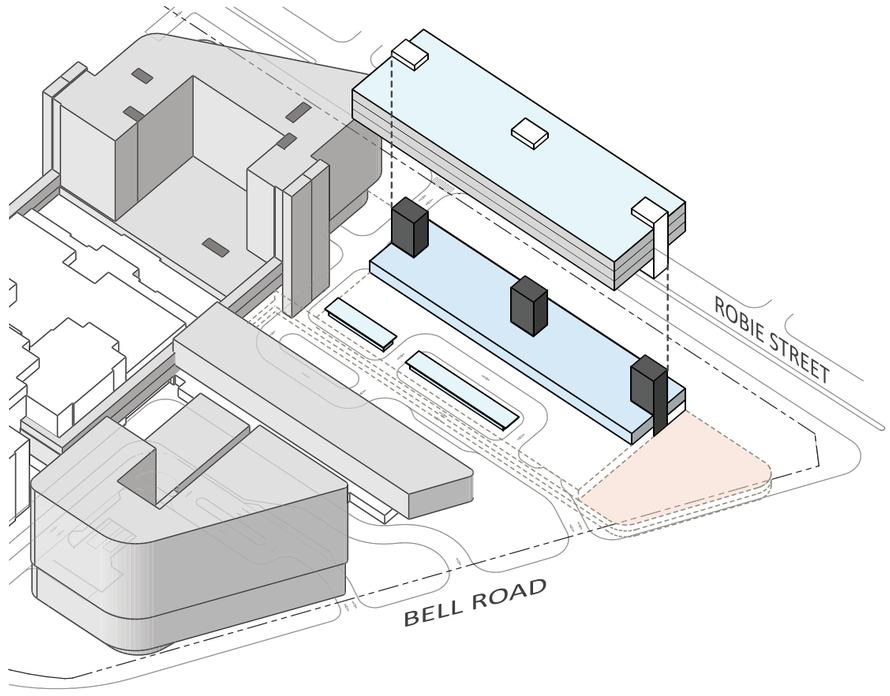
2.4 Test Fit Explorations

2.4.4 The Block

BUNKERS - BASEMENT LEVEL B1



ISOMETRIC FROM BELL/ROBIE - GROUND FLOOR



AREA SUMMARY

TOTAL GFA = 237,000 SF

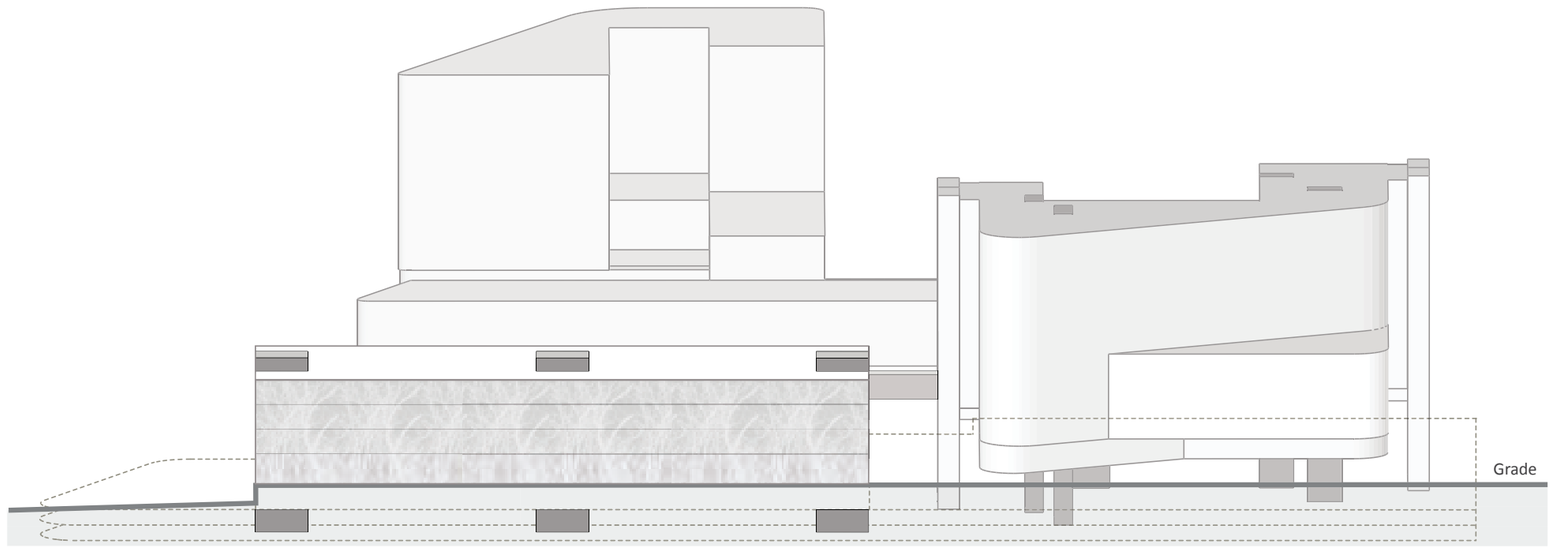
Level 2-4
45,000 SF X 3 = 135,000 SF

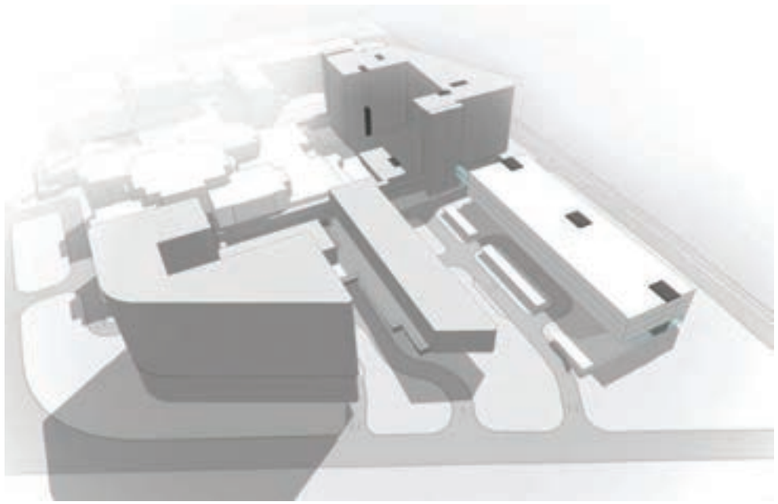
Level 1
34,000 SF

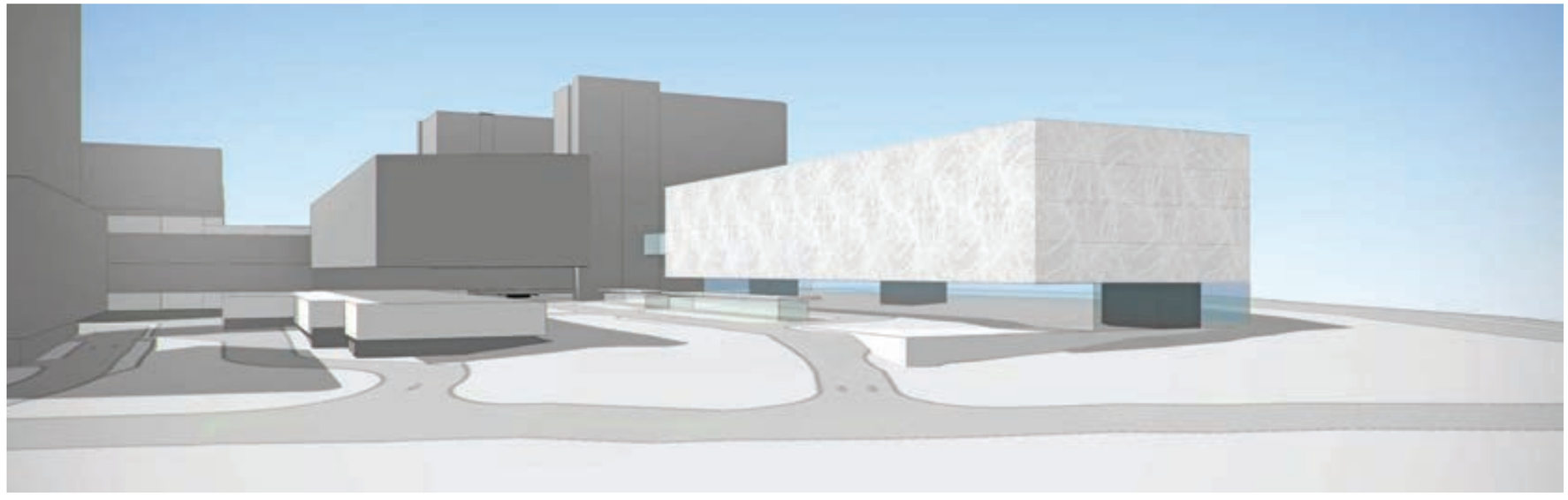
Level B1
68,000 SF

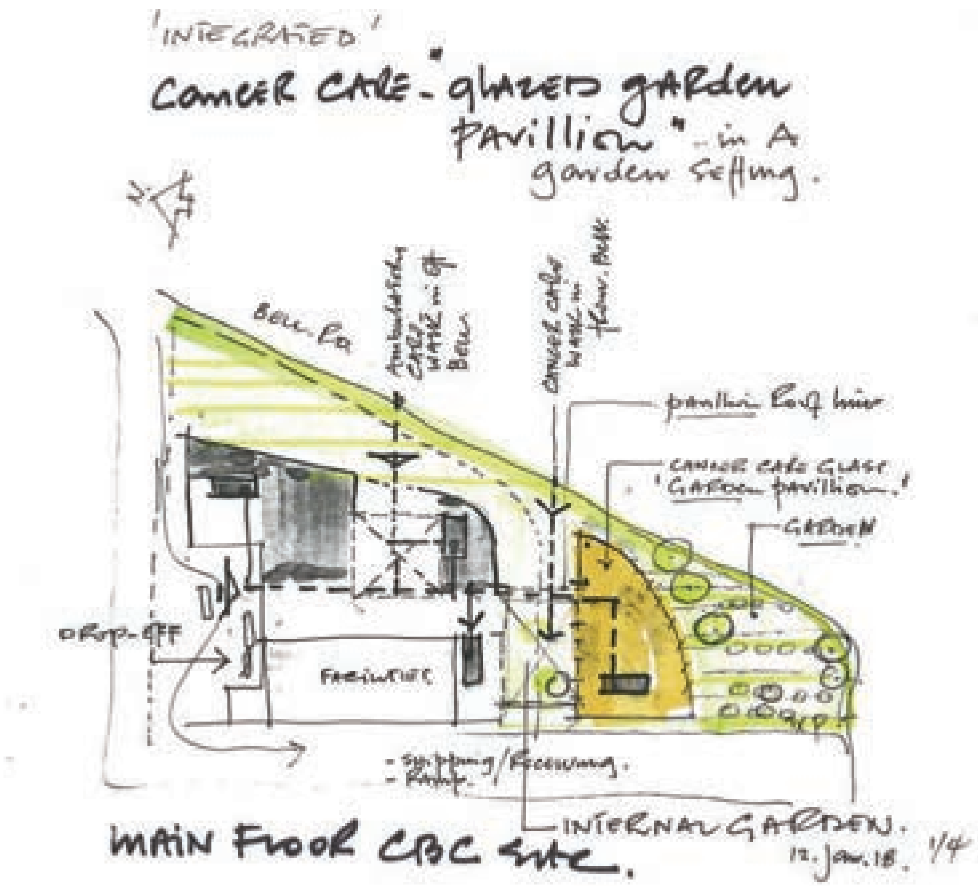
Level P1
90,000 SF

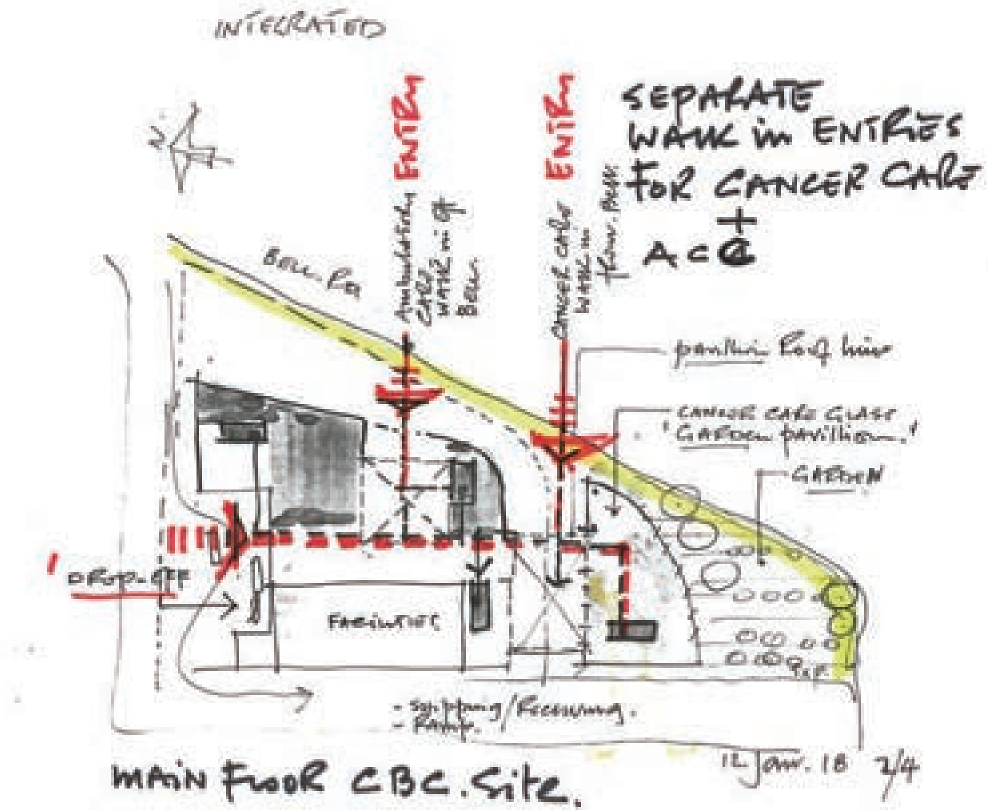
Level P2-P3
170,000 SF X 2 = 340,000 SF

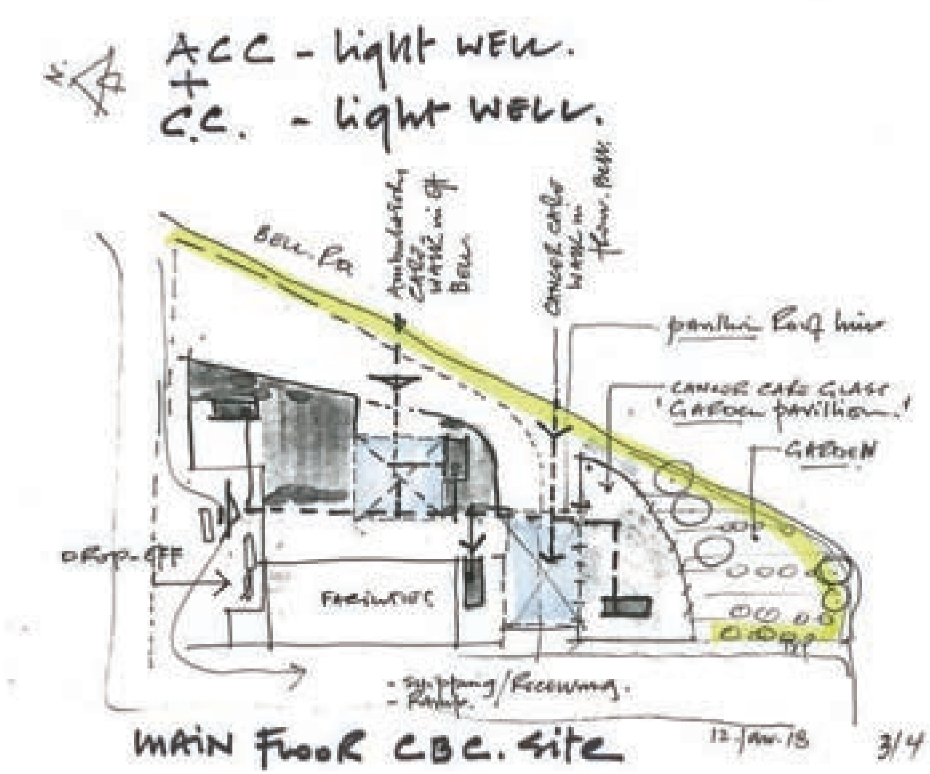


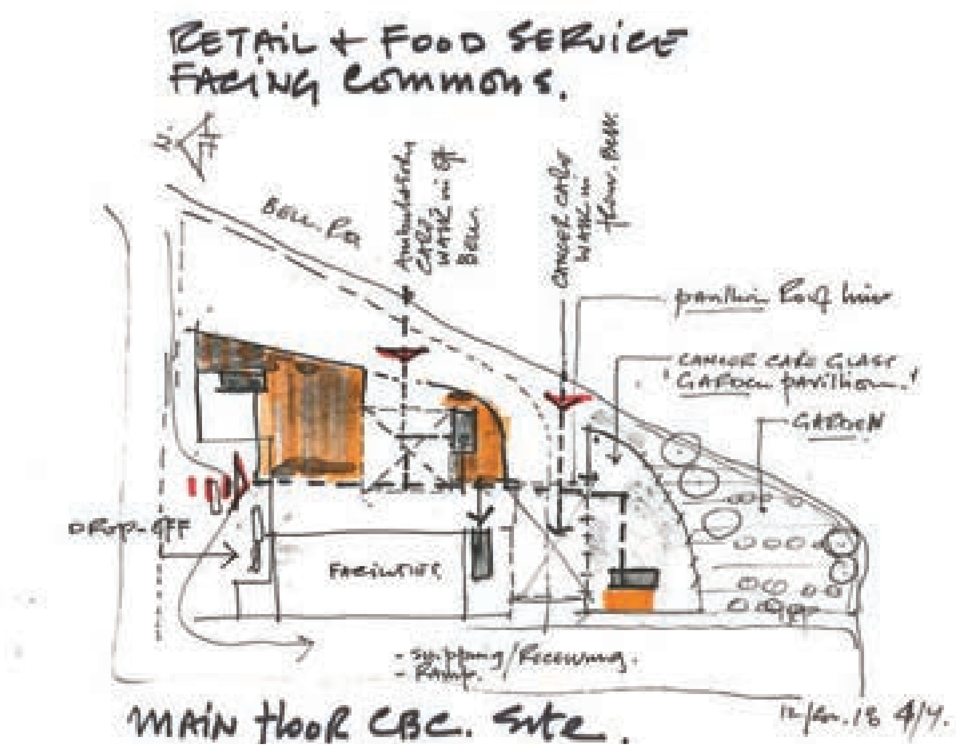


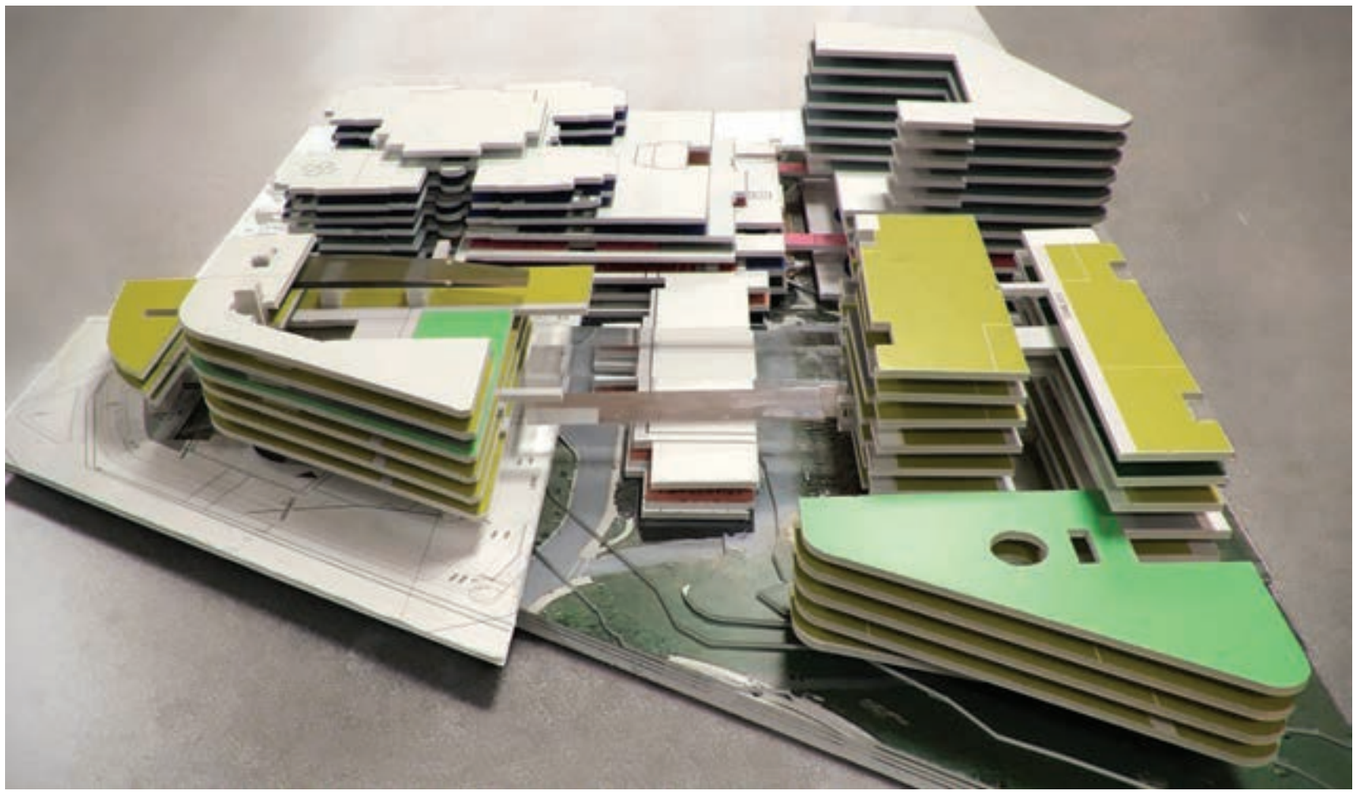



'INTEGRATED'
CANCER CARE - "glazed garden pavillion" in A garden setting.
BELL RD
pavilion roof line
CANCER CARE GLASS 'GARDEN pavillion.'
GARDEN
DROP-OFF
FACILITIES
- Shipping/Receiving.
- Ramp.
INTERNAL GARDEN.
MAIN FLOOR CBC SITE.
12.Jan.18. 1/4


INTEGRATED
ENTRY
ENTRY
SEPARATE WALK in ENTRIES FOR CANCER CARE + ACC
BELL RD
pavilion roof line
CANCER CARE GLASS 'GARDEN pavillion.'
GARDEN
DROP-OFF
FACILITIES
- Shipping/Receiving.
- Ramp.
MAIN FLOOR CBC. SITE.
12 Jan. 18 2/4


ACC - light well.
+
C.C. - light well.
BELL RD
pavilion roof line
CANCER CARE GLASS 'GARDEN pavillion.'
GARDEN
DROP-OFF
FACILITIES
- Shipping/Receiving.
- Ramp.
MAIN FLOOR CBC. SITE
12 Jan. 18 3/4


RETAIL + FOOD SERVICE FACING COMMONS.
BELL RD
pavilion roof line
CANCER CARE GLASS 'GARDEN pavillion.'
GARDEN
DROP-OFF
FACILITIES
- Shipping/Receiving.
- Ramp.
MAIN FLOOR CBC. SITE.
12 Jan. 18 4/4.

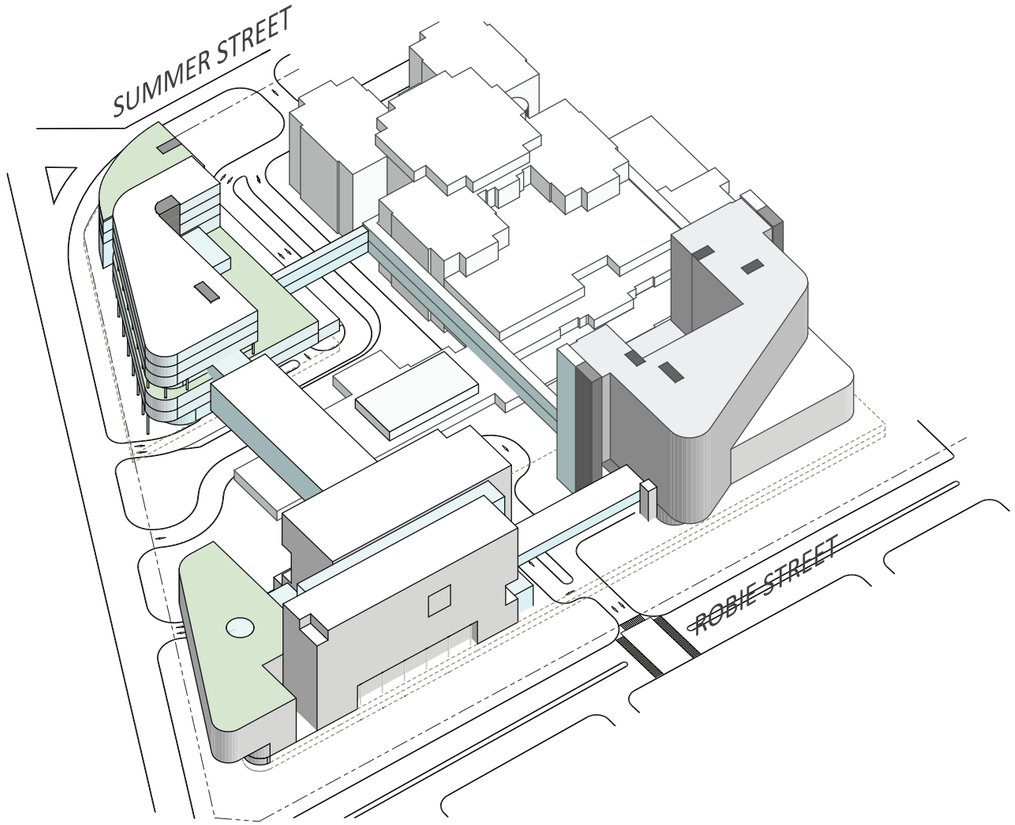


TEST FIT | INTEGRATED CANCER CARE CENTRE

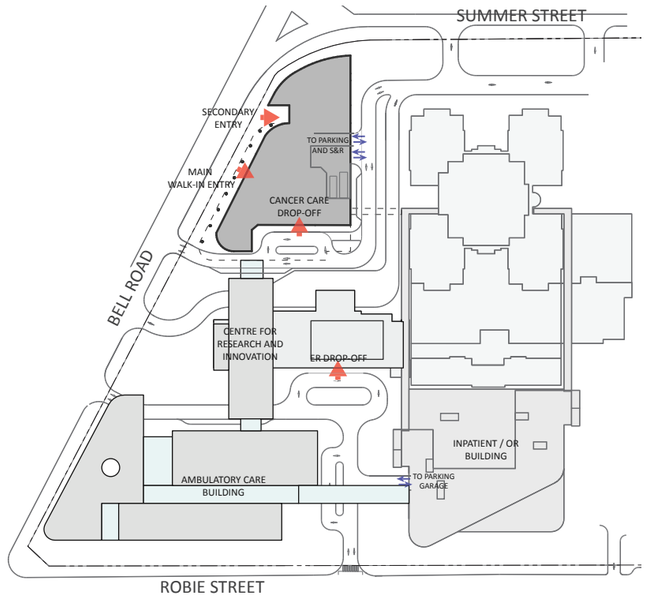
OPTION F.1 - CBC Cancer Care
(241,650 SF)

ISOMETRIC FROM BELL/ROBIE

8 Levels above grade
1 Levels full below grade parking
Bunkers at Level 02

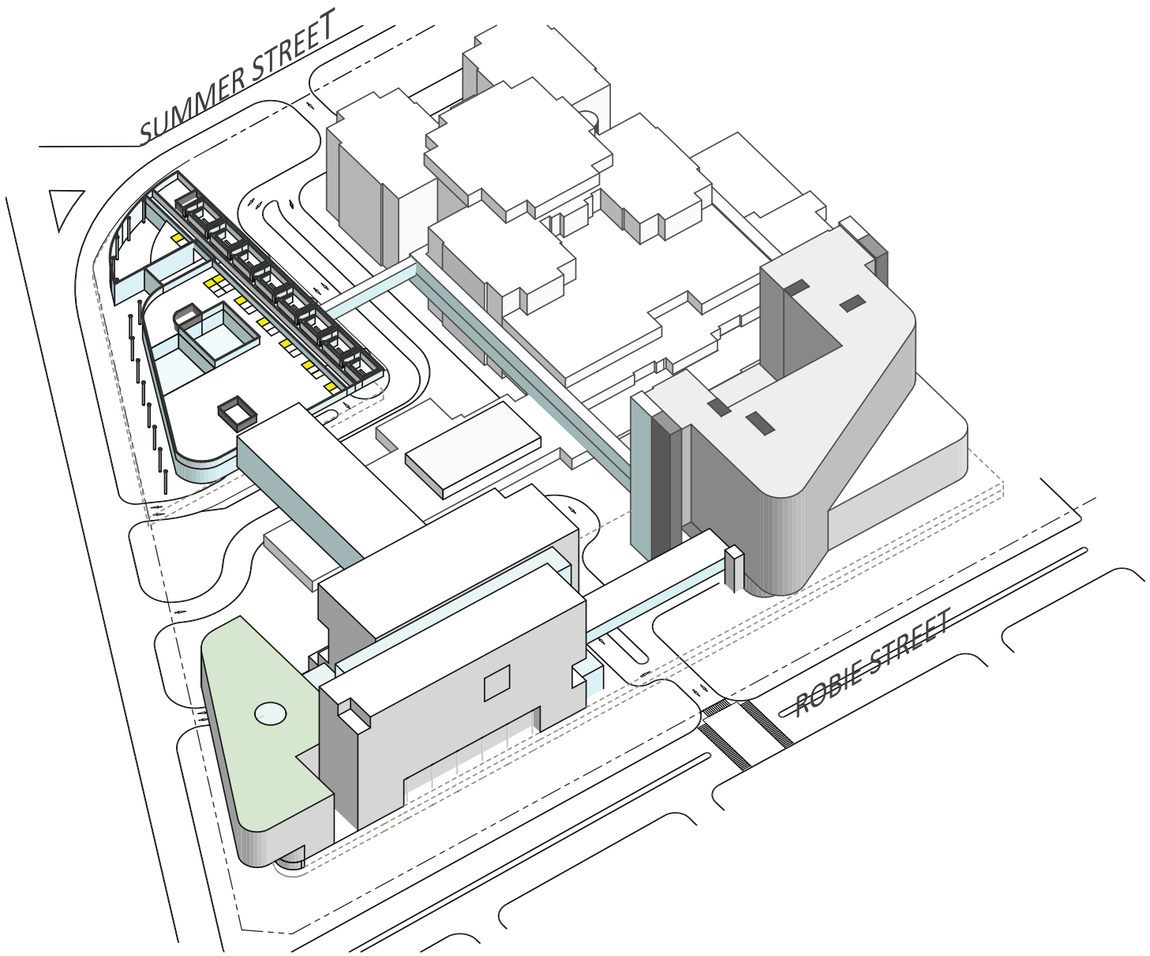


SITE PLAN

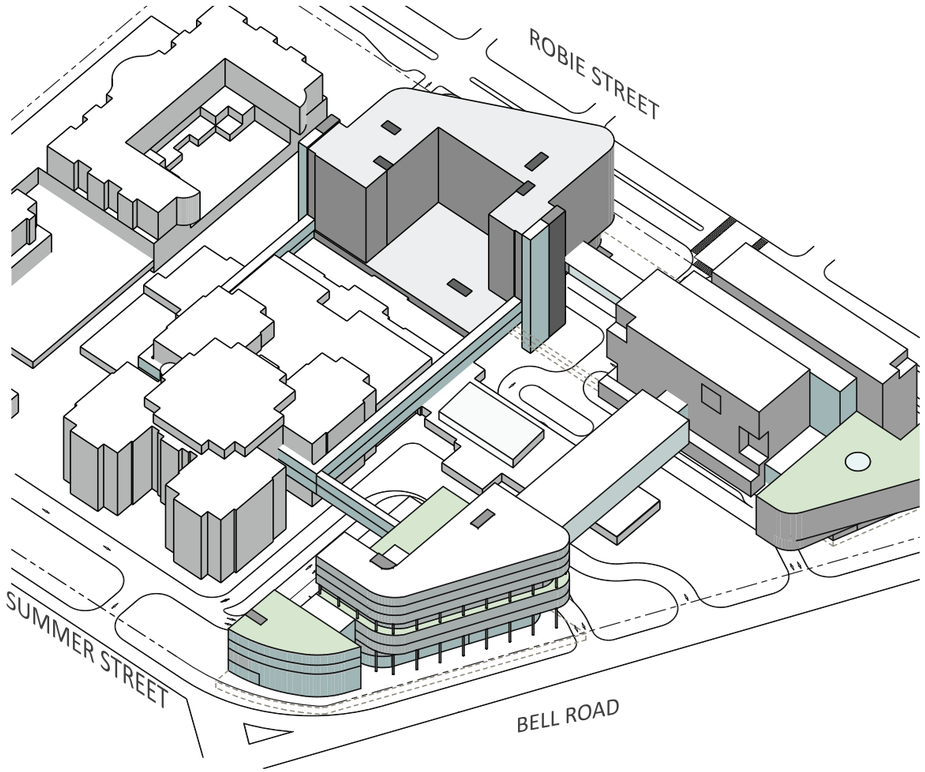


2.4 Test Fit Explorations
2.4.5 The Beacon

BUNKERS - LEVEL 02



ISOMETRIC FROM BELL/ROBIE



AREA SUMMARY

TOWER

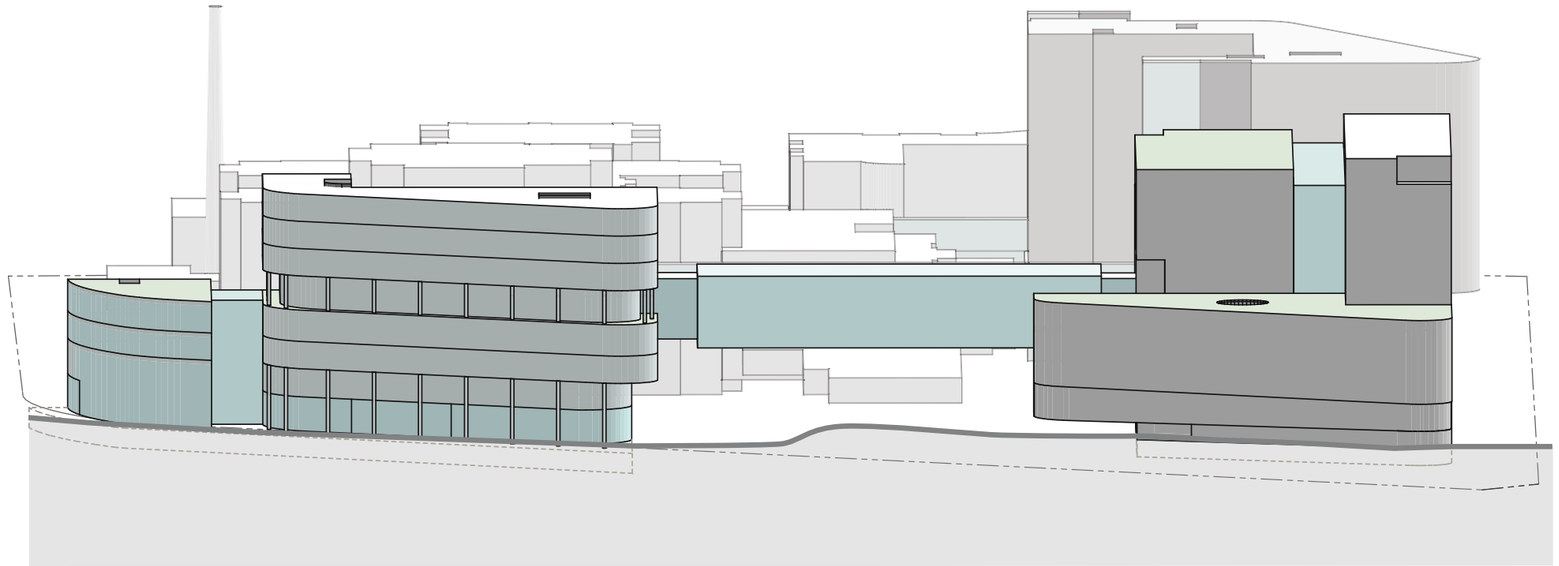
Level 5-8
(17,500) + (22,050 x 3) = 83,650 SF

PODIUM

Level 3-4
41,500 X 2 = 83,000 SF

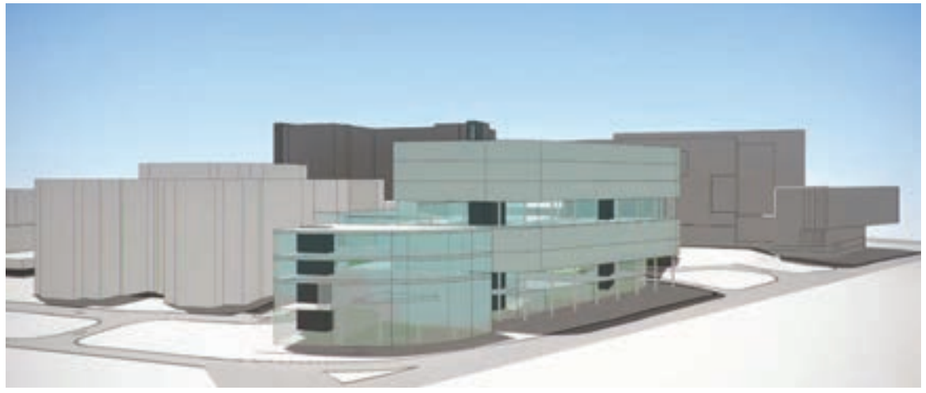
Level 1-2
37,500 X 2 = 75,000 SF

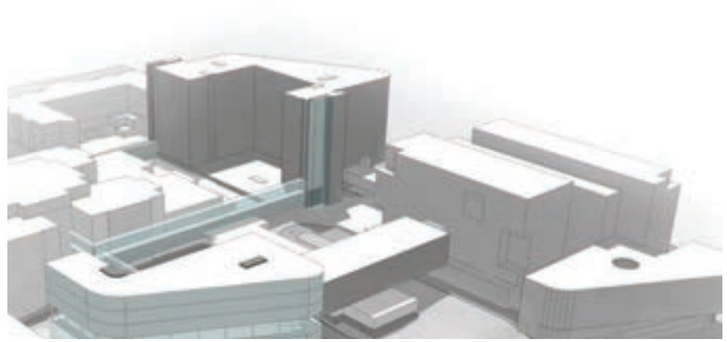
Below-Grade Parking

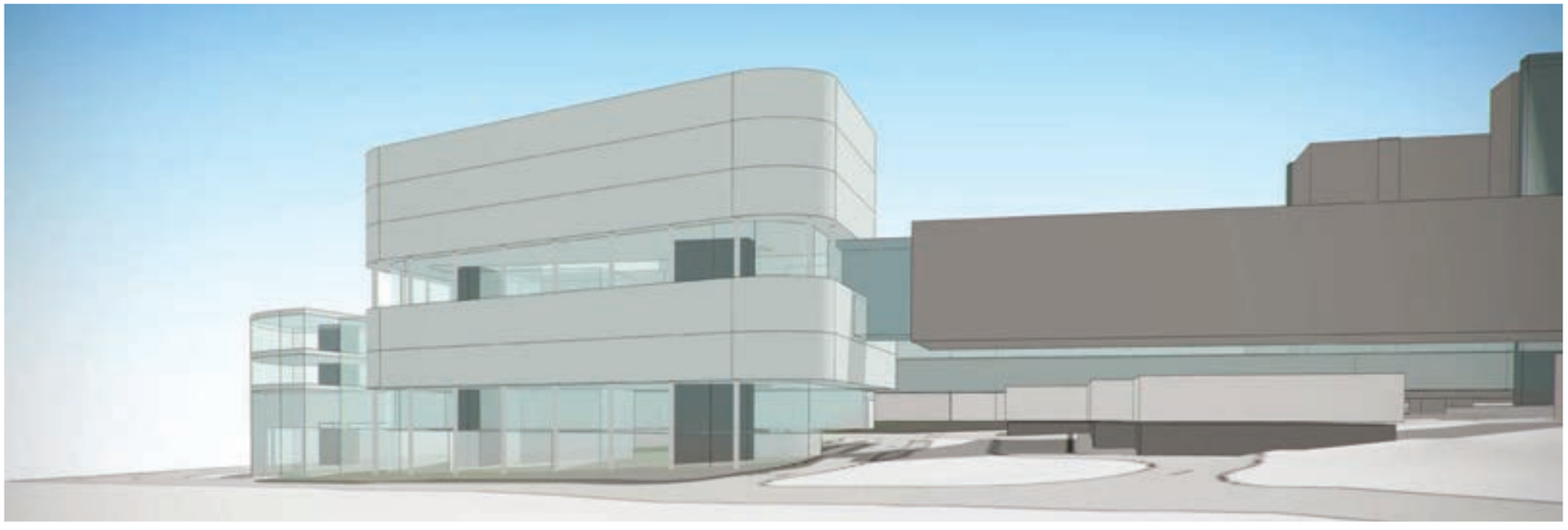


TOTAL GFA - 241,650 SF

*17,500 sf ALLOCATED FOR ADMINISTRATION SHORTFALL IN HI







Section

Site Plan

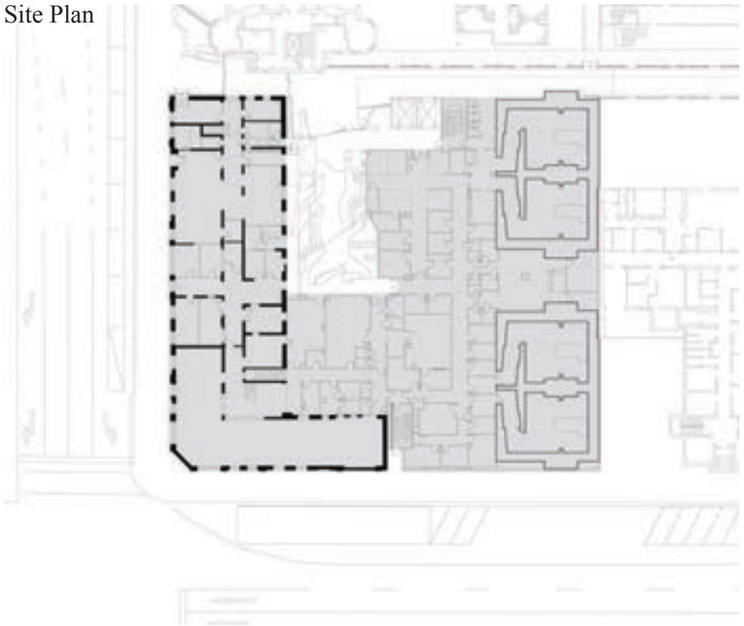
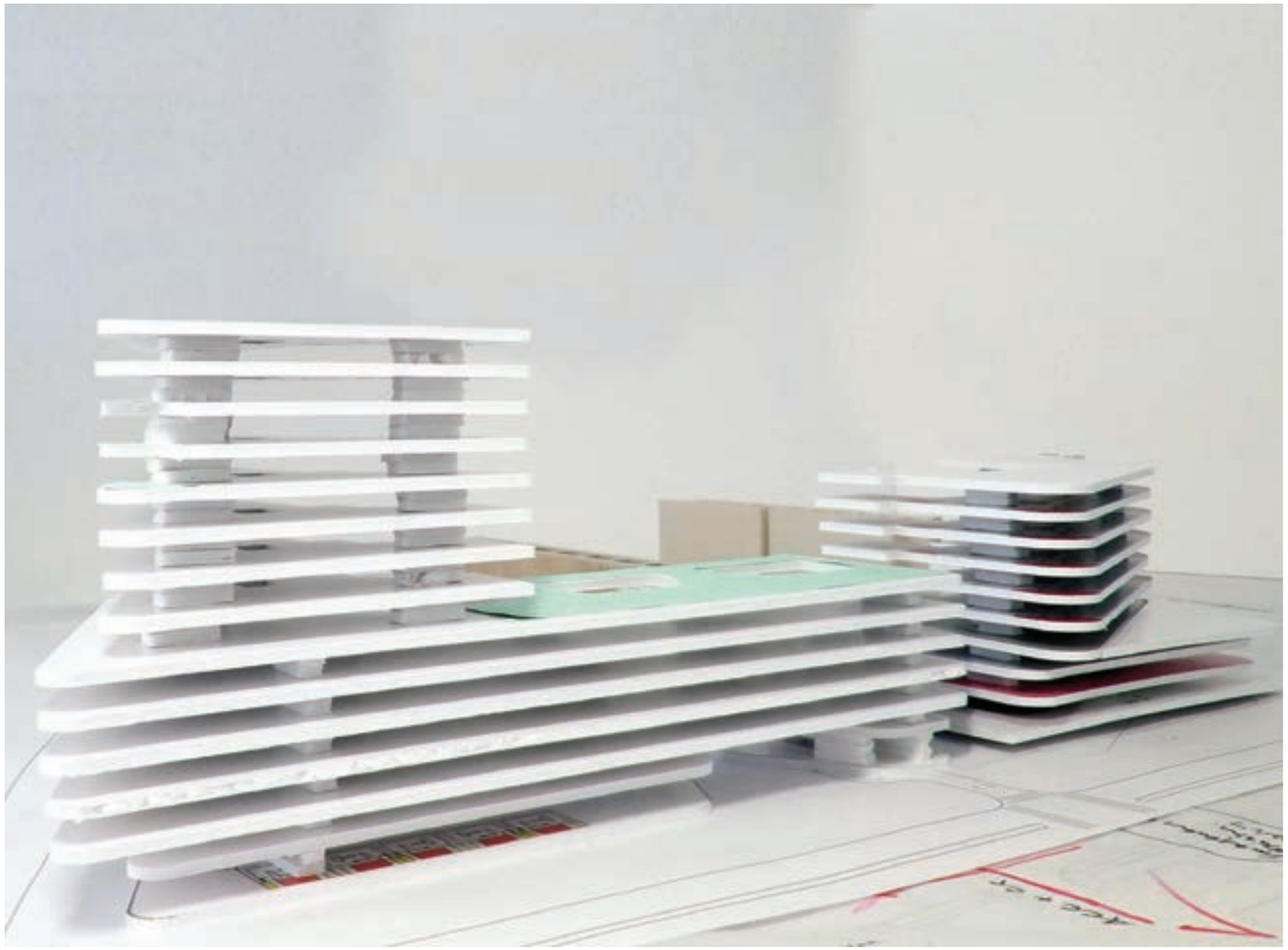


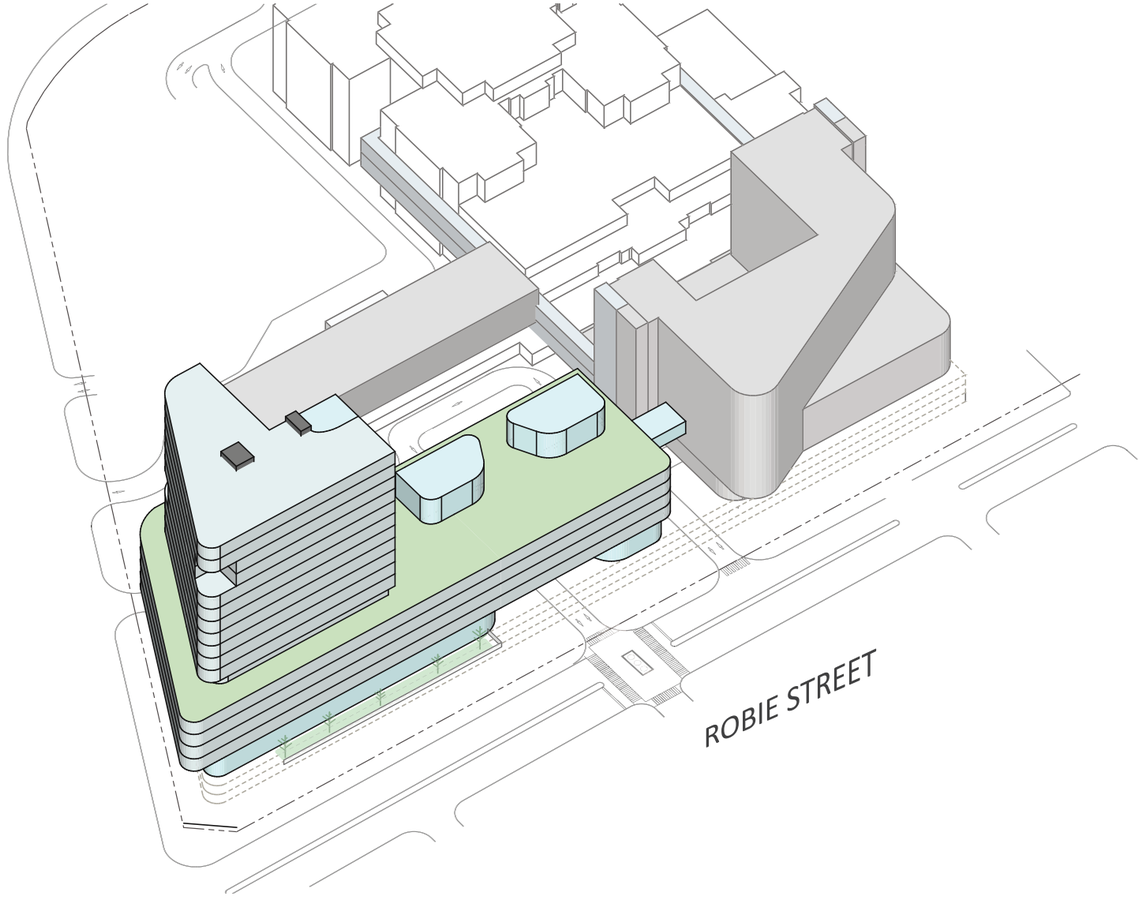
Fig. 213 Precedent Study: Ballarat Regional Integrated Cancer Centre, Ballard Leece Partnership

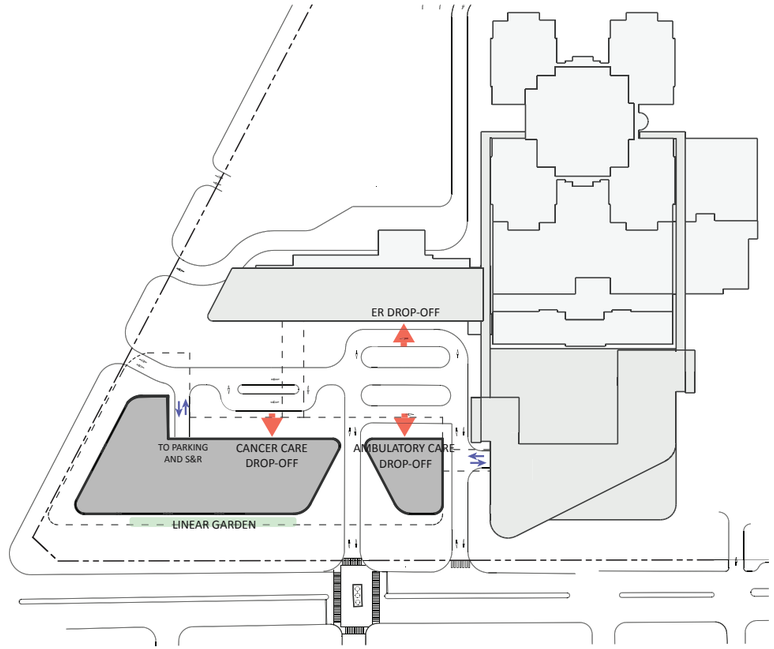
Lessons Learned

This ambulatory facility provides the latest technology for cancer treatment supported by a radiotherapy facility, Medical Oncology Unit, a satellite pharmacy ensuring immediate access to medication and treatments and a multidisciplinary consultation suite supporting the concept of a ‘one stop shop’ for patients and their families.

- Gross Floor Area: 91,500 SF, 5 floors
- Architect: Billard Leece Partnership
- Location: Ballarat, Australia
- Year: 2013

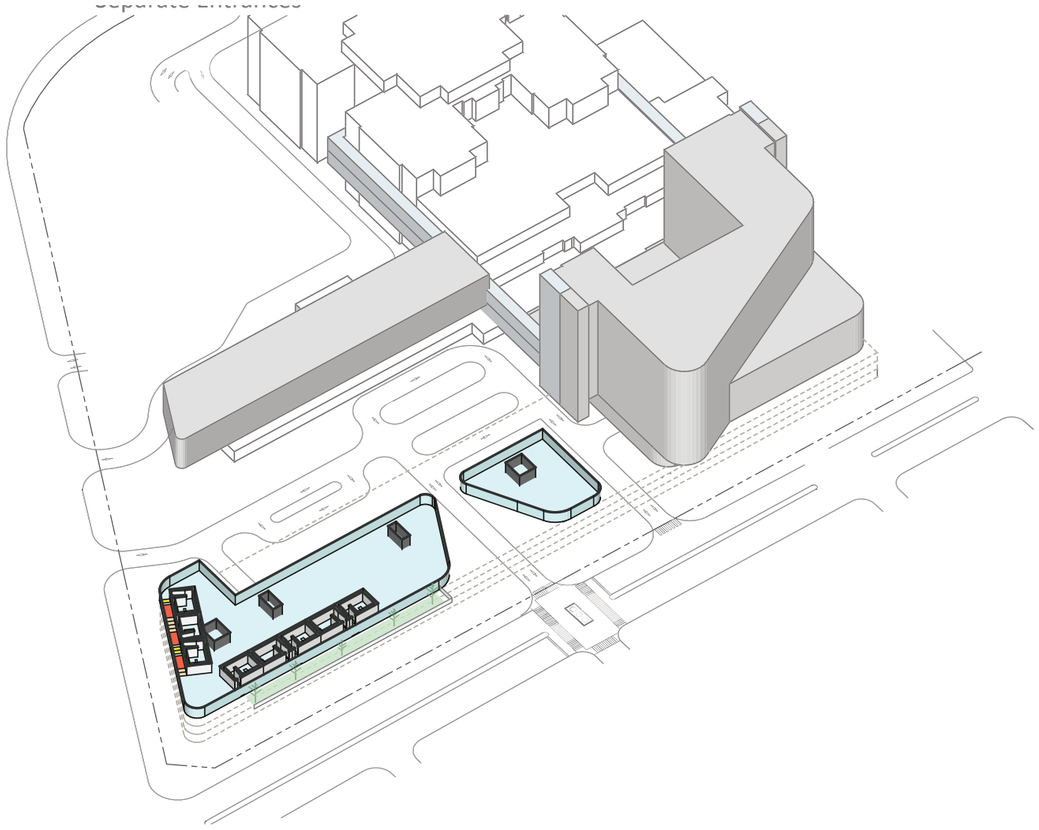


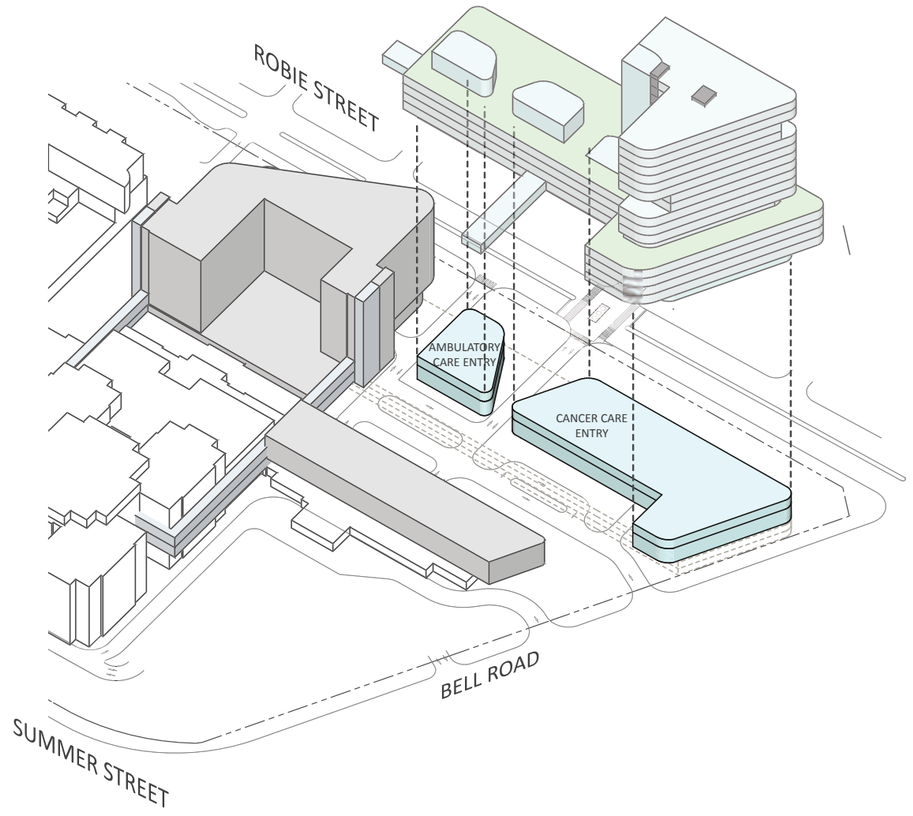

ROBIE STREET


ER DROP-OFF
TO PARKING AND S&R
CANCER CARE DROP-OFF
AMBULATORY CARE DROP-OFF
LINEAR GARDEN

2.4 Test Fit Explorations

2.4.6 Sky Garden





AREA SUMMARY

TOWER

Level 8-18
22,050 X 11 = 242,550 SF

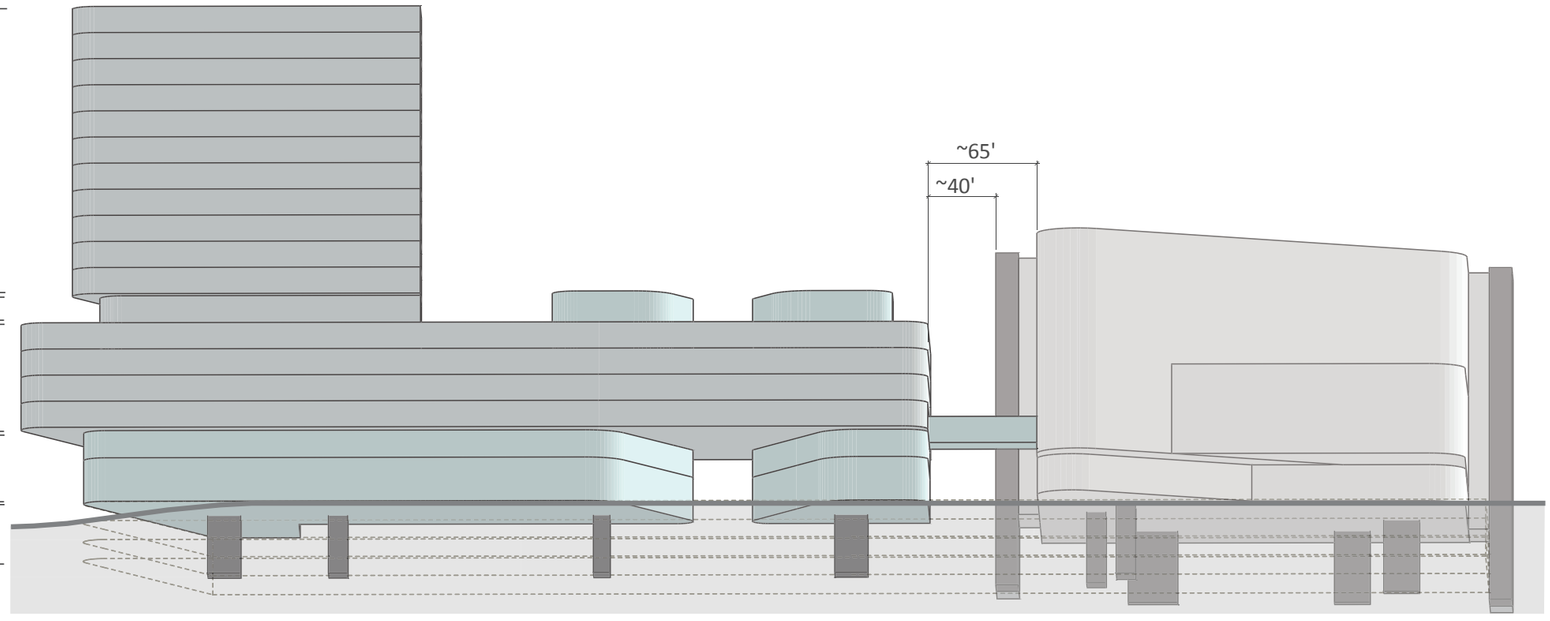
Level 7
17,500 SF

PODIUM

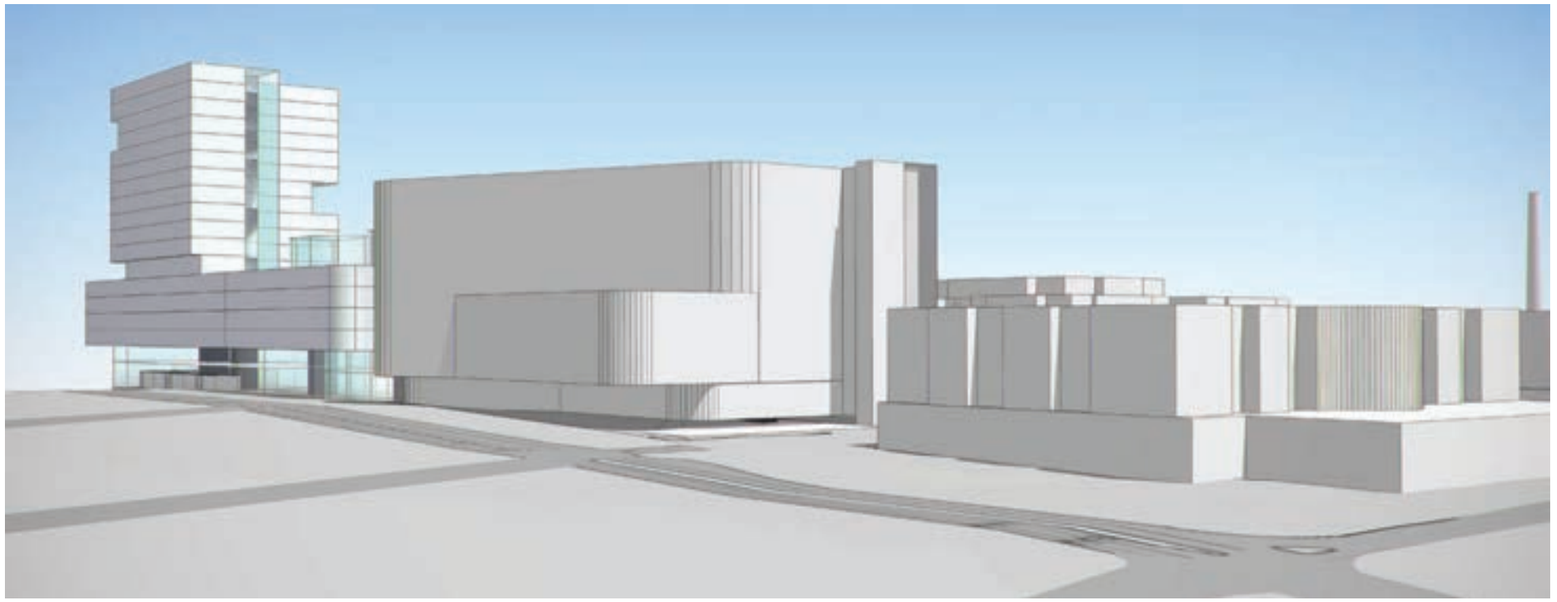
Level 3-6
76,150 X 4 = 304,600 SF

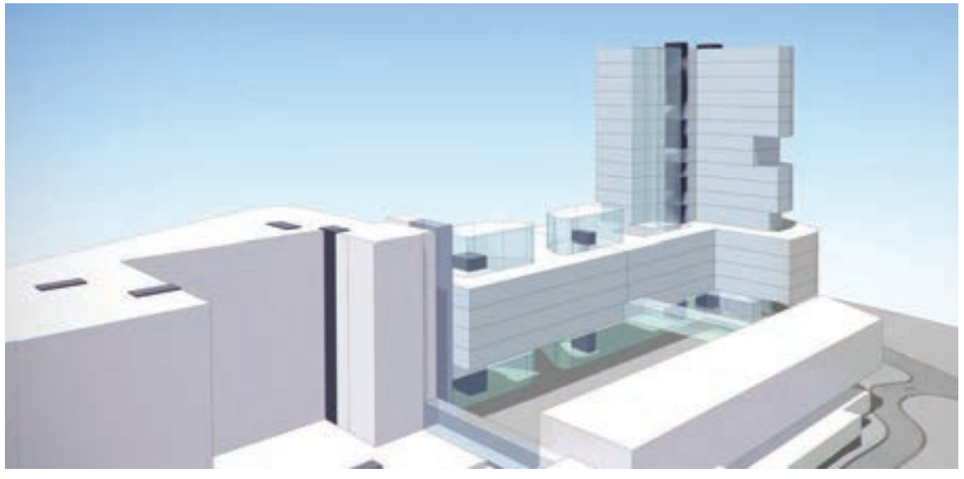
Level 1-2
45,750 X 2 = 91,500 SF

Below-Grade Parking

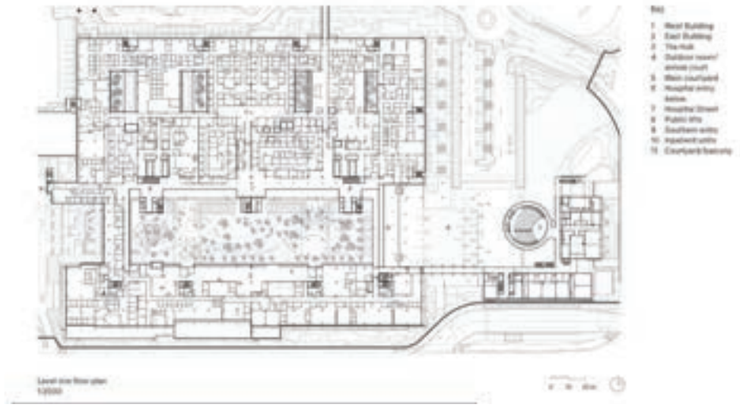


TOTAL GFA - 656,150 SF





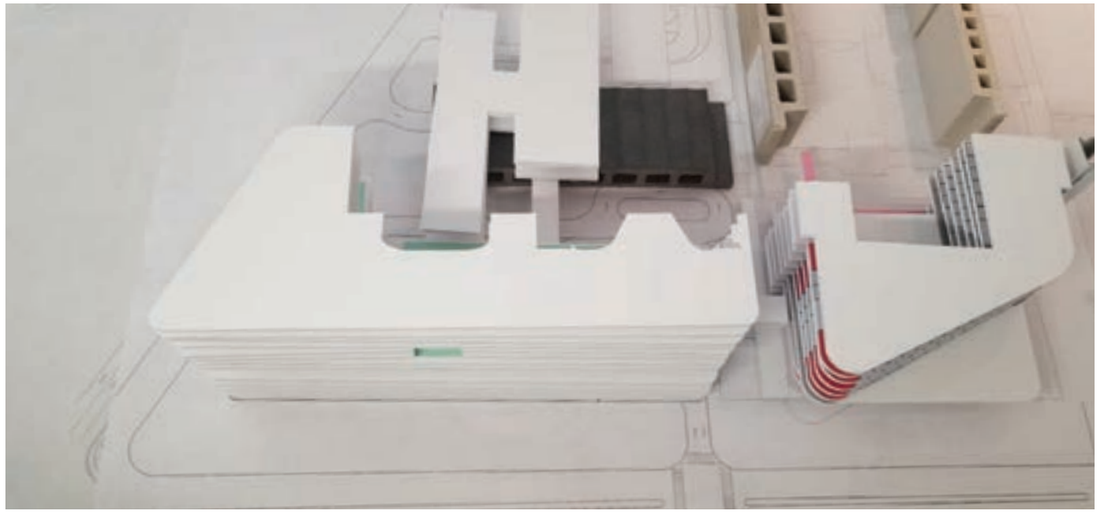
Level 1

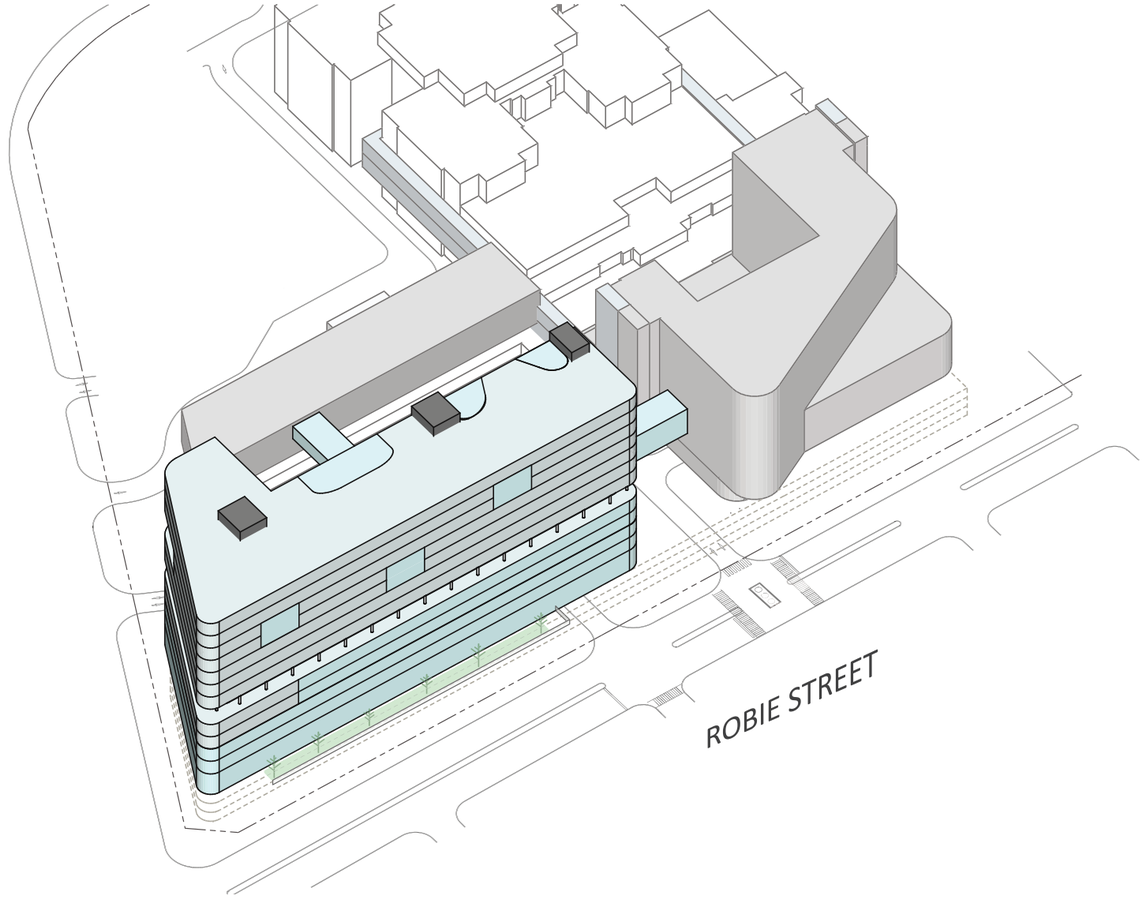


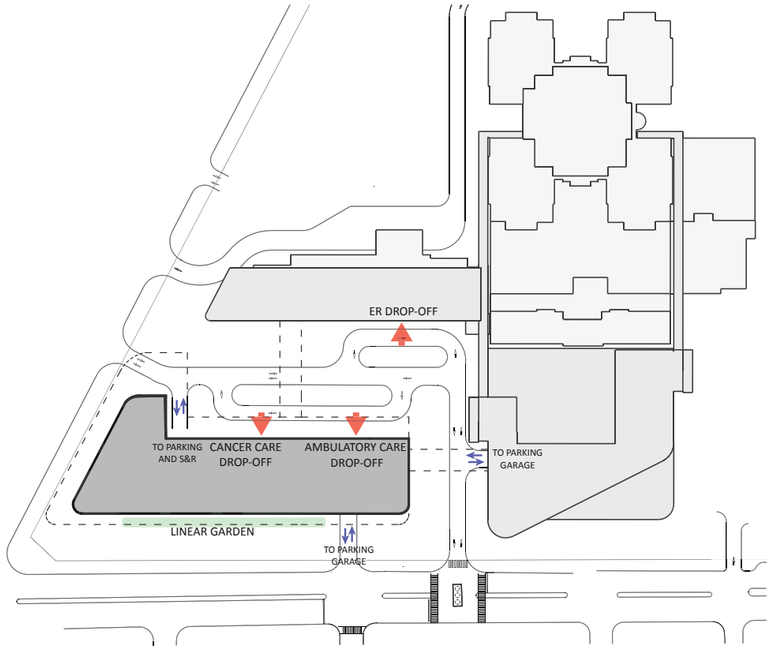
Lessons Learned

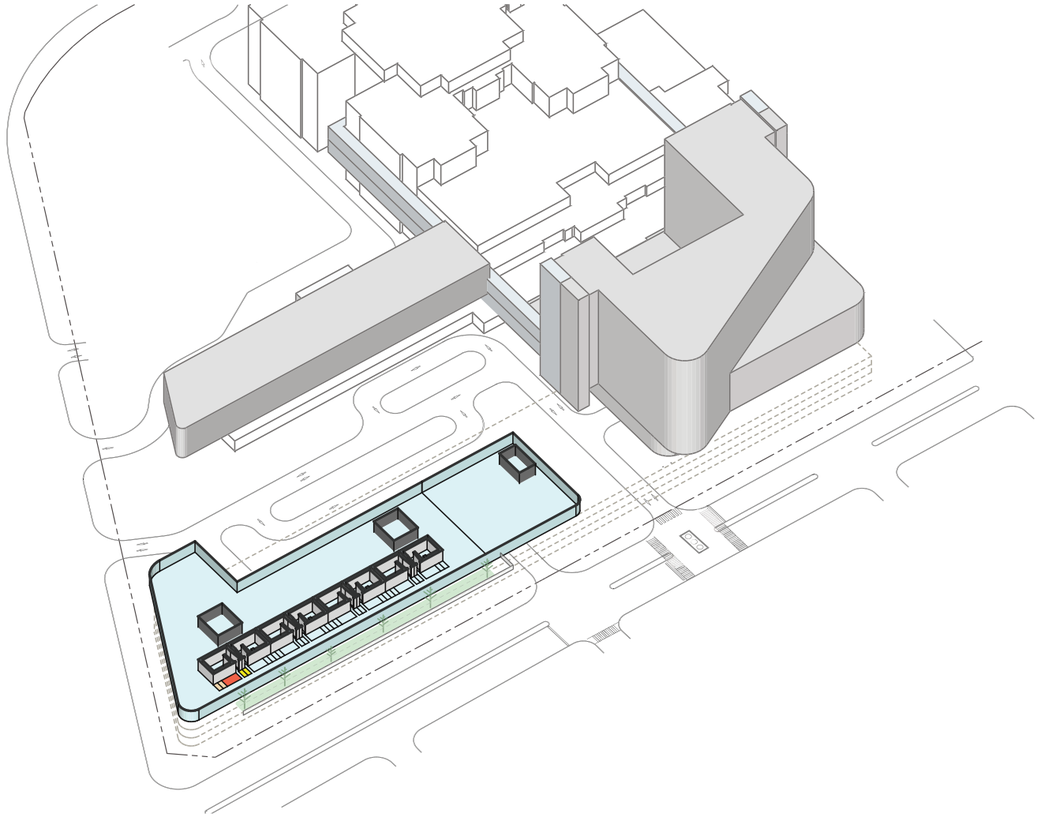
- ER, comprehensive cancer centre, specialised medical and surgical services, maternity service, rehabilitation service, mental health unit, renal service, interventional and diagnostic services.
- 450 inpatient beds, and expanding to 738 beds by 2021
- Gross Floor Area: 1,722,000 SF, 5 floors
- Architect: Architectus and HDR
- Location: Kawana, Queensland, Australia
- Year: 2016

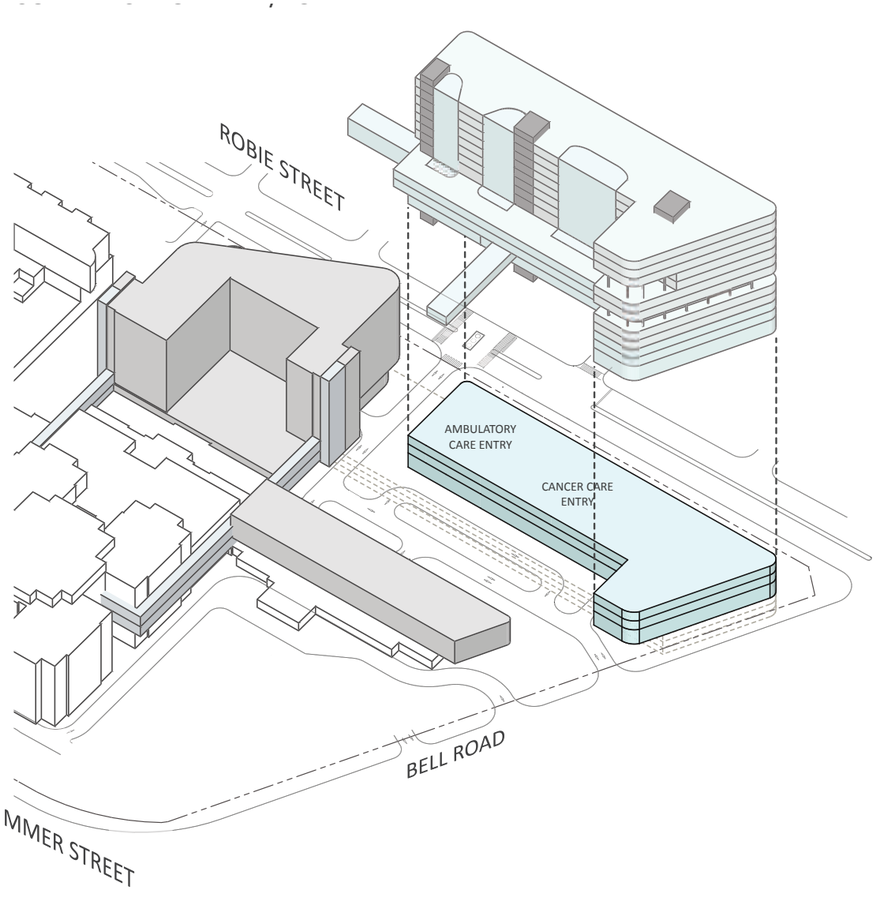
Fig. 214 Precedent Study: Sunshine Coast University Hospital, Architectus and HDR




ROBIE STREET


ER DROP-OFF
TO PARKING AND S&R
CANCER CARE DROP-OFF
AMBULATORY CARE DROP-OFF
TO PARKING GARAGE
LINEAR GARDEN
TO PARKING GARAGE




ROBIE STREET
AMBULATORY
CARE ENTRY
CANCER CARE
ENTRY
BELL ROAD
MMER STREET

AREA SUMMARY

TOWER

Level 7-13
(48,500 X 5) + (43,000S X 2) = 328,500 SF

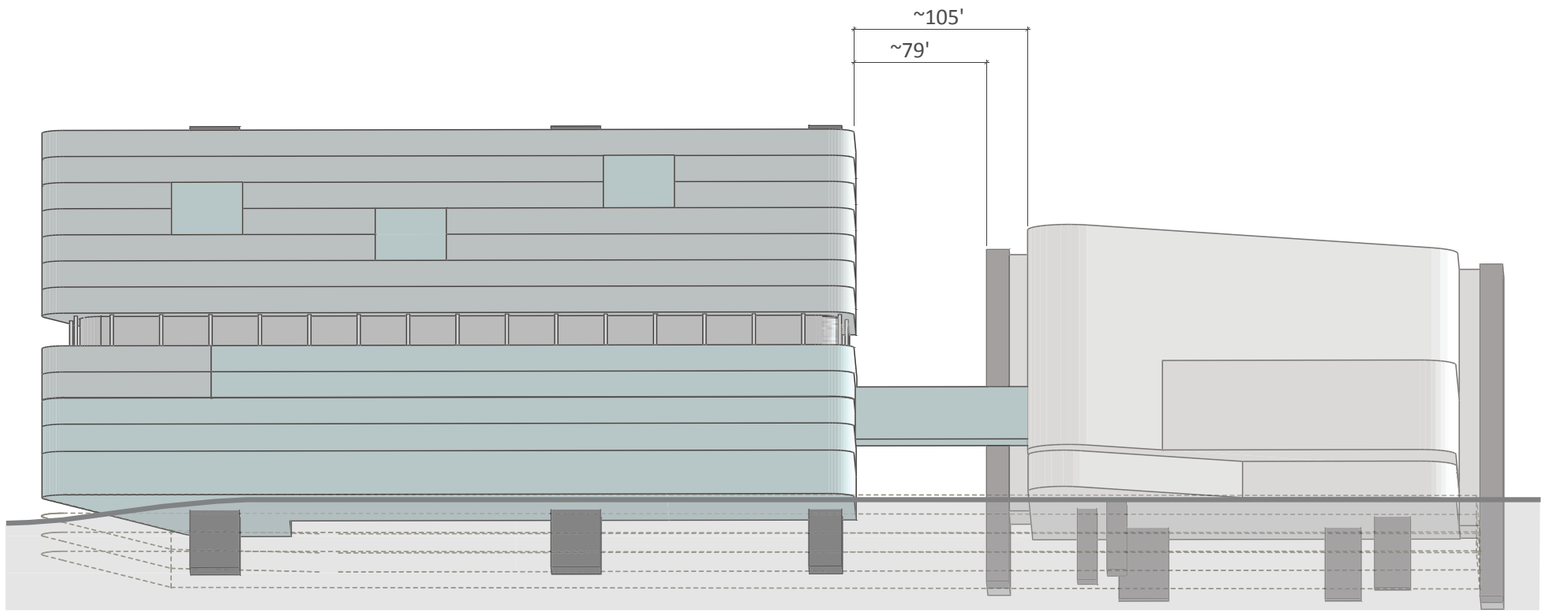
Level 6
37,000 SF

PODIUM

Level 4-5
61,000 x 2 = 122,000 SF

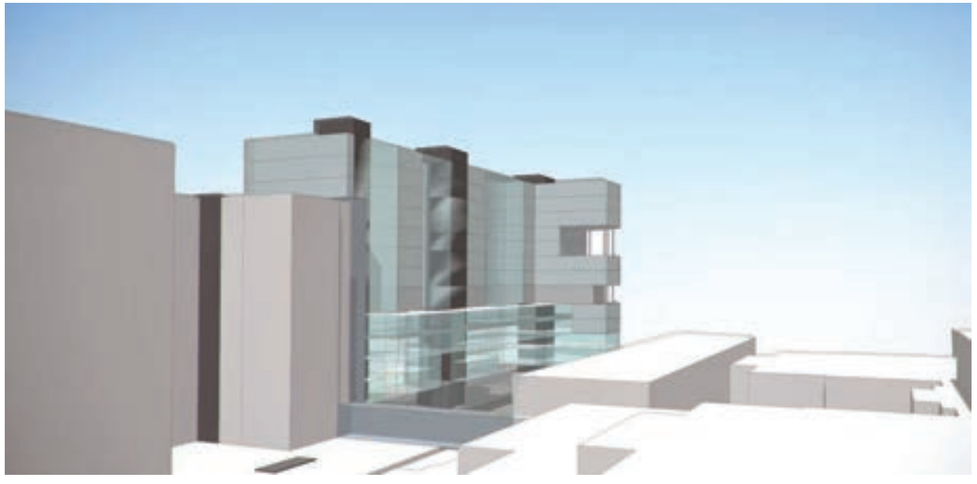
Level 1-3
59,000 x 3 = 177,000 SF

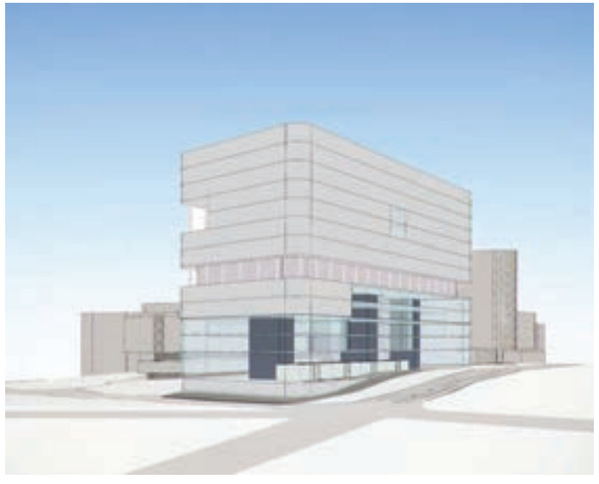
Below-Grade Parking

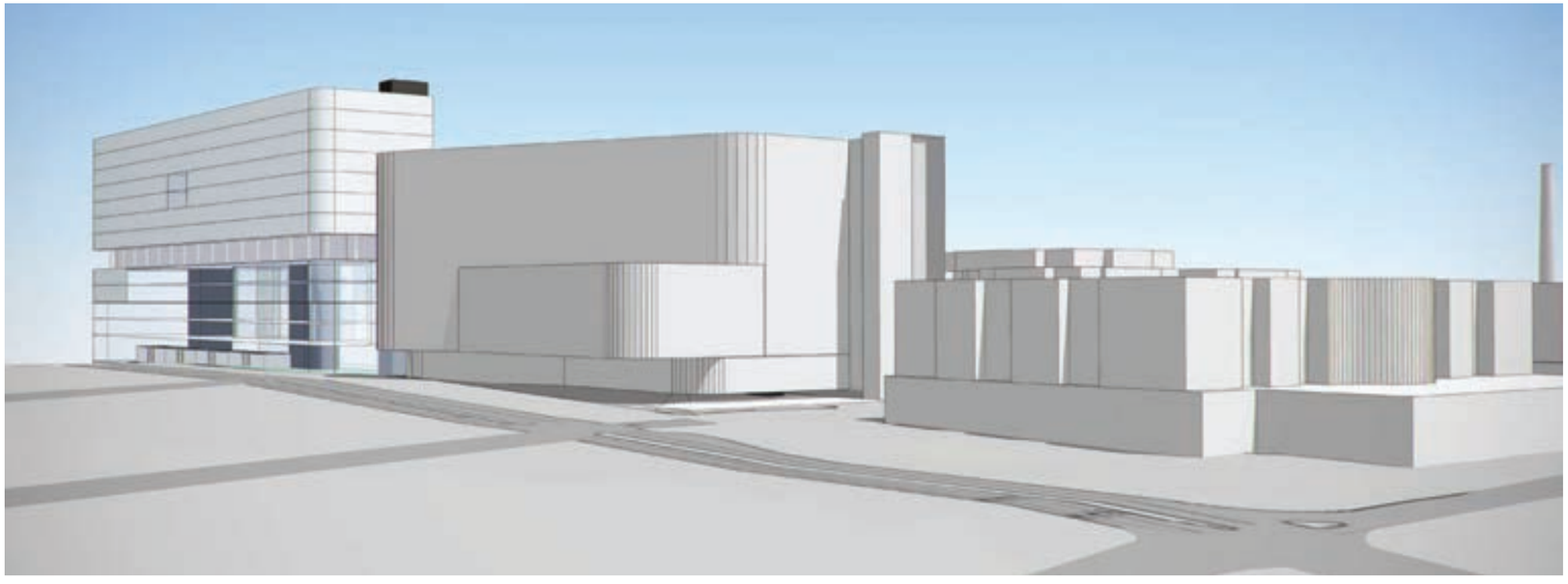


TOTAL GFA - 664,500 SF

2.4 Test Fit Explorations
2.4.7 The Lookout







3

Concept Development

Seven Cancer Care Explorations

High level options meant to explore critical adjacencies, circulation, connections and development patterns. Options A-F were first developed, with Option G being created later. Three of these options were further studied with alternatives considered.

Five Preliminary Test Fits

More detailed Test Fits of the three most feasible options; B, F and G. Vehicular circulation was considered and a more accurate area calcuation was developed. Of the five schemes investigated, two emerged as the most desirable; one with a Cancer Care on the CBC site, another with a Cancer Care on the Urban Garden Site.

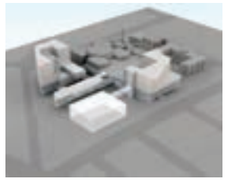
Two Final Concepts

The Garden Pavilion and **The Beacon** were investigated in more detail with consideration to programmed areas, vehicular circulation, critical adjacencies, parking etc. These concepts best addressed the projects key drivers, will provide a positive patient experience, and will enhance the sites image and identity.

Cancer Care Option A

Eliminated

Cancer Care Option B



Cancer Care Option C

Eliminated

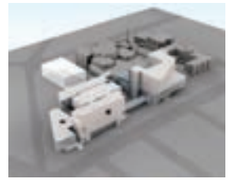
Cancer Care Option D

Eliminated

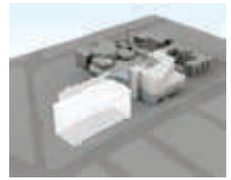
Cancer Care Option E

Eliminated

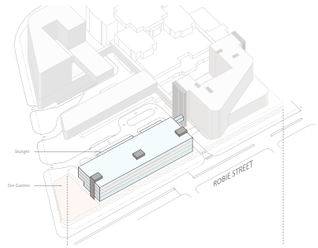
Cancer Care Option F



Cancer Care Option G

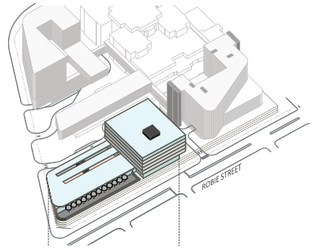


Cancer Care Option B.1
The Block

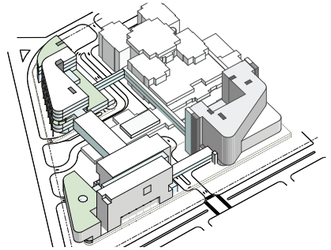


Eliminated

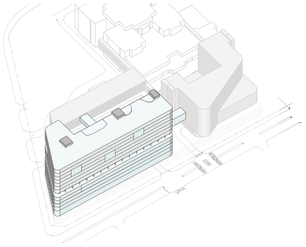
Cancer Care Option B.3
Garden Pavilion



Cancer Care Option F.1
CBC Cancer Care

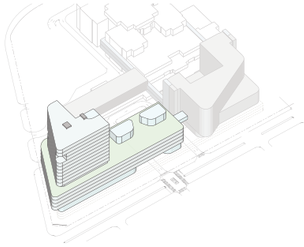


Cancer Care Option G.1
The Lookout



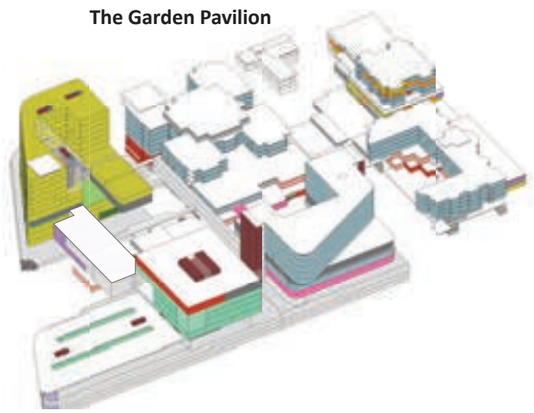
Eliminated

Cancer Care Option G.2
Sky Gardens

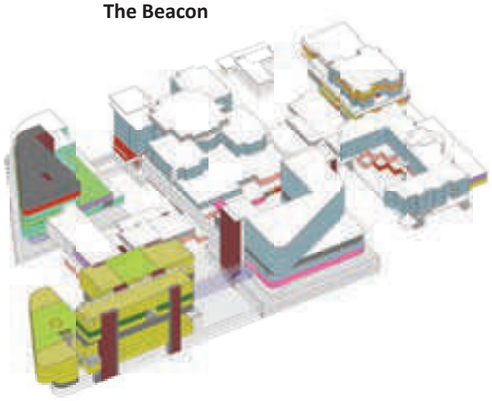


Eliminated

The Garden Pavilion



The Beacon



3.1 Garden Pavilion Concept

The Garden Pavilion Concept consists of:

- 6 storey Cancer Centre on the Urban Garden site (above grade) with 3 levels of below grade parking
- 9 storey Inpatient/ OR Building on the former site of the parking structure on Robie Street (above grade) with 4 levels of below grade parking (including mezzanine level)
- 13 storey Ambulatory Care Building on the CBC site (above grade) including 3 levels of below grade parking
- 2 storey Centre for Research and Innovation situated above the mechanical penthouse of the Emergency Department

Drawing inspiration from the Urban Garden at the corner of Robie St. and Bell Road, the Garden Pavilion explores the concept of integrating nature into the healing environment for Cancer Care. A 2-storey radiation therapy treatment pavilion at grade level is proposed with a dedicated healing garden, maximizing opportunities for patients and staff to connect with nature. The design also maximizes access to natural light to all patient care areas. A 6-storey building connected to the garden pavilion will house all other cancer ambulatory clinics and associated administrative spaces.

The Garden Pavilion allows cancer care to have a distinct and separate identity within the Halifax Infirmary site. A dedicated drop off and new front door reduces stress, anxiety and confusion for patients arriving at the HI site for treatment.

The Centre for Research and Innovation sits atop of the Emergency Department, creating a physical connection between cancer care and ambulatory care, to promote a culture of multi-disciplinary collaboration between care teams strongly rooted in research and innovation. The siting of the Centre for Research and Innovation perched on top of the Emergency Department also raises the profile of research and education to the community, as an integral part of a leading edge academic and teaching hospital.

The Inpatient / OR building is proposed on the site of the parking structure on Robie Street. It creates a new front door for the hospital that is connected to the urban streetscape. Upon arrival at the front entrance, patients, visitors and staff are greeted with a generous public space, and a large atrium brings natural light into the public areas.

The new building will also connect directly to the existing HI building via a multi-story atrium space- the light well. New public corridors will 'hug' the existing HI building and provide improved circulation and wayfinding when navigating from the new Inpatient/OR building into the existing HI building. A Wellness Garden has been proposed near the front entrance adjacent to Robie Street. The ground floor level will contain various types of amenity spaces, such as a café, spiritual care, a wellness gallery and a reception kiosk to name a few. The primary drop-off will be situated along the southern side of the building between the existing Camp Hill Veterans Memorial building and access to below grade parking will be located here, with an additional parking entrance on the north side of the building. Pedestrian entrances will be located along Robie Street, further reinforcing the edge condition. Level 5 will contain the expanded Perioperative Services and will connect directly to the existing HI OR via bridges within the light well. The U-shaped orientation of the Inpatient unit floors will ensure each room contains ample windows with views to the Citadel, Halifax Commons, or southerly facing windows orientated to the suns path. A bridge to the new Inpatient/ OR Building will connect Cancer Care to the expanded Perioperative Services located on Level 5, achieving an important clinical adjacency.

The Ambulatory Care building is located on the CBC Site and its massing respects the street edge along Bell Road. A centralized multi-story atrium space acts as the primary gathering point on the main floor. A vehicle drop-off and entry is located on the west side of the building, while the pedestrian entrance is located off of Bell Road. Access to the below grade parking, shipping and receiving as well as an ambulance drop-off is situated along the south side of the building between the existing HI building. A level 4 bridge connection to the existing ED is accompanied with an Ambulatory Procedure Unit. Bridge connections to the Existing HI building occur on level 4 and 5. Level 7 contains a public café as well as access to a rooftop terrace.

3.1 Garden Pavilion Concept

3.1.1 Site Plan

1. New Inpatient/OR Building
2. New Ambulatory Building
3. New Centre for Research and Innovation
4. New Cancer Care Building

Green Space

- Buffer Zone
- Green Space
- Roof Terraces / Healing Spaces
- VMB Veterans Garden to be reduced and enhanced

Vehicular Circulation/Entrances

- Vehicular Entrance
- Service / Parking Entrance
- Driveway
- Signalled Intersection
- Bus Stop

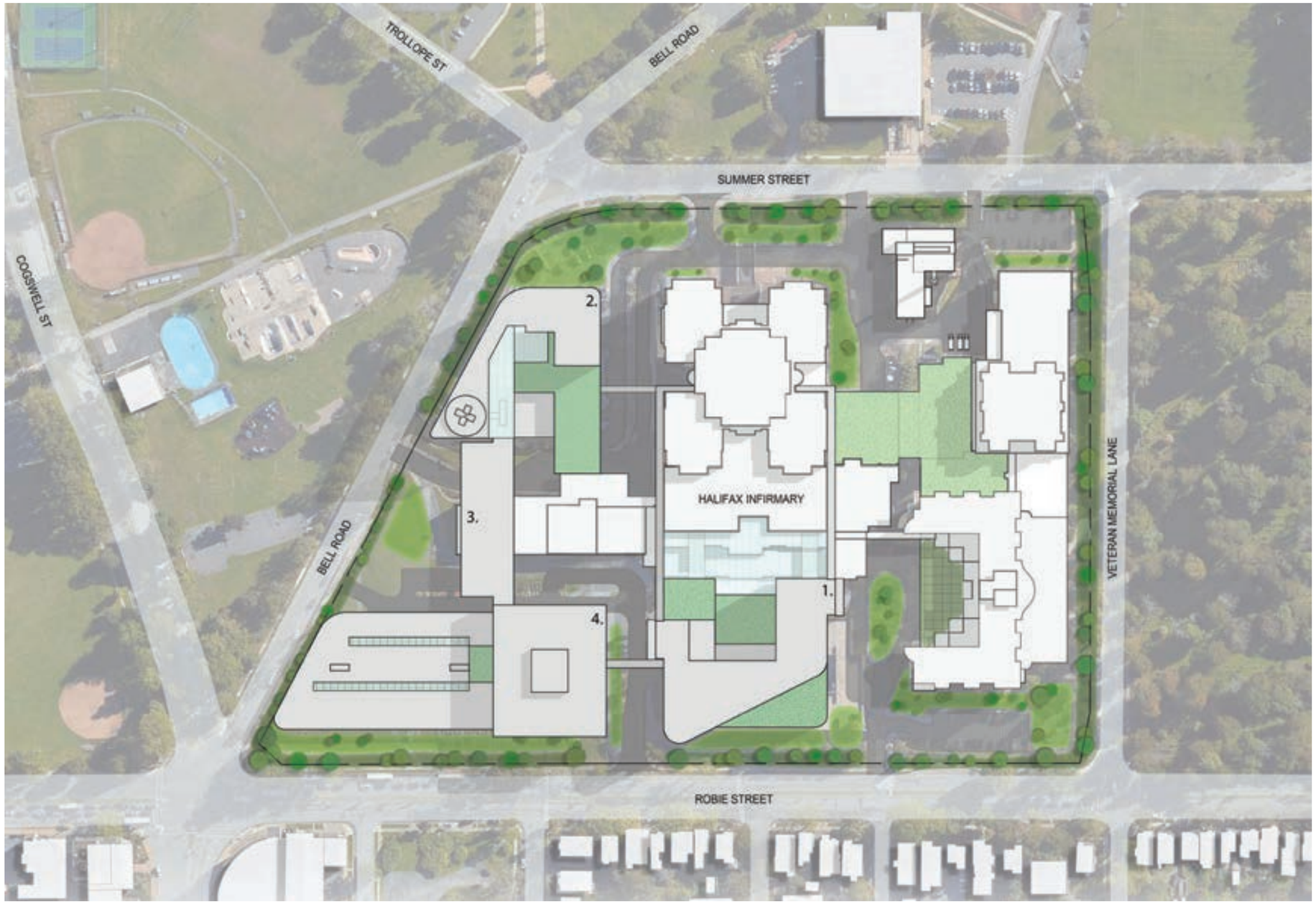
Pedestrian Circulation/Entrances

- Pedestrian Entrance
- Internal Circulation / Links

Views/Solar Diagram

- Views to Halifax Commons
- Solar Optimization

N



3.1 Garden Pavilion Concept

3.1.1 Site Plan: Green Spaces

1. New Inpatient/OR Building
2. New Ambulatory Building
3. New Centre for Research and Innovation
4. New Cancer Care Building

Green Space

- Buffer Zone
- Green Space
- Roof Terraces / Healing Spaces
- VMB Veterans Garden to be reduced and enhanced

Vehicular Circulation/Entrances

- Vehicular Entrance
- Service / Parking Entrance
- Driveway
- Signalled Intersection
- Bus Stop

Pedestrian Circulation/Entrances

- Pedestrian Entrance
- Internal Circulation / Links

Views/Solar Diagram

- Views to Halifax Commons
- Solar Optimization

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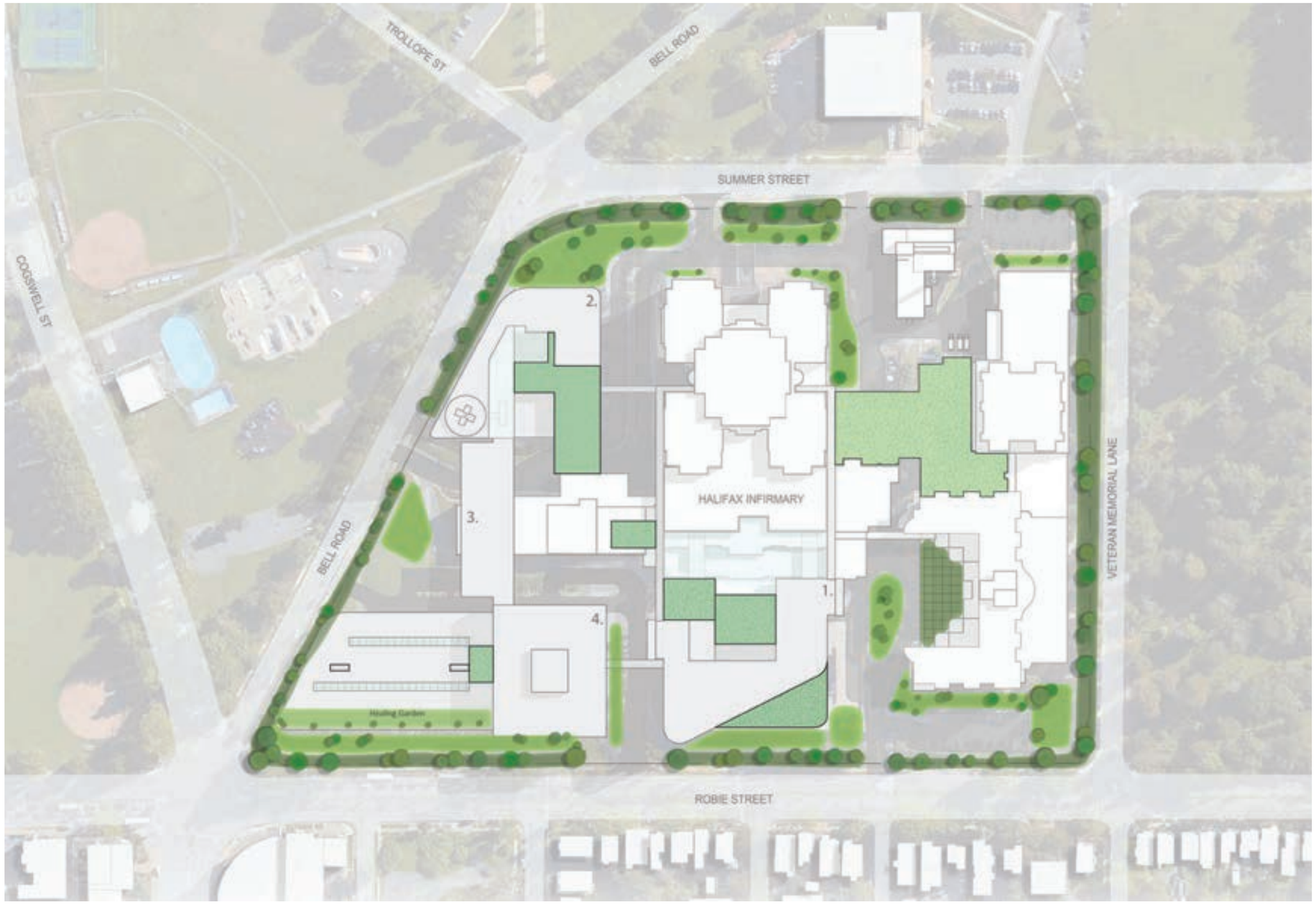

1. New Inpatient/OR Building
2. New Ambulatory Building
3. New Centre for Research and Innovation
4. New Cancer Care Building

Green Space

- Buffer Zone
- Green Space
- Roof Terraces / Healing Spaces
- VMB Veterans Garden to be reduced and enhanced

Vehicular Circulation/Entrances

- Vehicular Entrance
- Service / Parking Entrance
- Driveway
- Signalled Intersection
- Bus Stop

Pedestrian Circulation/Entrances

- Pedestrian Entrance
- Internal Circulation / Links

Views/Solar Diagram

- Views to Halifax Commons
- Solar Optimization

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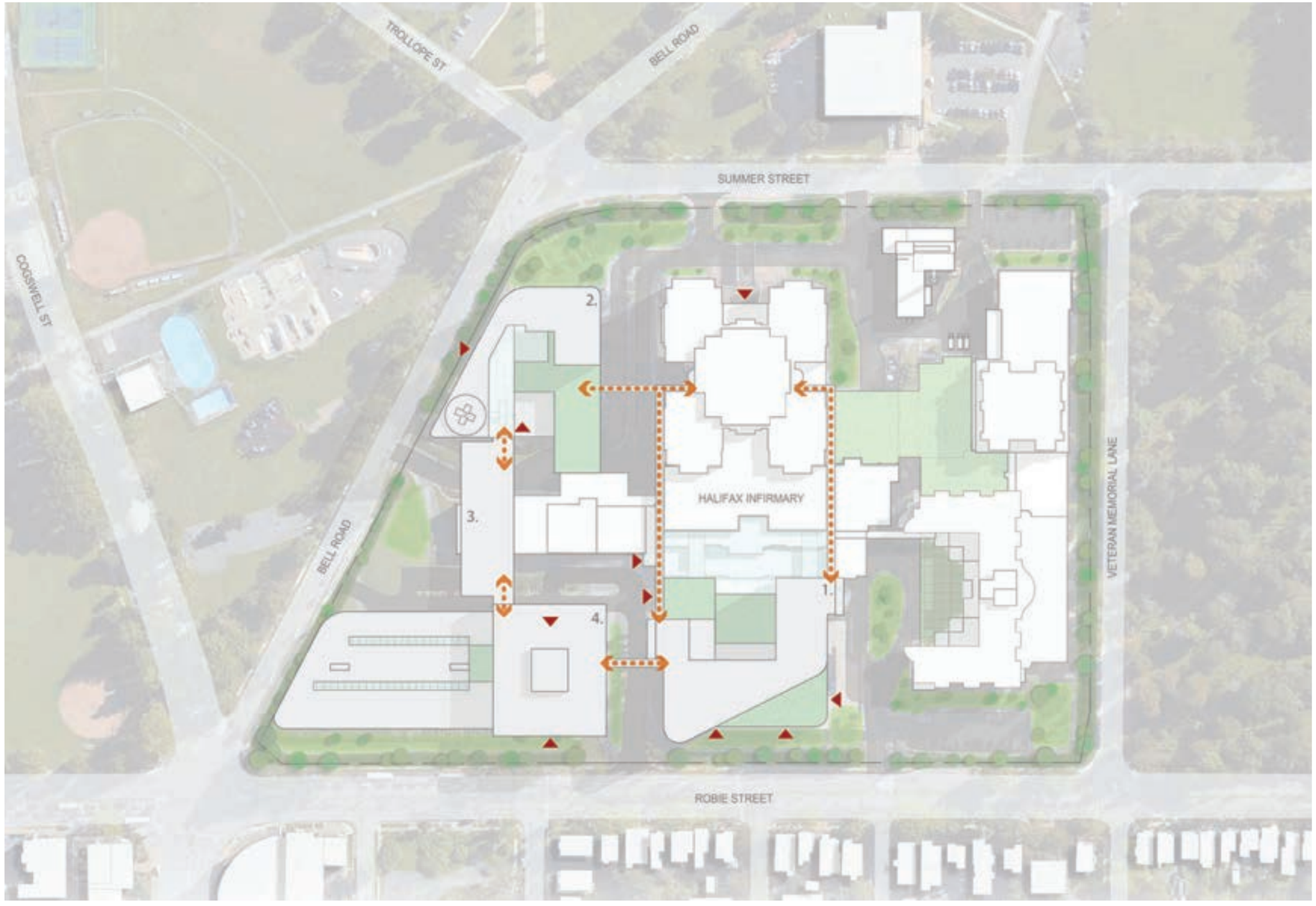

3.1 Garden Pavilion Concept

3.1.1 Site Plan: Traffic

1. New Inpatient/OR Building
2. New Ambulatory Building
3. New Centre for Research and Innovation
4. New Cancer Care Building

Green Space

- Buffer Zone
- Green Space
- Roof Terraces / Healing Spaces
- VMB Veterans Garden to be reduced and enhanced

Vehicular Circulation/Entrances

- Vehicular Entrance
- Service / Parking Entrance
- Driveway
- Signalled Intersection
- Bus Stop

Pedestrian Circulation/Entrances

- Pedestrian Entrance
- Internal Circulation / Links

Views/Solar Diagram

- Views to Halifax Commons
- Solar Optimization

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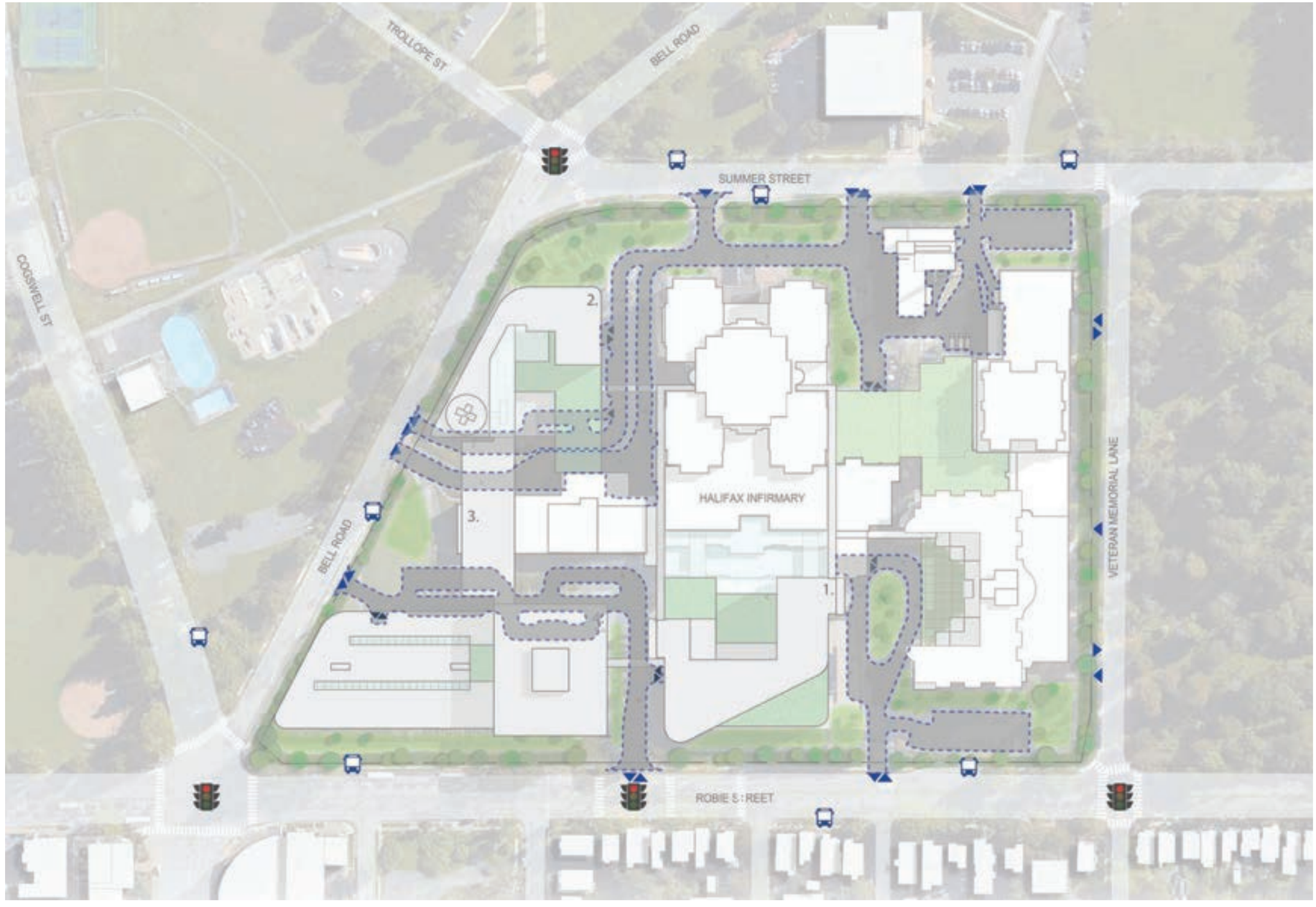

3.1 Garden Pavilion Concept

3.1.1 Ste Plan: Views

1. New Inpatient/OR Building
2. New Ambulatory Building
3. New Centre for Research and Innovation
4. New Cancer Care Building

Green Space

- Buffer Zone
- Green Space
- Roof Terraces / Healing Spaces
- VMB Veterans Garden to be reduced and enhanced

Vehicular Circulation/Entrances

- Vehicular Entrance
- Service / Parking Entrance
- Driveway
- Signalled Intersection
- Bus Stop

Pedestrian Circulation/Entrances

- Pedestrian Entrance
- Internal Circulation / Links

Views/Solar Diagram

- Views to Halifax Commons
- Solar Optimization

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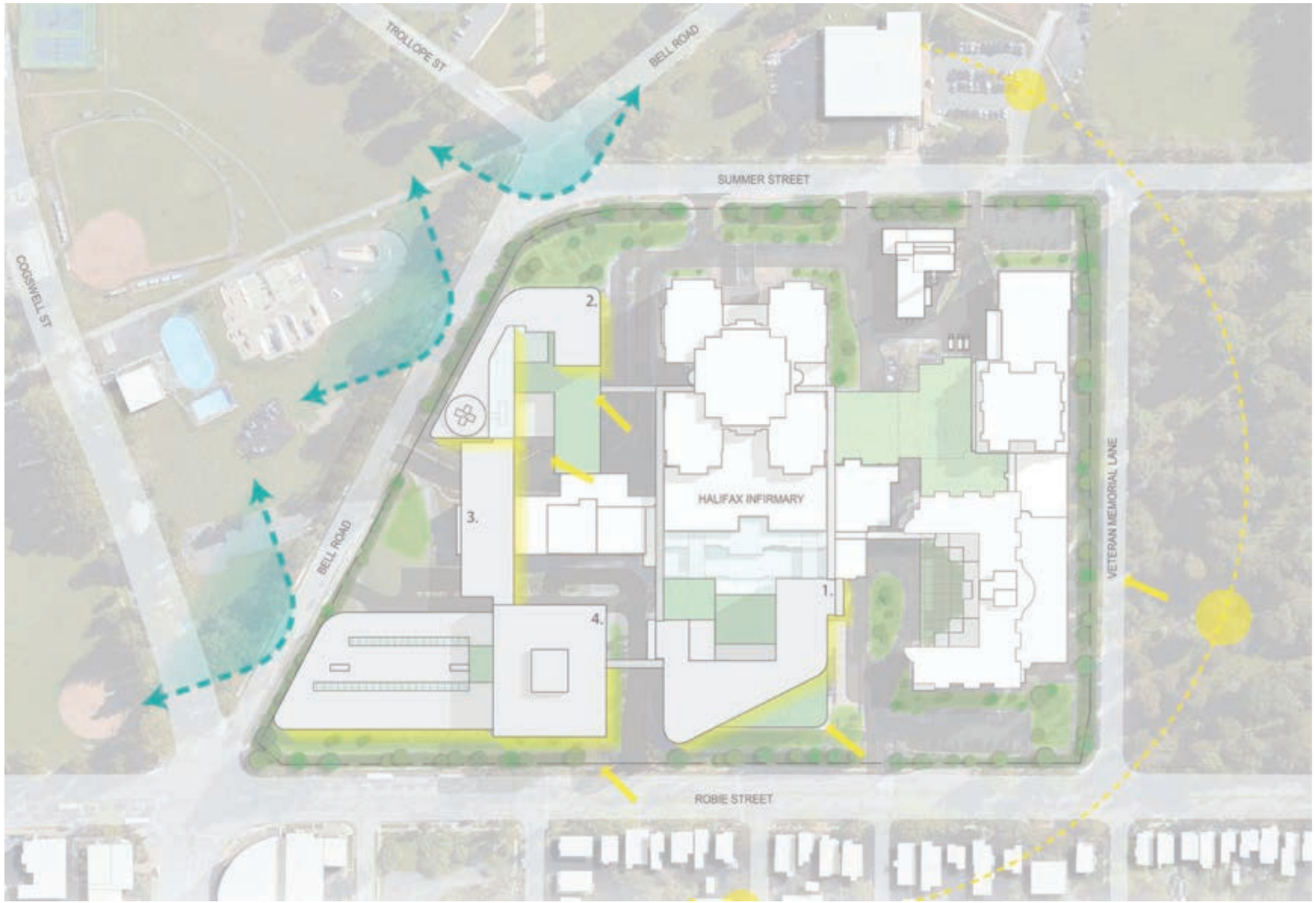
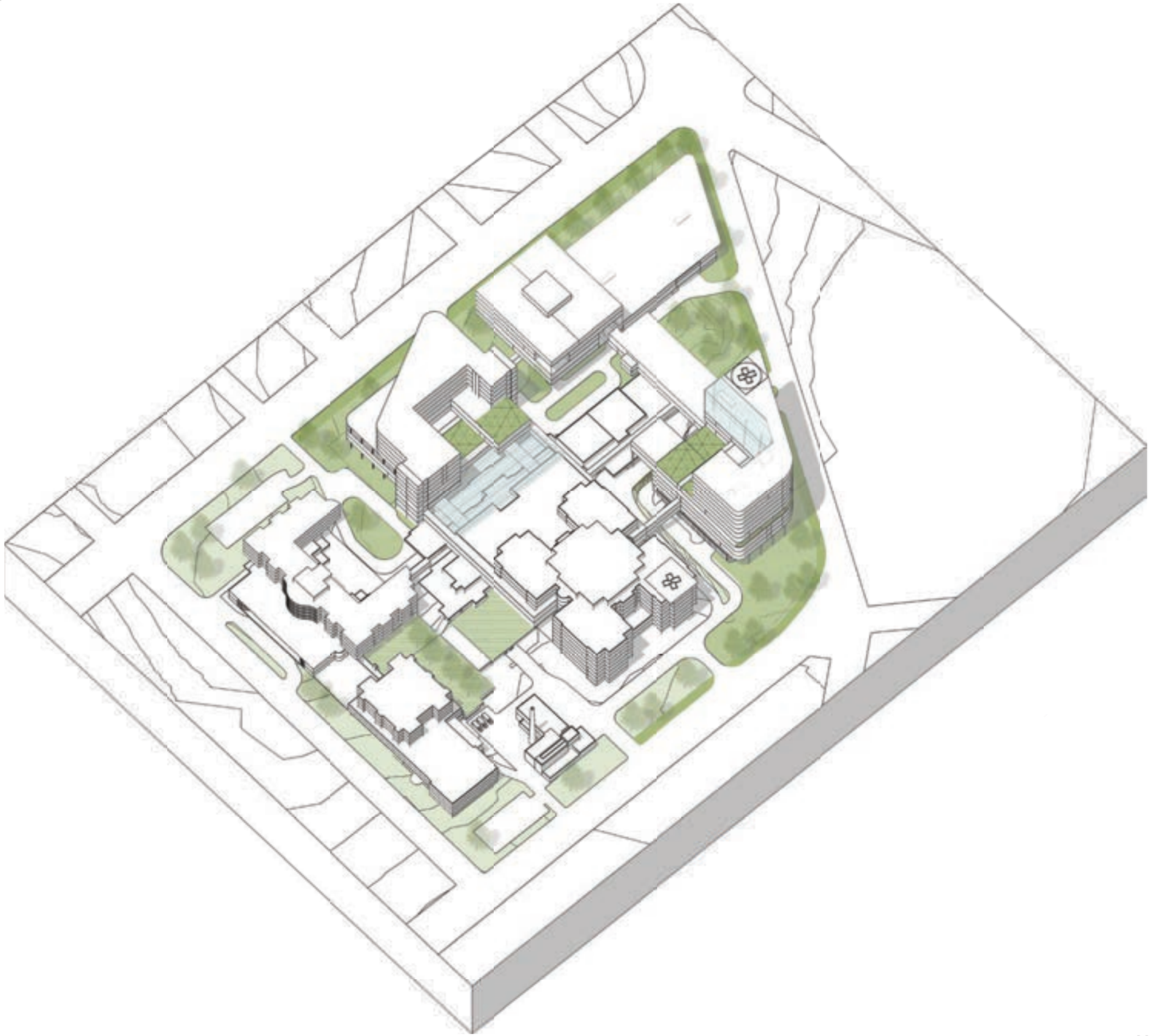
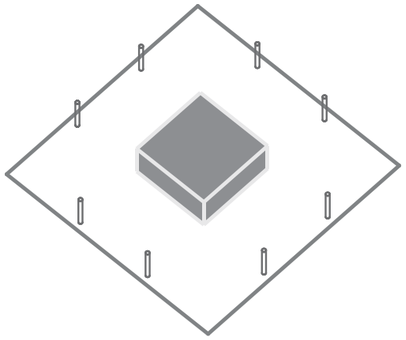
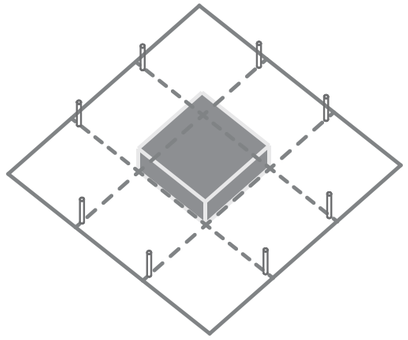


3.1 Garden Pavilion Concept
3.1.2 Green Space

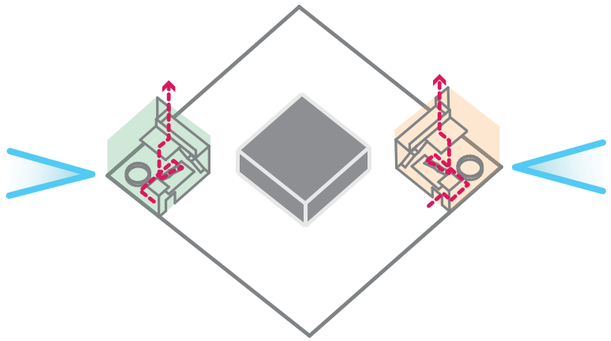




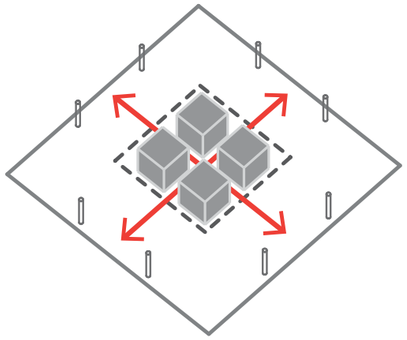
Efficient floor plate
- maximum Net to Gross ratio
- floor plate area appox. 36,000 SF



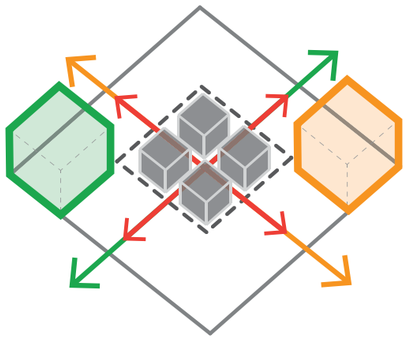
Rational Grid
- structural economy
- concrete structure



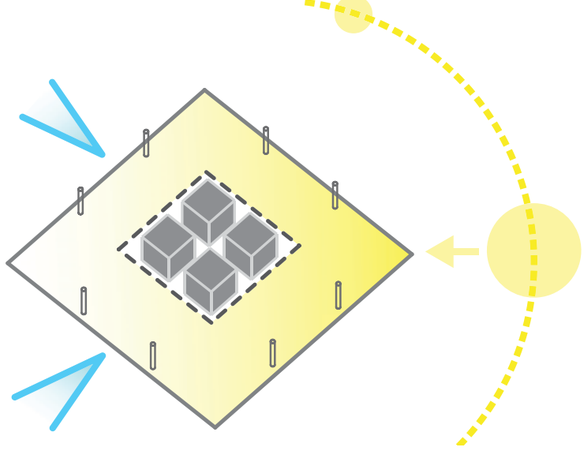
“Village Concept”
- Interconnected floors, linking same or similar programs



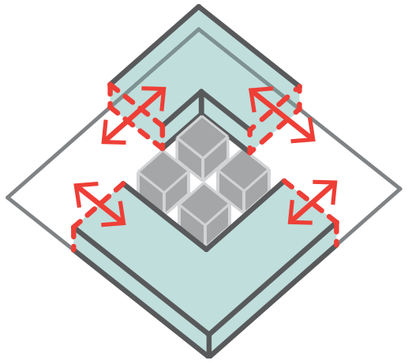
Central Core
- Flexible perimiter around the core



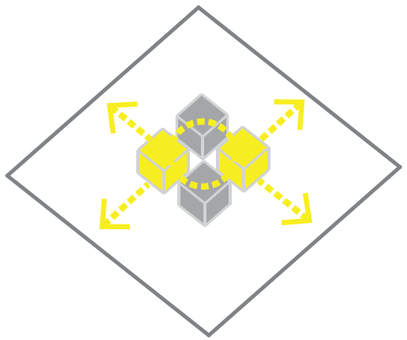
Wayfinding
- Intuitive space orientation



Views
- 360 degree panoramic overlook



Flexibility
- Opportunities for space division

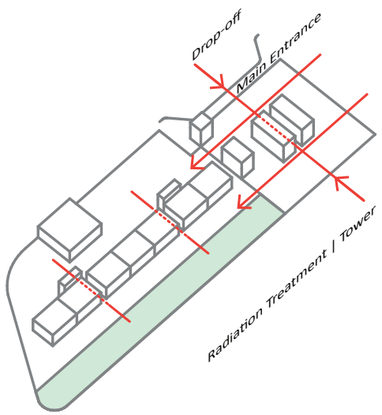


Distribution
- Centralized services in central core

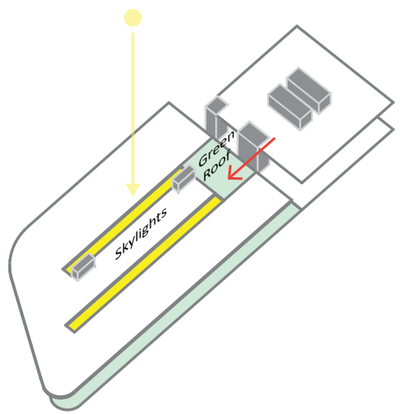
Key Plan

3.1 Garden Pavilion Concept

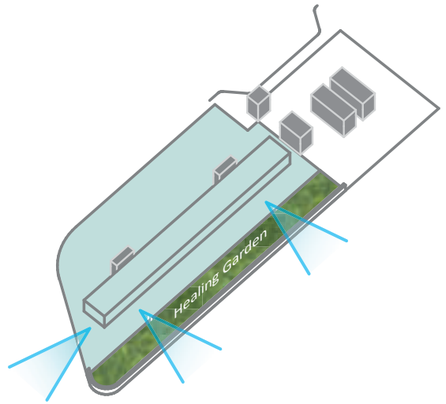
3.1.3 Concept Stacking and 3D Massing - Cancer Care Building



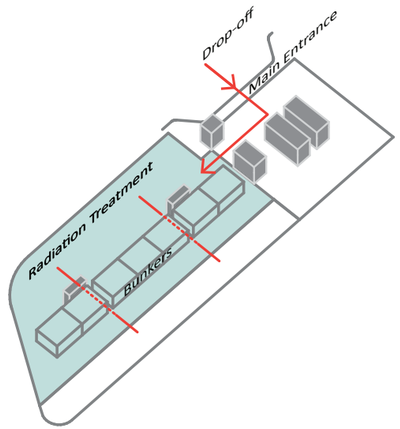
Accessibility
- Direct access from drop-off to radiation treatment zone (ground floor)



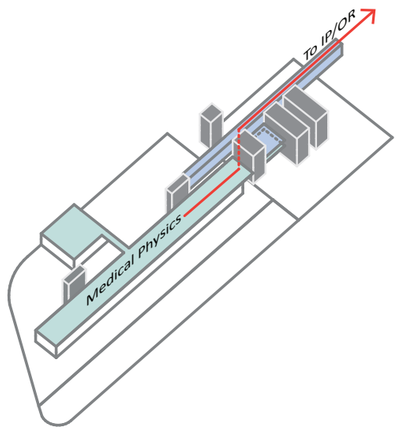
Light & Nature
- Pavilion is filled with light through the skylights and glass facade, facing the Healing Garden
- Green roof is accessed from Pavilion's core



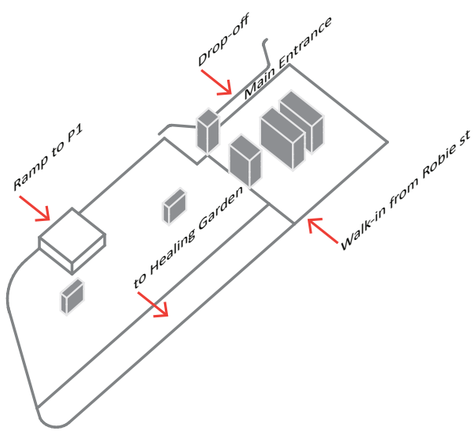
Views
- Radiation treatment department overlooking the Healing Garden and Bell road



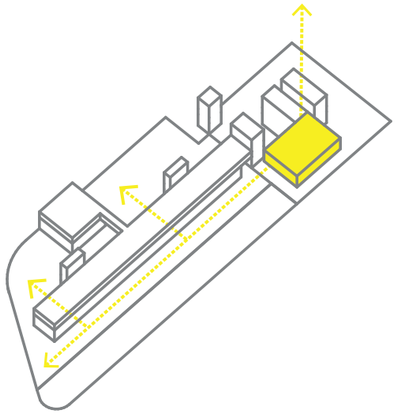
Consolidated Function
- Radiation Treatment program is located in one zone (approx. 44,000 SF)



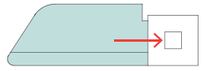
Integration
- Well connected with essential departments in adjacent buildings



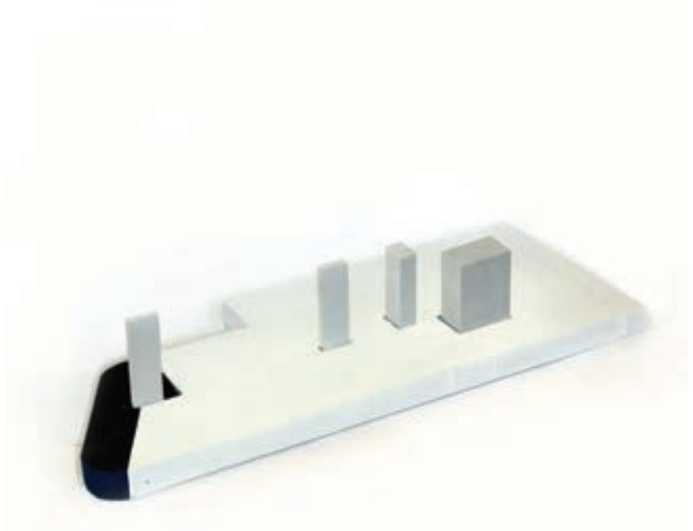
Service
- Direct access to parts of the building from drop-off, parking and Robie street



Distribution
- Satellite M&E at mezzanine level feeds pavilion and lower levels of the Tower



Key Plan



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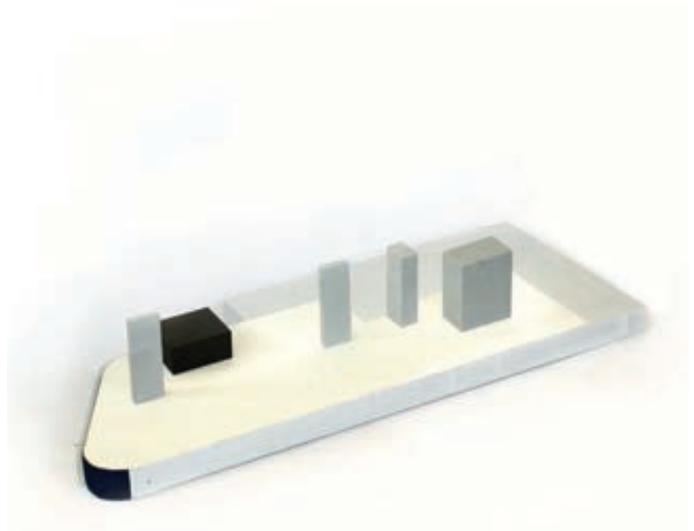

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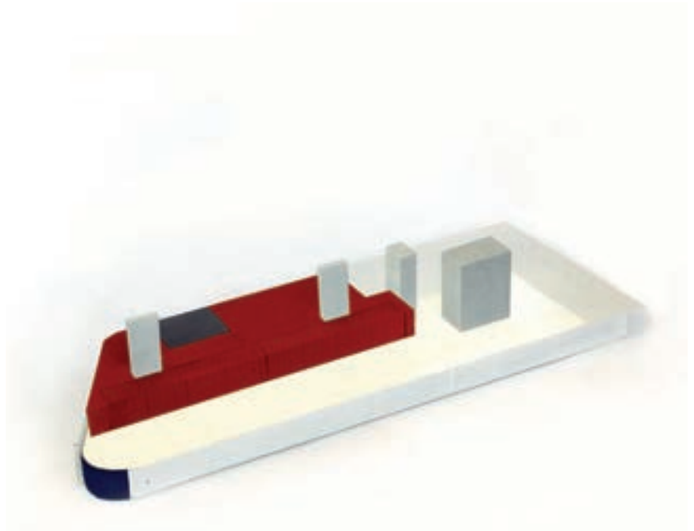

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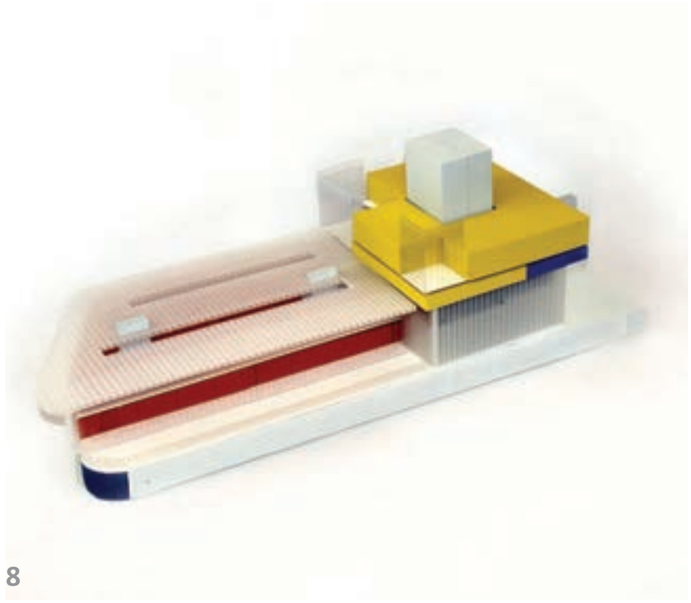
3.1 Garden Pavilion Concept

3.1.3 Concept Stacking and 3D Massing - Cancer Care Building

7



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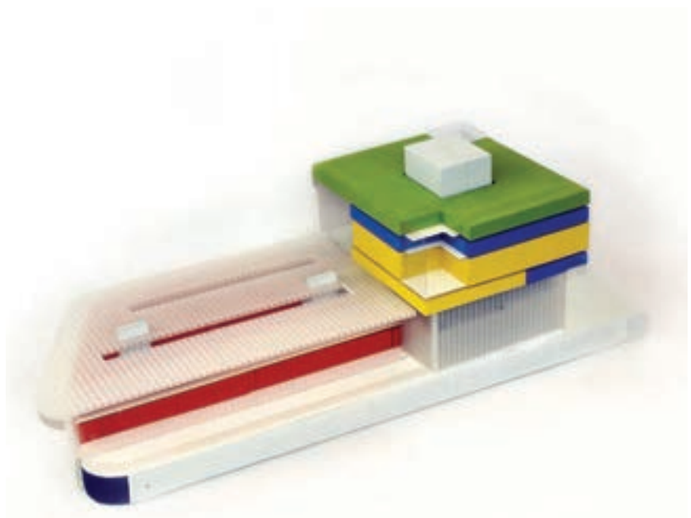

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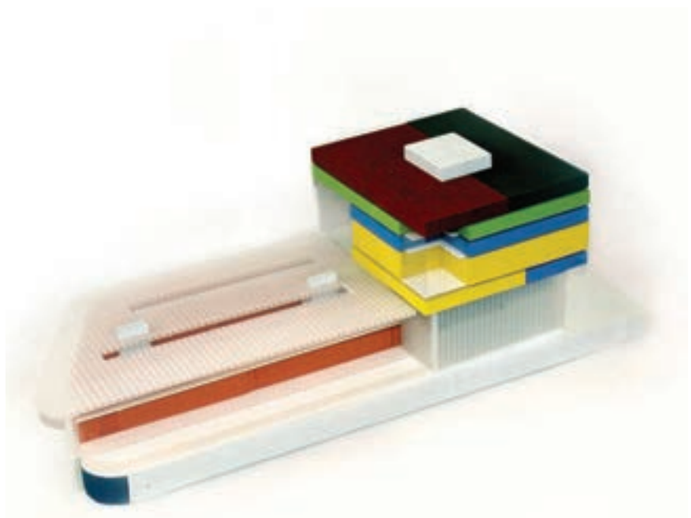

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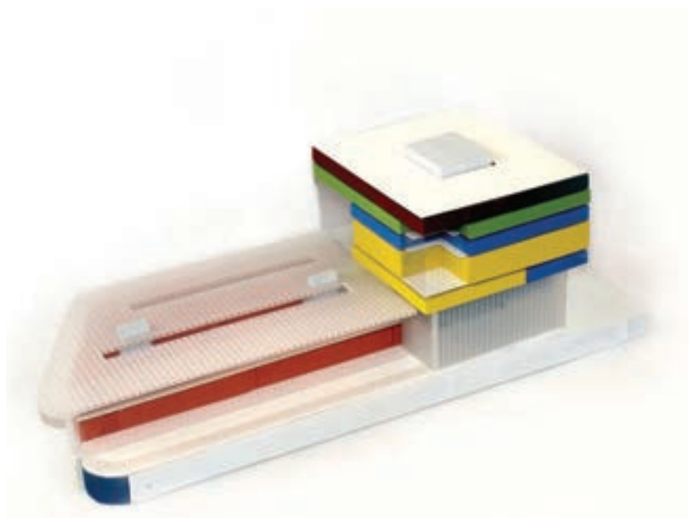

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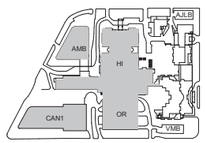
3.1 Garden Pavilion Concept
3.1.4 Department Plans

DGSF of Programs in Existing Halifax Infirmary (HI)

Categories	Department Name	Designed Area
Academic/Teaching	Academic/Teaching	12,146 SF
		12,146 SF
Administration	Academic Medical Staff/ Admin Services	55,032 SF
Administration	Corporate administration	10,475 SF
Administration	Foundation/ volunteers and auxiliary support	429 SF
Administration	Medical offices	17,166 SF
		83,102 SF
Ambulatory Care	Dialysis	8,010 SF
		8,010 SF
Clinical Support	Ancillary	1,736 SF
Clinical Support	Emergency	48,365 SF
Clinical Support	Laboratory	13,889 SF
Clinical Support	Pharmacy	9,648 SF
		73,638 SF
Diagnostic Imaging	Diagnostic Imaging	43,789 SF
		43,789 SF
External Agency	External Agency	1,544 SF
		1,544 SF
Inpatient Unit	Critical Care	79,770 SF
Inpatient Unit	Medical/Surgical Units	113,822 SF
		193,593 SF
Perioperative Services	Perioperative Services	49,662 SF
		49,662 SF
Research	Research	11,542 SF
		11,542 SF
Retail	Retail	6,532 SF
		6,532 SF
Support Services	Bio Med Engineering	6,205 SF
Support Services	Facility management	1,531 SF
Support Services	Food Services	13,068 SF
Support Services	Health information/ service registration	2,612 SF
Support Services	IT	589 SF
Support Services	M+E	75,147 SF
Support Services	MDR	19,211 SF
Support Services	Security	939 SF
Support Services	Staff services (lockers etc)	11,858 SF
Support Services	Supply chain (warehouse), procurement	4,142 SF
		135,301 SF
Total DGSF		**618,857 SF**
Existing Gross Builidng Area		± **744,000 SF**



KEY PLAN- HALIFAX INFIRMARY SITE

DGSF of Garden Pavilion - Inpatient/OR Extension (OR)

Categories	Department Name	Designed Area	AP Program
Amenities	Amenities	16,004 SF	
		16,004 SF	
Building Support	M+E	44,912 SF	
		44,912 SF	
Inpatient Unit	Critical Care	45,965 SF	39,904 (36 beds)
Inpatient Unit	Medical/Surgical Units	155,249 SF	149,930
		201,214 SF	
Perioperative Services	Surgical Suite	56,641 SF	52,365
		56,641 SF	
Support Services	MDR	1,277 SF	20,860
Support Services	Shipping & Receiving	11,728 SF	
		13,005 SF	
Total DGSF		**331,776 SF**	

Gross Building Area of Garden Pavilion - Inpatient/OR Extension

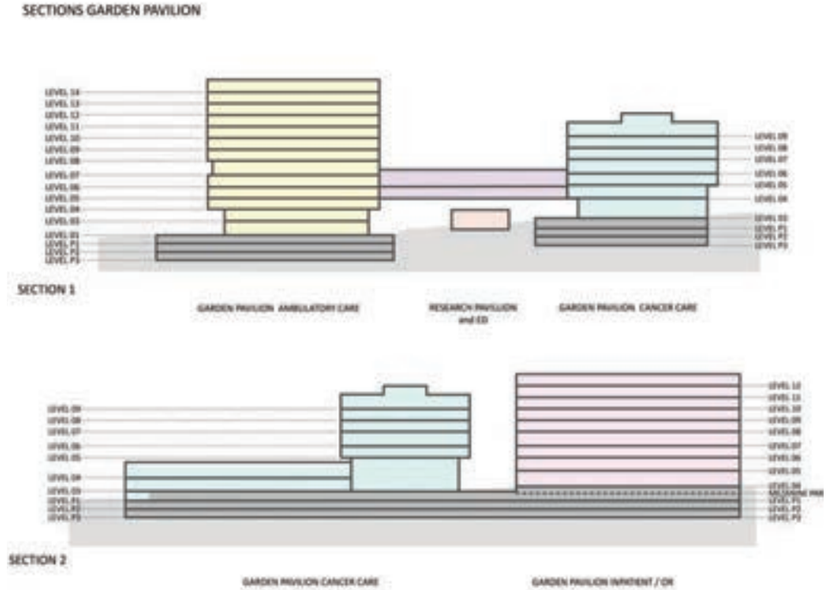
Categories	Designed Area
Amenities	16,004 SF
Building Support	44,912 SF
Inpatient Unit	201,214 SF
Perioperative Services	56,641 SF
Public	66,578 SF
Support Services	13,005 SF
Vertical Circulation	30,130 SF
Total	**428,484 SF**
Grossing Factor X 10% for Building Envelope	42,848 SF
GFA	**471,332 SF**

Gross Building Area of Garden Pavilion - Inpatient/OR Extension - Parking

Categories	Department Name	Designed Area
Public	Parking	200,760 SF

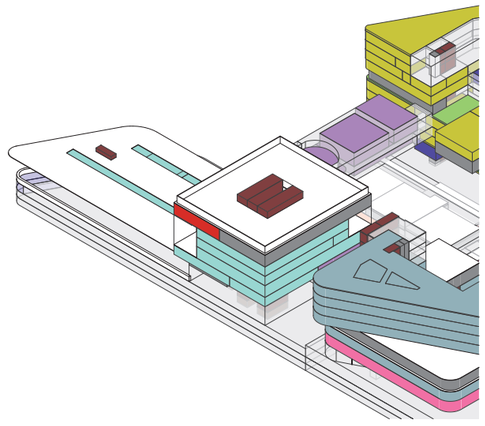
4 TOTAL LEVELS OF PARKING
(2 LEVEL TO BEDROCK)

The topographical nature of the Halifax Infirmary site resulted in unique building levels for each proposed building. For ease of reading, the following department plans use the universal levels of the HI site. The adjacent diagram illustrates the parking levels for each of the proposed Garden Pavilion buildings.



3.1 Garden Pavilion Concept

3.1.4 Department Plans



GARDEN PAVILION CANCER CARE - OVERALL 3D

DGSF of GARDEN PAVILION

Categories	Department Name	Designed Area	AP Program
Administration	Administration Shortfall in HI	17,728 SF	17,500 SF
		17,728 SF	
Amenities	Amenities	7,492 SF	
		7,492 SF	
Building Support	M+E	18,455 SF	20,000 DGSF
		18,455 SF	
Cancer Care	Administration and General Services	24,243 SF	24,156 DGSF
Cancer Care	Outpatient Clinics & Affiliated Services	43,981 SF	43,557 DGSF
Cancer Care	Radiation Treatment Program	45,171 SF	44,484 DGSF
Cancer Care	Systemic Oncology	28,627 SF	24,427 DGSF
		142,021 SF	
Research	Research	10,463 SF	
		10,463 SF	
Support Services	Support services	3,100 SF	
		3,100 SF	
Total DGSF		**199,259 SF**	

DGSF of GARDEN PAVILION - Ambulatory (AMB)

Categories	Department Name	Designed Area	AP Program
Ambulatory Care	Ambulatory Clinic	132,352 SF	128,530
Ambulatory Care	Ambulatory Procedure Unit	34,686 SF	35,025
Ambulatory Care	Dialysis	30,815 SF	30,230
Ambulatory Care	Eye Centre	41,875 SF	42,055
Ambulatory Care	Heart Health	47,822 SF	47,950
Ambulatory Care	Hyperbaric	8,521 SF	8,640
Ambulatory Care	Medical Day Care	9,851 SF	10,285
Ambulatory Care	Outpatient Specimen Collection	4,603 SF	4,675
		310,526 SF	
Amenities	Amenities	5,379 SF	
Amenities	Cafeteria	1,941 SF	
		7,320 SF	
Building Support	M+E	41,206 SF	
		41,206 SF	
Diagnostic Imaging	Diagnostic Imaging	14,099 SF	14,003
		14,099 SF	
Support Services	Bio Med Engineering	880 SF	
Support Services	Shipping & Receiving	4,236 SF	
		5,116 SF	
Total DGSF		**378,268 SF**	

DGSF of GARDEN PAVILION - Research and Innovation Centre (RES)

Categories	Department Name	Designed Area	AP Program
Research	Research	23,548 SF	34,430 SF
		23,548 SF	
Total DGSF		**23,548 SF**	

Gross Building Area of GARDEN PAVILION

Categories	Designed Area
Administration	17,728 SF
Amenities	7,492 SF
Building Support	18,455 SF
Cancer Care	142,021 SF
Public	38,206 SF
Research	10,463 SF
Support Services	3,100 SF
Vertical Circulation	29,838 SF
Gross Building Area	**267,302 SF**
GROSSING FACTOR X 10% for Building Envelope	26,730 SF
GFA	**294,032 SF**

Gross Building Area of GARDEN PAVILION - Cancer Care - Parking

Categories	Department Name	Designed Area
Public	Parking	**343,278 SF**

3 TOTAL LEVELS OF PARKING
(1.5 LEVEL TO BEDROCK)

Gross Building Area of GARDEN PAVILION - Ambulatory

Categories	Designed Area
Ambulatory Care	310,526 SF
Amenities	7,320 SF
Building Support	41,206 SF
Diagnostic Imaging	14,099 SF
Public	50,527 SF
Support Services	5,116 SF
Vertical Circulation	17,155 SF
Total	**445,950 SF**
GROSSING FACTOR X 10% for Building Envelope	44,595 SF
GFA	**490,545 SF**

Gross Building Area of GARDEN PAVILION - Ambulatory - Parking

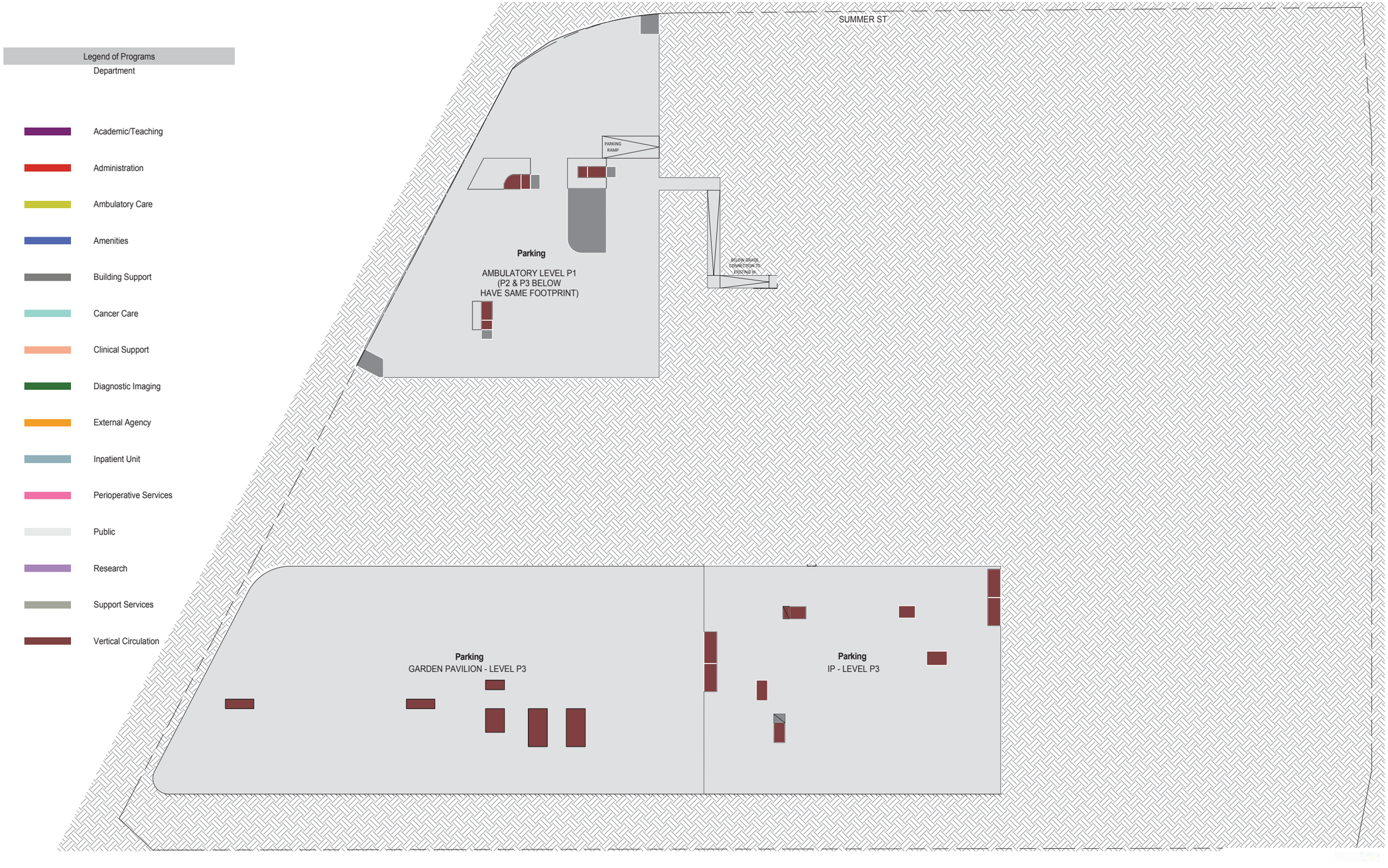
Categories	Department Name	Designed Area
Public	Parking	**236,983 SF**

3 TOTAL LEVELS OF PARKING
(1 LEVELS TO BEDROCK)

Gross Building Area of GARDEN PAVILION - Research and Innovation Centre (RES)

Categories	Designed Area
Public	13,336 SF
Research	23,548 SF
Vertical Circulation	1,092 SF
Gross Building Area	**37,976 SF**
GROSSING FACTOR X 10% for Building Envelope	3,798 SF
GFA	**41,774 SF**

3.1 Garden Pavilion Concept
3.1.4 Department Plans: Level P1

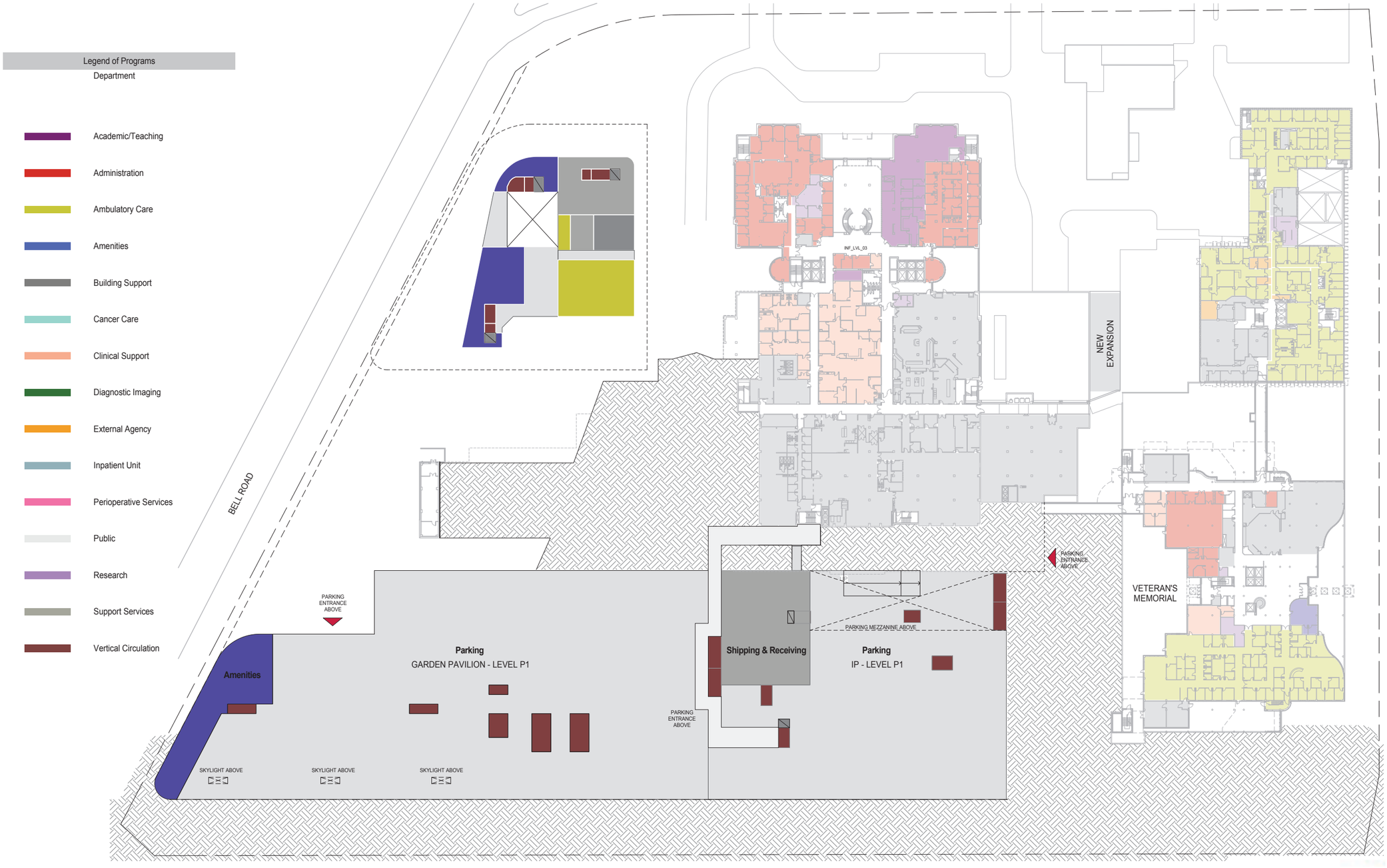


3.1 Garden Pavilion Concept

3.1.4 Department Plans: Level 01

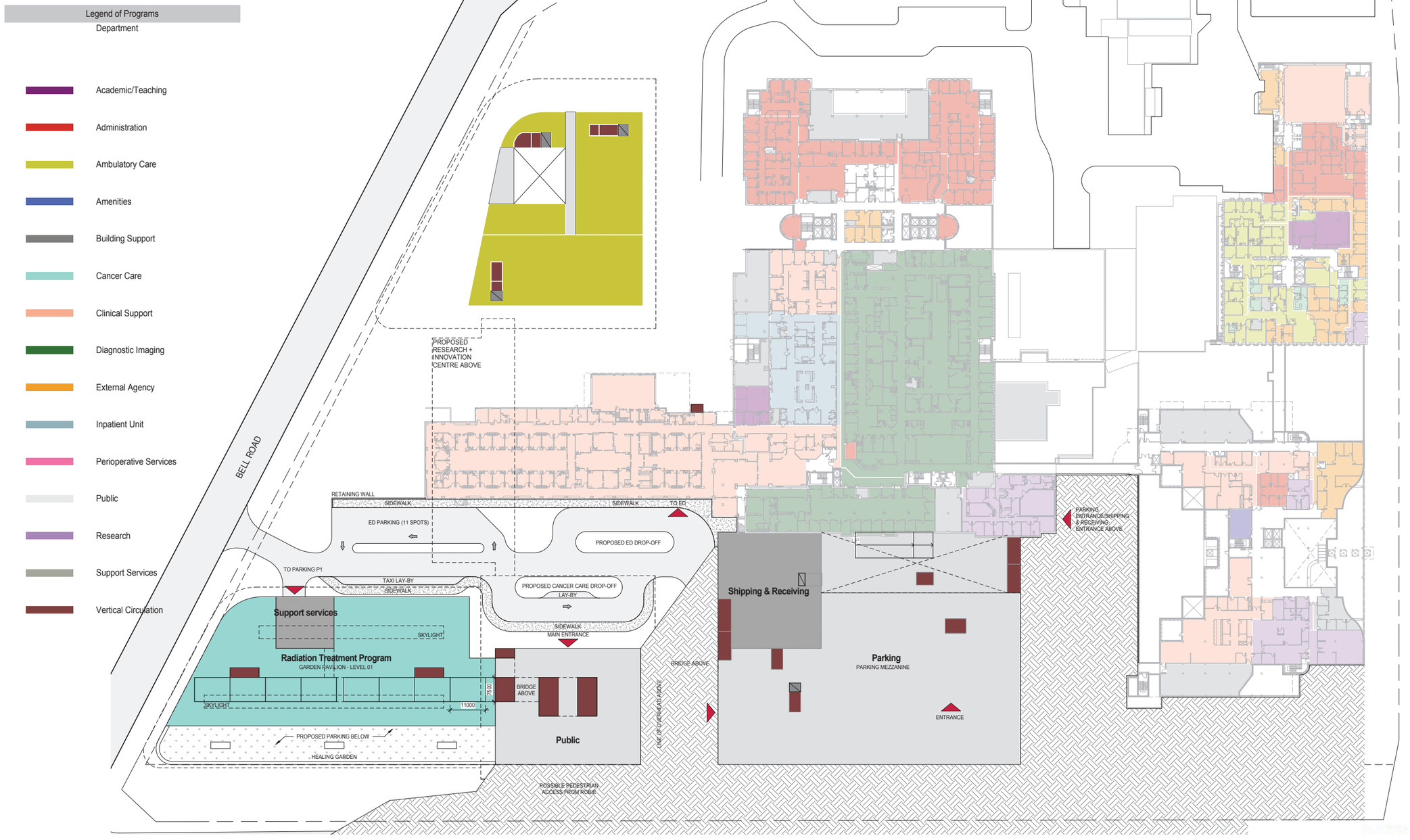
3.1 Garden Pavilion Concept

3.1.4 Department Plans: Level 02



3.1 Garden Pavilion Concept

3.1.4 Department Plans: Level 03



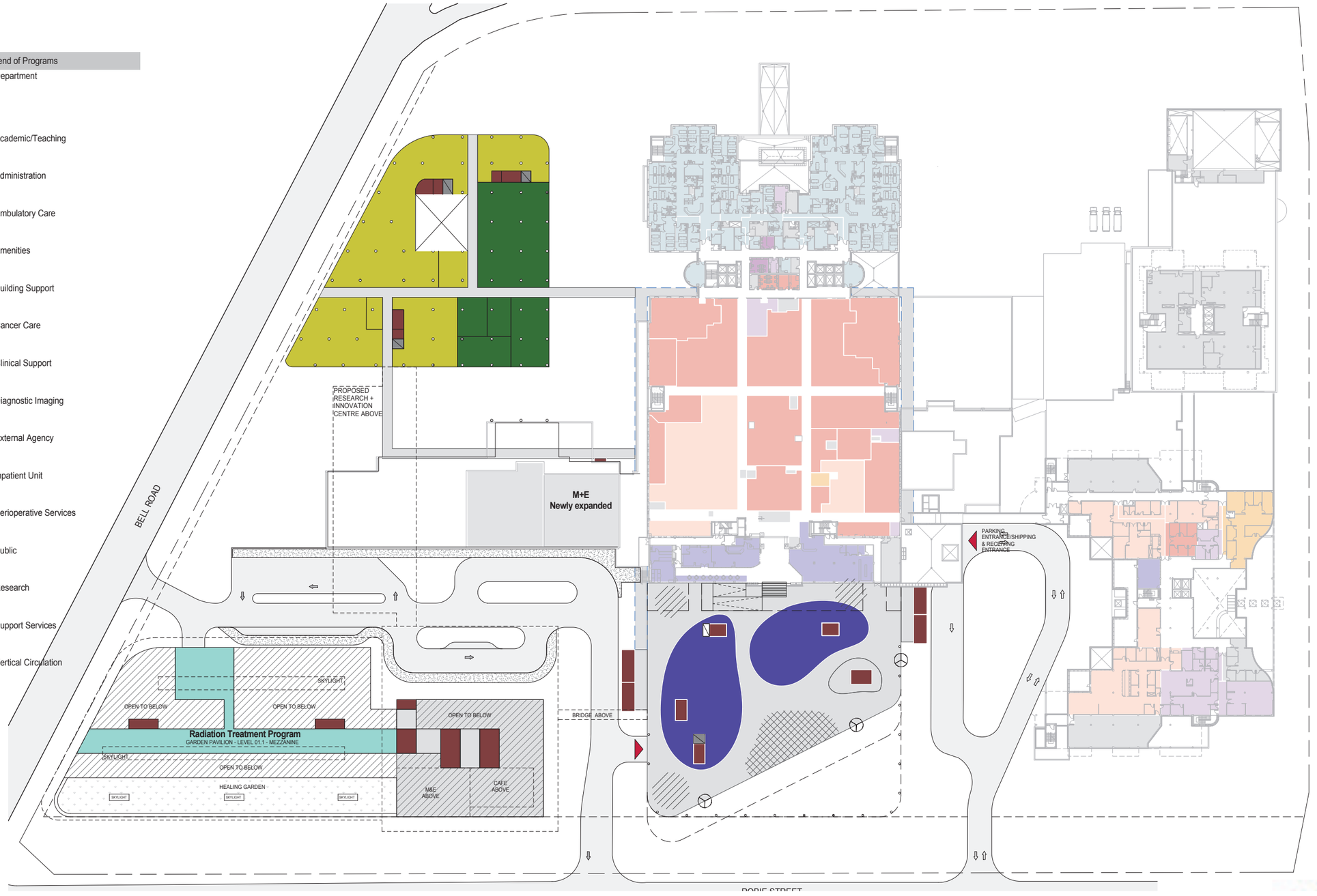
3.1 Garden Pavilion Concept

3.1.4 Department Plans: Level 04

Legend of Programs

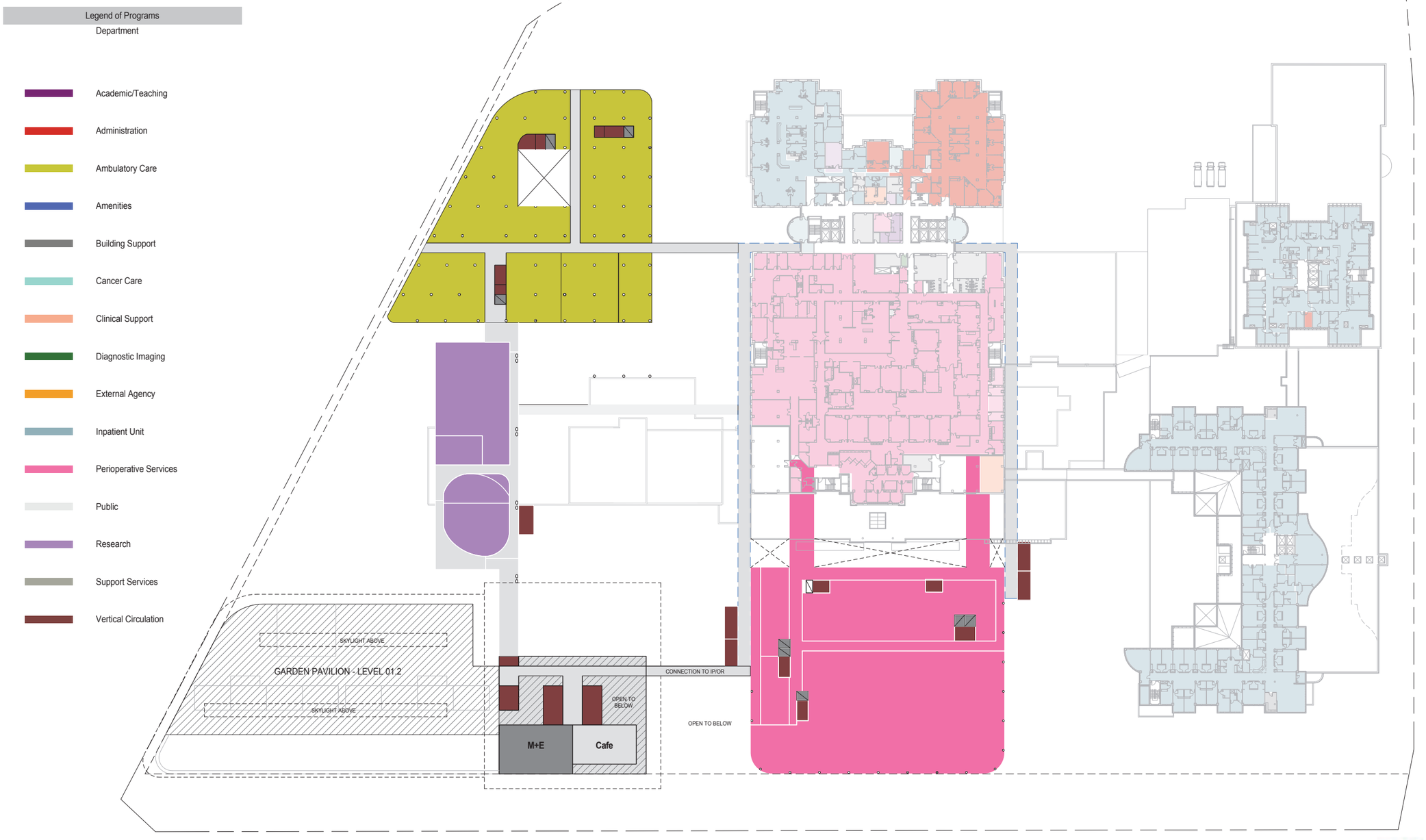
Department

- Academic/Teaching
- Administration
- Ambulatory Care
- Amenities
- Building Support
- Cancer Care
- Clinical Support
- Diagnostic Imaging
- External Agency
- Inpatient Unit
- Perioperative Services
- Public
- Research
- Support Services
- Vertical Circulation



3.1 Garden Pavilion Concept

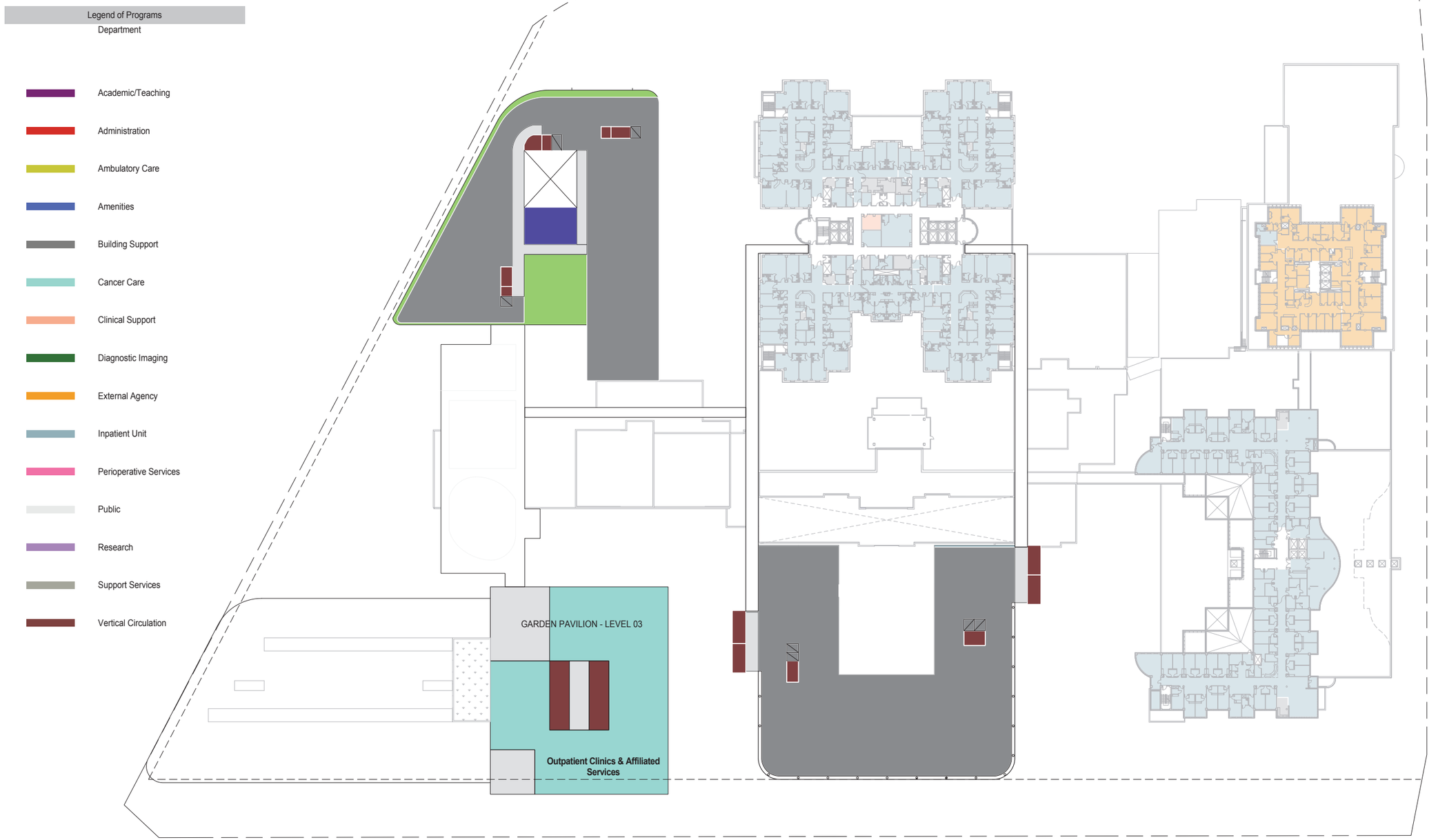
3.1.4 Department Plans: Level 05




Legend of Programs
Department
Academic/Teaching
Administration
Ambulatory Care
Amenities
Building Support
Cancer Care
Clinical Support
Diagnostic Imaging
External Agency
Inpatient Unit
Perioperative Services
Public
Research
Support Services
Vertical Circulation
GARDEN PAVILION - LEVEL 02
GREEN ROOF
Public
Research
BRIDGE BELOW
Outpatient Clinics & Affiliated Services
Administration and General Services
Critical Care
N

3.1 Garden Pavilion Concept

3.1.4 Department Plans: Level 07

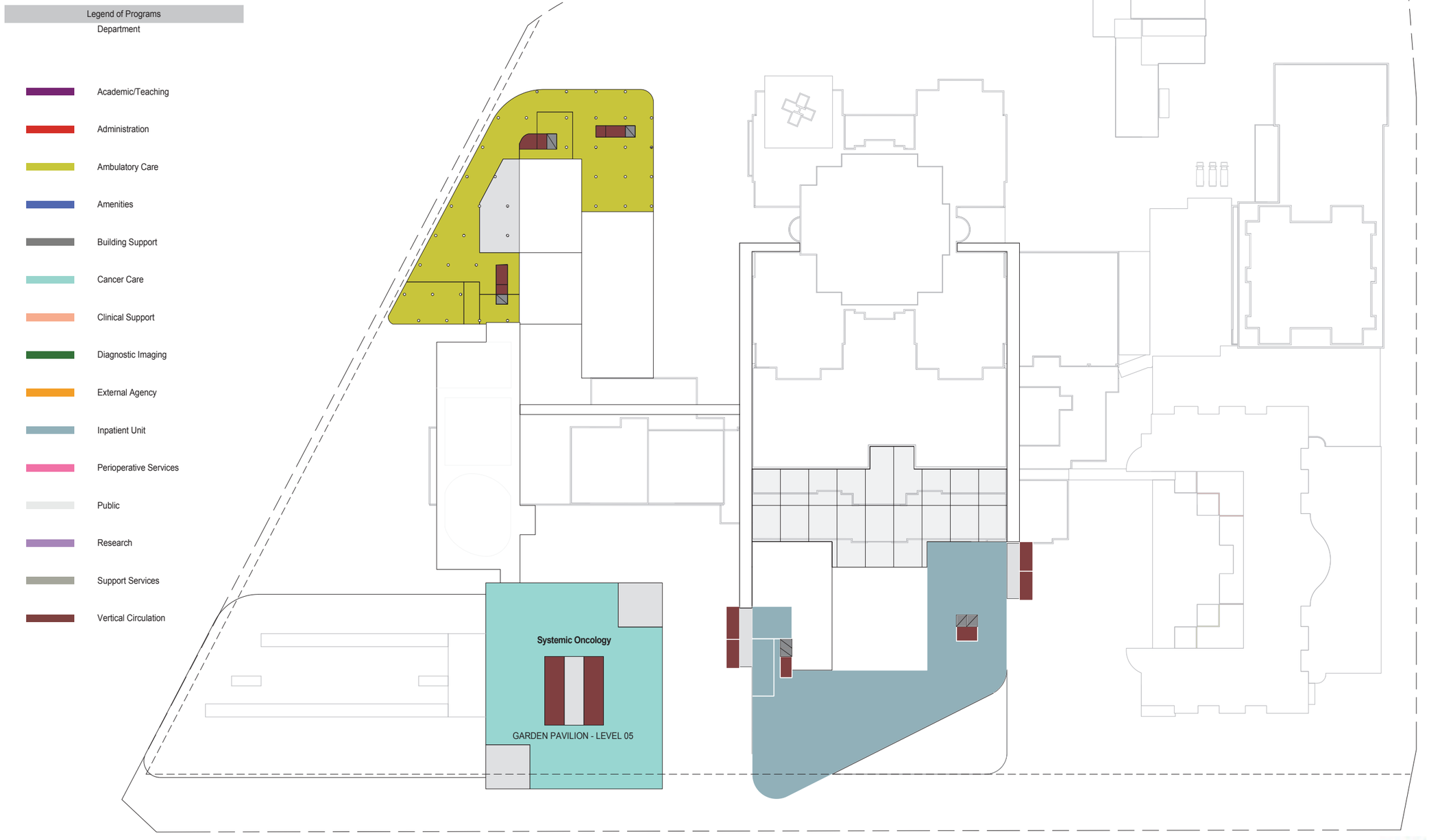


3.1 Garden Pavilion Concept

3.1.4 Department Plans: Level 08

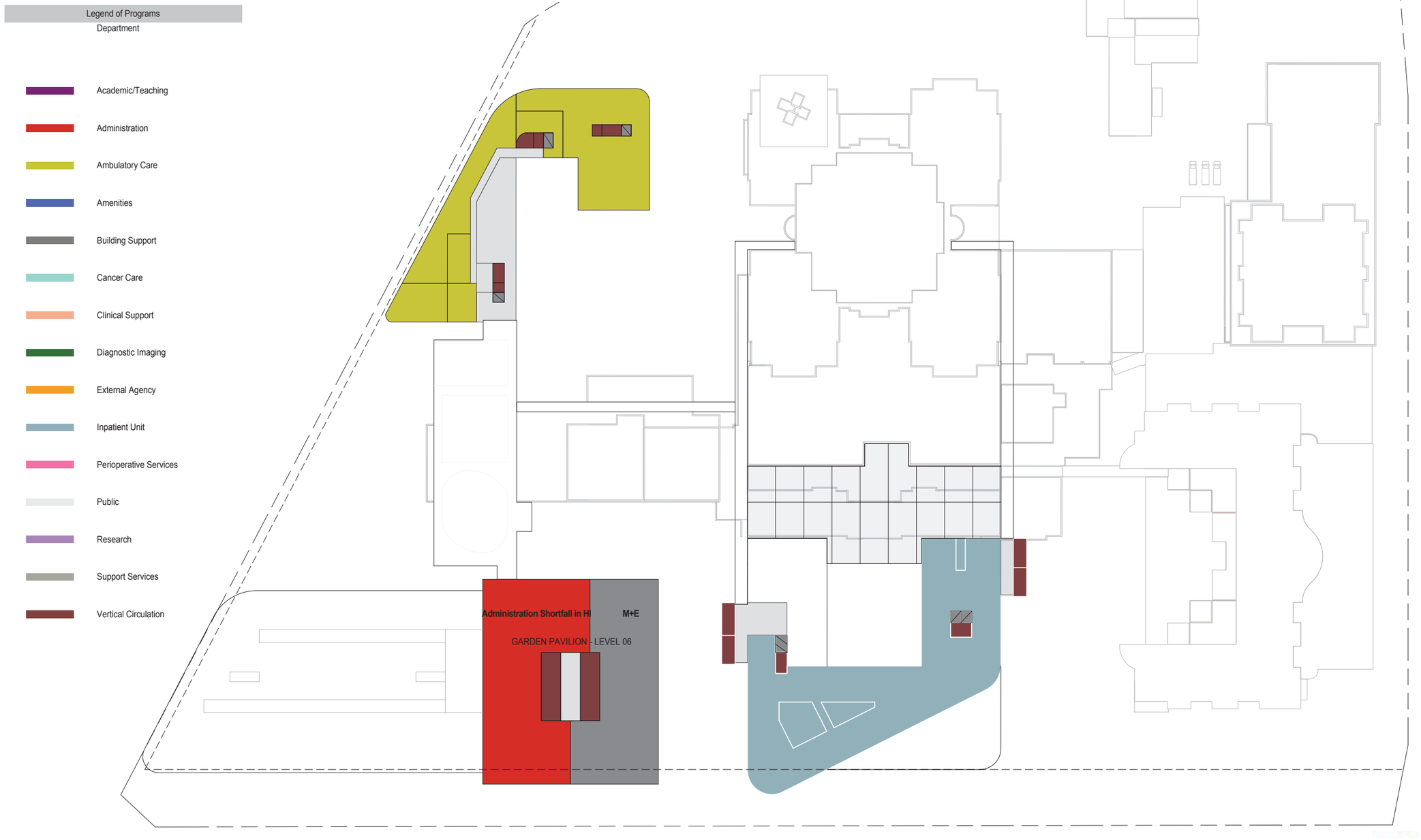
3.1 Garden Pavilion Concept

3.1.4 Department Plans: Level 09



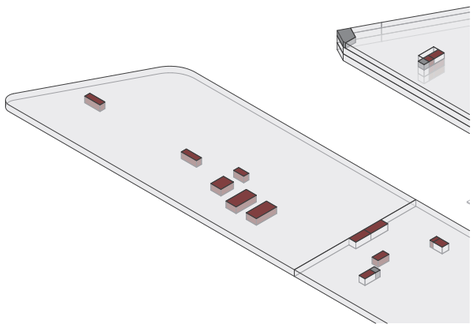
3.1 Garden Pavilion Concept

3.1.4 Department Plans: Level 10

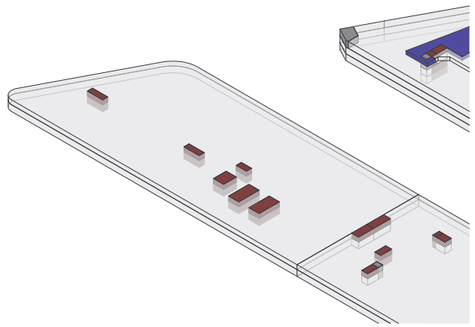


3.1 Garden Pavilion Concept

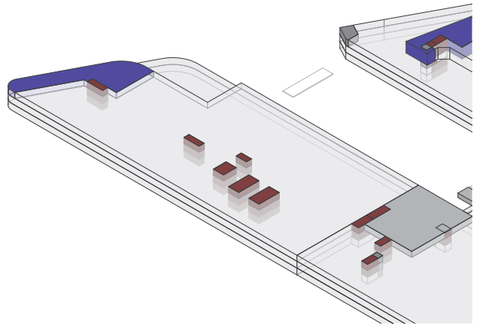
3.1.4 Department Plans: 3D Diagrams



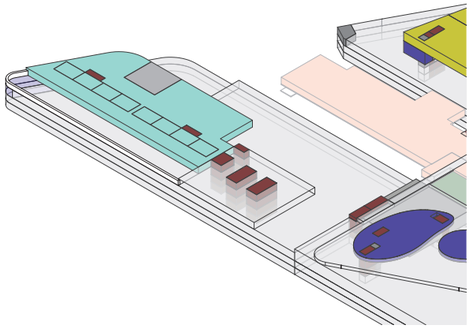
LEVEL 01



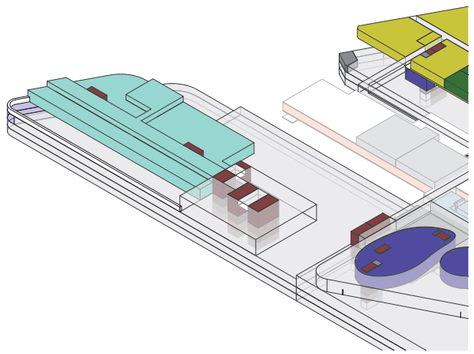
LEVEL 02



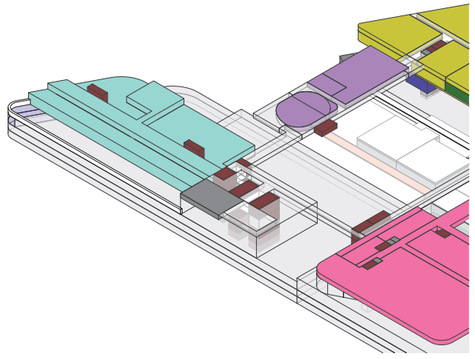
LEVEL 03



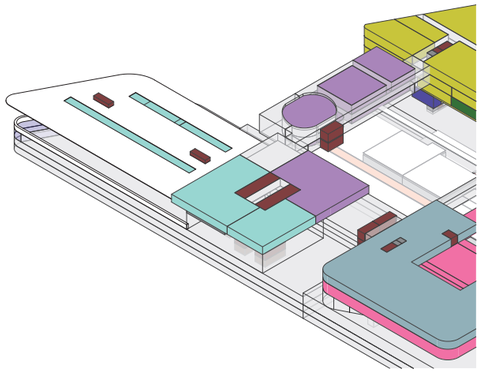
LEVEL 04



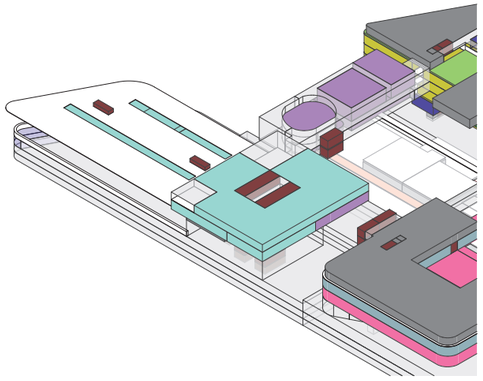
LEVEL 04.1



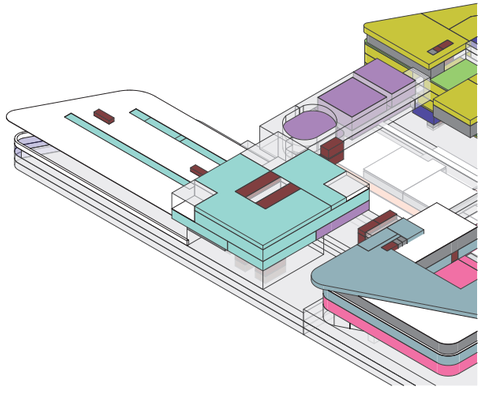
LEVEL 05



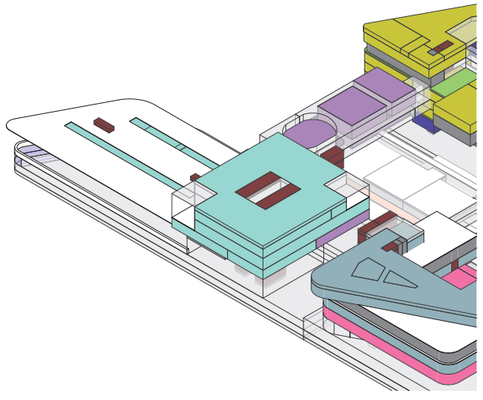
LEVEL 06



LEVEL 07



LEVEL 08



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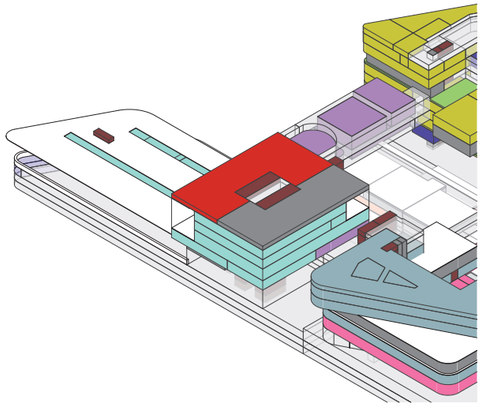
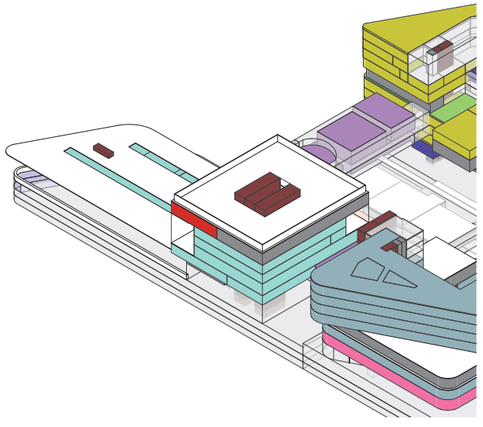


LEVEL 10

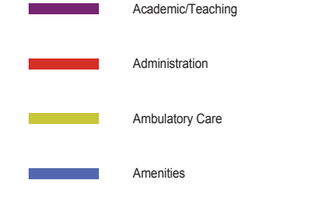


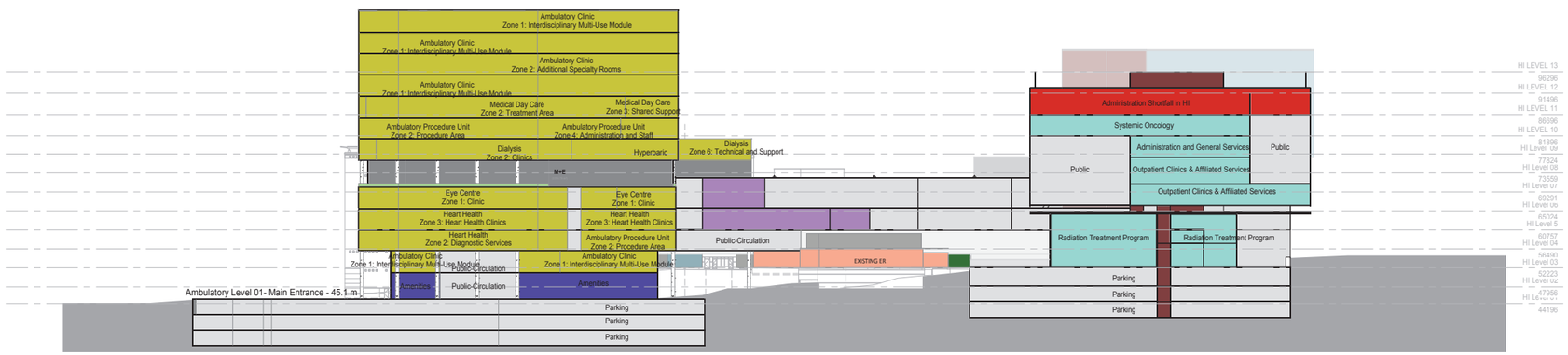
OVERALL

Legend of Programs

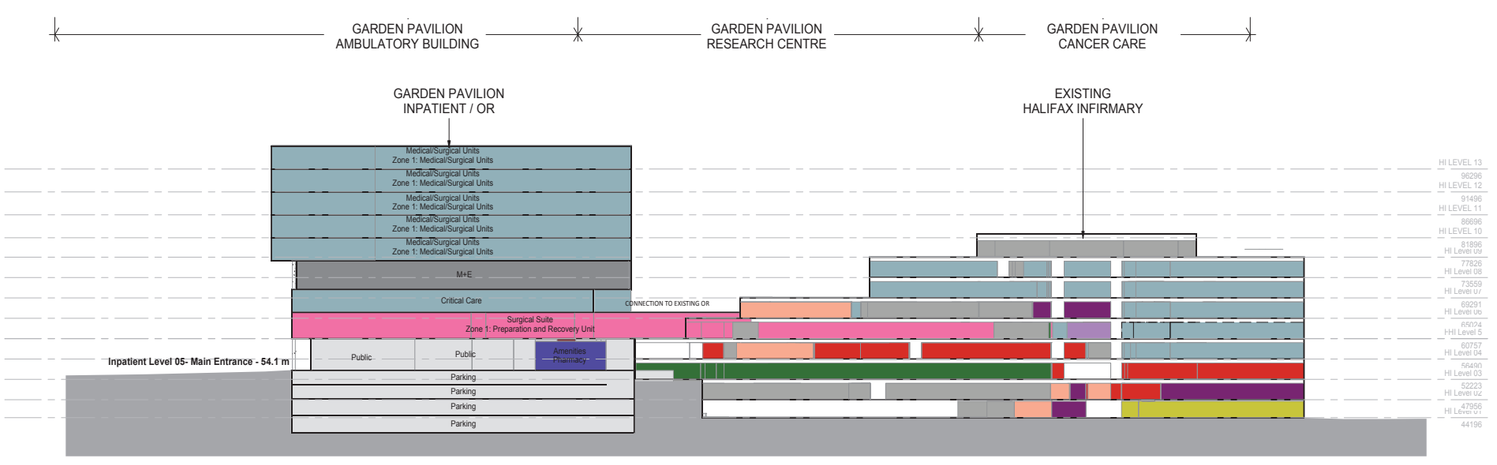
Department

- Academic/Teaching
- Administration
- Ambulatory Care
- Amenities
- Building Support
- Cancer Care
- Clinical Support
- Diagnostic Imaging
- External Agency
- Inpatient Unit
- Perioperative Services
- Public
- Research
- Support Services
- Vertical Circulation





GARDEN PAVILION - SECTION 01



GARDEN PAVILION - SECTION 02

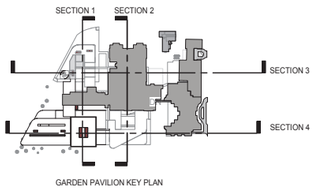
3.1 Garden Pavilion Concept

3.1.4 Department Plans: Sections

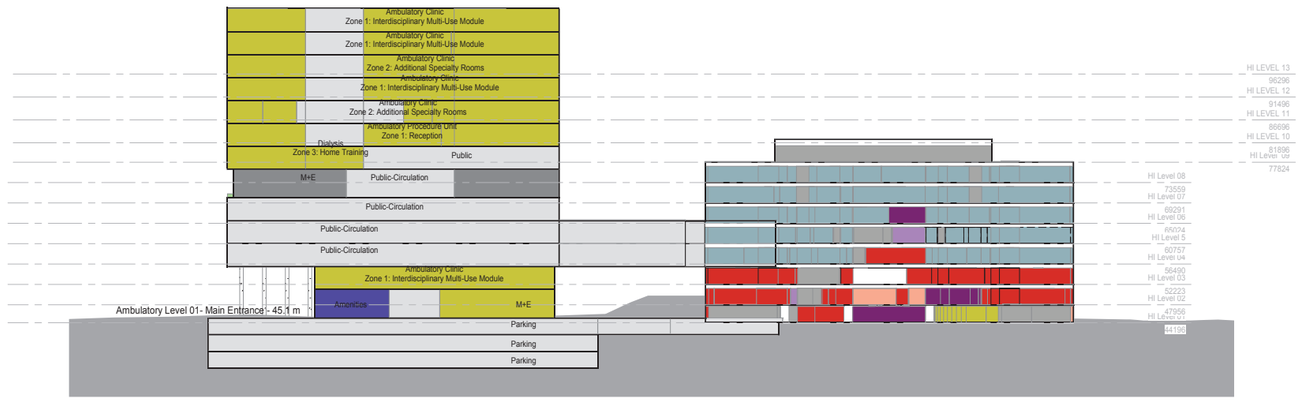
Legend of Programs

Department

- Academic/Teaching
- Administration
- Ambulatory Care
- Amenities
- Building Support
- Cancer Care
- Clinical Support
- Diagnostic Imaging
- External Agency
- Inpatient Unit
- Perioperative Services
- Public
- Research
- Support Services
- Vertical Circulation



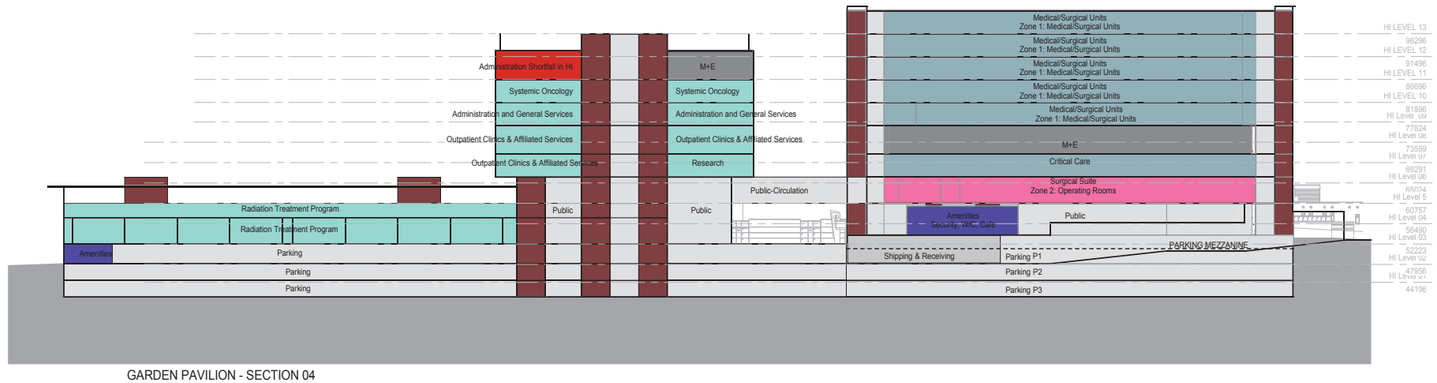
GARDEN PAVILION KEY PLAN



GARDEN PAVILION - SECTION 03

GARDEN PAVILION AMBULATORY CARE

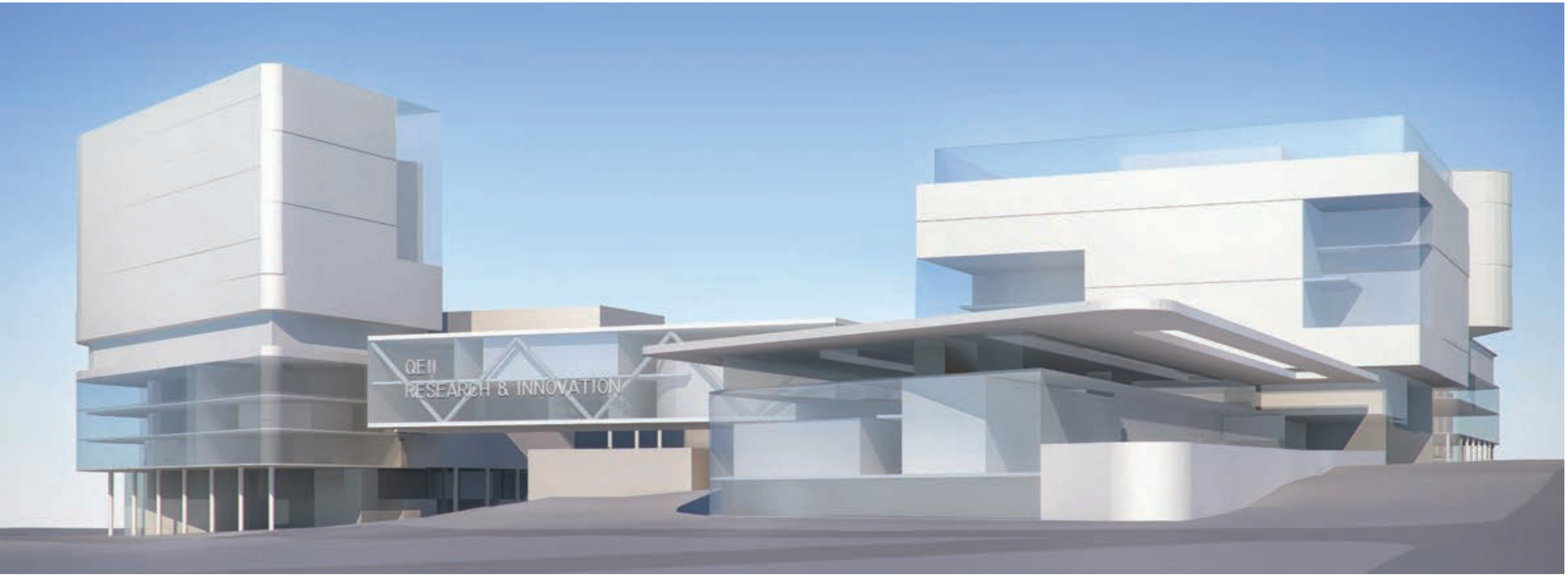
EXISTING HI BUILDING



GARDEN PAVILION - SECTION 04

GARDEN PAVILION CANCER CARE

GARDEN PAVILION INPATIENT / OR


QEII
RESEARCH & INNOVATION

3.1 Garden Pavilion Concept

3.2 The Beacon Concept

The Beacon consists of:

- 8 storey Cancer Centre on the CBC site (above grade) with 3 levels of below grade parking
- 9 storey Inpatient/ OR Building on the former site of the parking structure on Robie Street (above grade) with three levels of below grade parking
- 9 storey Ambulatory Care Building on the Urban Garden site (above grade) with 4 levels of below grade parking (including mezzanine level)
- 2 storey Centre for Research and Innovation situated above the mechanical penthouse of the Emergency Department

The Beacon locates the Cancer Centre on a prominent corner (Bell Rd and Summer St) of the HI site, given the Cancer Centre a highly visible identity that is visible from the community. A central light well brings natural light to all the floors and to the public spaces on the ground floor. All patient care and treatment areas are located to maximize natural light as well as views to The Commons, Citadel, and green spaces located on the HI site.

The Beacon allows cancer care to have a distinct and separate identity within the Halifax Infirmary site. A dedicated drop off and new front door reduces stress, anxiety and confusion for patients arriving at the HI site for treatment. A bridge connection provides a link between the cancer centre and the inpatient units in the existing HI building.

The Centre for Research and Innovation sits atop of the Emergency Department, creating a physical connection between cancer care and ambulatory care, to promote a culture of multi-disciplinary collaboration between care teams strongly rooted in research and innovation. The siting of the Centre for Research and Innovation perched on top of the Emergency Department also raises the profile of research and education to the community, as an integral part of a leading edge academic and teaching hospital.

The Inpatient / OR building is proposed on the site of the parking structure on Robie Street. It creates a new front door for the hospital that is connected to the urban streetscape. Upon arrival at the front entrance, patients, visitors and staff are greeted with a generous public space, and a large atrium brings natural light into the public areas.

The new building will also connect directly to the existing HI building via a multi-story atrium space- the light well. New public corridors will 'hug' the existing HI building and provide improved circulation and wayfinding when navigating from the new Inpatient/OR building into the existing HI building. A Wellness Garden has been proposed near the front entrance adjacent to Robie Street. The ground floor level will contain various types of amenity spaces, such as a café, spiritual care, a wellness gallery and a reception kiosk to name a few. The primary drop-off will be situated along the southern side of the building between the existing Camp Hill Veterans Memorial building and access to below grade parking will be located here, with an additional parking entrance on the north side of the building. Pedestrian entrances will be located along Robie Street, further reinforcing the edge condition. Level 5 will contain the expanded Perioperative Services and will connect directly to the existing HI OR via bridges within the light well. The U-shaped orientation of the Inpatient unit floors will ensure each room contains ample windows with views to the Citadel, Halifax Commons, or southerly facing windows orientated to the suns path.

The Ambulatory Care building on the urban garden site consists of two slender buildings linked by an interconnected multi-level atrium. These slender slabs are staggered to optimize solar performance while capitalizing on views to the Commons. A lower scale component along Bell Road and Robie Street ensures the sites conditions are respected and good urban design principles are followed. This ambulatory care building has a linkage to the new Inpatient/ OR Building for ease of access to ambulatory care services for inpatients. There is also the potential to create opportunities for some patient amenities such as a café along the bridge connection. Level 4 contains the Ambulatory Procedure Unit and has a direct connection to the emergency department. A consolidated Eye Centre is located on Level 5. Green rooftop terraces are accessible on Level 7 and 11 respectively. Large public patios are provided on several floors throughout the building provide gathering and outdoor space for visitors and staff alike.

3.2 The Beacon Concept

3.2.1 Site Plan

1. New Inpatient/OR Building
2. New Ambulatory Building
3. New Centre for Research and Innovation
4. New Cancer Care Building

Green Space

- Buffer Zone
- Green Space
- Roof Terraces / Healing Spaces
- VMB Veterans Garden to be reduced and enhanced

Vehicular Circulation/Entrances

- Vehicular Entrance
- Service / Parking Entrance
- Driveway
- Signalled Intersection
- Bus Stop

Pedestrian Circulation/Entrances

- Pedestrian Entrance
- Internal Circulation / Links

Views/Solar Diagram

- Views to Halifax Commons
- Solar Optimization

N

3.2 The Beacon Concept

3.2.1 Site Plan: Green Spaces

1. New Inpatient/OR Building
2. New Ambulatory Building
3. New Centre for Research and Innovation
4. New Cancer Care Building

Green Space

- Buffer Zone
- Green Space
- Roof Terraces / Healing Spaces
- VMB Veterans Garden to be reduced and enhanced

Vehicular Circulation/Entrances

- Vehicular Entrance
- Service / Parking Entrance
- Driveway
- Signalled Intersection
- Bus Stop

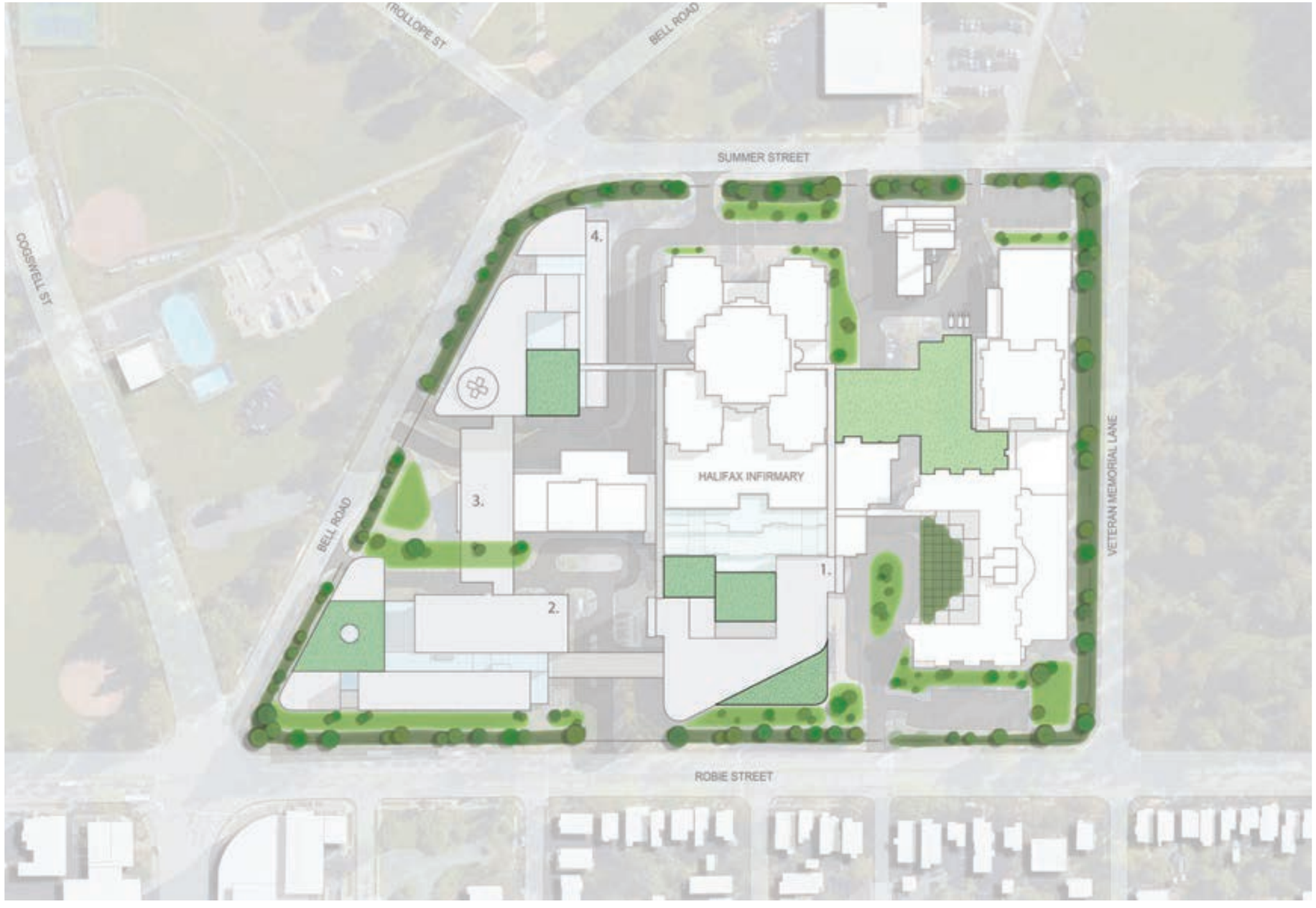
Pedestrian Circulation/Entrances

- Pedestrian Entrance
- Internal Circulation / Links

Views/Solar Diagram

- Views to Halifax Commons
- Solar Optimization

N



1. New Inpatient/OR Building
2. New Ambulatory Building
3. New Centre for Research and Innovation
4. New Cancer Care Building

Green Space

- Buffer Zone
- Green Space
- Roof Terraces / Healing Spaces
- VMB Veterans Garden to be reduced and enhanced

Vehicular Circulation/Entrances

- Vehicular Entrance
- Service / Parking Entrance
- Driveway
- Signalled Intersection
- Bus Stop

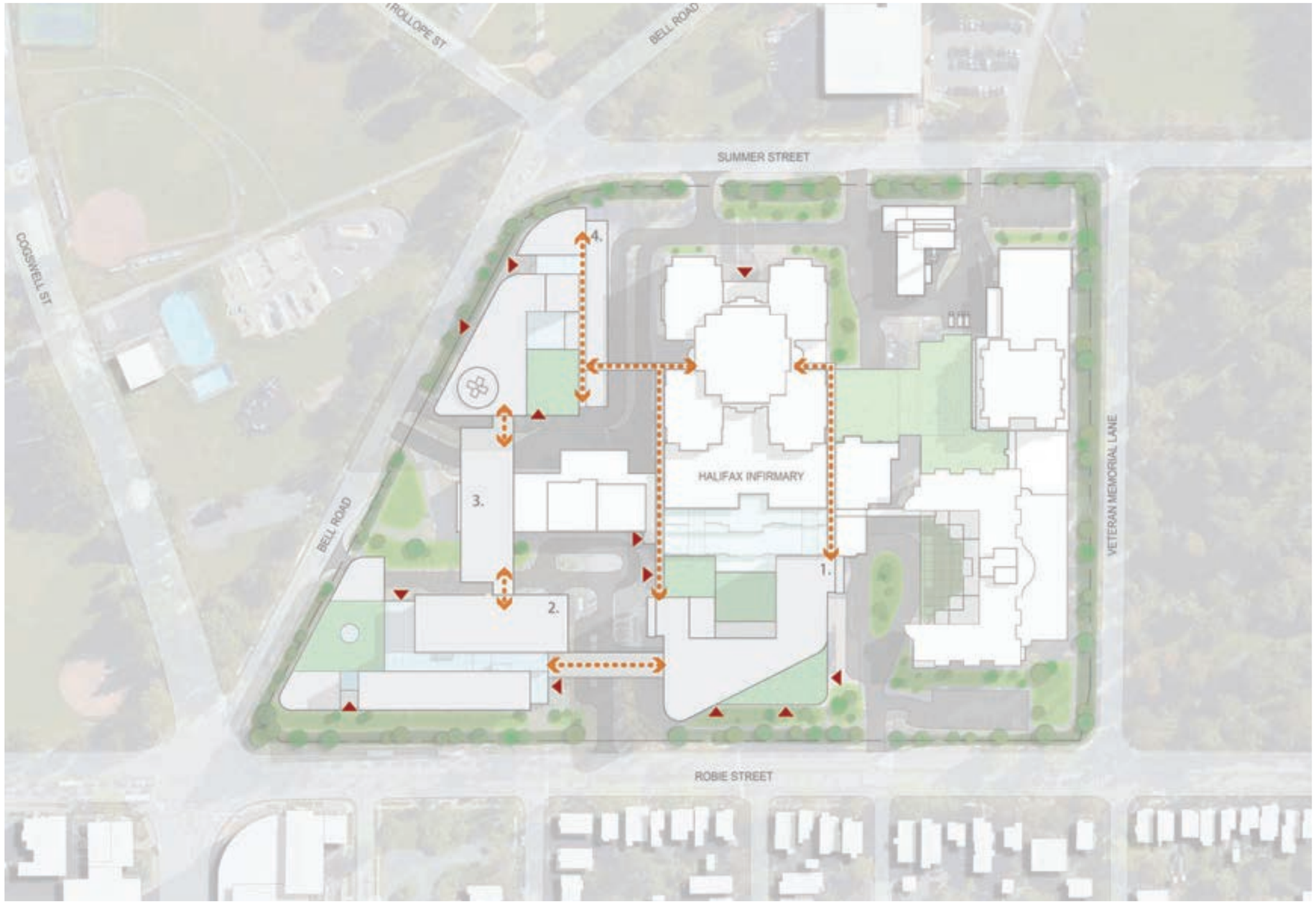
Pedestrian Circulation/Entrances

- Pedestrian Entrance
- Internal Circulation / Links

Views/Solar Diagram

- Views to Halifax Commons
- Solar Optimization

N



3.2 The Beacon Concept

3.2.1 Site Plan: Traffic

1. New Inpatient/OR Building
2. New Ambulatory Building
3. New Centre for Research and Innovation
4. New Cancer Care Building

Green Space

- Buffer Zone
- Green Space
- Roof Terraces / Healing Spaces
- VMB Veterans Garden to be reduced and enhanced

Vehicular Circulation/Entrances

- Vehicular Entrance
- Service / Parking Entrance
- Driveway
- Signalled Intersection
- Bus Stop

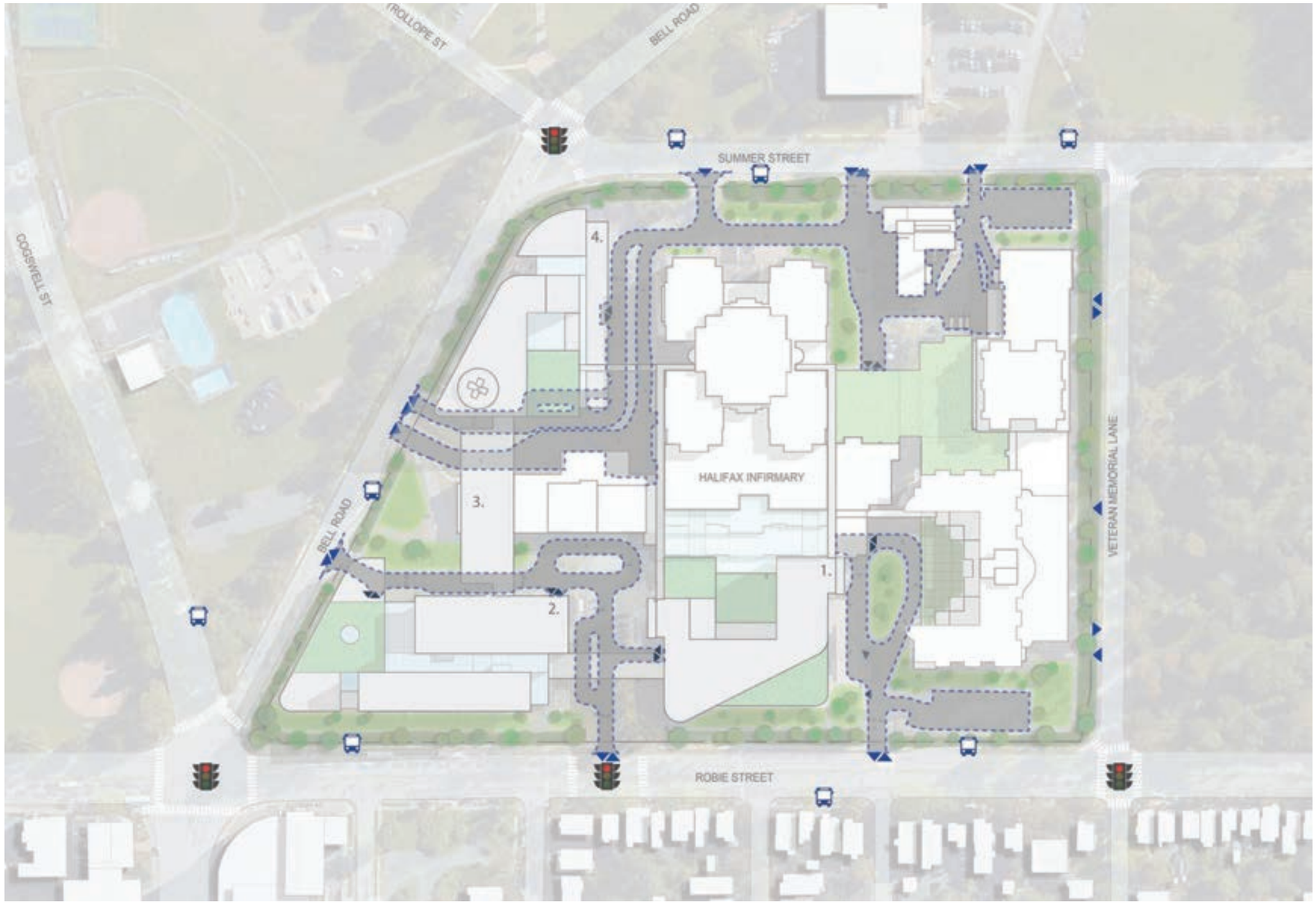
Pedestrian Circulation/Entrances

- Pedestrian Entrance
- Internal Circulation / Links

Views/Solar Diagram

- Views to Halifax Commons
- Solar Optimization

N



1. New Inpatient/OR Building
2. New Ambulatory Building
3. New Centre for Research and Innovation
4. New Cancer Care Building

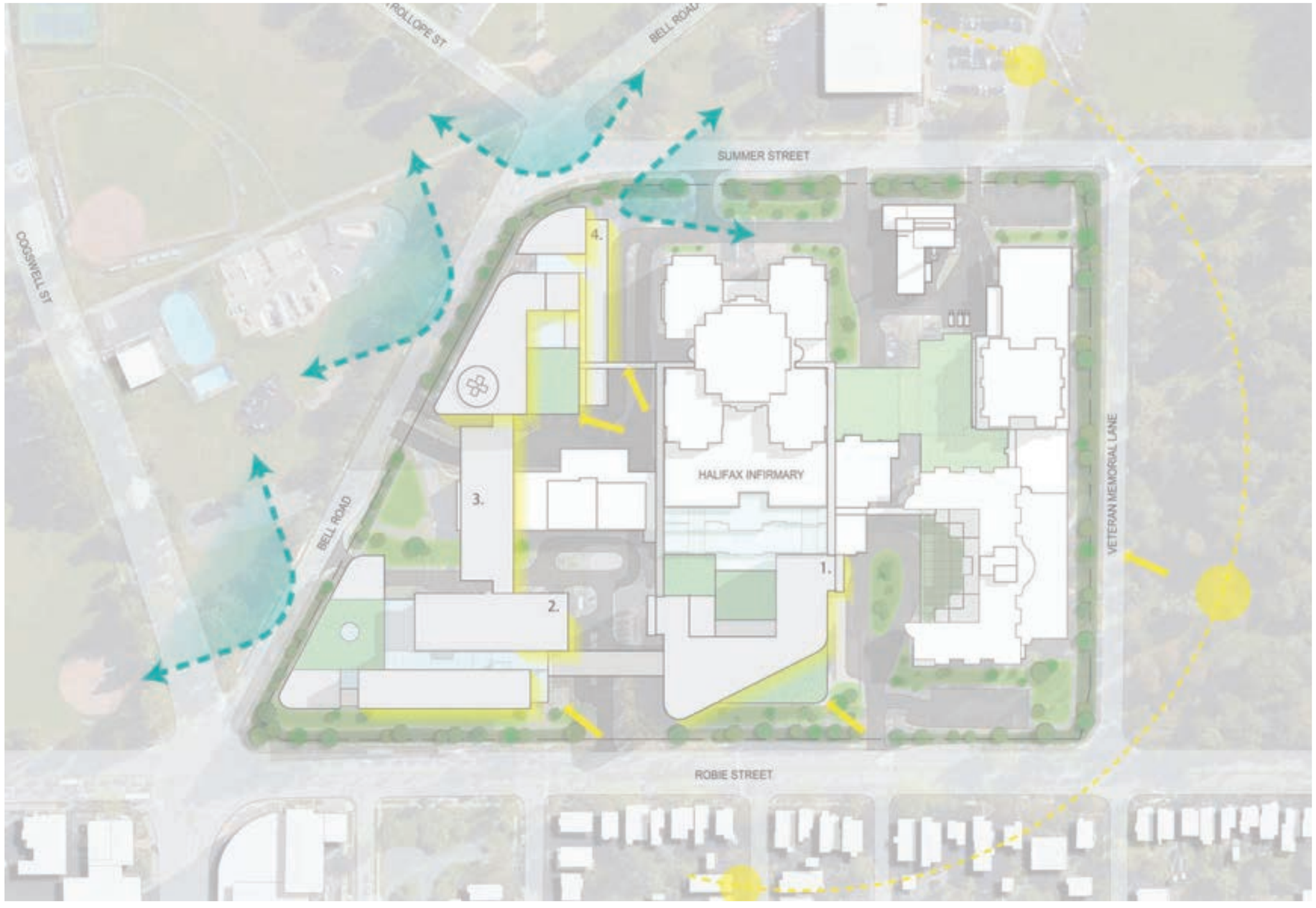
Green Space
- Buffer Zone
- Green Space
- Roof Terraces / Healing Spaces
- VMB Veterans Garden to be reduced and enhanced

Vehicular Circulation/Entrances
- Vehicular Entrance
- Service / Parking Entrance
- Driveway
- Signalled Intersection
- Bus Stop

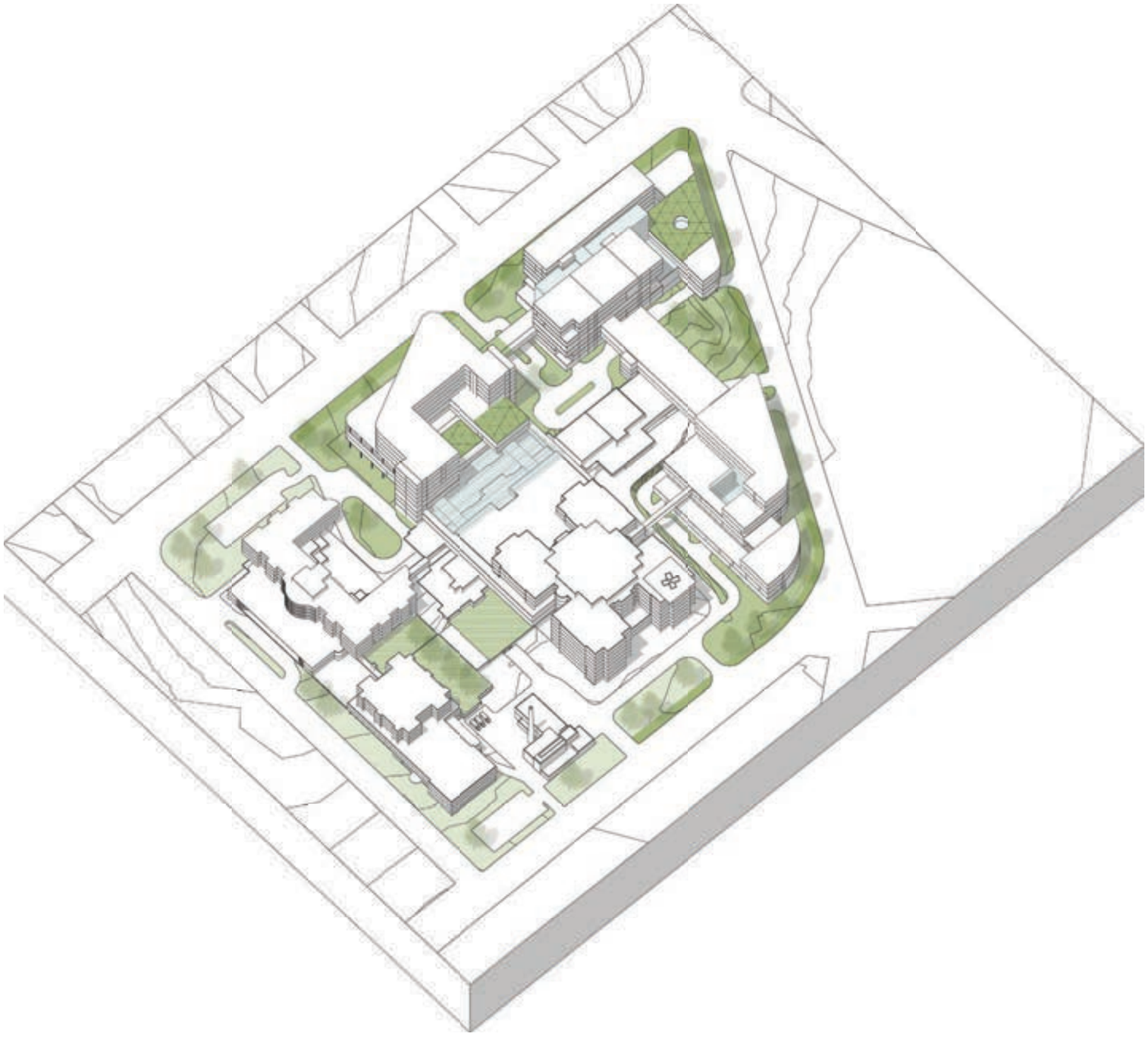
Pedestrian Circulation/Entrances
- Pedestrian Entrance
- Internal Circulation / Links

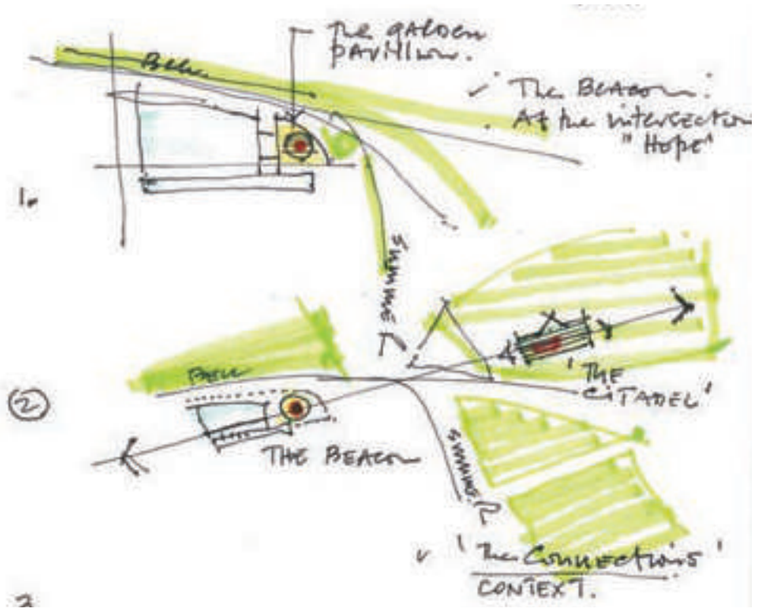
Views/Solar Diagram
- Views to Halifax Commons
- Solar Optimization

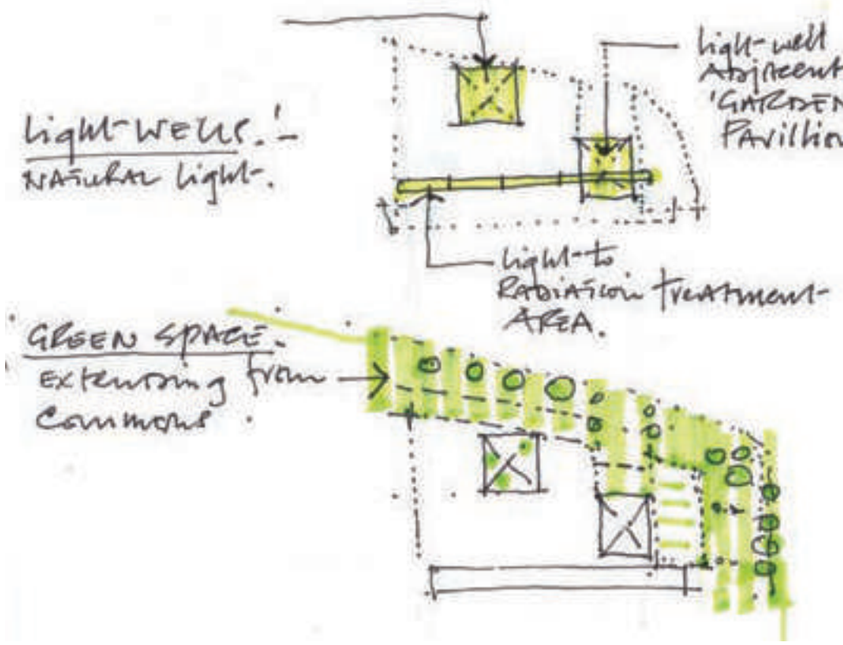
N

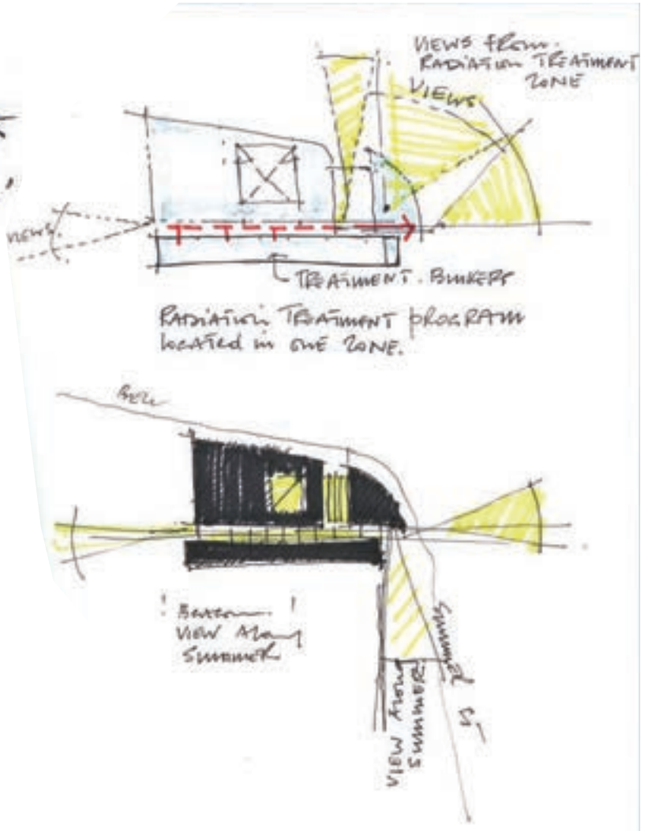


3.2 The Beacon Concept
3.2.2 Green Space

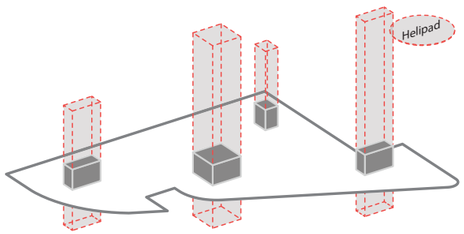



The Garden Pavilion.
'The Beacon'
At the intersection
"Hope"
Bell
Sunnyside
'The Citadel'
The Beach
Sunnyside
'The Connections'
Context.

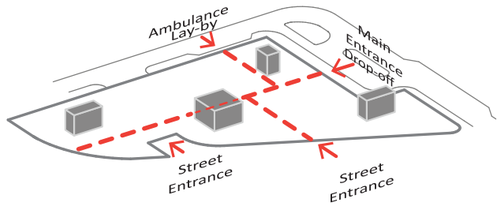

Light-wells.
Natural light.
light-well
Adjacent to
'Garden
Pavilion'
light-to
Radiation treatment-
Area.
Green space.
Extending from
Common


Views from
Radiation Treatment
Zone
Views
Treatment. Bunkers
Radiation Treatment program
located in one zone.
Bell
Bottom
View along
Sunnyside
Sunnyside
View along
Sunnyside

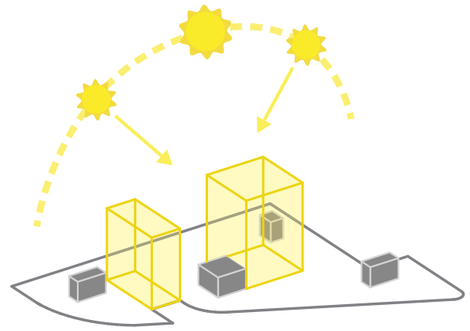
3.2 The Beacon Concept
3.2.3 Concept, Stacking and 3D Massing - Cancer Care Building



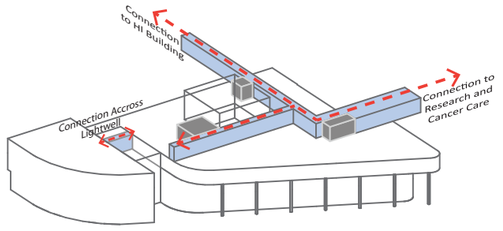
Core Distribution
- Strategically located



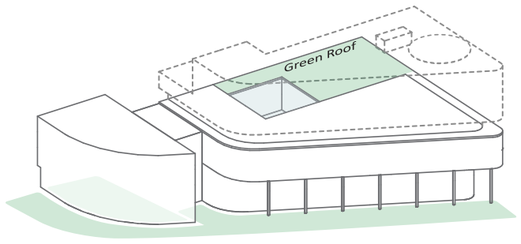
Accessibility
- Direct access from drop-off
- Access for ambulance lay-by
- Street entrances



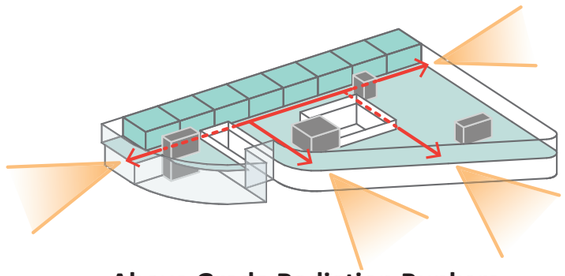
Lightwells
- Natural light source
- Wayfinding



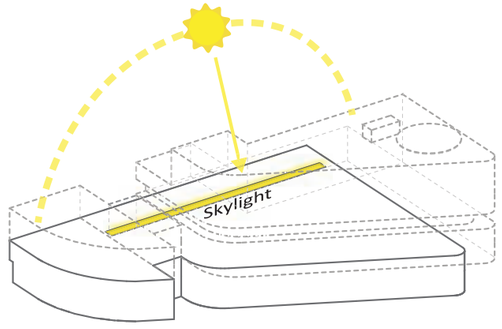
Integration - Bridge Connections
- Connection to HI building
- Connection to Research and Innovation Centre



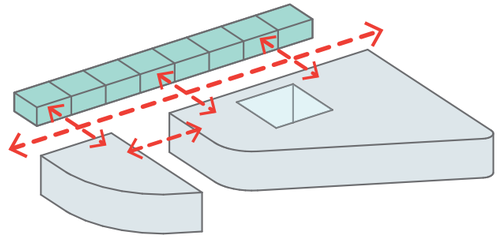
Green Space and Visual Connections
- Green roof adjacent to treatment spaces
- Edge condition - extension of Halifax Commons
- Views to the Citadel and Commons



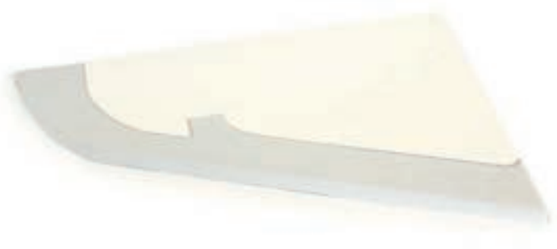
Above Grade Radiation Bunkers
- Views to exterior
- Connectivity to Commons and green space



Light-filled 'Inbetween Spaces'
- Natural light to radiation treatment zone



Connection of 'The Parts'
- The importance of 'inbetween spaces' in a healing environment



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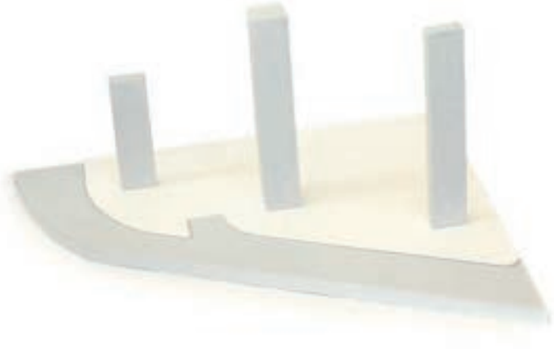

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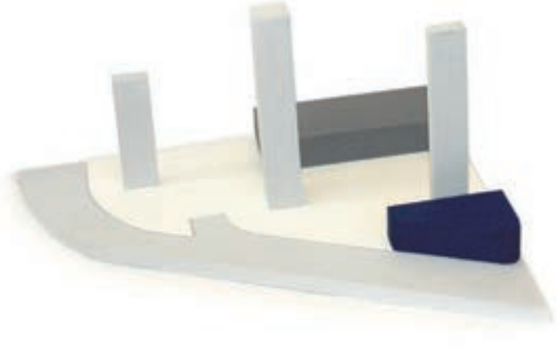

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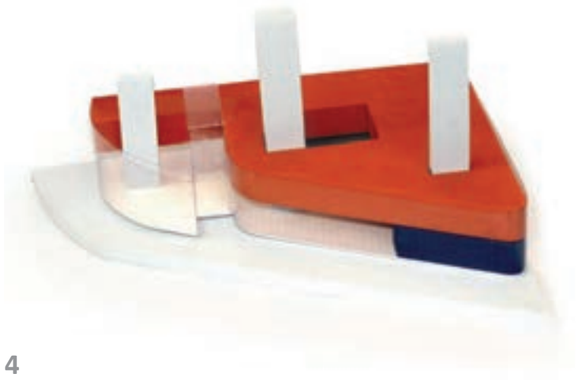

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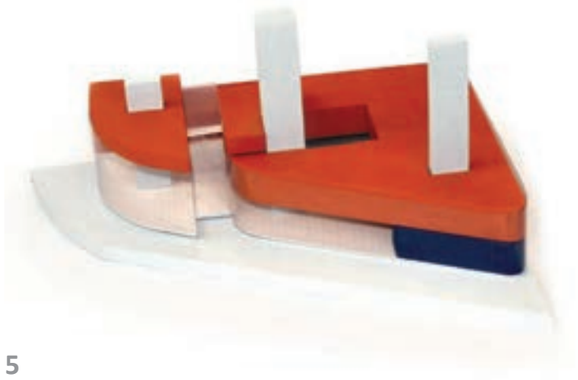

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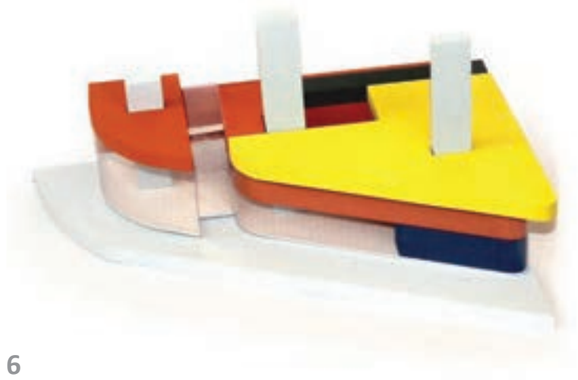

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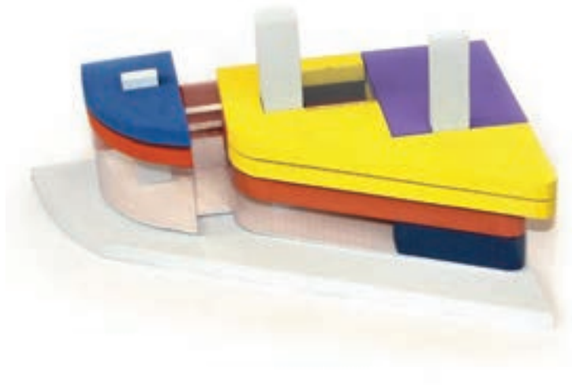
3.2 The Beacon Concept

3.2.3 Concept, Stacking and 3D Massing - Cancer Care Building



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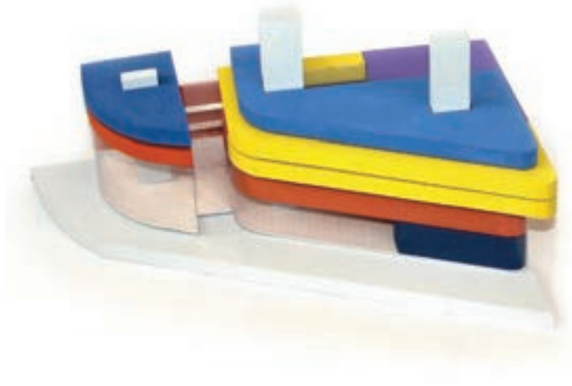

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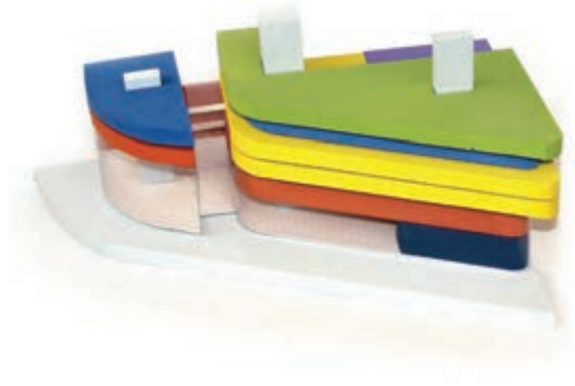

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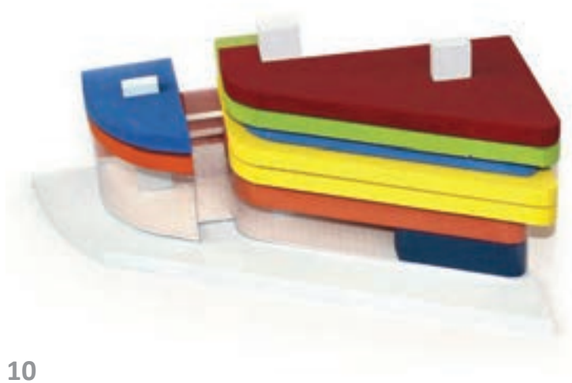

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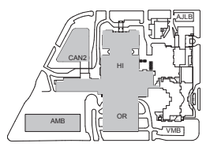
DGSF of Programs in Existing Halifax Infirmary HI

Categories	Department Name	Designed Area
Academic/Teaching	Academic/Teaching	12,146 SF
		12,146 SF
Administration	Academic Medical Staff/ Admin Services	55,032 SF
Administration	Corporate administration	10,475 SF
Administration	Foundation/ volunteers and auxiliary support	429 SF
Administration	Medical offices	17,166 SF
		83,102 SF
Ambulatory Care	Dialysis	8,010 SF
		8,010 SF
Clinical Support	Ancillary	1,736 SF
Clinical Support	Emergency	48,365 SF
Clinical Support	Laboratory	13,889 SF
Clinical Support	Pharmacy	9,648 SF
		73,638 SF
Diagnostic Imaging	Diagnostic Imaging	43,789 SF
		43,789 SF
External Agency	External Agency	1,544 SF
		1,544 SF
Inpatient Unit	Critical Care	79,770 SF
Inpatient Unit	Medical/Surgical Units	113,822 SF
		193,593 SF
Perioperative Services	Perioperative Services	49,662 SF
		49,662 SF
Research	Research	11,542 SF
		11,542 SF
Retail	Retail	6,532 SF
		6,532 SF
Support Services	Bio Med Engineering	6,205 SF
Support Services	Facility management	1,531 SF
Support Services	Food Services	13,068 SF
Support Services	Health information/ service registration	2,612 SF
Support Services	IT	589 SF
Support Services	M+E	75,147 SF
Support Services	MDR	19,211 SF
Support Services	Security	939 SF
Support Services	Staff services (lockers etc)	11,858 SF
Support Services	Supply chain (warehouse), procurement	4,142 SF
		135,301 SF
Total DGSF		**618,857 SF**
Existing Gross Builidng Area		**± 744,000 SF**



KEY PLAN- HALIFAX INFIRMARY SITE

DGSF of THE BEACON - Inpatient/OR

Categories	Department Name	Designed Area	AP Program
Amenities	Amenities	16,004 SF	
		16,004 SF	
Building Support	M+E	44,912 SF	
		44,912 SF	
Inpatient Unit	Critical Care	45,965 SF	39,904 (36 beds)
Inpatient Unit	Medical/Surgical Units	155,249 SF	149,930
		201,214 SF	
Perioperative Services	Surgical Suite	56,641 SF	52,365
		56,641 SF	
Support Services	MDR	1,277 SF	20,860
Support Services	Shipping & Receiving	11,728 SF	
		13,005 SF	
Total DGSF		**331,776 SF**	

The topographical nature of the Halifax Infirmary site resulted in unique building levels for each proposed building. For ease of reading, the following department plans use the universal levels of the HI site. The adjacent diagram illustrates the parking levels for each of the proposed Beacon buildings.

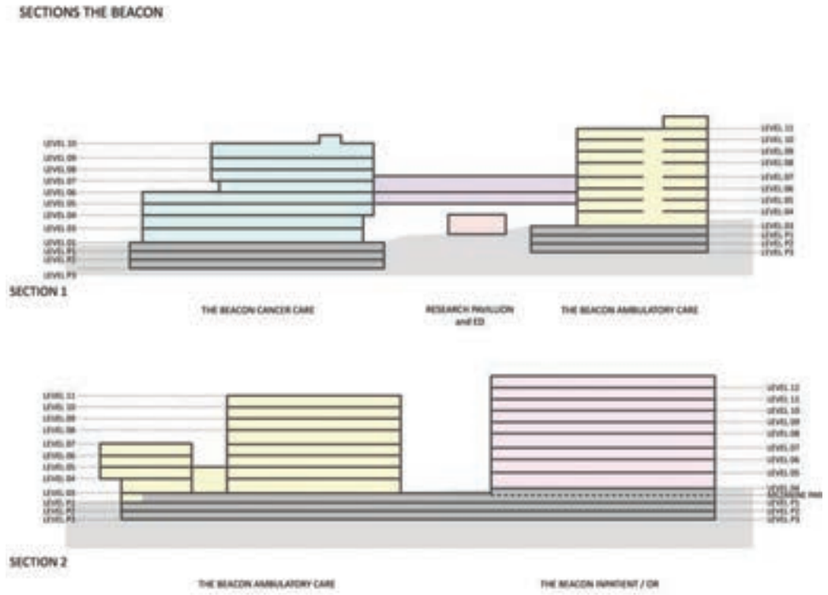
Gross Building Area of THE BEACON - Inpatient/OR

Categories	Designed Area
Amenities	16,004 SF
Building Support	44,912 SF
Inpatient Unit	201,214 SF
Perioperative Services	56,641 SF
Public	66,578 SF
Support Services	13,005 SF
Vertical Circulation	30,130 SF
Gross Building Area	**428,484 SF**
GROSSING FACTOR X 10% for Building Envelope	42,848 SF
GFA	**471,332 SF**

Gross Building Area of THE BEACON - Inpatient/OR - Parking

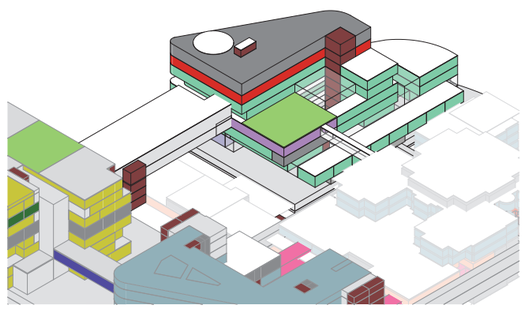
Categories	Department Name	Designed Area
Public	Parking	200,760 SF

4 TOTAL LEVELS OF PARKING
(2 LEVEL TO BEDROCK)



3.2 The Beacon Concept

3.2.4 Department Plans: Statistics



THE BEACON CANCER CARE - OVERALL 3D

DGSF of THE BEACON - Cancer Care

Categories	Department Name	Designed Area	AP Program
Administration	Administration Shortfall in HI	20,789 SF	TBD ~ 17,500 DGSF
		20,789 SF	
Amenities	Cafe	4,596 SF	
		4,596 SF	
Building Support	M+E	22,765 SF	
		22,765 SF	
Cancer Care	Administration and General Services	23,888 SF	24,156 DGSF
Cancer Care	Outpatient Clinics & Affiliated Services	41,509 SF	43,557 DGSF
Cancer Care	Radiation Treatment Program	44,015 SF	44,484 DGSF
Cancer Care	Systemic Oncology	24,598 SF	24,427 DGSF
		134,009 SF	
Research	Research	10,971 SF	TBD
		10,971 SF	
Support Services	Support Services	7,979 SF	
		7,979 SF	
Total DGSF		**201,110 SF**	

DGSF of THE BEACON - Ambulatory (AMB)

Categories	Department Name	Designed Area	AP Program
Ambulatory Care	Ambulatory Clinic	120,079 SF	128,530
Ambulatory Care	Ambulatory Procedure Unit	34,359 SF	35,025
Ambulatory Care	Dialysis	29,429 SF	30,230
Ambulatory Care	Eye Centre	42,527 SF	42,055
Ambulatory Care	Heart Health	48,602 SF	47,950
Ambulatory Care	Hyperbaric Medicine	8,754 SF	8,640
Ambulatory Care	Medical Day Care	9,784 SF	10,285
Ambulatory Care	Outpatient Specimen Collection	4,047 SF	4675
		297,581 SF	
Amenities	Amenities	5,001 SF	
Amenities	Cafeteria	4,902 SF	
		9,903 SF	
Building Support	M + E	39,246 SF	
		39,246 SF	
Diagnostic Imaging	Diagnostic Imaging	14,609 SF	14,003
		14,609 SF	
Support Services	Bio Med Engineering	971 SF	
Support Services	MDR	484 SF	
		1,456 SF	
Total DGSF		**362,795 SF**	

DGSF of THE BEACON - Research and Innovation Centre (RES)

Categories	Department Name	Designed Area	AP Program
Research	Research	24,136 SF	34,430 SF
		24,136 SF	
Total DGSF		**24,136 SF**	

Gross Building Area of THE BEACON - Cancer care

Categories	Designed Area
Administration	20,789 SF
Amenities	4,596 SF
Building Support	22,765 SF
Cancer Care	134,009 SF
Public	44,733 SF
Research	10,971 SF
Support Services	7,979 SF
Vertical Circulation	18,460 SF
Gross Building Area	**264,303 SF**
GROSSING FACTOR X 10% for Building Envelope	26,430 SF
GFA	**290,733 SF**

Gross Building Area of THE BEACON - Cancer Care - Parking

Categories	Department Name	Designed Area
Public	Parking	210,533 SF

3 TOTAL LEVELS OF PARKING
(1 LEVEL TO BEDROCK)

Gross Building Area of THE BEACON - Ambulatory (AMB)

Categories	Designed Area
Ambulatory Care	297,581 SF
Amenities	9,903 SF
Building Support	39,246 SF
Diagnostic Imaging	14,609 SF
Public	57,520 SF
Support Services	1,456 SF
Vertical Circulation	26,202 SF
Gross Building Area	**446,517 SF**
GROSSING FACTOR X 10% for Building Envelope	44,652 SF
GFA	**491,169 SF**

Gross Building Area of THE BEACON - Ambulatory - Parking

Categories	Department Name	Designed Area
Public	Parking	311,945 SF

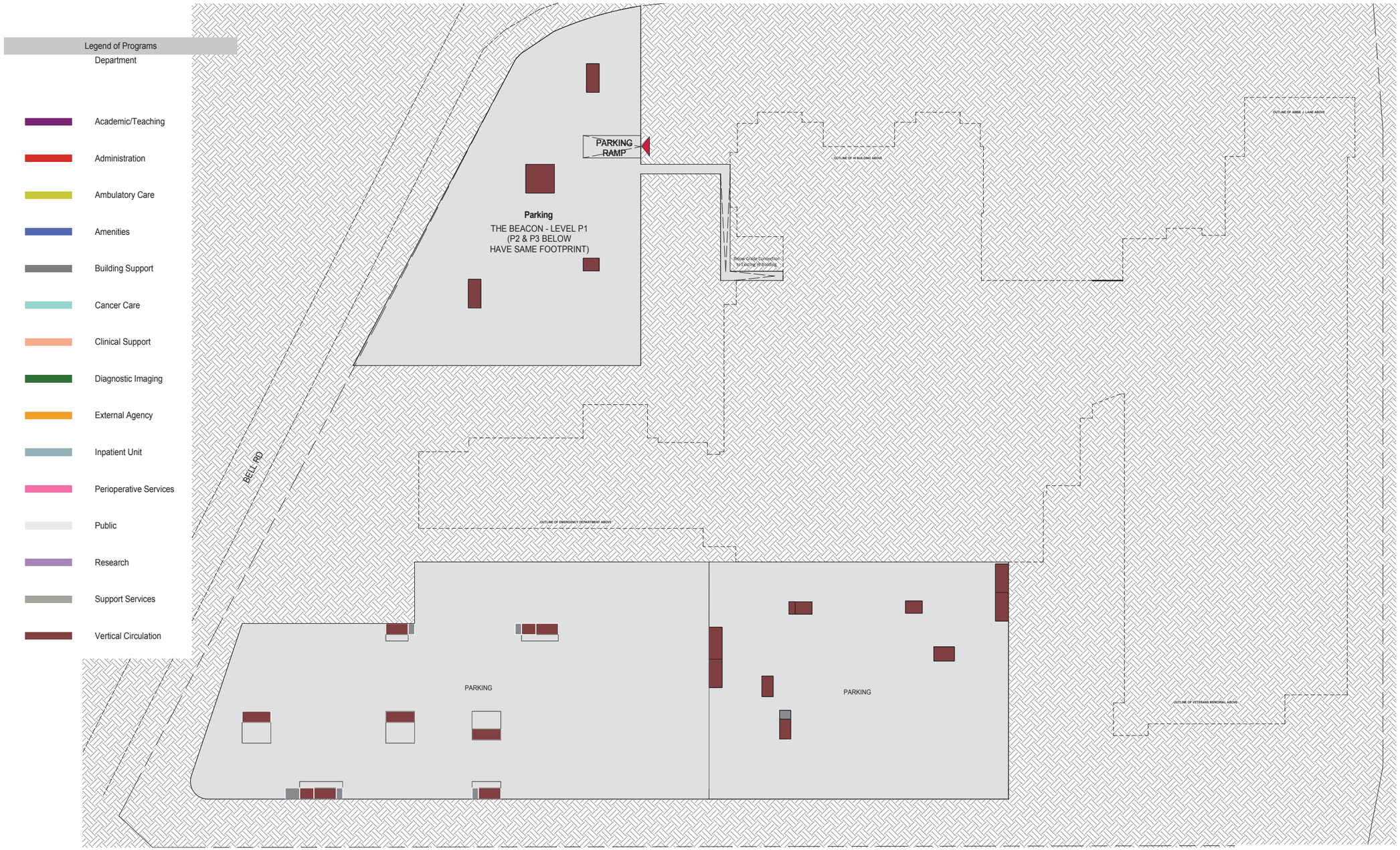
3 TOTAL LEVELS OF PARKING
(1.5 LEVELS TO BEDROCK)

Gross Building Area of THE BEACON - Research and Innovation Centre (RES)

Categories	Designed Area
Public	13,691 SF
Research	24,136 SF
Vertical Circulation	1,995 SF
Gross Building Area	**39,822 SF**
GROSSING FACTOR X 10% for Building Envelope	3,982 SF
GFA	**43,804 SF**

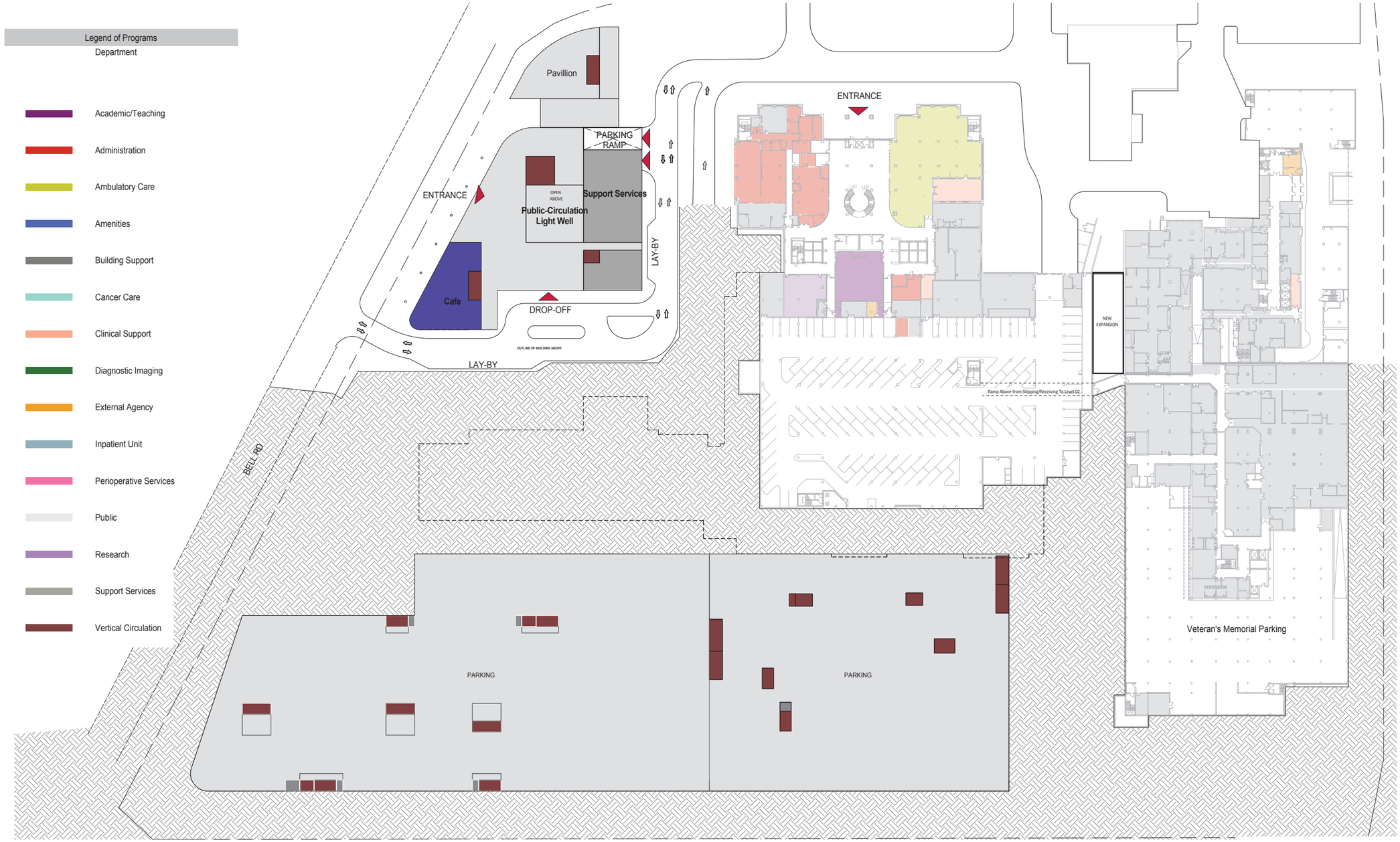
3.2 The Beacon Concept

3.2.4 Department Plans: Level P1



3.2 The Beacon Concept

3.2.4 Department Plans: Level 01



3.2 The Beacon Concept
3.2.4 Department Plans: Level 03

Legend of Programs

Department

- Academic/Teaching
- Administration
- Ambulatory Care
- Amenities
- Building Support
- Cancer Care
- Clinical Support
- Diagnostic Imaging
- External Agency
- Inpatient Unit
- Perioperative Services
- Public
- Research
- Support Services
- Vertical Circulation

NOTE: For Cancer Care on CBC Site, level 1 is double height followed directly by level 3 to match the global HI Site levels.

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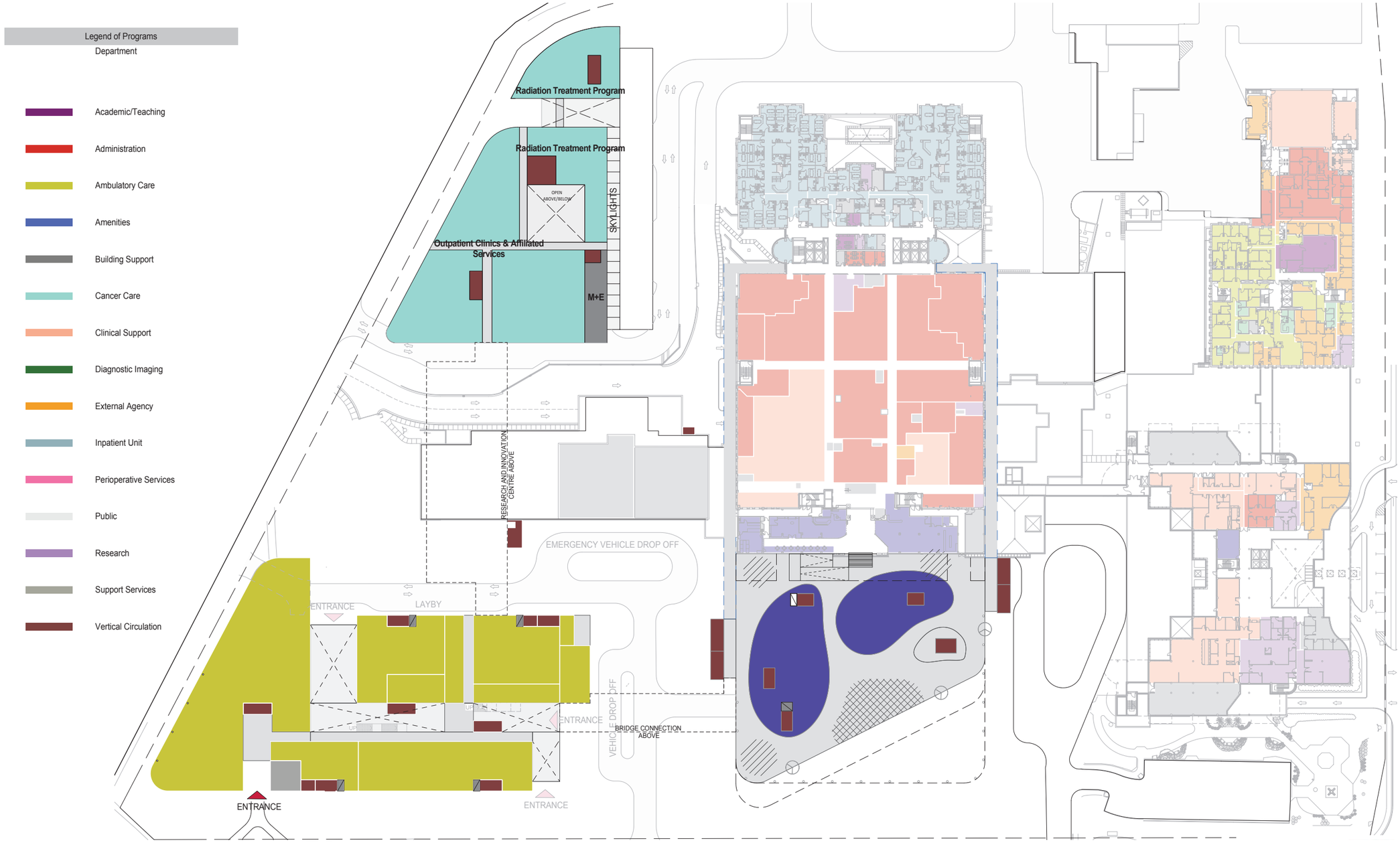
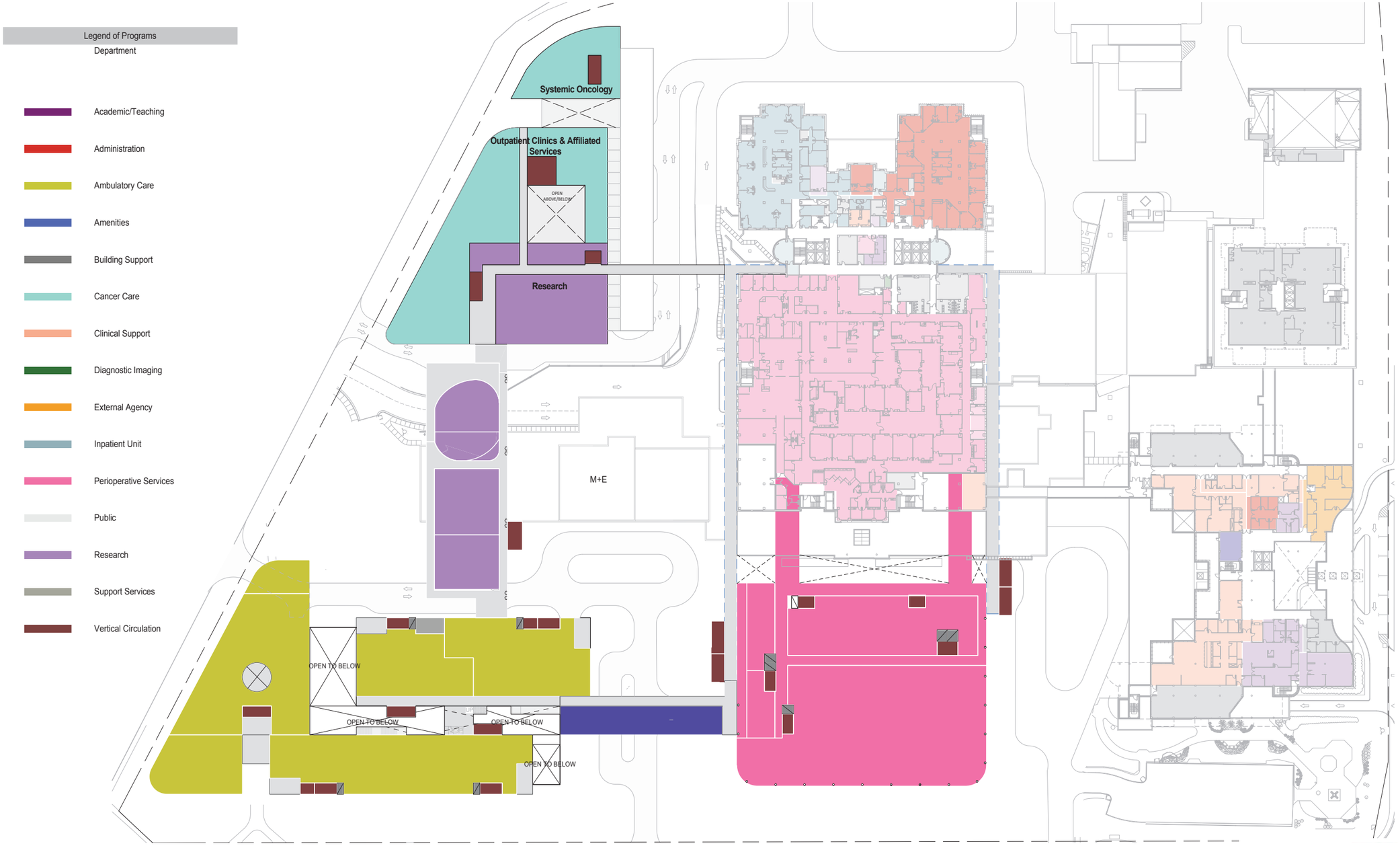
3.2 The Beacon Concept

3.2.4 Department Plans: Level 04



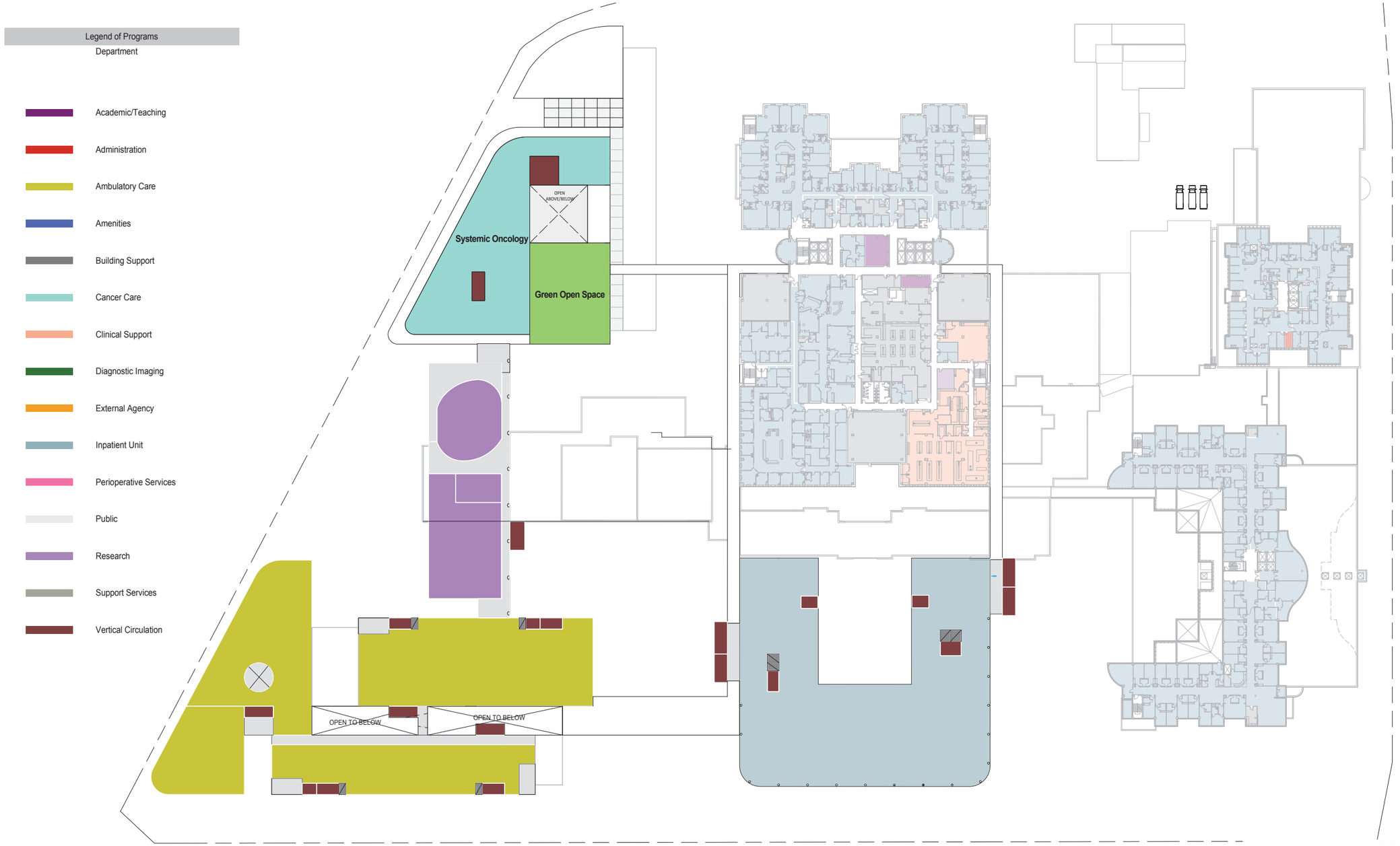
3.2 The Beacon Concept

3.2.4 Department Plans: Level 05



3.2 The Beacon Concept

3.2.4 Department Plans: Level 06



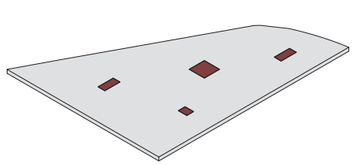
3.2 The Beacon Concept

3.2.4 Department Plans: Level 07

3.2 The Beacon Concept

3.2.4 Department Plans: Level 08

3.2 The Beacon Concept
3.2.4 Department Plans: Level 09



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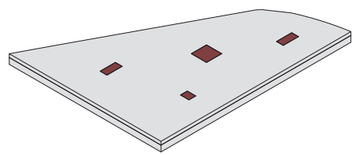
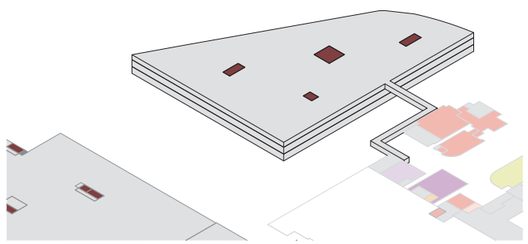
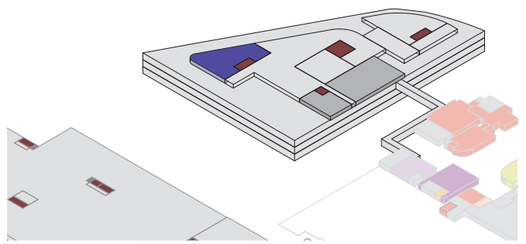


LEVEL P2



LEVEL P1



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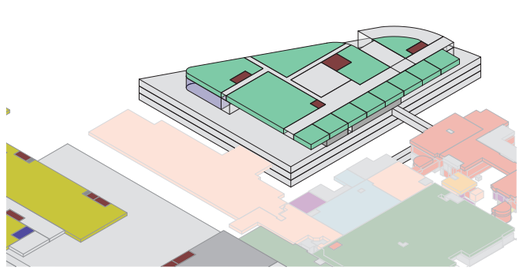

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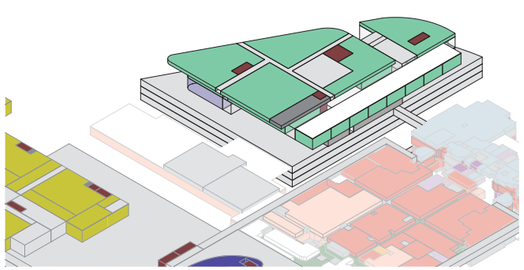

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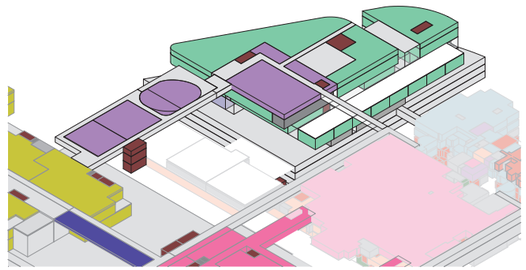

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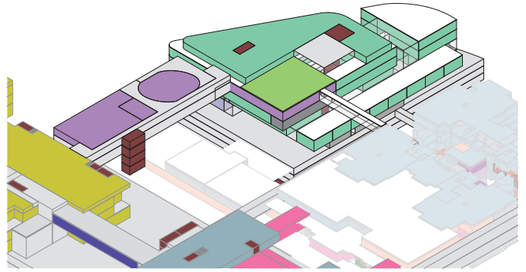

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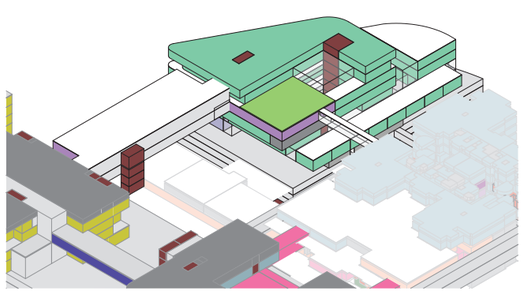

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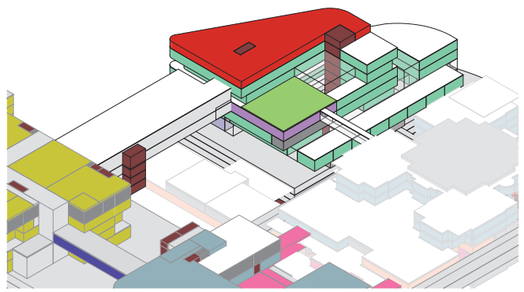

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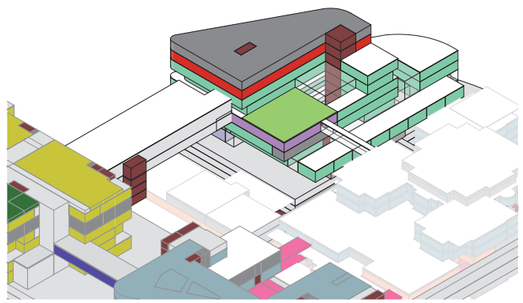


LEVEL 09

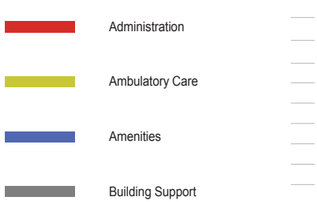
3.2 The Beacon Concept

3.2.4 Department Plans: Sections

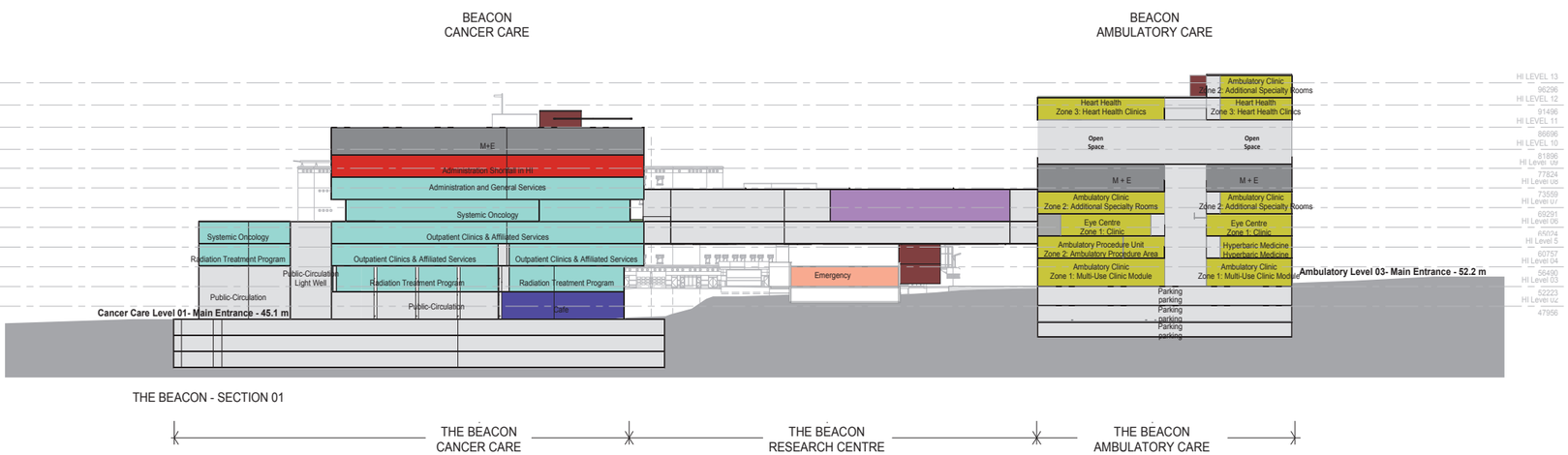
Legend of Programs

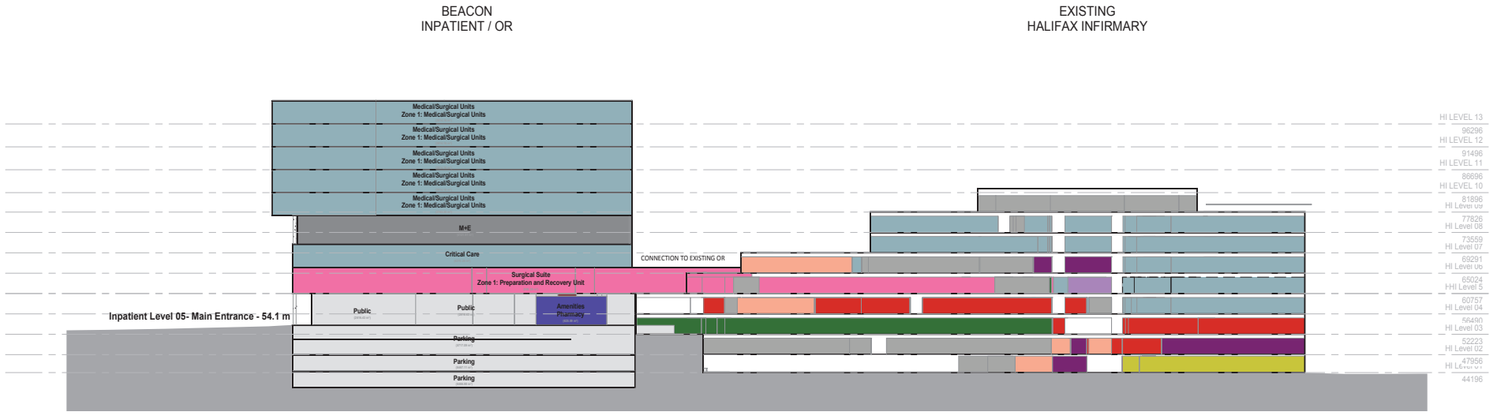
Department

- Academic/Teaching
- Administration
- Ambulatory Care
- Amenities
- Building Support
- Cancer Care
- Clinical Support
- Diagnostic Imaging
- External Agency
- Inpatient Unit
- Perioperative Services
- Public
- Research
- Support Services
- Vertical Circulation



AMB2 KEY PLAN





3.2 The Beacon Concept

3.2.4 Department Plans: Sections

Legend of Programs

Department

- Academic/Teaching
- Administration
- Ambulatory Care
- Amenities
- Building Support
- Cancer Care
- Clinical Support
- Diagnostic Imaging
- External Agency
- Inpatient Unit
- Perioperative Services
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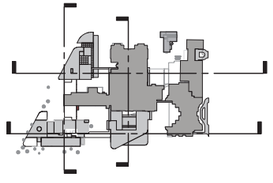
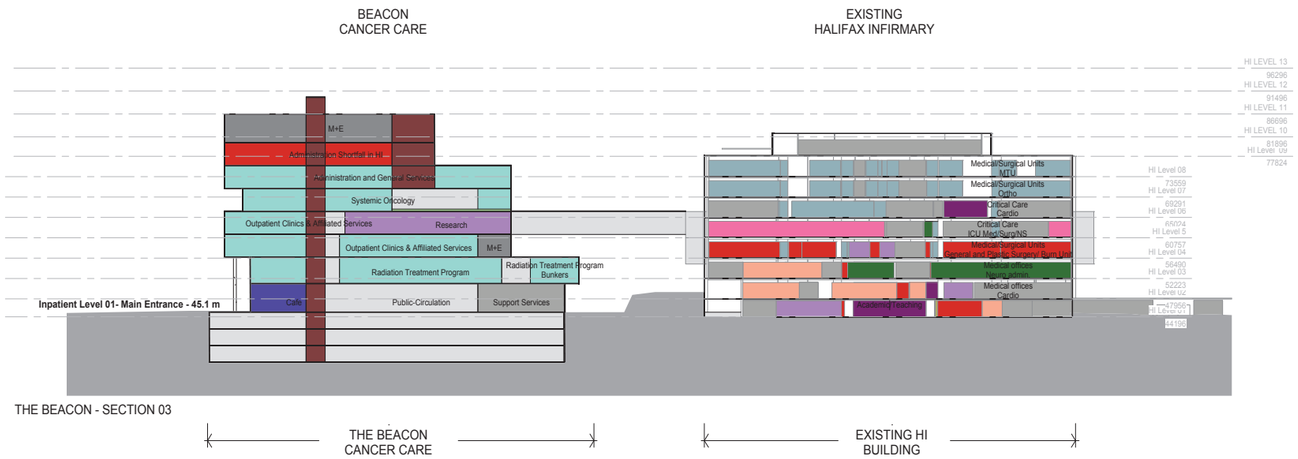
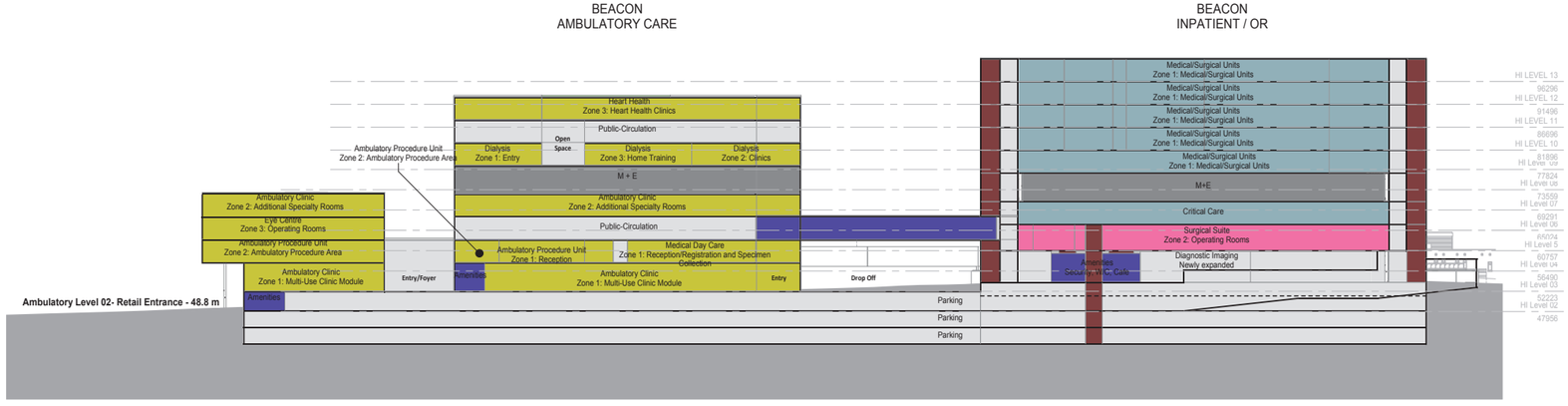
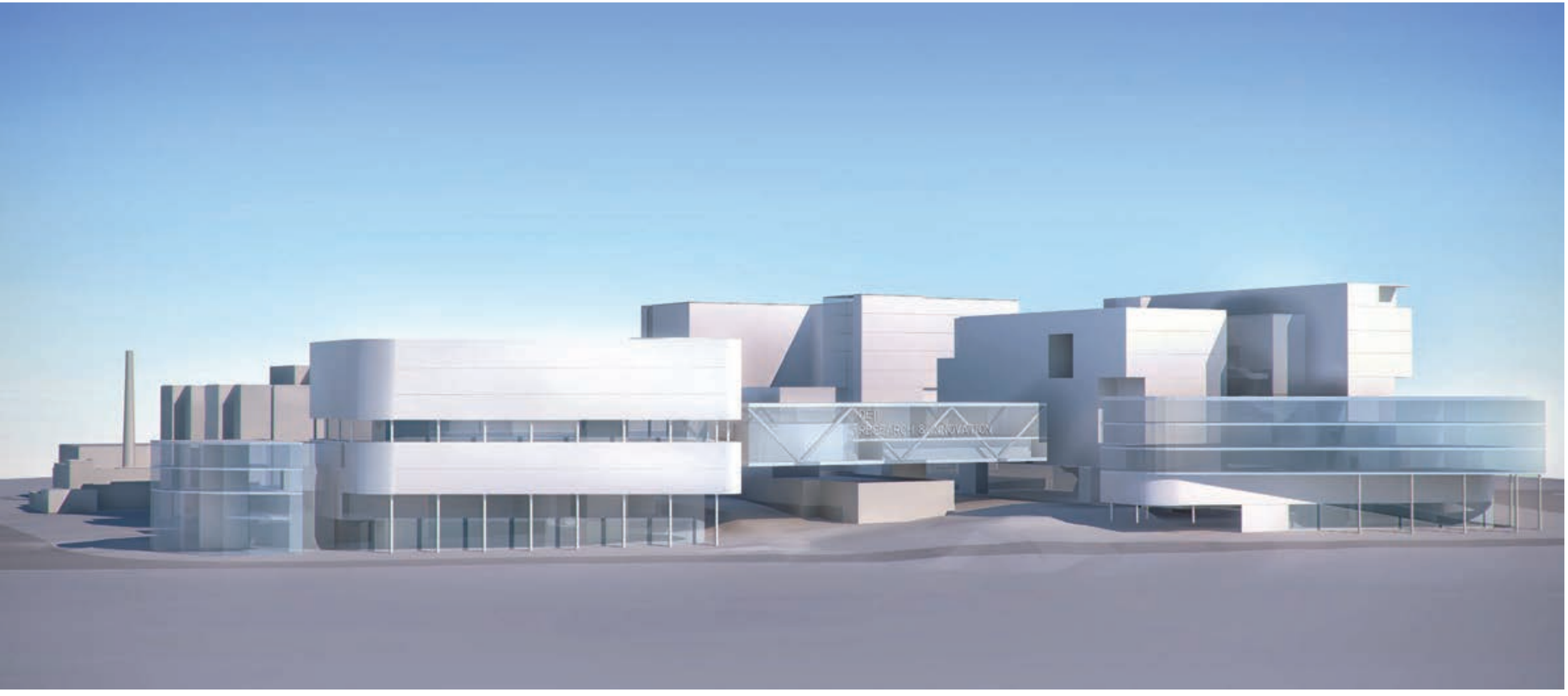
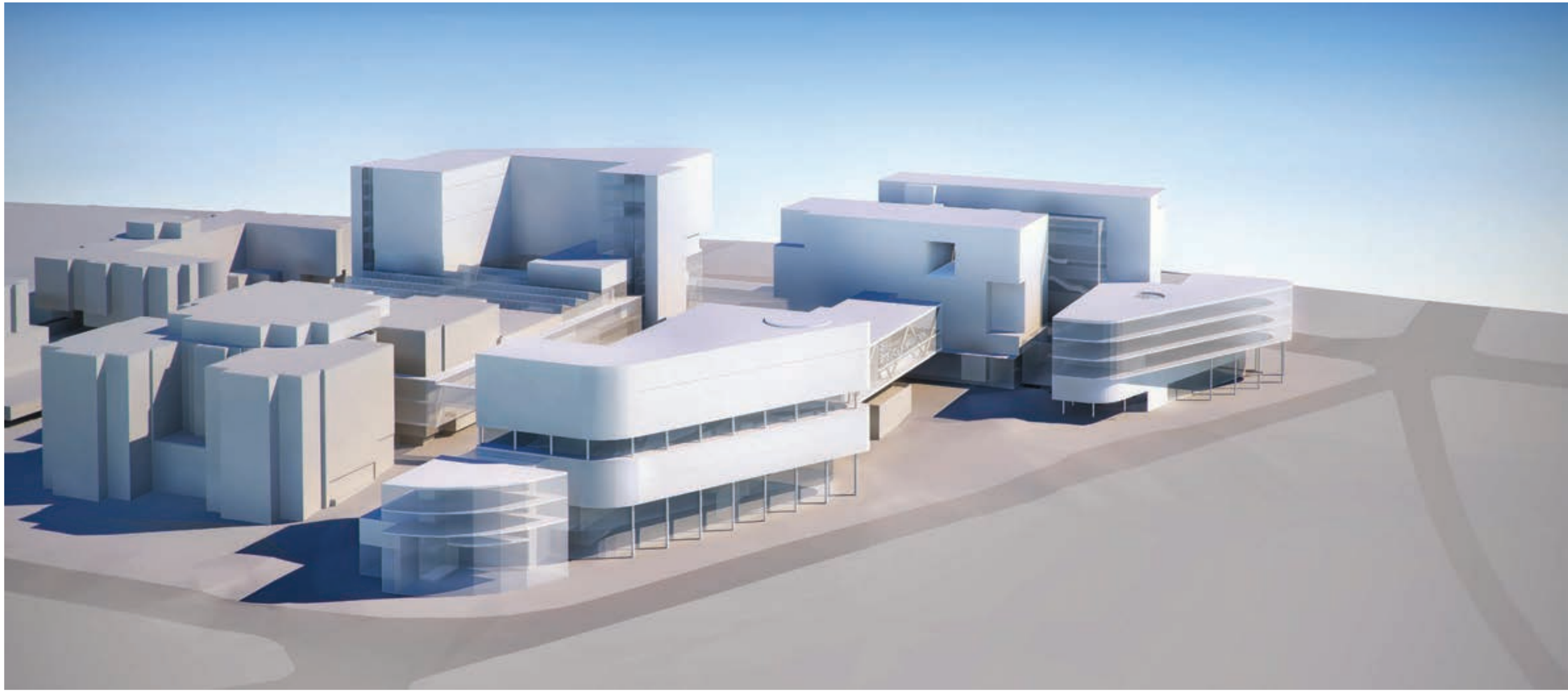
- Research
- Support Services
- Vertical Circulation











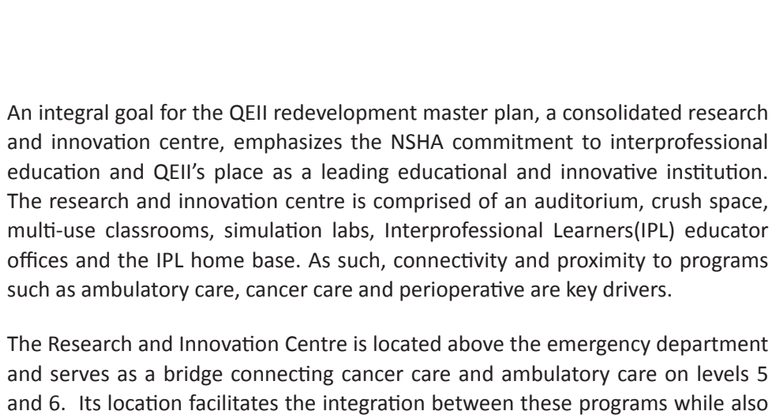
3.3 Research & Innovation

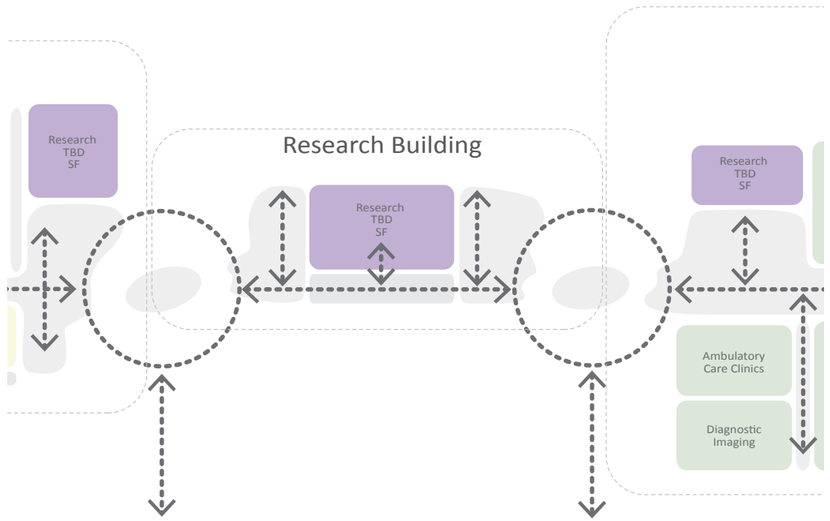
An integral goal for the QEII redevelopment master plan, a consolidated research and innovation centre, emphasizes the NSHA commitment to interprofessional education and QEII's place as a leading educational and innovative institution. The research and innovation centre is comprised of an auditorium, crush space, multi-use classrooms, simulation labs, Interprofessional Learners(IPL) educator offices and the IPL home base. As such, connectivity and proximity to programs such as ambulatory care, cancer care and perioperative are key drivers.

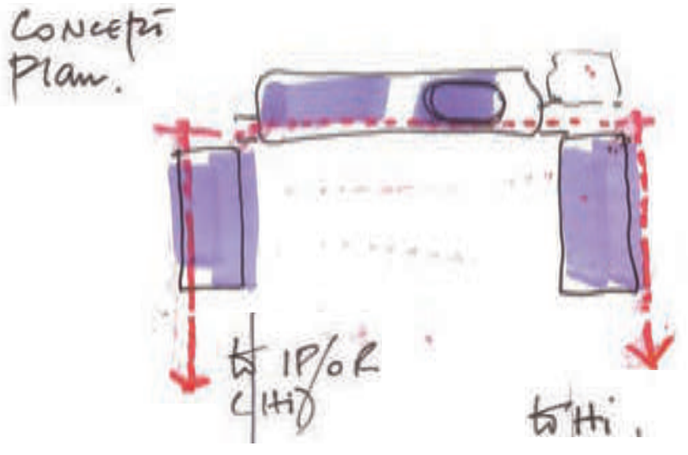
The Research and Innovation Centre is located above the emergency department and serves as a bridge connecting cancer care and ambulatory care on levels 5 and 6. Its location facilitates the integration between these programs while also providing a unique opportunity for visibility and signage along Bell street. This can be used to create a distinct identity for research and innovation within a cohesive and integrated scheme.

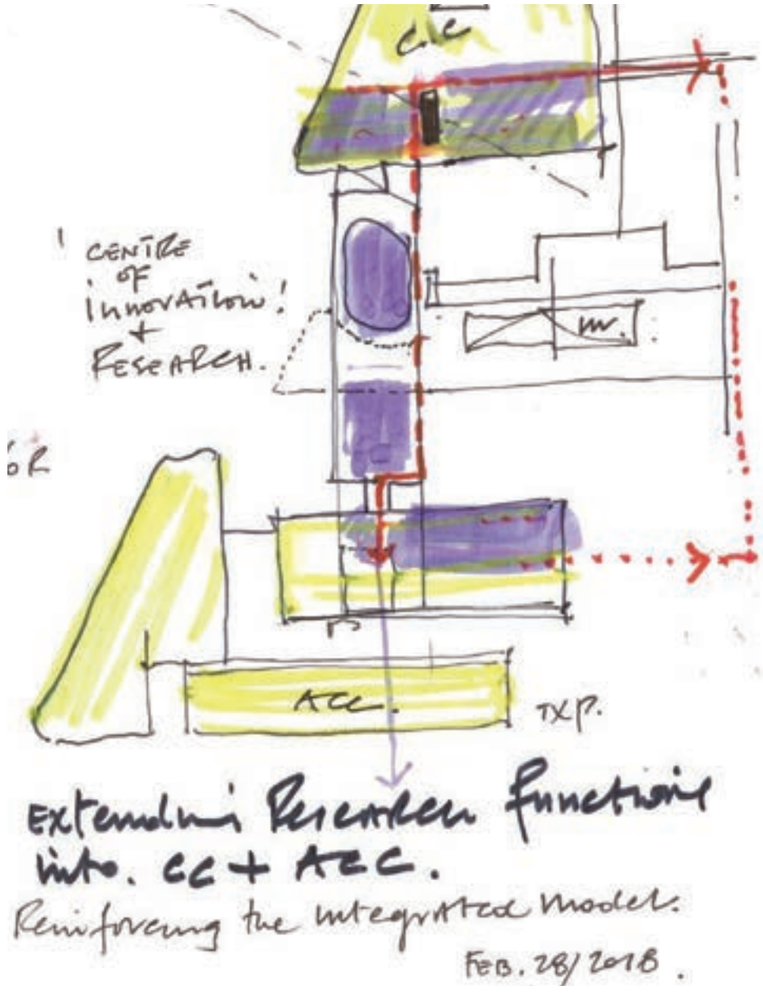
Maintaining its location, size and program components, the research and innovation centre's floor plan and layouts change slightly between the Garden Pavilion and The Beacon Concepts as it is analyzed in coordination with the cancer care centres, their ability to accommodate program and location of the connecting bridges denoting more public or more private transitions.

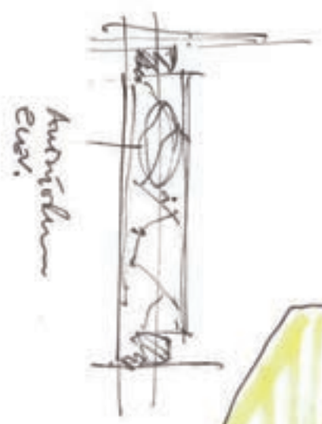
The following pages provide information into the flow, integration, preliminary sketches showing program allocations and finally department plans including the adjacent connections to cancer care and ambulatory care.

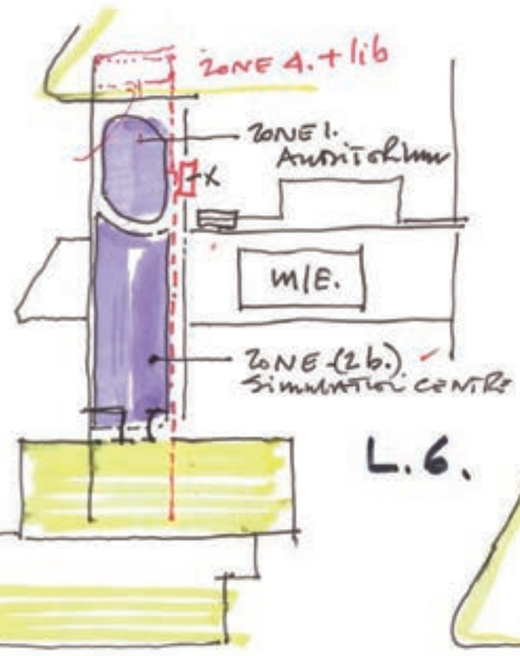


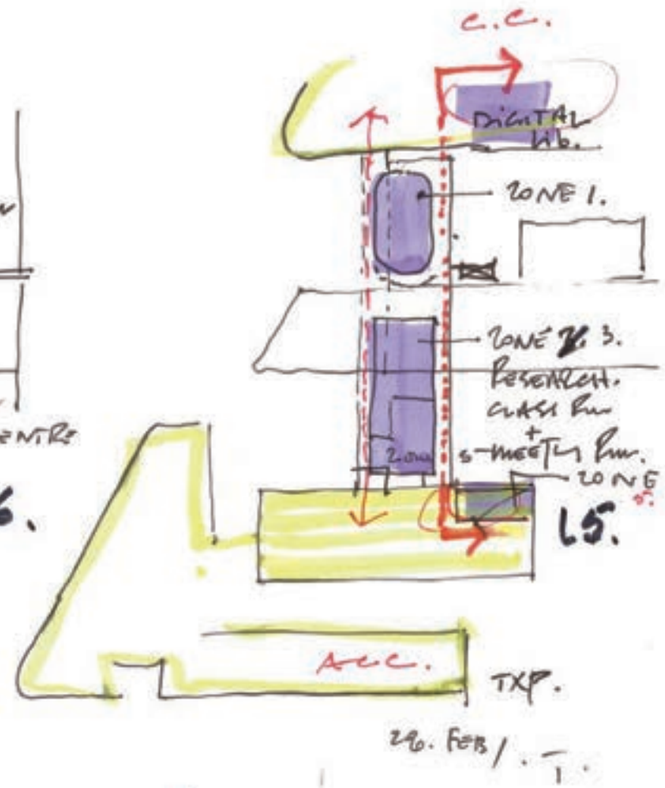





C.C.
CENTRE OF INNOVATION + RESEARCH.
M.
ACC.
TXP.
Extending Research functions into CC + ACC.
Reinforcing the integrated model.
FEB. 28/2018.


Auditorium
over.


ZONE 4.+ lib
ZONE 1.
AUDITORIUM
M/E.
ZONE (2b.)
SIMULATION CENTRE
L.6.


C.C.
DIGITAL lib.
ZONE 1.
ZONE 3.
RESEARCH.
CLASS Rm
+
MEETG Rm.
ZONE
L5.
ACC.
TXP.
29. FEB/

3.4 Integration, Connectivity and Wayfinding
Horizontal Integration: Garden Pavilion

The **horizontal integration diagrams** are a natural progression from the analytical flow diagrams produced to understand the patient flow patterns between programs.

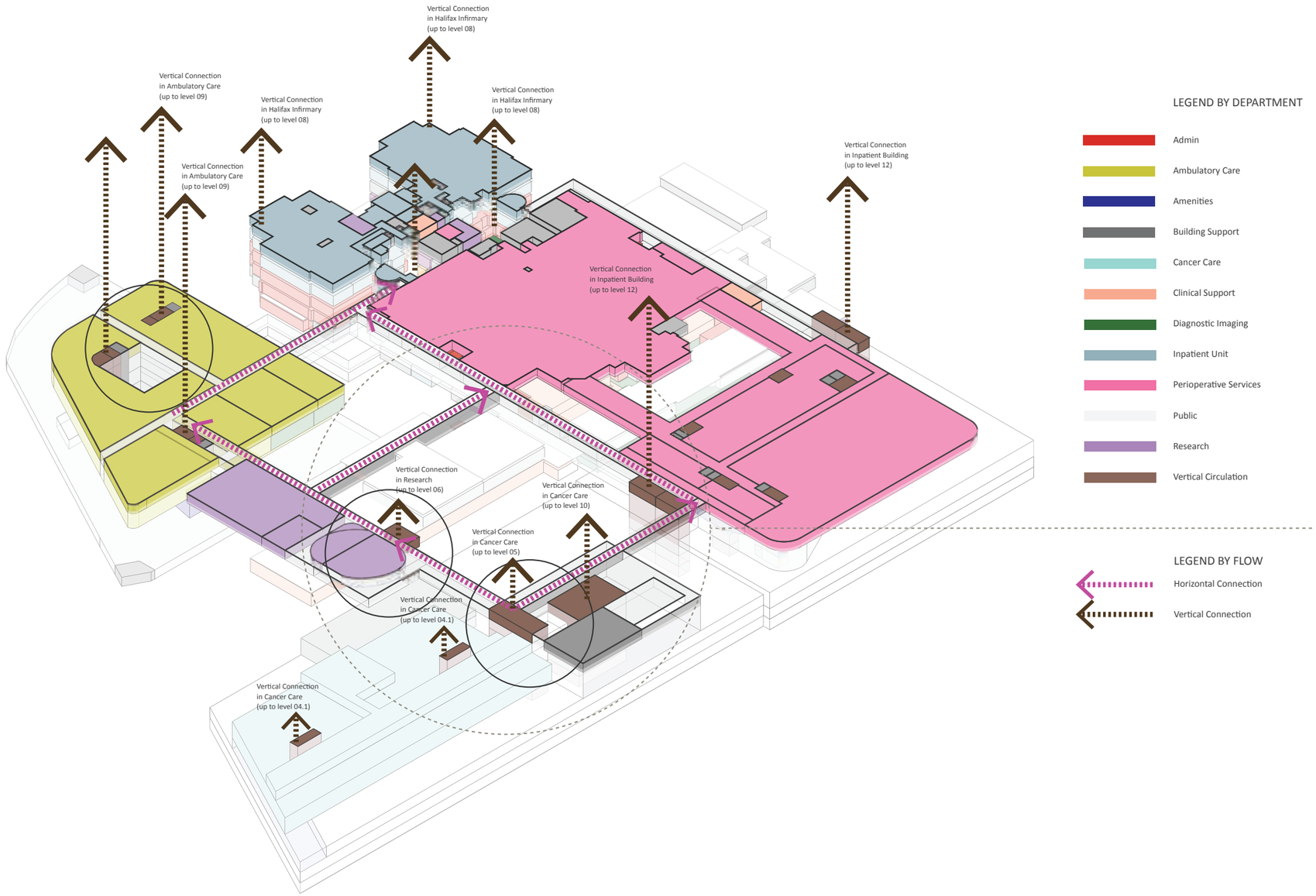
The purpose of integration diagrams is to demonstrate on a typical floor, in this case the fifth floor (perioperative) of the existing HI building the horizontal connectivity between the parts. Interrelated are the vertical connections that are also illustrated. Pages 160 - 161 illustrate the horizontal integration for the Garden Pavilion, while pages 162 - 163 represent the horizontal integration for The Beacon.

The diagram demonstrates that there is a closed loop connection between the proposed cancer centre / IP/OR building/ the existing HI / the proposed ambulatory care building and the research and education component.

It is proposed that it is essential that each of these connections be explored further in the next phase of the work. As we zoom into details the flow for patients, staff, materials and visitors will be detailed.

One of the key drivers and principles in the design thinking is wayfinding, it is a key element in generating the concepts. The objective in clear wayfinding is to ensure that no unnecessary stresses are imposed on patients, visitors and staff as they navigate the corridors within the hospital. The **connectors** incorporated into the design are also key elements in way finding, in most of cases these are incorporated to the exterior or building and on the edge of the structures, they inform the individuals moving between buildings where they are in time, space and the city context.

The “concept of legibility” is introduced into the design and is defined as the ease in which people understand the layout of the place.



Garden Pavilion Overall Plan - Level 05 Horizontal integration

3.4 Integration, Connectivity and Wayfinding

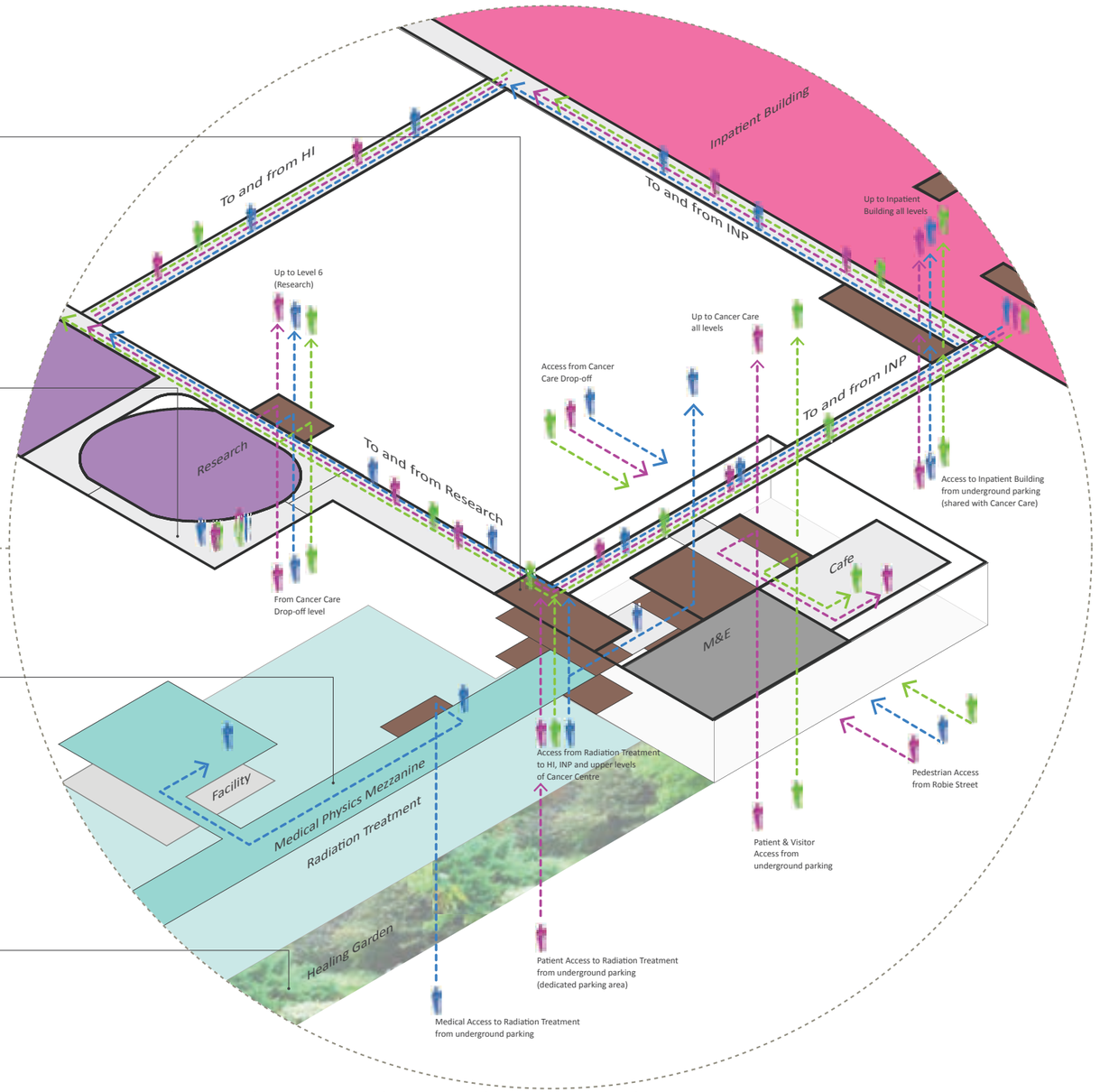
Horizontal Integration: Garden Pavilion

Open Stair: National Children's Hospital, Denmark
Architect: 3XN

Crush Space: Leslie Dan School of Pharmacy, Toronto
Architect: Foster + Partners

Mezzanine: New PGA Tour HQ, Florida
Architect: Foster + Partners

Healing Garden: MoMA, New York
Architect: Yoshio Taniguchi



Garden Pavilion Detail Plan - Level 05 Horizontal integration

LEGEND BY DEPARTMENT

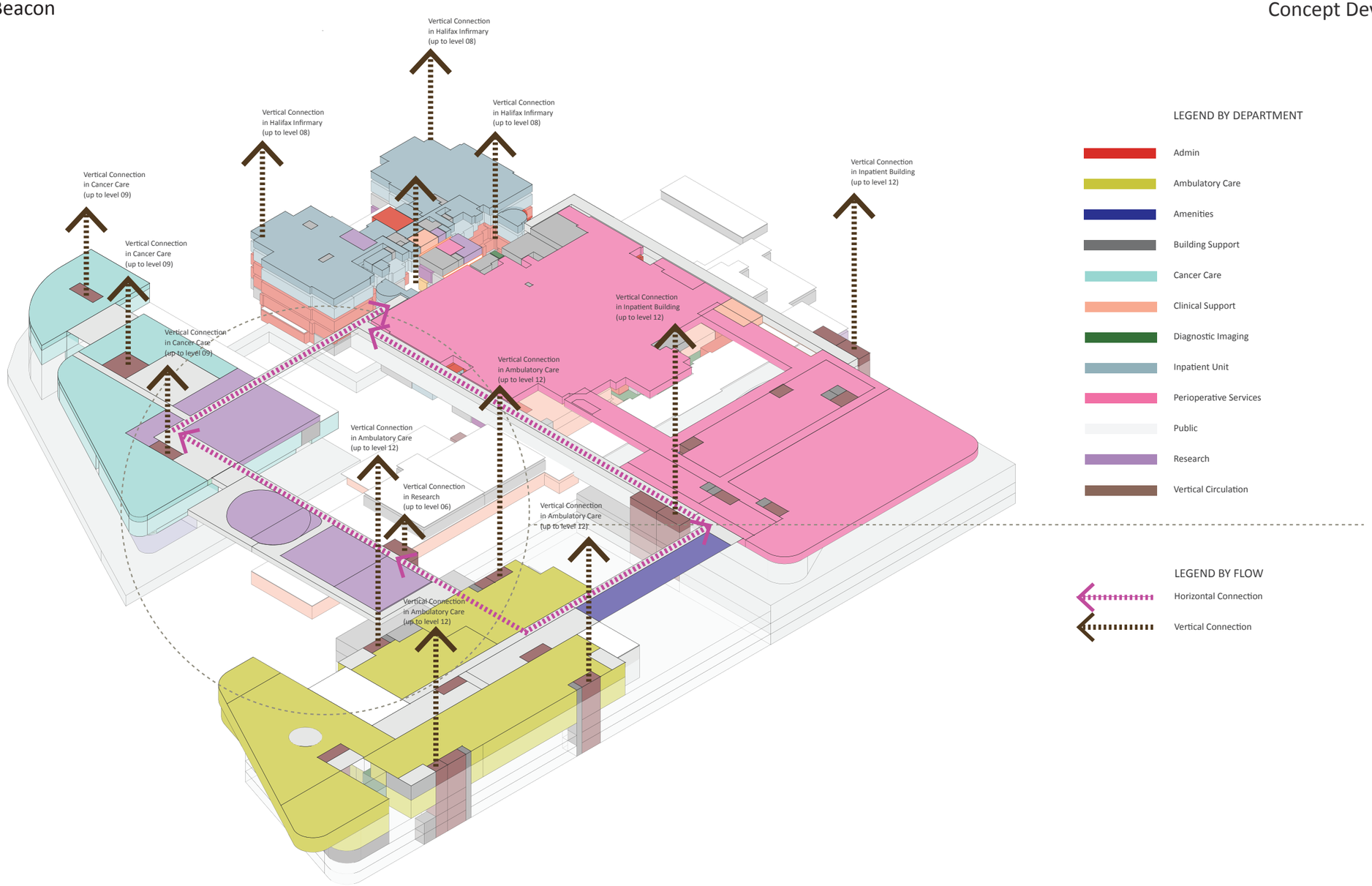
- Admin
- Ambulatory Care
- Amenities
- Building Support
- Cancer Care
- Clinical Support
- Diagnostic Imaging
- Inpatient Unit
- Perioperative Services
- Public
- Research
- Vertical Circulation

LEGEND BY FLOW

- Patients
- Staff
- Visitors

3.4 Integration, Connectivity and Wayfinding

Horizontal Integration: The Beacon



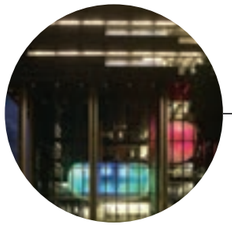
The Beacon Overall Plan - Level 05 Horizontal integration

3.4 Integration, Connectivity and Wayfinding

Horizontal Integration: The Beacon

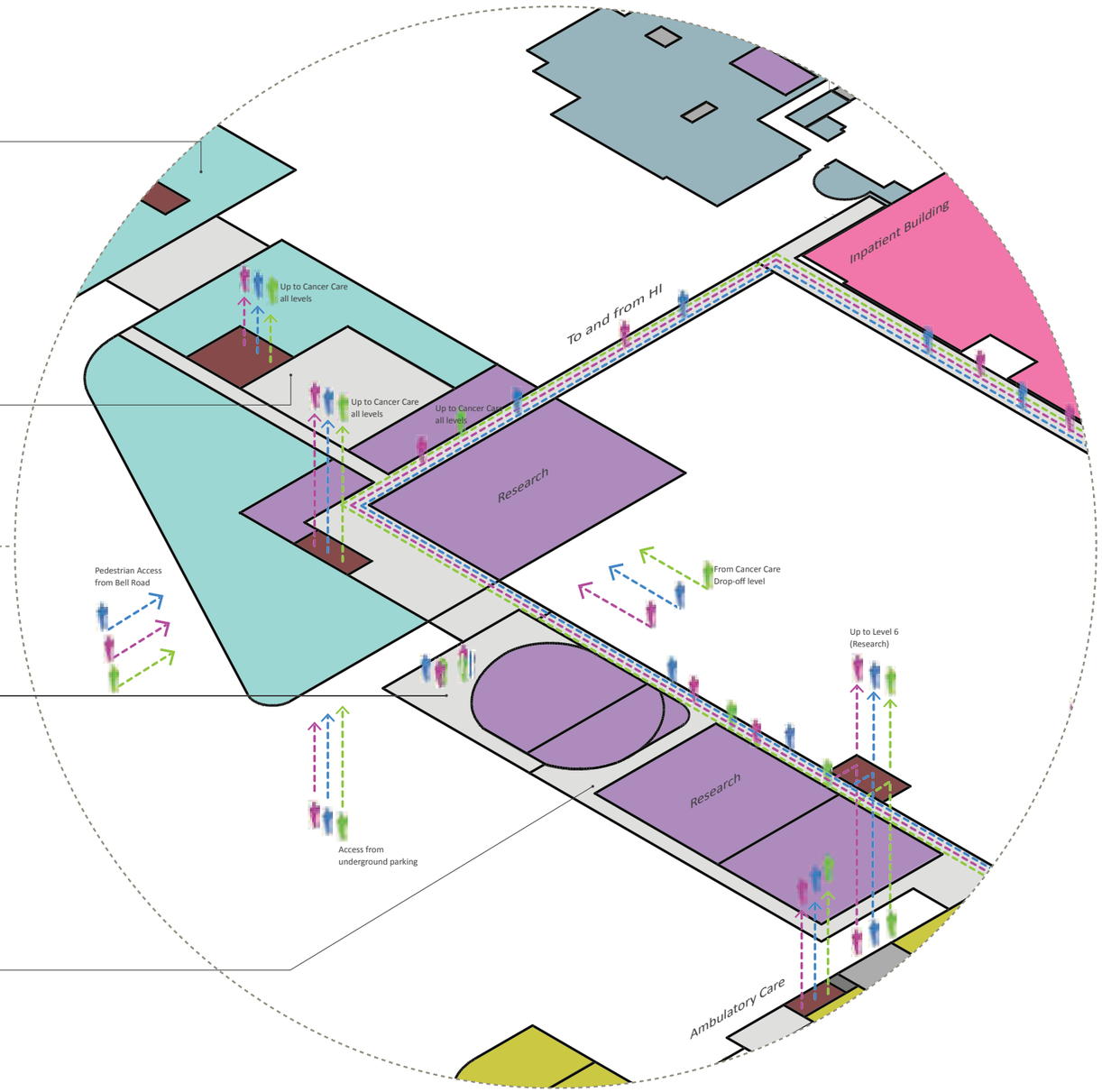
Beacon: Apple, Hangzhou, China
Architect: Foster + Partners

Atrium: Centennial College, Scarborough, ON
Architect: Diamond Schmitt Architects



Crush Space: Leslie Dan School of Pharmacy, Toronto
Architect: Foster + Partners

Atrium: Centennial College, Scarborough, ON
Architect: Diamond Schmitt Architects



The Beacon Detail Plan - Level 05 Horizontal integration

LEGEND BY DEPARTMENT

- Admin
- Ambulatory Care
- Amenities
- Building Support
- Cancer Care
- Clinical Support
- Diagnostic Imaging
- Inpatient Unit
- Perioperative Services
- Public
- Research
- Vertical Circulation

LEGEND BY FLOW

- Patients
- Staff
- Visitors

3.5 Radiation Therapy

The design approach to radiotherapy facilities / bunker design for cancer care.

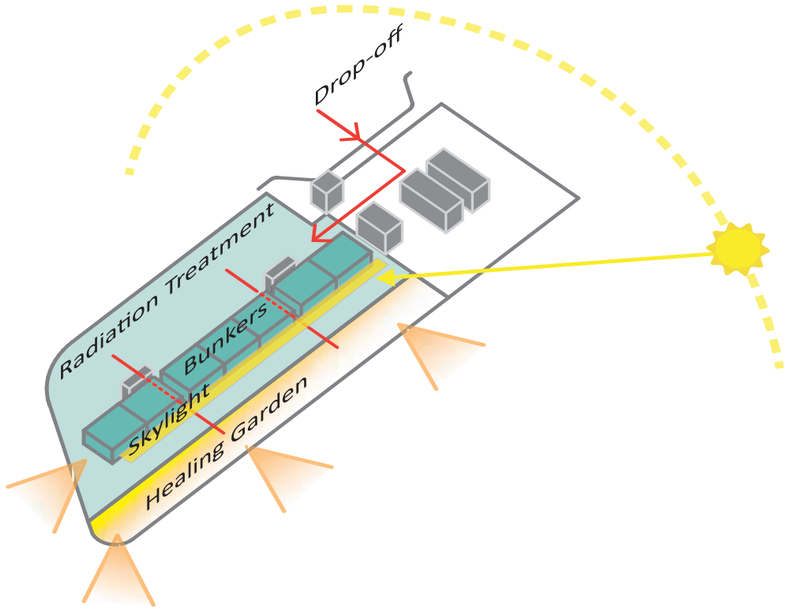
Although the same drivers and principles are followed in the design of the radiotherapy facilities, there are some diverse approaches within the two schemes outlined in this feasibility. Each one is driven by site specific influences and the need for the internal environment to be designed to improve an enhanced patient experience and for caregivers to be able to provide patient centred care.

The biggest difference between the two schemes is the location of the radiation treatment bunkers; in the Garden Pavilion the bunkers are located at grade, while in the Beacon the bunkers are located on the second floor. Modern technology in radiation shielding which include ground breaking system of dry stacking shielding modules make this possible. There are now new built examples, technology refinements are increasing at an accelerating pace that will enable added improvements in the future design development.

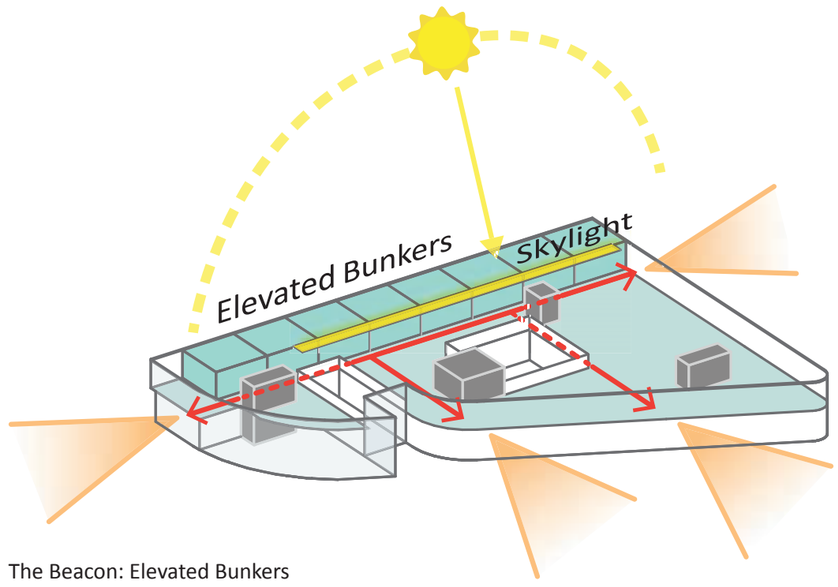
The treatment zone within the Garden Pavilion will be a free-flowing inspirational structure, with natural light, an inside outside feel, one-way glass for privacy and direct access to a Zen type garden.

The treatment zone for the Beacon is on the second level, the space will be lit via a light well and patients have direct access to the “lantern” located at the intersection of Bell and Summer. While in the ‘lantern’ patients can seek relief with great views of the Commons, the Citadel and the coming and goings at on Summer and Bell Road.

Common elements between the schemes are the linear and modular conceptual approach to planning, this system building approach allows for the possibility of utilizing pre-engineered components with efficiency in construction time and cost. Both schemes are planned to allow for the maximum utilization of natural light in the interconnected spaces between bunkers. Technology is now also in place that allows for windows providing views to the outside world from within the treatment zones; movable shielding technology is utilized to allow for this opportunity.
Both schemes allow direct views to the exterior from the treatment zone.

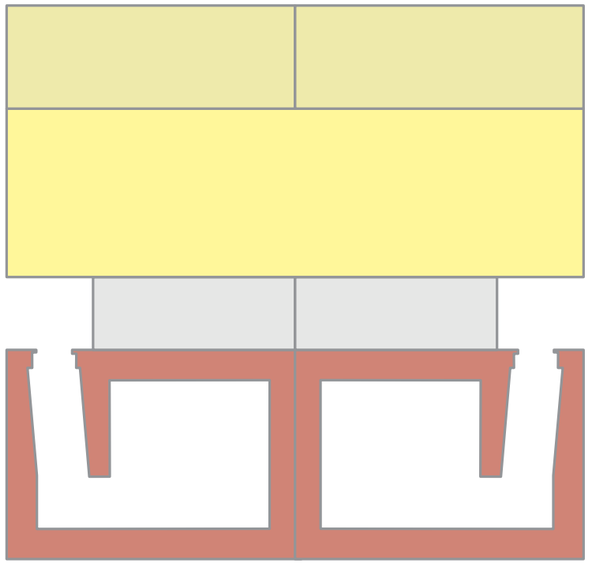


Garden Pavilion: At grade bunkers

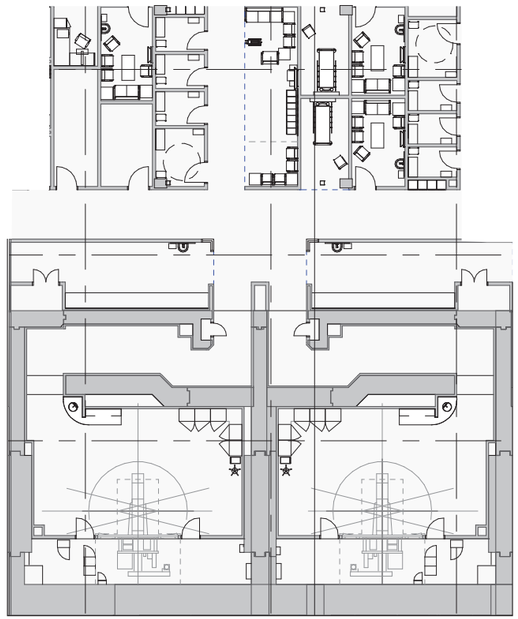


The Beacon: Elevated Bunkers

3.5 Radiation Therapy



Spatial Components



Sample Layout

Fig. 300 UT Southwestern Medical Centre Radiation Oncology, Dallas, USA

Skylights in treatment waiting area

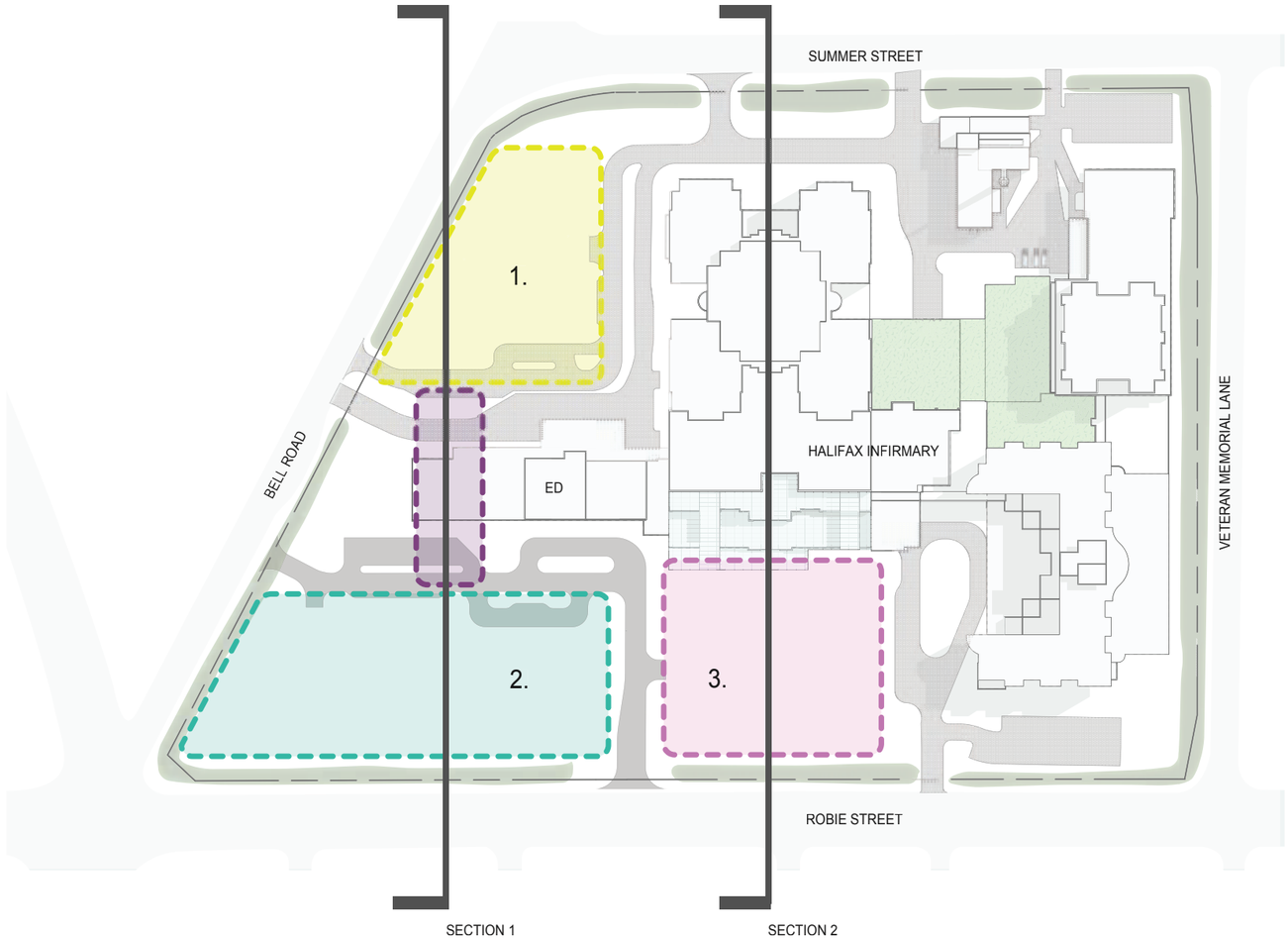
Fig. 301 Kaiser Permanente Kraemer Radiation Oncolocy Centre, Anaheim, USA

Views to the garden from radiation treatment bunkers

Fig. 302 Kaiser Permanente Kraemer Radiation Oncolocy Centre, Anaheim, USA

Natural light in the waiting area

KEY PLAN



UNDERGROUND PARKING STRATEGIES

1. CBC SITE UNDERGROUND PARKING

Geotechnical investigation report carried out on the CBC site in 1989 indicates that the bedrock surface elevation ranged from 139 feet to 144 feet. There is be a potential to get 1 underground parking level without removing a lot of bedrock.

Proposed underground parking: 120 space per floor/4 levels
Parking spaces above bedrock: 120
Parking spaces below bedrock: 360

2. URBAN GARDEN SITE UNDERGROUND PARKING

Approximately 1.5 storeys above bedrock. TBD

Proposed underground parking: 260 space per floor/2 levels
Parking spaces above bedrock: 390
Parking spaces below bedrock: 130

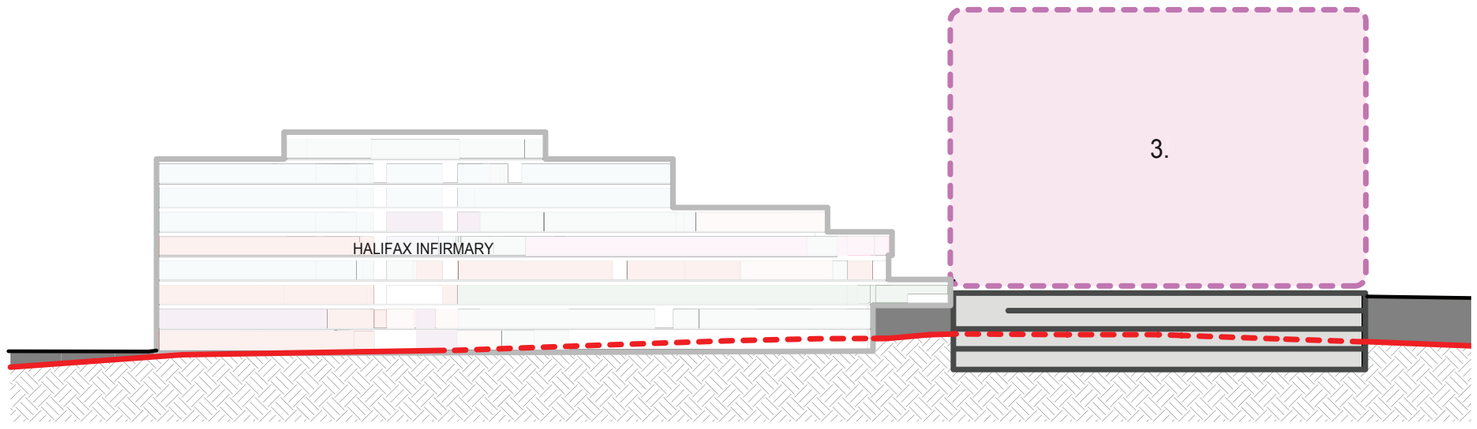
3. UNDERGROUND PARKING ON EXISTING ROBIE STREET PARKING STRUCTURE SITE

Boreholes from the April, 2017 geotechnical report show bedrock surface under the parkade in the range of 150 feet to 155 feet, which is significantly lower than the elevation of the lowest parking level, potential to construct 2 underground levels without encountering bedrock.

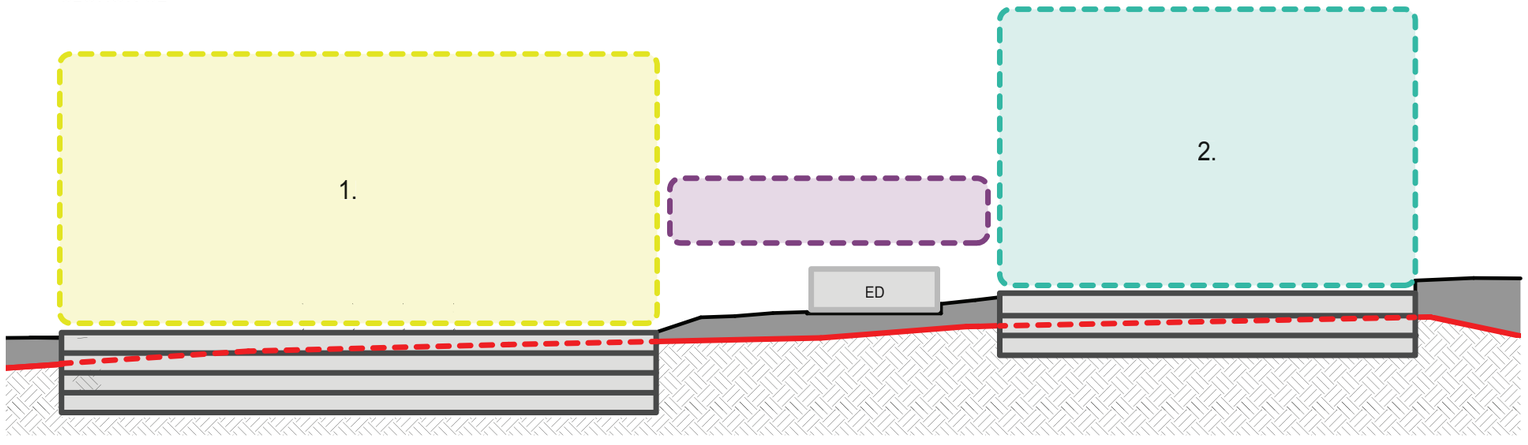
Proposed underground parking: 150 space per floor/4 levels
Parking spaces above bedrock: 300

3.6 Bedrock Study

SECTION 02



SECTION 01



SUMMARY

There is the potential added cost for the removal of acid bearing bedrock, however there is some potential savings in construction of foundations on bedrock with regards to vertical and lateral bearing load requirements.

FROM STRUCTURAL:

“Because all the buildings are hospitals, they will be post-disaster buildings which have significantly more strict requirements for lateral loads due to wind and seismic events.

The bedrock foundations will help alleviate the size, complexity and cost of the foundations and also potentially allow us to use rock anchors at the base of shear walls etc.”

LEGEND

SOIL

BEDROCK

MECHANICAL – The Beacon & Garden Pavilion Concepts

Table of Contents

3.7 Mechanical and Electrical
Mechanical

Executive Summary (Mechanical)

The purpose of the report is to describe the existing mechanical infrastructure serving each of the existing buildings (Halifax Infirmary, Abbie J. Lane, and the Veteran's Memorial Building) located on the Halifax Infirmary (HI) Site; then to assess the impact on the existing mechanical infrastructure in order to accommodate the three (3) new buildings (IPU/OR, Ambulatory, & Cancer Care) and an addition (Research & Innovation Centre - RES) to the Emergency Wing, of two (2) Master Planning/Programming Concepts (The Beacon & Garden Pavilion).

The existing and new mechanical infrastructure/systems were reviewed with the latest building codes, standards, and guidelines for Healthcare Facilities. Preliminary mechanical space allocations were proposed to serve each of the new buildings; for typical healthcare facilities, mechanical room spaces can range from 10–20% of the overall floor area of the building depending on the types of spaces contained within.

The report highlights the preliminary municipal plumbing drainage, domestic water, and fire protection requirements for each new building.

Outlined in the report are two (2) options to meet the additional medical gas requirements of the new buildings for the bulk storage systems (oxygen, nitrous oxide, and nitrogen); as well as, two (2) options to satisfy the medical air, medical vacuum, and the anaesthesia gas scavenging system (AGSS).

The existing cooling systems capacity cannot accommodate the new buildings or the addition (RES); therefore, new chilled water cooling systems containing chillers, pumps, and cooling towers will be required for each building.

The three (3) new buildings and the addition (RES) will have to be served from new ventilation air handling units to meet the airflow requirements of the CSA Z317.2-2015 standard (HVAC).

The existing steam Central Heating Plant cannot meet the increased demand of either concept. Four (4) options of expanding the Central Heating Plant are discussed; as well as, an all hydronic hot water heating configuration. A separate Co-Generation Plant study will be incorporated into the report to analyze the feasibility of these types of plants which are becoming a new trend for healthcare facilities.

Lastly, the report highlights some of the strategies to be incorporated in the design of the project to achieve the targeted LEED Silver Certification. The buildings shall be designed, constructed, operated, and maintained with sustainable strategies to reduce the carbon footprint and enhance energy efficiency.

Codes, Standards, and Guidelines

The mechanical systems design shall be in accordance with the following codes, standards, and guidelines:

- CSA Z8000-11, Canadian Health Care Facilities.
- CSA Z8001-13, Commissioning of Health Care Facilities.
- CAN/CSA Z317.1-16, Special Requirements for Plumbing Installations in Health Care Facilities.
- CAN/CSA Z317.2-15, Special Requirements for Heating, Ventilation, and Air-Conditioning (HVAC) Systems in Health Care Facilities.
- CAN/CSA Z317.13-17, Infection Control During Construction, Renovation, and Maintenance of Health Care Facilities.
- CAN/CSA Z320-11, Building Commissioning.
- CAN/CSA Z7396.1-12, Medical Gas Pipeline Systems - Part 1: Pipelines for Medical Gases, Medical Vacuum, Medical Support Gases, and Anaesthetic Gas Scavenging Systems.

- CAN/CSA B139-09 (reaffirmed 2014), Installation Code for Oil-Burning Equipment.
- CAN/CSA B149.1-15, Natural Gas and Propane Installation Code.

- National Building Code of Canada - 2015.
- National Plumbing Code of Canada - 2015.
- National Fire Code of Canada - 2015.
- National Energy Code of Canada for Buildings - 2011.

- Nova Scotia Building Code Regulations - 2017.
- LEED V4 Canada.
- DTIR Document DC-350, Design Requirements Manual - 2010.

- NFPA 10-13, Standard for Portable Fire Extinguishers.
- NFPA 13-13, Standard for the Installation of Sprinkler Systems.
- NFPA 14-13, Standard for the Installation of Standpipe and Hose Systems.

- ASHRAE Standards and Handbooks.

Sustainability

A sustainability strategy shall be integrated into the design, construction, operation, and maintenance of the new Cancer Care Centre. The building shall be designed to reduce its carbon footprint; reduce energy consumption; reduce water consumption; create a healthy environment through indoor air quality, thermal comfort, daylight and views without compromising patient safety or hygiene. The building envelope shall be optimised to reduce heating and air conditioning loads; but allow access to natural daylight, the outdoors, and natural materials which are all favourable to patient recovery.

LEED – Leadership in Energy and Environmental Design

The Cancer care building is targeted for LEED Silver Certification through the Canada Green Building Council. The mechanical systems shall be designed applying innovative technologies to reduce the building's carbon footprint and improve overall energy efficiency.

Recommended Strategies:

- Low-Flow Plumbing Fixtures;
- Enhanced 3rd Party Commissioning;
- Variable Speed Pumps for Heating/Cooling Systems;
- Variable Speed Fans for Primary Ventilation Systems;
- 100% Outside Air Ventilation Systems Combined with Heat Recovery;
- Heat Recovery – Utilizing 3 Angstrom Heat Wheels;
- High Efficient, Magnetic Bearing, Variable Speed Chillers;
- Heat Recovery Chillers;
- Efficient Duct Design to Reduce Static Pressure;
- CoGen Plant – Combined Heat & Power – if CoGen system selected;
- High Efficient, Condensing Boilers – if hydronic heating system selected;
- Solar Panels for Domestic Hot Water;
- Solar Panels for Building Heating;
- Photovoltaic Panels;
- High Performance Building Envelope.

HEATING

Existing:

Abbie Lane Building: High-pressure steam from the CHP is reduced in pressure through pressure reducing valves to provide low-pressure steam which serve the following: perimeter & reheat coil convertors; the air handling unit (AHU) heating coil convertor; the two (2) absorption chillers; and the steam-to-steam humidifiers. The heating for the Abbie Lane building is generated by steam-to-water, shell & tube convertors that supply hot water heating to the terminal reheat coils located throughout the building. Electric baseboard heaters are located on the lower levels to supplement the terminal reheat coils. Another steam-to-glycol/water, shell & tube convertor provides heating to the preheat and heating coils within the air handling units.

Veteran's Memorial Building: High-pressure steam from the CHP is reduced in pressure through pressure reducing valves to provide medium & low-pressure steam which serve the following: kitchen equipment; perimeter & reheat coil convertors; the AHU heating coil convertor; humidification steam for the AHU's; and the instantaneous domestic hot-water heaters. The heating for the VMB is generated by steam-to-water, shell & tube convertors that supply hot water heating to the terminal reheat coils and perimeter baseboard radiation located throughout the building.

Halifax Infirmary: High-pressure steam from the CHP is reduced in pressure through pressure reducing valves to provide medium and low-pressure steam which serve the following: perimeter & reheat coil convertors; the AHU heating coil convertors; the humidification steam generators; the instantaneous steam-fired domestic hot water heaters, and the sterilizing equipment, etc. located within the MDR

(Medical Device Reprocessing) Department. The heating for the Halifax Infirmary is generated by steam-to-water, shell & tube convertors that supply hot water heating to the perimeter heating and terminal reheat coils located throughout the building. Steam-to-glycol/water, shell & tube convertors provide heating to the preheat and heating coils within the air handling units.

Emergency Wing: High-pressure steam from the steam header located within the Infirmary mechanical room 2801 is reduced in pressure through pressure reducing valves to provide low-pressure steam which serve the following: perimeter & reheat coil convertors; the AHU heating coil convertors; the humidification steam generator; and the instantaneous steam-fired domestic hot water heaters. The heating for the Emergency Wing is generated by steam-to-water, shell & tube convertors that supply hot water heating to the perimeter heating and terminal reheat coils located throughout the building. A steam-to-glycol/water, shell & tube convertor provide heating to the preheat and heating coils within the air handling units. Radiant ceiling panels are installed in all spaces located along the exterior of the expansion.

The Beacon & Garden Pavilion (IPU/OR, Ambulatory, & Cancer Care):

One method to provide heat for The Beacon or the Garden Pavilion concepts is by utilizing high pressure (HP) steam; we have evaluated four (4) separate location alternatives and provided pros and cons within this report. Other options being considered are a CoGen Plant (or Combined Heat & Power) and Decentralized Hot Water Heating Systems with supplemental solar heating.

HP Steam Option:

The existing HI and VG sites are heated from Central HP steam plants; we have analyzed the existing HI steam plant loading and evaluated whether sufficient capacity exists within the HI steam plant to serve the proposed three (3) new buildings (IPU/OR, Ambulatory, & Cancer Care) and the Research & Innovation Centre (RES) addition.

Through the analysis, we determine the existing HP steam plant does not have the capacity to serve the new buildings and addition; and cannot meet the redundancy requirements of the CSA Z317.2-15 standard (HVAC). Therefore, four (4) HP steam plant alternatives were considered and summarized below.

Fully redundant convertors, pumps, steam generators (humidification), and domestic water heaters shall be provided for each of the systems mentioned above to maintain service if/when equipment failure occurs or maintenance shut-downs are required; equipment redundancy is a requirement of the CSA Standards Z317.1 (plumbing) and Z317.2 (HVAC).

The following is a summary table of the three (3) existing buildings located on the HI Site.

Building	Year Built	Building Age (Years)	GDA Gross Department Area (sq.ft.)	GFA Gross Floor Area (sq.ft.)
Halifax Infirmary	1998	19	568,150	744,373
Abbie J. Lane	1968	49	156,671	212,724
Veteran's Memorial	1986	31	211,075	351,551
			935,896	**1,308,648**

3.7 Mechanical and Electrical

Mechanical

Table M.1

The following two (2) tables summarize the floor areas for The Beacon & Garden Pavilion concepts.

The Beacon:				**GFA (sq.ft.)**
Ambulatory Building				511,665
Inpatient/OR Building				458,454
Research & Innovation Centre				41,307
Cancer Care				290,928
				1,302,354

Table M.2

Garden Pavilion:				**GFA (sq.ft.)**
Ambulatory Building				488,186
Inpatient/OR Building				458,453
Research & Innovation Centre				41,774
Cancer Care				314,190
				1,302,603

Table M.3

The following table is a summary of the existing steam boilers located within the HI CHP.

HI Site Central Plant:

Boiler #	Installed	Age (Years)	Manufacturer	Fuel Type	Steam/Hot Water	Output Rate (lb/hr)	Capacity (Btu/hr)
Boiler #1	1995	23	Volcano	N.G./Oil #2	Steam	42,000	50,106,000
Boiler #2	1995	23	Volcano	N.G./Oil #2	Steam	42,000	50,106,000
Boiler #3	1995	23	Volcano	N.G./Oil #2	Steam	42,000	50,106,000
						126,000	**150,318,000**

Table M.4

According to NSHA, the peak winter time steam load is 55,000 lb/hr (actual data). The peak summer time steam load is approximately 17,000 lb/hr. Based on the load profile of the existing buildings, the estimated additional steam capacity for the three (3) new buildings and the RES addition is 55,000 lb/hr; for a total combined peak steam load of 110,000 lb/hr. Therefore, during the peak winter heating months, the projected steam load would require all three (3) boilers to operate to meet the load demands. The CSA Z317.2-15 standard requires "The capacity, arrangement, and number of boilers/units shall be such that if the largest boiler or heating unit is out of service, the remaining boiler(s) or heating unit(s) is capable of providing a minimum of 100% of a Class A" healthcare facility."

Therefore, the existing CHP steam capacity will have to be expanded in some form to meet the new HI site demands.

At this stage, four (4) configurations and locations for the Central Heating Plant (CHP) were evaluated and matrices generated that outline the pros and cons of each configuration. A brief description of the scope of work for each option is provided to assist the Cost Consultant in determining a rough estimate. The following are the individual matrices for each of the four (4) proposed options:

CHP#1 - Add Fourth (4th) Boiler in Existing Central Heating Plant:

Description	Advantages	Disadvantages
- Install New High-Pressure Steam Boiler (42,000 lb/hr capacity) in existing Central Heating Plant. Either concept requires three (3) boilers to operate; CSA Z317.2-2015 requires a redundant boiler for a Class A healthcare facility.	- Keep Central Plant staff in one location.	- This option limits the growth opportunity for the remainder of the site after The Beacon or Garden Pavilion concepts are constructed. If another tower is constructed, the CHP would have to expand again.
- Must install 2nd stack in order to operate a 3rd boiler; the existing stack can only handle two (2) boilers operating; new expansion (The Beacon or Garden Pavilion) requires three (3) boilers to operate during peak months.	- Utilizes existing CHP boilers which are approx. (22) years old (mid-life) and should have another (18) years to go. - Note: At the completion of the Redevelopment Project, the existing boilers will be approx. (28) years old, with another (12) years to go. - New Boiler (#4) should last (40) years; older boilers will have to be replaced when the new boiler reaches its mid-life.	- Must relocate office space where the proposed 4th Boiler will be located.
- Must relocate office spaces and possibly raise the roof of the proposed location of the 4th Boiler. Temporary demo and extension of existing exterior wall to get new boiler into CHP.	- Existing emergency generator has sufficient capacity to serve the 4th Boiler.	- When both HP steam mains operate in the service tunnels, may have to add cooling to maintain temperatures within the service tunnels.
- Must modify breeching so only two (2) boilers go to each stack; i.e. Boilers #1 & #2 go to (e)stack; Boilers #3 & #4 (new) go to the (n)stack.	- Lowest capital cost of the four (4) options.	- Keeping the existing CHP limits any improvement on the existing entrance/exit to the shipping / receiving area.

- Have to modify/extend steam and condensate headers. Requires a plant shut down.		- Emergency generators will have to be located within the footprint of each new building of The Beacon or Garden Pavilion Concepts.
- Must connect new boiler into existing natural gas and fuel oil #2 systems.		
- Must upgrade existing CHP controls to accommodate the New Boiler (#4).		
Currently (2) 8"dia. HP steam mains run through the service tunnel (only (1) main is active at any time. Would have to operate both mains during winter months when The Beacon or Garden Pavilion Concepts are built.		
- Electrical: Recommend upgrading the wiring, replace MCC, etc.; all outdated.		

Note: Refer to "CHP Alternative #1 Appendix" for site plan and proposed boiler room layout.

CHP#2 - Supplemental Central Heating Plant - Intersection of Summer/Veterans Memorial Way:

Description	Advantages	Disadvantages
- Install Two (2) New High-Pressure Steam Boilers (42,000 lb/hr capacity each) in a new Supplemental Central Heating Plant located in parking lot at corner of Summer Street & Veterans Memorial Way.	- Utilizes the existing CHP whose boilers are approx. (22) years old (mid-life) and should have another (18) years to go. - Note: At the completion of the Redevelopment Project, the existing boilers will be approx. (28) years old, with another (12) years to go.	- Need two (2) Central Plant staff to operate the existing CHP and the new Supplemental CHP. Current CHP staff is (11) staff & (1) Chief. Supplemental CHP would have to have (11) staff; the Chief can oversee both plants.
- Install a new stack to serve the two (2) new boilers in the new Supplemental Central Heating Plant (CHP).	- Will have two (2) new boilers and a new stack that should last (40) years.	- The site services plan indicates the existing water main (ring main) runs below the existing parking lot; may have to be routed around the new Supplemental CHP.

- Must install a natural gas meter set and PRV station; and connect into the Heritage Gas main.	- The Supplemental CHP could be designed to expand in the future when the existing boilers need replacement; an addition would have to be added to house two (2) boilers and a new stack. At that time, the original boilers/stack could be removed and one (1) CHP staff could operate the CHP.	- Interconnecting the two (2) CHP's can be done with direct-buried pipes or pipes within an inverted trench; a service tunnel is not likely; but needs further investigation.
- Must install a new aboveground No.2 fuel oil tank (capacity: 45,400 L); requirement for an alternate fuel source as per CSA Z317.2-2015.		- Lose (29) parking stalls that will have to be added into the overall site parking count.
- Must connect the two (2) Central Steam Plants together; underground steam and condensate lines to the existing CHP.		
- Must construct a new building to house the new boilers, control room, chemical room, compressor room, etc.		
- Electrical: Feed New CHP from the existing normal/emergency power distribution (completed by ONSA in 2014).		

Note: Refer to "CHP Alternative #2 Appendix" for site plan and proposed boiler room layout.

CHP#3 - Standalone Central Heating Plant - Intersection of Summer St./Bell Rd.

Description	Advantages	Disadvantages
- Install Two (2) New High-Pressure Steam Boilers (2@55,000 lb/hr capacity) in new Standalone Central Heating Plant located at intersection of Summer St./Bell Road. This CHP would be dedicated to the buildings associated with either The Beacon or Garden Pavilion Concepts. They will be separate from the (e)CHP - HI/Abbie/VMB.	- The New Standalone CHP may be attractive for a P3 Consortium project for The Beacon or Garden Pavilion Concepts. The P3 Consortium would have to staff and operate the new Standalone CHP.	- After the P3 commitment expires, need two (2) Central Plant staff to operate the existing CHP and the New Standalone CHP. Current CHP staff consists of (11) staff and (1) Chief. The new Standalone CHP would require (11) staff; the chief can oversee both plants.

- Install a new stack to serve the new boilers in the new Standalone Central Heating Plant.	- Utilizes the existing CHP boilers which are approx. (22) years old (mid-life) and should have another (18) years to go. - Note: At the completion of the Redevelopment Project, the existing boilers will be approx. (28) years old, with another (12) years to go.	- Will have to extend HP steam and condensate lines across Summer St.; either direct-buried or pipes within an inverted trench; a service tunnel is highly unlikely; but requires further investigation.
- Must install a natural gas meter set and PRV station; and connect into the Heritage Gas main.	- Will have two (2) new boilers and a new stack that should last (40) years.	
- Must install a new aboveground No.2 fuel oil tank; requirement for an alternate fuel source as per CSA Z317.2-2015.	- This option can house the emergency generators for the three (3) new buildings as part of the Standalone CHP.	
- No Interconnect between the two (2) CHP's; the Existing CHP serves the HI/Abbie/VMB; the New Standalone CHP serves the three (3) new buildings & addition of The Beacon or Garden Pavilion Concepts.	- The Standalone CHP can be configured to be expandable in the future, say (20) years when the existing boilers must be replaced; an addition and another stack can be added to the new building to house all of the boilers.	
- Must construct a new building to house the new boilers, control room, chemical room, compressor room, etc.		
- Must extend the CHP steam and condensate piping from the new CHP to the three (3) new buildings. The piping could be direct-buried; or installed in an inverted trench; or installed within a service tunnel - further investigation is required to determine the feasibility of this option.		
- Must install a new emergency generator, including: exhaust, louvres, fuel tank, day tank, fuel polishing system, etc.		

Note: Refer to "CHP Alternative #3 Appendix" for site plan and proposed boiler room layout.

CHP#4 - New Entire Site Central Plant - Intersection of Summer St./Bell Rd.

Description	Advantages	Disadvantages
- Install Three (3) New High-Pressure Steam Boilers (3@75,000 lb/hr capacity) in new Standalone Central Heating Plant located at intersection of Summer St./Bell Road.	- The New CHP may be attractive for a P3 Consortium project.	- Difficulty in extending the steam and condensate mains to feed the entire site; service tunnels would be preferred; however, may have to be direct-buried or pipes installed within an inverted trench.
- Alternative: Install Four (4) New High-Pressure Steam Boilers (4@55,000 lb/hr capacity) in new Standalone Central Heating Plant located at intersection of Summer St./Bell Road.	- After the P3 commitment expires; only need one (1) CHP staff to operate the site.	- Existing boilers are approx. (22) years old (mid-life) and should have another (18) years to go. - Note: At the completion of the Redevelopment Project, the existing boilers will be approx. (28) years old, with another (12) years to go.
- Install two (2) new stacks to serve the new boilers in the new Supplemental Central Heating Plant for the entire site.	- Will have three (3) (or four (4) Alternative) new boilers and new stacks that should last (40) years.	- If demo existing CHP, then would have to relocate the fire pump, and install a new domestic water booster system.
- Alternative: Install a stack for each boiler.	- Can locate the emergency generators in one central location for the three (3) new buildings of either The Beacon or Garden Pavilion Concepts.	
- Must install a natural gas meter set and PRV station; and connect into the Heritage Gas main.	- Allows opportunity to reconfigure/enhance the existing shipping/receiving at the Abbie Lane.	
- Must install a new aboveground No.2 fuel oil tank(s); requirement for an alternate fuel source as per CSA Z317.2-2015.		
- Must extend HP steam and condensate mains from the new CHP to feed the existing HI/Abbie/VMB and three (3) new buildings.		

- Abandon and remove the existing boilers, stack, No.2 fuel tanks; natural gas entrance (meter set & PRV station) in the existing CHP.		
- Must construct a new building to house the new boilers, control room, chemical room, compressor room, etc.		
- Must install a new emergency generator, including: exhaust, louvres, fuel tank, day tank, fuel polishing system, etc.		

Note: Refer to "CHP Alternative #4 Appendix" for site plan and proposed boiler room layout.

CoGen Option:

A CoGen feasibility study is being carried out at the time this report was drafted. The study will evaluate the capital and lifecycle costs of three (3) CoGen plant configurations. The three (3) CoGen plant configurations consist of the following:

- (1) CoGen plant located at the HI Site to serve the HI Site (old & new buildings) and the VG Site (remaining buildings; post-demolition of the Centennial & Victoria Buildings).
- (1) CoGen plant located at the VG Site to serve the HI Site (old & new buildings) and the VG Site (remaining buildings; post-demolition of the Centennial & Victoria Buildings).
- (1) CoGen plant located at the HI Site to serve only the HI Site (old & new buildings); the VG Site continues to operate on the existing Central Heating Plant.

The results of the CoGen study will provide information to which will assist to determine the optimal energy solution for the ICFF Redevelopment Project. Owned and operated CoGen Plants are becoming a new trend for hospitals throughout North America because of the enhanced system efficiencies and operational costs. Typical electrical utility plants are 35-40% efficient; while CoGen Plants can operate at efficiencies between 85-90% since the plant waste heat is used for building heating loads, domestic water loads, humidification loads, and process loads.

Decentralized Hot Water Heating Systems with Supplemental Solar:

In addition to the four (4) central heating plant options included, and possibly the CoGen Plant study, an alternative to these approaches is to install decentralized, hydronic hot water heating boilers in each of the three (3) new buildings. Natural gas lines would have to be piped to each new building and extended to each boiler room; we recommend locating the hot water boilers within a mechanical penthouse on top of each building; that way the chimney length and the pressure rating of the boilers would be minimal. This arrangement would require additional natural gas piping to extend from the meter set up to the boiler room on top of the building; however, the cost of the extra natural gas piping would be offset by the reduced chimney exhaust stack length.

Consideration to the location of the boiler stacks in relation to the relocated helipad to one of the three (3) new buildings must be evaluated.

A second fuel source would have to be provided with fuel storage located near each new building. The boilers would have to be dual-fuel boilers capable of firing natural gas and fuel oil #2 (for example). The standby fuel source and dual-fuel burners are requirements of the CSA Z317.2-15 and Z8000 standards.

Low-temperature hydronic hot water distribution should be considered for this approach to utilize condensing boilers that would maximize boiler efficiency.

A purely low-temperature, hydronic hot water heating solution can satisfy the building perimeter, terminal reheat coil, and AHU heating coil needs; however, a higher temperature source would be necessary to serve the domestic hot water supply requirement as per the CSA Z317.1-16 standard.

In addition, typically MDR equipment utilizes high pressure (80 psig) steam to serve the sterilizers and cart washers, etc.; therefore, natural gas-fired steam boilers would have to be provided OR these units would have to be the electric type which increases the electric demand and consumption.

Another consideration is humidification; if steam boilers were installed to serve the MDR equipment; then the capacity size can be increased to provide capacity for the humidification loads of the air handling units. Otherwise, electric or natural gas-fired humidifiers would have to be provided to provide the required humidification loads.

Our recommendation to address the steam loads is to extend steam and condensate lines from the Infirmary to the three (3) new buildings to serve any domestic hot water, MDR equipment, and humidification loads.

Decentralized Hot Water Heating Systems		
Description	**Advantages**	**Disadvantages**
- Install a minimum (3) dual-fuel, hot water heating boilers; CSA Z317.2-15 requires if one of the boilers is out of service, the remaining boilers can supply 100% of the heating capacity. - Locate the boilers in a fire-rated boiler room in a mechanical penthouse on top of each building.	- The decentralized approach may be more attractive for a P3 Consortium project compared to the central steam plant option.	- Decentralized systems tend to have higher maintenance costs compared to central systems because of more pieces of equipment to maintain.
- Pipe natural gas to each new building from either Summer St. or Robie St. - Install a meter set at each new building. - Extend the natural gas piping	- No modifications to the existing central steam plant.	- May require a dispersion study to ensure boiler exhaust doesn't get re-entrained into existing and new ventilation systems.

from the meter set to the Boiler Room on top of each building.		
- Install a double-walled, aboveground storage tank and fuel transfer pumps within each new building. - Extend fuel oil supply and return lines up to the Boiler Room at the top of each new building.	- If the hot water heating systems are designed for low-temperatures, the boilers can be the condensing type and take advantage of the increased boiler efficiency. Condensing boilers typically operate at 95% efficiency compared to conventional boilers operating at 80-84%.	- Need a separate means to generate humidification steam. - Alternative methods: • Gas-Fired Humidifiers. • Electric Humidifiers. • Install a separate steam boiler. • Pipe HP steam from the HI and extend to each new building.
- Install individual chimneys for each boiler and extend 9'-0" above the Boiler Room roof. Both requirements are from DTIR DC-350.	- Can easily combine solar heating into the perimeter/reheat coil loops.	- MDR equipment (i.e. sterilizers, cart washers, etc.) will have to be one of the following: • Electric equipment. • Install a separate steam boiler. • Pipe HP steam from the HI and extend to the MDR in the new building(s).
- Provide combustion and ventilation air with louvers and fans for the Boiler Room.		- Domestic hot water: If a low-temperature hot water heating system is used then an alternative method to provide domestic hot water will have to be provided since the CSA Z317.1-16 standard requires the distribution to maintained at 140°F and any storage tanks maintained 160°F.

The Beacon & Garden Pavilion Concept (Research & Innovation Centre – RES):

A 4"high pressure steam main extends from the main header in the Level 200 mechanical room located on the south side of the HI building and serves the Emergency Wing. The 4" HP steam main was not sized to serve the six (6) additional future floors. However, based on preliminary calculations, the 4" HP steam main has capacity to serve the proposed RES addition. We recommend a 4"connection to the existing HP steam main in the existing Emergency Wing mechanical penthouse be extended to a new mechanical room or penthouse to serve the new RES addition. Since we recommend utilizing the central steam supply, we propose shell & tube convertors be provided to deliver hot water heating to radiant ceiling panels and terminal reheat coils throughout the RES addition. We also recommend separate convertors be provided to deliver glycol/water heating for the air handling unit heating coils. Lastly, we

suggest the steam be used to generate humidification steam using steam-to-steam humidifiers or a steam generator (depending on the humidification load).

Recommendations:

If the CoGen study is favourable from a payback and life cycle cost analysis, then a CoGen plant would be our recommendation. If the project budget cannot sustain the additional cost associated with a CoGen plant, then our recommendation would be the decentralized hydronic, hot water system and connect any steam loads for the three (3) new buildings into the existing steam distribution from the Infirmary building.

COOLING

Existing:

Each of the existing buildings (i.e. Infirmary, Abbie Lane, and VMB) have dedicated chillers and cooling towers.

Abbie Lane Building: The Abbie Lane's cooling is primarily served by two (2) absorption type chillers located in the Level 500 mechanical room; two (2) induced-draft cooling towers are located on the roof of the building and were replaced in 2000.

Veteran's Memorial Building: The VMB's cooling is provided by a centrifugal chiller located in the Level 100 mechanical room and the cooling tower located on the roof of the building.

Halifax Infirmary: Two (2) centrifugal chillers (each 1,050 cooling tons) are in Mechanical Room 2801 and provide cooling to the air handling units serving the Halifax Infirmary. These chillers are original when the building was built and do not have spare capacity. The condenser water from the chillers is piped to two (2) induced-draft cooling towers (1,050 ton each) and are located on the landscaped roof area towards the east above the parking level. These cooling towers were refurbished in 2011. A third cooling tower is located adjacent to the main towers that runs year-round and provides condenser water to localized heat pumps that are serving some dedicated equipment room loads.

Emergency Wing: A separate air-cooled chiller (135 cooling tons) was installed during the Emergency Wing expansion project and serves only this area; the chiller is located directly above the Emergency Wing Ambulance Bay.

The Beacon & Garden Pavilion Concept (IPU/OR, Ambulatory, & Cancer Care):

The existing chilled water plants do not have capacity to serve any portion of the new buildings.

The three (3) new buildings will require new chilled water systems to provide cooling for the air handling units and critical cooling loads. We recommend independent chilled water systems for each new building complete with variable-speed chillers, pumps, and cooling towers. We recommend oil-free chillers utilizing magnetic bearings for improved efficiency and reduced maintenance costs. Heat-recovery chillers or heat pump chillers should be considered to capture low-grade heat to supplement the perimeter heating, ventilation, reheating, and domestic water preheat.

The initial cooling capacity for the IPU/OR building in either concept is 1,600 tons.
The initial cooling capacity for the Ambulatory building in either concept is 1,400 tons.

3.7 Mechanical and Electrical
Mechanical

The initial cooling capacity for the Research & Innovation Centre in either concept is 150 tons.
The initial cooling capacity for the Cancer Care building in either concept is 1,000 tons.

Note: These capacities are based at a high level without specific details on the building envelope, equipment, occupancies, etc. Detailed heat loss/heat gain calculations would have to be completed to confirm the actual cooling requirements.

The CSA Z317.2-15 standard requires redundancy be built in the major equipment and distribution pumps; therefore, we propose redundant pumps for both the chilled water and tower/condenser water systems; install three (3) chillers each sized for 50% of the load; that way if one chiller fails or is shut-down, the other two (2) chillers can satisfy the cooling load; likewise for the cooling towers. We are proposing separate chilled water plants for each of the new buildings because of the distribution losses and better part-load performance compared to a much larger chilled water plant.

The Beacon & Garden Pavilion Concept (Research & Innovation Centre – RES):

The existing chilled water system serving the HI and the separate air-cooled chiller serving the Emergency Wing do not have capacity to serve the proposed RES addition. Therefore, due to the preliminary cooling load (150 ton) for the RES addition, we recommend a new air-cooled chiller be installed to serve the RES addition. The air-cooled chiller could be installed on the roof above the existing ambulance bay for the Emergency Wing; but would require a structural assessment to determine if the existing structure could handle the additional weight. Otherwise, the air-cooled chiller would have to be located on the roof above the RES addition. Depending on whether the RES simulation and research labs are considered Type 1 spaces (CSA Z317.2-15), a redundant air-cooled chiller may be required to satisfy the CSA standard requirements.

VENTILATION

Existing:

Each of the existing buildings (i.e. Infirmary, Abbie Lane, and VMB) have air handling units that were sized on the ventilation rates required at the time of their design/construction. Some of the ventilation rates do not meet the ventilation rates of today's standards.
Abbie Lane Building: The ventilation for the Abbie Lane is provided by eight (8) air handling units, all located within the Level 500 mechanical room. Half of the AHU's serve the floors above, and the other half serve the remainder of Level 500 and below. All of the AHU systems are of the mixed-air type; i.e. they bring in the minimum outside air and mix with return air from the zone that the AHU serves.

Veteran's Memorial Building: The ventilation for the VMB is provided by eight (8) air handling units, three (3) of which are 100% outside air systems, and five (5) AHU's that are of the mixed air type; i.e. they bring in the minimum outside air and mix with return air from the zone that the AHU serves. Four (4) of the AHU's are in mechanical room 2703 on the west side of Level 200; and three (3) AHU's are in mechanical room 2708 on the east side of Level 200. The last AHU is in mechanical room 0160 on Level 100 and serves the kitchen areas on Level 100.

Halifax Infirmary: The ventilation for the Infirmary is provided by (27) air handling units located within (11) mechanical rooms scattered throughout the facility. Fourteen (14) of the AHU's are 100% outside air systems; the remaining (13) AHU's are the mixed air type; i.e. they bring in the minimum outside air and mix with return air from the zone that the AHU serves.

Emergency Wing: The ventilation for the Emergency Wing is provided by two (2) 100% outside air systems with heat recovery. These units are located within the mechanical penthouse located directly above the Emergency Wing. The current Z317.2-15 standard requires fully redundant air handling units to serve the Emergency Wing; however, this was not a requirement when the Emergency Wing was designed/constructed. A separate dedicated, suspended air handling unit serves the ambulance bay of the Emergency Wing.

The Beacon & Garden Pavilion Concept (IPU/OR, Ambulatory, & Cancer Care):

Both new buildings will require ventilation air handling units to satisfy the building needs and the CSA Z317.2-15 minimum ventilation requirements. Parallel (redundant) air handling units are required for systems serving Type 1 spaces as identified in the CSA Z317.2-15 standard. The CSA Z317.2-15 standard allows mixed air systems to be utilized in healthcare facilities; however, many clients and consultants utilize 100% outside air systems because of the concerns or perceptions associated with mixing return air (i.e. possibly contaminated) air back into the supply airstream. Therefore, heat recovery systems need to be incorporated into any 100% outside air systems to reduce the energy costs associated with these types of units. For the baseline design, we propose to utilize True 3 Angstrom heat wheels due to their thermal heat recovery performance and eliminated cross-contamination concerns. True 3 Angstrom heat wheels allow water vapour to be transferred but prevent cross-contamination since the contaminants are larger than 3 Angstrom.

For budgetary purposes at this stage, we recommend basing the ventilation rate on 1cfm/sq.ft.. Final heat loss/heat gain and CSA ventilation rate calculations would have to be completed through the design process.

The ductwork distribution will be completely ducted for the supply, return, and exhaust airstreams. Each space will be equipped with a supply air terminal box with reheat coil and an associated exhaust air terminal box; the supply and exhaust terminal boxes will ensure the required room pressure is maintained.

An allowance will have to be made for Airborne Isolation Rooms (AIR) located in the new buildings. These spaces require HEPA filtered exhaust air with completely redundant HEPA filter housings and associated exhaust fans.

The underground parking levels within each new building will have to be ventilated with tempered air (glycol/water coils) to the minimum ventilation rate of 0.77 cfm/sq.ft.. Carbon monoxide and nitrogen dioxide monitoring systems are required to be installed in the underground parking levels of the new buildings.

The Beacon & Garden Pavilion Concept (Research & Innovation Centre – RES):

The RES addition will require new air handling units to provide the minimum outside and supply airflow rates as required by the CSA standard Z317.2-15 (HVAC). If the RES simulation and research labs are classified as Type 1 spaces (CSA Z317.2-15), parallel air handling units will have to be provided according to CSA Z317.2-15; further discussion with NSHA will be necessary during the design to determine mechanical space, budget, etc.

The CSA Z317.2-15 standard allows mixed air systems to be utilized in healthcare facilities; however, many clients and consultants utilize 100% outside air systems because of the concerns or perceptions

associated with mixing return air (i.e. possibly contaminated) air back into the supply airstream. Therefore, heat recovery systems need to be incorporated into any 100% outside air systems to reduce the energy costs associated with these types of units. For the baseline design, we propose to utilize True 3 Angstrom heat wheels due to their thermal heat recovery performance and eliminated cross-contamination concerns. True 3 Angstrom heat wheels allow water vapour to be transferred but prevent cross-contamination since the contaminants are larger than 3 Angstrom.

For budgetary purposes at this stage, we recommend basing the ventilation rate on 1cfm/sq.ft.. Final heat loss/heat gain and CSA ventilation rate calculations would have to be completed through the design process.

The ductwork distribution will be completely ducted for the supply, return, and exhaust airstreams. Each space will be equipped with a supply air terminal box with reheat coil and an associated exhaust air terminal box; the supply and exhaust terminal boxes will ensure the required room pressure is maintained.

PLUMBING – DOMESTIC WATER

Existing:

The HI Site is served by municipal domestic water mains; domestic water enters the site from Summer Street into the Central Heating Plant (CHP) that houses three (3) domestic water booster pumps and a newly installed fire pump. A 10"domestic water ring main begins at the CHP, runs south along Summer St., turns west and runs adjacent to Veteran's Memorial Drive, turns north and runs adjacent to Robie St.. The ring main extends past the parking garage, turns east and wraps around the Emergency Wing, then around the Infirmary, and finally closes the loop back at the CHP.
Domestic hot water is generated in a large domestic hot water heater for the Abbie Lane building and through instantaneous, steam-fired (i.e. tankless) heaters for the Halifax Infirmary and VMB buildings. The domestic hot water distribution piping for the Abbie Lane and VMB are piped a conventional way without localized mixing valves; this does not meet the requirements of the current CSA Z317.1 standard; however, met the requirements of the standards of the day. The domestic hot water distribution piping within the Halifax Infirmary is piped to meet the requirements of the CSA Z317.1 standard with localized mixing valves.

The Beacon & Garden Pavilion Concept (IPU/OR, Ambulatory, & Cancer Care):

Based on preliminary calculations, each new building will require a 6" diameter domestic water main that will have to connect into the HI site ring main independently; and based on preliminary calculations, the existing ring main is of adequate size to serve the new buildings. We recommend locating the water meter and associated backflow preventers in a water entrance room in each new building for either concept; the water entrance rooms should be located on the ground floor or basement level. The new buildings for both concepts are higher than the existing Halifax Infirmary; therefore, it is anticipated that each building will require a triplex domestic water booster system to provide the additional pressure required to serve the upper floors.

The following is a list of alternative methods of generating the domestic hot water needs of each new building:

Alternative Methods to Provide Domestic Hot Water	Advantages	Disadvantages
Instantaneous domestic water heaters fed from Central Steam Plant	• Compact; takes the least amount of floor space. • Served from the Central Steam Plant which has two (2) fuel sources; satisfy redundancy purposes.	• With no storage, need high steam capacity to satisfy the peak demand.
Indirect hot water storage tanks using hot water heating boilers	• DHW tanks are heated by a hot water boiler system which would have two (2) fuel sources; satisfy redundancy purposes.	• Would require many tanks to satisfy demand; takes up floor space.
Gas-fired domestic hot water heaters & storage tanks	• Can be connected to the natural gas distribution mains surrounding the site. • Would operate independently from heating system.	• Requires combustion air and exhaust vents to the outdoors. • Would require many tanks to satisfy demand; takes up floor space. • Would have to connect to heating system if fuel source (i.e. natural gas) was interrupted.
Oil-fired domestic hot water heaters & storage tanks	• Would operate independently from heating system.	• Requires fuel storage tank and fuel transfer pumps. • Requires combustion air and exhaust vents to the outdoors. • Would require many storage tanks to satisfy demand; takes up floor space. • Would have to connect to heating system if fuel source was interrupted to satisfy redundancy purposes.
Electric hot water heaters & storage tanks	• Least capital cost method to provide DHW.	• High operating cost; affects electrical demand and consumption charges. • Increases the size of the emergency generators.
Water-to-water heat pumps connected to DHW storage tanks	• Improved efficiency compared to electric DHW heaters.	• Would require multiple storage tanks & heat pumps to satisfy

		demand; takes up floor space. • Would have to ensure the supply temperature from the heat pumps can provide +60°C (140°F) water since CSA Z317.1-16 requires the storage tanks to be maintained at 60°C (140°F).
Solar panels connected to DHW storage tanks	• Most energy efficient method to generate domestic hot water.	• Would require many solar panels to satisfy DHW demands. • Need to connect to the hot water (or Central Steam Plant) heating system during periods when solar not available.

Recommendations:

If one of the Central Steam Plant options or one of the CoGen options is selected, we recommend the domestic hot water for the three (3) new buildings be generated by instantaneous steam-fired (i.e. tankless) water heaters; the distribution piping would be piped throughout in accordance with the CSA Z317.1 standard utilizing localized mixing valves. We recommend locating the instantaneous domestic hot water heaters in the same mechanical room where the domestic water entrance is located on the ground floor or basement levels.

If the decentralized hydronic (hot water) heating option is selected, we recommend the domestic hot water for the three (3) new buildings be generated utilizing indirect hot water storage tanks served by the hydronic boilers. The heating boilers will be needed year-round to satisfy the terminal reheat loads. The distribution piping would be piped throughout in accordance with the CSA Z317.1 standard utilizing localized mixing valves. We recommend locating the instantaneous domestic hot water heaters in the same mechanical room where the domestic water entrance is located on the ground floor or basement levels.

The Beacon & Garden Pavilion Concept (Research & Innovation Centre – RES):

The domestic water entrance serving the Emergency Wing is a 4"main located at the north end on Level 200; it was sized for six (6) additional future floors. Therefore, the domestic water entrance has the capacity to serve the new Research and Innovation Centre (RES). Depending on the quantity of fixtures for the new RES, the existing domestic water mains within the Emergency Wing may have the capacity to serve the new plumbing fixtures; otherwise, a new domestic cold water main from the water entrance would have to be extended up to the new RES addition.

The same applies to the domestic hot water; the Emergency Wing has two (2) instantaneous domestic hot water heaters; they have capacity for some additional fixtures. However, if the addition included a large quantity of plumbing fixtures, then we recommend two (2) new instantaneous water heaters be provided to serve the RES.

We recommend low-flow plumbing fixtures be installed throughout the RES addition to conserve water and this would be a mandatory requirement if the project targets some level of LEED certification.

PLUMBING – SANITARY & STORM DRAINAGE

Existing:

Municipal sanitary and storm services are located under Robie St., Bell Road, and Summer St.. Each of the existing buildings connects independently into the municipal sanitary and storm services.

The Beacon & Garden Pavilion Concept (IPU/OR, Ambulatory, & Cancer Care):

The three (3) new buildings will require independent service connections to the existing municipal services; based on preliminary calculations, the municipal services can handle the increased load. At this stage, each new building will require a 10"sanitary and 10"storm main (based on 25-year, rainfall intensity curves by Environment Canada) that will extend to the municipal sanitary and storm services. We recommend low-flow, high-efficiency plumbing fixtures will be installed to reduce the water consumption for the site (Note: low-flow, high-efficiency plumbing fixtures are necessary if LEED certification is a target for the new buildings since a mandatory prerequisite is a 20% reduction in water consumption than the baseline case). We recommend the use of controlled-flow roof drains be utilized on the roof to minimize the additional flow rate to the municipal storm services.

The Beacon & Garden Pavilion Concept (Research & Innovation Centre – RES):

The sanitary and storm mains serving the Emergency Wing are both 8"diameter; they were sized to handle six (6) additional floors; so, they can handle the plumbing drainage requirements of the proposed RES addition. The existing sanitary and storm mains exit the Emergency Wing on the east side adjacent to the HI building. The rainwater load capacity would simply be transferred from the Emergency Wing roof to the new RES roof.

We recommend low-flow plumbing fixtures be installed throughout the RES addition to conserve water and this would be a mandatory requirement if the project targets some level of LEED certification.

FIRE PROTECTION & STANDPIPE SYSTEMS

Existing:

Each of the existing buildings (i.e. Infirmary, Abbie Lane, and VMB) are connected to the HI site 10"diameter ring main.

Abbie Lane Building: Different sections of the building are protected by the following systems: wet-pipe sprinkler systems serving all heated occupied spaces; dry-pipe sprinkler systems in areas susceptible to freezing (i.e. parking level); and standpipe systems in the stairwells.

Veteran's Memorial Building: Different sections of the building are protected by the following systems: wet-pipe sprinkler systems serving all heated occupied spaces; dry-pipe sprinkler systems in areas susceptible to freezing (i.e. parking level); and standpipe systems in the stairwells.

3.7 Mechanical and Electrical

Mechanical

Halifax Infirmary: The Emergency Wing is primarily served by a wet-pipe sprinkler system; a small glycol loop is installed within the ambulance bay.

The Beacon & Garden Pavilion Concept (IPU/OR, Ambulatory, & Cancer Care):

The three (3) new buildings will connect into the existing HI Site 10"diameter ring main; a new 8"diameter line will extend into a mechanical room located on the floor below grade level for each building. Based on preliminary calculations, the ring main is of adequate size to satisfy the flow rate; but the fire pump may not have the capacity to achieve the required pressure in each new building, since the new buildings may be several stories higher than the existing buildings; therefore, a fire pump in series may be required for each new building to achieve the pressure requirement. We recommend a sprinkler tree within each building, to house the backflow preventers, etc.; we recommend sprinkler mains be zoned from this header; with the parking levels served by dry-pipe systems; and the remainder of the building fed from the wet-pipe sprinkler system zoned per floor; we recommend a standpipe riser system be piped to each of the stairwells.

The Beacon & Garden Pavilion Concept (Research & Innovation Centre – RES):

The sprinkler entrance for the Emergency Wing is in the northeast corner on Level 200. We recommend the existing sprinkler system be extended to serve the floors of the RES addition with dedicated floor-by-floor zone valve assemblies. We also recommend a standpipe system be provided to serve each of the new stairwells constructed.

MEDICAL GASES

Existing:

Currently the HI Site is serviced with the following medical gas systems: oxygen, medical air, medical vacuum, nitrous oxide, and nitrogen.

The oxygen supply is fed from a 9,000 USGal bulk storage tank and a 780 USGal reserve tank that are located adjacent to the entrance to the underground parking in the Infirmary building. The existing oxygen tanks are typically filled every (15) days.

The existing nitrous oxide supply system is served by a 3-ton horizontal bulk storage tank located adjacent to the oxygen bulk storage system. The nitrous oxide system is filled approximately three (3) times per year (every 4 months).

The existing nitrogen system consists of a 500 USGal storage tank located adjacent to the oxygen and nitrous oxide tanks. The nitrogen gas is supplied by the local medical gas supplier.

The existing medical air system is comprised of a triplex 25HP compressors with a duplex air dryer package. The air dryer package was installed in 2006; the triplex compressor package was installed in 2008-2009.

The existing medical vacuum system consists of a quad 12HP pumps that were installed in 2010.

The Halifax Infirmary is not equipped with an active Anaesthesia Gas Scavenging System (AGSS) which is a requirement of the current standard (CSA Z7396.1-12, Medical Gas Pipeline Systems - Part 1: Pipelines for Medical Gases, Medical Vacuum, Medical Support Gases, and Anaesthetic Gas Scavenging Systems); the building was designed with a passive system which met the requirements of the standard of the day.

The Beacon & Garden Pavilion Concept (IPU/OR, Ambulatory, & Cancer Care):

The existing systems cannot handle the additional capacity requirements of three (3) new buildings added to the HI site.

In discussions with the local medical gas supplier, the oxygen, nitrous oxide, and nitrogen systems can be expanded in their current area. The oxygen bulk storage tank would change from the 9,000 USGal tank to a 15,000 USGal tank. The nitrous oxide system would change from a 3-ton bulk storage tank to a 6-ton storage tank. The nitrogen system would be upgraded to a 900 USGal tank. Additional distribution piping from these sources would have to extend from the source, through the Infirmary Parking level and connect to the three (3) new buildings for distribution within each new building.

Alternatively, the existing oxygen, nitrous oxide, and nitrogen source tanks can remain as is and continue to serve the three (3) existing buildings (i.e. HI, Abbie Lane, & VMB). New bulk storage tanks (oxygen, nitrous oxide, & nitrogen) could be installed to serve the three (3) new buildings.

The following is a summary of the advantages and disadvantages related to either approach:

Options (for oxygen, nitrous oxide, & nitrogen systems)	Advantages	Disadvantages
Expand existing bulk storage tanks to serve entire site	• Medical gas supplier has one location to fill tanks. • Only one set of source systems to maintain. • Only have one set of master alarm panels for the source alarm points for oxygen, nitrous oxide, & nitrogen.	• Must extend piping from the existing source tanks to the three (3) new buildings through the existing HI parking level. • Will require a temporary source supply for each system in order to upsize/replace existing tanks. • Will require a temporary shutdown in order to connect into existing distribution mains for the three (3) new buildings.
Install new bulk storage (oxygen, nitrous oxide, & nitrogen) systems to serve three (3) new buildings; the existing bulk storage tanks remain to serve existing buildings	• Don't have to extend piping from the existing source tanks to the three (3) new buildings through the existing HI parking level. • No disruption to the existing bulk storage tanks.	• Requires an area of land to house the new bulk storage tanks on a congested site; must also provide minimum clearances to tanks. • Medical gas supplier has two (2) locations to fill tanks. Need additional

		space for the fill truck to park while filling tanks. • Twice as many tanks/source systems to maintain. • Will require new master alarm panel(s) to pickup all of the source alarm points.

Recommendation (Bulk Storage Systems):

We recommend expanding the existing oxygen, nitrous oxide, and nitrogen bulk storage systems in their current location; the site is congested and there are limited locations on the site to house the bulk tanks and maintain the minimum clearances.

New medical air, medical vacuum, and anaesthesia gas scavenging systems would be required to serve the three (3) new buildings in either concept. For either concept, the medical air, medical vacuum, and AGSS systems could be combined at one building and medical gas lines extended to the other buildings through the proposed link connecting the buildings. Alternatively, install independent medical air, medical vacuum, and AGSS systems for each new building. This way, the systems could be piped together for redundancy purposes and/or replacement purposes in the future. At this point, an AGSS is required for the IPU/OR building and we have assumed an AGSS system would be required for the Ambulatory building and Cancer Care building; however, this would require further consultation with NSHA to determine if the AGSS is in fact required for the Ambulatory and Cancer Care buildings.

The following is a summary of the advantages and disadvantages for either approach:

Options (medical air, medical vacuum, & AGSS)	Advantages	Disadvantages
Combined medical gas systems for the three (3) new buildings	• Only need one (1) master alarm panel to pick-up the alarm points for each system. • Less equipment to maintain. • Would require less mechanical room floor space compared to the separate systems approach.	• Must extend piping from one building to the other for each system. • Larger systems and piping distribution.
Separate medical gas systems for the three (3) new buildings	• Medical gas lines and systems are smaller compared to the combined approach.	• Need two (2) master alarm panels to pick-up the alarm points for each system; one located in each new building. • Requires more mechanical room floor

		space than the combined systems approach. • More capital cost and operation/maintenance cost associated with this approach.

Recommendation (Vacuum & Compressed Systems):

We recommend combining the medical gas systems (medical air, medical vacuum, and AGSS) for the Ambulatory and Cancer Care buildings and have separate systems for the new IPU/OR building. For each of these systems, they could be connected through the links to accommodate replacement of equipment in the future.

The NSHA may want to consider carbon dioxide for the new buildings; currently carbon dioxide is not a medical gas installed at the HI site; needs further discussion with NSHA.

The Beacon & Garden Pavilion Concept (Research & Innovation Centre – RES):

We expect the need for some medical gases (oxygen, medical air, & medical vacuum) for the research and simulation spaces of the RES addition. We do not foresee the quantity of outlets being extensive, therefore, connecting into the medical gas mains serving the Emergency Wing would be acceptable. We do not foresee the need for nitrous oxide or gas scavenging; however, needs further discussion with NSHA.

EMERGENCY POWER GENERATION - MECHANICAL

The Beacon & Garden Pavilion Concept:

A new emergency power generation building will be located on the HI Site to provide emergency back-up power to the existing Emergency Department; new diesel generators would be installed in each of the three (3) new buildings. To satisfy the ventilation requirements for the generators, we recommend the following: outside air intake louvers and dampers; ducted radiator exhaust air louvers and dampers; combustion air louvers and dampers; and generator chimney exhaust stacks equipped with mufflers that extend a minimum of 9'-0" above the roof level.

We recommend each of the diesel generators be piped to dedicated daytanks (each with a minimum 4-hour storage capacity in accordance with CSA Z32 & C282); with dedicated duplex pump packages to pump fuel from the main diesel fuel storage tanks to the corresponding daytank. The main diesel fuel storage tanks shall provide a minimum 72-hour fuel storage for each of the operating generators as required by the CSA standards; we recommend dedicated fuel polishing systems be provided for each of the main diesel fuel storage tanks. We recommend aboveground, double-walled diesel fuel storage tanks be installed and protected by an 8'-0"high fenced enclosure. The main diesel fuel storage tanks shall meet the requirements specified in the province of Nova Scotia DTIR's DC-350 document. The 8'-0" high fenced enclosure is a requirement of the province of Nova Scotia DTIR's DC-350 document.

DECANTING OF EXISTING SPACES - MECHANICAL

The Beacon & Garden Pavilion Concept (Pre-Decanting Renovation):

One of the Pre-Decanting renovations involves removing two (2) mechanical rooms - 55M1 and 56M1 located on Level 500, in the southwest and northwest corners, respectively.

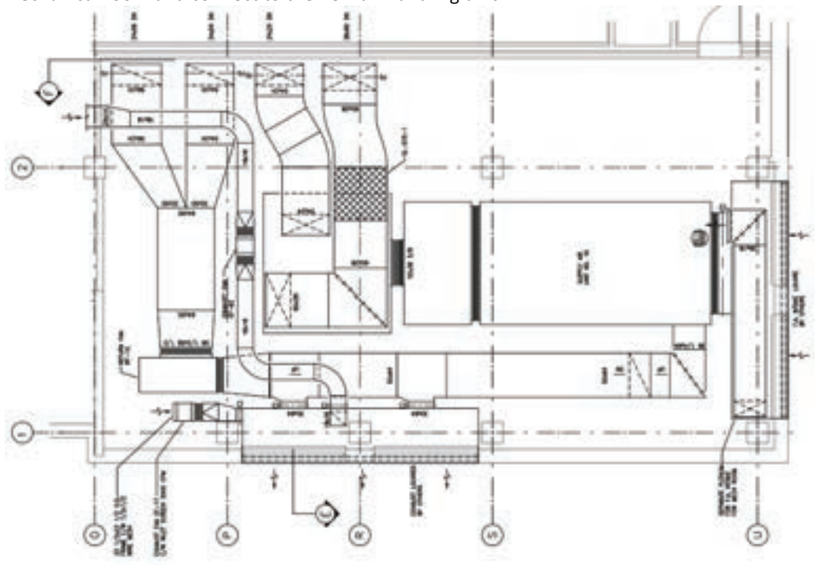
Mechanical Room 55M1 serves Medical Offices (Ortho, Food Services Dietician Admin, & a Laboratory space) located on the Level 400 southwest quadrant. The ventilation and HVAC piping plans are shown below. The intent is to duplicate the mechanical equipment to a new mechanical penthouse located south of the existing Emergency Wing mechanical penthouse on Level 400. A new corridor link will be constructed in between the new mechanical penthouse and the existing Infirmary.

The air handling unit (SAU15) located in Mechanical Room 55M1 has a supply airflow capacity of 29,900 cfm; the return fan (RF10) has a return airflow capacity of 25,070 cfm. Also included in this room are exhaust fans EF17 and EF62; EF17 serves the mechanical room; EF62 provides exhaust air from an electrical room.

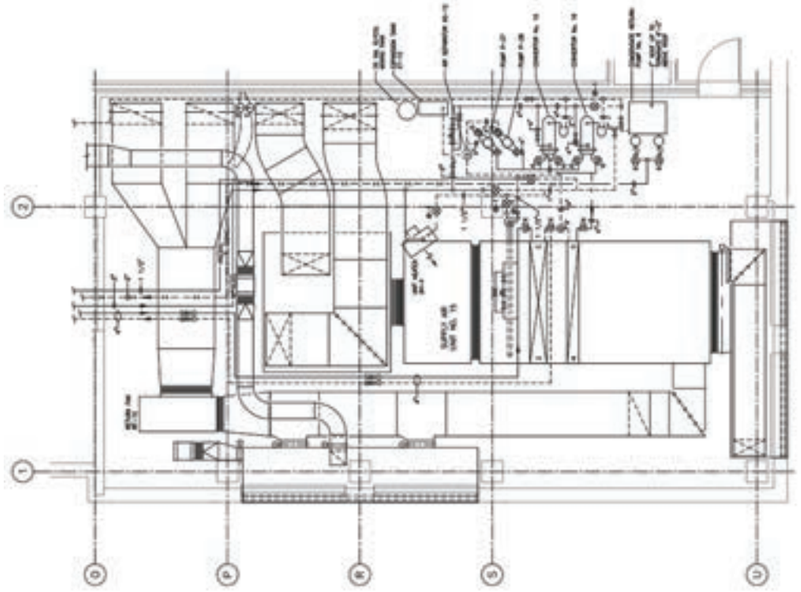
In addition to the ventilation equipment; the following equipment are located within this room: glycol/water circulating pumps; steam-to-water convertors; condensate receiver; expansion tank; glycol make-up tank. Chilled water lines and a humidification line are also piped to this mechanical room.

We recommend creating a new mechanical room on Level 400 to house the mechanical heating and ventilation equipment located within the displaced mechanical room 55M1.

Chilled water supply and return lines and a humidification line would have to extend to the new mechanical room and connect to the new air handling unit.



Mechanical Room 55M1 - Ventilation Plan



Mechanical Room 55M1 - HVAC Piping Plan

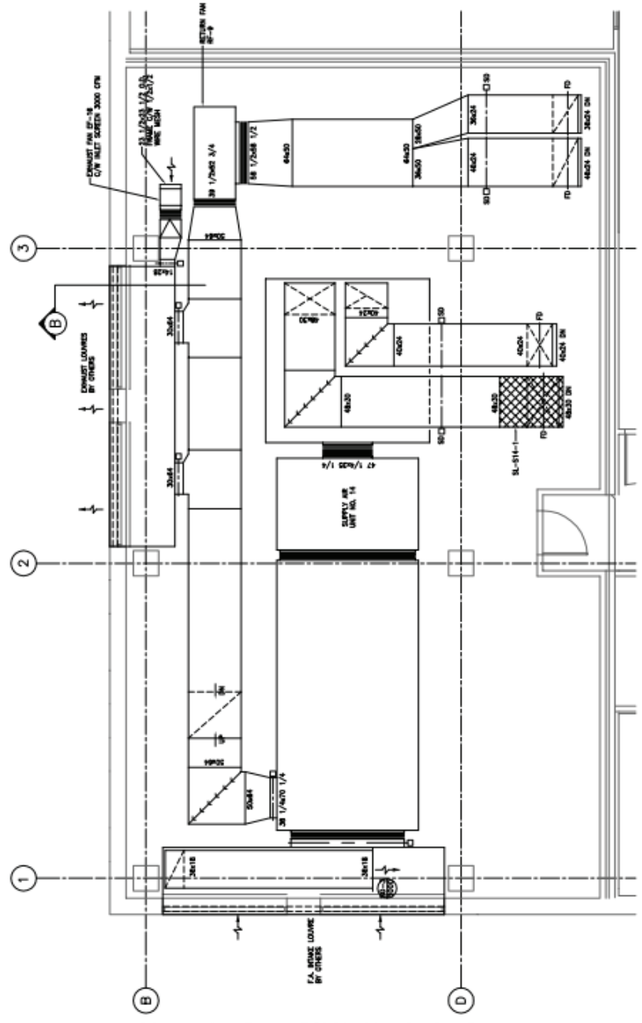
Mechanical Room 56M1 serves Medical Offices (Vascular & RT) located on the Level 400 northwest quadrant. The ventilation and HVAC piping plans are shown below. The intent is to duplicate the mechanical equipment to a new mechanical penthouse located south of the existing Emergency Wing mechanical penthouse on Level 400. A new corridor link will be constructed in between the new mechanical penthouse and the existing Infirmary.

The air handling unit (SAU14) located in Mechanical Room 56M1 has a supply airflow capacity of 24,800 cfm; the return fan (RF9) has a return airflow capacity of 19,370 cfm. Also included in this room is exhaust fans EF16; EF16 serves the mechanical room. The proposed new mechanical penthouse is approximately 40' away from the existing duct/floor penetrations.

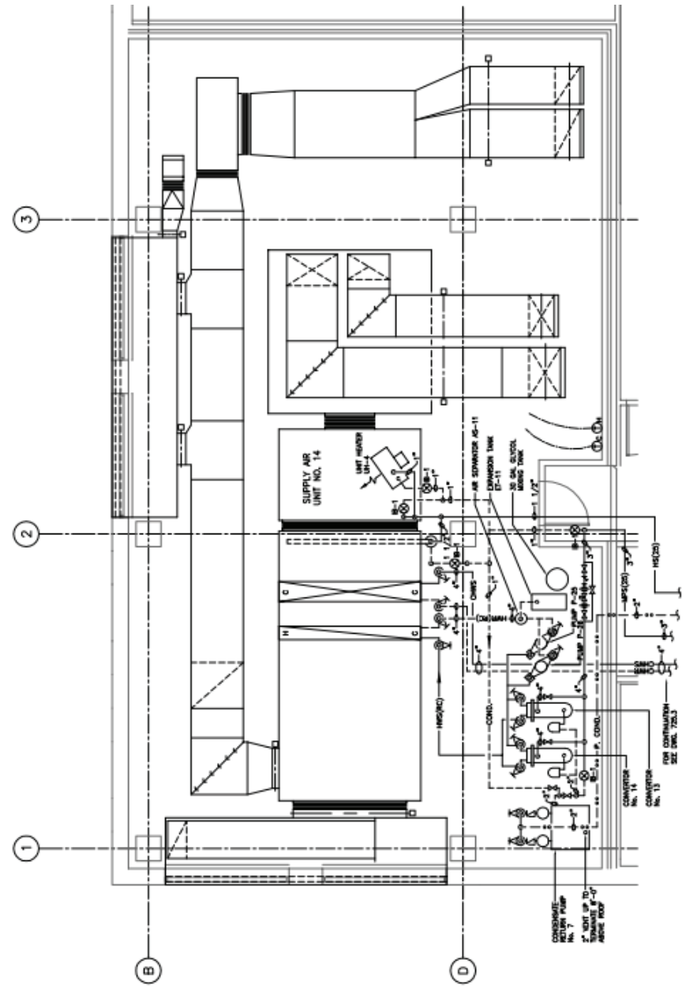
In addition to the ventilation equipment; the following equipment are located within this room: glycol/water circulating pumps; steam-to-water convertors; condensate receiver; expansion tank; glycol make-up tank. Chilled water lines and a humidification line are also piped to this mechanical room.

The supply and return ducting from a new air handling system would have to extend into the ceiling space of the new corridor link and penetrate the exterior wall of the Infirmary and re-connect into the existing duct mains.

Chilled water supply and return lines and a humidification line would have to extend to the new mechanical penthouse and connect to the new air handling unit.



Mechanical Room 56M1 - Ventilation Plan

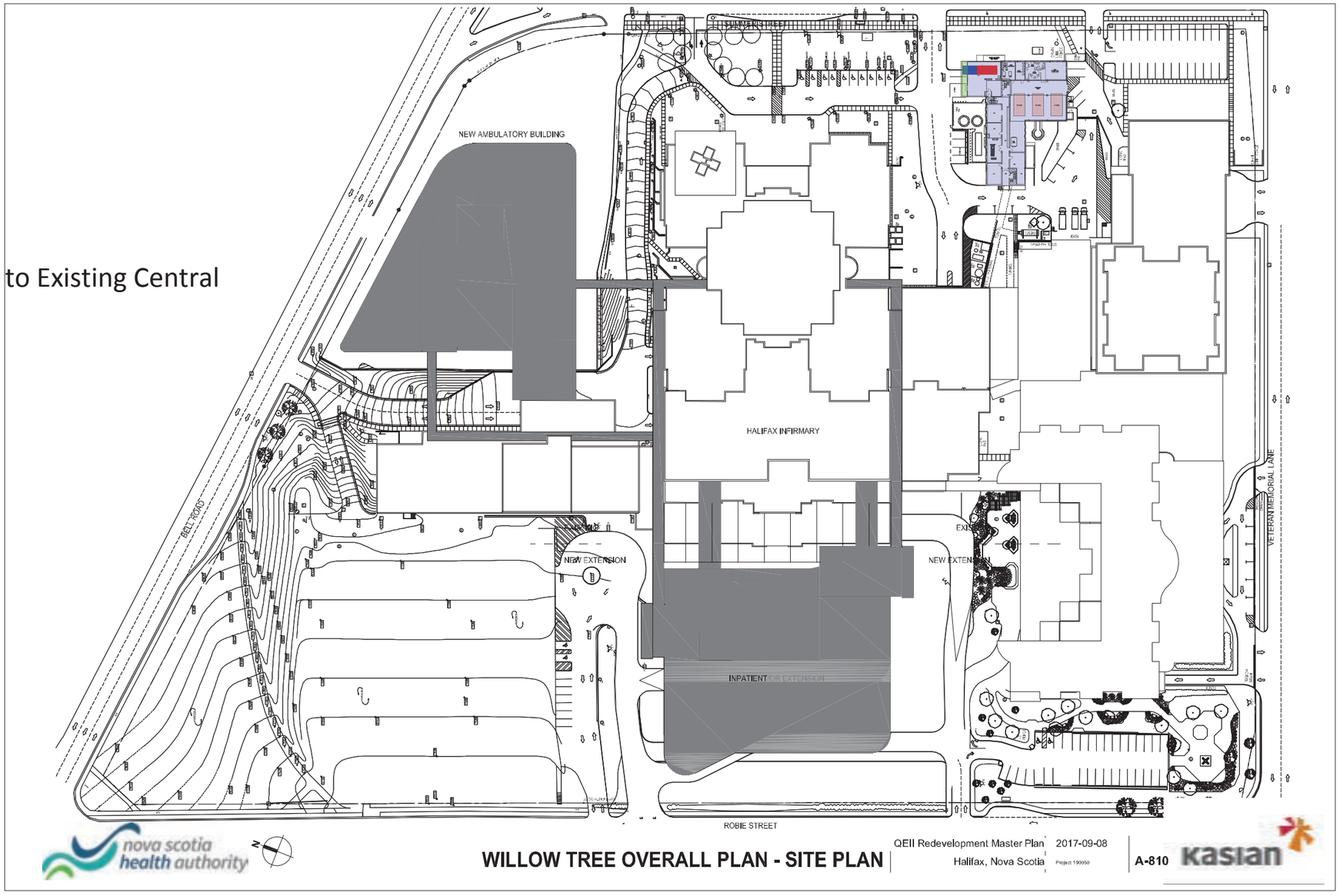


Mechanical Room 56M1 - HVAC Piping Plan

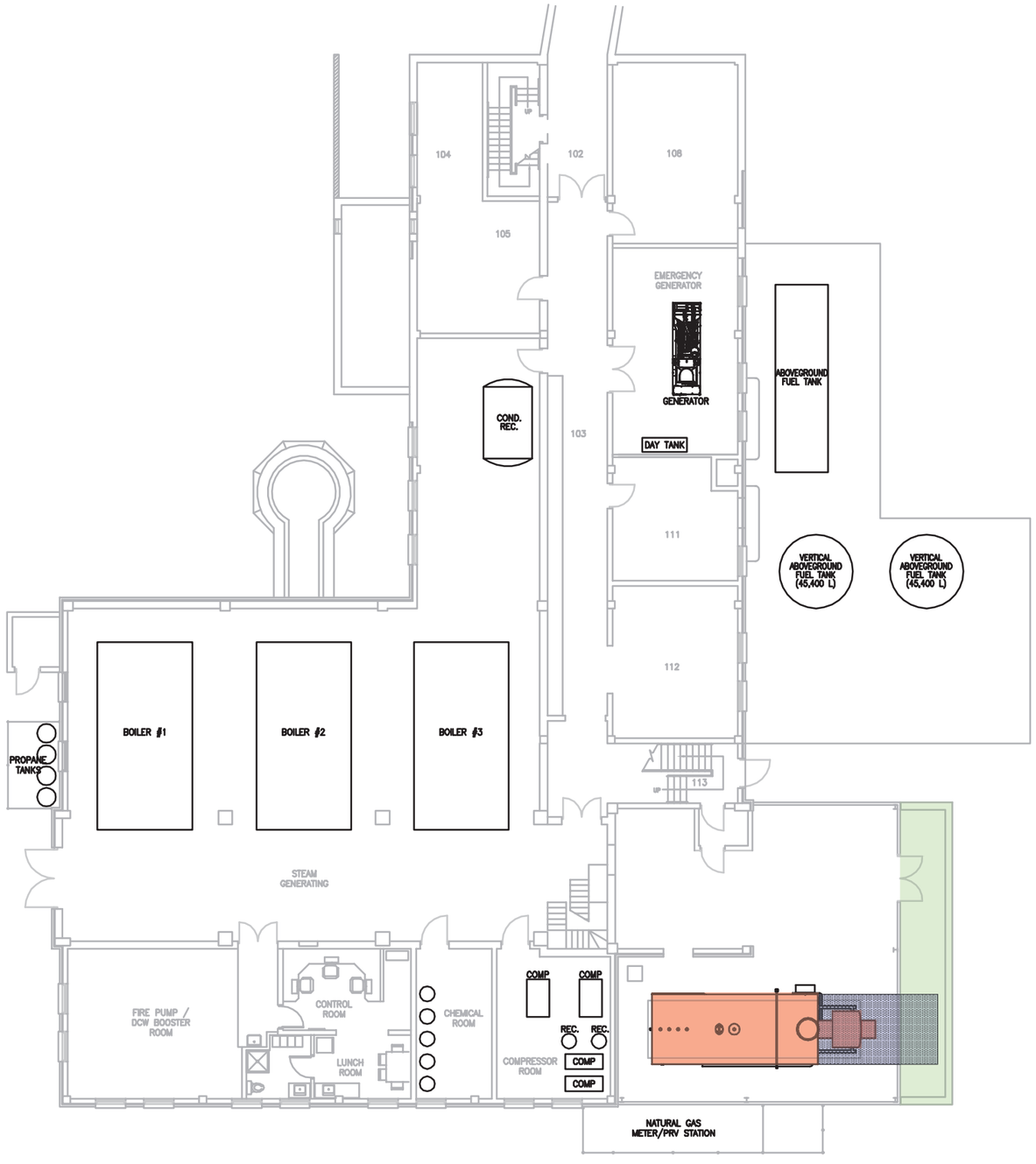
Appendix 1

CHP Alternative #1 - Add Fourth Boiler to Existing Central Heating Plant

CHP1 - Add 4th Boiler to Existing Heating Plant



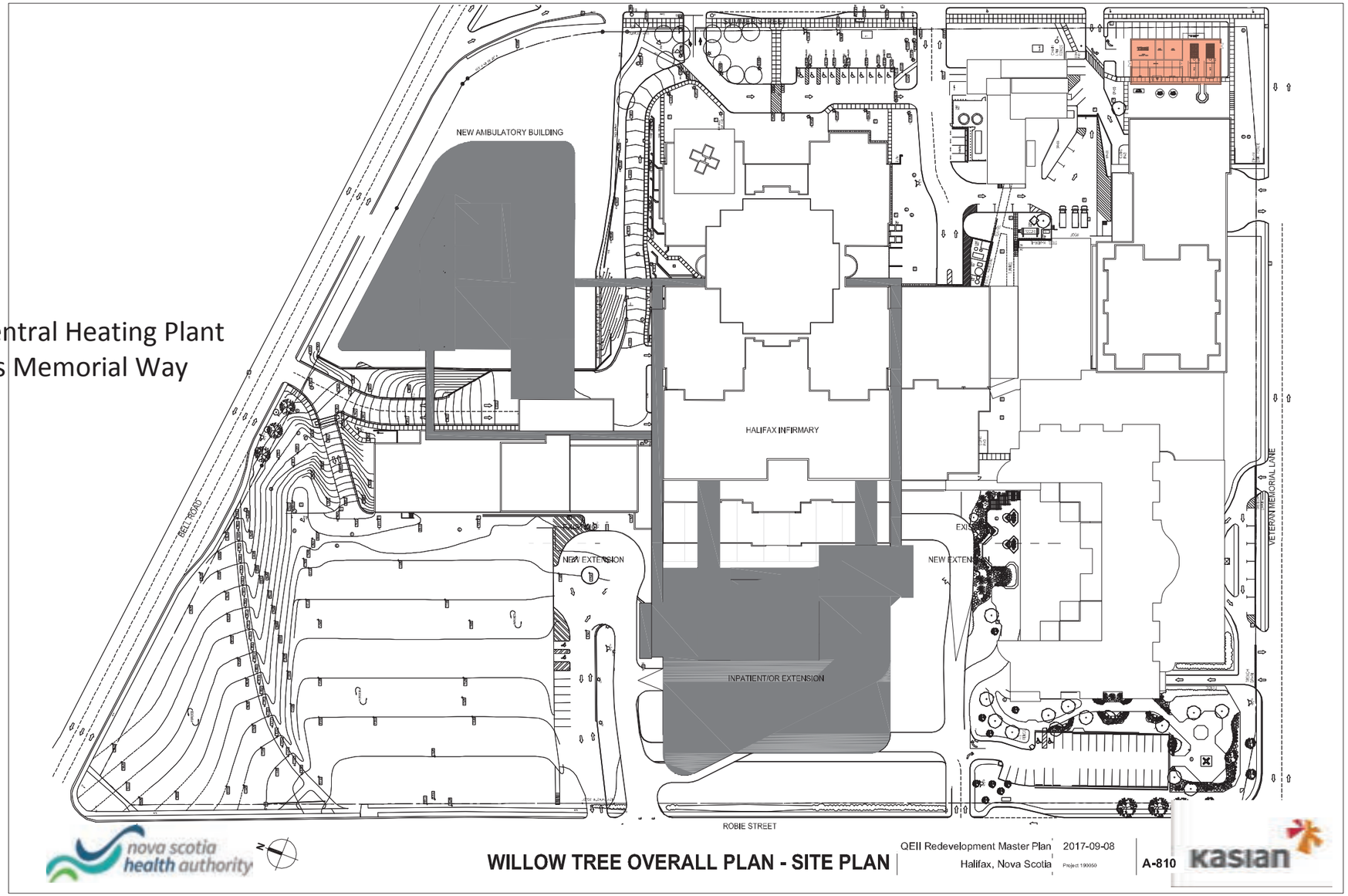
3.7 Mechanical and Electrical
Mechanical



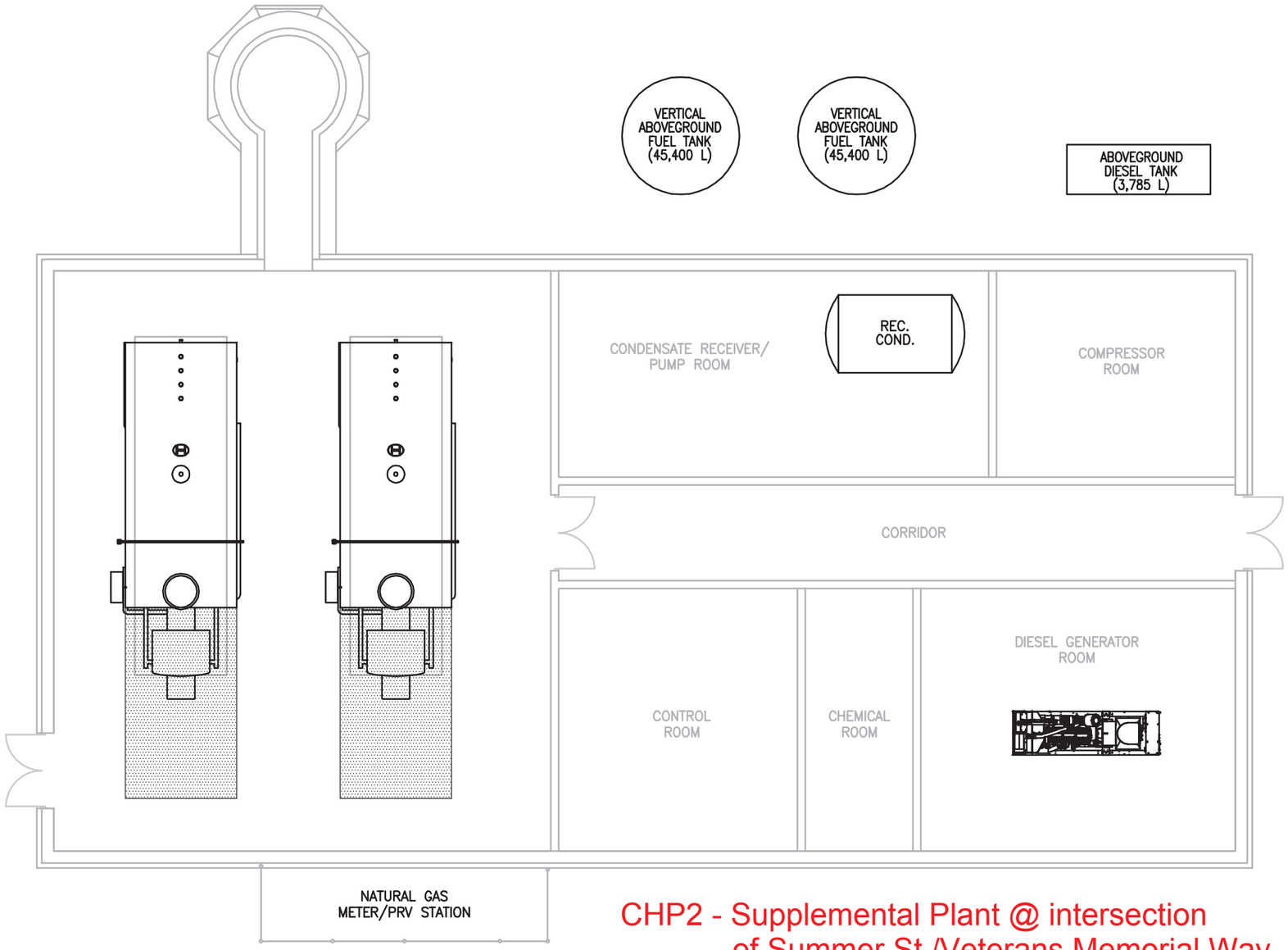
CHP1 - Add 4th Boiler to Existing Heating Plant

Appendix 2

CHP Alternative #2 - Supplemental Central Heating Plant
- Intersection of Summer/Veterans Memorial Way



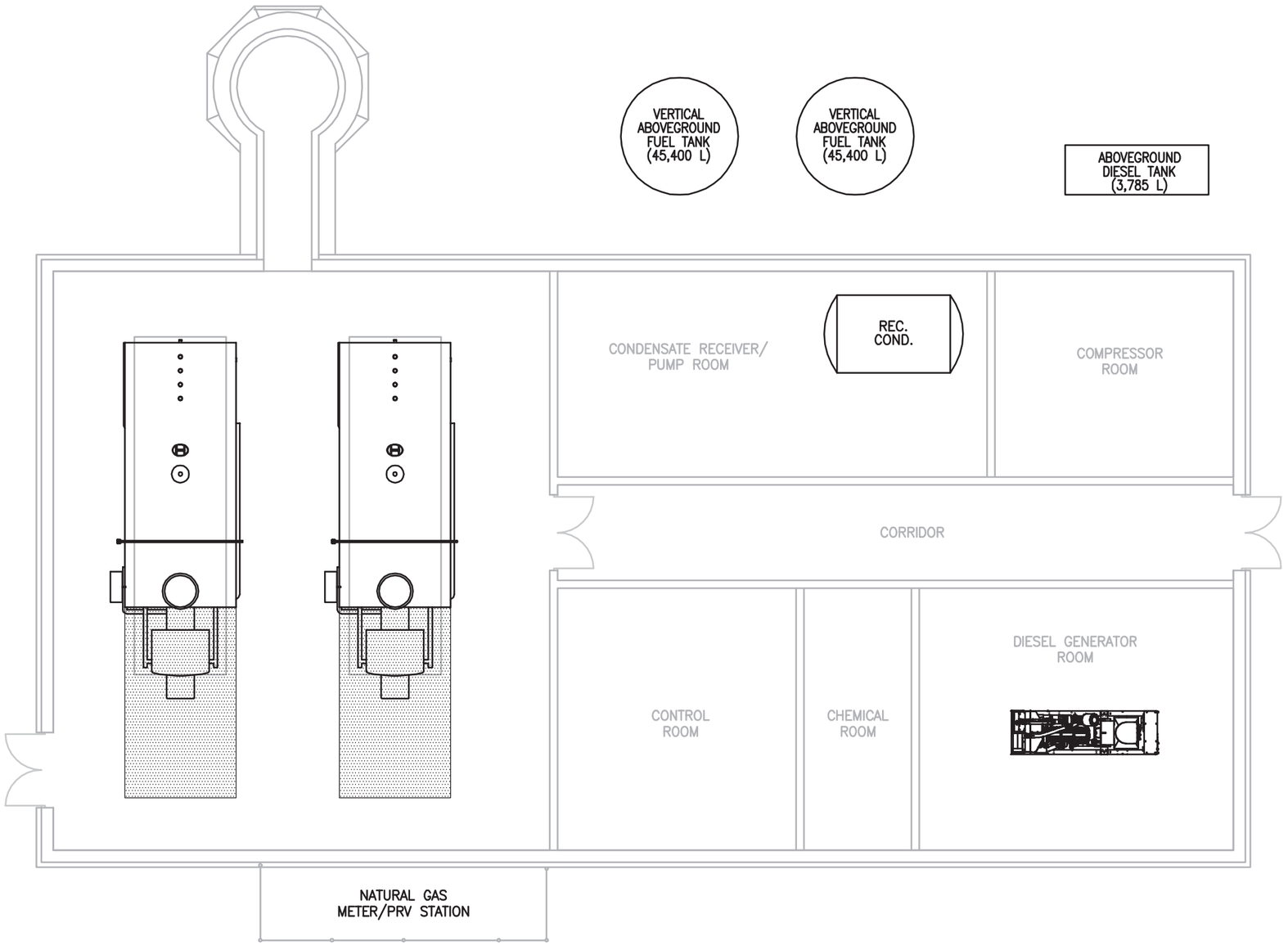
3.7 Mechanical and Electrical
Mechanical



CHP2 - Supplemental Plant @ intersection of Summer St./Veterans Memorial Way

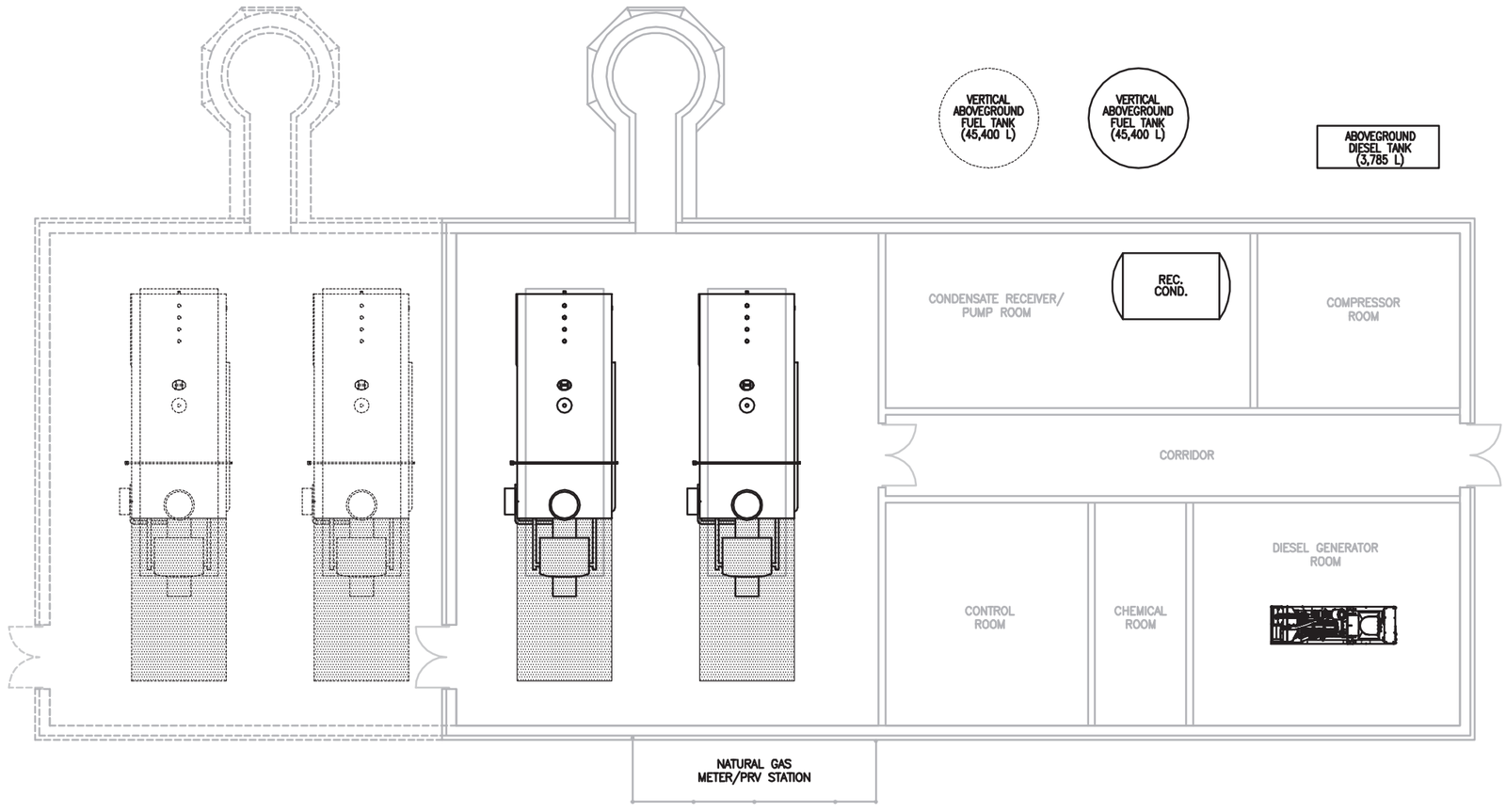
Appendix 3

CHP Alternative #3 - Standalone Central Heating Plant - Intersection of Summer St./Bell Rd.


VERTICAL ABOVEGROUND FUEL TANK (45,400 L)
VERTICAL ABOVEGROUND FUEL TANK (45,400 L)
ABOVEGROUND DIESEL TANK (3,785 L)
CONDENSATE RECEIVER/ PUMP ROOM
REC. COND.
COMPRESSOR ROOM
CORRIDOR
CONTROL ROOM
CHEMICAL ROOM
DIESEL GENERATOR ROOM
NATURAL GAS METER/PRV STATION

Appendix 4

CHP Alternative #4 - New Entire Site Central Plant - Intersection of Summer St./Bell Rd.


VERTICAL ABOVEGROUND FUEL TANK (45,400 L)
VERTICAL ABOVEGROUND FUEL TANK (45,400 L)
ABOVEGROUND DIESEL TANK (3,785 L)
CONDENSATE RECEIVER/ PUMP ROOM
REC. COND.
COMPRESSOR ROOM
CORRIDOR
CONTROL ROOM
CHEMICAL ROOM
DIESEL GENERATOR ROOM
NATURAL GAS METER/PRV STATION

Halifax Infirmary Site – The Beacon Concept Option

Table of Contents

NOTE: The Electrical Report for the HI Site references the Beacon Option, however the infrastructure requirements for both the Beacon and Garden Pavilion are the same.

Executive Summary

The primary purpose for this report is to provide background information for the existing electrical and communication infrastructure found at the Halifax Infirmary Site (HI), what buildings are affected and where major systems are lacking capacity to serve the new master plan for this site.

In addition, this report provides information to aid the next phase of engineered document production – such as; underground utility and building-to-building communication topologies, required building capacities – normal and emergency power, space to support an IT system that serves the next generation of acute health products, and what major systems have reached their rated service life.

Relevant Codes

The electrical system design will be in accordance with the applicable requirements of:

.1 Latest approved edition of the National Building Code of Canada (NBC), errata, revisions, and supplements,

.2 Latest edition of the Canadian Electric Code (CEC),

.3 ASHRAE/IES 90.1 - Energy Limitations for Lighting Systems,

.4 Illuminating Engineering Society North America (IESNA),

.5 CAN/ULC S524 Canadian Standard for Installation of Fire Alarm Systems,

.6 Provincial Department of Labour,

.7 Labour Code of Canada,

.8 Nova Scotia Power Building Inspection Department,

.9 Nova Scotia Building Code Regulations,

.10 LEED V4 Canada,

.11 NSTIR's DC 350 Document,

.12 CAN/ULC S524 Canadian Standard for Installation of Fire Alarm Systems,

.13 CSA – Z32 Electrical Safety and Essential Electrical Systems in Health Care Facilities,

.14 CSA – C282 Emergency Electrical Power Supply for Buildings,

.15 ANSI/TIA-1179A Healthcare Facility Telecommunications Infrastructure Standard,

.16 Refer to Mechanical Report.

Halifax Infirmary HV Electrical Site Services

Existing Site Services:

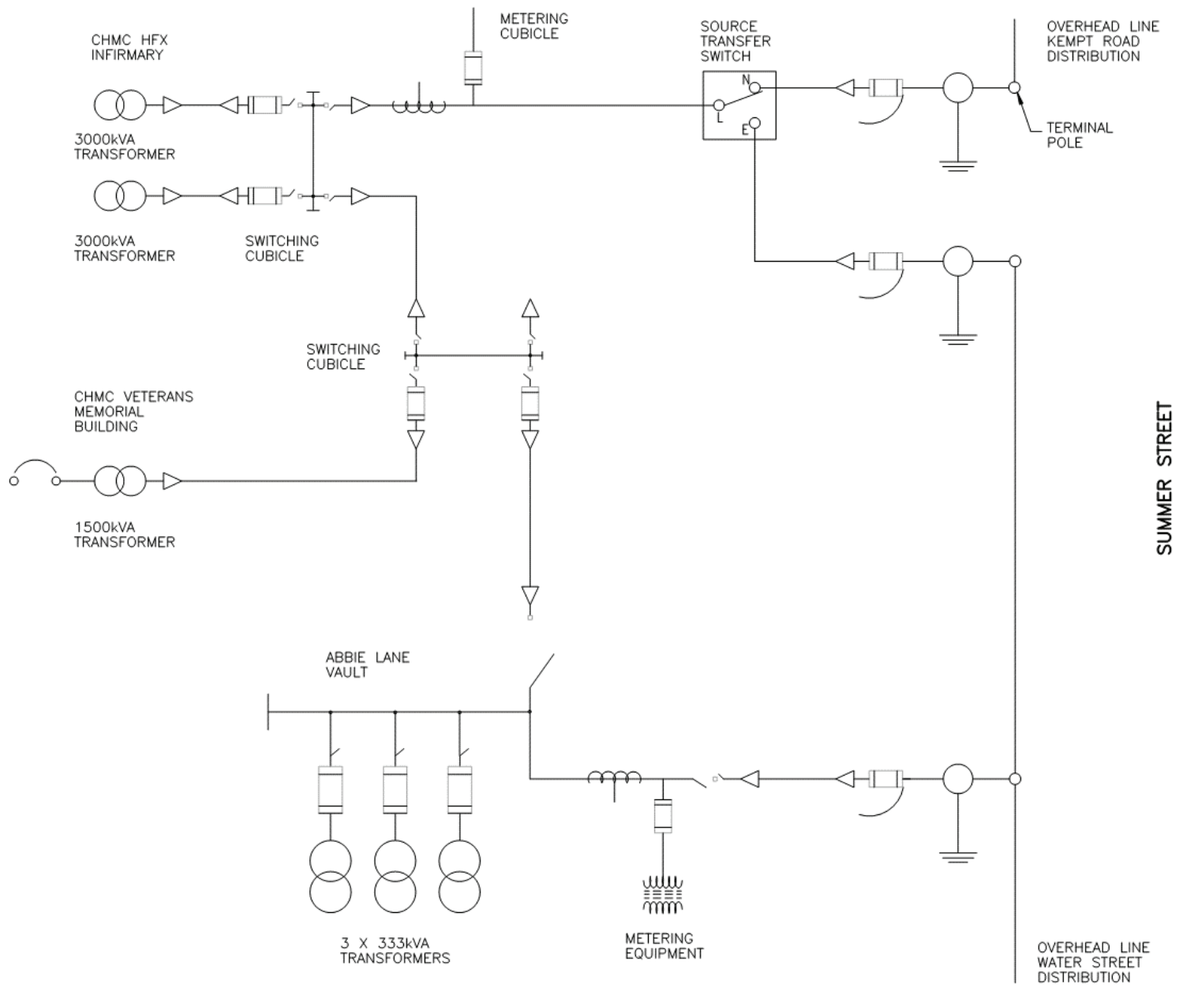


Figure 1: Current HV Arrangement For The Existing HI Site

3.7 Mechanical and Electrical

Electrical

This existing Halifax Infirmary (HI) site is serviced with two separate and independent utility 25kV High Voltage (HV) services – one over head utility service is derived from Lower Water Street substation and a second independent over head utility service is derived from Kempt Road substation. Each of these High Voltage (HV) services have a maximum loading profile of 14MWs – this is for all connected services (healthcare and non-healthcare loads). Both utility services are routed underground from utility terminal poles (along Summer Street) to a utility owned automatic transfer switch located on the property in front of the Halifax Infirmary site, once combined a common HV metering point is established for the HI Site.

These services, which are primary metered, are responsible for feeding the following buildings at the HI site:

- Halifax infirmary – (2) 3000kVA exterior pad mount transformers.
    - Sub feeds the power plant, parking structure and the Charles Keating Emergency Department.
- Abbie Lane – (3) 333kVA interior "vault configured" transformers.
- Veterans Memorial Building – (1) 1500kVA exterior pad mount transformer.

Halifax Infirmary Site Services Modification:

Under this project there are planned modifications to the HV distribution system, refer to proposed site services section for additional information.

Abbie Lane Site Services Modification:

Under this project there are no prescribe alterations to the HV electrical systems found in this building.

Veterans Memorial Site Services Modification:

Under this project there are no prescribe alterations to the HV electrical systems found in this building.

Proposed Site Services:

For the Beacon Concept, the functional program has a new Inpatient/OR Extension Building at 458,454 sq-ft (GFA) with 218,660sq-ft (GFA) of parking, a new Ambulatory Care Building at 511,665 sq-ft (GFA) with 293,312 sq-ft (GFA) of parking, and a new Cancer Care Building at 290,928 sq-ft (GFA) with 72,080 sq-ft (GFA) of parking. In addition to these three new acute health care facilities there will be a Research and Innovation Centre at 41,307 sq-ft (GFA) added to the existing Charles Keating Emergency Department.

To accommodate the proposed buildings and expansion at the Halifax infirmary site, the existing HV infrastructure will need to be upgraded as detailed in Figure 2.

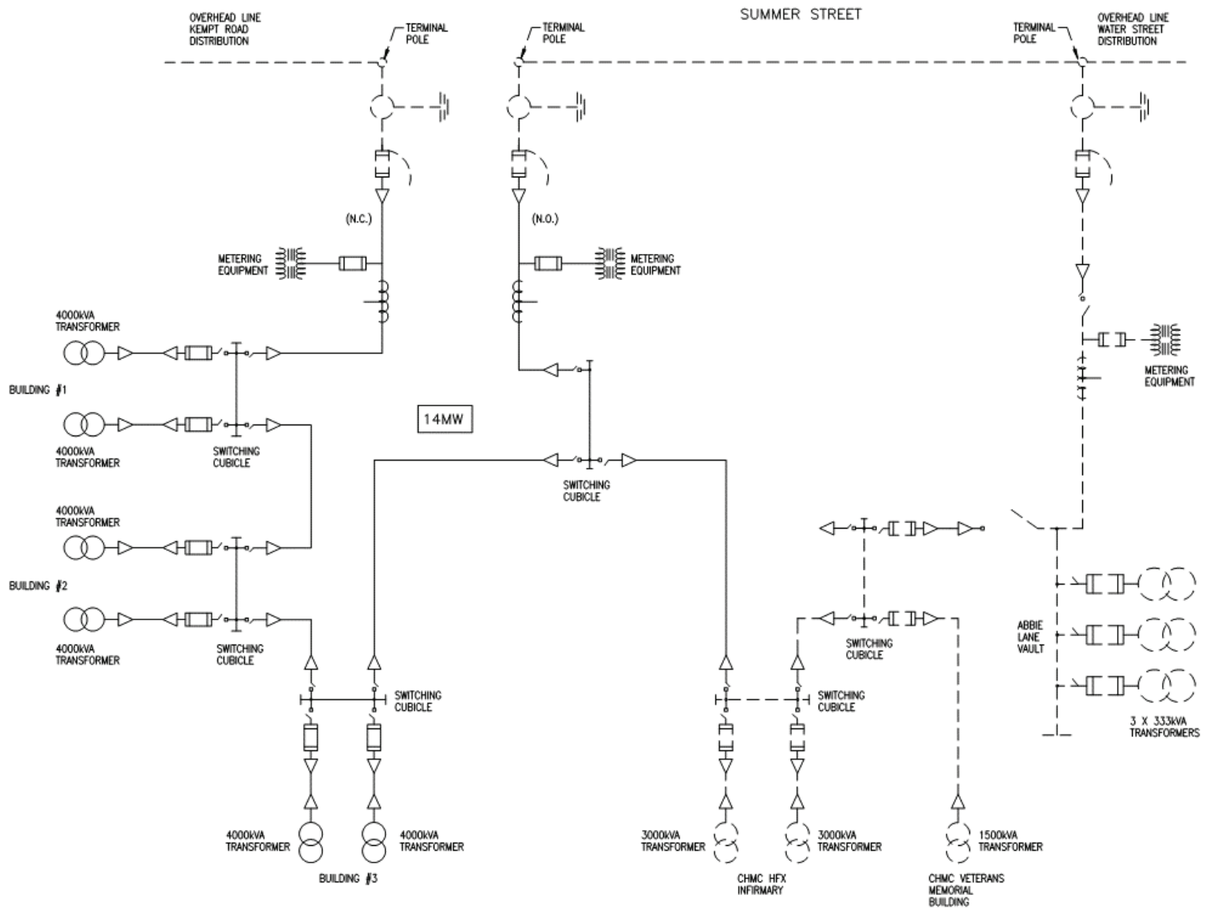


Figure 2: Proposed HV Arrangement For The Existing HI Site

The Beacon Concept - Normal Power Requirements

Existing Halifax Infirmary (HI) Building

The normal power electrical services at this building are reaching their designed capacity and can not support any new additions/expansions to the HI building with the emergency department connected. There is sufficient normal power capacity to address the internal decanting / renovation process as describe throughout the master planning document.

Inpatient/OR Extension Building

For this new building the client requires two-new incoming “utility owned” pad mount transformers (Side A and Side B) connected through a switching cubicle. The primary utilization voltage will be 25kV and the secondary utilization voltage will be 600V 3 Ph, 4W.

The initial capacity/building demand for each new building located at this site will be 4000kVA (for Side A and for Side B).

Note:

- All 600V primary distribution shall be insulated power circuit breakers of draw out design of a main-tie-main arrangement.

Ambulatory Care Building

For this new building the client requires two-new incoming “utility owned” pad mount transformers (Side A and Side B) connected through a switching cubicle. The primary utilization voltage will be 25kV and the secondary utilization voltage will be 600V 3 Ph, 4W.

The initial capacity/building demand for each new building located at this site will be 4000kVA (for Side A and for Side B).

Note:

- All 600V primary distribution shall be insulated power circuit breakers of draw out design of a main-tie-main arrangement.

Cancer Care Building

For this new building the client requires two-new incoming “utility owned” pad mount transformers (Side A and Side B) connected through a switching cubicle. The primary utilization voltage will be 25kV and the secondary utilization voltage will be 600V 3 Ph, 4W.

The initial capacity/building demand for each new building located at this site will be 4000kVA (for Side A and for Side B).

Note:

- All 600V primary distribution shall be insulated power circuit breakers of draw out design of a main-tie-main arrangement.

Charles V. Keating Emergency & Trauma Centre / Research and Innovation Centre

The emergency department which has multiple 600V feeders and is currently fed from the main 600V electrical room located in the Halifax Infirmary building. With the addition of the research and innovation centre to the existing emergency department it has been decided to refeed this structure with normal / emergency power from the new Cancer Care Centre.

Note:

- All 600V primary distribution shall be insulated power circuit breakers of draw out design of a main-tie-main arrangement.
- This building shall be fed with 1500A 347/600V (Side A and Side B)

The Beacon Concept – Emergency Power Requirements

Existing Halifax Infirmary (HI) Building

The emergency power electrical services at this building are reaching their designed capacity and cannot support any new additions/expansions to the building with the emergency department connected. There is sufficient emergency power capacity to address internal decanting / renovation process as described throughout the master planning.

Inpatient/OR Extension, Ambulatory Care, Cancer Center Buildings

Each of the proposed buildings identified in the master plan shall have their own incoming utility, normal, and selectively coordinated emergency power distribution system. The electrical system shall be fully compliant to CSA-282 and CSA-Z32 standards with an initial system emergency capacity of 4000kVA.

Note:

- All 600V primary distribution shall be insulated power circuit breakers of draw out design.
- UPS power shall be provided for all DI suites (room and patient safety) with a minimum battery run time of 40 minutes based on 100% loading. Batteries shall be over VLRA Absolyte or equivalent.
- 100% redundant UPS power shall be provided for all OR suites with a minimum battery run time of 40 minutes based on 100% loading. Batteries shall be over VLRA Absolyte or equivalent.

Charles V. Keating Emergency & Trauma Centre / Research and Innovation Centre

With the proposed expansion to the Emergency Department it has been decided that the emergency department receive its normal, and selectively coordinated emergency power distribution system from the Cancer Care Centre. The electrical system shall be fully compliant to CSA-282 and CSA-Z32 standards with an initial system emergency capacity of 1500kVA (Side A and Side B).

Note:

- All 600V primary distribution shall be insulated power circuit breakers of draw out design.

3.7 Mechanical and Electrical
Electrical

The Beacon Concept – Fire Alarm

Existing Halifax Infirmary (HI) Building
The existing fire alarm system consists of a network of Simplex 4100 series control panels and respective fire alarm devices. The system and the field devices have reached their service life and are no longer being manufactured. This product will be available for the next 7 years. The fire alarm system for this building is not planned to be replaced during the decanting / renovation process. For the areas being renovated, it is expected that the design and implementation be based on current codes.

Inpatient/OR Extension, Ambulatory Care, Cancer Care Centre Buildings
A new addressable, microprocessor based, zoned, non-coded, electrically supervised, Class A two stage fire alarm system will be provided to meet the requirements of the National Building Code, the Canadian Electrical Code, CAN/ULC S524. Verification of the fire alarm system shall be to CAN/ULC S537.

Charles V. Keating Emergency & Trauma Centre / Research and Innovation Centre
Charles V. Keating Emergency & Trauma Centre – (Emergency Department): The existing fire alarm system consists of a network of Simplex 4100 series control panels and respective fire alarm devices. The system and services have reached their service life and are no longer being manufactured. This product will be available for the next 7 years. The fire alarm system for this building is not planned to be replaced during the addition of the Research and Innovation Centre. For the areas being added/renovated, it is expected that the design and implementation be based on current codes.

The Beacon Concept – Nurse Call

Existing Halifax Infirmary (HI) Building
The HI building is continuously being renovated, during such renovations the nurse call system is selectivity updated to support an IP based nurse call system. For the areas being renovated under this project and where nurse call systems are affected they shall be replaced with an IP based nurse call system that is currently being utilized throughout the HI building. The IP based nurse call supplier shall provide a common platform for all NSHA assets that meets their functional requirement around providing acute health care delivery/patient support. The design and placement of devices will be typical of an acute health care environment. The new IP based system components shall be supplied, installed and programmed by others, all associated costs will be included in the manufacturer's price to the owner. All passive components are to be included in scope of services under this project.

Inpatient/OR Extension, Ambulatory Care, Cancer Care Centre Buildings
For each of the proposed buildings, an IP based nurse call supplier shall provide a common platform for all NSHA assets that meets their functional requirements around providing acute health care delivery/patient support. The design and placement of devices will be typical of an acute health care environment. The new IP based system components shall be supplied, installed and programmed by others, all associated costs will be included in the manufacturer's price to the owner. All passive components are to be included in scope of services under this project.

Charles V. Keating Emergency & Trauma Centre / Research and Innovation Centre
For the areas being renovated under this project and where nurse call systems are affected they shall be replaced with an IP based nurse call system that is currently being utilized throughout the HI building. The IP based nurse call supplier shall provide a common platform for all NSHA assets that meets their functional requirement around providing acute health care delivery/patient support. The design and placement of devices will be typical of an acute health care environment. The new IP based system components shall be supplied, installed and programmed by others, all associated costs will be included in the manufacturer's. All passive components are to be included in scope of services under this project.

The Beacon Concept – CCTV

Existing Halifax Infirmary (HI) Building
The HI is continuously being renovated, during such renovations the CCTV system is selectivity updated to support a POE IP based system. For the areas being renovated under this project and where CCTV systems are affected they shall be replaced with an POE IP based system that is currently being utilized throughout the HI building.

For the renovation areas of the HI building, an IP POE based system with cameras located at building entrances, exits and building perimeter covering exit / exit pathways. The system shall include provision of a raceway system complete with Category 6A wiring, backboxes, and IP based fast acting high resolution WDR cameras (3-5 megapixel), 1080p network video recorders with 30fps on all channels, monitoring, software, compatible with HEVC (H.265) compression standard, UPS and associated racks are supplied and installed by this contractor. The CCTV will be connected in to the Halifax Site for central monitoring.

Inpatient/OR Extension, Ambulatory Care, Cancer Care Centre Buildings
For each of the proposed buildings, an IP POE based system with cameras located at building entrances, exits and building perimeter covering exit / exit pathways. The system shall include provision of a raceway system complete with Category 6A wiring, backboxes, and IP based fast acting high resolution WDR cameras (3-5 megapixel), 1080p network video recorders with 30fps on all channels, monitoring, software, compatible with HEVC (H.265) compression standard, UPS and associated racks are supplied and installed by this contractor. The CCTV will be connected in to the Halifax Site for central monitoring.

Charles V. Keating Emergency & Trauma Centre / Research and Innovation Centre
For the renovation areas of the emergency department and the research and innovation centre, an POE IP based system with cameras located at building entrances, exits and building perimeter covering exit / exit pathways. The system shall include provision of a raceway system complete with Category 6A wiring, backboxes, and POE IP based fast acting high resolution WDR cameras (3-5 megapixel), 1080p network video recorders with 30fps on all channels, monitoring, software, compatible with HEVC (H.265) compression standard, UPS and associated racks are supplied and installed by this contractor. The CCTV will be connected in to the Halifax Site for central monitoring.

The Beacon Concept – Patient Communication & Collaboration System (PCCS):

Existing Halifax Infirmary (HI) Building
For the renovation areas of the HI building, provide a passive infrastructure for an IP based PCCS system.

Inpatient/OR Extension, Ambulatory Care, Cancer Care Centre Buildings

For each of the proposed buildings, an IP based supplier to provide a common platform for all their assets that meets their functional requirement around providing accurate health care delivery/patient support. The design and placement of devices will be typical of an acute health care environment. The new IP based system components shall be supplied, installed and programmed by others, all associated costs will be included in the manufacturer's price to the owner. All passive components are to be included in scope of services under this project.

Charles V. Keating Emergency & Trauma Centre / Research and Innovation Centre

For the renovation areas of the emergency department and the research and innovation centre building, provide a passive infrastructure for an IP based PCCS system.

The Beacon Concept – Electronic Access Control

Existing Halifax Infirmary (HI) Building

The facility has an IP-based card access system that permits staff with ID cards access to designated areas through secure doors. It consists of multiple servers, database software, monitoring software, control panels, and peripheral devices. These peripheral devices include card readers, pin pads, door contacts, motion sensors, alarm buttons, door strikes, and magnetic locks. The server and control panels are connected to the NSHealth Network LAN/WAN.

The access control system will be extended throughout the renovation area of the HI building. New control panels will be installed and connected to the LAN, and new peripheral devices will be connected to the control panels.

Inpatient/OR Extension, Ambulatory Care, Cancer Care Centre Buildings

The proposed buildings will require an IP-based system that will be integrated to the existing systems to allow for transparent flow between buildings based established access/user rights, etc. This new IP-based card access system shall permit staff with ID cards access to designated areas through secure doors. It will consist of multiple servers, database software, monitoring software, control panels, and peripheral devices. These peripheral devices include card readers, pin pads, door contacts, motion sensors, alarm buttons, door strikes, and magnetic locks. The server and control panels are connected to the NSHealth LAN/WAN.

New control panels will be installed and connected to the LAN, and new peripheral devices will be connected to the control panels.

Charles V. Keating Emergency & Trauma Centre / Research and Innovation Centre

The emergency department has an IP-based card access system that permits staff with ID cards access to designated areas through secure doors. It consists of multiple servers, database software, monitoring software, control panels, and peripheral devices. These peripheral devices include card readers, pin pads, door contacts, motion sensors, alarm buttons, door strikes, and magnetic locks. The server and control panels are connected to the NSHealth Network LAN/WAN.

The access control system will be extended throughout the renovation area of the emergency department and research and innovation centre building. New control panels will be installed and connected to the LAN, and new peripheral devices will be connected to the control panels.

The Beacon Concept – IT Infrastructure

IT Room Sizing

The primary goal for the IT design at the master planning phase is to ensure sufficient space is provided throughout the building, equipment rooms and telecommunication rooms/closets are sized and located to allow for NSHA IT (active network) to be realized. The description below indicates the current vision and the associated complexities that a new acute health care facility would require.

New equipment rooms sized in accordance to ANSI/TIA-1179-A, to accommodate unique acute healthcare requirements, such as robust WiFi, nurse call, staff duress, patient wandering/locating, RTLS, and biomedical systems, master clock systems(OR, ICU, ED, inpatient units), patient room electronic white boards, patient monitoring, patient entertainment, IP lighting controls, environmental controls, IP surveillance video/CCTV, IP security, AV Telehealth, and digital signage/wayfinding. Storage rooms could be located adjacent to the equipment rooms and used for future expansion of the equipment rooms if necessary.

New telecommunications rooms sized in accordance to ANSI/TIA-1179-A, to accommodate unique acute healthcare requirements, such as robust WiFi, nurse call, staff duress, patient wandering/locating, RTLS, and biomedical systems, master clock systems(OR, ICU, ED, inpatient units), patient room electronic white boards, patient monitoring, patient entertainment, IP lighting controls, environmental controls, IP surveillance video/CCTV, IP security, AV Telehealth and digital signage/wayfinding. The growth factor could be in the form of an adjacent storage room that could be given up if necessary.

All POE and IP based platforms (CCTV, Electronic Access, PCCS, Nurse Call, Staff Duress, Fire Alarm Transponders) equipment shall be located in telecommunication rooms.

Existing Halifax Infirmary (HI) Building

A voice and data communications infrastructure was installed at the Halifax Infirmary in accordance with the standards that applied at the time of construction (circa 1994). The infrastructure is still standard compliant, but the cabling cannot support the high-speed networks that have been developed in recent years.

A new structured wiring system will be installed in the proposed renovation areas in accordance with the ANSI/TIA-1179A Healthcare Facility Telecommunications Infrastructure Standard. Telecommunications Rooms will be installed on every floor. Backbone voice and data cables will interconnect these rooms; horizontal voice and data cables will be routed from these rooms to the work areas in the spaces they serve.

The Halifax Infirmary voice services are supplied from the Telephone Equipment Room in the sub-basement of the Abbie J. Lane Building. It lacks the spare capacity to serve the proposed expansion. A

3.7 Mechanical and Electrical

Electrical

plan to serve the proposed expansion will be developed in consultation with NSHA's IM/IT Department and ICTS.

A new backbone data cable will connect the new data communications infrastructure to the existing Halifax Infirmary local area network.

Inpatient/OR Extension, Ambulatory Care, Cancer Care Centre Buildings

A new structured wiring system will be installed in the proposed buildings in accordance with the ANSI/TIA-1179A Healthcare Facility Telecommunications Infrastructure Standard. Telecommunications Rooms will be installed on every floor as sized to meet the minimum requirements of the referenced health care standard. Backbone voice and data cables will interconnect these rooms; horizontal voice and data cables will be routed from these rooms to the work areas in the spaces they serve.

Telecommunications pathways and spaces for the new buildings at the Halifax Infirmary Site will feature telecommunications diversity (redundancy) that will allow normal operations to continue with as little interruption as possible during a catastrophic event. The extent of diversity designed into the system is a balance of risk vs. cost and it will be determined by the stakeholders before space is allocated on the floor plans.

One of the new buildings will house two telecommunications entrance facilities that will serve all new buildings. The entrance facilities will be physically separated from each other, and each will be served via a separate underground entrance route. The underground entrance routes will be physically separated from each other and be terminated at two different streets if practicable.

The other new building will have two main equipment rooms that will be served via separate underground interbuilding backbones from the first building.

Underground interbuilding backbone pathways will be routed from the new buildings to existing buildings on the HI site for increased diversity where practicable (similar to the pathways for the HV U/G electrical systems).

Telecommunications backbone pathways within the two new buildings and within the expanded portions of existing buildings will also include some diversity.

Provide a UPS system with 15 minutes of battery run time to service the main telecommunication entrances as well as communication rooms/closets throughout the building.

Charles V. Keating Emergency & Trauma Centre / Research and Innovation Centre

A voice and data communications infrastructure was installed at the emergency department in accordance with the standards that applied at the time of construction (circa 2009). The infrastructure is still standard compliant, but the cabling cannot support the high-speed networks that have been developed in recent years.

A new structured wiring system will be installed in the renovation area and the research and innovation center in accordance with the ANSI/TIA-1179A Healthcare Facility Telecommunications Infrastructure Standard. Telecommunications Rooms will be installed on every floor. Backbone voice and data cables will interconnect these rooms; horizontal voice and data cables will be routed from these rooms to the work areas in the spaces they serve.

The emergency department (through the Halifax Infirmary) voice services are supplied from the Telephone Equipment Room in the sub-basement of the Abbie J. Lane Building. It lacks the spare capacity to serve the proposed expansion. A plan to serve the proposed expansion will be developed in consultation with NSHA's IM/IT Department and ICTS.

A new backbone data cable will connect the new data communications infrastructure to the existing Halifax Infirmary local area network.

The Beacon Concept – LEED (Leadership in Energy and Environmental Design)

The two (2) new buildings are targeted for LEED Silver Certification through the Canada Green Building Council. The electrical systems shall be designed applying innovative technologies to reduce the buildings' carbon footprint and overall energy efficiency.

Recommended Strategies:

- Sustainable site;
- Enhanced Lighting and Digital Controls;
- High Efficient, transformers and UPS systems;
- Enhanced 3rd Party Commissioning;
- PV solar.

3.8 Evaluation Matrix

Overview of the relative strengths and weaknesses between the two master plan options with Cancer Care on the HI site: Garden Pavilion and The Beacon

During the initial phase of the project, Kasian lead a workshop with the Project Team to co-create what we collectively determined to be key evaluation criteria for the various master plan concepts, from which the Willow Tree and Commons Concept were collectively chosen as the concepts that best met these requirements. With the additional of the Cancer Centre on the HI site, this report revisits the evaluation matrix and it's criteria based on the evolution of the master plan concepts - The Garden Pavilion and The Beacon, in a holistic manner.

- **Reflects the Strategic Directions, Values and Vision of NSHA:**
  - Overall, redeveloping the HI site to accommodate key tertiary and ambulatory programs will be a key enabler in achieving organizational priority of healthy people and healthy communities. Current infrastructure is a barrier to achieving the required patient care and support services levels of efficiency and effectiveness associated with an academic teaching and research hospital.
  - Master Plan offers confirmation that the long-term site potential can serve NSHA well to meet its Vision "for Generations to come". Both schemes will enable enhanced recruitment and retention of talent.
- **Urban Design:** both schemes connect well with the immediate community fabric, streetscapes and edges, open spaces, parks and the Commons, evolving toward a more urban context with a holistic view to site massing within a context of greater urban density.
- **Creating a Rationale Growth Pattern:** both concepts support a logical pattern of site rejuvenation. Both demonstrate that this site can deliver value for money and is worthy of short and long-term development. With the Cancer Centre relocating to the HI site, all property for future development has been fully utilized until such time an existing building has reached its end of its useful life and can be demolished to make room for future development. Both options consider this scenario, and key linkages to future development from a clinical functionality perspective have been considered.
- **Patient Experience and Healing Environments:** Both concepts consider benefits of evidence based design including ample penetration of natural light to nurture staff, patients and families, intuitive wayfinding, dedicated, accessible parking for patients located in close proximity to where care is provided as a priority, access to nurturing green spaces, views to nature and community, a sense of arrival and convenient access to amenities.
- **Technical considerations:** Either concept supports a variety of required Central Plant opportunities
- **Sustainability:** Each master plan is aligned with the potential to achieve a minimum standard of LEED Silver Certification. Overall project sustainability goals (beyond LEED) will need to be identified by NSHA/ DTIR.
- **Integration of Academic Teaching and Research:** Both concepts express the value and importance of the organizations' mandate for Academic Teaching and Research in the form of a highly visible Research and Education Pavilion proposed above the Emergency Dept.
- **Procurement Method:** Both concepts can be adapted for a variety of procurement strategies including stipulated sum, Construction Management and a variety of P3 alternatives.
- **Clinical Functionality:** Both concepts address the primary clinical drivers in that all ambulatory programs and services are consolidated in new, purpose built facilities, while inpatient units are designed to meet the latest codes and standards for patient care. In both options, the new Inpatient/ OR building proposed on the site of the existing parking structure allows the extension of the perioperative services in the HI building into the new build to allow for enhanced connectivity and a more rational layout between the existing OR functions and the expanded OR functions. An expansion of the existing MDR will service the new ORs with a dedicated sterile elevator.

In both concepts, the idea of an integrated Cancer Centre and Ambulatory Care Building are achieved. While cancer care and ambulatory care services are located in separate buildings, they are horizontally integrated through the Research and Innovation Centre, which serves as a physical bridge between these two programs.

3.8 Evaluation Matrix

The Research and Innovation Centre also creates key linkages between clinical care and research and innovation, a key design driver for NSHA, as identified as one of the primary evaluation criteria for the master plan.

The benefits of the horizontally integrated Cancer Centre and Ambulatory Care Building includes the ability to improve patient care and outcomes by encouraging and enabling an inter-professional and multi-disciplinary collaborative care approach. Caregivers who may not cross paths with those in other programs if they worked in separate buildings now have the opportunity to connect and engage with others as part of a multi-disciplinary and collaborative approach to patient care.

The integration and physical link also allows for operational efficiencies for services to be provided in only one location without duplication in each building, ie. outpatient DI services will be provided in the ambulatory care building, but is easily accessible to cancer patients who require DI services as part of their diagnosis & treatment.

- **Constructability:** both concepts can be successfully implemented on the site with careful planning and consideration of: infrastructure/ facilities connections and routing, occupational health and safety, patient safety and security, wayfinding, parking and access (staff and patients), infection control measures and protocols.

As both concepts include building over the existing Emergency Dept as well as concurrent construction activities on both sides of the Emergency Dept (urban garden and CBC sites), the potential risks and impacts to Emergency must be carefully considered and planned around in order to minimize clinical disruption to Emergency during construction, which must remain in operation 24/7 during construction.

The following salient evaluation criteria, however, tend to differentiate the advantages and disadvantages of the two concepts as follows:

- **Future Development Opportunities:** Both concepts utilize all available land on the HI site for development. Future developments can only occur once an existing building has reached the end of its useful life and can be replaced. There is a significant difference between the Garden Pavilion and The Beacon. While both have good connectivity between Cancer Care to the Perioperative Services (Garden Pavilion is connected to the expanded Perioperative Services in the Inpatient/ OR tower and The Beacon is connected to the existing Perioperative Services in the Existing HI building), when the HI building reaches the end of its useful life and is replaced by a new building elsewhere on site, that connection between Cancer Care and Perioperative Services will be lost, impacting clinical functionality and the key adjacency between Cancer Care and Perioperative Services. In the case of the Garden Pavilion, the connection remains when the HI building is eventually demolished.

- **Impact on Parking: (TBC):**

Note: Both the Garden Pavilion and the Beacon concept requires the initial deconstruction of the Robie Street parking garage which will temporarily have a negative impact on the number of onsite parking spaces available. This risk can be mitigated by having a temporary parking strategy in place, which may include construction a parking garage at the VG site, and/ or other site in close proximity to HI, in advance of the deconstruction of the Robie Street parking garage, so that the net impact of parking spaces available during construction is not affected.

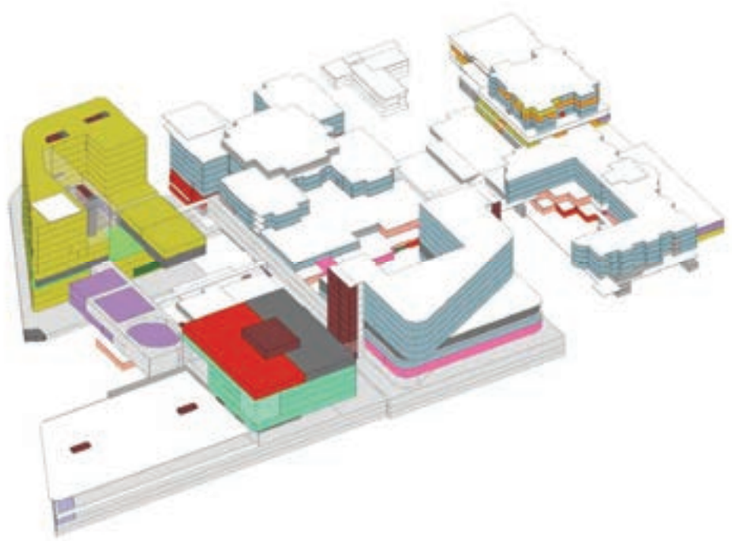
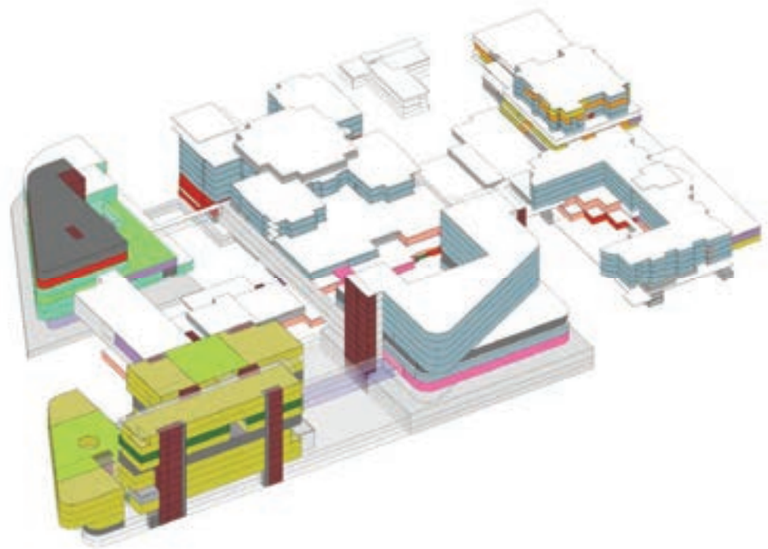
- Both concepts create a new, recognizable front entrance to the campus that better aligns with the NSHA brand, vision and image, while creating a unique identity and front door for cancer care within the campus.

- Both concepts integrate an innovative wayfinding linkage between the new and existing facilities, improving the patient and visitor experience and reducing the stress levels of navigating through a large hospital campus.

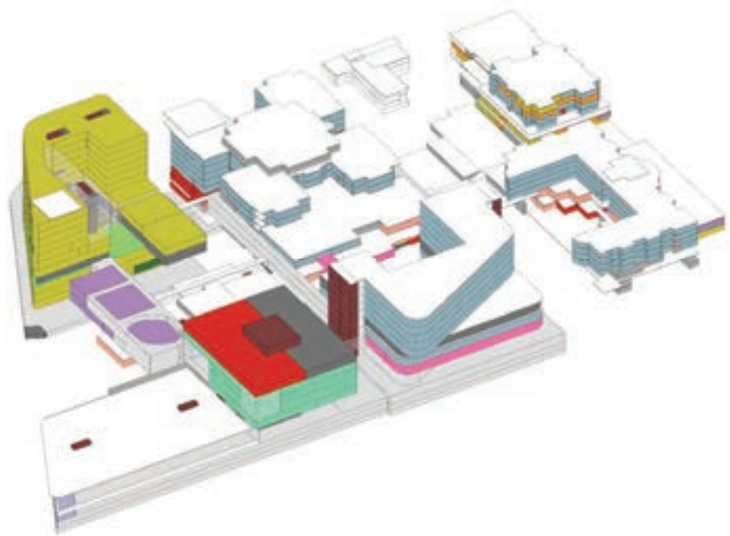
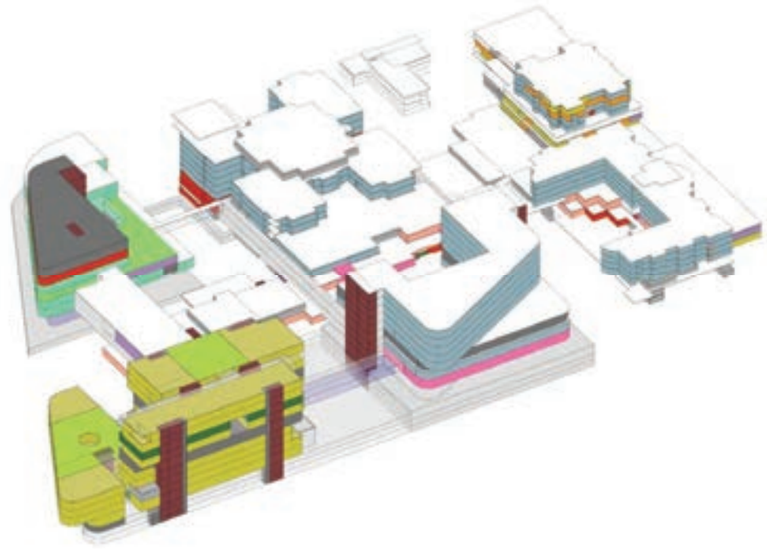
- Both concepts create an unique identity and main entrance to the Cancer Centre

- Capital cost: an order of magnitude cost estimate for each concept is currently underway and will be presented as a separate document.

3.8 Evaluation Matrix

Evaluation Criteria	Pros & Cons	Garden Pavilion • Cancer Care Centre constructed on Urban Garden Site linked to new Inpatient/ OR Building • Inpatient/ OR Building constructed on existing parking structure site • Ambulatory Care Building constructed on CBC site with link to HI Building and Emergency Dept	The Beacon • Cancer Care Centre constructed on CBC Site • Inpatient/ OR Building constructed on existing parking structure site • Ambulatory Care Building constructed on the Urban Garden site with link to HI Building and Emergency Dept
			
Reflects Strategic Directions, Values & Vision of NSHA: • Healthy People, Healthy Communities- for Generations • Respect, Integrity, Innovation, Courage & Accountability • Staff Recruitment and Retention	**Pros:**	• New facility designed for 30+ years allowing decanting from VG & Centennial Buildings • Consolidated Inpatient and Perioperative Services on one site • Design promotes collaborative care delivery by creating opportunities for enagement and key linkages between departments • Meets strategic direction, value & vision • Offers strong physical expression of organizational commitment to teaching & research with the dedicated Research & Education Pavilion above the Emergency Dept. • Four separate buildings allow for shorter construction period enabling patients to be decanted from the Centennial and Victoria Buildings sooner, therefore reducing clinical risk exposure • New front entrance on Robie St. (Acute Care) is more welcoming to patients and visitors, particularly rural visitors who find visiting the city a source of anxiety • Free standing Cancer Centre gives program unique identity and separate entrance for cancer patients • Physical connection to Ambulatory Care Building through the Research & Education pavillion promotes interdisciplinary care opportunities	• New facility designed for 30+ years allowing decanting from VG & Centennial Buildings • Consolidated Inpatient and Perioperative Services on one site • Design promotes collaborative care delivery by creating opportunities for enagement and key linkages between departments • Meets strategic direction, value & vision • Offers strong physical expression of organizational commitment to teaching & research with the dedicated Research & Education Pavilion above the Emergency Dept. • Four separate buildings allow for shorter construction period enabling patients to be decanted from the Centennial and Victoria Buildings sooner, therefore reducing clinical risk exposure • New front entrance on Robie St. (Acute Care) is more welcoming to patients and visitors, particularly rural visitors who find visiting the city a source of anxiety • Free standing Cancer Centre gives program unique identity and separate entrance for cancer patients • Physical connection to Ambulatory Care Building through the Research & Education pavillion results in promotes interdisciplinary care opportunities
	Cons:		

3.8 Evaluation Matrix

Evaluation Criteria	Pros & Cons	Garden Pavilion • Cancer Care Centre constructed on Urban Garden Site linked to new Inpatient/ OR Building • Inpatient/ OR Building constructed on existing parking structure site • Ambulatory Care Building constructed on CBC site with link to HI Building and Emergency Dept	The Beacon • Cancer Care Centre constructed on CBC Site • Inpatient/ OR Building constructed on existing parking structure site • Ambulatory Care Building constructed on the Urban Garden site with link to HI Building and Emergency Dept
			
Urban Design: • Urban Connectivity • Streetscapes • Open Spaces • Massing & Height • Image & Identity	**Pros:**	• Good opportunities for amenities to be accessible to neighbourhood (high visibility) • Creates new front door to the hospital and a distinct front entrance for cancer care- strong first impression, welcoming, aligned with NSHA brand • Create inviting urban streetscape at grade & improve connectivity to city • Revitalize image of hospital as part of community • Lower volume of the Cancer Centre at the corner of Robie Street and Bell Road allows for better streetscape	• Good opportunities for amenities to be accessible to neighbourhood (high visibility) • Creates new front door to the hospital and a distinct front entrance for cancer care- strong first impression, welcoming, aligned with NSHA brand • Create inviting urban streetscape at grade & improve connectivity to city • Revitalize image of hospital as part of community • Lower volume of the Ambulatory Care Centre at the corner of Robie Street and Bell Road allows for better
	Cons:	• Potential traffic and access risk without thorough, well considered parking and holistic transportation plan	• Potential traffic and access risk without thorough, well considered parking and holistic transportation plan
Patient Experience & Healing Environment: • natural light & views • patient centric • patient flow between buildings	**Pros:**	• Ambulatory Care Building and Cancer Centre would have partial views to The Commons • All buildings designed and oriented to maximize penetration of natural light • Parking in close proximity to each building is patient centric • Inpatient units would have views to The Commons on one side • Improved wayfinding- decreasing patient and visitor anxiety and frustration • Garden Pavilion in Radiation Treatment area for Cancer care is patient centric • Pedestrian link between the Cancer Centre and the Inpatient/ OR building allows easy access for inpatients to cancer treatment areas and between Cancer Care and Perioperative Services • Access to natural light and views to nature from the radiation therapy treatment area	• Ambulatory Care Building and Cancer Centre would have partial views to The Commons • All buildings designed and oriented to maximize penetration of natural light • Parking in close proximity to the each building is patient centric • Inpatient units would have views to The Commons on one side • Improved wayfinding- decreasing patient and visitor anxiety and frustration • Pedestrian link between the Cancer Centre and the Inpatient/ OR building allows easy access for inpatients to cancer treatment areas and between Cancer Care and Perioperative Services • Access to natural light from the radiation therapy treatment area
	Cons:	• Rural visitors may experience anxiety when using below grade parking at first	• Rural visitors may experience anxiety when using below grade parking at first

3.8 Evaluation Matrix

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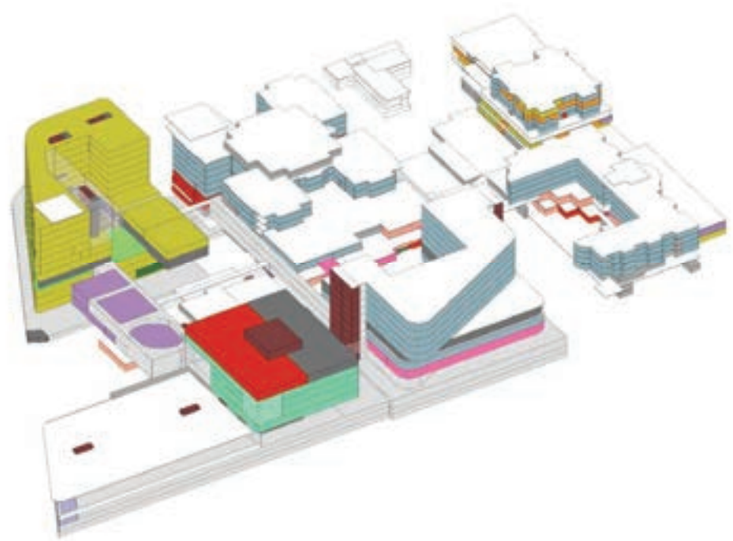
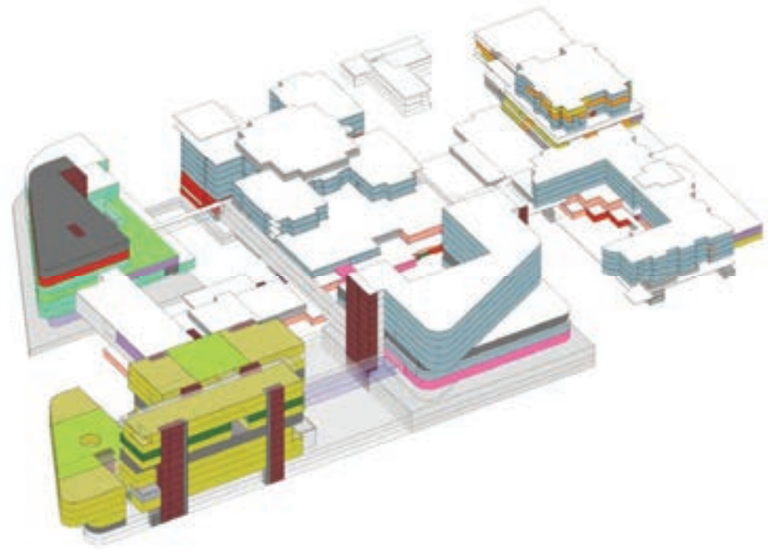
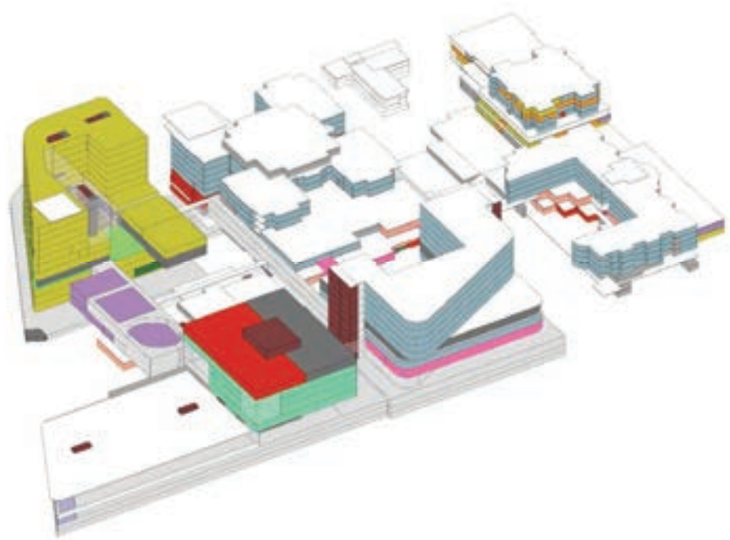
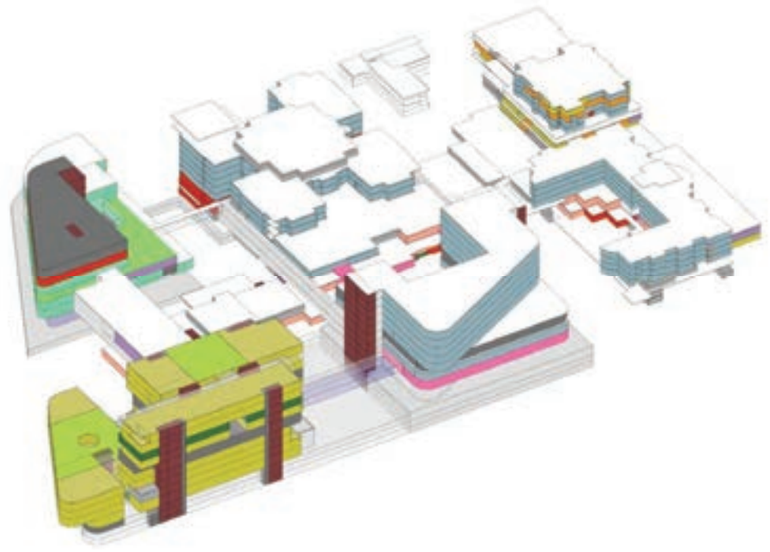
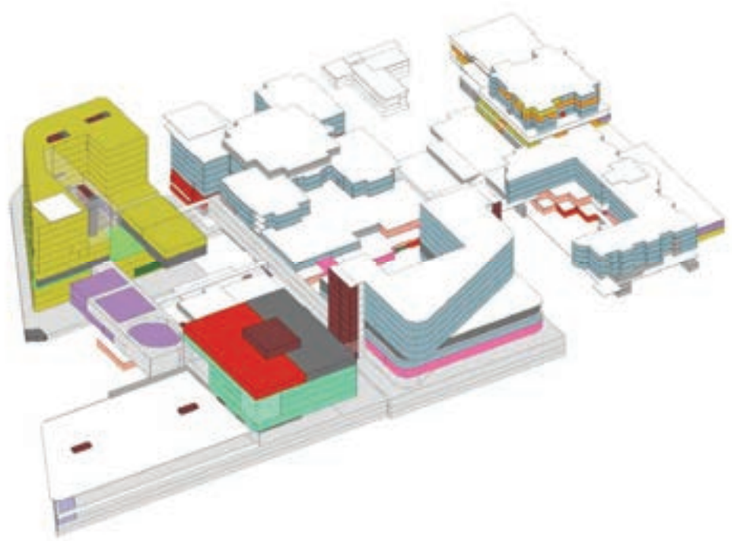
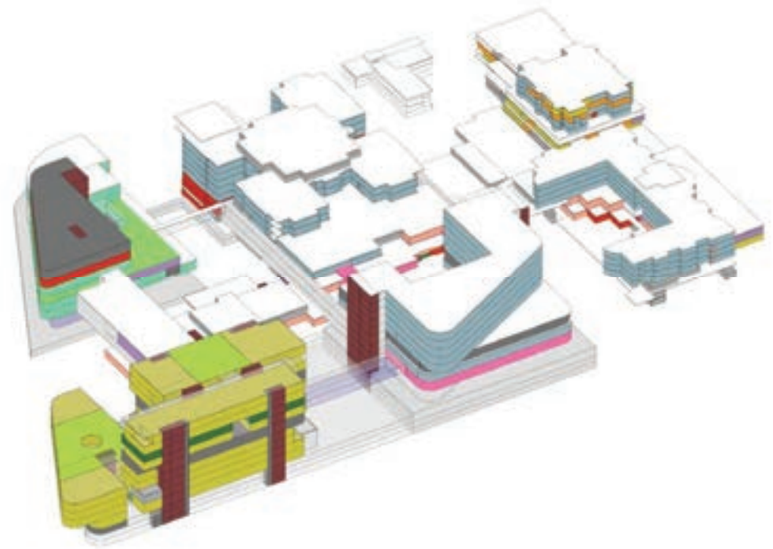
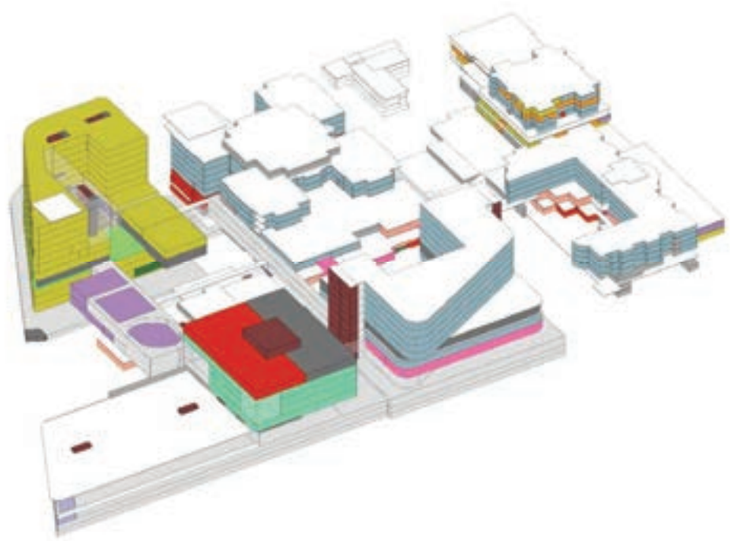
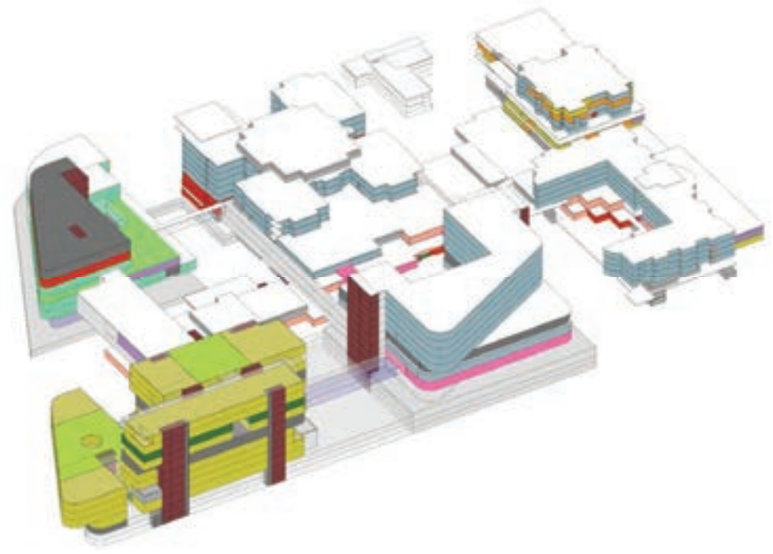
			
Clinical Functionality at Each Phase & LEAN	**Pros:**	• Expanded MDR serves all ORs - more efficient operationally • More rational layout for new ORs • ORs are on same level and contiguous with existing ORs in HI Building and can function as a system • Allows IPU bed allocation based on adjacency to supporting Ambulatory Care functions • Amalgamated ambulatory care services in one building • When the HI Building is eventually demolished, the ability to locate replacement OR's adjacent to those in the Willow Tree is optimal (ie, VMB site) • Link between Cancer Centre and Ambulatory Care allows consolidation of services (DI) in one location resulting in operational efficiency	• Expanded MDR serves all ORs - more efficient operationally • More rational layout for new ORs • ORs are on same level and contiguous with existing ORs in HI Building and can function as a system • Allows IPU bed allocation based on adjacency to supporting Ambulatory Care functions • Amalgamated ambulatory care services in one building • When the HI Building is eventually demolished, the ability to locate replacement OR's adjacent to those in the Willow Tree is optimal (ie, VMB site) • Link between Cancer Centre and Ambulatory Care allows consolidation of services (DI) in one location resulting in operational efficiency

3.8 Evaluation Matrix

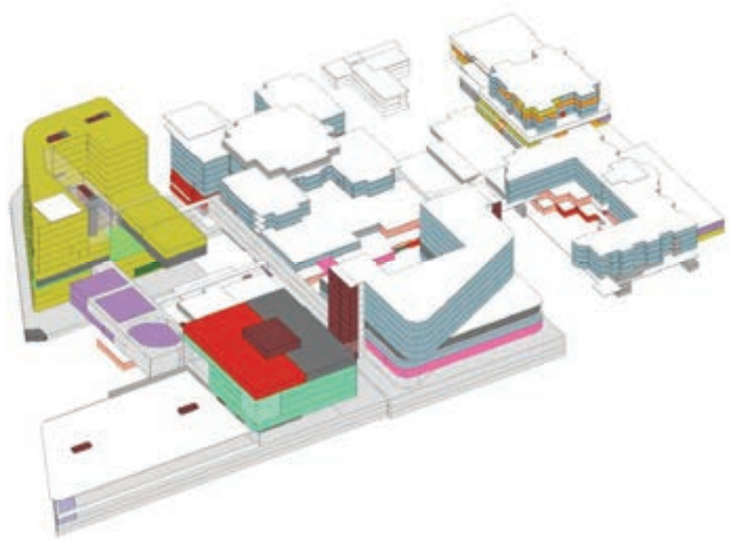
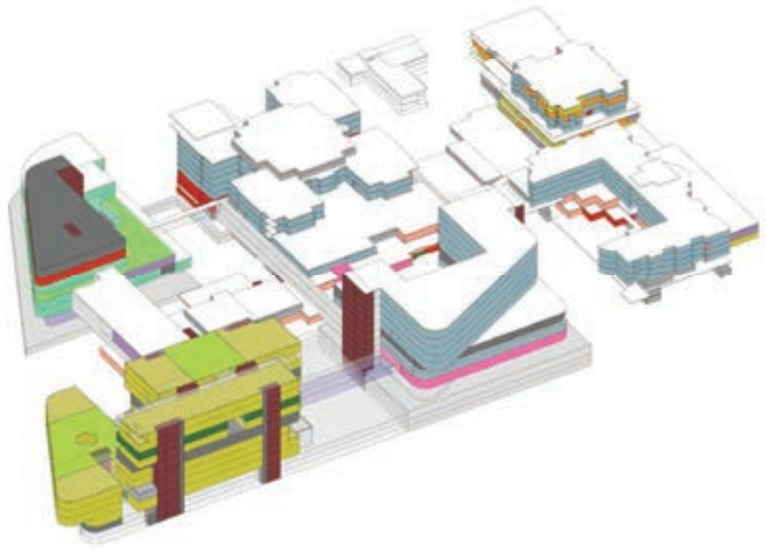
Evaluation Criteria	Pros & Cons	Garden Pavilion • Cancer Care Centre constructed on Urban Garden Site linked to new Inpatient/ OR Building • Inpatient/ OR Building constructed on existing parking structure site • Ambulatory Care Building constructed on CBC site with link to HI Building and Emergency Dept	The Beacon • Cancer Care Centre constructed on CBC Site • Inpatient/ OR Building constructed on existing parking structure site • Ambulatory Care Building constructed on the Urban Garden site with link to HI Building and Emergency Dept
			
	Cons:	• Only allows 36 critical care beds can be accomodated on one floor, requiring the 12 IMCU beds(built to ICU standard) to be on different level • No adjacent parking deck to Ambulatory Care Building, only below grade parking	• Only allows 36 critical care beds can be accomodated on one floor, requiring the 12 IMCU beds(built to ICU standard) to be on different level • No adjacent parking deck to Ambulatory Care Building, only below grade parking
Creating a Rational Growth Pattern & Allowing for Internal Program Flexibility/Growth/ Change: • Internal- accommodates program growth	**Pros:**	• Accommodates connections to future OR replacement when HI Building is demolished	• Accommodates connections to future OR replacement when HI Building is demolished
	Cons:		• When the HI Building is eventually demolished, connection between Cancer Care and Perioperative Services will be less direct
Phasing & Decanting	**Pros:**	• Multiple buildings strategy vs one single building expedites the overall construction schedule, reducing risk exposure in the Centennial and Victorial Buildings • Phasing and decanting strategy reflects commitment to minimize the number of moves (ie one single move for ambulatory care)	• Multiple buildings strategy vs one single building expedites the overall construction schedule, reducing risk exposure in the Centennial and Victorial Buildings • Phasing and decanting strategy reflects commitment to minimize the number of moves (ie one single move for ambulatory care)
	Cons:	• Requires parking structure to be relocated off-site to build new Inpatient/OR Building, temporary parking strategy required to replace lost parking stalls from the Robie Street parkade • Requires demolition of the CBC Building • Requires temporary parking, either off-site or on urban garden site	• Requires parking structure to be relocated off-site to build new Inpatient/OR Building, temporary parking strategy required to replace lost parking stalls from the Robie Street parkade • Requires demolition of the CBC Building • Requires temporary parking, either off-site or on urban garden site

Evaluation Criteria	Pros & Cons	Garden Pavilion • Cancer Care Centre constructed on Urban Garden Site linked to new Inpatient/ OR Building • Inpatient/ OR Building constructed on existing parking structure site • Ambulatory Care Building constructed on CBC site with link to HI Building and Emergency Dept	The Beacon • Cancer Care Centre constructed on CBC Site • Inpatient/ OR Building constructed on existing parking structure site • Ambulatory Care Building constructed on the Urban Garden site with link to HI Building and Emergency Dept
			
Operational Efficiency:	**Pros:**	• Does not require satellite MDR, MDR expansion will be in close proximity to new ORs • Better flows and less distance travelled by staff • Service tunnels allow better back of house efficiency • Potential opportunity to relocate helipad above Amb Care Building to provide improved connection to Emergency Dept and Perioperative Services	• Does not require satellite MDR, MDR expansion will be in close proximity to new ORs • Better flows and less distance travelled by staff • Service tunnels allow better back of house efficiency • Potential opportunity to relocate helipad above Cancer Centre to provide improved connection to Emergency Dept and Perioperative Services
	Cons:	• Requires Summer Street entrance to become main entrance during construction (not close to parking)	• Requires Summer Street entrance to become main entrance during construction (not close to parking) • Helipad more distant from new ORs/ ICU
Property Development Opportunities: • Optimize site utilization for future growth & change	**Pros:**	• Research & Education pavilion proposed above Emergency Dept showcasing Research & Education as core value of NSHA and utilizes past investment in the infrastructure of the Emergency Dept for vertical expansion • Master plan assumes future development on Abbie J. Lane Building site and Veterans Memorial Building site (long term)	• Research & Education pavilion proposed above Emergency Dept showcasing Research & Education as core value of NSHA and utilizes past investment in the infrastructure of the Emergency Dept for vertical expansion • Master plan assumes future development on Abbie J. Lane Building site and Veterans Memorial Building site (long term)
	Cons:	• no available land on HI site for future development- next phase of development will require demolition of an existing building	• no available land on HI site for future development- next phase of development will require demolition of an existing building
Technical Considerations: • M&E, Structural & Civil	**Pros:**	• Expanded (on HI site) or new (offsite) central plant can accommodate all existing and new build • Separate central plant for each building is also possible to support DBFM	• Expanded (on HI site) or new (offsite) central plant can accommodate all existing and new build • Separate central plant for each building is also possible to support DBFM

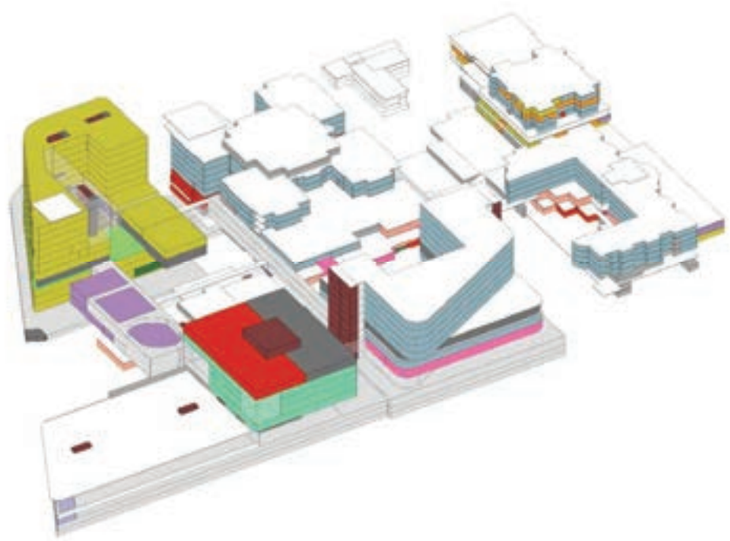
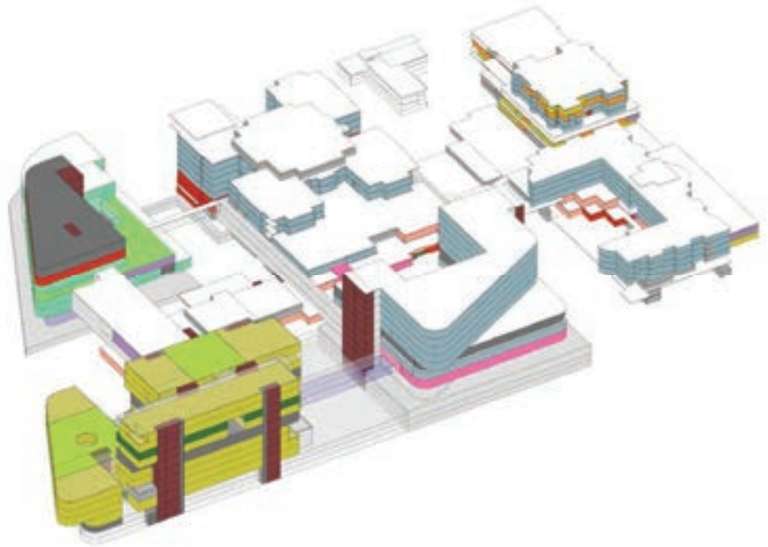
3.8 Evaluation Matrix
Section Sub-Heading

Evaluation Criteria	Pros & Cons	Garden Pavilion • Cancer Care Centre constructed on Urban Garden Site linked to new Inpatient/ OR Building • Inpatient/ OR Building constructed on existing parking structure site • Ambulatory Care Building constructed on CBC site with link to HI Building and Emergency Dept	The Beacon • Cancer Care Centre constructed on CBC Site • Inpatient/ OR Building constructed on existing parking structure site • Ambulatory Care Building constructed on the Urban Garden site with link to HI Building and Emergency Dept
			
	Cons:	• Expanding existing plant in situ may conflict with future development potential on Abbie J. Lane site • A separate central plant will require additional staffing	• Expanding existing plant in situ may conflict with future development potential on Abbie J. Lane site • A separate central plant will require additional staffing
Sustainability: • minimize impact on environment • operational & energy efficiency • LEED certification	**Pros:**	• Potential for new builds to achieve LEED Silver	• Potential for new builds to achieve LEED Silver
	Cons:		
Constructibility	**Pros:**	• no significant elements that would prevent this concept from being implemented on the site. Careful planning and consideration for: Infrastructure/ facilities connection and routing, occupational health and safety, patient safety and security, wayfinding, parking and access, and infection control measures and protocols will result in the successful implementation of the master plan	• no significant elements that would prevent this concept from being implemented on the site. Careful planning and consideration for: Infrastructure/ facilities connection and routing, occupational health and safety, patient safety and security, wayfinding, parking and access, and infection control measures and protocols will result in the successful implementation of the master plan
	Cons:	• Some temporary disruption to HI building due to interface of new Inpatient /OR Building • Construction access challenge on CBC site	• Some temporary disruption to HI building due to interface of new Inpatient /OR Building • Construction access challenge on CBC site
Impact on Parking	**Pros:**	• Maximize below grade parking for Inpatient/ OR building and Amb Care Building by utilizing entire footprint below grade for parking	• Maximize below grade parking for Inpatient/ OR building and Amb Care Building by utilizing entire footprint below grade for parking
	Cons:	• Temporary loss of Robie Street parkade- requires replacement or temporary parking off-site	• Temporary loss of Robie Street parkade- requires replacement or temporary parking off-site

3.8 Evaluation Matrix
Section Sub-Heading

Evaluation Criteria	Pros & Cons	Garden Pavilion • Cancer Care Centre constructed on Urban Garden Site linked to new Inpatient/ OR Building • Inpatient/ OR Building constructed on existing parking structure site • Ambulatory Care Building constructed on CBC site with link to HI Building and Emergency Dept	The Beacon • Cancer Care Centre constructed on CBC Site • Inpatient/ OR Building constructed on existing parking structure site • Ambulatory Care Building constructed on the Urban Garden site with link to HI Building and Emergency Dept
			
Logistics, Internal & External Site Circulation: • traffic access • shipping & receiving • support services	**Pros:**	• Access to main HI shipping and receiving area from the new Inpatient/ OR Building is direct • Opportunity for shared satellite shipping and receiving area to be shared between Inpatient/ OR building and Amb Care Building • Vehicular access and site circulation is better due to a greater separation between the buildings with high vehicular volumes (Inpatient/ OR and Amb Care)	• Access to main HI shipping and receiving area from the new Inpatient/ OR Building is direct • Opportunity for shared satellite shipping and receiving area to be shared between Inpatient/ OR building and Amb Care Building
	Cons:		• Cancer Centre requires small satellite shipping and receiving area • high traffic volumes (to the Inpatient/ OR building and Amb Care Building) to the site is concentrated on Robie Street could be a challenge
Creative & Intuitive Wayfinding	**Pros:**	• Atrium space & external circulation systems maximize natural light & makes wayfinding simpler • Better visibility of main entrance without parkade • Improved pedestrian accessibility/arrival at main entrance with less conflict with vehicular traffic • Buildings designed for clear and intuitive wayfinding through views to exterior and natural light	• Atrium space & external circulation systems maximize natural light & makes wayfinding simpler • Better visibility of main entrance without parkade • Improved pedestrian accessibility/arrival at main entrance with less conflict with vehicular traffic • Buildings designed for clear and intuitive wayfinding through views to exterior and natural light
	Cons:	• May cause confusion as there will be two inpatient wings at HI site & two separate elevator wings	• May cause confusion as there will be two inpatient wings at HI site & two separate elevator wings
Optimize Cost Benefit	**Pros:**		
	Cons:		
Integration of Academic & Research	**Pros:**	• Physical integration and expression of Academic & Research focus is achieved	• Physical integration and expression of Academic & Research focus is achieved
	Cons:		

3.8 Evaluation Matrix
Section Sub-Heading

Evaluation Criteria	Pros & Cons	Garden Pavilion • Cancer Care Centre constructed on Urban Garden Site linked to new Inpatient/ OR Building • Inpatient/ OR Building constructed on existing parking structure site • Ambulatory Care Building constructed on CBC site with link to HI Building and Emergency Dept	The Beacon • Cancer Care Centre constructed on CBC Site • Inpatient/ OR Building constructed on existing parking structure site • Ambulatory Care Building constructed on the Urban Garden site with link to HI Building and Emergency Dept
			
Amenities	**Pros:**	• Ambulatory Care Building on a prominent corner of the site with high visibility will attract amenity opportunities (CBC site) • Opportunities for amenities in new entrance lobby of Inpatient/ OR Building as part of arrival sequence for visitors • Opportunities for amenities in new lobby for each building	• Ambulatory Care Building on a prominent corner of the site with high visibility will attract amenity opportunities (Robie Street) • Opportunities for amenities in new entrance lobby of Inpatient/ OR Building as part of arrival sequence for visitors • Opportunities for amenities in new lobby for each building
	Cons:		
Disaster Planning	**Pros:**	• Potential for Research and Education Pavilion to be used as Command Centre in case of disaster	• Potential for Research and Education Pavilion to be used as Command Centre in case of disaster
	Cons:	• Expansion of MDR to serve all ORs makes it difficult to isolate/maintain use of new ORs in case of infection or buildings required to be shut down	• Expansion of MDR to serve all ORs makes it difficult to isolate/maintain use of new ORs in case of infection or buildings required to be shut down
Risk Factors	**Pros:**	• Better connections between buildings • Easier to isolate Ambulatory Care Building in case of infection outbreak or evacuation • Four building solution decreases construction time required to execute the priority of relocating ICU/ IPU/ OR/ Amb Care/ Cancer Care from VG, reducing risk exposure	• Better connections between buildings • Easier to isolate Ambulatory Care Building in case of infection outbreak or evacuation • Four building solution decreases construction time required to execute the priority of relocating ICU/ IPU/ OR/ Amb Care/ Cancer Care from VG, reducing risk exposure
	Cons:	• Phasing impacts for interim parking may be a PR risk • Expansion of MDR to serve all ORs makes it difficult to isolate/maintain use of new ORs in case of infection or building required to be shut down	• Phasing impacts for interim parking may be a PR risk • Expansion of MDR to serve all ORs makes it difficult to isolate/maintain use of new ORs in case of infection or building required to be shut down
Procurement Methodology	**Pros:**	• Potentially allows for other procurement strategies including stip sum, construction management, etc- to be further reviewed by Procurement Strategy consultant	• Potentially allows for other procurement strategies including stip sum, construction management, etc- to be further reviewed by Procurement Strategy consultant
	Cons:		

4

Traffic

4.1 Robie Street Driveway Alternatives

Traffic based analysis of Garden Pavilion Concept:

Entry from Robie Street with direct aligned to the entrance of the emergency building.

- The plan takes maximum advantage of full urban garden site; this is critical in view of limited open space availability for development at the HI.
- It creates an integrated Cancer Centre within the overall HI complex. Meeting the primary objective of the move from VG.
- Clarity in traffic circulation is provided, internal site and external.
- Direct visibility to the entrance of the emergency building is retained.
- Increased length for the drop off to the existing emergency building is provided, improving current condition.
- Creates a separate entry / drop off for the cancer centre to the NE face of the building away form Robie.
- Entry to below grade parking is away from traffic congestion points.
- Cancer patient flow is addressed, within the building and external.

QUEEN ELIZABETH II HOSPITAL MASTER PLAN

Traffic Considerations
Robie Street Driveway Alternatives

Prepared For: QEII Hospital, Halifax, Nova Scotia

April 23, 2018

45 St. Clair Avenue West, Suite 300
Toronto, ON M4V 1K9
www.bagroup.com

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4.1 Robie Street Driveway Alternatives
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1.0 INTRODUCTION

BA Group is retained by Kasian Architects to provide urban transportation consulting services in relation to the proposed expansion of the QEII Health Sciences Centre located in Halifax Regional Municipality (HRM). The site consists of two separate locations: Halifax Infirmary (HI) and Victoria General Hospital (VG). This report summarizes our findings with respect to a proposed new traffic signal controlled driveway on Robie Street to serve HI. The site context is illustrated in **Figure 1**.

There are two concepts currently being considered for the HI site, the Beacon concept and the Garden Pavilion concept. Both incorporate an Inpatient building on the site where the above-ground parking structure adjacent to Robie Street is currently located. Standalone Cancer Centre and Ambulatory buildings are being considered on either the existing CBC site or the Urban Garden site. For the purposes of this report, we are considering the Garden Pavilion concept which positions the Cancer Centre on the Urban Garden site and the Ambulatory Care facility on the CBC site. This represents a more conservative (erring on the high side) condition with more traffic assigned to Robie Street. The HI site concept plan is shown in **Figure 2**.

A summary of the on-site parking supply assumptions at HI for the Garden Pavilion concept is provided in **Table 1** and illustrated in **Figure 3**.

TABLE 1 ON-SITE PARKING SUPPLY ASSUMPTIONS FOR ANALYSIS

Parking Area	Parking Supply for Analysis
Existing parking supply on HI site to remain (adjacent to Summer St and Veterans Memorial Ln)	515 spaces
New parking garage adjacent to Robie Street	1,300 spaces
New parking garage on existing CBC Site	360 spaces
Total future HI on-site parking supply (high end)	**2,175 spaces**

The parking supply assumed in **Table 1** is at the high end of the future parking supply currently being considered (range of 1,800-2,175) representing a more conservative (erring on the high side) condition with more traffic assigned to Robie Street.

Distance Between Sites: 1.1km
15 minute walk
5 minute drive

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SITE CONTEXT

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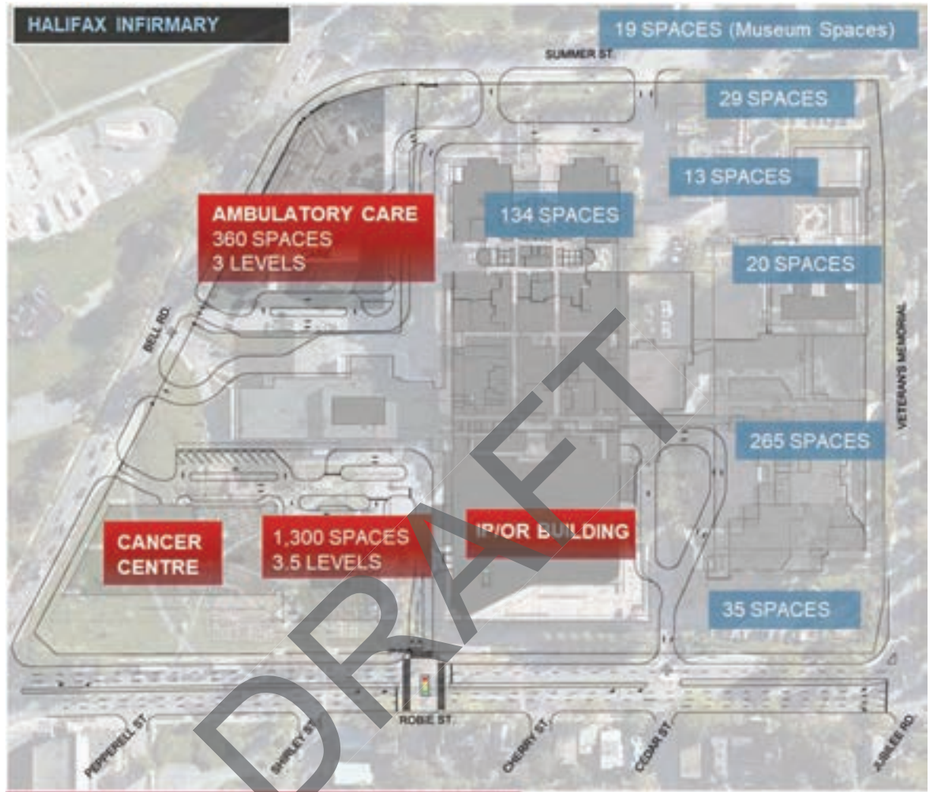
Queen Elizabeth II Health Sciences Centre (QEII)
7832-01 March, 2018

Figure 1

4.1 Robie Street Driveway Alternatives

FIGURE 2: HI SITE CONTEXT PLAN

FIGURE 3: FUTURE PARKING SUPPLY – CONCEPT FOR ANALYSIS



2.0 SITE DRIVEWAY ALTERNATIVES

For the Garden Pavilion concept, the following three site driveway options are analyzed:

- Option 1: No signalized driveway to Robie Street
- Option 2: Signalized driveway at Shirley Street / Robie Street
- Option 3: Mid-block signalized driveway to Robie Street (between Shirley Street and Cherry Street)

Each of the above-noted three site driveway options has a different site access arrangement along Robie Street north of the proposed Inpatient building (north of the existing above-ground parking structure), but otherwise share similar site circulation layouts.

Along Bell Road, two new site driveways are proposed for a total of three site driveways. A new site driveway is proposed to the east of the existing ambulance entrance and provides three-quarter access (outbound lefts restricted) to the existing CBC site. The existing ambulance entrance would be shifted further west to accommodate this access. The uses on the CBC site are also proposed to connect internally to the existing HI Summer Street accesses.

To the west, the second new three-quarter access (outbound lefts restricted) is proposed on Bell Road, which will provide vehicles with an additional option to leave the proposed Robie Street garage and emergency loading area without travelling through the Robie Street / Quinpool Road intersection. There also exists the potential to connect the underground parking facilities of the CBC site and Cancer Centre/Inpatient Tower at the third underground level. This connection is not assumed to be in place for this analysis as it creates a more conservative (erring on the high side) condition with more traffic assigned to Robie Street.

On Robie Street, there are three existing driveways, an inbound only driveway opposite Cedar Street, an outbound right turn only driveway opposite Cherry Street for vehicles exiting the parking garage, and an outbound right turn only driveway approximately mid-block between Shirley Street and Cherry Street for vehicles exiting the emergency parking area. The existing road network configuration is illustrated in **Figure 4**

Between the three site driveway options considered, the proposed Bell Road driveways and the existing Robie Street driveway opposite Cedar Street remain the same. The options only impact the outbound right turn only Robie Street driveways (opposite Cherry Street and mid-block between Shirley Street and Cherry Street).

A description of each of the site access options is provided below. The preliminary functional plans for Option 1, Option 2 and Option 3 are illustrated in **Figure 5**, **Figure 6**, and **Figure 7**, respectively. The future road network configuration for each option is illustrated in **Figure 8**.

Option 1 – No signalized driveway to Robie Street

- Move the existing unsignalized driveway from the emergency parking area to Robie Street approximately 10 metres to the south;
- Inbound left turn movements from Robie Street would be permitted in addition to the right turn inbound and outbound movements;
- Closure of the outbound only access from the parking garage to Robie Street opposite Cherry Street; and
- No changes to the existing Shirley Street and Cherry Street pedestrian crosswalks.

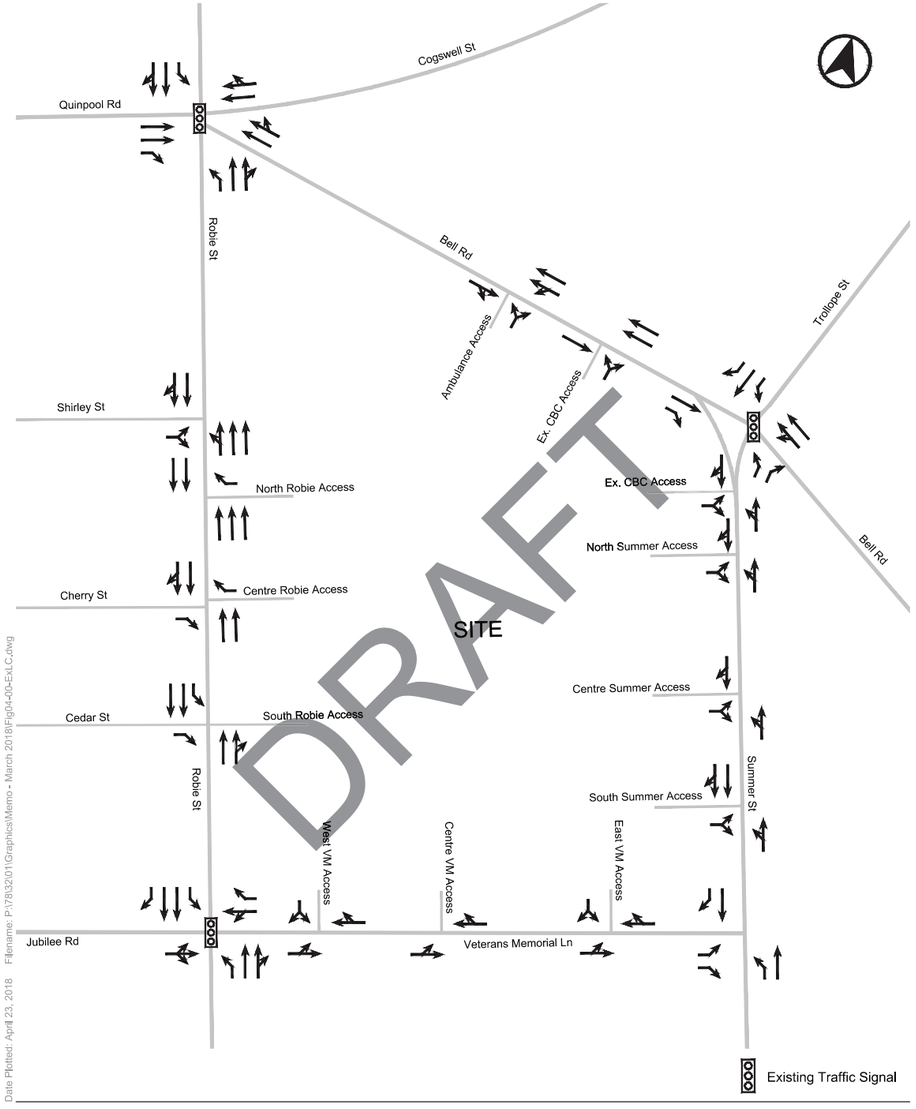
Option 2 – Signalized driveway at Shirley Street / Robie Street

- Move the existing unsignalized access from the emergency parking area to Robie Street approximately 40 metres to the north to align opposite Shirley Street and signalize the intersection;
- All movements would be permitted on all approaches of the intersection;
- No changes to the existing outbound only access to Robie Street opposite Cherry Street;
- The proposed traffic signal would replace the existing Shirley Street crosswalk; and
- Consideration may be given to removing the existing Cherry Street crosswalk due to the spacing from the new signalized intersection.

Option 3 – Mid-block signalized driveway to Robie Street (between Shirley Street and Cherry Street)

- Move the existing unsignalized access to Robie Street approximately 10 metres to the south and signalize the intersection;
- All movements would be permitted on all approaches of the intersection;
- Closure of the outbound only access from the parking garage to Robie Street opposite Cherry Street;
- Due to the proximity of the Shirley Street intersection, the existing gap in the median would be closed preventing left turns to and from Shirley Street;
- To limit the required diversion for Shirley Street residents, consideration could be given to opening the existing median at Cherry Street to allow motorists to make a left turn onto Cherry Street (outbound left turns from Cherry Street to Robie Street northbound would remain prohibited); and
- The proposed traffic signal would replace the existing Shirley Street and Cherry Street crosswalks.

4.1 Robie Street Driveway Alternatives



EXISTING LANE CONFIGURATIONS

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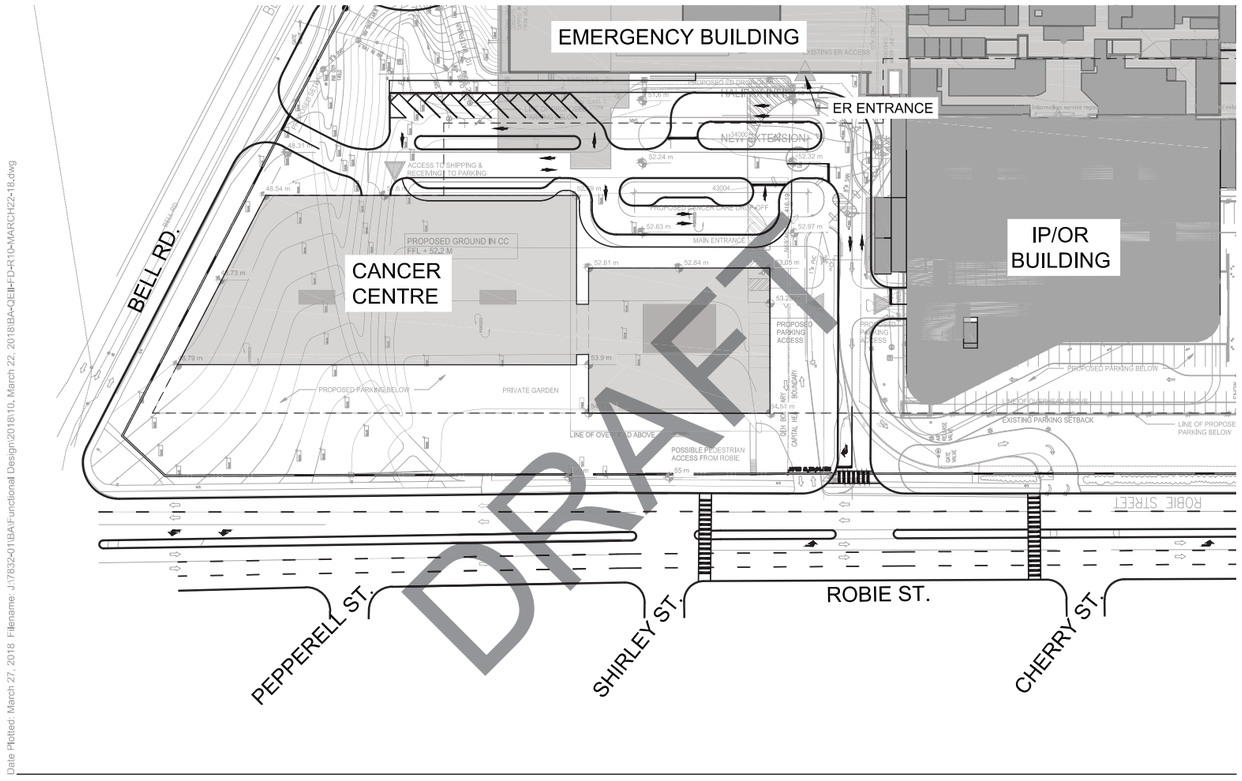
Queen Elizabeth II Health Sciences Centre (QEII)
7832-01 March 2018

Figure 4



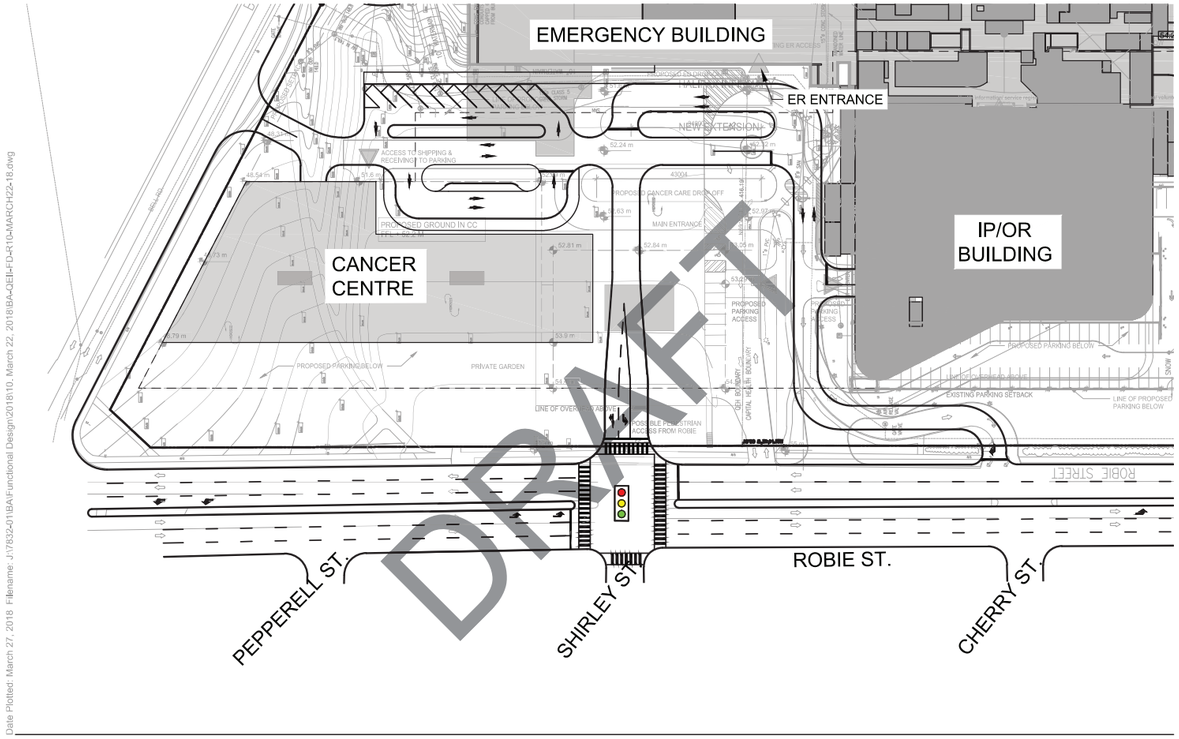
HALIFAX INFIRMARY
OPTION 1
NO SIGNALIZED ACCESS TO ROBIE STREET

BA Group

Queen Elizabeth II Health Sciences Centre (QEII)
7832-01 March, 2018

Figure 5

kasian



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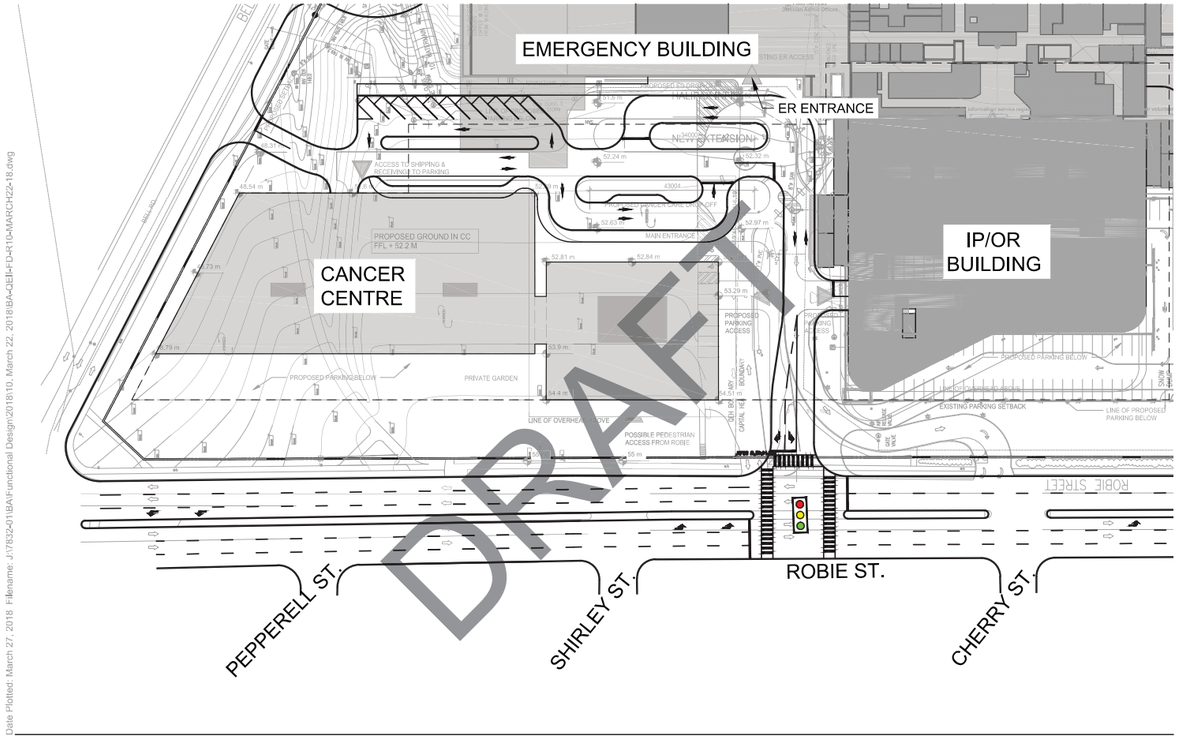
HALIFAX INFIRMARY
OPTION 2
SIGNALIZED ACCESS AT SHIRLEY STREET / ROBIE STREET

Queen Elizabeth II Health Sciences Centre (QEII)
7832-01 March, 2018

Figure 6



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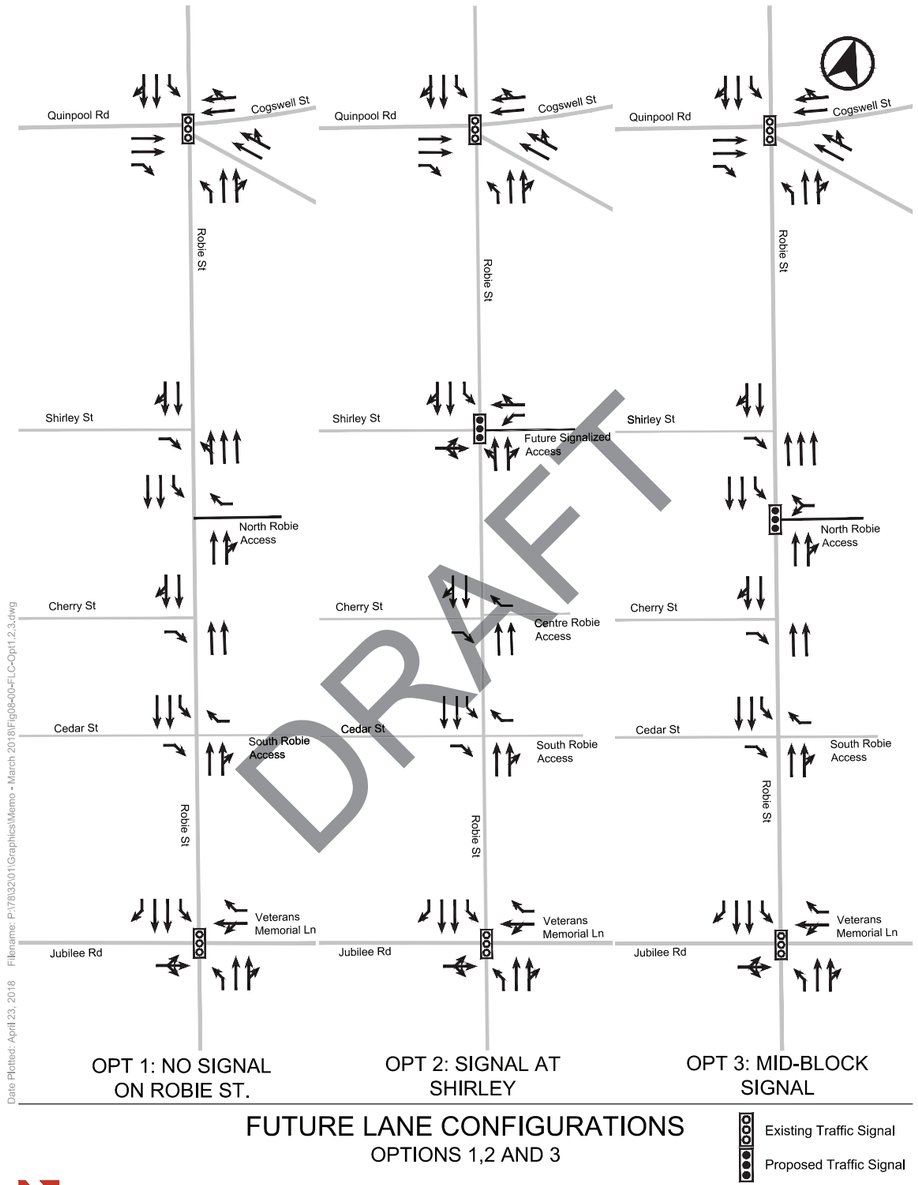
HALIFAX INFIRMARY
OPTION 3
SIGNALIZED ACCESS TO ROBIE STREET, MID-BLOCK SOUTH OF SHIRLEY STREET

Queen Elizabeth II Health Sciences Centre (QEII)
7832-01 March, 2018

Figure 7

4.1 Robie Street Driveway Alternatives



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Queen Elizabeth II Health Sciences Centre (QEII)
7832-01 March 2018

Figure 8

3.0 BASIS OF TRAFFIC OPERATIONS ANALYSIS

3.1 METHODOLOGY

Traffic operations analyses conducted at signalized intersections are based upon the methodologies outlined in the *Highway Capacity Manual 2000* using *Synchro 9* software. The base Synchro model network was provided by HRM and was modified to reflect the hospital access arrangements considered. The key performance indicator used for the signalized analyses is the volume to capacity (V/C) ratio where a V/C ratio of 1.0 reflects 'at-capacity' conditions.

Unsignalized STOP controlled intersection traffic operation analyses have been undertaken in accordance with the methodologies outlined in the *Highway Capacity Manual 2000* using *Synchro 9* software. The HCM methodology provides a Level of Service (LOS) designation for turning movements at an intersection. The LOS designation ranges from LOS A to LOS F which provides an understanding of the relative time a motorist may have to wait, on average, to complete a turn at an unsignalized intersection or driveway. A LOS A designation is reflective of a condition where motorists experience minimal delay while turning at a STOP controlled intersection, while an LOS F designation is reflective of extended delays.

Existing timings and intersection parameters at area signalized intersections were based on the values coded into HRM's City-wide Synchro model.

Synchro worksheets including detailed input parameters and output results are attached in **Appendix A**.

Existing traffic volumes at site driveways and their adjacent intersections are provided in **Figure 9**. No allowances have been made for prospective changes to the street network or traffic control regime in the HI site environs, e.g. dedicated bus lines on Robie Street. No growth in background traffic, i.e. traffic on these roadways not associated with the VG or HI sites, is assumed.

For simplicity, we have not reduced traffic from the HI site environs to reflect the fact that services are being relocated from the VG site to the HI site. By this assumption, the analysis is considered conservative, i.e. erring on the high side.

3.2 STUDY SCOPE

The following key intersections have been analyzed for each site access option for the Halifax Infirmary site:

- Quinpool Road / Robie Street / Cogswell Street / Bell Road (signal);
- Robie Street / Veterans Memorial Lane / Jubilee Road (signal);
- Shirley Street / Robie Street (unsignalized currently, potential signalized site access location); and
- Key Robie Street site accesses that differ between options.

Kasian

4.0 TRAFFIC VOLUMES

4.1 EXISTING TRAFFIC VOLUMES

Existing traffic volumes are based upon the most recent available HRM turning movement counts. Existing traffic volumes at site driveways and other area intersections are based upon traffic counts conducted by CBCL Limited for the Hospital.

Traffic volume projections for each option at intersections adjacent to the HI site along Bell Road, Summer Street, and Veterans Memorial Lane are made. Existing traffic volumes are balanced based on traffic levels at the major intersection on each corridor.

A summary of baseline existing traffic counts is provided in **Table 2**. Existing traffic volumes are illustrated in **Figure 9**.

TABLE 2 EXISTING TRAFFIC VOLUMES – COUNT SUMMARY

Intersection	Date of Count	Source
Quinpool Rd / Robie St / Cogswell St / Bell Rd	Wed., October 29, 2014	HRM
Summer St / Trollope St / Bell Rd	Wed., October 22, 2014	HRM
Robie St / Veterans Memorial Ln / Jubilee Rd	Wed., October 22, 2014	HRM
Summer St / Veterans Memorial Ln	Wed., September 20, 2017	CBCL
Shirley St / Robie St	Wed., November 15, 2017	CBCL
Existing Site Driveways	Tues., June 6, 2017	CBCL
Shirley St / Robie St Crosswalk	Wed., November 15, 2017	BA Group
Cherry St / Robie St Crosswalk	Wed. June 14, 2017	CBCL

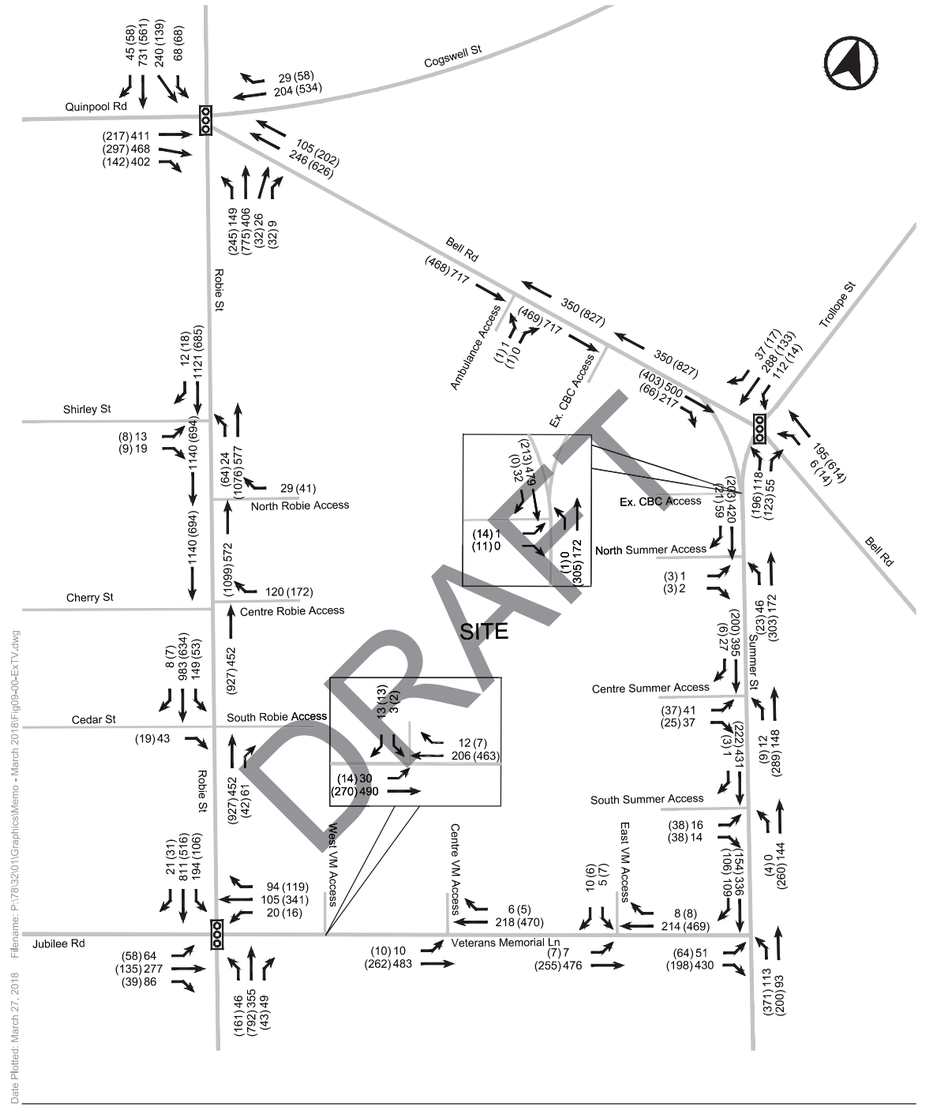
4.2 SITE PLAN TRAFFIC IMPACTS

Future traffic volumes in the study area are developed in two stages:

- Existing site traffic volumes associated with the elimination of existing on-site parking as a result of redevelopment of portions of HI are removed; and
- New traffic generated by proposed on-site parking at HI is added.

4.2.1 Removal of Existing Site Traffic Volumes

Existing site traffic volumes associated with existing on-site parking areas to be redeveloped are removed from the road network based on prevailing traffic patterns in the area and observed site driveway movement patterns.



EXISTING TRAFFIC VOLUMES

00 AM Peak Hour
(00) PM Peak Hour
Existing Traffic Signal

BA Group

Queen Elizabeth II Health Sciences Centre (QEII)
7832-01 March 2018

Figure 9

4.1 Robie Street Driveway Alternatives

4.2.2 New Site Traffic Volumes

New site traffic volumes are generated based on the new on-site parking estimates for the HI site. These site traffic volumes also include existing trips reassigned to new driveways where new parking spaces are created on site. The peak hour trip rates (per occupied parking space) were derived from the existing Hospital sites and their respective peak parking demand. The resulting trip generation rates are summarized in **Table 3**.

TABLE 3 TRIP GENERATION RATE

Use	AM Peak Hour			PM Peak Hour		
	In	Out	2-Way	In	Out	2-Way
Vehicle Trips / Parking Space	0.42	0.17	**0.59**	0.19	0.40	**0.59**

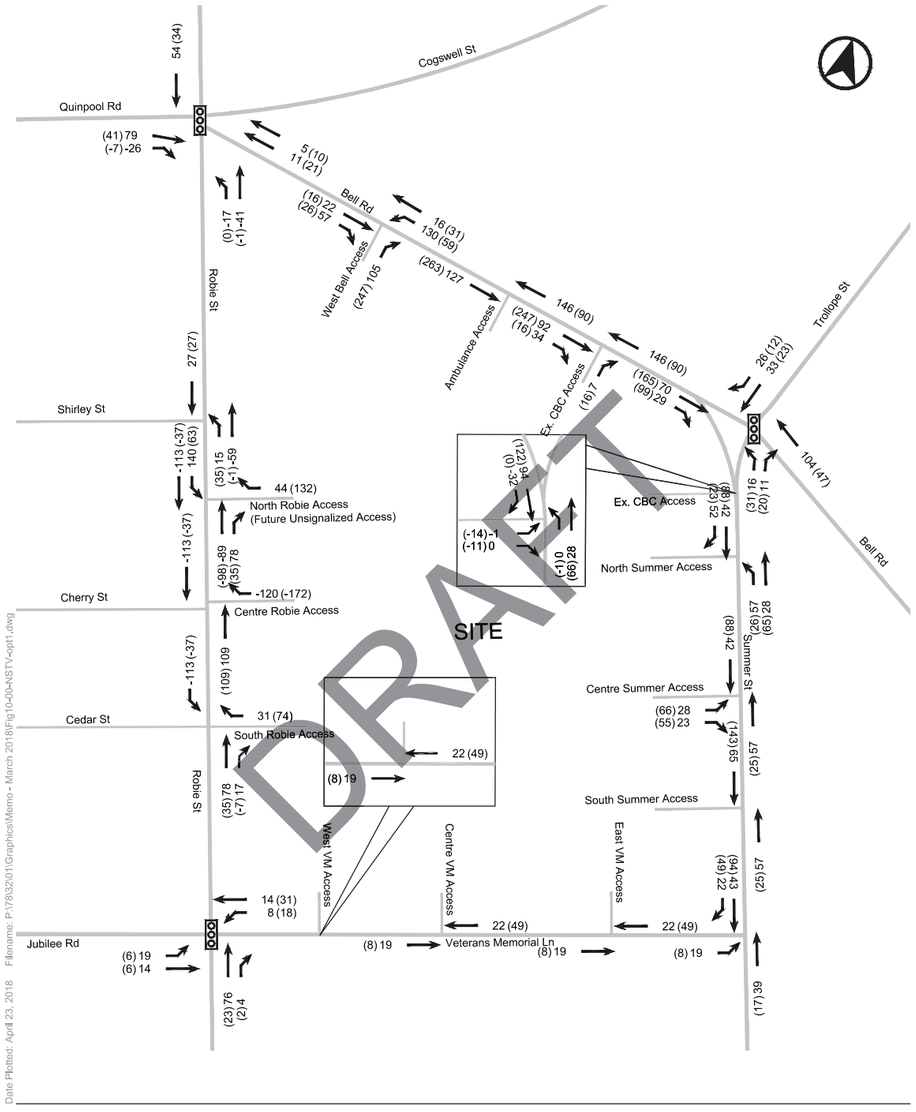
These site trip rates were applied to the new parking garage adjacent to Robie Street (1,300 spaces) and the new parking garage on the existing CBC site (360 spaces), assuming a peak utilization of the garages of 95%. The corresponding traffic generation is summarized in **Table 4**.

TABLE 4 SITE TRIP GENERATION

Use	AM Peak Hour			PM Peak Hour		
	In	Out	2-Way	In	Out	2-Way
Existing Site Trips						
Existing HI site trips	432	293	**725**	213	412	**625**
Removal of HI site trips associated with removal of existing site parking	-242	-150	**-392**	-96	-238	**-334**
New Site Trips[1]						
Trips / Peak Parking Demand	*0.42*	*0.17*	***0.59***	*0.19*	*0.40*	***0.59***
New Robie Street parking garage (1,300 parking spaces)	519	210	**729**	235	494	**729**
New parking garage on CBC lot (360 net new parking spaces)	144	58	**202**	65	137	**202**
Gross New Site Trips	663	268	**931**	300	631	**931**
Net New Site Trips	421	118	**539**	204	393	**597**
Future Total Site Trips	853	411	**1,264**	417	805	**1,222**

Notes:
1. Trips generated assuming a peak parking demand in each garage of 95% of supply.

As was done for the removal of existing site traffic volumes, new site trips were assigned based on prevailing traffic patterns in the area road network and observed site driveway movement patterns. Net site traffic volumes for Option 1, Option 2 and Option 3 are illustrated in **Figure 10**, **Figure 11** and **Figure 12**, respectively.



NET SITE TRAFFIC VOLUMES
OPTION 1: NO SIGNAL ON ROBIE

00 AM Peak Hour
(00) PM Peak Hour
Existing Traffic Signal

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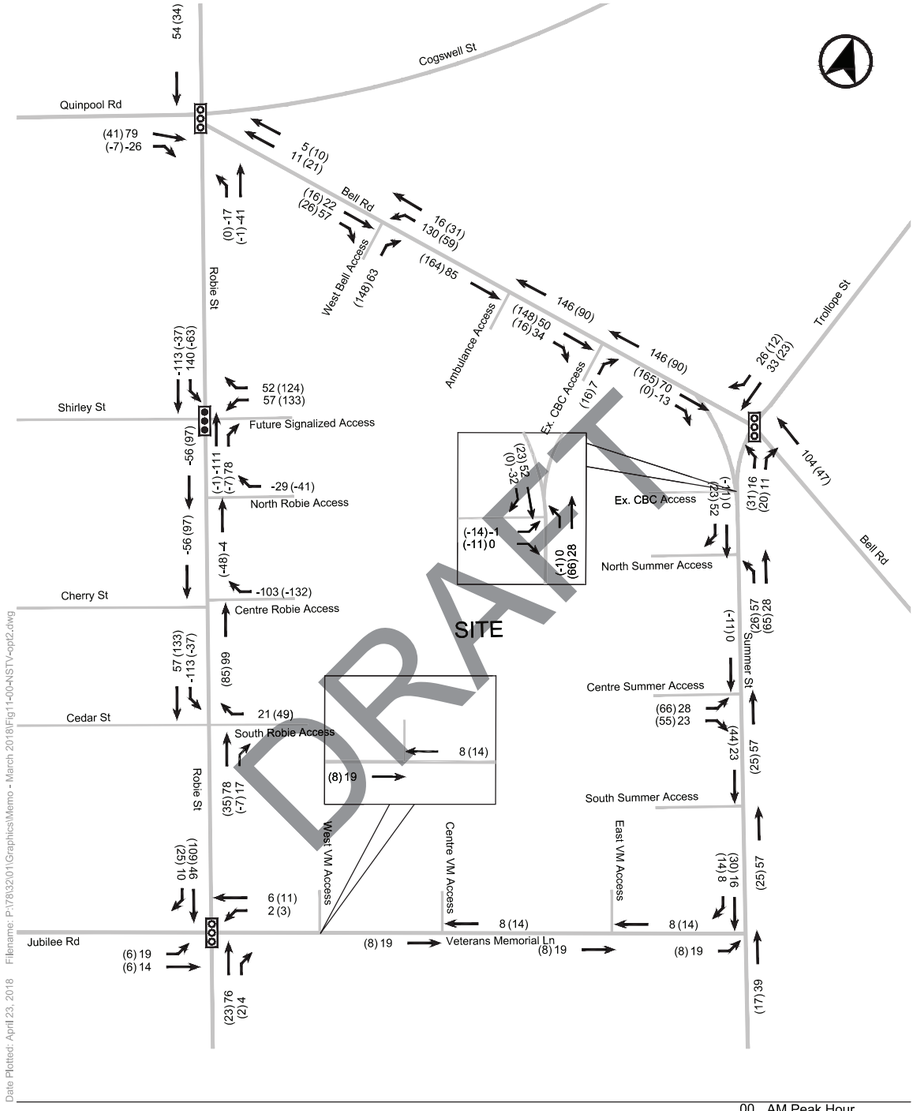
Figure 10

4.1 Robie Street Driveway Alternatives

Section Sub-Heading



NET SITE TRAFFIC VOLUMES
OPTION 2: SIGNAL AT SHIRLEY

00 AM Peak Hour
(00) PM Peak Hour
Existing Traffic Signal
Proposed Traffic Signal

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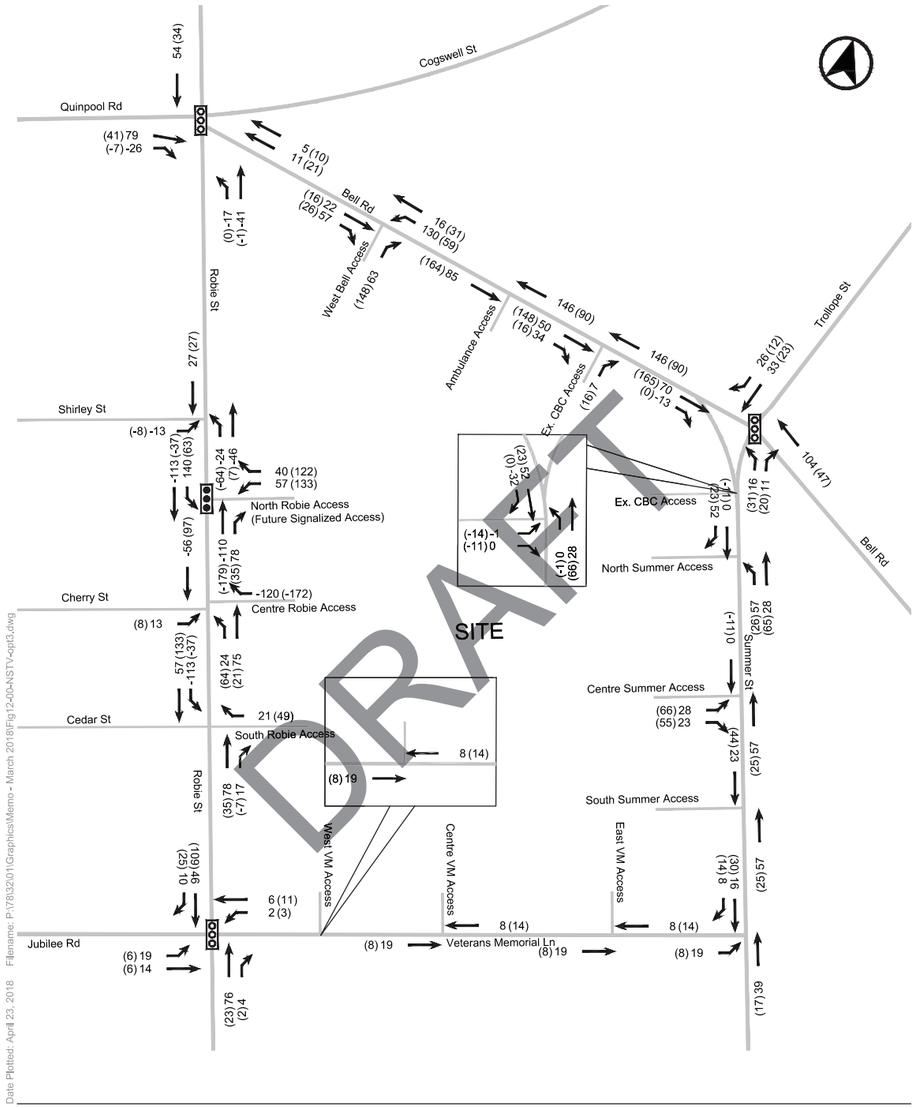
Figure 11



NET SITE TRAFFIC VOLUMES
OPTION 3: SIGNAL AT MID-BLOCK

00 AM Peak Hour
(00) PM Peak Hour
Existing Traffic Signal
Proposed Traffic Signal

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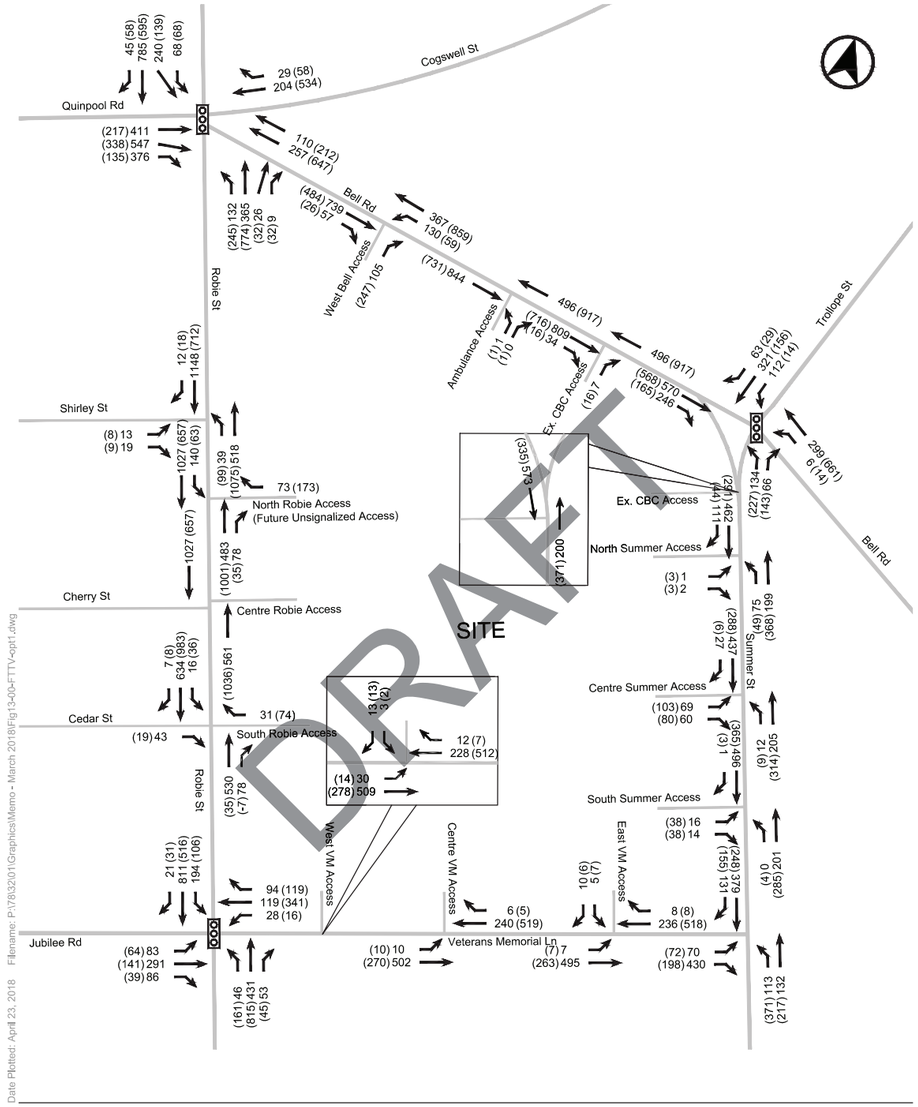
Figure 12

4.3 FUTURE TOTAL TRAFFIC VOLUMES

Future total traffic volumes for each of the three site driveway options, composed of existing traffic volumes plus net site traffic volumes, are illustrated in **Figure 13**, **Figure 14** and **Figure 15**.



FUTURE TOTAL TRAFFIC VOLUMES
OPTION 1: NO SIGNAL ON ROBIE

00 AM Peak Hour
(00) PM Peak Hour
Existing Traffic Signal

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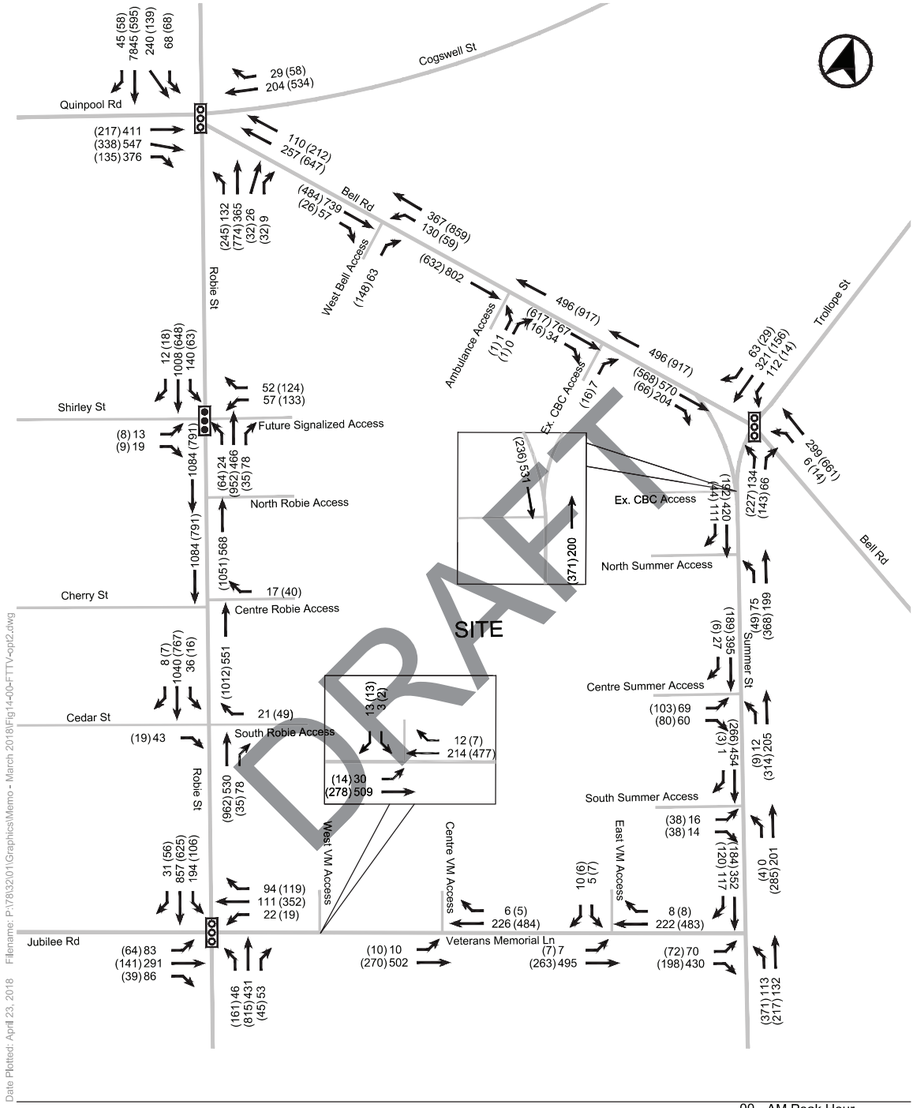
Figure 13

4.1 Robie Street Driveway Alternatives

Section Sub-Heading



DRAFT

FUTURE TOTAL TRAFFIC VOLUMES
OPTION 2: SIGNAL AT SHIRLEY

00 AM Peak Hour
(00) PM Peak Hour
Existing Traffic Signal
Proposed Traffic Signal

Queen Elizabeth II Health Sciences Centre (QEII)
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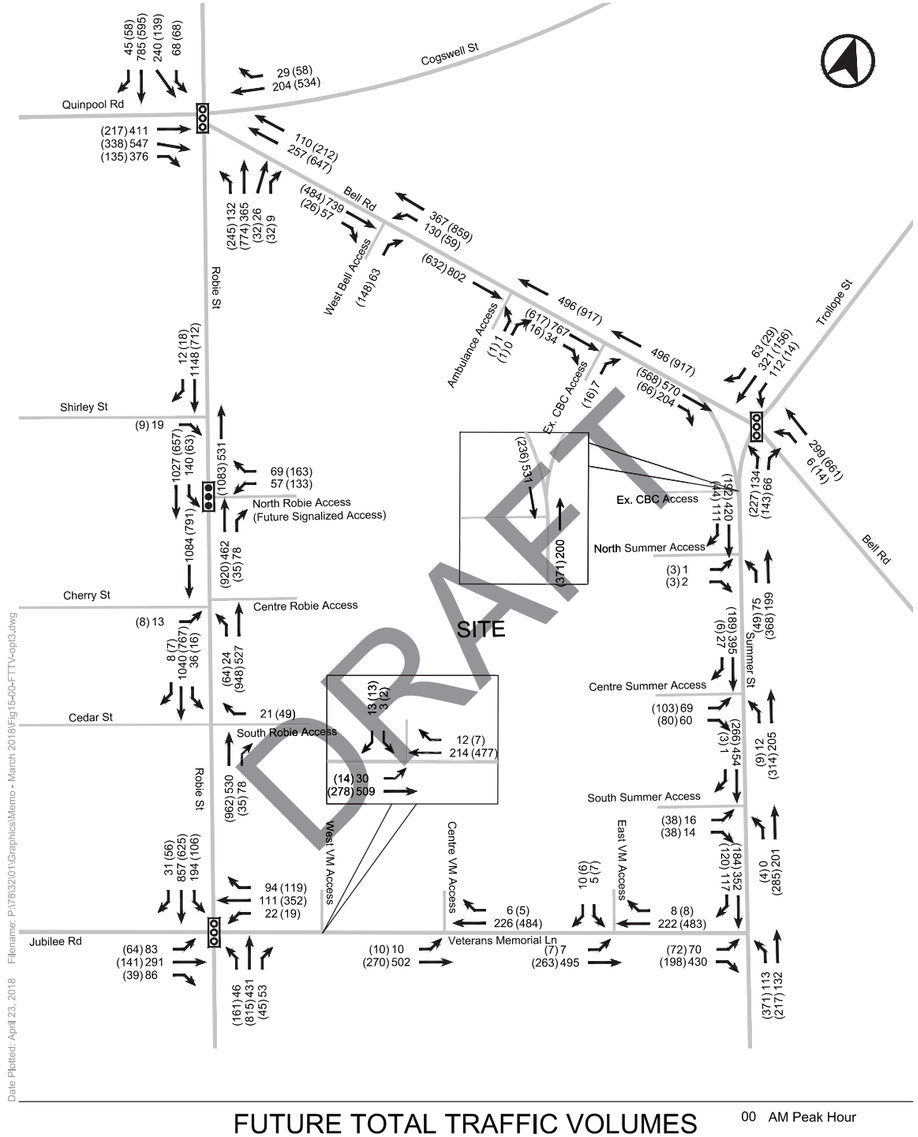
Figure 14



DRAFT

FUTURE TOTAL TRAFFIC VOLUMES
OPTION 3: SIGNAL AT MID-BLOCK

00 AM Peak Hour
(00) PM Peak Hour
Existing Traffic Signal
Proposed Traffic Signal

Queen Elizabeth II Health Sciences Centre (QEII)
7832-01 March 2018

Figure 15

5.0 TRAFFIC OPERATIONS ANALYSIS RESULTS

The results of operations analyses to assess the traffic impacts of each site access option are summarized below. Synchro output sheets are provided in **Appendix A**.

5.1 QUINPOOL ROAD / ROBIE STREET

The results of signalized traffic operations analysis at the Quinpool Road / Robie Street intersection are summarized in **Table 5**.

TABLE 5 QUINPOOL ROAD / ROBIE STREET – SIGNALIZED ANALYSIS (V/C)

Movement	Existing	Future Total All Options[4]
EBT	0.94 (0.67)	0.94 (0.67)
EBR (to Bell)	0.63 (0.40)	0.74 (0.44)
EBR (to Robie)	0.74 (0.12)	0.79 (0.13)
WBTR	0.28 (0.97)	0.28 (0.97)
NBL	0.59 (0.89)	0.55 (0.96)
NBTR	0.49 (0.99)	0.45 (0.99)
SBL	0.92 (0.94)	0.89 (0.96)
SBTR	0.90 (0.76)	0.97 (0.81)
NWLR	0.62 (0.98)	0.64 (0.98)
Overall	**0.89 (0.98)**	**0.93 (0.99)**

Notes:
1. 00 (00): Weekday morning peak hour (Weekday afternoon peak hour).
2. Results consist of volume-to-capacity ratios.
3. WB leg refers to Cogswell St, NW leg refers to Bell Rd.
4. Due to capacity constraints at the intersection, future total results are the same for each option, additional site traffic assumed to divert to Bell Road accesses.
5. In the weekday afternoon peak hour, cycle length increased from 155 to 160 seconds.

Under existing conditions, the intersection operates under busy conditions for an urban area, particularly in the afternoon peak hour, with overall volume-to-capacity (V/C) ratios of 0.89 and 0.98 during the weekday morning and afternoon peak hours, respectively. During the morning street peak period, when traffic is predominantly travelling into downtown Halifax, the Quinpool Road and southbound Robie Street legs approach capacity on certain movements. During the afternoon street peak period, with traffic travelling away from downtown Halifax, the northbound Robie Street, Cogswell Street, and Bell Road legs approach capacity on certain movements.

Under future total conditions, with the addition of site traffic and signal timing optimization, the intersection will continue to operate under busy urban conditions with overall V/C ratios of 0.93 and 0.99 during the weekday morning and afternoon peak hours, respectively.

5.2 SHIRLEY STREET / ROBIE STREET

5.2.1 Pedestrian Activity

Observed peak hour pedestrian activity at the crosswalks located on the south leg of the Shirley Street / Robie Street intersection and the north leg of the Cherry Street / Robie Street intersection is summarized in **Table 6**.

TABLE 6 EXISTING PEDESTRIAN CROSSWALK CROSSINGS

Crosswalk	Actuations of Crosswalk	Pedestrians Crossing at Crosswalk
Shirley Street	90 (89)	131 (133)
Cherry Street	- (-)	19 (24)

Notes:
1. 00 (00): Weekday morning peak hour (Weekday afternoon peak hour).
2. Cherry Street crosswalk actuations not counted.

The activity levels observed at both crosswalks were similar between the weekday morning and afternoon street peak hours. Approximately 90 actuations of the Shirley Street crosswalk occurred in each street peak hour with approximately 130 pedestrians crossing during those actuations. This represents an average rate of actuation of the crosswalk of approximately once every 40 seconds during each peak hour.

The number of crossing pedestrians at the Cherry Street crosswalk to the south were substantially less than the Shirley Street crosswalkand would result in a fewer actuations as a result, likely in the order of 20 in each per hour.

Additional pedestrians were observed crossing Robie Street at the emergency parking area outbound driveway between the two crosswalks.

5.2.2 Analysis Results

For Option 2 – Signal at Shirley Street, a cycle length of 75 and 80 seconds was selected for the weekday morning and afternoon street peak hours, representing 48 and 45 cycles per hour respectively. These cycle lengths reflect half of the Quinpool Road / Robie Street intersection cycle lengths. This allows for the ability to coordinate the two signals while reducing vehicle and pedestrian delays and vehicle queuing.

The results of traffic operations analysis using Synchro at the Shirley Street / Robie Street intersection both as a signalized and unsignalized intersection are summarized in **Table 7**.

TABLE 7 SHIRLEY ST / ROBIE ST – ANALYSIS SUMMARY

Movement	Existing[2]		Future Total[2] Option 1 No Signal		Future Total[3] Option 2 Signal at Shirley St	Future Total[2] Option 3 Mid-block Signal	
	Delay (sec)	LOS	Delay (sec)	LOS	V/C	Delay (sec)	LOS
EBLR / EBLTR[4]	20.9 (19.8)	C (C)	33.8 (31.2)	D (D)	0.02 (0.01)	13.2 (11.7)	B (B)
WBL[4]	- (-)	- (-)	- (-)	- (-)	0.11 (0.29)	- (-)	- (-)
WBTR[4]	- (-)	- (-)	- (-)	- (-)	0.04 (0.19)	- (-)	- (-)
NBTL / NBLTR[4]	2.3 (2.9)	A (A)	4.4 (4.9)	A (A)	0.84 (0.74)	- (-)	- (-)
SBL[4]	- (-)	- (-)	- (-)	- (-)	0.33 (0.43)	- (-)	- (-)
SBTR	- (-)	- (-)	- (-)	- (-)	0.63 (0.41)	- (-)	- (-)
Overall	**- (-)**	**- (-)**	**- (-)**	**- (-)**	**0.46 (0.55)**	**- (-)**	**- (-)**

Notes:
1. 00 (00): Weekday morning peak hour (Weekday afternoon peak hour).
2. Unsignalized analysis of existing intersection / Option 1 / Option 3.
3. Signalized analysis of intersection following proposed signalization in Option 2.
4. New or altered movement after proposed signalization in Option 2.

For existing conditions as an unsignalized intersection, the intersection operates under typical conditions for an urban area, with LOS C or better on turning movements experiencing delay in both the weekday morning and afternoon peak hours.

For Option 1 – No Signal, the unsignalized intersection will operate at LOS D or better. For Option 3 – Mid-block Signal, the unsignalized intersection will operate at LOS B.

For Option 2 – Signal at Shirley Street, the signalized intersection will operating with overall V/C ratios of 0.46 and 0.55. In the critical weekday morning street peak hour for southbound traffic, the 95th percentile queue at the Shirley Street / Robie Street intersection is projected to be 40 metres under future total conditions, well less than the 125 metre distance to the Quinpool Road / Robie Street intersection.

5.2.3 Additional Impacts to Robie Street Through Traffic

For existing conditions, northbound and southbound through traffic in the street peak hours on Robie Street between Veterans Memorial Lane / Jubilee Road and Quinpool Road / Bell Road will be interrupted as a result of the 90 actuations at the Shirley Street pedestrian crosswalk and the 20 actuations at the Cherry Street pedestrian crosswalk. Furthermore these pedestrian actuations do not appear to be coordinated in any fashion.

For Option 1 – No Signal, northbound and southbound through traffic in the street peak hours on Robie Street would experience the same number of interruptions as a result of the actuations as in existing conditions.

For Option 2 – Signal at Shirley Street, northbound and southbound through traffic in the street peak hours on Robie Street would experience fewer interruptions with the removal of the Shirley Street crosswalk and the installation of a signal. The proposed traffic signal would have 48 and 45 cycles per hour in the weekday morning and afternoon street peak hours (in comparison to the 90 shorter Shirley Street crosswalk actuations), while continuing to provide pedestrians a protected crossing. There would be no change to the number of interruptions of through traffic flow as a result of the Cherry Street crosswalk.

For Option 3 – Mid-block Signal, northbound and southbound through traffic in the street peak hours on Robie Street would experience the fewest interruptions of the three options with the removal of the Shirley Street and Cherry Street crosswalks and the installation of a signal mid-block. As in Option 2, the proposed traffic signal would have 48 and 45 cycles per hour in the weekday morning and afternoon street peak hours while continuing to provide pedestrians a protected crossing.

5.3 MID-BLOCK SITE DRIVEWAY

The results of traffic operations analysis at the primary mid-block Robie Street site driveway proposed in Option 1 and Option 3 are summarized in **Table 8**.

TABLE 8 MID-BLOCK SITE DRIVEWAY / ROBIE ST – ANALYSIS SUMMARY

Movement	Future Total[2] Option 1 No Signal		Future Total[3] Option 3 Mid-block Signal
	Delay (sec)	LOS	V/C
WBL[4]	- (-)	- (-)	0.09 (0.23)
WBR	12.7 (12.9)	B (B)	0.05 (0.26)
NBTR	- (-)	- (-)	0.52 (0.57)
SBL	10.6 (11.7)	B (B)	0.35 (0.36)
SBT	- (-)	- (-)	0.64 (0.40)
Overall	**- (-)**	**- (-)**	**0.40 (0.45)**

Notes:
1. 00 (00): Weekday morning peak hour (Weekday afternoon peak hour).
2. Unsignalized analysis of intersection as in Option 1.
3. Signalized analysis of intersection following proposed signalization in Option 3.
4. Westbound lefts allowed in Option 3 only.

All movements operate within capacity for each of the options in the weekday morning and afternoon street peak hours.

5.4 ROBIE STREET / VETERANS MEMORIAL LANE / JUBILEE ROAD

The results of traffic operations analysis at the Robie Street / Veterans Memorial Lane / Jubilee Road intersection are summarized in **Table 9**.

4.1 Robie Street Driveway Alternatives

TABLE 9 ROBIE ST / VETERANS MEMORIAL LN / JUBILEE RD – SIGNALIZED ANALYSIS (V/C)

Movement	Existing	Future Total Option 1 No Signal	Future Total Option 2 Signal at Shirley St	Future Total Option 3 Mid-block Signal
EBLTR	0.85 (0.93)	0.86 (0.92)	0.86 (0.95)	0.86 (0.86)
WBTL	0.25 (0.76)	0.28 (0.79)	0.24 (0.75)	0.24 (0.72)
WBR	0.08 (0.09)	0.08 (0.10)	0.08 (0.09)	0.08 (0.09)
NBL	0.27 (0.36)	0.28 (0.36)	0.29 (0.38)	0.29 (0.38)
NBTR	0.36 (0.55)	0.44 (0.58)	0.44 (0.56)	0.44 (0.58)
SBL	0.45 (0.33)	0.49 (0.34)	0.49 (0.32)	0.49 (0.32)
SBT	0.50 (0.36)	0.51 (0.37)	0.54 (0.42)	0.54 (0.45)
SBR	0.02 (0.03)	0.02 (0.03)	0.03 (0.06)	0.03 (0.06)
Overall	**0.66 (0.67)**	**0.68 (0.69)**	**0.69 (0.68)**	**0.69 (0.67)**

Notes:
1. 00 (00): Weekday morning peak hour (Weekday afternoon peak hour).
2. Results consist of volume-to-capacity ratios.

All movements operate within capacity for each of the options in the weekday morning and afternoon street peak hours.

6.0 ASSESSMENT OF SITE DRIVEWAY OPTIONS

6.1 EVALUATION OF OPTIONS

The three site options considered all share similar characteristics. Options 1 and 3 propose the driveway in the same location (and generally have the same impacts to the internal site layout) while Options 2 and 3 both propose the driveway to operate under signal control. Consequently, it is easiest to evaluate the options based upon their primary differences – driveway traffic control and driveway location.

6.1.1 Driveway Traffic Control Evaluation

The evaluation of driveway traffic control – unsignalized versus signalized, is shown in **Table 10.**

TABLE 10 COMPARISON OF DRIVEWAY TRAFFIC CONTROL

Criteria	Unsignalized Driveway Option 1 – No signalized access to Robie St	Signalized Driveway Option 2 – Signal at Shirley St Option 3 – Mid-block Signal
Site Accessibility	• **Less preferred** – Outbound vehicles can only exit to Robie Street northbound limiting accessibility to the public street network.	• **Preferred** – Outbound vehicles can exit to Robie Street northbound and southbound providing greater accessibility to the public street network
Site Circulation	• **Preferred** – No difference based on driveway traffic control	• **Preferred** – No difference based on driveway traffic control
Quinpool Rd / Robie St Intersection Traffic Operations	• **Less preferred** – A greater number of outbound vehicles will divert to Bell Road to avoid the at-capacity conditions at the Quinpool Road / Robie Street intersection or will not divert and exacerbate traffic operations.	• **Preferred** – Outbound vehicles can exit to Robie Street southbound and use alternative routes to avoid the Quinpool Road / Robie Street intersection.
Robie St Through Traffic Operations	• **Less preferred** – Through traffic on Robie Street will continue to experience interruptions as a result of the 90 Shirley Street crosswalk actuations and 20 Cherry Street crosswalk actuations in the street peak hours.	• **Preferred** – Through traffic on Robie Street will experience fewer interruptions with a traffic signal with 48 and 45 cycles in the weekday morning and afternoon street peak hours, respectively • Consideration may be given to removing the Cherry Street crosswalk and its associated 20 actuations in the street peak hours.
Pedestrians Crossing Robie St	• **Preferred** – Pedestrians experience minimal delays to cross Robie Street • Existing Shirley Street and Cherry Street crosswalks not directly aligned with the building accesses as evidenced by pedestrians observed crossing between the crosswalks.	• **Preferred** – Pedestrians may experience nominal additional delays to cross Robie Street given the longer cycle length of the signal • Signal and pedestrian crosswalks would be directly aligned with building accesses minimizing the number of unprotected pedestrian crossings • Pedestrians are better protected as driver compliance at traffic signals is generally better than at crosswalks.
Local Shirley St Access	• **Preferred** – No change in access for traffic on Shirley Street	• **Less preferred** – For Option 3, Shirley Street traffic destined for northbound Robie Street would be forced to divert to Jubilee Road • For Option 2, Shirley Street traffic would have the same access, but as a protected phase at the signalized intersection
Hospital Form and Function	• **Preferred** – No difference based on driveway traffic control	• **Preferred** – No difference based on driveway traffic control.
HI Campus Integration	• **Preferred** – No difference based on driveway traffic control	• **Preferred** – No difference based on driveway traffic control.
Hospital Wayfinding	• **Preferred** – No difference based on driveway traffic control	• **Preferred** – No difference based on driveway traffic control.

Based on these evaluation criteria, a signalized site driveway would be preferred compared to an unsignalized site driveway although it is acknowledged that there are negative impacts to Shirley Street traffic. Based on the existing traffic volumes, this would impact 13 and 8 vehicles turning left from Shirley Street to Robie Street northbound in the weekday morning and afternoon street peak hours, respectively.

There would also be 24 and 64 left turns from Robie Street to Shirley Street in the weekday morning and afternoon street peak hours that would be impacted. The impact to these left turning vehicles could be mitigated by opening the existing median at Cherry Street and permitting left turns to reduce the required diversion distance.

6.1.2 Driveway Location Evaluation

The evaluation of the driveway location, assumed to be signalized, directly opposite Cherry Street in Option 2 or at a mid-block location between Shirley Street and Cherry Street in Option 3, is shown in **Table 11**.

4.1 Robie Street Driveway Alternatives

TABLE 11 COMPARISON OF DRIVEWAY LOCATION

Criteria	Option 2 – Signal at Shirley Street	Option 3 – Mid-block Signal
Site Accessibility	• **Preferred** – Allows for direct access from site to Shirley Street although the number of vehicles expected to make this movement is minimal.	• **Less preferred** – Outbound site traffic destined for Shirley Street would be forced to divert to Cherry Street although the number of vehicles expected to make this movement is minimal.
Site Circulation	• **Less preferred** – Traffic destined for emergency, the Cancer Centre pick-up/drop-off and the parking garage are intermingled and are presented a challenging decision point upon entering the site	• **Preferred** – Traffic destined for each of the various hospital areas can turn off while circulating along the access road one after another providing for an easier decision making process.
Quinpool Rd / Robie St Intersection Traffic Operations	• **Less preferred** – Provides approximately 160 metre spacing from the Quinpool Road / Robie Street intersection (centre to centre).	• **Preferred** – Provides approximately 210 metre spacing from the Quinpool Road / Robie Street intersection (centre to centre).
Robie St Through Traffic Operations	• **Preferred** – If the Cherry Street crosswalk is retained, through traffic on Robie Street will continue to experience interruptions as a result of the pedestrian actuations. If the Cherry Street crosswalk was removed, there would be no difference based on driveway locations.	• **Preferred** – Through traffic on Robie Street will experience fewer interruptions with a traffic signal with 48 and 45 cycles and no actuations with the Shirley Street and Cherry Street crosswalks removed
Pedestrians Crossing Robie St	• **Preferred** – No difference based on driveway location	• **Preferred** – No difference based on driveway location
Local Shirley St Access	• **Preferred** – No change in access for traffic on Shirley Street	• **Less preferred** –Shirley Street traffic destined for northbound Robie Street would be forced to divert to Jubilee Road
Hospital Form and Function	• **Less preferred** – Lost development potential by dissecting the Urban Garden site and fragmenting development opportunities on an already constrained site	• **Preferred** – Realizes full development potential of the Urban Garden on an already constrained site
HI Campus Integration	• **Less preferred** – Bridge connections from the Cancer Centre to the main buildings become extremely long • Provides a Cancer Centre which is more challenging to integrate into the overall HI campus	• **Preferred** – Allows for a short bridge connection from the Cancer Centre to the main buildings • Provides a Cancer Centre integrated into the overall HI campus
Hospital Wayfinding	• **Less preferred** – Emergency building access is not visible from the street	• **Preferred** – Emergency building access is visible from the street

Based on these evaluation criteria, the signalized site driveway's preferred location would be mid-block between Cherry Street and Shirley Street.

6.2 RECOMMENDED OPTION

Based on the preceding evaluation, Option 3, the mid-block signalized access to Robie Street, has been identified as the recommended alternative for the hospital. It is acknowledged that there are impacts to residents on the local streets west of Robie Street, i.e. Pepperell Street, Shirley Street, Cherry Street, and Cedar Street with the prohibition of the left turn movements to and from Shirley Street from Robie Street.

Based on the existing traffic volumes, 13 and 8 vehicles left turning vehicles from Shirley Street to Robie Street would be affected in the weekday morning and afternoon street peak hours, respectively. There would also be 24 and 64 left turning vehicles from Robie Street to Shirley Street who would also be impacted. This impact could be somewhat mitigated if a break in the median is provided at Cherry Street.

Option 3 is best from a hospital planning perspective and in particular, allows for a fully integrated Cancer Centre. It also allows for the best internal site circulation and access configuration with alignment of the signalized Robie access with the emergency building entrance, and good connectivity between the Cancer Centre and the IP building.

More generally, the signalization of the north Robie access in Option 3 allows for significantly improved travel options for site traffic travelling to / from the proposed Robie garage, reduced interruptions on Robie corridor traffic given the removal of the pedestrian crosswalks on Robie Street as well as positioning the signal further from the Quinpool Road / Robie Street intersection to reduce potential queuing impacts, all the while continuing to provide protected pedestrian crossings at the signal.

Therefore, Option 3 represents the best combination of improvements for hospital operations and traffic operations along the Robie Street corridor.

TABLE OF APPENDICES

BA Group

QEII Master Plan – On-Site Parking Strategy – Option A

With Cancer Centre - Garden Pavilion Concept – Option A

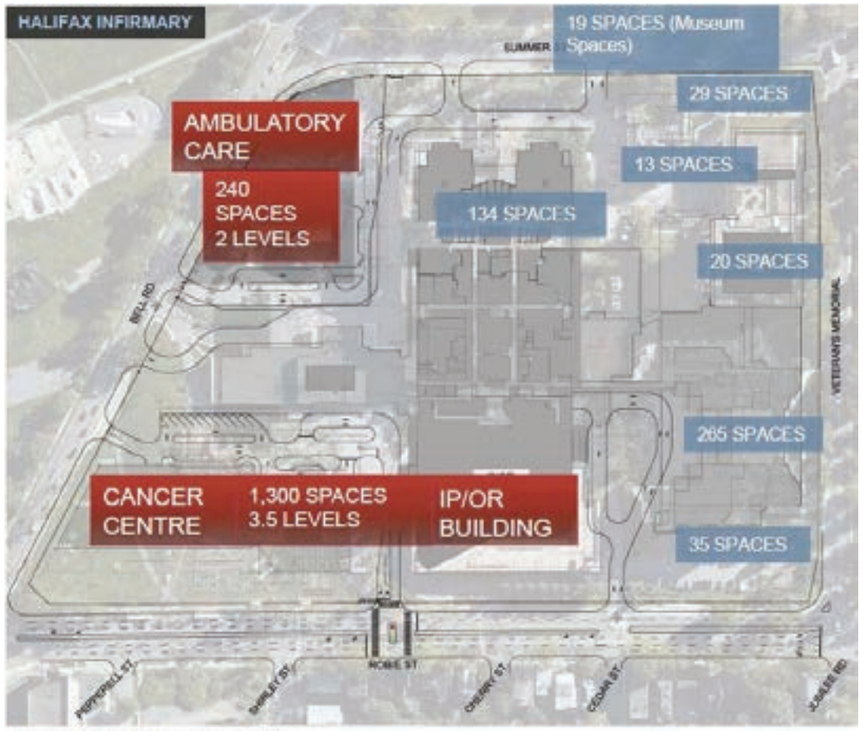
Phase	Duration	Description	HI + VG Sites (Combined)			HI Site Only			VG Site Only		
			Total Site Supply	Total Site Demand[1]	Total Site Surplus / Deficit	HI Site Supply	HI Site Demand[1]	HI Site Surplus / Deficit	VG Site Supply	VG Site Demand[1]	VG Site Surplus / Deficit
0		Existing parking supply	2,220	2,220	0	1,300	1,300	0	920	920	0
		Pre HI Hospital Building Construction									
1	6 months	Add temporary parking spaces to Urban Garden Site (+200)	2,420	2,220	+200	1,500	1,300	+200	920	920	0
2	1 year	Remove parking from the Victoria General site for construction of new parking structure (-120)	2,300	2,220	+80	1,500	1,300	0	800	920	-120
		Build new parking structure on Victoria General Site	2,300	2,220	+80	1,500	1,300	0	800	920	-120
		New parking structure complete on Victoria General site (+300)	2,600	2,220	+380	1,500	1,300	0	1,100	920	+180
5	4 months	Demolish existing parking structure on Halifax Infirmary site (-672 spaces)	1,930	2,220	-290	830	1,300	-470	1,100	920	+180
6	6 months	Demolish existing CBC building and leased parking spaces on CBC site (-90 spaces)	1,840	2,220	-380	740	1,300	-560	1,100	920	+180
		HI Building Construction									
8	3-4 years	Demolish emergency parking lot for construction of new Inpatient building (-25 spaces)	1,815	2,220	-405	715	1,300	-585	1,100	920	+180
9		Start construction on In-Patient Building	1,815	2,220	-405	715	1,300	-585	1,100	920	+180
		HI In-Patient Building complete (+500)	2,315	2,220	+95	1,215	1,300	-85	1,100	920	+180
		Relocated In-patient Facilities from VG to HI	2,315	2,495	-180	1,215	1,800	-585	1,100	695	+405
		Start construction on Ambulatory Building and Cancer Center (-200)	2,115	2,495	-380	1,015	1,800	-785	1,100	695	+405
10		CC and Ambulatory completed, underground parking combined along CC and IP (+1,040 spaces)[3]	3,155	2,495	+660	2,055	1,800	+255	1,100	695	+405
		Post HI Building Construction									
11		Relocate Cancer Centre and Ambulatory facilities from VG to HI	3,155	3,130	+25	2,055	2,720	-665	1,100	410	+690

Consider shuttle bus service from VG to HI and/or closer off-site parking opportunities [2]
Consider providing additional parking off-site for any total combined site deficit of over 50 spaces, in addition to a shuttle bus service
Comprehensive permanent shuttle bus operation between HI and VG and/or closer off-site parking is required [2].

1. The existing informal parking demand that is occurring in the immediate site environs of HI and VG is assumed to be to be maintained.
2. The staff component of the target parking supply could be reduced at the VG site during construction and at completion by way of improved public transit, TDM and Hospital policy directives. This would reduce the number of staff that needs to be shuttled between the VG and HI sites in the current concept.
3. 3.5 levels of parking underneath IP/OR building and Cancer Centre. 2 levels of parking underneath Ambulatory building.

QEII Master Plan – On-Site Parking Strategy – Option A

Garden Pavilion Concept –Option A



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QEII Master Plan – On-Site Parking Strategy – Option A

Without Cancer Centre – Willow Tree Concept - Option A

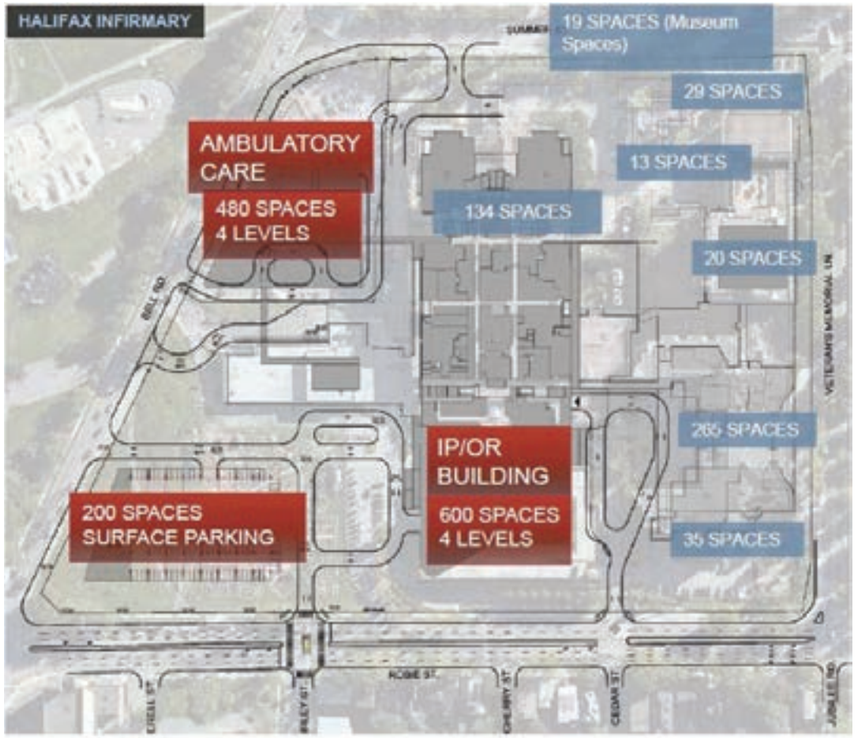
Phase	Duration	Description	HI + VG Sites (Combined)			HI Site Only			VG Site Only		
			Total Site Supply	Total Site Demand[1]	Total Site Surplus / Deficit	HI Site Supply	HI Site Demand[1]	HI Site Surplus / Deficit	VG Site Supply	VG Site Demand[1]	VG Site Surplus / Deficit
0		Existing parking supply	2,221	2,221	0	1,300	1,300	0	920	920	0
		Pre HI Hospital Building Construction									
1	6 months	Add 200 temporary parking spaces to Urban Garden site	2,421	2,221	+200	1,500	1,300	+200	920	920	0
2	1 year	Remove 250 parking spaces from Victoria General site for construction of new parking structure	2,171	2,221	-50	1,500	1,300	+200	670	920	-250
3		Build new parking structure on Victoria General site	2,171	2,221	-50	1,500	1,300	+200	670	920	-250
4		New parking structure complete on Victoria General site (+550 spaces)	2,721	2,221	+500	1,500	1,300	+200	1,220	920	+300
5	4 months	Demolish existing parking structure on Halifax Infirmary site (-672 spaces)	2,049	2,221	-172	830	1,300	-472	1,220	920	+300
6	6 months	Demolish existing CBC building and leased parking spaces on CBC site (-90 spaces)	1,959	2,221	-262	740	1,300	-562	1,220	920	+300
		HI Building Construction									
7	3-4 years	Provide laydown area / construction office at Urban Garden site (-20 spaces)	1,939	2,221	-282	720	1,300	-582	1,220	920	+300
8		Demolish emergency parking lot for construction of new Inpatient building (-25 spaces)	1,914	2,221	-307	695	1,300	-607	1,220	920	+300
9		Start construction on In-Patient and Ambulatory Buildings	1,914	2,221	-307	695	1,300	-607	1,220	920	+300
10		HI In-Patient and Ambulatory Buildings completed (+1,080 spaces)	2,994	2,221	+773	1,775	1,300	+473	1,220	920	+300
		Post HI Building Construction									
11		Relocate facilities from VG to HI	3,014	3,000	+15	1,795	2,550	-755	1,220	450	+770

Consider shuttle bus service from VG to HI and/or closer off-site parking opportunities [2]
Consider providing additional parking off-site for any total combined site deficit of over 50 spaces, in addition to a shuttle bus service
Comprehensive permanent shuttle bus operation between HI and VG and/or closer off-site parking is required [2].

1. The existing informal parking demand that is occurring in the immediate site environs of HI and VG is assumed to be to be maintained.
2. The staff component of the target parking supply could be reduced at the VG site during construction and at completion by way of improved public transit, TDM and Hospital policy directives. This would reduce the number of staff that needs to be shuttled between the VG and HI sites in the current concept.

QEII Master Plan – On-Site Parking Strategy – Option A

Willow Tree – Option A



ILLUSTRATIVE OPTION

New Parking:	1,280 spaces
Remaining Parking:	515 spaces
Total Parking:	1,795 spaces

ILLUSTRATIVE OPTION

New Parking:	550 spaces
Remaining Parking:	670 spaces
Total Parking:	1,220 spaces

QUEEN ELIZABETH HOSPITAL MASTER PLAN – ON-SITE PARKING STRATEGY
APRIL 18, 2018 7832-01

BA Group

QUEEN ELIZABETH II HOSPITAL REDEVELOPMENT

CANCER CARE CENTRE - PARKING

BA Consulting Group Ltd.
April 24, 2018

7832-01

BA Group

QEII Parking Supply Principles

1. The Priority for on-site parking at the Halifax Infirmary is to serve the needs of our patients and families
2. Parking resources at both the HI and VG sites will be optimally utilized. Access between sites will be supported by a shuttle service
3. Off-site (street) parking will continue to be utilized, in compliance with city by-laws
4. Additional off-site parking resources will be required on an interim basis
5. Parking and transportation solutions will safeguard staff safety and security at all times

- Distance between sites: 1.1km
- 15 minute walk
- 5 minute drive

2

Parking Supply Strategy

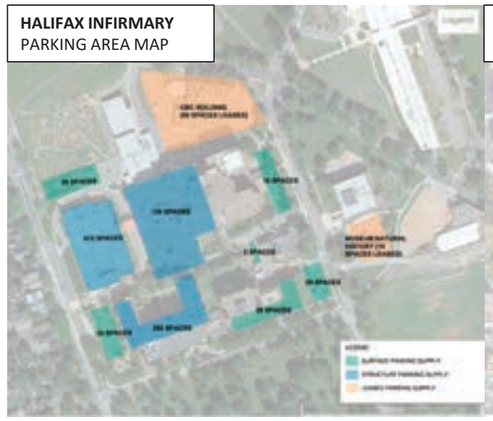
- Find balance between on-site and off-site parking
- Provide optimum parking supply on the HI site
- Provide residual parking supply on the VG site / Off-site
- Maintain but do not increase off-site parking
- Minimize the need for new structured parking

Key Considerations

1. Cost of newly constructed parking
2. Cost of continuous shuttle service
3. Parking deficit once HI parking structure is demolished
4. On-site parking capacity at VG and HI
5. Traffic impact on surrounding area
6. Opportunity to acquire additional land to provide parking
7. Opportunity to better use available off-site parking

Existing On-site Parking Supply

HALIFAX INFIRMARY
PARKING AREA MAP



VICTORIA GENERAL
PARKING AREA MAP

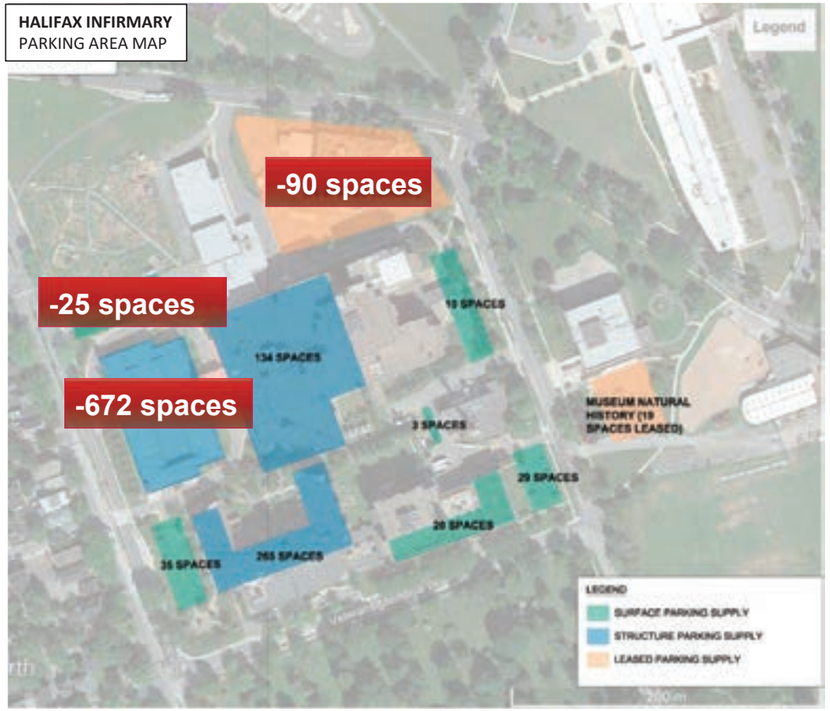
HI Parking Supply	1, 300
On-Site Parking Supply	1,200
Leased Supply	100

VG Parking Supply	920
On-Site Parking Supply	750
Off-Site Supply	170

Total On-site Parking:
2,220 Spaces

HI Parking Supply During Construction

HALIFAX INFIRMARY
PARKING AREA MAP



Demolished Parking:	**787 Spaces**
Remaining Parking:	**515 Spaces**
Parking Deficit:	**-787 Spaces**

4.2 On Site Parking Strategy

On-site Parking Demand

BA Group

HI	PARKING RATIO ON-SITE PER 100SM DGSF	PROJECTED DEMAND
NET NEW AMBULATORY (25,000 sm)	3.0 per 100 sm	750
NEW INPATIENT (33,200 sm)	1.5 per 100 sm	500
NEW CANCER CENTRE (11,150 sm)	1.5 per 100 sm	170
EXISTING (90,000 sm)	1.4 per 100 sm	1,300
NET NEW: 70,000 sm	2.0 per 100 sm	1,420
TOTAL: 160,000 sm	1.7 per 100 sm	2,720
VG	**PARKING RATIO ON-SITE PER 100SM DGSF**	**PROJECTED DEMAND**
EXISTING (101,000 sm)	0.9 per 100 sm	920
NET NEW (-53,200 sm)	0.96 per 100 sm	-510
TOTAL (47,800 sm)	0.86 per 100 sm	410
COMBINED	**PARKING RATIO ON-SITE PER 100SM DGSF**	**PROJECTED DEMAND**
TOTAL (207,800 sm)	1.5 per 100 sm	3,130

7

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On-site Parking Evaluation Table

INCREASE HI PARKING SUPPLY	INCREASE VG PARKING SUPPLY
+ Reduce/eliminate shuttle service	+ Disperses traffic between both sites
+ More consolidated parking supply	+ Alleviates parking deficit caused by demolition of HI parkade
+ Reduces need for new structured parking off-site	+ Makes use of existing Hospital lands
− Increases traffic congestion at HI	− Increases volume of shuttle service
− Increases cost associated with more structured parking levels	− Inconvenience for individuals parking on VG and shuttling to HI
− Does not alleviate parking deficit during construction	− Limits alternative land use at VG

8

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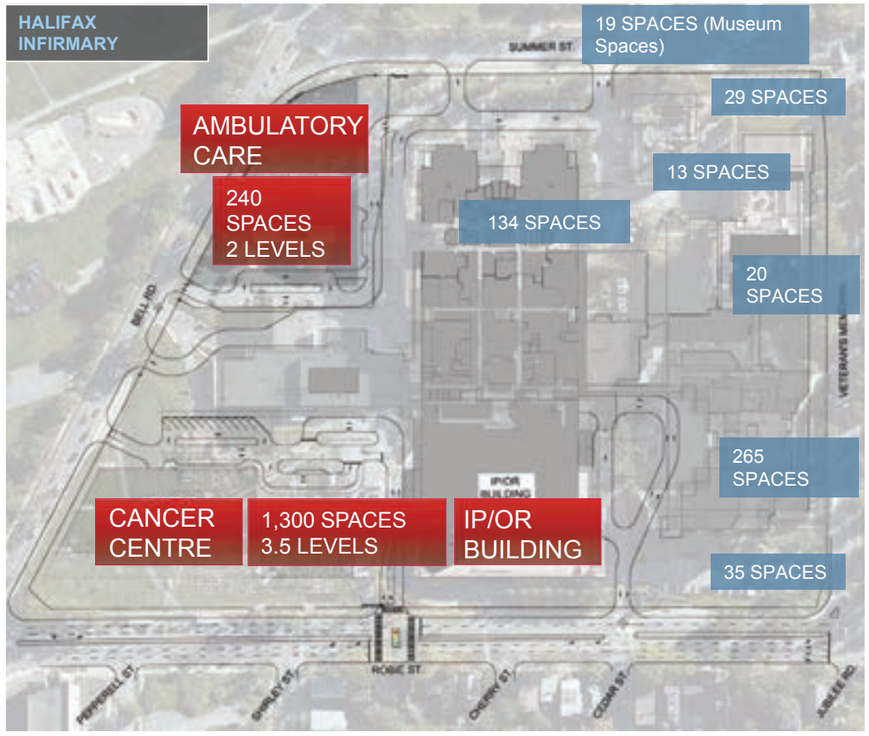
Parking Strategy – Garden Pavilion Option A



New Parking: 1,540 spaces

Remaining Parking: 515 spaces

Total HI Parking: 2,050 spaces

Total On-site Parking: 3,150 spaces

9

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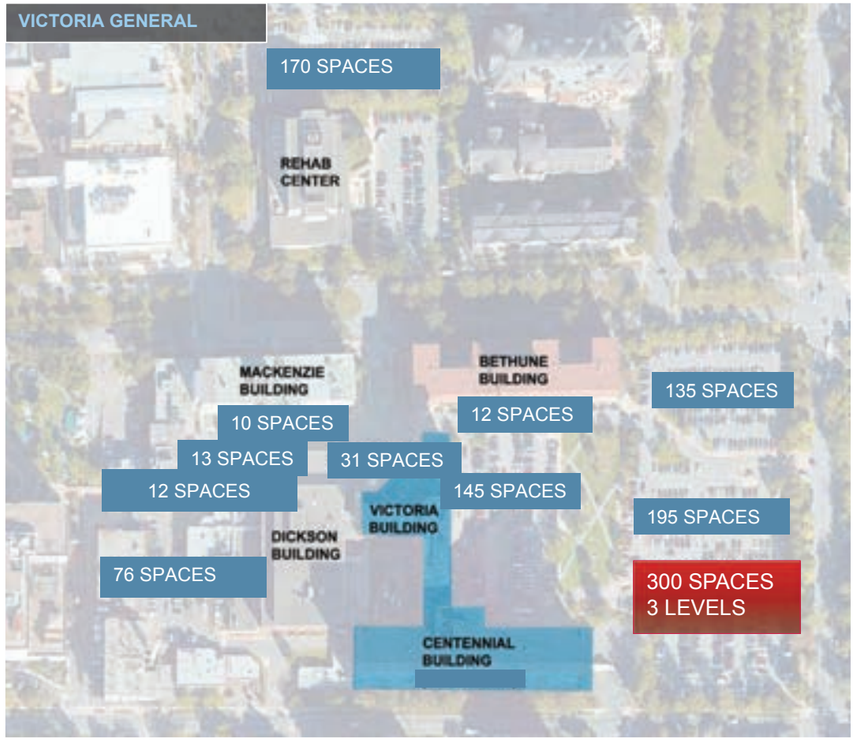
Parking Strategy – Garden Pavilion Option A



New Parking: 300 spaces

Remaining Parking: 800 spaces

Total VG Parking: 1,100 spaces

Total On-site Parking: 3,150 spaces

10

4.2 On Site Parking Strategy

Parking Supply During Construction

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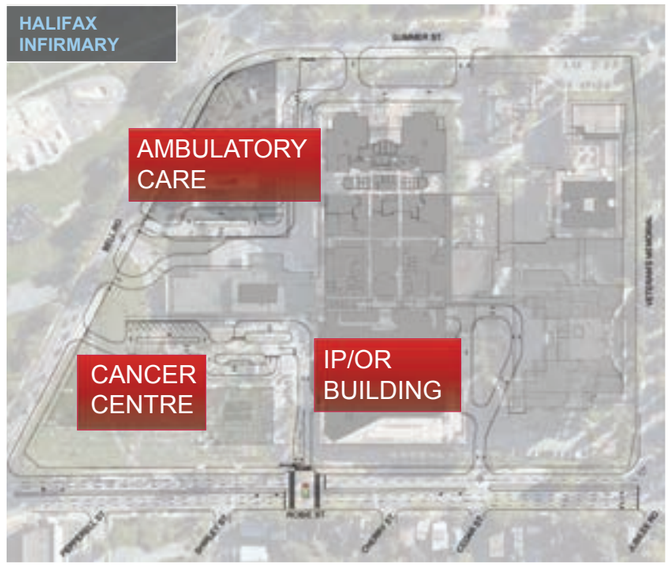
With Cancer Centre - Garden Pavilion Concept – Option A

Phase	Duration	Description	VG + VG Sites (Combined)			VI Site Only			VG Site Only		
			Total Site Supply	Total Site Demand[2]	Total Site Surplus / Deficit	VI Site Supply	VI Site Demand[2]	VI Site Surplus / Deficit	VG Site Supply	VG Site Demand[2]	VG Site Surplus / Deficit
0		Existing parking supply	2,220	2,220	0	1,300	1,300	0	920	920	0
Pre-VI Hospital Building Construction											
1	6 months	Add temporary parking spaces in Urban Garden Site (+200)	2,420	2,220	+200	1,500	1,300	+200	920	920	0
2	1 year	Remove parking from the Victoria General site for construction of new parking structure (-120)	2,300	2,220	+80	1,500	1,300	+200	800	920	-120
3		Build new parking structure on Victoria General site	2,300	2,220	+80	1,300	1,300	+200	800	920	120
4		New parking structure complete on Victoria General site (+300)	2,600	2,220	+380	1,500	1,500	+200	1,100	920	+180
5	6 months	Demolish existing parking structure on Nathan Jeffreyes site (-472 spaces)	1,930	2,220	-290	830	1,300	-470	1,100	920	+180
6	6 months	Demolish existing CDC building and leased parking spaces on CDC site (-90 spaces)	1,930	2,220	-290	740	1,300	-560	1,190	920	+270
VI Building Construction											
7	3-4 years	Demolish emergency parking lot for construction of new Inpatient building (-25 spaces)	1,815	2,220	-405	715	1,300	-585	1,100	920	+180
8		Start construction on In-Patient Building	1,815	2,220	-405	715	1,300	-585	1,100	920	+180
9		VI In-Patient Building complete (+500)	2,315	2,220	+95	1,215	1,300	-85	1,100	920	+180
10		Relocated In-patient Facilities from VG to VI	2,315	2,495	-180	1,215	1,800	-585	1,100	695	+405
11		Start construction on Ambulatory Building and Cancer Center (-200)	2,115	2,495	-380	1,015	1,800	-785	1,100	695	+405
12		CC and Ambulatory completed, underground parking combined along CC and IP (+1,040 spaces)[3]	3,155	2,495	+660	2,055	1,800	+255	1,100	695	+405
First VI Building Construction											
13		Relocate Cancer Centre and Ambulatory facilities from VG to VI	3,155	3,130	+25	2,055	2,720	-665	1,100	410	+690

1. Consider shuttle bus service from VG to VI and/or closer off-site parking opportunities.
2. Consider providing additional parking off-site for any total combined site deficit of over 50 spaces, in addition to a shuttle bus service.
3. Comprehensive permanent shuttle bus operation between VI and VG and/or closer off-site parking is required.

1. The existing informal parking demand that is occurring in the immediate site environs of VI and VG is assumed to be to be maintained.
2. The staff component of the target parking supply could be reduced at the VG site during construction and at completion by way of improved public transit, TDM and cognitive policy directives. This would reduce the number of staff that needs to be shuttled between the VG and VI sites in the current concept.
3. 3.5 levels of parking underneath IP/OR building and Cancer Centre. 2 levels of parking underneath Ambulatory building.



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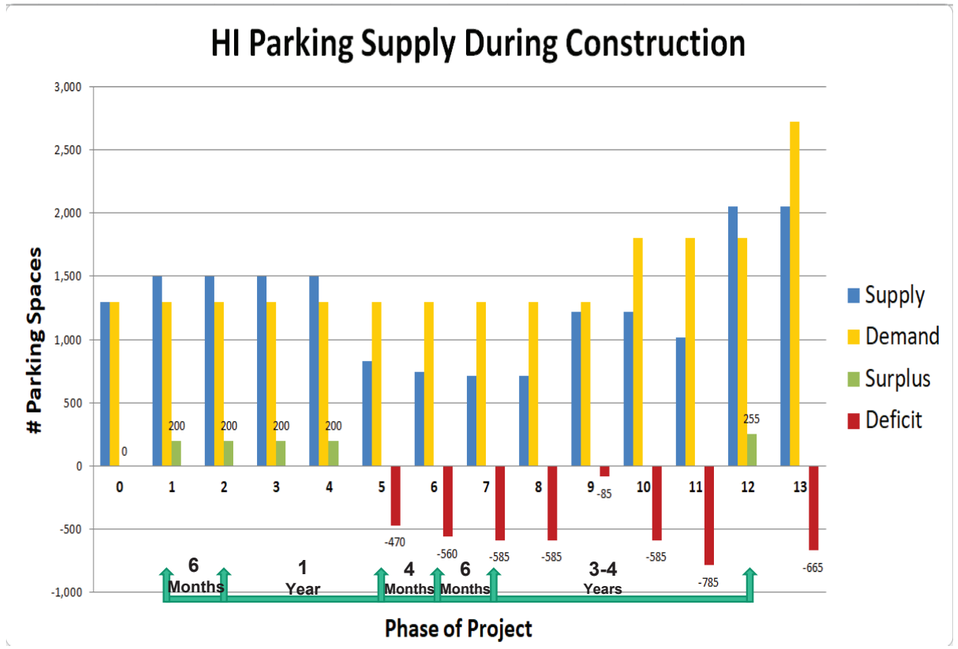
HI Parking Supply During Construction



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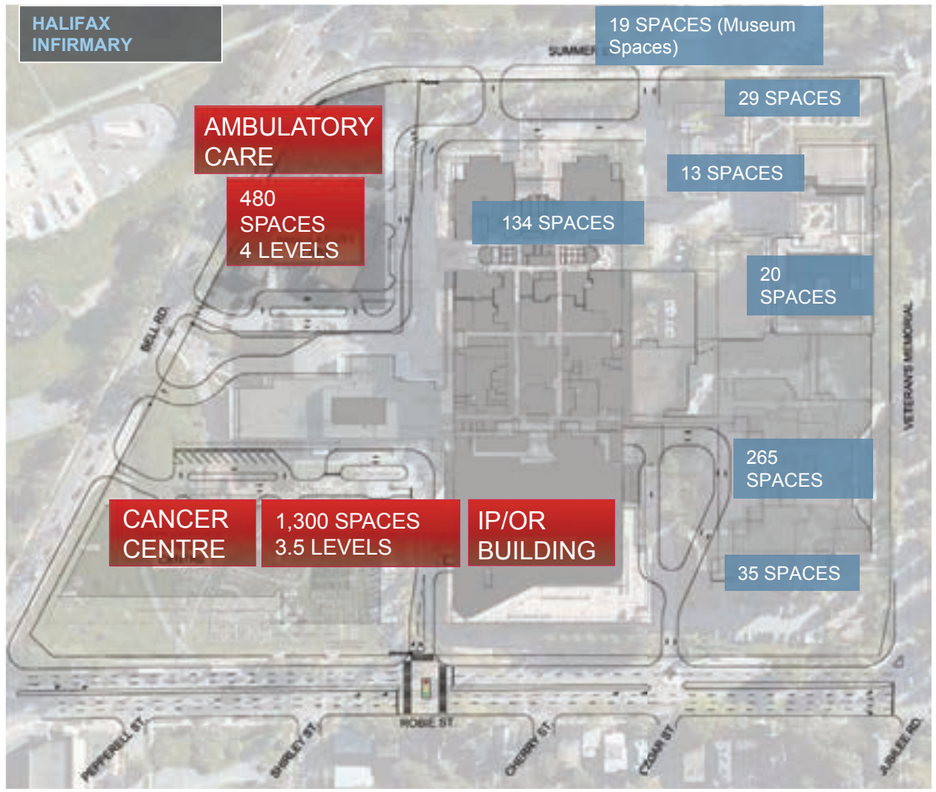
Future Parking Supply - HI



New Parking:	1,780 spaces
Remaining Parking:	515 spaces

Total HI Parking: 2,300 spaces

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Additional Off-Site Parking

- ✓Alleviates parking deficit during phases of construction
- ✓Reduces traffic congestion on Hospital sites
- ✓Closer proximity to HI site compared to VG (reasonable walking distance)
- ✓Reduce/eliminate shuttle service volume between HI and VG
- ✓Reduces need for underground parking on HI
- ✓Harmonious with future Hospital plans
- ✓Potential for unencumbered re-use of VG lands

- Potential for 300 Surface Parking Spaces
- Potential for 700 Structured Parking Spaces
- 400 metres from IP/OR Entrance (6 minute walk)

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Key Considerations

1. Evaluate cost of structured parking vs. shuttle service
2. Discuss how to diminish parking deficit during phased construction
3. Establish optimum supply of parking at the HI site
4. Consider the costs of providing parking on VG to serve HI demand
5. Pursue the acquisition of off-site lands for additional parking

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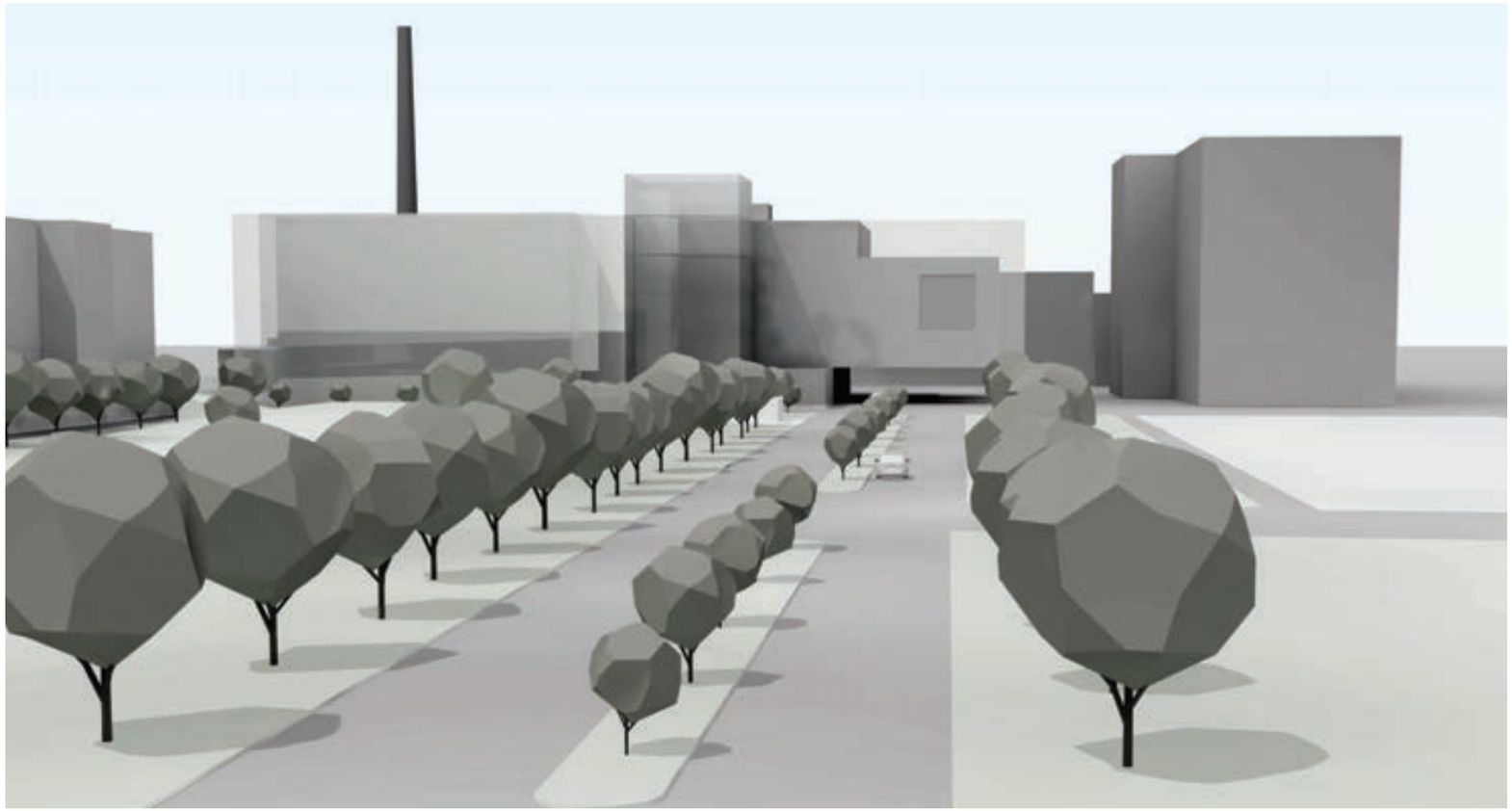
5

The Future of VG

5.1 Repurposing of the Dickson Building



- **Repurpose the Dickson Building**
- **Demolition and Removal of Victoria and Centennial**
- **New Image / Frontage**
- **New Below Grade and Surface Parking Lots**
- **New Greenspace**

1. Demolition of Victoria and Centennial Buildings
2. Construct new below grade parking by capitalizing on excavation left behind from Victoria
3. Create new lobby and vertical circulation for Dickson building with views of adjacent greenspace and entrances
4. New entrances and extended drop-off to Dickson
5. New surface parking on top of below grade parking
6. Temporary surface parking on Centennial site
7. Centennial site retained for future development
8. Substantial new green space
9. **Option to create a parking structure fronting South Park Street**

The original master plan, as reflected in volumes 1 and 2 of the Master Plan Study, addresses the demolition of the Centennial and Victoria Buildings, providing a new east façade to the Dickson building, the decanting of ambulatory care functions currently within Dickson to HI site and the consolidation of cancer care functions within Dickson. Maintaining cancer care functions currently in Dickson to remain, allowed for minimal disruption to the zones in use such as, radiation treatment and diagnostic imaging. Maintaining 24/7 utilization of cancer care functions meant the requirement for a phased renovation approach.

Facility assessment reflecting compromised building condition coupled with the extent of differed maintenance cost and a primary focus on caner patient wellbeing resulted in a feasibility assessment looking at moving cancer care to the HI site. With the relocation of cancer functions into a new building at the HI site, major space is vacated in Dickson. The following drawings reflect the extent of cancer functions that are removed from the Dickson building proposal in the original Master Plan. Also identified are non-cancer function, mainly ambulatory, that were previously relocated in the plan. This is done through existing plans and future plans showing vacancies.

As part of the original Master plan study several explorations were demonstrated in Volume 1 of the Master Plan Study (Section 5.3). With the feasibility study to relocate Cancer Care to HI the repurposing of Dickson needs to be re-evaluated in the context of the overall Victoria General site as part of a separate study.

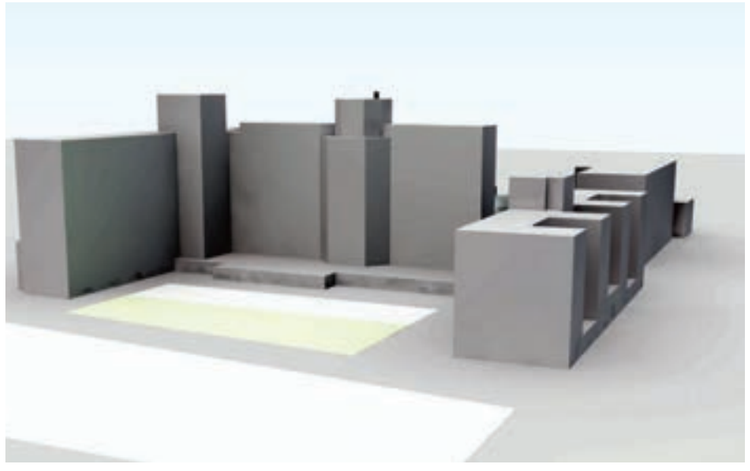
5.1 Repurposing of the Dickson Building

Dickson Isometric Section

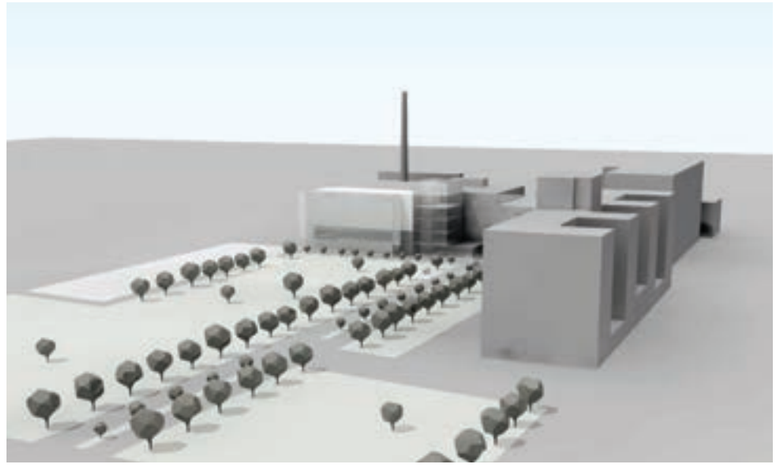
The series of images below represent a sequential long-term evolution of the site. The initial 3D image depicts the existing Victoria, Centennial and Bethune buildings in place. There is no visibility of the Dickson building from its east exposure. With the demolition of the Victoria and Centennial, the east face of the Dickon building is immediately visible, lending itself to a face lift and the possibility of creating a new image and identity.

The third image represents a view of the site after the Bethune building is demolished.

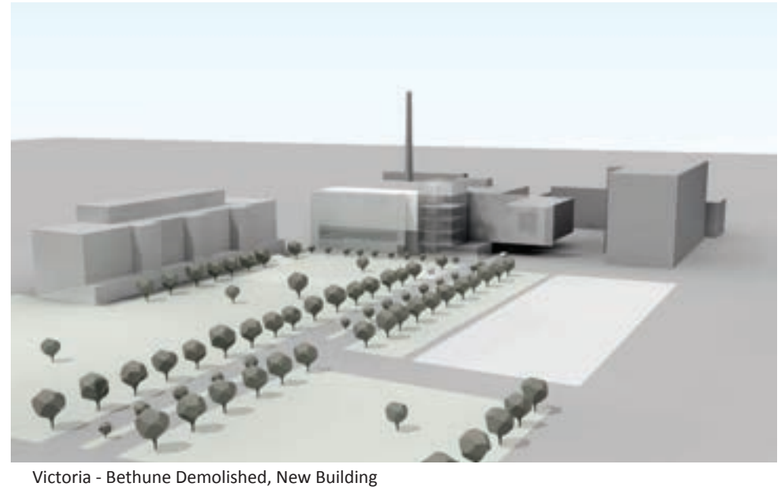
The site is now transformed into a “building within a park”, the proposed boulevard on to the site reinforcing this image. Finally allowing for a proposed development along the SE edge of the site as it continues to evolve.



Victoria General - Existing Condition

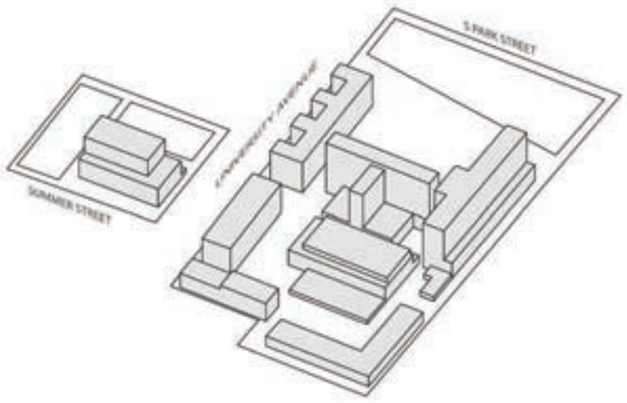


Victoria - Victoria and Centennial Demolished



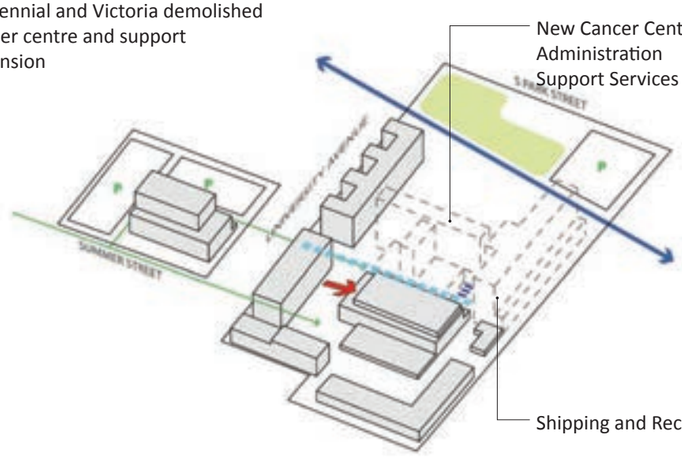
Victoria - Bethune Demolished, New Building

Existing Context



Phase 1 - 2022

- Centennial and Victoria demolished
- Cancer centre and support expansion

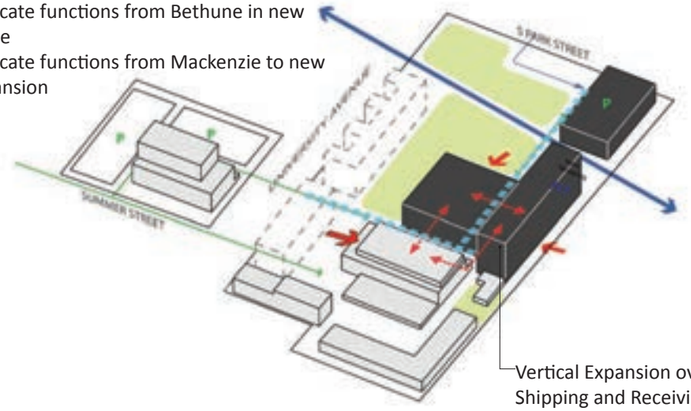


New Cancer Centre
Administration
Support Services

Shipping and Receiving

Phase 2 - 2030

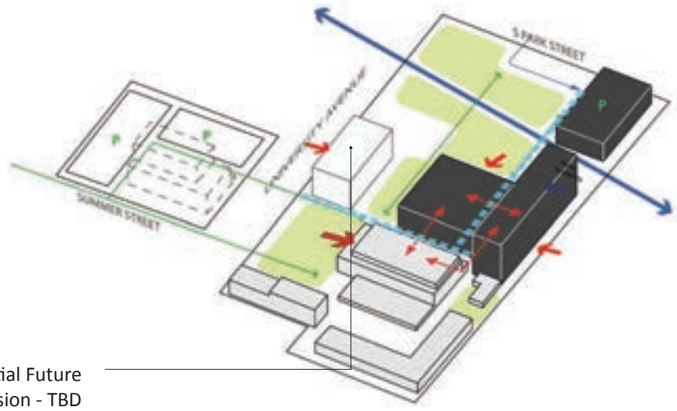
- Park structure constructed
- Expand over new shipping and receiving
- Relocate functions from Bethune in new space
- Relocate functions from Mackenzie to new expansion



Vertical Expansion over
Shipping and Receiving
Academic and Teaching
Administration

Phase 3 - 2037

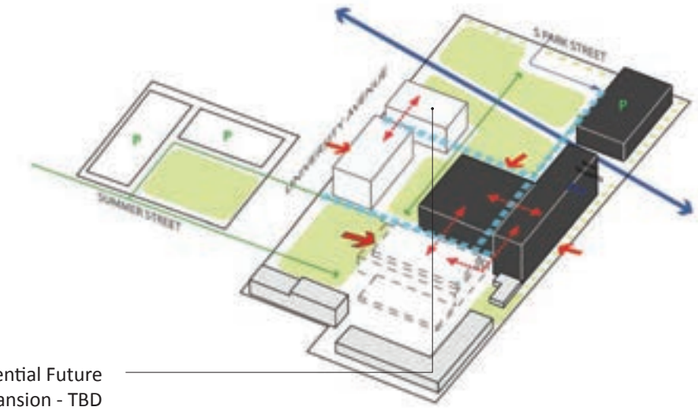
- Potential for new function in former Bethune site



Potential Future
Expansion - TBD

Phase 4 - 2045

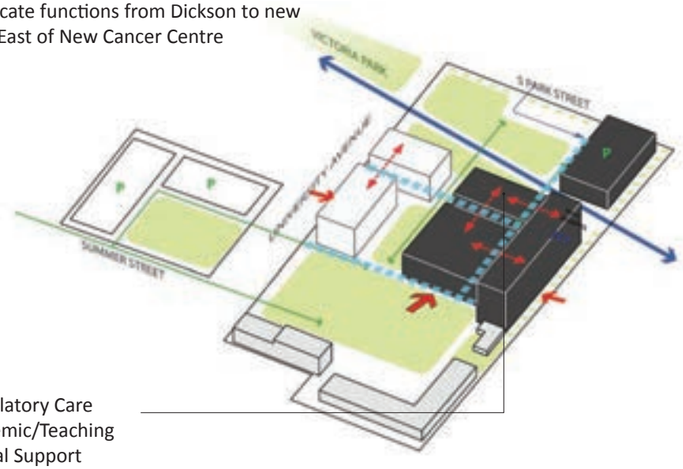
- Potential for new function in former Mackenzie site



Potential Future
Expansion - TBD

Phase 5 - 2055

- Relocate functions from Dickson to new site East of New Cancer Centre



Ambulatory Care
Academic/Teaching
Clinical Support
Diagnostic Imaging

Victoria General Site Exploration A

1. Dickson
2. Relocated Parking Structure from HI Site (TBD)
3. Cyclotron

Green Space
- Buffer Zone
- Green Space
- Roof Terraces / Healing Spaces

Vehicular Circulation/Entrances
- Vehicular Entrance
- Service / Parking Entrance
- Driveway
- Signalled Intersection
- Bus Stop

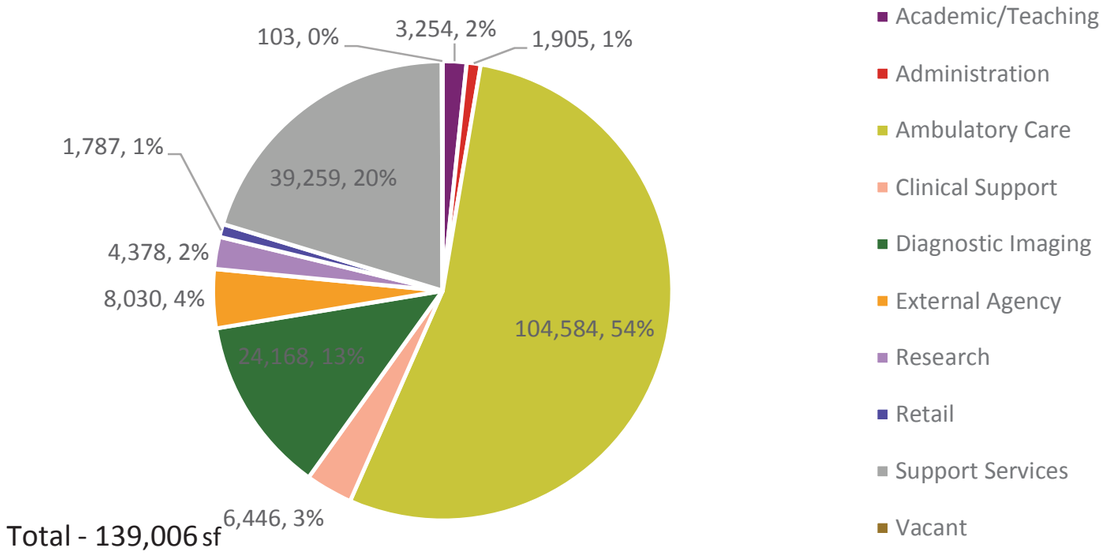
Pedestrian Circulation/Entrances
- Pedestrian Entrance
- Internal Circulation / Links

Views
- Views to Halifax Commons

N

5.1 Repurposing of the Dickson Building
5.1.3 Summary of Existing and Future Available Space

GDA - Subdepartments - Dickson Building - Existing



The pie chart above illustrates a breakdown of existing functions currently in Dickson. With cancer care and ambulatory functions moved to the HI site, a significant amount of space will be left vacant.

GDA - Dickson Building - Future

Proposed DGSF - Dickson Building

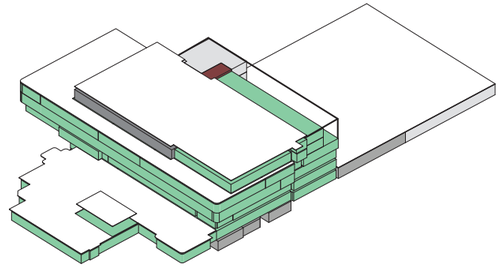
Category	Department	Area
Amenities	Amenities	901 SF
	Subtotal	901 SF
Building Support	M+E	5,949 SF
	Subtotal	5,949 SF
New Public	New Public	13,355 SF
	Subtotal	13,355 SF
Support Services	Bio Med Engineering	12,705 SF
Support Services	Food Services	5,068 SF
Support Services	Health information/ service registration	976 SF
Support Services	New Shipping and Receiving	5,231 SF
Support Services	Staff services (lockers etc)	2,730 SF
	Subtotal	26,710 SF
TBD	Vacant	175,111 SF
	Subtotal	175,111 SF
Total		222,026 SF
Diagnostic Imaging	Cyclotron	4,570 SF

UTILIZATION OF EXISTING SPACES TO BE CONFIGURED FOLLOWING ASSESSMENT OF EXISTING BUILDING CONDITION

CYCLOTRON TO REMAIN

VACANT SPACE FOR FUTURE UTILIZATION: 175,111 SF

FUNCTIONS TO REMAIN IN DICKSON: 46,915 SF



5.1 Repurposing of the Dickson Building

5.1.4 Plans Pre-Decanting Level 01

Decanted DGSF - Dickson Building - Level 01

Category	Department		Area
Ambulatory Care	Clinic		1589 SF
		Subtotal	1589 SF
Cancer Care	Cancer Care radiation treatment		5194 SF
		Subtotal	5194 SF
Clinical Support	Respiratory		2057 SF
		Subtotal	2057 SF
Support Services	Bio Med Engineering		976 SF
		Subtotal	976 SF
Grand total			9817 SF

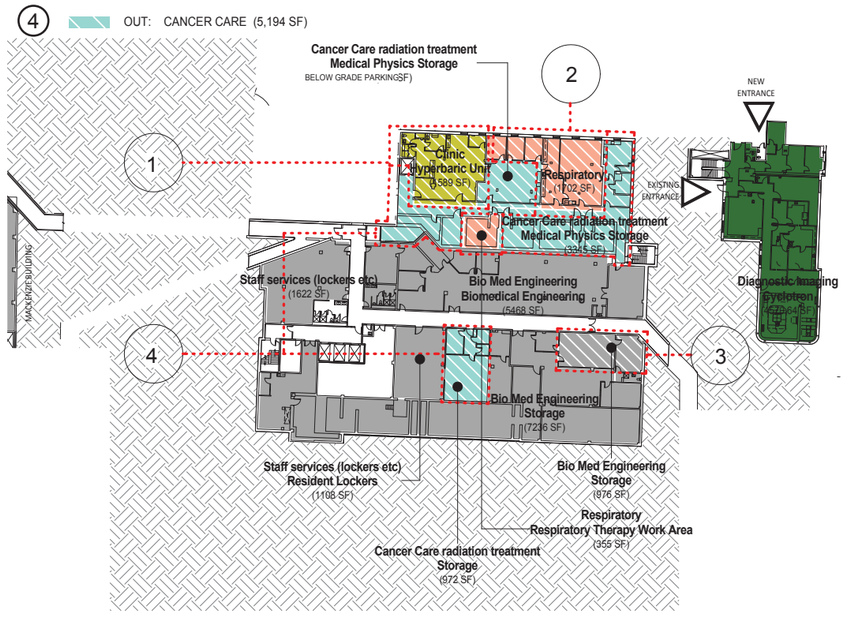
PROGRAMS TO BE DECANTED

1 OUT: HYPERBARIC UNIT (1,589 SF)
IN: T.B.D.

2 OUT: RESPIRATORY (1,665 SF)
IN: T.B.D.

3 OUT: BIO MED (900 SF)
NEW IN: HEALTH INFO

4 OUT: CANCER CARE (5,194 SF)



Pre-Decanting Level 02

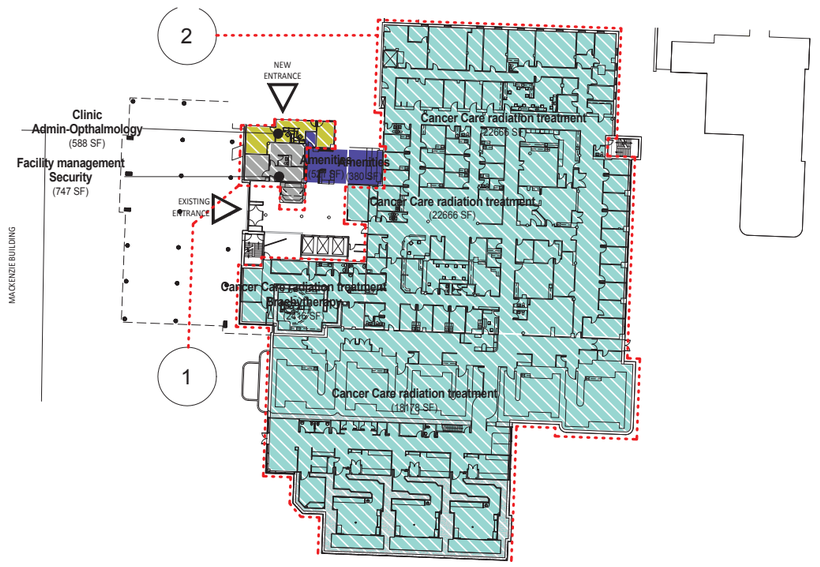
Decanted DGSF - Dickson Building - Level 02

Category	Department		Area
Ambulatory Care	Clinic		588 SF
		Subtotal	588 SF
Cancer Care	Cancer Care radiation treatment		43261 SF
		Subtotal	43261 SF
Support Services	Facility management		747 SF
		Subtotal	747 SF
Grand total			44596 SF

PROGRAMS TO BE DECANTED

1 OUT: PART OF OPHTALMOLOGY ADMIN AND AMENITY (APPX. 1,300 SF)
IN: T.B.D.

2 OUT: CANCER CARE (43,261 SF)
IN: T.B.D.



5.1 Repurposing of the Dickson Building

5.1.4 Plans: Pre-Decanting Level 03

Decanted DGSF - Dickson Building - Level 03			
Category	**Department**		**Area**
Ambulatory Care	Clinic		9199 SF
		Subtotal	9199 SF
Diagnostic Imaging	Diagnostic Imaging		20209 SF
		Subtotal	20209 SF
External Agency	External Agency		6228 SF
		Subtotal	6228 SF
Research	Research		650 SF
		Subtotal	650 SF
Grand total			36285 SF

PROGRAMS TO BE DECANTED

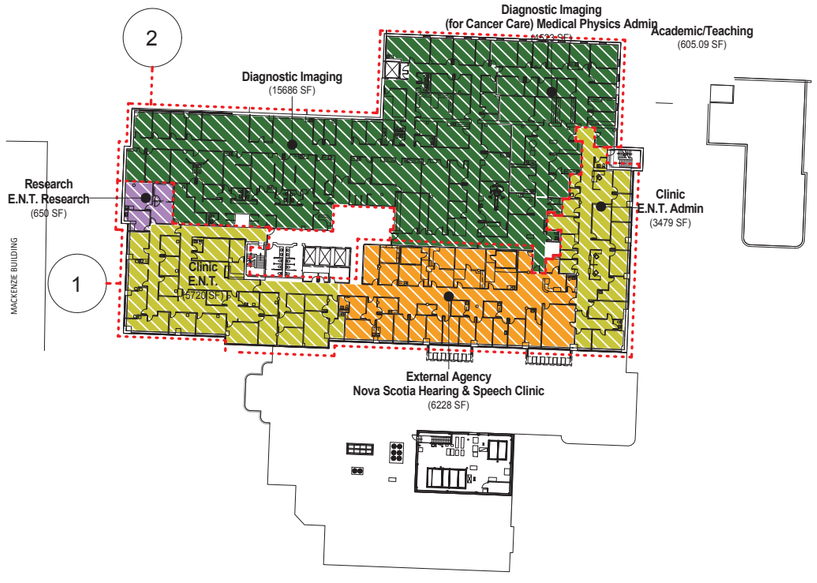
1 (9,200 SF) (600 SF) (6,200 SF) OUT: AMBULATORY CLNICS, EXTERNAL OFFICES, AND RESEARCH OFFICE (APPX. 16,100 SF)

NOTE: QEII TO CONFIRM THE PROPOSED FUTURE LOCATION OF NOVA SCOTIA HEARING & SPEECH CLINIC

IN: T.B.D.

2 OUT: DIAGNOSTIC IMAGINB (20,209 SF)

IN: T.B.D.



Pre-Decanting Level 04

Decanted DGSF - Dickson Building - Level 04			
Category	**Department**		**Area**
Ambulatory Care	Clinic		21545 SF
		Subtotal	21545 SF
Cancer Care	Cancer Care administration		2107 SF
		Subtotal	2107 SF
Clinical Support	Rehab		4781 SF
		Subtotal	4781 SF
Research	Research		3728 SF
		Subtotal	3728 SF
Grand total			32160 SF

PROGRAMS TO BE DECANTED

1 OUT: AMBULATORY CLINICS (21,500 SF)

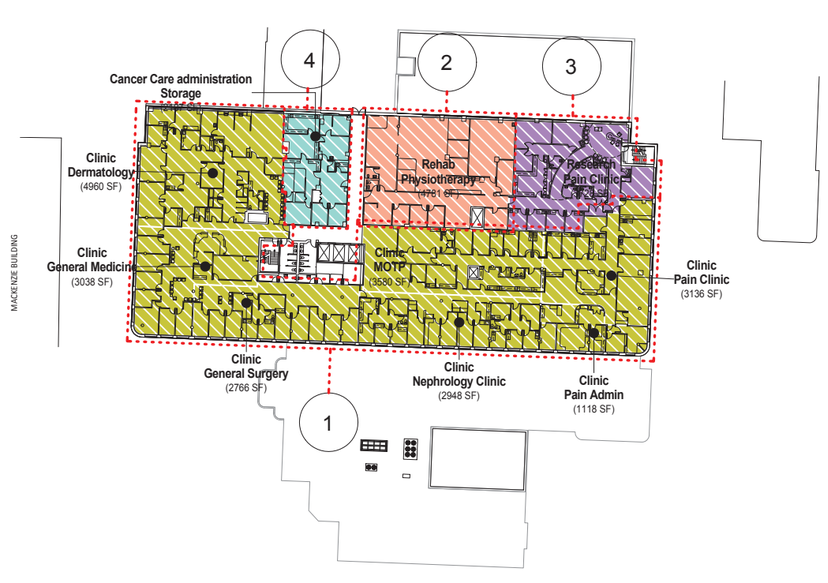
IN: T.B.D.

2 OUT: REHAB (4,800 SF)

IN: T.B.D.

3 OUT: RESEARCH (3,700 SF)

IN: T.B.D.



5.1 Repurposing of the Dickson Building

5.1.4 Plans: Pre-Decanting Level 05

Decanted DGSF - Dickson Building - Level 05

Category	Department	Area
Academic/Teaching	Academic/Teaching	3254 SF
	Subtotal	3254 SF
Administration	Corporate Administration	647 SF
	Subtotal	647 SF
Ambulatory Care	Clinic	6957 SF
	Subtotal	6957 SF
Cancer Care	Cancer Care systemic oncology	6339 SF
	Subtotal	6339 SF
External Agency	External Agency	1802 SF
		1802 SF
	Subtotal	
Support Services	Food Services	473 SF
Support Services	Health information/ service registration	7668 SF
		8140 SF
Grand total		27139 SF

PROGRAMS TO BE DECANTED

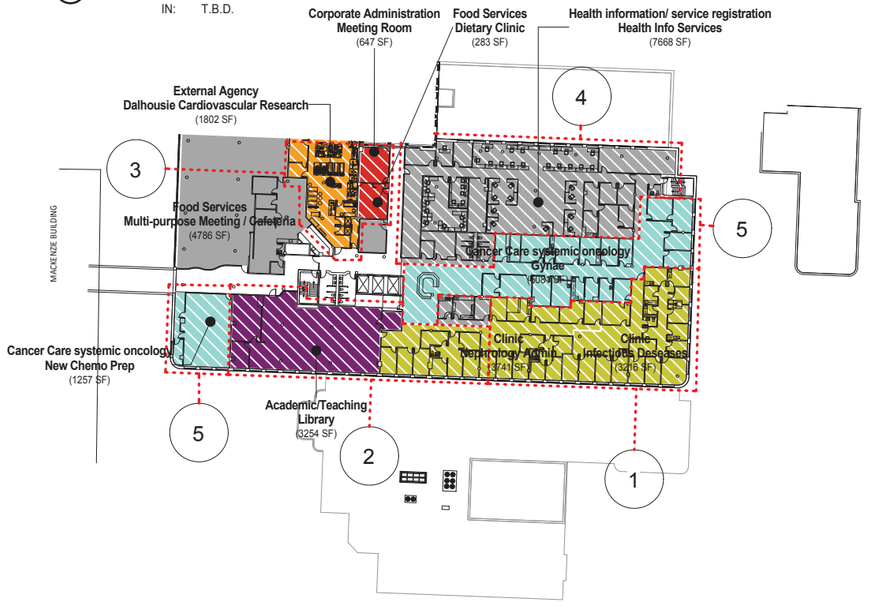
1 OUT: AMBULATORY CLINICS (5,300 SF)
IN: T.B.D.

2 OUT: RESEARCH, CLINICS, SUPPORT SERVICES (5,300 SF)
IN: T.B.D.

3 OUT: EXTERNAL, ADMIN (2,500 SF)
IN: T.B.D.

4 OUT: HEALTH INFO (7,700 SF)
IN: T.B.D.

5 OUT: CANCER CARE (6,339 SF)
IN: T.B.D.



Pre-Decanting Level 06

Decanted DGSF - Dickson Building - Level 06

Category	Department	Area
Ambulatory Care	Dialysis	15247 SF
	Subtotal	15247 SF
Support Services	Food Services	213 SF
	Subtotal	213 SF
Grand total		15461 SF

PROGRAMS TO BE DECANTED

1 OUT: AMBULATORY CLINICS AND OTHERS (15,200 SF
IN: T.B.D.

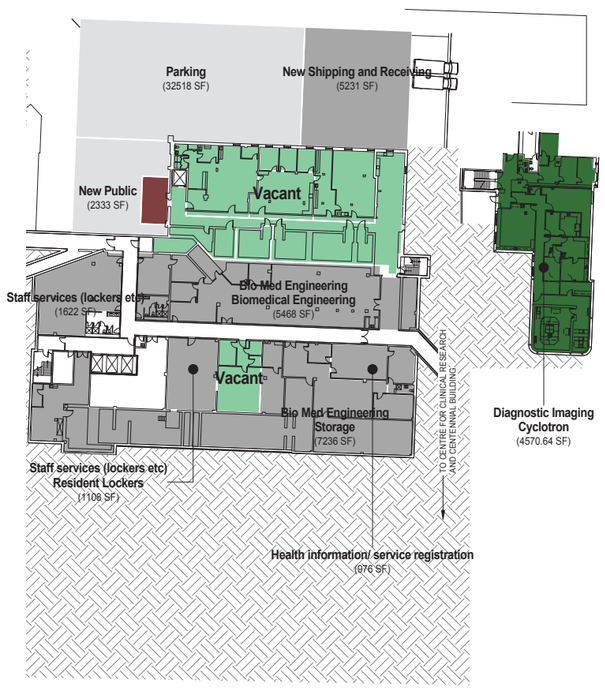
5.1 Repurposing of the Dickson Building

5.1.4 Plans: Level 01

Proposed DGSF - Dickson Building - Level 01

Category	Department		Area
New Public	New Public		2333 SF
		Subtotal	2333 SF
Support Services	Bio Med Engineering		12705 SF
Support Services	Health information/ service registration		976 SF
Support Services	New Shipping and Receiving		5231 SF
Support Services	Staff services (lockers etc)		2730 SF
		Subtotal	21642 SF
TBD	Vacant		8841 SF
		Subtotal	8841 SF
Grand total			32815 SF
Diagnostic Imaging	Cyclotron		4,570 SF

VACANT - FUTURE UTILIZATION TBD
(CANCER RELOCATED)
NET AREA - 8,841 SF

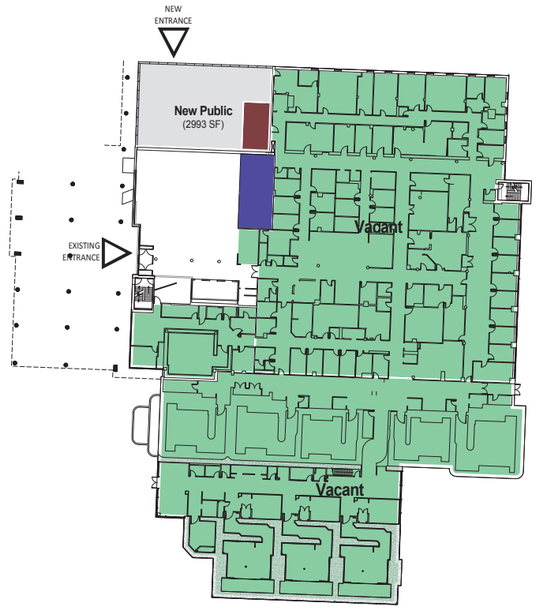


Level 02

Proposed DGSF - Dickson Building - Level 02

Category	Department		Area
Amenities	Amenities		901 SF
		Subtotal	901 SF
New Public	New Public		2993 SF
		Subtotal	2993 SF
TBD	Vacant		43261 SF
		Subtotal	43261 SF
Grand total			47154 SF

VACANT - FUTURE UTILIZATION TBD
(CANCER RELOCATED)
NET AREA - 43,261 SF



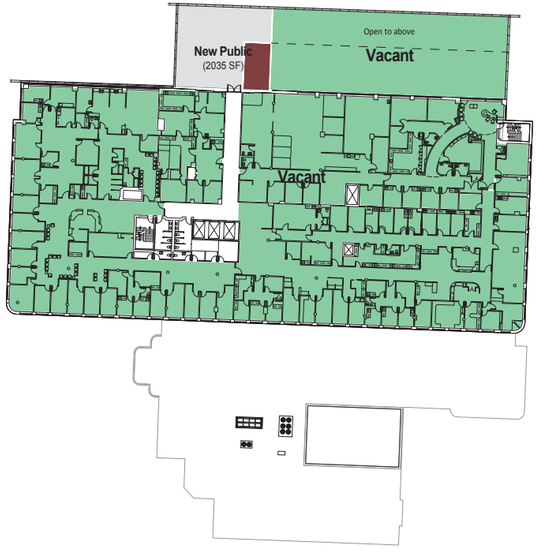
5.1 Repurposing of the Dickson Building

5.1.4 Plans: Level 03

Proposed DGSF - Dickson Building - Level 04

Category	Department		Area
New Public	New Public		2035 SF
		Subtotal	2035 SF
TBD	Vacant		38158 SF
		Subtotal	38158 SF
Grand total			40193 SF

VACANT - FUTURE UTILIZATION TBD
CANCER AND CAFE RELOCATED
NET AREA - 38,159 SF

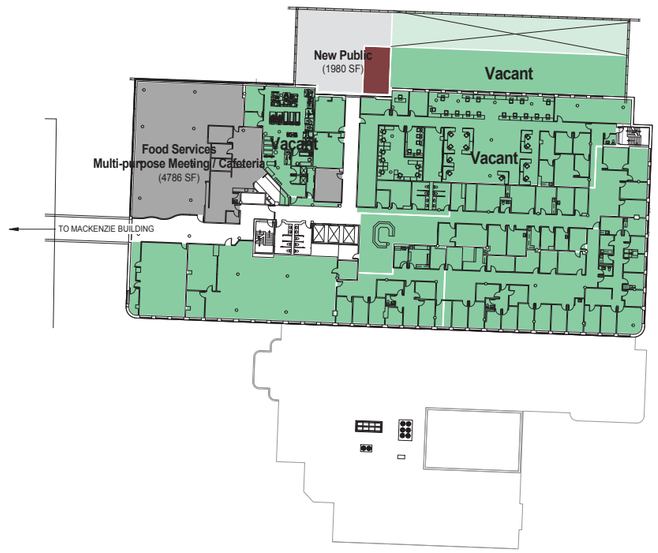


Level 04

Proposed DGSF - Dickson Building - Level 05

Category	Department		Area
New Public	New Public		1980 SF
		Subtotal	1980 SF
Support Services	Food Services		5068 SF
		Subtotal	5068 SF
TBD	Vacant		30137 SF
		Subtotal	30137 SF
Grand total			37186 SF

VACANT - FUTURE UTILIZATION TBD
(CANCER RELOCATED)
NET AREA - 30,137 SF



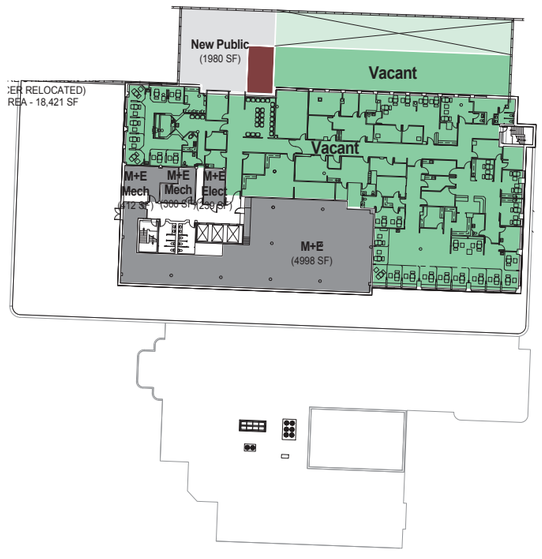
5.1 Repurposing of the Dickson Building

5.1.4 Plans: Level 05

Proposed DGSF - Dickson Building - Level 06

Category	Department		Area
Building Support	M+E		5,949 SF
		Subtotal	5,949 SF
New Public	New Public		1,980 SF
		Subtotal	1,980 SF
TBD	Vacant		18,421 SF
		Subtotal	18,421 SF
Grand total			26,350 SF

VACANT - FUTURE UTILIZATION TBD
(CANCER RELOCATED)
NET AREA - 18,421 SF

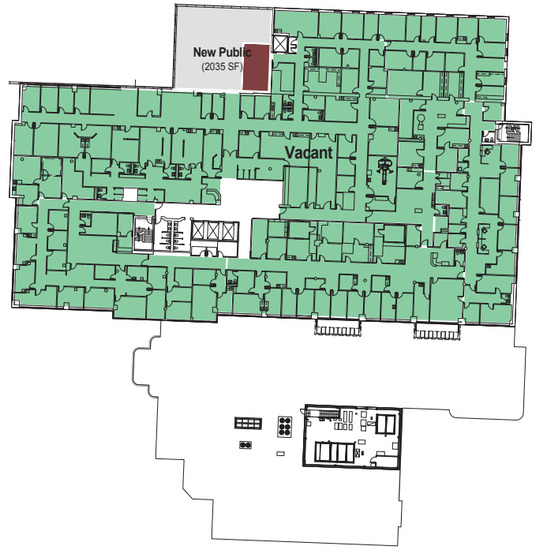


Level 06

Proposed DGSF - Dickson Building - Level 03

Category	Department		Area
New Public	New Public		2035 SF
		Subtotal	2035 SF
TBD	Vacant		36293 SF
		Subtotal	36293 SF
Grand total			38328 SF

VACANT - FUTURE UTILIZATION TBD
(CANCER RELOCATED
NET AREA - 36.294 SF



6

Conclusions & Next Steps

6.1 Conclusions

Conclusions

In consultation with the stakeholders, a series of workshops were held to develop the two feasibility concepts for Cancer Care. With the inclusion of Cancer Care on the HI site, the original concepts- The Willow Tree and The Commons as presented in Vol 2 of the QEII Redevelopment Project Master Planning Report- have evolved into The Garden Pavilion and The Beacon. While significant changes have been made to the proposed redevelopment of the HI site, the two concepts presented still meet the master planning key drivers and principles and evaluation criteria developed by the team.

This feasibility study, developed with input from the consultant team, demonstrates that it is feasible to relocate Cancer Care on the HI site, reduces risk of transferring patients between sites, resulting in improved patient care and outcomes for cancer patients.

6.1 Next Steps
Section Sub-Heading

Next Steps

If this feasibility study is approved, the next step will be the full development of the master plan including Cancer Care on the HI site. DTIR has requested, under a separate Contemplated Change Order, the completion the functional programs for all support services at the HI and VG site, and the completion of the functional program for the Community Outpatient Centre at Bayers Lake.

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