

Eastern Health Health Science Centre Berm Environmental Preview Report

173056.01 • Environmental Preview Report • March 2018


Prepared for:



Prepared by:



CBCL LIMITED
Consulting Engineers

Final	G. Sheppard	March 13, 2018	M. Rutherford
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CBCL LIMITED

Consulting Engineers

March 13, 2018

Dept. of Municipal Affairs and Environment
PO Box 8700
St. John's, NL
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Attention: Ms. Susan Squires, Ph.D.
Director of Environmental Assessment

*RE: Eastern Health – Health Science Center (HSC) Berm
Environmental Preview Report (EPR) Document
CBCL Project # 173056.01*

Dear Ms. Squires:

Enclosed is our application and associated materials required for your review of the Environmental Preview Report (EPR) for the above noted project. Ten printed copies and an electronic version have also been included for the submission. If you have any questions or require clarification, please contact me.

Yours very truly,

CBCL Limited

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Project No: 173056.01



Table of Contents

CHAPTER 1	Name of Undertaking.....	1
CHAPTER 2	Proponent.....	2
2.1	Name of Corporate Body	2
2.2	Address	2
2.3	Proponent	2
2.3.1	Project Manager - Planning & Engineering Infrastructure Support.....	2
2.4	Principal Contact for Purpose of Environmental Assessment	2
2.4.1	CBCL Limited Project Manager.....	2
2.4.2	CBCL Limited Environmental Lead	2
CHAPTER 3	The Undertaking	3
3.1	Name of the Undertaking	3
3.2	Purpose/Rationale/Need for the Undertaking	3
CHAPTER 4	Description of the Undertaking.....	4
4.1	Geographic Location / Physical Components / Existing Environmental.....	4
4.1.1	Geographic Location	4
4.1.2	Physical Components of the Undertaking	8
4.1.3	Existing Environment	9
4.2	Construction.....	17
4.3	Operations and Maintenance	19
4.4	Occupations	19
CHAPTER 5	Alternatives	21
5.1	Berms or Levees.....	23
5.1.1	Berm North side of Leary’s Brook (Selected Option).....	23
5.1.2	Berm South side of Leary’s Brook	23
5.2	Flood Control Reservoirs.....	24
5.3	Channel modification	25
5.4	Diversion	25
CHAPTER 6	Potential Environmental Effects and Mitigation.....	26
6.1	Potential Environmental Effect.....	28
6.1.1	Surface Water and Surface Water Management.....	28

6.1.2	Land Use	37
6.1.3	Groundwater	37
6.1.4	Geology and Soils	38
6.1.5	Vegetation	38
6.1.6	Wetlands	38
6.1.7	Fish and Fish Habitat:	39
6.1.8	Wildlife	39
6.1.9	Air Emissions and Quality.....	41
6.1.10	Health and Safety	41
6.1.11	Land Users	41
6.2	Mitigation Measures.....	42
6.2.1	General	42
6.2.2	Surface Water and Surface Water Management.....	44
6.2.3	Groundwater, Geology and Soils	45
6.2.4	Vegetation	45
6.2.5	Wetlands	45
6.2.6	Fish and Fish Habitat	46
6.2.7	Wildlife	46
6.2.8	Air Emissions and Quality.....	47
6.2.9	Land Users	47
CHAPTER 7	Decommissioning and Rehabilitation	48
CHAPTER 8	Project Related Documents.....	49
CHAPTER 9	Public Information Meeting	51
9.1	Public Meeting Announcements.....	51
9.1.1	Public Advertisements per the Environmental Preview Report	52
9.1.2	Additional Notification Efforts	52
9.2	Summary of Public Information Meeting	52
9.2.1	Public Comments, Questions, and Concerns	53
CHAPTER 10	Approval of Undertaking	56

Tables

Table 4.1 - Species of Conservation Concern	15
Table 4.2 - Anticipated Positions / Occupations Required	20
Table 6.1 - Potential Interactions between Project and Environmental Components	27
Table 6.2 - Summary of the Hydrologic and Hydraulic computer 1:20 AEP CC and the 1:100 AEP CC, and 1:100 AEP CC + 30%.....	29
Table 9.1 - Dates of Announcements and Notice Postings for the Eastern Health Berm Public Information Session	51
Table 9.2 - Summary of Questions and Concerns from Public Information Meeting and Location addressed in the EPR.....	53
Table 10.1 - List of Permits, approvals and authorization for the Undertaking	56

Figures

Figure 4.1 - Site Location.....	5
Figure 4.2 - Project Location	6
Figure 4.3 - Proposed Berm Layout	7
Figure 4.4 - 1:20 AEP Climate Change Boundaries	12
Figure 4.5 - 1:100 AEP Climate Change Boundaries	13
Figure 5.1 - Locations of Alternatives	22
Figure 6.1 - 1:20 AEP Climate Change Boundaries Existing Conditions and Post Berm Construction.....	30
Figure 6.2 - 1:100 AEP Climate Change Boundaries Existing Conditions and Post Berm Construction.....	32
Figure 6.3 - 1:100 AEP plus 30% Climate Change Boundaries Existing Conditions and Post Berm Construction	34
Figure 6.4 – Proposed Wetland Alterations.....	40

Appendices

APPENDIX A – Construction Drawings	
APPENDIX B – Plant Inventory	
APPENDIX C – Site Photos	
APPENDIX D – Flood Mapping Memo	
APPENDIX E – Birds Detected on Newfoundland and Labrador	
APPENDIX F – Erosion & Sediment Control Health Sciences Centre Berm	
APPENDIX G – Eastern Health Open House / Public Meeting	
APPENDIX H – Pippy Park Commission Approval	
APPENDIX I – Fisheries and Oceans Canada (DFO) Response	

Submission Checklist. Please see the report sections indicated in the table below to locate the required information for the Environmental Preview Report, as outlined in the Newfoundland and Labrador Department of Municipal Affairs and Environment (MAE) Guidelines for Environmental Preview Report for the Health Science Centre Berm (2017).

Required Information from EPR Guidelines		
Item	Description	Section
1	Name of Undertaking	1.0
2	Proponent	2.0
3	The Undertaking	3.0, Appendix A
4	Description of the Undertaking	4.0
4.1	Geographical Location / Physical Components / Existing Environmental	4.1, Appendix B, C, D, E
4.2	Construction	4.2
4.3	Operation and Maintenance	4.3
5	Alternatives	5.0
6	Potential Environmental Effects and Mitigation	6.0
6.1	Mapping and Evaluation	4.1, 6.1.1 and 6.2, Appendix D
6.2	Other Legitimate Land Users	6.1.11 and 6.2
6.3	Justification of the Berm Design and Construction	6.1.2 and 6.2
6.4	Protection of Riparian, Aquatic and Avian Species	6.1.4, 6.1.5, 6.1.6 , 6.1.7, and 6.2
7	Decommissioning and Rehabilitation	7.0
8	Project Related Documents	8.0
9	Public Meeting	9.0, Appendix F
10	Approval of Undertaking	10.0, Appendix G, H

CHAPTER 1 **NAME OF UNDERTAKING**

Eastern Health – Health Science Center (HSC) Berm

PROPONENT

2.1 Name of Corporate Body

Eastern Health

2.2 Address

300 Prince Philip Drive
St. John's, NL
A1B 3V6

2.3 Proponent

2.3.1 *Project Manager - Planning & Engineering Infrastructure Support*

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3.1 Name of the Undertaking

Eastern Health – HSC Berm

3.2 Purpose/Rationale/Need for the Undertaking

The proposed project includes the construction of a flood protection berm to protect the Health Science Centre (HSC) Hospital in St. John's, Newfoundland and Labrador (NL) from future risk of flooding from the adjacent Leary's Brook and tributaries. The flood protection berm would protect HSC from damage, which is essential to health services to the province. The flood protection berm would be constructed along the maintained edge of the Eastern Health property on the north side of Leary's Brook.

A berm currently exists on-site and was constructed with the initial construction of the HSC. This berm will be left in place and incorporated as part of the new berm. The proposed berm would serve as protection from flooding problems associated with a 1:100 Annual Exceedance Probability (AEP) storm event. Construction of a new berm along the north side of Leary's Brook would protect against inundation caused by water levels and wave action, to adjacent HSC buildings (AMEC 2014, CBCL 2014, 2016).

This proposed project is part of a series of potential flood protection solutions identified within the Rennie River Watershed. Other measures include a weir at the end of Long Pond near Allandale Road and two berms upstream of the HSC between Wicklow Street and Thorburn Road (CBCL 2014). Eastern Health is not able to complete all the flood management solutions, as many are not located within Eastern Health property or jurisdiction. These structures and others associated with the RRCSWMP are outside of the scope of this project. Other alternatives of preventing flooding were assessed; additional details of these alternatives are located in Chapter 5.

DESCRIPTION OF THE UNDERTAKING

4.1 Geographic Location / Physical Components / Existing Environmental

4.1.1 Geographic Location

The proposed location of the flood protection berm is on the property at 300 Prince Philip Drive, St. John's., NL, located along the undeveloped portion on the south side of the property adjacent to Leary's Brook, between Leary's Brook and HSC (Figure 4.1 and Figure 4.2). The HSC is accessed by Clinch Crescent, a collector road that loops around the HSC property from two intersection points with Prince Philip Drive. The Project site will be accessed via an access road on the south side of HSC and Warner's Road.

The proposed Project would be located on Eastern Health property and land controlled by the C.A. Pippy Park Commission. A berm already exists on the property, in the location of the proposed berm, and is situated along the widening (pond) of Leary's brook south of the main hospital building (Figure 4.3)

The new berm will require an estimated area of 1.05 hectares (10521.8 m²) with a total construction disturbance area of 1.21 hectares (12,140.6 m²). During construction of the proposed berm, approximately 1426.4 m² of delineated wetland will be altered. The berm is approximately 480 m long, ranging from the southwest end of the Angus Cowan Hostel and Clinch Cres East (Figure 4.3). Within the berm footprint, an approximately 120 m long x 5 m wide portion will be located along the Leary's Brook Pond bank, and will be constructed with a retaining wall preserving the existing waterline. The remainder of the berm will be constructed approximately 5-10 m from the normal waterline. The proposed boundaries for the berm as identified in Figure 4.3 are (NAD83, MTM 1):

A - 324095.2822 (E), 5270113.9444 (N)

B - 324100.7147 (E), 5270119.6084 (N)

C - 324424.7134 (E), 5270350.5144 (N)

D - 324434.5347 (E), 5270361.1767 (N)

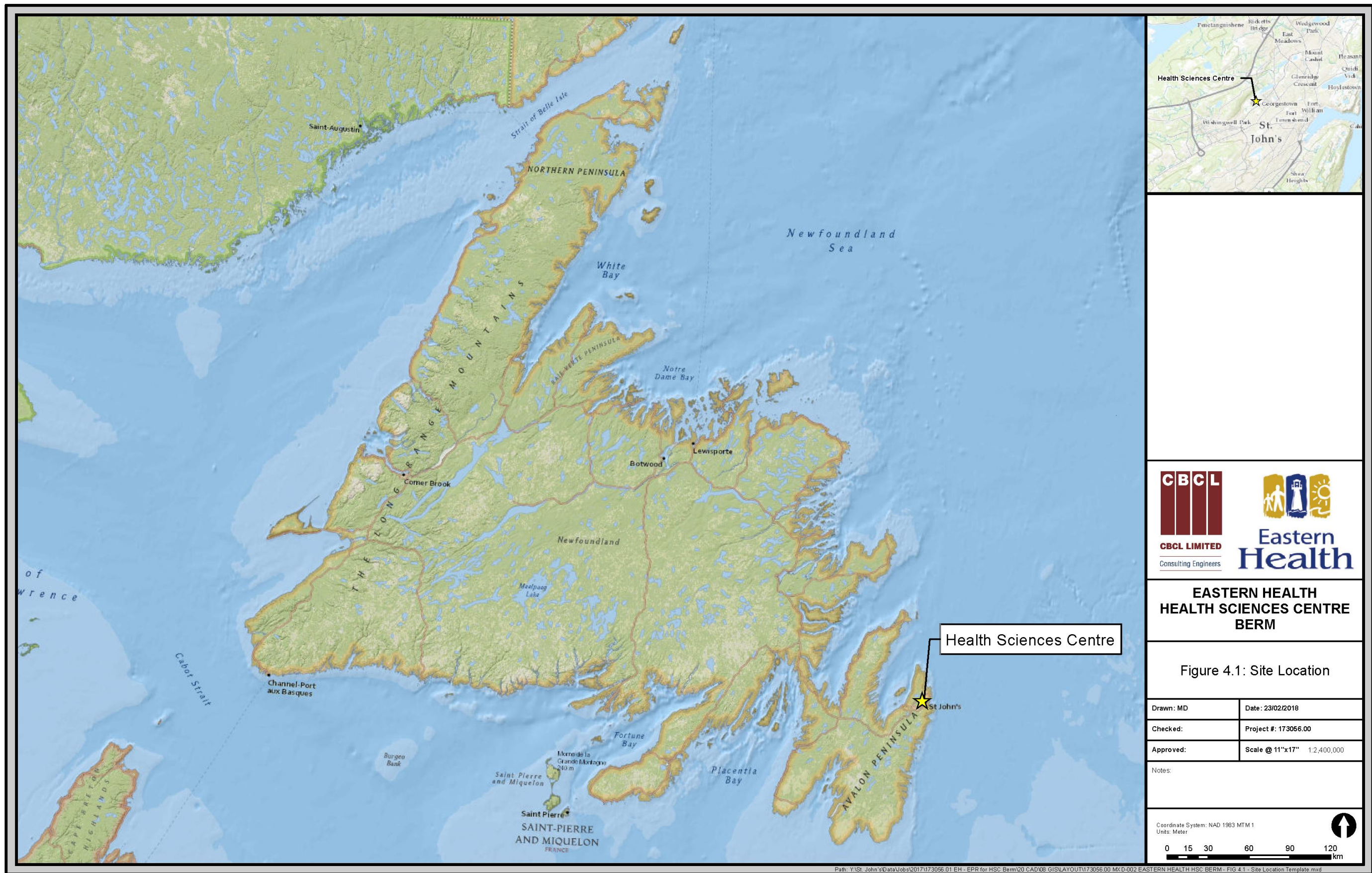


Figure 4.1 - Site Location

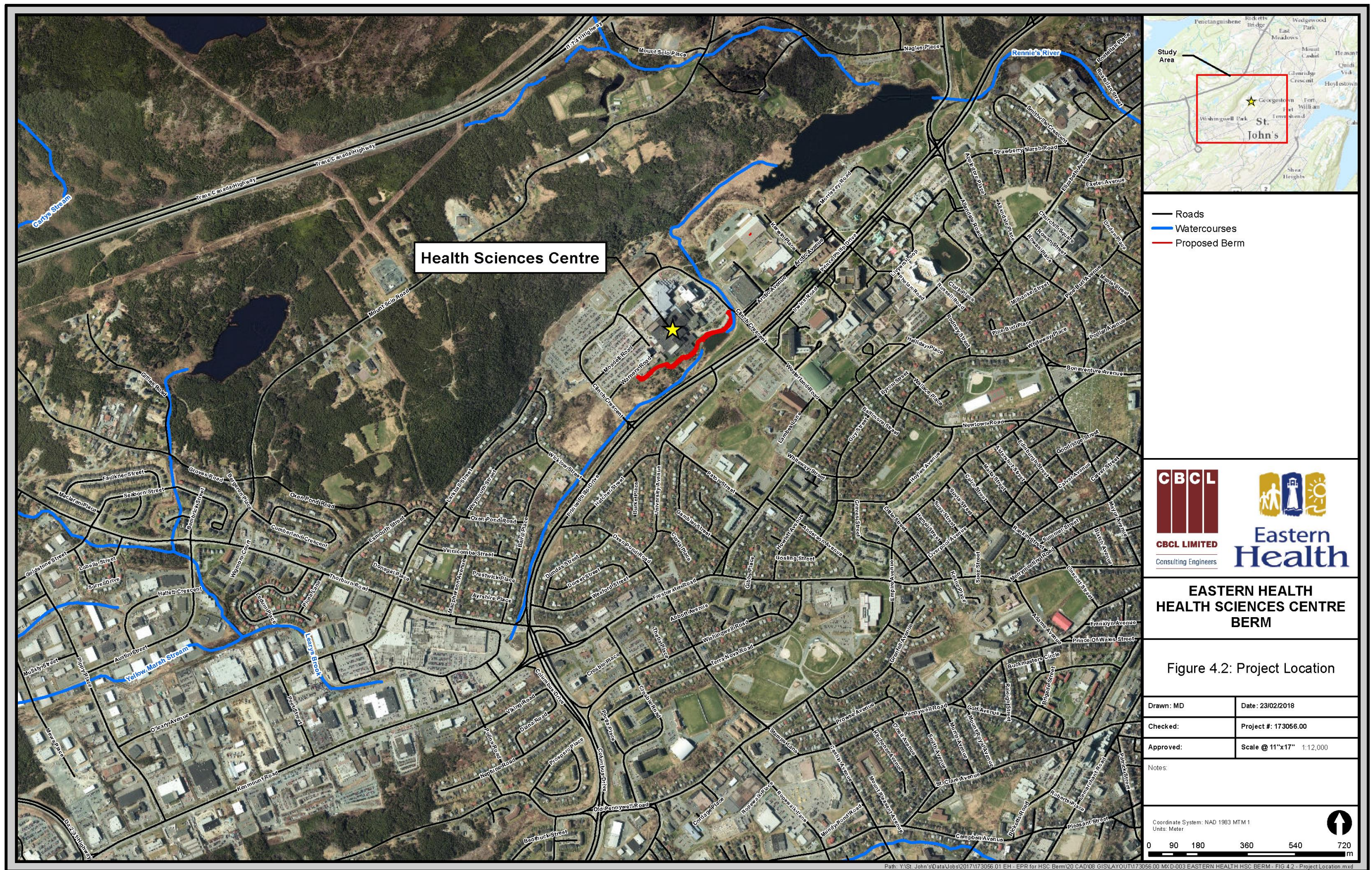


Figure 4.2 - Project Location

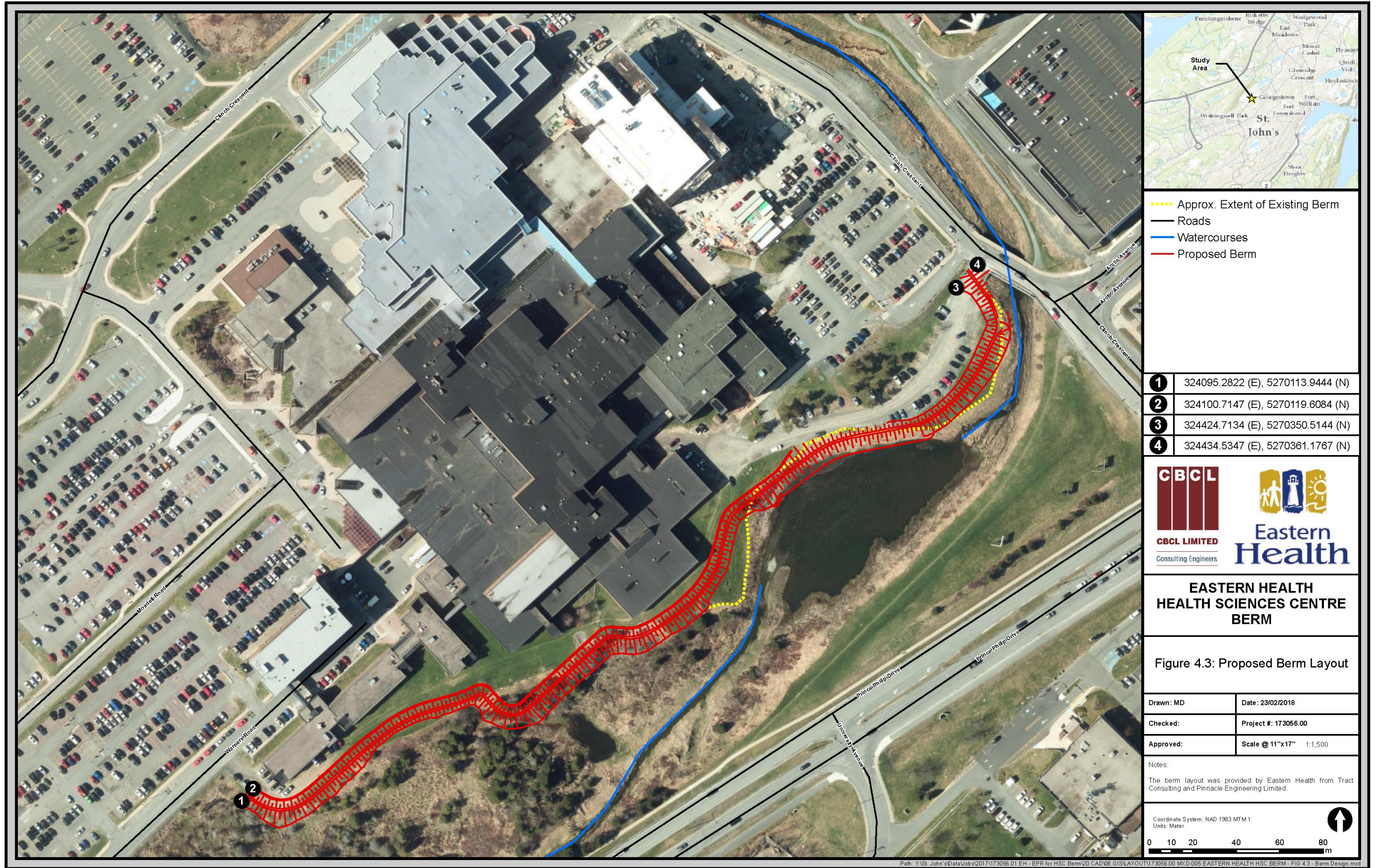


Figure 4.3 - Proposed Berm Layout

The proposed site is located within the Pippy Park land use zone as pre the *Pippy Park Commission Act*. An approval is required from the C.A. Pippy Park Commission prior to development.

4.1.2 Physical Components of the Undertaking

4.1.2.1 DESCRIPTION OF THE PROJECT

The flood protection berm will be located between HSC and Leary's Brook. The berm will be approximately 480 m long and will extend from the southwest end of the Agnes Cowan Hostel to the Clinch Crescent East Bridge (Figure 4.3). The berm will be constructed with 2.5:1 side slopes to an elevation of 58.50 m. The berm will vary between 4 to 10 m in elevation above the existing grade. Some segments will be constructed with a retaining wall rather than an engineered slope, in order to reduce impact to the waterbodies (Appendix A).

Site preparation along the proposed berm area will include clearing of vegetation and grubbing of all organic materials to prepare a base for construction. The berm that currently exists on-site will be left in place and incorporated as part of the new berm.

Depending on the timing of construction, approximately 600 m² will require temporary dewatering. In the 225.5 m² section of wetland to be infilled below grade, adjacent to watercourse and other wet areas, the berm will be constructed with 200 mm clean rockfill (free of fines; Appendix A). The remainder of the berm will be built over dry land and will be constructed of a typical sand and gravel mixture containing 10-15% fines content and a maximum particle size of 200 mm in diameter. Berm slopes along the waterside edge or facing the water will be stabilized using hydraulic riprap, including at the foot of the retaining walls. The retaining wall will be placed on undisturbed native soils or competent fill base. Hydraulic riprap and amour stone will be installed to protect the toe of retaining walls.

The remainder of the berm will be stabilized with top soil and covered with a mix of hydroseed and/or sod for stabilization and erosion and sediment control. Predominantly native shrubs and trees will be planted to provide some further stability, and to blend the berm into the surrounding landscape. The minimum finished slope of the landscaped areas will be 2.00%.

The berm will be designed to assist local drainage by the installation of a stormwater management system. The stormwater management system includes a rock infiltration swale, and stormwater drainage piping including backwater valves / sub drains. A rock infiltration swale will be placed at the toe of the slope on the side of the berm facing HSC. The infiltration swales will channel water to stormwater drainage piping and backwater valves during storm events, directing stormwater back into the Leary's Brook. The rock infiltration swale will not be included in the area adjacent to the parking lot at Clinch Cres East. In this area, stormwater will be collected and redirected to the parking lot catch basin. As part of the stormwater drainage piping, seven backwater valves and two sub drains will be installed. The backwater valves will be installed within the berm to facilitate the flow of

water from the north side of the berm towards Leary's Brook during storm events. As the water rises above the stormwater drainage piping on the Leary's Brook Side, the backwater valves close and prevent water from flowing from the Leary's Brook side to the HSC side. Flow from the north side of the berm will resume when the Leary's Brook recedes below the stormwater drainage piping. The backwater valve outfalls will be stabilised with rock fill mattress. Three existing stormwater outfalls will be replaced; four new backwater valve outfalls will be installed. Two sub-drains will be designed into the berm located along the constructed retaining walls. The sub-drains will be connected into the stormwater drainage piping and discharged out the stormwater drainage piping into Leary's Brook.

Surface water management practices will be employed to prevent erosion of the berm and release of material that may harm fish habitat; these practices will include an engineered slope design, landscaping and rock stabilization techniques. An Environmental Protection Plan (EPP) including Erosion & Sediment Control will be implemented during construction (Section 6.2).

4.1.2.2 SCHEDULE

The project design is already complete. Upon receipt of all required approvals and authorizations, the estimated start date for construction is April 2018, to facilitate clearing of vegetation prior to the breeding bird nesting season (mid-April to mid-August, ECCC 2017). The construction is expected to occur over a four-month period including mobilization to demobilization. The earliest that in-water work construction could commence is estimated to be the week of June 1, 2018, with the latest to be is June 30, 2018. All in-water works will be completed within periods of low flow, or in isolation from flows, to further reduce the risk to fish and fish habitat. The identified timing window for in-stream work in Newfoundland and Labrador is from June 1 to September 30.

4.1.3 Existing Environment

Setting & Major Vegetation: The project is located in Pippy Park Land Use area. The site is located in the Southeastern Barrens Subregion of the Maritime Barrens Ecoregion. The Ecoregion is characterized by stunted and almost pure stands of balsam fir (*Abies balsamea*), that are divided by extensive open heathland. As result of development in the area, including historical practices and development of City of St. John's, much of the original ecoregion vegetation has been altered. Other factors influencing vegetation include wind, lack of protective snow cover and soil frost disturbance. (Government of Newfoundland and Labrador, 2017).

The Project site itself is relatively flat, and falling slightly in elevation from west to east. The project area varies from approximately 60 to 100 m in width and over 500 m in length. The area is characterized primarily by urban development, including roads, buildings and lawns; remnant natural areas consist primarily of wetlands, and the open water of Leary's Brook.

Site Vegetation: A total of 82 species of vascular plants were noted at the HSC property (both in wetland and upland), of which 38 (46.3%) are exotic species (Appendix B and

Appendix C). The wetland area exhibits many hallmarks of anthropogenic disturbance. A rather large proportion of the project area and adjacent wetland is colonized by exotic species, a number of which are strongly dominant in some locations; reed canary grass (*Phalaris arundinacea*) and reed meadowgrass (*Glyceria maxima*) are two such species. Reed canary grass is ubiquitous throughout the wetland; reed meadowgrass appears to be contained largely to the shores of the ponded area at the northern portion of the Project site. A number of other exotic species are scattered throughout the body of the wetland, including climbing nightshade (*Solanum dulcamara*), purple loosestrife (*Lythrum salicaria*), policemen's helmet (*Impatiens glandulifera*), and marsh hedge-nettle (*Stachys palustris*). The wetland-upland edge yields abruptly to the developed surrounding of the HSC facilities to the north, and Prince Philip Dr to the south. A vegetated upland buffer is largely absent from wetland, and where present, is composed primarily of groomed lawn areas. An abundance of exotic forb species occupy the upland areas immediately adjacent to wetland, and include species such as Japanese knotweed (*Polygonum cuspidatum*), butter and eggs (*Linaria vulgaris*), black starthistle (*Centaurea nigra*), St. John's wort (*Hypericum perforatum*), sheep sorrel (*Rumex acetosella*), sticky groundsel (*Senecio viscosus*), dandelion (*Taraxacum officinale*), coltsfoot (*Tussilago farfara*), various clovers (*Trifolium* spp.), among many other species.

Forestry: The Project is located in District 1 of the Eastern Region of Newfoundland. There are no known timber harvest rights on the property.

Soils: Soils within the project area are loose fill at the surface with scattered organic debris overlies. The thickness of the fill varies from 1.2 to 3.3 meters thick. Below the fill, there is a compacted layer of till ranging from well-graded sand with gravel to a silty sand with gravel, with occasional cobbles and boulders (Stantec 2016).

Climate: The Maritime Barrens Ecoregion has the coldest summers often with frequent fog and strong winds. The winters are mild, with snow cover particularly on the coastline (Government of Newfoundland and Labrador 2017). The coldest day on average is recorded in February (daily average -4.6 °C), with peak summer temperature observed in August (16.1 °C, Environmental Canada 2017). Average annual precipitation is 1534.2 mm, with most precipitation falling as rain. The highest precipitation is recorded in December with an average of 164.8 mm. Average monthly rain was recorded to be in excess of 120 mm monthly from September to December, with the highest monthly average of rain in October with 153.7 (Environment Canada 2017). Within Newfoundland, peak hurricane months can range from June to December (Government of Newfoundland and Labrador 2018).

Hydrology: Leary's Brook is a tributary of Rennie's River system that flows west to east, south of the HSC property (Appendix D). This watercourse drains a watershed of approximately 20 km². Land uses within this watershed system ranges from undeveloped areas, around the headwaters of the river, to high-density urban development towards the downstream section, where the HSC is located. Leary's Brook drains into a series of straight channels, bridges and culverts. The stream channel has an average width of 1 m along the

northwest section, expanding into Long Pond, a 4,000 m² waterbody downstream and northeast of HSC. A large wetland is present where Leary's Brook enters Long Pond, north of the HSC site. The area surrounding the project area is susceptible to localized flooding during 1:20 and 1:100 AEP events (Figure 4.4 and Figure 4.5).

On-Site Wetlands: The wetland area bordering the Project is primarily classified as a riparian fen¹/marsh complex. The boundaries of the wetland were delineated, and depicted on Figure 4.6. The present wetland characterization is limited to those areas bounded as follows, though, the physical extent of wetlands continues well beyond these areas, both upstream and downstream:

- On the north by the HSC and associated parking lots;
- On the south by Prince Philip Drive; and
- On the east and west by Clinch Crescent.

In the general sense, fens are peatlands that have a fluctuating water table that is either at or slightly below the wetland surface (Rydin & Jeglum 2006) and are rich in dissolved minerals derived from the influence of surrounding mineral soils (National Wetland Working Group 1997). In Newfoundland, fens are highly variable in their size, ranging from small forest openings to large expanses on exposed uplands (Wells & Pollet 1983). More specifically, riparian fens develop adjacent to waterbodies such as lakes, ponds and streams, and may be subject to occasional inundation by floodwaters (National Wetland Working Group, 1997). In most cases, peat forms the interface between the wetland and its associated waterbody. The two components of riparian fens are shore fens (associated with lakes or ponds) and stream fens (associated with rivers or streams). In each of these, the water table within the wetland is directly affected by the water level of its associated waterbody, whether normal or flooded. Peat deposits occasionally will contain inorganic material deposited during flooding (National Wetland Working Group, 1997). A defined vegetation gradient is typical in these wetlands, with graminoids and mosses proximal to the waters' edge, grading to shrubs and trees with increasing lateral and vertical distance from water.

¹ 'Fen' is a vernacular term, which has been used for a very long time, but has only in the last century been rigorously defined scientifically (Rydin & Jeglum 2006). In Newfoundland, as in many other parts of the world, there is a tendency for peatlands (i.e., bogs and fens) to be collectively referred to as 'bog'. Within the present discussion on wetlands, the definition of the term 'fen' is based upon the scientific definition of this wetland class as elaborated herein, rather than the local tendency to refer to such wetlands as 'bog'.

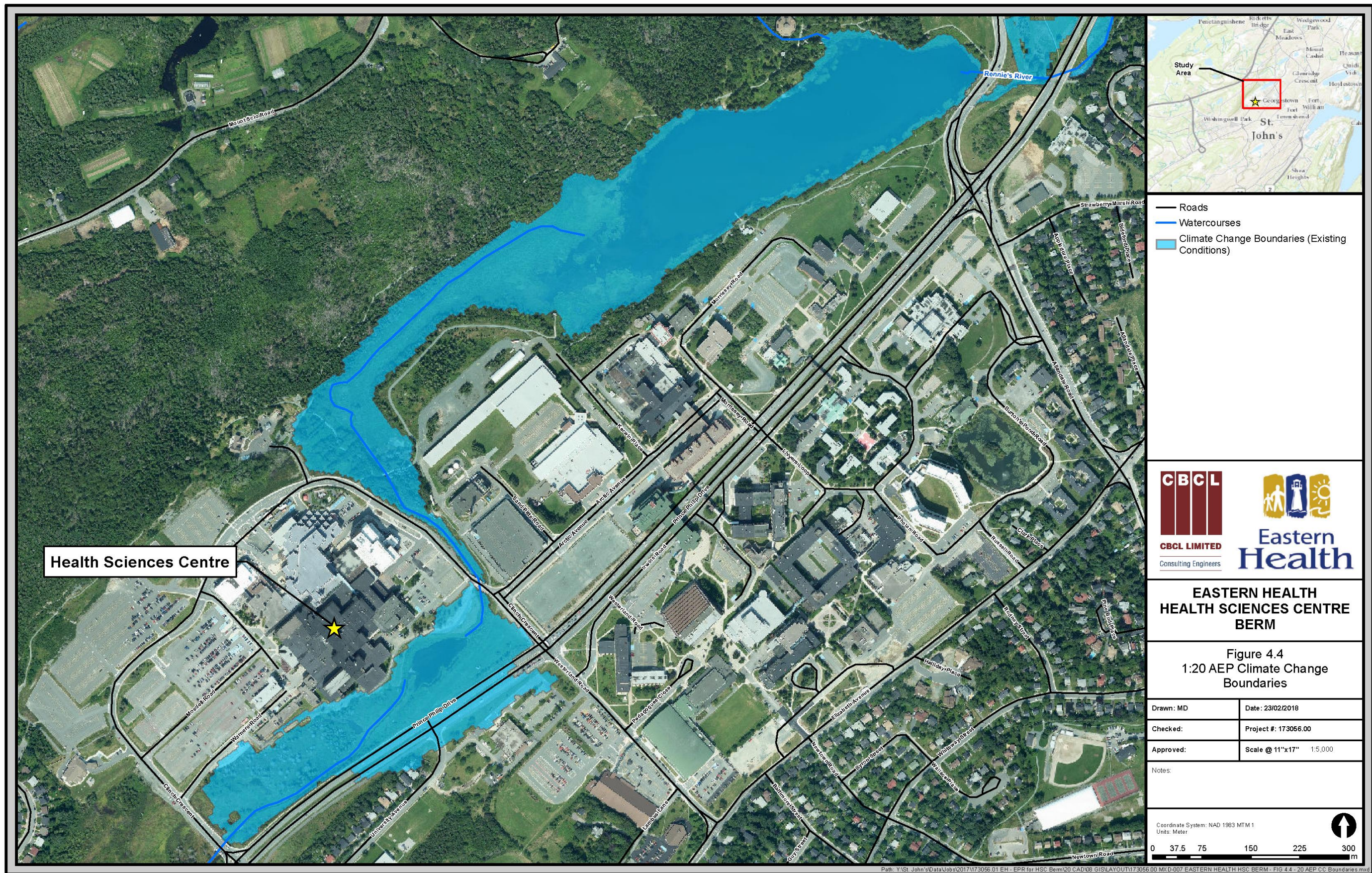


Figure 4.4 - 1:20 AEP Climate Change Boundaries

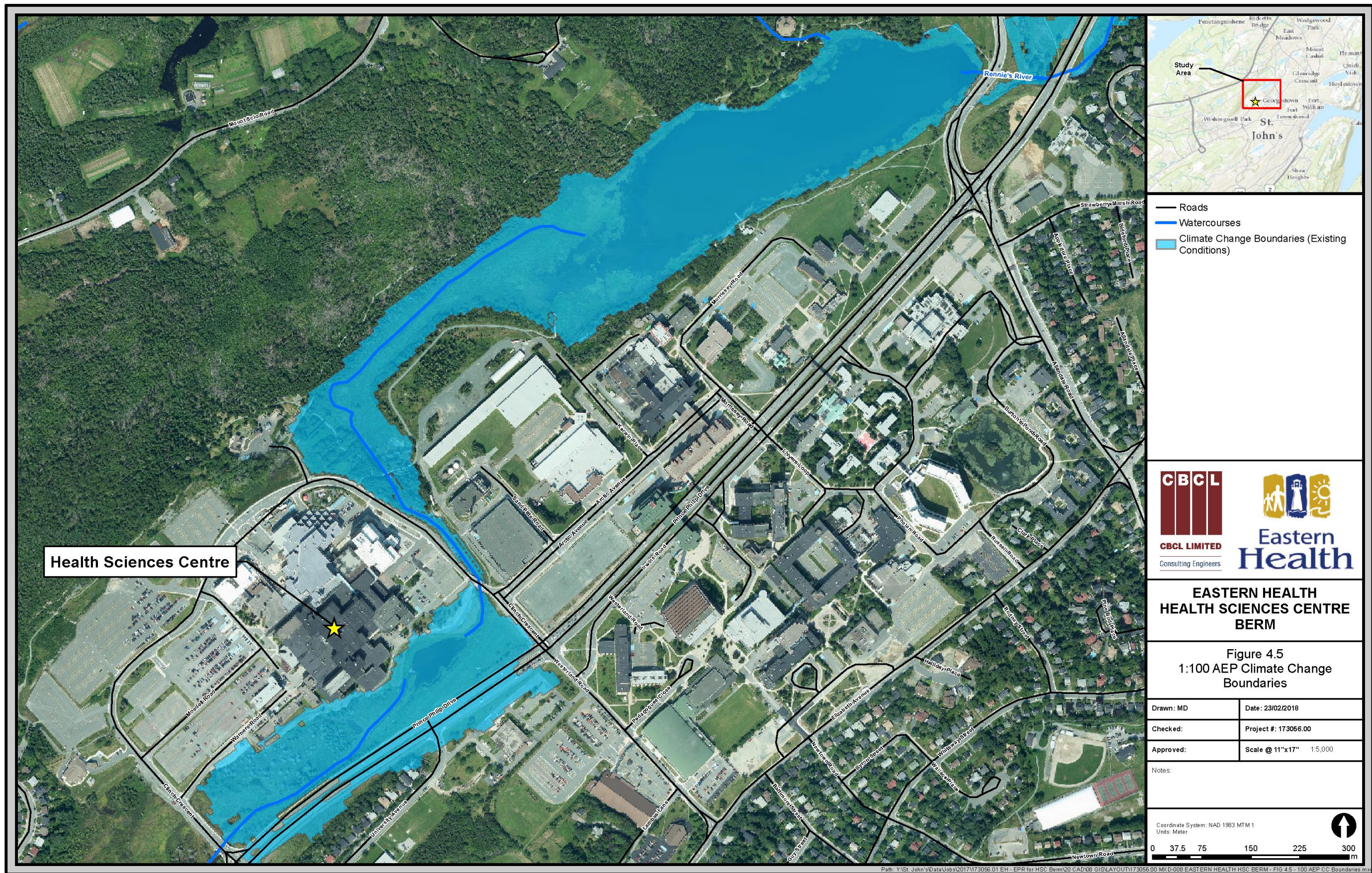


Figure 4.5 - 1:100 AEP Climate Change Boundaries

Marshes are mineral based (or occasionally peat based) wetlands which are periodically inundated by standing or flowing water. These waters are nutrient rich, and their levels tend to fluctuate seasonally. The dominant vegetation comprises numerous herbaceous emergent species such as *Typha spp.* (cattails), *Juncus spp.* (rushes), *Calamagrostis spp.* (reed grasses), and sedges (*Carex spp.*); in shallow open water areas, there is occasional submergent and floating leaved species (Wells & Pollet, 1983). Riparian marshes occupy the riparian zones of rivers and streams. These receive their hydrologic regime from overland flow of water from adjacent uplands, and from periodic overbank flooding from the stream or river (National Wetland Working Group, 1997).

Groundwater: The depth of groundwater was observed from 1.5 m to 3.0 m below ground surface. The local groundwater level is likely to fluctuate seasonally and in response to precipitation events (Stantec 2016).

Wildlife: Common mammal wildlife that may be present within the Ecoregion include moose, snowshoe hare, Arctic hare, fox, muskrat, otter, mink, black bear, beaver, lynx, and other small fur bearing mammals; however, do the proximately to the City of John's the likelihood of larger species is lower (Government of Newfoundland and Labrador 2017b).

Over 372 bird species (204 native, 166 irregular visitors) have been found in Newfoundland and Labrador (Government of Newfoundland and Labrador 2017). The Project site is located in Bird Conservation Region 8 (BCR 8), the Boreal Softwood Shield. Priority bird species found in BCR 8 are primarily associated with wetland, coniferous forests, and riparian habitats. During North American Breeding Bird Surveys, which were conducted in close proximity to the Project site, 85 breeding bird species were recorded (Appendix E). The regional nesting period for the Project area is mid-April to mid-August (ECCC 2017), although some species may breed outside of this period. In addition, 36 species have been observed within the Project site (eBird 2017; Appendix E).

The Project site primarily consists of a wetland and riparian area, which could be used by many species for breeding, feeding, and resting for at least part of the year. In addition, edges and ditches associated with roads can provide breeding habitat for bird species that are able utilize disturbed and wet sites (e.g. Song Sparrow, Savannah Sparrow, and Common Yellowthroat). The Project site can also provide habitat for birds during the winter months. Waterfowl such as American Black Duck, American Wigeon, Eurasian Wigeon, and Mallard have been observed using the pond during the winter months. Other species observed during the winter months include but not limited to, Great Black-backed Gull, Herring Gull, American Crow, Dark-eyed Junco, and European Starlings (eBird 2017).

Fish and Fish Habitat: Species confirmed as present within the Rennie's River Watershed include brown trout (*Salmo trutta*, D. Keefe. MAE, pers comm. September 20, 2017). Other species which may be present in Leary's Brook include Atlantic salmon (*Salmo salar*), American eel (*Anguilla rostrata*), brook trout (*Salvelinus fontinalis*), and three-spined

sticklebacks (*Gasterosteus aculeatus*). Leary’s Brook is not designated as Scheduled Salmon Rivers (DFO 2017).

Species of Concern: The Atlantic Canada Conservation Data Centre (AC CDC) documented 36 rare plant observations and 759 rare animal observations within 5 km of the Project. Of the 759 rare animal records, the following species of conservation concern were observed: Red Crossbill, Ivory Gull, Bank Swallow, Bobolink, Rusty Blackbird, Short-eared Owl, Harlequin Duck Gray-Cheeked Thrush, Barn Swallow, Common Nighthawk, Chimney Swift, monarch butterfly, and polar bear. The remaining species observed were not provincially or nationally listed, but are not considered rare globally. The 36 rare plant records included species that are not provincially or federally listed. Three species were identified in the 5 km buffer, including Hump-backed Elves (*Buxbaumia minakatae*), Fernald’s Chuckleyppear (*Amelanchier fernaldii*) and Woodland Cudweed (*Omalotheca sylvatica*). Outside of Newfoundland & Labrador, these species are considered globally rare (A. Durocher, AC CDC, pers comm. August 30, 2017).

Based on AC CDC Expert Opinion Maps of provincially and federally listed species, no species have been identified within 5 km of the project location; however, the Expert Opinion Maps suggest that boreal felt lichen presence is possible, while banded killifish, and Newfoundland marten are possible, but unlikely. The Project is also identified within the Barrow's Goldeneye range (A. Durocher, AC CDC, pers comm. August 30, 2017).

Species of conservation concern are species that are protected by provincial and/or federal legislation. Species that are or may be found in the project area include the following (Table 4.1):

Table 4.1 - Species of Conservation Concern

Species	NL <i>Endangered Species Act Status</i>	<i>Canadian Species at Risk Act (SARA)</i>	Committee on the Status of Endangered Wildlife in Canada (COSEWIC)
Bird			
Bank Swallow <i>Riparia riparia</i>	No Status	No Status	Threatened
Barn Swallow <i>Hirundo rustica</i>	No Status	No Status	Threatened
Barrow's Goldeneye <i>Bucephala islandica</i>	Vulnerable	Schedule 1 – Special Concern	Special Concern
Bobolink <i>Dolichonyx oryzivorus</i>	Vulnerable	No Status	Threatened

Species	NL <i>Endangered Species Act</i> Status	Canadian <i>Species at Risk Act (SARA)</i>	Committee on the Status of Endangered Wildlife in Canada (COSEWIC)
Chimney Swift <i>Chaetura pelagica</i>	Threatened	Schedule 1 – Threatened	Threatened
Common Nighthawk <i>Chordeiles minor</i>	Threatened	Schedule 1 – Threatened	Threatened
Eskimo Curlew <i>Numenius borealis</i>	Endangered	Schedule 1 – Endangered	Endangered
Gray-cheeked Thrush <i>Catharus minimus</i>	Vulnerable	No Status	
Harlequin Duck <i>Histrionicus histrionicus</i>	Vulnerable	Schedule 1 – Special Concern	Special Concern
Ivory Gull <i>Pagophila eburnea</i>	Endangered	Schedule 1 – Endangered	Endangered
Newfoundland Gray-cheeked Thrush <i>Catharus minimus</i>	Threatened	No Status	
Olive-sided Flycatcher <i>Contopus cooperi</i>	Threatened	Schedule 1 – Threatened	Threatened
Red Crossbill <i>Loxia curvirostra percna</i>	Endangered	Schedule 1 – Endangered	Endangered
Red Knot <i>Calidris canutus rufa</i>	Endangered	Schedule 1 – Endangered	Endangered
Rusty Blackbird <i>Euphagus carolinus</i>	Vulnerable	Schedule 1 – Special Concern	Special Concern
Short-eared Owl <i>Asio flammeus</i>	Vulnerable	Schedule 1 – Special Concern	Special Concern
Fish			
American eel <i>Anguilla rostrata</i>	Vulnerable	No Status	Threatened
Banded Killifish <i>Fundulus diaphanous</i>	Vulnerable	Schedule 1 – Special Concern	Special Concern
Insect			
Monarch Butterfly <i>Danaus plexippus</i>	No Status	Schedule 1 – Special Concern	Endangered
Mammal			
Polar Bear <i>Ursus maritimus</i>	Vulnerable	Schedule 1 – Special Concern	Special Concern

Species	NL <i>Endangered Species Act</i> Status	Canadian <i>Species at Risk Act (SARA)</i>	Committee on the Status of Endangered Wildlife in Canada (COSEWIC)
Plant			
Boreal Felt Lichen <i>Erioderma pedicellatum</i>	Vulnerable	Schedule 1 – Special Concern	Special Concern

Protected Areas: There are no existing Provincial protected areas, such as provincial parks, wilderness reserves, wildlife reserves, wildlife parks, ecological reserves, provisional ecological reserves, public reserves, special management, or Canadian heritage rivers; or Federal parks/reserves such as national parks, national historic sites, migratory bird sanctuaries or marine protected areas on the property; however, the Project is located within Pippy Park land use zone. Any development within Pippy Park is subject to the *Pippy Park Commission Act* and approval of the C.A. Pippy Park Commission.

4.2 Construction

The construction of the flood protection berm is estimated to take four (4) months in total. The activities are likely to commence from the most easterly point adjacent to Clinch Crescent East, moving west along Leary’s Brook. Project components will include the following major features described below.

- Site Preparation
 - Vegetation clearing; and
 - Grubbing of all organic materials in preparation of construction.
- Construction of the berm
 - Excavation for the berm foundation;
 - Dewatering of isolated areas of berm construction (estimated 600 m²);
 - Infilling of 225.5 m² wetland section with structural fill;
 - Placement of new materials such as clean rock fill and sand and gravel mixture containing 10-15% fines. Clean rock fill will be placed in areas directly adjacent to the waterbodies and where wet conditions are encountered;
 - Stabilization berm slopes using placement of concrete retaining wall face around waterbody;
 - Installation of 1.8 m handrail along concrete retaining wall;
 - Removal and replacement of stormwater management infrastructure;
 - Installation of rock infiltration swale;
 - Replace 300 mm corrugated metal pipe with 300 mm polyvinyl chloride (PVC);
 - Replacement of 5 m of 300 mm PVC with 7 m of 300mm PVC;
 - Replacement of 7 m of 200 mm PVC with 8.5 m of 200mm PVC;

- Installation of four new back-valve outfalls; and
 - Installation of two sub drains.
- Concrete encasement to protect storm sewer;
- Stabilization of berm slopes using Class 1 hydraulic rip rap (as per City of St. John's Specifications Book) on berm faces adjacent to Leary's Brook;
- Placement of granular walk;
- Site compaction;
- Grading and shaping of berm to a 2.5H:1V embankment slope;
- Placement of 150 mm of topsoil in areas unless noted otherwise in the construction plans;
- Revegetation of the constructed berm using Hydroseeding and sod. The hydroseed mixture will include:
 - 30% birdsfoot trefoil;
 - 15% white clover;
 - 5% boreal creeping fescue;
 - 35% timothy;
 - 7% double cut red clover; and
 - 8% alsike clover; and
- Pocket plantings of mostly native shrubs and trees provide some further stability. Native shrubs and trees to be used include red maple (*Acer rubrum*), mountain ash (*Sorbus decora*), pin cherry (*Prunus pensylvanica*), larch (*Larix laricina*), red osier dogwood (*Cornus sericea*), elderberry (*Sambucus canadensis*), serviceberry (*Amelanchier canadensis*) and pussy willow (*Salix discolor*). Non-native species to be planted include autumn blaze maple (*Acer freemanii*), and nannyberry (*Viburnum lentago*).
- Environmental Protection, and sediment and erosion control measures (Section 6.2 and Appendix F)

All construction works will be performed in accordance with the City of St. John's Specifications Book.

Regular Project hours for construction are to be Monday to Friday from 07:00 to 17:00 hours. Approval is required to work outside of regular hours or days of the Project. Requests for changes to the schedule must be made at least 72 hours in advance if work is scheduled outside these times.

Machinery such as dump truck, loaders, bulldozers, and backhoes will be used for the construction. All equipment used on site will be in good working order, and idling will be minimized to reduce effects of air emissions, such as greenhouse gases and noise.

The berm is proposed to remain in its existing location for the known future with long-term management options and operational maintenance. Options identified for decommission and rehabilitation are outlined in Chapter 7 Decommissioning and Rehabilitation.

4.3 Operations and Maintenance

Operation and maintenance activities regarding the berm will be minimal. The following activities have been identified:

- Annual inspection of drainage piping and backwater valves;
- Cleaning, repair and replacement of drainage piping and backwater valves as a result of annual inspections;
- Annual inspection of berm conditions (planting and structural) for evidence of erosion, piping, and settlement;
- Berm repairs including regrading and planting to maintain berm conditions and aesthetic;
- Geotechnical inspection will be completed every 5 years including review of annual inspections; and
- Pumping of water from the north side of the berm, as required.

The annual inspections will be completed during the spring/summer at minimum. The activity will be incorporated into the Eastern Health Operational Maintenance System as a preventative measure in which a work order will be set up within the system to comply with annual inspections.

4.4 Occupations

The contract for this job has been awarded to Bursey's Excavating and Development Incorporated (Bursey's). All positions are direct hire employees of Bursey's, for the purpose of this evaluation they will be considered contracted out by Eastern Health.

Employment equity will be the responsibility of Bursey's or another the successful contractors during the construction. Bursey's hiring practices are based on ability and equal opportunity. They have been successful awarded numerous construction contracts by the federal government.

It is projected that the following occupations will be required for employment during the construction and operations phase of the project. Table 4.2 displays the approximate anticipated number of positions during construction and their associated National Occupational Classification (NOC) codes.

Table 4.2 - Anticipated Positions / Occupations Required

Position	National Occupational Classification Group Title Code	Type of Employment Full / Part-time	Number Positions Anticipated	Duration of Employment (months)	Hiring Method Contracted Out, Direct Hire, Existing Staff
Construction Superintendent	0711	Full Time	1	4	Contracted Out
Truck Drivers	7411	Part-time	1	4	Contracted Out
Pipefitters	7252	Full Time	2	1	Contracted Out
Excavator Operator	7421	Full Time	1	4	Contracted Out
Flagman	7611	Part-time	1	4	Contracted Out
Construction Trades Helpers & Laborers	7611	Full Time	4	4	Contracted Out

CHAPTER 5 **ALTERNATIVES**

Structural methods of preventing flooding, including upgrading existing infrastructure and construction of new alternatives, were assessed as alternatives to the Project. The potential alternatives were investigated within the Leary's Brook portion of the Rennies River watershed from Clinch Crescent West and Clinch Crescent East, the options derived from hydrologic and hydraulic models included (Figure 5.1**Error! Reference source not found.**):

- Berms or Levees;
- Flood Control Reservoirs;
- Channel Modifications; and
- Diversion.

The option of a levee or berm within the Eastern Health property was ultimately selected for this project as it protects HSC from flooding, it is located on Eastern Health managed property, it has a reduced potential damage to the natural environment, as part of the proposed berm is in the location of an existing berm, and it has low capital cost and maintenance requirements. Upon evaluation of the alternatives, the other options were considered impractical due to a combination of factors such as space limitations within the watershed, land ownership, and potential damage to the natural environment. The following section describes the alternatives and the preferred option.

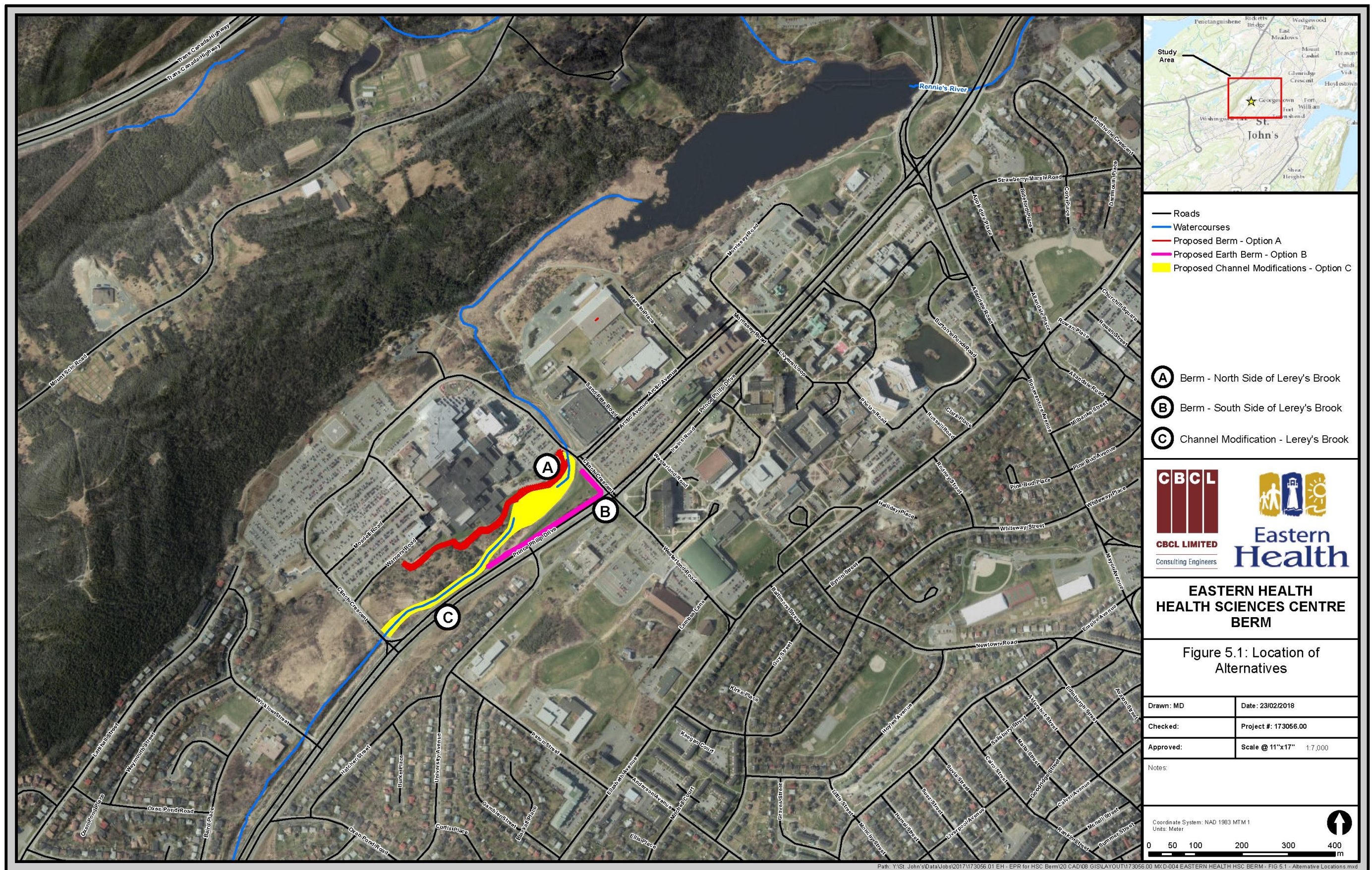


Figure 5.1 - Locations of Alternatives

5.1 Berms or Levees

Berms or levees are engineered berms or earth dams used to restrict surplus water to a smaller area, reducing or controlling an area than would be flooded in absence of their protection.

5.1.1 Berm North side of Leary's Brook (Selected Option)

This would include a 480 m berm from the southwest end of the Agnes Cowan Hostel to the Clinch Crescent East Bridge (Section 4.1.2.1, Figure 4.2 and Figure 4.3). The berm would occupy approximately 1.05 hectares (10521.8 m² or 2.6 acres) with a total construction disturbance area of 1.21 hectares (12140.6 m² or 3 acres). Along the Pond bank, the berm will be approximately 120 m long x 5 m wide, preserving the existing waterline. The remainder of the berm will be constructed approximately 5 to 10 m from the normal waterline. Constructed with 2.5H: 1V berm engineered slope, the berm will reach a height of 58.50 m in elevation, with height varying between 4 to 10 m. The design was based on the U.S. Federal Emergency Management Agency and supported by the report from AMEC, which provides guidance on the minimum levee freeboard criteria of flood level of the proposed berm plus three feet (AMEC 2014).

The berm will be constructed of a sand and gravel mixture containing 10-15% fines content, and a maximum particle size of 200 mm in diameter). In areas of encroaching on natural saturated areas, the berm will be constructed with 200 mm clean rockfill (free of fines). Some segments will be constructed with a retaining wall rather than an engineered slope to reduce impact to the waterbodies, such as retaining walls and hydraulic riprap. The remainder of the berm will have an engineered slope and will be covered with vegetation to provide some further stability, mitigate releases of material that may harm fish habitat, and to blend the berm into the surrounding landscape.

The berm will be designed to assist local drainage by the inclusion of a rock infiltration swale placed at the toe of the slope on the side of the berm facing HSC. The infiltration swales will channel water to backwater valves during storm events, directing stormwater back into the Pond. Seven backwater valves and two sub drains will be installed. The backwater valve outfalls will be stabilised with rock fill mattress.

This option was selected as the preferred alternative, as it protects HSC from the effects of a 1:100 AEP flood with combined wind and wave actions. This option was also recommended in the Rennies River Catchment Stormwater Management Plan north of Leary's Brook south of HSC (CBCL 2014). Analysis of potential environmental effects are outlined in Section 6, and include effects to surface water and surface water management; land use; vegetation; fish and fish habitat; wildlife and other land-users.

5.1.2 Berm South side of Leary's Brook

An additional berm assessed included a potential berm located on the south side of Leary's Brook, which would be constructed at the east side of Clinch Crescent and along the north side of Prince Philip Dr. between Clinch Crescent East and Clinch Crescent West. This berm

was identified within the Rennies River Catchment Stormwater Management Plan (CBCL 2014).

For the purposes of this EPR, the recommended size and construction of the berm used was as presented in the Rennies River Catchment Stormwater Management Plan (CBCL 2014). The berm required would be approximately 480 m long and include an approximately 360 m berm and 120 m cast in place concrete along edge of Leary's Brook (Figure 5.1). The berm will reach a height of 58.50 m in elevation, which will be able to handle the 1:100 AEP storm event. The berm will be constructed follow the same design principals as identified in section 5.1.1. The berm will have a 2.5V:1H engineered slope and will be covered with vegetation to provide some further stability, mitigate releases of material that may harm fish habitat and to blend the berm into the surrounding landscape. Some segments will be constructed with a retaining wall rather than an engineered slope to reduce impact to the waterbodies, such as retaining walls and hydraulic riprap. The berm will be constructed of a sand and gravel mixture containing 10-15% fines content, and a maximum particle size of 200 mm in diameter). In areas of encroachment on natural saturated areas, the berm will be constructed with 200 mm clean rockfill (free of fines).

Analysis of potential environmental effects are similar to that of the selected option (Section 5.1.1) and include effects to surface water and surface water management; land use; vegetation; fish and fish habitat; wildlife and other land-users.

The proposed location of the Berm South side of Leary's Brook does not protect HSC against flooding from wind and wave actions. Due to this reason, the alternative was not considered a viable alternative to the proposed Project; however, the installation of the south side berm in conjunction with the north berm could result in reduced flooding in the localized area in general.

5.2 Flood Control Reservoirs

Flood Control Reservoirs can be used to temporary store floodwaters, reducing the magnitude of the peak discharge and peak stages downstream of the reservoir. Requirements for this alternative include sufficient area available to locate a flood-control reservoir (AMEC 2014).

There was little space between Clinch Crescent West and Clinch Crescent East suitable for water retention by use of a flood-control reservoir. Potential areas were investigated for flood control reservoirs upstream of Long Pond. There are no available areas upstream of the HSC to allow for the construction of a flood-control reservoir with a capacity to reduce flooding at the hospital (AMEC 2014). The site located west of Clinch Crescent West suggested as an option during the Public Information Meeting, unfortunately, the location demonstrated little water retention capacity as the space already floods (CBCL 2014) and is at a similar elevation to the HSC area, which reduces its potential for use of water retention. As a result, this alternative was given no further consideration.

5.3 Channel modification

Channel modifications, such as deepening and/ or widening, can increase the capacity of a stream channel, which may result in lower water levels at the area of concern. This option would require the channel modifications to Leary's Brook, using activities such as dredging of the channel of Leary's Brook (Figure 5.1).

Channel modifications could result in impacts to the aquatic and riparian zones of the Leary's brook, such as removal of naturally graded rock and gravel, and modifications of the natural low flow pool and riffle system, which is critical for fish survival during summer low flows. Detailed environmental assessments, as well as, various permits from several different provincial and federal departments may be have been required to assess the potential environmental effects (AMEC 2014).

Increasing the flow capacity of the channel in Leary's Brook by channel modification, may result in higher flows would be allowed to reach the downstream areas, increasing the risks of flooding at these locations.

As a result of potential environment impacts and potential increase on the risks of flooding in the downstream area, this option was given no further consideration.

5.4 Diversion

Diversions can be used to protect vulnerable areas by bypassing flood flows around areas vulnerable to flooding. This would reduce the magnitude of the peak discharge and consequent stage for any given return event. Requirements for this alternative include sufficient area available to locate a diversion channel and inlet.

Diversion could result in the increase of flow capacity to downstream areas such as Long Pond, which may result in higher flows reaching the downstream areas, increasing the risks of flooding at these locations.

As there are no available areas surrounding HSC to allow for the construction of a diversion (AMEC 2014), and the risk of additional flooding impacts downstream, this option was given no further consideration.

POTENTIAL ENVIRONMENTAL EFFECTS AND MITIGATION

The project components and environmental components identified in Chapter 4 have been assessed to determine if there is a potential environmental effect.

The Project will be designed and constructed to minimize risk and potential environmental impacts. Potential environmental impacts that have been identified include:

- Flooding;
- Silt and sedimentation runoff;
- Risk of fuel, lubricant and hydraulic fluid release;
- Removal of vegetation;
- Removal of wetlands and aquatic habitats;
- Disruption of wildlife, including birds and fish;
- In-water works (berm placement);
- Dust;
- Construction debris;
- Airborne emissions from construction equipment;
- Noise pollution from construction activities; and
- Effects to other land users.

Potential sources of pollutants that may occur as a result of construction include the following:

- Spills and releases (fuel, lubricant and hydraulic fluid release);
- Silt and sedimentation runoff;
- Airborne exhaust emissions from construction equipment;
- Noise from construction activities;
- Dust; and
- Construction debris.

The following Table outlines the potential interactions between project components and environmental components.

Table 6.1 - Potential Interactions between Project and Environmental Components

PROJECT PHASES / COMPONENTS	ENVIRONMENTAL COMPONENTS																		
	Direct Environmental Effects															Indirect Env. Effects			
	Land			Water					Air		Natural Systems					Socio-Economic		Cultural	
	Terrain and Topography	Soil Quality	Erosion / Slope Stability	Surface Water Quality	Surface Water Quantity	Groundwater Quality	Groundwater Quantity	Erosion / Slope Stability	Air Quality	Noise	Vegetation	Wetlands	Species at Risk	Wildlife / Wildlife Habitat	Fish and Fish Habitat	Human Health / Safety	Land Use	Physical and Cultural heritage	Historical / Archaeological site
Construction:																			
Site Preparation	X	X	X	X		X		X	X	X	X	X	X	X	X	X			
Construction of Berm	X	X	X	X		X		X	X	X	X	X	X	X	X	X			
Operation / Maintenance:																			
Use of Berm			X	X	X			X			X								
Cleaning and Repair	X		X	X	X			X			X	X	X	X	X				
Pumping of Water				X				X			X			X	X				
Decommissioning:																			
Berm Removal	X	X	X	X		X		X	X		X	X	X	X	X	X			
Vegetation Planting		X	X	X				X			X	X	X	X		X			
Berm Alternation	X	X	X	X		X		X	X		X	X	X	X	X	X			

6.1 Potential Environmental Effect

The following potential environmental effects have been identified and a discussed further below:

- Surface Water and Surface Water Management
- Land Use
- Groundwater
- Soils and Geology
- Vegetation
- Wetlands
- Fish and Fish habitat
- Wildlife
- Air Emissions and Quality
- Health and Safety
- Other Land-Users

Appropriate mitigation measures to the identified environmental effects are outlines in Section 6.2

6.1.1 *Surface Water and Surface Water Management*

Flooding and Surface Water Management: The potential environmental effects of flooding caused by the berm construction were evaluated using the floodlines, delineated using a hydrologic and hydraulic computer model of the Rennies River catchment system (Appendix D, CBCL 2018). The calculations are based on the 1:20 AEP, 1:100 rainfall events with climate change calculated during the Rennies River catchment studies (CBCL 2014). The evaluated scenarios also included the 1:100 AEP event with climate change plus 30% (Appendix D, CBCL 2018). An assessment of the resulting floodlines between the existing conditions and post berm construction indicated the following, (Figure 6.1, Figure 6.2, Figure 6.3 and, Table 6.2).

Table 6.2 - Summary of the Hydrologic and Hydraulic computer 1:20 AEP CC and the 1:100 AEP CC, and 1:100 AEP CC + 30%

Scenario	Maximum Change in Water Level along HSC Berm between Existing Conditions and Post-Construction (m)	Maximum Width from Existing Conditions Floodline to Post-Construction Floodline (m)	Additional Area Flooded from the Existing Floodline and Post-Construction (m ²)	Areas showing Additional Floods
1:20 AEP CC	0.06	10	2,275	Parking lot and green areas south of Prince Phillip Drive (such as ditches, greenways, and yards)
1 :100 AEP CC	0.07	10	2,278	Clinch Crescent East, Prince Phillip Drive, and parking lot and green areas south of Prince Phillip Drive (such as ditches, greenways, and yards)
1:100 AEP CC 30%	0.10	45	27,348	Clinch Crescent East, Prince Phillip Drive, parking lot and green areas south of Prince Phillip Drive (such as ditches, greenways, and yards), Arctic Ave, Sand Pitts Road, Adjacent to Core Sciences, and NRC Building.

1:20 AEP with Climate Change: For the modelled scenario, the structure reduces flooding next to the HSC. Post berm construction, the water level increases by up to 0.06 m between Clinch Crescent East and West, resulting in an area of 2275 m² with a 5 to 10 m flood extent increase from the existing conditions to post berm construction floodline. The areas affected include Prince Phillip Drive, adjacent parking lots and green areas (such as ditches, greenways, and yards) located south of Prince Phillip Drive. The change in flooding extent does not affect additional buildings. Downstream of Clinch Crescent East and around Long Pond, the calculated flood extents do not show changes after construction of the berm. Although the post-construction floodline extends past the existing conditions floodline south of Prince Phillip Drive, the flooding decreases, mostly within the area of the constructed berm and HSC from 35.82 ha to 35.50 ha within the modelled area.

1:100 AEP with Climate Change: Under this scenario, the berm reduces the extent of the flood plain to the north toward HSC at the location the structure. Post berm construction, the water level along the berm increased up to 0.07 m between Clinch Crescent East and West, resulting in an area of 2278 m². The post-construction floodline extends 5 to 10 m from the existing floodplain, particularly south of Prince Philip Drive and east over Clinch Crescent East. The areas affected south of the berm include Prince Phillip Drive, adjacent parking lots and green areas (such as ditches, greenways, and yards) located south of Prince Phillip Drive. The depth of water over Clinch Crescent East ranges between 0.05 m and 0.25 m. The changes in the calculated flooding extent post berm construction do extend to the Core Sciences, under construction.

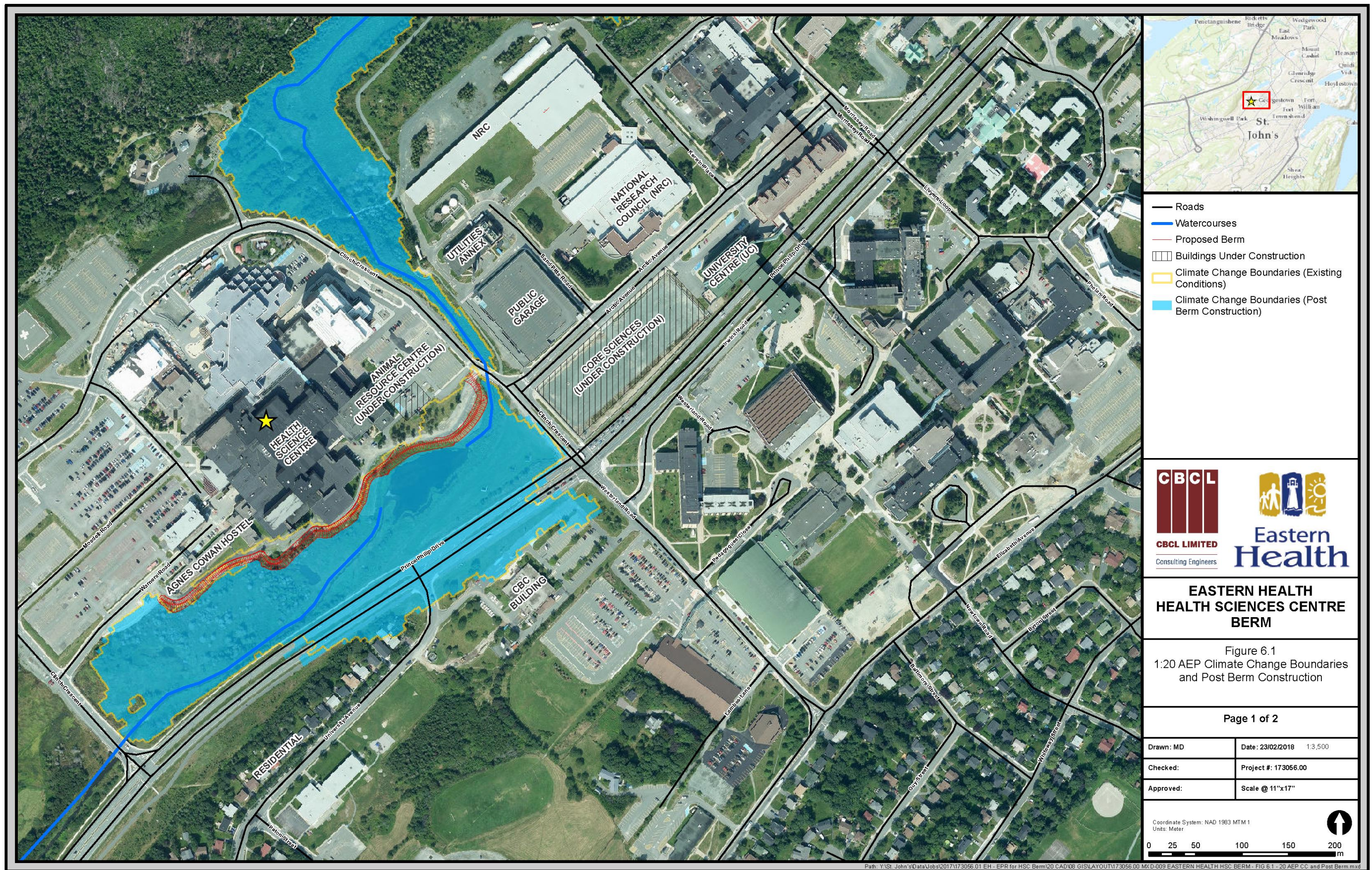


Figure 6.1 - 1:20 AEP Climate Change Boundaries Existing Conditions and Post Berm Construction



Figure 6.1 - 1:20 AEP Climate Change Boundaries Existing Conditions and Post Berm Construction

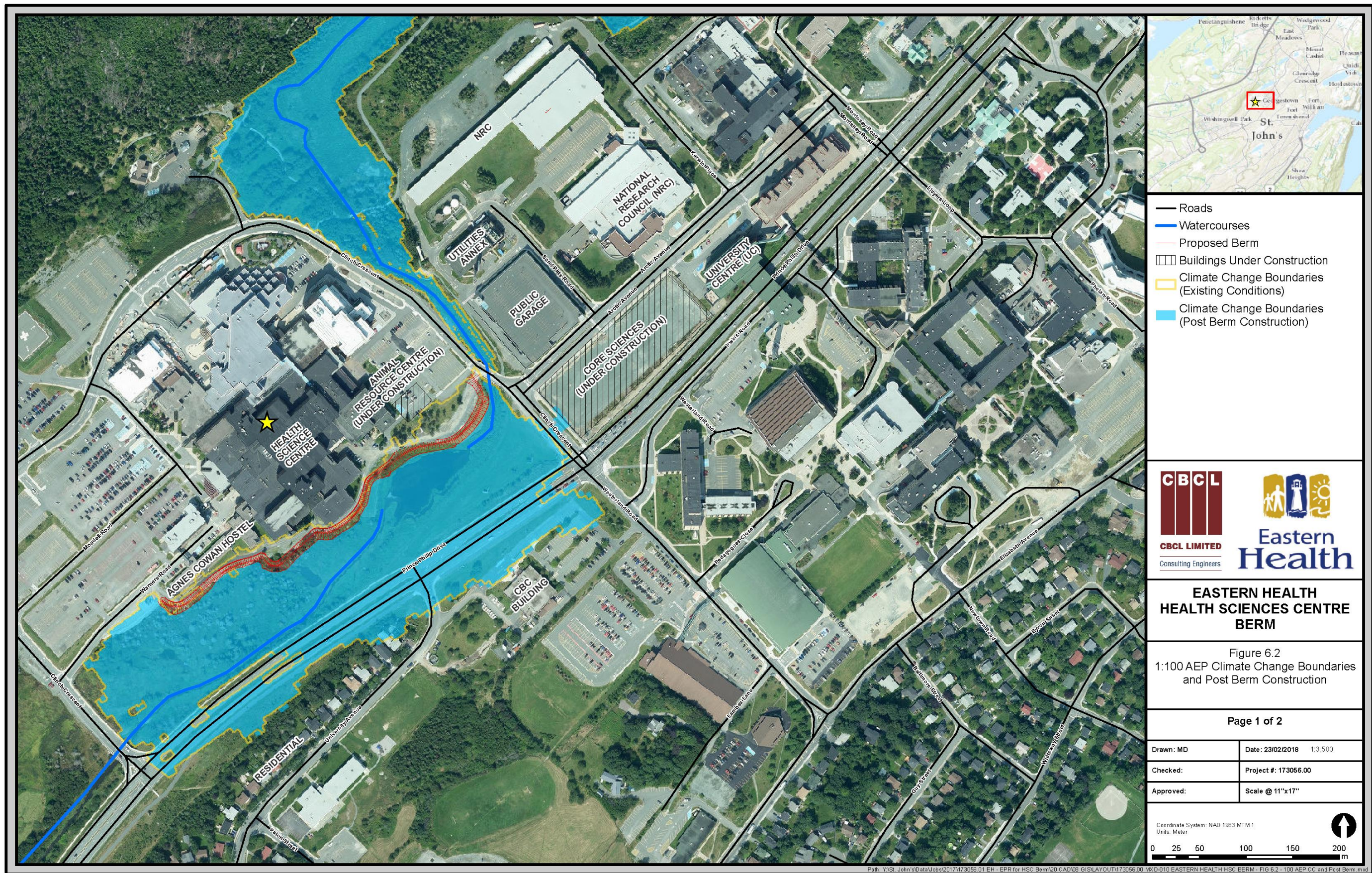


Figure 6.2 - 1:100 AEP Climate Change Boundaries Existing Conditions and Post Berm Construction

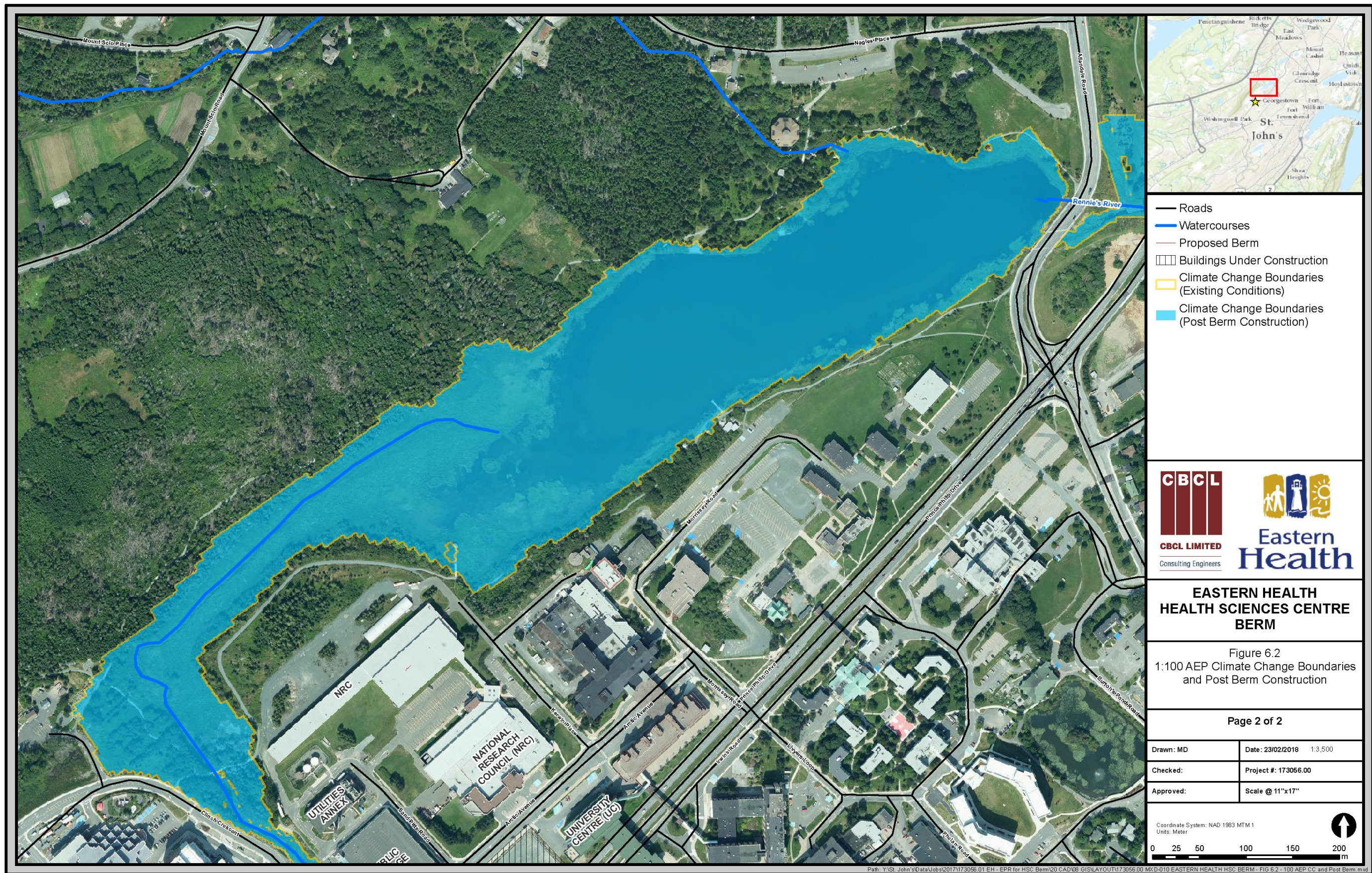


Figure 6.2 - 1:100 AEP Climate Change Boundaries Existing Conditions and Post Berm Construction

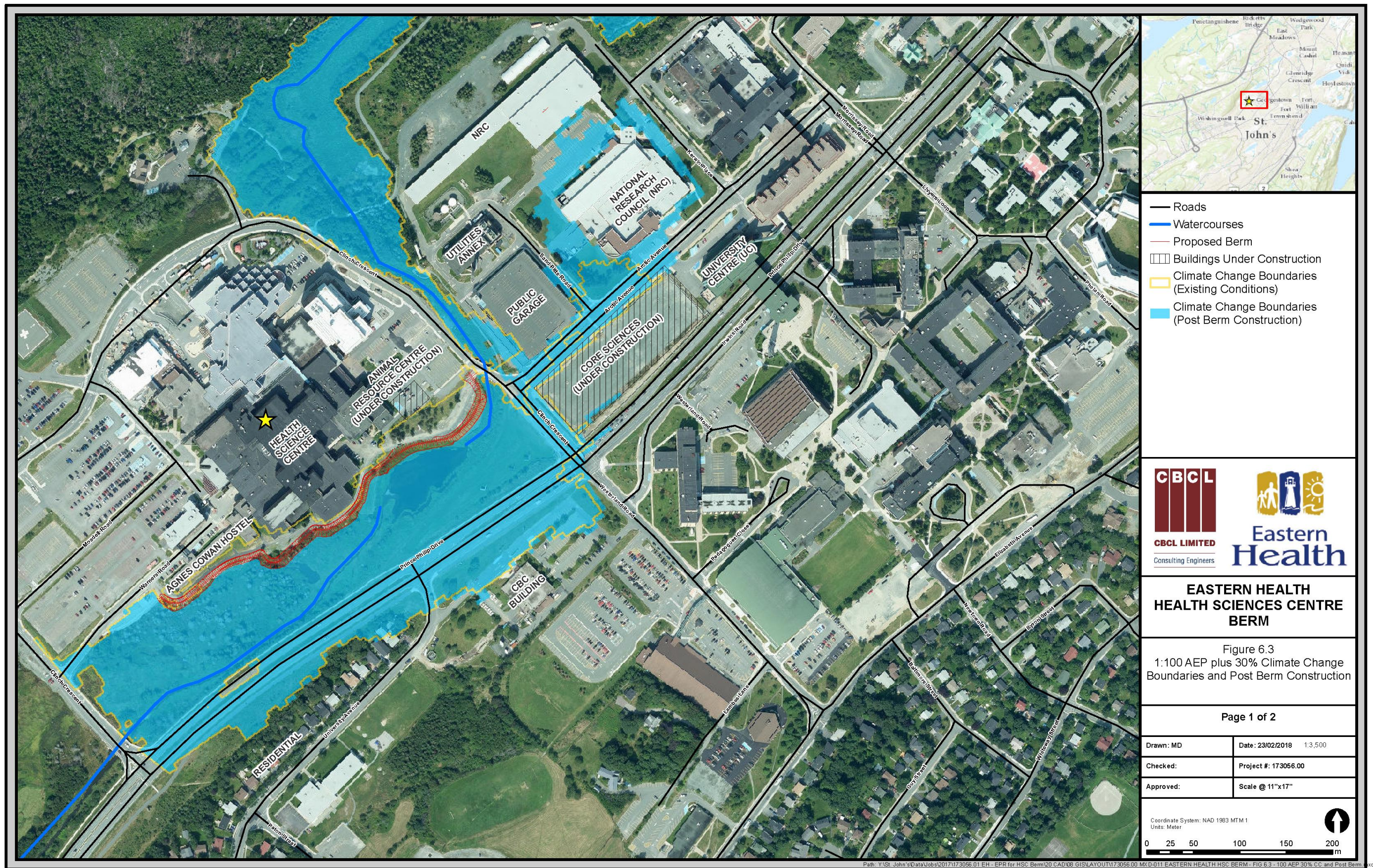


Figure 6.3 - 1:100 AEP plus 30% Climate Change Boundaries Existing Conditions and Post Berm Construction

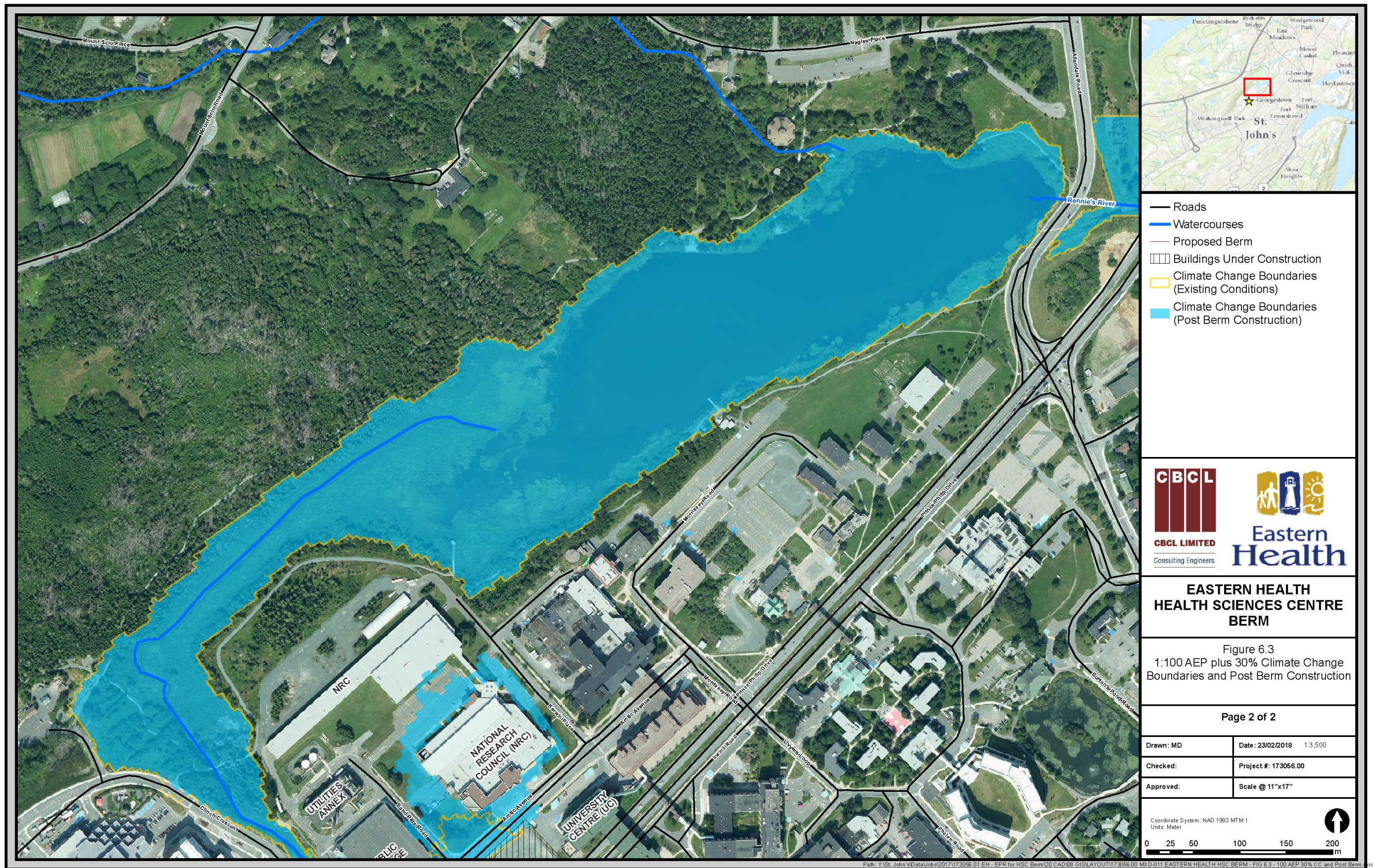


Figure 6.3 - 1:100 AEP plus 30% Climate Change Boundaries Existing Conditions and Post Berm Construction

In the downstream area around Long Pond, the floodplain extents show minimal changes after construction of the berm. Although the post-construction floodline extends past the existing conditions floodline south of Prince Phillip Drive and over Clinch Crescent East, the flooding decreases, mostly within the area of the constructed berm and HSC from 39.74 ha to 39.32 ha within the modelled area.

1:100 AEP with Climate Change plus 30%: Under this scenario, water levels along the proposed berm increased by up to 0.10 m increasing the flooding area extent by 27348 m² with a linear extent up to 45 m from the existing floodline. After construction of the berm, areas affected include areas east of Clinch Crescent, and south of Prince Phillip Drive.

Affected areas east of Clinch Crescent include Clinch Crescent East, Artic Ave, Sand Pitts Road, parking lots, green areas (such as ditches, greenways, and yards), the north and west side of the Core Sciences building, as well as the National Research Council (NRC) Building, which is located at a local low point. Within the NRC building subcatchment, the flows associated with the 100-year AEP with climate change plus 30 %, are likely to exceed the hydraulic capacity of the minor drainage system around the building and result in local flooding. Under these conditions, the actual impact of the berm in this area may be negligible (Appendix D).

The areas affected south of the berm include Prince Phillip Drive, adjacent parking lots and green areas (such as ditches, greenways, and yards) located south of Prince Phillip Drive.

The difference between the existing and post construction floodlines varied, from 50.22 ha to 50.65 ha within the modelled area. This could be due to the minor drainage system within the areas of the NRC. The flooding extent is similar pre and post berm construction in the area surrounding Long Pond.

Sedimentation, Erosion, Spills and Release of Deleterious Substances: There is a potential for loss of soil by stormwater run-off or wind erosion, and spills during construction. The Berm will be designed with a 2.5V:1H to reduce the effects of run-off, as well as sediment and erosion control measures will be implemented. When working near watercourses, retaining wall and riprap will be used to reduce encroachment into watercourses.

This can be mitigated by protecting topsoil by stockpiling for reuse; preventing sedimentation of storm sewer or receiving streams by use of temporary erosion and pollution control devices; and dust suppression measures to prevent pollution of the air with dust and particulate matter. Temporary erosion and pollution control devices such as silt fences will be used to mitigate the possible sources of pollutants. Mitigation measures such as an EPP including an Erosion and Sediment Control Plan and Spill Response Plan will be prepared as outlined in Section 6.2. Additional mitigation measures have been identified in Section 6.2. Following these requirements, minimal potential effects are expected.

6.1.2 Land Use

The proposed berm will replace an existing berm located in the Pippy Park land use zone. The berm is designed to complement the aesthetics of Pippy Park. The berm is designed with engineered slopes will have minimal maintenance requirements. Adjacent to watercourses, only clean rock fill materials (fill free of fines) will be used to reduce the potential of release of sediments or any other materials considered deleterious to fish and fish habitat. Post construction, the berm will be covered with topsoil, hydroseed and sod as well as revegetated with preference to native trees and shrubs. The already existing granular walkway located north of the berm will remain intact.

A care and maintenance program will be implemented to assess berm conditions annually, at a minimum. Berm will be rehabilitated as required to maintain the berm aesthetics and function. The surface water management system within the berm will also be assessed annually, equipment will be repaired and cleaned as required to maintain the function of the infrastructure.

Construction equipment will not be permitted to operate outside the construction zone to prevent damaging adjacent areas.

Upon implementation of these mitigation measures, the potential for interaction between project activities and ground water is expected to be minimal.

6.1.3 Groundwater

The use of equipment on site during the construction phase of the Project may result in activities whereby effluent / pollutants enter the hydrological cycle and adversely impact groundwater quality. For example, accidental spillage or leaks of fuels, lubricants, or hydraulic fluids may negatively impact groundwater quality. Improper disposal and treatment of effluent during construction could also lead to contaminated groundwater. An Emergency Spill Response Plan and measures for mitigating the improper handling, storage and disposal of hazardous and other waste materials are outlined in Section 6.2.

There is also potential of inflow of groundwater into excavations, all construction including the work in wet areas should be completed during dry or low-flow periods. The identified timing window in Newfoundland and Labrador is from June 1 to September 30.

Dewatering plans and associated measures will be implemented to control the inflow of groundwater into excavations. Measures may include use of earthworks such as perimeter ditches and sump pumps. Any discharge of water from the site will be conducted in accordance with applicable environmental guidelines.

Upon implementation of these mitigation measures, the potential for interaction between project activities and ground water is expected to be minimal.

6.1.4 Geology and Soils

Construction equipment will not be permitted to operate outside the construction zone to prevent damaging adjacent areas. Where possible, surface soil will be reused. All soils and surface water impacted via spills and releases will be disposed of off-site in accordance with all applicable environmental regulations and legislation. Mitigation measures are outlined in Section 6.2. Upon implementation of such mitigation measures, potential impacts to geology and soils are expected to be minimal.

6.1.5 Vegetation

Site preparation (e.g. clearing and grubbing) of the berm area will result in the direct loss or alteration of vegetation communities. Indirect impacts to vegetation may include the introduction of invasive and exotic species into existing natural communities, primarily via heavy machinery during construction. The removal of vegetative communities within the wetland and riparian area may also impact wildlife that utilize these communities for cover, foraging, and breeding activities.

The berm will be covered with topsoil, hydroseed and sod as well as revegetated with preference to native trees and shrubs. A hydroseed mixture will be used in areas directly adjacent to watercourses and will include birdsfoot trefoil, white clover, boreal creeping fescue, timothy, double cut red clover, and alsike clover. The planting plan includes the use of sod in some locations not directly adjacent to watercourse.

Vegetation clearing will occur outside the breeding bird period (mid-April to mid-August) when possible. If this is not avoidable, all nests and neighbouring vegetation will be left undisturbed until nesting is complete. If nests containing eggs or young of migratory birds are discovered during construction, all disruptive activities in the nesting area should cease until nesting is completed, and a buffer zone should be established at an appropriate set-back distance surrounding the nest. A trained biologist should complete surveys to confirm the present of breeding birds.

Mitigation measures, including restrictions on the timing of vegetation removal not within the breeding bird period (mid-April to mid-August), operation of equipment to avoid transfer of invasive and exotic species, as well as the restoration of native plants post construction are outlined in Section 6.2. Upon implementation of such mitigation measures, potential impacts to vegetation are expected to be minimal.

6.1.6 Wetlands

The proposed undertaking will interact with a single wetland located within the Project area (). The wetland encompasses a minimum of 3.6 ha delineated during the site visit. Its total area extends beyond the project area and delineation boundaries. During construction of the proposed berm, approximately 1426.4 m² of wetland will be altered, 1360.8 m² as a result of the berm or infilling and 65.6 m² will be regraded, resulting in the direct loss of

wetland (Figure 6.4). Indirect impacts to the wetland may include the loss or alteration of ecological function via flooding, deposition of deleterious substances, sedimentation and erosion. Measures to mitigate these potential impacts are outlined in Section 6.2. Upon implementation of these measures, the impact of the proposed undertaking on the wetland in question is not expected to be significant.

6.1.7 Fish and Fish Habitat:

Due to the proximity of the Project site to Leary's Brook and the pond situated at the northeast end of Leary's Brook, there is potential for Project activities to impact fish and fish habitat. Potential effects of Project activities (e.g. clearing, grubbing, etc.) include the following:

- Bank erosion and sediment loading;
- Changes to channel morphology and water flow;
- Alteration to riparian habitat through vegetation removal; and
- Release of deleterious substances associated with accidental spills/leaks, improper disposal of waste materials, or the use of chemical-based dust suppressants.

The earthen berm will be constructed to minimize impacts to any water body and, subsequently, fish and fish habitat. Such measures include the stabilization of berm slopes facing the waterbody through the installation of hydraulic riprap and a concrete retaining wall. The remainder of the berm will be covered with topsoil, hydroseed, sod and native vegetation for further stabilization. As outlined in Section 6.2, further mitigation measures to address the above-mentioned effects will be prepared and included in an Erosion and Sediment Control Plan and Emergency Spill Response Plan, both of which will be incorporated into an all-encompassing EPP. These mitigation measures shall include those recommended by Fisheries and Oceans Canada (DFO) for projects conducted near water and are outlined in Section 6.2 and Appendix I. Following implementation of these mitigation measures, DFO has determined that the proposed undertaking will not cause serious harm to fish and Project and thus comply with subsection 35(1) of the *Fisheries Act*.

6.1.8 Wildlife

Potential impacts to wildlife, i.e., terrestrial mammals and migratory birds, may result from the following:

- Habitat loss or alteration;
- Deposition of harmful substances into areas utilized by wildlife;
- Noise associated with machinery;
- Improper disposal of refuse; and
- Construction lighting.

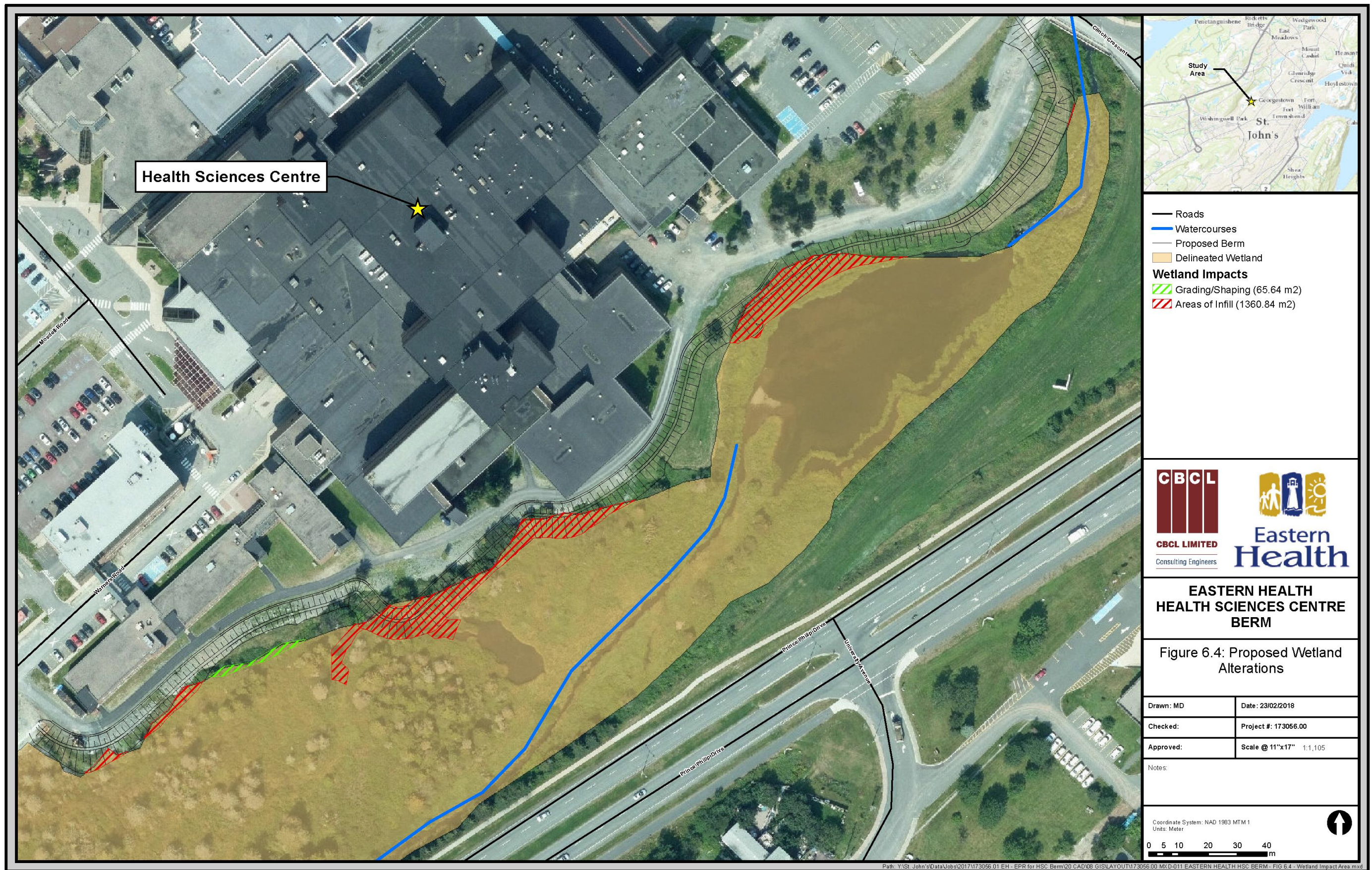


Figure 6.4 – Proposed Wetland Alterations

Loss or alteration of habitat, particularly wetland and riparian habitat, may impact wildlife that utilize these habitats for cover, foraging and important life functions (e.g. breeding and nesting). Deposition of harmful substances into waterbodies or areas utilized by wildlife could potentially occur as a result of an accidental spill or leak. Operation of machinery, human presence and associated noise during the construction phase of the Project may result in short-term disturbance to wildlife and temporary avoidance of the area. Conversely, improper disposal of domestic refuse by on-site personnel may attract wildlife that opportunistically forage on these materials. Construction lighting can also attract wildlife, specifically migratory birds, to the area, increasing the likelihood of wildlife coming in contact with machinery and subsequent injury.

Vegetation clearing will occur outside the breeding bird period (mid-April to mid-August) when possible. If this is not avoidable, all nests and neighbouring vegetation will be left undisturbed until nesting is complete. If nests containing eggs or young of migratory birds are discovered during construction, all disruptive activities in the nesting area should cease until nesting is completed, and a buffer zone should be established at an appropriate set-back distance surrounding the nest. A trained biologist should complete surveys to confirm the present of breeding birds.

Best practices for the protection of wildlife during construction, such as those outlined in Section 6.2, will be incorporated into the EPP. Upon implementation of mitigation measures, potential impacts to wildlife are expected to be minimal.

6.1.9 Air Emissions and Quality

Air emissions and air quality measures will be incorporated into the Environmental Management Plan to prevent pollution of the air with dust, particulate matter and noise. All equipment and construction activities on site will occur during approved working hours and all equipment used on site will be in good working order to reduce effects of air emissions, such as greenhouse gases and noise. Following these best management practices, interactions between construction activities and air emissions/quality are expected to be minimal.

6.1.10 Health and Safety

The berm has been designed following applicable engineering standards and will be constructed using a qualified contractor. Following Health and Safety Guidelines and best management practices, interactions between construction activities and health and safety are expected to be minimal.

6.1.11 Land Users

The Project area is located less than a kilometer from residential and commercial properties. Effects to neighbouring land users include air quality, noise, and flooding. During the construction phase of the Project, activities will be conducted in full compliance with municipal by-laws to minimize disturbance to surrounding land users. During the

operational phase of the Project, there is risk of flooding to adjacent properties thereby impacting adjacent land users. Locations within the Rennies River Watershed with known flooding problems under existing conditions include Prince Philip Drive and the CBC building parking lot between Clinch Crescent East and Clinch Crescent West (CBCL 2014). As discussed under Section 6.1.1, floodplain and flood extent maps illustrating the 1:20 and 1:100 climate change flow indicate that the extent of the floodlines south of the proposed undertaking is greater in area than that which exists under current conditions (Figure 6.1, Figure 6.2, and Figure 6.3). Mitigation measures to avoid or minimize impacts associated with noise, air quality and flooding on surrounding infrastructure and land users are provided in Section 6.2.

6.2 Mitigation Measures

Eastern Health has identified the following project specific mitigation measures and best management procedures to minimize potential environmental effects and resource conflicts. Eastern Health and their contractors will follow all identified mitigation measures, construction best management practices and specified permit conditions during construction. The following project specific mitigation measures are divided into the following categories:

- General
- Surface Water and Surface Water Management
- Vegetation
- Wetlands
- Fish and Fish Habitat
- Wildlife
- Groundwater
- Air Emissions and Quality
- Land Users

6.2.1 General

- Project activities will be conducted in compliance with federal, provincial legislation and municipal by-laws and regulations, such as the Environmental Protection Act (SNL 2002: Chapter E-14.2), Wild Life Act, Occupational Health and Safety Act, Fisheries Act, Migratory Birds Convention Act, Species at Risk Act and their regulations;
- A site specific EPP will be developed and followed. The EPP will include training and mitigation measures which would reduce impacts to terrestrial, aquatic and human health such as accidental spills/leaks and release of fuel and mechanical fluids, hazardous materials and deleterious substances. At minimum, the EPP will include the following
 - Emergency Response Plan,

- Emergency Spill Response Plan including locations of spill response equipment,
 - Erosion and Sediment Control Plan,
 - Site dewatering plans,
 - Handling and storage of fuel, gasoline and associated products
 - Waste management strategy, and
 - Operation and maintenance of machinery.
- An Erosion and Sediment Control Plan will be implemented prior to construction and will describe the measures implemented to prevent loss of soil during construction by stormwater run-off and wind erosion. The plan will include protecting topsoil by stockpiling for reuse; preventing sedimentation of storm sewer or receiving streams; and preventing air pollution by dust and particulate matter. Temporary erosion and pollution control devices such as silt fences will be used to mitigate possible sources of pollutants.
 - In the event of a spill or leak, the operator must immediately notify the Department and the Environmental Emergencies 24 Hour Report Line (1-800-563-9089), abate the discharge and restore the affected area to the satisfaction of the Department;
 - All debris and waste materials will be disposed of in accordance with the provisions of the Environmental Protection Act and latest regulations, guidelines and policies. A construction waste management plan will be developed and will include designated specific area(s) on the construction site for segregated or comingled collection of recyclable materials. Non-hazardous construction and demolition debris will be either recycled or salvaged; items may include cardboard, metal, concrete, plastic, clean wood, and glass. The disposal of all waste materials not reused, resold or recycled will be at an approved waste disposal site;
 - On completion of the Project, all construction equipment, surplus materials and temporary works will be cleared away and removed from the site.
 - On completion of the Project, any disturbed area will be restored to the original conditions or better.
 - Only new or reused, clean materials will be used for the purposes of the berm, backfill, and grading.
 - All construction activities will occur during working hours as defined in the permit.
 - Weekly Environmental Inspection reports with a minimum of three (3) digital photographs will be provided to Eastern by the Contractor. Photograph will include general progress and documentation of Erosion and sediment control measures. The Inspection reports will document any deficiencies and corrective actions taken to address problems. All corrective actions will be implemented within 24 hours of the

inspection. Environmental Inspection reports will occur at minimum weekly and after each rainfall events.

- The berm will be inspections will be implemented, annually for inspection of drainage piping and backwater valves; and berm conditions (planting and structural) for evidence of erosion, piping, and settlement, and geotechnical inspection will be completed every 5 years including review of annual inspections.
- Stormwater components will be cleaned, repaired and replaced as required to keep in good working order.
- Berm repairs will be completed, including regrading and planting, to maintain berm conditions and aesthetic; and
- Geotechnical inspection will be completed every 5 years including review of annual inspections.

6.2.2 *Surface Water and Surface Water Management*

- An Erosion and Sediment Control Plan will be implemented prior to construction and will describe the measures implemented to prevent the release of sediment and deleterious substances during construction by stormwater run-off and wind erosion. The plan at a minimum will address the following:
 - Site dewatering;
 - Protecting topsoil by stockpiling for reuse;
 - Preventing sedimentation of storm sewer or receiving streams; and preventing air pollution by dust and particulate matter.
 - Temporary erosion and pollution control devices such as silt fences will be used to mitigate possible sources of pollutants and their removal at completion of the Project.
- Dewatering plans and associated measures will be implemented to control the inflow of water into excavations. Measures may include use of earthworks such as perimeter ditches and sump pumps. Any discharge of water from the site will be conducted in accordance with applicable environmental guidelines;
- Discharge of sewage or other materials into a body of water, public sewer or sewer leading to a public sewer, is prohibited unless authorized under the Environmental Control Water and Sewage Regulations (2003);
- Fueling and storage of gasoline and associated products (e.g. oils, greases, diesel, hydraulic and transmission fluids), should occur in a designated refueling /storage area at least 30 m from any waterbody or wetland and on flat, paved terrain;
- All maintenance of equipment should occur at least 30 m from any waterbody or wetland and on flat, paved terrain; and
- Water held on the north side of the berm will be held and pumped to the Leary's Brook only after peak flow has occurred.

6.2.3 *Groundwater, Geology and Soils*

- Surface soil stripping will be minimized where possible; material will be stockpiled and reused where possible;
- Construction methods will be implemented to suit local soil conditions;
- Any quarried materials required for the proposed Project shall be purchased from an external supplier permitted under the Quarry Materials Act (1998);
- All soils and surface water impacted via spills and releases will be disposed of off-site in accordance with all applicable environmental regulations and legislation; and
- Dewatering plans and associated measures will be implemented to control the inflow of groundwater into excavations. Measures may include use of earthworks such as perimeter ditches and sump pumps. Any discharge of water from the site will be conducted in accordance with applicable environmental guidelines.

6.2.4 *Vegetation*

- The Project will be designed to minimize disruption to existing natural areas. All removal and disposal of trees, brush, stumps, surface litter, boulders and grubblings will follow applicable permits and best management practices. Vegetation such as trees, and shrubs should be retained when possible.
- The berm will be covered with topsoil, hydroseed and sod as well as revegetated with preference to native trees and shrubs. A hydroseed mixture will be used in areas directly adjacent to watercourses and will include birdsfoot trefoil, white clover, boreal creeping fescue, timothy, double cut red clover, and alsike clover. The planting plan includes the use of sod in some locations not directly adjacent to watercourse.
- All equipment must be devoid of soils, seeds, and residual debris prior to use on-site. Undercarriages, wheels, tracks and blades / buckets should be cleaned (i.e. pressure washed) prior to use on the site.
- The contractor shall develop an invasive species mitigation plan as part of the Environmental Protection Plan, outlining measures to reduce the risk of introducing invasive species to Project areas, particularly wetlands. Mitigation measures may include activities such as limiting mechanical clearance in areas adjacent to the wetland or clearing during the winter.

6.2.5 *Wetlands*

- Where alteration to a wetland is unavoidable, the initiatives outlined in the Federal Policy on Wetland Conservation (Government of Canada, 1991) and MAE Policy for Development in Wetlands to sustain wetland functions will be considered;
- Implementation of sediment and erosion control measures such as and installing erosion and sediment barriers (ie. silt fence) as well as drainage control measures

(e.g. sediment traps or settling ponds) along the edge of the construction area to reduce the likelihood of contaminants entering the wetland during construction by directing surface run-off into retention/sedimentation basins placed away from wetlands;

- Minimizing grubbing activities and timing such activities to avoid periods of heavy rainfall, clearing wetlands during winter; and
- Revegetating disturbed areas immediately post construction.

6.2.6 Fish and Fish Habitat

- Existing watercourses (i.e. Leary's Brook and its banks) are not to be disturbed, other than that identified in the construction drawings. No heavy machinery is permitted in this area;
- All in-water works will be completed within periods of low flow to further reduce the risk to fish and fish habitat or isolated from flows. The identified timing window in Newfoundland and Labrador is from June 1 to September 30;
- Adjacent to watercourses, only clean rock fill materials (fill free of fines) will be used to reduce the potential of release of sediments or any other materials considered deleterious to fish and fish habitat;
- Erosion and sediment control measures shall be implemented to reduce impacts to fish and fish habitat. Such measures may include, but are not limited to, isolation measures (e.g. silt curtains), minimizing the removal of vegetation and natural debris (i.e. rocks, logs, sand), and shoreline stabilization with appropriate materials (e.g. native vegetation, rip-rap or armour stone);
- Removal of materials from below the high water mark is not permitted;
- Fish passage and flow should be maintained at all times; and
- All guidance and mitigation measures issued from DFO shall will be followed for projects conducted near water (Appendix I).

6.2.7 Wildlife

- The contractor shall develop a management plan encompassing measures to mitigate impacts to migratory birds. These measures shall include ways to avoid disturbing birds' nests or eggs. Avian surveys conducted by trained biologists are recommended prior to commencement of construction, particular if clearing is required during the breeding bird nesting season. Any species at risk observations should be reported to Environment and Climate Change Canada - Canadian Wildlife Services (ECCC-CWS);
- If nests containing eggs or young of migratory birds are discovered during construction, all disruptive activities in the nesting area should cease until nesting is completed, and a buffer zone should be established at an appropriate set-back

distance surrounding the nest. Measures to deter migratory birds from nesting in stockpiles during the breeding season shall also be implemented;

- Any clearing of vegetation will occur prior to the breeding bird nesting season (mid-April to mid-August) or breeding bird /nest surveys will be completed prior to removal of vegetation or disturbance of potential habitat;
- Contractors should implement management practices to reduce the effects to migratory birds as a result of human induced light, such reducing the number of site illuminating lights in the project area, utilizing LED lights, where possible, and low intensity strobe lights at night;
- Best management practices for wildlife protection during construction will be incorporated into the EPP, such as proper waste management to deter wildlife from entering the Project area; and
- To minimize impacts to wildlife, it is recommended that the earthen berm be revegetated with native trees and plants, particularly the south side of the berm facing Leary's Brook and adjoining pond in addition to the adjacent riparian area.

6.2.8 Air Emissions and Quality

- To minimize impacts to air quality, all Project activities will be in compliance with the Air Pollution Control Regulations (2004); dust mitigation measures will be implemented. Specific measures might include dust suppression activities such as wetting of the construction areas and sweeping and washing of paved road surfaces;
- All heavy machinery should be in good working order and operated in a manner to maximize fuel efficiency, thereby reducing greenhouse gas emissions and impacts to air quality such as noise;
- Utilization of water for dust suppression over other less environmentally sound methods (i.e. chloride and lignin-based suppressants). If the former is not possible, alternate methods of dust suppression and ways to negate impacts to the environment will be outlined in the EPP; and
- Construction will be scheduled to avoid extreme wind, and rainy period to reduce potential erosion and sediment mobility.

6.2.9 Land Users

- As required, traffic control will be provided by certified traffic control persons, in accordance with the Traffic Control Manual issued by the Newfoundland and Labrador Department of Transportation and Works. Access will be maintained for all emergency vehicles in construction areas; and
- All construction activities will occur during working hours as defined in the permit.

DECOMMISSIONING AND REHABILITATION

During the construction of the HSC, a berm was installed for the purpose of flood protection. The proposed Project would elevated the existing berm and support flood protection for updated flood prediction conditions.

The berm is to stay in place indefinitely, with appropriate care and maintenance.

The HSC is planned to be a long-standing fixture within the community of St. John's and the Province of Newfoundland and Labrador. The berm is proposed to remain in its existing location for the known future with long-term management options and operational maintenance. In the case that the hospital is moved or the berm is no longer determined to be sufficient for flood protection the following options have been identified for decommission and rehabilitation:

- the berm will be revised or incorporated into additional flood / water control structures for HSC property;
- the berm will be removed and area will be replanted with vegetation; or
- the berm will be left in place and integrated into overall water management for the Rennie's River watershed;

Eastern Health commits to work with MAE on the selected closure options in advance of planning closure of the HSC.

PROJECT RELATED DOCUMENTS

The following resources were used to form this document

Amec Americas Ltd. (AMEC).2014. Health Sciences Centre: Flood Plain Study Report. Technical Report. File No. 174811-0000-CD10-RPT-0001. Report prepared for Eastern Health by AMEC, St. John's, NL. Dated August 6, 2014.

CBCL Consulting Engineers Ltd. (CBCL) 2016. RE: Leary's Brook Investigation: Final Report. File No. 153039.00. Report prepared for Eastern Health by CBCL, St. John's, NL. Dated April 1, 2016.

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Keefe, Donald. Ecosystem Management Ecologist, Aquatic, Wildlife Division, Newfoundland and Labrador, Department of Municipal Affairs and Environment, Corner Brook, Newfoundland and Labrador. September 20, 2017.

National Wetlands Working Group. 1997. The Canadian Wetland Classification System, 2nd Edition. Warner, B.G. and C.D.A. Rubec (eds.), Wetlands Research Centre, University of Waterloo, Waterloo, ON, Canada. 68 p.

Pinnacle Engineering Ltd. (2016, 10 July). Health Sciences Centre – Flood Protection Berm. Sheets C1-C5 & D1. Construction Drawings.

Rydin, H. and Jeglum, J. K. 2006. The biology of peatlands. Oxford University Press, Oxford, 360 pp.

Stantec Consulting Ltd. (Stantec). 2016. Geotechnical Investigation – Flood Protection Berm (Rev. 1), Health Sciences Centre, St. John's, NL. Technical Letter Report. Report prepared for Eastern Health by Stantec, St. John's, NL. Dated July 7, 2016

Tract Consulting Inc. (2016, 10 July). Health Sciences Centre Berm. Sheets L1-L3. Construction Drawings.

Wells, E.D. and Pollett, F.C. 1983. Peatlands. In: South, G.R. (ed.). Biogeography and ecology of the Island of Newfoundland, Vol. 48. Dr W. Junk Publishers, The Hague. p. 207–265

The following Project related documents have been provided for further information:

CBCL. 2018. Floodplain Mapping and Evaluation (Appendix D)

Stantec. 2017. Erosion & Sediment Control Health Sciences Centre Berm (Appendix E)

PUBLIC INFORMATION MEETING

Eastern Health held an Open House Public Information Session in St. John's, NL on January 18, 2018 from 6:30pm to 8:30pm. The purpose of the meeting was to present information on the project and to outline the process for the registration of the undertaking according to the *Environmental Protection Act* and *Environmental Assessment Regulations*.

9.1 Public Meeting Announcements

Under the requirements of the *Environmental Assessment Regulations* and the EPR, Eastern Health provided the following Announcements and Notice Postings regarding for the Eastern Health Berm Public Information Session to the Public (Table 9.1). MAE was notified of the Public Information Meeting on January 8, 2018.

Table 9.1 - Dates of Announcements and Notice Postings for the Eastern Health Berm Public Information Session

Location of Announcement / Notice Posting	Days of Posting
The Telegram	January 13, 2018 January 15, 2018 January 16, 2018 January 17, 2018
City Hall	January 11, 2018
Memorial University Main bulletin board	January 11, 2018
Local post office	January 11, 2018
CBC Building main Entrance	January 11, 2018
Canadian Blood Services	January 11, 2018
Eastern Health's New Centre	January 11, 2018
Eastern Health's issued Public Service Announcement	January 11, 2018
Eastern Health's Health Science Centre Berm Webpage	January 11, 2018
Facebook	January 11, 2018 January 18, 2018
Twitter	January 11, 2018 January 18, 2018

9.1.1 Public Advertisements per the Environmental Preview Report

The public meeting was advertised following the EPR Guidelines. All newspaper ads were at two (2) column widths and a minimum of 17.8 cm by 12.7 cm (seven (7) inches by five (5) inches). A copy of the notice was posted in the following locations as outlined in Table 9.1 (Appendix G.):

- The Telegram Newspaper,
- City Hall,
- Local post office,
- Memorial University Main bulletin board and / or website, and
- CBC Building main Entrance

A notice was presented at the local Post Office; however, the local Post Office could not confirm that the notice could be posted at the location. MAE was contacted immediately and an additional notice was posted at Canadian Blood Services, 7 Wicklow Street, St. John's. Also upon the recommendation of MAE, Eastern Health distributed notices at local residential properties along University Cres and Hatcher St.

9.1.2 Additional Notification Efforts

In addition to the public advertising requirements of the EPR, Eastern Health also provided notification and additional information through the Eastern Health website and social media. Announcements were posted in the following locations (Table 9.1, Appendix G.):

- Eastern Health's New Centre;
- Eastern Health's issued Public Service Announcement;
- Eastern Health's Health Science Centre Berm Webpage;
- Facebook; and
- Twitter.

9.2 Summary of Public Information Meeting

The Public Information Meeting, held from 6:30pm to 8:30pm on January 18, 2018, included members of the public and other invited guests including Eastern Health Executive / Board, Eastern Health employees, Representatives of Memorial University, City of St. John's, Pippy Park Commission, and Provincial Government Departments. A sign in sheet was available for members of the public to sign-in (Appendix G). Twenty to thirty members of the public attended, including invited guests.

A brief presentation was provided; followed by poster boards (Appendix G). Upon the request of the attendees, Eastern Health revised the format of the Public Information Meeting to facilitate a more presentation style. The public was encouraged to ask questions, questions regarding the environmental effects of the undertaking were recorded. Questions asked about other undertakings not included within this assessment were not been included.

Presentation materials, such as presentations and poster boards, are include in Appendix G. Presentation topics general included:

- Project Background;
- Project Location;
- Project Design;
- Project Construction;
- Project Alternatives;
- Flood mapping; and
- Environmental Assessment Process.

9.2.1 Public Comments, Questions, and Concerns

A summary of questions and concerns raised and location of where they are addressed in the EPR are presented in Table 9.12 and Appendix G. Response to questions and concerns from the meeting are located in Appendix G.

Table 9.2 - Summary of Questions and Concerns from Public Information Meeting and Location addressed in the EPR

Theme	Topic	Response Location in the EPR
Existing Conditions	Location of existing berm Rain conditions in St. John’s, NL	Section 4.1.1 Geographic Location; and Figure 4.3. Section 4.1.3 Existing Environment
Berm Construction	Berm Construction – Was a membrane included within the design? Construction in relation to the River bed Timing of construction in relation to construction of the weir Adequacy of the berm for flood mitigation and the 1:100 + 30% What types of vegetation will be used? Impact of Hydroseeding	Section 4.1.2.1 Description of the Project, Section 4.2 Construction and Appendix A. Section 4.1.2.1 Description of the Project, Section 4.2 Construction and Appendix A. Section 6.1.1 Surface Water and Surface Water Management Section 6.1.1 Surface Water and Surface Water Management Section 4.2 Construction and Appendix A. Section 6.1.1 Surface Water and Surface Water Management and

Theme	Topic	Response Location in the EPR
	How will the berm design reduce the introduction of sediment to the river system and effects to fish?	Appendix F - Erosion & Sediment Control Health Sciences Centre Berm Section 6.1.1 Surface Water and Surface Water Management and Appendix F - Erosion & Sediment Control Health Sciences Centre Berm
Flooding Risks	Will the project increase flooding downstream of Long Pond?	Section 6.1.1 Surface Water and Surface Water Management and Appendix D
	Will the velocity be increased downstream of Long Pond?	Section 6.1.1 Surface Water and Surface Water Management and Appendix D
	Is flooding of the new Core Sciences building possible?	Section 6.1.1 Surface Water and Surface Water Management and Appendix D
	Why was 30% added to the 1:100?	Section 6.1.1 Surface Water and Surface Water Management and Appendix D
	Will flooding increase as a result of the berm or will it just displace existing water?	Section 6.1.1 Surface Water and Surface Water Management and Appendix D
Environmental / Engineering Studies Completed	Have fish studies been completed?	Section 4.1.3 Existing Information
Environmental Assessment	A comprehensive approach could be useful for the approvals of all similar water management /flooding related projects rather than project specific approvals.	Comment included reference to other undertakings; comment was recorded but not addressed in the EPR.

Theme	Topic	Response Location in the EPR
	<p>Will sediment and erosion control reduce the introduction of sediment to the river system and effects to fish?</p> <p>Public Meeting; Presentation vs. Poster Boards.</p>	<p>Section 6.1.1 Surface Water and Surface Water Management and Appendix F - Erosion & Sediment Control Health Sciences Centre Berm</p> <p>Section 9.0 Public Information Meeting</p>
Alternatives	<p>What other alternatives were considered within the region?</p> <p>Was retrofitting existing infrastructure considered as an option for alternatives?</p> <p>Was there consideration of water retention, such as West of Clinch Crescent West?</p>	<p>Section 5.0 Alternatives</p> <p>Section 5.0 Alternative; Comment included reference to other undertakings, comment was recorded but not addressed in the EPR.</p> <p>Section 5.0 Alternatives, and Section 5.2 Flood - Control Reservoirs</p>
Approvals	Pippy Park Approvals	Section 10.0 Approval of the Undertaking; and Appendix H

CHAPTER 10 APPROVAL OF UNDERTAKING

Additional permits, approvals and authorizations may be required for the construction and operation of the Eastern Health – HSC Berm. The following permits, approvals, and authorizations from various issuing agencies that may be required include, but are not limited to, the items listed in Table 10.1.

Table 10.1 - List of Permits, approvals and authorization for the Undertaking

Permit, Approval or Authorization	Applicable Legislation	Issuing Body	File Number Registration Number
Approval for the Undertaking	<i>Environmental Protection Act, SNL 2002 / Environmental Assessment Regulation</i>	Minister of Municipal Affairs and Environment	1887
Development, Building, and Occupancy Permits	<i>City of St. John's Act, RSNL 1990</i>	St. John's City Council	
Approval from the C.A. Pippy Park Commission	<i>Pippy Park Commission Act, RSNL 1990</i>	C.A. Pippy Park Commission	N/A
Permit to Alter a Body of Water Schedule I- Development in a Flood Risk Area Schedule J - Miscellaneous Works in a Freshwater Body i.e. Other works not specific to above schedules	<i>Water Resources Act, SNL 2002 and MAE Policy for Development in Wetlands</i>	Department of Environment and Climate Change. Water Resources Management Division	
Request for Review	<i>Fisheries Act</i>	Fisheries and Oceans Canada (DFO)	16-HNFL-00368

The Pippy Park Commission provided Eastern Health a letter on June 30, 2017 granting approval of the HSC Berm subject to receipt of the all other required approvals (Appendix H).

A request for review was submitted to DFO on August 17, 2016. The Fisheries Protection Programme branch responded with a letter (File No: 16-HNFL-00368) dated September 16, 2016 that concluded with the provided mitigation measure implemented into the project planning, that it will not result in serious harm to fish and that no formal approval is required under the *Fisheries Act* (Appendix I).

This document was prepared for the party indicated herein. The material and information in the document reflects CBCL Limited's opinion and best judgment based on the information available at the time of preparation. Any use of this document or reliance on its content by third parties is the responsibility of the third party. CBCL Limited accepts no responsibility for any damages suffered because of third party use of this document.

APPENDIX A – Construction Drawings

Tract Consulting

Pinnacle Engineering Limited

Drawing Lists

00 COVER

C1 GENERAL PLAN

C2 SITE GRADING PLAN - 01

C3 SITE GRADING PLAN - 02

C4 SITE GRADING PLAN - 03

C5 SITE SECTIONS

D1 CIVIL CONSTRUCTIONS DETAILS

L1 LANDSCAPE LAYOUT

L2 LANDSCAPE LAYOUT

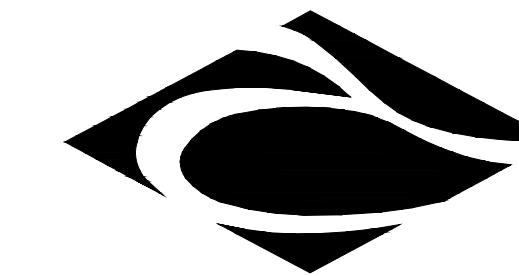
L3 LANDSCAPE LAYOUT



CLIENT:



PRIME CONSULTANT:



100 LEMARCHANT RD.
ST. JOHN'S, NL
CANADA A1C 2H2

TRACT

TEL (709) 738-2500
FAX (709) 738-2499

CIVIL CONSULTANT:



PROJECT TITLE:

**HEALTH SCIENCES CENTRE
FLOOD PROTECTION BERM**

DRAWINGS LIST:

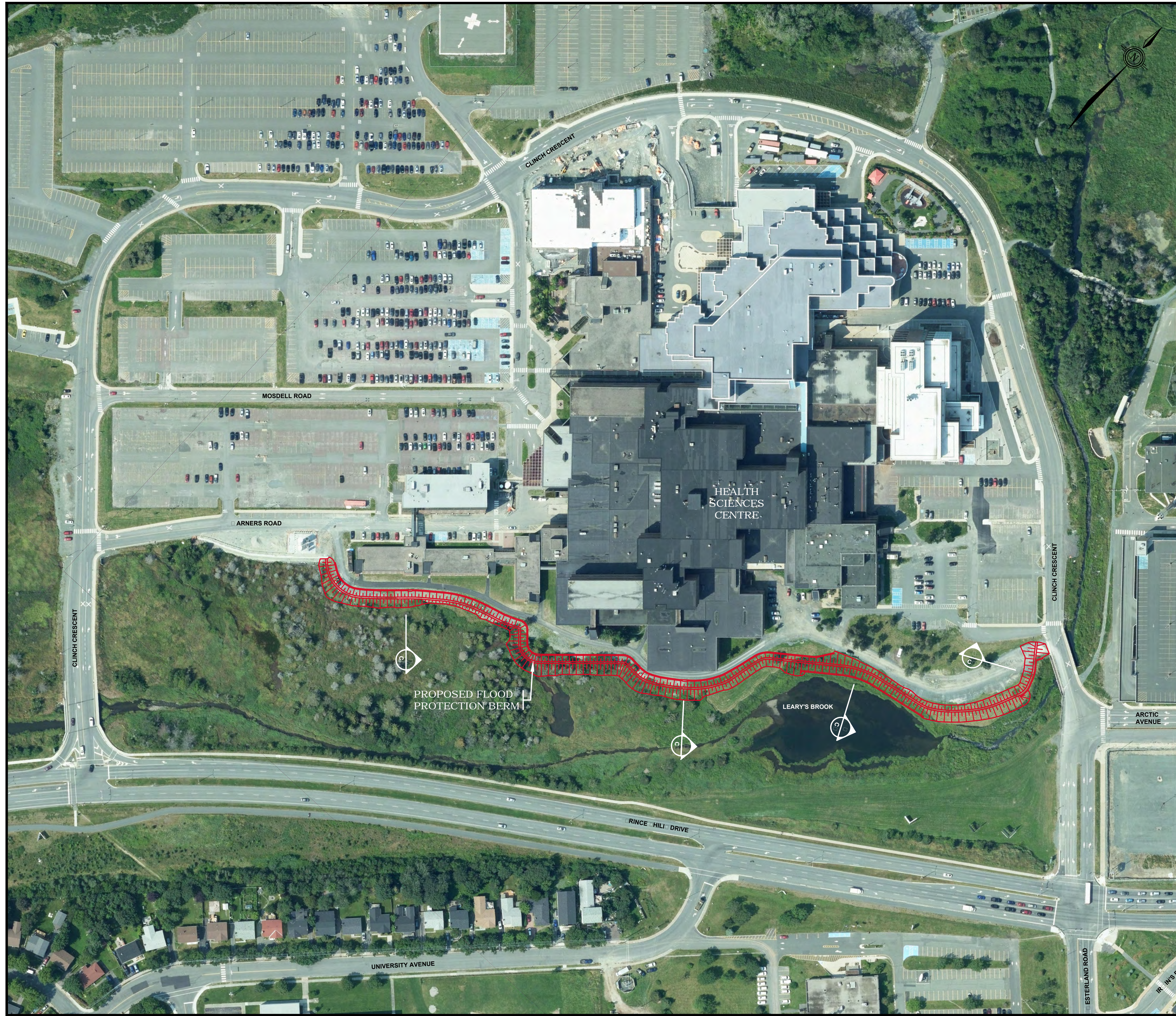
- 00 COVER
- C1 GENERAL PLAN PLAN
- C2 SITE GRADING PLAN - 01
- C3 SITE GRADING PLAN - 02
- C4 SITE GRADING PLAN - 03
- C5 SITE SECTION
- D1 CIVIL CONSTRUCTIONS DETAILS

- L1 LANDSCAPE LAYOUT
- L2 LANDSCAPE LAYOUT
- L3 LANDSCAPE LAYOUT

TYPICAL NOTES. (APPLIES TO ALL SHEETS)

1. DO NOT RELY UPON INFORMATION SHOWN ON THIS DRAWING FOR CONSTRUCTION UNLESS IT STATES BELOW THE SHEET HAS BEEN SPECIFICALLY ISSUED FOR THAT PURPOSE AND THE SHEET HAS BEEN STAMPED AND SIGNED.
2. SURVEY INFORMATION PROVIDED BY DUFFETT M. R. & ASSOCIATES, UPDATED 2016.
3. DO NOT SCALE FROM THIS DRAWING.
4. ALL DIMENSIONS ARE IN MILLIMETRES (mm) UNLESS OTHERWISE NOTED
5. CONTRACTOR TO VERIFY CONDITIONS ON SITE BEFORE PROCEEDING WITH THIS WORK.
6. CONTRACTOR TO ENSURE ALL PERMITS AND APPROVALS ARE IN PLACE BEFORE COMMENCING WORK.
7. CONTRACTOR TO LOCATE ALL BURIED SERVICES PRIOR TO COMMENCING EXCAVATION WORK.
8. TOPSOIL AND SOD ALL DISTURBED AREAS UNLESS OTHERWISE NOTED.
9. WHERE POSSIBLE, RETAIN EXISTING VEGETATION.
10. ALL WORK TO CONFORM TO CITY OF ST. JOHN'S MASTER SPECIFICATIONS, LATEST EDITION, UNLESS NOTED OTHERWISE.

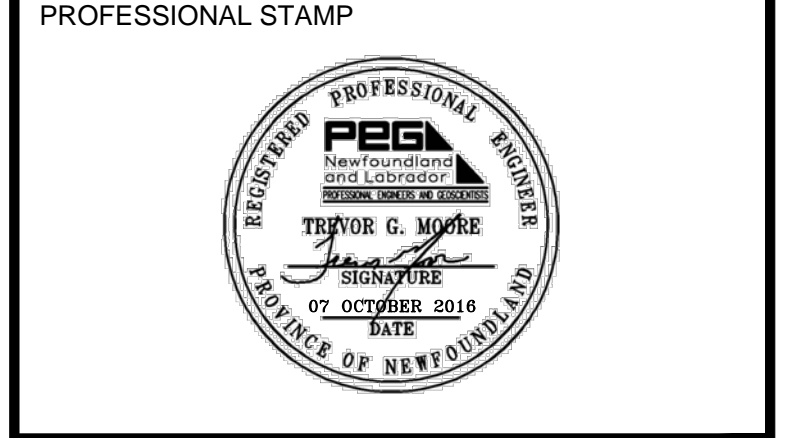
No.	By	DESCRIPTION	MM/DD/YYYY
1	TW	ISSUE FOR CONSTRUCTION	10/07/2016
0	TW	ISSUE FOR TENDER	08/15/2016
REVISIONS			



- GENERAL NOTES**
- ALL WORK TO BE PERFORMED IN ACCORDANCE WITH THE CITY OF ST. JOHN'S SPECIFICATIONS BOOK.
 - CONTOURS SHOWN ARE BASED ON TOPOGRAPHIC SURVEY BY M.R. DUFFETT & ASSOC AND CITY OF ST. JOHN'S DIGITAL LIDAR MAPPING.
 - AERIAL PHOTO SHOWN ON DWG C1 IS FOR ILLUSTRATIVE PURPOSES ONLY AND MAY NOT REFLECT CURRENT EXISTING SITE CONDITIONS.
 - ALL MEASUREMENTS ARE HORIZONTAL GROUND DISTANCES IN METRES AND REFERENCED TO NAD83 DATUM.
 - LEGAL SURVEYOR TO ESTABLISH TBMS.
 - CONTRACTOR RESPONSIBLE TO SECURE SITE DURING CONSTRUCTION FOR PUBLIC SAFETY.
 - DO NOT SCALE FROM DRAWINGS.
 - THE PROJECT SOILS REPORT CONSISTS OF THE FOLLOWING DOCUMENTS PREPARED BY STANTEC CONSULTING LTD.:
 - GEOTECHNICAL INVESTIGATION - FLOOD PROTECTION BERM (REV. 1), HEALTH SCIENCES CENTRE, ST. JOHN'S NL (FILE No. 121619655) DATE 7 JULY 2016.
- EROSION / SEDIMENTATION CONTROL NOTES**
- CONTRACTOR SHALL SUBMIT AN EROSION AND SEDIMENTATION CONTROL (ESC) PLAN PREPARED BY QUALIFIED FIRM FOR REGULATORY APPROVAL. COMMENCEMENT OF WORK SHALL NOT TAKE PLACE UNTIL ESC PLAN IS APPROVED BY REGULATORY AGENCIES. THE ESC PLAN SHALL AT A MINIMUM ADDRESS / INCORPORATE THE FOLLOWING MEASURES:
 - SITE DEWATERING.
 - ENSURE ALL WORK IS COMPLETED WITHIN THE TIMING WINDOW (JUNE 1 TO SEPTEMBER 30) IN COMPLIANCE WITH THE DEPARTMENT OF FISHERIES AND OCEANS FOR IN-STREAM WORK.
 - THE WORK SHALL BE SCHEDULED TO AVOID WET, WINDY AND RAINY PERIODS TO REDUCE EROSION AND SEDIMENT MOVEMENT.
 - ADDRESS THE OPERATION AND MAINTENANCE OF MACHINERY FOR THIS PROJECT.
 - THE SITE SHALL BE STABILIZED UPON COMPLETION OF THE WORK IN ACCORDANCE WITH THE CONSTRUCTION DRAWINGS. REMOVE ALL NON-BIODEGRADABLE ESC CONTROL MEASURES ONCE SITE IS STABILIZED.
 - INSTALLATION OF EFFECTIVE ESC MEASURES TO BE COMPLETED BEFORE COMMENCING ANY WORK TO PREVENT SEDIMENT FROM ENTERING THE WATER BODY. THE COST OF PROVIDING ESC PLAN AND MEASURES IS INCIDENTAL TO THE CONTRACT.
 - CONTRACTOR SHALL PROVIDE ENGINEER WITH WEEKLY ESC INSPECTION REPORT WITH MINIMUM OF THREE DIGITAL PHOTOGRAPHS OF EACH ESC MEASURE. THE INSPECTION REPORT TO NOTE ANY DEFICIENCIES AND THE CORRECTIVE ACTIONS TAKEN TO RECTIFY PROBLEMS. CORRECTIVE ACTION TO TAKE PLACE WITHIN 24HR OF INSPECTION. INSPECTION OF ESC TO TAKE PLACE WEEKLY AND AFTER EACH RAINFALL EVENT.
- SITE / RADIN / NOTES**
- CONTRACTOR TO VERIFY ALL DIMENSIONS AND ELEVATIONS ON SITE BEFORE PROCEEDING WITH THIS WORK.
 - ALL DISTURBED AREAS BEYOND LIMITS OF WORK TO BE RESTORED TO ORIGINAL CONDITIONS OR BETTER.
 - CONTRACTOR TO PROVIDE CONSTRUCTION METHODS TO SUIT LOCAL SOIL CONDITIONS & THAT WILL NOT WEAKEN SUBGRADE. RECTIFY DEFICIENCIES IN SUBGRADE CAUSED BY CONSTRUCTION OPERATIONS TO SATISFACTION OF ENGINEER.
 - EXISTING STREAM RESERVATION TO BE UNDISTURBED (UNLESS OTHERWISE NOTED). ABSOLUTELY NO CUTTING OR HEAVY MACHINERY PERMITTED IN THIS AREA. ALL WORK WITHIN LEARY'S BROOK TO BE COMPLETED DURING DRY SEASON IN ACCORDANCE WITH DEPARTMENT OF FISHERIES AND OCEANS AND DEPARTMENT OF ENVIRONMENT & CONSERVATION REQUIREMENTS.
 - CONTRACTOR TO INSTALL 1.8m HIGH 'PROTEK' TEMPORARY GALVANIZED BARRICADE HOARDING FENCE PANELS OR APPROVED EQUAL. CONTRACTOR TO PROVIDE TEMPORARY HOARDING FENCE PLAN TO BE APPROVED BY EASTERN HEALTH.
 - STABILIZE SLOPES WITH 150mm TOPSOIL & SOD UNLESS OTHERWISE NOTED.
 - MINIMUM FINISHED SLOPE OF LANDSCAPED AREAS TO BE 2.00%.
 - INSTALL GRANULARS, ASPHALT, AND CURB & GUTTER IN ACCORDANCE WITH CITY OF ST. JOHN'S SPECIFICATIONS BOOK. ALL ASPHALT CUTS IN WALKING TRAIL TO HAVE A 3.0m WIDE RESTORATION PATCH.
 - ASPHALT RECONSTRUCTION ON WALKING TRAILS TO CONSIST OF 100mm CLASS 'A' AND 50mm 'C' ASPHALT.
 - NORMAL VARIATIONS BETWEEN TEST PITS SHOULD BE EXPECTED AND SHALL BE INCLUDED IN THE CONTRACTOR'S COSTS. REFER TO PROJECT SOILS REPORT.
 - TEST PIT LOCATIONS ARE BASED AS PER PROJECT SOILS REPORTS.
 - BOG DEPTHS ARE APPROXIMATE. REFER TO PROJECTS REPORT.
 - REFER TO PROJECT SOILS REPORT FOR SUBSURFACE FINDINGS, SITE PREPARATION AND STRUCTURAL FILL.
- SITE SERVICIN / NOTES**
- CONTRACTOR RESPONSIBLE FOR LOCATING EXISTING UNDERGROUND INFRASTRUCTURE AND CONFIRMING PIPE SIZES, & INVERT ELEVATIONS (I.E. WATERMAIN, STORM SEWERS, TELEPHONE, CABLE, POWER LINES, FIBROPTIC LINES, ETC) BEFORE PROCEEDING WITH THIS WORK. ADVISE ENGINEER OF ANY DISCREPANCIES.
 - EX. WATERMAIN SHOWN IN APPROXIMATE LOCATION ONLY. CONTRACTOR TO PROCEED WITH EXTREME CAUTION WHEN WORKING IN CLOSE PROXIMITY TO EX. WATERMAIN. ANY DAMAGE TO EX. INFRASTRUCTURE SHALL BE CORRECTED AT THE CONTRACTOR'S EXPENSE.
 - CONTRACTOR TO OBTAIN PERMIT TO CONNECT PRIOR TO COMMENCING ANY SERVING WORK.
 - DITCH INLET SIZES SHOWN TO BE CONFIRMED BY MANHOLE SUPPLIER. CONTRACTOR TO PROVIDE SHOP DRAWINGS OF ALL DITCH INLETS, BACKFLOW VALVES, RECON BLOCK RETAINING WALLS & HANDRAILS FOR APPROVAL.
 - RECON BLOCK SIZES SHOWN ARE FOR ILLUSTRATIVE PURPOSES ONLY. CONTRACTOR TO VERIFY RECON BLOCK SIZES WITH MANUFACTURER AND INCLUDE IN THEIR PRICING. CONTRACTOR TO PROVIDE SHOP DRAWINGS OF ALL RECON BLOCK RETAINING WALLS & HANDRAILS FOR APPROVAL. SHOP DRAWINGS SHALL BE SIGNED & STAMPED BY A PROFESSIONAL ENGINEER LICENSED TO PRACTICE IN NEWFOUNDLAND & LABRADOR.
 - RED STORM SEWERS IN CLASS 'B' BEDDING (CLASS 'B' BEDDING NOT REQUIRED IN LOCATIONS WHERE CONCRETE ENCASEMENT OR TRENCH PLUG ARE SPECIFIED).
 - CONSTRUCT, TEST AND INSPECT STORM SEWERS IN ACCORDANCE WITH CITY OF ST. JOHN'S SPECIFICATION BOOK.
 - SUBRAIN TO BE CONSTRUCTED USING 150mm PVC PERFORATED PIPE (SRD28) USING LONG RADIUS BENDS, TEES AND WYE CONNECTIONS.
 - CONTRACTOR TO INSTALL 'GALAXY PLASTICS' 300mm THREE-WAY GASKETED INLINE BACKWATER VALVE C/W 300 PVC (SDR35) RISER PIPE, END CAP, QUAZITE PG2424B24 ENCLOSURE BOX AND QUAZITE PG2424CA0009 BOLT-DOWN COVER LOCATED AT CENTER OF FLOOD PROTECTION BERM. CONTRACTOR TO PROVIDE COMMON FILL TRENCH PLUG WITH 30% MIN. FINES). PLUG TO BE FULL TRENCH WIDTH & DEPTH AND 2.0m LONG DOWNSTREAM OF INLINE BACKWATER VALVE.
 - CONTRACTOR TO PROVIDE CONCRETE ENCASEMENT TO PROTECT STORM SEWER. MINIMUM SIZE OF CONCRETE ENCASEMENT TO BE PIPE O.D. + 300mm ALL AROUND. MINIMUM CONCRETE COMPRESSIVE STRENGTH 30MPa AFTER 28 DAYS.



NO.	REVISIONS	DATE
1	ISSUED FOR CONSTRUCTION	07/10/16
0	ISSUED FOR TENDER	15/08/16



PROVINCE OF NEWFOUNDLAND
 PERMIT HOLDER
 PEG and Labrador
 Class 'A'
 This Permit Allows
 PINNACLE ENGINEERING LIMITED
 To practice Professional Engineering
 in Newfoundland and Labrador.
 Permit No. as issued by PEGNL L0331
 which is valid for the year 2016.

CIVIL CONSULTANT
PINNACLE
 ENGINEERING LIMITED

PROJECT TITLE
**HEALTH SCIENCES CENTRE -
 FLOOD PROTECTION BERM**

SHEET TITLE
GENERAL PLAN

PROJECT NO.
16016

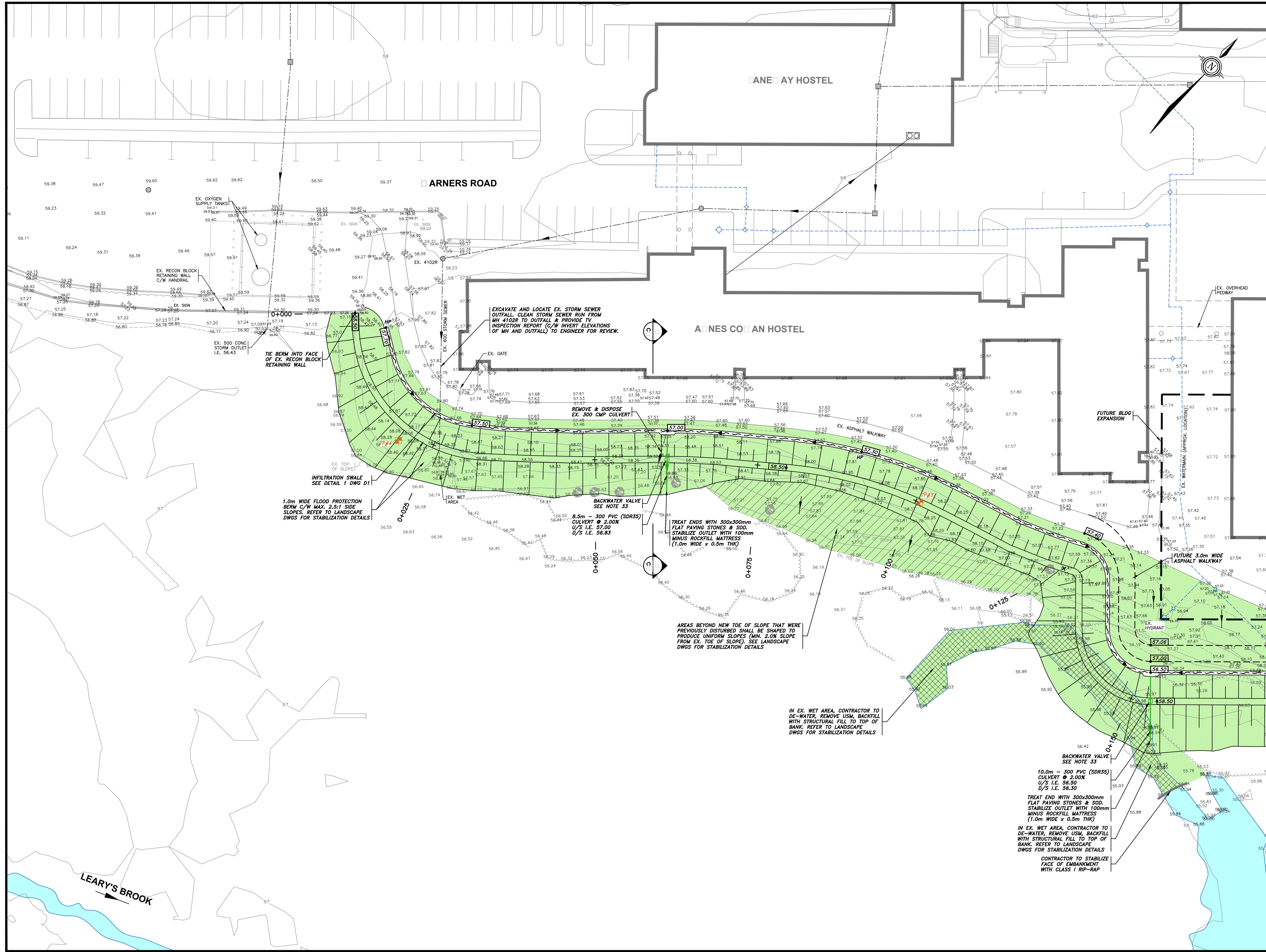
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CHECKED BY
 KHH

DATE
 JUNE 2016

DRAWING NO.
C1

SCALE
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LEGEND:

- EXISTING GROUND SPOT ELEVATIONS (TOPO SURVEY BY M.R. DUFFETT & ASSOC.)
- EXISTING FENCELINE
- EXISTING DITCH CENTRELINE
- EXISTING TREE LINE
- EXISTING HYDROPOLE
- EXISTING LIGHT STANDARD
- EXISTING SIGN
- EXISTING WATERMAIN (SEE NOTE 1)
- EXISTING HYDRANT & MARKER POLE
- EXISTING LINE VALVE
- EXISTING SANITARY TRUNK SEWER
- EXISTING SANITARY MANHOLE
- EXISTING STORM SEWER
- EXISTING STORM MANHOLE
- EXISTING SINGLE CATCHBASIN
- NEW FINISHED GRADE
- NEW TOP OF RETAINING WALL ELEVATION
- NEW INFILTRATION SWALE
- REFER TO LANDSCAPE DWGS FOR STABILIZATION DETAILS
- STABILIZE WITH CLASS 1 HYDRAULIC RIP-RAP
- NEW STORM SEWER
- NEW PERFORATED SUBDRAIN
- NEW RECON BLOCK RETAINING WALL C/W HANDRAIL
- 2.5H:1V TRANSITIONAL SLOPING UNLESS NOTED OTHERWISE
- BOS PROBE LOCATIONS (SEE PROJECT SOILS REPORT & NOTE 9 DWG C1)
- TEST PIT LOCATIONS (SEE PROJECT SOILS REPORT & NOTE 9 DWG C1)

1	ISSUED FOR CONSTRUCTION	07/10/16
0	ISSUED FOR TENDER	15/08/16
NO.	REVISIONS	DATE

PROFESSIONAL STAMP

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PINNACLE ENGINEERING LIMITED

PROJECT TITLE
HEALTH SCIENCES CENTRE - FLOOD PROTECTION BERM

SHEET TITLE
SITE GRADING PLAN - 01

PROJECT NO.
16016

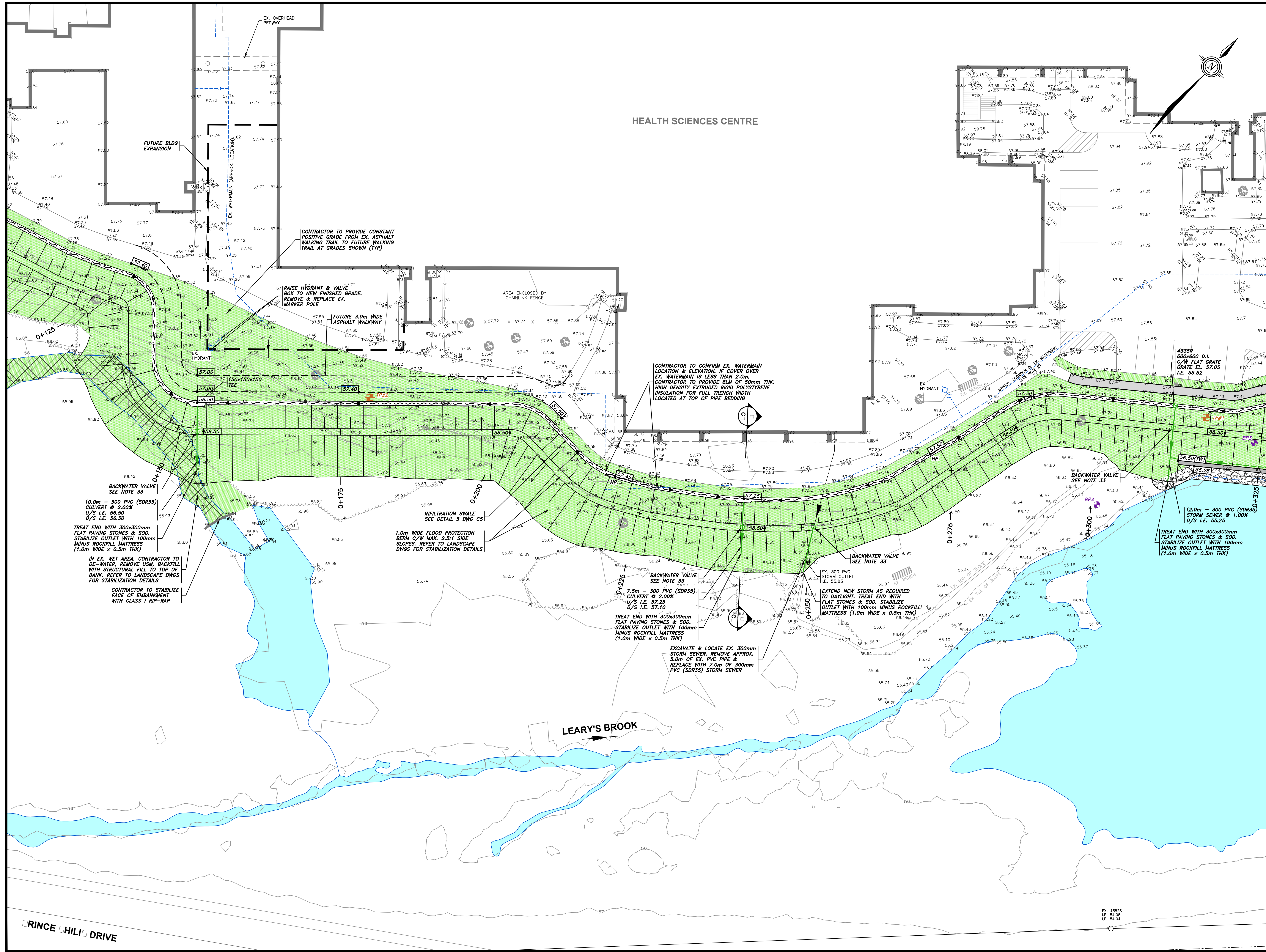
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DATE
JUNE 2016

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C2

SCALE
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LEGEND:

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- EXISTING FENCELINE
- EXISTING DITCH CENTRELINE
- EXISTING TREE LINE
- EXISTING HYDROPOLE
- EXISTING LIGHT STANDARD
- EXISTING SIGN
- EXISTING WATERMAIN (SEE NOTE 1)
- EXISTING HYDRANT & MARKER POLE
- EXISTING LINE VALVE
- EXISTING SANITARY TRUNK SEWER
- EXISTING SANITARY MANHOLE
- EXISTING STORM SEWER
- EXISTING STORM MANHOLE
- EXISTING SINGLE CATCHBASIN
- NEW FINISHED GRADE
- NEW TOP OF RETAINING WALL ELEVATION
- NEW INFILTRATION SWALE
- REFER TO LANDSCAPE DWGS FOR STABILIZATION DETAILS
- STABILIZE WITH CLASS HYDRAULIC RIP-RAP
- NEW STORM SEWER
- NEW PERFORATED SUBDRAIN
- NEW PECON BLOCK RETAINING WALL C/W HANDRAIL
- 2.5H:1V TRANSITIONAL SLOPING UNLESS NOTED OTHERWISE
- BOG PROBE LOCATIONS (SEE PRODUCT SOILS REPORT & NOTE 9 DWG C1)
- TEST PIT LOCATIONS (SEE PROJECT SOILS REPORT & NOTE 9 DWG C1)

1	ISSUED FOR CONSTRUCTION	07/10/16
0	ISSUED FOR TENDER	15/08/16
NO.	REVISIONS	DATE

PROFESSIONAL STAMP

PROVINCE OF NEWFOUNDLAND
 PERMIT HOLDER
 Class 'A'
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 Permit No. as issued by PEGNL L0331
 which is valid for the year 2016.

CIVIL CONSULTANT

PROJECT TITLE
**HEALTH SCIENCES CENTRE -
 FLOOD PROTECTION BERM**

SHEET TITLE
SITE GRADING PLAN - 02

PROJECT NO.
16016

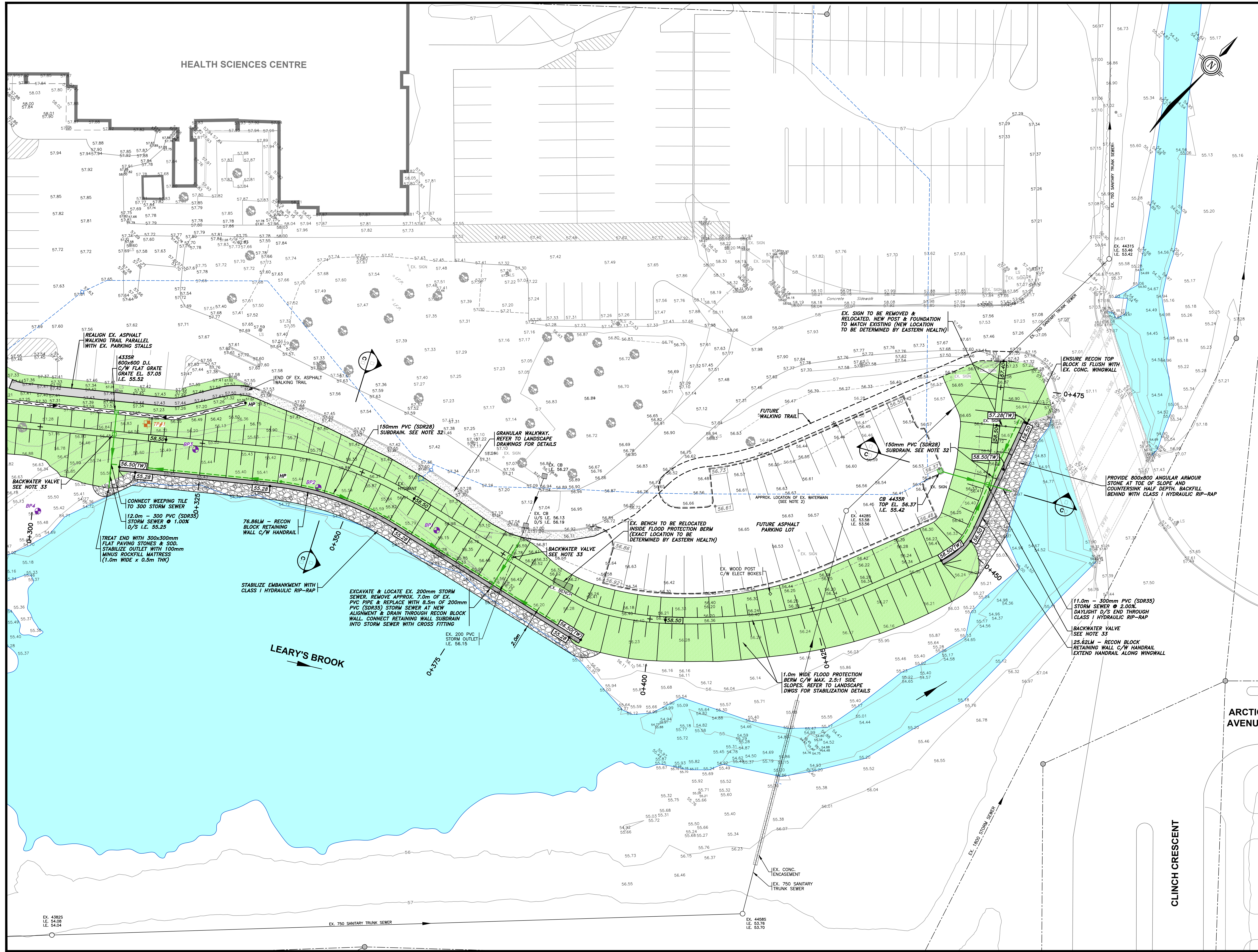
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CHECKED BY
 KHH

DATE
 JUNE 2016

DRAWING NO.
C3

SCALE
 1 : 250






Eastern Health

LEGEND:

- EXISTING GROUND SPOT ELEVATIONS (TOPO SURVEY BY M.R. DUFFETT & ASSOC.)
- EXISTING FENCELINE
- EXISTING DITCH CENTRELINE
- EXISTING TREE LINE
- EXISTING HYDROPOLE
- EXISTING LIGHT STANDARD
- EXISTING SIGN
- EXISTING WATERMAIN (SEE NOTE 1)
- EXISTING HYDRANT & MARKER POLE
- EXISTING LINE VALVE
- EXISTING SANITARY TRUNK SEWER
- EXISTING SANITARY MANHOLE
- EXISTING STORM SEWER
- EXISTING STORM MANHOLE
- EXISTING SINGLE CATCHBASIN
- NEW FINISHED GRADE
- NEW TOP OF RETAINING WALL ELEVATION
- NEW INFILTRATION SWALE
- REFER TO LANDSCAPE DWGS FOR STABILIZATION DETAILS
- STABILIZE WITH CLASS I HYDRAULIC RIP-RAP
- NEW STORM SEWER
- NEW PERFORATED SUBDRAIN
- NEW RECON BLOCK RETAINING WALL C/W HANDRAIL
- 2.5H:1V TRANSITIONAL SLOPING UNLESS NOTED OTHERWISE
- BOG PROBE LOCATIONS (SEE PROJECT SOILS REPORT & NOTE 9 DWG C1)
- TEST PIT LOCATIONS (SEE PROJECT SOILS REPORT & NOTE 9 DWG C1)

	ISSUED FOR CONSTRUCTION	07/10/16
	ISSUED FOR TENDER	15/08/16
NO.	REVISIONS	DATE

PROFESSIONAL STAMP



PROVINCE OF NEWFOUNDLAND PERMIT HOLDER

PEGNL Class 'A' This Permit Allows

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PINNACLE ENGINEERING LIMITED

PROJECT TITLE

HEALTH SCIENCES CENTRE - FLOOD PROTECTION BERM

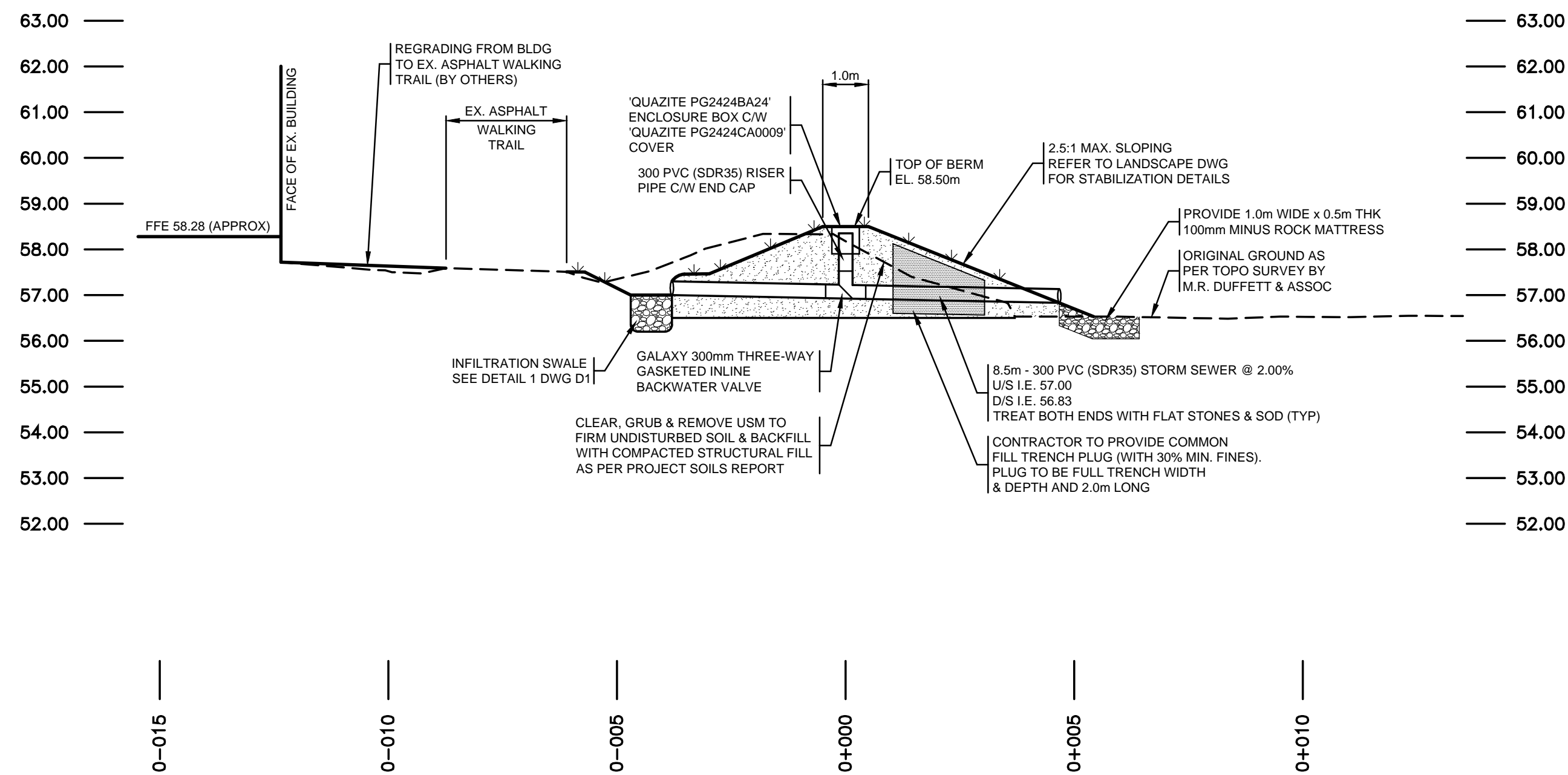
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SITE GRADING PLAN - 03

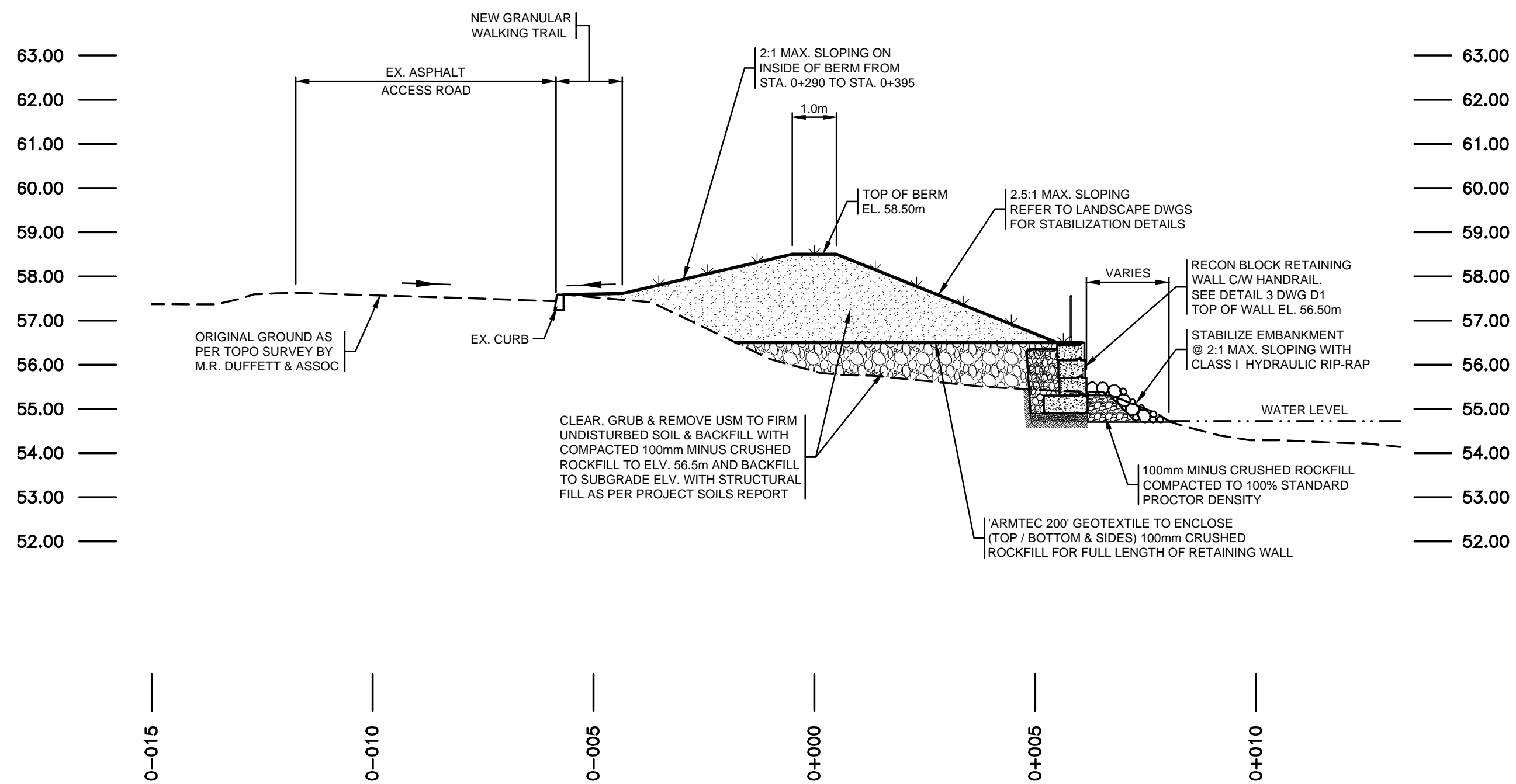
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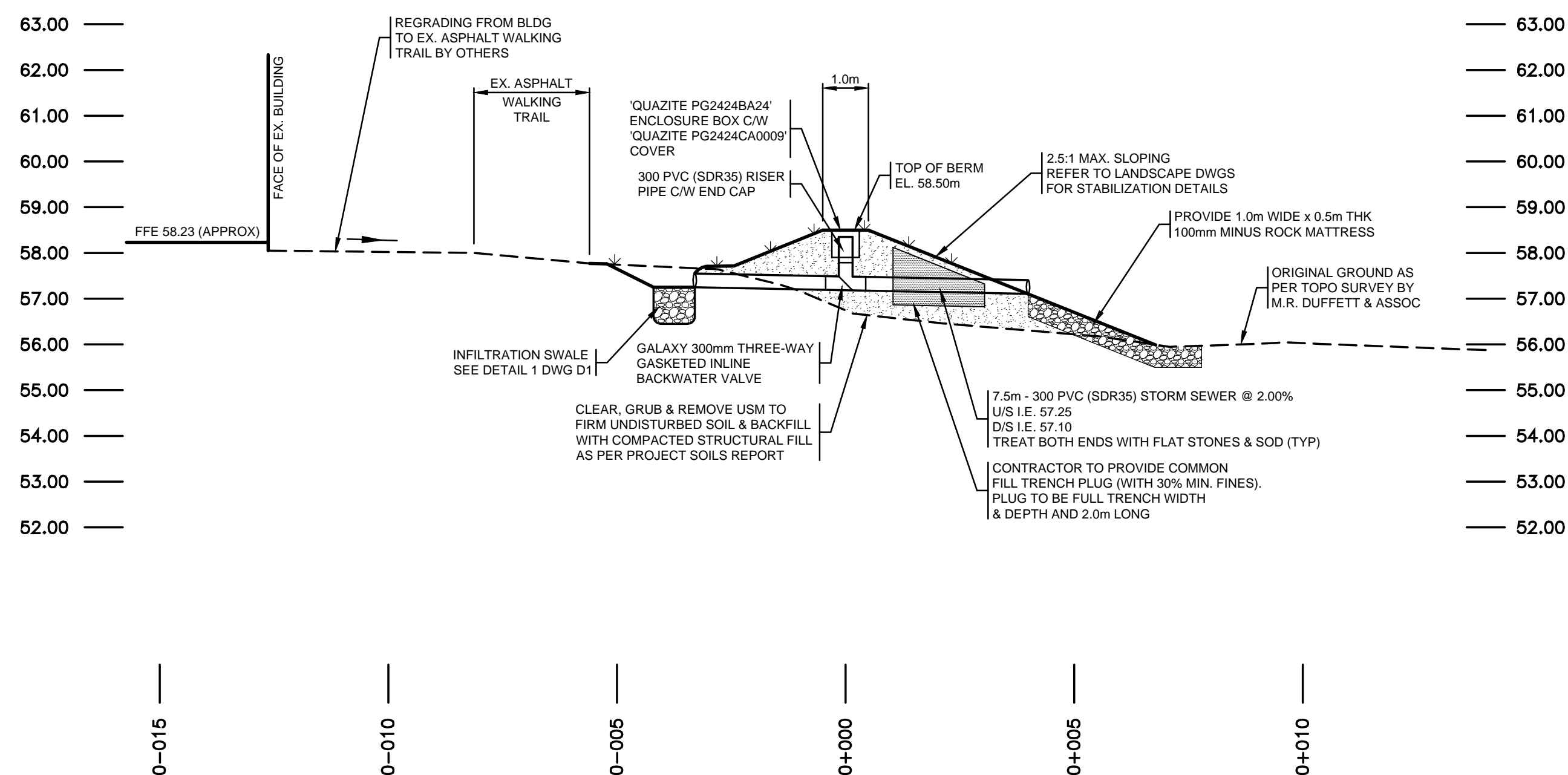
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DATE JUNE 2016	DRAWING NO. C4
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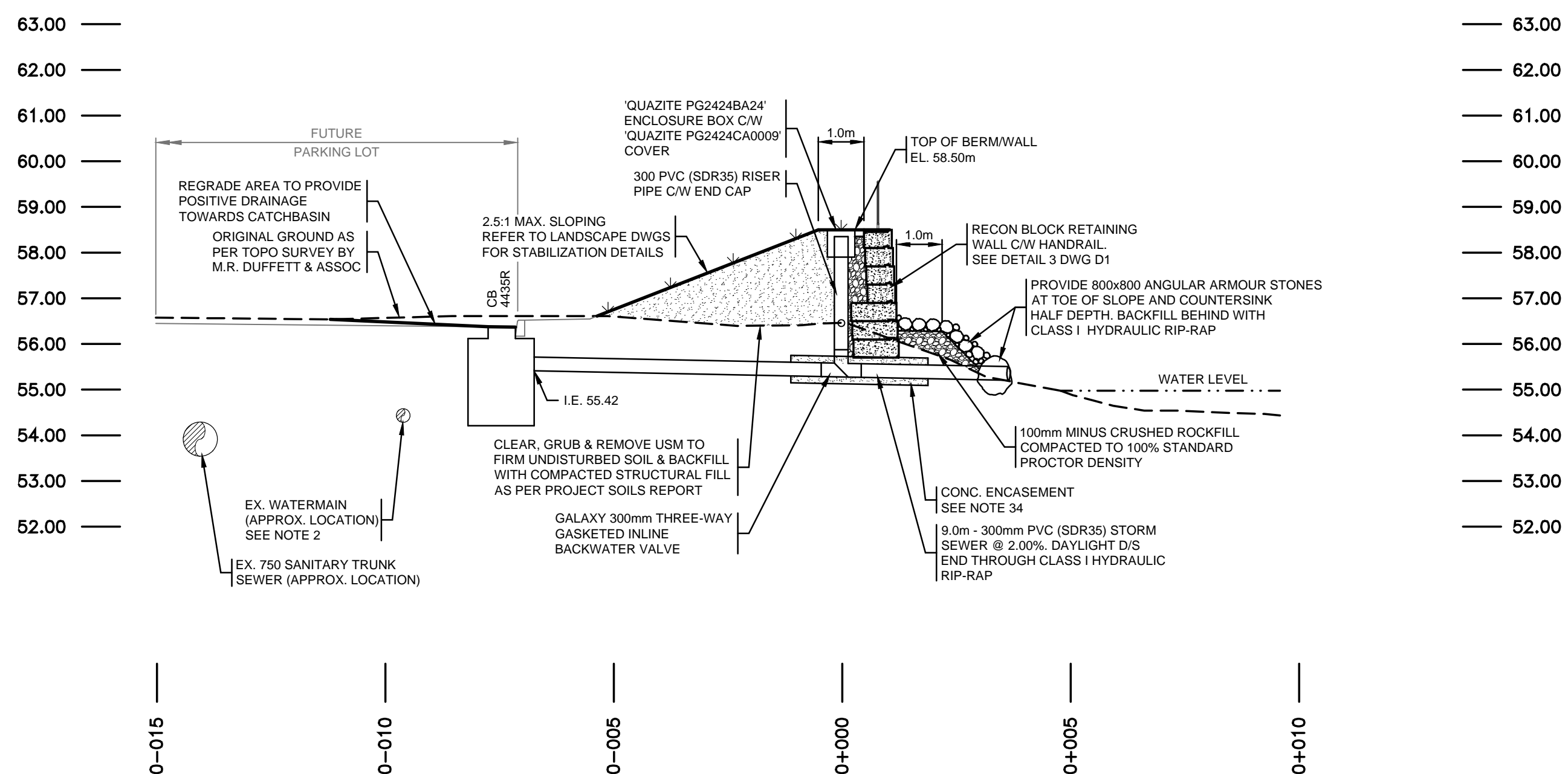
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SITE SECTION (STA) SCALE



SITE SECTION (STA) SCALE



SITE SECTION (STA) SCALE

NO.	REVISIONS	DATE
1	ISSUED FOR CONSTRUCTION	07/10/16
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CIVIL CONSULTANT

PROJECT TITLE

HEALTH SCIENCES CENTRE - FLOOD PROTECTION BERM

SHEET TITLE

SITE SECTIONS

PROJECT NO.

16016

DRAWN BY

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KHH

DATE

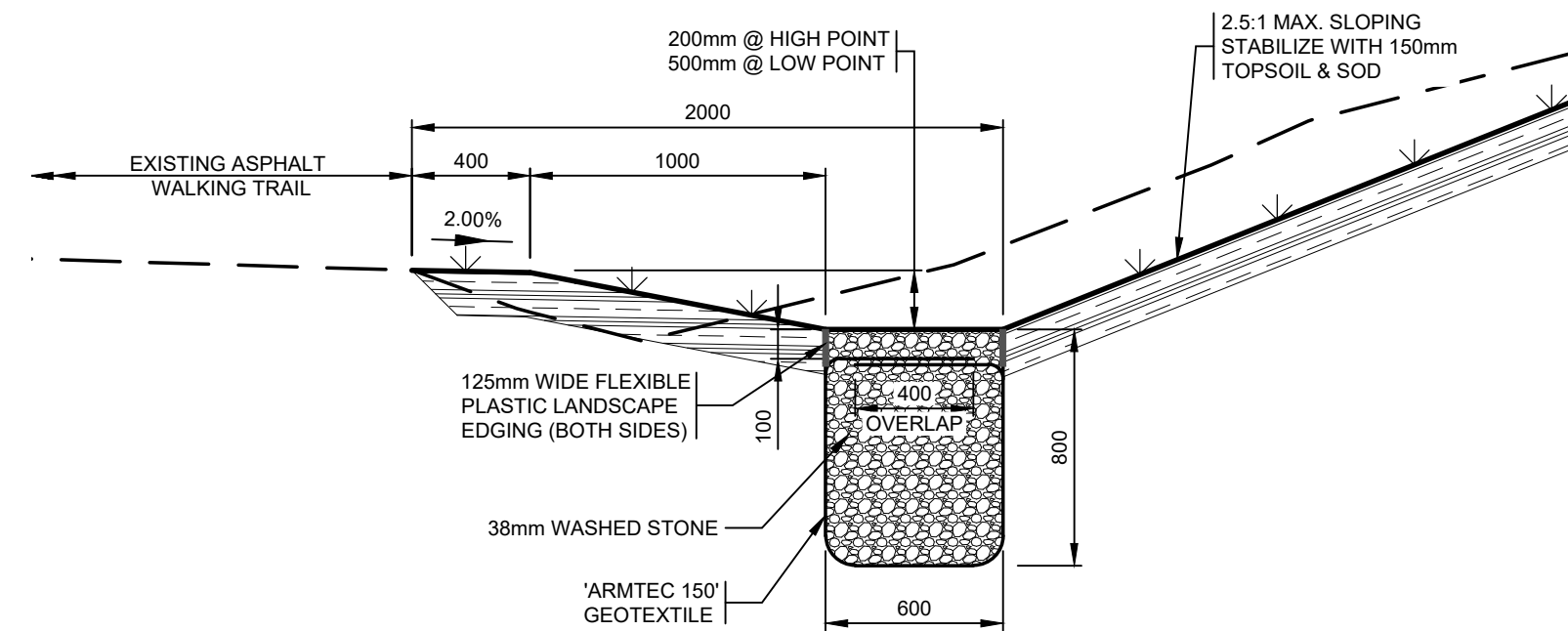
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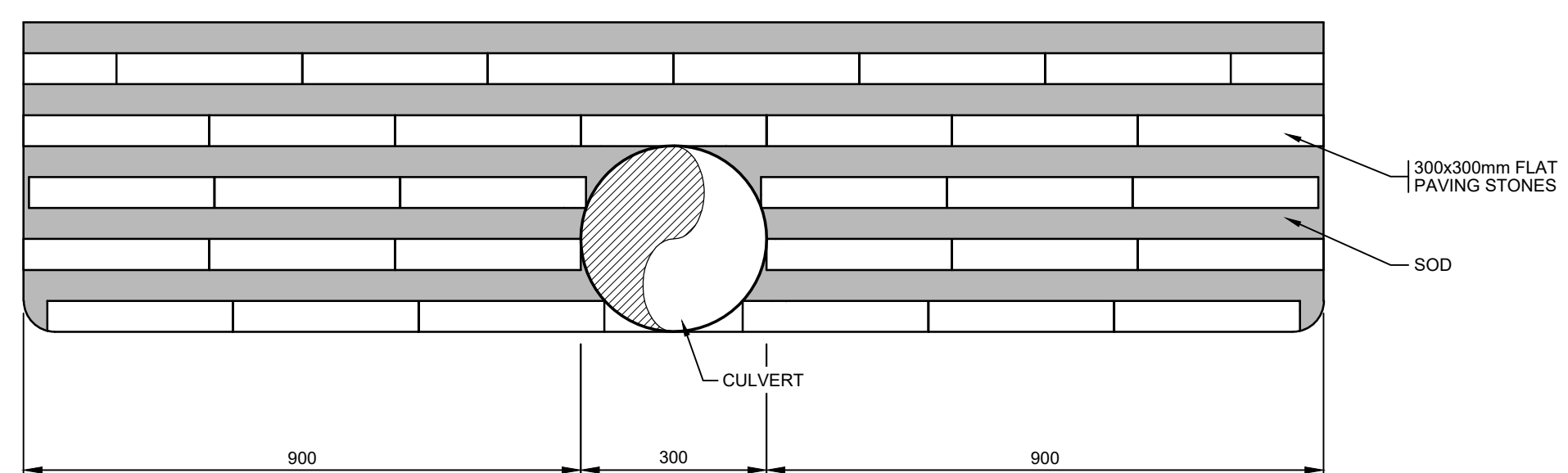
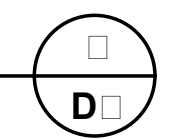
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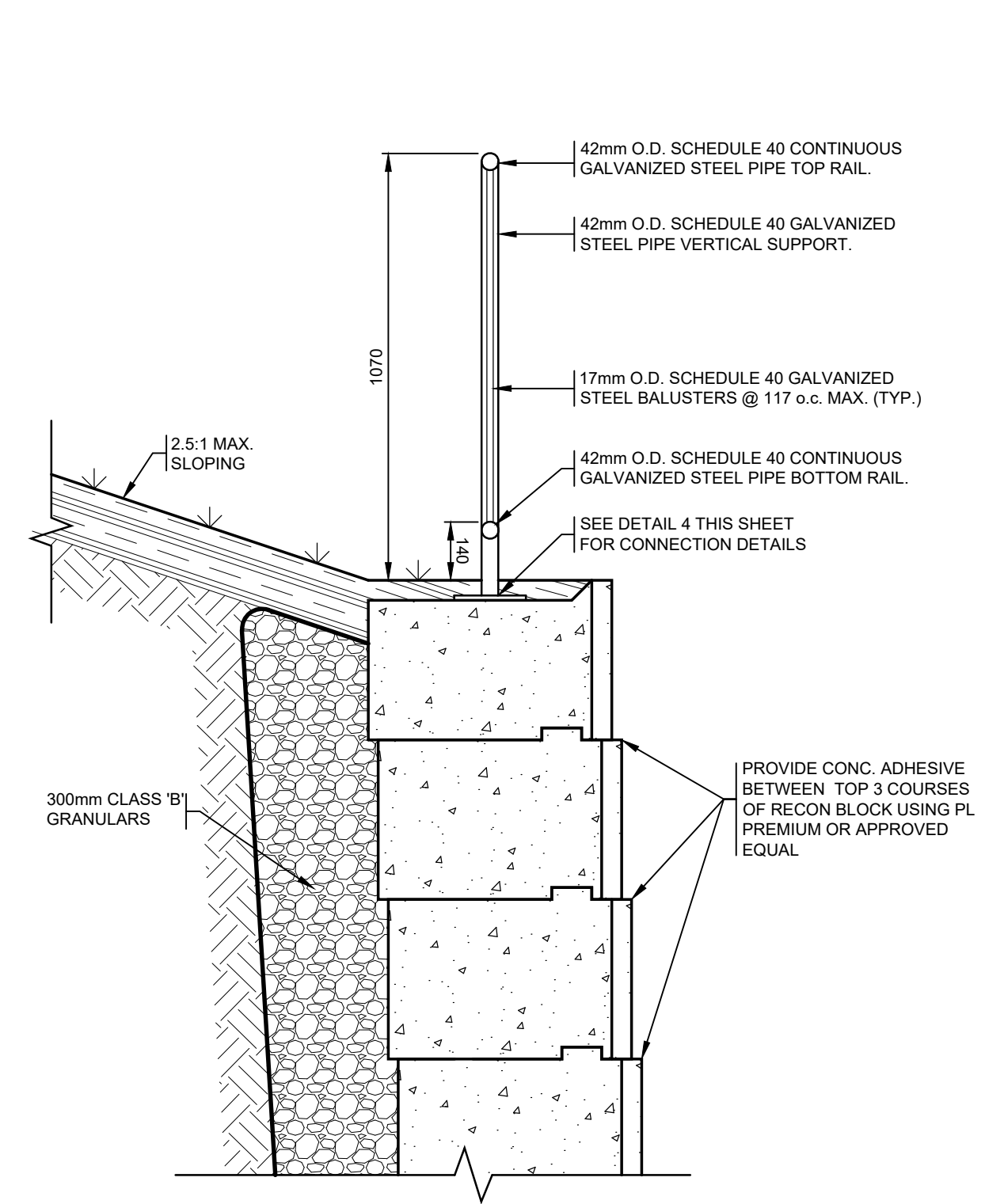
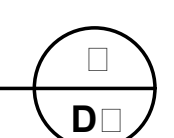
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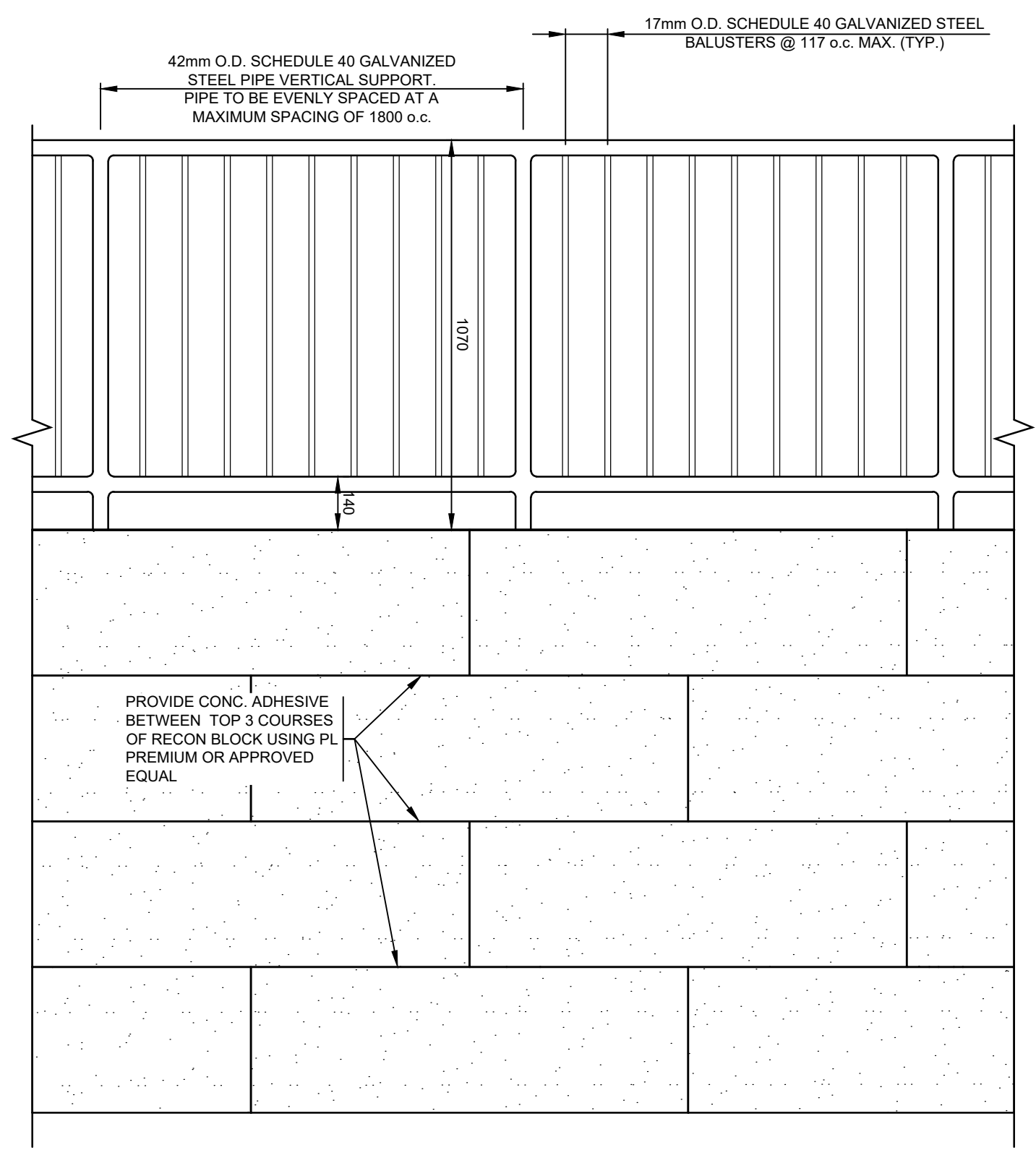
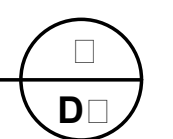
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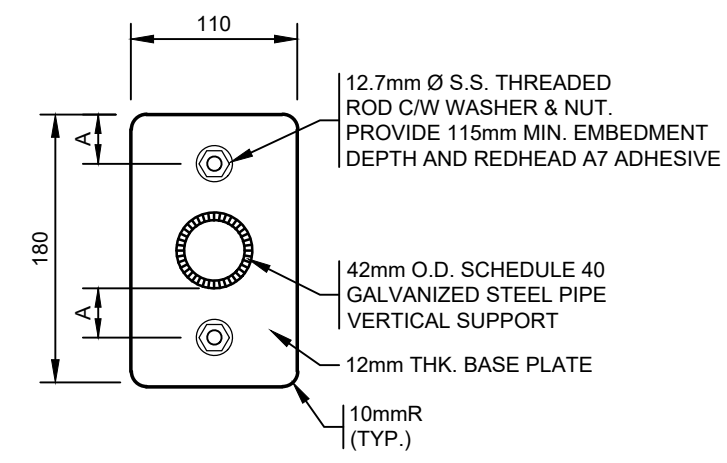
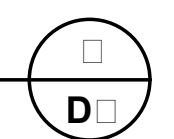
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TYPICAL HANDRAIL DETAIL
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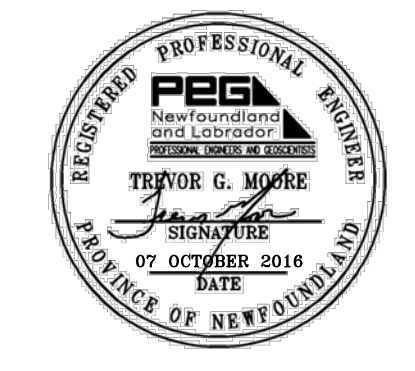


HANDRAIL CONNECTION DETAIL
SCALE: N.T.S.



NO.	REVISIONS	DATE
1	ISSUED FOR CONSTRUCTION	07/10/16
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PROFESSIONAL STAMP



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ENGINEERING LIMITED

PROJECT TITLE
**HEALTH SCIENCES CENTRE -
FLOOD PROTECTION BERM**

SHEET TITLE
**CIVIL CONSTRUCTION
DETAILS**

PROJECT NO.
16016

DRAWN BY
MEWC

CHECKED BY
KHH

DATE
JUNE 2016

DRAWING NO.
D1

SCALE
AS SHOWN

NOTES

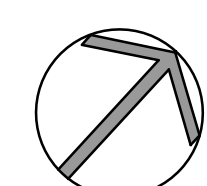
- PLANTING NOTES:**
- LOCATE AND VERIFY THE EXISTENCE OF ALL UTILITIES PRIOR TO STARTING WORK.
 - LOCATION OF ALL PLANT MATERIAL SHALL BE APPROVED ON SITE PRIOR TO INSTALLATION.
 - ALL PLANT MATERIAL SHALL CONFORM TO "CANADIAN STANDARDS FOR NURSERY STOCK".
 - ALL PLANTS SHALL BEAR THE SAME RELATIONSHIP TO FINISHED GRADE AS THE PLANT'S ORIGINAL GRADE BEFORE DIGGING.
 - ALL PLANTS AND STAKES SHALL BE SET PLUMB.
 - ALL PLANTS SHALL BE WATERED THOROUGHLY TWICE DURING THE FIRST 24 HOUR PERIOD FOLLOWING PLANTING. ALL PLANTS SHALL BE WATERED WEEKLY, OR MORE IF NECESSARY, DURING THE FIRST GROWING SEASON.
 - PLANTING SOIL MIXTURE: 3 PARTS SCREENED TOPSOIL, 1 PART WELL ROTTED MANURE, AND 1 PART PEAT.
 - ALL SHRUB GROUPINGS SHALL BE IN A CONTINUOUSLY MULCHED PLANTING BED.
 - ALL PLANTS SHALL BE GUARANTEED FOR ONE YEAR FROM THE DATE OF ACCEPTANCE BY THE LANDSCAPE ARCHITECT. ANY MATERIAL NEEDING REPLACEMENT AS DETERMINED BY THE LANDSCAPE ARCHITECT SHALL HAVE AN ADDITIONAL ONE YEAR GUARANTEE PERIOD.
 - PLANT MATERIAL LOCATION SHALL BE VERIFIED ON SITE BY TRACT CONSULTING PRIOR TO INSTALLATION.
 - ALL LANDSCAPED AREAS THAT ARE DISTURBED IN THE CONSTRUCTION PROCESS SHALL BE SODDED UNLESS NOTED OTHERWISE.
 - COORDINATE LANDSCAPE WORK WITH CIVIL DRAWINGS. INFORM CONSULTANT OF ANY DISCREPANCIES.
 - SUBMIT TOPSOIL FOR TESTING, PROVIDE RESULTS FOR REVIEW. AMEND SOIL AS INDICATED IN SOIL TEST REPORT
 - HYDRO-SEED MIX:
30% BIRDSFOOT TREFLOIL
15% WHITE CLOVER
5% BOREAL CREEPING FESCUE
35% TIMOTHY
7% DOUBLE CUT RED CLOVER
8% ALSIKE CLOVER
SEEDING RATE: 225 kg/hectar
MULCH: 1250 kg/ha
TACKIFIER: 25 kg/ha
FERTILIZER: 600 kg/ha
 - HYDROSEED MIXTURE TO INCLUDE LIME AT RATES AS RECOMMENDED BY SEED SUPPLIER.
 - ALL WORK TO CONFORM TO CITY OF ST. JOHN'S MASTER SPECIFICATIONS, LATEST EDITION, UNLESS NOTED OTHERWISE.

LEGEND:

- [Pattern] TOPSOIL AND SOD
- [Pattern] TOPSOIL AND HYDRO-SEED

NOTE:
1. ALL OTHER AREAS DISTURBED BY CONSTRUCTION TO BE REINSTATED WITH 150mm OF TOPSOIL AND SOD UNLESS OTHERWISE NOTED.

STAMP

NORTH REF.	
	

1	TW	ISSUED FOR CONSTRUCTION	10/07/2016
0	TW	ISSUED FOR TENDER	08/15/2016
No.	By	DESCRIPTION	MM/DD/YYYY

REVISIONS



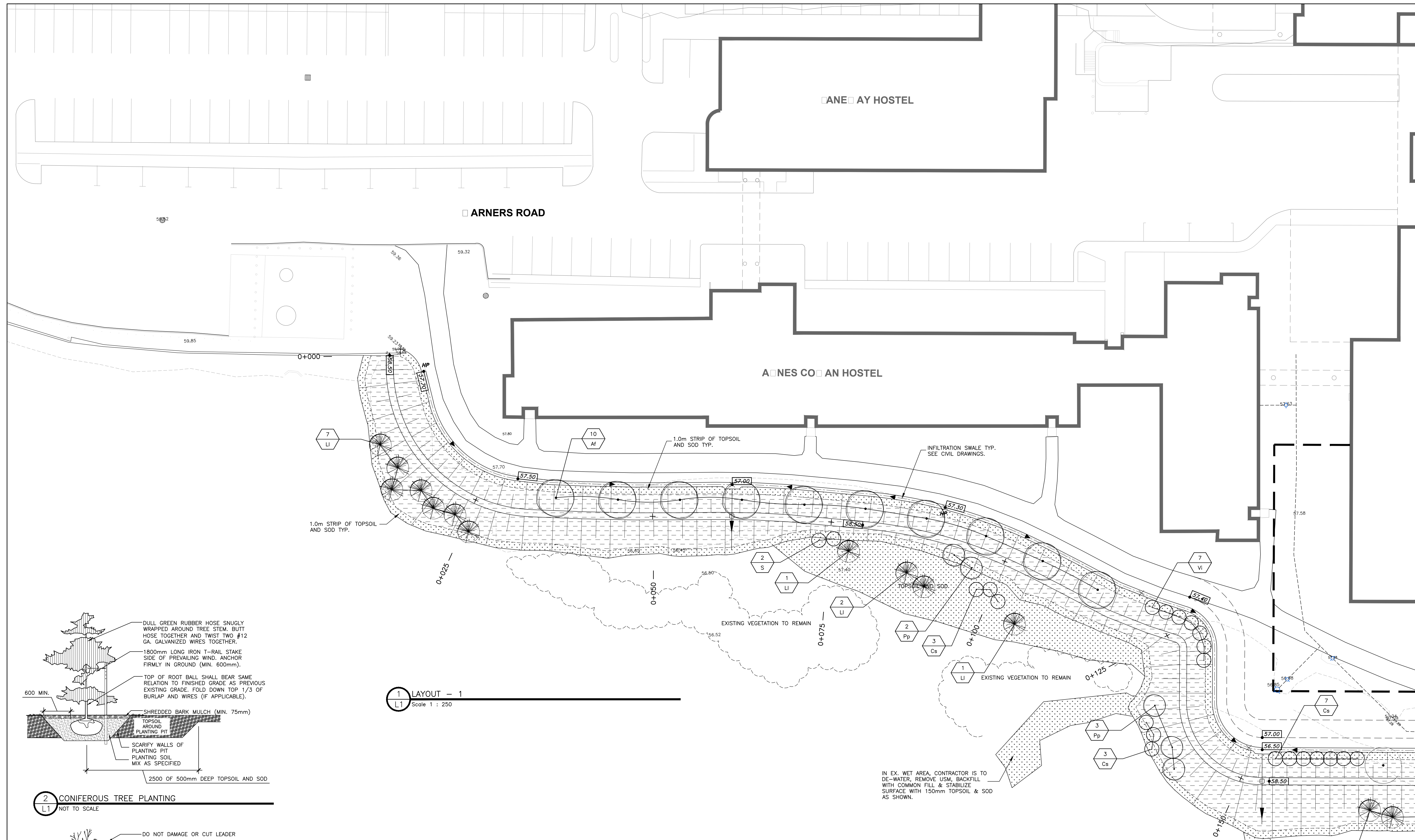
100 LEMARCHANT RD.
ST. JOHN'S, NL
CANADA A1C 2H2
TEL (709) 738-2500
FAX (709) 738-2499

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EASTERN HEALTH

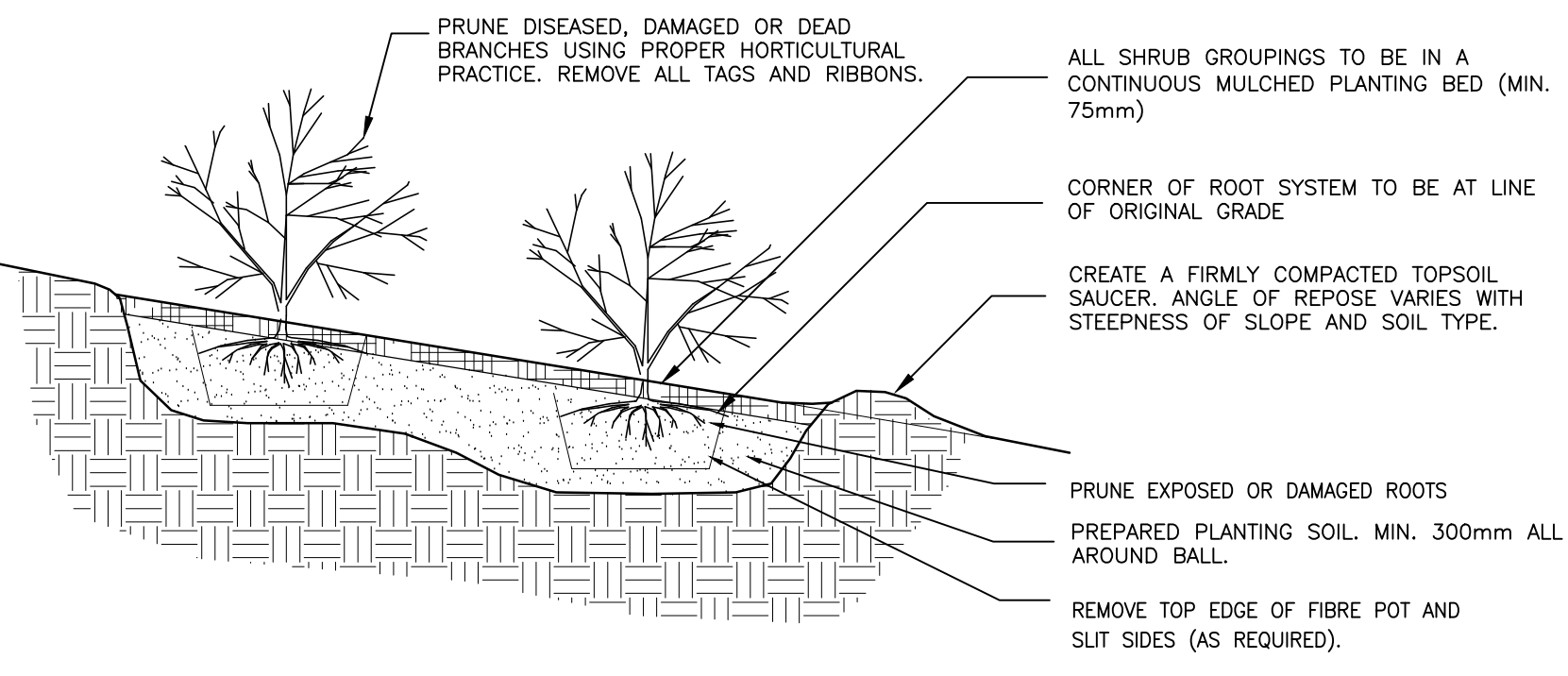
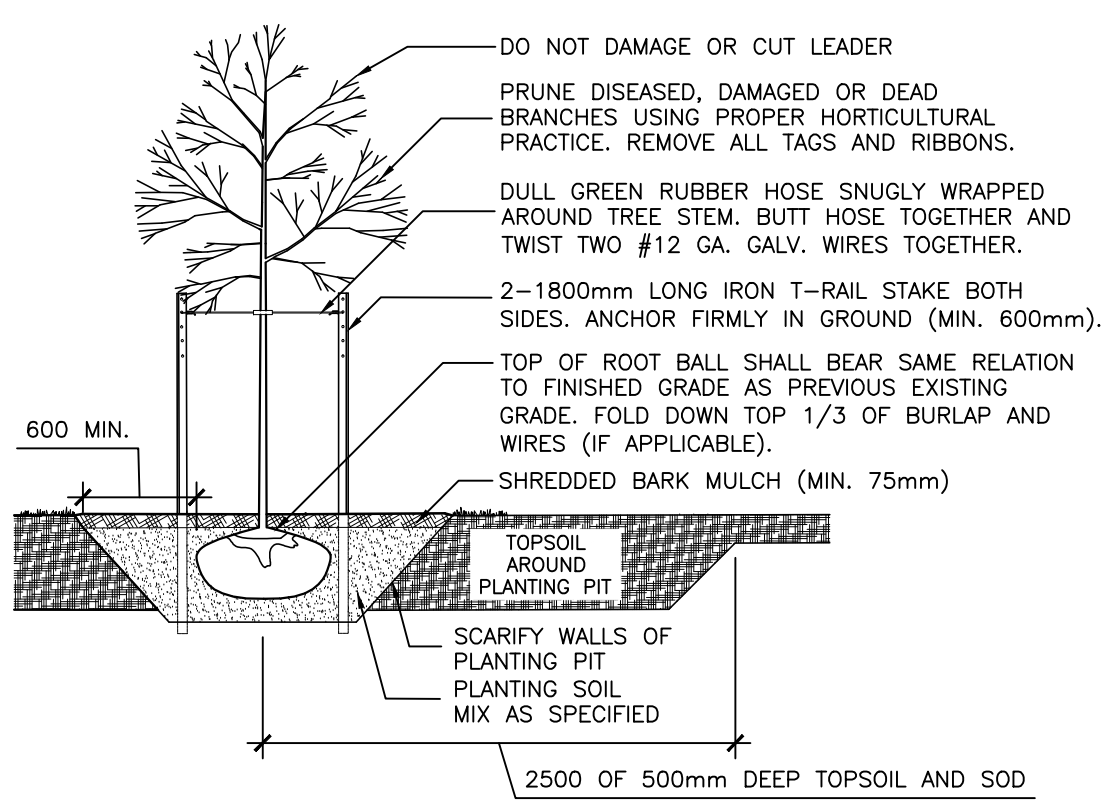
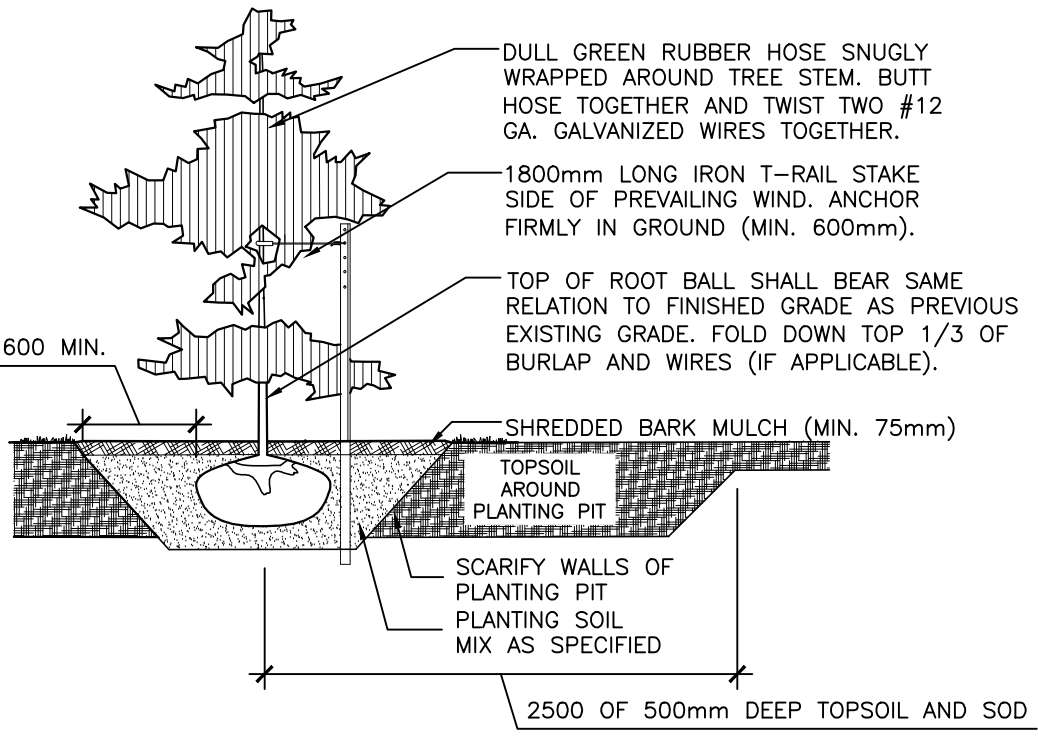
PROJECT
HEALTH SCIENCE CENTRE BERM

DRAWING
LANDSCAPE LAYOUT

DESIGNED TRACT	DRAWN LW	SCALE 1 : 250
APPROVED TW	DATE JUNE 2016	SHEET L1
PROJECT NO. EHLTH-1613		SHEET 1 of 3



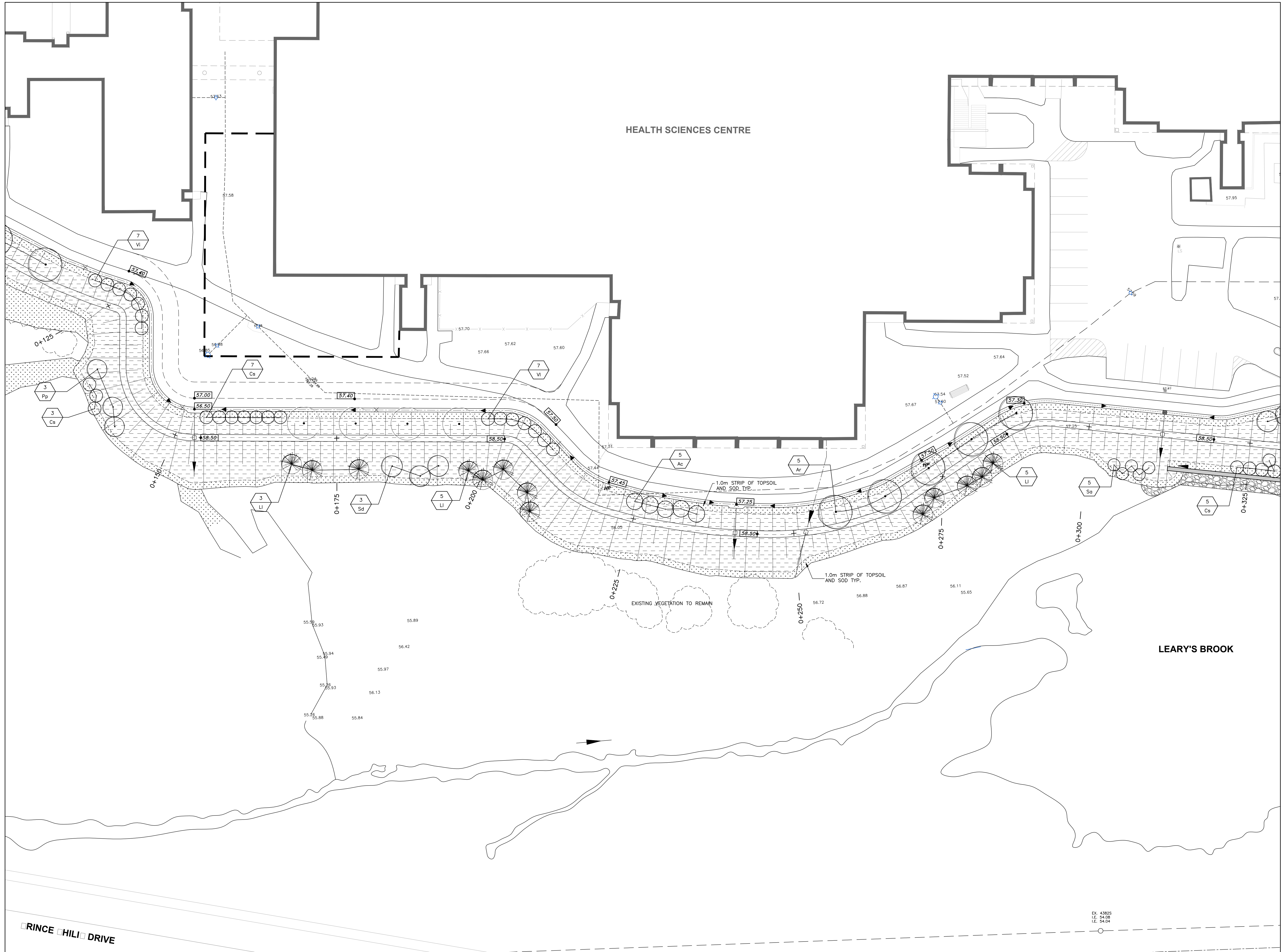
1 LAYOUT - 1
Scale 1 : 250



PLANT LIST APPLICABLE TO ALL DRAWINGS

SYM	QTY	BOTANICAL NAME	COMMON NAME	CAL	SIZE	O/C SPACING	CONDITION	COMMENTS
DECIDUOUS TREES								
Af	10	Acer freemanii "Autumn Blaze"	Autumn Blaze Maple	38 mm		8.0m or as shown	W.B.	
Ar	5	Acer rubrum	Red Maple	38 mm		8.0m or as shown	W.B.	
Sd	10	Sorbus decora	Mountain Ash	30 mm		4.0m or as shown	CONT.	
Pp	5	Prunus pensylvanica	Pin Cherry		#5 POT	3.0m or as shown	CONT.	
CONIFEROUS TREES								
LI	29	Larix laricina	Larch		100 cm ht.	As shown - 3.0m min.		
SHRUBS								
Cs	25	Cornus sericea	Red Osier Dogwood		#3 POT	2.0m		
VI	14	Viburnum lentago	Nannyberry		#3 POT	2.0m		
S	2	Sambucus canadensis	Elderberry		#3 POT	2.0m		
Ac	5	Amelanchier canadensis "Serviceberry"	Serviceberry		#3 POT	2.5m		
Sa	20	Salix discolor	Pussy Willow		#3 POT	1.8m		

NOTE: SOME ADJUSTMENT TO PLANT LOCATIONS IS TO BE EXPECTED TO SUIT SITE CONDITIONS. CONTRACTOR TO MARK PLANT LOCATIONS ON SITE FOR APPROVAL BY OWNER'S REPRESENTATIVE.




NOTES

- LEGEND:
- TOPSOIL AND SOD
 - TOPSOIL AND HYDRO-SEED
- NOTE:
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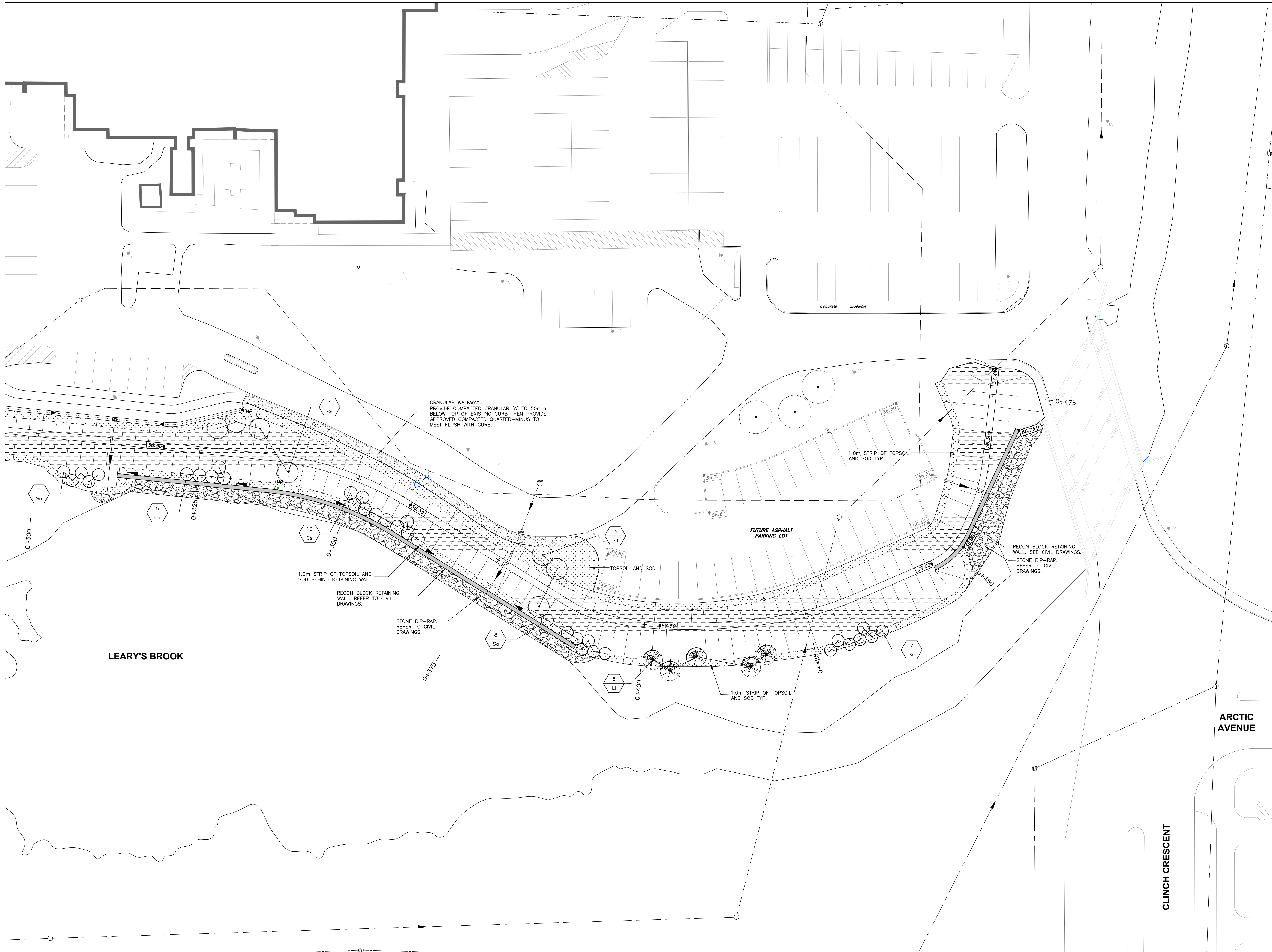
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PROJECT
HEALTH SCIENCE CENTRE BERM



DRAWING
LANDSCAPE LAYOUT

DESIGNED TRACT	DRAWN LW	SCALE 1 : 250
APPROVED TW	DATE JUNE 2016	SHEET L2
PROJECT NO. EHLTH-1613		SHEET 2 of 3

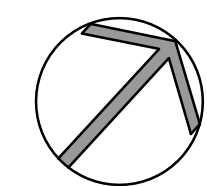
EX. 43825
I.E. 54.08
I.E. 54.04



NOTES

LEGEND:
 TOPSOIL AND SOD
 TOPSOIL AND HYDRO-SEED

NOTE:
 1. ALL OTHER AREAS DISTURBED BY CONSTRUCTION TO BE REINSTATED WITH 150mm OF TOPSOIL AND SOD UNLESS OTHERWISE NOTED.

STAMP		NORTH REF.	
			

1	TW	ISSUED FOR CONSTRUCTION	10/07/2016
0	TW	ISSUED FOR TENDER	08/15/2016
No.	By	DESCRIPTION	MM/DD/YYYY

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DRAWING
LANDSCAPE LAYOUT

DESIGNED TRACT	DRAWN LW	SCALE 1 : 250
APPROVED TW	DATE JUNE 2016	SHEET L3
PROJECT NO. EHLTH-1613		SHEET 3 of 3

APPENDIX B – Plant Inventory

Species Name	Common Name	S-Rank
<i>Abies balsamea</i>	Balsam Fir	S5
<i>Acer pseudoplatanus</i>	Sycamore Maple	SNA
<i>Achillea millefolium</i>	Common Yarrow	SNA
<i>Aegopodium podagraria</i>	Bishops Goutweed	SNA
<i>Alnus incana</i>	Speckled Alder	S5
<i>Alnus viridis</i>	Green Alder	S5
<i>Anaphalis margaritacea</i>	Pearly Everlasting	S5
<i>Angelica atropurpurea</i>	Great Angelica	S4
<i>Artemisia vulgaris</i>	Common Wormwood	SNA
<i>Barbarea verna</i>	Early Winter-Cress	SNA
<i>Betula papyrifera</i>	Paper Birch	S5
<i>Calamagrostis canadensis</i>	Blue-Joint Reedgrass	S5
<i>Calamagrostis stricta</i>	Slim-Stem Small-Reedgrass	S5
<i>Carex stipata</i>	Stalk-Grain Sedge	S4S5
<i>Centaurea nigra</i>	Black Starthistle	SNA
<i>Chamerion angustifolium</i>	Fireweed	S5
<i>Chelone glabra</i>	White Turtlehead	S4
<i>Cicuta bulbifera</i>	Bulb-Bearing Water-Hemlock	S3
<i>Cornus stolonifera</i>	Red Osier Dogwood	S5
<i>Epilobium ciliatum</i>	Hairy Willow-Herb	S5
<i>Euthamia graminifolia</i>	Flat-Top Fragrant-Golden-Rod	S5
<i>Eutrochium maculatum var. maculatum</i>	Spotted Joe-Pye Weed	S4S5
<i>Fragaria virginiana</i>	Virginia Strawberry	S5
<i>Galium palustre</i>	Marsh Bedstraw	S4S5
<i>Glyceria canadensis</i>	Canada Manna-Grass	S5
<i>Glyceria maxima</i>	Reed Meadowgrass	SNA
<i>Glyceria striata</i>	Fowl Manna-Grass	S5
<i>Gnaphalium uliginosum</i>	Low Cudweed	SNA
<i>Hieracium praealtum var. decipiens</i>	King Devil	SNA
<i>Hieracium umbellatum</i>	Umbellate Hawkweed	S4
<i>Hypericum perforatum</i>	A St. John's-Wort	SNA
<i>Impatiens glandulifera</i>	Policeman's Helmet	SNA
<i>Jacobaea vulgaris</i>	Common Ragwort	SNA
<i>Juncus articulatus</i>	Jointed Rush	S5
<i>Juncus bufonius</i>	Toad Rush	S5
<i>Juncus canadensis</i>	Canada Rush	S4S5
<i>Juncus effusus</i>	Soft Rush	S5
<i>Leucanthemum vulgare</i>	Oxeye Daisy	SNA
<i>Linaria vulgaris</i>	Butter-And-Eggs	SNA
<i>Lupinus polyphyllus</i>	Lupine	SNA
<i>Lythrum salicaria</i>	Purple Loosestrife	SNA
<i>Mentha canadensis</i>	Canada Mint	S5
<i>Myosotis scorpioides</i>	True Forget-Me-Not	SNA
<i>Myrica gale</i>	Sweet Bayberry	S5
<i>Onoclea sensibilis</i>	Sensitive Fern	S4S5
<i>Osmundastrum cinnamomeum</i>	Cinnamon Fern	S5

Species Name	Common Name	S-Rank
<i>Persicaria maculosa</i>	lady's-thumb, redshank	SNA
<i>Persicaria sagittata</i>	arrowleaf tearthumb, arrow-vine	SNA
<i>Phalaris arundinacea</i>	Reed Canary Grass	SNA
<i>Phleum pratense</i>	Meadow Timothy	SNA
<i>Picea glauca</i>	White Spruce	S5
<i>Polygonum cuspidatum</i>	Japanese Knotweed	SNA
<i>Potentilla recta</i>	Sulphur Cinquefoil	SNA
<i>Prunus pensylvanica</i>	Fire Cherry	S4S5
<i>Ranunculus acris</i>	Tall Butter-Cup	SNA
<i>Ranunculus repens</i>	Creeping Butter-Cup	SNA
<i>Rosa virginiana</i>	Virginia Rose	S4S5
<i>Rubus idaeus ssp. strigosus</i>	wild red raspberry	S5
<i>Rumex acetosella</i>	Sheep Sorrel	SNA
<i>Rumex crispus</i>	Curly Dock	SNA
<i>Salix discolor</i>	Pussy Willow	S5
<i>Sambucus racemosa</i>	Red Elderberry	S4
<i>Scirpus atrocinctus</i>	Black-Girdle Bulrush	S5
<i>Scirpus microcarpus</i>	Small-Fruit Bulrush	S4S5
<i>Senecio viscosus</i>	Sticky Groundsel	SNA
<i>Solanum dulcamara</i>	Climbing Nightshade	SNA
<i>Solidago rugosa</i>	Rough-Leaf Goldenrod	S5
<i>Sonchus arvensis</i>	Field Sowthistle	SNA
<i>Sorbus americana</i>	American Mountain-Ash	S4S5
<i>Sorbus decora</i>	Northern Mountain-Ash	S5
<i>Spiraea latifolia</i>	Broadleaf Meadowsweet	S4S5
<i>Stachys palustris</i>	Marsh Hedge-Nettle	SNA
<i>Symphyotrichum novi-belgii</i>	New Belgium American-Aster	S5
<i>Taraxacum officinale</i>	Common Dandelion	SNA
<i>Thalictrum pubescens</i>	Tall Meadow-Rue	S5
<i>Trifolium arvense</i>	Rabbit-Foot Clover	SNA
<i>Trifolium campestre</i>	Low Hop Clover	SNA
<i>Trifolium pratense</i>	Red Clover	SNA
<i>Tussilago farfara</i>	Colt's-foot	SNA
<i>Typha latifolia</i>	Broad-Leaf Cattail	SNA
<i>Vicia cracca</i>	Tufted Vetch	SNA
<i>Urtica dioica ssp. gracilis</i>	Stinging nettle	S3S5

APPENDIX C – Site Photos

Eastern Health HSC Berm EPR
APPENDIX 'C' – August 31, 2017 Site Photos



PHOTO 1: Wetland conditions observed adjacent to the existing retaining wall at the hospital site. Dominant species at this location is reed canary-grass (*Phalaris arundinacea*). Looking northeast.



PHOTO 2: Wetland conditions observed adjacent to the existing retaining wall at the hospital site. Dominant species at this location is reed canary-grass (*Phalaris arundinacea*). Looking southeast.

Eastern Health HSC Berm EPR
APPENDIX 'C' – August 31, 2017 Site Photos



PHOTO 3: Stormwater outflow, presumably from parking areas, discharging into wetland. Looking northwest.



PHOTO 4: Typical vegetation and water pooling within area located down-gradient from stormwater outflow. Looking southeast.

Eastern Health HSC Berm EPR
APPENDIX 'C' – August 31, 2017 Site Photos



PHOTO 5: Typical conditions within pooled area down-gradient from stormwater outflow, adjacent to existing bank. Looking southwest.



PHOTO 6: Typical conditions within pooled area down-gradient from stormwater outflow. Stagnant conditions, with apparent presence of iron-reducing bacteria. Looking southeast.

Eastern Health HSC Berm EPR
APPENDIX 'C' – August 31, 2017 Site Photos



PHOTO 7: Water pooling down-gradient of stormwater outflow, with wet-meadow vegetation dominated by bluejoint reedgrass, reed canary grass, and various sedges. Looking south.



PHOTO 8: Water pooling down-gradient of stormwater outflow, with wet-meadow vegetation dominated by bluejoint reedgrass, reed canary grass, and various sedges. Looking northeast.

Eastern Health HSC Berm EPR
APPENDIX 'C' – August 31, 2017 Site Photos



PHOTO 9: Some vegetation clearing has taken place at the periphery of the wetland and along the existing berm, in preparation for construction. Looking northeast.



PHOTO 10: Main channel of Leary's brook, where it flows into the ponded area adjacent to The HSC. The brook is flanked on both banks by tall grasses, chiefly reed manna-grass (*Glyceria maxima*) and reed canary-grass (*Phalaris arundinacea*) at this location. Looking southwest.

Eastern Health HSC Berm EPR
APPENDIX 'C' – August 31, 2017 Site Photos



PHOTO 11: Poned area east of the HSC. Sediment control boom visible at site of retaining wall construction. Looking northeast.



PHOTO 12: Eastern bank of Learys Brook, dominated by reed canary-grass (*Phalaris arundinacea*). Looking east.

Eastern Health HSC Berm EPR
APPENDIX 'C' – August 31, 2017 Site Photos



PHOTO 13: Western bank of Learys Brook, dominated by reed manna-grass (*Glyceria maxima*). Looking west.



PHOTO 14: Typical gravel and cobble substrate of Learys Brook, where it enters the ponded area adjacent to the HSC.

Eastern Health HSC Berm EPR
APPENDIX 'C' – August 31, 2017 Site Photos



PHOTO 15: Site of initial retaining wall construction, adjacent to Clinch Crescent bridge. Looking south.



PHOTO 16: TEXT

Eastern Health HSC Berm EPR
APPENDIX 'C' – August 31, 2017 Site Photos



PHOTO 17: TEXT



PHOTO 18: TEXT

APPENDIX D – Flood Mapping Memo



CBCL LIMITED

Consulting Engineers

MEMORANDUM

DATE: 13/02/2018

PROJECT NO: 173056.01

MEMO TO	Daniel J. Parsons -Eastern Health Authority
PROJECT NAME	Environmental Preview Report for the Health Centre Berm
SUBJECT	Floodplain Mapping and Evaluation
FROM	Victoria Fernandez,
COPIES TO	Greg Sheppard, Alexander Wilson, Melissa Rutherford

PO Box 606
Halifax, Nova Scotia
Canada B3J 2R7

Telephone: 902 421 7241

Fax: 902 423 3938

E-mail: info@cbcl.ca

URL: <http://www.cbcl.ca>

1 INTRODUCTION

The Rennies River watershed has an area of approximately 32 km² and contains several major watercourses, including Yellow Marsh Stream, Ken Brook, Leary’s Brook and Rennies River. Runoff from this catchment ultimately discharges to Quidi Vidi Lake. During significant rainfall events, flooding has occurred at locations along Ken Brook, Leary’s Brook and Rennies River. Flooding has ranged from an inconvenience to the residents of the City of St. John’s to major damage of public and private property.

In 2012, the City of St John’s retained CBCL to conduct a flood risk analysis in the Rennies River watershed and develop the Rennies River Catchment Stormwater Management Plan (RRCSMP). The study included hydrologic modelling of the catchment to determine flood flows for existing and future land uses, considering up-to-date rainfall data as well as climate change impacted rainfall data. CBCL developed a hydraulic model of the river and the hydraulic structures in the system to examine the extent of the floodplain resulting from extreme rainfall events. However, this hydraulic model does not include the network of stormwater pipes and ditches that constitute the minor drainage system.

CBCL evaluated several flood protection measures using the hydrologic and hydraulic models developed for the RRCSMP Study. These options included the construction of flood protection berms and walls to the south side of the Health Science Centre (HSC) and the north side of Prince Philip Drive, between Clinch Crescent East and Clinch Crescent West. Impacts of constructing the structure shown in Figure 1 was evaluated under the flood scenarios defined in the Environmental Preview Report (EPR) Guidelines for the Health Science Centre Berm.

The hydrologic and hydraulic calculations presented in this assessment were conducted using the computer model of Rennies River developed for the RRCSMP study. The following sections describe the modelling approach and the results of the assessment.





Figure 1 Health Science Centre Berm as Proposed in the RRCSMP study

2 RENNIES RIVER SYSTEM – COMPUTER MODELLING

The development of the RRCSMP included assembling a hydrologic and hydraulic computer model of the Rennies River catchment system. The model was built using XPSWMM, a modelling software developed by XP Solutions that uses standard hydrological methods to estimate runoff flows in a watershed and solves dynamic flow equations to calculate 1D flows through pipes, culverts, narrow channels, etc. The software also calculates 2D flows through floodplains, large bodies of water, wide bridges, etc. For a detailed description of the RRCSMP model, the reader may refer to the RRCSMP report, available at:

http://www.stjohns.ca/sites/default/files/files/publication/Rennies%20River%20Catchment%20Stormwater%20Management%20Plan_0.pdf

2.1 HYDROLOGIC ASSESSMENT

The RRCSMP study included developing a hydrologic model of the Rennies River watersheds to estimate runoff flows under a range of rainfall events. Hydrologic inputs for these calculations include watershed areas, slopes, percentage of impervious land, surface roughness, infiltration parameters, and rainfall hyetographs (precipitation time series). The physical characteristics of each sub-catchment were estimated using topographical survey data, 1 m contour mapping and LiDAR survey data from 2012 and 2015.

The hydrologic model was calibrated by comparing the flow hydrograph recorded at Environment Canada's (EC) Leary's Brook at Prince Philip Drive hydrometric station (02ZM020) with the hydrograph simulated at the same location, using the observed precipitation data during Hurricane Igor. Modelling parameters such as the overland roughness coefficients were adjusted until the simulated hydrograph was representative of the observed hydrograph.

Table 1 shows that peak flows calculated with the most recent information are slightly smaller than those calculated using the 2012 LiDAR information. Since the RRCSMP hydrologic model was calibrated to a major flood event using the 2012 LiDAR dataset and this version of the model produces more conservative peak flows, the hydrologic model originally developed for the RRCSMP was selected to calculate the boundary conditions for the hydraulic calculations.

2.2 HYDRAULIC ASSESSMENT

The hydraulic module of XPSWMM was used to estimate the water levels and flow rates through the river channel, the river floodplains, and the structures located along the river reach. The 2D model results were also used to produce floodplain maps under existing conditions and after construction of a berm with a crest elevation of 58.5 m.

The input data for this module consists of river channel invert elevations, channel and floodplain roughness coefficients, the 2015 LiDAR information, hydraulic structure dimensions and flow hydrographs (flow time series) calculated using the hydrologic module of the software. The domain of the model consists mainly of a 5 m grid used to calculate the 2D flow of water within the floodplain. The grid was connected to the 1D elements in the model, that were used to calculate the flow through the main channel, bridges and culverts.

Hurricane Igor was also used as the calibration event for the hydraulic model. Water levels observed at the City-owned Long Pond level gauge were compared to the water levels simulated by the hydraulic model. The calibrated model includes adjustments to the Manning's roughness coefficient along the river channel and floodplains, and adjustments to the riverbed slope.

Table 1: Slope and 1:100 AEP with Climate Change Peak Flows Calculated Using the 2012 and 2015 LiDAR Dataset

Watershed	2012 LiDAR Dataset		2015 LiDAR Dataset	
	Slope(%)	1:100 AEP + CC flow (m ³ /s)	Slope (%)	1:100 AEP + CC flow (m ³ /s)
Great Eastern Ave. at Ken	3.1	8.2	2.8	8.0
Lady Smith Dr. at Ken Brook	4.8	20.8	4.8	20.6
NL Power Yard at Yellow	3.8	27.5	3.8	27.4
O'Leary Ave. at Leary's Brook	5.2	42.9	4.8	42.5
Pippy Place at Leary's Brook	2.5	67.8	2.2	66.6
Wicklow St. at Leary's Brook	4.9	91.9	4.6	90.4
Allandale Rd. at Rennies	6.8	22.7	6.8	22.7
Prince Philip Dr. at Rennies	8.8	10.1	8.0	10.0
Portugal Cove Rd. at Rennies	4.7	25.0	4.3	24.5
Carnell Dr. at Rennies River	7.6	28.9	7.0	28.4

2.3 FLOODPLAIN MAPPING

The EPR guidelines require delineating the floodplain extents after construction of the berm for the following scenarios:

- 1:20 year Climate Change AEP;
- 1: 100 year Climate Change AEP; and
- 1: 100 year Climate Change AEP plus 30%.

2.3.1 1:20 YEAR AEP WITH CLIMATE CHANGE

Figures 2 and 3 present the 1:20 year AEP floodplains with climate change, calculated before and after construction of the berm. In the upstream area, the structure reduces flooding next to the HSC. However, the calculations indicate that, between the East and West sections of Clinch Crescent, water levels increased by up to 0.06 m. This change results in a 5 to 10 m flood extent increase around Prince Philip Drive, affecting also the adjacent parking lots and green areas located to the south. However, the change in flooding extent does not affect additional buildings. Downstream of Clinch Crescent East, the calculated flood extents do not show changes after construction of the berm.

2.3.2 1:100 YEAR AEP WITH CLIMATE CHANGE

Figures 4 and 5 present the 1:100 AEP floodplains with climate change, calculated before and after construction of the berm. In the upstream area, the calculations show that the berm reduces the extent of the floodplain at the location the structure. Water levels along the berm increased by up to 0.07m resulting in a 5 to 10 m increase in the extent of the floodplain, south of Prince Philip Drive and over Clinch Crescent East. The depth of waver over Clinch Crescent drive ranges between 0.05 and 0.10 m. However, the changes in the calculated flooding extent do not affect additional buildings. In the downstream area, the floodplain extents do not show changes after construction of the berm.

2.3.3 1:100 YEAR AEP WITH CLIMATE CHANGE PLUS 30% (SENSITIVITY SCENARIO)

Figures 6 and 7 present the 1:100 year AEP with Climate Change plus 30% floodplains calculated before and after construction of the berm. After construction, water levels along the proposed berm increased by up to 0.10 m, which in the model resulted in a 45 m increase in the extent of flooding. After construction of the berm, the floodline calculated with the model includes parking lots, green areas east of Clinch Crescent Drive as well as the National Research Council (NRC) Building, which is located at a local low point. However, within the building subcatchment, the flows associated with the 100-year AEP with climate change plus 30 % rainfall, are likely to exceed the hydraulic capacity of the minor drainage system around the building and result in local flooding. Under these conditions, the actual impact of the berm in this area may be negligible. Confirmation of this assumption requires expanding the model to include the minor drainage system in the area.

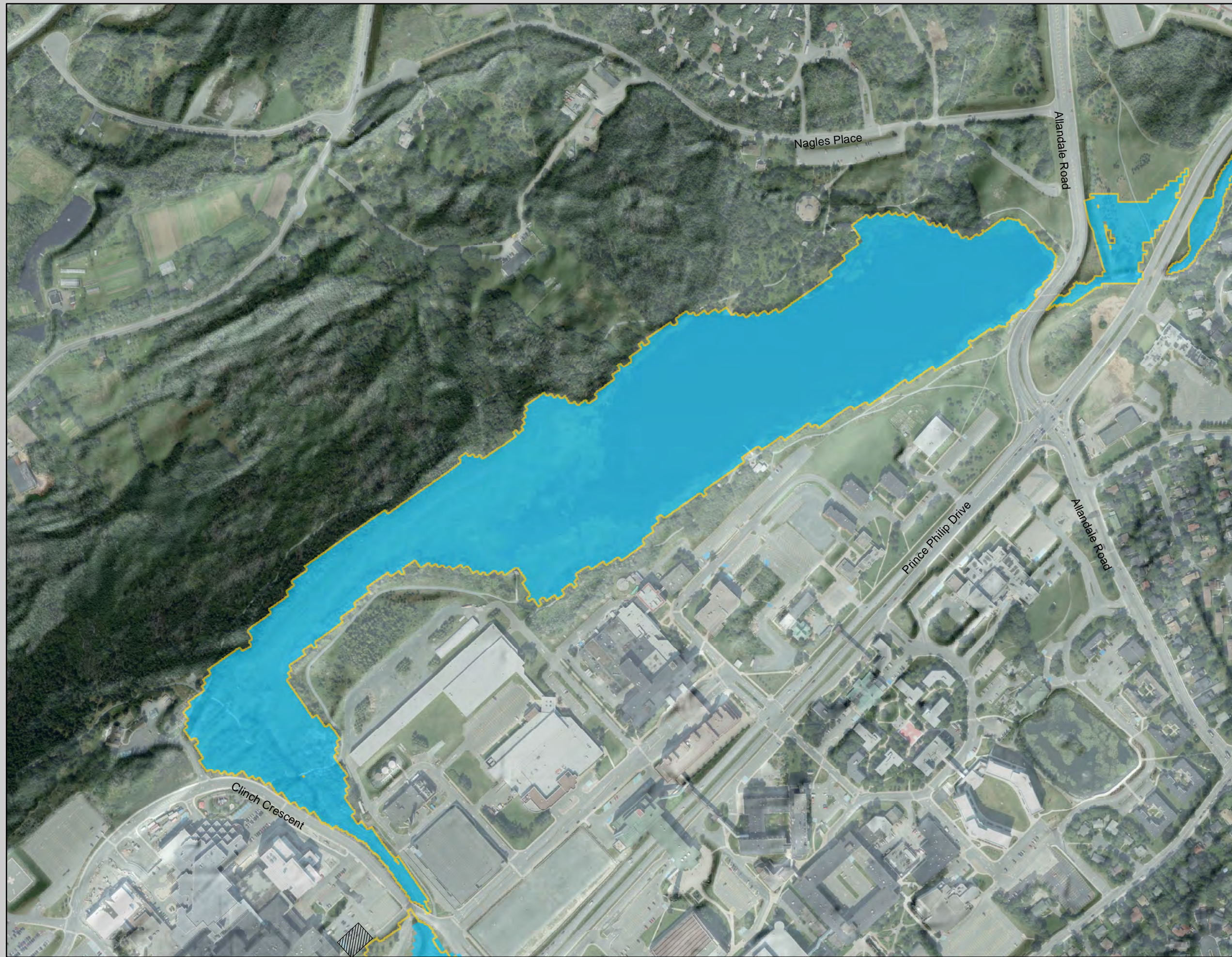
Model calculations show that in the area downstream of the Artic Ave. parking garage, the extent of flooding before and after construction of the HSC berm remains the same.

2.4 SUMMARY OF RESULTS

Table 2: shows a summary of the results calculated with the model.




Scenario	Maximum Change in Water Level along HSC Berm (m)	Maximum Changes in Flooding extent width (m)	Areas with Additional Floods
1:20 AEP CC	0.06	10	Parking lot and green areas
1 :100 AEP CC	0.07	10	Clinch Crescent East, Parking lots Green Areas
1:100 AEP CC 30%	0.10	45	Parking lots and green areas NRC Building

The model results show a reduction in the extent of flooding in the area adjacent to the HSC. Reducing risk of flooding in Clinch Crescent East and Prince Philip Drive requires implementing additional mitigation measures as indicated in the RRSMP.



**Health Science Centre Berm
Environmental Preview Report**

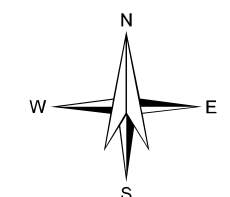
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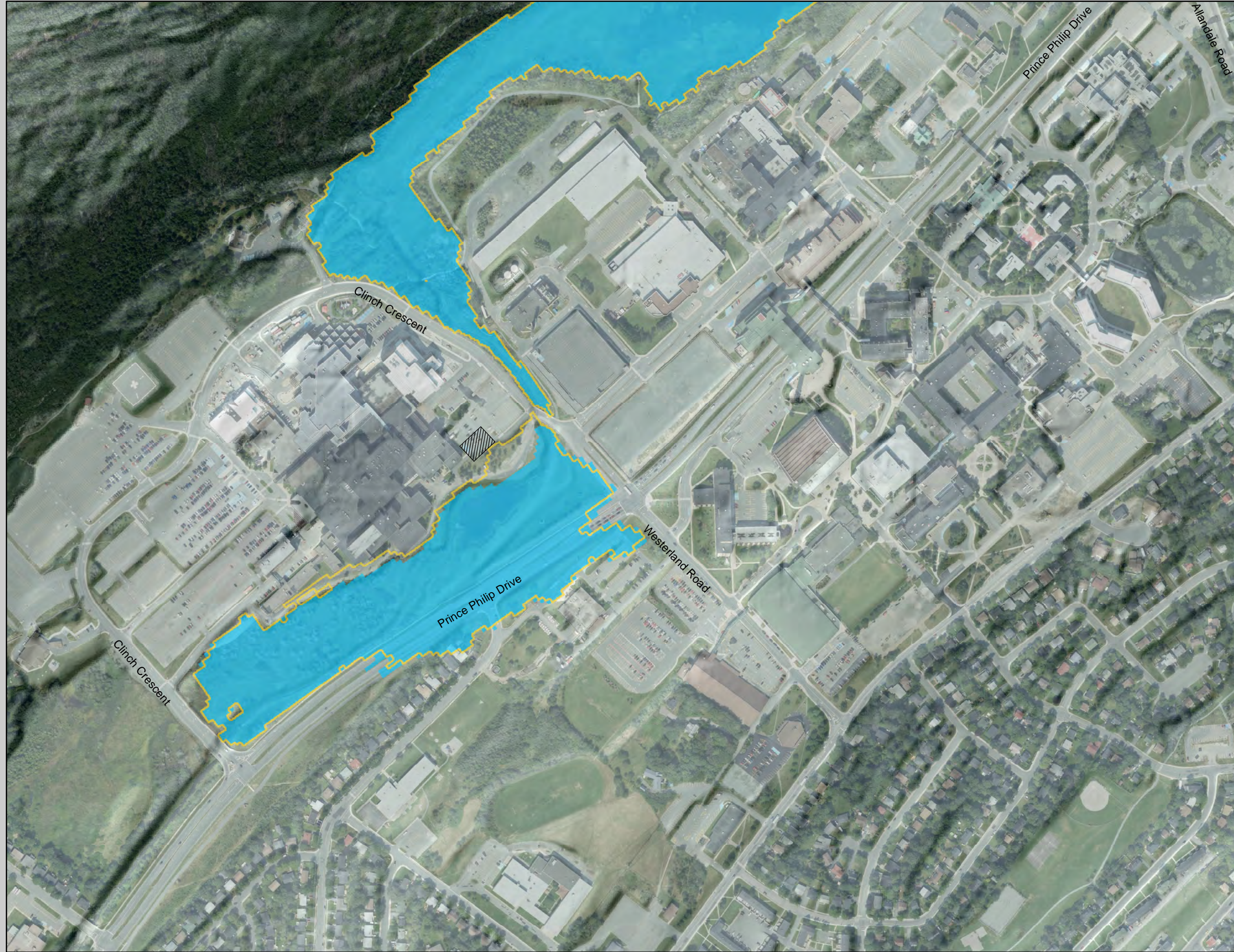
-  Existing Conditions
-  Post Berm Construction
-  Animal Resource Centre (in construction)

**Figure 2
1:20 AEP
Climate Change
Existing Conditions at Long Pond**






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Units: Metre
Scale: 1:7,500





**Health Science Centre Berm
Environmental Preview Report**

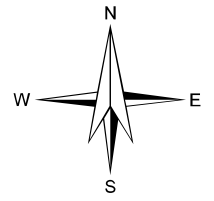
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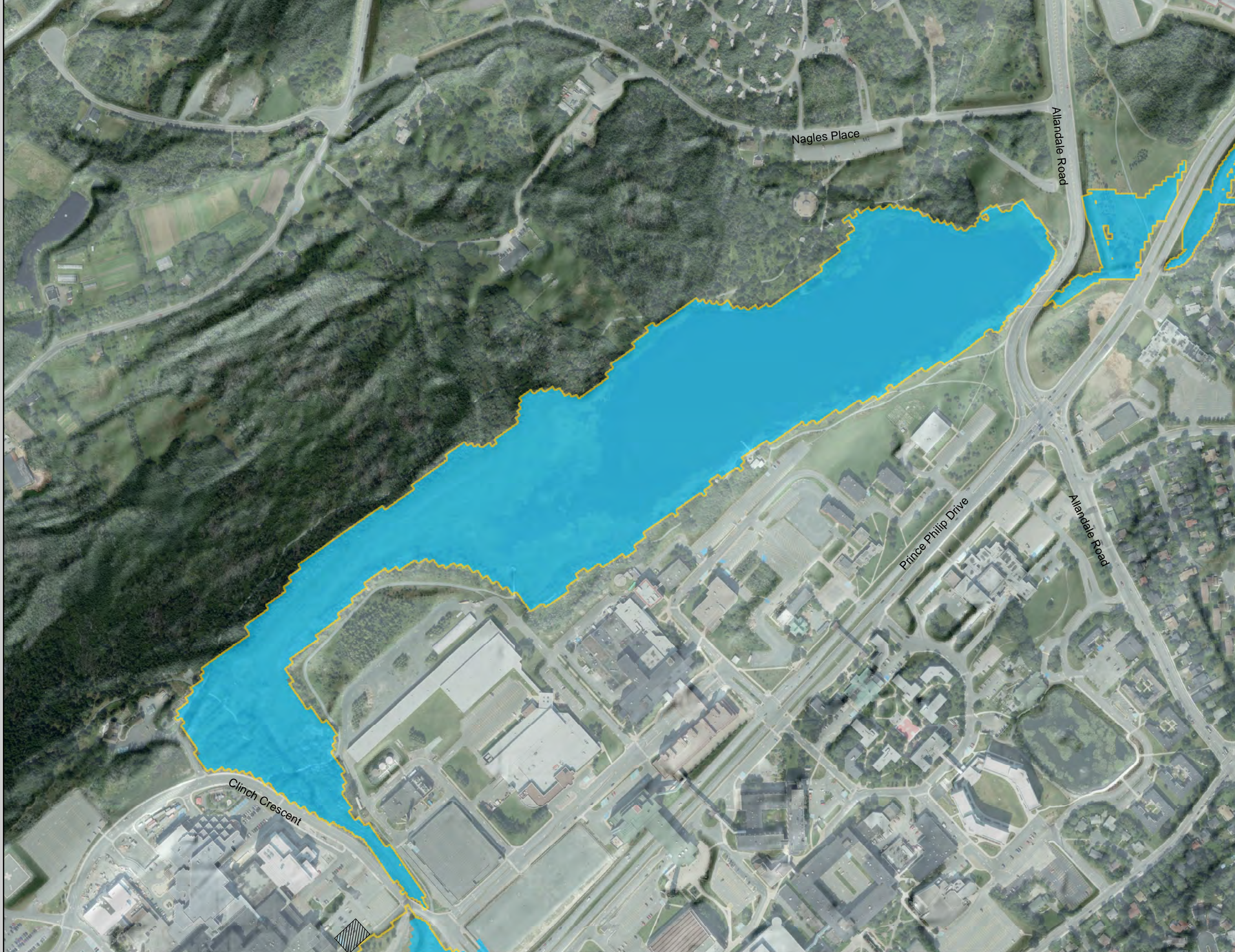
-  Existing Conditions
-  Post Berm Construction
-  Animal Resource Centre (in construction)

**Figure 3
1:20 AEP
Climate Change
Existing Conditions at Long Pond**



Coordinate System:
NAD_1983_MTM_1
Units:Metre
Scale:1:7,500





**Health Science Centre Berm
Environmental Preview Report**

Legend




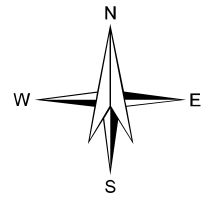
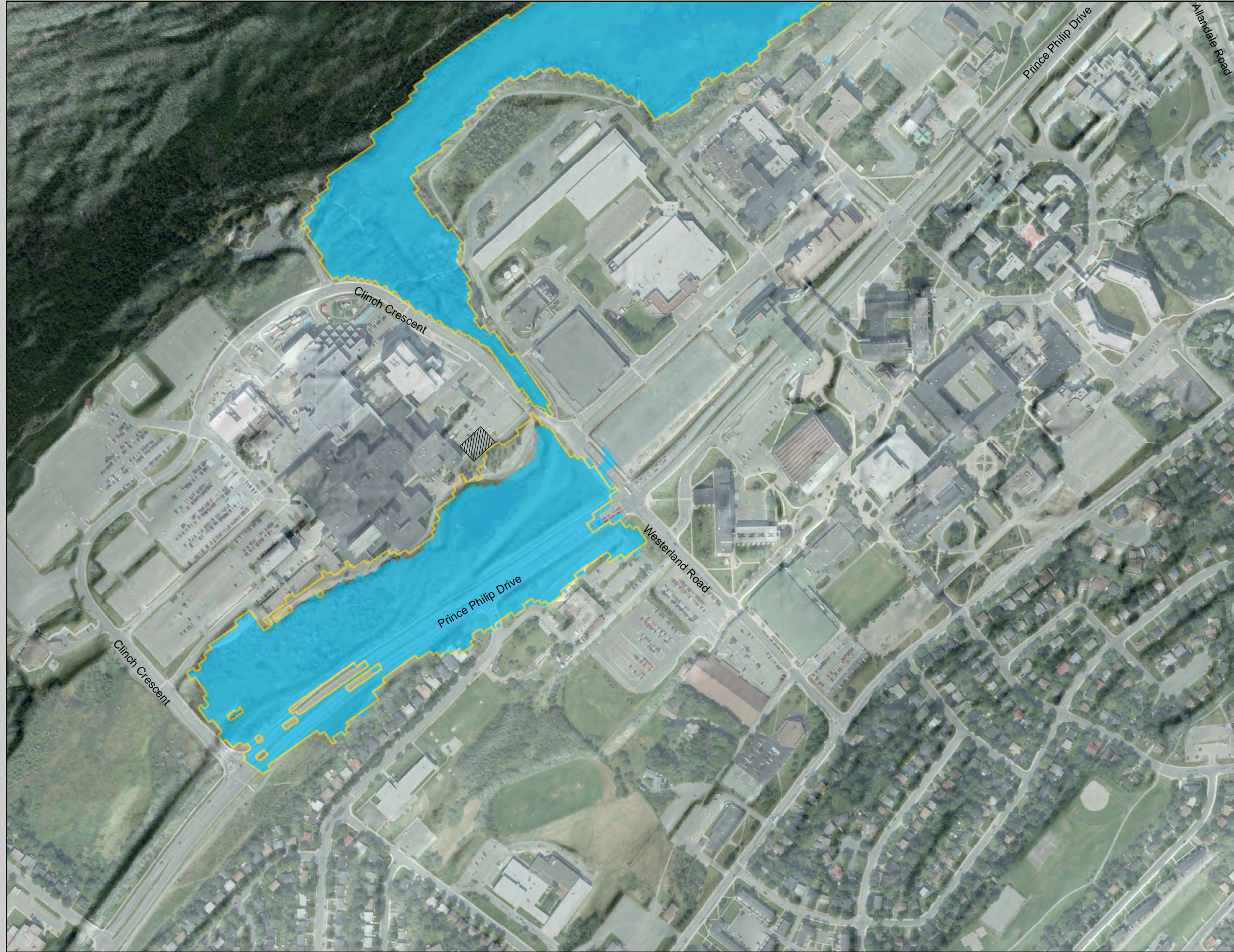
-  Existing Conditions
-  Post Berm Construction
-  Animal Resource Centre (in construction)

Figure 4
1:100 AEP
Climate Change
Existing Conditions at Long Pond






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**Health Science Centre Berm
Environmental Preview Report**

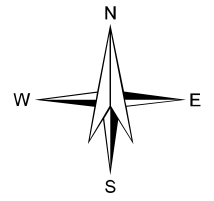
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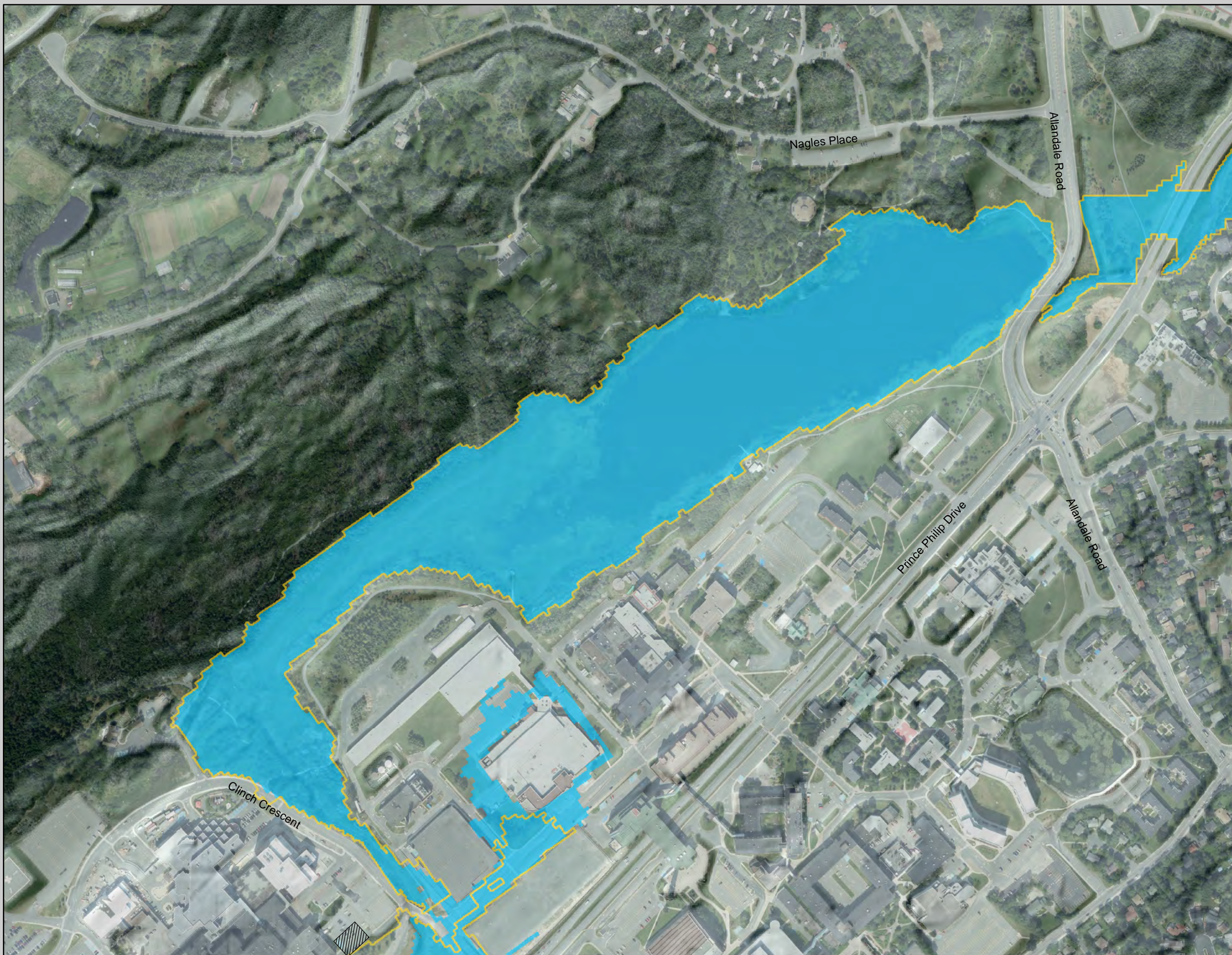
-  Existing Conditions
-  Post Berm Construction
-  Animal Resource Centre (in construction)

**Figure 5
1:100 AEP
Climate Change
Existing Conditions at Long Pond**



Coordinate System:
NAD_1983_MTM_1
Units: Metre
Scale: 1:7,500





**Health Science Centre Berm
Environmental Preview Report**

Legend




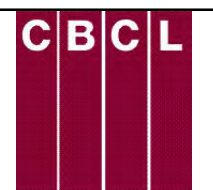
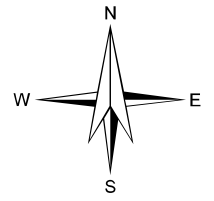
-  Existing Conditions
-  Post Berm Construction
-  Animal Resource Centre (in construction)

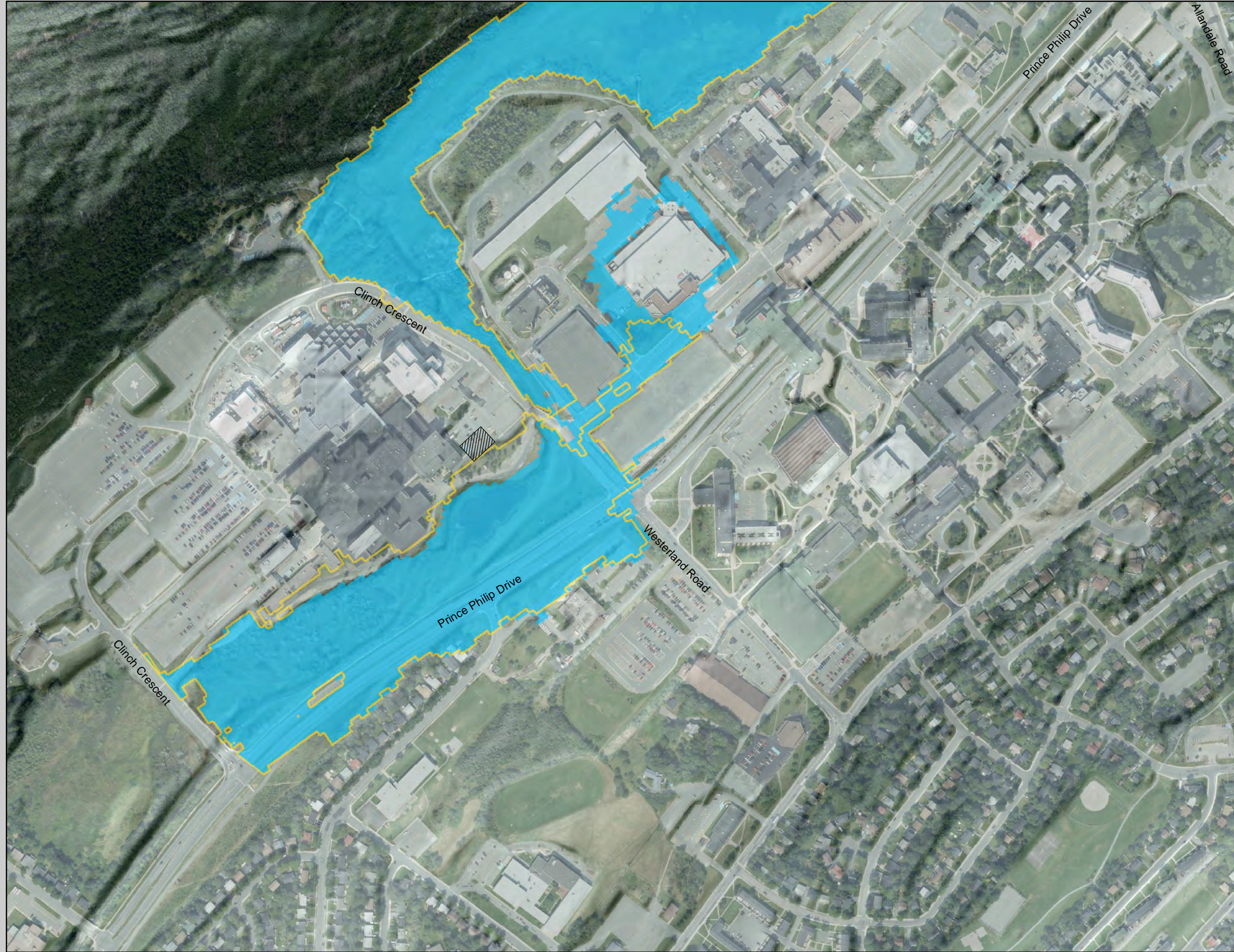
Figure 6
**1:100 AEP plus 30%
Climate Change**
Existing Conditions at Long Pond



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Consulting Engineers

Coordinate System:
NAD_1983_MTM_1
Units: Metre
Scale: 1:7,500





**Health Science Centre Berm
Environmental Preview Report**

Legend




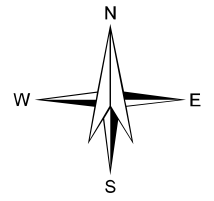
-  Existing Conditions
-  Post Berm Construction
-  Animal Resource Centre (in construction)

Figure 7
**1:100 AEP plus 30%
Climate Change**
Existing Conditions at Long Pond



CBCL LIMITED
Consulting Engineers

Coordinate System:
NAD_1983_MTM_1
Units: Metre
Scale: 1:7,500



APPENDIX E – Birds Detected on Newfoundland and Labrador

E.1 Breeding Birds Detected on Newfoundland and Labrador’s “St. John’s (57003)” BBS
Route.

E.2 Species observed within the Project area and submitted to eBird.

Appendix E.1 Breeding Birds Detected on Newfoundland and Labrador's "St. John's (57003)" BBS Route.

Species	
Canada Goose	Boreal Chickadee
American Black Duck	Red-breasted Nuthatch
Mallard	Golden-crowned Kinglet
Northern Pintail	Ruby-crowned Kinglet
Green-winged Teal+A98	Gray-cheeked Thrush
Ring-necked Duck	Swainson's Thrush
Black Scoter	Hermit Thrush
Rock Pigeon	American Robin
Mourning Dove	European Starling
Least Sandpiper	Cedar Waxwing
Wilson's Snipe	House Sparrow
Spotted Sandpiper	American Pipit
Greater Yellowlegs	Pine Grosbeak
Black Guillemot	Purple Finch
Black-legged Kittiwake	Red Crossbill
Ring-billed Gull	White-winged Crossbill
Herring Gull	Common Redpoll
Great Black-backed Gull	Pine Siskin
Common Tern	American Goldfinch
unid. Tern	Ovenbird
Common Loon	Northern Waterthrush
Leach's Storm-Petrel	Black-and-white Warbler
Northern Gannet	Tennessee Warbler
American Bittern	Mourning Warbler
Osprey	Common Yellowthroat
Northern Harrier	American Redstart
Sharp-shinned Hawk	Magnolia Warbler
Belted Kingfisher	Yellow Warbler
Downy Woodpecker	Blackpoll Warbler
Hairy Woodpecker	Palm Warbler
Northern Flicker	Yellow-rumped Warbler
Merlin	Black-throated Green Warbler
Olive-sided Flycatcher	Wilson's Warbler
Yellow-bellied Flycatcher	Savannah Sparrow
Alder Flycatcher	Fox Sparrow
Red-eyed Vireo	Song Sparrow
Gray Jay	Lincoln's Sparrow
Blue Jay	Swamp Sparrow
American Crow	White-throated Sparrow
Common Raven	Dark-eyed Junco
Tree Swallow	Bobolink

Species	
Barn Swallow	Rusty Blackbird
Black-capped Chickadee	

Appendix E. Species observed within the Project area and submitted to eBird.

Species observed in Project area	
Blue-winged Teal	Herring Gull
Eurasian Wigeon	Iceland Gull
American Wigeon	Lesser Black-backed Gull
Eurasian/American Wigeon	Herring x Lesser Black-backed Gull (hybrid)
Mallard	Glaucous Gull
American Black Duck	Great Black-backed Gull
Mallard x American Black Duck (hybrid)	Common Tern
Northern Pintail	Rock Pigeon
Green-winged Teal	Snowy Owl
Ring-necked Duck	American Crow
Tufted Duck	Common Raven
Greater Scaup	American Robin
Lesser Scaup	European Starling
Bufflehead	Bohemian Waxwing
Hooded Merganser	Yellow Warbler
Great Cormorant	Dark-eyed Junco
Osprey	Savannah Sparrow
Northern Goshawk	Swamp Sparrow
Wilson's Snipe	American Goldfinch
Ring-billed Gull	

APPENDIX F – Erosion & Sediment Control

Health Sciences Centre Berm

Consultants

Legend

- SILT FENCE
- SAND BAG
- CONSTRUCTION BARRICADES
- JERSEY BARRIERS

Revision	By	Appd.	YY.MM.DD	
C	SA	PP	17.06.12	
B	SA	PP	17.05.31	
A	SA	PP	17.05.30	
Issued	By	Appd.	YY.MM.DD	
File Name:	Dwn.	Chkd.	Dsgn.	YY.MM.DD

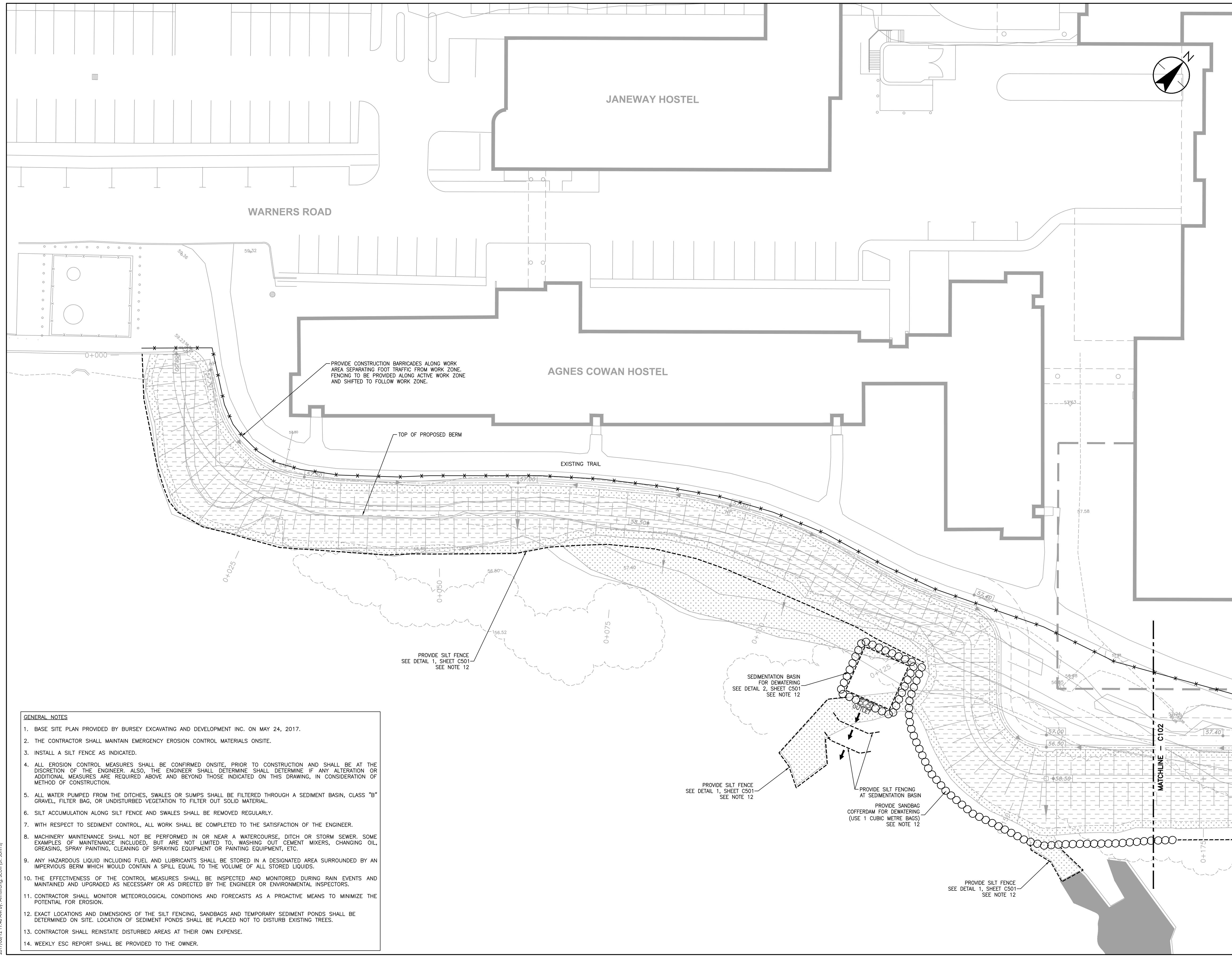
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PROVINCE OF NEWFOUNDLAND AND LABRADOR
ENGINEERING PERMIT J0291
STANTEC CONSULTING LTD.
05371
Signature or Member Number (Member-in-Responsible Charge)

Client/Project
BURSEY'S EXCAVATING & DEVELOPMENT LTD.
EROSION & SEDIMENTATION CONTROL
HEALTH SCIENCES CENTRE BERM
St. John's, Newfoundland & Labrador

Title
EROSION SEDIMENTATION CONTROL PLAN #1

Project No. 133347813
Scale 1:250
Drawing No. C101
Sheet 1 of 4
Revision C



- GENERAL NOTES**
1. BASE SITE PLAN PROVIDED BY BURSEY EXCAVATING AND DEVELOPMENT INC. ON MAY 24, 2017.
 2. THE CONTRACTOR SHALL MAINTAIN EMERGENCY EROSION CONTROL MATERIALS ONSITE.
 3. INSTALL A SILT FENCE AS INDICATED.
 4. ALL EROSION CONTROL MEASURES SHALL BE CONFIRMED ONSITE, PRIOR TO CONSTRUCTION AND SHALL BE AT THE DISCRETION OF THE ENGINEER. ALSO, THE ENGINEER SHALL DETERMINE IF ANY ALTERATION OR ADDITIONAL MEASURES ARE REQUIRED ABOVE AND BEYOND THOSE INDICATED ON THIS DRAWING, IN CONSIDERATION OF METHOD OF CONSTRUCTION.
 5. ALL WATER PUMPED FROM THE DITCHES, SWALES OR SUMPS SHALL BE FILTERED THROUGH A SEDIMENT BASIN, CLASS "B" GRAVEL, FILTER BAG, OR UNDISTURBED VEGETATION TO FILTER OUT SOLID MATERIAL.
 6. SILT ACCUMULATION ALONG SILT FENCE AND SWALES SHALL BE REMOVED REGULARLY.
 7. WITH RESPECT TO SEDIMENT CONTROL, ALL WORK SHALL BE COMPLETED TO THE SATISFACTION OF THE ENGINEER.
 8. MACHINERY MAINTENANCE SHALL NOT BE PERFORMED IN OR NEAR A WATERCOURSE, DITCH OR STORM SEWER. SOME EXAMPLES OF MAINTENANCE INCLUDED, BUT ARE NOT LIMITED TO, WASHING OUT CEMENT MIXERS, CHANGING OIL, GREASING, SPRAY PAINTING, CLEANING OF SPRAYING EQUIPMENT OR PAINTING EQUIPMENT, ETC.
 9. ANY HAZARDOUS LIQUID INCLUDING FUEL AND LUBRICANTS SHALL BE STORED IN A DESIGNATED AREA SURROUNDED BY AN IMPERVIOUS BERM WHICH WOULD CONTAIN A SPILL EQUAL TO THE VOLUME OF ALL STORED LIQUIDS.
 10. THE EFFECTIVENESS OF THE CONTROL MEASURES SHALL BE INSPECTED AND MONITORED DURING RAIN EVENTS AND MAINTAINED AND UPGRADED AS NECESSARY OR AS DIRECTED BY THE ENGINEER OR ENVIRONMENTAL INSPECTORS.
 11. CONTRACTOR SHALL MONITOR METEOROLOGICAL CONDITIONS AND FORECASTS AS A PROACTIVE MEANS TO MINIMIZE THE POTENTIAL FOR EROSION.
 12. EXACT LOCATIONS AND DIMENSIONS OF THE SILT FENCING, SANDBAGS AND TEMPORARY SEDIMENT PONDS SHALL BE DETERMINED ON SITE. LOCATION OF SEDIMENT PONDS SHALL BE PLACED NOT TO DISTURB EXISTING TREES.
 13. CONTRACTOR SHALL REINSTATE DISTURBED AREAS AT THEIR OWN EXPENSE.
 14. WEEKLY ESC REPORT SHALL BE PROVIDED TO THE OWNER.

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 2017/06/12 11:46 AM By: Armstrong, SCOTT (S. John's)

- SILT FENCE
- SAND BAG
- CONSTRUCTION BARRICADES
- JERSEY BARRIERS

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C	SA	PP	17.06.12	
B	SA	PP	17.05.31	
A	SA	PP	17.05.30	
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Signature or Member Number (Member-in-Responsible Charge)

REGISTERED PROFESSIONAL ENGINEER

P. T. PORTER

2017.06.12

PROVINCE OF NEWFOUNDLAND

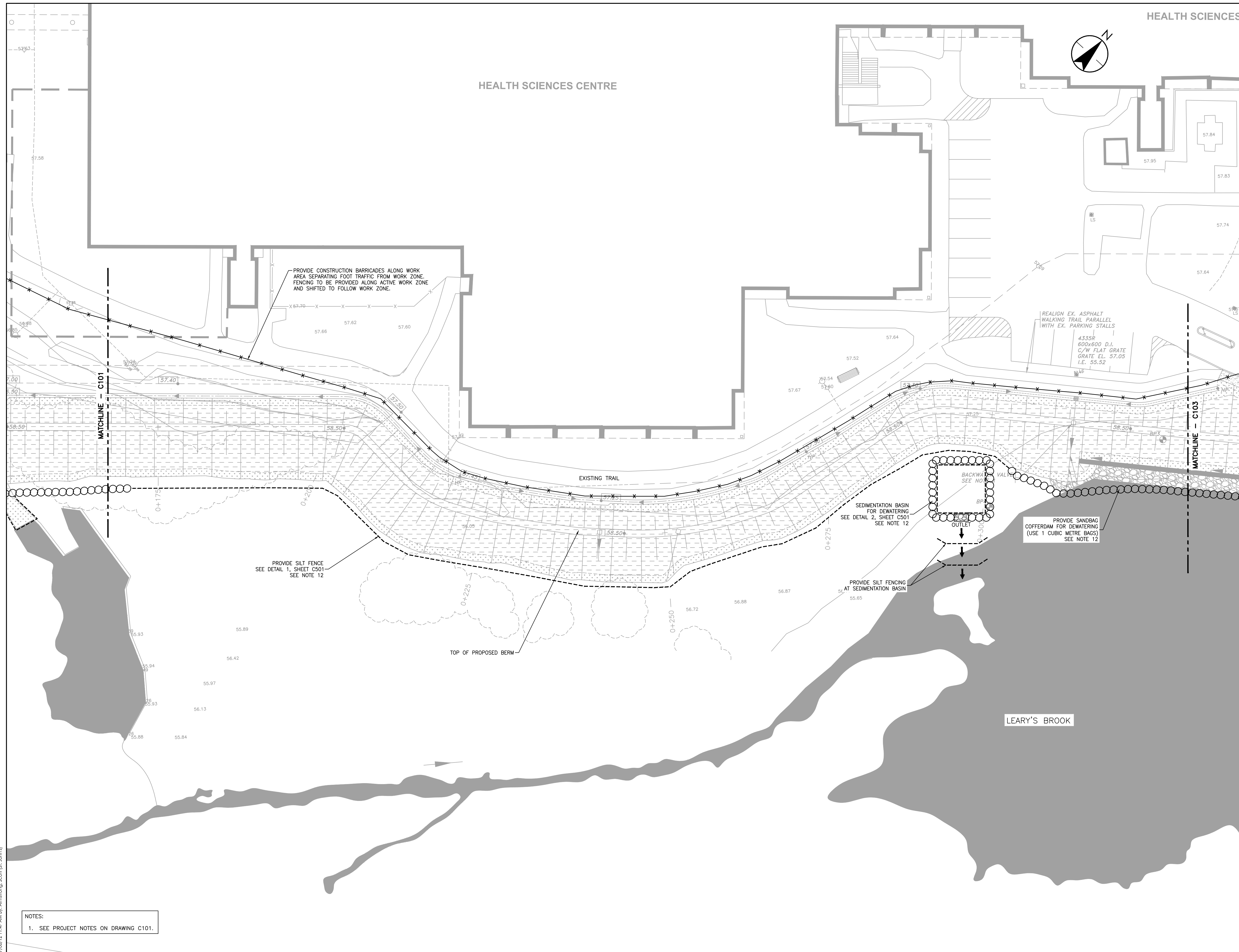
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EROSION & SEDIMENTATION CONTROL
 HEALTH SCIENCES CENTRE BERM
 St. John's, Newfoundland & Labrador

Title
 EROSION SEDEMENTATION CONTROL PLAN #2

Project No. 133347813 Scale 1:250

Drawing No. C102 Sheet 2 of 4 Revision C



NOTES:
 1. SEE PROJECT NOTES ON DRAWING C101.

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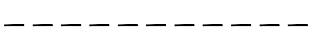

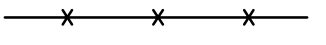

EX. 43825
 LC. 54.09

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-  SAND BAG
-  CONSTRUCTION BARRICADES
-  JERSEY BARRIERS

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A	ISSUED FOR REVIEW	SA	PP 17.05.30
Issued		By	Appd. YY.MM.DD

File Name:	Dwn.	Chkd.	Dsgn.	YY.MM.DD

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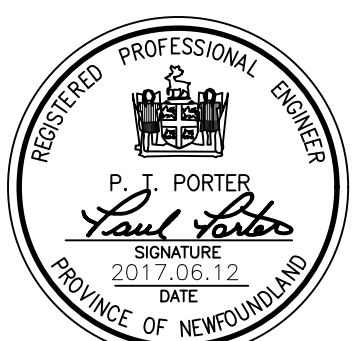
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HEALTH SCIENCES CENTRE BERM
St. John's, Newfoundland & Labrador

Title
EROSION SEDEMENTATION CONTROL PLAN #3

Project No. 133347813	Scale 1:250	
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Drawing No. C103	Sheet 3 of 4	Revision C
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PROVIDE CONSTRUCTION BARRICADES AND JERSEY BARRIERS ALONG WORK AREA SEPARATING VEHICULAR TRAFFIC FROM WORK ZONE. FENCING TO BE PROVIDED ALONG ACTIVE WORK ZONE AND SHIFTED TO FOLLOW WORK ZONE.

PROVIDE JERSEY BARRIERS SEE DETAIL 3, SHEET C501

PROVIDE SANDBAG COFFERDAM FOR DEWATERING (USE 1 CUBIC METRE BAGS) SEE NOTE 12

LEARY'S BROOK

PROPOSED LAYDOWN AREA COORDINATE WITH OWNER
FUTURE ASPHALT PARKING LOT

TOP OF PROPOSED BERM

PROVIDE SANDBAG COFFERDAM FOR DEWATERING (USE 1 CUBIC METRE BAGS) SEE NOTE 12

PROVIDE SILT FENCE SEE DETAIL 1, SHEET C501 SEE NOTE 12

PROVIDE SILT FENCING AT SEDIMENTATION BASIN

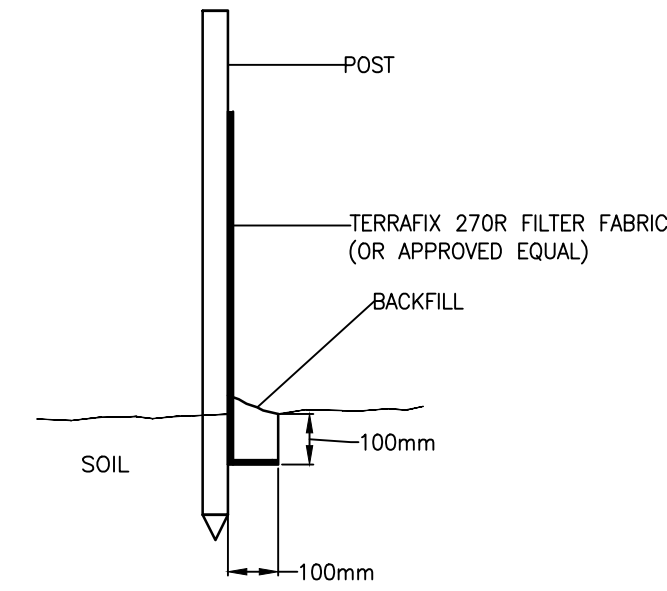
SEDIMENTATION BASIN FOR DEWATERING SEE DETAIL 2, SHEET C501 SEE NOTE 12

NOTES:
1. SEE PROJECT NOTES ON DRAWING C101.

Consultants

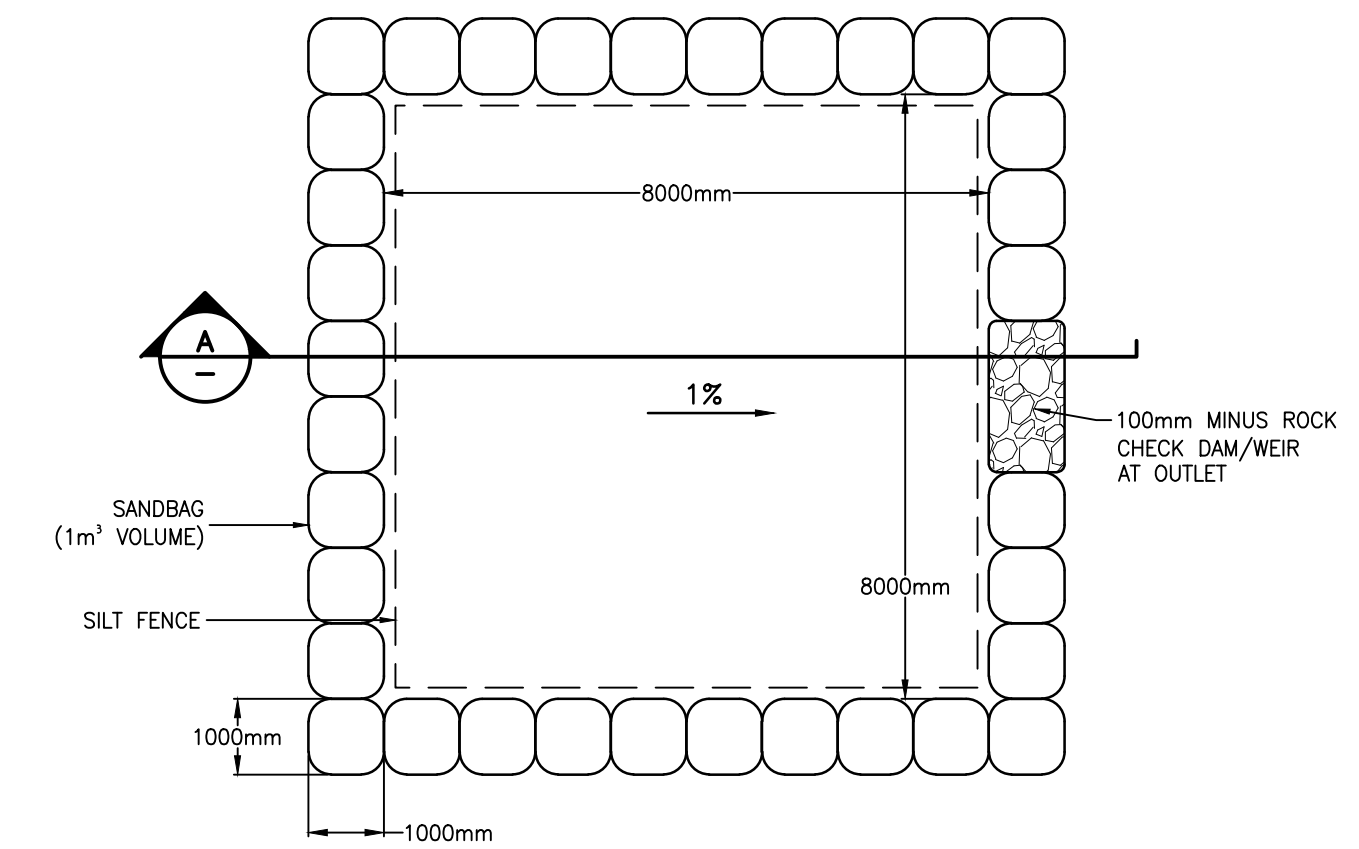
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- SILT FENCE
- _____ SAND BAG
- x---x---x--- CONSTRUCTION BARRICADES
- ==== JERSEY BARRIERS

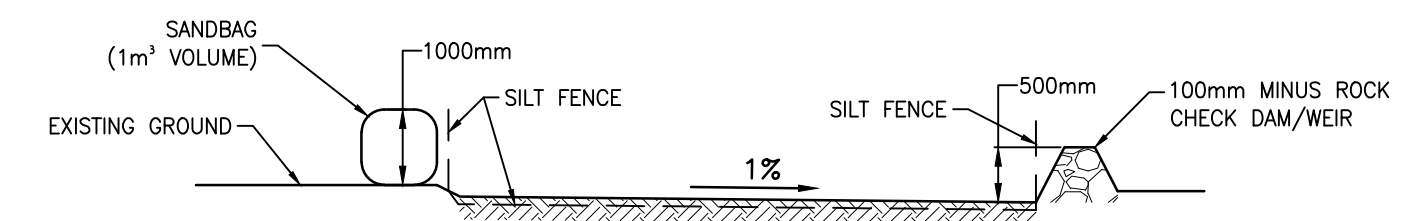


- INSTALLATION OF GEOTEXTILE SILT FENCE**
- EXCAVATE A 100 x 100 TRENCH IN A CRESCENT SHAPE ACROSS THE FLOW PATH WITH ENDS POINTING UPSLOPE.
 - DRIVE STURDY STAKES, SPACED 3000 APART, INTO THE GROUND ALONG THE DOWNSLOPE SIDE OF THE TRENCH.
 - INSTALL THE FILTER FABRIC FROM A CONTINUOUS ROLL AND CUT TO REQUIRED LENGTH. THE FILTER FABRIC SHOULD BE STAPLED TO THE UPSTREAM SIDE OF THE STAKES, EXTENDING THE BOTTOM 200 INTO THE TRENCH.
 - BACKFILL AND COMPACT THE SOIL IN THE TRENCH OVER THE FILTER FABRIC.

1 SILT FENCE DETAIL
 C101 N.T.S.

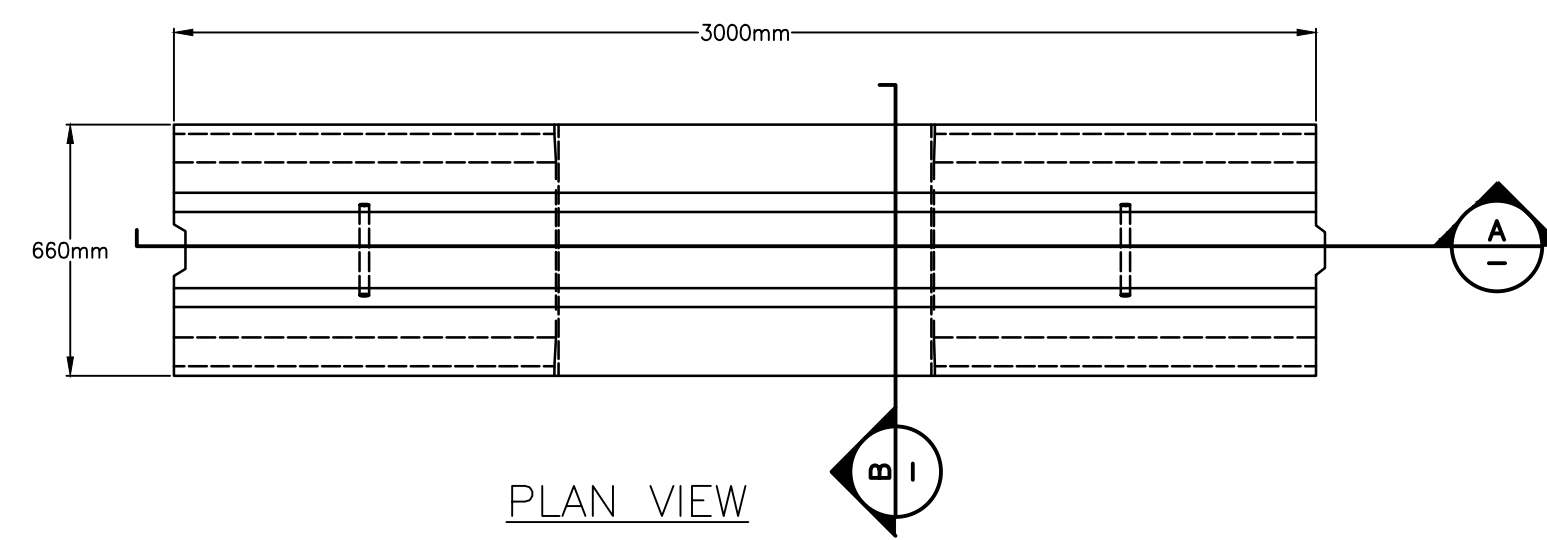


PLAN VIEW

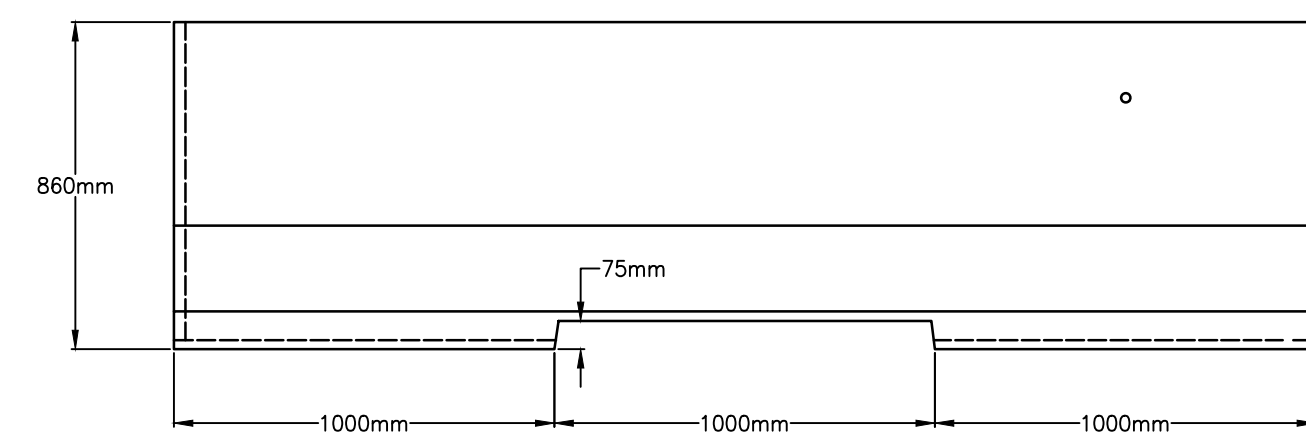


SECTION A

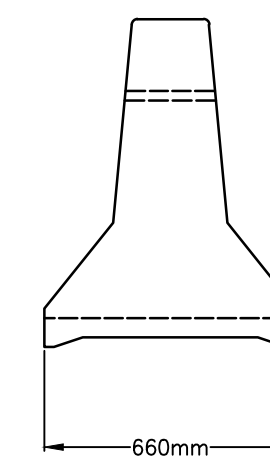
2 SEDIMENTATION BASIN DETAIL
 C101 N.T.S.



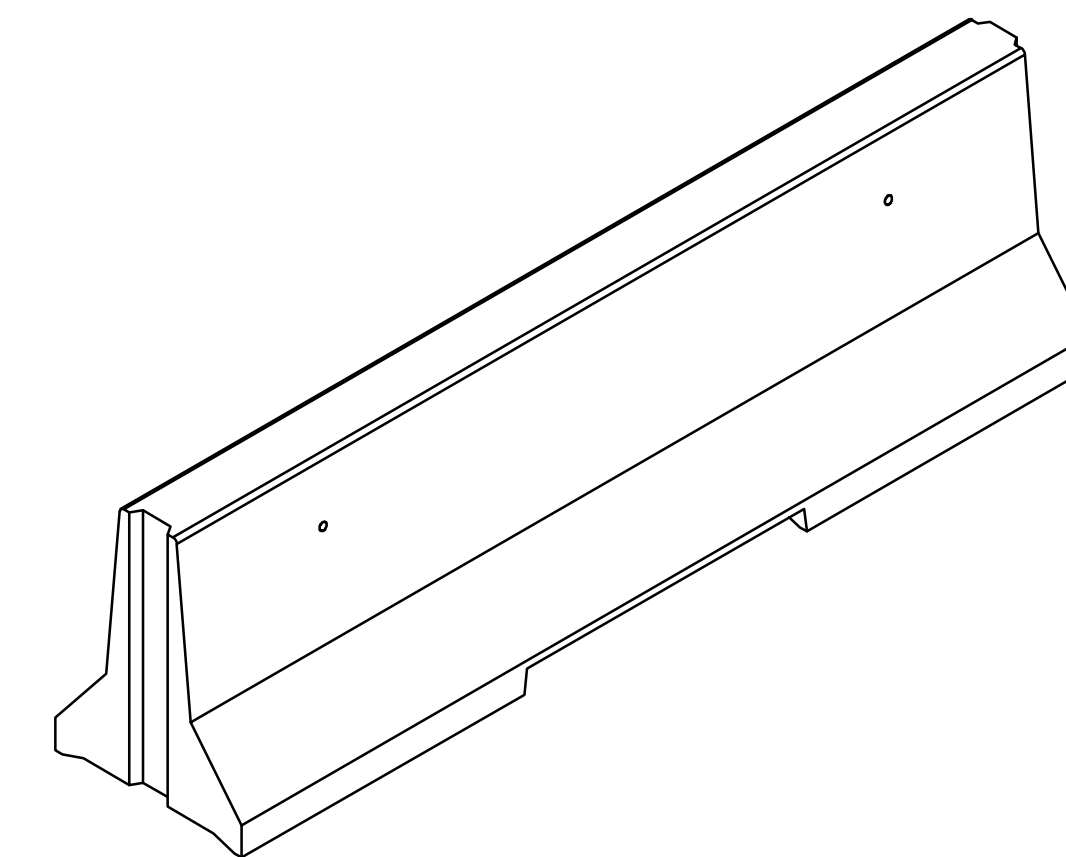
PLAN VIEW



SECTION A



SECTION B



ISOMETRIC

3 JERSEY BARRIER DETAIL
 C103 N.T.S.

NOTES:
 1. SEE PROJECT NOTES ON DRAWING C101.

Revision	By	Appd.	YY.MM.DD
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 HEALTH SCIENCES CENTRE BERM
 St. John's, Newfoundland & Labrador

Title
 CIVIL DETAILS

Project No. 133347813	Scale AS SHOWN
Drawing No. C501	Sheet 4 of 4
	Revision C

APPENDIX G – Eastern Health Open House / Public Meeting

PUBLIC NOTICE



Public Information Session on the Proposed

Health Sciences Centre Berm, St. John's, Newfoundland and Labrador

shall be held at

Health Sciences Centre, Main Level, Rooms 2J618/2J619

Thursday, January 18, 2018

6:30 – 8:30 p.m.

This session shall be conducted by the Proponent,
Eastern Health Infrastructure Support Department, (709) 777-5160,
as part of the environmental assessment for this project.

The purpose of the session is to describe all aspects of the proposed project,
to describe the activities associated with it and to provide an opportunity
for all interested persons to request information or state concerns.

ALL ARE WELCOME



Eastern
Health

PUBLIC SERVICE ANNOUNCEMENT

Eastern Health to Hold Public Information Session on Health Sciences Centre Berm Project

January 11, 2018 - St. John's, NL: Eastern Health will hold a public information session on Thursday, January 18, 2018 to discuss the construction of a berm at the Health Sciences Centre in St. John's. The public information session will be held from 6:30 to 8:30 p.m. on the main level of the Health Sciences Centre, Rooms 2J618/2J619.

The purpose of the session is to describe all aspects of the proposed project and the activities associated with it as well as to provide an opportunity for all interested persons to request information and/or state concerns. The information and feedback obtained will be considered as part of the Environmental Preview Report and the plans for the project going forward. This session is open to all members of the public and Eastern Health encourages stakeholders and those who live in the area to attend.

For more information, please visit <http://www.easternhealth.ca/AboutEH.aspx?d=4&id=2437&p=787> or call Eastern Health's Infrastructure Support Department at (709) 777-5160.

- 30 -

Media Contact:

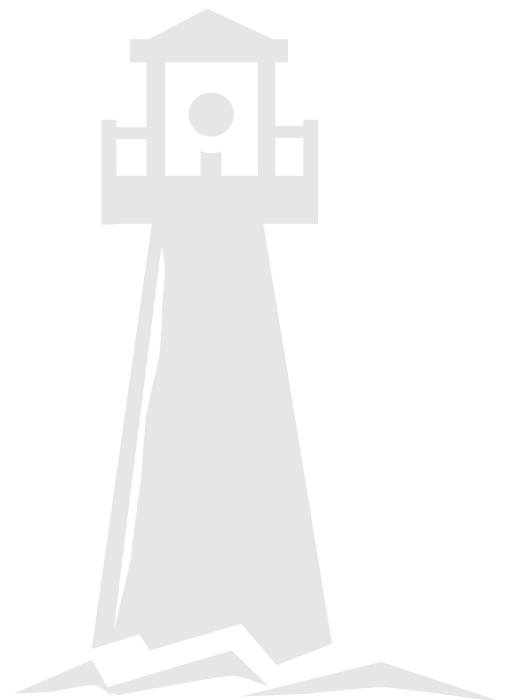
Tracey Boland

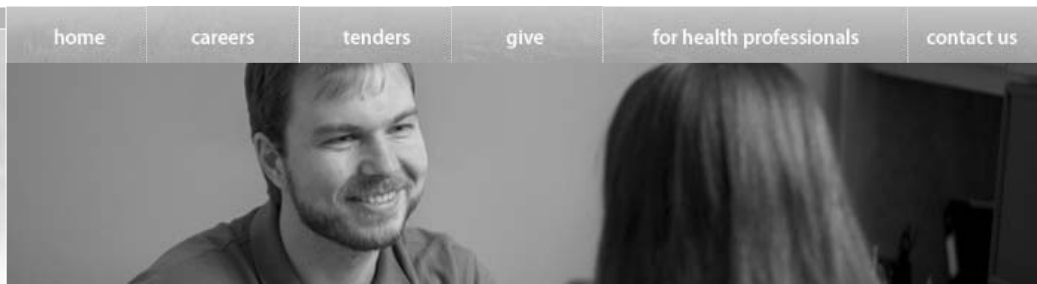
Media Relations Manager

Eastern Health

T: 777-1412

TraceyL.Boland@easternhealth.ca





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- [Storm Watch](#)
- [Increase of Mumps in Eastern Region](#)

News Centre

Eastern Health provides access to the most up-to-date information released. Archives of previous news releases are also available.

Feb 01, 2018

[PSA_Eastern Health's Centre for Nursing Studies to Hold Open House](#)

Feb 01, 2018

[News Release_Expansion of Automated Notification System for Clinical Appointments](#)

Jan 15, 2018

[Public Advisory_Eastern Health Reports Increase in Mumps](#)

Jan 11, 2018

[PSA_Eastern Health to Hold Public Information Session on Health Sciences Centre Berm Project](#)

Jan 11, 2018

[PSA_Eastern Health Continues to Offer Seasonal Influenza Vaccine](#)

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Health Science Centre Berm

Proposed Project Details

Eastern Health is proposing a flood protection berm on the Health Sciences Centre (HSC) property at 300 Prince Philip Drive, St. John's, NL. The berm will be located along the undeveloped portion of the property adjacent to Leary's Brook, between Leary's Brook and the HSC.

A berm currently exists onsite and was constructed with the initial construction of the hospital. This historical berm will be left in place and incorporated as part of the new berm.

The proposed project will enhance protection of the HSC from the risk of flooding from Leary's Brook. The flood protection berm would protect the building and critical infrastructure areas on the site from damage which are essential to provide uninterrupted hospital services.

The berm will be approximately 480 m long and will be located between the southwest end of the Agnes Cowan Hostel and the Clinch Crescent East bridge. The berm will be constructed with 2.5:1 berm slopes to a height of 58.50 m in elevation. Some segments will be constructed with a retaining wall rather than an engineered slope to reduce impact to the waterbodies.

The berm will be stabilized with top soil and covered with a mix of hydroseed and/or sod for stabilization, erosion and sediment control. Mostly native shrubs and trees will be planted to provide further stability, and to blend the berm into the surrounding landscape. Berm slopes along the waterside edge or facing the water will be stabilized using hydraulic rip rap or armour stone, including at the foot of the retaining walls.

The berm will be designed to assist with local drainage by the inclusion of a rock infiltration swale - a basin designed to manage water runoff placed at the toe of the slope on the side of the berm facing HSC. The infiltration swales will channel water to backwater valves during storm events, directing storm water back into Leary's Brook. The swale will not be included in the area adjacent to the parking lot at Clinch Crescent. In this area, stormwater will be collected and redirect stormwater to the parking lot catch basin.

- [Health Science Centre Berm DESIGN - Public Meetings - Storyboard \(PDF\)](#)
- [Health Science Centre Berm LOCATION - Public Meetings - Storyboard \(PDF\)](#)

For more information on the **Environmental Assessment Process** for this project, please visit:

- [Health Science Centre Berm, Department of Municipal Affairs and Environment, Government of Newfoundland and Labrador.](#)

Questions or feedback may be directed to Eastern Health's **Infrastructure Support Department at (709) 777-5160**.

Frequently Asked Questions

Project Schedule

When could the project start?

The start date for the project will depend on required approvals and authorizations. If authorization to proceed is received, clearing of vegetation will begin in March 2018 prior to the breeding bird nesting season (mid-April to mid-August).

How long will the project be under construction?

The construction is expected to occur over a four month period including mobilization to demobilization.

Alternatives

Have other options to the berm been investigated?

Other structural methods of preventing flooding were reviewed as alternatives to the project. The options that were reviewed included:

- Increasing the hydraulic opening of the Clinch Crescent East Bridge;
- Berms or Levees;
- Flood – Control Reservoirs;
- Channel Modifications; and
- Diversion.

Why was this option selected?

Upon evaluation of the alternatives, this option was the only one that protected the hospital from flooding. The other options were not selected due to a combinations of factors such as technical suitability, space limitations within the watershed, land ownership, and potential damage to the natural environment.

Environmental Assessment Timeline

How long will the Environmental Preview Report (EPR) be under review?

The Minister has seven days to post the receipt of the Environmental Preview Report (EPR) document following submission. The Minister has 45 days to review the EPR document and 10 days to post the decision after the 45 day review period.

How will EPR document be available for comment?

The public will have 35 days following the posting of the EPR to provide comments to the Minister. The EPR will be available on the Department of Municipal Affairs and Environment, Environmental Assessment Webpage.

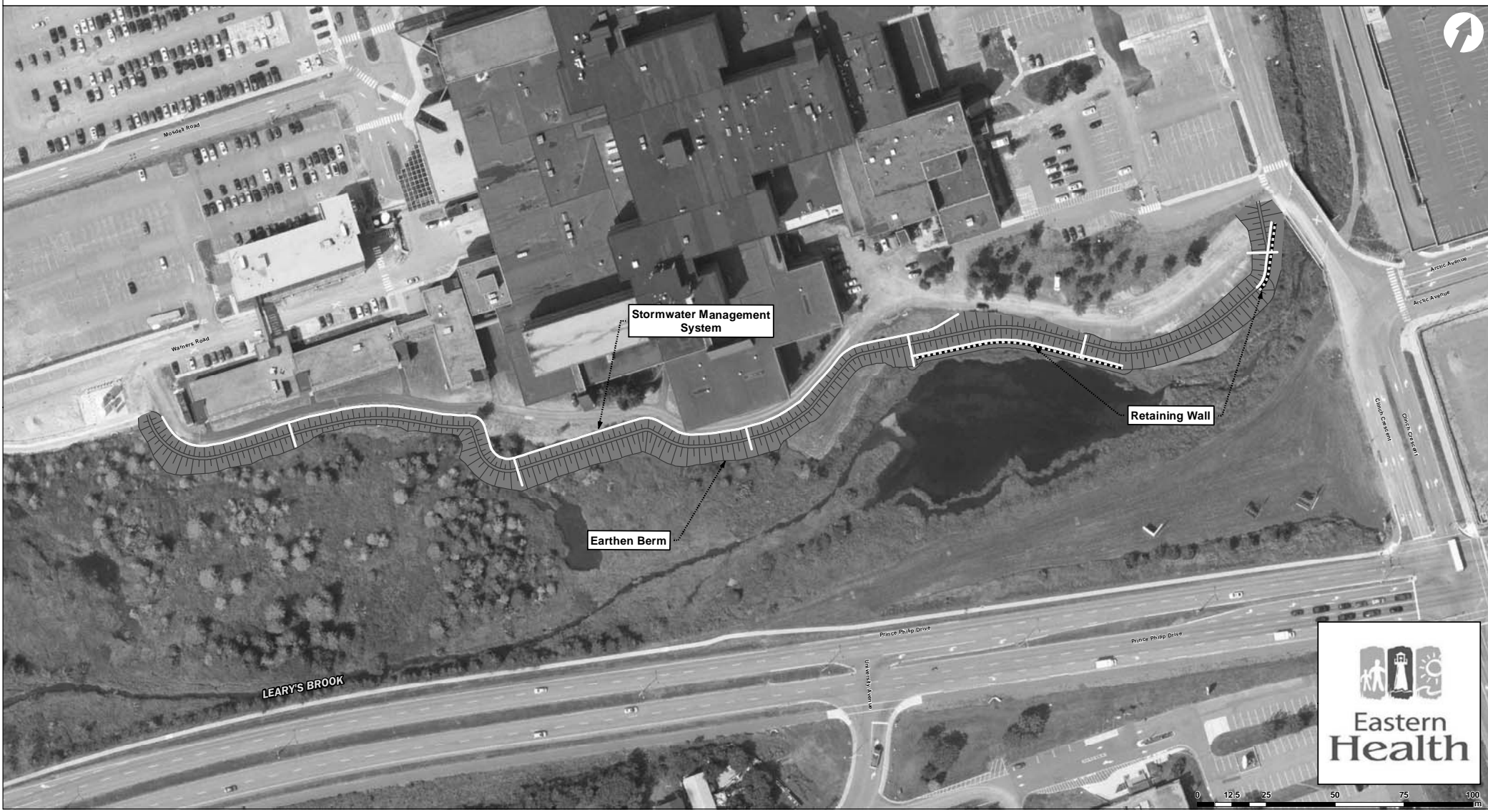
[Top]

Updated Jan 24, 2018

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PROJECT DESIGN

Health Sciences Centre Flood Protection Berm Environmental Preview Report



PROJECT LOCATION

Health Sciences Centre Flood Protection Berm Environmental Preview Report



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January 11, 2018 - <https://www.facebook.com/EasternHealthNL/posts/1611624572218014>

**Eastern Health** January 11 at 10:53am · 🌐 ⋮

Eastern Health will host a public information session on the Health Sciences Centre berm project on Thursday, January 18, 2018 from 6:30 – 8:30 p.m., Main Level, Health Sciences Centre, Rooms 2J618/2J619.

This session is open to all members of the public. We encourage stakeholders and those who live in the area to attend.

For more info., please visit: <http://www.easternhealth.ca/AboutEH.aspx?d=4&id=2437&p=787>

Eastern Health - Public Information Session: Health Science Centre Berm
Largest health authority in Newfoundland and Labrador offering the full continuum of health and community services.
EASTERNHEALTH.CA

 Like  Comment  Share

January 18, 2018 - <https://www.facebook.com/EasternHealthNL/posts/1617667621613709>

**Eastern Health** January 18 at 8:48am · 🌐 ⋮

Eastern Health will host a public information session on the Health Sciences Centre berm project tonight from 6:30 – 8:30 p.m., Main Level, Health Sciences Centre, Rooms 2J618/2J619.

This session is open to all members of the public. We encourage stakeholders and those who live in the area to attend.

For more info., please visit: <http://www.easternhealth.ca/AboutEH.aspx?d=4&id=2437&p=787>

Eastern Health - Public Information Session: Health Science Centre Berm
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January 11, 2018 - <https://twitter.com/EasternHealthNL/status/951470098635730944>



Eastern Health @EasternHealthNL · Jan 11

Eastern Health will host a public information session on the Health Sciences Centre berm project on Thursday from 6:30 – 8:30 p.m., Main Level, Health Sciences Centre, Rooms 2J618/2J619.

1



Eastern Health
@EasternHealthNL

Follow

This session is open to all members of the public. We encourage stakeholders and those who live in the area to attend.

For more info., please visit:
easternhealth.ca/AboutEH.aspx?d...

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January 18, 2018 - <https://twitter.com/EasternHealthNL/status/953972597074612231>



Eastern Health @EasternHealthNL · Jan 18

Eastern Health will host a public information session on the Health Sciences Centre berm project tonight from 6:30 – 8:30 p.m., Main Level, Health Sciences Centre, Rooms 2J618/2J619.

1



Eastern Health
@EasternHealthNL

Follow

This session is open to all members of the public. We encourage stakeholders and those who live in the area to attend.

For more info., please visit:
easternhealth.ca/AboutEH.aspx?d...

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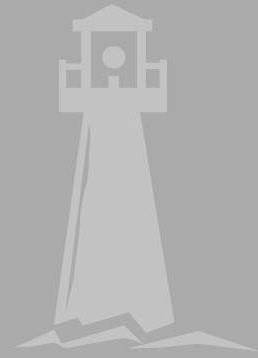
1 Retweet

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***Health Science Centre – Berm Project
Public Information Session***

Daniel Parsons
Senior Regional Manager, Planning and Engineering



Background



Health Sciences Centre (HSC)

- Largest acute care health facility in NL.
- Provides specialized services to all residents of the province.
- Development and Implementation of risk mitigation strategies to protect the facility when faced with a severe weather event.

Risk Mitigation Strategies

- Goal – To provide uninterrupted services in the event of any external weather event or external disaster.
- To implement strategies to continue access and operations.

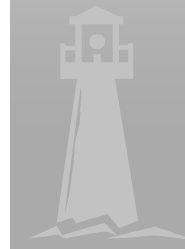


Public Information Session



Purpose:

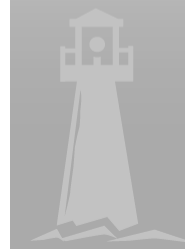
- To provide information concerning the undertaking to the people whose environment may be affected by the undertaking.
- To respond to the questions or concerns of the local community regarding the environmental effects of the undertaking.



Completed Strategies



- 2016 – Completion of an Emergency Access road to the south of the HSC.
- 2016 - Completion of an alternative access road from the HSC complex to Larkhall Street.
- 2016 – Completion of an above ground emergency power link between Memorial University Annex and the HSC.



Current Strategy: Berm



Design and construction of a berm in 2017-18:

- To help keep anticipated water from Leary's Brook and Leary's Brook Pond from moving toward the hospital in the event of heavy rainfall events.

Studies:

- Previous engineering studies have confirmed the need for a berm at the HSC and as part of overall water management in the Rennie's River Watershed.



PROJECT LOCATION

Health Sciences Centre
Flood Protection Berm
Environmental Preview Report



PROJECT DESIGN

Health Sciences Centre
Flood Protection Berm
Environmental Preview Report



Environmental Assessment Process



- April 12, 2017 – Project was registered as an undertaking with Municipal Affairs and Environment (MAE).
- June 29, 2017 – MAE announced that an Environmental Preview Report (EPR) is required.
- August 3, 2017 – EPR Guidelines issued.
- August, 2017 - Eastern Health starts EPR.
- January 18, 2018 – Eastern Health holds a Public Information Meeting / Open House Public Information Session.
- Winter 2018 – Eastern Health Submits EPR to MAE.



Discussion and Questions



Subject Matter Experts:

- Daniel Parsons – Project Concept
- Trevor Moore – Project Design
- Melissa Rutherford – Environmental
- Greg Sheppard – Surface Water Management

Storyboards:

- Project Location
- Alternatives
- Project Design
- 20-year Climate Change (CC) Annual Exceedance Probability (AEP) Flood Boundaries
- 100 - year AEP CC Flood Boundaries
- 100 - year + 30% AEP CC Flood Boundaries

Questions:

Please visit the storyboards of more information.

We would be pleased to answer any questions or concerns you may have regarding the project at the storyboards.



Thank you



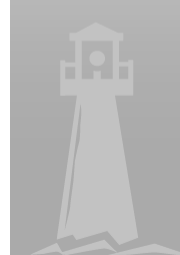
More information is available on the project at the following locations:

Eastern Health Project Website

<http://www.easternhealth.ca/AboutEH.aspx?d=4&id=2437&p=787>

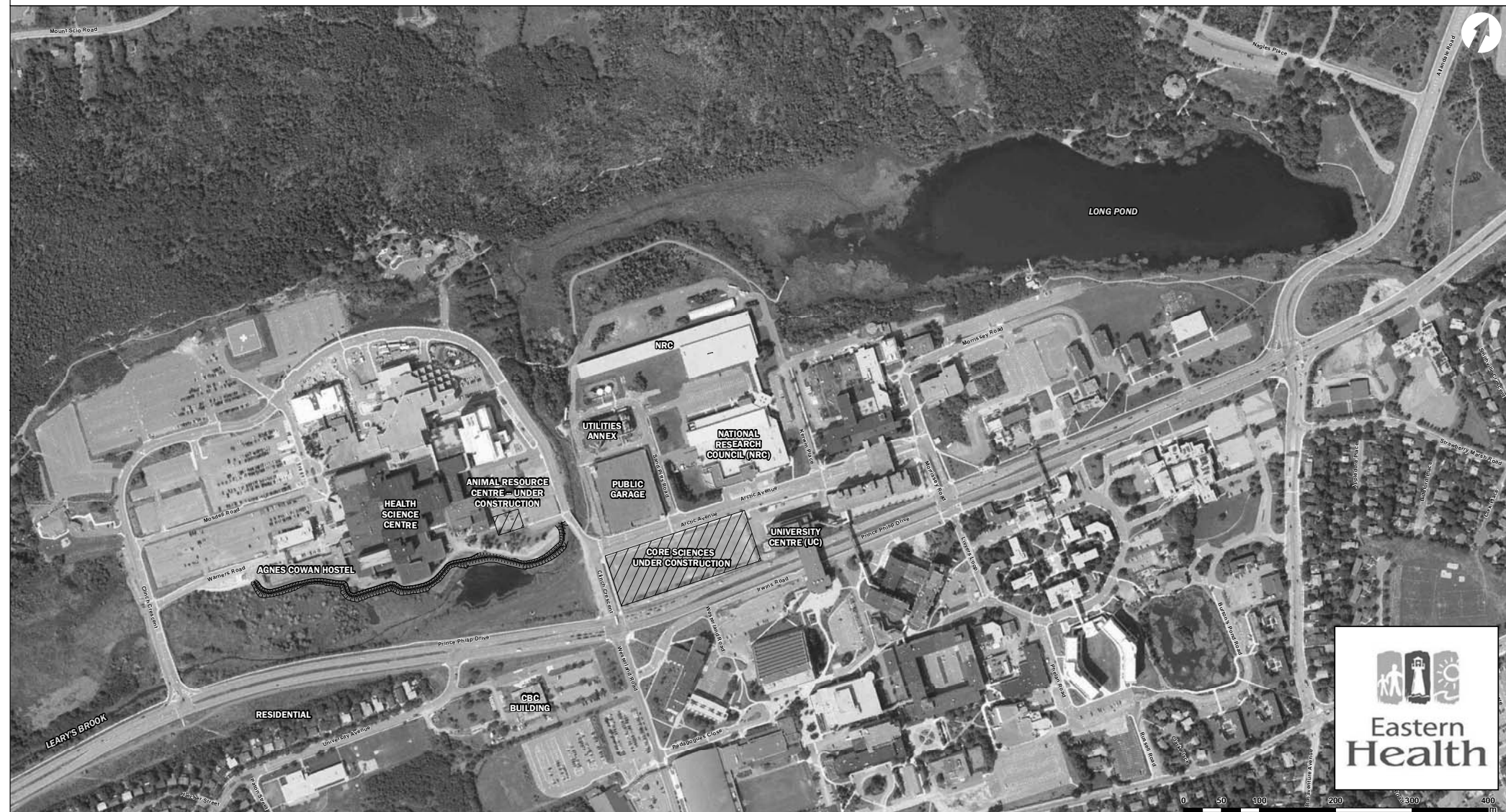
Municipal Affairs and Environment Project Website

http://www.mae.gov.nl.ca/env_assessment/projects/Y2017/1887/index.html



PROJECT LOCATION

Health Sciences Centre Flood Protection Berm Environmental Preview Report



PROJECT DESIGN

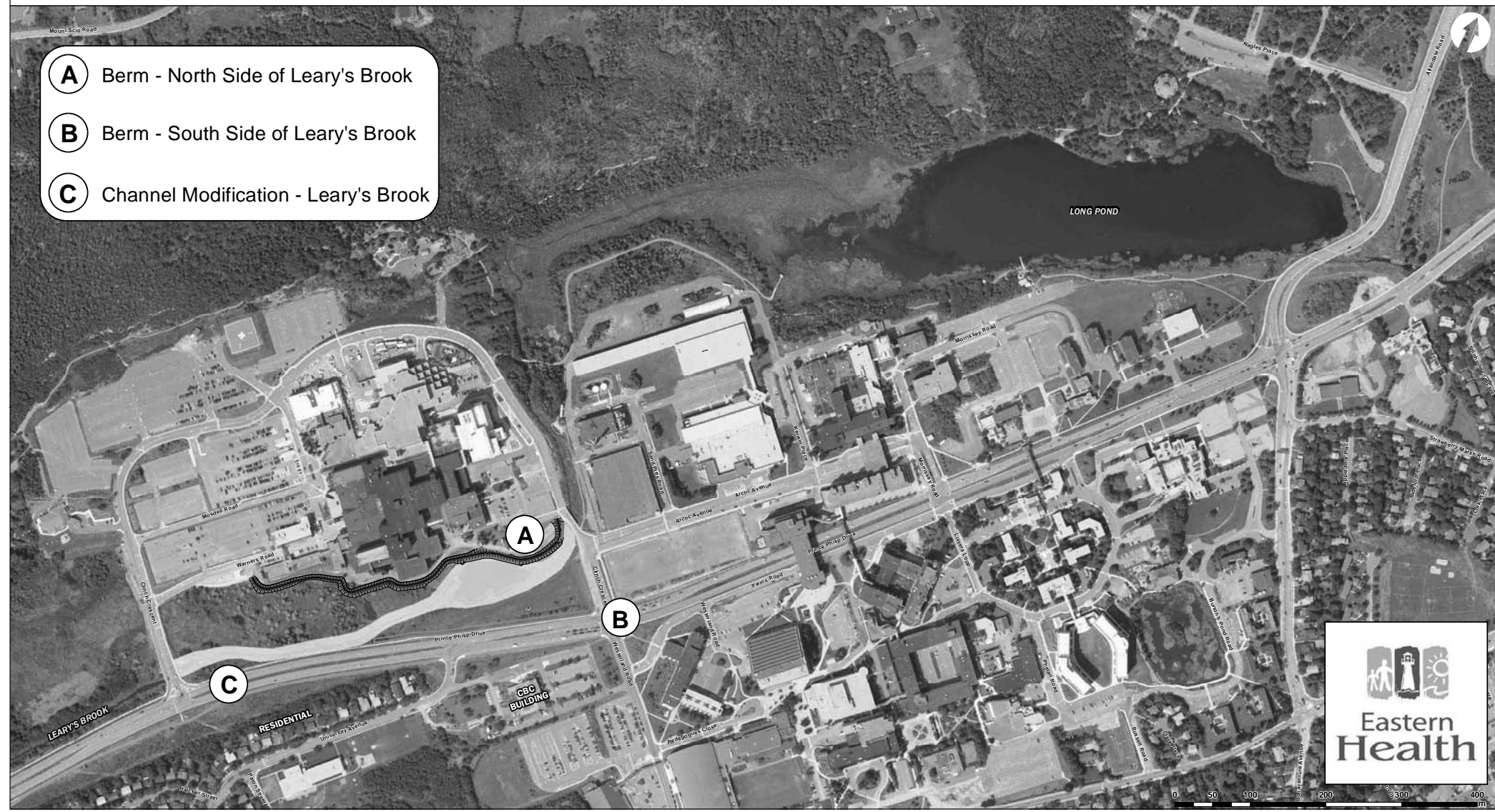
Health Sciences Centre Flood Protection Berm Environmental Preview Report



ALTERNATIVES

Health Sciences Centre Flood Protection Berm Environmental Preview Report

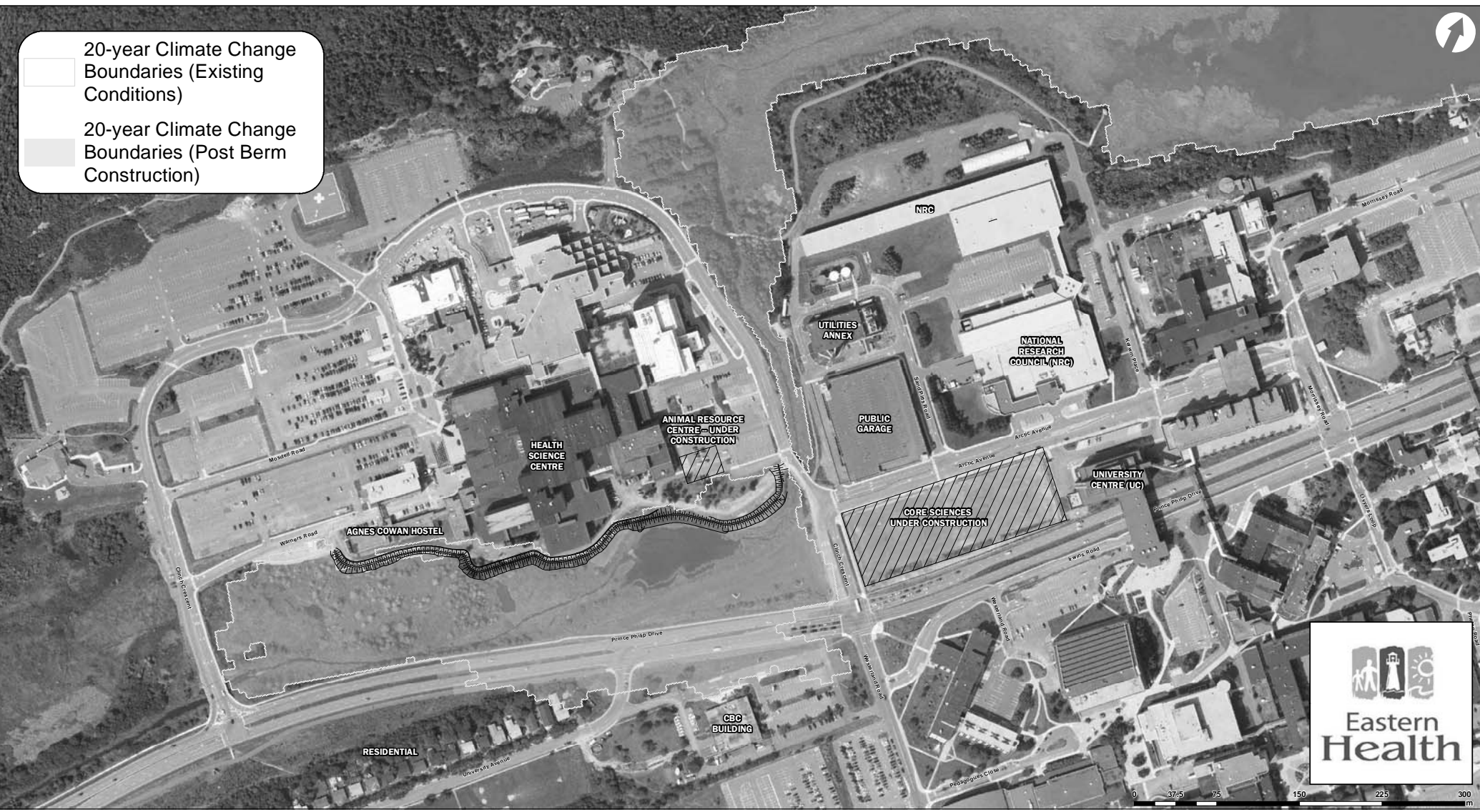
- A** Berm - North Side of Leary's Brook
- B** Berm - South Side of Leary's Brook
- C** Channel Modification - Leary's Brook



20-year Climate Change Flood Boundaries

Health Sciences Centre Flood Protection Berm Environmental Preview Report

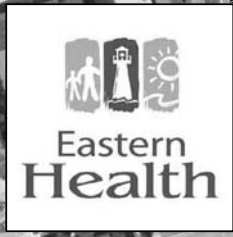
- 20-year Climate Change Boundaries (Existing Conditions)
- 20-year Climate Change Boundaries (Post Berm Construction)



100-year Climate Change Flood Boundaries

Health Sciences Centre Flood Protection Berm Environmental Preview Report

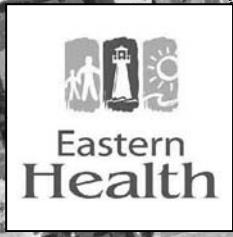
- 100-year Climate Change Boundaries (Existing Conditions)
- 100-year Climate Change Boundaries (Post Berm Construction)



100-year + 30% Climate Change Flood Boundaries

Health Sciences Centre Flood Protection Berm Environmental Preview Report

- Climate Change Boundaries (Existing Conditions)
- Climate Change Boundaries (Post Berm Construction)



Eastern Health, Health Science Centre, Flood Protection Berm
 Open House Public Information Session
 January 18, 2018

THEME	TOPIC	RESPONSE	RESPONSE LOCATION IN THE EPR
Existing Conditions	<p>Location of existing berm</p> <p>Rain conditions in St. John's, NL</p>	<p>The existing berm is roughly located along the pond along Leary's Brook.</p> <p>Highest precipitation amounts are typical during storm events, such as hurricanes. The highest precipitation is recorded in December with an average of 153.7 mm.</p>	<p>Section 4.1.1 Geographic location; and Figure 4.3.</p> <p>Section 4.1.3 Existing Environment</p>
Berm Construction	<p>Berm Construction – Was a membrane included within the design?</p> <p>Construction in relation to the River bed</p>	<p>The Berm does not have a member or liner within the Design. The use of a membrane could have increased the area of impact, so the option was not use in the design.</p> <p>A 120 m long x 5 m wide portion will be located along the Leary's Brook Pond bank; and will be constructed with a retaining wall preserving the existing waterline. The remainder of the Berm will be constructed approximately 5-10 m from the normal waterline. Sediment and erosion control</p>	<p>Section 4.1.2.1 Description of the Project, Section 4.2 Construction and Appendix A.</p> <p>Section 4.1.2.1 Description of the Project, Section 4.2 Construction and Appendix A.</p>

Eastern Health, Health Science Centre, Flood Protection Berm
 Open House Public Information Session
 January 18, 2018

THEME	TOPIC	RESPONSE	RESPONSE LOCATION IN THE EPR
	Timing of construction in relation to construction of the weir	measures will be implemented to reduce potential negative effects to the river bed and fish and fish habitat. The timing of the potential weir construction is not known.	Section 6.1.1 Surface Water and Surface Water Management
	Adequacy of the Berm for flood mitigation and the 1:100 + 30%	The Berm has been designed with stabilized slope and during a 1:100 AEP will have approximately 90 cm (3 feet) from the level to flooding to the top of the Berm. The Berm has capacity for the 1:100 + 30% AEP.	Section 6.1.1 Surface Water and Surface Water Management
	What types of vegetation will be used?	Planting and vegetation plan has been completed and is included within the EPR	Section 4.2 Construction and Appendix A.
	Impact of Hydroseeding	Sediment and erosion control measures will be implemented to reduce potential negative effects of hydroseeding. Use of sod is also within the Project Design.	Section 6.1.1 Surface Water and Surface Water Management and Appendix F - Erosion & Sediment Control Health Sciences Centre Berm

Eastern Health, Health Science Centre, Flood Protection Berm
 Open House Public Information Session
 January 18, 2018

THEME	TOPIC	RESPONSE	RESPONSE LOCATION IN THE EPR
	How will the Berm design reduce the introduction of sediment to the river system and effects to fish?	The Berm will be designed with a 2.5:1 to reduce the effects of run-off, as well as sediment and erosion control measures will be implemented. When working near watercourses, retaining wall and rip-rap will be used to reduce encroachment into watercourses.	Section 6.1.1 Surface Water and Surface Water Management and Appendix F - Erosion & Sediment Control Health Sciences Centre Berm
Flooding Risks	Will the project increase flooding downstream of Long Pond?	The assessment focused on localized flooding effects, and was modelled to the outflow of Long Pond. The flooding extent around Long Pond and at the outflow of Long Pond demonstrates minimal variability between pre and post Berm conditions.	Section 6.1.1 Surface Water and Surface Water Management and Appendix D
	Will the velocity be increased downstream of Long Pond?	The assessment focused on localized flooding effects, and was modelled to the outflow of Long Pond. The velocity downstream of Long Pond was not assessed.	Section 6.1.1 Surface Water and Surface Water Management and Appendix D
	Is flooding of the new Core Sciences Building be possible?	Yes there is a risk of flooding as depicted in the 1:100 AEP CC 30%.	Section 6.1.1 Surface Water and Surface Water Management and Appendix D

Eastern Health, Health Science Centre, Flood Protection Berm
 Open House Public Information Session
 January 18, 2018

THEME	TOPIC	RESPONSE	RESPONSE LOCATION IN THE EPR
	<p>Why was 30% added to the 1:100?</p> <p>Will flooding increase as a result of the Berm or will it just displace existing water?</p>	<p>The additional 30% is a safety factor applied by the Water Resources Management Department.</p> <p>Some scenarios 1:20 AEP and 1:100 AEP, showed that the flooding within the area as a total decreased with the installation of the Berm. However, the 1:100 AEP + 30% showed that flooded area increased, particularly east of Clinch Cres.</p>	<p>Section 6.1.1 Surface Water and Surface Water Management and Appendix D</p> <p>Section 6.1.1 Surface Water and Surface Water Management and Appendix D</p>
<p>Environmental / Engineering Studies Completed</p>	<p>Have fish studies been completed?</p>	<p>Fish studies have not been completed specifically for this Project. Identification of known and potential fish species are included in Section 4.1.3 of the EPR.</p>	<p>Section 4.1.3 Existing Information</p>
<p>Environmental Assessment</p>	<p>A comprehensive approach could be useful for the approvals of all similar water management /flooding related projects rather than project specific approvals.</p> <p>Will sediment and erosion control reduce the introduction</p>	<p>The comment will be noted and include in the EPR report.</p> <p>Yes, effective sediment and erosion control measures can</p>	<p>Comment included reference to other undertakings, comment was recorded but not addressed in the EPR.</p> <p>Section 6.1.1 Surface Water and Surface Water Management and Appendix F -</p>

Eastern Health, Health Science Centre, Flood Protection Berm
 Open House Public Information Session
 January 18, 2018

THEME	TOPIC	RESPONSE	RESPONSE LOCATION IN THE EPR
	<p>of sediment to the river system and effects to fish?</p> <p>Public Meeting; Presentation vs. Poster Boards.</p>	<p>reduce the introduction of sediment to the river system and effects to fish</p> <p>Both methods are suitable for presentation of the material.</p>	<p>Erosion & Sediment Control Health Sciences Centre Berm</p> <p>Section 9.0 Public Information Meeting</p>
<p>Alternatives</p>	<p>What other alternatives were considered within the region?</p> <p>Was retrofitting existing infrastructure considered as an option for alternatives?</p>	<p>Alternatives were focus around Clinch Cres East and Clinch West. Alternatives considered were Berms or Levees; Flood – Control Reservoirs; Channel Modifications; and Diversion.</p> <p>Retrofitting existing infrastructure was only considered Clinch Cres East and Clinch West; such as upgrading an already existing berm.</p> <p>Retrofitting existing infrastructure upstream of Clinch Cres was not considered; however, should be investigated by other proponents for overall watershed management by other Proponents.</p>	<p>Section 5.0 Alternatives</p> <p>Section 5.0 Alternative; Comment included reference to other undertakings, comment was recorded but not addressed in the EPR.</p>

Eastern Health, Health Science Centre, Flood Protection Berm
 Open House Public Information Session
 January 18, 2018

THEME	TOPIC	RESPONSE	RESPONSE LOCATION IN THE EPR
	Was there consideration of water retention, such as West of Clinch Cres West?	The possibility of water retention was investigated; the site west of Clinch Cres West had little water retention capacity as it already floods and is at a similar elevation to the HSC area which reduces its potential for use of water retention.	Section 5.0 Alternatives, and Section 5.2 Flood - Control Reservoirs
Approvals	Pippy Park Approvals	An approval from the C.A. Pippy Park Commission has been issued subject to receipt of the all other required approvals	Section 10.0 Approval of the Undertaking; and Appendix H

APPENDIX H – Pippy Park Commission Approval

Pippy Park Commission

15 Mt. Scio Road
P.O. Box 8861
St. John's, NL
A1B 3T2
Tel: 709-737-3655
Fax: 709-737-3303



June 30, 2017

Mr. Daniel Parsons, B. Eng
Project Manager – Planning and Engineering
Eastern Health
Suite SM-135, Morrissey Wing
St. Clare's Mercy Hospital
St. John's, A1C 5B8

Re: Construction of an Earth Berm at the Health Sciences Center

Mr. Parsons,

To follow up on our discussion today and previous discussions I have prepared a written response to your request. In a letter dated June 22, 2016, Eastern Health made a request for Pippy Park Commission approval, as required under the Pippy Park Commission Act, to develop an earth berm on the south portion of the Health Science Center to ensure adequate protection against a 100 year flood. It has been recommended that an earth berm is required to mitigate the flood risk and protect the Health Sciences Center. A clear description of the project and design drawings prepared by Tract Consulting and Pinnacle Engineering Ltd. were attached to your letter.

Your request was discussed at the 530th meeting of the Pippy Park Commission and approval is given subject to your receipt of all other required approvals.

Sincerely,



Ric Mercer
Executive Director
C. A. Pippy Park Commission

- CAMPGROUND • NORTHBANK LODGE • PLAYGROUNDS
- GOLF COURSE & BANQUET FACILITIES • HIKING & SKIING TRAILS

APPENDIX I – Fisheries and Oceans Canada (DFO) Response



P.O. Box 5667
St. John's, NL A1C 5X1

Your file *Votre référence*

SEP 16 2016

Our file *Notre référence*
16-HNFL-00368

Daniel Parsons
Eastern Regional Health Authority
300 Prince Phillip Drive
St. John's, NL A1B 3V6

Dear Mr. Parsons:

Subject: Implementation of mitigation measures to avoid and mitigate serious harm to fish – Berm construction

The Fisheries Protection Program (the Program) of Fisheries and Oceans Canada received your proposal on August 17, 2016.

Your proposal has been reviewed to determine whether it is likely to result in serious harm to fish which is prohibited under subsection 35(1) of the *Fisheries Act*.

The proposal has also been reviewed to determine whether it will adversely impact listed aquatic species at risk and contravene sections 32, 33 and 58 of the *Species at Risk Act*.

Our review consisted of:

- Application for Review
- Additional information received September 1, 2016

We understand that you propose to:

- Construct a flood protection earthen berm along the property of the Health Sciences Centre.

To avoid the potential of serious harm to fish and their habitat, we are recommending that the attached mitigation measures be included into your plans.

Provided that these mitigation measures are incorporated into your plans, the Program is of the view that your proposal will not result in serious harm to fish. The Program is also of the view that your proposal will not contravene sections 32, 33 or 58 of the *Species at Risk Act*. No formal approval is required from the Program under the *Fisheries Act* or the *Species at Risk Act* in order to proceed with your proposal.

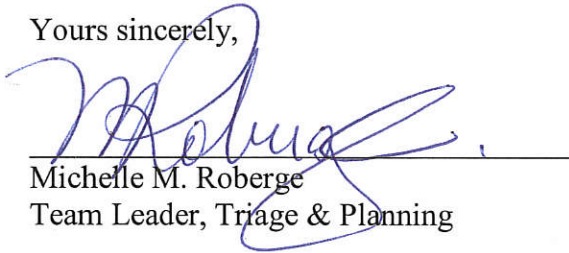
Provided that these mitigation measures are incorporated into your plans, the Program is of the view that your proposal will not result in serious harm to fish. No formal approval is required from the Program under the *Fisheries Act* in order to proceed with your proposal.

If your plans have changed or if the description of your proposal is incomplete, or changes in the future, you should consult our website (<http://www.dfo-mpo.gc.ca/pnw-ppe/index-eng.html>) or consult with a qualified environmental consultant to determine if further review is required by the Program.

A copy of this letter should be kept on site while the work is in progress.

If you have any questions, please contact Triage & Planning Unit at 709-772-4140, by fax at 709-772-5562, or by email at FPP-NL@dfo-mpo.gc.ca. Please refer to the file number referenced above when corresponding with the Program.

Yours sincerely,



Michelle M. Roberge
Team Leader, Triage & Planning

Attch (2)



Shoreline Infill (Marine or Freshwater)

Fisheries and Oceans Canada

Measures to Avoid Causing Harm to Fish and Fish Habitat

On November 25, 2013 the Fisheries Protection Provisions of the **Fisheries Act** came into force. The **Fisheries Act** requires that projects avoid causing serious harm to fish unless authorized by the Minister of Fisheries and Oceans. This applies to work being conducted in or near waterbodies that support fish that are part of or that support a commercial, recreational or Aboriginal fishery.

If you are conducting a project near water, it is your responsibility to ensure you avoid causing serious harm to fish in compliance with the **Fisheries Act**. The following advice will help you avoid causing harm and comply with the **Act**.

- a. *Suitable fill material may include clean blasted rock or boulders; fill should be free of fines or sediment, concrete or any other substance deleterious to fish or fish habitat.*
- b. *Use site isolation measures (e.g., silt boom or silt curtain) for containing suspended sediment where in-water work is required.*
- c. *Stabilize disturbed shorelines areas to prevent erosion using rip-rap or armour stone. Material used for shoreline stabilization must not be removed from below the high water mark. Material is to be of sufficient size to resist displacement by wave or tidal activity.*
- d. *All in-water works should be carried out in the dry.*
- e. *Fish passage and flows should be maintained at all times.*
- f. *Conduct in-water work during periods of low flow to further reduce the risk to fish and their habitat or to allow work in water to be isolated from flows.*
- g. *Equipment should be mechanically sound to avoid leaks of oil, gas, and/or hydraulic fluids.*
- h. *When works are completed, banks and approaches should be restored to original condition.*

Additional measures that may be required to protect fish and fish habitat can be found on the DFO national website (<http://www.dfo-mpo.gc.ca/pnw-ppe/index-eng.html>) and in the *Guidelines for the Protection of Freshwater Fish Habitat in Newfoundland & Labrador* (<http://www.dfo-mpo.gc.ca/Library/240270.pdf>)

Should your plans change please contact the Fisheries Protection Program-Regulatory Review:

Fisheries Protection Program
Fisheries and Ocean Canada
80 East White Hills Road
St. John's NL A1C 5X1
Telephone: (709) 772-4140
Fax: (709) 772-5562
Email: FPP-NL@dfo-mpo.gc.ca

Note: This advice is only applicable to the project specified on the accompanying DFO letter.



Dredging

Fisheries and Oceans Canada

Measures to Avoid Causing Harm to Fish and Fish Habitat

On November 25, 2013 the Fisheries Protection Provisions of the **Fisheries Act** came into force. The **Fisheries Act** requires that projects avoid causing serious harm to fish unless authorized by the Minister of Fisheries and Oceans. This applies to work being conducted in or near waterbodies that support fish that are part of or that support a commercial, recreational or Aboriginal fishery.

If you are conducting a project near water, it is your responsibility to ensure you avoid causing serious harm to fish in compliance with the **Fisheries Act**. The following advice will help you avoid causing harm and comply with the **Act**.

- a. *Time work in water to protect fish, including their eggs, juveniles, spawning adults, migration and/or the organisms upon which they feed.*
- b. *Sensitive or important fish habitat should be avoided.*
- c. *Conduct in-water work during periods of low flow to further reduce the risk to fish and their habitat or to allow work in water to be isolated from flows.*
- d. *Minimize duration of in-water work.*
- e. *Schedule work to avoid wet, windy and rainy periods that may increase erosion and sedimentation.*
- f. *Minimize the amount of dredged material removed by only dredging the area and depth required.*
- g. *Equipment should be mechanically sound to avoid leaks of oil, gas, and/or hydraulic fluids.*
- h. *Operate machinery on land above the high water mark, on ice, or from a floating barge in a manner that minimizes disturbances to the bank and bed of the water body.*
- i. *Use site isolation measures (e.g., silt boom or silt curtain) for containing suspended sediment where in-water work is required.*

Additional measures that may be required to protect fish and fish habitat can be found on the DFO national website (<http://www.dfo-mpo.gc.ca/pnw-ppe/index-eng.html>) and in the *Guidelines for the Protection of Freshwater Fish Habitat in Newfoundland & Labrador* (<http://www.dfo-mpo.gc.ca/Library/240270.pdf>)

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Email: FPP-NL@dfo-mpo.gc.ca

Note: This advice is only applicable to the project specified on the accompanying DFO letter.