Canada Lands Company
Société immobilière du Canada

Public Services and Procurement Canada
Services publics et Approvisionnement Canada

Tunney's Pasture - Site Servicing and Public Road Redevelopment
Assessment of Adequacy of Public Services, Municipal Infrastructure

ARCADIS | IBI GROUP

Prepared for: Canada Lands Company & Public Service and Procurement Canada
by ARCADIS IBI Group
October 2024
Report 139833-6.4.3

Table of Contents

Table of Contents (continued)

Table of Contents (continued)

1 INTRODUCTION

Arcadis IBI Group was retained by Canada Lands Company (CLC) and Public Service and Procurement Canada (PSPC) to assist in the transformation of the Tunney's Pasture federal government campus (herein referred to as the 'Campus') to a mixed used development with publicly owned roads and a mixture of private and publicly owned buildings through the Draft Plan of Subdivision process. Copy of proposed land use plan is included in Appendix 1. This report supports the Draft Plan Application for the subject lands by demonstrating the conceptual servicing of municipal infrastructure including water supply, wastewater collection and disposal and storm sewers and stormwater management within the Proposed Right of Ways (ROW). The newly created Right of Ways (ROW) to be conveyed to the City of Ottawa will serve as a framework to facilitate the long-term redevelopment of individual property parcels within the Campus.

Tunney's Pasture presently exists as a single-use government workplace campus which was built primarily in the 1950s and 1960s in accordance with the 1950 Gréber Plan and is currently owned and operated by the federal government. The Campus is approximately 49 hectares in size and is located about four kilometres west of Parliament Hill in the City of Ottawa, Ontario. The site is bound by the Ottawa Riverfront to the north, as well as established communities, including Laroche Park to the east, Wellington West/Hintonburg to the south and Champlain Park to the west.

The Tunney's Pasture Master Plan (TPMP), approved in September 2014, was prepared to guide the development of the site into a sustainable, transit-oriented, mixed-use community and federal employment node over the next 25 years. The TPMP envisioned office and employment opportunities for approximately 22,000 to 25,000 employees and approximately 3,400 to 3,700 dwelling units.

The ensuing report, an assessment of existing services (water, sanitary sewers, storm sewers), was prepared to inform the Infrastructure Upgrade and Divestiture Strategy Report. For the purposes of this assessment, we are using the employee and residential population estimates from the Massing Model Statistics dated October 30, 2023. The Massing Model Statistics estimate that the campus redevelopment will provide for a total of 6,867 federal/retail employees, 3,200 students, and a residential population of 16,290 persons.

Planning and implementation advisory services have been procured by the Government of Canada to conduct the next phase of planning for the Campus. This 'next phase' focuses on roads and servicing, which includes an Investment Program Plan (IPP). One component of the IPP involves the preparation of an Infrastructure Upgrade and Divestiture Strategy Report. The report, among other issues, will include a road divestiture plan for the eventual transfer of roadways and infrastructure (above and below grade) to the City of Ottawa as municipal rights-of-way (ROWs). Divestiture is intended to provide opportunities for private sector development in the future. **Figure 1 in Appendix 1** illustrates the location of a compilation of underground infrastructure including but not limited to storm, sanitary sewers, watermains, heating and cooling lines/tunnels.

CLC and PSPC have retained Arcadis to assist in transforming the site from federal employment campus to a mix use Plan of Subdivision. Stage 1 of the program to transformer the campus is the creation of Municipal ROW and Blocks, the subsequent development of Blocks whether it is repurposing a building, demolishing and constructing new building will be completed under the City of Ottawa Site Plan Approval process. The purpose of this report is to support the application for Draft Plan of Subdivision Approval by demonstrating the existing municipal infrastructure surrounding the campus can support the proposed redevelopment.

2 BACKGROUND INFORMATION

Prior to commencing this study, an extensive review of background documents provided by PSPC/CLC was undertaken to develop an appreciation for existing studies that have already been conducted for the Campus. The following is a partial list of background information that was used in the creation of this report:

- City of Ottawa Utility Coordinating Committee (UCC) Central Registry Drawings
- City of Ottawa 1K Mapping
- City of Ottawa Water Distribution Design Guidelines – July 2010
- City of Ottawa Sewer Design Guidelines – October 2012
- Drawing No. TNP-054-C-01-22 Site Plan from PSPC showing watermain, storm sewer and sanitary sewer distribution of the Tunney's Pasture Campus
- Tunney's Pasture Redevelopment Assessment of Existing Services Study January 28, 2019 by Parsons
- Tunney's Pasture Master Plan (TPMP) and supporting Infrastructure Overview (July 2014)
- Tunney's Pasture Redevelopment Telecommunication and Technology Assessment and Planning Proposal prepared by the Attain Group dated February 1, 2019
- Various communications with Public Services and Procurement Canada (PSPC) and Canada Lands Company (CLC) personnel
- Sewer Feasibility Study Final (Revision 1) April 28, 2023 by Jp2g Consultants Inc.

Since there has been no significant alteration or additions to the mainline underground watermain, sanitary sewer or storm sewers within the limits of the proposed ROW since the previous reports, this report draws upon data/analysis previously commissioned by PSPC. While there has been no significant change to mainline municipal services, some buildings have been removed from the Tunney's Pasture Campus and a new Central Heating and Cooling Plant (ESAP) is being constructed including modifications to the distribution network for the heating and cooling system.

3 WATER NETWORK INFRASTRUCTURE

3.1 BACKGROUND

Campus connection to the City of Ottawa Water Distribution network illustrated in **Figure 2, in Appendix 2,** Existing Watermain Infrastructure. The figure notes water is supplied to the site from a 1,050mm diameter watermain on Scott Street. Sir Frederick Banting Driveway and Tunney's Pasture Driveway each contain a 406mm diameter watermain that connects to the Scott Street watermain, crosses the Transitway, and provides water into the Tunney's Pasture campus. These two 406mm watermains each have an isolation valve at the connection to the Scott Street watermain. Furthermore, there is an isolation valve on the Scott Street watermain between these two connection points. In the event of a failure on the Scott Street watermain sufficient isolation valves exist to ensure water supply to the campus from either of the two connections.

3.2 EXISTING WATER NETWORK INFRASTUCTURE

The on-site distribution network is comprised of a network of water mains that vary in diameter from 203mm to 406mm. The original watermains, many dated from the 1950’s and 1960’s, were all replaced by the Operating Authority under a multiphase life-cycle renewal program. The exceptions being the 406mm ductile iron watermain on Tunney’s Pasture Driveway (north of the meter chamber) and Colombine Driveway (from Sir Frederick Banting Driveway to Tunney’s Pasture Driveway). The renewal program also involved provision of a second service lateral to every building on site, separated by an isolation valve. Thus, in the event of a local watermain or service lateral failure, supply to each building can be maintained. **Figure 2 in Appendix 2** illustrates the location of existing watermains within and adjacent to the campus.

3.3 ANTICIPATED WATER NETWORK SYSTEM WORKS

As per City of Ottawa Technical Bulletin ISTB-2021-03 in relation to the City of Ottawa Water Distribution Design Guidelines (Guidelines), the average demand per resident is 280 L/c/d. Upon redevelopment, the 16,290 residents on campus will demand an average of 4.56 ML/d. Applying a maximum day factor of 2.5, per Guidelines, the maximum day demand from residents will be 11.40 ML/d. Applying a maximum hour factor of 2.2, the maximum hour demand from residents will be 25.08 ML/d.

Assuming office employees demand on average 75 L of water per day per employee, upon redevelopment the federal/retail employees on the campus will demand an average of 0.73 ML/d. Applying a maximum day factor of 1.5, per Table 4.2 of City of Ottawa Guidelines, the maximum day demand from employees will be 1.10 ML/d. Applying a maximum hour factor of 1.8 the maximum hour demand from employees will be 1.98 ML/d.

The total demand, from residents and federal/retail employees, on the entire redeveloped campus will be; 5.29 ML/d for average day, 12.50 ML/d for maximum day, and 27.06 ML/d for maximum hour.

One 406mm watermain, flowing at a nominal velocity of 1.5 m/s, would supply 16.29 ML/d or approximately 3 times the average day demand of the site.

While the existing distribution layout suits current conditions, to divest the site into municipal ROWs and multiple individual property parcels, some segments of existing watermain will need to be realigned to suit the proposed ROW cross section or removed if they traverse a proposed development parcel. In other instances, new watermain will be required where current of future buildings do not have fronting watermains to connect to.

The existing City of Ottawa water distribution network has ample capacity to accommodate the redevelopment of the Campus. The adjacent municipal system is adequately sized to meet the water demands for the anticipated redeveloped conditions. The on- campus distribution network is generally adequate, but, as identified above, will require relocation and extension at various locations to suit the incorporation of municipal ROWs.

Watermain boundary conditions from the City of Ottawa based on the anticipated total demand are contained in **Appendix 2**. Based on the conceptual water model a conceptual layout of watermains is illustrated in **Figure 3 in Appendix 2**, the figure also notes which mains at this time are known to be removed/replaced to more closely align with proposed road network, and the mains that could be retained to function as block services.

The conceptual unit composition has changed slightly since requesting and receiving boundary conditions as shown on the Water Demand Calculation Sheet in **Appendix 2**, however the change has resulted in minor variances in each scenario. Updated boundary conditions will be requested at Detail Design stage.

3.4 HYDRAULIC MODEL

The 2010 City of Ottawa Water Distribution Guidelines state that the preferred practice for design of a new distribution system is to have normal operating pressures range between 345 kPa (50 psi) and 552 kPa (80 psi) under maximum daily flow conditions. Other pressure criteria identified in the guidelines are as follows:

Minimum Pressure	Minimum system pressure under peak hour demand conditions shall not be less than 276 kPa (40 psi)
Fire Flow	During the period of maximum day demand, the system pressure shall not be less than 150 kPa (21 psi) during a fire flow event.
Maximum Pressure	Maximum pressure at any point in the distribution system shall not exceed 689 kPa (100 psi). In accordance with the Ontario Building/Plumbing Code, the maximum pressure should not exceed 552 kPa (80 psi). Pressure reduction controls may be required for buildings where it is not possible/feasible to maintain the system pressure below 552 kPa.

A computer model for the proposal has been developed using the InfoWater program produced by Innovyze. The model incorporates the boundary conditions received from the City of Ottawa at the two connection points on Scott Street. Basic day (max HGL), Peak hour (min HGL) and Max Day plus Fire scenarios were run using the provided HGLs. To be conservative, a fire flow demand of 250.0 l/s has been added to all the nodes in the InfoWater model.

The hydraulic model has a 406mm diameter "backbone" watermain through the site as well as a series of 305mm diameter local watermain. All new watermains are looped resulting in no dead-end scenarios.

Results of the hydraulic model are included in **Appendix 2** and summarized as follows.

Table 3-1 Results of the Hydraulic Model

Scenario	Results
Basic Day (Max HGL) kPa	498.5 to 560.17
Peak Hour (Min HGL) kPa	425.09 to 484.23
Max Day + Fire Flow	(250.0 l/s)
Minimum Residual Pressure kPa	409.72

A comparison of the results and design criteria is summarized as follows:

Maximum Pressure	Under the basic day (Max HGL) scenario there are some nodes that exceed 552 kPa (80 psi) therefore pressure reducing control may be required. No nodes exceed the maximum of 689 kPa (100 psi).
Minimum Pressure	The minimum peak hour pressures at all nodes exceed the minimum requirement of 276 kPa (40 psi).
Fire Flow	All nodes had a fire flow demand of 250.0 l/s applied. Results of the analysis results show all nodes exceeding the minimum residual pressure of 150 kPa (21 psi) therefore the fire flow requirement has been achieved.

3.5 WATERMAIN SITE SERVICING ISSUES

Addressing site servicing issues for the subject development as it relates to existing watermain infrastructure and future watermain installation, involves taking into consideration several critical factors. The age of the existing watermain plays a key role in determining its durability and potential for reliable service. Evaluating the condition of the existing watermain is essential to gauge its structural integrity and anticipate any potential risks associated with its continued use, as deterioration over time can lead to leaks, pressure drops and disruptions to the water supply. Equally important is the location of the existing watermain, which could influence the feasibility of its integration into the new development's infrastructure. Moreover, the future installation of the watermains may be placed within a non-standard city right-of-way location, needing coordination to ensure compliance with local regulations. A thorough analysis of these constraints is crucial to developing an effective solution that ensures efficient water supply while addressing the challenges posed by the existing watermain's age, condition, location, and the future non-standard city's right-of-way locations. Prior to the commencement of detail design stakeholders from the City and design team should develop a matrix which assist in to predetermining whether a main meets the threshold for remove/replace, requires secondary review by stakeholders or meets the requirements to remain in service. In addition to main watermain lines there are appurtenances that will require adjustment, this includes but is not limited to items such as fire hydrants and building service vales. These items will be required to meet municipal standards such as location and type. The location of hydrants and valves may in certain locations be influenced by the ESAP infrastructure and nonstandard locations may be required. Similar to the mains Hydrants and valves will also form part of the matrix screening process.

As noted previously the redevelopment of the campus will occur over decades the actual rehabilitation of the road network and associated infrastructure will be completed in stages and depending on market conditions this may take upwards of Five years. However, with the recent announcement of the Federal Government Land Bank program which included releasing multiple buildings/lands within this campus for repurposing to residential housing to assist in meeting the current housing crisis the time frame may be accelerated.

4 SANITARY INFRASTRUCTURE

4.1 BACKGROUND

Campus connections to the City of Ottawa Sanitary Sewer System is illustrated in **Figure 4 in Appendix 3**, Existing Sanitary Infrastructure. The figure notes there are several connections from the site to the WNC. There is a 450mm diameter sewer at Tunney's Pasture Driveway, a 600mm diameter sewer east of Sir Frederick Banting Driveway, as well as connections to the 375mm diameter sanitary sewer on Parkdale Avenue, which discharges into WNC.

City staff have noted the limitations of the WNC, during extreme wet-weather events, the deep WNC sewer can operates under surcharged conditions. During dry weather the WNC has ample capacity to accommodate the areas it services. Recognizing the constraints along the WNC the City has identified diversion projects that reduce inflows to the collector during wet weather conditions, such that it will operate with a reduced risk of basement flooding in critical areas. At the time of this report staff at the City of Ottawa advised that no diversion work has yet been undertaken impacting the Tunney's Pasture area. However, the City did completed work to disconnect abandoned infrastructure from the Sanitary system in the NCC fields between Churchill and Island Park Drive. City Staff had determined these old pipes were a significant source of I/I during the 2019 flood event.

The City also has identified long term projects within the Cities 2025 Infrastructure Master Plan (IMP) the report acknowledges the limitation of existing trunk sanitary sewer systems and presents an Infrastructure Capacity Management program which is necessary to:

• Support intensification:

• Identify the most appropriate intensification-driven upgrades to local systems that will meet long-term needs;

• Ensure adequate capacity is available for individual development projects; and

• Manage risks to level of service due to intensification and climate change.

The IMP identified several projects such as Prince of Wales (2039-2044 $5.3M), Crystal Beach Ph1 & 2 (2029-2044 $63.7M) and Woodroffe Collector (2029-2034 $59.9M) diversions that would remove flow from the WNC, the timelines and cost as noted above are long and significant. Given the pressures to rapidly bring online new housing, all stakeholders including the City will need to expedite work programs to ensure the municipal infrastructure is properly operating to meet the demands from not just this site but from the numerous proposed infill projects. For example, it is conceptually estimated by City staff that the Prince of Wales diversion could free up between 200-300 l/s for this area of the WNC which would be more than sufficient to accommodate this redevelopment plus many more sites within the area. The proposed timing of the works could be accelerated via a Front Ending Agreement between City and the proponent as a condition of Draft Approval. The use of Front Ending agreements has been successfully used on significant number of other projects within the City to facilitate the construction of works necessary for the development of lands.

4.2 EXISTING SANITARY INFRASTUCTURE

A Sewer Feasibility Study was completed by the owner in 2023 that included the existing sanitary sewer system. The study only assessed the structural condition of the sanitary sewers and did not include any kind of operational assessment. Of the sanitary sewers inspected the majority were noted as being in general good condition. The study included a map of the sanitary sewers that were assessed and provides a structural index rating as well as rehabilitation recommendations. The existing on-site sanitary sewer collection system was designed to service a private campus with numerous segments of existing sanitary sewers crossing potential development parcels and typically do not follow City standards. The majority of sewers will be removed and new sewers installed to City standards as part of the roadway reconstruction. At detailed design phase of the project, an assessment of the location, capacity and condition of any existing sanitary sewers proposed to be conveyed to the Municipality will be undertaken to confirm the acceptability of the sewer.

4.3 ANTICIPATED SANITARY WORKS

The proposed redevelopment of the site will occur over a long period, existing buildings retained for the short or long term will continue to require sanitary sewer. **Figure 5 in Appendix 3** Conceptual Sanitary Infrastructure illustrates how the site could be serviced. The conceptual system utilizes the two existing sanitary connections on Scott Street to the WNC and one sanitary connection on Parkdale Avenue which also discharges into the WNC. A conceptual sanitary sewer design sheet is also included in **Appendix 3** and illustrates the conceptual sewers as noted can provide the necessary capacity to service the proposed development of Tunney's Pasture.

Based on Appendix 4-A of the City of Ottawa Sewer Design Guidelines (Guidelines), office employees generate on average 75 L of wastewater per day per employee. Upon redevelopment the 6867 federal/retail employees within the development, will generate an average of 515,025 L/d. Applying a peaking factor of 1.5, per Figure 4.3 in Guidelines, the peak design flow from employees will be 772,537.5 L/d (8.94 L/s).

Based on Appendix 4-A of the City of Ottawa Sewer Design Guidelines (Guidelines), students generate on average 90 L of wastewater per day per student. Upon redevelopment the 3200 students within the development, will generate an average of 288,000 L/d. Applying a peaking factor of 1.5, per Figure 4.3 in Guidelines, the peak design flow from students will be 432,000 L/d (5.0 L/s).

Based on Appendix 4-A of the City of Ottawa Sewer Design Guidelines (Guidelines), retail space generates on average 5 L of wastewater per day square meter of retail floor space. Upon redevelopment the 14,925sm retail space within the development, will generate an average of 74,625 L/d. Applying a peaking factor of 1.5, per Figure 4.3 in Guidelines, the peak design flow from employees will be 111,937.5 L/d (1.30 L/s)

Based on Figure 4.3 in the Guidelines (revised in Technical Bulletin ISTB 2018-01), the average resident generates 280 L/d of wastewater. Upon redevelopment, the 16,290 residents within the development will generate an average of 4,561,200 L/d. Appling a peaking factor of 2.74, per Harmon formula, the peak design flow from residents will be 12,497,688 L/d (144.65 L/s)

Applying an allowance of 0.33 L/s/ha, per Guidelines, the peak extraneous flow from the 49 ha. Campus will be 16.17 L/s.

The summation of all flows (i.e. 8.941+5.0+1.30+144.65+16.17) results in a Total Peak Design Flow of 176.06 L/s from the entire redeveloped campus.

The existing campus under the design requirements at the time would have been allocated 50,000 l/ha/d for the commercial use, with a Peaking Factor of 1.5 and infiltration allowance of 0.28l/Ha/s. Which would have resulted in 42.534 + 13.72= 56.25l/s. the redevelopment will in theory add approximately 120 l/s to the system. As noted previously the WNC is subject to surcharging during wet weather events; to minimize potential impact on downstream system the completion of the Prince of Wales diversion project would remove significantly more flow from the WNC then the redeveloped site would generate. In addition, given the majority of sewers within the campus will be replaced the level of infiltration from the campus will also be reduced further reducing wet weather flow issues with the WNC.

The conceptual sewer system follows the proposed Draft Plan ROW configuration to this end various sanitary sewers will be required to be removed and replaced to suit municipality approved cross sections (standard or custom). It is also anticipated that the existing sanitary sewer connections to the existing Municipal system will remain. A Municipal requirement for monitoring Maintenance Holes (MH's) to be located on service connections from buildings or private sewer lines connecting to the municipal system.

4.4 SANITARY SITE SERVICING ISSUES

All the constraints flagged under the watermain site servicing issues section will apply to the sanitary sewer site servicing issues. While the majority of sanitary sewers will be removed and replaced the age/condition of any proposed retained sanitary sewer infrastructure serves as a crucial determinant in gauging its operational longevity and potential vulnerabilities. It is anticipated a review of any proposed retained portions of the system, not currently under municipal ownership will be completed in conjunction with the City prior to detail design and direction received to remove/replace any sections the City is not prepared to accept. Additionally, the intention is to position the future sanitary sewer within the standard city right-of-way location however due to the nature of the development, and existing retaining infrastructure such as the ESAP system non-standard location will need to be used in specific areas. This may also include the location of monitoring MH's which are a standard item required by the City and they will be added to meet municipal standards however we anticipate numerous conflicts with the ESAP system and any non standard location of monitoring MH will require City approval.

5 STORMWATER INFRASTRUCTURE

5.1 BACKGROUND

Campus connections to the City of Ottawa Storm Sewer System is illustrated on **Figure 6 in Appendix 4** Existing Storm Infrastructure. The figure notes there are four outlet sewers that serve the campus, these are; a 525mm diameter sewer servicing the northwest quadrant discharging to an existing ditch which outlets to and existing 2,100mm diameter sewer extending from Carleton Avenue to the Ottawa River, a 1,800mm diameter sewer on Tunney's Pasture Driveway servicing the central core of the campus which outlets to the Ottawa River, a section of the eastern portion of the site is serviced by a 300mm diameter sewer which discharges into an existing 2,100mm diameter sewer on Parkdale Avenue that outlets to the Ottawa River, and 750mm diameter sewer servicing the south west quadrant outlets to a twin cell 3,800mm x 2,400mm box trunk-sewer located below the West Transitway. When the above noted West Transitway trunk was constructed in the 1980's any sewer that crossed the trunk alignment was truncated and diverted into the trunk. The 1800mm diameter storm sewer along Tunney's Drive no longer carries the contributing flows from the south, and therefore has additional residual capacity.

5.2 EXISTING STORMWATER INFRASTRUCTURE

Of the four outlet sewers, the 1,800mm on Tunney's Pasture Driveway drains most of the site and as noted above because of the West Transitway trunk intercepts all drainage south of the campus it now only collects drainage from within the Tunney's Pasture campus. At an average slope of 0.3% is has a capacity of approximately 6,568 L/s.

The estimated peak runoff from the entire redeveloped campus (49 ha), using the modified rational method, is 6,700 L/s assuming a rainfall intensity of 61.77 mm/hr. (2-year return period, 15-minute duration) and a runoff coefficient C = 0.8. Therefore the

1,800mm storm sewer has adequate capacity to service the redeveloped campus if appropriate flow management techniques are incorporated into the design.

The existing local storm sewer collection system consists of approximately 3,200m of sewers, including service laterals, in diameters ranging from 250mm to 750mm. The original design of the existing storm sewer system did not include any specific flow control measures (i.e. inlet control devices, orifices). While there is not a history of concerns regarding surface ponding during rainfall events, The Infrastructure Overview indicated that most of the local sewers do not have sufficient capacity to meet current City of Ottawa design guidelines.

A Sewer Feasibility Study was completed by the owner in 2023 that included the existing storm sewer system. The study only assessed the structural condition of the storm sewers and did not include any kind of operational assessment. Of the storm sewers inspected the majority were noted as being in general good condition. The study included a map of the storm sewers that were assessed and provides a structural index rating as well as rehabilitation recommendations.

The existing on-site storm sewer collection system was designed to service a private campus with numerous segments of existing storm sewers crossing potential development parcels and typically do not follow City standards. To this end the majority of sewers will be removed and new sewers installed to City standards as part of the roadway reconstruction. At detailed design phase of the project, an assessment of the location, capacity and condition of any existing storm sewers proposed to be conveyed to the Municipality will be undertaken to confirm the acceptability of the sewer.

5.3 ANTICIPATED STORMWATER WORKS

While the existing storm sewer collection system was installed in a manner which best suited the needs of the campus as it was developed, it is not suitable to divest the campus into municipal ROWs and multiple individual property parcels. Many segments of existing storm sewer will need to be realigned to suit the proposed ROW cross section or extended where none currently exist to service fronting buildings.

The storm sewer system for the redeveloped site can re-use the existing outlet locations and the existing 1,800mm sewer on Tunney's Pasture Driveway. Most of the local storm sewers, however, will have to be replaced to meet current City of Ottawa and MECP design guidelines for conveyance capacity of the sewers In addition the overall storm system must accommodate major storms with onsite quantity control measures and providing onsite quality control measures.

The proposed redevelopment of the site will occur over an extended period, existing buildings and roadways retained for the short or long term will continue to require storm sewer connections. **Figure 5 in Appendix 3** Conceptual Storm Infrastructure illustrates conceptually how the sewer mains could be redesigned to meet City and MECP requirements. Also in **Appendix 3** is a conceptual storm sewer design sheet demonstrating the system is able to service the site if the identified runoff coefficients are incorporated into the design.

As noted previously the campus system was originally designed without any onsite quality or quantity control, nor is their any end of pipe treatment for the site, as was traditionally done during the original timing of the development. Due to space restrictions and while vacant land exists between the development and the Ottawa River it is not proposed to construct an end of pipe treatment facility on NCC lands to service the proposed redevelopment of the site. Due to type of redevelopment which more resembles urban renewal then greenfield development it is proposed to incorporate onsite controls for the site. This will be in the form of onsite attenuation for quantity control and Oil and Grit Separators (OGS) for quality control.

Quantity control of stormwater runoff from the site is proposed to be achieved through the use of onsite controls, where each block of development within the site will provide quantity control through the use of either surface, roof top, underground storage, or combination of these measures. Once the campus is draft approved detail design will establish a master stormwater allocation for each development block. When individual blocks are redeveloped, they will be subject to Site Plan Approval (SPA) and will be required to demonstrate the detail design submitted to support the SPA conforms to the master allocation. The allocation will be based on equally dividing the average flow from the site assuming a post development restriction of C=0.5 (or as approved by the Municpality), A conceptual allocation was prepared and is included in Appendix 3 and illustrates how each area could be assigned a percentage of flow, and utilizing the modified rational method the 100yr storage is estimated.

Quality control of stormwater runoff from the site is proposed to be achieved through the use of Oil and Grit Separators (OGS), the OGS units will be sized and strategically placed to proved 80% TSS removal for the area. In addition streets will be designed using Low Impact Development (LID) features, the LID systems will provide pretreatment of stormwater runoff before being processed by the OGS's. LID's are further discussed in section 8 of this report.

5.4 STORMWATER SITE SERVICING ISSUES

Identifying the site servicing challenges for the planned redevelopment requires a thorough review of any proposed retained storm sewers that are not currently under municipal ownership. Building upon the considerations highlighted in the sanitary sewer section; the age, location, and condition of the existing storm sewer infrastructure become pivotal factors, shaping the effectiveness of the drainage network. A careful evaluation of any proposed retained portion of the existing storm sewer is to be undertake at detail design to confirm Municipality acceptance of the sewer/infrastructure. Moreover, the exact existing and future positioning of the storm sewer lines impacts their integration into the new development's layout and drainage configuration, conflicts with the ESAP system will further complicate the storm sewer system location including the provision of monitoring MH to be installed for building or private sewer lines.

6 HIGH LEVEL UTILITIES

6.1 BACKGROUND

There are various underground utilities that serve the current Tunney's Pasture Campus and with the proposed adoption of a Municipal ROW network throughout the Campus the locations of each utility will need to be reviewed and if necessary, relocated to support the redevelopment of the Campus. Once the proposed ROW locations have been finalized the utilities will be contacted to coordinate a Composite Utility Plan (CUP). The CUP will detail all the utilities to be located within the new Municipal ROW's will require review and approval by the City of Ottawa.

6.2 ELECTRICAL SITE ISSUES

Hydro Ottawa and PSPC have entered into an agreement for the transfer of ownership and maintenance of the hydro infrastructure within the Tunney's Pasture Campus to Hydro Ottawa. Hydro Ottawa has advised the existing Hydro Ottawa distribution system in the vicinity of the Tunney's Pasture Campus has ample spare capacity to accommodate the redevelopment of the Campus.

6.2.1 Electrical Site Issues

With regards to the existing electrical site servicing for the Tunney's Pasture Site the following information from Hydro Ottawa. We have included assumptions and comments to allow for the electrical design to progress. In addition to the "ultimate" electrical site servicing, interim servicing will be required during various phases of works as existing infrastructure is removed/replaced/relocated. The installation of temporary overhead system (poles) will be reviewed in detail at detail design stage to ensure current tenants have stable electrical supply.

6.2.2 Capacity of the existing Hydro Ottawa Utility Service to the Site

Hydro Ottawa's Response:

The site is very large, and we have multiple circuits running through it. There is capacity right now, but this is ever changing based on the demand of the system.

Assumptions:

Capacity for utilities is based on a first-come-first serve basis, so although there Is currently upstream capacity; construction projects in the area that commence before utility service applications are made for the Tunney's Pasture site will get priority access to the available capacity. It is assumed that the demand load for the site will increase with inclusion of EV charging and the migration from natural gas fired to electric mechanical units.

6.2.3 Location and quantities of Hydro Ottawa feeders to existing buildings/infrastructure on the Tunney's Pasture Site

Hydro Ottawa's Response:

There are lots of feeders at the campus and this is changing constantly. this is not information we share but know that there are main feeders located on each road, street and driveway.

Assumptions:

Based on the current access to the site, and location of existing Hydro Ottawa overhead services we are making the following assumptions with regards to the locations of Primary and Secondary ductbanks

There are primary service ductbanks into the site running North-South along the following roads served from Scott Street

- Sir Frederick Banting Driveway
- Goldenrod Driveway
- Tunney Pasture Driveway

There is a primary service ductbank into the site running East-West along the following road served from Parkdale Avenue

- Columbine Driveway

Secondary branch ductbanks are tapped off primary service ductbanks and serve the interior of the site.

6.2.4 Current capacities of the existing Hydro Ottawa primary services into the existing buildings on the Tunney's Pasture site

This information to come from PSPC, Health Canada, Equans, etc.

Assumptions:

This information has been previously requested. In order for the design team to review existing building capacity, and provide comment on necessary service upgrades, we require existing building drawings and single line diagrams, in addition to monthly Hydro Ottawa billing to determine the existing age and service capacity for each building.

6.2.5 Age of existing Hydro Ottawa primary feeders and duct banks on the Tunney's Pasture site

There have been some major changes to the existing infrastructure in the last 5 years with lots of upgrades to our civil and electrical plant. There is also a lot of old infrastructure that is in good condition. Anything that is being identified as requiring an upgrade is taken seriously and a plan is put in place. Age of infrastructure ranges from 0-60 years.

Assumptions:

The existing infrastructure is in good condition and that it will be replaced as needed to serve the new development projects on site. Existing infrastructure will be assessed during construction of new roads/sidewalks and any required work will be coordinated with Hydro Ottawa at that time.

6.3 ESAP CENTRAL HEATING AND COOLING PLANT (CHCP)

When the original Tunney's Pasture Campus was developed the CHCP was located at the northeast corner of Sorrel Street and Du Chardon Street (50 Chardon, Building #13) and included an underground heating and cooling pipe network as shown on Drawing no. TNP_035_C_01_17 in **Appendix 5**. The existing heating and cooling pipes are located in concrete conduits. As part of the redevelopment of the Tunney's Pasture Campus a new CHCP is under construction at the southwest corner of Columbine Driveway and Goldenrod Driveway and includes a new underground heating and cooling pipe network which will be shallow buried concrete encased system. The general layout of the new CHCP and underground pipe network is shown on Drawing no. TUd-000-C001 in **Appendix 5**. At the time of this report the new CHCP and underground pipe network were under construction. Any residual abandoned concrete conduits including heating and cooling pipes that are not removed as part of the ESAP project will be decommissioned and either filled in or removed as required under the Municipal infrastructure renewal. In addition to the ESAP infrastructure various telecom systems are located within sections of the existing ESAP concrete duct banks. Prior to decommissioning the existing ESAP tunnels the existing telecom will need to be relocated to an interim service pole line until such time as the ultimate utility duct system is completed. In previous sections it was noted the new ESAP infrastructure within the ROW will conflict with other infrastructure necessitating nonstandard installations which will impact approvals and construction costs.

6.4 NATURAL GAS

Natural gas to and within the Tunney's Pasture Campus is provided by Enbridge Gas, the gas network within the campus services a limited number of buildings. Once the new Municipal ROW network has been finalized and future building gas service loading is available, Enbridge will recommend where the natural gas network requires expansion or relocation.

6.5 TELECOMMUNICATIONS

Existing telecommunications on site will remain in the ownership of the respective service providers. If there are telecommunications services not currently provided in the Tunney's Pasture Campus, there will be an opportunity to add them during the re-development process. All existing telecommunications services will be relocated to the new Municipal ROW network for ease of maintenance. As noted earlier there will be a transition period where the infrastructure will be relocated to temporary pole system to assist in the reconstruction of municipal services in the ROW and/or the removal/disposal of concrete duct backs shared with abandoned ESAP infrastructure. All works related to telecommunications will be coordinated with SSC.

The Attain Group prepared a report titled Tunney's Pasture Redevelopment Telecommunication and Technology Assessment and Planning Proposal dated July 26, 2024. The report provided their site analysis of current and future campus telecommunications infrastructure also looked at both current and future technologies as the campus migrates from a government campus to a mixed-use community. A copy of the report is included in **Appendix 5.**

6.6 DECOMMISSIONED REACTOR

The decommissioned reactor is situated at 20 Goldenrod Street, a property currently under the ownership of Canada Lands Company, having previously owned by Atomic Energy of Canada Limited (AECL). As outlined in the Limited Radiological Survey at 20 Goldenrod Street – Basement Level compiled by DST, dated April, 2001, the location of the decommissioned slow poke reactor pool is confined within the southwestern part of the designated building. This area is characterized by an 8-meter by 6-meter void cut into the bedrock, to a depth of 11.5 meters beneath the overlying overburden grade. This void has been backfilled to meet the adjacent ground levels with a blend of crushed remnants from the former AECL building demolition and earth extracted from the immediate confines of the subject property. Additionally, on the northwestern corner of subject building, two decommissioned cells were once stationed. This area of the property has now been filled with concrete.

7 GEOTECHNICAL CONSIDERATIONS

Paterson Group was retained by Arcadis to prepare a Geotechnical investigation for the subject lands. The Paterson report PG6348-1 dated June 2024 has been submitted under separate cover, among other things, the report provides recommendations for the following;

- Grading
- Backfilling
- Pavement structures,
- Excavation and Infrastructure Construction
- Groundwater Control
- Winer Construction

8 LOW IMPACT DEVELOPMENT

Aquafor Beech Ltd. was retained by Arcadis to prepare a Low Impact Development (LID) design memo for the proposed Right of Ways within the subject lands. The Aquafor Beech memo 67564 dated August 2024 in included in **Appendix 5**, among other things, the report provides recommendations for the implementation of LID features within the proposed ROW, the following:

Permeable Pavements and Pavers – Collective terms for a variety of surface treatments including pervious concrete, porous asphalt, permeable interlocking pavers, rubberized granular surfaces, and plastic or concrete grid systems. These systems contain pore spaces that allow stormwater to pass through into a stone base for treatment or infiltration.

Dry Creek Bed Infiltration Facilities – Designed to mimic the tributaries of the Ottawa River using a limestone creek bed typology at the surface that will meander through medians and boulevards, widening at bump out locations. Stormwater will be directed to the creek bed from road, sidewalk and cycle track surfaces via curb cuts and will infiltrate into a subsurface infiltration trench below. The infiltration trench is composed of a rectangular trench lined with geotextile fabric and filled with clean granular stone or other void forming material to encourage infiltration, filtration and cooling of runoff. The creek bed at the surface will be composed of limestone aggregate and boulders ranging in size and shape to mimic natural tributary form and aesthetic. Where these facilities intersect with key amenity nodes, plazas and parks, the creek bed can be hardened to activate these spaces by keep runoff at the surface. This can be accomplished by grouting joints between the stones or installing an impermeable liner between the limestone creek bed and infiltration gallery in specific locations. At the downstream end of these ‘hardened’ zones, runoff will again be permitted to infiltrate into the galleries below where it will be filtered and cooled before being directed back to the storm sewer. The meandering form of the creek bed will create pockets for integration of street trees and plant material to allow for enhanced stormwater treatment, urban cooling and habitat integration.

Tree Pits - located to take advantage of available space in the boulevard to enhance stormwater capture and filtration and provide passive irrigation of street trees. They can be designed to take runoff from the sidewalk or street and are composed of engineered soils such as biomedia and an underdrain to direct overflow to the storm sewer.

Rain Pockets and Enhanced Micro-pools - small engineered grassy basins that incorporate engineered soil such as biomedia and an optional perforated underdrain pipe designed to mimic natural depressions in upland forests, meadows and prairies that capture, filter and slow runoff, provide topographic interest and support biodiversity. These basins may be planted with more elaborate landscaping, and allow for enhanced infiltration and storage of runoff in comparison to enhanced grass swales.

Bioswale – vegetated open channels designed to convey, treat and attenuate stormwater runoff. Check dams and vegetation in the swale slows water to allow filtration of sediments, evapotranspiration, and infiltration into underlying soils to occur. Additionally, a biomedia channel bed encourages filtration of runoff through this soil-based layer and into a perforated subdrain below for conveyance into the storm sewer system as treated runoff.

9 SEDIMENT AND EROSION CONTROL

9.1 General

During construction, existing stream and conveyance systems can be exposed to significant sediment loadings. Although construction is only a temporary situation, it is proposed to possibly introduce a number of mitigative construction techniques to reduce unnecessary construction sediment loadings. These may include:

- Groundwater in trench will be pumped into a filter mechanism prior to release to the environment
- Bulkhead barriers will be installed at the nearest downstream manhole in each sewer which connects to an existing downstream sewer
- Seepage barriers will be constructed in any temporary drainage ditches
- Filter cloths will remain on open surface structure such as manholes and catchbasins until these structures are commissioned and put into use

Silt fence on the site perimeter.

At detail design of each phase of the roadway renewal site specific Sediment and Erosion Control Plans will be prepared for each stage of works.

9.2 Trench Dewatering

Any trench dewatering using pumps will be discharged into a filter trap made up of geotextile filters and straw bales similar in design to the OPSD 219.240 Dewatering Trap. These will be constructed in a bowl shape with the fabric forming the bottom and the straw bales forming the sides. Any pumped groundwater will be filtered prior to release to the existing surface runoff. The contractor will inspect and maintain the filters as needed, including sediment removal and disposal and material replacement as needed. It should be noted that that the contractor will be responsible for the design and management of the trap(s).

9.3 Bulkhead Barriers

At the first new manhole constructed within the development that is immediately upstream of an existing sewer a temporary ½ diameter bulkhead will be constructed over the lower half of the outletting sewer. This bulkhead will trap any sediment carrying flows thus preventing any construction-related contamination of existing sewers. The bulkheads will be inspected and maintained including periodic sediment removal as needed and removed prior to top course asphalt being laid.

9.4 Seepage Barriers

In order to further reduce sediment loading to the downstream system, seepage barriers will be installed on any surface water courses at appropriate locations that may become evident during construction. These barriers will be Light Duty Straw Bale Barriers per OPSD 219.100 and Heavy-Duty Silt Fence Barriers per OPSD 219.130. They are typically made of layers of straw bales or geotextile fabric staked in place. All seepage barriers will be inspected and maintained as needed.

9.5 Surface Structure Filters

All catchbasins, and to a lesser degree manholes, convey surface water to sewers. However, until the surrounding surface has been completed these structures should be covered in some fashion to prevent sediment from entering the minor storm sewer system. Until the boulevards are sodded or until streets are asphalted and curbed, catchbasins and manholes will be constructed with geotextile filter bags, or a geotextile filter fabric located between the structure frame and cover respectively. These will stay in place and be maintained during construction and build until it is appropriate to remove same.

9.6 Stockpile Management

During construction of any redevelopment similar to that proposed by the Owner, both imported and native soils are stockpiled. Mitigative measures and proper management to prevent these materials entering the sewer systems is needed. Significant excess material will be generated from the subject lands and will need to be disposed of off-site in a manner consistent with all MOE regulations.

During construction of the deeper municipal services, water, sewers and service connections, imported granular bedding materials are temporarily stockpiled on site. These materials are however quickly used up and generally before any catchbasins are installed. Street catchbasins are installed at the time of roadway construction.

Contamination of the environment as a result of stockpiling of imported construction materials is generally not a concern provided the above noted seepage barriers are installed. These materials are quickly used and the mitigative measures stated previously, especially the ½ diameter sewer bulkheads and filter fabric in catchbasins and manholes help to manage these concerns.

The roadway granular materials are not stockpiled on site. They are immediately placed in the roadway and have little opportunity of contamination. Lot grading sometimes generates stockpiles of native materials. However, this is only a temporary event since the materials are quickly moved off site.

To assist in the control of transporting sediment off-site into municipal roads, mud mats will be employed at the construction entrances.

10 CONSTRUCTION MANAGEMENT PLAN

At detail design/construction stage a Construction Management Plan (CMP) will be prepared and approved by stakeholders which will include but not limited to: PSPC, CLC, Heath Canada, National Defence, SSC, City of Ottawa, Ottawa and Gatineau Transit operators, Hydro Ottawa, Utility providers, successful Contractor(s) plus others deemed appropriate to invite. The CMP will outline the specific scope of works to be completed with each contract. As multiple contracts are expected to be entered into to complete the works over multiple years. Each CMP will include the projected timelines with key milestone and deadlines, as the site will continue to have federal tenants each with specific requirements the project timeline including specific elements such as rock blasting or road closures will be reviewed and approved by the stakeholders. The contractor will be required to provide Resource Management Schedule to coincide with the contracted completion dates and milestone dates for the works, this will include the listing of any long term delivery of materials necessary for the project.

For each CMP the stakeholders and contractor will complete a risk management assessment noting potential risks and their impact and note the corresponding mitigation strategies to manage or reduce risks.

For each CMP the stakeholders and contractor will establish a Safety Plan to ensure workers and tenants are able to travers the site safely. This will also include an emergency plan and contacts in the event of an onsite issue.

Fore each CMP the stakeholders and contractor will also review potential environment impacts and mitigation measures, and review/implement sustainable construction practices for the works.

11 CONCLUSION

This report was prepared to support the application for Draft Plan Approval of the ROW for the subject lands. The report has illustrated that the proposed redevelopment can be serviced via existing municipal infrastructure. The water network will be adjusted within the development to provide necessary domestic and fire flow service for the future blocks. The sanitary sewer system will be generally removed and replace within the development to service the site. It is acknowledged there is limited capacity/surcharging within the WNC during wet weather events however noted offsite works can mitigate the impact of the redevelopment. Similarly the storm sewer system will be generally removed and replaced within the development to service the site. Stormwater runoff from the future blocks will be subject to quantity controls to ensure the proposed renewed storm sewer system within the ROW is able to accommodate the redevelopment. In addition to ROW LID's OGS will assist in meeting quality control targets. The sanitary and storm sewer designs for this development will be completed in conformance with City of Ottawa and MOE standards.

Based on the information provided within this report, the existing municipal systems can support the proposed redevelopment of the site. Conditions of Draft Approval will dictate the specific detail design requirements to implement the urban renewal of the ROW's to support the future development of blocks which will be subject to SPA and required to meet the City of Ottawa and MOE requirements.

Demetrius Yannoulopoulos, P. Eng.
Director – Office Lead

https://arcadiso365.sharepoint.com/sites/Projects2/139833/Internal Documents/6.0_Technical/6.04_Civil/03_Reports/Assessment of Adequacy/2024-xx Assessment of Adequacy/CTR-Assessment of Adequacy-2024-10-16.docx\

APPENDIX 1

Proposed Land Use

Site Boundary

22-24m ROW - Yarrow Woonerf

Proposed Land Use Designations	Area (ha)
Mixed-Use (Residential, Office, Retail, Community Use)	22.667
Open Space	7.951
Lab/Office/Utility	6.666
Transit Station	0.636
Public Right-of-Way	11.209
TOTAL:	49.129

Notes:
- Proposed road pattern by Arcadis IBI Group, July 2024.
- Plans are subject to change following NCC Board approvals.

Location
TUNNEY'S PASTURE

Date 2024-11-13

Drafted By SD

Scale 0 100m 1:1500

North

ARCADIS

Building Legend:

- Short-term Retention
- Short-term Retention Repurposed
- Mid-term Retention (10-15 Years)
- Long Term Retention (20+ Years)
- Permanent
- Health Canada Property Limits

Légende:

- Conservation à court terme
- Conservation à court terme Réaménagement
- Conservation à moyen terme (10-15 ans)
- Conservation à long terme (plus de 20 ans)
- Permanent

LEGEND

- Water Valve, Valve Chamber, Fire Hydrant
- Sewer Manhole, Catch Basin Manhole
- Catch Basin / Drainage, Wing Wall, Head Wall
- Pole, Pole w/ light, Decorative, Lawn Light (UP, H)
- Power Supply, Panel, Pedestal, Transformer, Tower, Regulator (P/S, B, PED, GR)
- Amp, Hand Hole, Vault, Gas Valve (AMP)
- OC Transpo: Bus Shelter-No Power, Energized, Isolated (BUS, BUS, BUS)
- Streetscape: Planter Box, Grate Square, Eng. Soil (TGS)
- Traffic Connect Box / Disconnect Box, SL Disconnect (TCB, TDB, SDB)
- Red Light Hand Hole, Red Light Camera (THH)
- Scada: Handhold, Monitoring Panel (S, M)

Reducer
Pipe, Duct, Conduit, Lateral
Culvert
Abandoned
Capped
Buried Cable
Property Line
Install Year (2015)

TELECOM GLOSSARY

A.....Allstream	P.....Primus
AT.....Atria	P2P.....Canadian P2P Fibre
B.....Bell	R.....Rogers
BH.....Birch Hill	S.....Sprint
F.....Fibre Noir	SL.....Street Lighting
G.....Globility	T.....Traffic
GT.....Group Telecom	TO.....Telecom Ottawa
H.....Hydro Ottawa	TU.....Telus
H1.....Hydro One	V.....Videotron
L / L3.....Level 3	Z.....Zayo

GLOSSARY - OTHER

DD.....Dept. of Defence	PED.....Pedestal (owner unknown)
MH.....Manhole (owner unknown)	PW.....Public Works
O/OC.....OCTranspo	UP.....Utility Pole (owner unknown)
SCD.....Scada	

CAUTION/ATTENTION

Although utility locations are established using the best available informaiton, they cannot be guaranteed.
Property Lines were compiled from plans and documents recorded in the Land Registry System and are for indexing purposes only.

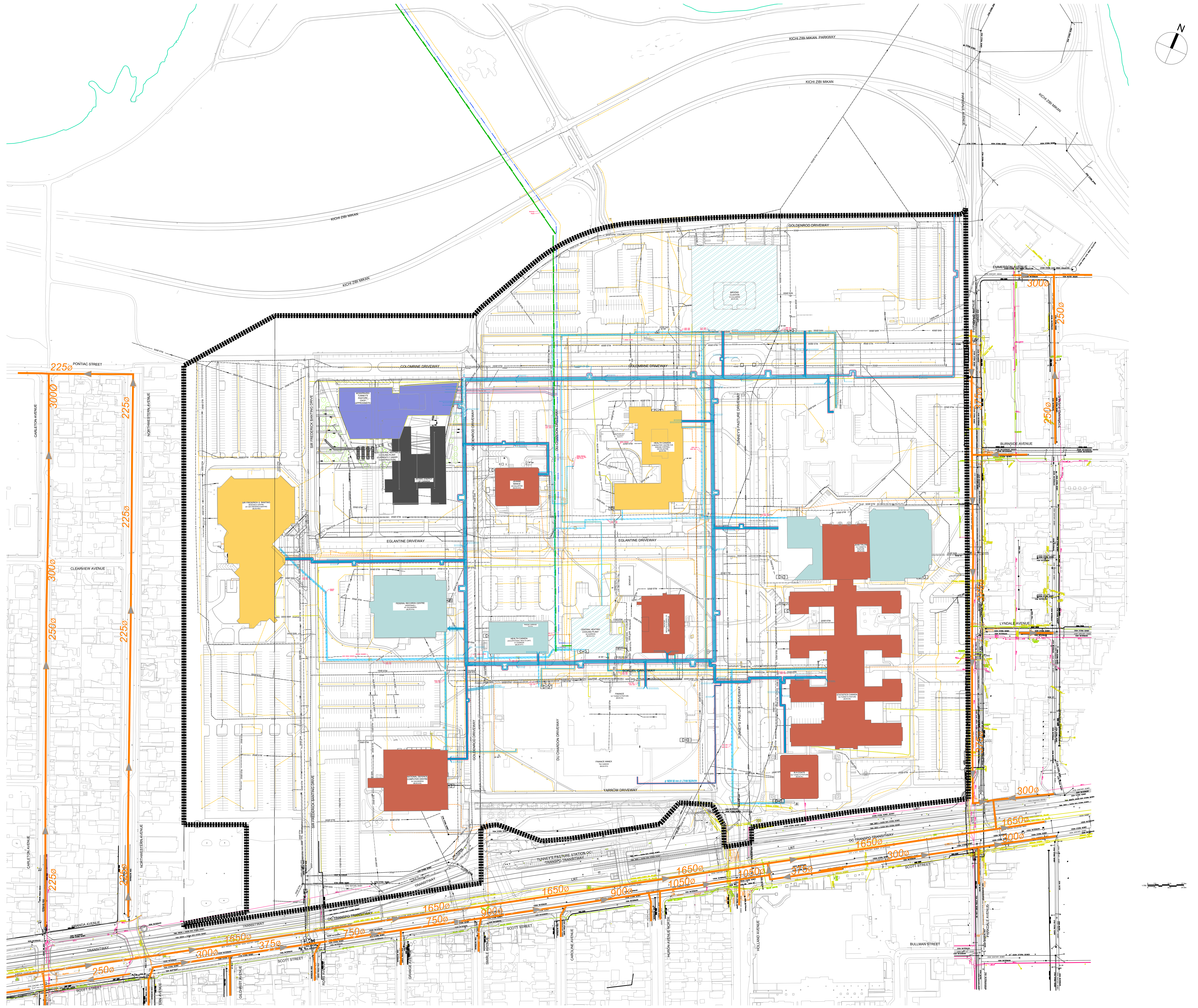
UTILITY COORDINATING COMMITTEE U C C Ottawa C C S P COMITÉ DE COORDINATION DES SERVICES PUBLICS

Bien que l'emplacement des services publics soient établis en utilisant la meilleure information disponible, ils ne peuvent pas être garantis.
Des lignes de propriété ont été compilées en utilisant des plans et des documents enregistrés dans le système de cadastre et sont pour l'indexation seulement.

PWGSC LEGEND

- U/G BELL TELEPHONE SERVICE
- A/G BELL TELEPHONE SERVICE
- U/G FIBER OPTICS
- U/G LOW VOLTAGE ELECTRICAL
- A/G LOW VOLTAGE ELECTRICAL
- U/G ELECTRICAL SERVICE ABN
- U/G HIGH VOLTAGE ELECTRICAL
- A/G HIGH VOLTAGE ELECTRICAL
- A/G SECURITY LINE
- SECURITY SERVICE LINE
- CHILLED WATER RETURN
- CHILLED WATER SUPPLY
- STEAM CONDUIT
- CONDENSATE
- STEAM CONDUIT ABANDONED
- WATERMAIN CONDUIT
- WATERMAIN ABANDONED
- IRRIGATION LINE
- STORM SEWER
- STORM ABANDONED
- SANITARY SEWER
- COMBINED SEWER
- SANITARY FORCED MAIN
- SANITARY ABANDONED
- GAS LINE
- GAS LINE ABANDONED
- TREE LINE/ EDGE OF BUSH
- TOP OF SLOPE
- BOTTOM OF SLOPE

	VERTICAL CONTROL	BHP	BELL-HYDRO POLE
	HORIZONTAL CONTROL	HP	HYDRO POLE
IB	SQUARE IRON BAR	BP	BELL POLE
RIB	ROUND IRON BAR	GUY	GUY ANCHOR
CC	CUT CROSS	GP	GUY POLE
NAIL	SURVEY NAIL	BP	BELL PEDESTAL
WS	WOODEN STAKE	CP	CABLE PEDESTAL
	BENCH MARK		ELECTRICALPULL BOX
MH	GENERAL MANHOLE		ELECTRICAL PLUG POST
SMH	SANITARY MANHOLE		LIGHTNING ROD
DMH	STORM MANHOLE	TCB	TRAFFIC CONTROL BOX
	ELECTRICAL MANHOLE	TL	TRAFFIC LIGHT
FOMH	FIBRE OPTIC MANHOLE	FC	SECURITY CAMERA
BMH	BELL MANHOLE	LS	LIGHT STANDARD
B/FOMH	BELL-FIBRE OPTIC MANHOLE	LP	LAMP POST
TMH	TRAFFIC MANHOLE	FL	FLOOD LIGHT
MC	METER CHAMBER	D-LS	DOUBLE LIGHT STANDARD
H	FIRE HYDRANT	H/LP	HYDRO-LAMP POST
VC	VALVE CHAMBER	GV/N	NATURAL GAS VALVE
VB	VALVE BOX	GM/N	NATURAL GAS METER
CS	WATER CURB STOP	VENT/N	NATURAL GAS VENT
	STANDPIPE	OFC	OIL FILLER CAP
IV	IRRIGIATION VALVE BOX		ROAD BOLLARD
IS	IRRIGATION SPRINKLER HEAD	MP	ENVIRONMENTAL MONITOR PIN
IV	INTAKE VALVE	MW	ENVIRONMENTAL MONITOR WELL
CO/SA	SANITARY SEWER CLEAN OUT	TP	GEOTECH TEST PIT
CO/SW	STORM SEWER CLEAN OUT	BH	GEOTECH BOREHOLE
CB	SQUARE CATCH BASIN	SD	SATELLITE DISH
CB	DOUBLE CATCH BASIN	SB	SATELLITE BOX
CB	INLET CATCH BASIN	M/GP	METAL GATE POST
CB	RECTANGULAR CATCH BASIN	W/GP	WOODEN GATE POST
CB	ROUND CATCH BASIN		SHRUB
DI	DITCH INLET		STUMP
DR	DRAIN		
	FLAG POLE		
	DECORATIVE POLE		
	DECIDUOUS		
	CONIFEROUS		



...Site Servicing Issues Memo\139833Storm.dwg Layout Name: Existing Underground Infrastructure Last Saved By: milnem4626 Last Saved At: Oct. 17, 24

ARCADIS

Project Title

Tunney's Pasture
Site Servicing and Public Road Redevelopment
Prepared for Canada Lands Company & Public Service and Procurement Canada

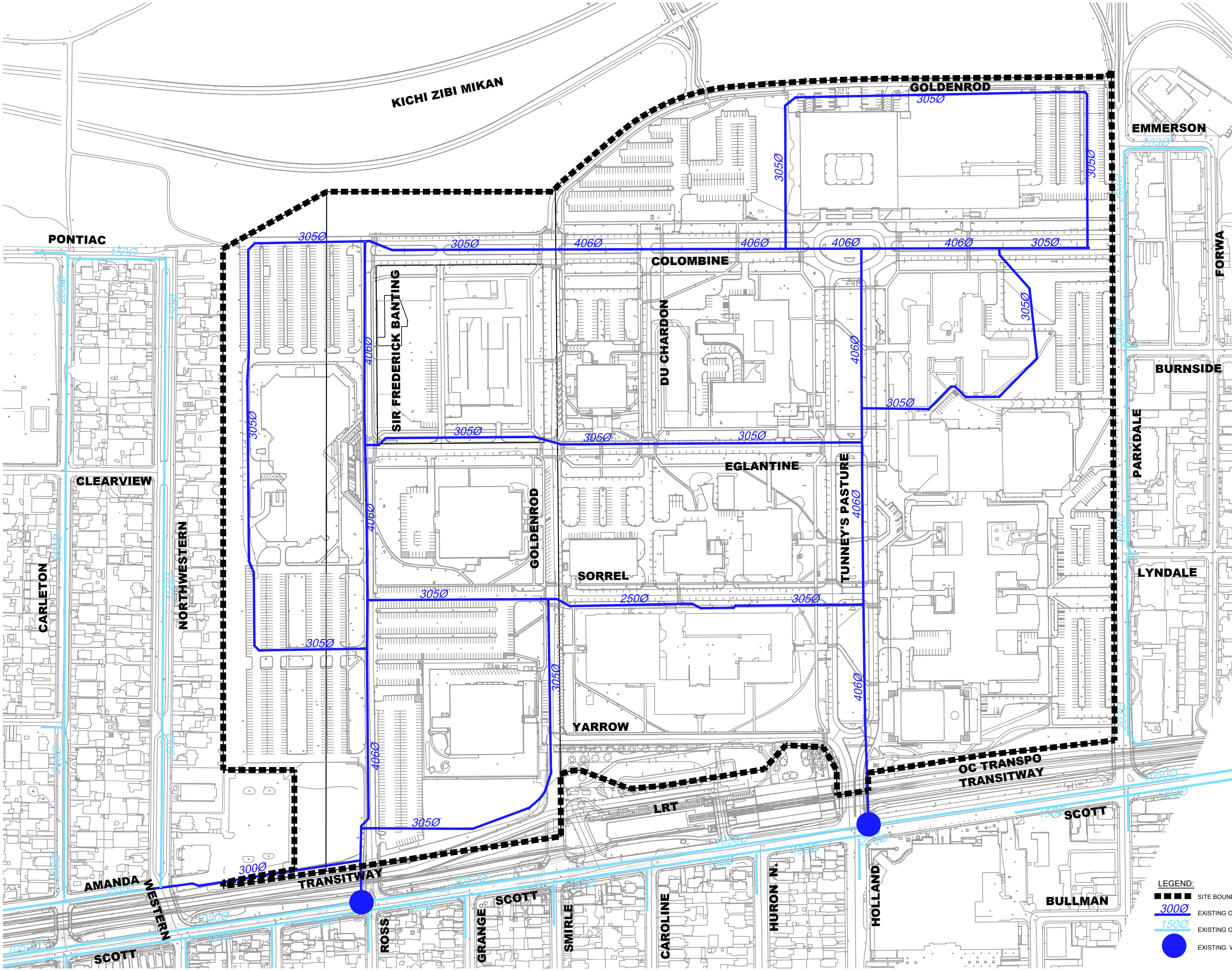
Drawing Title

Existing Underground Infrastructure

Sheet No.

Figure 1

APPENDIX 2



Project Title	Drawing Title	Sheet No.
Tunney's Pasture Site Servicing and Public Road Redevelopment Prepared for Canada Lands Company & Public Service and Procurement Canada	Existing Watermain Infrastructure	Figure 2

ARCADIS

T:\139833_TunneyPasture\7.0_Production\7.03_Design\04_Civil_Land\Figures\Site Servicing Issues Memo\139833Watermain.dwg Layout Name: Figure 2 Existing Watermai

Labadie, Sam

From: Whelan, Amy <amy.whelan@ottawa.ca>
Sent: September 3, 2024 11:44 AM
To: Labadie, Sam
Subject: RE: Tunney's Pasture - Boundary Condition Request
Attachments: Tunney's Pasture Redevelopment August 2024.pdf

Hi Sam,

******The following information may be passed on to the consultant, but do NOT forward this e-mail directly.******

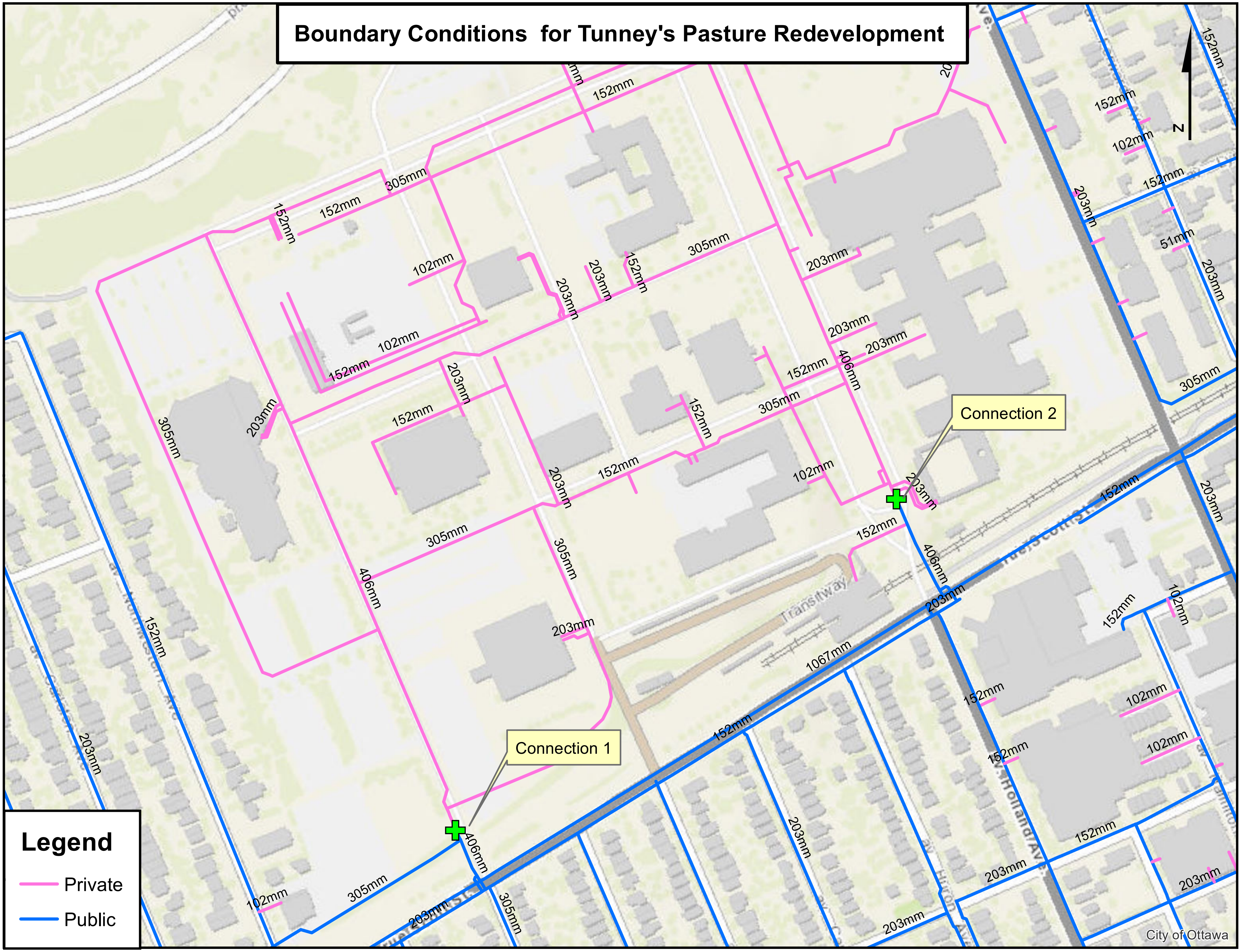
The following are boundary conditions, HGL, for hydraulic analysis at Tunney's Pasture Redevelopment (zone 1W) assumed to be connected via two connections to the 406 mm watermain on Sir Frederick Banting Driveway AND the 406 mm watermain on Tunney's Pasture (see attached PDF for location).

Connection	Min HGL (m)	Maximum HGL (m)	Max Day + FF (250 L/s)	Max Day + FF (166.67 L/s)
1. Sir Frederick Banting	107.8	114.7	109.1	109.5
2. Tunney's Pasture	107.6	114.7	108.3	109.0

These are for current conditions and are based on computer model simulation.

Disclaimer: The boundary condition information is based on current operation of the city water distribution system. The computer model simulation is based on the best information available at the time. The operation of the water distribution system can change on a regular basis, resulting in a variation in boundary conditions. The physical properties of watermains deteriorate over time, as such must be assumed in the absence of actual field test data. The variation in physical watermain properties can therefore alter the results of the computer model simulation.

From: Whelan, Amy
Sent: September 03, 2024 10:07 AM
To: Labadie, Sam <samantha.labadie@arcadis.com>
Subject: RE: Tunney's Pasture - Boundary Condition Request


Boundary Conditions for Tunney's Pasture Redevelopment
Connection 1
Connection 2
Legend
Private
Public
Transitway
1067mm
City of Ottawa

WATERMAIN DEMAND CALCULATION SHEET

IBI GROUP
333 PRESTON STREET
OTTAWA, ONTARIO
K1S 5N4

PROJECT : Tunney's Pasture
CLIENT : PSPC/CLC

FILE: 139833-6.04.04
DATE PRINTED: 21-Oct-24
DESIGN: SEL

NODE	RESIDENTIAL				NON-RESIDENTIAL (ICI)			AVERAGE DAILY DEMAND (l/s)			MAXIMUM DAILY DEMAND (l/s)			MAXIMUM HOURLY DEMAND (l/s)			FIRE DEMAND (l/min)
	SINGLE FAMILY UNITS	TOWNHOUSE UNITS	APARTMENT UNITS	POPULATION	INDUST. (ha)	COMM. (m2)	INSTIT. (pp)	RESIDENTIAL	ICI	TOTAL	RESIDENTIAL	ICI	TOTAL	RESIDENTIAL	ICI	TOTAL	
Totals																	
Residential				16290.00				52.79		52.79	131.98		131.98	290.35		290.35	15,000
Institutional						16,175	9,262		8.51	8.51		12.76	12.76		22.97	22.97	15,000
										61.30			**144.74**			**313.33**	
Boundary Condition																	
Based on:																	
Residential				12960.00				42.00		42.00	105.00		105.00	231.00		231.00	15,000
Institutional							29,800		25.87	25.87		38.80	38.80		69.84	69.84	15,000
										67.87			**143.80**			**300.84**	

POPULATION DENSITY

- Single Family 3.4 persons/unit
- Townhouse 2.7 persons/unit
- Avg Apartment 1.8 persons/unit

WATER DEMAND RATES

- Residential 280 l/cap/day
- Commercial Shopping Center 2,500 L/(1000m2)/day
- Institutional 75 l/cap/day

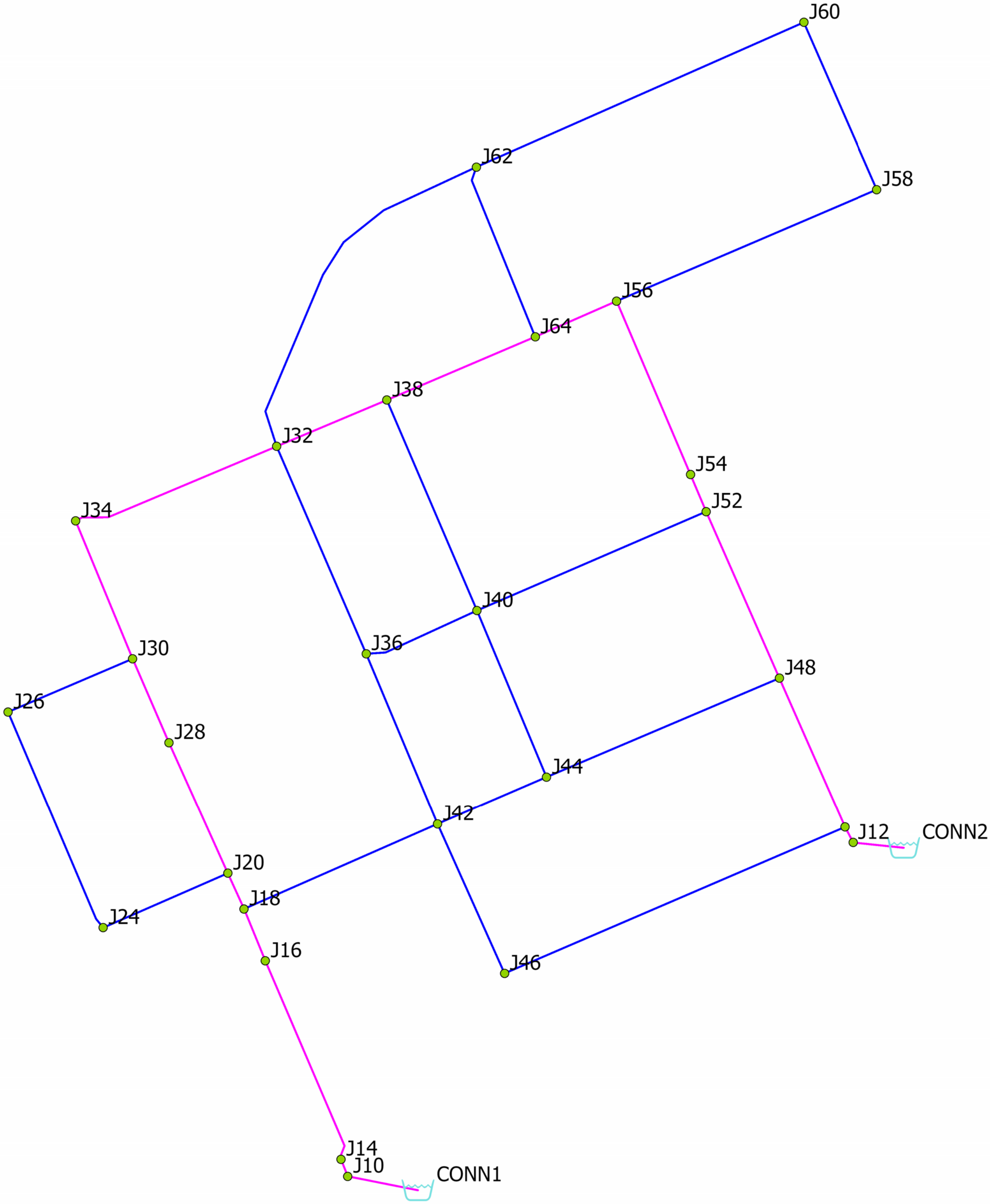
PEAKING FACTORS

- Maximum Daily
  - Residential 2.5 x avg. day
  - Commercial 1.5 x avg. day
- Maximum Hourly
  - Residential 2.2 x avg. day
  - Commercial 1.8 x avg. day

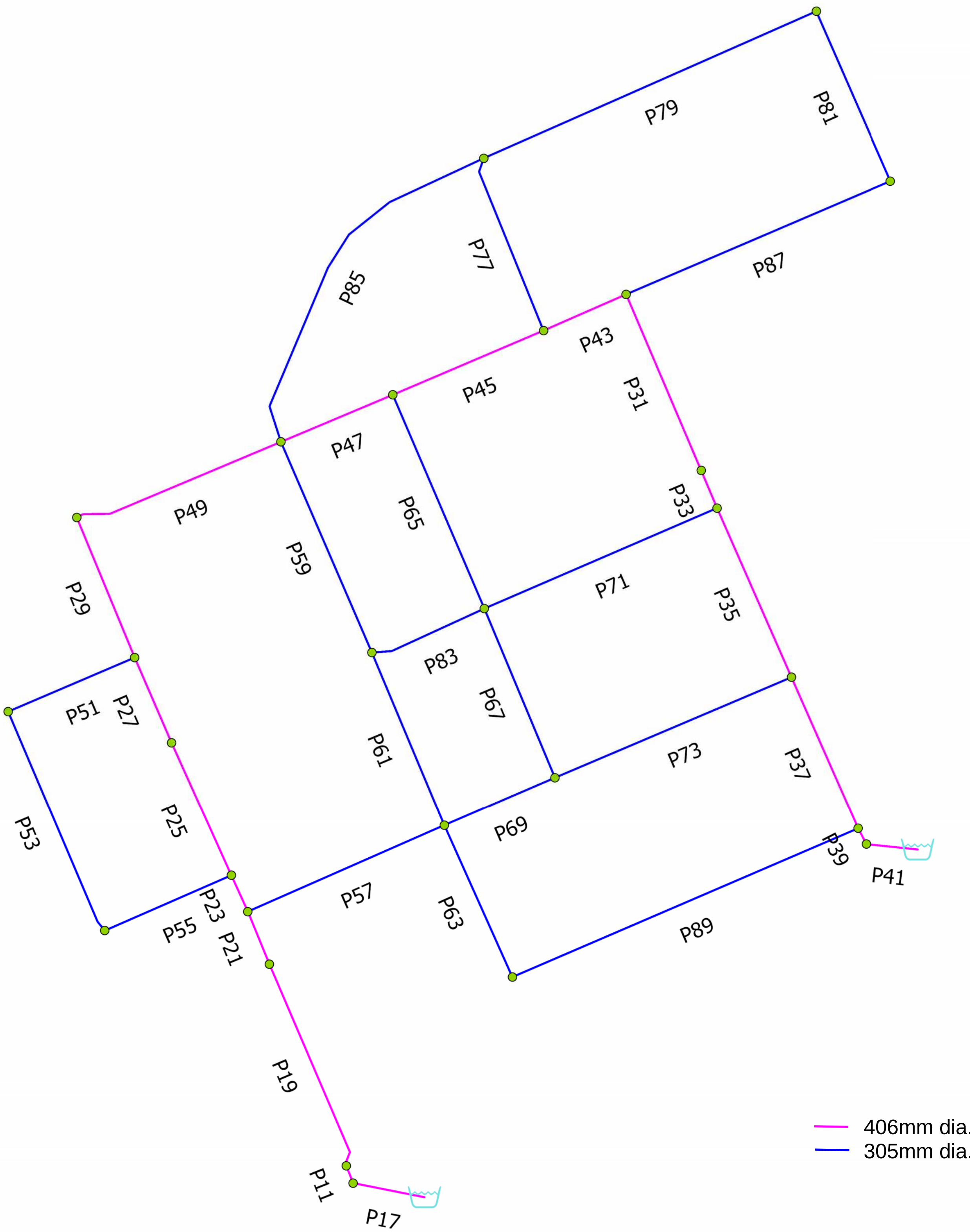
FIRE DEMANDS

- Single Family 10,000 l/min (166.7 l/s)
- Semi Detached & Townhouse 10,000 l/min (166.7 l/s)
- Medium Density 15,000 l/min (250 l/s)

Node IDs

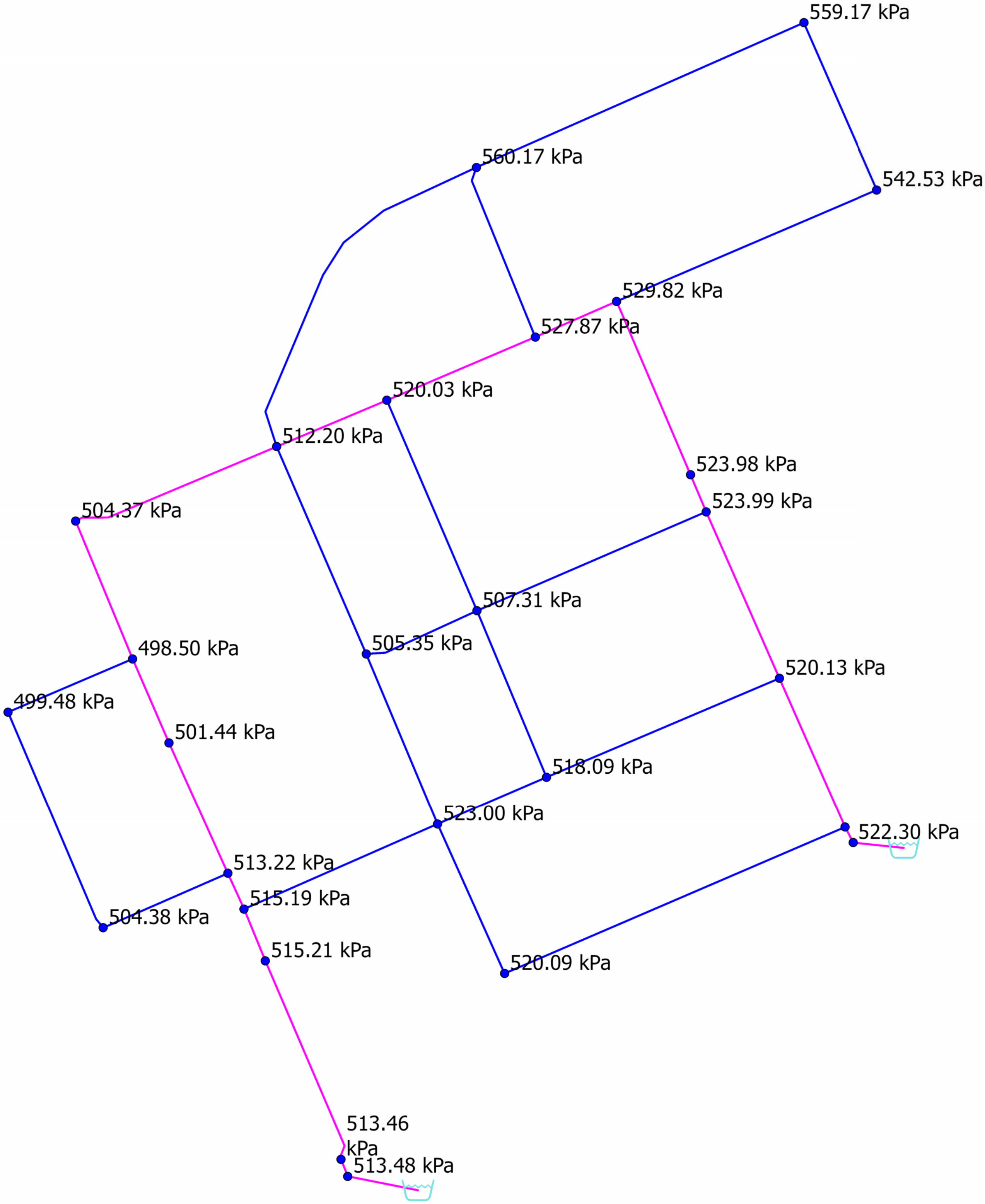

J60
J62
J58
J56
J64
J38
J32
J54
J34
J52
J40
J36
J30
J48
J26
J28
J44
J42
J12
CONN2
J20
J18
J24
J16
J46
J14
J10
CONN1

Pipe IDs


P79
P81
P77
P85
P87
P43
P45
P31
P47
P65
P33
P49
P59
P71
P35
P29
P83
P51
P27
P67
P61
P73
P37
P25
P53
P69
P39
P41
P57
P23
P63
P55
P21
P89
P19
P11
P17
406mm dia.
305mm dia.

		ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (kPa)
1		J10	0.00	62.30	114.70	513.48
2		J12	0.00	61.40	114.70	522.30
3		J14	0.00	62.30	114.70	513.46
4		J16	8.17	62.10	114.68	515.21
5		J18	0.00	62.10	114.67	515.19
6		J20	0.00	62.30	114.67	513.22
7		J24	4.38	63.20	114.67	504.38
8		J26	0.88	63.70	114.67	499.48
9		J28	1.86	63.50	114.67	501.44
10		J30	0.00	63.80	114.67	498.50
11		J32	0.00	62.40	114.67	512.20
12		J34	0.00	63.20	114.67	504.37
13		J36	0.65	63.10	114.67	505.35
14		J38	2.66	61.60	114.67	520.03
15		J40	0.68	62.90	114.67	507.31
16		J42	1.76	61.30	114.67	523.00
17		J44	10.22	61.80	114.67	518.09
18		J46	4.11	61.60	114.67	520.09
19		J48	4.41	61.60	114.68	520.13
20		J50	2.72	61.40	114.70	522.26
21		J52	0.00	61.20	114.67	523.99
22		J54	1.79	61.20	114.67	523.98
23		J56	5.35	60.60	114.67	529.82
24		J58	0.00	59.30	114.67	542.53
25		J60	5.83	57.60	114.66	559.17
26		J62	5.83	57.50	114.66	560.17
27		J64	0.00	60.80	114.67	527.87

Avg Day

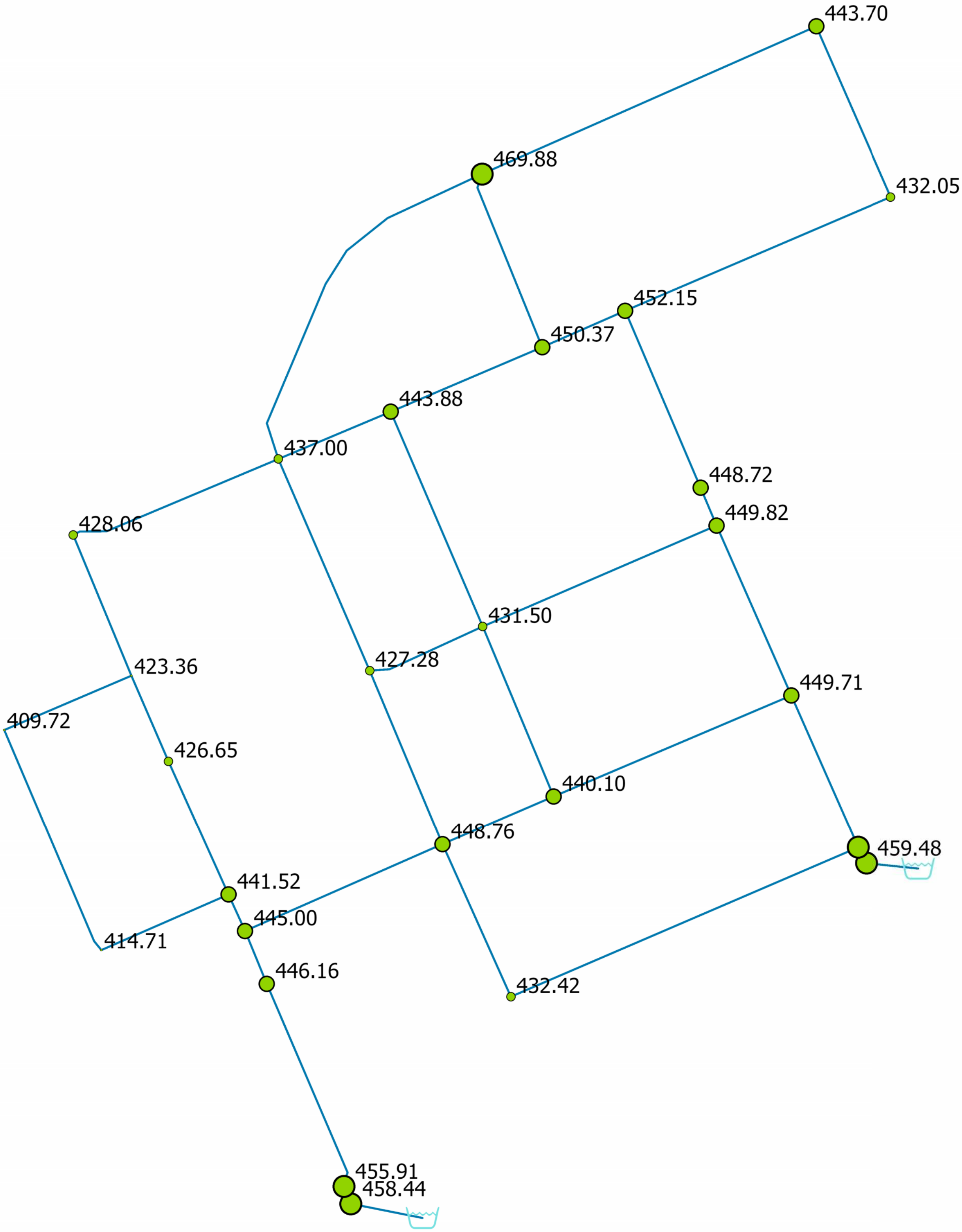


559.17 kPa
560.17 kPa
542.53 kPa
529.82 kPa
527.87 kPa
520.03 kPa
512.20 kPa
523.98 kPa
523.99 kPa
504.37 kPa
507.31 kPa
498.50 kPa
505.35 kPa
520.13 kPa
499.48 kPa
501.44 kPa
518.09 kPa
523.00 kPa
522.30 kPa
513.22 kPa
515.19 kPa
504.38 kPa
515.21 kPa
520.09 kPa
513.46 kPa
513.48 kPa

Max Day + Fireflow 15000 L/min

		ID	Static Demand (L/s)	Static Pressure (kPa)	Static Head (m)	Fire-Flow Demand (L/s)	Residual Pressure (kPa)	Hydrant Available Flow (L/s)	Hydrant Pressure at Available Flow (kPa)
1		J10	0.00	458.58	109.10	250.00	458.44	22,941.14	151.92
2		J12	0.00	459.58	108.30	250.00	459.48	20,676.75	151.55
3		J14	0.00	458.21	109.06	250.00	455.91	5,262.95	150.06
4		J16	20.42	455.85	108.62	250.00	446.16	1,992.49	149.97
5		J18	0.00	455.03	108.54	250.00	445.00	1,897.31	149.97
6		J20	0.00	452.84	108.51	250.00	441.52	1,744.34	149.97
7		J24	10.94	443.63	108.47	250.00	414.71	947.27	149.96
8		J26	2.19	438.55	108.45	250.00	409.72	923.00	149.96
9		J28	2.79	440.68	108.47	250.00	426.65	1,474.14	149.97
10		J30	0.00	437.51	108.45	250.00	423.36	1,458.62	149.97
11		J32	0.00	449.96	108.32	250.00	437.00	1,570.69	149.97
12		J34	0.00	442.87	108.39	250.00	428.06	1,412.41	149.97
13		J36	0.98	443.03	108.31	250.00	427.28	1,333.78	149.97
14		J38	6.61	457.63	108.30	250.00	443.88	1,541.94	149.97
15		J40	1.02	444.87	108.30	250.00	431.50	1,492.38	149.97
16		J42	4.40	460.74	108.32	250.00	448.76	1,635.33	149.97
17		J44	25.24	455.58	108.29	250.00	440.10	1,432.57	149.97
18		J46	10.25	457.62	108.30	250.00	432.42	1,021.50	149.96
19		J48	9.53	457.54	108.29	250.00	449.71	2,132.30	149.98
20		J50	4.08	459.57	108.30	250.00	458.16	5,330.68	150.07
21		J52	0.00	461.45	108.29	250.00	449.82	1,699.12	149.97
22		J54	4.44	461.43	108.29	250.00	448.72	1,615.23	149.97
23		J56	12.70	467.29	108.29	250.00	452.15	1,499.88	149.97
24		J58	0.00	479.89	108.27	250.00	432.05	746.01	149.96
25		J60	14.58	496.47	108.26	250.00	443.70	745.23	149.96
26		J62	14.58	497.57	108.28	250.00	469.88	1,092.00	149.96
27		J64	0.00	465.35	108.29	250.00	450.37	1,485.90	149.97

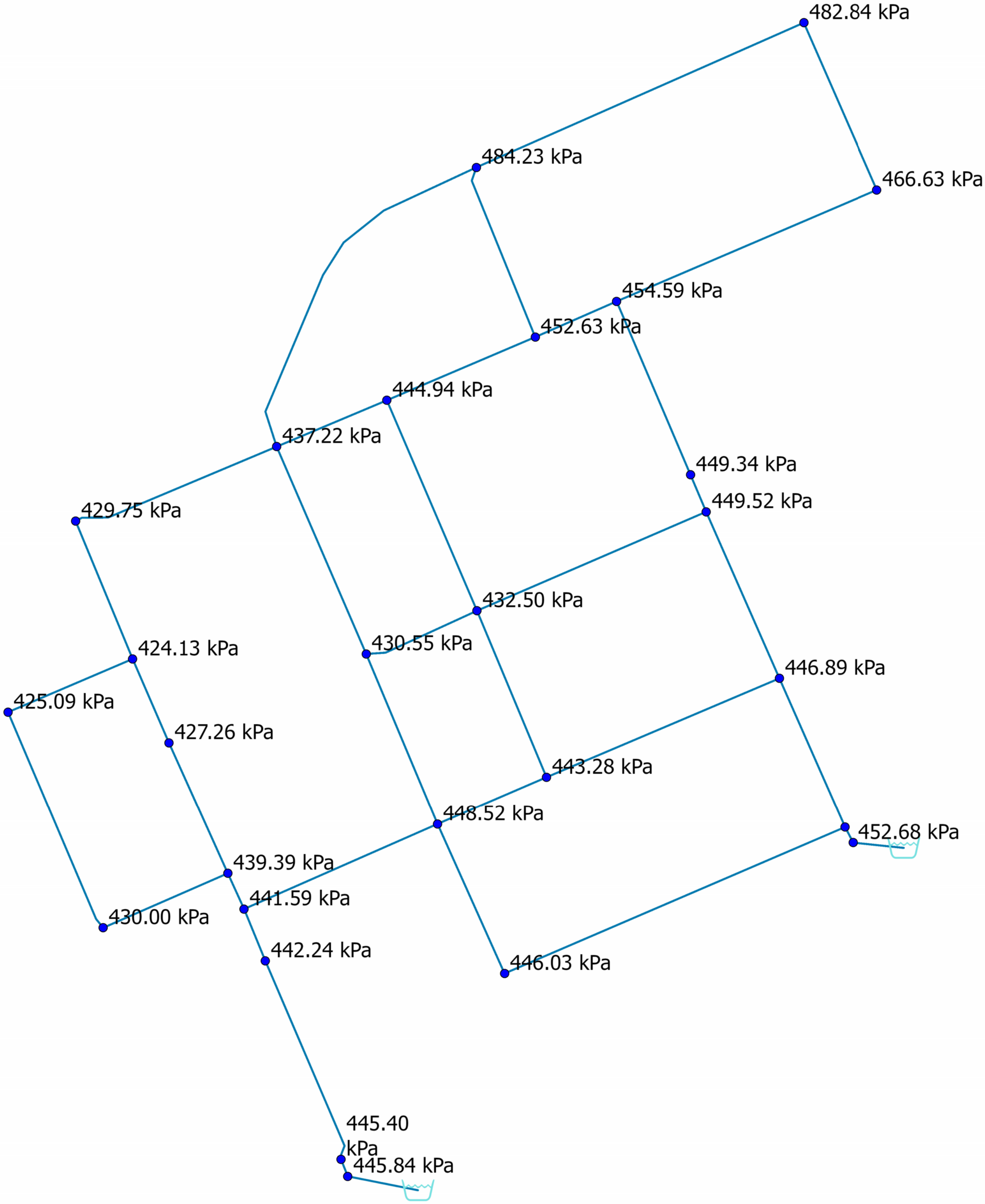
Residual Pressure



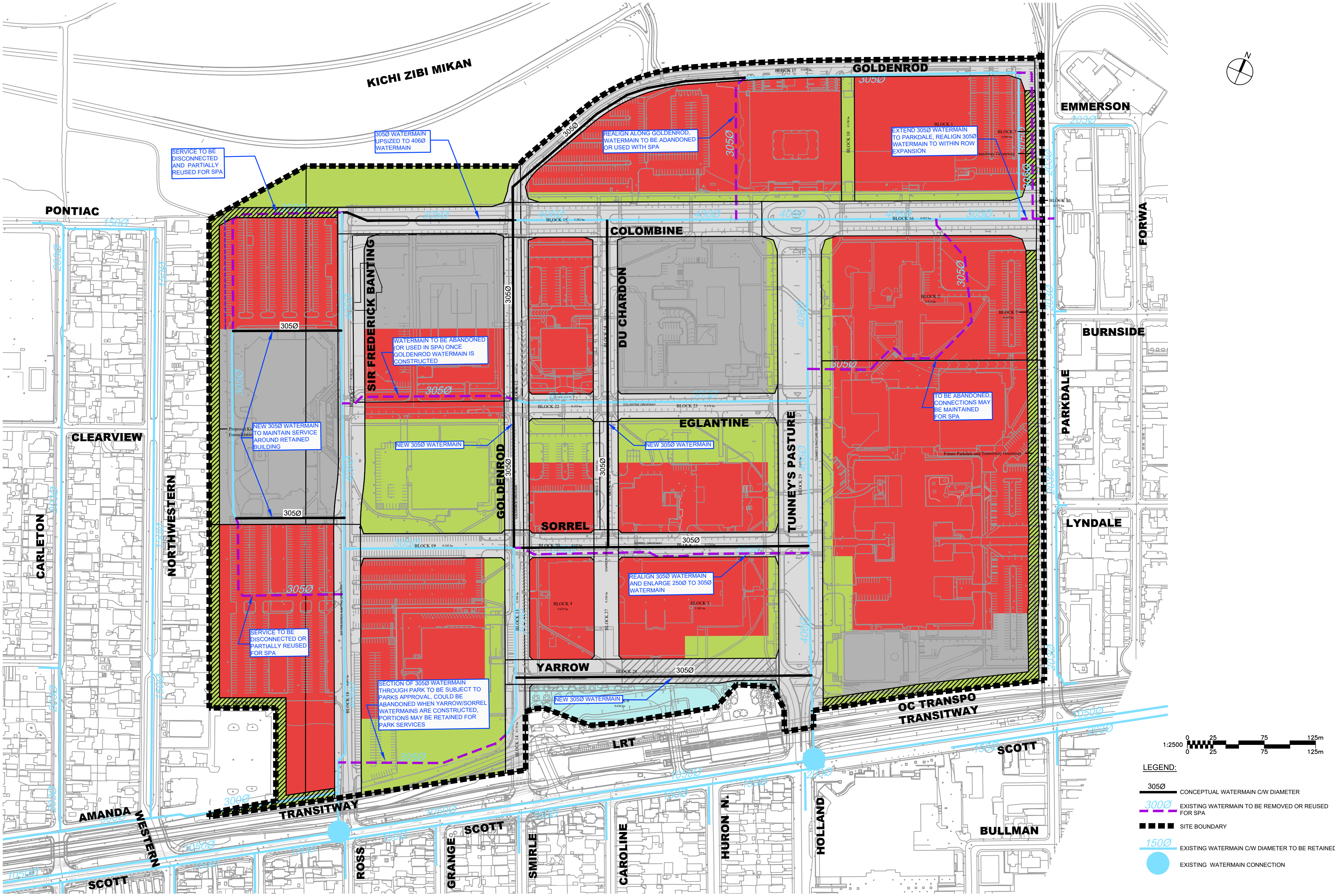
		ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (kPa)
1		J10	0.00	62.30	107.80	445.84
2		J12	0.00	61.40	107.60	452.68
3		J14	0.00	62.30	107.75	445.40
4		J16	44.92	62.10	107.23	442.24
5		J18	0.00	62.10	107.16	441.59
6		J20	0.00	62.30	107.14	439.39
7		J24	24.06	63.20	107.08	430.00
8		J26	4.81	63.70	107.08	425.09
9		J28	5.03	63.50	107.10	427.26
10		J30	0.00	63.80	107.08	424.13
11		J32	0.00	62.40	107.02	437.22
12		J34	0.00	63.20	107.06	429.75
13		J36	1.76	63.10	107.04	430.55
14		J38	14.53	61.60	107.01	444.94
15		J40	1.84	62.90	107.04	432.50
16		J42	9.66	61.30	107.07	448.52
17		J44	55.35	61.80	107.04	443.28
18		J46	22.53	61.60	107.12	446.03
19		J48	20.08	61.60	107.20	446.89
20		J50	7.34	61.40	107.53	452.04
21		J52	0.00	61.20	107.07	449.52
22		J54	9.73	61.20	107.05	449.34
23		J56	27.52	60.60	106.99	454.59
24		J58	0.00	59.30	106.92	466.63
25		J60	32.08	57.60	106.87	482.84
26		J62	32.08	57.50	106.92	484.23
27		J64	0.00	60.80	106.99	452.63

		ID	From Node	To Node	Length (m)	Diameter (mm)	Roughness	Flow (L/s)	Velocity (m/s)	Headloss (m)	HL/1000 (m/k-m)	Status	Flow Reversal Count
1		P11	J14	J10	14.30	406.00	120.00	-138.49	1.07	0.04	3.12	Open	0
2		P13	J10	CONN1	55.75	406.00	120.00	-14.19	0.11	0.00	0.05	Open	0
3		P15	J10	J66	5.64	406.00	120.00	0.00	0.00	0.00	0.00	Open	0
4		P17	J10	CONN1	1.00	406.00	120.00	-124.30	0.96	0.00	2.55	Open	0
5		P19	J14	J16	167.52	406.00	120.00	138.49	1.07	0.52	3.12	Open	0
6		P21	J16	J18	43.66	406.00	120.00	93.57	0.72	0.07	1.51	Open	0
7		P23	J18	J20	30.49	406.00	120.00	67.51	0.52	0.03	0.82	Open	0
8		P25	J20	J28	111.54	406.00	120.00	41.96	0.32	0.04	0.34	Open	0
9		P27	J28	J30	71.07	406.00	120.00	36.93	0.29	0.02	0.27	Open	0
10		P29	J30	J34	115.88	406.00	120.00	33.61	0.26	0.03	0.23	Open	0
11		P31	J56	J54	146.54	406.00	120.00	-47.85	0.37	0.06	0.44	Open	0
12		P33	J54	J52	31.19	406.00	120.00	-57.58	0.44	0.02	0.61	Open	0
13		P35	J52	J48	141.44	406.00	120.00	-71.99	0.56	0.13	0.93	Open	0
14		P37	J48	J50	126.61	406.00	120.00	-124.60	0.96	0.32	2.57	Open	0
15		P39	J50	J12	13.63	406.00	120.00	-174.83	1.35	0.07	4.80	Open	0
16		P41	J12	CONN2	1.00	406.00	120.00	-174.83	1.35	0.00	4.80	Open	0
17		P43	J56	J64	69.09	406.00	120.00	1.09	0.01	0.00	0.00	Open	0
18		P45	J64	J38	125.39	406.00	120.00	-23.88	0.18	0.02	0.12	Open	0
19		P47	J38	J32	92.93	406.00	120.00	-24.66	0.19	0.01	0.13	Open	0
20		P49	J34	J32	168.04	406.00	120.00	33.61	0.26	0.04	0.23	Open	0
21		P51	J30	J26	105.32	305.00	120.00	3.32	0.05	0.00	0.01	Open	0
22		P53	J26	J24	183.82	305.00	120.00	-1.49	0.02	0.00	0.00	Open	0
23		P55	J24	J20	105.71	305.00	120.00	-25.55	0.35	0.06	0.55	Open	0
24		P57	J18	J42	164.32	305.00	120.00	26.06	0.36	0.09	0.57	Open	0
25		P59	J32	J36	175.49	305.00	120.00	-11.00	0.15	0.02	0.12	Open	0
26		P61	J36	J42	143.54	305.00	120.00	-15.94	0.22	0.03	0.23	Open	0
27		P63	J42	J46	127.45	305.00	120.00	-20.36	0.28	0.05	0.36	Open	0
28		P65	J38	J40	177.92	305.00	120.00	-13.75	0.19	0.03	0.17	Open	0
29		P67	J40	J44	140.29	305.00	120.00	2.00	0.03	0.00	0.00	Open	0
30		P69	J44	J42	92.22	305.00	120.00	-20.82	0.28	0.03	0.38	Open	0
31		P71	J40	J52	194.03	305.00	120.00	-14.42	0.20	0.04	0.19	Open	0
32		P73	J44	J48	196.71	305.00	120.00	-32.53	0.45	0.17	0.86	Open	0
33		P77	J64	J62	142.14	305.00	120.00	24.97	0.34	0.07	0.53	Open	0
34		P79	J62	J60	278.28	305.00	120.00	12.84	0.18	0.04	0.15	Open	0
35		P81	J60	J58	141.88	305.00	120.00	-19.24	0.26	0.05	0.32	Open	0
36		P83	J36	J40	93.30	305.00	120.00	3.18	0.04	0.00	0.01	Open	0
37		P85	J62	J32	293.08	305.00	120.00	-19.95	0.27	0.10	0.35	Open	0
38		P87	J56	J58	220.23	305.00	120.00	19.24	0.26	0.07	0.32	Open	0
39		P89	J46	J50	288.23	305.00	120.00	-42.89	0.59	0.41	1.43	Open	0

Peak Hour


482.84 kPa
484.23 kPa
466.63 kPa
454.59 kPa
452.63 kPa
444.94 kPa
437.22 kPa
449.34 kPa
429.75 kPa
449.52 kPa
432.50 kPa
424.13 kPa
430.55 kPa
446.89 kPa
425.09 kPa
427.26 kPa
443.28 kPa
448.52 kPa
452.68 kPa
439.39 kPa
441.59 kPa
430.00 kPa
442.24 kPa
446.03 kPa
445.40 kPa
445.84 kPa

T:\139833_TunneyPasture\7.0_Production\7.03_Design\04_Civil_Land\Figures\Servicing Report\139833Watermain.dwg Layout Name: Figure 3 Existing Watermain Infrastructure



ARCADIS

Project Title

Tunney's Pasture

Site Servicing and Public Road Redevelopment

Prepared for Canada Lands & Public Service and Procurement Canada

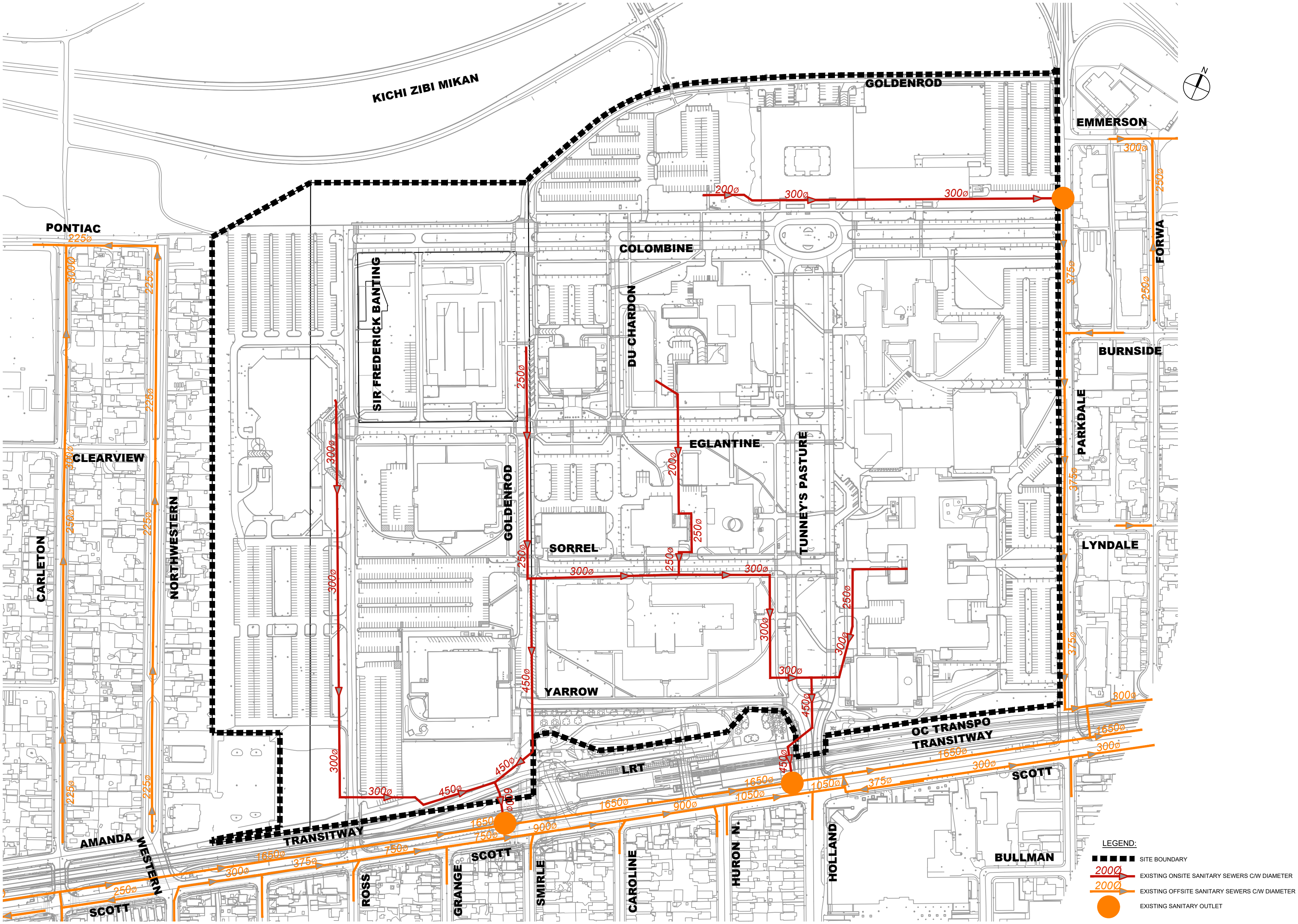
Drawing Title

Conceptual Watermain Infrastructure

Sheet No.

Figure 3

APPENDIX 3



T:\139833_TunneyPasture\7.0_Production\7.03_Design\04_Civil_Land\Figures\Site Servicing Issues Memo\139833Sanitary.dwg Layout Name: Existing Sanitary Infrastructure (L...

ARCADIS

Project Title

Tunney's Pasture

Site Servicing and Public Road Redevelopment

Prepared for Canada Lands Company & Public Service and Procurement Canada

Drawing Title

Existing Sanitary Infrastructure

Sheet No.

Figure 4

T:\139833_TunneyPasture\7.0_Production\7.03_Design\04_Civil_Land\Figures\Servicing Report\139833Sanitary.dwg Layout Name: Figure 5 Existing Sanitary Infrastructure (Le

Project Title

Tunney's Pasture

Site Servicing and Public Road Redevelopment

Prepared for Canada Lands Company & Public Service and Procurement Canada

Drawing Title

Conceptual Sanitary Infrastructure

Sheet No.

Figure 5

ARCADIS

Arcadis Canada Inc.
500-333 Preston Street
Ottawa, Ontario K1S 5N4 Canada
arcadis.com

CONCEPTUAL SANITARY SEWER DESIGN SHEET

Tunney's Pasture
Ottawa
CLC

LOCATION				RESIDENTIAL										ICI AREAS								INFILTRATION ALLOWANCE			FIXED FLOW (L/s)		TOTAL FLOW	PROPOSED SEWER DESIGN						
				AREA w/ Units	UNIT TYPES				AREA w/o Units	POPULATION		RES PEAK FACTOR	PEAK FLOW	AREA (Ha)						ICI PEAK FACTOR	PEAK FLOW	AREA (Ha)		FLOW				CAPACITY	LENGTH	DIA	SLOPE	VELOCITY (full)	AVAILABLE CAPACITY	
														INSTITUTIONAL		EMPLOYMENT		RETAIL																
STREET	AREA ID	FROM MH	TO MH	(Ha)	SF	SD	TH	APT	(Ha)	IND	CUM		(L/s)	IND	CUM	IND	CUM	IND	CUM		(L/s)	IND	CUM	(L/s)	IND	CUM	(L/s)	(L/s)	(m)	(mm)	(%)	(m/s)	L/s	(%)
Colombine		5	6	4.59						2700.0	2700.0	3.48	30.46	0.00	0.00	0.00	0.00	0.00	0.00	1.50	0.00	4.59	4.59	1.51	0.00	0.0	31.97	48.38	182.00	300	0.23	0.663	16.41	33.92%
Parkdale		6	36988	1.27						1350.0	4050.0	3.33	43.69	0.00	0.00	0.00	0.00	0.00	0.00	1.50	0.00	1.27	5.86	1.93	0.00	0.0	45.62	96.79	30.30	375	0.28	0.849	51.17	52.87%
Parkdale		36988	37457	0.00						0.0	4050.0	3.33	43.69	0.00	0.00	0.00	0.00	0.00	0.00	1.50	0.00	0.00	5.86	1.93	0.00	0.0	45.62	100.18	72.30	375	0.30	0.879	54.56	54.46%
SF Banting		1	2	2.15						270.0	270.0	4.00	3.50		0.00		0.00	0.00	0.00	1.00	0.00	2.15	2.15	0.71	0.00	0.0	4.21	62.04	100.00	250	1.00	1.224	57.83	93.21%
SF Banting		2	3	5.96						0.0	270.0	4.00	3.50	750.00	750.00	2145.00	2145.00	0.00	0.00	1.50	3.96	5.96	8.11	2.68	0.00	0.0	10.14	55.26	190.00	300	0.30	0.757	45.11	81.65%
SF Banting		3	4	5.90						2862.0	3132.0	3.43	34.78	0.00	750.00	0.00	2145.00	0.00	0.00	1.50	3.96	5.90	14.01	4.62	0.00	0.0	43.37	100.18	240.00	375	0.30	0.879	56.82	56.71%
SF Banting		4	ex17	0.00						0.0	3132.0	3.43	34.78	0.00	750.00	0.00	2145.00	0.00	0.00	1.50	3.96	0.00	14.01	4.62	0.00	0.0	43.37	100.18	67.00	375	0.30	0.879	56.82	56.71%
		ex17	*ex35A*	0.00						0.0	3132.0	3.43	34.78	0.00	750.00	0.00	2145.00	0.00	0.00	1.50	3.96	0.00	14.01	4.62	0.00	0.0	43.37	100.18	72.00	375	0.30	0.879	56.82	56.71%
Goldenrod		ex20A	ex18	2.44						0.0	0.0	4.00	0.00	0.00	0.00	20.00	20.00	0.00	0.00	1.50	0.03	2.44	2.44	0.81	0.00	0.0	0.83	42.53	223.00	250	0.47	0.839	41.70	98.05%
Goldenrod		ex18	ex34							0.0	0.0	4.00	0.00	0.00	0.00	0.00	20.00	0.00	0.00	1.50	0.03	0.00	2.44	0.81	0.00	0.0	0.83	154.55	94.00	450	0.27	0.941	153.72	99.46%
Goldenrod		ex34	ex35	1.38						1008.0	1008.0	3.80	12.41	0.00	0.00	0.00	20.00	0.00	0.00	1.50	0.03	1.38	3.82	1.26	0.00	0.0	13.69	188.11	57.00	450	0.40	1.146	174.42	92.72%
Goldenrod		ex35	ex35A																															
Goldenrod		35A	exN8							0.0	4140.0	3.32	44.54	0.00	750.00	0.00	2165.00	0.00	0.00	1.50	3.99	0.00	17.83	5.88	0.00	0.0	54.42	202.56	42.00	600	0.10	0.694	148.15	73.14%
Colombine		7	8	5.88						900.0	900.0	3.83	11.17	0.00	0.00	785.00	785.00	0.00	0.00	1.50	1.02	5.88	5.88	1.94	0.00	0.0	14.13	62.04	120.00	250	1.00	1.224	47.91	77.22%
Chardon		8	9							0.0	900.0	3.83	11.17	0.00	0.00	0.00	785.00	0.00	0.00	1.50	1.02	0.00	5.88	1.94	0.00	0.0	14.13	50.44	180.00	300	0.25	0.691	36.31	71.99%
Eglantine		10	9	2.44						1350.0	1350.0	3.71	16.24	0.00	0.00	0.00	0.00	1640.00	1640.00	1.50	0.14	2.44	2.44	0.81	0.00	0.0	17.19	62.04	70.00	250	1.00	1.224	44.85	72.29%
Eglantine		9	11	0.00						0.0	2250.0	3.55	25.85	0.00	0.00	0.00	785.00	0.00	1640.00	1.50	1.16	0.00	8.32	2.75	0.00	0.0	29.76	50.44	180.00	300	0.25	0.691	20.68	41.00%
Tunney's Pasture		12	11	3.09						630.0	630.0	3.92	8.00	750.00	750.00	785.00	785.00		0.00	1.50	2.19	3.09	3.09	1.02	0.00	0.0	11.22	62.04	120.00	250	1.00	1.224	50.82	81.92%
Tunney's Pasture		11	13							0.0	2880.0	3.46	32.27	0.00	750.0	0.00	1570.0	0.00	1640.0	1.50	3.36	0.00	11.41	3.77	0.00	0.0	39.39	91.46	93.13	375	0.25	0.802	52.06	56.93%
Sorrel		14	13	5.65						5220.0	5220.0	3.23	54.60	0.00	0.00	0.00	0.00	11885.00	11885.00	1.50	1.03	5.65	5.65	1.86	0.00	0.0	57.50	100.88	70.00	300	1.00	1.383	43.39	43.01%
Tunneys		13	ex3A	6.88							8100.0	3.04	79.93	1700.00	2450.0	3132.00	4702.0	1400.00	14925.0	1.50	11.25	6.88	23.94	7.90	0.00	0.0	99.08	162.91	160.00	450	0.30	0.992	63.83	39.18%
total site (future)				47.63						16290.00		2.74		3200.00			6867.00	14925.00									199.11							

Design Parameters:

Residential			ICI Areas			
SF	3.4	p/p/u				
SD	2.7	p/p/u	INST	90	L/student/day	
TH	2.7	p/p/u	EMP	75	L/emp/day	
APT	1.8	p/p/u	RETAIL	5	L/sm/day	MOE Chart
Other	115	p/p/Ha	ex com	50,000	l/ha/d	

Notes:
1. Mannings coefficient (n) = 0.013
2. Demand (per capita): 280 L/day L/day
3. Infiltration allowance: 0.33 L/s/Ha 0.28 for existing
4. Residential Peaking Factor:
   Harmon Formula = 1+(14/(4+(P/1000)^0.5))
   where K = 0.8 Correction Factor
5. Commercial and Institutional Peak Factors based on total area,
   1.5 if greater than 20%, otherwise 1.0

Designed: WZ

Checked: DGY

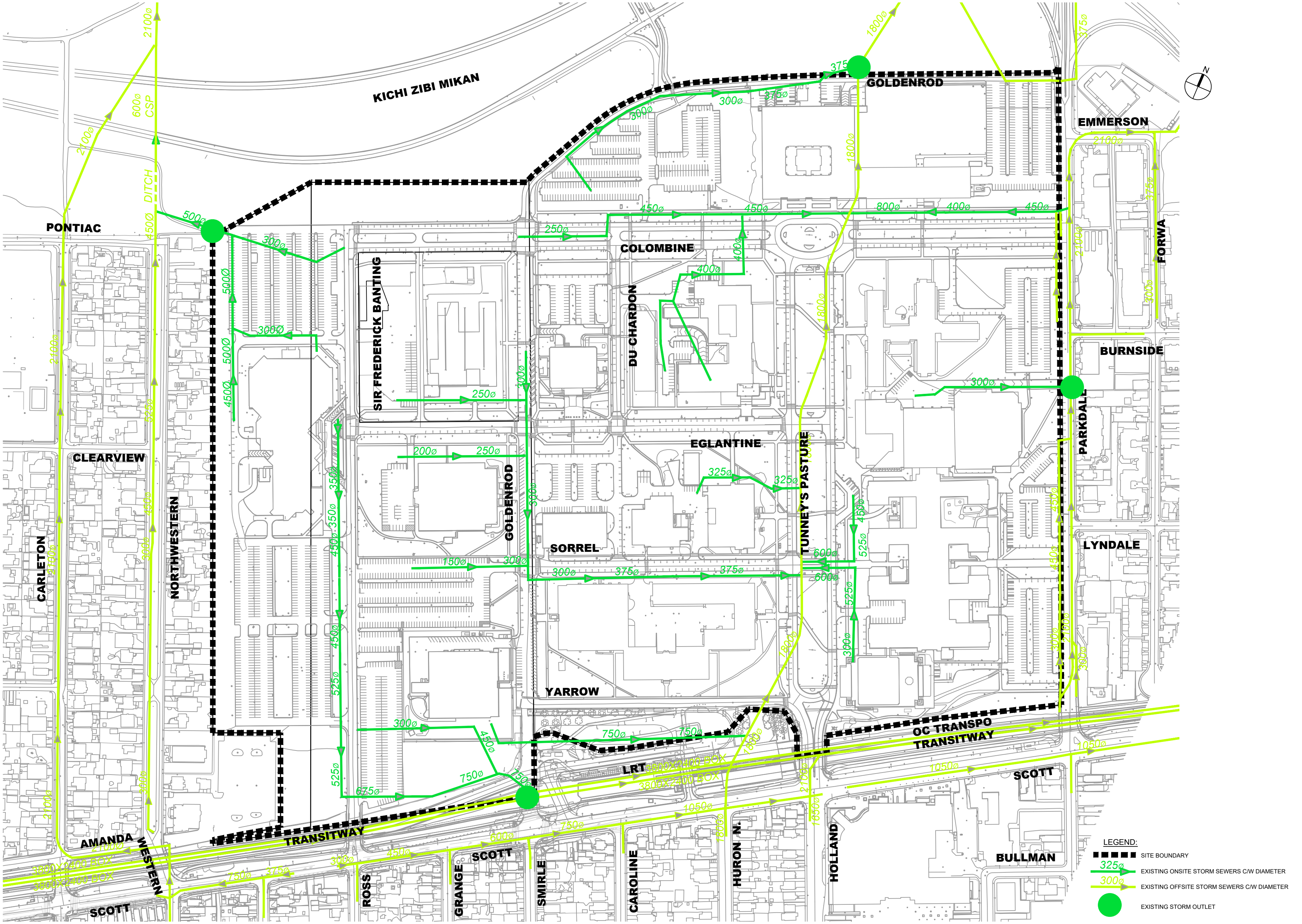
Dwg. Reference: 143385

No.	Revision	Date
1	APSR	2024-09-30
2		
3		
4		

File Reference:		Date:	Sheet No:
143385-6.04.04		2023-11-03	1 of 1

APPENDIX 4

T:\139833_TunneyPasture\7.0_Production\7.03_Design\04_Civil_Land\Figures\Site Servicing Issues Memo\139833Storm.dwg Layout Name: Figure 4 Existing Storm Infrastructure



ARCADIS

Project Title

Tunney's Pasture

Site Servicing and Public Road Redevelopment

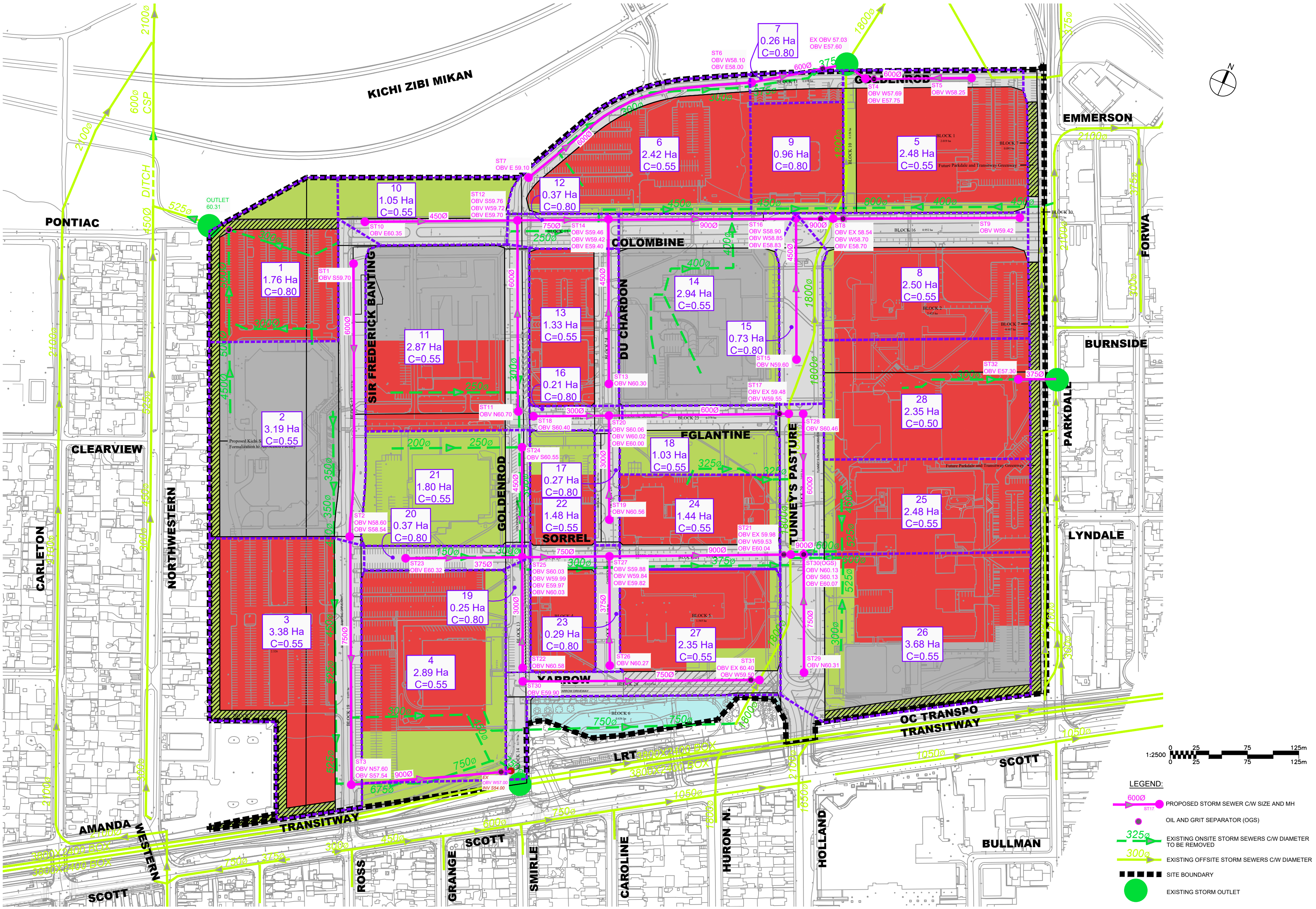
Prepared for Canada Lands Company & Public Service and Procurement Canada

Drawing Title

Existing Storm Infrastructure

Sheet No.

Figure 6



Project Title

Tunney's Pasture

Site Servicing and Public Road Redevelopment

Prepared for Canada Lands & Public Service and Procurement Canada

Drawing Title

Conceptual Storm Infrastructure

Sheet No.

Figure 7

T:\139833_TunneyPasture\7.0_Production\7.03_Design\04_Civil_Land\Figures\Servicing Report\139833Storm.dwg Layout Name: Figure 7 Existing Storm Infrastructure (Lette

ARCADIS

IBI GROUP

ARCADIS IBI GROUP
500-333 Preston Street
Ottawa, Ontario K1S 5N4 Canada
ibigroup.com

STORM SEWER DESIGN SHEET
Tunney's Pasture
CLC
City of Ottawa

LOCATION				AREA (Ha)										RATIONAL DESIGN FLOW																SEWER DATA								
STREET	AREA ID	FROM	TO	C= 0.20	C= 0.25	C= 0.50	C= 0.55	C= 0.57	C= 0.65	C= 0.69	C= 0.70	C= 0.80	C= 0.90	IND 2.78AC	CUM 2.78AC	INLET (min)	TIME IN PIPE	TOTAL (min)	i (2) (mm/hr)	i (5) (mm/hr)	i (10) (mm/hr)	i (100) (mm/hr)	2yr PEAK FLOW (L/s)	5yr PEAK FLOW (L/s)	10yr PEAK FLOW (L/s)	100yr PEAK FLOW (L/s)	FIXED FLOW IND	FIXED FLOW CUM	DESIGN FLOW (L/s)	CAPACITY (L/s)	LENGTH (m)	PIPE SIZE (mm) DIA	W	H	SLOPE (%)	VELOCITY (m/s)	AVAIL CAP (2yr) (L/s)	AVAIL CAP (2yr) (%)
Colombine blk	1	BLK	ditch									1.76		3.91	3.91	15.00	0.44	15.44	61.77	83.56	97.85	142.89	241.77	327.06	383.02	559.32	0.00	0.00	241.77	634.50	75.80	525			2.00	2.839	392.72	61.90%
Parkdale	28	32	ex			2.35								3.27	3.27	15.00	0.29	15.29	61.77	83.56	97.85	142.89	201.76	272.94	319.63	466.76	0.00	0.00	201.76	258.68	40.00	375			2.00	2.269	56.91	22.00%
SF Banting	2	1	2				3.19							4.88	4.88	15.00	3.24	18.24	61.77	83.56	97.85	142.89	301.27	407.55	477.27	696.97	0.00	0.00	301.27	405.13	270.00	600			0.40	1.388	103.85	25.64%
SF Banting	3	2	3				3.38							5.17	10.05	18.24	2.43	20.67	55.04	74.36	87.04	127.03	552.93	747.01	874.37	1,276.13	0.00	0.00	552.93	734.54	235.00	750			0.40	1.611	181.61	24.72%
SF Banting	4	3	ex				2.89							4.42	18.38	20.67	1.47	22.14	50.97	68.81	80.51	117.46	936.80	1,264.57	1,479.72	2,158.79	0.00	0.00	936.80	1,117.30	150.00	900			0.35	1.701	180.50	16.16%
Yarrow	27	30	31				2.35							3.59	3.59	15.00	3.97	18.97	61.77	83.56	97.85	142.89	221.94	300.23	351.60	513.44	0.00	0.00	221.94	449.81	235.00	750			0.15	0.986	227.87	50.66%
Goldenrod	19	22	25									0.25		0.56	0.56	10.00	1.88	11.88	76.81	104.19	122.14	178.56	42.70	57.93	67.91	99.28	0.00	0.00	42.70	71.33	110.00	300			0.50	0.978	28.63	40.14%
Sorrel	20	23	25									0.37		0.82	0.82	10.00	2.09	12.09	76.81	104.19	122.14	178.56	63.20	85.74	100.51	146.93	0.00	0.00	63.20	100.18	110.00	375			0.30	0.879	36.98	36.92%
Goldenrod	21	24	25				1.80							2.75	2.75	15.00	1.37	16.37	61.77	83.56	97.85	142.89	170.00	229.97	269.31	393.27	0.00	0.00	170.00	210.32	105.00	450			0.50	1.281	40.32	19.17%
Sorrel	22	25	27				1.48							2.26	6.39	16.37	1.44	17.80	58.72	79.39	92.95	135.70	375.46	507.61	594.32	867.68	0.00	0.00	375.46	449.81	85.00	750			0.15	0.986	74.35	16.53%
Chardon	23	26	27									0.29		0.64	0.64	10.00	1.93	11.93	76.81	104.19	122.14	178.56	49.54	67.20	78.78	115.16	0.00	0.00	49.54	108.21	110.00	375			0.35	0.949	58.68	54.22%
Sorrel	24	27	21				1.44							2.20	9.24	17.80	2.62	20.42	55.86	75.48	88.35	128.95	516.17	697.45	816.42	1,191.63	0.00	0.00	516.17	731.45	175.00	900			0.15	1.114	215.28	29.43%
Tunney's	26	29	30				3.68							5.63	5.63	15.00	2.03	17.03	61.77	83.56	97.85	142.89	347.55	470.15	550.58	804.03	0.00	0.00	347.55	449.81	120.00	750			0.15	0.986	102.27	22.74%
Tunney's	25	28	30				2.48							3.79	3.79	15.00	1.97	16.97	61.77	83.56	97.85	142.89	234.22	316.84	371.05	541.84	0.00	0.00	234.22	320.28	130.00	600			0.25	1.097	86.06	26.87%
Tunneu's		30	21											0.00	9.42	16.97	0.30	17.27	57.47	77.68	90.94	132.75	541.28	731.61	856.51	1,250.32	0.00	0.00	541.28	731.45	20.00	900			0.15	1.114	190.17	26.00%
Tunney's		21	17											0.00	22.25	18.97	0.90	19.87	53.75	72.59	84.96	123.99	1,196.03	1,615.40	1,890.65	2,759.02	0.00	0.00	1,196.03	6,568.16	135.00	1800			0.30	2.500	5372.13	81.79%
Chardon	17	19	20									0.27		0.60	0.60	10.00	1.70	11.70	76.81	104.19	122.14	178.56	46.12	62.57	73.34	107.22	0.00	0.00	46.12	71.33	100.00	300			0.50	0.978	25.21	35.35%
Eglantine	16	18	20									0.21		0.47	0.47	10.00	1.28	11.28	76.81	104.19	122.14	178.56	35.87	48.66	57.05	83.39	0.00	0.00	35.87	71.33	75.00	300			0.50	0.978	35.46	49.71%
Eglantine	18	20	17				1.03							1.57	2.69	11.70	2.66	14.36	70.83	95.98	112.46	164.34	190.30	257.87	302.18	441.57	0.00	0.00	190.30	320.28	175.00	600			0.25	1.097	129.98	40.58%
Tunney's		17	8											0.00	24.94	19.87	1.33	21.20	52.24	70.54	82.55	120.44	1,302.84	1,759.13	2,058.63	3,003.74	0.00	0.00	1,302.84	6,568.16	200.00	1800			0.30	2.500	5265.32	80.16%
Goldenrod	11	11	12				2.87							4.39	4.39	15.00	1.99	16.99	61.77	83.56	97.85	142.89	271.05	366.67	429.40	627.05	0.00	0.00	271.05	452.94	185.00	600			0.50	1.552	181.89	40.16%
Colombine	10	10	12				1.05							1.61	1.61	10.00	2.18	12.18	76.81	104.19	122.14	178.56	123.31	167.28	196.09	286.67	0.00	0.00	123.31	188.11	150.00	450			0.40	1.146	64.81	34.45%
Colombine	12	12	14									0.37		0.82	6.82	16.99	1.08	18.06	57.44	77.64	90.90	132.69	391.57	529.26	619.61	904.50	0.00	0.00	391.57	636.13	90.00	750			0.30	1.395	244.56	38.45%
Chardon	13	13	14				1.33							2.03	2.03	15.00	2.08	17.08	61.77	83.56	97.85	142.89	125.61	169.92	198.99	290.59	0.00	0.00	125.61	210.32	160.00	450			0.50	1.281	84.71	40.28%
Colombine	14	14	16				2.94							4.50	13.35	18.06	1.90	19.97	55.37	74.81	87.57	127.81	738.97	998.41	1,168.67	1,705.70	0.00	0.00	738.97	1,034.42	180.00	900			0.30	1.575	295.45	28.56%
Tunney's	15	15	16									0.73		1.62	1.62	10.00	1.82	11.82	76.81	104.19	122.14	178.56	124.69	169.16	198.30	289.89	0.00	0.00	124.69	210.32	140.00	450			0.50	1.281	85.62	40.71%
Colombine		16	8											0.00	14.97	19.97	0.35	20.32	52.08	70.32	82.30	120.08	779.65	1,052.68	1,231.89	1,797.42	0.00	0.00	779.65	1,117.30	36.00	900			0.35	1.701	337.65	30.22%
Colombine	8	9	8				2.50							3.82	3.82	15.00	2.16	17.16	61.77	83.56	97.85	142.89	236.11	319.40	374.04	546.21	0.00	0.00	236.11	405.13	180.00	600			0.40	1.388	169.02	41.72%
Block	9	8	ex									0.96		2.14	45.87	21.20	1.00	22.20	50.17	67.72	79.23	115.58	2,301.18	3,105.81	3,634.01	5,301.29	0.00	0.00	2,301.18	6,568.16	150.00	1800			0.30	2.500	4266.98	64.96%
Goldenrod	6	7	6				2.42							3.70	3.70	15.00	2.88	17.88	61.77	83.56	97.85	142.89	228.55	309.18	362.07	528.73	0.00	0.00	228.55	405.13	240.00	600			0.40	1.388	176.58	43.59%
Goldenrod	7	6	ex									0.26		0.58	4.28	17.88	1.08	18.96	55.71	75.27	88.11	128.60	238.35	322.04	376.97	550.22	0.00	0.00	238.35	405.13	90.00	600			0.40	1.388	166.78	41.17%
Goldenrod	5	5	4				2.48							3.79	3.79	15.00	1.44	16.44	61.77	83.56	97.85	142.89	234.22	316.84	371.05	541.84	0.00	0.00	234.22	405.13	120.00	600			0.40	1.388	170.91	42.19%
Goldenrod		4	ex											0.00	3.79	16.44	0.26	16.71	58.56	79.17	92.70	135.33	222.07	300.22	351.50	513.16	0.00	0.00	222.07	405.13	22.00	600			0.40	1.388	183.06	45.19%
NCC		ex	ex											0.00	53.94	22.20	0.67	22.87	48.74	65.76	76.93	112.21	2,628.66	3,546.75	4,149.46	6,052.37	0.00	0.00	2,628.66	6,568.16	100.00	1800			0.30	2.500	3939.50	59.98%

Definitions:
Q = 2.78CiA, where:
Q = Peak Flow in Litres per Second (L/s)
A = Area in Hectares (Ha)
i = Rainfall intensity in millimeters per hour (mm/hr)
[i = 732.951 / (TC+6.199)^0.810] 2 YEAR
[i = 998.071 / (TC+6.053)^0.814] 5 YEAR
[i = 1174.184 / (TC+6.014)^0.816] 10 YEAR
[i = 1735.688 / (TC+6.014)^0.820] 100 YEAR

Notes:
1. Mannings coefficient (n) = 0.013

Designed: AB

Checked: DY

Dwg. Reference: 126884-500

No.	Revision	Date
1.	APSR	2024-10-16

File Reference: 126884-6.04.04
Date: 2024-04-16
Sheet No: 1 of 1

Formulas and Descriptions

i_{2yr} = 1:2 year Intensity = $732.951 / (T_c+6.199)^{0.810}$
i_{5yr} = 1:5 year Intensity = $998.071 / (T_c+6.053)^{0.814}$
i_{100yr} = 1:100 year Intensity = $1735.688 / (T_c+6.014)^{0.820}$
T_c = Time of Concentration (min)
C = Average Runoff Coefficient
A = Area (Ha)
Q = Flow = 2.78CiA (L/s)

Maximum Allowable Release Rate

Restricted Flowrate ($Q_{restricted} = 2.78*C*i_{5yr}*A_{site}$ based on C=0.50, Tc=10min)

C =	0.5	
T_c =	10	min
i_{5yr} =	104.19	mm/hr
A_{site} =	47.130	Ha

$Q_{restricted}$ =	6825.76	L/s

SWM Statistics of Modified Site Areas C=0.8			
Area #	**Area (Ha)**	**Allocation l/s**	**Storage (m3)**
1	1.760	254.898	400.33
2	3.190	462.002	725.60
3	3.380	489.520	768.82
4	2.890	418.554	657.36
5	2.480	359.174	564.10
6	2.420	350.485	550.45
7	0.260	37.655	59.14
8	2.500	362.071	568.65
9	0.960	139.035	218.36
10	1.050	152.070	238.83
11	2.870	415.657	652.81
12	0.370	53.586	84.16
13	1.330	192.622	302.52
14	2.940	425.795	668.73
15	0.730	105.725	166.05
16	0.210	30.414	47.77
17	0.270	39.104	61.41
18	1.030	149.173	234.28
19	0.250	36.207	56.87
20	0.370	53.586	84.16
21	1.800	260.691	409.43
22	1.480	214.346	336.64
23	0.290	42.000	65.96
24	1.440	208.553	327.54
25	2.480	359.174	564.10
26	3.680	532.968	837.05
27	2.350	340.347	534.53
28	2.350	340.347	534.53
	47.130	6825.759	10720.205

MODIFIED RATIONAL METHOD (100, 100+20% storage requirements)

Drainage Area	***1***		
Area (Ha)	1.760		
C =	1.00	Restricted Flow $Q_{r\ for\ swm\ calc}$ (L/s)=	254.90

100-Year Ponding						**100-Year +20% Ponding**		
T_c Variable (min)	***i_{100yr} (mm/hour)***	***Peak Flow Q_p=2.78xCi_{100yr}A (L/s)***	***Q_r (L/s)***	***Q_p-Q_r (L/s)***	***Volume 100yr (m^3)***	***100YRQ_p 20% (L/s)***	***Qp - Qr (L/s)***	***Volume 100+20 (m^3)***
9	188.25	921.09	254.90	666.19	359.74			
14	148.72	727.67	254.90	472.77	397.13			
19	123.87	606.06	254.90	351.17	**400.33**	727.28	472.38	**538.51**
24	106.68	521.94	254.90	267.05	384.55			
29	94.01	459.99	254.90	205.09	356.87			

Drainage Area	***2***		
Area (Ha)	3.190		
C =	1.00	Restricted Flow $Q_{r\ for\ swm\ calc}$ (L/s)=	462.00

100-Year Ponding						**100-Year +20% Ponding**		
T_c Variable (min)	***i_{100yr} (mm/hour)***	***Peak Flow Q_p=2.78xCi_{100yr}A (L/s)***	***Q_r (L/s)***	***Q_p-Q_r (L/s)***	***Volume 100yr (m^3)***	***100YRQ_p 20% (L/s)***	***Qp - Qr (L/s)***	***Volume 100+20 (m^3)***
9	188.25	1669.48	462.00	1207.47	652.04			
14	148.72	1318.90	462.00	856.90	719.80			
19	123.87	1098.49	462.00	636.49	**725.60**	1318.19	856.19	**976.05**
24	106.68	946.02	462.00	484.02	696.99			
29	94.01	833.74	462.00	371.73	646.82			

Drainage Area	***3***		
Area (Ha)	3.380		
C =	1.00	Restricted Flow $Q_{r\ for\ swm\ calc}$ (L/s)=	489.52

100-Year Ponding						**100-Year +20% Ponding**		
T_c Variable (min)	***i_{100yr} (mm/hour)***	***Peak Flow Q_p=2.78xCi_{100yr}A (L/s)***	***Q_r (L/s)***	***Q_p-Q_r (L/s)***	***Volume 100yr (m^3)***	***100YRQ_p 20% (L/s)***	***Qp - Qr (L/s)***	***Volume 100+20 (m^3)***
9	188.25	1768.91	489.52	1279.39	690.87			
14	148.72	1397.46	489.52	907.94	762.67			
19	123.87	1163.92	489.52	674.40	**768.82**	1396.70	907.18	**1034.19**
24	106.68	1002.37	489.52	512.85	738.50			
29	94.01	883.40	489.52	393.88	685.34			

Drainage Area	***4***		
Area (Ha)	2.890		
C =	1.00	Restricted Flow $Q_{r\ for\ swm\ calc}$ (L/s)=	418.55

100-Year Ponding						**100-Year +20% Ponding**		
T_c Variable (min)	***i_{100yr} (mm/hour)***	***Peak Flow Q_p=2.78xCi_{100yr}A (L/s)***	***Q_r (L/s)***	***Q_p-Q_r (L/s)***	***Volume 100yr (m^3)***	***100YRQ_p 20% (L/s)***	***Qp - Qr (L/s)***	***Volume 100+20 (m^3)***
9	188.25	1512.47	418.55	1093.92	590.72			
14	148.72	1194.87	418.55	776.32	652.11			
19	123.87	995.19	418.55	576.63	**657.36**	1194.22	775.67	**884.26**
24	106.68	857.06	418.55	438.50	631.44			
29	94.01	755.33	418.55	336.78	585.99			

Drainage Area	**5**							
Area (Ha)	2.480							
C =	1.00	Restricted Flow $Q_{r\ for\ swm\ calc}$ (L/s)=		359.17				
100-Year Ponding						**100-Year +20% Ponding**		
T_c Variable (min)	i_{100yr} (mm/hour)	Peak Flow $Q_p = 2.78xCi_{100yr}A$ (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 100yr (m^3)	100YRQ$_p$ 20% (L/s)	Qp - Qr (L/s)	Volume 100+20 (m^3)
9	188.25	1297.90	359.17	938.73	506.91			
14	148.72	1025.36	359.17	666.18	559.59			
19	123.87	854.00	359.17	494.83	**564.10**	1024.80	665.63	**758.81**
24	106.68	735.47	359.17	376.29	541.86			
29	94.01	648.17	359.17	289.00	502.86			

Drainage Area	**6**							
Area (Ha)	2.420							
C =	1.00	Restricted Flow $Q_{r\ for\ swm\ calc}$ (L/s)=		350.48				
100-Year Ponding						**100-Year +20% Ponding**		
T_c Variable (min)	i_{100yr} (mm/hour)	Peak Flow $Q_p = 2.78xCi_{100yr}A$ (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 100yr (m^3)	100YRQ$_p$ 20% (L/s)	Qp - Qr (L/s)	Volume 100+20 (m^3)
9	188.25	1266.50	350.48	916.01	494.65			
14	148.72	1000.55	350.48	650.06	546.05			
19	123.87	833.34	350.48	482.85	**550.45**	1000.01	649.52	**740.46**
24	106.68	717.67	350.48	367.19	528.75			
29	94.01	632.49	350.48	282.01	490.69			

Drainage Area	**7**							
Area (Ha)	0.260							
C =	1.00	Restricted Flow $Q_{r\ for\ swm\ calc}$ (L/s)=		37.66				
100-Year Ponding						**100-Year +20% Ponding**		
T_c Variable (min)	i_{100yr} (mm/hour)	Peak Flow $Q_p = 2.78xCi_{100yr}A$ (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 100yr (m^3)	100YRQ$_p$ 20% (L/s)	Qp - Qr (L/s)	Volume 100+20 (m^3)
9	188.25	136.07	37.66	98.41	53.14			
14	148.72	107.50	37.66	69.84	58.67			
19	123.87	89.53	37.66	51.88	**59.14**	107.44	69.78	**79.55**
24	106.68	77.11	37.66	39.45	56.81			
29	94.01	67.95	37.66	30.30	52.72			

Drainage Area	**8**							
Area (Ha)	2.500							
C =	1.00	Restricted Flow $Q_{r\ for\ swm\ calc}$ (L/s)=		362.07				
100-Year Ponding						**100-Year +20% Ponding**		
T_c Variable (min)	i_{100yr} (mm/hour)	Peak Flow $Q_p = 2.78xCi_{100yr}A$ (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 100yr (m^3)	100YRQ$_p$ 20% (L/s)	Qp - Qr (L/s)	Volume 100+20 (m^3)
9	188.25	1308.37	362.07	946.30	511.00			
14	148.72	1033.62	362.07	671.55	564.10			
19	123.87	860.89	362.07	498.82	**568.65**	1033.06	670.99	**764.93**
24	106.68	741.40	362.07	379.33	546.23			
29	94.01	653.40	362.07	291.33	506.91			

Drainage Area	***9***		
Area (Ha)	0.960		
C =	1.00	Restricted Flow $Q_{r\ for\ swm\ calc}$ (L/s)=	139.04

100-Year Ponding						**100-Year +20% Ponding**		
T_c Variable (min)	***i_{100yr} (mm/hour)***	***Peak Flow $Q_p=2.78xCi_{100yr}A$ (L/s)***	***Q_r (L/s)***	***Q_p-Q_r (L/s)***	***Volume 100yr (m^3)***	***100YRQ$_p$ 20% (L/s)***	***Qp - Qr (L/s)***	***Volume 100+20 (m^3)***
9	188.25	502.41	139.04	363.38	196.22			
14	148.72	396.91	139.04	257.88	216.62			
19	123.87	330.58	139.04	191.55	**218.36**	396.70	257.66	**293.73**
24	106.68	284.70	139.04	145.66	209.75			
29	94.01	250.91	139.04	111.87	194.65			

Drainage Area	***10***		
Area (Ha)	1.050		
C =	1.00	Restricted Flow $Q_{r\ for\ swm\ calc}$ (L/s)=	152.07

100-Year Ponding						**100-Year +20% Ponding**		
T_c Variable (min)	***i_{100yr} (mm/hour)***	***Peak Flow $Q_p=2.78xCi_{100yr}A$ (L/s)***	***Q_r (L/s)***	***Q_p-Q_r (L/s)***	***Volume 100yr (m^3)***	***100YRQ$_p$ 20% (L/s)***	***Qp - Qr (L/s)***	***Volume 100+20 (m^3)***
9	188.25	549.51	152.07	397.44	214.62			
14	148.72	434.12	152.07	282.05	236.92			
19	123.87	361.57	152.07	209.50	**238.83**	433.89	281.82	**321.27**
24	106.68	311.39	152.07	159.32	229.42			
29	94.01	274.43	152.07	122.36	212.90			

Drainage Area	***11***		
Area (Ha)	2.870		
C =	1.00	Restricted Flow $Q_{r\ for\ swm\ calc}$ (L/s)=	415.66

100-Year Ponding						**100-Year +20% Ponding**		
T_c Variable (min)	***i_{100yr} (mm/hour)***	***Peak Flow $Q_p=2.78xCi_{100yr}A$ (L/s)***	***Q_r (L/s)***	***Q_p-Q_r (L/s)***	***Volume 100yr (m^3)***	***100YRQ$_p$ 20% (L/s)***	***Qp - Qr (L/s)***	***Volume 100+20 (m^3)***
9	188.25	1502.00	415.66	1086.35	586.63			
14	148.72	1186.60	415.66	770.94	647.59			
19	123.87	988.30	415.66	572.64	**652.81**	1185.96	770.30	**878.14**
24	106.68	851.12	415.66	435.47	627.07			
29	94.01	750.10	415.66	334.44	581.93			

Drainage Area	***12***		
Area (Ha)	0.370		
C =	1.00	Restricted Flow $Q_{r\ for\ swm\ calc}$ (L/s)=	53.59

100-Year Ponding						**100-Year +20% Ponding**		
T_c Variable (min)	***i_{100yr} (mm/hour)***	***Peak Flow $Q_p=2.78xCi_{100yr}A$ (L/s)***	***Q_r (L/s)***	***Q_p-Q_r (L/s)***	***Volume 100yr (m^3)***	***100YRQ$_p$ 20% (L/s)***	***Qp - Qr (L/s)***	***Volume 100+20 (m^3)***
9	188.25	193.64	53.59	140.05	75.63			
14	148.72	152.98	53.59	99.39	83.49			
19	123.87	127.41	53.59	73.82	**84.16**	152.89	99.31	**113.21**
24	106.68	109.73	53.59	56.14	80.84			
29	94.01	96.70	53.59	43.12	75.02			

Drainage Area	***13***		
Area (Ha)	1.330		
C =	1.00	Restricted Flow $Q_{r\,for\,swm\,calc}$ (L/s)=	192.62

100-Year Ponding						**100-Year +20% Ponding**		
T_c Variable (min)	***i_{100yr} (mm/hour)***	***Peak Flow Q_p=2.78xCi $_{100yr}$ A (L/s)***	***Q_r (L/s)***	***Q_p-Q_r (L/s)***	***Volume 100yr (m^3)***	***100YRQ $_p$ 20% (L/s)***	***Qp - Qr (L/s)***	***Volume 100+20 (m^3)***
9	188.25	696.05	192.62	503.43	271.85			
14	148.72	549.89	192.62	357.27	300.10			
19	123.87	457.99	192.62	265.37	**302.52**	549.59	356.97	**406.94**
24	106.68	394.42	192.62	201.80	290.59			
29	94.01	347.61	192.62	154.99	269.68			

Drainage Area	***14***		
Area (Ha)	2.940		
C =	1.00	Restricted Flow $Q_{r\,for\,swm\,calc}$ (L/s)=	425.80

100-Year Ponding						**100-Year +20% Ponding**		
T_c Variable (min)	***i_{100yr} (mm/hour)***	***Peak Flow Q_p=2.78xCi $_{100yr}$ A (L/s)***	***Q_r (L/s)***	***Q_p-Q_r (L/s)***	***Volume 100yr (m^3)***	***100YRQ $_p$ 20% (L/s)***	***Qp - Qr (L/s)***	***Volume 100+20 (m^3)***
9	188.25	1538.64	425.80	1112.84	600.94			
14	148.72	1215.54	425.80	789.75	663.39			
19	123.87	1012.40	425.80	586.61	**668.73**	1214.88	789.09	**899.56**
24	106.68	871.88	425.80	446.09	642.37			
29	94.01	768.40	425.80	342.60	596.13			

Drainage Area	***15***		
Area (Ha)	0.730		
C =	1.00	Restricted Flow $Q_{r\,for\,swm\,calc}$ (L/s)=	105.72

100-Year Ponding						**100-Year +20% Ponding**		
T_c Variable (min)	***i_{100yr} (mm/hour)***	***Peak Flow Q_p=2.78xCi $_{100yr}$ A (L/s)***	***Q_r (L/s)***	***Q_p-Q_r (L/s)***	***Volume 100yr (m^3)***	***100YRQ $_p$ 20% (L/s)***	***Qp - Qr (L/s)***	***Volume 100+20 (m^3)***
9	188.25	382.04	105.72	276.32	149.21			
14	148.72	301.82	105.72	196.09	164.72			
19	123.87	251.38	105.72	145.65	**166.05**	301.65	195.93	**223.36**
24	106.68	216.49	105.72	110.76	159.50			
29	94.01	190.79	105.72	85.07	148.02			

Drainage Area	***16***		
Area (Ha)	0.210		
C =	1.00	Restricted Flow $Q_{r\,for\,swm\,calc}$ (L/s)=	30.41

100-Year Ponding						**100-Year +20% Ponding**		
T_c Variable (min)	***i_{100yr} (mm/hour)***	***Peak Flow Q_p=2.78xCi $_{100yr}$ A (L/s)***	***Q_r (L/s)***	***Q_p-Q_r (L/s)***	***Volume 100yr (m^3)***	***100YRQ $_p$ 20% (L/s)***	***Qp - Qr (L/s)***	***Volume 100+20 (m^3)***
9	188.25	109.90	30.41	79.49	42.92			
14	148.72	86.82	30.41	56.41	47.38			
19	123.87	72.31	30.41	41.90	**47.77**	86.78	56.36	**64.25**
24	106.68	62.28	30.41	31.86	45.88			
29	94.01	54.89	30.41	24.47	42.58			

Drainage Area	***17***							
Area (Ha)	0.270							
C =	1.00	Restricted Flow $Q_{r\ for\ swm\ calc}$ (L/s)=		39.10				
100-Year Ponding						**100-Year +20% Ponding**		
T_c Variable (min)	***i_{100yr} (mm/hour)***	***Peak Flow Q_p=2.78xCi$_{100yr}$ A (L/s)***	***Q_r (L/s)***	***Q_p-Q_r (L/s)***	***Volume 100yr (m^3)***	***100YRQ$_p$ 20% (L/s)***	***Qp - Qr (L/s)***	***Volume 100+20 (m^3)***
9	188.25	141.30	39.10	102.20	55.19			
14	148.72	111.63	39.10	72.53	60.92			
19	123.87	92.98	39.10	53.87	**61.41**	111.57	72.47	**82.61**
24	106.68	80.07	39.10	40.97	58.99			
29	94.01	70.57	39.10	31.46	54.75			

Drainage Area	***18***							
Area (Ha)	1.030							
C =	1.00	Restricted Flow $Q_{r\ for\ swm\ calc}$ (L/s)=		149.17				
100-Year Ponding						**100-Year +20% Ponding**		
T_c Variable (min)	***i_{100yr} (mm/hour)***	***Peak Flow Q_p=2.78xCi$_{100yr}$ A (L/s)***	***Q_r (L/s)***	***Q_p-Q_r (L/s)***	***Volume 100yr (m^3)***	***100YRQ$_p$ 20% (L/s)***	***Qp - Qr (L/s)***	***Volume 100+20 (m^3)***
9	188.25	539.05	149.17	389.87	210.53			
14	148.72	425.85	149.17	276.68	232.41			
19	123.87	354.69	149.17	205.51	**234.28**	425.62	276.45	**315.15**
24	106.68	305.46	149.17	156.28	225.05			
29	94.01	269.20	149.17	120.03	208.85			

Drainage Area	***19***							
Area (Ha)	0.250							
C =	1.00	Restricted Flow $Q_{r\ for\ swm\ calc}$ (L/s)=		36.21				
100-Year Ponding						**100-Year +20% Ponding**		
T_c Variable (min)	***i_{100yr} (mm/hour)***	***Peak Flow Q_p=2.78xCi$_{100yr}$ A (L/s)***	***Q_r (L/s)***	***Q_p-Q_r (L/s)***	***Volume 100yr (m^3)***	***100YRQ$_p$ 20% (L/s)***	***Qp - Qr (L/s)***	***Volume 100+20 (m^3)***
9	188.25	130.84	36.21	94.63	51.10			
14	148.72	103.36	36.21	67.16	56.41			
19	123.87	86.09	36.21	49.88	**56.87**	103.31	67.10	**76.49**
24	106.68	74.14	36.21	37.93	54.62			
29	94.01	65.34	36.21	29.13	50.69			

Drainage Area	***20***							
Area (Ha)	0.370							
C =	1.00	Restricted Flow $Q_{r\ for\ swm\ calc}$ (L/s)=		53.59				
100-Year Ponding						**100-Year +20% Ponding**		
T_c Variable (min)	***i_{100yr} (mm/hour)***	***Peak Flow Q_p=2.78xCi$_{100yr}$ A (L/s)***	***Q_r (L/s)***	***Q_p-Q_r (L/s)***	***Volume 100yr (m^3)***	***100YRQ$_p$ 20% (L/s)***	***Qp - Qr (L/s)***	***Volume 100+20 (m^3)***
9	188.25	193.64	53.59	140.05	75.63			
14	148.72	152.98	53.59	99.39	83.49			
19	123.87	127.41	53.59	73.82	**84.16**	152.89	99.31	**113.21**
24	106.68	109.73	53.59	56.14	80.84			
29	94.01	96.70	53.59	43.12	75.02			

Drainage Area	***21***							
Area (Ha)	1.800							
C =	1.00	Restricted Flow $Q_{r\ for\ swm\ calc}$ (L/s)=		260.69				
100-Year Ponding						**100-Year +20% Ponding**		
T_c Variable (min)	***i_{100yr} (mm/hour)***	***Peak Flow $Q_p=2.78xCi_{100yr}A$ (L/s)***	***Q_r (L/s)***	***Q_p-Q_r (L/s)***	***Volume 100yr (m^3)***	***100YRQ$_p$ 20% (L/s)***	***Qp - Qr (L/s)***	***Volume 100+20 (m^3)***
9	188.25	942.02	260.69	681.33	367.92			
14	148.72	744.21	260.69	483.52	406.16			
19	123.87	619.84	260.69	359.15	**409.43**	743.81	483.12	**550.75**
24	106.68	533.81	260.69	273.11	393.29			
29	94.01	470.45	260.69	209.76	364.98			

Drainage Area	***22***							
Area (Ha)	1.480							
C =	1.00	Restricted Flow $Q_{r\ for\ swm\ calc}$ (L/s)=		214.35				
100-Year Ponding						**100-Year +20% Ponding**		
T_c Variable (min)	***i_{100yr} (mm/hour)***	***Peak Flow $Q_p=2.78xCi_{100yr}A$ (L/s)***	***Q_r (L/s)***	***Q_p-Q_r (L/s)***	***Volume 100yr (m^3)***	***100YRQ$_p$ 20% (L/s)***	***Qp - Qr (L/s)***	***Volume 100+20 (m^3)***
9	188.25	774.55	214.35	560.21	302.51			
14	148.72	611.91	214.35	397.56	333.95			
19	123.87	509.65	214.35	295.30	**336.64**	611.57	397.23	**452.84**
24	106.68	438.91	214.35	224.56	323.37			
29	94.01	386.81	214.35	172.47	300.09			

Drainage Area	***23***							
Area (Ha)	0.290							
C =	1.00	Restricted Flow $Q_{r\ for\ swm\ calc}$ (L/s)=		42.00				
100-Year Ponding						**100-Year +20% Ponding**		
T_c Variable (min)	***i_{100yr} (mm/hour)***	***Peak Flow $Q_p=2.78xCi_{100yr}A$ (L/s)***	***Q_r (L/s)***	***Q_p-Q_r (L/s)***	***Volume 100yr (m^3)***	***100YRQ$_p$ 20% (L/s)***	***Qp - Qr (L/s)***	***Volume 100+20 (m^3)***
9	188.25	151.77	42.00	109.77	59.28			
14	148.72	119.90	42.00	77.90	65.44			
19	123.87	99.86	42.00	57.86	**65.96**	119.84	77.84	**88.73**
24	106.68	86.00	42.00	44.00	63.36			
29	94.01	75.79	42.00	33.79	58.80			

Drainage Area	***24***							
Area (Ha)	1.440							
C =	1.00	Restricted Flow $Q_{r\ for\ swm\ calc}$ (L/s)=		208.55				
100-Year Ponding						**100-Year +20% Ponding**		
T_c Variable (min)	***i_{100yr} (mm/hour)***	***Peak Flow $Q_p=2.78xCi_{100yr}A$ (L/s)***	***Q_r (L/s)***	***Q_p-Q_r (L/s)***	***Volume 100yr (m^3)***	***100YRQ$_p$ 20% (L/s)***	***Qp - Qr (L/s)***	***Volume 100+20 (m^3)***
9	188.25	753.62	208.55	545.07	294.34			
14	148.72	595.37	208.55	386.81	324.92			
19	123.87	495.87	208.55	287.32	**327.54**	595.05	386.49	**440.60**
24	106.68	427.04	208.55	218.49	314.63			
29	94.01	376.36	208.55	167.80	291.98			

Drainage Area	***25***		
Area (Ha)	2.480		
C =	1.00	Restricted Flow $Q_{r\ for\ swm\ calc}$ (L/s)=	359.17

100-Year Ponding						**100-Year +20% Ponding**		
T_c Variable (min)	***i_{100yr} (mm/hour)***	***Peak Flow $Q_p = 2.78xCi_{100yr}A$ (L/s)***	***Q_r (L/s)***	***Q_p-Q_r (L/s)***	***Volume 100yr (m^3)***	***100YRQ$_p$ 20% (L/s)***	***Qp - Qr (L/s)***	***Volume 100+20 (m^3)***
9	188.25	1297.90	359.17	938.73	506.91			
14	148.72	1025.36	359.17	666.18	559.59			
19	123.87	854.00	359.17	494.83	**564.10**	1024.80	665.63	**758.81**
24	106.68	735.47	359.17	376.29	541.86			
29	94.01	648.17	359.17	289.00	502.86			

Drainage Area	***26***		
Area (Ha)	3.680		
C =	1.00	Restricted Flow $Q_{r\ for\ swm\ calc}$ (L/s)=	532.97

100-Year Ponding						**100-Year +20% Ponding**		
T_c Variable (min)	***i_{100yr} (mm/hour)***	***Peak Flow $Q_p = 2.78xCi_{100yr}A$ (L/s)***	***Q_r (L/s)***	***Q_p-Q_r (L/s)***	***Volume 100yr (m^3)***	***100YRQ$_p$ 20% (L/s)***	***Qp - Qr (L/s)***	***Volume 100+20 (m^3)***
9	188.25	1925.92	532.97	1392.95	752.19			
14	148.72	1521.49	532.97	988.53	830.36			
19	123.87	1267.23	532.97	734.26	**837.05**	1520.67	987.70	**1125.98**
24	106.68	1091.34	532.97	558.37	804.05			
29	94.01	961.80	532.97	428.83	746.17			

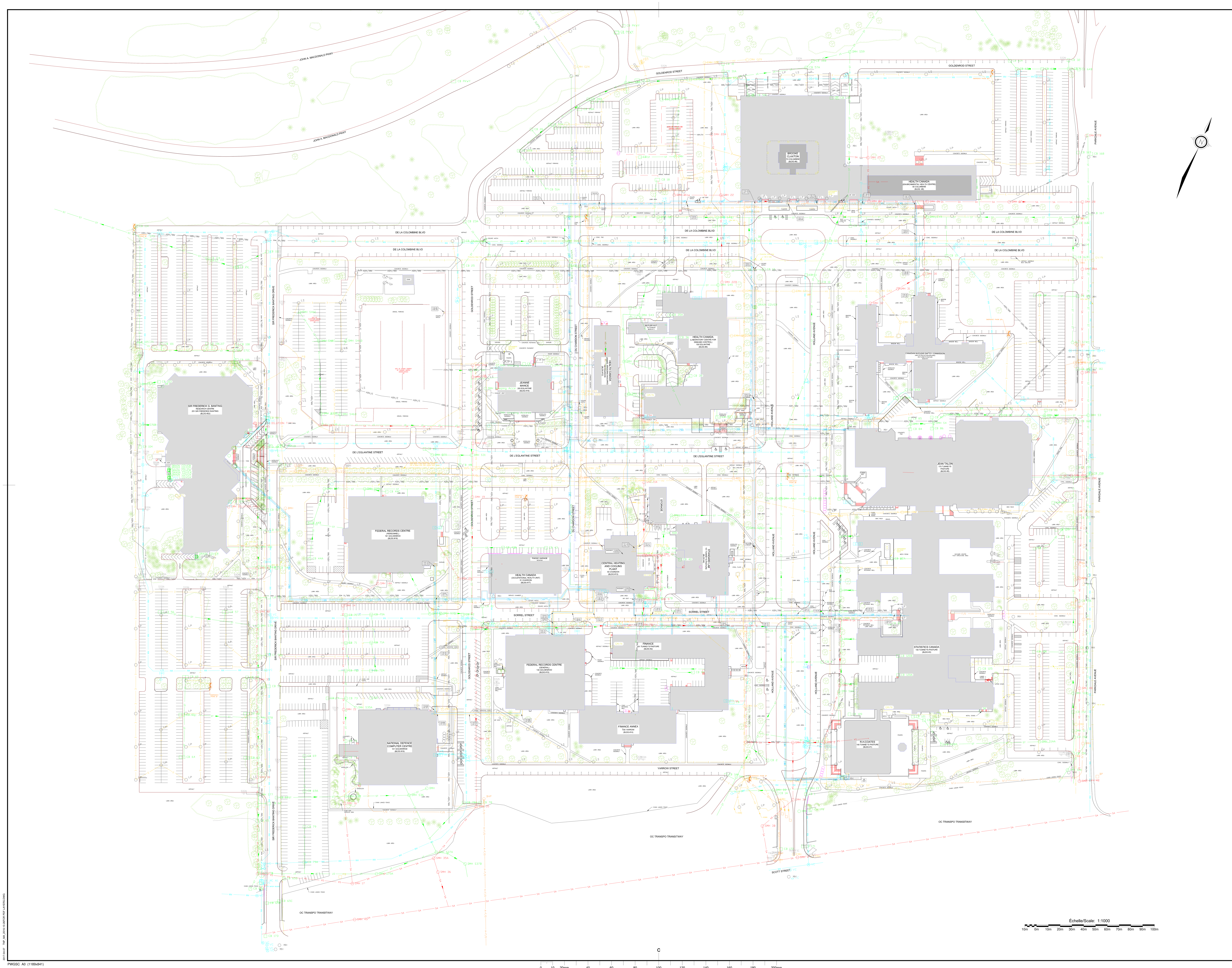
Drainage Area	***27***		
Area (Ha)	2.350		
C =	1.00	Restricted Flow $Q_{r\ for\ swm\ calc}$ (L/s)=	340.35

100-Year Ponding						**100-Year +20% Ponding**		
T_c Variable (min)	***i_{100yr} (mm/hour)***	***Peak Flow $Q_p = 2.78xCi_{100yr}A$ (L/s)***	***Q_r (L/s)***	***Q_p-Q_r (L/s)***	***Volume 100yr (m^3)***	***100YRQ$_p$ 20% (L/s)***	***Qp - Qr (L/s)***	***Volume 100+20 (m^3)***
9	188.25	1229.86	340.35	889.52	480.34			
14	148.72	971.61	340.35	631.26	530.26			
19	123.87	809.23	340.35	468.89	**534.53**	971.08	630.73	**719.04**
24	106.68	696.91	340.35	356.57	513.46			
29	94.01	614.19	340.35	273.85	476.50			

Drainage Area	***28***		
Area (Ha)	2.350		
C =	1.00	Restricted Flow $Q_{r\ for\ swm\ calc}$ (L/s)=	340.35

100-Year Ponding						**100-Year +20% Ponding**		
T_c Variable (min)	***i_{100yr} (mm/hour)***	***Peak Flow $Q_p = 2.78xCi_{100yr}A$ (L/s)***	***Q_r (L/s)***	***Q_p-Q_r (L/s)***	***Volume 100yr (m^3)***	***100YRQ$_p$ 20% (L/s)***	***Qp - Qr (L/s)***	***Volume 100+20 (m^3)***
9	188.25	1229.86	340.35	889.52	480.34			
14	148.72	971.61	340.35	631.26	530.26			
19	123.87	809.23	340.35	468.89	**534.53**	971.08	630.73	**719.04**
24	106.68	696.91	340.35	356.57	513.46			
29	94.01	614.19	340.35	273.85	476.50			

APPENDIX 5



Canada

Publics Works and Government Services Canada | Travaux publics et services gouvernementaux Canada

Real Property Branch | Direction générale des biens immobiliers

Professional and Technical Services Geomatics - NCA Ops | Services professionnels et techniques – Géomatique - SOCN

LEGEND

- B — U/G BELL TELEPHONE SERVICE
- A-B — A/G BELL TELEPHONE SERVICE
- F/O — U/G FIBER OPTICS
- E — U/G LOW VOLTAGE ELECTRICAL
- A-LV — A/G LOW VOLTAGE ELECTRICAL
- ABN/E — U/G ELECTRICAL SERVICE ABN
- HV — U/G HIGH VOLTAGE ELECTRICAL
- A-HV — A/G HIGH VOLTAGE ELECTRICAL
- A-S — A/G SECURITY LINE
- SEC — SECURITY SERVICE LINE
- CWR — CHILLED WATER RETURN
- CWS — CHILLED WATER SUPPLY
- STM — STEAM CONDUIT
- STM/C — CONDENSATE
- ABN/STM — STEAM CONDUIT ABANDONED
- WM — WATERMAIN CONDUIT
- ABN/WM — WATERMAIN ABANDONED
- IR — IRRIGATION LINE
- ST — STORM SEWER
- ABN/ST — STORM ABANDONED
- SA — SANITARY SEWER
- COMB — COMBINED SEWER
- F-SA — SANITARY FORCED MAIN
- ABN/SA — SANITARY ABANDONED
- G — GAS LINE
- ABN/G — GAS LINE ABANDONED
- TREE LINE/ EDGE OF BUSH
- TOP OF SLOPE
- BOTTOM OF SLOPE

- VERTICAL CONTROL
- HORIZONTAL CONTROL
- IB — SQUARE IRON BAR
- RIB — ROUND IRON BAR
- CC — CUT CROSS
- NAIL — SURVEY NAIL
- WS — WOODEN STAKE
- BENCH MARK
- MH — GENERAL MANHOLE
- SMH — SANITARY MANHOLE
- DMH — STORM MANHOLE
- EMH — ELECTRICAL MANHOLE
- FOMH — FIBRE OPTIC MANHOLE
- BMH — BELL MANHOLE
- B/FOMH — BELL-FIBRE OPTIC MANHOLE
- TMH — TRAFFIC MANHOLE
- MC — METER CHAMBER
- H — FIRE HYDRANT
- VC — VALVE CHAMBER
- VB — VALVE BOX
- CS — WATER CURB STOP
- STANDPIPE
- IV — IRRIGIATION VALVE BOX
- IS — IRRIGATION SPRINKLER HEAD
- IV — INTAKE VALVE
- CO/SA — SANITARY SEWER CLEAN OUT
- CO/SW — STORM SEWER CLEAN OUT
- CB — SQUARE CATCH BASIN
- CB — DOUBLE CATCH BASIN
- CB — INLET CATCH BASIN
- CB — RECTANGULAR CATCH BASIN
- CB — ROUND CATCH BASIN
- DI — DITCH INLET
- DR — DRAIN
- FLAG POLE
- DECORATIVE POLE
- DECIDUOUS
- CONIFEROUS
- BHP — BELL-HYDRO POLE
- HP — HYDRO POLE
- BP — BELL POLE
- GUY — GUY ANCHOR
- GP — GUY POLE
- BP — BELL PEDESTAL
- CP — CABLE PEDESTAL
- PB — ELECTRICALPULL BOX
- ELECTRICAL PLUG POST
- LR — LIGHTNING ROD
- TCB — TRAFFIC CONTROL BOX
- TL — TRAFFIC LIGHT
- FC — SECURITY CAMERA
- LS — LIGHT STANDARD
- LP — LAMP POST
- FL — FLOOD LIGHT
- D-LS — DOUBLE LIGHT STANDARD
- H/LP — HYDRO-LAMP POST
- GV/N — NATURAL GAS VALVE
- GM/N — NATURAL GAS METER
- VENT/N — NATURAL GAS VENT
- OFC — OIL FILLER CAP
- ROAD BOLLARD
- MP — ENVIRONMENTAL MONITOR PIN
- MW — ENVIRONMENTAL MONITOR WELL
- TP — GEOTECH TEST PIT
- BH — GEOTECH BOREHOLE
- SD — SATELLITE DISH
- SB — SATELLITE BOX
- M/GP — METAL GATE POST
- W/GP — WOODEN GATE POST
- SHRUB
- STUMP

SURVEY RECORD

DATE	SURVEY DETAILS

Coordinates shown on this plan are in meters and have been referenced to MTM NAD 83 (original), Zone 9.
Canadian Geodetic Vertical Datum of 1928 (CGVD28)

Les coordonnées sur ce plan sont en mètres et sont en référence au système géodésique MTM NAD 83 (origine), Fuseau 9.
Système canadien de référence altimétrique de 1928 (CGVD28)

Please Note:
The utility information shown on this drawing has been collected using various sources and/or quality of information. It represents the best available data, but its accuracy or completeness cannot be guaranteed. This is only a single source of information, Contractors should contact the property owner and other PWGSC sources prior to digging. It is the responsibility of all subsequent users of this drawing to verify all pertinent information to the degree necessary to support subsequent designs, construction works, or other site interventions. Any discrepancies must immediately be brought to the attention of the PWGSC Geomatics Services.
Geomatics.Geomatique@pwgsc-tpsgc.gc.ca

Veuillez noter :
Les informations des servitudes figurant sur ce plan ont été recueillies à l'aide de diverse source et/ou de qualité d'information. Elle représente nos meilleures données disponibles, mais l'exactitude ou l'intégralité ne peut être garantie. Elle ne s'agit que d'une seule source d'information, les entrepreneurs doivent communiquer avec le gestionnaire des biens de propriété de TPSGC et autres sources avant de creuser. Cela demeure la responsabilité de tous utilisateurs de ce plan de vérifier tous l'information pertinente pour le degré nécessaire en vue d'appuyer leurs travaux de conception, de construction ou à d'autres interventions. Tout écart doit immédiatement être porté à l'attention des services géomatique de TPSGC.
Geomatics.Geomatique@pwgsc-tpsgc.gc.ca

project | projet

Tunney's Pasture Complex

Ottawa ON

drawing | dessin

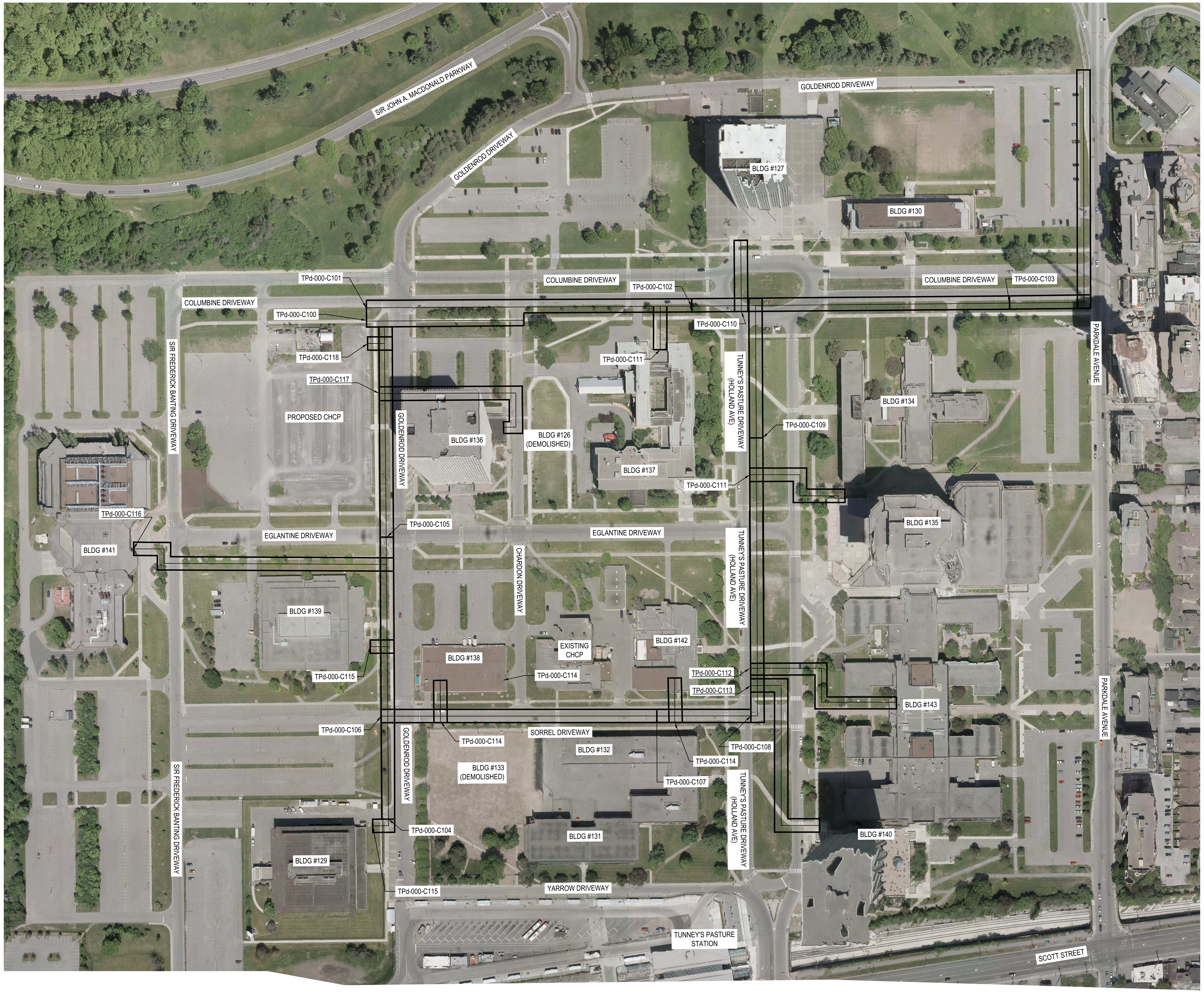
Services Plan

Drawn By	J. De Curtis	Dessiné par
Date	2017-04-07	(yyyy/mm/dd)
Reviewed By		Examiné par
Date		(yyyy/mm/dd)
Project no.		No. du projet
Drawing no.	TNP_035_C_01_17	No. du dessin

PWGSC A0 (1189x841)

SHEET INDEX

Sheet Number	Sheet Title	Revision Number	Revision Description	Revision Date
TUd-000-C001	DRAWING LIST AND KEY PLAN	4	ISSUED FOR FINAL DETAILED DESIGN REPORT (100%)	2021.05.28
TUd-000-C100	DISTRIBUTION PLAN & PROFILE 0+000 to 0+120	5	ISSUED FOR FINAL DETAILED DESIGN REPORT (100%)	2021.05.28
TUd-000-C101	DISTRIBUTION PLAN & PROFILE 1+000 to 1+230	5	ISSUED FOR FINAL DETAILED DESIGN REPORT (100%)	2021.05.28
TUd-000-C102	DISTRIBUTION PLAN & PROFILE 1+230 to 1+460	4	ISSUED FOR FINAL DETAILED DESIGN REPORT (100%)	2021.05.28
TUd-000-C103	DISTRIBUTION PLAN & PROFILE 1+460 to 1+695	4	ISSUED FOR FINAL DETAILED DESIGN REPORT (100%)	2021.05.28
TUd-000-C104	DISTRIBUTION PLAN & PROFILE 2+000 to 2+215	4	ISSUED FOR FINAL DETAILED DESIGN REPORT (100%)	2021.05.28
TUd-000-C105	DISTRIBUTION PLAN & PROFILE 2+215 to 2+405	6	ISSUED FOR FINAL DETAILED DESIGN REPORT (100%)	2021.05.28
TUd-000-C106	DISTRIBUTION PLAN & PROFILE 3+000 to 3+210	4	ISSUED FOR FINAL DETAILED DESIGN REPORT (100%)	2021.05.28
TUd-000-C107	DISTRIBUTION PLAN & PROFILE 3+210 to 3+288	4	ISSUED FOR FINAL DETAILED DESIGN REPORT (100%)	2021.05.28
TUd-000-C108	DISTRIBUTION PLAN & PROFILE 4+000 to 4+215	4	ISSUED FOR FINAL DETAILED DESIGN REPORT (100%)	2021.05.28
TUd-000-C109	DISTRIBUTION PLAN & PROFILE 4+215 to 4+310	4	ISSUED FOR FINAL DETAILED DESIGN REPORT (100%)	2021.05.28
TUd-000-C110	DISTRIBUTION PLAN & PROFILE 5+000 to 5+060	4	ISSUED FOR FINAL DETAILED DESIGN REPORT (100%)	2021.05.28
TUd-000-C111	DISTRIBUTION PLAN & PROFILE 8+000 to 8+040, 9+000 to 9+090	4	ISSUED FOR FINAL DETAILED DESIGN REPORT (100%)	2021.05.28
TUd-000-C112	DISTRIBUTION PLAN & PROFILE 10+000 to 10+116	4	ISSUED FOR FINAL DETAILED DESIGN REPORT (100%)	2021.05.28
TUd-000-C113	DISTRIBUTION PLAN & PROFILE 20+000 to 20+160	4	ISSUED FOR FINAL DETAILED DESIGN REPORT (100%)	2021.05.28
TUd-000-C114	DISTRIBUTION PLAN & PROFILE 12+000 to 12+025, 15+000 to 15+025	4	ISSUED FOR FINAL DETAILED DESIGN REPORT (100%)	2021.05.28
TUd-000-C115	DISTRIBUTION PLAN & PROFILE 16+000 to 16+030, 17+000 to 17+030	4	ISSUED FOR FINAL DETAILED DESIGN REPORT (100%)	2021.05.28
TUd-000-C116	DISTRIBUTION PLAN & PROFILE 18+000 to 18+210	4	ISSUED FOR FINAL DETAILED DESIGN REPORT (100%)	2021.05.28
TUd-000-C117	DISTRIBUTION PLAN & PROFILE 19+000 to 19+145	4	ISSUED FOR FINAL DETAILED DESIGN REPORT (100%)	2021.05.28
TUd-000-C118	DISTRIBUTION PLAN & PROFILE 21+000 to 21+027, 22+000 to 22+020	5	ISSUED FOR FINAL DETAILED DESIGN REPORT (100%)	2021.05.28
TUd-000-C200	REMOVAL PLAN	2	ISSUED FOR FINAL DETAILED DESIGN REPORT (100%)	2021.05.28
TUd-000-C201	REMOVAL PLAN	2	ISSUED FOR FINAL DETAILED DESIGN REPORT (100%)	2021.05.28
TUd-000-C202	NEW UTILITIES	2	ISSUED FOR FINAL DETAILED DESIGN REPORT (100%)	2021.05.28
TUd-000-C203	NEW UTILITIES	2	ISSUED FOR FINAL DETAILED DESIGN REPORT (100%)	2021.05.28
TUd-000-C204	NEW UTILITIES	2	ISSUED FOR FINAL DETAILED DESIGN REPORT (100%)	2021.05.28
TUd-000-C300	REINSTATEMENT PLAN	2	ISSUED FOR FINAL DETAILED DESIGN REPORT (100%)	2021.05.28
TUd-000-C301	REINSTATEMENT PLAN	2	ISSUED FOR FINAL DETAILED DESIGN REPORT (100%)	2021.05.28
TUd-000-C302	REINSTATEMENT PLAN	2	ISSUED FOR FINAL DETAILED DESIGN REPORT (100%)	2021.05.28
TUd-000-C303	REINSTATEMENT PLAN	2	ISSUED FOR FINAL DETAILED DESIGN REPORT (100%)	2021.05.28
TUd-000-C800	BEND SCHEDULE 0+000 to 0+120	3	ISSUED FOR FINAL DETAILED DESIGN REPORT (100%)	2021.05.28
TUd-000-C801	BEND SCHEDULE 1+000 to 1+230	3	ISSUED FOR FINAL DETAILED DESIGN REPORT (100%)	2021.05.28
TUd-000-C802	BEND SCHEDULE 1+230 to 1+460	3	ISSUED FOR FINAL DETAILED DESIGN REPORT (100%)	2021.05.28
TUd-000-C803	BEND SCHEDULE 1+460 to 1+695	3	ISSUED FOR FINAL DETAILED DESIGN REPORT (100%)	2021.05.28
TUd-000-C804	BEND SCHEDULE 2+000 to 2+215	3	ISSUED FOR FINAL DETAILED DESIGN REPORT (100%)	2021.05.28
TUd-000-C805	BEND SCHEDULE 2+215 to 2+405	3	ISSUED FOR FINAL DETAILED DESIGN REPORT (100%)	2021.05.28
TUd-000-C806	BEND SCHEDULE 3+000 to 3+210	3	ISSUED FOR FINAL DETAILED DESIGN REPORT (100%)	2021.05.28
TUd-000-C807	BEND SCHEDULE 3+210 to 3+288	3	ISSUED FOR FINAL DETAILED DESIGN REPORT (100%)	2021.05.28
TUd-000-C808	BEND SCHEDULE 4+000 to 4+215	3	ISSUED FOR FINAL DETAILED DESIGN REPORT (100%)	2021.05.28
TUd-000-C809	BEND SCHEDULE 4+215 to 4+310	3	ISSUED FOR FINAL DETAILED DESIGN REPORT (100%)	2021.05.28
TUd-000-C810	BEND SCHEDULE 5+000 to 5+060	3	ISSUED FOR FINAL DETAILED DESIGN REPORT (100%)	2021.05.28
TUd-000-C811	BEND SCHEDULE 8+000 to 8+040	3	ISSUED FOR FINAL DETAILED DESIGN REPORT (100%)	2021.05.28
TUd-000-C812	BEND SCHEDULE 10+000 to 10+116	3	ISSUED FOR FINAL DETAILED DESIGN REPORT (100%)	2021.05.28
TUd-000-C813	BEND SCHEDULE 20+000 to 20+160	3	ISSUED FOR FINAL DETAILED DESIGN REPORT (100%)	2021.05.28
TUd-000-C814	BEND SCHEDULE 12+000 to 12+025, 15+000 to 15+025	3	ISSUED FOR FINAL DETAILED DESIGN REPORT (100%)	2021.05.28
TUd-000-C815	BEND SCHEDULE 16+000 to 16+030, 17+000 to 17+030	3	ISSUED FOR FINAL DETAILED DESIGN REPORT (100%)	2021.05.28
TUd-000-C816	BEND SCHEDULE 18+000 to 18+210	3	ISSUED FOR FINAL DETAILED DESIGN REPORT (100%)	2021.05.28
TUd-000-C817	BEND SCHEDULE 19+000 to 19+145	3	ISSUED FOR FINAL DETAILED DESIGN REPORT (100%)	2021.05.28
TUd-000-C818	BEND SCHEDULE 21+000 to 21+027, 22+000 to 22+020	3	ISSUED FOR FINAL DETAILED DESIGN REPORT (100%)	2021.05.28
TUd-000-C900	DISTRIBUTION DETAILS	4	ISSUED FOR FINAL DETAILED DESIGN REPORT (100%)	2021.05.28
TUd-000-C901	DISTRIBUTION DETAILS	4	ISSUED FOR FINAL DETAILED DESIGN REPORT (100%)	2021.05.28
TUd-000-C902	DISTRIBUTION DETAILS	4	ISSUED FOR FINAL DETAILED DESIGN REPORT (100%)	2021.05.28
TUd-000-C903	DISTRIBUTION DETAILS	1	ISSUED FOR FINAL DETAILED DESIGN REPORT (100%)	2021.05.28
TUd-000-C904	DISTRIBUTION DETAILS	1	ISSUED FOR FINAL DETAILED DESIGN REPORT (100%)	2021.05.28



SYMBOL LEGEND

EXISTING STREET LIGHTING		NEW STREET LIGHTING		EXISTING MANHOLE		NEW MANHOLE	
EXISTING VALVE BOX		NEW VALVE BOX		EXISTING CATCHBASIN MANHOLE		NEW CATCHBASIN MANHOLE	
EXISTING SIGNAGE		NEW SIGNAGE		EXISTING CAP		NEW CAP	
EXISTING CATCHBASIN		NEW CATCHBASIN		EXISTING GAS METER	GM	EXISTING SPRINKLER VALVE	
EXISTING HYDRANT		NEW HYDRANT		EXISTING PEDESTAL BOX	PB	EXISTING FLAGPOLE	FP

Canada

Public Works and Government Services Canada / Travaux publics et services gouvernementaux Canada
Real Property Branch / Services des Biens Immobiliers

INNOVATE ENERGY

wsp

Rev.	Description	Date
4	ISSUED FOR FINAL DETAILED DESIGN REPORT (100%)	2021.05.28
3	DIRECT BURIED DISTRIBUTION EXPEDITED SUBMISSION 100%/IFC	2021.04.06
2	ISSUED FOR DETAILED DESIGN REPORT (99%)	2020.12.11
1	ISSUED FOR DETAILED DESIGN REPORT (66%)	2020.07.31
0	ISSUED FOR PRELIMINARY DESIGN REPORT (33%)	2020.03.27

Seal / Sceau: REGISTERED PROFESSIONAL ENGINEER, E. DONALDSON, 100008956, MAY 28, 2021, PROVINCE OF ONTARIO

North / Nord

Project / Projet

ENERGY SERVICES ACQUISITION PROGRAM MODERNIZATION PROJECT

drawing / dessin

MODERNIZED TUNNEY'S PASTURE CHCP
DRAWING LIST AND KEY PLAN

Designed By / Conçu par: B. LEBLANC, C. GRAHAM, J. BOURBONNAIS
Date

Drawn By / Dessiné par: B. LEBLANC, C. GRAHAM, J. BOURBONNAIS, B. NANDLAL
Date

Reviewed By / Examiné par: L. GIRARD
Date

Approved By / Approuvé par: E. DONALDSON
Date

Tender / Soumission

Project Manager / Administrateur de projets

Project no. / No. du projet: EP635-173247/001/NB

Drawing no. / No. du dessin: TUd-000-C001 | Rev #: 4

PWGSC A0 (1189x841)

Tunney's Pasture Redevelopment - *Telecommunications and Technology Assessment and Planning Report*

Prepared For:

ARCADIS Design & Consultancy for natural and built assets

Prepared By:

attain

Report Date:
July 26th, 2024

Table of Contents

Executive Summary

The Tunney's Pasture Redevelopment project aims to modernize and enhance the telecommunication and technology infrastructure to support future development and operations. This report provides an updated assessment and planning strategy, building on the foundations laid in our original 2019 report.

Key observations and recommendations include:

1. **Infrastructure Status**:
   - Since 2019, the cable plant infrastructure at Tunney's Pasture has seen minimal changes. There have been a few new installations; however, these have followed existing routes.
2. **Carrier Coordination**:
   - Carriers have been informed of the development transition plan. Importantly, they will require a one-year notice to plan and implement necessary changes. Effective coordination during the next phase, which includes detailed design and financial planning, is essential.
3. **Strategic Planning**:
   - A RACI (Responsible, Accountable, Consulted, Informed) matrix needs to be created to outline key steps, milestones, and potential risks. This will ensure clear roles and responsibilities throughout the project phases.
4. **Development Strategy**:
   - The overarching strategy is to establish new temporary overland conveyances for all telecommunications infrastructure, including poles and ducts. Each building will have new, independent cable entrances, minimizing interdependencies and ensuring that development can progress without disrupting adjacent buildings or services.
   - Carriers will be notified of changes on a phase-by-phase basis, allowing them to plan for long-term infrastructure in Tunney's Pasture similarly to any other commercial or residential street in Ottawa.
5. **Infrastructure Enhancements**:

   We recommend installing a series of new lateral ducts between each building and an underground handhole. This setup will facilitate both temporary feeds and long-term connections to the permanent telecom system, which will be developed as the project progresses. Tenant Preparation and Coordination:

   - Detailed tenant preparation and discussions, along with coordination and communication, will ensure a smooth cutover of temporary and permanent services. This includes a detailed planning phase by building to address specific needs and timelines. This phase requires a detailed review of each buildings' Main Telecom Room and building backbone(s) to assess suitability for long-term accommodation of services.

- There are other "low-voltage" services that need to be considered during the development process; specifically, security and surveillance systems, public lighting, traffic control systems, emergency call

By implementing these recommendations, we aim to create a robust and flexible telecommunications framework that supports the redevelopment of Tunney's Pasture, ensuring seamless service delivery and future-proof infrastructure.

Background

This report updates our 2019 assessment, addressing the evolving technological landscape and its implications for the development of Tunney's Pasture in Ottawa. Given the critical role of technology in commercial and residential developments, our focus has been on ensuring that the latest telecommunication advancements are integrated from the development stage.

The Tunney's Pasture Complex in Ottawa, Ontario, Canada, is home to many Federal Civil Servants primarily employed by Health Canada, Statistics Canada, and the Department of National Defense. There are 14 buildings managed by Public Services and Procurement Canada located on the campus.

The contiguous property includes both an older (located in building 13) and a new central heating and cooling plant operation (CHCP) that is comprised of several underground pathways and tunnels interconnecting buildings.

To distribute services to the individual client departments, Telecom Service Providers (TSPs), such as Bell Canada, Rogers Communications, broadcasters like Rogers, CBC, CTV, and others, including the client departments themselves, have utilized this system of underground tunnels and manholes to accommodate the fibre optic and copper cables required to interconnect carriers' networks to the individual departments. Additionally, these pathways connect various buildings and functional departments to each other.

The proliferation of network cables installed by both carriers, tenants, and broadcasters, without associated and appropriate support infrastructure, pathways, and management planning, has created a situation that prevents further installation of cables in existing pathways. The current voice system for all buildings, primarily a copper distribution with a few exceptions of fiber feed RLMs, is at maximum capacity for several buildings. The Centrex technology currently in use is at the end of its life with extremely limited replacement parts available.

As development proceeds, a new ESOP Plant is being installed. Collaboration with the development team (Arcadis, Canada Lands, PSPC) and IT teams (Bell, TELUS, Rogers, Zayo) is essential. We would like to extend recognition to SSC Salina Aubrey and Stephen Pilon for their contributions to this effort.

Scope

- **Phase 1: Telecommunications Site Condition Report**
  - Update the TBCR for each building to understand existing connections and inter-dependencies between buildings.
  - Survey each building and entrance to validate 2019 report findings.
  - Emphasize modern, redundant entries for each building, allowing for both multiple profile tenants.
  - Provide recommendations about potential upgrades or enhancements based on recent technological advancements.

- **Phase 2: Coordinated Technology Development & Transition Plan**
  - Review and update the interconnectivity plans with a focus on modularity and adaptability to future technological changes.
  - Ensure that the duct bank infrastructure plan is aligned with the latest environmental and construction standards.
  - Collaborate with SSC, City of Ottawa planning, and carriers to develop a comprehensive, forward-looking transition plan.
  - Update wireless coverage options to include the latest in cellular and Wi-Fi technology, considering 5G and futureproofing for upcoming standards.
  - Provide updated Class "A" cost estimates, reflecting current market prices and technological costs.
  - Explore new revenue streams from IT and telecommunications service providers, considering recent market shifts and regulatory changes.

Methodology

To capture the necessary data and determine the effects of the proposed development on the existing infrastructure, the Attain Group employed a comprehensive approach, including:

Carrier Meetings:

- Held meetings with wireline carriers Bell Canada, Rogers, TELUS, and Zayo to determine their existing cable plant routes into and around the campus.
- Gathered carriers' requests regarding their requirements for a new campus-wide underground cable plant infrastructure and proposed routing of new redundant entrance points into the campus.
- Discussed feeding temporary new entrances to each building during development and construction.

Stakeholder Meetings:

- Conducted multiple meetings with various Government of Canada stakeholders from the Department of National Defense (DND), Public Services and Procurement Canada (PSPC), Statistics Canada (Stats Can), Health Canada (HC), Innovation, Science and Economic Development Canada – Measurement Canada (ISED-M), Shared Services Canada (SSC) (Voice, Data, WAN, LAN, and Project-related staff), Canada Lands (CLC), Indigenous Services Canada/Crown-Indigenous Relations and Northern Affairs Canada (ISC-CIRNAC).
- These meetings were instrumental in understanding the diverse needs and concerns of all parties involved.

Data Review:

- Reviewed carrier plans and client-supplied information to ensure a comprehensive understanding of existing conditions and requirements.
- Reviewed the updated carrier report commissioned by BGIS in 2021 to incorporate the latest developments and insights.

With all the information gathered, the Attain Group analyzed the redevelopment requirements and developed a project transition plan. This plan encompasses the phasing, carrier requests, and future technology deployment of the future Tunney's Pasture community, ensuring a robust and future-proof telecommunication infrastructure.

Way Forward

Early into the updating of the 2019 report, it became apparent that a novel approach was needed to align with the goals of the Tunney's Pasture Redevelopment project. Due to the aggressive Phase 1 construction schedule which involves deep roadwork and associated utilities replacement (such as water, sewer, hydro and communications ducts) it became obvious that such work would directly impact existing utilities tunnels, duct banks and therefore communications services to most buildings in the Pasture.

With that understanding, a way forward was needed by all stakeholders to:

1) De-risk and prevent outages of communications services to all clients within the Pasture.
2) Provide a strategy for PSPC, SSC and their clients, and Arcadis to attempt to align with the construction schedule.

Approach

With all parties in agreement with the way forward, and approach or strategy was developed. While still high-level, all parties agree with the principles and steps which our outlined below:

1) Working with the major communications carriers (Bell, Zayo, Rogers, Telus), provide temporary services to all buildings to mirror current capacity.
2) Temporary services (fibre cables) would be fed from Parkdale Ave and Scott St.
3) Method of conveying the cables will have to be coordinated with all carriers, PSPC, Arcadis, and SSC (to ensure confidence of service level agreements).
4) Options for conveyance could include:
    a. New utility poles for street crossing to avoid construction traffic and equipment.
    b. Overland options such as utility poles, HDPE ducts with concrete protection or other proposed method.
    c. Tie-in to existing building entrance ducts, or construction of new entrance ducts to all affected buildings.

Risk Mitigation Strategy

Once new temporary services are installed and configured by the carriers to mirror those currently in service, the following steps would take place:

1) Cut-over existing services to new "temporary" services using new overland routes to avoid roadway construction.
2) Maintain current services until all building cutovers have been completed or both the carriers and major clients (i.e. SSC, BGIS) and tenants (Health Canada, Stats Canada, DND etc.) are satisfied that the new services are operationally stable.

3) Out-order (remove or abandon) all current copper and fibre cables utilizing the underground tunnels and duct structures.
4) New roadway construction can then proceed with the knowledge that all communications services to buildings are on temporary services not affected by construction.

Coordinated Technology Development and Transition Plan Overview

Overview

The plan aims to modernize and transition the telecommunication and technology infrastructure at Tunney's Pasture to meet current and future needs. It involves updating the existing copper and fiber cable systems and transitioning from a centralized campus to a decentralized city streetscape with robust, redundant connectivity.

Key Objectives

1. Ensure Continuity: Prevent outages of communication services during construction.
2. Align with Construction: Synchronize technology updates with the Phase 1 construction schedule.
3. Modernize Infrastructure: Upgrade to smart city technologies, focusing on IoT, AI, and smart grids.
4. Future-proof Connectivity: Prepare for emerging technologies.

Phase 1: Coordinated Technology Development & Transition Plan

1. Temporary Services Installation
    - Work with major carriers (Bell, Zayo, Rogers, TELUS) to install temporary services that mirror current capacity.
    - Utilize Parkdale Ave and Scott St for temporary fiber cable feeds.
    - Coordinate with carriers, PSPC, Arcadis, and SSC to ensure service level agreements are maintained.
    - Options for conveyance include new utility poles, HDPE ducts with concrete protection, and new entrance ducts.

2. Risk Mitigation and Cutover Process
    - Cutover existing services to new temporary services using new overland routes.
    - Maintain current services until all building cutovers are complete and new services are stable.
    - Decommission (out-order) current underground copper and fiber cables.
    - Proceed with new roadway construction once all communications services are on temporary setup.

3. Permanent Infrastructure Development
    - Develop a robust permanent infrastructure with enhanced capacity and resilience.
    - Implement smart city technologies focusing on IoT, AI, and smart grids.
    - Update wireless coverage to include 5G and future-proof standards.

- Ensure the duct bank infrastructure plan aligns with environmental and construction standards.

4. Tenant Preparation and Coordination
    - Conduct detailed discussions with tenants to prepare for the transition.
    - Provide clear communication on cutover schedules and temporary service setups.
    - Implement a detailed planning phase for each building.
    - Offer ongoing support and updates to tenants throughout the transition process.

5. Cost Estimates and Revenue Streams
    - Provide updated Class "A" cost estimates reflecting current market prices and technological costs.

Conclusion

The coordinated technology development and transition plan for Tunney's Pasture offers a strategic and comprehensive approach to modernizing the telecommunication and IT infrastructure. It ensures continuity, aligns with construction schedules, incorporates the latest technologies, and prepares for future advancements, supporting a smooth transition and futureproofing the campus.

Transition Plan – Next Steps

1. Working with Major Communications Carriers

Current State**:**
- Existing communications services are routed through underground tunnels and duct structures, which will be impacted by Phase 1 construction.

Temporary Solution**:**
- Engage with major carriers (Bell, Zayo, Rogers, Telus) to install temporary services that mirror the current capacity as development phases are confirmed.
- Temporary services (fiber cables) will be fed from Parkdale Ave and Scott St.
- Identify funding sources.

Permanent Solution**:**
- Once construction is completed, transition to a permanent infrastructure setup with enhanced capacity and resilience.

Steps**:**
1. Coordinate with carriers to design temporary service routes.
2. Install temporary fiber cables.
3. Test and validate temporary services to ensure they meet current capacity requirements.
4. Maintain a detailed record of temporary installations for future reference.

2. Conveyance Method Coordination

Current State**:**
- Existing conveyance methods are primarily underground, which will be disrupted by construction.

Temporary Solution**:**
- Explore and implement alternative conveyance methods, such as new utility poles, HDPE ducts with concrete protection, or new entrance ducts to affected buildings.

Permanent Solution**:**
- Develop a robust and resilient permanent conveyance infrastructure that avoids disruption from future construction activities.

Steps**:**
1. Evaluate and select the best temporary conveyance method in coordination with carriers, PSPC, Arcadis, and SSC.
2. Install the chosen temporary conveyance method.

3. Ensure all stakeholders are confident in the service level agreements for the temporary setup.
4. Plan for a transition to permanent conveyance methods post-construction.

3. Risk Mitigation Strategy

Current State**:**

- Existing services are at risk of outages due to construction activities.

Temporary Solution**:**

- Install and configure new temporary services to prevent outages and ensure continuity.

Permanent Solution**:**

- Transition to a stable and permanent service infrastructure post-construction.

Steps**:**

1. Cut-over existing services to new temporary services using new overland routes.
2. Maintain current services until all building cutovers are complete and the new services are operationally stable.
3. Decommission (out-order) all current underground copper and fiber cables.
4. Proceed with new roadway construction, knowing that communications services are safeguarded on temporary setups.

4. Detailed Tenant Preparation and Coordination

Current State**:**

- Tenants rely on existing infrastructure, which will be disrupted by construction.

Temporary Solution**:**

- Prepare tenants for the transition by providing detailed information and timelines.

Permanent Solution**:**

- Ensure tenants are smoothly transitioned to permanent services with minimal disruption.

Steps**:**

1. Conduct detailed discussions with tenants to prepare them for the transition.
2. Coordinate communication to ensure tenants are aware of cutover schedules and temporary service setups.
3. Implement a detailed planning phase by building to address specific needs and timelines.
4. Provide ongoing support and updates to tenants throughout the transition process.

Other Low Voltage Networks - Considerations

There are a range of other systems that might also be run underground (or through overhead lines) and encompass a range of utilities and services. Here are the primary low voltage networks commonly found that should also be considered during development:

1. **Low-Voltage Electric Power Distribution Networks**:
   - Low voltage (typically 120/240V) distribution lines provide electricity to residential, commercial, and public buildings.
2. **Emergency Call Stations**:
   - Fibre optic, copper or cellular based connected systems.
   - The system that allows for emergency call and assistance to pedestrians and occupants of Tunney's Pasture.
3. **Public Lighting Systems**:
   - Street lighting systems operating at low voltage levels to illuminate roadways, sidewalks, and public spaces.
4. **Traffic Control Systems**:
   - Low voltage wiring for traffic lights, pedestrian signals, and related control systems.
5. **Security and Surveillance Systems**:
   - Networks for CCTV cameras and other security monitoring equipment.
6. **Public Wi-Fi Networks**:
   - Infrastructure for public Wi-Fi hotspots installed by municipalities or private providers.
7. **Environmental Monitoring Systems**:
   - Sensors and data collection networks for monitoring air quality, weather conditions, and other environmental parameters.
8. **Smart City Infrastructure**:
   - IoT (Internet of Things) devices and sensors for smart lighting, smart parking, and other smart city applications.
9. **Electric Vehicle Charging Stations**:
   - Infrastructure to support the charging of electric vehicles, including both public and private charging points.

Comprehensive planning and stakeholder engagement are key to seamlessly incorporating these critical low voltage networks into the redevelopment project, ensuring both current functionality and future adaptability.

Recommended Infrastructure Enhancements

To ensure robust and resilient telecommunication services throughout the redevelopment of Tunney's Pasture, we are recommending the installation of a handhole with two lateral 100 mm ducts to each building. This infrastructure enhancement will be implemented in two strategic locations per building, providing redundant access points that are crucial for maintaining service continuity during both the temporary and permanent phases of the project.

The handholes, equipped with dual 100 mm ducts, will serve as pivotal connection points for both temporary carrier provisioning and long-term connectivity solutions. By establishing these redundant access points, we can mitigate the risk of service interruptions caused by construction activities or unforeseen incidents. This approach not only ensures a seamless transition from existing services to temporary setups but also lays the groundwork for a stable and future-proof permanent telecommunications infrastructure.

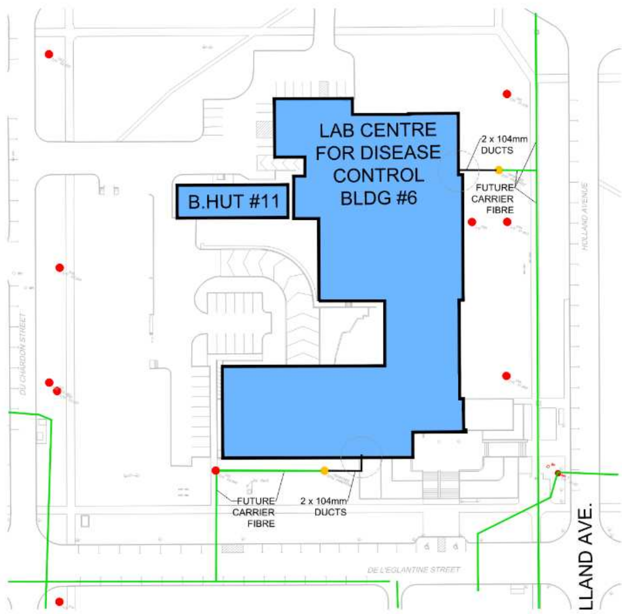


Figure 1: Recommendation for New Handhole and Lateral Ducts

In the temporary phase, these handholes will facilitate the rapid deployment of carrier services, allowing for flexible and efficient re-routing of connections as construction progresses. The dual duct system provides ample capacity for multiple carriers, ensuring that all telecommunication needs are met without compromising on performance or reliability. Once the permanent infrastructure is ready, these same handholes and ducts will be utilized to establish enduring connections, streamlining the cutover process and reducing downtime.

Moreover, the installation of handholes with redundant lateral ducts aligns with our overall strategy of decentralizing the telecommunication infrastructure at Tunney's Pasture. By providing multiple entry points to each building, we enhance the resilience of the network, making it less susceptible to single points of failure. This forward-thinking design not only addresses current requirements but also anticipates future demands, ensuring that the redeveloped Tunney's Pasture is equipped with a state-of-the-art telecommunication infrastructure.

In summary, the recommended installation of handholes with dual 100 mm lateral ducts in two locations per building is a critical component of our redevelopment strategy. This approach guarantees that both temporary and permanent telecommunication services are robust, flexible, and capable of supporting the evolving needs of Tunney's Pasture.

Please see full handhole detail in Appendix B (Figure 21).

Current Conditions

Carrier Findings

Bell Canada

Bell Canada is the incumbent local exchange carrier (ILEC) for telephone, internet, and network services. Based out of Montreal, QC, Bell Canada is a national service provider.

Voice Services (EEWD):

- Bell Canada indicated that the current Enhanced Exchange Wide Dial (EEWD) Centrex telephone system is at end of life due to the scarcity of active equipment for the system. This situation makes it impossible to add nodes via fibre to key buildings, thereby eliminating dependence on the existing copper multi-pair cables.
- Currently, there is a main telephone switch (DMS) located in the main building and some remote nodes (RLM) at Brooke Claxton and Jean Mance which are believed to be at or near capacity. Without a direct technology upgrade, fresh solutions for voice services will need to be explored.
- Additionally, there are 3 DMS switches in 101 Goldenrod providing various voice services to DND.
- A fire necessitated the reinstallation of copper services, with the existing copper cables utilizing the same route as shown on drawing xxx.

Entry Points:

- Bell Canada services the Tunney's Pasture campus with fibre optics and copper from street pathways.
    1. The first two entry points are both off Parkdale Avenue (near Lyndale Avenue) and north of the Main Stats building. Bell Canada cabling enters the campus through the existing utility hole system to Building 7 (Main Stats building); from this location, fibre is distributed using the existing steam tunnel and utility hole/duct system.
    2. The second campus entry is near the southwest corner of Northwestern and Premier Avenues. This entrance feeds the National Defense Data Centre (Building 16) through underground ducting.

Routing:

- Bell Canada currently uses both the old CHCP steam tunnels and the government-owned utility hole/duct and aerial pole-line infrastructure systems for distribution pathways around the campus.

- Highlights of Bell Canada distribution include:
    - Relocation of Bell Canada fibre from Building 15 via a new aerial run, avoiding the use of the building as a pathway to facilitate its demolition.
    - Building 13 (Central Heating Plant) serves as a pathway for all east-to-west cabling.
    - Splice locations in Building 3 (Main Building) are used for distribution to the rest of the campus.
    - Splice location in Building 16 (National Defense Data Centre) used for campus-wide distribution.
    - Several other splice locations are strategically placed in the CHCP steam tunnels.
    - New copper installed in the same existing route due to fire.

Other Discussion:

- Bell Canada agrees with our approach to provide temporary feeds to all buildings via new infrastructure and noted that their installation and planning would be triggered by an order from a tenant or SSC.
- Bell Canada needs to understand the financial model of this development. It is currently considered private property, and as such, the GoC is responsible for providing the main pathways (poles, ducts, tunnels) to allow for the installation of Bell Cabling. It is recommended to hold a follow-up meeting with Bell to discuss financial responsibilities regarding temporary infrastructure to ensure development timelines are not affected.

Bell Canada currently has cable deployment in the following buildings:

Building	**Fibre Optic**	**Copper**
R. H. Coats Building (1)	Yes	Yes
Main Building (3)	Yes	Yes
Standards Building (4)	Yes	Yes
Jean Talon Building (5)	Yes	Yes
Laboratory Centre for Disease Control (6)	Yes	Yes
Brooke Claxton Building (9)	Yes	Yes
Butler Hut (11)	Yes	Yes
National Defence Data Centre (16)	Yes	Yes
Occupational Health Unit Building (17)	Yes	Yes
Personnel Records Centre (18)	Yes	Yes
Jeanne Mance Building (19	Yes	Yes
Sir Frederick G Banting Research Centre (22)	Yes	Yes

Table 1: Bell Canada Cable Deployment at Tunney's Pasture

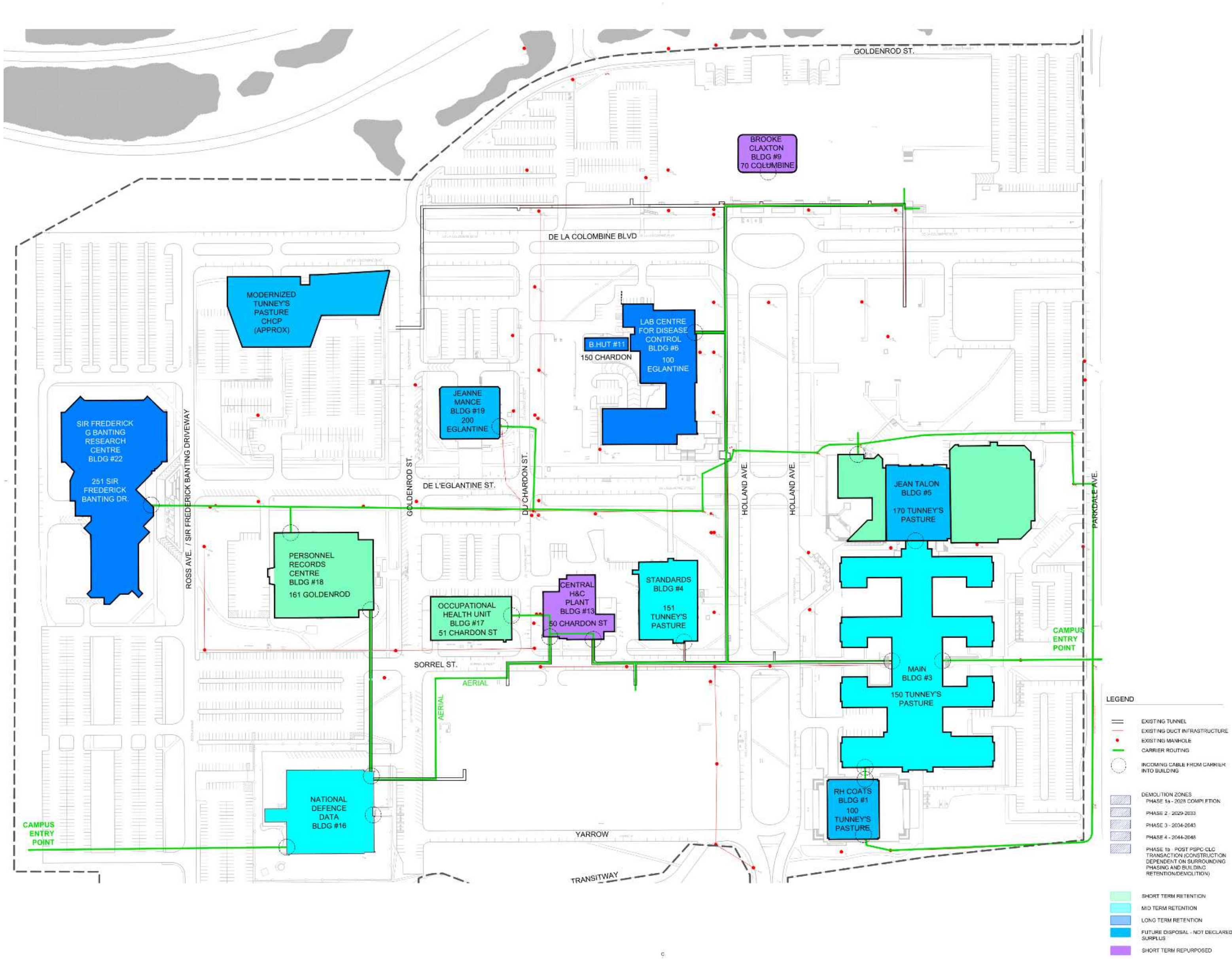


Figure 2: Existing Bell Fibre Routing at Tunney's Pasture

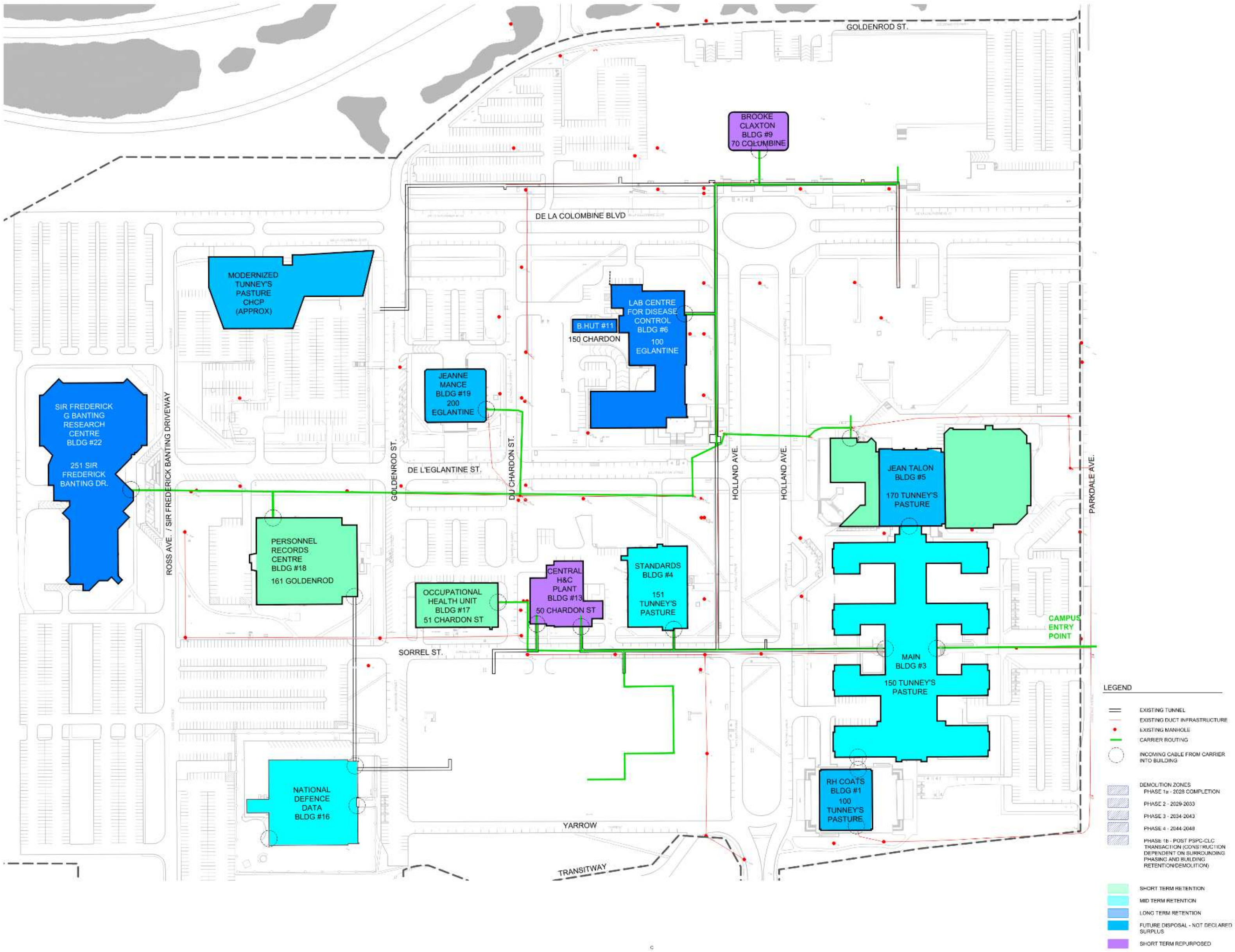


Figure 3: Existing Bell Copper Routing at Tunney's Pasture

Rogers

Rogers Communications Inc. is a Canadian communications and media company operating in wireless communications, cable television, telephone, and internet connectivity, with a significant fiber optic network presence in Canada. Rogers has a strong presence on Tunney's Pasture campus.

Entry Points:

Rogers Communications services the Tunney's Pasture campus with fiber optics from four distinct pathways:

1. The first campus entry is off Parkdale Avenue (near Lyndale Avenue). Rogers Communications fiber enters the campus through the existing utility hole system to Building 7 (Main Stats building); from this location, fiber is distributed using the existing steam tunnel and utility hole/duct system.
2. The second campus entry is also off Parkdale Avenue (near Burnside Avenue). Rogers Communications fiber enters the campus through the existing utility hole system; from this location, fiber is distributed using the existing steam tunnel and utility hole/duct system.
3. The third entrance is located off Scott Street. The fiber for the campus enters aerially across the transit cut at the end of Goldenrod Driveway. At this point, the fiber enters Building 16 (National Defense Data Centre) underground via an existing duct system. The Rogers Communications fiber is distributed using the existing steam tunnel and utility hole/duct system from a splice point in Building 16.
4. The fourth entrance is located off Scott Street. The Rogers Communications fiber for the campus enters at the end of Tunney's Pasture Driveway through the existing utility hole system; from this location, fiber is distributed using the existing steam tunnel and utility hole/duct system.

Routing:

Rogers Communications currently uses both the CHCP steam tunnels and the government-owned utility hole/duct system and pole line infrastructure for distribution pathways around the campus. Key highlights of Rogers Communications distribution include:

- Rogers's fiber has been relocated from Building 15 via a new aerial run that avoids using the building as a pathway to facilitate its demolition.
- Building 13 (Central Heating Plant) currently acts as a pathway for all east-to-west cabling.
- Rogers currently has splice locations in Building 3 (Main Building) that are used for distribution to the rest of the campus.

- Building 18 (Personnel Records) currently acts as a pathway for north-to-south cabling from Building 16 (National Defense Data Centre) to the utility hole system on Eglantine Driveway.
- Building 16 (National Defense Data Centre) has a splice location that is used for distribution to the rest of the campus.
- Several other splice locations are located at strategic points in the CHCP steam tunnels.
- There is a new aerial run from Scott Street to 101 Goldenrod.
- Rogers' new installations follow a Passive Optical Network approach (like Bell Fibe). All new installations will be done with fiber optic, eliminating distance restrictions for installed services.
- Rogers is agreeable to sharing pathways with other major carriers for both short and long-term purposes.

Other Discussion:

- Rogers agrees with our approach to provide temporary feeds to all buildings via new infrastructure, noting that their installation and planning would be triggered by an order from a tenant or SSC. They also noted that it is less expensive to provide services via new aerial infrastructure.

- Rogers needs to understand the financial model of this development. As the property is currently considered private, the GoC is responsible for providing the main pathways (poles, ducts, tunnels) to allow for the installation of Rogers Cabling. It is recommended to hold a follow-up meeting with Rogers to discuss financial responsibilities regarding temporary infrastructure to ensure development timelines are not affected.

Rogers Communications currently has cable deployment in the following buildings:

Building	**Fibre Optic**
R. H. Coats Building (1)	Yes
Main Building (3)	Yes
Standards Building (4)	Yes
Jean Talon Building (5)	Yes
Laboratory Centre for Disease Control (6)	Yes
Brooke Claxton Building (9)	Yes
Butler Hut (11)	Yes
National Defence Data Centre (16)	Yes
Occupational Health Unit Building (17)	Yes
Personnel Records Centre (18)	Yes
Jeanne Mance Building (19)	Yes
Sir Frederick G Banting Research Centre (22)	Yes

Table 2: Rogers Communications Cable Deployment at Tunney's Pasture

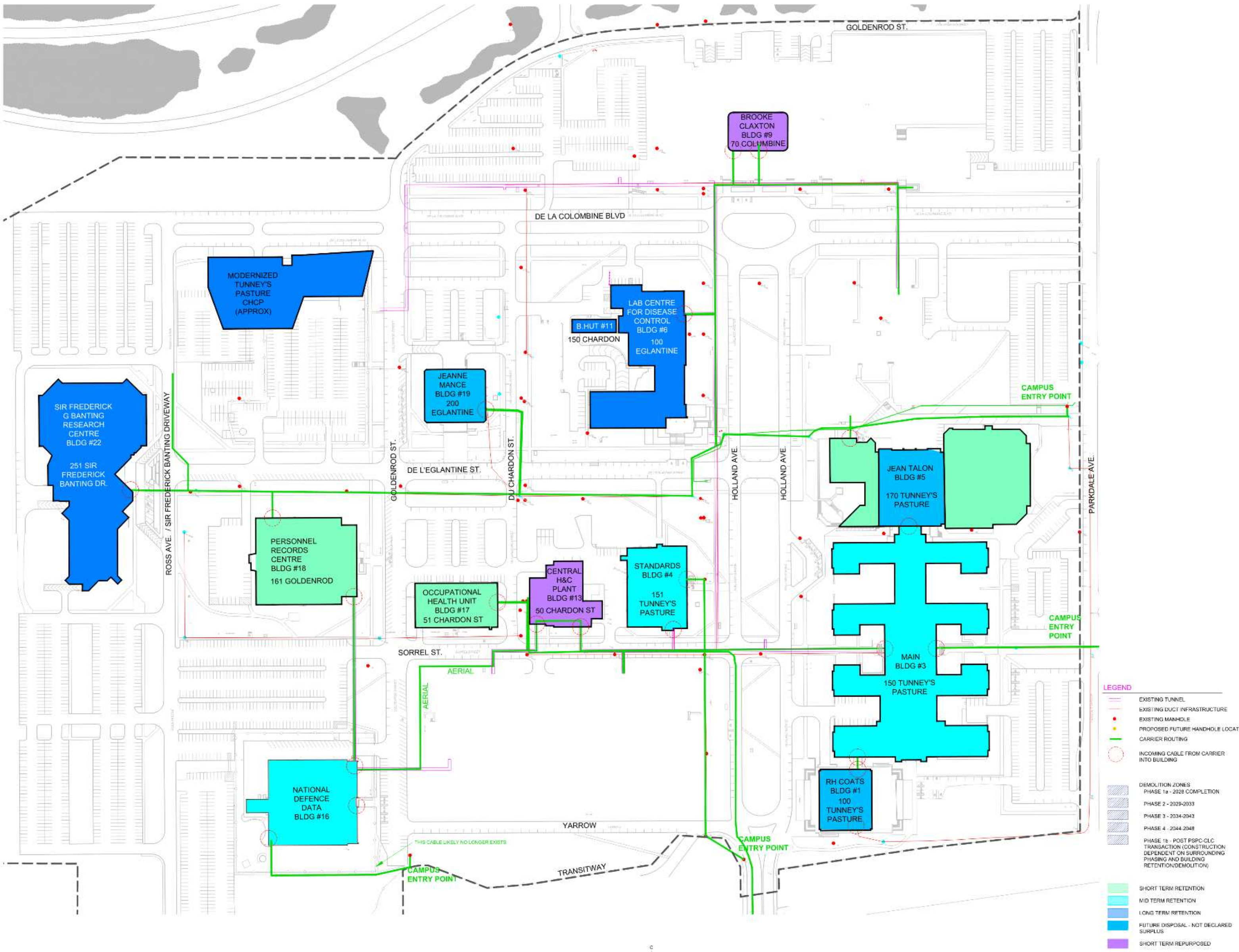


Figure 4: Existing Rogers Fibre Routing at Tunney's Pasture

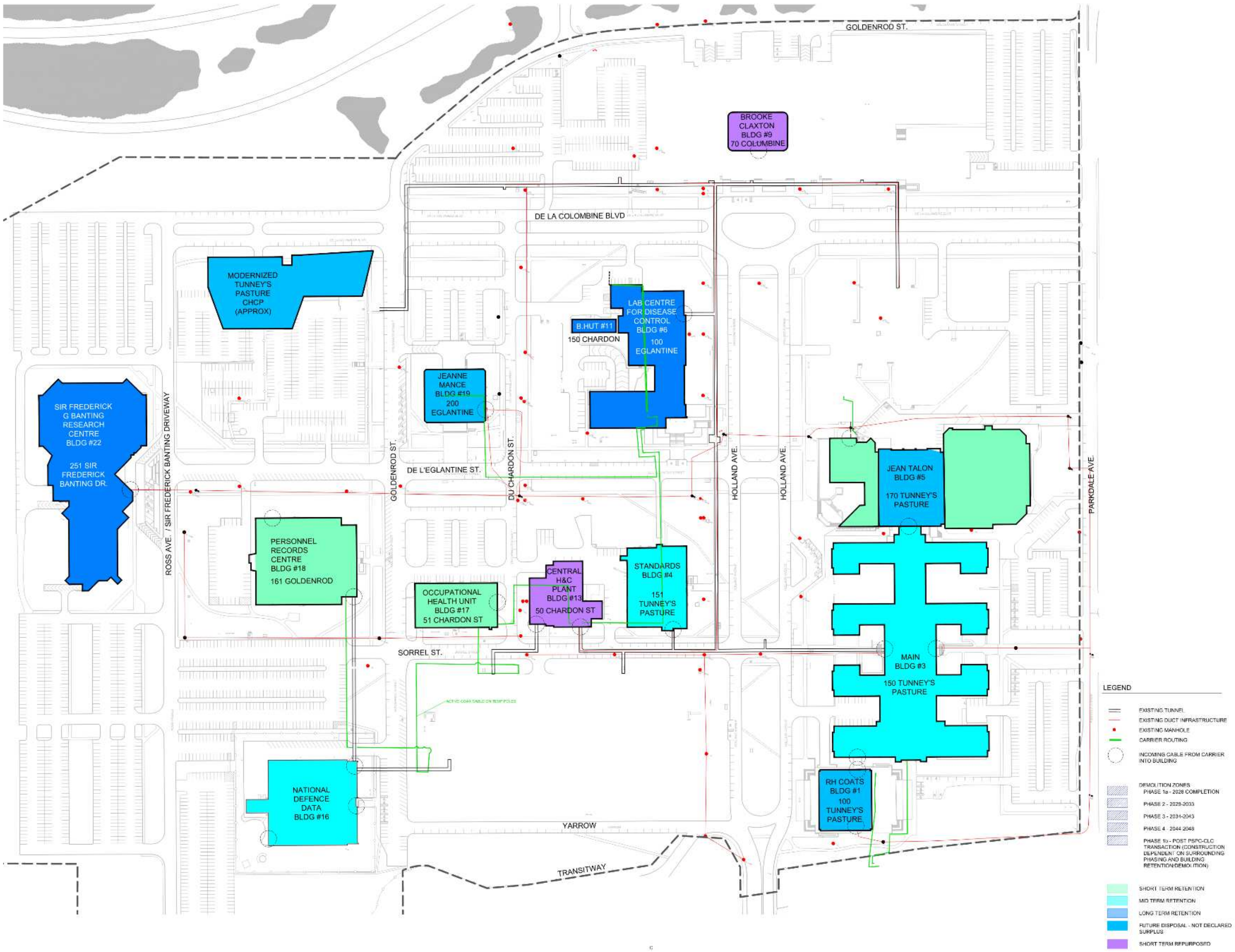


Figure 5: Existing Rogers COAX Routing at Tunney's Pasture

Zayo (Formerly Allstream AT&T)

Zayo is a leading global provider of bandwidth infrastructure services, formerly known as Allstream AT&T. Zayo operates an extensive fiber optic network across Canada, providing high-capacity bandwidth and connectivity solutions.

Entry Points:

Zayo services the Tunney's Pasture campus with fiber optics through multiple entry points:

1. The first campus entry is off Parkdale Avenue (near Lyndale Avenue). Zayo fiber enters the campus through the existing utility hole system to Building 7 (Main Stats building); from this location, fiber is distributed using the existing steam tunnel and utility hole/duct system.
2. The second entry point is located off Scott Street. The fiber for the campus enters aerially across the transit cut at the end of Goldenrod Driveway. At this point, the fiber enters Building 16 (National Defense Data Centre) underground via an existing duct system. Zayo fiber is then distributed using the existing steam tunnel and utility hole/duct system from a splice point in Building 16.
3. Additional entry points are facilitated through various utility hole systems strategically located around the campus, providing robust connectivity and redundancy.

Routing:

Zayo utilizes both the CHCP steam tunnels and the government-owned utility hole/duct system and pole line infrastructure for distribution pathways around the campus. Key highlights of Zayo's distribution include:

- Relocation of fiber from Building 15 via a new aerial run to avoid using the building as a pathway, making way for its demolition.
- Building 13 (Central Heating Plant) serves as a pathway for all east-to-west cabling.
- Splice locations in Building 3 (Main Building) are used for distribution to the rest of the campus.
- Building 18 (Personnel Records) acts as a pathway for north-to-south cabling from Building 16 (National Defense Data Centre) to the utility hole system on Eglantine Driveway.
- Building 16 (National Defense Data Centre) has a splice location that supports distribution to the entire campus.
- Several other splice locations are strategically placed in the CHCP steam tunnels.
- New aerial runs and installations follow a modernized approach, ensuring future-proof infrastructure.

Other Discussion:

- Zayo supports our approach to provide temporary feeds to all buildings via new infrastructure, noting that their installation and planning would be triggered by an order from a tenant or SSC.
- Zayo needs to understand the financial model of this development. As the property is currently considered private, the GoC is responsible for providing the main pathways (poles, ducts, tunnels) to allow for the installation of Zayo cabling. It is recommended to hold a follow-up meeting with Zayo to discuss financial responsibilities for temporary infrastructure to ensure development timelines are not affected.

Zayo group currently has cable deployment in the following buildings:

Building	Fibre Optic
R. H. Coats Building (1)	Yes
Main Building (3)	Yes
Jean Talon Building (5)	Yes
Brooke Claxton Building (9)	Yes
Central Heating and Cooling Plant (13)	Yes
National Defence Data Centre (16)	Yes
Personnel Records Centre (18)	Yes
Jeanne Mance Building (19)	Yes

Table 3: Zayo Group Cable Deployment at Tunney's Pasture

PLEASE PROCEED TO FOLLOWING PAGE FOR ILLUSTRATION

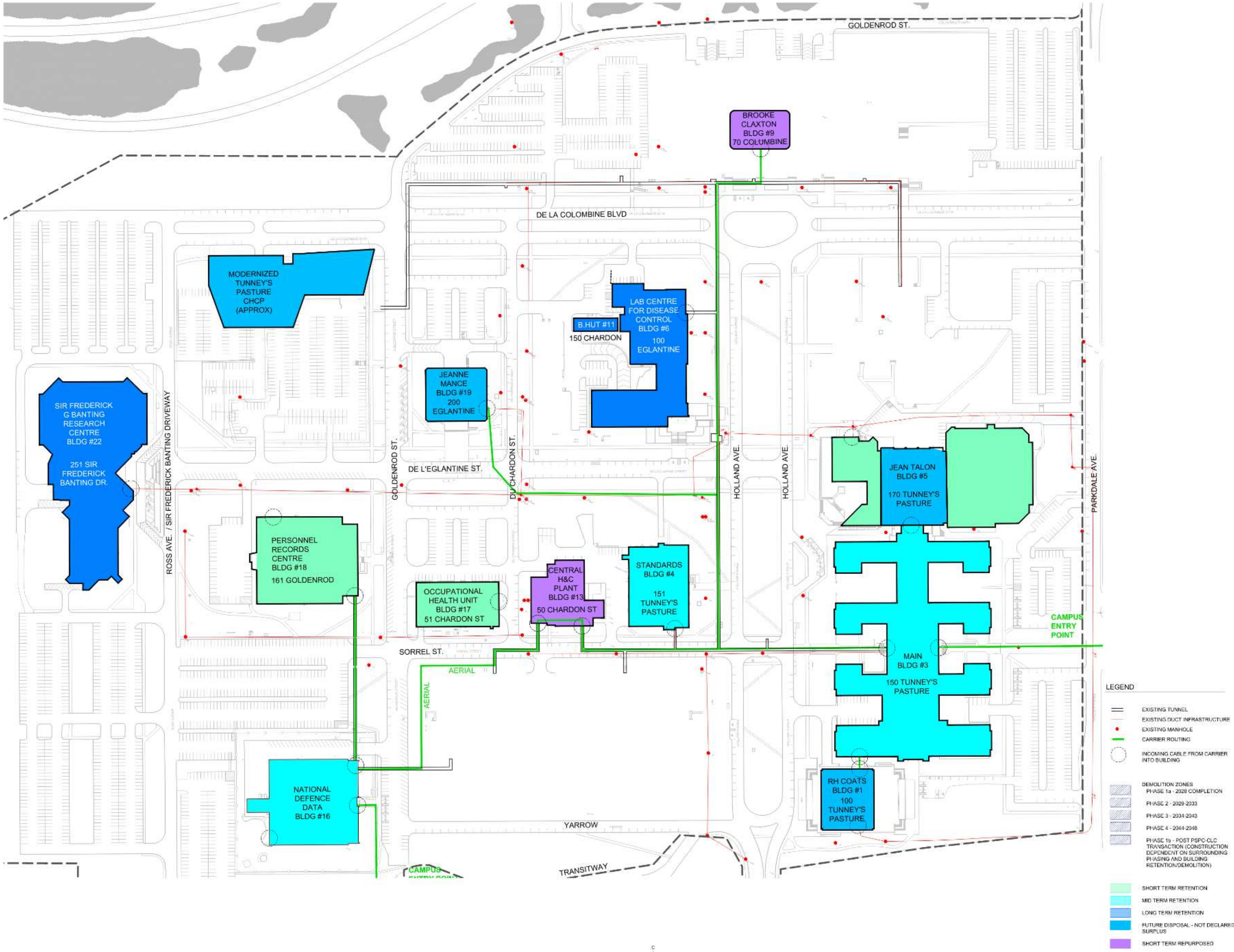


Figure 6: Existing Zayo Fibre Routing at Tunney's Pasture

TELUS

Several meetings were held with TELUS who has confirmed that there facilities are installed on other carriers fibre optic facilities – specifically at 101 Golden Road using Rogers Fibre (and possibly Birch Hill Dark Fibre).

Phased Approach

The buildings within Tunney's Pasture campus have been categorized into various retention periods to facilitate a structured redevelopment plan. These categories are as follows:

- Short Term Retention (1-5 years): Buildings identified for short-term retention will be maintained and operational for the next 1-5 years. During this period, necessary infrastructure upgrades and temporary solutions will be implemented to ensure seamless connectivity and functionality.
- Mid Term Retention (5-10 years): Buildings in this category will remain operational for the next 5-10 years. These buildings will undergo phased infrastructure enhancements, including the installation of new fiber optics and the establishment of independent cable entrances to minimize interdependencies.
- Long Term Retention (20+ years): Buildings slated for long-term retention will be integral parts of the campus for the next 20+ years. Comprehensive infrastructure upgrades will be undertaken to future-proof these buildings, ensuring they meet the technological demands of the coming decades.
- Future Disposal – Not Declared Surplus: These buildings will remain on the campus but may potentially be transferred to another owner. Infrastructure planning for these buildings will include provisions for easy transfer of ownership, ensuring that new owners can seamlessly integrate their own telecommunication systems.
- Short Term Retention – Repurposed: Buildings in this category will be maintained for short-term use but will be repurposed. Infrastructure adjustments will be made to accommodate their new functions while ensuring minimal disruption to existing services.

The diagram on the following page prepared by Arcadis, visually represents the categorization and phased approach for each building within the campus. By categorizing the buildings into these retention periods, we can implement a phased approach that ensures continuous operation and connectivity across the campus. This structured plan allows for systematic upgrades and infrastructure enhancements tailored to the specific needs and timelines of each building category.

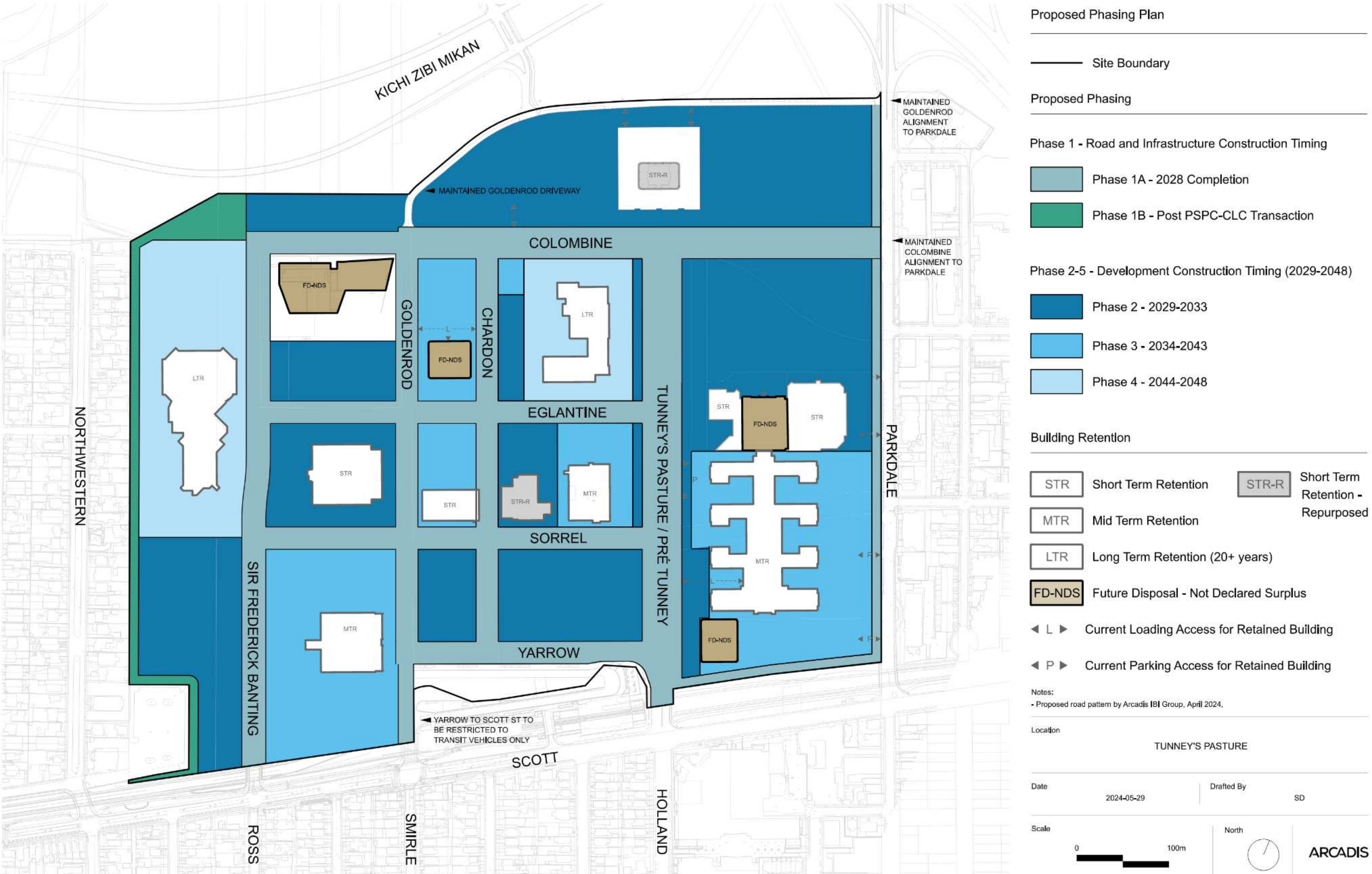


Figure 7: Proposed Phasing Plan For Tunney's Pasture Campus (All Phases, Drawing 1)

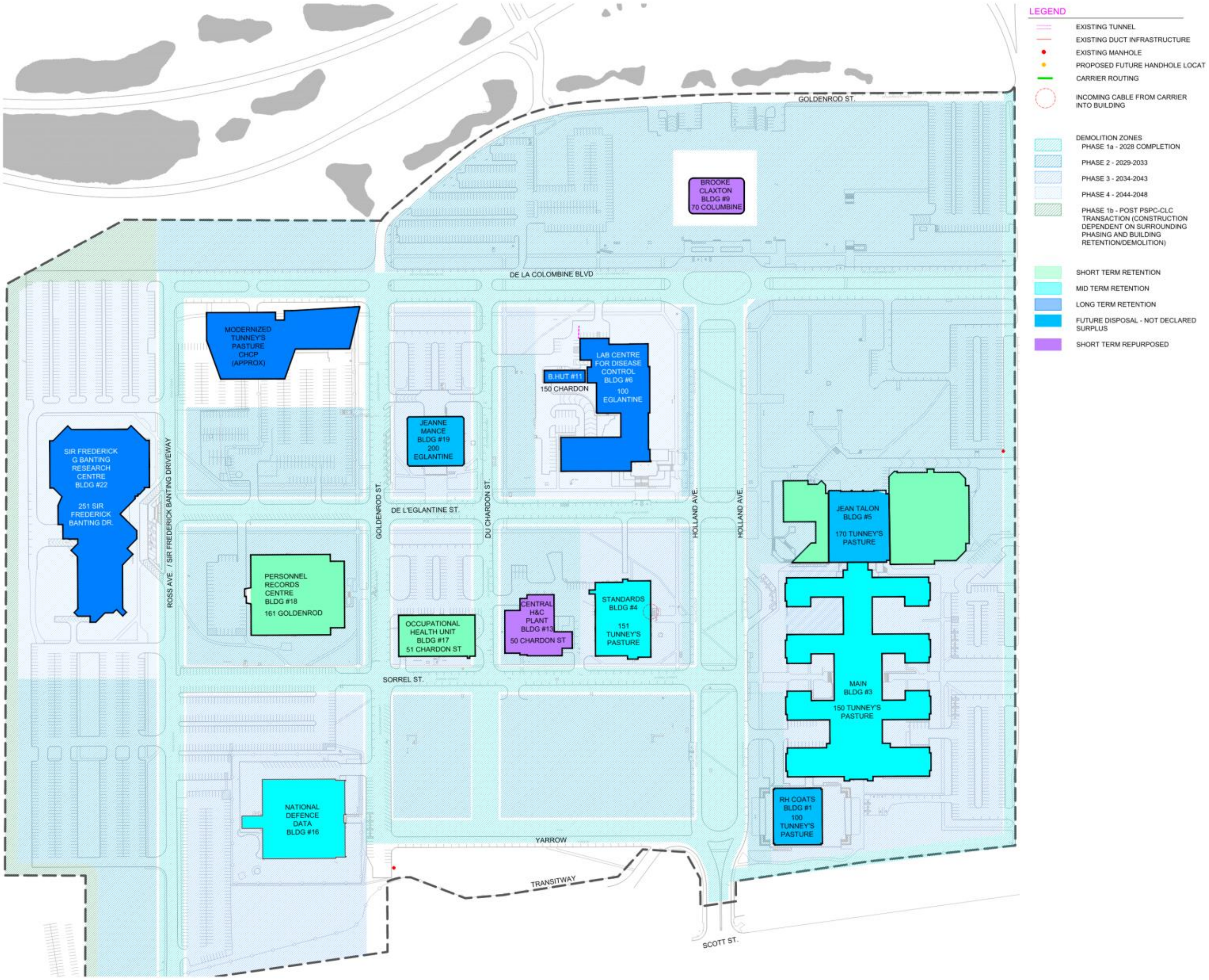


Figure 8: Proposed Phasing Plan For Tunney's Pasture Campus (All Phases, Drawing 2)

Figure 9: Phase 1a Illustration

Figure 10: Phase 1b Illustration

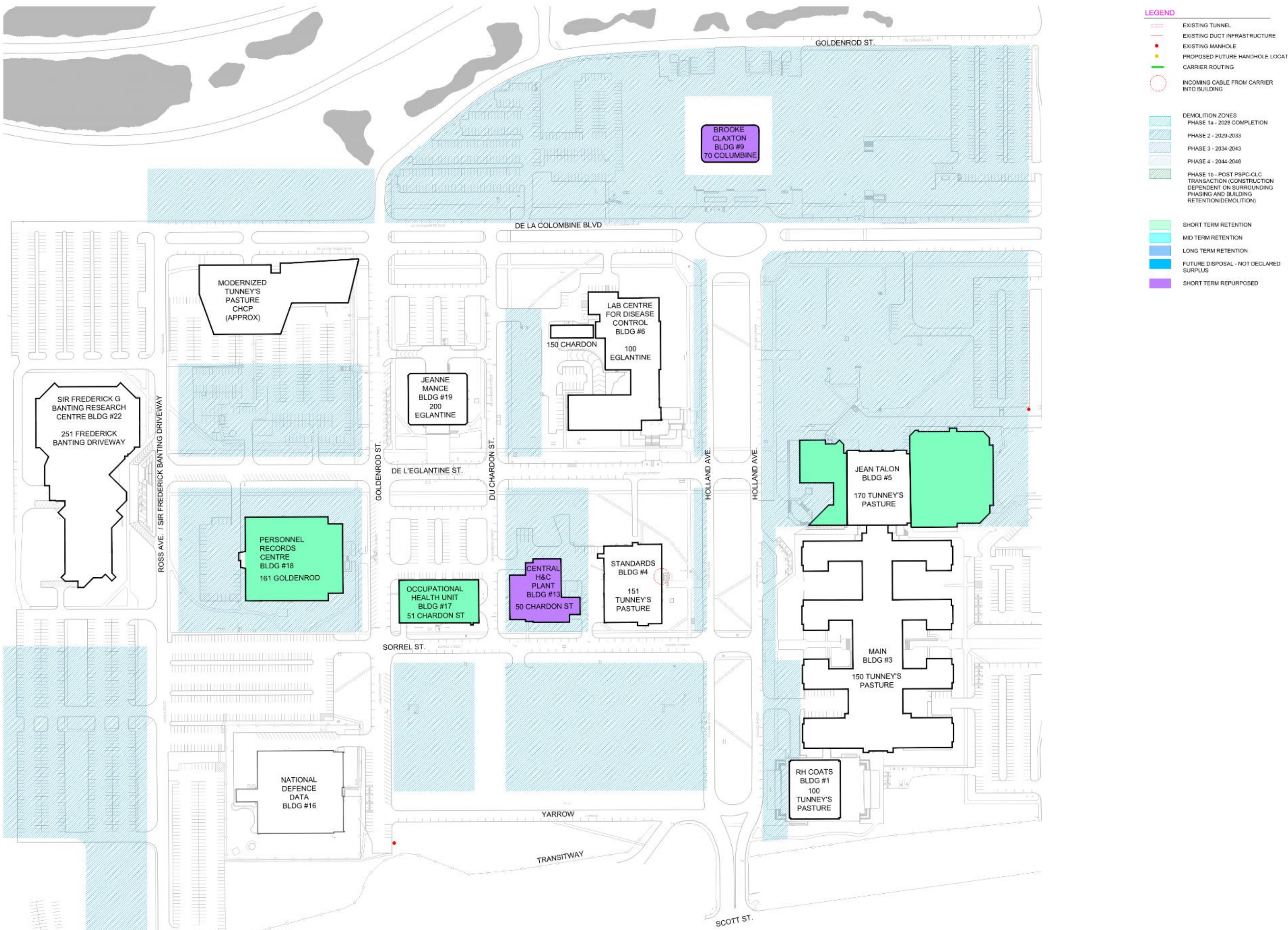


Figure 11: Phase 2 Illustration

Figure 12: Phase 3 Illustration

Figure 13: Phase 4 Illustration

Figure 14: Remaining Structures w/ New Roadways Following Completion of Project

Short Term Retention - Repurpose

The following buildings are slated for demolition between year zero and five of the development plan. There is an additional building labelled Short-Term Retention – Repurpose. For the sake of this report, they are both included here as well. The buildings labelled Short Term Retention, are Occupational Health Unit (17) and Personnel Records Centre (18). The other two short term retention – repurpose are the Brooke Claxton Building (9) and the (old) Central Heating and Cooling Plant (13).

The Brooke Claxton Building (Building 9)
Address: 70 Columbine

The Brooke Claxton Building (Building 9) is a 19-storey (67M) office tower built in 1965. Located at 70 Columbine Driveway, the building has a net rentable area of 21,056 m2.

The Brooke Claxton Building

Building 9 currently has one entrance into the building; it is as follows:

- One from the steam tunnel system on the south side directly into the building. This is a significant issue as the only feed into the building is via steam tunnels that will be impacted by development. Suggestion is to install new temporary services directly from Parkdale from a minimum of two (2) carriers.

Communications cabling is feed to the building by a combination of utility hole/duct systems and existing steam tunnels.

The in addition to the steam tunnels, outside plant ducts and maintenance holes, the following buildings are considered important to maintaining of telecommunications services to the Brooke Claxton Building; elimination of any of these buildings will negatively affect the Brooke Claxton Building in terms of telecommunications services.

- Building 3 (the main building) is an essential building for the distribution of communication services to the Jean Mance Building as it serves as the main communications hub for both copper and fiber optic systems.
- Building 13 (Central Heating and Cooling Plant (CHCP)) serves as a distribution pathway for cables going from an east-west direction of the campus and may serve as a pathway for redundant fiber optic connections from the west.
- Building 16 (National Defense Data Centre) serves as an entry point for several carriers and is part of the redundant link to the Main building (3) for some carriers.

It is also one of the main pathways from the west end of the campus that distributes to other buildings.

- Building custodial transfer to Health Canada
- 2 x OGD in building
- Dual GCBB WAN supplied by Carriers
- Possible BGIS and Commissionaires

The Central Heating & Cooling Plant (CHCP) (Building 13)
Address: 50 Chardon

The Central Heating and Cooling Plant (CHCP) (Building 13) is a low-rise steam plant. Built in 1952, the building is located at 50 Chardon Driveway

1. This building has three entry points. They are as follows:
2. From the south going west thru the CHCP Steam tunnels.
3. From the south going east thru the CHCP Steam tunnels.
4. From west to the Government owned utility hole system

The CHCP Building

The elimination of this building would have a potentially negative effect on the following buildings since it is a major pathway east-west:

- R. H. Coats Building (1)
- Finance Building (2)
- Main Building (3)
- Standards Building (4)
- Jean Talon Building (5)
- Laboratory Centre for Disease Control (6)
- Environmental Health Building (8)
- Brooke Claxton Building (9)
- Butler Hut (11)
- Finance Annex (14)
- National Defense Data Centre (16)
- Occupational Health Unit Building (17)
- Personnel Records Centre (18)
- Jeanne Mance Building (19)
- Sir Frederick G Banting Research Centre (22)

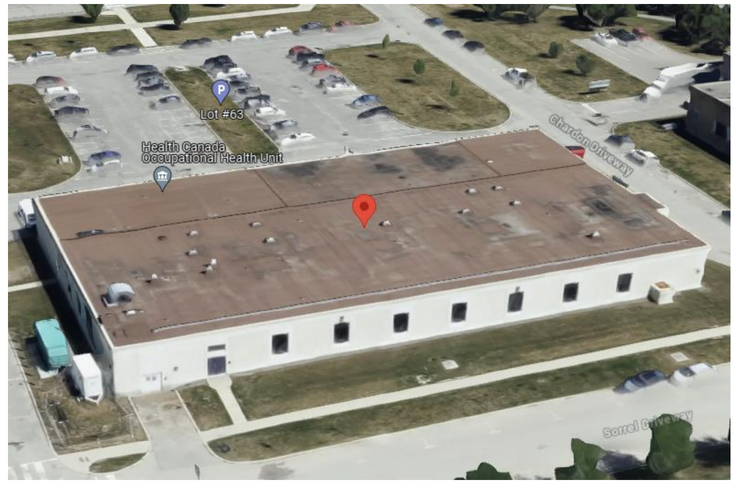
Occupational Health Unit (Building 17)
Address: 51 Chardon

Built in 1956, the Occupational Health Unit (Building 17) is a low-rise building located at 51 Chardon Driveway.

This building has the following entry point:

1. Ducts enter the east of building from a utility hole duct system located on Chardon Driveway

This building does not appear to have any building interconnections that would be affected if eliminated.



Occupational Health Unit

Personnel Records Centre (Building 18)
Address: 161 Goldenrod

Built in 1965, the Personnel Records Centre (Building 18) is a low-rise building located at 161 Goldenrod Driveway.

This building has the following entry points:

1. From the south using the CHCP Steam tunnels.
2. From the north ducting to the Eglantine utility hole system.

The Personnel Records Centre

The elimination of this building would have a potentially negative effect on the following buildings:

- R. H. Coats Building (1)
- Finance Building (2)
- Main Building (3)
- Standards Building (4)
- Jean Talon Building (5)
- Laboratory Centre Disease Control (6)
- Environmental Health Building (8)
- Brooke Claxton Building (9)
- Butler Hut (11)
- Central Heating and Cooling Plant (13)
- Finance Annex (14)
- National Defense Data Center (16)
- Occupational Health Unit Building (17)
- Jeanne Mance Building (19)
- Sir Frederick G Banting Research Centre (22)

Mid Term Retention

These buildings are slated to be removed during the 10-to-15-year phase of the development. The buildings in this phase are the Main Stats Building (3), Standards Building (4), and the National Defence Building (16).

Main Stats Building (Building 3)
Address: 150 Tunney's Pasture Driveway

Main Stats Building

The building was completed in 1952 and is a four-storey federal government office building located in the Tunney's Pasture area of Ottawa. It is connected on the north side by the Jean Talon Building and on the south side by the R. H. Coats Building has the following entry point:

- Building 3 (the main building) is an essential building for the distribution of communication services to the RH Coats, to Jean Talon and is integrally interconnected both physically and from a telecommunications perspective. With all carriers using it for distribution, it serves as the main communications hub for both copper and fiber optic systems to all buildings within Tunney's Pasture.
- Has a main Bell Hub (DMS) with a connection to Place du Portage IV (PdP IV)
- Centre location for copper switching to entire campus
- Dual GCBB WAN connectivity
- Centrex of over 450 lines
- SSC has a new lab in Main Stats
- Call Centre
- Former data centre, some power generation capability for future
- BGIS and Commissionaires connectivity present
- Has a DAS (Distributed Antenna System for Cellular coverage)
- House Stats, Health, SSC and PSPC on various floors
- Census considerations 2025-2027

Standards Building (Building 4)
151 Tunney's Pasture Driveway


The Standards Building

Built in 1954, the Standards Building (4) is a low-rise office building located at 151 Tunney's Pasture Driveway.

This building has the following entry point:

1. From the south using the CHCP Steam tunnels

This building does not appear to have any building interconnections that would be affected if eliminated.

National Defence Data Centre (Building 16)
Address: 101 Goldenrod Driveway


National Defence DC

National Defence Data Centre (Building 16) is located at 101 Goldenrod Driveway. This building is an MSEC zone building (no copper/Fibre only).

This building has four entry points. They are as follows:

1. From the north using the CHCP Steam tunnels,
2. From the east using the CHCP Steam tunnels,
3. South from underground ducts from aerial campus entry off Scott Avenue
4. West from Bell Canada campus entry ducts from Northwestern Avenue

The elimination of this building would have a potentially negative effect on the following buildings:

- R. H. Coats Building (1)
- Finance Building (2)
- Main Building (3)
- Standards Building (4)
- Jean Talon Building (5)
- Laboratory Centre Disease Control (6)
- Environmental Health Building (8)
- Brooke Claxton Building (9)
- Butler Hut (11)
- Central Heating and Cooling Plant (13)
- Finance Annex (14)
- Occupational Health Unit Building (17)
- Personnel Records Centre (18)
- Jeanne Mance Building (19)
- Sir Frederick G Banting Research Centre (22)

Long Term Retention

These buildings are slated to be removed during the 20-to-25-year phase of the development. The building in this phase includes the Lab Centre for Disease Control (6), The Bulter Hut (11) and the Frederick Banting Building (22).

Laboratory Centre for Disease Control (Building 6)
Address: 100 Eglantine Drive

The Laboratory Centre for Disease Control (LCDC) Building is a low-rise laboratory located at 100 Eglantine Driveway.

LCDC Building

Entry Point:

1. From the south using the CHCP steam tunnels.

The elimination of this building would have a potentially negative effect on the following buildings:

- The Butler Hut (11)
- LCDC has an OGD presence and Dual GCBB WAN, all supplied by carrier fibre.
- Both Bell and Rogers have fibre in this building.
- Bell has copper in this building.

Butler Hut (Building 11)
Address: 150 Chardon Drive

The Butler Hut is a low-rise building located at 150 Chardon Driveway. Built in 1955, it is physically connected to the Laboratory Centre for Disease Control (Building 6).

LCDC Building

Entry Point:

1. From the east through the directly attached Laboratory Centre for Disease Control (Building 6).

This building does not appear to have any building interconnections that would be affected if eliminated.

Sir Frederick Banting Research Centre (Building 22)
Address: 251 Sir Frederick Banting Drive

Sir Frederick Banting Building

Built in 1978, the Sir Frederick Banting Research Centre is a low-rise research building located at 251 Sir Frederick Banting Driveway.

Entry Point:

1. Ducts enter the east of the building from a utility hole duct system located on Eglantine Driveway.

This building does not appear to have any building interconnections that would be affected if eliminated.

Additional Information:

- Alternative site for Brooke Claxton.
- Dual GCBB WAN and Rogers fibre for on-site labs.
- CANARIE connectivity at building demarcation point.

Future Disposal – Not Declared Surplus

R.H. Coats Building (Building 1)
Address: 100 Tunney's Pasture Drive

R.H Coats Building

The R.H. Coats Building is a multi-story commercial office building located at 100 Tunney's Pasture Driveway. Completed in 1976, it stands at 26 stories (99 meters) tall, making it the tallest tower in Tunney's Pasture, with 40,829 square meters of rentable floor space.

As the R.H. Coats Building is physically connected to the Main Stats Building, most cabling services are provided internally between the buildings. However, there are exceptions where cables are installed from the Main Stats Building through a utility hole system to the east side of the R.H. Coats Building. This pathway from the government-owned utility hole duct system enters the south side of the building.

In addition to the steam tunnels, outside plant ducts, and utility holes, the following buildings are essential to maintaining telecommunications services to the R.H. Coats Building. The elimination of any of these buildings would negatively affect telecommunications services:

- Building 3 (Main Building): An essential building for distributing communication services to the R.H. Coats Building. It is integrally interconnected both physically and from a telecommunications perspective. Serving as the main communications hub, it supports both copper and fiber optic systems used by all carriers.
- Building 13 (Central Heating Plant): Serves as a distribution pathway for cables coming from the west of the campus and may provide a redundant fiber optic connection pathway.
- Building 16 (National Defense Data Centre): Acts as an entry point for several carriers and is part of the redundant link to the Main Building (3).

Additional Information:

- Approximately 200 Centrex telephone lines are still in service from the RLM in the Main Stats Building.
- Both BGIS and Commissionaires have services in this building.

- A helpdesk to support Census 2026 will open in early summer 2024 (this can be temporarily relocated with 2-3 weeks' notice).
- The helpdesk is not a physical location but is spread throughout Stats Can buildings, including R.H. Coats, Main, and Jean Talon.
- The building is currently undergoing densification (2,500 people).
- Key blackout dates start in August 2025 and extend through December 2027 due to the Census.
- The peak period for the Census is from April 2026 to August 2026.
- The building has a full WiFi system and Distributed Antenna System (DAS) in place.
- Some backup generator power is available on-site.
- Bell Copper/Zayo POP is in the basement wall closet in the BGIS Ops room, SW Corner.

The Jean Talon Building (Building 5)
Address: 170 Tunney's Pasture Drive

Jean Talon Building

The Jean Talon Building is a 13-story (44 meters) commercial office building constructed in 1979. Located at 170 Tunney's Pasture Driveway, it is directly attached to the Main Building (Building 3). The building has a total of 60,906 square meters of floor space in both its high-rise and low-rise sections.

As the Jean Talon Building is physically connected to the Main Stats Building, most cabling services are provided internally between the buildings. However, there are some exceptions where cables are installed from the Main Stats Building through a utility hole system to the east side of the Jean Talon Building. This pathway from the government-owned utility hole duct system enters the north side of the building.

In addition to the steam tunnels, outside plant ducts, and utility holes, the following buildings are essential to maintaining telecommunications services to the Jean Talon Building. The elimination of any of these buildings would negatively affect telecommunications services:

- **Building 3 (Main Building)**: An essential building for distributing communication services to the Jean Talon Building. It is integrally interconnected both physically and from a telecommunications perspective. Serving as the main communications hub, it supports both copper and fiber optic systems used by all carriers.

- **Building 13 (Central Heating Plant)**: Serves as a distribution pathway for cables coming from the west of the campus and may provide a redundant fiber optic connection pathway.
- **Building 16 (National Defense Data Centre)**: Acts as an entry point for several carriers and is part of the redundant link to the Main Building (3).

Additional Information:

- The building is currently undergoing full renovation.
- The building is undergoing densification (2,500 people).
- Key blackout dates start in August 2025 and extend through December 2027 due to the Census.
- The peak period for the Census is from April 2026 to August 2026.
- The building has a full WiFi system and Distributed Antenna System (DAS) in place.
- Some backup generator power is available on-site.
- Bell Copper/Rogers & Zayo POP located in B-1E-7 Basement NW.

Jeanne Mance Building (Building 19)
Address: 200 Eglantine Drive

Built in 1969, the Jeanne Mance Building is a multi-story commercial office tower located at 200 Eglantine Driveway. The building stands 21 stories high (77 meters) and has a rentable floor space of 32,755 square meters.

Building 19 currently has two entrances:

- From the Eglantine utility hole/duct system directly into the east side of the building.
- From the same Eglantine utility hole/duct system that travels up Chardon Ave and then into the east side of Building 19.

Jeanne Mance Building

Communications cabling is fed to the building by a combination of utility hole/duct systems and existing steam tunnels.

In addition to the steam tunnels, outside plant ducts, and utility holes, the following buildings are essential to maintaining telecommunications services to the Jeanne Mance Building. The elimination of any of these buildings may negatively affect telecommunications services:

- **Building 3 (Main Building)**: An essential building for distributing communication services to the Jeanne Mance Building. It serves as the main communications hub for both copper and fiber optic systems.
- **Building 13 (Central Heating and Cooling Plant (CHCP))**: Serves as a distribution pathway for cables running east-west across the campus and may provide a redundant fiber optic connection pathway.
- **Building 16 (National Defense Data Centre)**: Acts as an entry point for several carriers and is part of the redundant link to the Main Building (3) for some carriers. It is also one of the main pathways from the west end of the campus that distributes to other buildings.
- **Building 18 (Personnel Records Building)**: Serves as a pathway from Building 16 (National Defense Data Centre) to the Eglantine utility hole/duct systems, which appears to serve the Jeanne Mance Building, at least as a redundancy route.

Additional Information:

- Dual GCNet WAN by carriers.
- Currently houses both Health Canada and Indigenous Services of Canada (ISC).
- This building will be more difficult than others to provide temporary service based upon its location in the centre of the campus.

In Building Networks

Further Investigation and Inventory Requirements

As we advance into the next stages of the Tunney's Pasture Redevelopment project, it is essential to emphasize the necessity of further investigation within each building. While this report provides a comprehensive overview of the current telecommunications infrastructure, a more detailed examination will be required once the development phasing is solidified. This step is crucial to ensure that all potential disruptions are anticipated and managed effectively.

Prior to disconnecting any circuits, it is imperative to conduct a thorough inventory of intra-building networks. This inventory will help identify any in-building systems that may have been added since the last assessment. These systems might include security networks, internal communication systems, or specialized equipment networks that are not captured in the current report. Understanding the full scope of these networks is vital to prevent any unintended service interruptions during the transition phase.

Moreover, as development phases are detailed and finalized, targeted investigations within each building will provide valuable insights into the specific needs and dependencies of the existing infrastructure. This approach ensures that we can tailor our transition plans to address unique building requirements, thereby minimizing risk and maintaining service continuity. Comprehensive documentation of these findings will further support our strategy, ensuring all stakeholders are well-informed and prepared for the changes ahead.

During the Attain Groups consultation and analysis, it was determined that new Main Telecommunications Rooms (MTR's) and Entrance Facility (EF) /Carrier Room should be established in all the key buildings as well as all new commercial buildings. These rooms would have established minimum sizes and requirements.

Provisions for future in building wireless in the form of distributed antenna systems (DAS), rooftop pathways and 5G cell services must also be taken into consideration.

All key buildings, as part of the first phase of the redevelopment, should have new MTR's and EFs constructed to allow for proper termination points regarding the new infrastructure design.

Main Telecommunications' Room (MTR)

The Main Telecommunications Room (MTR) serves as the building focal point for telecommunications related services. Voice, data, ISS, and CATV will emanate from this room vertically to all required Telecom Rooms within the building.

The MTR would be ideally located within 25 meters of building riser system with a minimum area of 10 m2. It would be located a dry area not subject to flooding and as close as practicable to the building entrance point and next to the electrical service room to reduce the length of bonding conductor to the electrical grounding system.

There should be no false ceiling in MTR (open to slab) and extend all walls from floor to slab and entrance doors open outwards to maximize space.

There must be provision for electrical panel within the MTR reserved only for services within the room. This panel to be serviced by an uninterruptible source with circuits dedicated solely to telecommunications requirements within the MTR. The MTR should have a Telecommunications Grounding Bus bar (TGB) connected to main telecom building ground (TMGB).

The MTR must have a dedicated HVAC system operating 24 hours per day, 7 days per week and ensure the maintenance of a positive air pressure with a minimum of one air change per hour in all telecommunications spaces.

No services (including water pipes) are to pass through telecommunications spaces apart from those relevant to the functioning of the space.

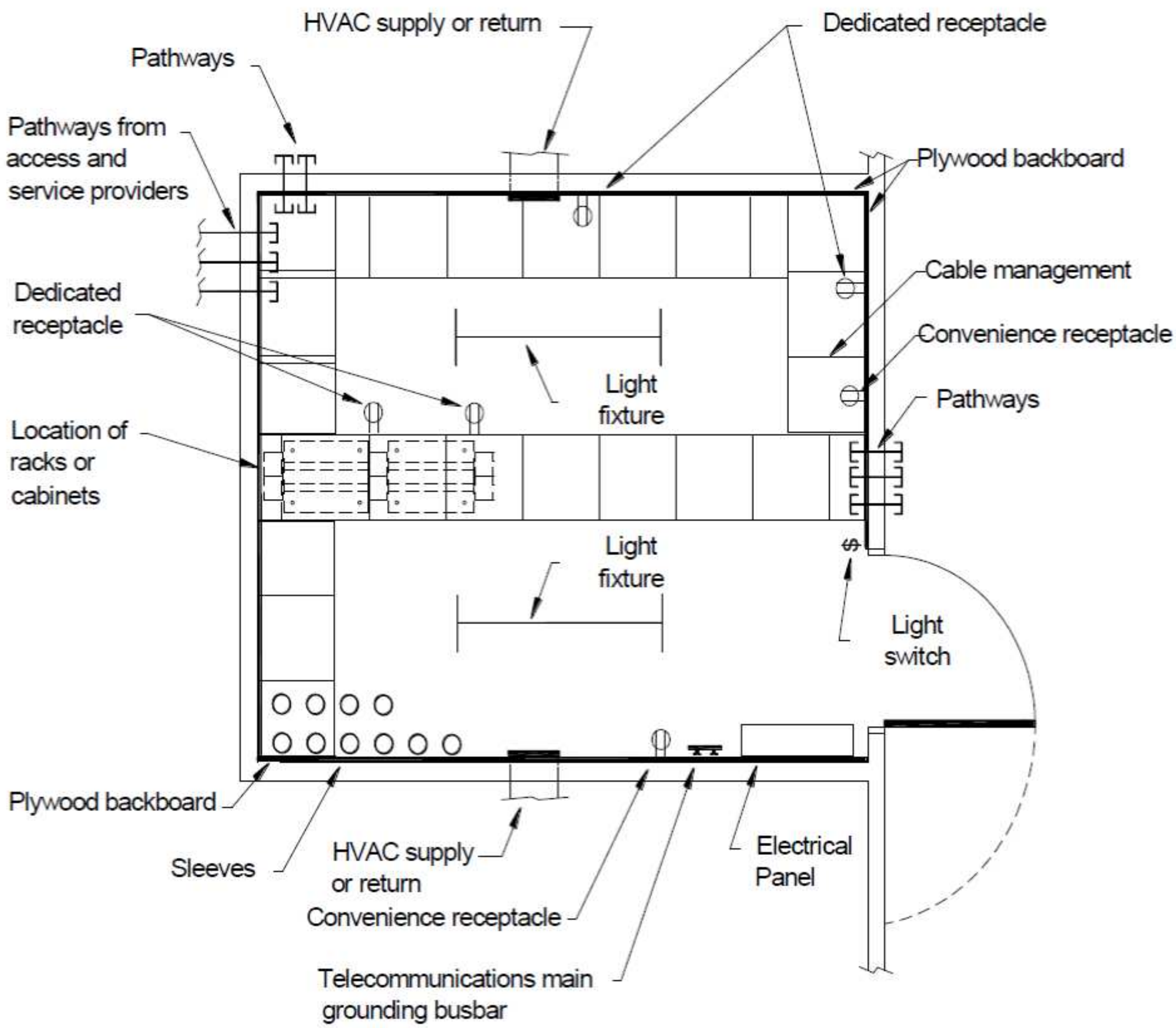


Figure 15: Typical MTR Diagram

Entrance Facility (Carrier Room)

The Entrance Facility (EF) is the telecommunications space where all cabling from outside the building will terminate. Cables may be from a telecommunications carrier such as Bell, Telus, or Rogers. Its main function is as a transition point from outside cable to indoor rated cable and as a point of demarcation for telecommunications carriers.

The EF would be ideally located within 25 meters of building riser system with a minimum area of 10 m2. It would be located a dry area not subject to flooding and as close as practicable to the building entrance point and next to the electrical service room to reduce the length of bonding conductor to the electrical grounding system.

There should be no false ceiling in EF (open to slab) and extend all walls from floor to slab and entrance doors open outwards to maximize space.

The EF should have dedicated outlets on uninterruptible supply as well as a Telecommunications Grounding Bus bar (TGB) connected to main building ground.

Pathways should be established with either tray or conduits between EF and the Main Telecommunications Room (MTR).

The entrance facility must have a dedicated HVAC system operating 24 hours per day, 7 days per week (via dedicated chilled water from ESAP supply) and ensure the maintenance of a positive air pressure with a minimum of one air change per hour in all telecommunications spaces. In addition, equipment must be connected to the emergency generator.

No services (including water pipes) to pass through telecommunications spaces apart from those relevant to the functioning of the space.

Fire protection systems and generator systems to be considered as part of the next phase design.

Roof Top Infrastructure

Wireless carriers typically require a roof-mounted antenna to provide services. Coordination for the antenna mounting requirements with known wireless service providers is essential to assess each carrier's needs.

As rooftop antenna may have a visual impact on the architecture of the building depending on the size and placement, it is important to coordinate all wireless infrastructures (antenna, enclosures, dishes, etc.) with the carriers with rooftop agreements before the installation begins.

Providing a Trade Size 53 conduit (EMT or rigid conduit) linking the building penetration to a telecommunications room located on the top floor allows for a dedicated pathway for cables of the wireless provider to be run through this conduit, through spare backbone pathways, through the Distribution Room and to the Entrance Room where their equipment would reside.

Consideration should be given for the placement of a rooftop walkway to service wireless rooftop infrastructure if required as well as for the placement of specialized standoffs, mounts, or other structures for the support of wireless rooftop infrastructure including power and cables if required.

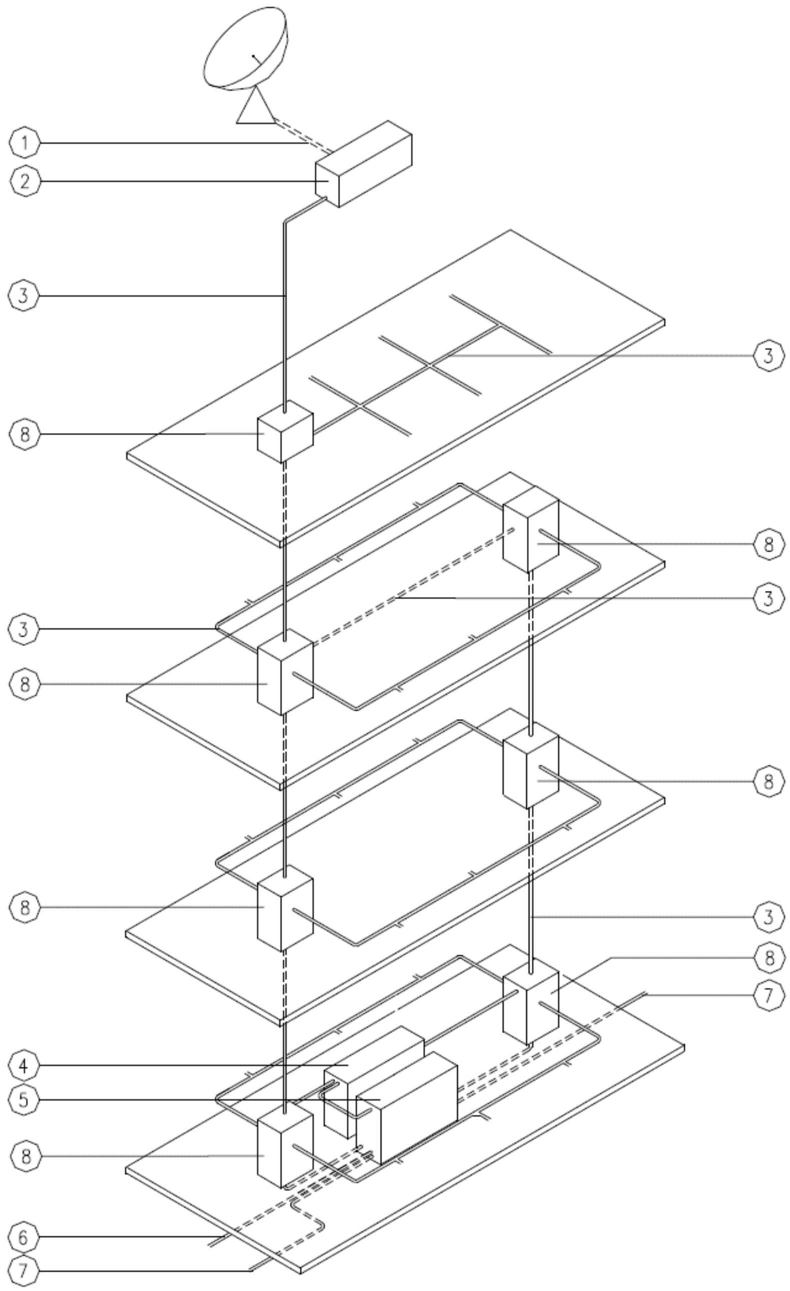


Figure 16: Typical Multi-tenant Building common spaces and pathways.

1. Wireless Service Entry
2. Entrance Facility
3. Common Building Pathways
4. Access provider space
5. Entrance Facility
6. Service Entrance Pathway
7. Diversity of Entrance Routes
8. Main Telecommunications Room

Voice Services

Technology and future operations procedure has made the use of the EEWD and other Centrex hard wired based telephony obsolete.

Future of government operations is an activity-based workspace (ABW) with no assigned desk. ABW allows the employees the freedom to decide for themselves: how to work, where to work, which tools to use and with whom to collaborate to get the work done. Employees will be mobile with the ability to work in any office space or remotely from home. Mobile wireless phones and Voice over IP (VOIP) telephony is the key to this transition due to the transferable nature of voice services.

It is highly recommended the Government agencies, located in the permanent buildings on Jean Mance and Brooke Claxton, as well as the midterm buildings of Standards Building (4), Laboratory Centre for Disease Control (6), Central Heating and Cooling Plant (13) and Sir Frederick Banting Research Centre (22), look to migrate to Voice over IP (VOIP) within the first couple years of the redevelopment. Alternatively, these government agencies could migrate to cellular, while the transition to VOIP plan is developed.

Permanent buildings Jean Talon, and RH Coats along with the Main Stats Building could look at a later migration date, due to the main switch residing in Main building and the direct connection to the other buildings.

If it is not feasible to migrate to the current technologies, there is capacity for new copper cabling in the proposed duct design. This approach would not be recommended due to costs and almost certain early abandonment.

Design Considerations

Glossary of Telecommunications Terms

Alternate Service Provider - Any telecommunications service provider other than the Incumbent Local Exchange Carrier (e.g., Bell Canada, Telus) such as MTS Allstream, also known as competitive local exchange carriers (CLECs).

Analog - Transmission method that uses electrical or physical analogies to produce a continuous signal.

Backboard A panel (e.g. wood or metal) used in mounting connecting hardware and equipment (typically 19mm (3/4") plywood).

Backbone A facility (e.g. pathway, cable, or conductors) between any of the following spaces: telecommunications rooms, common telecommunications rooms, floor-serving terminals, entrance facilities, equipment rooms, and common equipment rooms.

Bonding The permanent joining of metallic parts to form an electrically conductive path that will ensure electrical continuity and the capacity to conduct safely any current likely to be imposed.

Cable tray A support mechanism used to route and support telecommunications and other cables. Typically equipped with sides that allow cables to be placed within the sides over the tray's entire length.

Centrex - A coordinated phone service that can be leased from the local telephone company and which requires no special on-site equipment; it often includes enhanced services such as 4-digit extension dialling, call waiting, three-way calling, and off-site transfer.

Collocation - The process in which telecommunications service providers locate equipment in the same space. Collocation allows service providers to easily interconnect equipment and/or networks.

Competitive Local Exchange Carrier (CLEC) - See Alternate Service Provider above.

Easement - A right of use over the property of another.

End-User Switch - A device controlling a tenant's telecommunications system.

ILEC – Incumbent Local Exchange Carrier – the former monopolistic carriers (i.e. Bell Canada, TELUS, Rogers, Zayo, etc.).

Electronic Industries Alliance (EIA) An alliance organized along specific electronic product and market lines, and, as a standards association, develops and publishes industry guidelines.

Entrance Facility (EF) An entrance to a building for both public and private network service cables (including wireless) including the entrance point at the building wall and continuing to the entrance room or space. (TIA))

Fibre (U.K. & Canada) or **Fiber** (U.S.) Thin filament of glass or plastic that conducts a light signal.

Infrastructure A collection of telecommunications components, excluding equipment, that together provides the basic support for the distribution of all information within a building or campus.

Institute of Electrical and Electronics Engineers, Inc. (IEEE) An international organization whose purpose is to advance global prosperity by promoting the engineering process of creating, developing, integrating, sharing, and applying knowledge about electrical and information technologies by the definition and application of standards.

Interbuilding (campus) backbone A backbone network providing communications between more than one building.

Intrabuilding Backbone A backbone network providing communications within a building.

Key System - Multi-line telephone that allows the user to view and select any line serving the premises.

Local Area Network (LAN) - A limited-distance network connecting individual computer terminals, typically within a single building.

Main Telecommunications Room (MTR) The location of the cross-connect point of incoming cables from the telecommunications external network and the premises cable system. (TIA)

Utility Hole (UH) A vault located in the ground or earth as part of an underground duct system and used to facilitate placing, termination and maintenance of cables as well as the placing of associated equipment, in which it is expected that a person will enter to perform work.

Pathway - A sequence of connections that provides the connectivity between devices on a network or between networks on an Internetwork. 2. The vertical and horizontal route of the telecommunications cable. 3. A facility for the placement of telecommunications cable.

Personal Communications Service (PCS) - Digital wireless telecommunications service that operates over transmission spectrum auctioned by the FCC in 1996. Similar in application to cellular services.

Plain Old Telephone Service (POTS) - Standard analog telephone lines using a twisted pair of copper wires.

Point-of-Presence (POP) - A point where calls, data, or other electronic signals are transferred from one type of network to another.

Private Branch Exchange (PBX) - A system that allows for switching and routing of multiple lines without specific user knowledge or intervention.

Riser - A vertical or horizontal space used for utility distribution within the building.

Service Provider - Any company providing telecommunications services, including local, long distance, cellular, paging, video, data, and the Internet.

Shared PBX Services - A central switch that is established for use by multiple tenants; service is typically provided to tenants on a station-by-station basis.

Singlemode Optical Fibre Optical fibre with a small diameter, featuring a core of 8-9 micron (micrometers) and a cladding diameter of 125 micron; light is restricted to a single path, or mode, in singlemode fibre.

Strand 2. A single unit of optical fibre within a cable (e.g. a 12-strand fibre cable has twelve individual optical fibres within the cable sheath).

Switching - Interconnection of transmission equipment to provide individual communications services.

Telecommunications Any transmission, emission, and reception of signs, signals, writings, images, and sounds, that is, information of any nature by cable, radio, optical, or other electromagnetic systems.

Telecommunications Bonding Backbone (TBB) A conductor that interconnects telecommunications bonding backbones.

Telecom License Agreement - A privilege to do some act or a series of acts without possessing any estate or interest. It is usually revocable at the will of the licensor and is not assignable.

Wide Area Network (WAN) - An integrated data network linking individual computer stations or local networks over common carrier facilities.

Acronyms

ABW	Activity Based Workspace
AP	Access Point
BAS	Building Automation System
BBC	Backbone Bonding Conductor
BICSI	Building Industry Consulting Service International
CATV	Cable Television
CCTV	Closed-Circuit Television
CEC	Canadian Electrical Code
CHCP	Central Heating and Cooling Plant
COAX	Coaxial Cable
DAS	Distributed Antenna System
EF	Entrance Facility
EIA	Electronic Industries Alliance
EEWD	Enhanced Exchange Wide Area Dialing
EMT	Electrical Metallic Tubing
EP	Entrance Point
EF	Entrance Facility
ER	Equipment Room
EIA	Electronic Industries Alliance
EMT	Electrical Metallic Tubing
HVAC	Heating, Ventilation, and Air Conditioning
IEEE	Institute of Electrical and Electronics Engineers, Inc.
ILEC	Incumbent Local Exchange Carrier
IP	Internet Protocol
IT	Information Technology
IoT	Internet of Things

MTR	Main Telecommunications Room
MH	Utility hole
MM	Multimode (Fibre)
OSP	Outside Plant
PM	Project Manager
PoE	Power over Ethernet
PVC	Polyvinyl Chloride
RCDD	Registered Communications Distribution Designer
RLM	Remote Line Module
SSC	Shared Services Canada
SM	Singlemode (Fibre)
TBB	Telecommunications Bonding Backbone
TBC	Telecommunications Bonding Conductor
TIA	Telecommunications Industry Association
TMGB	Telecommunications Main Grounding Busbar
TSP	Telecommunications Service Provider
VoIP	Voice over Internet Protocol
WiFi	Wireless Fidelity

Appendix A: Contact Directory

Name	*Representing*	*Role/Title*	*E-Mail*
Derrick Hanson	Attain	Consultant - Technology	derrick.hanson@theattaingroup.com
Robert Horne	Attain	Engineering - Technology	robert.horne@theattaingroup.com
Bethany Houle	Attain	Technologist	bethany.houle@theattaingroup.com
Abs Shah	Attain	PM, Technologist	abs.shah@theattaingroup.com
James Plante	PSPC	DND Real Property Liaison	james.plante@tpsgc-pwgsc.gc.ca
Jane Hayward	PSPC	PSPC Project Manager	jane.hayward@tpsgc-pwgsc.gc.ca
Patrice Ramier	PSPC	Contract/Asset Performance	patrice.ramier@tpsgc-pwgsc.gc.ca
Pierre Lachance	PSPC	Property/Facilities Officer	pierre.lachance@tpsgc-pwgsc.gc.ca
Tom Kardaras	PSPC	Director, Physical Security	tom.kardaras@tpsgc-pwgsc.gc.ca
Tanya Boileau	PSPC	National Senior Account Manager	tanya.boileau@tpsgc-pwgsc.gc.ca
David Catana	PSPC	Executive Project Manager	david.catana@tpsgc-pwgsc.gc.ca
Cameron Smith	PSPC	---	cameron.smith@tpsgc-pwgsc.gc.ca
Darragh Kilroy	PSPC	---	darragh.kilroy@tpsgc-pwgsc.gc.ca
Stanley Leinwand	PSPC	Manager NCE (Architecture)	stanley.leinwand@tpsgc-pwgsc.gc.ca
Bianca Lagueux	PSPC	---	bianca.lagueux@tpsgc-pwgsc.gc.ca
Kelly Wojnarski	PSPC	Senior Landscape Architect	kelly.wojnarski@tpsgc-pwgsc.gc.ca
Angela Russell	PSPC	---	angela.russell@tpsgc-pwgsc.gc.ca
Susan Cook	PSPC	---	susan.cook@tpsgc-pwgsc.gc.ca
Greg Velis	PSPC	Conservation Landscape Architect	greg.velis@tpsgc-pwgsc.gc.ca
Jonathan Byrd	PSPC	Senior Urban Planner	jonathan.byrd@tpsgc-pwgsc.gc.ca
Selina Aubrey	SSC	SSC Project Manager	salina.aubrey@ssc-spc.gc.ca
Tayeb Mesbah	SSC	Optical Ring	tayeb.mesbah@ssc-spc.gc.ca
Earl Scott	SSC	GCBB	earl.scott@ssc-spc.gc.ca
Dann Bennett	SSC	SSC LAN	daniel.j.bennett@ssc-spc.gc.ca
Yvon Leblanc	SSC	LAN/WAN	yvon.lablanc@ssc-spc.gc.ca
Daniel Brouillard	SSC	Technical Support Specialist	daniel.brouillard@ssc-spc.gc.ca
Kori Skinner	SSC	WAN Engineering	kori.skinner@ssc-spc.gc.ca
Christopher Greenhorn	SSC	Technical Advisor	christopher.greenhorn@ssc-spc.gc.ca
Collingwood Twaddle	SSC	DND Telephony	collingwood.twaddle@ssc-spc.gc.ca
Rick DeVries	SSC	Infrastructure Support Operations	rick.devries@ssc-spc.gc.ca
Rejean Gagnon	SSC	Voice Services	rejean.gagnon@ssc.spc.gc.ca
Boris Milicevic	SSC	IT Technician	boris.milicevic@ssc-spc.gc.ca
Stephen Pilon	SSC	Business Analyst	stephen.pilon@ssc-spc.gc.ca
Gary Bochert	SSC	Network Engineer	gary.bochert@ssc-spc.gc.ca
Nick Lenardon	SSC	Manager OSA-SOA	nick.lenardon@ssc-spc.gc.ca
Zeinab Ayoub	SSC	Senior Network Engineer	zeinab.ayoub@ssc-spc.gc.ca
Juan Fino	SSC	Network/Data Center Architect	juan.fino@ssc-spc.gc.ca
Phillippe Carrierapereira	SSC	---	phillippe.carrierapereira@ssc-spc.gc.ca
Andrew Skoczylas	SSC	Technical Advisor	andrew.skoczylas@ssc-spc.gc.ca
Marc Grenier	SSC	Cable Plant	marc.grenier@ssc-spc.gc.ca
Eric Legault	SSC	Support Analyst	eric.legault@ssc-spc.gc.ca
Robert MacLennan	SSC	Engineering & Design Office	robert.maclennan@ssc-spc.gc.ca
Geoff Lyng	SSC	Network Analyst	geoff.lyng@ssc-spc.gc.ca
Michel Girard	SSC	SSC-SPC, Team Lead, SB-SB	michel.a.girard@ssc-spc.gc.ca
Todd Gagnon	SSC	Team Lead, WAN Operations	todd.gagnon@ssc-spc.gc.ca
Dan Gagne	SSC	Network Analyst	dan.gagne@ssc-spc.gc.ca
Luke Ferris	SSC	---	luke.ferris@ssc-spc.gc.ca
Jocelyn Guillemette	SSC	IT Technical Advisor	jocelyn.guillemette@ssc-spc.gc.ca
James Cullen	SSC	LAN/WAN Technical Advisor	james.cullen@ssc-spc.gc.ca
Boon Quah	SSC	Senior Network Analyst	boon.quah@ssc-spc.gc.ca
Blair Griezic	SSC	---	blair.griezic@ssc-spc.gc.ca
Alex Desruisseaux	SSC	Technician DND	alex.desruisseaux@ssc-spc.gc.ca
Nathalie Desrosiers	RCMP	Forensic Laboratory Team Leader	nathalie.desrosiers@rcmp-grc.gc.ca
Louise Cloutier	RCMP	Analyst, Business Analysis	louise.cloutier@rcmp-grc.gc.ca

Ghislain Cormier	RCMP	General Manager RCMP, NFLS	ghislain.cormier@rcmp-grc.gc.ca
Jeff Anderson	RCMP	---	jeff.anderson@rcmp-grc.gc.ca
Captain Blackburn	Forces	Recruitment Officer	alexandre.blackburn@ecn.forces.gc.ca
Ying Che	Forces	Senior Analyst	ying.che@ecn.forces.gc.ca
Sylvain Neveu	Forces	---	sylvain.neveu@ecn.forces.gc.ca
Francois St-Arneault	Forces	---	francois.st-arneault@ecn.forces.gc.ca
Alexander Tolentino	Forces	Manager, IT Projects	alexander.tolentino@ecn.forces.gc.ca
Stephane Chenier	Forces	Application Integration Analyst	stephane.chenier@ecn.forces.gc.ca
Irena Seifert	Stats Canada	Executive Assistant, DG	irena.seifert@statscan.gc.ca
Greg Jodoin	Pace	---	gjodouin@paceconsulting.ca
Julie Harris	Matrix	---	jharris@matrixheritage.ca
Annie Boucher	Fuse Com	---	aboucher@fusecommunications.ca
Mary Jarvis	CLC	---	mjarvis@clc.ca
Stefaniie Potvin-Caissie	CLC	---	spotvincaissie@clc.ca
Nathalie Labelle	CLC	Administrative Officer	nlabelle@clc.ca
Mikaela Coon	CLC	---	mcoon@clc.ca
Scott Hindle	CLC	---	shindle@clc.ca
Xavier Redhead	CLC	---	xredhead@clc.ca
Chris Vandyk	CLC	---	cvandyk@clc.ca
Manon Lapensee	CLC	---	mlapensee@clc-sic.ca
Julia Lattmann	CLC	---	jlattmann@clc.ca
Doug Cave	Arcadis	Associate/ Manager, Engineering	doug.cave@arcadis.com
Demetrius Yannoulopoulos	Arcadis	---	demetrius.yannoulopoulos@arcadis.com
Catriona Moggach	Arcadis	Associate, Urban Planner	catriona.moggach@arcadis.com
Nick Sutherland	Arcadis	---	nick.sutherland@arcadis.com
Stephen Albanese	Arcadis	---	stephen.albanese@arcadis.com
Jamie Rathwell	Arcadis	---	jamie.rathwell@arcadis.com
Ben Pascolo-Neveu	Arcadis	---	ben.pascoloneveu@arcadis.com
David Hook	Arcadis	---	david.hook@arcadis.com
Mara Bender	Arcadis	---	mara.bender@arcadis.com
Raymond Lee	Arcadis	---	raymond.lee@arcadis.com
Rachel Vesz	Arcadis	---	rachel.vesz@arcadis.com
Zayne Sakkal	Arcadis	---	zayne.sakkal@arcadis.com
Ge Fu	Arcadis	---	ge.fu@arcadis.com
Valérie Bouillant	Arcadis	---	valerie.bouillant@arcadis.com
Graham Winn	Rogers	Outside Planning & Engineering	graham.winn@rci.rogers.com
Martin Proulx	Rogers	Outside Plant Engineering	martin.proulx@rci.rogers.com
Aubrey MacMillan	Rogers	---	aubrey.macmillan@rci.rogers.com
Chris McTiernan	Rogers	---	chris.mctiernan@rci.rogers.com
Graham Lyons	Rogers	---	graham.lyons@rci.rogers.com
Stephane Konstantina	Bell	Access Provisioning	stephane.konstantina@bell.ca
Olga Sandri	Bell	---	olga.sandri@bell.ca
John Steele	Zayo	Outside Plant Project Manager	john.steele@zayo.com
Patrick Mossman	Telus	---	patrick.rossman@telus.com
Marie-Francoise Hamel	Telus	---	marie-francoise.hamel@telus.com
Jovica Stojanovski	Telus	---	jovica.stojanovski@telus.com
Thanh Huynh	Telus	---	thanh.huynh@telus.com
Daniel Haug	Telus	---	daniel.haug@telus.com
Luigi Carinci	Telus	---	luigi.carinci@telus.com

Appendix B: Supplementary Drawings

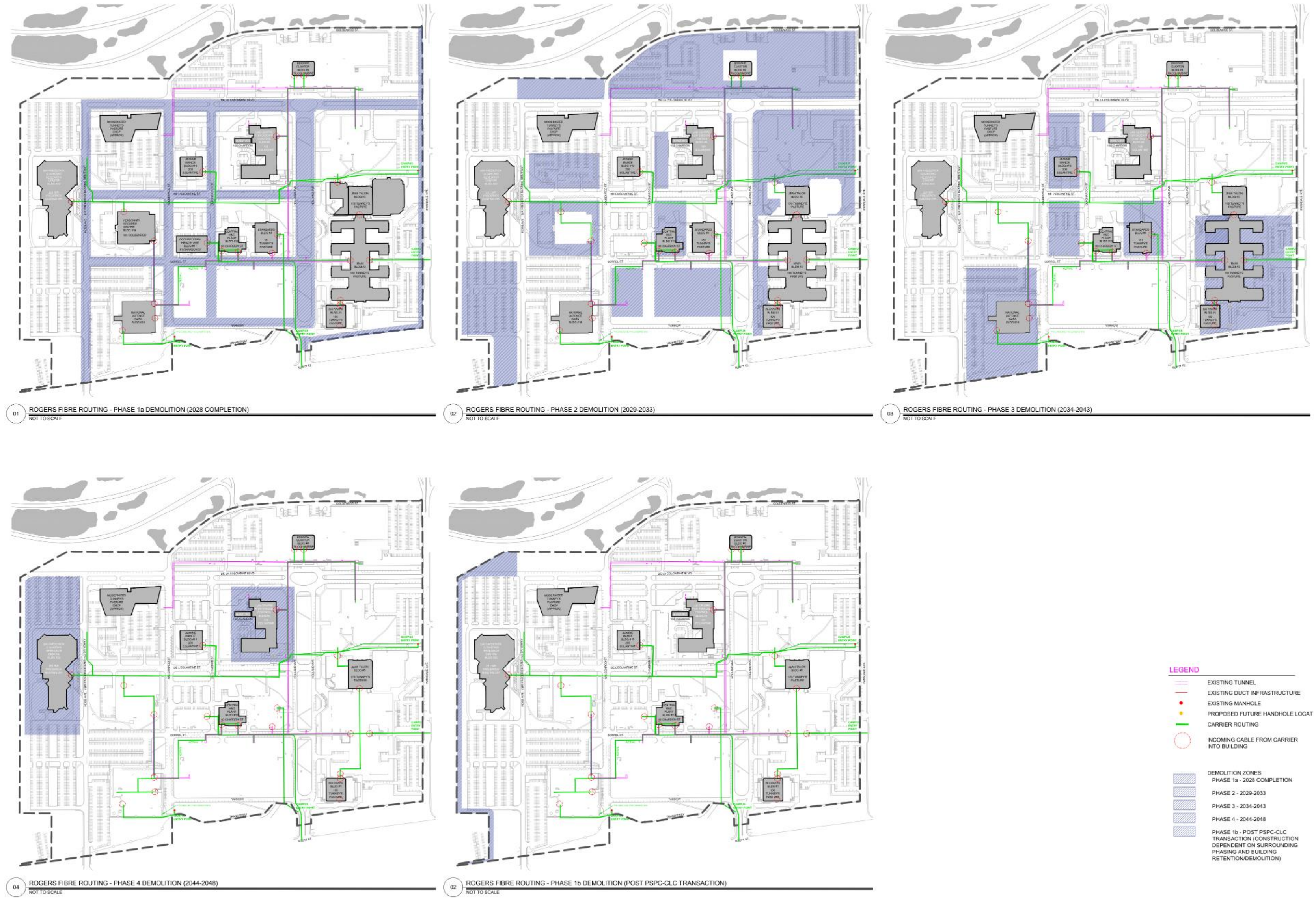


Figure 17: Rogers Fibre Routing Demolition (By Phases)

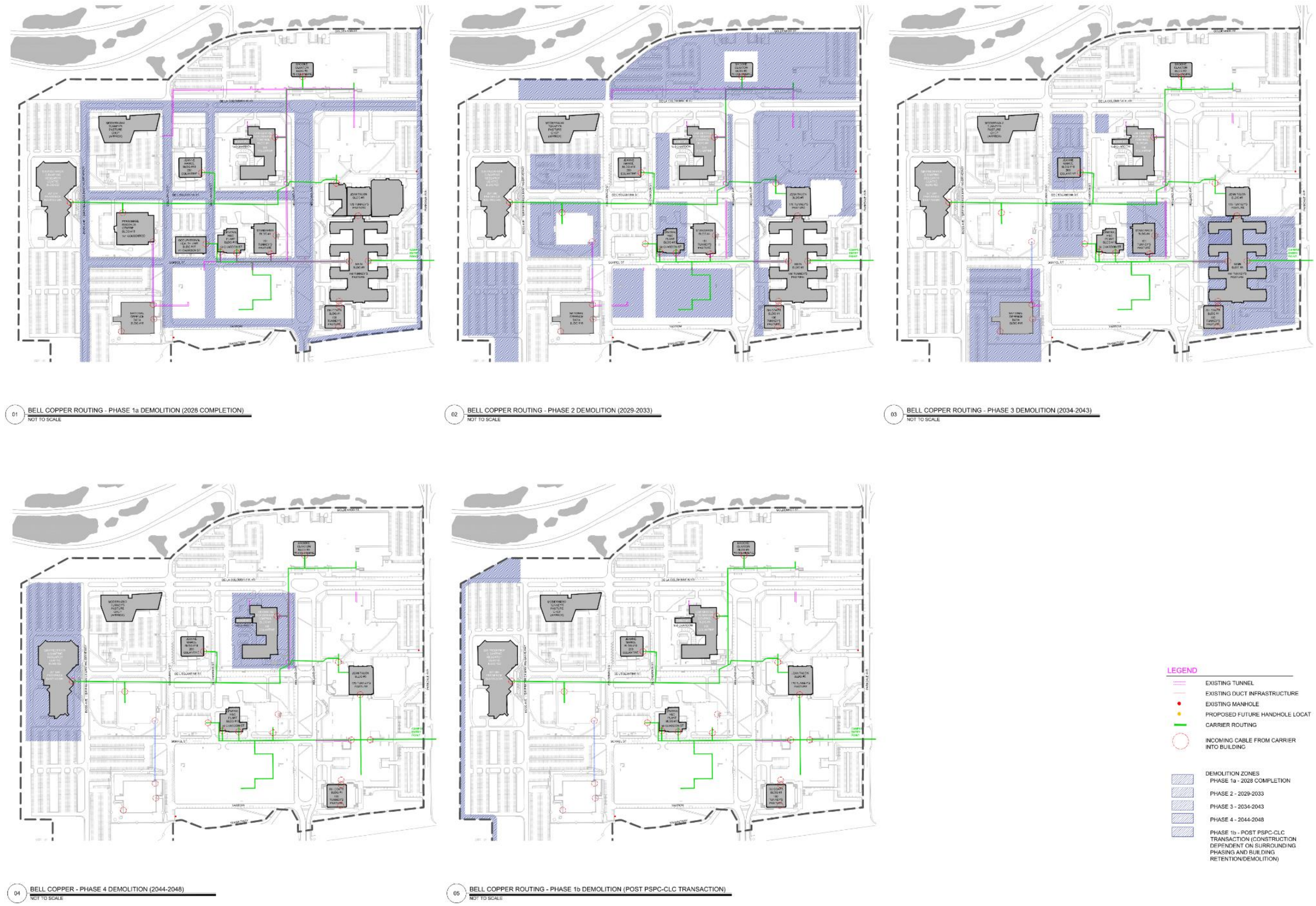


Figure 18: Bell Copper Routing Demolition (By Phases)

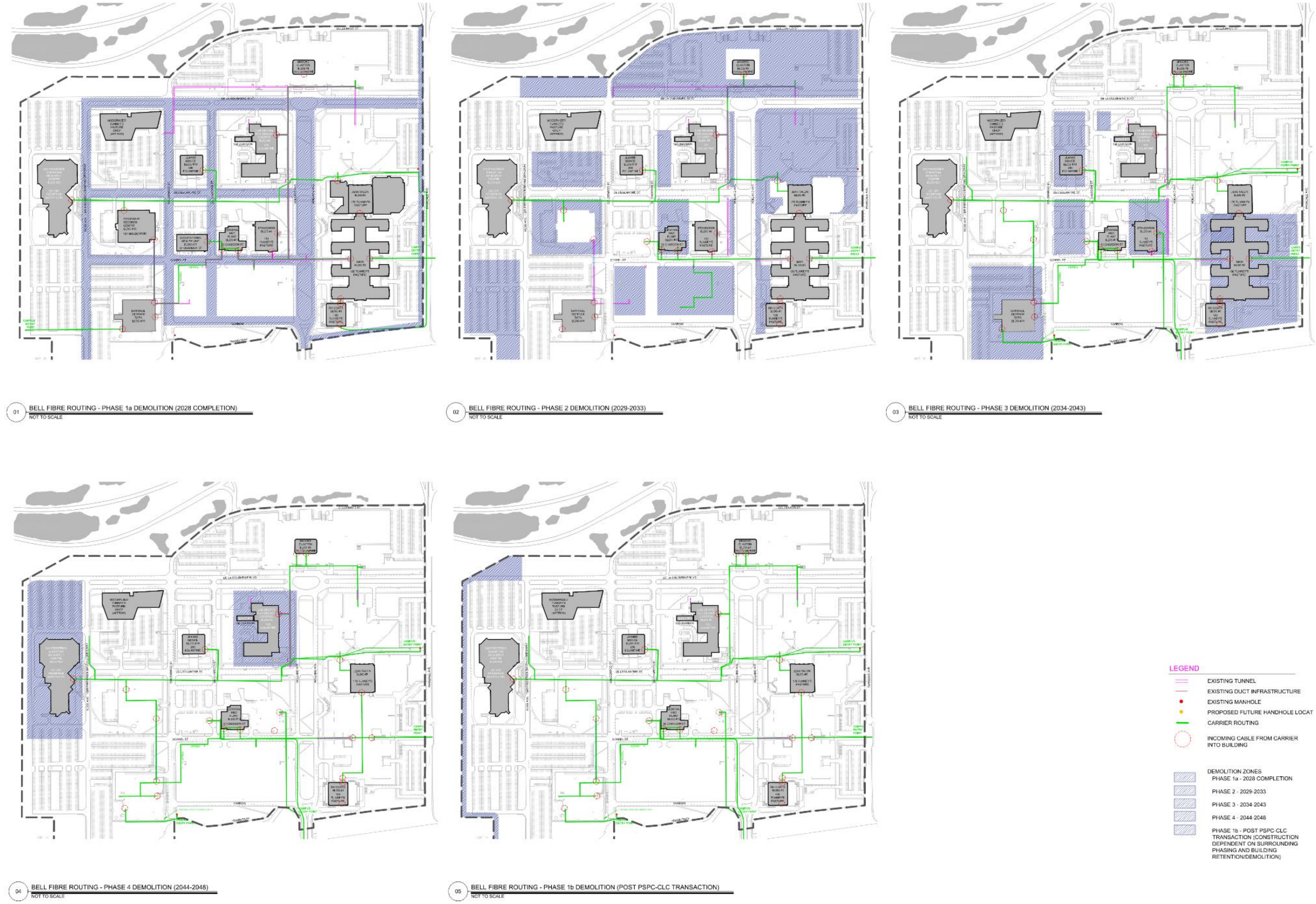


Figure 19: Bell Fibre Routing Demolition (By Phases)

Figure 20: Zayo Fibre Routing Demolition (By Phases)

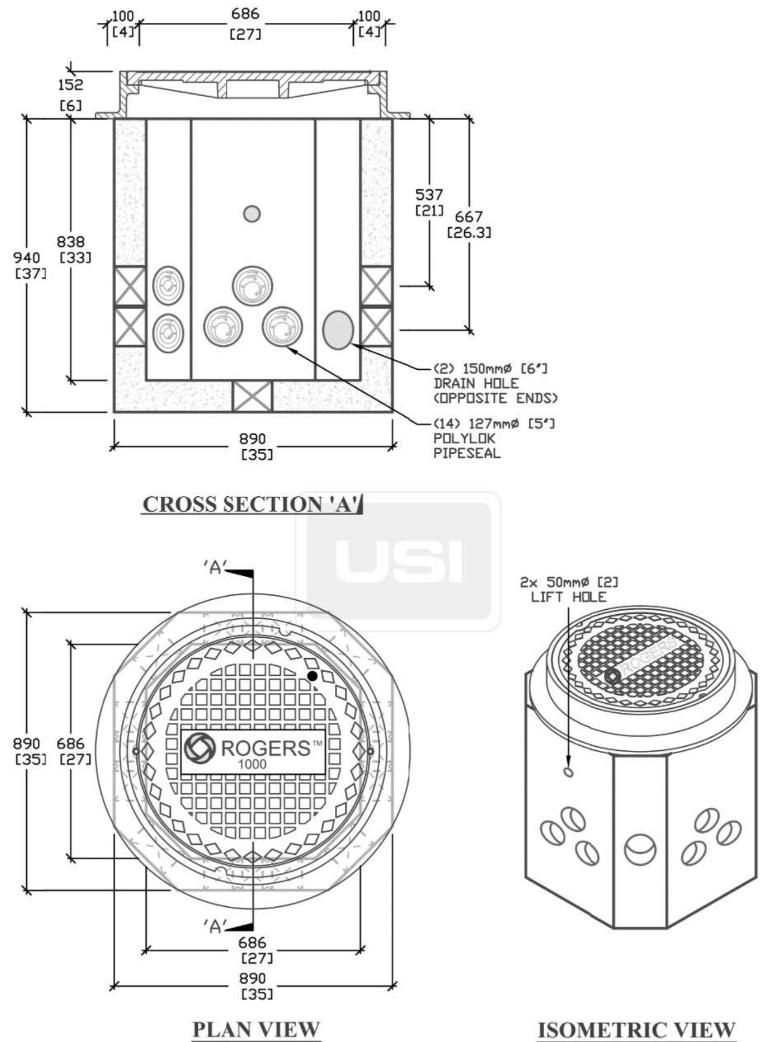


Figure 21: Proposed Handhole Detail

END REPORT

Prepared for:

Arcadis

Tunney's Pasture:

Low Impact Development Design Memo

Design Brief prepared by:

Aquafor Beech Limited

August 2024

2600 Skymark Ave, Bldg 6, Suite 202

Mississauga, ON, L4W 5B2

Reference #: 67564

Report Prepared By:

Mara Peever, B. Eng

Water Resource Analyst

peever.m@aquaforbeech.com

613-585-8368

Reviewed By:

Jake Martin, P.Eng, B. Eng, CAN-CISEC

Water Resource Engineer

Martin.j@aquaforbeech.com

519-635-5154

Chris Denich, P.Eng., M. Sc. WRE, CAN-CISEC, GIP

Senior Project Manager

Denich.c@aquaforbeech.com

647-993-2267

Table of Contents

Table of Tables

1 Project Introduction

Aquafor Beech was retained by Arcadis on behalf of Canada Lands Company (CLC) and Public Service and Procurement Canada (PSPC) to complete Low Impact Development (LID) stormwater management designs for the development at Tunney's Pasture federal government campus and the adjacent road network. The LID designs will support a Draft Plan of Subdivision application to the City of Ottawa for the proposed Right of Ways (ROW) realignments, which will be the basis for redevelopment of property parcels within the campus. The designs will also serve as an integral part of the site's ability to achieve the water balance, quality, and quantity control targets in accordance with the City of Ottawa Low Impact Development (LID) Technical Guidance Report (February, 2021), the Tunney's Pasture Master Plan (September, 2014) and Tunney's Pasture Redevelopment Project Sustainability Charter (2018).

The Tunney's Pasture Re-Development project encompasses a 49-hectare federally-owned government workplace campus primarily constructed in the 1950s and 60s. The campus is located in Ottawa, Ontario, approximately 4km west of Parliament Hill, and is bounded by the Ottawa River to the north, Laroch Park to the east, Wellington West/Hintonburg to the south and Champlain Park to the west. The Tunney's Pasture Master Plan (September, 2014) detailed plans for the re-development of the site to a sustainable, transit-oriented, mixed-use community and federal employment node over the next 25 years, including transfer of the Municipal Right of Ways to the City of Ottawa. Operation and maintenance responsibilities for the Municipal Right of Ways shall also be transferred to the City.

The purpose of this memo is to summarize the design development process including design objectives, background review, site investigations and the presentation of conceptual LID designs. The proposed LID features will contribute to the achievement of the design objectives listed in **Section 4** and advancing the work to mitigate the impacts of increased runoff and stormwater pollution.

2 Objectives of LID Implementation

Stormwater Management through LID involves treating runoff at the source and as a resource to be managed and protected. The emphasis in managing runoff at the project site will be to retain/maintain the existing infiltration of water into the ground by managing runoff through lot level (source) and conveyance (street level) LID measures using what is referred to by the Ministry of the Environment (MOE) as a "treatment train" approach to stormwater management. LID measures will be implemented on individual property parcels and combined with LID measures within the ROWs to create sustainable stormwater management features that are integrated into the fabric of the re-development project. The proposed LID measures will encourage infiltration, improve water quality, and reduce the quantity of runoff reaching local drainage features. Many opportunities exist to implement varying types of LIDs within the project area, which are detailed further in this memo.

3 Background Information

A review of both existing site conditions and relevant design standards was completed to support the development of the LID features. The following subsections outline relevant information from both review exercises.

3.1 Relevant Design Standards

The following design standards were referenced in the design development process for the proposed LID features:

1. City of Ottawa Sewer Design Guidelines (Second Edition, October 2012)
2. Stormwater Management Planning and Design Manual (Ministry of Environment, Conservation, and Parks, March 2003)
3. Low Impact Development Stormwater Management Guide (TRCA/CVC, 2010)
4. Draft - Consolidated Linear Infrastructure: Environmental Compliance Approval, Appendix A. in C. a. Ministry of the Environment (Ministry of Environment, Conservation, and Parks, March 2022)
5. Road Corridor Planning & Design Guidelines: Urban Village & Collectors – Rural Arterials & Collectors (City of Ottawa, 2008)
6. City of Ottawa Official Plan (City of Ottawa, 2022)
7. Technical Reference for Office Building Design (Public Services and Procurement Canada, 2017)
8. Tunney's Pasture Sustainability Charter (Urban Equation, 2018)

3.2 Relevant Site Studies

The following sub sections outline the relevant site studies that were referenced in support of LID design for the Right of Way regions of the Tunney's Pasture site.

3.2.1 Geotechnical Investigation

In support of detailed design, Paterson Group was retained by Arcadis Group to complete a geological investigation at the project site. The goals of the investigation were to determine the subsoil and groundwater conditions, and provide geotechnical recommendations for the design of proposed roadway and site servicing works, including construction considerations which may affect the design. This investigation was conducted between April 2, 2024 and April 5, 2024 which included the following components:

- Drilling of eighteen (18) boreholes to a maximum depth of 11.9m below ground surface (m bgs);
- Installation of ten (10) monitoring wells and groundwater level monitoring.
- Collection of soil samples from auger flights or split spoon sampler for analytical testing, and coring of bedrock to assess bedrock quality;
- Slug testing (falling and rising head testing) at six (6) groundwater monitoring well locations to establish estimated hydraulic conductivity of underlying bedrock; and
- Analytical testing of one soil sample for sulphate, chloride, resistivity and pH to assess corrosion potential for ferrous metals and potential for sulphate attacks against subsurface concrete structures.

Findings from the geotechnical investigations show the following:

- Subsurface profile was found to generally consist of fill material with an approximate thickness of 0.5 m to over 4.0 m overlaying bedrock surface or glacial till deposit consisting of silty sand with trace clay, gravel, cobbles and boulders.
- Bedrock across the majority of the site consists of limestone or limestone with dolomite interbedding and shale partings in some locations. Bedrock surface elevations range from 56 m to 64m across the site.

- Water levels were measured at a minimum of 1.98 m bgs (58.77 masl) and maximum of 6.85 m bgs (56.53 masl) on April 23, 2024. Anticipated long-term groundwater table is located within the upper 3 m of the bedrock surface, fluctuating with the depth of bedrock across the site.
- Hydraulic conductivity values of the bedrock formation range from 1.46×10^{-7} m/s to 4.61×10^{-5} m/s.

Recommendations and conclusions drawn from these findings from an LID feature design perspective included:

- Conventional infiltration based LID measures are not generally considered suitable due to shallow depth and relative impermeability of bedrock across the site. While small amounts of groundwater recharge and discharge may occur, conditions are overall not suitable for recharge and discharge on a large scale. As such, partial infiltration based LIDs are proposed and are anticipated to utilize filtration as the main control mechanism.
- Hydrostatic pressures and groundwater influx is not expected to impact service design due to low permeability of the bedrock.
- Effective control of ground water and surface water during construction is considered essential to maintaining the integrity of the bearing strata as well as maintaining the stability of excavation side slopes.
- The subgrade soils are considered to be frost susceptible, therefore care and adequate protection during winter construction will be required. 2.2 m of soil cover is recommended for protection of watermain services, and 1.8 m for storm and sanitary sewer services.
- All side slopes in overburden materials should be cut back at 1H:1V or shallower to maintain stability, or trench boxes should be used where this is not suitable.
- Bedrock stabilization measures may be required within trenches where weathered bedrock or seams/joints are observed.

3.2.2 Existing Conditions Memo

Arcadis IBI Group was retained by Canada Lands Company (CLC) and Public Service and Procurement Canada (PSPC) to complete an Existing Conditions Report (December, 2022) reviewing existing municipal infrastructure within the Tunney's Pasture federal government campus and the adjacent road network. This review of existing conditions and summary of key background information formed part of the Scoping component for the Master Servicing Study in support of a Draft Plan of Subdivision application to for the conveyance of the municipal services within newly created Right of Ways (ROW) to the City of Ottawa, and to inform the Infrastructure Upgrade and Divestiture Strategy Report. The report included a review of water network, sanitary, and stormwater infrastructure, assessing existing infrastructure as well as anticipated works, and also reviewed high level utilities (hydro, natural gas and telecommunications). Stormwater management design-related findings from the report included the following:

- **Sanitary Infrastructure:** Sanitary sewers will need to be realigned to suit the proposed ROW alignment, and some sewers need to be extended to service parcels without fronting sewers. Various sanitary sewers may also need to be removed and replaced to suit municipality approved cross sections. LID feature layouts shall adhere to City of Ottawa horizontal vertical clearances and consider locations of realigned sanitary sewers at the detailed design stage.
- **Water Network Infrastructure:** The on-campus distribution network is generally adequate in capacity, but will require relocation and extension at various locations to suit the incorporation

of municipal ROWs. LID feature layouts shall adhere to City of Ottawa horizontal vertical clearances and consider locations of realigned water mains at the detailed design stage.

- **Stormwater Infrastructure:** While there is not a history of concerns regarding surface ponding during rainfall events, the Infrastructure Overview indicated that most of the local sewers do not have sufficient capacity to meet current City of Ottawa design guidelines. Many segments of existing storm sewer will need to be realigned to suit the proposed ROW cross section or extended where none currently exist to service fronting buildings.
- **Hydro Ottawa:** Hydro Ottawa has advised the existing Hydro Ottawa distribution system in the vicinity of the Tunney's Pasture Campus has ample spare capacity to accommodate the redevelopment of the Campus. Proximity of hydro infrastructure to the proposed LID features will be reviewed at the detailed design stage.
- **Natural Gas:** Once the new Municipal ROW network has been finalized, a review of the underground natural gas network will be undertaken and if required, relocations coordinated with Enbridge Gas. Proximity of the current and realigned gas mains to the proposed LID features will be reviewed at the detailed design state.
- **Telecommunications:** All existing telecommunications services will be relocated to the new Municipal ROW network for ease of maintenance. Proximity of telecommunications infrastructure to the proposed LID features will be reviewed at the detailed design stage.

3.2.3 Topographic Survey

Existing topographic survey data was provided to Aquafor Beech via Arcadis as part of the background data gathered for the site. This existing condition topographic survey was referenced as a general outline of future Right of Way corridor grading when determining drainage patterns to all proposed LID locations.

3.2.1 LID Constraints Memo

Aquafor completed an LID Site Servicing Constraints Memorandum in 2023 to identify site servicing constraints associated with implementing LIDs in the project area, as well as overall design requirements. Selection of LID features and function within this memo are developed in conjunction with the findings of this memo. A summary of key findings is provided under **Section 5.1** of this memo.

4 Applicable Stormwater Management Criteria

Table 4-1 below outlines the applicable stormwater management criteria for the site, including LID/green infrastructure design.

Table 4-1: Summary of Applicable Stormwater Management Criteria.

Criteria	Sustainability Charter (Tunney's Pasture, 2018)	City of Ottawa[1]	Rideau Valley Conservation Authority[2]	MECP Stormwater Management and Planning Design Manual (2003)	MECP Draft 2022 & CLI ECA Appendix A (MECP, 2022)	Federal (PSPC, 2017)	Applicable Criteria
Flooding / Volume Control	n/a see water balance	Site discharge controlled to pre-development rates Build resilience to flood risks and stormwater runoff by: - Restricting development in flood plains and mitigating risks in areas vulnerable to flooding under future climate conditions - Implementing SWM practices and infrastructure that is resilient to future climate conditions - Using LID SWM features where feasible to manage smaller rainfall events (City of Ottawa, 2022) Site- level measures should be used to reduce and control volume and rate of runoff Assess impact of 100-year event outlined in the City's Sewer Design Guidelines (2012) with a 20% increase of rainfall intensity for climate change sensitivity. Maximum depth of flow under static or dynamic conditions less than 0.3m. Provide adequate emergency overflow conveyance off-site. For further storm sewer design, refer to City of Ottawa (2012)	n/a	Peak flows must not exceed pre development values for 2–100 year return period storms. Ensure that there will not be any increase in flood damage potential For specific control design guidance criteria see MECP (2003)	Development Manage peak flow control as per watershed/subwatershed plans. Municipal criteria of a minimum 100-year return storm, other plans (Master SWM Plan, Class EA, etc.,) as appropriate. Retrofit: If 'development' approach not feasible, improve level of flood control currently provided to Maximum Extent Possible based on environmental site feasibility studies. Regulate water quantity as per municipal standards, Master Stormwater Management Plan, or Class EA e.t.c., as appropriate for the project End-of-pipe control is 3rd priority.	See infiltration section: All surface runoff must be addressed on site ("Addressed" assumed to mean control) Site planning must include strategy to minimize volume of stormwater and snowmelt runoff going into municipal systems based on historical ecosystem conditions of the region. Gravity-based system must have as a minimum: • Pipe flow velocity 0.6 m/s to 3 m/s under full flow conditions • Optimization of on-site water detention • The following SWM components: ○ 200 mm minimum diameter catch basin leads ○ 1200 mm diameter maintenance holes ○ Sumps in maintenance holes and catch basins ○ Safety platforms in maintenance holes >5m deep. Major drainage system must be designed to address 1:100 year storm event • Where a minor drainage system is required, must address 1:5 year storm event	(City of Ottawa) Site discharge controlled to pre-development rates **OR** *Discharge rate set by city based on existing system capacity limits (TBD)* Assess impact of 100-year event outlined in the City's Sewer Design Guidelines (2012) with a 20% increase of rainfall intensity for climate change sensitivity. **Road ROIW:** Major/ Minor system design. (MECP, 2022) Development Manage peak flow control as per watershed/subwatershed plans. Municipal criteria of a minimum 100-year return storm, other plans (Master SWM Plan, Class EA, etc.,) as appropriate. *City to confirm if watershed/ subwatershed study exists Retrofit: If 'development' approach not feasible, improve level of flood control currently provided to Maximum Extent Possible based on environmental site feasibility studies. Regulate water quantity as per municipal standards, Master Stormwater Management Plan, or Class EA etc., as appropriate for the project (PSPC, 2017) Where a minor drainage system is required, must address ("addressed" assumed to mean control) 1:5 year storm event

Criteria	Sustainability Charter (Tunney's Pasture, 2018)	City of Ottawa[1]	Rideau Valley Conservation Authority[2]	MECP Stormwater Management and Planning Design Manual (2003)	MECP Draft 2022 & CLI ECA Appendix A (MECP, 2022)	Federal (PSPC, 2017)	Applicable Criteria
Water Quality	Best Management Practices must be capable of removing 80% average annual post-dev TSS load 95th percentile of regional or local rainfall events runoff managed on site using LID and green infrastructure	Reference not found, assumed 80% TSS removal required. City to confirm.	n/a	End of pipe facility (w/ 24hr drawdown) removal dependant on the downstream aquatic habitat sensitivity, from most sensitive to least: *Enhanced Protection* - 80% removal of TSS *Normal Protection* - 70% removal of TSS *Basic Protection* - 60% removal of TSS See table 3.2 in MECP (2003) Bacteria: If no downstream recreational water activities (swimming), wet SWM facilities adequately control bacteria. If yes downstream swimming, additional considerations req'd. If development >= 10% of drainage area discharging to swimming area, undertake subwatershed plan. Temperature SWM facilities will always raise temperatures. Ways to reduce water temperature include: - Pond configuration, Riparian planting in the shoreline fringe, bottom draw outlet e.t.c., If temperature is a significant concern, consult with DFO and OMNR (nat. resources). Ensure that water quality will be protected	Development: Generally: • Characterize water quality to be protected and stormwater contaminants • Watershed/sub watershed plan to minimize or prevent contaminant loads Suspended Solids (SS): • Control 90th percentile storm event and, if conventional methods are necessary, aim for 80%/70%/60% S.S. removal. Retrofit: Improve level of water quality currently provided on site **AND** Follow 'development' criteria for SS **OR** design a treatment train to achieve 'development' criteria within 10 years **OR** Control as per 'Maximum Extent Possible'.	All surface runoff must be addressed on site ("Addressed" assumed to mean control) Site drainage plan include development of a strategy to improve water quality based on historical ecosystem conditions of the region. Minimize volume of stormwater and snowmelt going to municipal systems, improve water quality Control stormwater and sanitary sewage to meet discharge standards of authority having jurisdiction Proper drainage to eliminate standing water	(Tunney's Pasture, 2018) Best Management Practices must be capable of removing 80% average annual post-dev TSS load Runoff from 95th percentile (27mm event) of regional or local rainfall events runoff managed on-site using LID and green infrastructure, including **Road ROW**. (MECP, 2003) If water temperature is a significant concern, consult with DFO / OMNR Ensure that water quality will be protected Development: Generally: • Characterize water quality to be protected and stormwater contaminants • Watershed/sub watershed plan to minimize or prevent contaminant loads Retrofit: Improve level of water quality currently provided on site **AND** Follow 'development' criteria for SS **OR** design a treatment train to achieve 'development' criteria within 10 years **OR** Control as per 'Maximum Extent Possible'. (PSPC, 2017) All surface runoff must be addressed on-site ("Addressed" assumed to mean control) Minimize volume of stormwater and snowmelt going to municipal systems, improve water quality (MECP, 2022) The Runoff Volume Control Target (RVCt) hierarchy: 1. Priority 1 Retention – Infiltration, Re-use and Evapotranspiration 2. Priority 2 – LID Filtration 3. Priority – Conventional Treatment Where management/ control of the 95th percentile isn't possible due to Site Restrictions (Constraints) using Priority 1 and Priority 2, achieve control to the Maximum Extent Possible (MEP).

Criteria	Sustainability Charter (Tunney's Pasture, 2018)	City of Ottawa[1]	Rideau Valley Conservation Authority[2]	MECP Stormwater Management and Planning Design Manual (2003)	MECP Draft 2022 & CLI ECA Appendix A (MECP, 2022)	Federal (PSPC, 2017)	Applicable Criteria
Erosion Control	n/a	Reference not found, assumed defer to MECP (2003). City to confirm.	n/a*	Follow Detailed or Simple Erosion Design Plan as given by Section 3.4. Ensure that the watercourse will not undergo undesirable and costly geomorphic change	Follow erosion assessment in watershed/subwatershed plan OR Follow MECP (2003) detailed or simplified design approaches based on proponent preference or size of drainage area. In the absence of a study, detain at a minimum, runoff volume generated from 25mm event over 24 to 48 hours.	Plan and design must include strategy to control and minimize erosion, waterway sedimentation and airborne dust. Must conform to erosion and sediment requirements of provinces/municipalities Mitigate risk of erosion of embankments/slope areas especially those that could impact riparian zones, waterways and stormwater retention ponds.	(Tunney's Pasture, 2018) Runoff from 95th percentile (27mm event) of regional or local rainfall events runoff managed on-site using LID and green infrastructure, including **Road ROW**. (MECP, 2022) Follow erosion assessment in watershed/subwatershed plan OR Follow MECP (2003) detailed or simplified design approaches based on proponent preference or size of drainage area. In the absence of a study, detain at a minimum, runoff volume generated from 25mm event over 24 to 48 hours.
Water Balance/ Infiltration Retention – Infiltration *	95th percentile of regional or local rainfall events runoff managed on site using LID and green infrastructure	Use of dual drainage principle (City of Ottawa, 2012) Site discharge controlled to pre-development rates	n/a*	Pre-development water balance should be maintained or restored via water balance on a site-by-site basis (modelling or calculation) Ensure that groundwater and baseflow characteristics are conserved Lot-level infiltration controls are also suggested such as: Reduced grading to allow ponding or directing roof leaders to rear yard ponding areas or cisterns (for more examples see p. 4-3 of MECP (2003))	New Development: • Complete assessment to control pre- and post- development water balance changes using site level strategies (see document) • Assessment study NOT completed: ○ Control recharge to meet pre development **OR** control runoff from 90th percentile event Retrofit Scenarios: • Complete assessment to control pre- and post- development water balance changes using site level strategies • Assessment study not completed: ○ Control recharge to meet pre development **OR** control runoff from 90th percentile event	Design of site drainage must minimize impacts of site grading strategies to municipal infrastructure among other items All surface runoff must be addressed on site ("Addressed" assumed to mean control) Storm drainage systems must rely on gravity flow wherever possible Minimize volume	The more stringent of: 1) (MECP, 2022) • Complete assessment to control pre- and post- development water balance changes using site level strategies (see document) OR 2) (Tunney's Pasture, 2018) • 95th percentile of regional or local rainfall events runoff managed on-site using LID and green infrastructure Retrofit Scenarios (MECP, 2022): • Complete assessment to control pre- and post- development water balance changes using site level strategies • Assessment study not completed: ○ Control recharge to meet pre development

Criteria	Sustainability Charter (Tunney's Pasture, 2018)	City of Ottawa[1]	Rideau Valley Conservation Authority[2]	MECP Stormwater Management and Planning Design Manual (2003)	MECP Draft 2022 & CLI ECA Appendix A (MECP, 2022)	Federal (PSPC, 2017)	Applicable Criteria
Retention - Water Re-use	Site-wide distribution system to utilize river water for toilets and irrigation. No potable water in flush toilets. No potable water irrigation Install Greywater reuse in all multi unit residential buildings more than six storeys in height.	Reference not found, assumed defer to MECP (2003). City to confirm.	n/a*	Lot-level storage controls as a starting point for treatment train include methods such as: - Rooftop, parking lot, superpipe and rear yard All with the intention of detaining stormwater and reducing peak runoff rates.	LID Retention (with water re-use features) is a 1st priority control and must be utilized to the maximum extent possible before going to 2nd control	Integrated stormwater retention and detention system for the roof in order to reduce runoff and, where applicable, provide irrigation Eliminate use of potable water for irrigation and using where required grey water irrigation systems and plantings e.g., rainwater harvesting strategy Provision of grey water irrigation to assist on-site vegetation growth	(Tunney's Pasture, 2018) Site-wide distribution system to utilize river water* for toilets and irrigation. No potable water in flush toilets. No potable water irrigation **: to be amended to rainwater only* Install greywater reuse in all multi-unit residential buildings more than six storeys in height. (PSPC, 2017) Integrated stormwater retention and detention system for the roof in order to reduce runoff and, where applicable, provide irrigation Eliminate use of potable water for irrigation and using where required grey water irrigation systems and plantings e.g., rainwater harvesting strategy Provision of grey water irrigation to assist on-site vegetation growth
Retention - Evapotranspiration	n/a	Protect and enhance tree canopy and protect wetlands and other nature-based solutions by: - Protecting, enhancing and managing trees, shorelines wetlands and other natural areas - Considering and mitigating impacts of climate change on the environment - Managing risks of wildland fire. The City of Ottawa has a target of 40 percent urban canopy cover by 2050 (City of Ottawa, 2022)	n/a*	Potential for increase in evapotranspiration based on lot-level control selection.	LID Retention (with evapotranspiration features) controls is a 1st priority control and must be utilized to the maximum extent possible before going to 2nd control	Planned with trees placed to provide shaded rest areas, reducing heat via canopy. Conservation and enhancement of natural areas and restoration of damaged areas Two new trees reinstated for every tree removed	(City of Ottawa, 2022) The City of Ottawa has a target of 40 percent urban canopy cover by 2050 (PSPC, 2017) Planned with trees placed to provide shaded rest areas, reducing heat via canopy. Conservation and enhancement of natural areas and restoration of damaged areas Two new trees reinstated for every tree removed

Criteria	Sustainability Charter (Tunney's Pasture, 2018)	City of Ottawa[1]	Rideau Valley Conservation Authority[2]	MECP Stormwater Management and Planning Design Manual (2003)	MECP Draft 2022 & CLI ECA Appendix A (MECP, 2022)	Federal (PSPC, 2017)	Applicable Criteria
LID/Green Infrastructure	n/a	If new collectors are proposed, refer to City of Ottawa (2008) design guidelines for LID / Green sustainable roadway infrastructure Subdrains required in swales where longitudinal gradient is < 1.5% (City of Ottawa, 2012)	n/a*	Ensure that an appropriate diversity of aquatic life and opportunities for human uses will be maintained. Recommended to use lot-level control followed by end-of-pipe control in designs. Treatment train approach for maximum water quality, balance, quantity and erosion control benefits.	Filtration based LID controls are 2nd priority control	Refer back to other elements, green infrastructure is preferred/emphasized Building objectives include environmental responsibility Design and construction must protect and conserve water. Real Property Branch (RPB) goals include meeting environmental legislation and policies to ensure protection and preservation of ecological zones Designs must preserve ecological features of the community and demonstrate compatibility with surrounding environment Reduce impervious elements by designing with natural landscaping materials Designed using native plants to limit maintenance and promote biodiversity Integrate planting in and around building Parking areas and circulation routes must maximize sustainable best practices and reduce impacts on natural stormwater environment Use of above- and below-ground sustainable green infrastructure stormwater control systems and site design	(MECP, 2003) Recommended to use lot-level control followed by end-of-pipe control in designs. Treatment train approach for maximum water quality, balance, quantity and erosion control benefits. The Runoff Volume Control Target (RVCt) hierarchy: 1. Priority 1 Retention – Infiltration, Re-use and Evapotranspiration 2. Priority 2 – LID Filtration 3. Priority – Conventional Treatment (PSPC, 2017) Use of above- and below-ground sustainable green infrastructure stormwater control systems and site design Reduce impervious elements by designing with natural landscaping materials Parking areas and circulation routes must maximize sustainable best practices and reduce impacts on natural stormwater environment Design and construction must protect and conserve water. Designed using native plants to limit maintenance and promote biodiversity

5 LID Feature Selection

5.1 Site Constraints

Site specific constraints within the project area include the following:

- Conventional LID measures that adopt infiltration of stored runoff into the underlying subsoils for groundwater recharge are generally not considered suitable for the subject site from a geotechnical perspective. Some techniques, such as catchbasins and amended topsoil finishes used in conjunction with soak-away pits, may be considered suitable due to the presence of the impermeable bedrock. LID measures featuring filtration practices are generally considered to be feasible.
  - As such, Aquafor Beech has developed preliminary LID designs that utilize partial-infiltration and adopt runoff filtration as the primary mechanism to achieve the required water quality target of the site, as outlined in **Section 6** below. Infiltration of the captured runoff is anticipated to occur on a limited basis and will be value added.
- Dense utility corridors identified as part of the background review may limit LID feasibility and implementation within the site rights-of-way over their full extents. Localized constraints may require use of alternative cross-sections, mitigation measure, additional infrastructure and/or alternative LID approaches (i.e. filtration vs. infiltration etc.).

5.2 Proposed LID Features

Low impact development comprises a set of naturalized design features that minimize runoff and distributed, small scale structural practices that mimic natural or predevelopment hydrology through processes such as infiltration, evapotranspiration, harvesting, filtration and detention of stormwater. The proposed LID practices for the Tunney's Pasture realigned ROW design are listed below.

1. **Permeable Pavements and Pavers** – Collective terms for a variety of surface treatments including pervious concrete, porous asphalt, permeable interlocking pavers, rubberized granular surfaces, and plastic or concrete grid systems. These systems contain pore spaces that allow stormwater to pass through into a stone base for treatment or infiltration.
2. **Dry Creek Bed Infiltration Facilities** – Designed to mimic the tributaries of the Ottawa River using a limestone creek bed typology at the surface that will meander through medians and boulevards, widening at bump out locations. Stormwater will be directed to the creek bed from road, sidewalk and cycle track surfaces via curb cuts and will infiltrate into a subsurface infiltration trench below. The infiltration trench is composed of a rectangular trench lined with geotextile fabric and filled with clean granular stone or other void forming material to encourage infiltration, filtration and cooling of runoff. The creek bed at the surface will be composed of limestone aggregate and boulders ranging in size and shape to mimic natural tributary form and aesthetic. Where these facilities intersect with key amenity nodes, plazas and parks, the creek bed can be hardened to activate these spaces by keep runoff at the surface. This can be accomplished by grouting joints between the stones or installing an impermeable liner between the limestone creek bed and infiltration gallery in specific locations. At the downstream end of these 'hardened' zones, runoff will again be permitted to infiltrate into the galleries below where it will be filtered and cooled before being directed back to the storm sewer. The meandering form of the creek bed will create pockets for integration of street trees and plant material to allow for enhanced stormwater treatment, urban cooling and habitat integration.
3. **Tree Pits -** located to take advantage of available space in the boulevard to enhance stormwater capture and filtration and provide passive irrigation of street trees. They can be designed to take

runoff from the sidewalk or street and are composed of engineered soils such as biomedia and an underdrain to direct overflow to the storm sewer.

4. **Rain Pockets and Enhanced Micro-pools -** small engineered grassy basins that incorporate engineered soil such as biomedia and an optional perforated underdrain pipe designed to mimic natural depressions in upland forests, meadows and prairies that capture, filter and slow runoff, provide topographic interest and support biodiversity. These basins may be planted with more elaborate landscaping, and allow for enhanced infiltration and storage of runoff in comparison to enhanced grass swales.
5. **Bioswale** – vegetated open channels designed to convey, treat and attenuate stormwater runoff. Check dams and vegetation in the swale slows water to allow filtration of sediments, evapotranspiration, and infiltration into underlying soils to occur. Additionally, a biomedia channel bed encourages filtration of runoff through this soil-based layer and into a perforated subdrain below for conveyance into the storm sewer system as treated runoff.

6 LID Feature Design

The following subsections outline the design development process used in sizing the LID SWM facilities.

6.1 Tree Pits

Table 6-1 below outlines the basic design parameters adopted for the proposed tree pit LID features, further used to determine overall capacity of the ROW LID systems by Block throughout the site.

Table 6-1: Tree Pits Design Parameters

Design Parameter	Value (or Range Where Applicable)
Width (m)	4-5
Length (m)	Varies by location
Subsurface Media Depth - includes stone layers (m)	Minimum 0.5m
Surface Ponding Depth (m)	0.1
Infiltration Storage (m3)	TBD at detailed design
Underdrain Size (mm)	TBD at detailed design

6.2 Bioswales

Table 6-2 below outlines the basic design parameters adopted for the proposed bioswale LID features, further used to determine overall capacity of the ROW LID systems by Block throughout the site.

Table 6-2: Bioswale Design Parameters

Design Parameter	Value (or Range Where Applicable)
Width (m)	3.45
Length (m)	Varies by location
Subsurface Media Depth - includes stone layers (m)	Minimum 0.5m
Surface Ponding Depth (m)	0.05
Infiltration Storage (m3)	TBD at detailed design
Underdrain Size (mm)	100

6.3 Dry Swale Filtration Trenches

Table 6-3 below outlines the basic design parameters adopted for the proposed dry swale LID features, further used to determine overall capacity of the ROW LID systems by Block throughout the site.

Table 6-3: Dry Swale Design Parameters

Design Parameter	Value (or Range Where Applicable)
Width (m)	4.5-6
Length (m)	Varies by location
Subsurface Media Depth - includes stone layers (m)	Minimum 0.5
Surface Ponding Depth (m)	0.05
Infiltration Storage (m3)	TBD at detailed design
Underdrain Size (mm)	150

6.4 Enhanced Micro-pools/Rain Pockets

Table 6-4 below outlines the basic design parameters adopted for the proposed enhanced micro-pool/rain pocket LID features, further used to determine overall capacity of the ROW LID systems by Block throughout the site.

Table 6-4: Enhanced Micro-pool/Rain Pocket Design Parameters

Design Parameter	Value (or Range Where Applicable)
Width (m)	5
Length (m)	Varies by location
Subsurface Media Depth - includes stone layers (m)	Minimum 0.5m
Surface Ponding Depth (m)	0.2
Infiltration Storage (m3)	TBD at detailed design
Underdrain Size (mm)	TBD at detailed design

6.5 Permeable Pavements

Table 6-5 below outlines the basic design parameters adopted for the proposed permeable pavement LID features, further used to determine overall capacity of the ROW LID systems by Block throughout the site.

Table 6-5: Permeable Pavement Design Parameters

Design Parameter	Value (or Range Where Applicable)
Width (m)	2-2.4
Length (m)	Varies by location
Subsurface Media Depth - includes stone layers (m)	Minimum 0.4m
Surface Ponding Depth (m)	0.1
Infiltration Storage (m3)	TBD at detailed design
Underdrain Size (mm)	100-200

6.6 Stormwater Management Facilities Summary

Contributing catchments were delineated within the site area using existing conditions topographic survey data under the assumption that general grading patterns will be respected in the proposed grading design. Should any catchments require refinement based on proposed grading once developed, re-delineation of catchments and revised LID design shall be undertaken as required.

Table 6-6 below outlines the key hydrologic parameters produced from catchment delineation for each LID feature location.

Table 6-6: Hydrologic Parameters of LID Feature Locations

Block Number	Catchment Size (ha)	Impervious Area (m2)	Total LID Footprint Area (m2)*	I:P Ratio	Water Quality Target – 27mm (m3)	Total Design Storage (m3)
Block 11	1.20	10,146	1,870	5.4:1	324	608
Block 12	0.69	5,784	1,108	5.2:1	186	310
Block 13	0.25	2,078	424	4.9:1	68	119
Block 15	2.24	17,470	4,965	3.5:1	606	1,061
Block 17	0.77	6,660	1,001	6.7:1	207	263
Block 18	0.64	5,597	763	7.3:1	172	202
Block 19	0.39	3,289	604	5.4:1	105	205
Block 20	0.24	2,142	269	8.0:1	65	90
Block 21	0.38	3,188	595	5.4:1	102	198
Block 22	0.17	1,376	335	4.1:1	46	134
Block 23	0.40	3,394	637	5.3:1	109	215
Block 24	0.40	3,369	634	5.3:1	108	217
Block 26	0.25	2,118	415	5.1:1	68	141
Block 27	0.22	1,821	421	4.3:1	61	143
Block 28	0.64	4,730	1,661	2.8:1	173	676
Eglantine Driveway	0.33	2,663	600	4.4:1	88	168

**includes 50% factor of safety reduction in consideration of future driveway access points, utilities, and other surface features limiting available space for LID features*

As part of the detailed design process, proposed grading will be reviewed to refine the catchment areas to each LID feature. For any portions of the proposed development Right of Way that is not controlled (or insufficiently controlled) by LID features, additional or alternative SWM measures such as Oil and Grit Separators and subsurface detention facilities will be investigated to ensure the complete proposed Right of Way area meets the applicable stormwater criteria outlined in **Section 4** of this memo.

7 Operation and Maintenance Considerations

A number of operation and maintenance (O&M) practices should be considered by the site owner to ensure the features maintain their as-designed function in future years. The considerations outlined in **Tables 7-1** to **7-4** are summarized from previous industry experience of Aquafor Beech and the TRCAs' Low Impact Development Stormwater Management Practice Inspection and Maintenance Guide.

Table 7-1: Operation and Maintenance Considerations for Bioswales and Dry Swales.

Design Component	O & M Description	Frequency
Contributing Drainage Area	CDAs should be free of point sources of pollutants (e.g., leaking waste containers, spills, failing ESCs). Trash, sediment and debris should be removed regularly from pavements and other stormwater conveyances (e.g., gutters, eavestroughs) draining to the BMP.	Biannual visual inspections.
Inlet Conveyance System	Inlets must remain unobstructed to ensure that stormwater enters the BMP as designed. Scour protection features (e.g., stone cover, flow spreader) may also be needed for curb-cut or pipe inlets to prevent erosion of the filter bed from concentrated flow.	Visual Inspection – biannual Flushing & CCTV – when clogging/damage suspected.
Pretreatment	Proper pretreatment extends the operating life cycle of the BMP by reducing the rate of accumulation of coarse sediment in the BMP. Devices include vegetated filter strips, gravel diaphragms, forebays, check dams, oil and grit separators and manholes containing baffles or filters and sumps. Pretreatment devices require frequent (e.g., annual or bi-annual) trash, sediment and debris removal.	Biannual visual inspections. .
Perimeter	Inspection of the perimeter: confirm dimensions of the BMP are acceptable, ensure the structural integrity of side slopes or vertical walls is maintained and confirm that the BMP continues to provide the designed surface ponding water storage capacity. Periodic maintenance of side slopes may be needed to repair erosion rills or damage from vehicle or foot traffic.	Annual visual inspections.
Filter Bed	Filter beds should be checked for presence of standing water. Trash should be removed from the filter bed regularly. Mulch or stone cover should be maintained on non-vegetated areas to prevent weed growth and soil erosion. Accumulated sediment should be periodically removed to maintain infiltration function. Repair of animal burrows, sunken areas, erosion rills or damage from vehicle or foot traffic may also be needed to prevent short circuiting of flow through the filter media soil. Maximum ponding depth should be checked to ensure designed water storage capacity is maintained.	Annual visual inspections. Flushing & Vac Truck – when drawdown exceeds 92hrs **OR** sediment accumulation impeding inlet/outlet function.
Vegetation	Routine maintenance of vegetation is the same as a conventional planting bed (i.e., weeding, mowing, pruning, irrigation during droughts). In the first 2 months of establishment, plantings need to be irrigated frequently (e.g., bi-weekly). As bioretention practices are intended to retain nutrients from inflowing stormwater, applying fertilizer to the filter bed should not be a part of routine maintenance.	Routine maintenance, varies with plantings
Overflow Outlets	Overflow outlet structures must be kept free of obstructions to ensure stormwater is safely conveyed during major storm events.	Biannual visual inspections.
Sub-drain	Sub-drains may be included where the permeability of the underlying native sub-soil is low or, due to other	Biannual visual inspections.

	constraints, an impermeable liner is required. The perforated pipe must be kept free of obstructions to ensure that the subsurface water storage capacity of the BMP drains within a specified time period. A maintenance port standpipe may be connected to the perforated pipe to provide a means of flushing and inspecting it. Perforated pipes should be routinely flushed with water to remove sediment. If the sub-drain is equipped with a flow-restrictor (e.g., orifice plate, ball valve) to attenuate flow rates, the flow restrictor must be inspected and cleaned regularly.	
Monitoring well	Monitoring wells are needed to determine if the BMP drains within an acceptable time period and to track drainage performance over its operating lifespan. Standpipes should be securely capped on both ends and remain undamaged and free of sediment which may require periodic flushing.	Biannual access function inspections.

Table 7-2: Operation and Maintenance Considerations for Permeable Pavements and Pavers

Design Component	O & M Description	Frequency
Contributing Drainage Area	CDAs should be free of point sources of pollutants (e.g., leaking waste containers, spills, failing ESCs). Trash, sediment and debris should be removed regularly from pavements and other stormwater conveyances (e.g., gutters, eavestroughs) draining to the BMP.	Biannual visual inspections.
Pavement surface	Surface should be inspected for damage, deformation (e.g. ruts), unevenness, open joints and sediment accumulation. Should not allow ponding of water on the surface to occur when functioning acceptably so any observation of surface ponding indicates that a problem exists. Trash and natural debris should be periodically removed. Surface needs to be swept and vacuumed regularly to remove fine sediment from joints and pores, and plowed of snow and spread with de-icing salt as needed during winter. Sand should not be spread as an anti-slip agent as it will clog the joints or pores. Grid systems with topsoil and grass fill are maintained like lawns.	Biannual visual inspections and routine maintenance.
Vegetation	Permeable interlocking grid systems may be filled with topsoil and planted with grass. Routine maintenance of grid system grass cover is the same as conventional lawns (i.e., weeding, mowing, watering during droughts). In the first 2 months of establishment, plantings need to be irrigated frequently (e.g., bi-weekly). Where compost amended topsoil is used to fill grid cells, periodic top dressing with compost should be all that is needed to maintain healthy vegetation cover (i.e., application of chemical fertilizers should not be a part of routine maintenance).	Routine maintenance, varies with plantings

Overflow outlets	Flows exceeding the storage capacity of the BMP are conveyed to an adjacent drainage system via an overflow outlet structure (e.g., flush curb, curb-cut, catch basin). Overflow outlet structures must be kept free of obstructions to ensure stormwater is safely conveyed during major storm event.	Biannual visual inspections.
Sub-drain	Sub-drains may be included where the permeability of the underlying native sub-soil is low or where an impermeable liner is required. The perforated pipe must be kept free of obstructions to ensure that the subsurface water storage capacity of the BMP drains within a specified time period. A maintenance port standpipe may be connected to the perforated pipe to provide a means of flushing and inspecting it. Perforated pipes should be routinely flushed with water to remove sediment. If the sub-drain is equipped with a flow-restrictor (e.g., orifice plate, ball valve) to attenuate flow rates, the flow restrictor must be inspected and cleaned regularly.	Biannual visual inspections.
Monitoring well	Monitoring wells are needed to determine if the BMP drains within an acceptable time period and to track drainage performance over its operating lifespan. Standpipes should be securely capped on both ends and remain undamaged and free of sediment which may require periodic flushing.	Biannual access function inspections.
Control structure	The manhole or catchbasin which provides access to the sub-drain and flow restrictor device, if present. Inspect for damage and sediment accumulation.	Biannual visual inspections.

Table 7-3: Operation and Maintenance Considerations for Rain Pockets and Enhanced Micro-pools

Design Component	O & M Description	Frequency
Contributing Drainage Area	CDAs should be free of point sources of pollutants (e.g., leaking waste containers, spills, failing ESCs). Trash, sediment and debris should be removed regularly from pavements and other stormwater conveyances (e.g., gutters, eavestroughs) draining to the BMP.	Biannual visual inspections.
Inlet Conveyance System	Inlets must remain unobstructed to ensure that stormwater enters the BMP as designed. Scour protection features (e.g., stone cover, flow spreader) may also be needed for curb-cut or pipe inlets to prevent erosion of the filter bed from concentrated flow.	Visual Inspection – biannual Flushing & CCTV – when clogging/damage suspected.
Pretreatment	Proper pretreatment extends the operating life cycle of the BMP by reducing the rate of accumulation of coarse sediment in the BMP. Devices include vegetated filter strips, gravel diaphragms, forebays, check dams, oil and grit separators and manholes containing baffles or filters and sumps. Pretreatment	Biannual visual inspections. .

	devices require frequent (e.g., annual or bi-annual) trash, sediment and debris removal.	
Perimeter	Inspection of the perimeter: confirm dimensions of the BMP are acceptable, ensure the structural integrity of side slopes or vertical walls is maintained and confirm that the BMP continues to provide the designed surface ponding water storage capacity. Periodic maintenance of side slopes may be needed to repair erosion rills or damage from vehicle or foot traffic.	Annual visual inspections.
Filter Bed	Filter beds should be checked for presence of standing water. Trash should be removed from the filter bed regularly. Mulch or stone cover should be maintained on non-vegetated areas to prevent weed growth and soil erosion. Accumulated sediment should be periodically removed to maintain infiltration function. Repair of animal burrows, sunken areas, erosion rills or damage from vehicle or foot traffic may also be needed to prevent short circuiting of flow through the filter media soil. Maximum ponding depth should be checked to ensure designed water storage capacity is maintained.	Annual visual inspections. Flushing & Vac Truck – when drawdown exceeds 92hrs **OR** sediment accumulation impeding inlet/outlet function.
Vegetation	Routine maintenance of vegetation is the same as a conventional planting bed (i.e., weeding, mowing, pruning, irrigation during droughts). In the first 2 months of establishment, plantings need to be irrigated frequently (e.g., bi-weekly). As bioretention practices are intended to retain nutrients from inflowing stormwater, applying fertilizer to the filter bed should not be a part of routine maintenance.	Routine maintenance, varies with plantings.
Overflow Outlets	Flows exceeding the storage capacity of the BMP are conveyed to an adjacent drainage system via an overflow outlet structure (e.g., pipe, standpipe, curb-cut, swale, catchbasin). Overflow outlet structures must be kept free of obstructions to ensure stormwater is safely conveyed during major storm events.	Biannual visual inspections.
Sub-drain	Sub-drains may be included where the permeability of the underlying native sub-soil is low or where an impermeable liner is required. The perforated pipe must be kept free of obstructions to ensure that the subsurface water storage capacity of the BMP drains within a specified time period. A maintenance port standpipe may be connected to the perforated pipe to provide a means of flushing and inspecting it. Perforated pipes should be routinely flushed with water to remove sediment. If the sub-drain is equipped with a flow-restrictor (e.g., orifice plate, ball valve) to attenuate flow rates, the flow restrictor must be inspected and cleaned regularly.	Biannual visual inspections.

Monitoring well	Monitoring wells are needed to determine if the BMP drains within an acceptable time period and to track drainage performance over its operating lifespan. Standpipes should be securely capped on both ends and remain undamaged and free of sediment which may require periodic flushing.	Biannual access function inspections.

Table 7-4: Operation and Maintenance Considerations for Tree Pits

Design Component	O & M Description	Frequency
Contributing Drainage Area	CDAs should be free of point sources of pollutants (e.g., leaking waste containers, spills, failing ESCs). Trash, sediment and debris should be removed regularly from pavements and other stormwater conveyances (e.g., gutters, eavestroughs) draining to the BMP.	Biannual visual inspections.
Inlet Conveyance System	Inlets must remain unobstructed to ensure that stormwater enters the BMP as designed. Scour protection features (e.g., stone cover, flow spreader) may also be needed for curb-cut or pipe inlets to prevent erosion of the filter bed from concentrated flow.	Visual Inspection – biannual Flushing & CCTV – when clogging/damage suspected.
Pretreatment	Proper pretreatment extends the operating life cycle of the BMP by reducing the rate of accumulation of coarse sediment in the BMP. Devices include vegetated filter strips, gravel diaphragms, forebays, check dams, oil and grit separators and manholes containing baffles or filters and sumps. Pretreatment devices require frequent (e.g., annual or bi-annual) trash, sediment and debris removal.	Biannual visual inspections.
Perimeter	Inspection of the perimeter: confirm dimensions of the BMP are acceptable, ensure the structural integrity of side slopes or vertical walls is maintained and confirm that the BMP continues to provide the designed surface ponding water storage capacity. Periodic maintenance of side slopes may be needed to repair erosion rills or damage from vehicle or foot traffic.	Biannual visual inspections.
Filter Bed	Filter beds should be checked for presence of standing water. Trash should be removed from the filter bed regularly. Mulch or stone cover should be maintained on non-vegetated areas to prevent weed growth and soil erosion. Accumulated sediment should be periodically removed to maintain infiltration function. Repair of animal burrows, sunken areas, erosion rills or damage from vehicle or foot traffic may also be needed to prevent short circuiting of flow through the filter media soil. Maximum ponding depth should be checked to ensure designed water storage capacity is maintained.	Annual visual inspections. Flushing & Vac Truck – when drawdown exceeds 92hrs **OR** sediment accumulation impeding inlet/outlet function.

Vegetation	Routine maintenance of vegetation is the same as a conventional planting bed (i.e., weeding, mowing, pruning, irrigation during droughts). In the first 2 months of establishment, plantings need to be irrigated frequently (e.g., bi-weekly). As bioretention practices are intended to retain nutrients from inflowing stormwater, applying fertilizer to the filter bed should not be a part of routine maintenance.	Routine maintenance, varies with plantings.
Overflow Outlets	Flows exceeding the storage capacity of the BMP are conveyed to an adjacent drainage system via an overflow outlet structure (e.g., pipe, standpipe, curb-cut, swale, catchbasin). Overflow outlet structures must be kept free of obstructions to ensure stormwater is safely conveyed during major storm events.	Biannual visual inspections.
Sub-drain	Sub-drains may be included where the permeability of the underlying native sub-soil is low or where an impermeable liner is required. The perforated pipe must be kept free of obstructions to ensure that the subsurface water storage capacity of the BMP drains within a specified time period. A maintenance port standpipe may be connected to the perforated pipe to provide a means of flushing and inspecting it. Perforated pipes should be routinely flushed with water to remove sediment. If the sub-drain is equipped with a flow-restrictor (e.g., orifice plate, ball valve) to attenuate flow rates, the flow restrictor must be inspected and cleaned regularly	Biannual visual inspections.
Monitoring well	Monitoring wells are needed to determine if the BMP drains within an acceptable time period and to track drainage performance over its operating lifespan. Standpipes should be securely capped on both ends and remain undamaged and free of sediment which may require periodic flushing.	Biannual access function inspections.
Trees	Tree pruning should be completed by a qualified forestry crew for safety concerns, tree health & vitality, and disease control. Standard tree pruning involves removing all dead, dying, diseased, decayed, interfering, noticeably weak or crowded branches, the removal of lower branches and stem suckers, clearing stop signs to a minimum of 25 metres clear view, clearing traffic signals to a minimum 25 metres clear view and reporting any other defects to the Forestry Coordinator for inspection and action.	Tree pruning is required approximately every 7–10 years.

8 Conclusion

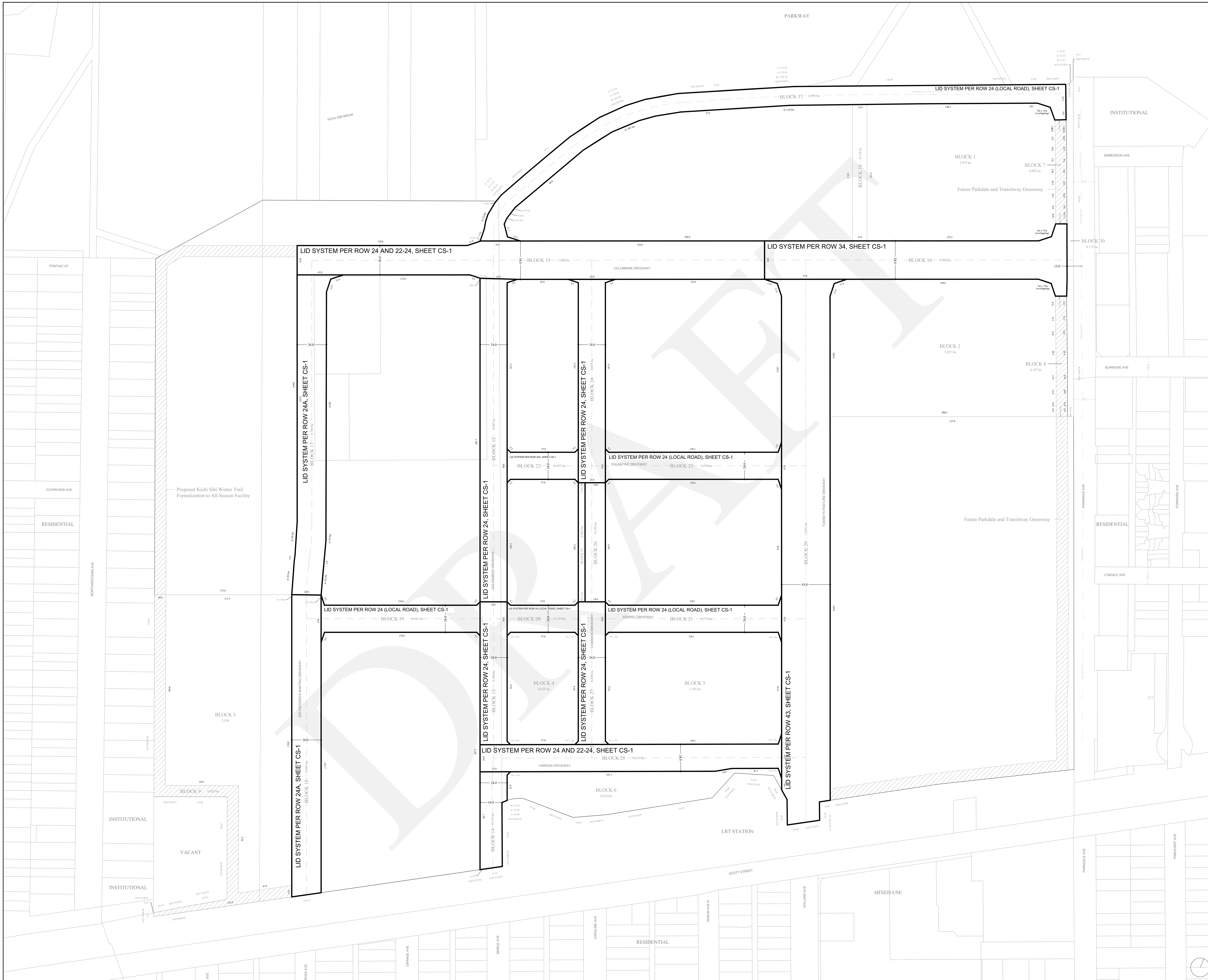
An LID treatment train approach was designed for the proposed Right of Way realignments within the Tunney's Pasture study area as part of the proposed stormwater management system that considers a number of technical site constraints, provides an aesthetic finish to the proposed right of ways, adheres to the recommended SWM Criteria and considers incorporation that compliments the layout of the proposed shared-use transportation corridors. The proposed LID features vary by location throughout the site and include bioswales, enhanced micro-pools/rain pockets, permeable pavements, dry swale filtration trenches, and tree pits. These LID designs adopt a number of general design features to meet existing site constraints, effective LID design per the relevant design standards outlined in **Section 3.1**, and the SWM criteria outlined in **Section 4.0** of this memo.

Table 8-1 below outlines the various notable design features and the relevant guideline or criteria. The LID strategy will be further advanced as part of subsequent detailed design tasks.

Table 8-1: Summary of Design Features and Relevant Guidelines/Criteria

Design Feature	Relevant Guideline/Criteria	Justification
Partial-infiltration included in any LID feature (all contain subdrains).	Patterson Group Site-Specific Geotechnical Investigation	Investigation determined that conventional infiltration only LID measures that adopt infiltration only as the primary mechanism are not generally considered suitable due to shallow depth and relative impermeability of bedrock across the site.
Maximum depth of facility of 0.5m	Patterson Group Site-Specific Geotechnical Investigation	Depth of LID measures considers the minimum bedrock depth of the site to ensure that excavations for LID features do not extend into bedrock.
Impervious to Pervious Ratio: does not exceed 10:1	Low Impact Development Stormwater Management Guide (CVC, 2010)	Typical recommended range for I:P ratio to a bioretention facility is 5:1 to 15:1. For infiltration trenches, a maximum of 10:1 is recommended when runoff from roadways or parking lot contributes to the facility.
Maximum Allowable Ponding Depth: does not exceed 0.3m	Low Impact Development Stormwater Management Guide (CVC, 2010)	Limits ponded standing water time to under the mosquito breeding cycle and supports vegetation health.
Total Storage Volume > 95th Percentile Storm Event Runoff Volume	Table 4-1, LID/green infrastructure design	Ensures complete capture and treatment of the 95th percentile event runoff.

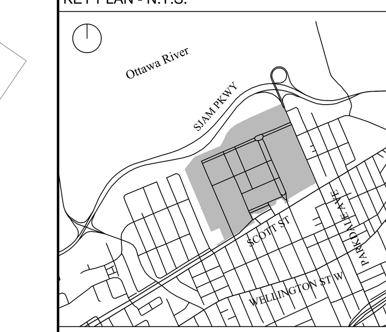
Proposed grading will be reviewed in detailed design to refine the catchment areas to each LID feature. For any portions of the proposed Right of Way not controlled (or insufficiently controlled) by LID features, additional or alternative SWM measures such as Oil and Grit Separators and subsurface detention facilities will be investigated to all proposed Right of Way area meets the applicable stormwater criteria outlined in **Section 4** of this memo.



PUBLIC ROAD REDEVELOPMENT

TUNNEY'S PASTURE
OTTAWA, ON

KEY PLAN - N.T.S.



INFORMATION REQUIRED

UNDER SECTION 51 (17) OF THE PLANNING ACT, R.S.O. 1990. c.P.13 AS AMENDED
(a) - AS SHOWN
(b) - AS SHOWN
(c) - AS SHOWN
(d) - AS LISTED
(e) - AS SHOWN
(f) - AS SHOWN
(g) - AS SHOWN
(h) - MUNICIPAL WATER
(i) - URBAN, NA
(j) - AS SHOWN
(k) - MUNICIPAL SANITARY AND STORM SEWERS
(l) - AS SHOWN

SURVEYOR'S CERTIFICATE

I HEREBY CERTIFY THAT THE BOUNDARIES OF THE LANDS TO BE SUBDIVIDED ON THIS PLAN AND THEIR RELATIONSHIP TO THE ADJACENT LANDS ARE ACCURATELY AND CORRECTLY SHOWN.

SIGNED
V ANDREW SHELP, O.L.S.
ANNIS, O'SULLIVAN, VOLLEBEKK LTD

DATE

OWNER'S CERTIFICATE

I HEREBY CONSENT TO THE FILING OF THIS PLAN BY IBI GROUP, IN DRAFT FORM.

SIGNED
CANADA LANDS COMPANY

DATE

LAND USE SCHEDULE

BLOCKS	DESCRIPTION	AREA (ha)
1	MIXED-USE	2.019
2	MIXED-USE	2.425
3	MIXED-USE	2.326
4	MIXED-USE	0.625
5	MIXED-USE	1.545
6	TRANSIT (TO BE CONVEYED TO CITY)	0.636
7	OPEN SPACE	0.092
8	OPEN SPACE	0.107
9	OPEN SPACE	0.420
10	OPEN SPACE	0.156
11	PUBLIC ROW (Goldenrod Driveway)	0.953
12	PUBLIC ROW (Goldenrod Driveway)	0.687
13	PUBLIC ROW (Goldenrod Driveway)	0.304
14	PUBLIC ROW (Goldenrod Driveway)	0.179
15	PUBLIC ROW (Colombine Driveway)	1.282
16	PUBLIC ROW (Colombine Driveway)	0.952
17	PUBLIC ROW (Sir Frederick Banting Driveway)	0.743
18	PUBLIC ROW (Sir Frederick Banting Driveway)	0.691
19	PUBLIC ROW (Sorrel Driveway)	0.342
20	PUBLIC ROW (Sorrel Driveway)	0.153
21	PUBLIC ROW (Sorrel Driveway)	0.378
22	PUBLIC ROW (Eglantine Driveway)	0.153
23	PUBLIC ROW (Eglantine Driveway)	0.378
24	PUBLIC ROW (Chardon Driveway)	0.435
25	ROW WIDENING - FUTURE (Chardon Driveway)	0.063
26	PUBLIC ROW (Chardon Driveway)	0.190
27	PUBLIC ROW (Chardon Driveway)	0.304
28	PUBLIC ROW (Yarrow Driveway)	0.631
29	PUBLIC ROW (Tunney's Pasture Driveway)	2.051
30	ROW WIDENING (Parkdale Avenue)	0.175
	TOTAL:	21.395

#	DATE	BY	DESCRIPTION
1	2024-08-28	JS	Preliminary Draft LID Concept Plan

DRAWING ISSUE RECORD

APPROVALS

ARCADIS

Aquafor Beech Limited
#6-202-2600 SKYMARK Ave,
MISSISSAUGA, ONTARIO, L4W 5B2
PHONE: (905) 629-0099, FAX: (905) 629-0089

BENCHMARK

1. Elevations shown are geodetic and are referred to the CGVD2013 geodetic datum.
2. It is the responsibility of the user of this information to verify that the job benchmark has not been altered or disturbed and that it's relative elevation and description agrees with the information shown on this drawing.

SCALE 15 0 10 20 40
1:1000 (m)

PROJECT NO: 139833

DRAWN BY: JS | CHECKED BY:

PROJECT MGR: SA | APPROVED BY:

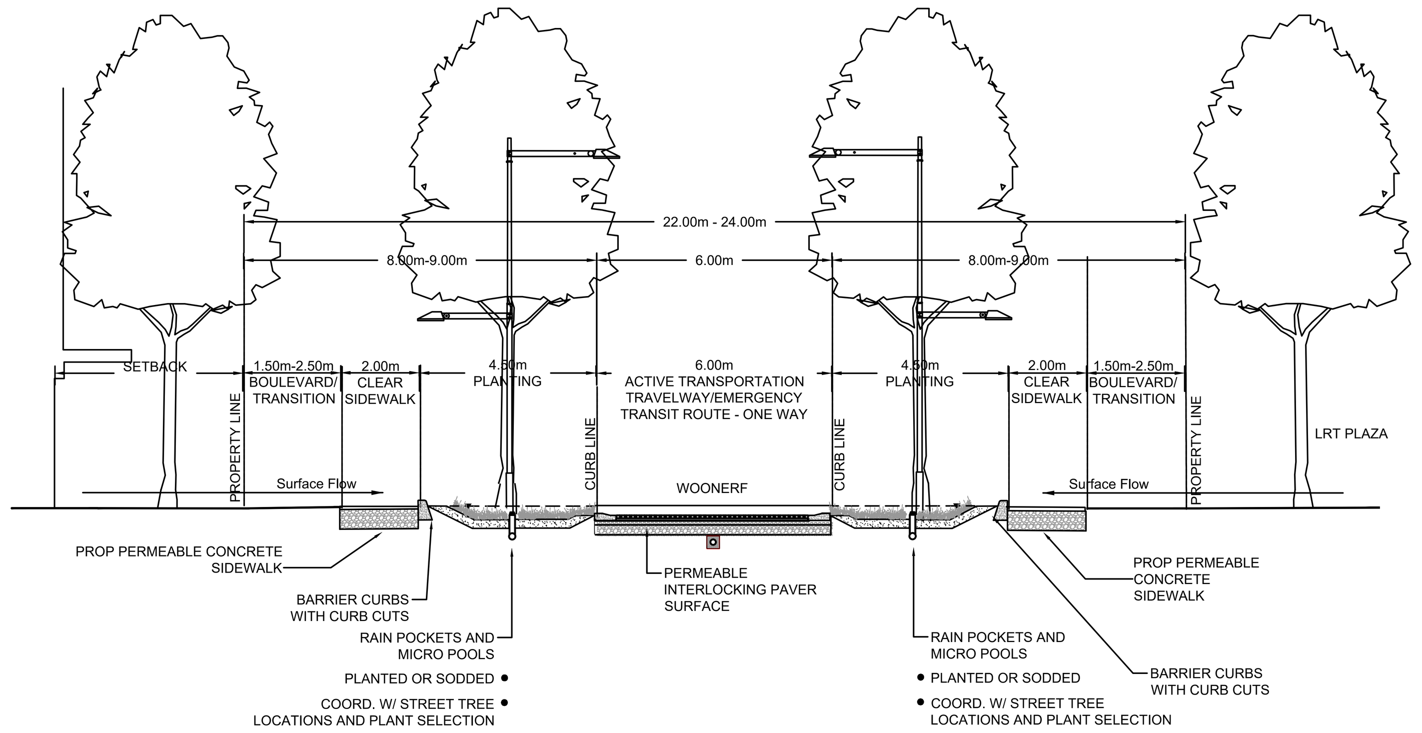
SHEET TITLE

STORMWATER MANAGEMENT GENERAL PLAN

SHEET NUMBER 1 | ISSUE 1.8

File Location: J:\139833_TunneyPasture\7.0_Production\7.03_Design\17_Planning\Draft Plan of Subdivision

SCALE CHECK 1 in 10mm



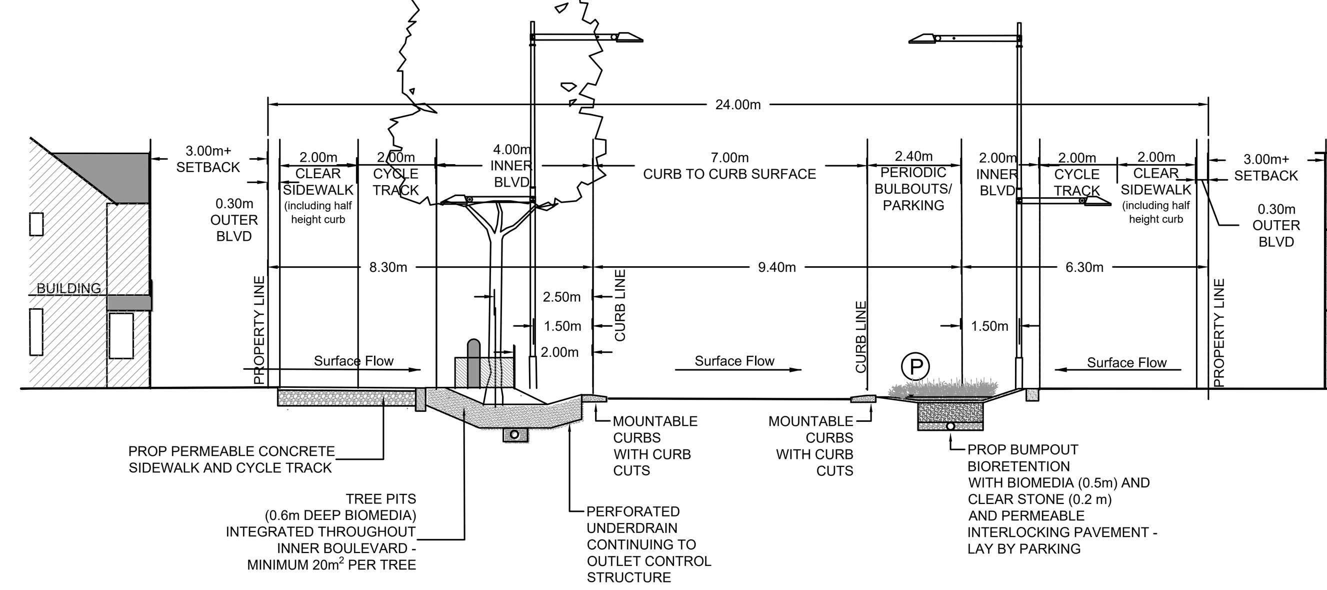
22.0 - 24.0m ROW

YARROW DRIVEWAY

(from BUS LOOP EMERGENCY ACCESS to TUNNEY'S PASTURE)

WOONERF

TARGETED PERCENTAGE OF ROW WIDTH ALLOCATED FOR NON-AUTO USES (URBAN DESIGN MANUAL 2018): 40%
NON-AUTO PERCENTAGE ACHIEVED FOR THIS TYPICAL CROSS SECTION: 100%

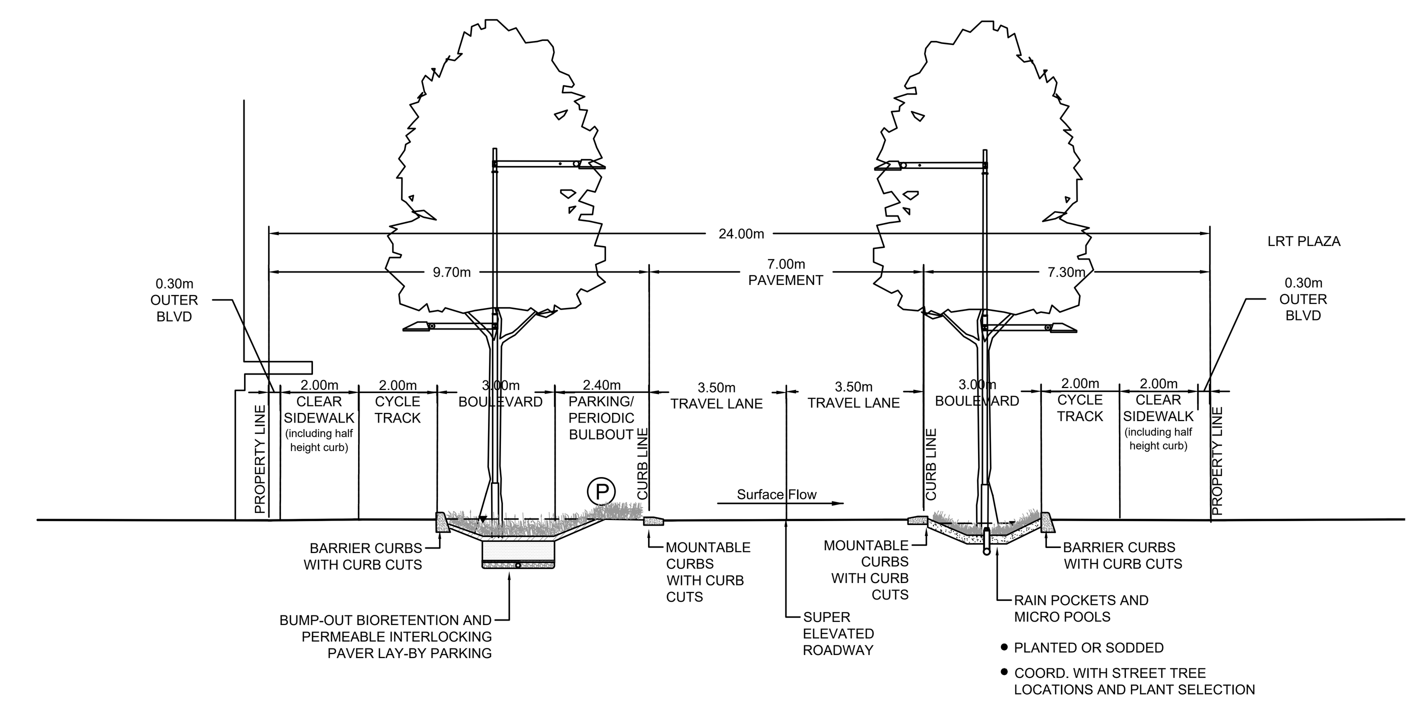


24A MIXED FRONTAGES

ALL 24m ROW STREETS

EXCEPT YARROW DRIVEWAY (from GOLDENROD to TUNNEY'S PASTURE)

TARGETED PERCENTAGE OF ROW WIDTH ALLOCATED FOR NON-AUTO USES (URBAN DESIGN MANUAL 2018): 40%
NON-AUTO PERCENTAGE ACHIEVED FOR THIS TYPICAL CROSS SECTION: 60%

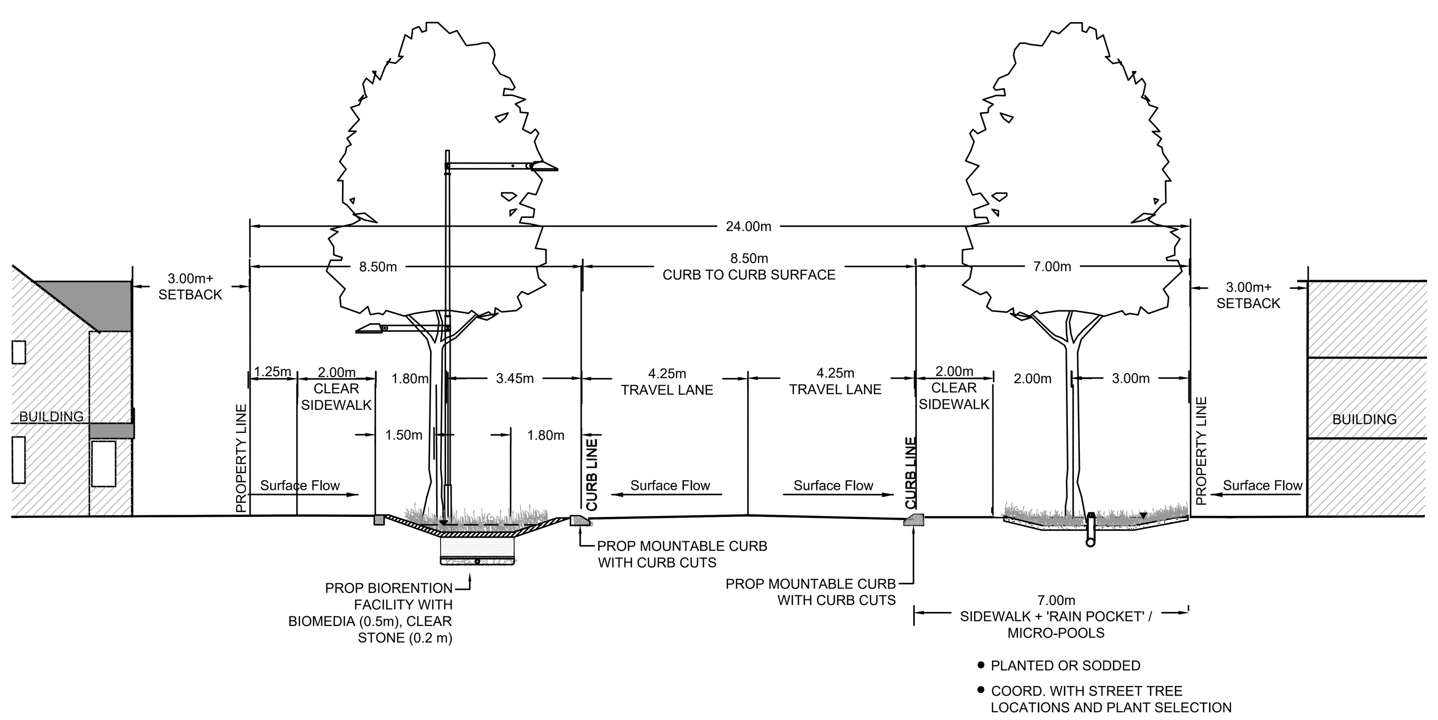


24.0m ROW

YARROW DRIVEWAY

(from GOLDENROD to BUS LOOP EMERGENCY ACCESS)

TARGETED PERCENTAGE OF ROW WIDTH ALLOCATED FOR NON-AUTO USES (URBAN DESIGN MANUAL 2018): 40%
NON-AUTO PERCENTAGE ACHIEVED FOR THIS TYPICAL CROSS SECTION: 60%

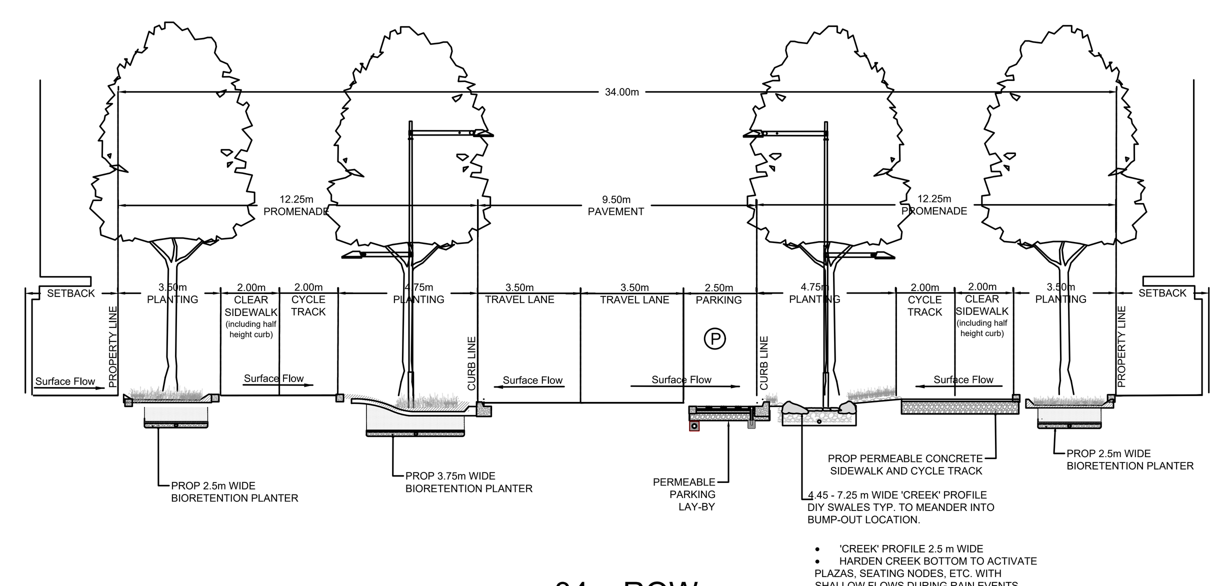


24.0m ROW

LOCAL ROAD WITH LID

TARGETED PERCENTAGE OF ROW WIDTH ALLOCATED FOR NON-AUTO USES (URBAN DESIGN MANUAL 2018): 40%
NON-AUTO PERCENTAGE ACHIEVED FOR THIS TYPICAL CROSS SECTION: 65%

NOTE:
BIOSWALE TO BE LOCATED IMMEDIATELY BEHIND THE CURB.
BIOSWALE LOCATION CAN ALTERNATE ON EITHER SIDE OF THE ROADWAY. TO BE IMPLEMENTED WHERE FEASIBLE.



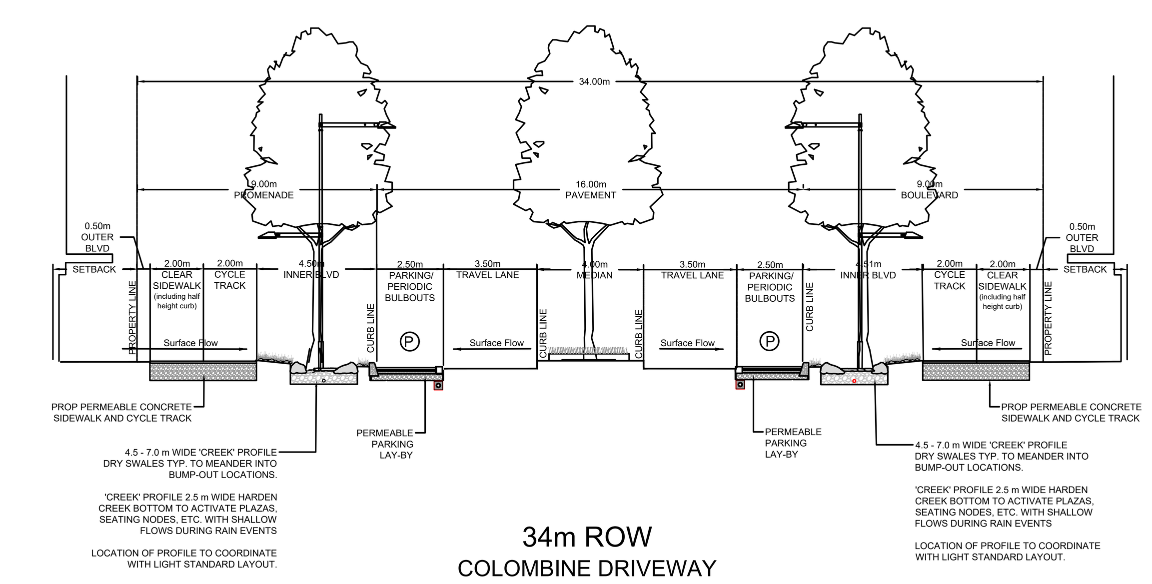
34m ROW

ALTERNATIVE WITHOUT MEDIAN

COLOMBINE DRIVEWAY

(from GOLDENROD to PROPOSED ROADWAY EAST OF TUNNEY'S PASTURE)

TARGETED PERCENTAGE OF ROW WIDTH ALLOCATED FOR NON-AUTO USES (URBAN DESIGN MANUAL 2018): 40%
NON-AUTO PERCENTAGE ACHIEVED FOR THIS TYPICAL CROSS SECTION: 72%

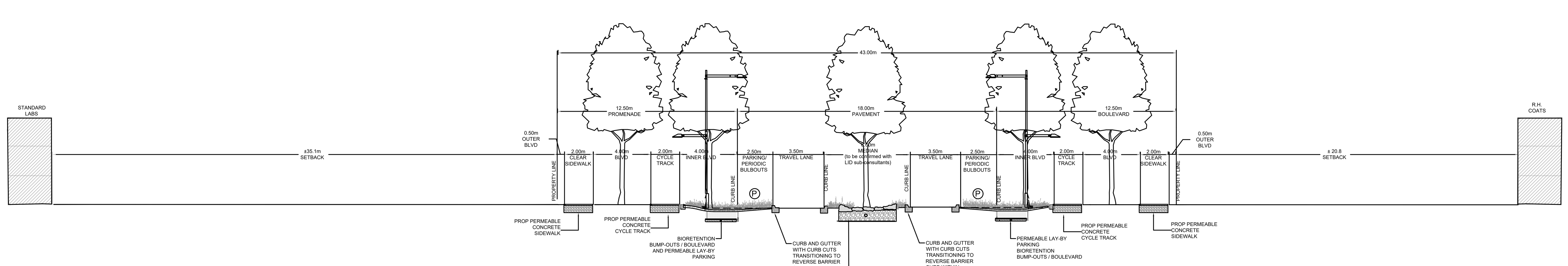


34m ROW

COLOMBINE DRIVEWAY

(from GOLDENROD to PROPOSED ROADWAY EAST OF TUNNEY'S PASTURE)

TARGETED PERCENTAGE OF ROW WIDTH ALLOCATED FOR NON-AUTO USES (URBAN DESIGN MANUAL 2018): 40%
NON-AUTO PERCENTAGE ACHIEVED FOR THIS TYPICAL CROSS SECTION: 65%



TARGETED PERCENTAGE OF ROW WIDTH ALLOCATED FOR NON-AUTO USES (URBAN DESIGN MANUAL 2018): 40%
NON-AUTO PERCENTAGE ACHIEVED FOR THIS TYPICAL CROSS SECTION: 72%

NOTES: SET-BACK FROM BUILDINGS IS CALCULATED FROM DISTANCE

1. BETWEEN FRONTAGE OF STANDARDS LAB AND EXTENSION OF FRONTAGE OF R.H. COATS BUILDING. ROW WIDTH CAN BE FURTHER REDUCED BY KEEPING
2. SINGLE-ROW OF TREES ON EITHER SIDE.
3. MEDIAN MAY RESULT IN SIGHT LINE ISSUES AT INTERSECTIONS ALONG TUNNEY'S PASTURE DRIVEWAY, ESPECIALLY IF THERE IS VEGETATION/PLANTINGS WITHIN CLOSE PROXIMITY TO THESE JUNCTIONS.
4. ONE-WAY VEHICLE LANES SEPARATED BY A MEDIAN ARE LIKELY TO ENCOURAGE HIGHER OPERATING SPEEDS AND MAY NOT BE COMPATIBLE A WITH 40KM/H POSTED SPEED WITHOUT SIGNIFICANT TRAFFIC CALMING MEASURES.
5. LID EFFICIENCY IN MEDIAN IS NOT OPTIMAL. LID IS RECOMMENDED BEHIND THE CURB.

43.0m ROW

WITH LID IN MEDIAN

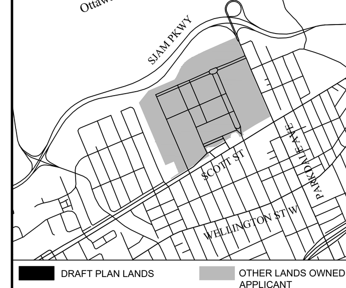
TUNNEY'S PASTURE DRIVEWAY

(FROM COLOMBINE TO YARROW)

PUBLIC ROAD REDEVELOPMENT

TUNNEY'S PASTURE
OTTAWA, ON

KEY PLAN - N.T.S.



DRAFT PLAN LANDS
OTHER LANDS OWNED BY APPLICANT

INFORMATION REQUIRED

UNDER SECTION 51 (17) OF THE PLANNING ACT, R.S.O. 1990. c.P.13 AS AMENDED
(a) - AS SHOWN
(b) - AS SHOWN
(c) - AS SHOWN
(d) - AS LISTED
(e) - AS SHOWN
(f) - AS SHOWN
(g) - AS SHOWN
(h) - MUNICIPAL WATER
(i) - URBAN, NA
(j) - AS SHOWN
(k) - MUNICIPAL SANITARY AND STORM SEWERS
(l) - AS SHOWN

SURVEYOR'S CERTIFICATE

I HEREBY CERTIFY THAT THE BOUNDARIES OF THE LANDS TO BE SUBDIVIDED ON THIS PLAN AND THEIR RELATIONSHIP TO THE ADJACENT LANDS ARE ACCURATELY AND CORRECTLY SHOWN.

SIGNED
V ANDREW SHELP, O.L.S.
ANNIS, O'SULLIVAN, VOLLEBEKK LTD
DATE

OWNER'S CERTIFICATE

I HEREBY CONSENT TO THE FILING OF THIS PLAN BY IBI GROUP, IN DRAFT FORM.

SIGNED
CANADA LANDS COMPANY
DATE

LAND USE SCHEDULE

BLOCKS	DESCRIPTION	AREA (ha)
1	MIXED-USE	2.019
2	MIXED-USE	2.425
3	MIXED-USE	2.326
4	MIXED-USE	0.625
5	MIXED-USE	1.545
6	TRANSIT (TO BE CONVEYED TO CITY)	0.636
7	OPEN SPACE	0.092
8	OPEN SPACE	0.107
9	OPEN SPACE	0.420
10	OPEN SPACE	0.156
11	PUBLIC ROW (Goldenrod Driveway)	0.953
12	PUBLIC ROW (Goldenrod Driveway)	0.687
13	PUBLIC ROW (Goldenrod Driveway)	0.304
14	PUBLIC ROW (Goldenrod Driveway)	0.179
15	PUBLIC ROW (Colombine Driveway)	1.282
16	PUBLIC ROW (Colombine Driveway)	0.952
17	PUBLIC ROW (Sir Frederick Banting Driveway)	0.743
18	PUBLIC ROW (Sir Frederick Banting Driveway)	0.691
19	PUBLIC ROW (Sorrel Driveway)	0.342
20	PUBLIC ROW (Sorrel Driveway)	0.153
21	PUBLIC ROW (Sorrel Driveway)	0.378
22	PUBLIC ROW (Eglantine Driveway)	0.153
23	PUBLIC ROW (Eglantine Driveway)	0.378
24	PUBLIC ROW (Chardon Driveway)	0.435
25	ROW WIDENING - FUTURE (Chardon Driveway)	0.063
26	PUBLIC ROW (Chardon Driveway)	0.190
27	PUBLIC ROW (Chardon Driveway)	0.304
28	PUBLIC ROW (Yarrow Driveway)	0.631
29	PUBLIC ROW (Tunney's Pasture Driveway)	2.051
30	ROW WIDENING (Parkdale Avenue)	0.175
	TOTAL:	21.395

#	DATE	BY	DESCRIPTION
1	2024-08-28	JS	Preliminary Draft LID Concept Plan

DRAWING ISSUE RECORD

APPROVALS

ARCADIS

Aquafor Beech Limited
#6-202-2600 SKYMARK Ave,
MISSISSAUGA, ONTARIO, L4W 5B2
PHONE: (905) 629-0099, FAX: (905) 629-0089

BENCHMARK

1. Elevations shown are geodetic and are referred to the CGVD2013 geodetic datum.
2. It is the responsibility of the user of this information to verify that the job benchmark has not been altered or disturbed and that it's relative elevation and description agrees with the information shown on this drawing.

SCALE 15 0 10 20 40
1:1000 (m)

PROJECT NO: 139833

DRAWN BY: JS
CHECKED BY:
PROJECT MGR: SA
APPROVED BY:

SHEET TITLE
STORMWATER MANAGEMENT CROSS SECTION

SHEET NUMBER 2
ISSUE 1.8

File Location: J:\139833_TunneyPasture\7.0_Production\7.03_Design\17_Planning\Draft Plan of Subdivision

SCALE CHECK 1 in 10mm