



Artistic rendering of the West Don Lands stormwater management facility



4.11

LINEAR AND GREEN INFRASTRUCTURE

The Port Lands transformation requires considerable investment in new and reconfigured municipal servicing and utility infrastructure to both serve future Port Lands residents and employees, but also to maintain infrastructure that serves the broader city servicing. The new and reconfigured infrastructure will advance Toronto's ambitions for a low-carbon, resilient future.

The watermains, sanitary sewers and stormwater infrastructure that currently exists in portions of the Port Lands is insufficient to support future growth. Further, much of this existing infrastructure is over 80 years old, near the end of its life span and is from a time when no standards existed for conserving energy and managing

water quality. Other areas, such as south of the Ship Channel, currently have little to no municipal servicing. This presents an opportunity to revisit the way that municipal servicing is delivered in the Port Lands, driven by a vision that water is a resource, not merely a waste product. There is also a convergence of hydro electric infrastructure in the Port Lands, dating to 1950s when the Hearn Generating Station was originally constructed, which continues to power the broader city. Other utilities will need to be accommodated in the new and reconstructed streets such as a major Enbridge gas pipeline that feeds into the Port Lands Energy Centre. There are also numerous abandoned oil pipelines that will need to be addressed.

A number of studies were undertaken as part of the development of this Framework to inform future infrastructure needs and configuration. These included:

- The Lower Don Lands Infrastructure Master Plan (LDL IMP) and 2014 Addendum and the Lower Don River Due Diligence and Validation Report;
- The Port Lands and South of Eastern Transportation and Servicing Master Plan (TSMP);
- A feasibility study undertaken by Hydro One on behalf of the City and Waterfront Toronto to address relocation and reconfiguration of existing hydro transmission infrastructure; and
- The Port Lands-wide Community Energy Plan.

Both the Port Lands and South of Eastern Transportation and Servicing Master Plan (TSMP) and the Lower Don Lands Infrastructure Master Plan (LDL IMP) established the preferred municipal servicing solutions for the Port Lands. These Master Plans explored a range of solutions from

conventional servicing approaches, to practical, innovative approaches that recognize the value of water to our everyday lives and environment.

The preferred solutions identified in the Master Plans advance a progressive agenda for change, while also recognizing existing regulatory frameworks, and maintenance and operational considerations. The solutions build on planned infrastructure upgrades, both within and in proximity to the Port Lands, and capitalize on the proximity of the Ashbridges Bay Treatment Plant. Integrated and efficient water infrastructure systems will be implemented in the Port Lands through cost-effective, modern, and sustainable environmental solutions.

The reconstruction of the street network and reconfiguration of municipal servicing and utilities also provides additional opportunities for integrating linear infrastructure to support low-carbon energy solutions. Reconfiguration of existing hydro electric infrastructure can also be pursued to reduce the above-grade footprint of this infrastructure, accommodate transit, and contribute to a significantly improved public realm.



MUNICIPAL SERVICES



GREEN INFRASTRUCTURE



HYDRO TRANSMISSION



PROTECTING FOR THERMAL NETWORKS AND SMART CITY INFRASTRUCTURE

4.11.1 Municipal Services

Water

The preferred water supply solutions in the Port Lands are to reduce water usage through various conservation approaches, while enlarging and extending watermains to serve the new communities and employment districts. Watermains, to the extent possible, will be located within the

future street network. The system of watermains provide for looping and redundancy of supply to improve fire flows and maintain water quality. On a pilot basis, non-potable water applications may be advanced in the Lower Don Lands, subject to meeting regulatory requirements.

Wastewater

The existing wastewater collection system in the Port Lands consists of a separated system of pipes ranging in diameter from 200 mm to 675 mm. Lands north of the Ship Channel currently connect by gravity to a large diameter interceptor sewer, called the Low Level Interceptor (LLI) that collects and conveys flow to the Ashbridges Bay Sewage Treatment Plant (ABTP). Only a small portion of the lands south of Ship Channel are connected to the sanitary system. The balance of the lands either have no sanitary servicing or are on a private communal system.

A number of alternatives were explored in the EA processes. In both EAs, reductions in wastewater flows and gravity-based systems have been identified. Gravity-based systems are the most efficient and cost effective solutions. They require no power to convey flows to their treatment destinations. The City is, however, in the process of updating the Waterfront Sanitary Servicing Master Plan. A centralized pumping station is being identified through this process that would service the entire

geography, including the Lower Don Lands. As an interim solution for the Lower Don Lands, and depending on timing of development east of the Don Roadway, a pumping station may be required at the Don Roadway and Commissioners Street, which was identified in the LDL IMP.

Currently, the Port Lands sanitary system is proposed to connect into the Carlaw Interconnecting Sewer at Eastern Avenue, and ultimately to the Mid-Toronto Interceptor (MTI). The introduction of a new centralized pumping system would provide the City with additional flexibility for conveying the Port Lands sewage to the ABTP.

An eco-island concept was explored for a small portion of the Lower Don Lands geography as part of the LDL IMP. A decentralized system south of the Ship Channel with the potential reuse of black water to harness energy was also explored as part of the TSMP. While both of these alternatives were progressive approaches to managing wastewater, given the gravity-based system and proximity to the

Ashbridges Bay Treatment Plant they were deemed not practical or cost effective. Regulatory and technical challenges related to the disposal of greywater and biosolids also required additional infrastructure which negated the benefits of these types of systems in the Port Lands. There may

be opportunities in the future at the Ashbridges Bay Treatment Plant for energy generation which would have city-wide application and benefit. For instance, small generating plants in the vicinity of Leslie Street using methane from the Treatment Plant could supply power into Toronto's grid.

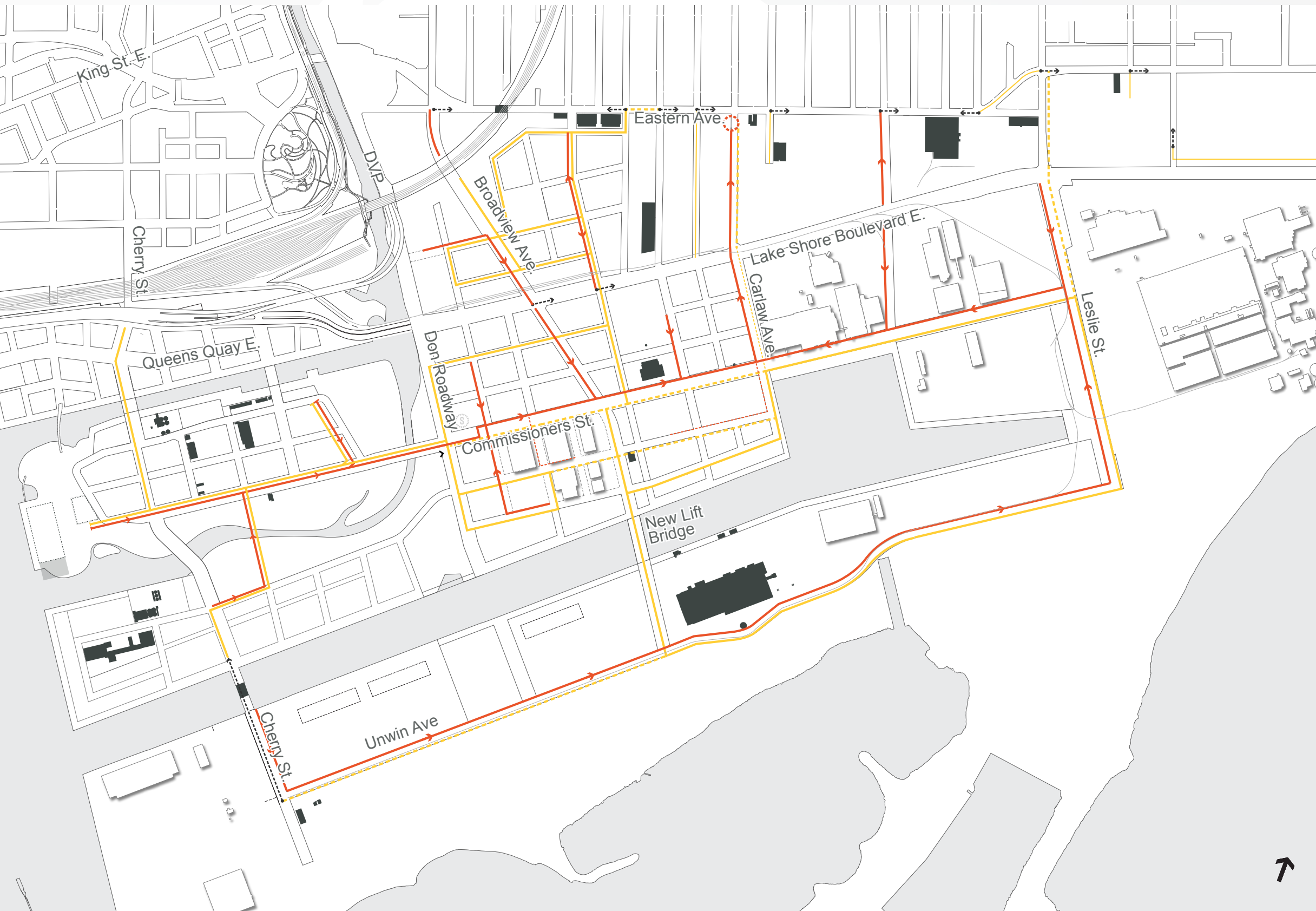
Stormwater Management

Existing stormwater management infrastructure in the Port Lands consists of a local sewers system north of the Ship Channel that currently collect flows that then discharges untreated to the Ship Channel and Turning Basin. There are also a number of large trunk sewers and stormwater outfalls in the Port Lands that service areas to the north. The areas to the north have combined sewers and during weather events discharge their flows untreated to the outfalls in the Port Lands. Major capital upgrades will be advanced through the Don River and Central Waterfront project to improve water quality and address the problem of stormwater and combined

sewer overflow discharges. South of the Ship Channel there is no existing stormwater infrastructure, and these lands regularly flood during heavy rainfall events.

Both the LDL IMP and the TSMP advanced progressive solutions for managing local stormwater flows using the City's Wet Weather Flow Management Guidelines as a base. These guidelines direct that stormwater flows are to be treated close to the source, with quality and quantity controls. Systems that replicate and mimic natural hydrologic and environmental processes are desirable.

Figure 78: Water and Wastewater Systems





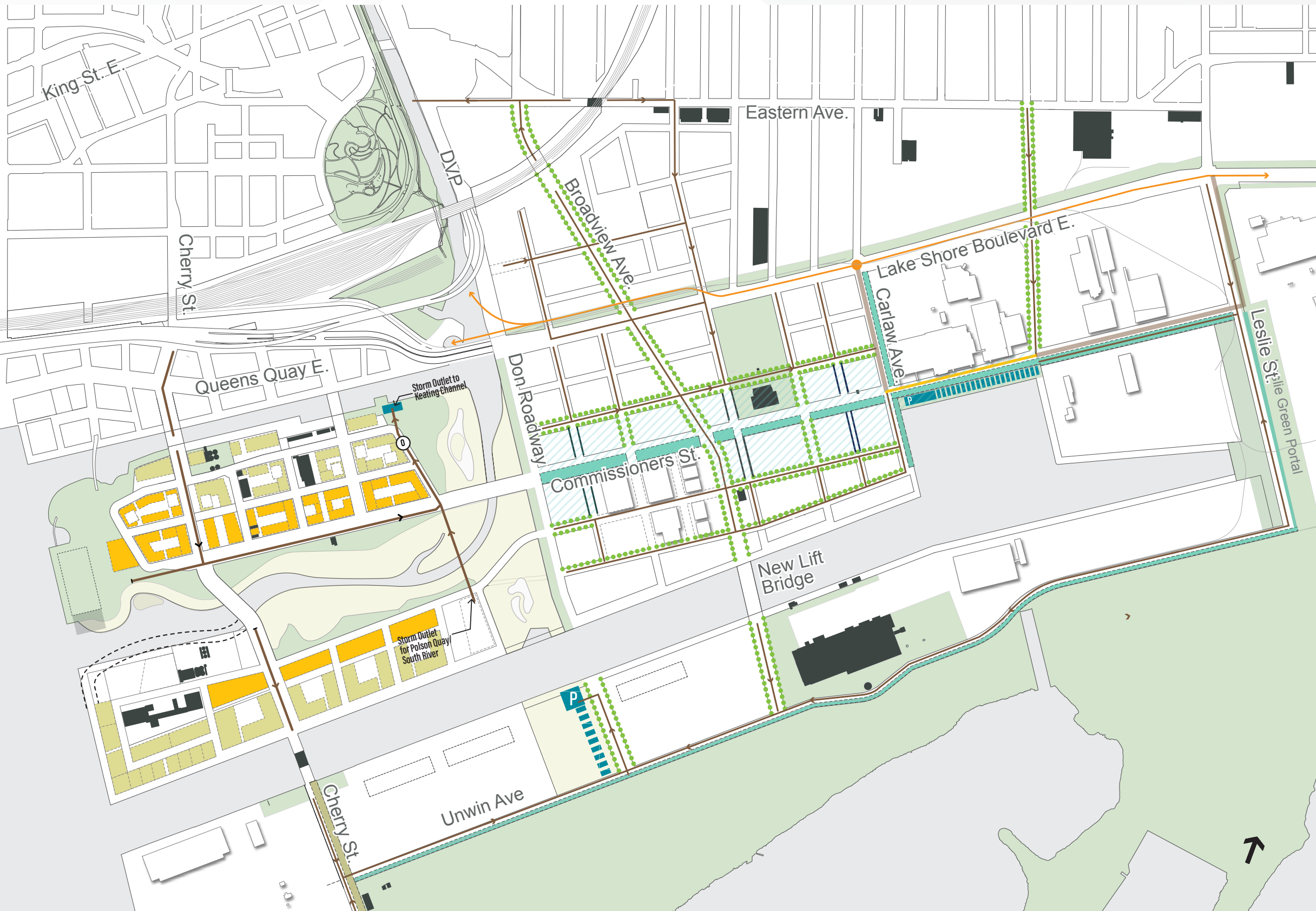
-  Connect to Existing Infrastructure
-  New Gravity Fed Sewer
-  Connect to Mid-Toronto Interceptor
-  Decommission Temporary Pumping Station
-  Existing Gravity Fed Sewer to Remain
-  New Watermains
-  Watermains to be Replaced
-  Fire Flow Upgrades
-  Existing Watermain to Remain

Figure 79: Stormwater System



- Open Channels
 - Open Channel and Sand Filter
 - Urban Bioswales
 - Hardscape Channel
 - Stormwater Quality Treatment Facility
 - Passive Treatment Opportunities
 - Storm Sewers
 - P Pumping Station
 - Pilot Area
 - Roofs Drained to Wetlands
 - Roofs Used for Street Tree Irrigation
-
- EXTERNAL STORMWATER SERVICING**
- Box Culverts
 - New 1950mm Sewer
 - Inner Harbour Tunnel
 - WWF Connection Point to Inner Harbour Tunnel

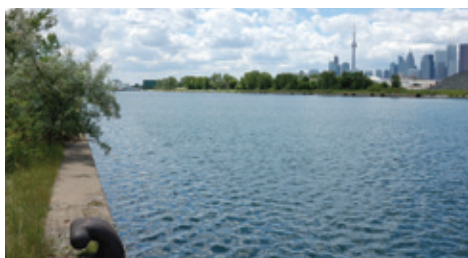
Designing with Water as a Resource

Stormwater in the Port Lands will not be managed in a conventional way. It will be managed more progressively and celebrated. Designing with water as a resource embeds the movement and treatment of stormwater into the everyday experience of streets and open spaces. Stormwater will be daylighted and partially treated through open, planted channels, swales, wetlands and tree plantings that are integrated into the public realm. Stormwater elements take on new meaning - offering communal places for shade and gathering and bringing the narrative of water to life. People will develop a better appreciation and understanding for water and the importance and challenges of managing it in an urban context.

Natural processes will be used to the extent possible in the Port Lands. Due to the nature of fill that created the Port Lands and historical industrial

uses, there is limited potential for infiltration, and hybrid systems will be required. Evapotranspiration, harvesting and bio-retention will be employed to contribute to the removal of nutrients, pathogens and other pollutants from runoff. The open channels and swales will reduce the volume and intensity of stormwater flows that are discharged to the Ship Channel, Turning Basin and Lake Ontario, and can save the City money on upgrading and repairing infrastructure. In the Lower Don Lands, rather than discard rainwater from rooftops, it will be collected and used to water the new signature parks and open spaces.

A healthy system of street trees will equally contribute to the Port Lands sustainable, green infrastructure by capturing rainfall in their leaves and soil, trapping sediments, and breaking down and stabilizing pollutants. They will also contribute to reducing



IDENTITY



WATER AS A MEANINGFUL FRAMEWORK FOR A NEW TYPE OF STREET



WATER AS A MEANINGFUL FRAMEWORK FOR PUBLIC REALM



MICROCLIMATE - SHADE, TREE GROWTH



EDUCATION - BRINGING THE NARRATIVE OF WATER TO LIFE



WATER AS A COMMUNAL EXPERIENCE

the volume and temperature of stormwater runoff (Boston Complete Street Guidelines, 2013). Sufficient soil volumes or other techniques, such as the use of silva cells, will be required to ensure the necessary conditions to grow great trees.

A pilot project is also proposed along the Commissioners Street corridor where no sewers are proposed at all. Stormwater flows will be collected in a wide, open channel and directed to the Turning Basin. Passive treatment techniques can be tested for small portions of the flows requiring treatment, with the balance treated in a new stormwater water quality facility.

South of the Ship Channel, regrading to allow positive drainage will occur and stormwater infrastructure will be introduced. This will minimize the potential for flooding that currently occurs during heavy rainfall events, but will need to be done sensitively to protect the Environmentally Significant Areas south of Unwin Avenue. Additional analysis is required at detailed design to maintain and/or improve hydrologic conditions for these areas. Flows will be directed to the Don Greenway for treatment at a new stormwater treatment facility that will be integrated into an overall design for this important natural heritage linkage.

While the green infrastructure will contribute to managing and treating stormwater run-off through natural processes, additional treatment is required. Oil grit separators will be used to pre-treat run-off, and three end-of-pipe stormwater quality treatment facilities are required. One would serve Villiers Island, Polson Quay and South River. One would serve lands east of the

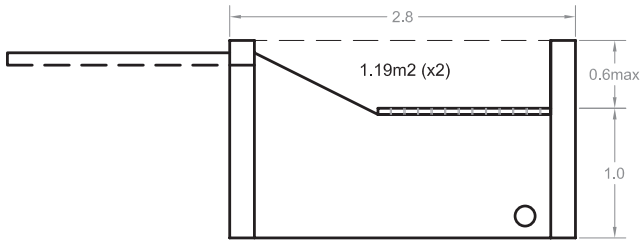
Don Roadway north of the Ship Channel and the Unilever precinct. The final would serve lands south of the Ship Channel at the Don Greenway.

The treatment facility for the lands east of the Don Roadway will be located at the Turning Basin. Alternatively, should wet weather flow infrastructure associated with the Don River and Central Waterfront project be implemented prior to redevelopment advancing in these areas, this infrastructure will be used to convey flows to the high-rate treatment facility proposed at the ABTP. The stormwater system has been devised to direct flows to Carlaw Avenue and the Turning Basin enabling both options.

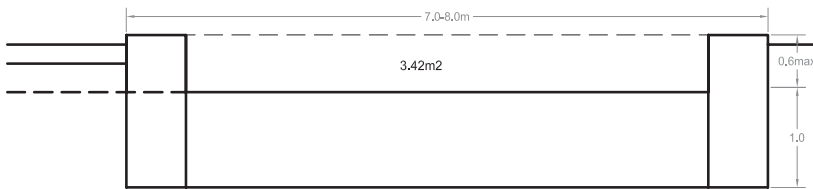
The overall approach is progressive and practical. It is principled on using a “light touch” and natural processes to manage stormwater run-off. Other potential benefits include increased storage capacities for more frequent and heavier rainfall events associated with a changing climate. However, it is a relatively new approach for the City, with only a handful of precedents elsewhere in the City, and none where swales and channels have been introduced on such a mass district-wide scale. It will have additional maintenance requirements that will need to be addressed following the adoption of this Framework.

The LDL IMP was completed prior to broader acceptance and understanding of green infrastructure for the conveyance and treatment of run-off. As detailed design progresses for the streets and river valley in the Lower Don Lands, incorporation of green infrastructure will be encouraged and advanced.

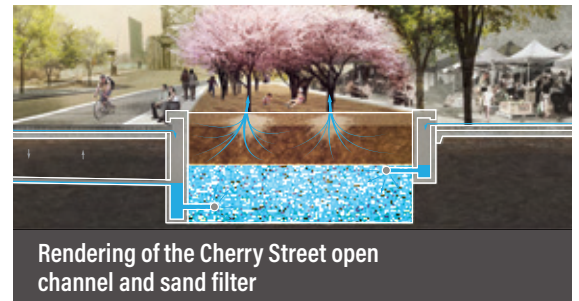
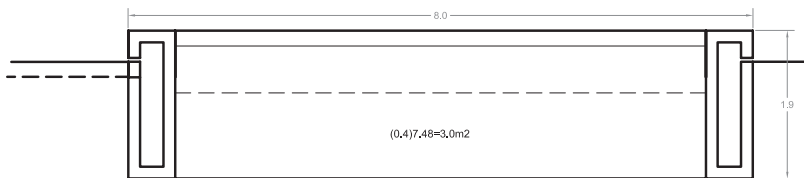
Urban Bioswales



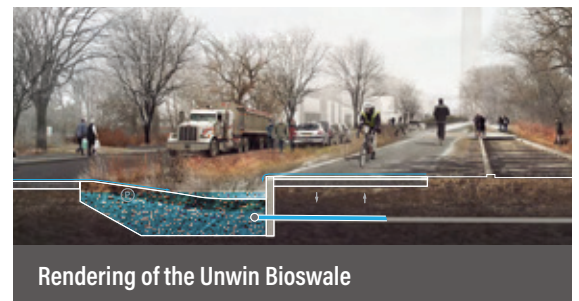
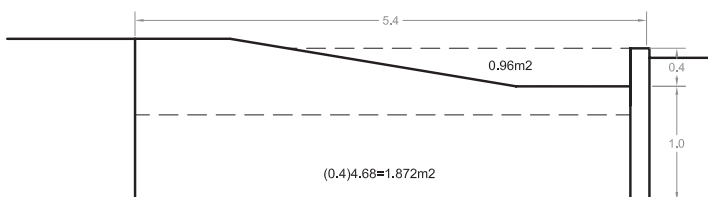
Commissioners Open Channel



Open Channel and Sand Filter



Unwin Channel/Swale



Local Development Servicing

Much like elsewhere in the city, developers will be required to provide and pay for new infrastructure, or improvements to existing infrastructure required to serve the proposed development (including streets, sanitary and storm sewers, municipal water and electricity

supplies and any telecommunication networks). Should a developer wish to proceed with a project in advance of growth-related infrastructure being implemented by, or on behalf of the City, developers will be required to front-end the cost of any necessary infrastructure.

4.11.2 Hydro Transmission

There is a convergence of hydro electric transmission infrastructure in the Port Lands, dating back to when the Hearn Generating Station was first constructed in the Port Lands in the 1950s. The power is coming into the Port Lands, but also leaving it to power the city, with the Port Lands Energy Centre contributing to the power leaving the Port Lands. As a result, there is a complicated web of underground, overhead and-at grade infrastructure.

There are overhead transmission lines running along the east side of the Don Roadway and down the centre

of Commissioners Street to Bouchette Street. Underground high-voltage cables are located under Lake Shore Boulevard, Villiers Street west of the Don Roadway, and under Bouchette Street. These transmission lines and cables lead to the Basin Transmission Station located adjacent to the Ship Channel, centrally located in the Film Studio District adjacent to the future water's edge promenade. They then cross the Ship Channel overhead and connect into the recently reconfigured Hearn Switching Station and new transmission station adjacent to the Port Lands Energy Centre.



Hydro towers down the centre of Commissioners Street

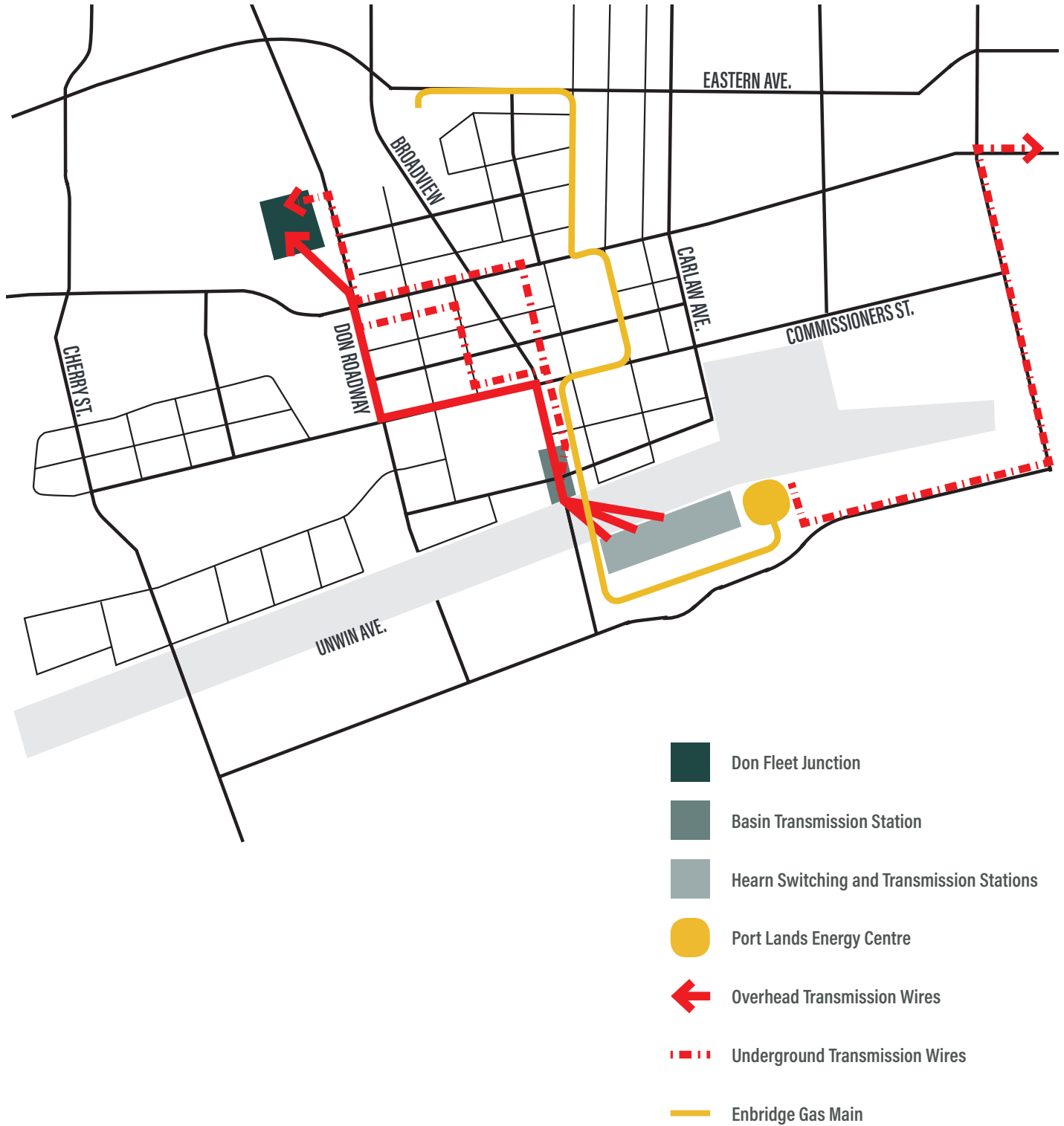


The Basin Transmission Station



The reconfigured Hearn Switching Stations

Figure 80: Existing Hydro-Electric Infrastructure



North of the Port Lands the transmission lines and underground circuits connect to the Don Fleet Junction near Corktown Common. Overhead transmission lines cut diagonally across the Don River. Underground cables head north and then across the Don River in a utility bridge structure to the Don Fleet Junction. There are also underground high-voltage cables south of Ship Channel and under Leslie Street. See Figure 80 for a schematic showing existing hydro infrastructure.

All of this infrastructure combined works to distribute power to the network and then across the city,

but also to power the Port Lands itself. However, much was installed prior to, or without consideration to, regeneration and renewal in Port Lands. Reconfiguration and relocation of some of this existing infrastructure is required to accommodate the flood protection measures, but also to achieve other city-building objectives.

Hydro One, on behalf of the City and Waterfront Toronto, undertook a feasibility study to explore different options and scenarios for reconfiguring and relocating their infrastructure. The study was undertaken in two parts. The first part dealt with the modifications to hydro infrastructure associated with



A Hydro transmission tower crumples under the weight of the ice.

flood protection measures only. The towers adjacent to the Don Roadway and one tower on Commissioners Street could be raised to accommodate the required Valley Wall Feature adjacent to the Don Roadway. The underground cable under Villiers Street would be replaced with a new, modern cable at an appropriate depth to address heat dissipation associated with the placement of additional fill. The utility bridge across the Don River north of Lake Shore Boulevard could be replaced with a new bridge to ensure flood conveyance would not be restricted, or potentially converted to overhead transmission lines.

The second part of the study explored other broader city-building moves, including widening and reconstructing the Don Roadway necessitating relocation of the overhead transmission wires, introducing dedicated streetcar service on Commissioners Street and accommodating the preferred street network identified through the TSMP, including the Broadview Extension and re-aligned Basin Street.

Initially, a number of options were explored for the overhead transmission wires, including relocating the towers elsewhere in the Port Lands while maintaining connections into the existing transmission and switching stations. These initial options were deemed not realistic or practical. While transit would have been able to be accommodated on Commissioners Street, some of the options would have required additional land and/or had significant impacts to various water's edge conditions.

The only feasible option was determined to be undergrounding

the transmission wires. This could occur within the future rights-of-way of Commissioners Street and Don Roadway, or a combination of different streets to provide additional redundancy in the system. Undergrounding the transmission wires could have additional benefit by maintaining power during severe weather, such as an ice storm.

The study also explored the feasibility of relocating the Basin Transmission Station to accommodate the Broadview Extension and the re-aligned Basin Street. Currently, this station is owned by Hydro one, but also includes Toronto Hydro infrastructure. With the Hearn decommissioned, the station is awkwardly located in the middle of the Port Lands and was not designed to fit into an urban context. The existing site is approximately 11,000m², but is generally underutilized. In downtown Toronto, there are similar stations with smaller footprints and that are either located in structures or are attractively screened.

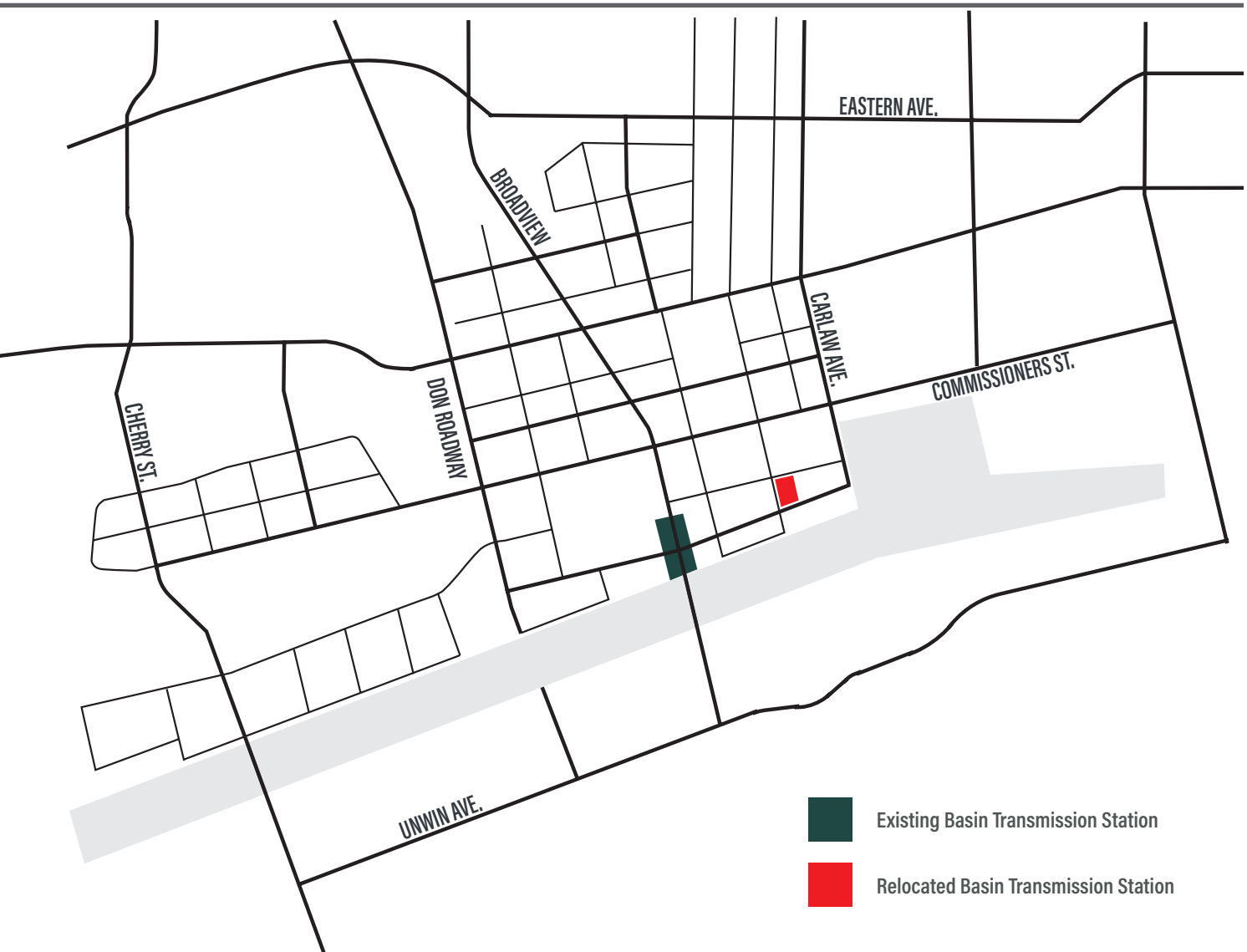
The study concluded that the station could be relocated to a 2,250m² site away from the water's edge. A potential site for the relocated station is identified on Figure 81. In the process of relocating the station, all existing overhead infrastructure to the north, including the transmission wires that cross the Don River north of Lake Shore Boulevard, would be redirected underground to the new station and Don Fleet Junction.

Existing below-grade circuits would also be redirected to the new station, providing additional opportunities to optimally configure and align the

infrastructure with the future street network. Additionally, the hydro infrastructure would cross the Ship Channel to the Hearn Switching Station under the Channel. This could have the additional benefit of significantly improving the water's edge condition in the vicinity of the Hearn.

Additional detailed study and continued coordination will be needed with Hydro One as the street network, flood protection works and servicing infrastructure advances to more detailed design. Cost sharing opportunities with Hydro One and Toronto Hydro also need to be explored.

Figure 81: Relocating the Basin Transmission Station



4.11.3 Protecting for Thermal Networks

An overall objective for the Port Lands is for the area to be a net zero district. A net zero district means that all of the district's energy use and supply is from low-carbon, local, and resilient energy solutions. Energy efficiency is maximized to the extent possible, while continuing to meet other objectives. Section 4.9 - Innovation and Sustainability - discusses the need to design passively, but also the importance of building-scale renewable energy and block-scale energy sharing

to achieve net zero. Block-scale, low-carbon energy solutions could include lake water cooling, waste heat recovery, biomass facilities or combined-heat power facilities. A critical aspect for block-scale solutions is ensuring sufficient space is reserved in street right-of-ways for thermal networks or microgrids. Depending on the location and timing for a block-scale energy solution, pipes could be pre-installed in streets as they are reconstructed to enable future connections.

4.11.4 Smart City Infrastructure

The new communities and employment clusters in the Port Lands need to be ready for the web-enabled technologies and applications of the future. Industries and entrepreneurs in the Port Lands will benefit from an open-access, ultra-high-speed broadband community network, much like has been established in other waterfront communities.

Every residence and business will be able to enjoy affordable and unlimited access to Internet speeds exponentially faster than typical North

American residential networks. This is also a critical aspect in solidifying the Port Lands as a centre for film, television and digital media. This will enable people living and working on the waterfront to work in information-intensive industries, such as film and entertainment and software development. These opportunities will promote economic growth and development and foster innovation and creativity, helping to keep Toronto competitive with major urban centres around the world for business, jobs, and talent.

4.11.5 Recommendations

The recommendations identified below reflect outcomes from the various concurrent studies undertaken to inform linear and green infrastructure in the Port Lands. While considerable progress has been made in advancing infrastructure solutions to support regeneration and renewal, further exploration and consultation will be needed as more detailed design progresses.



The provision of municipal servicing, utilities, and green infrastructure will be coordinated with the design of streets and open spaces, and will ensure the integrity of flood protection features is maintained.



The future design of municipal servicing systems will need to ensure space for the provision of utilities and the undergrounding of hydro transmission wires located along the Don Roadway, Commissioners Street and Bouchette Street.



Infrastructure and energy production facilities needed to support the introduction of a low-carbon thermal network or electrical microgrid and information communication technology will be protected for and/or incorporated, as applicable, in the design of parks and open spaces, streets, fixed bridges and/or municipal servicing during precinct planning, Phase 3 of the Municipal Class Environmental process for streets and municipal servicing and/or at detailed design, and should be incorporated and/or protected for in the design of buildings.



A potential site in the Turning Basin District for the relocated Basin Transmissions Station has been identified, located midpoint between the Broadview Extension and Carlaw Avenue on the north side of the realigned Basin Street extension. The site will be protected for. Temporary uses may be permitted.



Development, new utilities or new hydro electric infrastructure will not impede achievement of any planned infrastructure corridors or preferred street and transit alignments determined through the **Environmental Assessment Act** process.



Official Plan Policy Direction



Future Follow-on Work



Continued Consultation



Development will be required to:

- Contribute to the sustainable design of streets;
- Provide and pay for local municipal servicing, utilities and green infrastructure to service proposed redevelopments;
- Provide proper fit-outs, including necessary above and below-grade infrastructure informed by the City's Thermal Network-ready Design Guideline, to ensure connection to future low-carbon thermal energy networks, such as deep lake water cooling, geo-exchange systems, sewer heat recovery and/or combined heat/power plants; and
- Install ducting for information communication technology within individual new residential and commercial developments.



Development will be encouraged to:

- Install dual plumbing systems that allow use of harvested rainwater and gray water for landscape irrigation, toilet flushing and other uses, as permitted from a public health perspective and Building Codes, to reduce the use of potable water;
- Utilize native and low water-use vegetation that does not require permanent irrigation systems to reduce the requirement for irrigation; and
- Utilize harvested rainwater for landscape irrigation, as permitted from a public health perspective and Building Codes, rather than a potable water source. Building roofs should incorporate one or more devices for rainfall collection, storage and reuse, which could include, but are not limited to green roofs and equipment to harvest, filter and/or store rainfall.



Establish a working group with applicable City Divisions and Waterfront Toronto to establish a framework and maintenance approach for the green infrastructure proposed in the street network.



As detailed design progresses on various infrastructure projects in the Port Lands, consult and work with Hydro One and Toronto Hydro on relocating, reconfiguring, and upgrading existing hydro infrastructure.



Pursue cost-sharing arrangements with Hydro One and Toronto Hydro for relocating, upgrading and reconfiguring hydro electric infrastructure.



Official Plan Policy Direction



Future Follow-on Work



Continued Consultation