SUSTAINABLE

RELIABLE

AFFORDABLE

Document 1 - Technical Overview

06 July 2011

Ottawa Light Rail Transit Project

Phase 1, Increment 1 | Tunney's Pasture to Blair Station

www.ottawalightrail.ca

Our Mission

Transformation through transportation.

Our Vision

To leverage the power of transportation and community to create a modern, integrated capital city that is environmentally, socially, economically and culturally sustainable and a desirable place for living, working and visiting.

Light rail will shape how we grow our City.

An Official Publication of The City of Ottawa.

Please direct any questions concerning this publication to:

Gary Craig
Chief, Rail Engineering and Maintenance
lightrail@ottawa.ca

Table of Contents

1. Ottawa Light Rail Transit project (Tunney's Pasture to Blair) - Technical Overview

The descriptions provided in this section reflect the current state of design of the major elements of the OLRT project. They are representative and indicative of what the team believes can be constructed for the cost estimate provided in the main body of the report while still maintaining the required functionality to achieving the transit objectives for this project.

As the design is advanced by the preliminary engineering team and subsequently the design-build team there may be further changes as additional opportunities for design innovation are identified to achieve the most cost effective design from a construction and maintenance perspective. We will present the recommended design-build team's design to Committee and Council prior to contract award.

2. Stations

2.1. Overall design attributes

Each of the OLRT's 13 stations is unique, providing a clear station identity; yet many attributes are consistent across part or the entire network. A combination of ground related elements, landscape elements and a roof enclosure ensure a consistent design theme. This will be accomplished considering the following:

Accessibility-Elevators will meet the requirements of the Accessibility for Ontarians with Disabilities Act (AODA) and will be large enough to accommodate stretchers and bicycles.

Weatherization –Most stations, including those within the tunnel, will provide a measure of protection from extreme weather conditions such as cold winter winds, snow-fall, and hot summer sun; however, in general they will not be fully enclosed tempered spaces.

Environmental Sustainability – The design will employ leading edge sustainable design principles including storm water management, water efficient landscaping, energy management, construction waste management, and indoor environmental quality.

Fare Control – The station designs will incorporate the provision for fare gates and fare control devices, however, actual implementation of a fare control system will depend on decisions to be made in conjunction with OC Transpo.

Hardscape –Surface pavements adjacent to the station entrances will be a mix of unit pavers and concrete, depending on the surrounding area where required.

Site Furniture – Stations will be equipped with benches, waste receptacles, and bicycle racks. Where design standards already exist (such as the University of Ottawa, and Bank Street) furniture will adhere to those standards. Elsewhere, the benches will either have a powder coat

finish; cast aluminum base with wood seat, or at some stations, full timber surfaced models could be used. Where possible, existing site furniture will be salvaged, rehabilitated to like-new condition, and reinstated to their current locations.

Lighting –Lighting levels will be designed to meet the recommendations of the Illuminating Engineering Society of North America (IESNA) Lighting Handbook and Ontario Building Code (OBC) for egress lighting. All exit signs will be circuited to the essential power system and shall have an uninterruptable power supply. Lighting will be standardized as much as feasible to aid in stocking of bulbs.

Advertising – Advertising when and where provided will not in any way interfere with safe traffic flow and with the ability of passengers to quickly and easily find the optimal pathway through the stations.

Wayfinding & Signage – The development of an effective Wayfinding and Signage strategy is critical to provide orientation, direction, information, and identification. At a higher level, it will serve to knit together and connect the various stations and communities along the line and enhance their experiential qualities. Wayfinding tools include the following:

- Light: The placement and type of light can direct users, highlight entries and stopping points, increase legibility from distance, and create a sense of security and safety.
- Colour: Colour is used to define ordinal direction, to reinforce brand, to provide universally designed cues, to organize information, and to code by function.
- Sound: Sound is used for public announcements, to provide directional information, and to deliver information to users regardless of visual ability.

Likewise, an effective system of signage will be developed to aid in overall site and facility navigation. Strategy considerations include the following:

- Graphics consist of the use of colour, pictograms, arrows, and other visual elements used in addition to text. Graphics can simplify complex information, are universally recognized, and may include illustrative drawings to tell a story or provide information/instructions.
- Typography is used to reinforce key destinations, identifications, or instructions, to define zones and /or sections, and to guide users to destinations.
- Mapping consists of on-site maps for use during low density times, printed maps which are easily accessible during the entire journey, hand held wireless navigation applications (GPS, smart-phones), and includes multi-language support for international visitors.
- Technology applications include LED signs conveying dynamic information while being energy efficient and sustainable, tactile and/or audio maps to aid the vision and hearing impaired, and sound systems.

Public Art – The current project budget reflects Council's policy on public art which calls for public art to be commissioned over the course of the project implementation. The focus will be on local art and, will be themed around significant cultural aspects of Ottawa and its history in designated stations. There will be a tender call for public art during the RFP process that will initially be open to local artists only, with consideration by Council on any aspect that would be open to Canadian artists outside the National Capital.

The development of the public art program for the OLRT is being developed in accordance with the following objectives:

- Ensure artistic excellence considering stakeholder and public interests
- Develop a stratified approach to public art opportunities
- Maximize incremental budget opportunities from architecture and landscape architecture
- Design a broad, open, fair, transparent procurement process
- Provide sustainable stewardship framework recognizing maintenance requirements
- Draft methodology, recognizing handoff to design/build process
- Establish fair and equitable artist/client contract

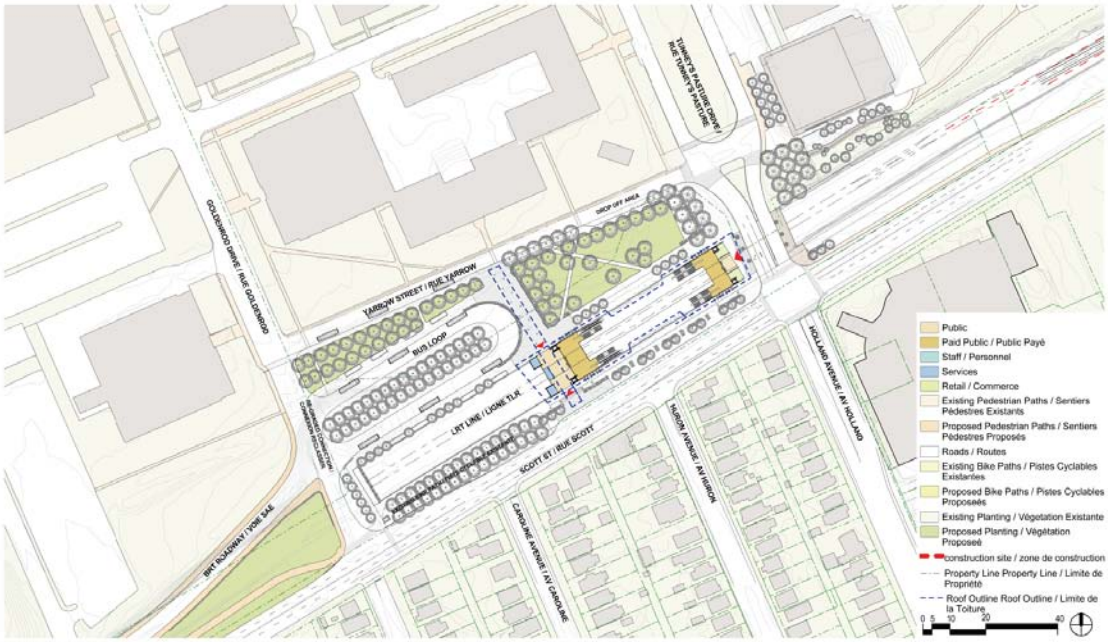
Public Art in a transit facility will increase customer satisfaction, manage the facility's reputation while increasing advocacy with customers, and buy-in with Ottawa citizens and other stakeholders. Public Art will also increase the proportion of Ottawa citizens feeling abler and confident to use public transit.

3. Station by Station Descriptions

3.1. Tunney's Pasture Station

Artist Concept

The Artist rendering shows Tunney's Pasture station viewed from the corner of Scott St. and Holland Ave. This is one out of three entries of the station. The rendering shows the roof design, exterior design, and the surrounding landscape.



Design for bus transfer and staging areas is still in progress; bus areas on this plan are conceptual only. I La conception des transferts d'autobus et des régions de mise en scène sont encore en progrès; les régions d'autobus sur ce plan sont seulement conceptuelles.

Site Context I Contexte

The site plan shows a top view of the station. It shows the concourse level, landscape design surrounding the station, and outlines the station, and outlines the roof.

Station Type: Terminal, bus/light rail transit hub

Platform Style: Side

Entrance/Exits: from bus loop, Scott Street and Holland Avenue

Theme: Not a themed station

Description:
Tunney's Pasture is an existing bus transit station along the Transitway that will be converted to serve as the west terminal of the OLRT. The existing bus service will be relocated from its current lower level to a new bus loop at grade.

The new station design will facilitate the fast and convenient movement of passengers between buses and the LRT. Bus passengers will be dropped off on the right side of a circular drop-off from which they can move easily along a wide sidewalk towards the LRT. Barriers in the center traffic island and at the eastern end of the eastern loop prevent short cutting to and from the bus stops. Bicycle parking is provided at each entry location. Plazas and sidewalks at each entrance provide generous approaches to the station.

The widths of the pedestrian walkways on both sides of the Holland Bridge will be expanded to provide better access to Tunney's Pasture and the station platforms.

The existing bus platforms will be extended and the existing four lanes of Transitway roadway will be converted to two sets of rails. The change to train use will also require platform modifications to allow for level entry to the trains rather than the current step-up conditions for bus usage. It is not expected at this time that the existing culvert below the roadway will need to be relocated.

Existing bridges across the 'cut' will be refurbished and transformed into two new entrances at the upper level, which will be connected to the platform level with stairs, elevators and escalators. The east entrance will provide a functional and somewhat ceremonial entrance from the Holland Avenue overpass, in keeping with the formal character of the federal campus. The west entrance will be the principle entrance and provide a direct connection to the reconfigured bus loop and other parts of the campus.

Track & Platform Configuration:
Both tracks are at the centre of the station with platforms on the outsides. Since the station is a terminal, trains on both tracks will be heading east. Indicators on the entry level will alert passengers which side platform the next train departs from. Trains are able to crossover to their designated track immediately outside the station. The platforms will be initially 120 metres long with provision to extend to 150 metres when ridership volumes warrant.

Descent / Ascent:
Trains will be accessed one level below grade. Riders may descend and ascend via stairs, elevators, or escalators.

Connections:
Tunney's Pasture will be the major west-end hub between the LRT and bus service. There will also be connection to a cycling route with bicycle parking at each entry/exit.

Future Consideration:
The station design will allow for potential integration with future development plans for Tunney's Pasture. There are lands surrounding the station that are available for Transit Oriented Development (TOD).

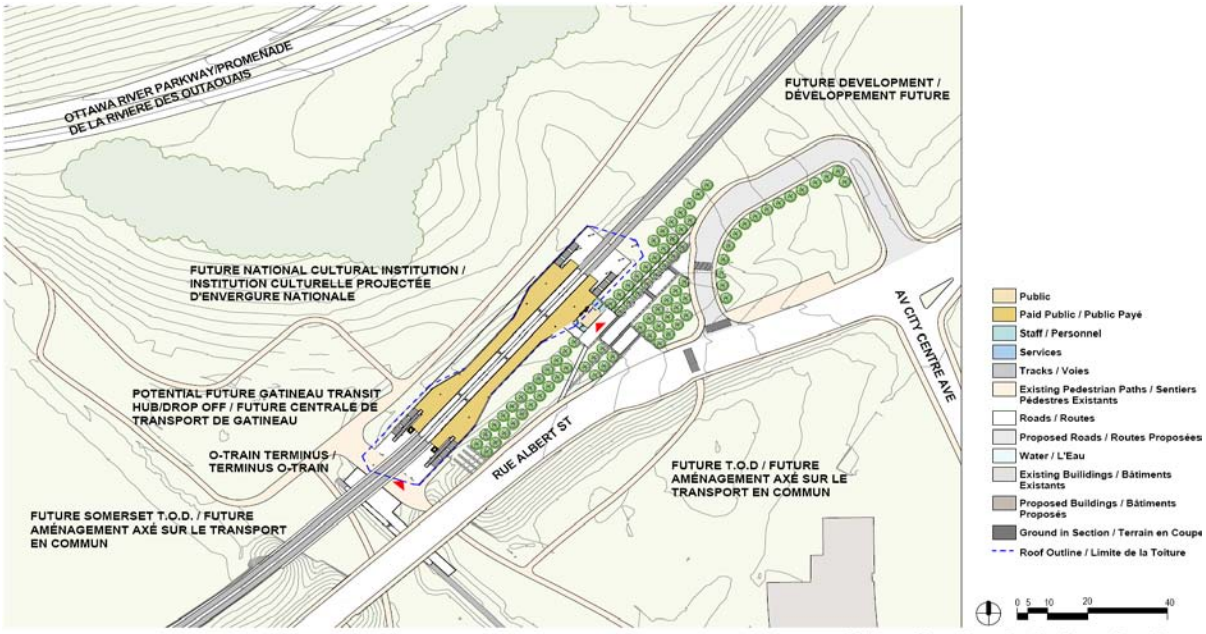
In Proximity:
This station is adjacent to the Federal Government's Tunney's Pasture campus, which includes Statistics Canada and Health Canada. The station is also a few short blocks away from the neighbourhoods of Wellington West, Hintonburg, and Westboro. There are currently no buildings directly connected to this station.

Property Impact:
Property required to construct this station will need to be acquired from the Federal Government.

3.2.Bayview Station

Artist Concept

The Artist rendering shows Bayview Station's North-West entrance with LRT in the upper level and the O- Train on the lower level. The Rendering shows exterior of the station, the roof design, surrounding landscape, and predicted pedestrian and cyclist movements.



Site Context I Contexte

Bayview Station

Site and Landscape Plan shows the top view of the station platform, roof outline, and future development opportunities.

Station Type: Transfer (O-Train Connection)

Platform Style: Side

Entrance/Exits:

1. South-East to Albert Street
2. West to O-Train

Theme: Sustainability
This theme concept would incorporate environmentally friendly and eco-conscious art and design. This concept promotes an approach to materials and mediums that consider natural elements and environmental sensitivity of the Ottawa area.

Description:
Bayview is an existing bus transit station along the Transitway which also acts as a link to the existing O-Train. This connection will be retained and improved.

Passengers approaching from Albert Street will access the station across a southerly entrance plaza. Bicycle parking is provided at the upper level next to the entrance. A pedestrian crossing at the entrance will give pedestrians safe access to the station from future development to the south.

Station design will allow for both the east-west and north-south cycling pathways to interconnect north of the proposed station. Access to the north side of the station will be via a new path underneath the existing transit bridge around the north end of the O-Train line.

Track & Platform Configuration:
LRT trains will be accessed from grade level while the O-Train connection will be maintained at the lower level. The platforms will be initially 120 metres long with provision to extend to 150 metres when ridership volumes warrant.

Descent / Ascent:
LRT trains will be accessed from grade or from one level below grade. Passengers may descend and ascend via stairs, elevators, or escalators. Access to/from the O-Train platform will be improved at the west end of the station.

Connections:
Bayview Station is positioned at the western edge of the existing Transitway station to provide O-Train and LRT passengers with a weather-protected, convenient, and quick transfer point. Bicycle parking is provided at the upper level adjacent the entrance. Local buses are able to drop-off transferring passengers along the Albert Street interface. A pedestrian crossing at the entrance gives pedestrians safe access to the station from future development to the south.

Future Consideration:
There is land to the south and east of the station slated for development. The area to the north of the station will allow for potential future Interprovincial transit connection.

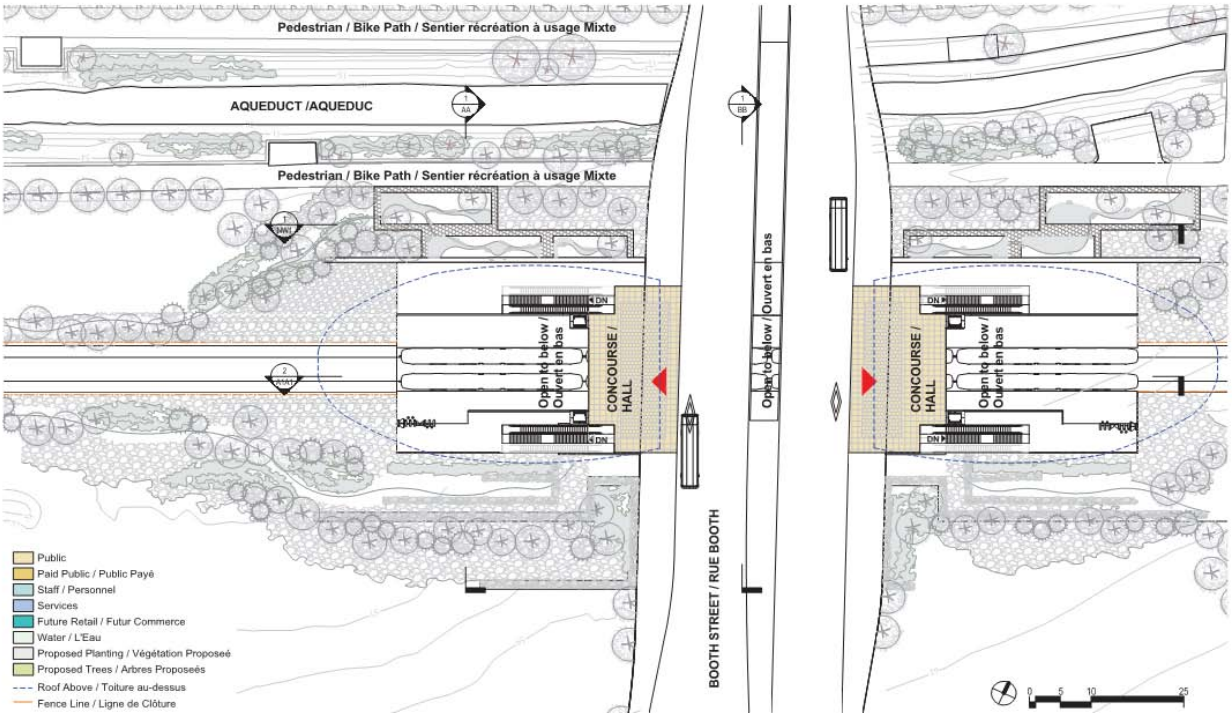
In Proximity:
Bayview Station is near the eastern edge of Hintonburg, and is one O-Train stop from Little Italy.

Property Impact:
The majority of the work associated with this station is located on property currently owned by the National Capital Commission. A minor portion of the land that is required is currently owned by the City of Ottawa.

3.3.LeBreton Station

Artist Concept

The Artist rendering shows LeBreton Station viewed from the Aqueduct. It shows the entrance and connection through Booth St. facing North-West, interior and exterior walls, and roof design.



LeBreton Station

The Site and Landscape Plan shows a top view of the station platform, roof outline.

Station Type: Line station

Platform Style: Side

Entrance/Exits:

1. East side of Booth Street Bridge
2. West side of Booth Street Bridge
3. Below Booth Street Bridge to pathways

Theme: Algonquin

The theme of this station is 'Algonquin' and as such, the station design will express Algonquin culture. One of the ways that this will be achieved is through the development of a visible storm water management system and water garden that helps to explain the importance of the natural world in general and water in particular to the Algonquin's. Additional concepts to express Algonquin culture will be developed in conjunction with the local and aboriginal community.

Description:
Lebreton is an existing bus transit station along the Transitway. The OLRT alignment will be located a short distance south of the existing bus Transitway.

The new station will be integrated with a new Booth Street bridge. This will raise Booth Street through the NCC's development land on either side of the Booth Street right of way. The new station platform will be located one level below the bridge, along the edge of the existing aqueduct. The station platforms extend east and west of Booth Street; however, the bridge provides significant cover over the platforms. Pedestrians arrive through wide plazas located on both the east and west sides of Booth Street. Passengers descend to the platforms at the lower level.

Passengers will have direct visual and physical access to the existing cycling and pedestrian pathways along the aqueduct. Bicycle racks will be at the aqueduct levels in weather protected zones.

The Lebreton site has a unique relationship to a number of heritage elements and other neighbourhood amenities, including the Canadian War Museum and Park, the Fleet Street Pumping Station, the Ottawa River, Chaudière Falls, the City of Gatineau, nearby recreational trails and the Trans Canada Trail. The station design will allow for pedestrian connections to all of these elements, as well as accommodating increased pedestrian traffic from the redevelopment of vacant lands around the station. It will also respect the heritage designation of both the adjacent bridge and aqueduct.

Track & Platform Configuration:
Both tracks are at the centre of the station with platforms on the outsides. The platforms will be initially 120 metres long with provision to extend to 150 metres when ridership volumes warrant.

Descent / Ascent:
Trains will be accessed one level below the Booth Street bridge approximately six metres down. Passengers may descend and ascend via stairs, elevators, or escalators.

Connections:
There will be connections to a cycling route with bicycle parking at each entry/exit. Connections to OC Transpo as well as to STO buses will be made via Booth Street entrances.

Future Considerations:
The construction of the new Booth Street Bridge is compatible with the NCC's development plans for the adjacent lands.

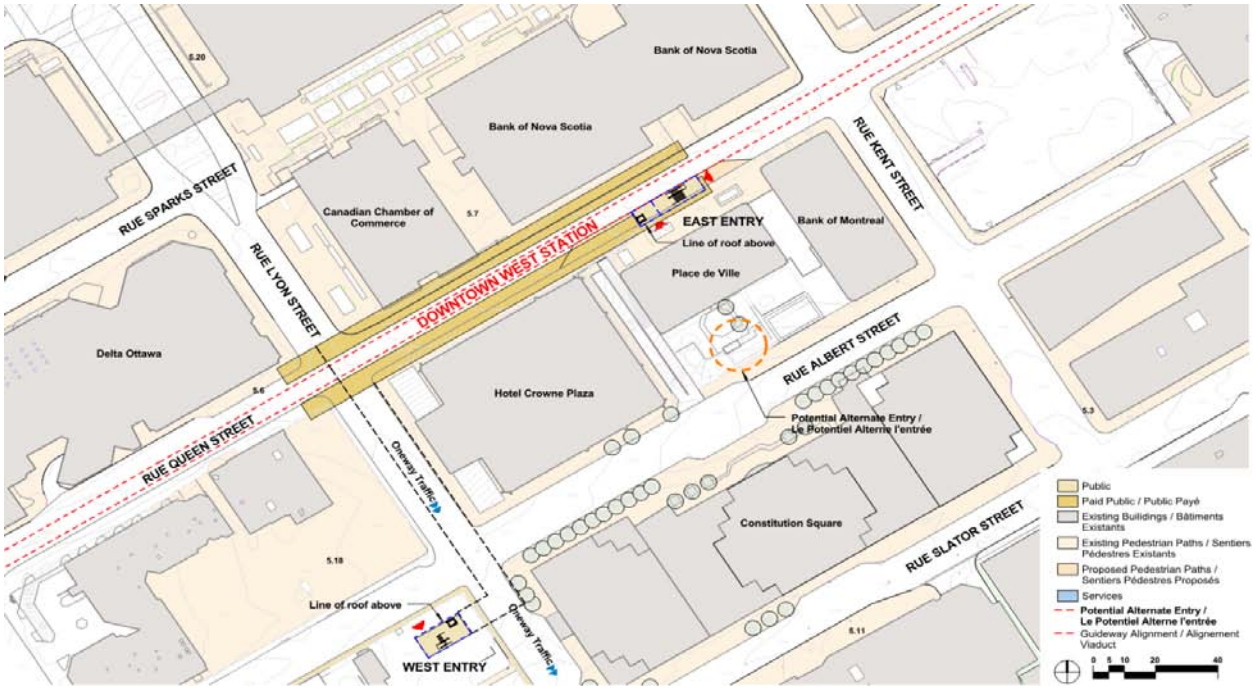
In Proximity:
The station is located in the NCC's Lebreton Flats development lands and is only a few blocks away from the neighbourhoods of West Centertown, Chinatown, and Little Italy. The station is close to the Canadian War Museum. The plaza outside the War Museum is a major event centre that draws large public gatherings such as Bluesfest. It is also just across the Chaudière Bridge from large federal government offices, including Place de la Chaudière and serves as a major transfer point.

Property Impact:
The work associated with this station is located on property currently owned by the National Capital Commission

3.4.Downtown West Station

Artist Concept

Rendering shows the exterior of Downtown West Station's east entry. It shows its proximity to the sidewalks on Queen St., and pedestrian flow around the entrance



Downtown West Station

The site plan shows top views of both east and west entrances and station platforms.

Station Type: Underground, line station

Platform Style: Side

Entrance/Exits:

1. West side on Albert Street at Lyon Street
2. East side on Queen Street at Place de Ville

Theme: Bytown

Celebrating the history of Ottawa, this theme could include our early origins, significant achievements such as the Rideau Canal and/or the community leads that helped build Ottawa

Description:
Downtown West is a new underground station that will replace a number of street level bus stations along the Transitway. This station will provide a principal connection to downtown Ottawa along Queen Street near Lyon Street.

Both entrances will be connected to the station platforms below with a combination of escalators, elevators, and stairs.
The west entrance is located at the corner of Albert Street and Lyon Street on currently undeveloped urban lands. Passengers access the station through a connecting tunnel under Lyon Street.

The east entrance is planned to be integrated into the existing Place de Ville office building plaza with potential access through the building from Albert Street.

Ventilation shafts located in the road right-of-way will be integrated into the streetscape as structured elements and/or as part of the art component.

Bicycle parking will be provided in close proximity to the station entrance.

Track & Platform Configuration:
The platforms will be 150 meters long on either side of the tracks.

Descent / Ascent:
Trains will be accessed two levels below grade. The distance is approximately 15 metres down. Passengers may descend and ascend via stairs, elevators, or escalators. Estimated travel time from street to platform is approximately 60 seconds.

Connections:
The City is pursuing the southwest corner of Albert and Lyon with a connection to the platform below grade on Lyon Street. This is a vital access to the system because it serves the existing downtown west residential, office and commercial sectors as well as future anticipated growth opportunities. In addition, access from Albert Street could be provided through the Place de Ville building to connect to the Queen Street access point.

In Proximity:
The station is linked directly to Place de Ville. As a downtown station it services a dense area of

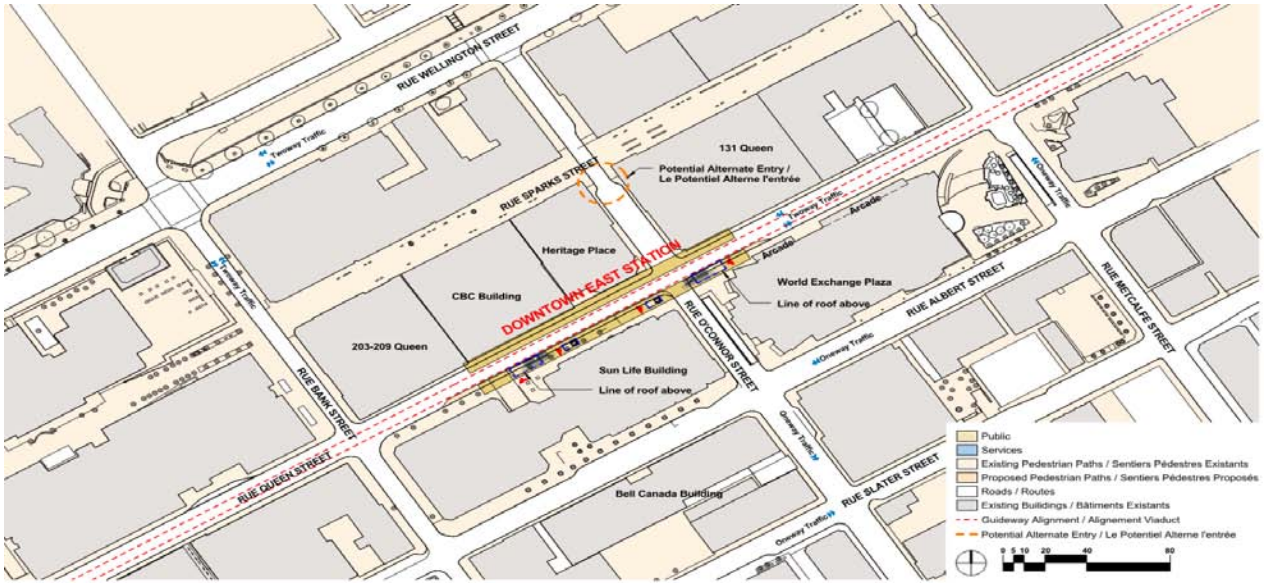
commercial, residential, and government traffic. It is the closest station to the Federal Library and Archives.

Property Impact:
The station at the platform level is located directly underneath Queen Street, which is owned by the City of Ottawa. The proposed east entry is located partially on private land and the west entry is located on private lands. Discussions have been initiated to secure access to the property associated with the proposed station entrances.

3.5.Downtown East Station

Artist Concept

Rendering shows the exterior and interior of Downtown East Station's west entry. It shows its proximity to the adjacent Sun Life building.



Downtown Station East

Site Context shows the location of the station entrances to the station itself, station platforms, and other potential station entrance locations

Station Type: Underground, line station

Platform Style: Side

Entrance/Exits:

1. Western entrance is on south side of Queen Street; east of Bank Street, next to the Sun Life building.
2. Eastern entrance is on the south side of Queen Street; near O'Connor Street, next to World Exchange Plaza.

Theme: Confederation

This theme concept would incorporate design elements that recognise Ottawa's role as the Nation's Capital and could include symbols of Canadian identity and /or the unique cultures of each Province and Territory.

Description:
Downtown East is a new underground station; that will replace a number of street level bus stations along the Transitway. This station will provide a principal connection to downtown Ottawa along Queen Street near O'Connor Street. The station will be located approximately 16 meters below street level.

Both entrances will be connected to the station platforms below with a combination of escalators, elevators, and stairs.

Track & Platform Configuration:
The platforms will be 150 meters long on either side of the tracks

Descent / Ascent:
Trains will be accessed two levels below grade. The distance is approximately 16 meters down. Riders may descend and ascend via stairs, elevators, or escalators. Estimated time from street to platform is approximately 60 seconds.

Connections:
Pedestrians can connect directly to the Sparks Street Mall. The station is a short walk to bus connections on Bank Street.

Future Consideration:
There have been discussions regarding possible access to the station entrances from the adjacent Sun Life and World Exchange office buildings. There is also potential for future connections to the block of four "C class" office buildings located south of the World Exchange Plaza.

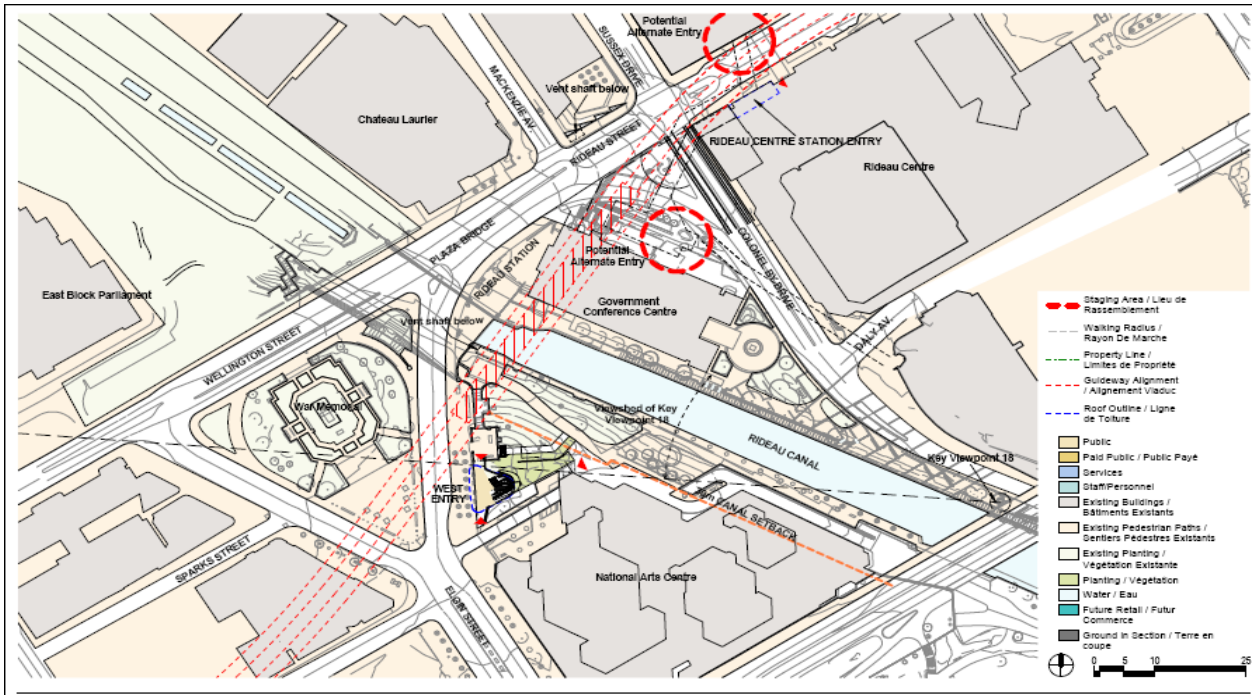
In Proximity:
The station is directly adjacent to the Sun Life and the World Exchange office buildings. As a downtown station it services a dense area of commercial, residential, and government traffic. It is the closest station to Parliament Hill.

Property Impact:
This station is located within the existing city owned right-of-way.

3.6.Rideau Station

Artist Concept

Rendering shows the station's west entry which faces Elgin St. It shows the exterior and roof design as well as landscape surrounding the entrance.



Rideau Station

Site Context shows the location of station entrances and platforms, and landscaping.

Station Type: Underground, line station, downtown hub

Platform Style: Centre

Entrance/Exits:

1. The West entrance is on the south side of Elgin Street adjacent to National Arts Centre and the National War Memorial.
2. The East entrance is located on the south side of Rideau Street inside the Rideau Shopping Centre adjacent to the existing food court.

Theme: Gallery

This theme would create a space for temporary art exhibits covering contemporary Canadian art. It could be designed to incorporate opportunities for temporary art works and exhibitions. The design could include aspects of versatile uses of space, consideration of incorporation of all artistic mediums within the plans for operational requirements, and potential links/partnerships for art/academic institutions.

Description:
Rideau is a new underground station located approximately 29 meters below street level. This station will provide the principal connection to the 'heart' of Canada's Capital.

The design responds to the unique mix of symbolic and practical land uses near the station that create a special place and identity for Ottawa, and serve as a stage for communicating Canadian culture and history. The design respects development standards protecting the visual integrity and symbolic primacy of the Parliament Buildings and other important view corridors.

The east entrance is planned to be integrated into the Rideau Shopping Centre, adjacent to the existing food court. This location will maintain the functional requirements of the roadway and sidewalks on Rideau Street.

The west entrance is integrated into the green space just north of the National Art Centre (NAC). Passengers can access the station from the broad Elgin Street tree lined sidewalk, just north of the Frieman Lane access road that leads to the NAC front entrance. The station entrance is positioned at the south side of the park to minimize its visual presence within the NCC protected capital view shed #18.

The station entrance is designed to provide universal access to the Rideau Canal through the use of elevators and a ramp. The station is embedded into the side slopes of the park, which allows 90% of the structures to be covered with plantings and turf.

Track & Platform Configuration:
There is a 150 metre long centre platform with tracks on each side.

Descent / Ascent:

Trains will be accessed from the platforms four levels below grade. The distance is approximately 29 metres down. Riders may descend and ascend via stairs, elevators, or escalators. Estimated time from entrance to platform is approximately 160 seconds.

Connections:
Rideau station will provide access to office buildings, retail shops, and restaurants on Rideau Street and in the Byward Market as well as destinations such as hotels, the Convention Centre, the National Arts Centre, and the War Memorial.

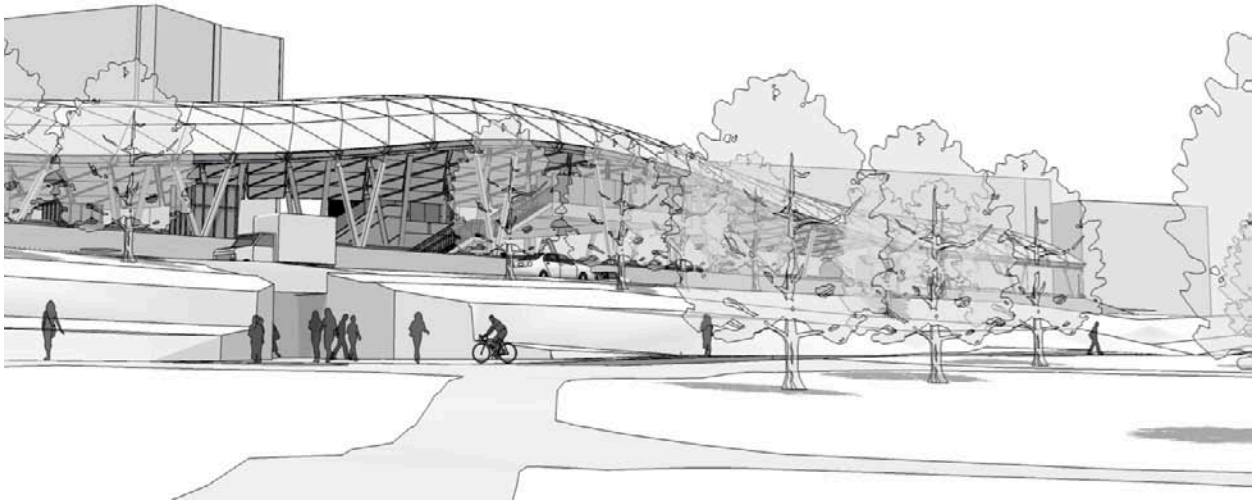
Future Consideration:
A second east entrance could be located within the proposed Lord Stanley Plaza in the urban open space at the southwest corner of Rideau Street and Colonel By Drive. It would be positioned in the south half of the plaza space giving way to the proposed commemorative landmark and outdoor entertainment square in the north half. A potential future connection to the Government Conference Centre (former Train Station) could also be provided in this location.

In Proximity:
The station will be directly linked to The Rideau Shopping Centre. It is also in proximity to the Byward Market, Rideau Street commercial and arts district and the Rideau Canal.

Property Impact:
The west station entry is located on land currently owned by Public Works Government Services Canada and will allow for a connection to the National Arts Centre to the south and east.

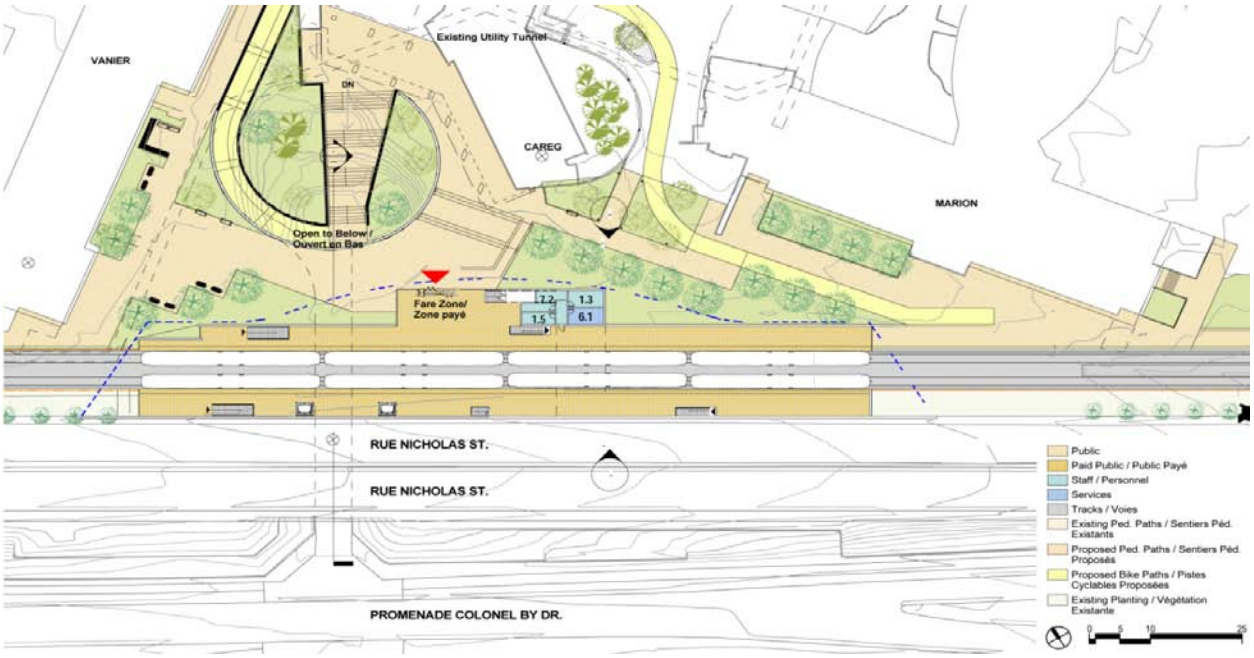
The east station entries are located within the privately owned Rideau Centre and on land currently owned by the City and the National Capital Commission east of the Government Conference Centre. Additional tunnelling for the station will take place beneath land owned by the City, Parks Canada, Public Works Government Services Canada, and the National Capital Commission.

3.7.Campus Station



Artist Concept

Rendering shows the north-west side of the station facing Nicholas St. It also shows the exterior roof design, the tunnel, and the overpass connecting to the station



Campus Station

Site context shows the top view of the station platform and the re-configuration of the Campus plaza

Station Type: Line station

Platform Style: Side

Entrance/Exits:

1. East to University of Ottawa plaza and campus
2. West to pedestrian tunnel under Nicholas Street

Theme: Innovation

The theme of this station is Innovation; in conjunction with the local academic/visual arts community this concept could encompass various elements of innovation realized through choice of materials, medium, subject matter etc. The University of Ottawa will be consulted in the process of designing the station to reflect this design theme.

Description:
Campus is an existing bus transit station along the Transitway, which will be converted to serve as a train station along the OLRT. The existing four lanes of Nicholas Street will remain in their current condition. Modifications to allow for an at-level entry to the trains will necessitate the relocation of some services currently located beneath the center of the existing Transitway.

The new station will be integrated with the existing underground pedestrian tunnel that connects the University of Ottawa to Colonel By Drive and the Rideau Canal, the Sandy Hill neighbourhood, and the Golden Triangle neighbourhood via the Corktown Footbridge. A broad plaza in front of the east entrance provides space for sitting, bicycle parking, and station access. A new ramp along the north edge of the plaza links cyclists to the underpass and the canal cycling routes. The ramp will also provide universal access for pedestrians and cyclists to the underpass, station and Rideau Canal pathway networks. A designated cycling lane will be created in the plaza to guide cyclists around the station to maintain existing routes through the campus.

A pedestrian overpass will also be provided to connect the platforms on each side of the tracks, which will provide a view to the Rideau Canal and downtown.

Track & Platform Configuration:
Both tracks are at the centre of the station with 120 meter platforms on the outsides. Provision is made to allow their extension to 150 metres when ridership volumes warrant.

Descent / Ascent:
Trains will be accessed at grade.

Connections:
Passengers can connect to the Corktown Footbridge and multiuse paths along the Rideau Canal.

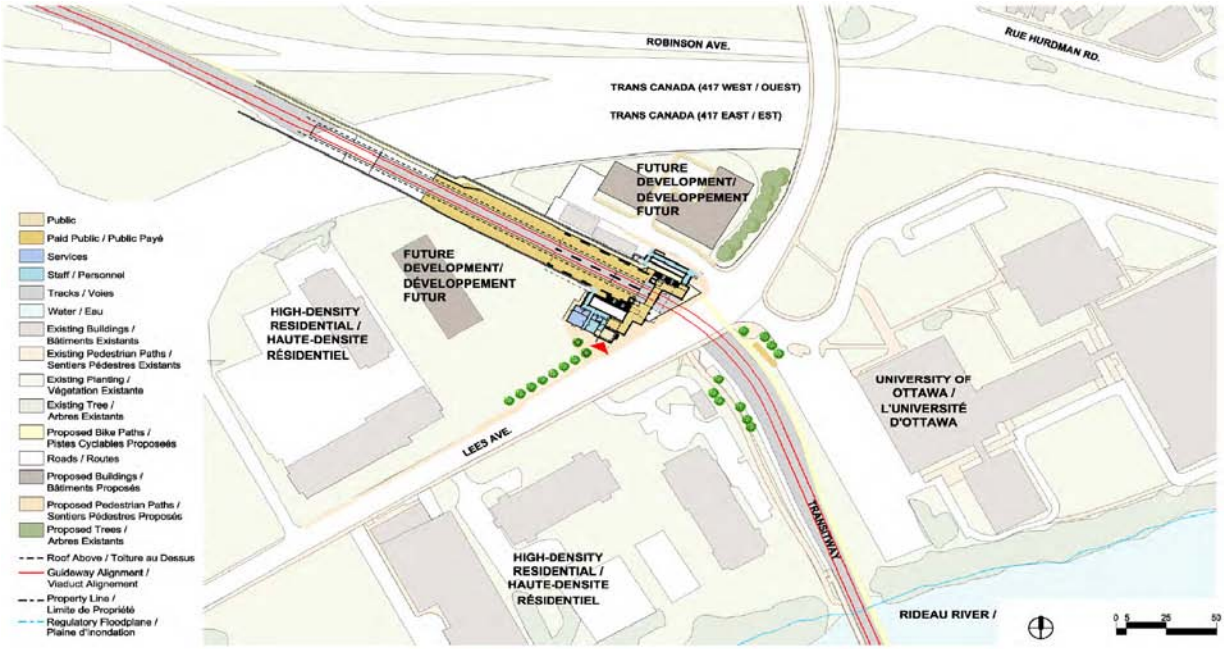
In Proximity:
This station is close to the Rideau Canal, the University of Ottawa, Sandy Hill, and the Golden Triangle.

Property Impact:
The majority of the work associated with this station is located on property currently owned by the City of Ottawa. A small portion at the north end of the east platform infringes on the University of Ottawa owned land.

3.8.Lees Station

Artist Concept

Rendering shows the south-west entry of Lees station facing Lees Ave. It shows the design and support of the roof structure and the station exterior.



Lees Station

Site context shows the top view of the station platform layout and future developments surrounding the station.

Station Type: Line station

Platform Style: Side

Entrance/Exits:
1. North to Lees Avenue
2. South to Lees Avenue

Theme: Not a themed station

Description:
Lees Station is situated along the Transitway between the Highway 417 and the Lees Avenue overpasses, south of Queensway and just to north of the Rideau River.

The existing station platforms are approximately seven metres below street level, with access provided via stairs and elevator towers on both sides of the station. The existing cycling and pedestrian pathway connections extend from the south side of the Rideau River share the Highway 417 underpass on the east side of the station and continue north towards the downtown core. Recreational pathways extend from the station south on the west side of the LRT corridor to the future city pathways.

The cycling path proposed to link Campus Station to the Rideau River and to Hurdman Station to the east has been integrated within the westbound platform which stretches along the entire length of the north side of the station. The bike path is connected outside the station with the adjacent University of Ottawa Campus site.

Passengers exiting from the station at street level can turn left to walk over the Lees Avenue overpass of Highway 417 to reach Sandy Hill or turn right to reach the apartment buildings and the residential neighbourhood west of the station.

Track & Platform Configuration:
Both tracks are at the centre of the station with 120 metre platforms on the outsides. Provision is made to allow their extension to 150 metres when ridership volumes warrant.

Descent / Ascent:
Trains will be accessed one level below grade, approximately 7 metres down. Passengers may descend and ascend via stairs or elevators.

Future Consideration:
The area to the west of the station is slated for future residential and mixed use development by private developers and, to the southwest by the University of Ottawa.

In Proximity:
Lees Station serves Old Ottawa East and the Sandy Hill Heights community. The station also provides access to the south part of the University of Ottawa campus.

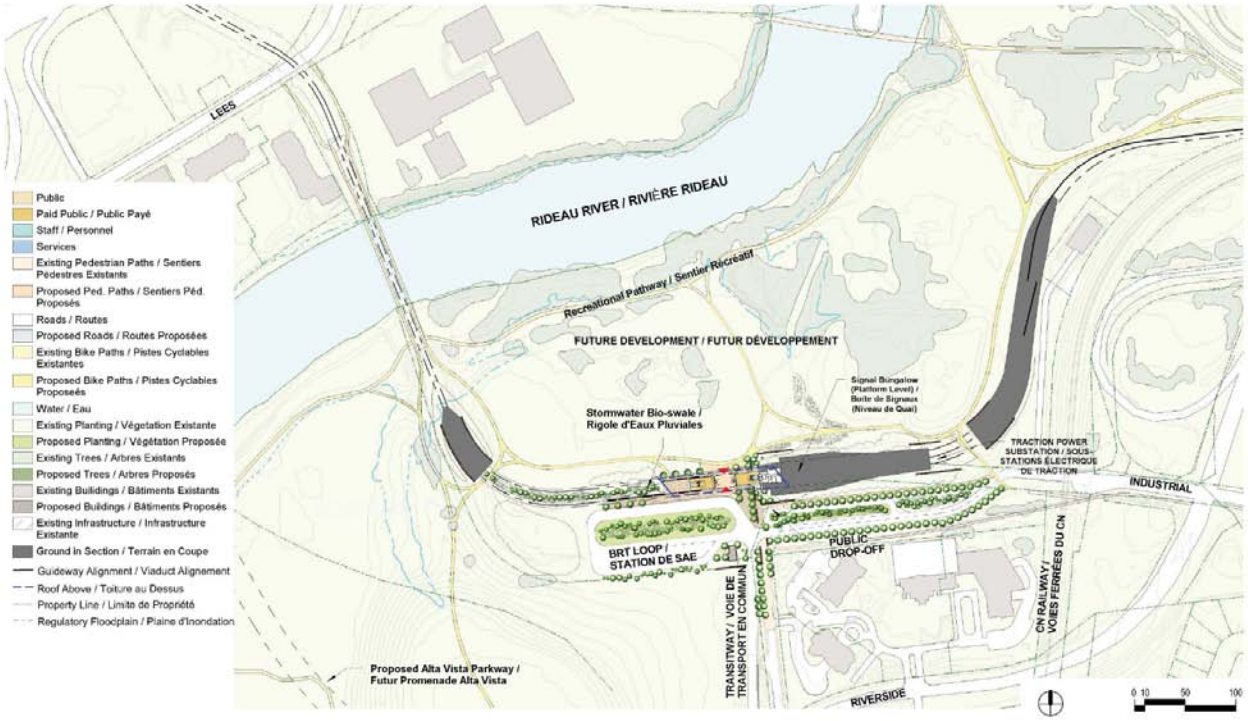
Property Impact:
Lees Station has the potential to be integrated into the redevelopment of adjacent lands as

proposed in the Nicholas - Mann Gateway Precinct Design Plan and also future redevelopment of University of Ottawa lands to the south.

3.9.Hurdman Station

Artist Concept

Rendering shows the south side of the station facing the BRT loop. It shows the exterior of the platform, the roof design, and the bus area



Hurdman Station

Site Context shows the top view of the station platform, and the existing and future developments surrounding the station.

Station Type: Major Transfer Station

Platform Style: Centre

Entrance/Exits:

1. North exit to pathways along Rideau River
2. South exit to BRT/Local bus connections, Industrial Avenue and Riverside Drive

Theme: Not a themed station

Description:
Hurdman is an existing bus transit station along the Transitway, which will serve as a major transit transfer point with the new train station along the OLRT while continuing to serve as a bus station for the South-East Transitway.

Hurdman Station will facilitate pedestrian connections between the termination of the Transitway and local buses and the LRT station. The Transitway and local buses will have a combined station on the south side of the LRT station. Sufficient space has been allocated at Hurdman Station for circulation, bus drop-off and lay-by areas.

Wide pedestrian corridors provide easy access to the station entrances for passengers traversing between the two modes of transit. All passenger connections are made without the need to cross roadways. The combination of the structure for the LRT tracks and the station platform above provide a canopy shelter covering the bus platform below.

The station will connect to existing NCC pathways adjacent to the Rideau River and Riverside Drive.

Track & Platform Configuration:
This station has a centre 120 metre platform located between two sets of rails. Provision is made to allow the platform to be extended to 150 metres when ridership volumes warrant.

Descent / Ascent:
Trains will be accessed one level above grade. The distance is approximately seven metres up. Passengers arriving on buses will ascend one level. Passengers may descend and ascend via stairs, elevators, or escalators.

Connections:
Access to the Transitway and local buses is provided via the south entrance. Access to the multi-use paths is provided via the north entrance.

Future Consideration:
The lands to the north of the station are planned for future development by the National Capital Commission. Discussions have been initiated to ensure the station design can be integrated into the development.

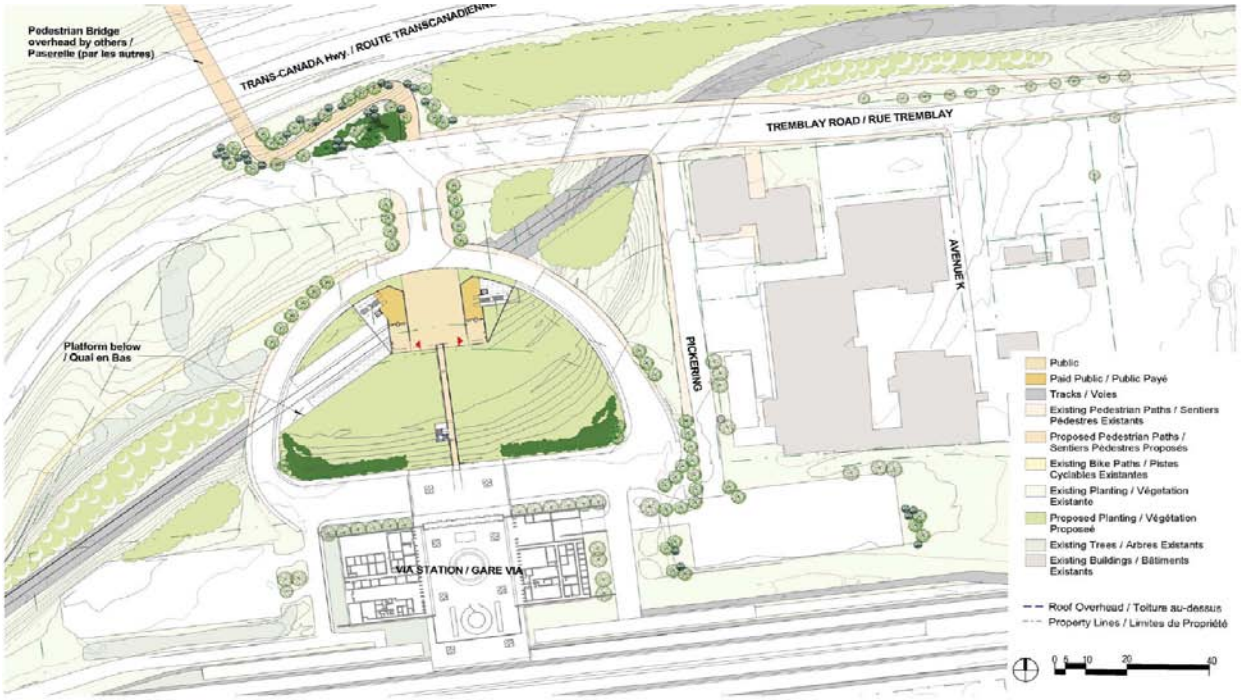
In Proximity:
This station is close to residential development to the east and south as well as businesses in the Industrial Avenue/Riverside Drive area.

Property Impact:
The work associated with this station is located on property currently owned by the National Capital Commission.

3.10. Train Station

Artist Concept

Rendering shows north side of Train Station facing the VIA Station, the west and east entries, and station's exterior design.



Train Station

The Site Context shows current developments and landscape designs surrounding the station.

Station Type: Line station with transfer to VIA Rail

Platform Style: Side

Entrance/Exits:
1. North to Tremblay Road / Pedestrian bridge / Cycling pathways
2. South to VIA Rail Station

Theme: Not a themed station

Description:
Train is an existing bus transit station along the Transitway.

The station will be integrated with the VIA Rail train station, situated immediately to the south of the LRT via an extension of the existing overhead walkway. The platform level will be located one story below the existing VIA Rail station. Two entrances will be located on either side of a plaza which frames a view to the existing entrance to the VIA Rail station.

Track & Platform Configuration:
Both tracks are at the centre of the station with 120 metre platforms on the outsides. Provisions have been made to allow the platforms to be extended to 150 metres when ridership volumes warrant.

Descent / Ascent:
Trains will be accessed one level below grade, approximately seven metres down. Passengers may descend and ascend via stairs or elevators.

Connections:
Connects to VIA Rail Station

Future Considerations:
Provision has been made in the station layout to accommodate a planned pedestrian bridge over Highway 417 which will provide a connection to residential and commercial development on the north side of the highway, including the federally owned RCMP property.

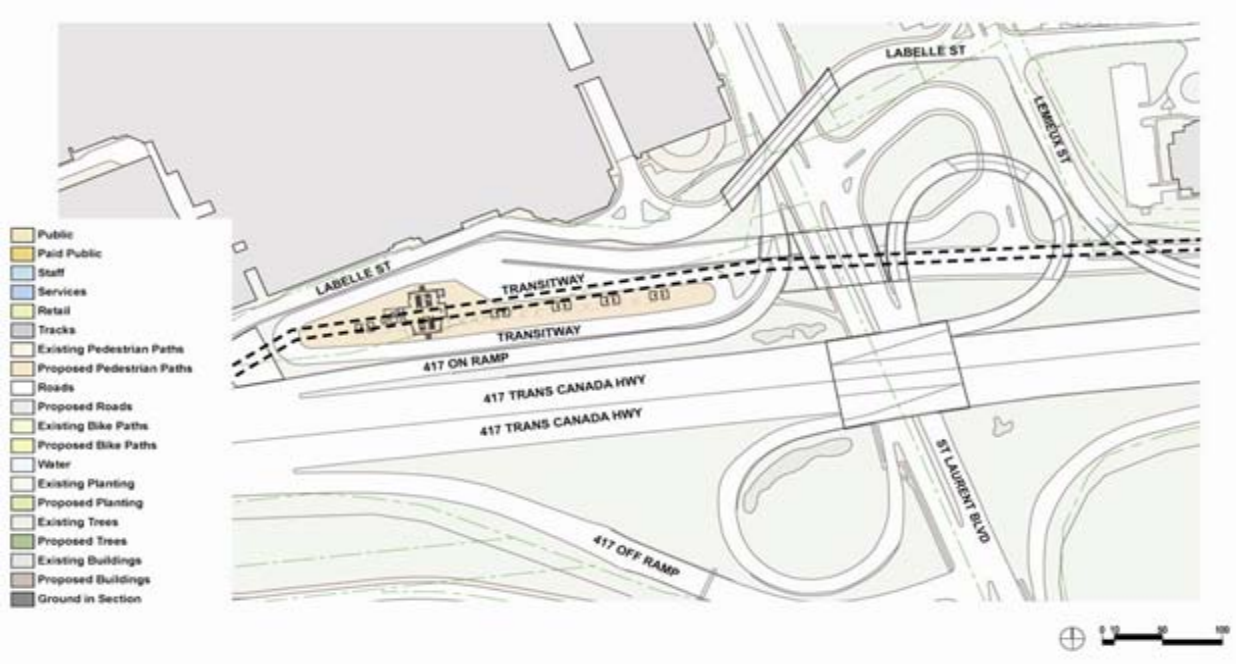
In Proximity:
This station is adjacent to the VIA Rail station. It is also the closest major transit station to the Ottawa Baseball Stadium.

Property Impact:
The work associated with this station is located on property currently owned by the National Capital Commission.

3.11. St. Laurent Station

Artist Concept

Rendering shows the interior of the station on the platform level



St. Laurent Station

Site context shows the station layout and its surrounding area.

Station Type: Line with local bus transfer station

Platform Style: Side

Entrance/Exits:
1. Northwest to St. Laurent Mall
2. South West to pedestrian/cycling pathway

Theme: Not a themed station

Description:
St. Laurent station is an existing bus transit station along the Transitway that will be converted to serve as a new train station along the OLRT while still maintaining its use as a bus station at the upper level.

The station will facilitate passenger transfers between local buses, LRT, and adjacent commercial development. Passengers arrive from the local buses or commercial development and continue to the platform level for the LRT. A pedestrian walkway from the commercial development across the bus way provides a direct route for passengers.

An existing pathway connection from the southwest under Highway 417 will be protected, and access to the lower platform level provided. Barriers will be provided to prevent pedestrians from crossing the train track.

Station identity will be maintained through the re-use of the existing coloured glazing system at the lowest platform level. Only the lowest LRT platform level of the station will be renovated as part of this project. At the new platform extensions down the existing tunnel, a new suspended wood finished “wave” form will provide a new ceiling to the space and will closely match in appearance the ceiling of the new roof structures at nearby stations such as Cyrville and Blair.

Track & Platform Configuration:
Both tracks are at the centre of the station with 120 metre platforms on the outsides. Provision is made to allow the platforms to be extended to 150 metres when ridership volumes warrant.

Descent / Ascent:
Trains will be accessed two levels below grade, approximately 15 metres down. Passengers may descend and ascend via stairs, elevators, or escalators.

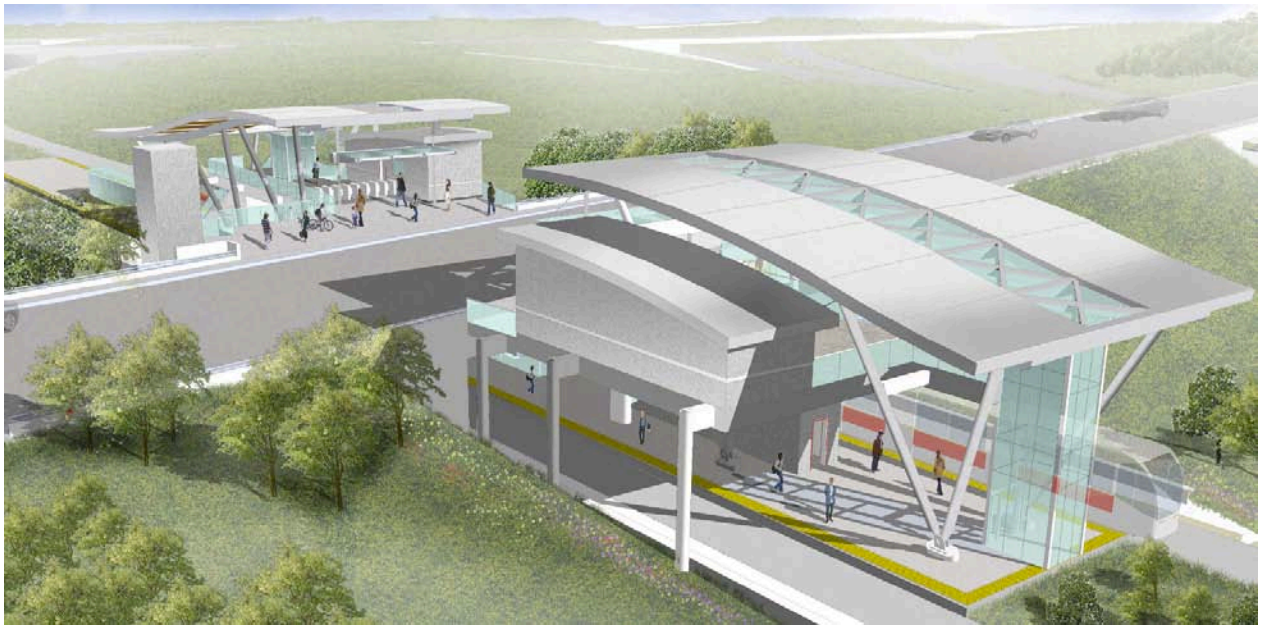
Connections:
Connects to local buses at the upper level and also provides access to commercial development at the concourse level.

Future Consideration:
Discussions have been initiated with Public Works Government Services Canada concerning a potential connection to the station from its lands on the south side of Highway 417.

In Proximity:
This station is adjacent to the St. Laurent Shopping Centre, as well as close to the Federal Government offices to the east.

Property Impact:
All work considered as part of this renovation is located within (or under) property already owned by the City of Ottawa, with the possible exception of the easternmost portion of the two emergency egress corridors to the east, which pass under the existing Queensway.

3.12. Cyrville Station



Artist Concept

Rendering shows Cyrville Station viewed from the north side with Cyrville Road passing through. It shows the station exterior, roof design and, landscaping.

Cyrville Station

Site Context shows a top view of the station platform and its surrounding developments and landscape.

Station Type: Line station

Platform Style: Centre

Entrance/Exits:

East and west side of Cyrville Road

Theme: Not a themed station

Description:

Cyrville Station is an existing bus transit station along the Transitway at Cyrville Road, directly northeast of Highway 417, and is to be converted to function as a train station along the proposed OLRT line.

The new station will accommodate current usage, as well as the future needs of the residential development to the immediate north of the station. The central platform allows for elevators and stairs to be located on both the east and west sides of Cyrville Road, allowing pedestrians to access the platform without crossing the roadway.

Provisions for future pedestrian connections to and from the "Place des Gouverneurs" located northeast, and Queensway Corporate Complex located northwest of the Station will be accommodated.

Track & Platform Configuration:
The station has a central 120 metre platform with tracks on either side. Provision is made to allow the platform to be extended to 150 metres when ridership volumes warrant.

Descent / Ascent:
Trains will be accessed one level below grade, approximately six metres down. Passengers may descend and ascend via stairs or elevators.

Connections:
There will be a connection to cycling routes with bicycle parking at each entry/exit.

Future Consideration:
Lands adjacent to Cyrville Station have potential for significant intensification on existing surface parking lots within the Queensway Corporate Centre. A new office building is currently under construction at the northwest corner of the intersection of Labelle Street and Cyrville Road. Future phases of the "Place des Gouverneurs" residential development located immediately northeast of Cyrville Station, that upon completion will accommodate up to 3,000 residents, will result in increased ridership at this station.

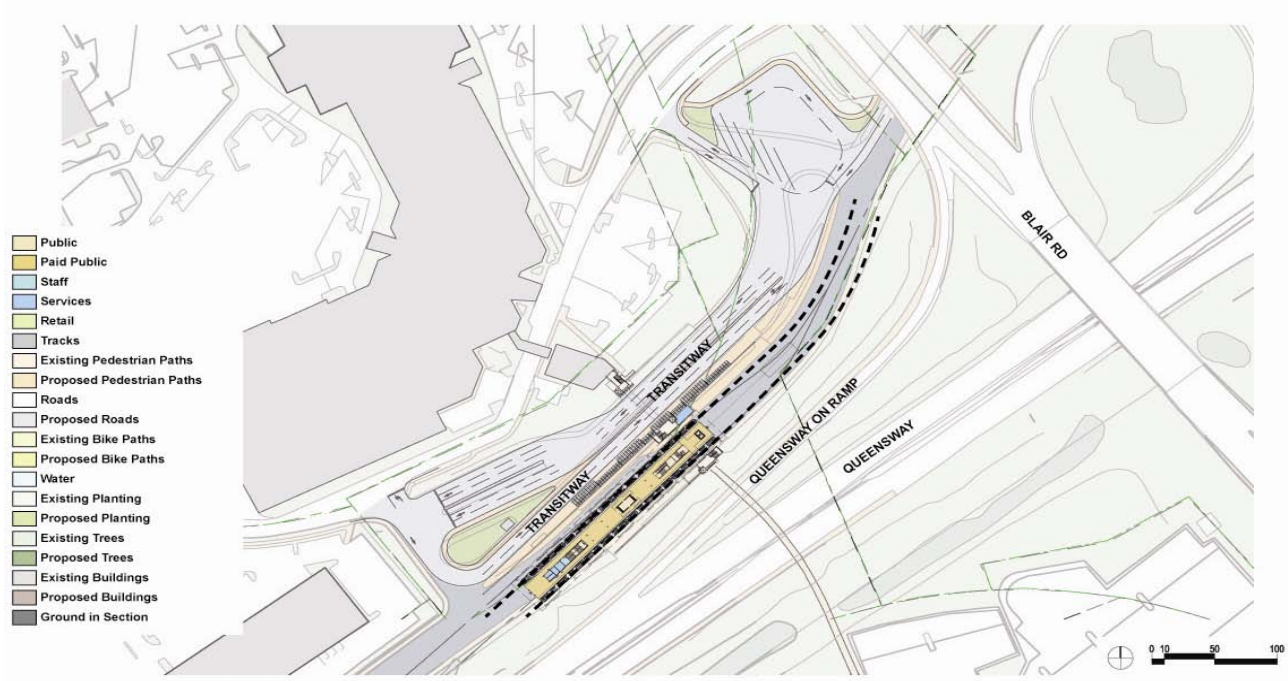
In Proximity:
Cyrville Station is the western extent of the Cyrville Mixed-Use Centre located at the north side of Highway 417. Beyond the existing office development, some higher density residential development is located north of the station between Cyrville Road and Ogilvie Road. Mixtures of industrial and smaller commercial businesses are located on the south side of Highway 417, along and south of Cyrville Road.

Property Impact:
All property required for construction at the station is currently owned by the City of Ottawa.

3.13. Blair Station

Artist Concept

Rendering shows Blair Station facing the Transitway. It shows the station's new roof design, existing building/terminals, and the LRT vehicles at the platforms.



Blair Station

Site Context shows the top view of the station platform and surrounding development.

Station Type: Terminal, major hub

Platform Style: Centre

Entrance/Exits:

1. Northwest to Gloucester City Centre
2. Southeast to Ottawa Road 174 pedestrian overpass

Theme: Not a themed station

Description:

Blair Station is an existing bus transit station along the Transitway that will be converted to serve as a new terminal train station along the OLRT while still maintaining its use as a terminal bus station for surrounding routes.

Blair Station will provide pedestrian connections between the LRT, the BRT, the commercial lands to the north and the Ottawa Road 174 pedestrian overpass.

The new platform will be accessible from both the bus level below and from the existing pedestrian walkway above. It will be covered by a new roof structure above with a wood-finished underside that is to sweep up and over the existing pedestrian walkway. Staggered wind-break walls will be positioned along the sides of the station.

Cycling and pedestrian connections occur at the adjacent city streets and provide ease of access to the LRT station

Sufficient space has been allocated at Blair Station for circulation, bus drop-off and lay-by areas.

Track & Platform Configuration:
There will be a 120 metre long combined centre platform with tracks on either side. Provision is made to allow the platform to be extended to 150 metres when ridership volumes warrant. Since the station is a terminal, trains on both tracks will be heading west. Indicators on the entry level will alert passengers which side of the platform the next train departs from. Trains are able to crossover to their designated track immediately outside the station.

Descent / Ascent:
Trains will be accessed one level below the pedestrian overpass, and one level above the bus level. The distance is approximately 5.6 metres down. Riders may descend and ascend via stairs, elevators, or escalators.

Connection:
Blair Station will be the major east-end hub between the LRT and bus service. There will also be connection to a pedestrian bridge over Ottawa Road 174, as well as connection to the Gloucester Centre.

In Proximity:
Blair Station is adjacent to the Gloucester City Centre; in addition there are a number of commercial developments in the vicinity.

Property Impact:
There are no additional property requirements

4. Maintenance and Storage Facility

Artist Concept

The LRT Maintenance and Storage Facility (M&SF) is included within the scope of the OLRT project and is an integral part of the project, as it will:

- House and service all of the light rail vehicles and systems needed to operate the line
- Provide a base for non-revenue vehicles used for maintenance purposes
- Provide heavy maintenance to the light rail vehicles for the LRT network

The M&SF will be located on an approximately 16 hectare site on the north side of Belfast Road just east of the crossing of Belfast Road over the VIA Rail right of way, which defines the northern property line. The eastern site boundary is a property occupied by Pepsi Cola. The site zoning is compatible with the proposed use and activities associated with a light rail maintenance facility.
The Maintenance and Storage Facility site will be comprised of three structures: the Maintenance of Equipment (MOE) shop building, a Maintenance of Way/Car Cleaners' (MOWCC) building, and Vehicle Storage Yard. There will also be two traction power substations (TPSS), which are anticipated to be prefabricated structures.

Discussions have been undertaken with all current landholders who are anxious to move forward and to resolve the property matters associated with this site the benefit of the Expropriations Act which allow for complex tenancy and ownership agreements to be dealt with in a fair and expeditious manner.

The constructor will have the opportunity to design this facility to provide an optimal balance of cost and service.

5. LRT Systems Overview

The Track

The current Transitway was designed with an eventual conversion to light rail in mind. A bi-directional, double track guideway is required to support the planned operations. The 12.5 km guideway includes track constructed at-grade, inside shallow trenches, on bridges and within tunnels.

The passenger ride will be more refined than that achievable with BRT and will improve and enhance passenger comfort by minimising vehicle dynamic forces, which are the forces experienced by a passenger when the vehicle is travelling through curves in the alignment.

Light Rail Vehicles

Light Rail Vehicles (LRV) were selected as the vehicle that could best bridge the system requirements of the initial central area OLRT project and the future extensions to the suburbs beyond 2031. This technology was approved by Council in October 2009 and specified in the Provincial Environmental Project Report (EPR).

The LRV's will be low floor to allow level boarding on platforms. The vehicles will be in the range of 30 to 40 meters long, 2.65 meters wide and up to 3.8 m tall. The LRV will be electrical powered by a roof mounted single pantograph per LRV. These will be connected to a powered wire mounted on poles referred to as the Overhead Catenary System (OCS).

Part of the responsibilities of the Design Builder will be to undertake an LRV industrial design function which will facilitate the development of the vehicle interior and exterior aesthetics. The theme and branding will be in line with overall LRT System and OC Transpo requirements.

Load levelling shall ensure that the low floor height and platform gap are within the limits of the Americans with Disabilities Act (ADA), as referenced in the Accessibility for Ontarians with Disabilities Act (AODA). Trains will operate in service at a maximum speed of 100 km/hr. The LRV shall be designed to run a minimum of 100,000 kilometres per year with a minimum service life of 30 years.

Power Supply

Facilities- Power will be fed from the Hydro Ottawa distribution system and where necessary dual redundant electrical feeds support essential loads. Critical loads will be served by uninterruptable power supplies. A diesel generator will serve the Maintenance & Storage Facility (M&SF) for back-up power.

Traction Power Substations (TPSS) - There will be a network of eight (8) along the alignment and two (2) at the M&SF designed to sustain operation with failure of an adjacent TPSS. Supply will be fed from Hydro Ottawa with dual redundancy.

System hubs and traffic planning

The LRT system will be fully integrated with the existing O-Train and with existing bus transit hubs. As part of this commitment, service on the O-train will improve to every eight (8) minutes from the current fifteen (15) minute schedule. All current bus transit nodes will include bus marshalling facilities. The marshalling areas are already integrated into the Hurdman Station and Blair Station and marshalling areas will be secured at or near Tunney's Pasture Station. Negotiations with the Federal Government and NCC are ongoing with the goal of ensuring that facilities are available to marshal buses in an effective manner.

Intervals and traffic flows

It is currently envisaged that the OLRT system will provide 3:15 minute service (headway) during peak hours. That frequency will gradually increase over time to become two (2) minute service by 2031. The system will be built to support this growth in demand. At the east and west end points (terminal stations), the trains will be able to enter straight into the station via a cross over which will allow two trains to load and unload at the same time and then switch directions to head back towards the opposite terminal.

Based on the current modeling of system operation it is anticipated that the train travel time from Blair Station to Tunney's Pasture Station will be approximately twenty-four (24) minutes. The time from Blair Station to Rideau Station will be less than sixteen (16) minutes and Tunney's Pasture Station to Rideau Station will be just over eight (8) minutes.

Operation and Maintenance

Performance based specifications around LRT Systems will be part of the Request for Proposals (RFP). Amongst the requirements will be redundancy to protect against equipment failures and the provisions for the system to be able to expand to accommodate future growth.

The system maintenance will be conducted by the successful private sector proponent, from the Maintenance and Storage facility. Requirements with respect to system availability and upkeep will be backstopped by availability payments and constructor guarantees. Failure to provide a fully available system results in penalties and reduced payments to the private sector maintainer. This ensures that the best value in securing parts and ensuring the required service level. Growth in operations and supervision, along with expected inflation in maintenance costs are set out elsewhere in this report and have been incorporated into the Long Range Financial Outlook for Public Transit.

6. Underneath the Downtown Core

The tunnel as shown in the image below will have a west entrance/exit (portal) located east of LeBreton Station, three underground stations (Downtown West, Downtown East, and Rideau) and an east portal located south of Laurier Avenue and north of Campus Station

The number of stations in the downtown remains as previous approved by Council however the location of the station platforms has been shifted to reflect the advanced design based on the increased knowledge of ground conditions and to improve constructability. Station entrances, where changing, will be located to preserve the objective of ensuring ease of access and connection to local transit routes, major trip producers, existing and future internal building connections, and adequate transit service coverage of the core.

Safety and emergency preparedness

Fire – The structural components are required to be non-combustible construction and will require protective systems to provide the fire resistance ratings (FRR) required by Ontario Building Code. Capital Transit Partners (CTP) has done an extensive fire evaluation and plan for the system as part of the specification development. Fire Department approved standpipe system to be installed for fire fighters to use within the station in accordance with The National Fire Protection Association's standard for fixed guide way transit and passenger rail systems (NFPA 130) Fire extinguishers and equipment will be provided throughout in accordance with the Fire Department's requirements.

Seismic activity – The structures will need to be designed for earthquake loads and effects to meet the requirements of Ontario Building Code Part 4 and National Building Code. Parameters defining the seismic hazard for the concourse structure should be taken to be the same as for the tunnel liner design.

Since Ottawa is located in a moderately high seismic zone, elements of structures, non-structural components, equipment, and their connections to the structure will require special consideration in accordance with Ontario Building Code 4.1.8.17.

Ventilation – The emergency ventilation is required to be provided as per the National Fire Protection Association's (NFPA) standard. The emergency ventilation system shall provide outside air to assist passenger evacuation and purge smoke. There will be ventilation shafts that terminate above grade level at each end of the underground stations. The emergency ventilation room shall be equipped with reversible fans, fan dampers, sound attenuators, and relief shaft dampers for forced ventilation during emergency operations.

Smoke ventilation system for each underground station consists of four exhaust fans. The high power requirement is the major factor for the design of the emergency power supply system.

Geotechnical Analysis

A detailed geotechnical study drilling program was undertaken to assess the ground conditions at depth. In addition, on the adjusted alignment, there is existing knowledge about the conditions gathered during the excavation of buildings along Queen Street.

The results of the study indicate that most of the route downtown is underlain by shallow bedrock, at depths ranging from about two metres to five metres below existing ground surface between the west portal and Rideau Station area. In the vicinity of the Rideau Station, a valley in the rock is known to exist, where the surface of the bedrock is indicated to be locally much deeper. South of Laurier Avenue, the bedrock becomes progressively deeper, extending to depths ranging from about five metres to twenty five metres below existing ground surface, and changes from limestone to shale.

There are five faults that cross the tunnel alignment in the downtown core. These faults are now considered inactive but create important features likely to impact the overall bedrock quality and hydro-geological regime. The construction of the tunnel and stations through these faults can be adequately managed through engineering and design as it has been done for other transit systems in the world.

The results of the 2010 and 2011 geotechnical studies have been used to inform and better guide the design of the tunnel and downtown stations.