

ANNEX B

Urbandale LRT System Proposal Materials

Proposal Document- An Affordable Solution for Rapid Transit in Ottawa

N-S LRT Downtown Map (Tunnel, Sparks and Nicholas)

N-S LRT System Phased Implementation Map (Map 1)

N-S LRT Cost Savings Map (Map 2)

Letter to Ms. Vivi Chi - Development of a Financially Viable LRT System

Cost Reduction Estimates E-Mail from M.R. Renfrew, September 04, 2007)

This proposal for rapid transit in the City of Ottawa was prepared by R. Morrison Renfrew, P. Eng., Engineering Management Consultant, with funding provided by Urbandale Corporation.

The decision to initiate this city-wide study is based on Urbandale Corporation's commitment to the transit oriented design of Riverside South and a concern for improvements to transit in both the East and in the West.

Urbandale is the principal owner of the Riverside South community, Kanata Lakes, Kanata Town Center, Kanata Village Green and Bridlewood. And lands in the Trim Road/Innes Road area. While we are well aware of the advantages that an efficient transit system would bring to these Urbandale properties, we sincerely believe that our interests are consistent with those of the broader community and that the recommendations contained in the proposed plan will ultimately benefit all residents of our city

When decided to initiate this study, we asked people in the industry to identify a consultant with world-wide experience in municipal transportation projects. This led to Mr. Morrison Renfrew, currently based in Ottawa, who has participated in similar projects in many of the world's major cities. Mr. Renfrew was also peripherally involved in the previous Ottawa L.R.T plan as a sub-consultant to one of the consultants.

Mr. Renfrew's report proposes modifications to the previous plan in order to improve the cost effectiveness and efficiency, providing savings which could go towards the additional proposed work.

Please accept this brief in the spirit in which it is being proposed, as a constructive suggestion about a very important issue.

S. Lyon Sachs, P. Eng.
President, Urbandale Corporation

Background

In December 2006 the Ottawa Light Rail Transit Project (OLRT) was cancelled after approximately 3 years of preparatory activity. The OLRT Project incorporated surface operation in the Central Business District (CBD) which did not provide relief from bus congestion. The alignment in the south was not optimal and in addition there were several areas where substantial costs could have been saved without adversely affecting performance.

The OLRT scheme proposed a route starting in Barrhaven, crossing the Rideau River on a future 6-lane bridge with a grade-separated crossing of River Road. It then looped south of Armstrong Rd. through a future subdivision from where it continued north-east past the large maintenance facility. It proceeded north, by-passing the airport, continuing through a twinned tunnel under Dow's Lake. At Bayview it turned east through the CBD on Albert and Slater streets, terminating on the western edge of the University of Ottawa.

The problems with this concept included:

- a) The CBD surface operation in mixed traffic generated variable delays requiring the twinning of the Dow's Lake tunnel and a consequent increase in the fleet requirement.
- b) The propagation of CBD delays caused timetable variability throughout the system.
- c) Trip time from Woodroffe (40 mins.) and River Road (38 mins.) to the CBD was excessive for the purpose of attracting car users.
- d) Utility relocation away from the tracks was required in the CBD.
- e) The transfer between BRT and LRT at LeBreton was problematic.
- f) Maintenance and operating costs escalated due to the increased fleet.

The focus of the analyses in this report has been to identify how the issues which led to the cancellation can be resolved in order to permit the establishment of progress toward a regional rapid transit network within a feasible cost framework. It appears that a significantly less expensive system can be achieved on the basis of existing rights-of-way plus a realistic investment in extensions beyond the urban core. The resultant integrated BRT / LRT system can be implemented within a decade and will satisfy the immediate objectives of the city to increase the utilization of transit vs. the automobile.

Requirements for a rapid transit network

Private RoW operation

The availability of rights-of-way (RoW) is fundamental to creating a rapid transit network. Ottawa is fortunate that, due to some far-sighted investment and recent commitments, the city has a substantial inventory of rights-of-way suitable for transit. These include the transitways, the N-S rail corridor, recently dedicated corridors in suburbia and E-W rail corridors (both active and abandoned) which have available capacity.

It was the lack of a suitable RoW through the Central Business District (CBD) which was the cause of the major performance problem of the OLRT. Due to the unpredictable delays caused by mixed traffic the departure times of the trains from the CBD were subject to considerable variation from the timetable. This eliminated the possibility of single track operation of the Dow's Lake tunnel, imposed additional capacity demands at certain stations where delayed trains required a stopping berth to enable recovery of the operations and resulted in an increased fleet of LRV's.

In order to attract new riders service levels must be *substantially* better than automobile travel. The primary metrics are:

- Travel times which are both fast and consistent.
- Transfer wait time between modes or routes must be short and predictable.

The use of 100% private RoW will reduce the trip times which will encourage additional switching from automobiles to rapid transit. It will also minimize the LRV fleet due to better utilization and reduce the probability of damage to trains from surface traffic. Coordination of bus and LRT transfers will be maximized due to accurate timetable operation.

Productivity

Higher productivity (lower cost per passenger-km) is necessary to reduce subsidy levels while maintaining service quality. The capacity provided during the daily demand cycle should track the ridership demand.

Urban integration

Incremental growth of the network coverage at a controlled capital cost, with minimum disruption to the residents and businesses, will be provided to facilitate urban growth linked to transit availability.

Effective de-congestion of the urban core will improve the commercial and residential environment.

The proposed modifications to the OLRT (New LRT)

The New LRT (NLRT) system (refer to Map1) is based on the OLRT Project. It uses the basic N-S alignment (in the initial phase) with modifications to increase the speed (which will attract more riders) and reduce the capital cost. The modifications proposed (refer to Map 2) include:

- a)** The southern Phase 1 termination at River Road and Armstrong Rd.
- b)** Proceed along Armstrong Rd instead of the southerly route through the subdivisions.
- c)** Reduce the scale of the maintenance facility at Bowesville (refer to pages 12 and 13).
- d)** Maintain the existing single tunnel under Dow's Lake with train control by the signaling system (refer to page 11).
- e)** Establish Bayview as the system hub station.
- f)** A tunnel under the CBD to the east of the Canal with stations serving the CBD and Ottawa University.
- g)** A transfer stop at Hurdman.
- h)** Continue east to terminate Phase 1B at the VIA Rail station.

The advantages of the NLRT revisions

- a)** The travel time from River Road will be reduced by 3 minutes due to the Armstrong Rd alignment and the elimination of (probably) 2 station stops.
- b)** A quick passage, free of congestion, through the CBD.
- c)** Effective integration with other modes at Bayview and the VIA station.
- d)** Interfaces efficiently with the Mayor's Task Force recommendations.
- e)** Faster speed will reduce the fleet size.
- f)** Costly utility relocation will be eliminated.
- g)** Any necessity for a second bridge structure at Strandherd-Armstrong is removed.
- h)** Faster speeds and improved feeder bus access on Armstrong Road.
- i)** Eliminates the grade separation at River Road.

BRT and LRT will operate jointly on sections of the transitway (refer to Page 10) to provide an economical gateway to the east and west. From Bayview the transitway will provide fast access to a street alignment and a western park-and-ride (anticipated to be located at the 416/417 junction). The VIA station access will be from the south side. The VIA station is not only convenient to rail passengers but also offers an efficient possible easterly route crossing the 417 on the existing rail RoW which conforms to the City of Ottawa Transportation Master Plan.

<u>Cost savings from NLRT \$M</u>	
Elimination of grade separation at River Road	
Elimination of loop south of Armstrong Road	
Reduced maintenance facility	
Elimination of second tunnel under Dow's Lake	
Elimination of surface travel through CBD	
Total estimated savings	200
Estimated costs for phases 1A and 1B	\$M
Target cost River Road to Bayview inclusive of NLRT cost savings	595
Bayview to west portal of the tunnel; 3 kms twin bore tunnel; 3 underground stations	350
Contingency for underground conditions and protection of existing structures	50
East portal to VIA station using transitway via Hurdman	45
Additional rolling stock due to Phase 1B	28
Total Phase 1A & 1B (including tunnel contingency)	1068

The implementation strategy for NLRT

The proposed implementation for the network is based on a phased approach (refer to Map 2) to minimize the delays between segments coming into service:

a) Phase 1A is the building of the N-S line between Bayview and River Road, based on the already-approved EA and the preliminary design and field work already completed. This is expected to be operational within 3 years from Notice to Proceed. The O-train shut-down interval is expected to be considerably reduced due to the elimination of the second tunnel construction.

b) Phase 1B (refer to Map3) is a 3 km CBD tunnel with the western portal at Le Breton and the eastern portal beside the transitway south of the Ottawa U. transitway station. Three underground stations will be located at Kent, Metcalfe and Union Station to serve the CBD, Rideau Centre and University of Ottawa. Phase 1B will then utilize the transitway (which will be equipped with a vehicle control system) through Hurdman and on to the VIA station where it will connect with the proposed commuter services. The total length of Phase 1B will be approximately 6.5 kms. The tunnel completion will overlap with Phase 1A and will be between 5 and 6 years including the EA and design tasks prior to construction.

Phase 2 will have 3 elements (due to the time constraints details could not be developed):

c) the west extension will be a shared-use BRT / LRT corridor from Bayview which will subsequently diverge to a road alignment and proceed to a park-and-ride at the intersection of 416 and 417;

d) the east extension from the VIA station to Blackburn Hamlet and Trim will use the abandoned railway RoW to the 417 and will then proceed east;

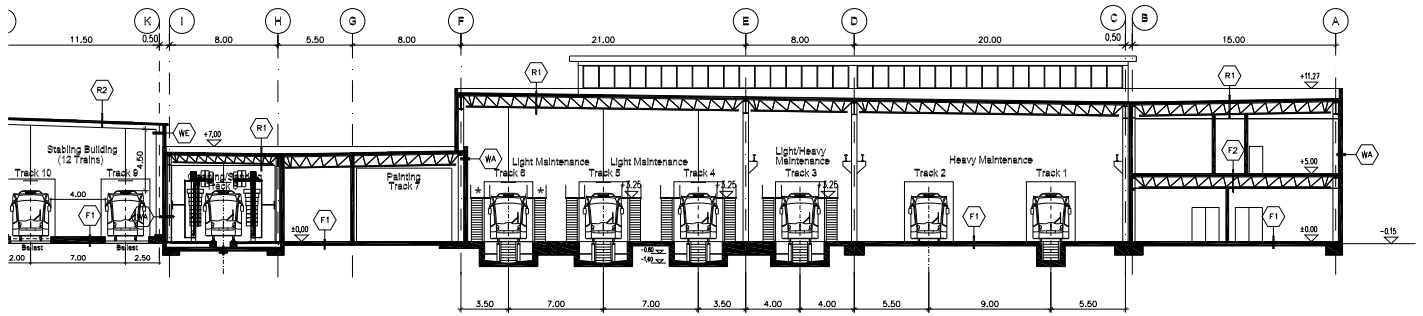
e) the reserved RoW from River Road to Barrhaven Town Centre will be utilized when the passenger demand develops.



Essen Germany: the operation of guided buses and LRT on the same alignment using common signaling. (The use of shared RoW has been implemented in a number of German cities due to street space limitations.) This is similar to the proposed BRT/LRT joint operation on the Transitway.

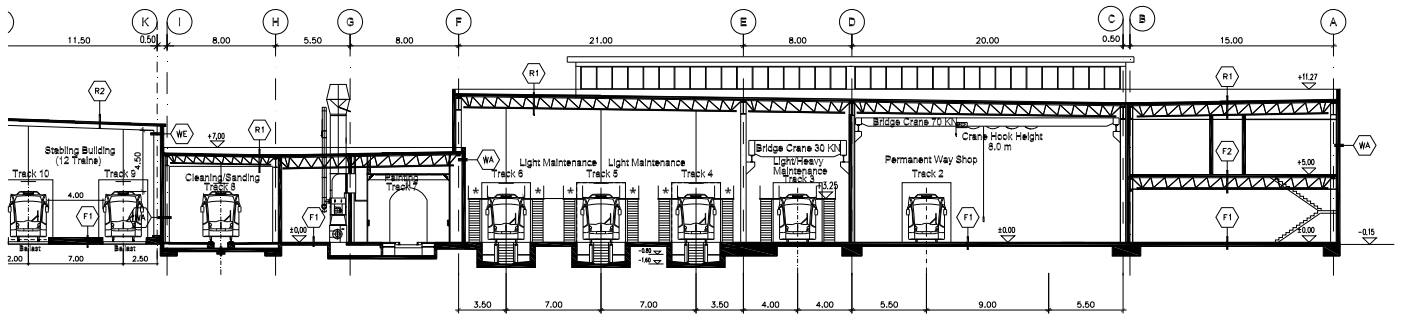


Single-track operation due to RoW constraints (and capital cost avoidance) on the Croydon Tramlink (UK). The same merge configuration is proposed for the entrances to the single-track Dow's Lake tunnel.



* Roof working platform FUTURE EXTENSION

SECTION A - MAINTENANCE BUILDING & STABLING BUILDING



* Roof working platform FUTURE EXTENSION

SECTION B - MAINTENANCE BUILDING & STABLING BUILDING

The maintenance facility as proposed for OLRT (included future expansion for E-W line). (A scaled-down approach for the NLRT will be based on light maintenance facilities in the east and west)



The Sheffield Supertram maintenance facility (same fleet size as OLRT).
(This scale of facility will serve as the NLRT heavy maintenance centre)

Conclusions and recommendations

- i. The objective of a reduced-cost LRT system is feasible.
- ii. Appropriate number and siting of stations will enable *rapid* transit and control cost.
- iii. Integration with BRT can be achieved without significant incremental cost.
- iv. The technology for shared-use operation of the transitways has been proven elsewhere.
- v. Cost risks associated with the tunnel construction should be examined in detail to confirm the least-cost alignment.
- vi. The proposed phasing of implementation will result in a realistic schedule for total system completion within an orderly financial requirement. The EA and construction sequence for the CBD tunnel should be fast-tracked.

The relatively modest incremental cost (compared to the original OLRT project) to achieve a true *rapid transit* system represents extremely high added value.

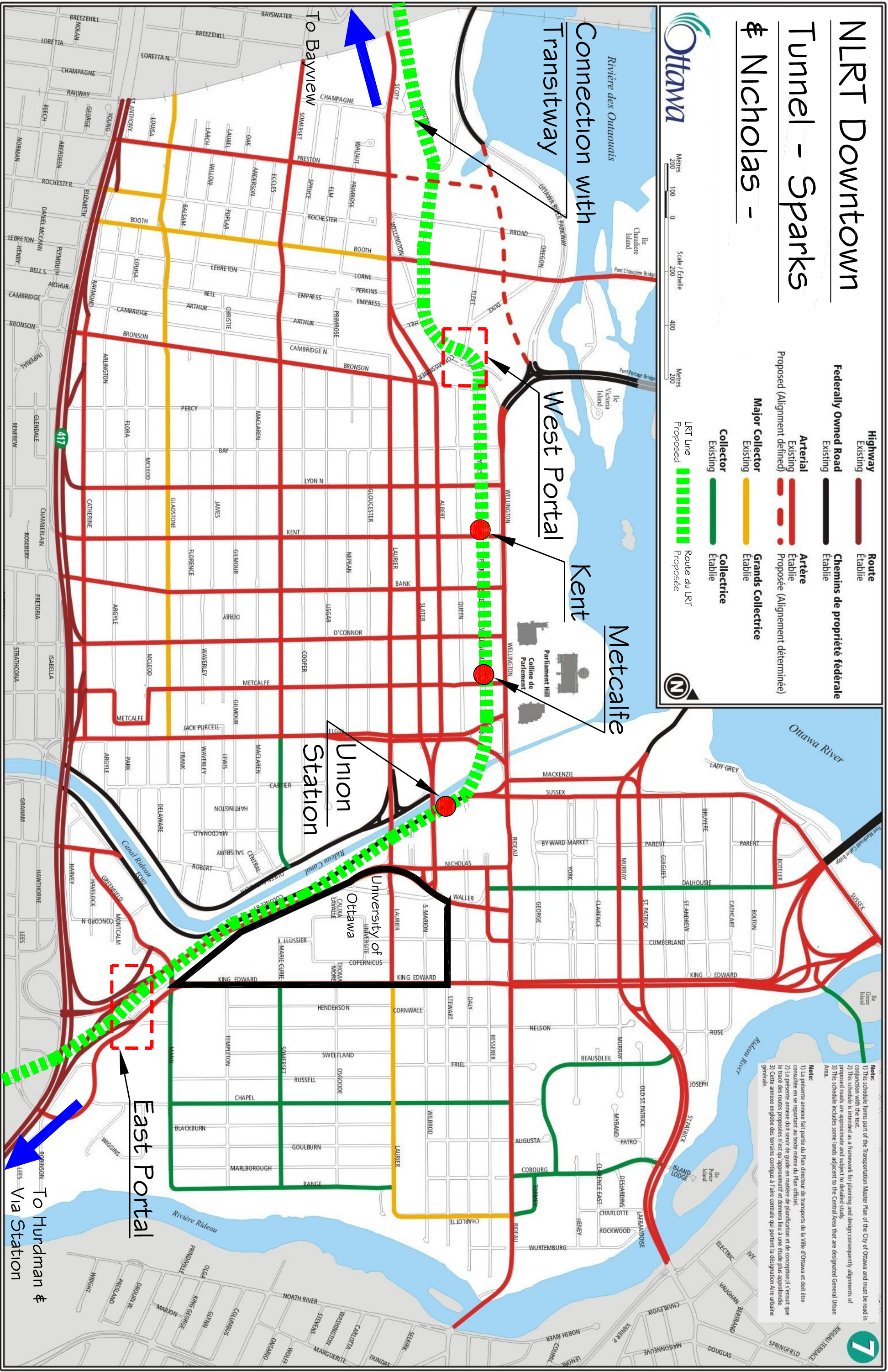
NLRT DOWNTOWN

Tunnel - Sparks

\$ Nicholas -



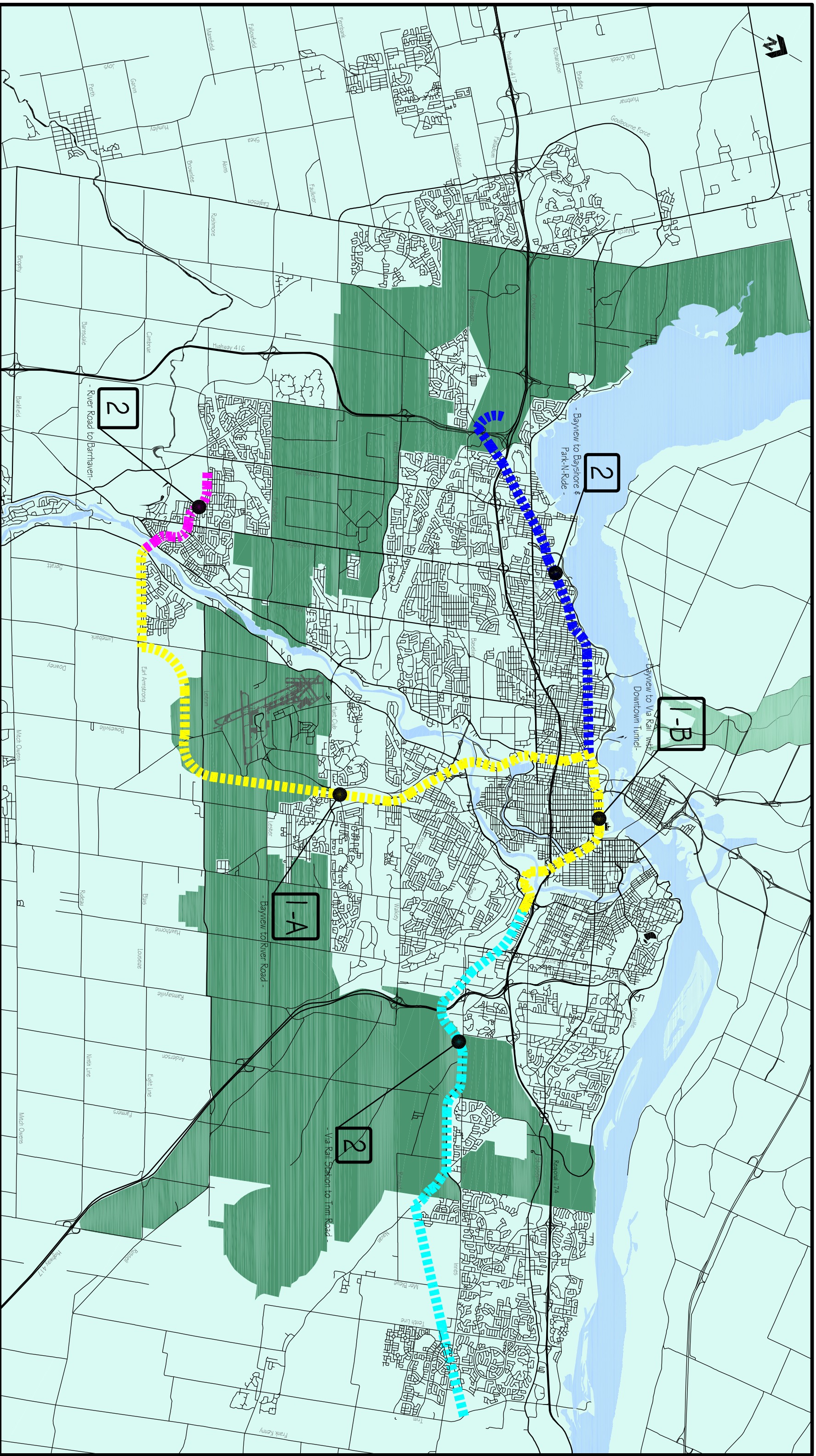
- Highway**
 - Existing
 - Établie
- Federally Owned Road**
 - Existing
 - Établie
- Arrière**
 - Existing
 - Établie
- Arrière**
 - Proposée (Alignement déterminée)
 - Établie
- Major Collector**
 - Existing
 - Établie
- Collector**
 - Existing
 - Établie
- LRT Line**
 - Existing
 - Proposée
 - Route du LRT



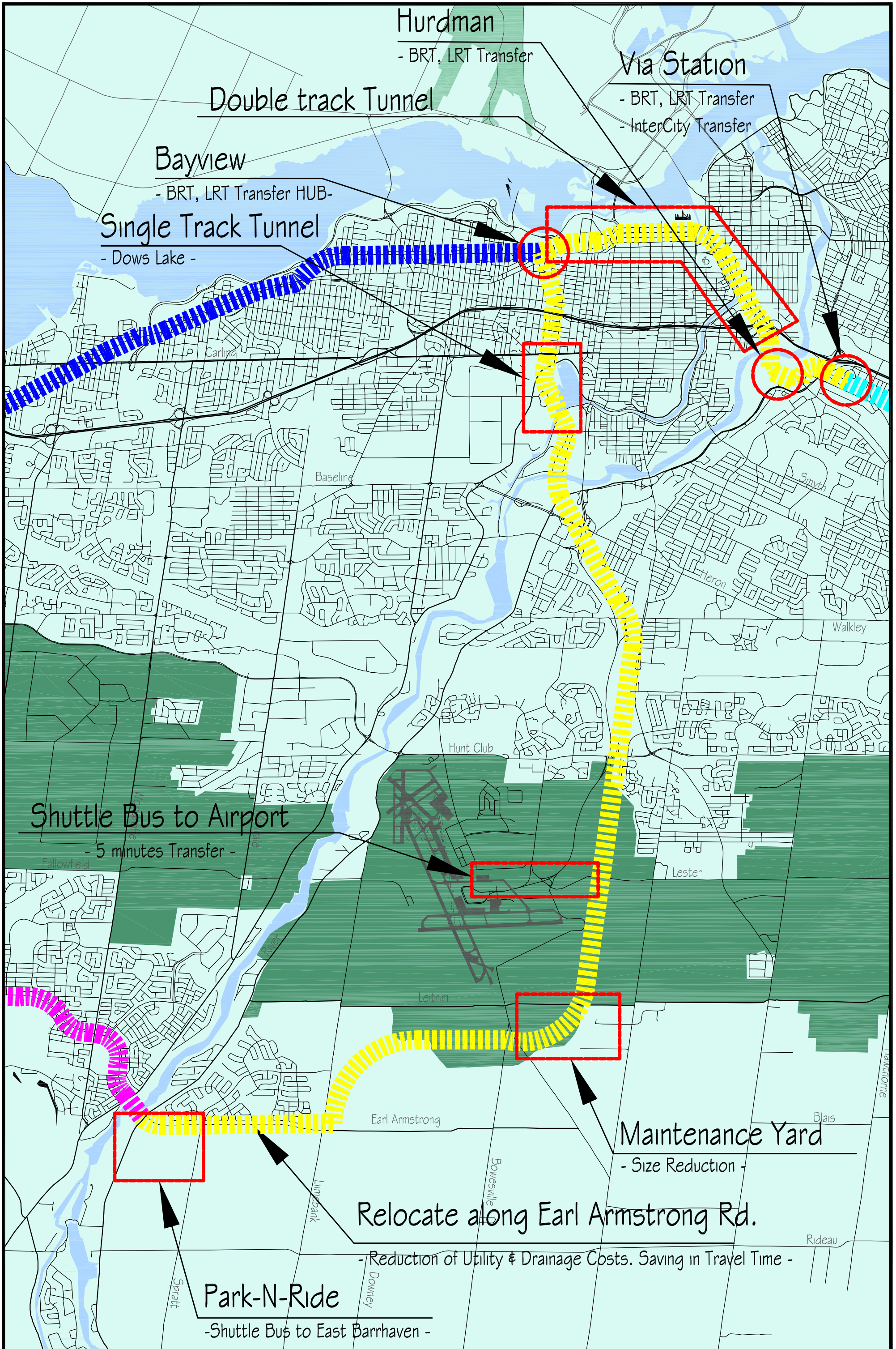
Note:
 1) This schedule forms part of the Transportation Master Plan of the City of Ottawa and must be read in conjunction with the text.
 2) This schedule is intended as a framework for planning and design; consequently alignments of proposed roads are approximate and subject to detailed study.
 3) This schedule includes some lands adjacent to the Central Area that are designated General Urban Area.

Note:
 1) La présente annexe fait partie du Plan directeur de transports de la Ville d'Ottawa et doit être consultée en se reportant au texte même du Plan officiel.
 2) La présente annexe doit servir de guide en matière de planification et de conception; il s'ensuit que le tracé des routes proposées n'est qu'approximatif et donnera lieu à une étude plus approfondie.
 3) Cette annexe englobe des terrains contigus à l'aire centrale qui portent la désignation « site urbain générale ».

- SYSTEM PHASED IMPLEMENTATION -



- COST SAVINGS -



Ms Vivi Chi
Manager of Planning
City of Ottawa
111 Laurier Ave
Ottawa

Subject: Development of a financially-viable LRT system

Dear Ms Chi:

In response to your request for clarification of the new proposal submitted to the Transportation Committee on 15.08.07 I offer the following observations and guidance. The cost estimates are based (to some extent) on the Value Engineering discussions with the Siemens-PCL team (in which I participated) and are therefore subject to the Confidentiality Agreement.

1. It should be noted that the new proposal is based on 3 phases. Phase 1A is based on the previous OLRT project definition (University of Ottawa to Barrhaven Town Centre) and cost data (insofar as the City has permitted visibility into the bid price) with substantial scope revisions as described in the new proposal. It is not possible for this new proposal to reliably include additional works intended by the City but not divulged as to their proposed scope and financing. We have therefore made estimates for these works which we believe are reliably priced.
2. Phase 1B is based on the deletion of the scope of the OLRT in the CBD and a revised scope to incorporate a tunnel and surface route to the VIA station. The costing is based on actual tunnel prices from recent projects and is being reviewed by tunneling experts.
3. Phase 2 integration is based on the effective use of available rights-of-way options to minimize capital costs.
4. During the value engineering activity it became apparent the City had not required unit costs for contract scope amendments in the OLRT Contract. This was unfortunate since it left the estimating of scope change costs to an undefined negotiation process, which was in a state of flux at the time of suspension of the negotiations. It is therefore risky to attempt to derive *unit* costs for the proposed scope changes (based on the OLRT price) since the pricing structure of the bidder was opaque.
5. Due to the opacity of the OLRT tender pricing your team should exercise caution in assuming that a renegotiated scope will result in a linear relationship to price. This new proposal is based on a revised system configuration with adjusted OLRT costs using other LRT applications as a reference.
6. The City appears to include substantial contingencies in its tunnel estimates which, on the basis of the recent budgetary submission, appear to be based on very different assumptions than are used in this proposal. While it is necessary to provide contingencies in a project of this magnitude, the new proposal assumes the imposition of a costing discipline based on value-for-money related to the services delivered by the proposed LRT system. This results in a no-frills approach for the Phase 1 system.
7. In summary, the **target price** of \$640 M (2005) derived for Phase 1A includes civil works reductions of \$175 M and E&M works reductions of \$34 M compared to the former scope (see page 2), plus an estimated \$20 M for the Bayview interchange station. The Phase 1B estimate is based on twin 4.7 m dia. tunnels, 3.1 kms in length, bored in rock with 3 stations to serve the CBD and an allowance for station infrastructure at Hurdman and VIA. The fleet increase required is 3 vehicles for Phase 1B (2011).

I trust these clarifications will be helpful to your team.


Morrison Renfrew

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Page 1 of 2

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	Scope change item	Cost adjustment
Phase 1A	CBD scope elimination	
	Maintenance Facility size reduction	
	Le Breton Station elimination	
	Dow's Lake additional tunnel elimination	
	Earl Armstrong Rd alignment (vs southerly diversion)	
	Delete station (Greenboro- Retain bus station- based on Ridership study comments) to increase average speed	
	Fleet reduction (5 vehicles less than OLRT Woodroffe-McKK)	
	Total eliminations	(209)
	Addition: Bayview bus interchange station	20
	Target cost River Road - Bayview	640
Phase 1B	3 kms twin bore tunnel 4.7 m dia	
	Bayview to west tunnel portal (assumed open cut)	
	Additional works to Bayview bus interchange	
	3 centre platform stations (8m width platform)	
	E&M track/ signaling/TPS	
	Station finishes (E&M; Tunnel vent ; escalators, elevators)	
	East tunnel portal	
	Design cost allowance	
	Tunnel contingency (15%)	
	Tunnel cost	401
	Shared-use on transitway (2.5 kms) including bus protection signals	
	Structure across VIA track (access to south side of VIA station)	
	Station @ VIA	
	Additions @ Hurdman (LRT platform; trackwork; TPS; signaling)	
	East portal-VIA	44
	Additional fleet required to serve Bayview-VIA (3 vehicles)	16

Brian De Freitas

From: "Brian De Freitas" <DeFreitB.TRN.Thor.MMM>
Organization: MMM Group Limited
To: defreitb.trn
Date sent: Wed, 19 Sep 2007 10:02:46 -0400
Subject: Re: cost reduction estimates
Send reply to: DeFreitasB@mmm.ca

-----Original Message-----

From: ROBERT RENFREW [<mailto:rrenfrew0407@rogers.com>]
Sent: September 04, 2007 11:48 PM
To: Nouraeyan, Abdol; marcus Boyle
Cc: Mary Jarvis; Lyon Sachs
Subject: cost reduction estimates

Dear Abdol:

In response to your request for more details on the target cost for the New LRT system I have prepared some illustrative numbers. The real requirement is for a common set of requirements that can be a basis for comparison. Incremental costing on the basis of subjective requirements will never provide a definitive comparison. The Operational Requirements should be, in effect, a mini-spec inclusive of the ridership requirements. From such a basis we can then mutually discuss the value-for-money of each requirement and eliminate the nice-to-have elements which merely inflate cost without quantifiable performance benefit. My deletions include:

- * elimination of the trackwork on the S-A bridge and Woodroffe-RR alignment; Woodroffe station; at a nominal saving of \$15M *
- simplification of Leitrim station (single platform and elimination of crossover tracks) since the projected boardings do not justify short-turning at this location, at a nominal saving of \$2M *
- scale reduction of the maintenance facility on the basis of an 18 car fleet, contracting-out of widely intermittent tasks (e.g. bogie refurbishment at half-life); simple shelter for stabling (using car heat for overnight);
- elimination of the 3rd track to Leitrim; can be provided for an estimated \$45M at commercial rates for building area and facilities. *
- reduction in PST & GST

Additional cost reductions not counted in the target cost, but highly recommended, include:

- * elimination of the duplicated control centre at Belfast Rd (the future complete network may justify such a facility but not the Phase 1 system) at a saving of \$5M *
- simplification of the signalling system due to the use of double track on PRW exclusively: \$8M *
- delete the Business Park station (boarding projections are trivial): \$2M

The operating cost can be reduced significantly due to the fleet reduction, reduction in fleet-kms, and the more effective choice of turnback locations. Both the fixed and variable costs will be beneficially affected. I have not attempted to quantify these at this time. I hope these will assist you in understanding the value-for-money approach I have taken.

Regards,
Morrison Renfrew

rrenfrew0407@rogers.com

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----- End of forwarded message -----

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