7.0 PROJECT GOALS, PLANNING OBJECTIVES AND DESIGN CRITERIA

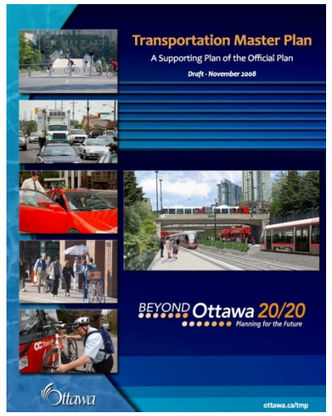
To achieve the Vision set forth in the Transportation Master Plan (TMP), this section sets forth the Goal of the overall Downtown Ottawa Transit Tunnel (DOTT) Project. The foundation towards the realization of the Goal is identified in 11 Project Planning Objectives and 122 directly linked Design Criteria which guide the development of alternative transit alignments and station designs for the DOTT Project.

Sections include:

Downtown Ottawa Transit Tunnel: Tunney's Pasture to Blair Station via a Downtown LRT Tunnel

7.1 Transportation Master Plan Vision

The Transportation Master Plan sets the overall vision for the City's future transportation system to the year 2031. All transportation planning decisions are meant to be guided by this Vision Statement:



> "*In 2031, Ottawa's transportation system will enhance our quality of life by supporting social, environmental and economic sustainability in an accountable and responsive manner*"

7.2 Goal of the Downtown Ottawa Transit Tunnel Project

The Transportation Master Plan identifies the DOTT project as a Phase 1, Increment 1 transit infrastructure project, thereby establishing it as one of the highest priority transportation projects in the City. Within this context and for the purpose of this study, the goal of the DOTT project is:

> *"To establish a faster, more efficient, high quality rail-based rapid transit service which will accommodate existing and future travel demand into and through the downtown, and to successfully accomplish this in a manner which is consistent with the TMP Vision Statement"*

7.3 The Need for Guidance

Project planning objectives and associated design criteria have been identified to guide the development and evaluation of alternative alignments and designs for the DOTT project. These objectives and criteria:

- Enable a shared understanding by the City, the design team, and all stakeholders of the project and its expectations;
- Implement planning and design directions of the Plan for Canada's Capital, Ontario's Provincial Policy Statement, and the City of Ottawa's Official Plan and Transportation Master Plan Update;
- Form the fundamental planning objectives and basic design assumptions;
- Provide guidance for designers and others to use when trade-offs need to be addressed;
- Provide a basis for the selection of criteria to be used in the evaluation and assessment of alternative designs; and
- Form the basis for determining detailed design criteria and specifications.

These objectives and criteria are not intended to replace existing federal, provincial and municipal policies and standards which apply to the study area and which the design of the DOTT will be required to meet. Rather they complement and enhance those provisions and provide additional design direction that is focused specifically on this project in this context.

7.3.1 Planning Objectives and Design Criteria

The DOTT project is being planned and designed in accordance with the following eleven (11) project planning objectives. The project will:

A. Increase Transit Ridership and Mobility

B. Enhance Ottawa's Urban Character and National Stature

C. Stimulate Smart Growth

D. Create Successful Rapid Transit Stations

E. Provide Safe and Efficient Linear Infrastructure

F. Provide a Safe and Efficient Tunnel and Compatible Portals

G. Be Compatible With Adjacent Communities

H. Maintain or Improve Natural and Physical Environments

I. Showcase Sustainable Design Best Practices

J. Manage Construction Disruption and Risk

K. Result in a Wise Public Investment

Each of these eleven (11) project planning objectives is elaborated on below and partnered with a series of design criteria. It is important to note that a combination of qualitative and quantitative design criteria is provided. In some cases, such as matters pertaining to urban character, the criteria provide guidance on topics that are subject to interpretation and professional opinion. In other cases, the criteria are technical and specific in nature and form the project's basic engineering design

assumptions. However, both styles of criteria are equally valid and are measurable in their own right.

It is also important to note that not all of the design criteria will be applicable to the project evaluation phases. On this basis, only those criteria that assist in the comparative evaluation of alternatives need to be carried forward. In some cases the criteria may be refined or further supplemented to enable a more detailed evaluation.

A. Increase Transit Ridership and Mobility

The project will provide a fast, convenient, comfortable, reliable, and efficient rapid transit service that will be the core of Ottawa's rapid transit network, while being fully integrated and connected with other transportation networks. Associated design criteria comprise:

A-1. Modal Split Target:

Assist in the City's pursuit of its goal of 30% transit modal split during weekday peak period, by providing the highest possible level of transit service and connectivity with other non-vehicle modes along the corridor.

A-2. Rapid Transit Travel Time:

Achieve a rapid travel time along the corridor, based on a combination of station frequency, track geometry, and vehicle technology.

A-3. Travel Comfort:

Deliver a comfortable trip experience for riders, based on a combination of track geometry and vehicle technology.

A-4. Rapid Transit Network Connectivity:

Maximize connectivity to and avoid disruptions to Ottawa's existing and planned rapid transit network, including the West Transitway, East Transitway, Southeast Transitway, the O-Train line, and the future Rideau/Montreal LRT Corridor.

A-5. Bus Transit Network Connectivity:

Maximize connectivity to Ottawa's existing and planned bus transit network.

A-6. Interprovincial Transit Connectivity:

Maximize connectivity to the existing and planned transit network serving the Outaouais, including the potential for interprovincial transit connections at Bayview Station and/or at approaches to existing interprovincial bridge crossings.

A-7. Passenger Rail Connectivity:

Maximize connectivity to the Ottawa Train Station and its VIA passenger rail service, considering its potential to become a major intermodal hub providing connections between the LRT and inter-city and potentially regional commuter train service.

A-8. Pedestrian Network Integration:

Maximize connectivity to existing and planned pedestrian networks.

A-9. Cycling Network Integration:

Maximize connectivity to existing and planned on-road and off-road cycling networks, including the provision of bicycle parking at rapid transit stations.

A-10. Recreational Pathway Integration:

Maximize connectivity to existing and planned recreational pathway networks, and provide parallel pathway links where possible.

A-11. Road Network Integration:

Maximize connectivity to existing and planned road networks, including truck routes.

A-12. Emergency Service Vehicles:

Provide for the possibility of emergency service vehicles to traverse or cross the corridor.

B. Enhance Ottawa's Urban Character and National Stature

The project will enhance the urban character of downtown Ottawa and adjacent neighbourhoods and will exhibit a quality and attention to design detail that is befitting the Nation's Capital. Associated design criteria comprise:

B-1. National Capital Symbolism:

Require that the design excellence and attention to detail befits Ottawa's symbolic role as the National Capital, services the Capital's various destinations along the corridor, and contributes to an enhanced visitor experience.

B-2. Downtown Ottawa:
Implement the City's strategy for excellence in urban design in the downtown area and reinforce its positive image and civic pride as one of Canada's major cities.

B-3. Arrival Route:
Treat the corridor as an important visitor arrival route to downtown Ottawa as the Nation's capital, affording a pleasant and comfortable trip with views to important landmarks and institutions and in a green setting where possible.

B-4. Civic Places:
Use rapid transit stations and their interface with streets and major land uses as opportunities to create vibrant public spaces linked to their context and that will be appreciated by residents and visitors alike.

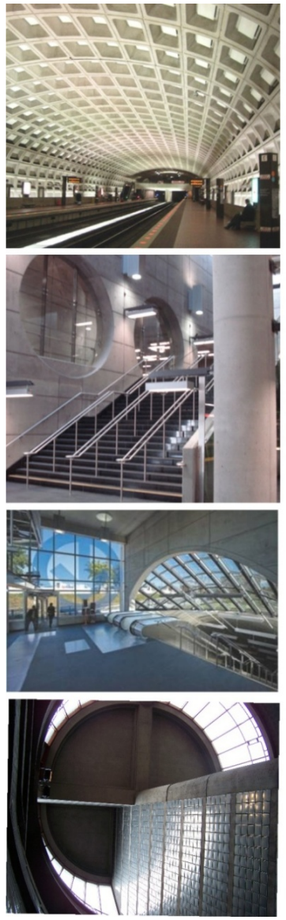
B-5. Architectural Quality:
Set a high standard of architectural quality in the design of transit stations, structures, and landscaping.

B-6. Views:
Maintain existing and protected views and vistas and provide opportunities for riders to appreciate those views and vistas.

B-7. Streetscaping:
Integrate rapid transit stations with their adjacent streets through coordinated street surfaces, street furniture, street lighting, and signage.

B-8. Private Property
Integration: Integrate building designs, materials, and site landscaping on private lands adjacent to transit stations with those of the station, to pursue seamless and cohesive spaces.

B-9. Public Art:
Provide multiple opportunities to capitalize on the ***City's Art in Public Places Funding*** which provides for 1% of project value to be used for art, possibly to act as transit station landmarks or to assist in visual continuity of the transit system's public spaces.




C. Stimulate Smart Growth
The project will stimulate opportunities for land use intensification and transit oriented development (TOD) on adjacent lands and will increase transit service to existing uses. Associated design criteria comprise:

C-1. TOD Intensification:
Locate transit stations adjacent to existing or planned higher density and mixed use land uses, or vacant or underutilized lands with potential for higher density and mixed land uses, to promote new transit oriented development.

C-2. Mixed Use Centres:
Locate transit stations to help stimulate development and redevelopment at designated Mixed Use Centres along the corridor.

C-3. Brownfield Reinvestment:
Use the public investment in rapid transit service to stimulate private investment in brownfield redevelopment.

C-4. Downtown Business Vitality:
Contribute to the vitality of downtown business improvement areas and individual businesses by reducing on-street bus congestion and providing excellent rapid transit service for employees and patrons.

D. Create Successful Rapid Transit Stations

The project's rapid transit stations will be safe, accessible, attractive, functional, and highly utilized while designed as a connected system of important public amenities. Associated design criteria comprise:

D-1. Capture Area:
Capture the maximum number of riders by locating rapid transit stations that are within relatively short walking distance of medium and high density land uses.

D-2. Building Integration:
Select station sites that provide for the best opportunity to integrate the station with existing or planned buildings, tourist destinations, and below-grade retail businesses.

D-3. Personal Services:
Encourage accessory retail and service uses to be co-located at all rapid transit stations.

D-4. Spacing:
Space rapid transit stations at a frequency that balances the need to capture riders with the need for rapid service.

D-5. Capacity:
Vary the scale and capacity of rapid transit stations to match the civic context and expected ridership for the year 2031 and beyond, including the possible need to service special events at certain stations.

D-6. Passenger Circulation in Stations:
Design internal circulation to account for stairs and escalators, elevators, run-off areas, queue spaces and corridor flows.

D-7. Transfer Stations:
Avoid conflicts between vehicles and between users at transfer stations (including Bayview and Hurdman Stations), and provide capacity for safe and efficient movements and ticket transactions.

D-8. Platform Length:
Accommodate the future by planning stations for 6-car LRT trains.

D-9. Platform Access:
Maintain at least two access points from all platforms.

D-10. Building Code:
Require that all structures adhere to the Ontario Building Code and other associated codes as applicable.

D-11. Barrier Free Design:
Ensure that rapid transit stations and associated pedestrian routes are 100% barrier free for persons with a range of abilities.

D-12. Elevating Devices:
Provide elevator and redundant escalator connections between all levels, in both directions.

D-13. Wayfinding:
Provide legible communications and signage systems that enable user wayfinding and ease of orientation, for persons with a range of abilities including visitors.

D-14. Branding:
Develop a common branding scheme that assists in identifying station locations and creating a memorable user experience.

D-15. Durability & Maintenance:
Use materials and finishes that are timeless, durable, easily maintained, vandalism resistant, and appropriate for Ottawa's four-season climate and harsh urban conditions.

D-16. Noise and Vibration Management:
Use building materials, systems and station designs that minimize noise and vibration transmission.

D-17. Ventilation:
Provide adequate ventilation for operating requirements and emergency events, while minimizing the need for mechanical systems through the use of natural ventilation and the piston effect of trains.

D-18. Ventilation Exhaust:
Locate ventilation exhaust ports in unobtrusive locations and avoid proximity to fresh air intakes from adjacent buildings.

D-19. Fare Collection:
Allow space for a fare collection line including collector booths, sales of tickets, and smartcard readers.

D-20. Signals and Communication:
Provide high quality control and communications systems for persons with a range of abilities, including intelligent passenger and tourist information solutions.

D-21. Climate Control:
Provide weather protection at surface stations, local transit connections, and pick-up/drop-off facilities.

D-22. Personal Safety:
Ensure that all public spaces adhere to the principles of crime prevention through environmental design, including the provision of: publicly visible spaces for passive surveillance, easily located entrances, and appropriate use of lighting and landscaping.

D-23. System Security:
Provide for surveillance and security systems to maintain a safe and secure system.

E. Provide Safe and Efficient Linear Infrastructure

The project's linear infrastructure, including running structures, track, power supply, bridges and structures will provide for the safe, efficient, durable, expedient and reliable movement of transit vehicles as well as the routing of services and utilities. Related design criteria comprise:

E-1. Route Length:

Use shortest routes to reduce trip times and cost of construction.

E-2. Transitway Co-alignment:

Reuse existing roadbed and drainage wherever possible, including the possibility of using existing transitway corridors.

E-3. Transitway Conversion:

Provide for potential interface with existing bus rapid transit station facilities wherever possible.

E-4. Mainline Track Curvature:

Design and build mainline track to minimize noise and vibration and to maximize ride comfort by assuming 425 m as the desirable minimum for horizontal curves at 80 km/hr vehicle speed, with 150 m being the minimum for basic ride comfort, and with 75 m absolute minimum.

E-5. Balanced and Unbalanced Superelevation:

Design for a maximum superelevation of outer rail of circular curves of 100 mm, and minimize unbalanced superelevation. Consider a functional planning maximum unbalanced superelevation of 25 mm (with a lateral acceleration of 0.018g), and an absolute maximum unbalanced superelevation of 75 mm (with lateral acceleration of 0.1g).

E-6. Clearance Envelope Calculation:

Develop and apply a vehicle clearance envelope that accounts for the design vehicle dynamic envelope, superelevation effect, curvature effect and trackwork construction and maintenance tolerances.

E-7. Track Centres:

Minimum track separation with a centre OCS pole - 4.5 m on tangent track, with minimum track separation on curves increased by 3.5 times the superelevation.

E-8. Track Gauge:

Track gauge shall be "standard" gauge of 1435 mm (4'-8½"), measured 16 mm below top of rail.

E-9. Track Structure:

A durable and long-life track support system will be developed to respond to the various corridor segments. Embedded track will be used where emergency vehicles require access, double-tie and vibration isolation systems will be used where sensitive land uses exist and the track will be directly fixed to the tunnel or bridge structures as required for long term stability.

E-10. Vertical Curves:

For functional design purposes, crest vertical curves should have a minimum 250 m radius and sag vertical curves should have a minimum 350 m radius.

E-11. Track Grades:

Track grades should be less than the desired maximum of 3.5%. Where necessary, short stretches of track with a 5.0% grade will be acceptable as the absolute maximum.

E-12. Station Grades:

Stations should be planned with a constant 0.3% grade for drainage, but can have grades up to 1.5% maximum. If a station has to be on a crest curve, the maximum grade would be 0.5% down in each direction from station centreline. Stations cannot be planned with sag curves.

E-13. Special Trackwork and Storage Tracks:

To provide for operational flexibility and to recover from disrupted operations, special track work and storage tracks will be designed into the system. Special trackwork shall be placed on a constant grade, preferably less than 0.5%, on tangent track with no horizontal or vertical curves. These elements shall be placed to provide good flexibility but are more easily accommodated outside the tunnel area.

E-14. Electrical Power Substations:

Electrical power substations should be integrated into stations or adjacent buildings. If possible, the substations will not be located in the downtown core area.

E-15. Municipal Services & Utilities:
The construction or realignment of municipal services and utilities should cross the alignment at a right angle, where possible, rather than running parallel or directly above.

E-16. Emergency Vehicle Access:
Provide potential for emergency vehicle access along and across the corridor, where appropriate.

E-17. Underground Structures:
Assume a design life for underground structures of 100-120 years.

E-18. Bridge Structures:
Design bridges to the Canadian Highway Bridge Design Code CAN/CSA–S6-06 (or latest revision).

E-19. Seismic Rating:
Assume an importance category of "Emergency-route" in regards to the seismic rating of bridges and structures.

E-20. Aesthetic:
Design structures that compliment their community context.

F. Provide a Safe and Efficient Tunnel and Compatible Portals

The project's tunnel will be safe and durable and will be located with a depth and alignment that provides for efficient construction and the best opportunities for constructing rapid transit stations, with portals that are compatible with adjacent land uses and visually unobtrusive. Associated design criteria comprise:

F-1. Design Life:
Assume a 100 to 200 year design life for tunnel and associated structures.

F-2. Tunnel Clearance Envelope:
Ensure that additional running clearance requirements are provided to account for curvature and superelevation within bored tunnels.

F-3. Seismic Rating:
Assume an importance category of "Emergency-route" in regards to the seismic rating of the tunnel, bridges and structures.

F-4. Services and Utilities:
Maximize tunnel invert depth to avoid deeply founded structures, services or utilities, where feasible, and avoid portal locations with shallow municipal services and utilities that would require relocation.

F-5. Groundwater and Settlement:
Avoid the potential for settlement of existing structures above tunnels due to long-term lowering of groundwater levels.



F-6. Landscape Integration:
Integrate portals with existing/planned land uses by pursuing an integrated architecture, engineering and landscape architecture solution.

F-7. Environmental Features:
Select portal locations that minimize the potential for encountering environmental, archaeological or heritage concerns.

F-8. Drainage:
Minimize the risk of surface runoff flowing into tunnel at portals.


G. Be Compatible With Adjacent Communities and Buildings

The project will be planned and designed to be an integral and compatible component of downtown Ottawa and the other communities that it traverses. Associated design criteria comprise:

G-1. Community Cohesion:
Use the facility and its supporting infrastructure to link and unite adjacent communities rather than separate them.

G-2. Business Asset:
Deliver a facility that will be a welcomed by the adjacent business community as a highly valued asset supporting their long-term vitality.

G-3. Open Space Integration:
Find opportunities for the corridor to link open spaces along it and towards it, through a combination of recreational pathway connections and landscaping or naturalization treatments.

G-4. Noise and Vibration Reduction:
Design the alignment, track systems, stations and structures to reduce or eliminate noise and vibration which could impact adjacent building occupants.

G-5. Air Quality:
Target a reduction in emissions of NOx, SOx, and other potentially harmful substances by maximizing the potential for vehicle trip reductions through the corridor and by pursuing efficiency of bus movements at transfer stations.

G-6. Lighting:
Avoid light pollution to the night skies from facility lighting and minimize light trespass onto adjacent properties to acceptable levels.

G-7. Heritage Resources:
Design the system to have as small an impact as possible on heritage resources including designated buildings or buildings located in designated heritage conservation districts.

G-8. Archaeological Resources:
Design the system to have as small an impact as possible on archaeological resources.

G-9. Visual Environment:
Contribute to and be respectful of the visual environment and identity of communities and special areas along the corridor, and select rapid transit infrastructure (including overhead catenary wires) that is as visually unobtrusive as possible.

G-10. Private Property Requirements:
Minimize the need for encroachments onto private lands, private property acquisitions, and easements by locating components on public lands when feasible.

G-11. Property Access:
Maintain vehicular access to private lands along the corridor wherever feasible.

H. Maintain or Improve Natural and Physical Environments
The project will have minimal effects on the natural and physical environment, and will create opportunities for environmental improvements. Associated design criteria comprise:

H-1. Terrestrial Habitats:
Design the system to have as small an impact as possible on terrestrial habitats such as woodlots, riparian areas, and seek opportunities for improvement.

H-2. Aquatic Habitats:
Design the system to have as small an impact as possible on aquatic habitats such as rivers, streams, ponds, riparian areas, and seek opportunities for improvement.

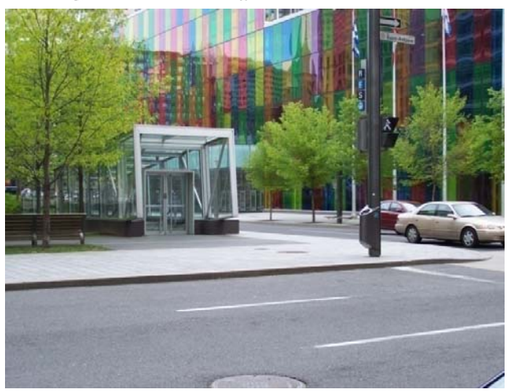
H-3. Urban Forest:
Design the system to have as small an impact as possible on existing trees forming part of the urban forest, including individual street trees.

H-4. Ground Water and Soils:
Avoid changes to ground water resources that might result in changes to surface habitats or soil load bearing capacities, and seek opportunities for ground water recharge.

H-5. Surface Water:
Apply storm water management best practices to maintain or improve the quality and quantity of runoff along the corridor.

H-6. Snow Management:
Consider micro-climatic conditions and the likelihood that snow will accumulate on the tracks as well as requirements for snow storage along the corridor.

I. Showcase Sustainable Design Best Practices
The project will exemplify best practices in energy and environmental design, including "green infrastructure" choices. Associated design criteria comprise:



I-1. Reduced Energy Demand:
Select rapid transit technologies and building designs that are energy efficient to build and operate.

I-2. Energy Conservation:
Develop energy conservation plans that seek to reduce energy consumption during project construction and operation.

I-3. Alternative Energy Supply:
Provide opportunities for renewable energy sources such as solar or wind power to locate within the corridor, to supplement the energy grid or power infrastructure accessories such as lighting or communications equipment.

I-4. Corridor Greening:
Incorporate a range of landscape treatments including trees and grass and shrubs with the objective of creating a green rapid transit corridor that assists in oxygen production and CO_2 reduction.

I-5. Naturalized Drainage:
Use naturalized drainage techniques such as bio-retention swales to reduce infrastructure materials required and to encourage ground water recharge.

I-6. Green Roofs:
Consider the use of green roofs for rapid transit stations or tunnel portals.

I-7. Natural Lighting:
Enable natural light to penetrate and illuminate rapid transit stations to the degree possible to reduce energy demands while improving the user experience.

I-8. Infrastructure Reuse:
Use existing infrastructure corridors and services whenever possible, to reduce the project footprint and additional materials that need to be consumed.

I-9. Recycled Materials:
Use recycled materials where feasible, to reduce the amount of natural resources depleted or total energy consumed.

I-10. Local Materials:
Use materials and resources from local suppliers to reduce transport distances and associated energy consumption.

I-11. Waste Management:
Reduce the amount of waste accumulated from construction activities, to reduce the amount of material that will be sent to a landfill.

I-12. Toxics Reduction:
Use landscaping treatments and surfaces that can be managed naturally and without pesticide use.

J. Manage Construction Disruption and Risk
The project will be implemented in a manner that minimizes the potential for negative effects on businesses, communities, transportation systems, and other infrastructure during the construction period. Associated design criteria comprise:

J-1. Construction Mitigation Strategy:
Actively involve adjacent businesses and landowners, and the overall community, in the City's preparation of a construction mitigation strategy for the project, including a shared understanding that while construction period disruption is inevitable, best efforts will be made to minimize and mitigate that disruption and the hardship or inconvenience that may result.

J-2. Communications:
Prepare a communications plan that establishes methods for the City and its contractor to communicate with project stakeholders in order to share information on project activities and its schedule.

J-3. Community Organization:
Encourage the community, in particular the adjacent businesses and landowners, to become organized to work with the City in the implementation of the construction mitigation strategy and communications plan, and to develop means for effective lines of communication with construction managers during the construction period, possibly including "block captains", business improvement association, representatives, newsletters, and web site updates.

J-4. Traffic Management:
Prepare a traffic management plan that minimizes disruption to the existing pedestrian, cycling, transit, road, and truck networks during construction.

J-5. Project Streamlining:
Establish, as an overall goal, that the duration of construction be compressed and streamlined as much as practical to reduce potential negative effects on adjacent businesses and landowners and on the surrounding community and its environment.

J-6. Business Access:
Make best efforts to maintain access to existing businesses during construction.

J-7. Project Work Sites:
Identify potential sites during the planning process for contractor site offices and materials storage areas, and require plans to be approved by the City that include temporary visual screening and buffering from adjacent communities.


J-8. Contaminated Sites:
Require Environmental Site Assessments to be completed prior to site alteration, to determine the potential for project excavation activities that may encounter contaminated soil or ground water.

J-9. Hazardous Materials, Spills and Accidents:
Require a hazardous materials, spills and accidents contingency plan to be provided by the contractor and approved by the City and applicable agencies.

J-10. Monitoring:
Monitor environmental conditions, including matters such as noise, vibration, and air quality, as warranted.

K. Result in a Wise Public Investment
The project will be a wise financial investment, considering all components of its life cycle as well as the "triple bottom line" of economic, social and environmental facets. Associated design criteria comprise:

K-1. Capital Cost:
Reduce construction costs by reducing the amount and complexity of infrastructure components and by employing value engineering principles.

K-2. Maintenance and Operating Cost:
Reduce operating costs by using durable, easily maintained, and low energy consuming materials and equipment.

K-3. Replacement Cost:
Reduce replacement costs by reducing the initial amount and complexity of infrastructure components and requiring good maintenance and operating procedures to extend life spans.

K-4. Total Life Cycle Cost:
Evaluate project value by determining the total cost of constructing, maintaining, operating, and replacing the infrastructure components over their intended life spans.



K-5. Social and Environmental Benefits:
Consider the economic benefits to the City in regards to social and environmental matters such as improved air quality, health, reduced cost of congestion, reduced travel times, improved goods movement, and increased worker productivity.

K-6. Private Landowner Benefits:
Evaluate benefits to property values and development potential associated with "uplift" from the public sector investment in rapid transit.

K-7. Public Fiscal Benefits:
Evaluate the economic spin-off effects associated with potential increased revenue from municipal property taxes, development charges, and other taxes and fees.

The fulfillment of these design criteria will enable the project planning objectives to be achieved. It is recognized, however, that the degree to which criteria are fulfilled will vary, and that some criteria may have more importance than others.