NEW STATION ANALYSIS
Methodology and Process

Leslie Woo, Chief Planning Officer
September 22, 2015
Summary

Recent investments in the transit network in the Greater Toronto and Hamilton Area provide an opportunity to consider new stations and the expansion of stations on the GO network. In support of this work, we have developed a methodology and are completing an analysis of potential new stations.

This report provides an overview of:

– The role of new stations and their impact on the network
– The criteria used to identify 120+ potential locations and to focus on the 50+ sites which are moving to the second stage of analysis

The next stage of analysis will lead to a short list of stations that will be determined following municipal and public engagement, and will include business case assessments.
Stations and the GO Rail network

- The GO Rail regional network consists of 7 lines with 63 stations (and 7 underway) linking with 12 local transit networks.
- Stations are where GO, local transit services and communities intersect.

<table>
<thead>
<tr>
<th>GO Corridor</th>
<th>Planned/In progress</th>
</tr>
</thead>
<tbody>
<tr>
<td>Richmond Hill</td>
<td>Bloomington</td>
</tr>
<tr>
<td>Lakeshore West</td>
<td>Confederation</td>
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<tr>
<td>Barrie</td>
<td>Caledonia</td>
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<td>Barrie</td>
<td>Downsvie Park</td>
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<td>Richmond Hill</td>
<td>Gormley</td>
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<td>Kitchener</td>
<td>Mount Dennis</td>
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<tr>
<td>Lakeshore West</td>
<td>West Harbour</td>
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</tbody>
</table>
Regional Express Rail

Regional Express Rail (RER) will transform the way GO serves the region.

- Frequent service can encourage users to reconsider their mode choice.
- Stations can become important hubs for daily activities, not simply arrival and departure points.
- Work continues with City of Toronto to integrate analysis on proposed SmartTrack stations.
New Stations: Advantages and Impacts

New stations need to balance service frequency, expansion and cost. They can:

**Advantages**
- Expand service area, schedule and destinations
- Attract new customers
- Improve access for customers
- Improve integration with other transportation modes
- Be a potential catalyst for development

**Impacts**
- Increase travel time on corridor
- Cause delay to, and contribute to the potential loss of upstream riders
- Increase capital costs
- Increase operating, maintenance and energy costs
- Facilitate urban sprawl in remote locations
New Stations Objectives

The objectives of new stations are to:

- Improve service and add riders
- Minimize impact on trip time for existing customers
- Maintain appropriate station spacing for the vehicle technology
- Support existing regional and municipal plans
- Consider the different roles and needs of each location, adapt to urban and suburban context
New Station Analysis

Stage 1. Identified an initial list
120+ sites identified using key site and network considerations

Stage 2. Focusing analysis
Analyzed site factors, service considerations and historical requests, to scope list to 50+ sites

Stage 3. Evaluating
Analyzed strategic, economic, technical/operational and cost/revenue considerations of 50+ sites

Stage 4. Municipal and Public Engagement
Feedback and review of 50+ sites

Stage 5. Moving to Shortlist
Scope sites for further analysis

Stage 6. Further Analysis
Following public engagement, more detailed business case analysis will begin on shortlisted sites
Stage 1: Identified an initial list of sites

We started with a system-wide analysis that looked at:

- Site and network considerations such as:
  - station spacing
  - key transit connections and intersections
- Sites identified by Metrolinx, and listed in municipal and public documents

Over 120 possible sites identified

See Appendix for details of the considerations and initial list of locations
Stage 2: Focusing Analysis

How did we move from 120+ locations to 50+?

- We scored and compared the identified sites based on three categories:
  - Plans and Land Use
  - Transportation Connectivity
  - Technical Feasibility
- Completed March 2015

See Appendix for Stage 2 Methodology and list of 50+ locations
Stage 3: Evaluating

To guide the development of criteria for evaluating the 50+ locations, based on the objectives of new stations, we asked:

• Where will new stations improve service and riders?
• How many stations can we accommodate without negative impact to existing customers?
• Where do they fit in the region and existing plans?

See Appendix for details of Stage 3 criteria development

• In responding to the questions, we identified 40 measures for each location that are captured under the following four categories:
  1. Strategic criteria
  2. Economic criteria
  3. Technical/operational criteria
  4. Cost and revenue criteria

• Of the 40 measures, 5 sets of key criteria were identified that significantly differentiate stations from each other and were better predictors of overall performance. These criteria are presented in the appendix.
Stage 3-6

Stage 1+2 (complete)

Stage 3
50+ station evaluation

Stage 4
Engage stakeholders and public on 50+ stations

Stage 5
Supports RER program?

- Yes
- No

Defers for future consideration

Stage 6
Further analysis (including Business Case) on short listed stations

Recommended new station locations

Stage 5
Identify stations for focused analysis:

<table>
<thead>
<tr>
<th>Strategic/Economic</th>
<th>Financial/Technical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>Normal</td>
</tr>
<tr>
<td></td>
<td>Expensive</td>
</tr>
<tr>
<td>Med.</td>
<td>Fail</td>
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<tr>
<td>High</td>
<td>Pass</td>
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<tr>
<td></td>
<td>Pass</td>
</tr>
</tbody>
</table>

Recommended new station locations:

- Pass
- Fail

Further analysis (including Business Case) on short listed stations:
## 50+ location list: by corridor

<table>
<thead>
<tr>
<th>Lakeshore East</th>
<th>Lakeshore West</th>
<th>Barrie</th>
<th>Stouffville</th>
<th>Kitchener</th>
</tr>
</thead>
<tbody>
<tr>
<td>[DVP-Eastern]</td>
<td>Park Lawn*</td>
<td>[Queen W-Dufferin]</td>
<td>DVP-Eastern</td>
<td>Queen W-Dufferin</td>
</tr>
<tr>
<td>[Queen-Degrassi]</td>
<td>Kipling</td>
<td>[Dundas W]</td>
<td>Queen-Degrassi</td>
<td>Dundas W</td>
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<tr>
<td>[Gerrard-Carlaw]</td>
<td>Maple Grove</td>
<td>St. Clair</td>
<td>Gerrard-Carlaw</td>
<td>Islington*</td>
</tr>
<tr>
<td>[Jones]</td>
<td>Dorval</td>
<td>Hwy 7-Concord*</td>
<td>Jones</td>
<td>Hwy 27-Woodbine</td>
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<td>[Coxwell]</td>
<td></td>
<td>Sideroad 15-Bathurst</td>
<td>Coxwell</td>
<td>Breslau</td>
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<tr>
<td>Whites Rd</td>
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<td>Mulock</td>
<td>Lawrence East</td>
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<td>Lakeridge Rd</td>
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<td>Innisfill</td>
<td>Ellesmere</td>
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<td>Finch East</td>
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<td>14th Av</td>
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<table>
<thead>
<tr>
<th>Richmond Hill</th>
<th>Milton</th>
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</thead>
<tbody>
<tr>
<td>Parliament-Cherry</td>
<td>[Parliament-Cherry]</td>
<td>[Bathurst-Spadina]</td>
<td></td>
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<tr>
<td>Queen East</td>
<td>[Queen East]</td>
<td>[Liberty Village]</td>
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<td>Dundas East</td>
<td>[Dundas East]</td>
<td>[Queen W-Dufferin]</td>
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<td>Gerrard East</td>
<td>[Gerrard East]</td>
<td>[Dundas W]</td>
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<tr>
<td>Don Mills-Bond</td>
<td>[Don Mills-Bond]</td>
<td>East Mall</td>
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<tr>
<td>Millwood</td>
<td>[Millwood]</td>
<td>West Mall</td>
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<td>Eglinton</td>
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<td>Cawthra-Dundas</td>
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<td>York Mills</td>
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<td>Trafalgar</td>
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<td>John-Green</td>
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<td>16th Av</td>
<td>[16th Av]</td>
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</tbody>
</table>

### Selected sites

[] - location reviewed under other corridor

*Considered in comparison to existing neighboring stations
Next Steps

**Stage 4. Municipal and Public Engagement**

(September) Municipal meetings:
- Background on RER and stations
- Gather local knowledge on specific sites

(Fall 2015) Public meetings:
- Discussion on methodology, criteria and process, identified locations and clusters

**Stage 5. Moving to Shortlist**
(Winter 2015/16)
- Based on public engagement and continuing analysis

**Stage 6. Further Analysis**
(Winter 2015/16)
- Undertake further study including business case assessment on short list

**Recommend new stations for consideration**
(Spring 2016)
- Based on results of further analysis
Appendix

EVALUATION DETAILS
IDENTIFIED AN INITIAL LIST
Stage 1. Identified an initial list

Network Considerations

How far apart do stations need to be?

Locating stations too close together will reduce travel speeds and the benefits of electrification.

Larger station spacing means trains cover distances at higher speeds.

Adding stations mean trains need to stop and accelerate again, slowing travel along the corridor.
Stage 1. Identified an initial list

Site Considerations

Considerations when planning for new stations:

Transportation Connectivity
• e.g. transport network connectivity

Plans and Land Use
• e.g. proximity to urban growth centre
• e.g. mix and scale of surrounding development, and potential destinations

Technical Feasibility
• e.g. track geometry
• e.g. property availability for appropriate station typology
## Stage 1. Identified an initial list

### Initial location list

<table>
<thead>
<tr>
<th>Lakeshore East</th>
<th>Lakeshore West</th>
<th>Barrie</th>
<th>Stouffville</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laker Ridge Rd S, Ajax</td>
<td>Ottawa St</td>
<td>Innisfil</td>
<td>Elgin Mills Rd E</td>
</tr>
<tr>
<td>Harwood Av E</td>
<td>Chapel/Gage/Tim Hortons’s Field</td>
<td>Holland Yard</td>
<td>Major MacKenzie Dr E</td>
</tr>
<tr>
<td>Durham Live Casino/Bailey</td>
<td>Queen St S</td>
<td>Mulock Dr</td>
<td>16th Av</td>
</tr>
<tr>
<td>Brock Rd</td>
<td>Dundurn St, S/Cathedral Park</td>
<td>St John’s Sideroad</td>
<td>Kennedy Rd</td>
</tr>
<tr>
<td>Whites Rd</td>
<td>Plains Rd W</td>
<td>Yonge St</td>
<td>Hwy 7</td>
</tr>
<tr>
<td>Rosebank Rd</td>
<td>King Rd</td>
<td>Bathurst St/Side Rd 15</td>
<td>14th Av</td>
</tr>
<tr>
<td>Morningside Av</td>
<td>QEW</td>
<td>Dufferin St</td>
<td>McNicoll Av</td>
</tr>
<tr>
<td>Markham Rd</td>
<td>Guelph Line</td>
<td>Kirby Rd</td>
<td>Finch Av</td>
</tr>
<tr>
<td>Brimley Rd</td>
<td>Walker’s Line/Cumberland</td>
<td>Keele St/Teston Rd</td>
<td>Ellesmere Rd</td>
</tr>
<tr>
<td>Birchmount Rd</td>
<td>Burloak Dr</td>
<td>Langstaff Rd</td>
<td>Lawrence Av</td>
</tr>
<tr>
<td>Warden/Danforth</td>
<td>Bronte Rd</td>
<td>Hwy 7 (Concord)</td>
<td>Danforth Rd/ Midland Av</td>
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<tr>
<td>Victoria Park</td>
<td>Third Line</td>
<td>Steeles Av</td>
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<td>Woodbine Av</td>
<td>Fourth Line</td>
<td>Finch Av</td>
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<td>Coxwell Av</td>
<td>Dorval</td>
<td>Downsvie Park</td>
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<td>Greenwood Av</td>
<td>Maple Grove</td>
<td>Wilson Av</td>
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<tr>
<td>Jones Av</td>
<td>Ford Dr</td>
<td>Lawrence Av</td>
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<tr>
<td>Gerrard St E/Carlaw Av</td>
<td>Winston Churchill Biv</td>
<td>Caledonia</td>
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<tr>
<td>Dundas St E/Logan Av</td>
<td>Lorne Park Rd</td>
<td>Rogers Rd</td>
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<td>Queen St E</td>
<td>Mississauga Rd</td>
<td>St Clair Av W</td>
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<tr>
<td>Eastern Av</td>
<td>Cawthra Rd</td>
<td>Davenport Rd</td>
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<tr>
<td>Cherry St</td>
<td>Thirteenth St</td>
<td>Dupont St</td>
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<tr>
<td>Parliament St</td>
<td>Kipling Av</td>
<td>Bloor St</td>
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<tr>
<td>Lower Sherbourne St</td>
<td>Park Lawn Rd</td>
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<td>Windermere Av</td>
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<td>Roncesvalles Av</td>
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<td>Bathurst St</td>
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<tr>
<td></td>
<td>Spadina Av</td>
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</tbody>
</table>
# Stage 1. Identified an initial list

## Initial location list (cont’d)

<table>
<thead>
<tr>
<th>Richmond Hill</th>
<th>Milton</th>
<th>Kitchener</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elgin Mills</td>
<td>Trafalgar Rd</td>
<td>Rockwood</td>
</tr>
<tr>
<td>9th Line</td>
<td>Britannia Rd W</td>
<td>Heritage Rd</td>
</tr>
<tr>
<td>Weidrick Rd</td>
<td>Eglinton Av W</td>
<td>Chinguacousy Rd</td>
</tr>
<tr>
<td>16th Av</td>
<td>Mavis Rd</td>
<td>McLauchlan Rd N</td>
</tr>
<tr>
<td>Bantry Av</td>
<td>Cawthra Rd/Dundas St E</td>
<td>Kennedy Rd S</td>
</tr>
<tr>
<td>Under Hwy 407</td>
<td>The West Mall</td>
<td>Hwy 410</td>
</tr>
<tr>
<td>Bayview Av</td>
<td>The East Mall</td>
<td>Dixie Rd</td>
</tr>
<tr>
<td>John St</td>
<td>Shorncliffe Rd</td>
<td>Hwy 427</td>
</tr>
<tr>
<td>Steeles Av E</td>
<td>Islington Av</td>
<td>Hwy 27/ Woodbine</td>
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<tr>
<td>Cummer Av</td>
<td>Royal York Rd/Dundas St W</td>
<td>Islington Av</td>
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<tr>
<td>Finch Av E</td>
<td>Runnymede Rd</td>
<td>Jane St</td>
</tr>
<tr>
<td>York Mills Rd</td>
<td>Bloor St</td>
<td>St Clair Av W</td>
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<tr>
<td>Don Mills Rd</td>
<td></td>
<td>Dupont</td>
</tr>
<tr>
<td>Lawrence Av E</td>
<td></td>
<td>Dundas/College/Landsdowne</td>
</tr>
<tr>
<td>Eglinton Av E</td>
<td></td>
<td>Dufferin/Queen W</td>
</tr>
<tr>
<td>Don Mills Rd</td>
<td></td>
<td>King St</td>
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<tr>
<td>Millwood Rd</td>
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<tr>
<td>Eglinton Av E</td>
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<tr>
<td>Millwood Rd</td>
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<tr>
<td>Bayview Av</td>
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<tr>
<td>Brickworks</td>
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<tr>
<td>Prince Edward Viaduct</td>
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<tr>
<td>Gerrard St E</td>
<td></td>
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<tr>
<td>Dundas St E</td>
<td></td>
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<tr>
<td>Queen St E</td>
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<tr>
<td>Eastern Av</td>
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</tbody>
</table>
APPENDIX: STAGE 2

FOCUSING ANALYSIS
Stage 2. Focusing Analysis

Methodology

Plans and Land Use

Criteria:
• Proximity to urban growth centres, regional centres
• Supportive land use and density
• Number of destinations in proximity
• Land availability

High: meets all criteria  
Medium: meets at least 2 criteria  
Low: meets only 1 or no criteria

Transportation Connectivity

Criteria:
• (Potential) connection to high order transit (subway, LRT, streetcar)
• Connection to high quality active transportation route or facility
• Highway connection
• Good local transit connections

High: meets all criteria  
Medium: meets at least 2 criteria  
Low: meets only 1 or no criteria

Technical

• High: few obvious difficulties in building a platform and connecting
• Medium: some challenges constructing platform or adjacent connections, which may require higher than usual investment to overcome
• Low: obvious challenges with platform location or connections, may require undue effort to overcome
APPENDIX: STAGE 3

EVALUATING
Stage 3. Evaluating

Developing the criteria

Where will stations improve service and add riders?

Suburban stations…
- Depend heavily on auto mode share

New suburban stations may…
- Redistribute existing riders between stations
- Shorten automobile trips (and decrease regional vehicle-kilometres travelled)
- Improve walking, biking access
Developing the criteria (cont’d)

Where will stations improve service and add riders?

**Urban stations**…
- Rely on transit and active transportation for ridership

**New urban stations may**…
- Encourage new GO riders from congested local transit
- Provide more opportunities to access employment on the approaches to Union
Stage 3. Evaluating

Developing the criteria (cont’d)

How will stations impact journey time?

- New stations will increase dwell time by 2-3 minutes each
- Electrification will reduce the travel time – e.g. from Oshawa to Union by about 5 minutes

<table>
<thead>
<tr>
<th>Schedule time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum Run Time</td>
</tr>
<tr>
<td>Station Dwell</td>
</tr>
</tbody>
</table>

**Existing schedule**

- Minimum Run Time
- Station Dwell

**With new stations**

- Minimum Run Time
- Station Dwell

**New stations + electrification**

- Minimum Run Time
- Station Dwell

**Minimum Run Time (MRT):** travel time accounting for vehicle and track speeds and distance; allowances and buffering

**Station Dwell:** time stopped at station for boarding/alighting
Stage 3. Evaluating
Developing the criteria (cont’d)

Where do they fit in the region and existing plans?

Land use defines ridership: how many people there are to use a service and how they will use it

**Density:**
- Suburban stations: lower densities work because there is ample parking, facilitating large catchment areas. Need residential intensification to add new riders within existing catchment area.
- Urban stations: high residential density may not mean large number of new GO riders, since transit users have more alternatives and less demand for trips to Union.

**Mixed Use:**
- Urban stations are most effective with significant employment in close proximity.

**Focus/Timing:**
- Concentrate development capacity on identified growth centres and mobility hubs.
- Stations are not always a catalyst for significant growth.
### Stage 3. Evaluating

#### Strategic Criteria

<table>
<thead>
<tr>
<th>Considerations</th>
<th>Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Over 30 measures reviewed covering:</td>
<td>• System-wide evaluation by planning consultant</td>
</tr>
<tr>
<td>• Policy Alignment (Provincial, Regional, Local)</td>
<td>• Level of detail for analysis dependent on available data</td>
</tr>
<tr>
<td>• Connectivity (transit, active transportation)</td>
<td>• Framework allows for ongoing refinement of data</td>
</tr>
<tr>
<td>• Land use and destinations</td>
<td></td>
</tr>
<tr>
<td>• Market demand</td>
<td></td>
</tr>
<tr>
<td>• Land value uplift, development propensity</td>
<td></td>
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<tr>
<td>• Social inclusion</td>
<td></td>
</tr>
<tr>
<td>• Community impact (construction, fit)</td>
<td></td>
</tr>
</tbody>
</table>
Stage 3. Evaluating Economic Criteria

Considerations
- Travel time savings
- Potential for land value uplift
- Potential for Metrolinx land value capture
- VKT reduction and mode shift potential

Method
- High level evaluation of surrounding market by real estate consultant
- Time savings analysis for each location by Metrolinx staff
Stage 3. Evaluating

Technical/Operational Criteria

Considerations

• Grades and curves
• Corridor width and track spacing
• Efficient train movement and flow through
• Platform and passenger capacity
• Operational requirements

Method

• High level evaluation by engineering consultant
• Input from other studies (e.g. environmental assessments)
• Feedback from internal delivery groups
Stage 3. Evaluating

Cost and Revenue Criteria

Considerations

• Construction costs
  – Early works and site improvements
  – Related/dependent infrastructure
• Operating costs
• Potential revenue
  – Boardings
  – Land value capture from joint development

Method

• Magnitude of costs assumed based on comparison to existing station typologies
• Further site planning work required for more detail
Stage 3. Evaluating

Assumptions

The 50+ evaluation requires a consistent scenario to determine the relative performance of each station location. The following assumptions have been made for the analysis:

– Today’s land use
– Today’s fare structure
– Today’s service structure (mostly)
– Single station analysis
– Coarse grain ridership estimates

Changing the scenario assumptions, such as fare integration and RER service patterns, may improve the performance of sites at a later time.
## Stage 3. Evaluating

### Key criteria

- Of the 40 measures, these key criteria differentiate stations from each other and are better predictors of location performance

<table>
<thead>
<tr>
<th>Category</th>
<th>Objective</th>
<th>Criteria</th>
<th>Measure/Metric</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strategic/Economic</td>
<td>Connectivity and Ridership Drivers</td>
<td>How many trips will start and end at this station?</td>
<td>Sum of boardings + alightings</td>
</tr>
<tr>
<td>Planning</td>
<td></td>
<td>Does the station connect to other higher order transit modes and have potential to improve network and/or corridor service?</td>
<td>Distance to existing and planned routes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Does the station connect to key destinations?</td>
<td>Number of nearby destinations and places of interest</td>
</tr>
<tr>
<td>Travel Time Savings</td>
<td></td>
<td>What are the time savings associated with the new station?</td>
<td>Ratio for time penalty of existing riders to minutes saved for new station users</td>
</tr>
<tr>
<td></td>
<td></td>
<td>How well situated is the station in relationship to future market demand?</td>
<td>High level assessment of market potential</td>
</tr>
</tbody>
</table>
### Stage 3. Evaluating

#### Key criteria (cont’d)

<table>
<thead>
<tr>
<th>Category</th>
<th>Objective</th>
<th>Criteria</th>
<th>Measure/Metric</th>
</tr>
</thead>
<tbody>
<tr>
<td>Financial/Technical</td>
<td>Affordability</td>
<td>What is the cost to construct the station?</td>
<td>Relative expected cost</td>
</tr>
<tr>
<td></td>
<td>Ease of construction</td>
<td>Can the required facilities be constructed in this location?</td>
<td>Degree of site constraint</td>
</tr>
</tbody>
</table>
Stage 3. Evaluating

Kitchener Corridor

- Existing GO station
- Planned GO station
- Potential location
- Cluster of alternative sites
Stage 3. Evaluating
Kitchener Corridor - Enlargement

- Existing GO station
- Planned GO station
- Potential location
- Cluster of alternative sites
Stage 3. Evaluating Stouffville Corridor
Stage 3. Evaluating
Stoufville Corridor - Enlargement
Stage 3. Evaluating

Lakeshore East Corridor
Stage 3. Evaluating
Lakeshore East Corridor - Enlargement
Stage 3. Evaluating

Barrie Corridor
Stage 3. Evaluating
Barrie Corridor - Enlargement
Stage 3. Evaluating

Lakeshore West Corridor

- Existing GO station
- Planned GO station
- Potential location
- Cluster of alternative sites
Stage 3. Evaluating
Milton Corridor

- Existing GO station
- Planned GO station
- Potential location
- Cluster of alternative sites
Stage 3. Evaluating

Richmond Hill Corridor
Stage 3. Evaluating
Richmond Hill Corridor - Enlargement

- Existing GO station
- Planned GO station
- Potential location
- Cluster of alternative sites
Business Case Framework

Business Case
Project Scope & Assumptions

Policy/Planning (Strategic Case)
- Region/Policy
- Network/System
- Corridor/Service
- Local Conditions
- Land Use, Development & Timing
- Social Inclusivity
- Community Impact

User Benefits (Economic Case)
- Benefit of VKT Reduction
- Time Savings Benefit

Pro forma (Financial Case)
- Capital Costs
- Operating Costs
- Revenue

Technical/Operational (Deliverability Case)
- Track Geometry
- Local Geography
- Switching and Signaling

Available data
Further analysis