

F.G. Gardiner Expressway Strategic Rehabilitation Plan

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Public Works & Infrastructure Committee
March 4, 2014

Presentation Outline

- Background
- Condition Assessment
- Conventional Rehabilitation
- Accelerated Rehabilitation Plan
- Traffic Congestion Assessment
- Scheduling and Financial Implications
- Recommendations

Background

Public Works & Infrastructure Committee (April 10, 2013)

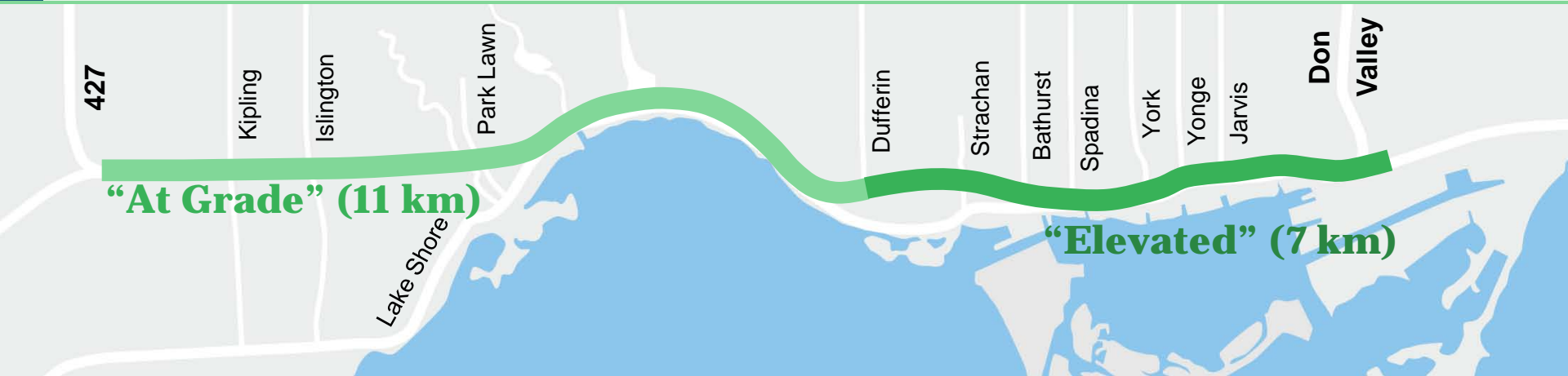
Staff Report “Revisions to the F.G. Gardiner Rehabilitation Project”

- Provided an overview of the planned rehabilitation works for the F.G. Gardiner Expressway
- Recommended a revised rehabilitation plan – starting with West Deck – given resumption of the F.G. Gardiner East EA
- Recommended corresponding cash flow adjustments to address rehabilitation needs in Transportation Services’ 2013 to 2022 Capital Budget and Plan:
 - 2013 to 2022 total (10 year) cash flow of \$495 million;
 - 2013 to 2025 total (13 year) cash flow of \$663 million

City Council (May 7, 2013):

- Approved revised rehabilitation plan and associated revisions to capital budget cash flows recommended in staff report to PWI
- Requested General Manager, Transportation Services and Executive Director, Engineering & Construction Services to incorporate options to accelerate phasing of the F.G. Gardiner Expressway rehabilitation in a report to PWI in early 2014 on the F.G. Gardiner Expressway Strategic Rehabilitation Plan

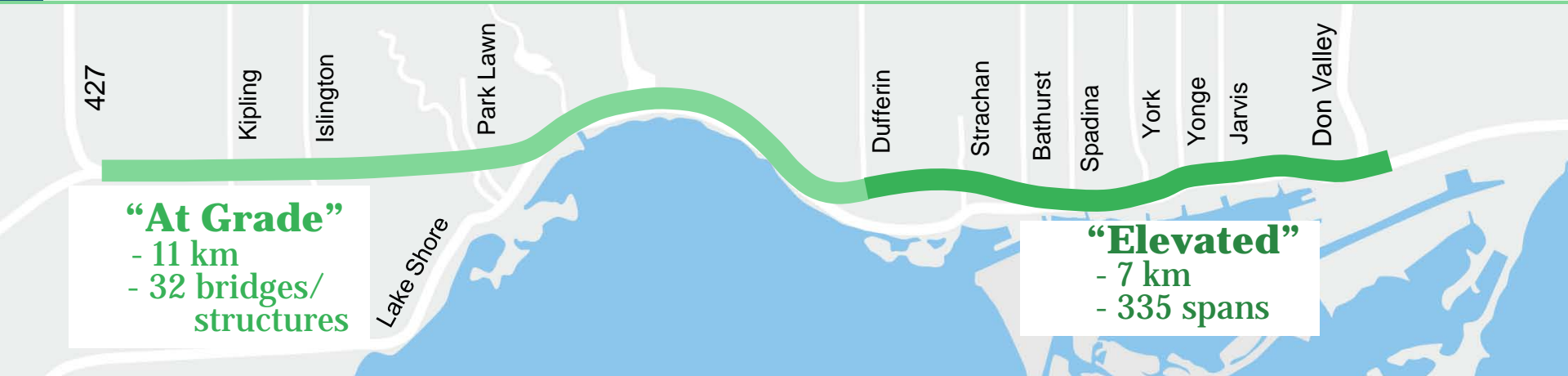
Strategic Rehabilitation Plan Considerations:



- Study area: Highway 427 to Logan Avenue (DVP)
- Recent condition assessments and prioritization of works based on public safety and needs
- Consideration given to recently completed studies
- Identify: immediate, short term and longer term rehabilitation needs

Condition Assessment

“Anatomy” of the F.G. Gardiner Expressway:



- At Grade Section: Hwy. 427 to Dufferin Street (1955 to 1958)
- Elevated Section: Dufferin Street to Logan Avenue (1959 to 1966)

“Anatomy” of the F.G. Gardiner Expressway:

- 3 types of structures support steel reinforced concrete deck shown with % of total length of “elevated” section:



a) Concrete T-Beam
(5%)

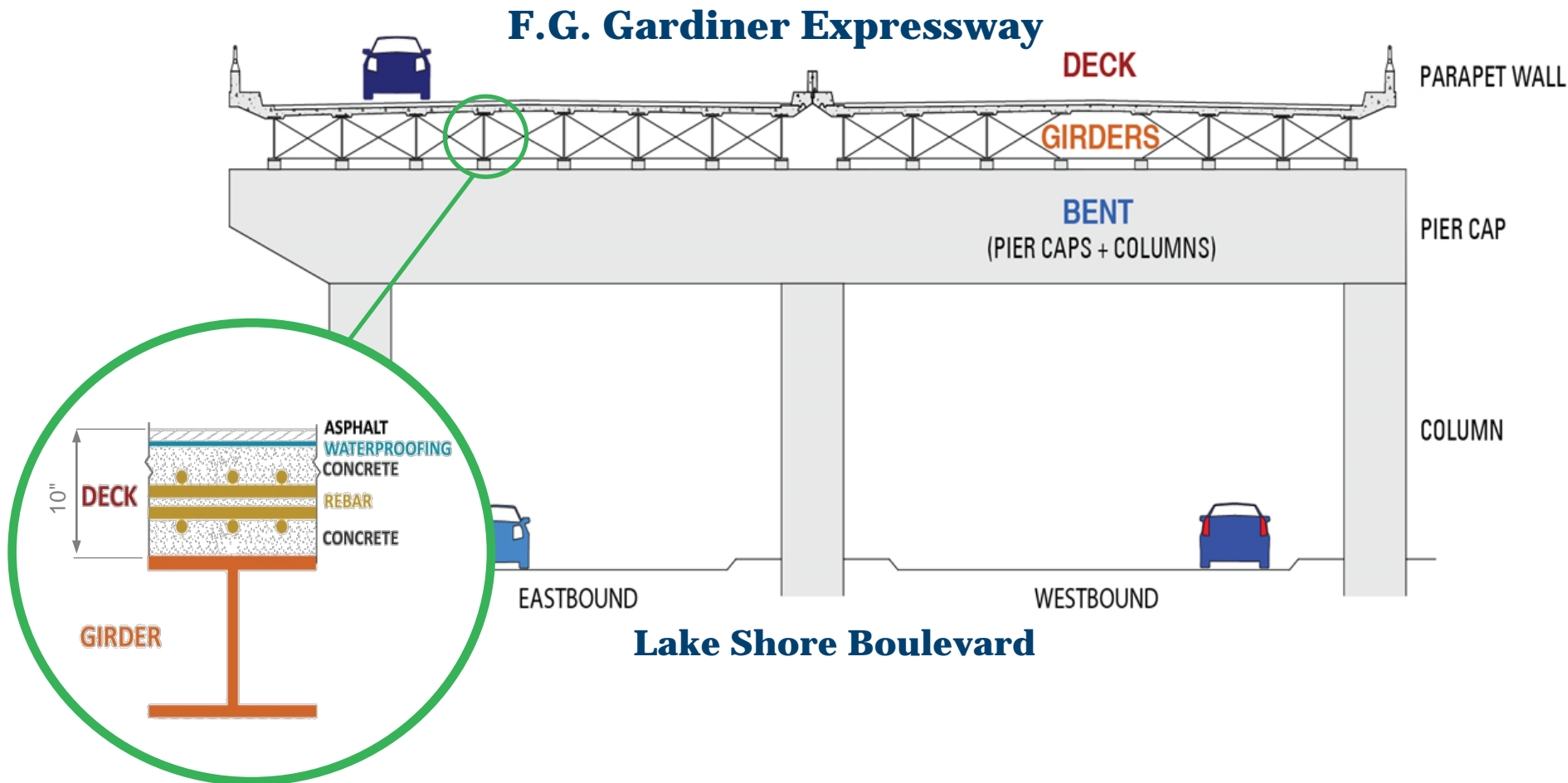


b) Steel Girder
(80%)

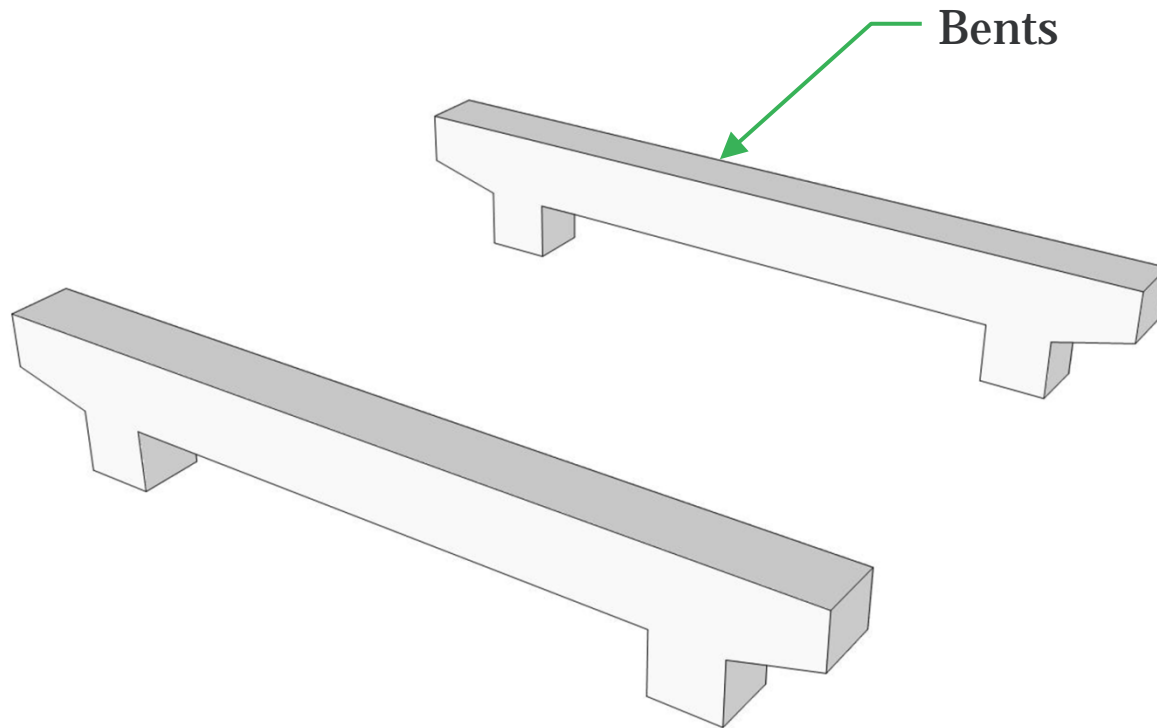


c) Concrete Box Girder
(15%)

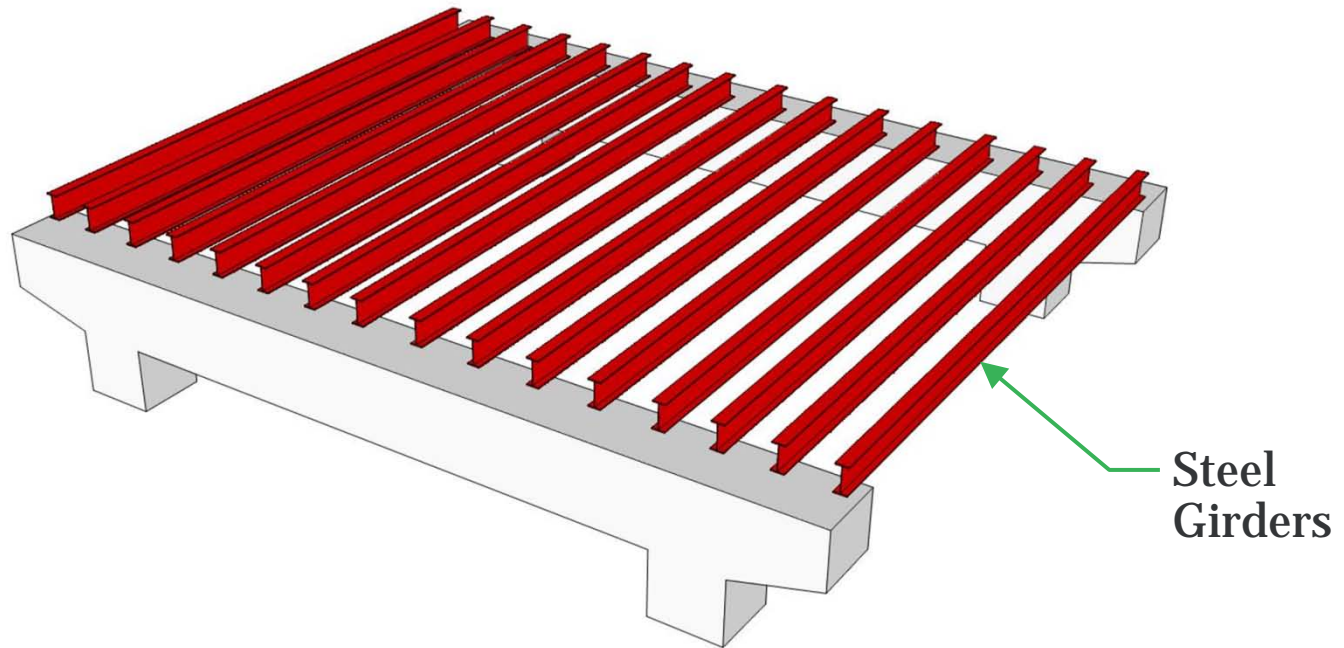
Cross Section of Steel Girder Span: Along “Bent”



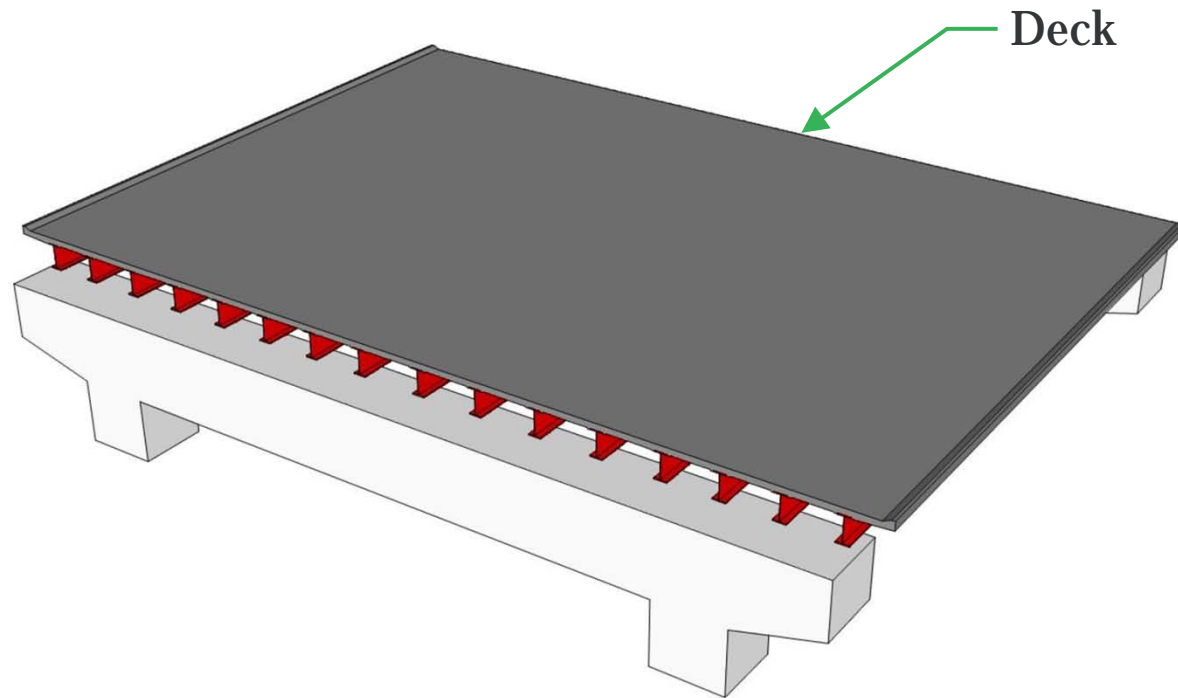
Construction of Steel Girder Sections



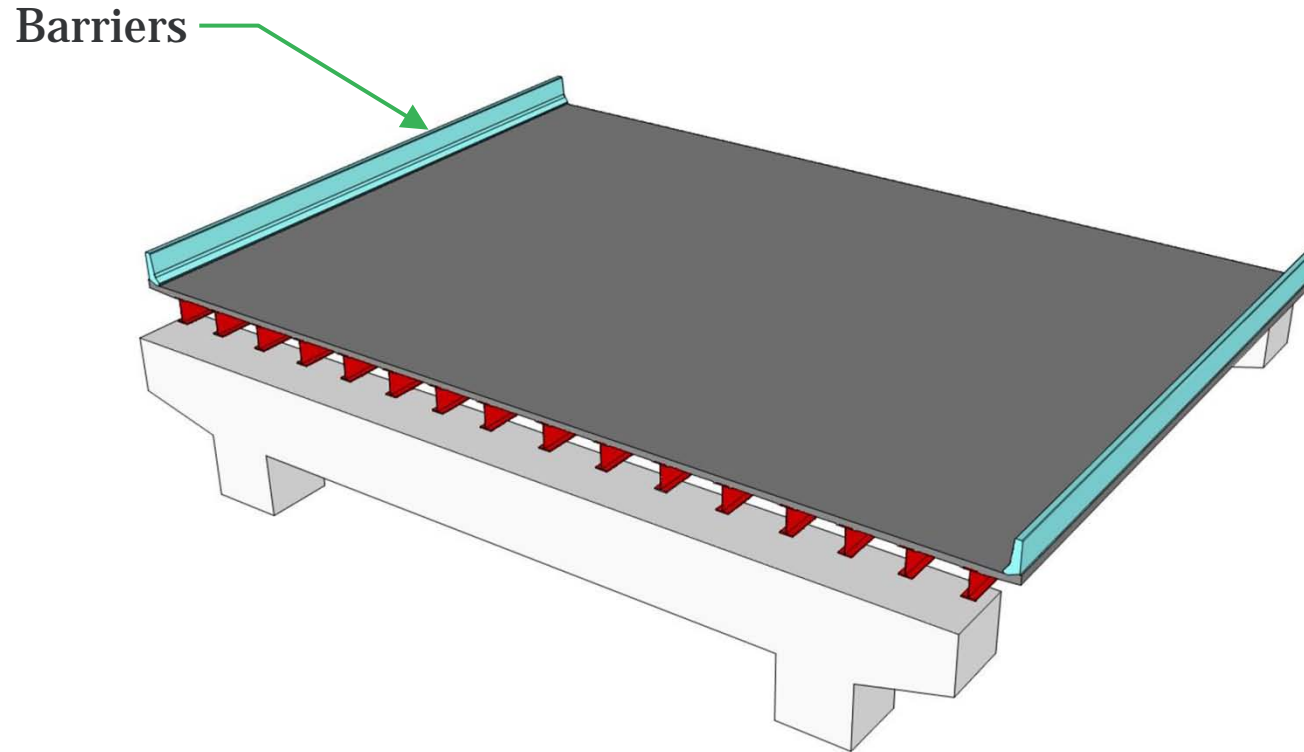
Construction of Steel Girder Sections



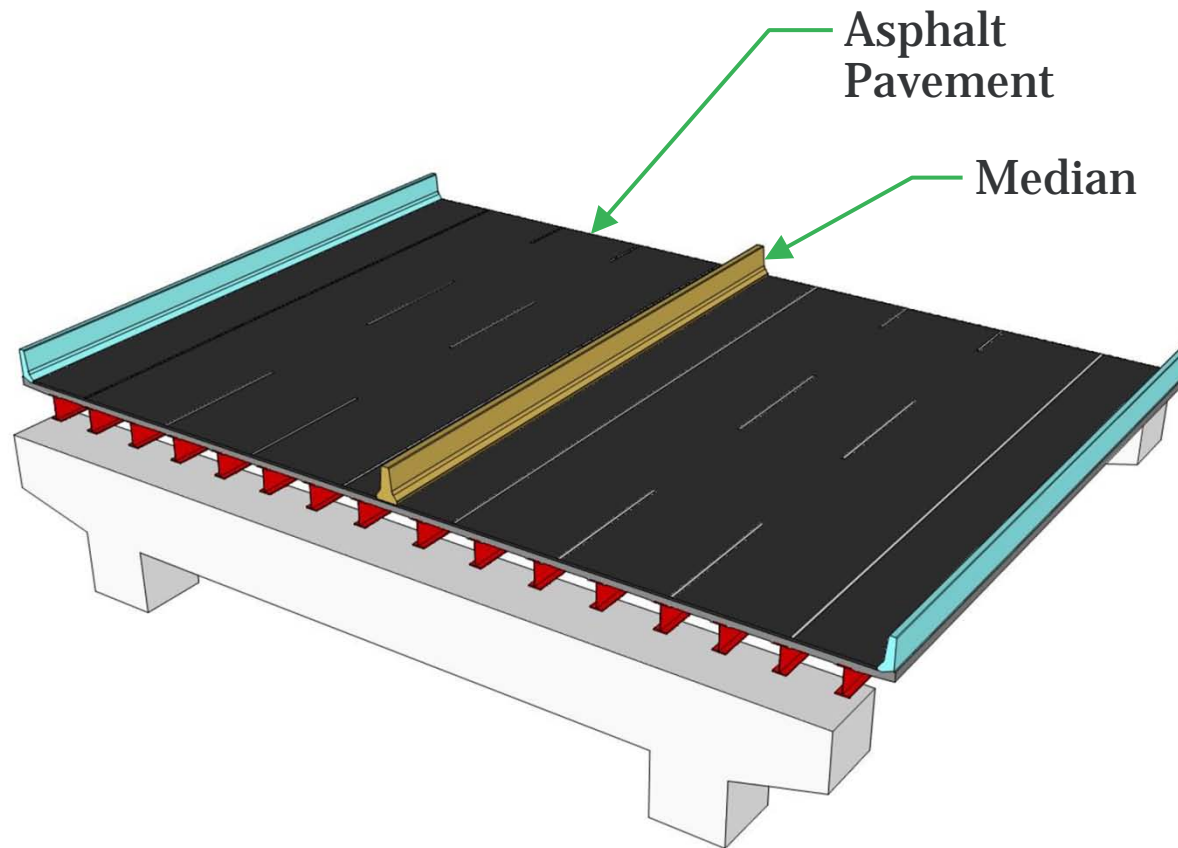
Construction of Steel Girder Sections



Construction of Steel Girder Sections

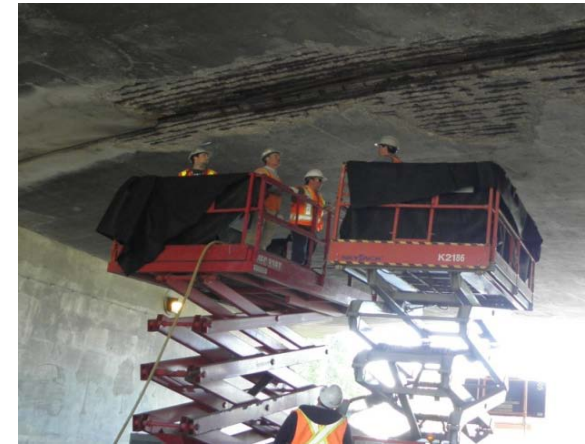


Construction of Steel Girder Sections



Condition Assessment Investigations of Elevated Sections:

- 2012 Detailed Deck Condition Survey
- 2012 Falling Concrete Independent Assessment (IBI)
- 2012 Ontario Bridge Inspections (OSIM)
- 2012 Ground Penetrating Radar Survey
- 2003/2013 Steel Girder Inspection (Jarvis-DVP)
- 2009 Precast Box Girders (York-Jarvis)
- 2004 Detailed Deck Condition Survey (Jarvis-DVP)
- Other inspections including hammer soundings & visual inspections



Area of Condition Assessment



Condition Assessment

Deck & Barriers



Girders



Section Type



Concrete T-Beam



Steel Girder



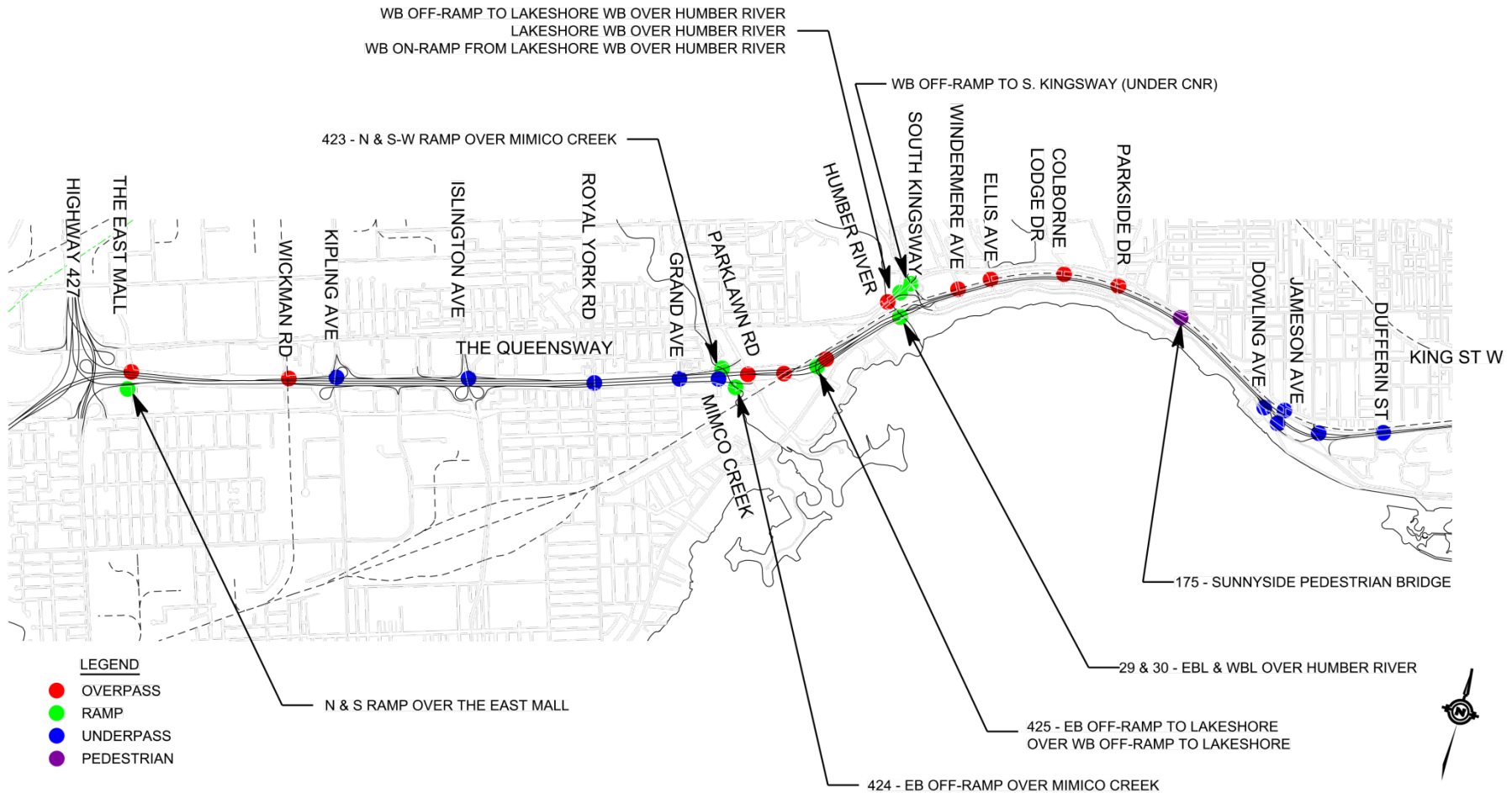
Concrete Box Girder

- Bents (substructure) - some require extensive work
- Bearings – good to poor
- Drainage System – functional issues

Survey/Investigations of At-Grade Section

- 2013 visual inspection of the 32 at-grade structures
- 2013 structural evaluations of the 10 bridges over the main-line, in accordance with the Canadian Highway Bridge Design Code (CHBDC)
- 2013 visual inspection of the pavement, including ramps
- 2013 visual inspection of the existing roadside safety measures
- 2013 assessment of the at-grade drainage
- 2001 pavement design report F.G. Gardiner Expressway, Highway 427 to Dowling Ave.

At-Grade Section Structures Key Plan

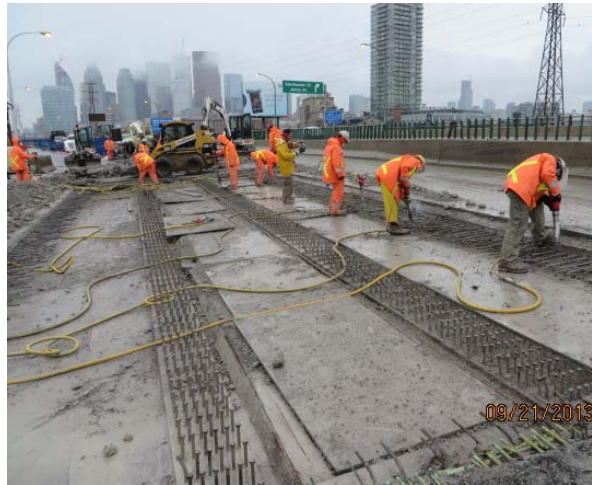
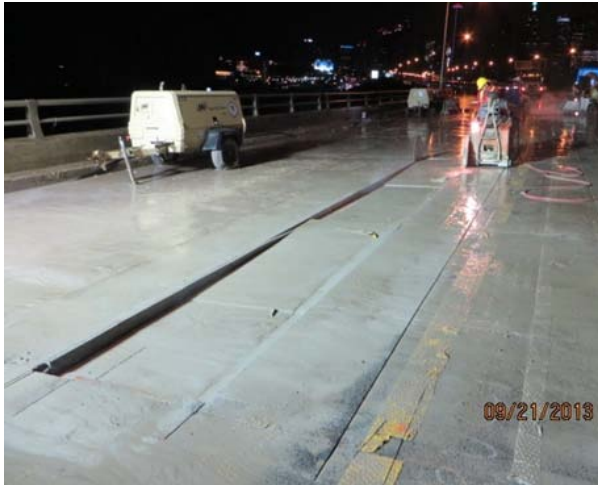


Condition Assessment: At-Grade Section

- Overpass and Underpass Concrete Repairs
- Pavement Reconstruction
- Roadside Safety Improvements
- Storm sewer reconstruction
- Complete High Mast Lighting Illumination program
- Incorporate recommendations from completed Environmental Assessments:
 - i) Kipling Avenue to Park Lawn Road widening (2012)
 - ii) Interchange reconfigurations at Kipling Avenue and Islington Avenue (2012)
 - iii) York/Bay/Yonge ramp reconfigurations (2013)

Conventional Rehabilitation

Conventional Reconstruction Approach



Conventional Construction Conclusions

Advantages

Low capital construction cost;

The scope of work is well understood by local contractors

Flexibility to address unforeseen conditions.

Disadvantages

Excessive noise, dust, vibrations

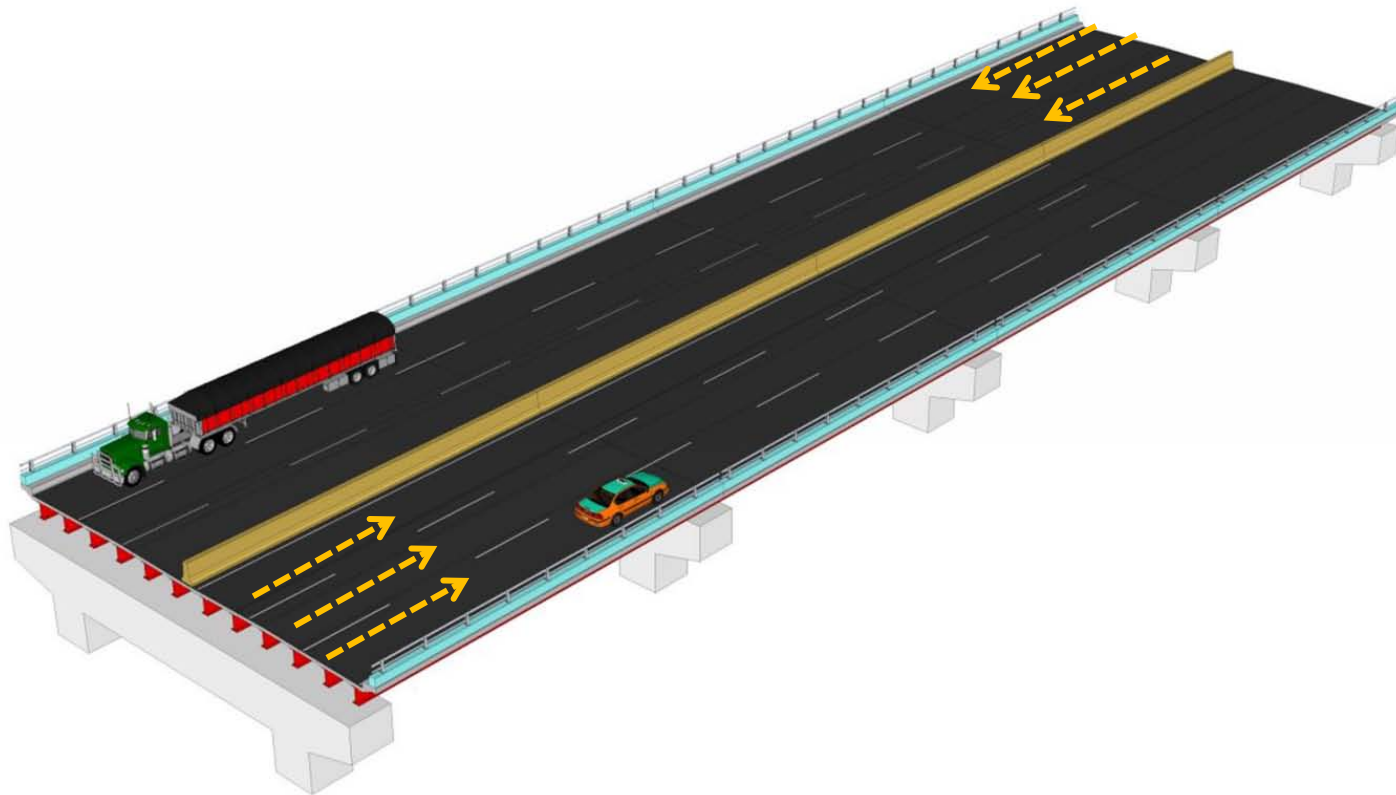
Long construction duration increasing user impact costs

Weather dependent

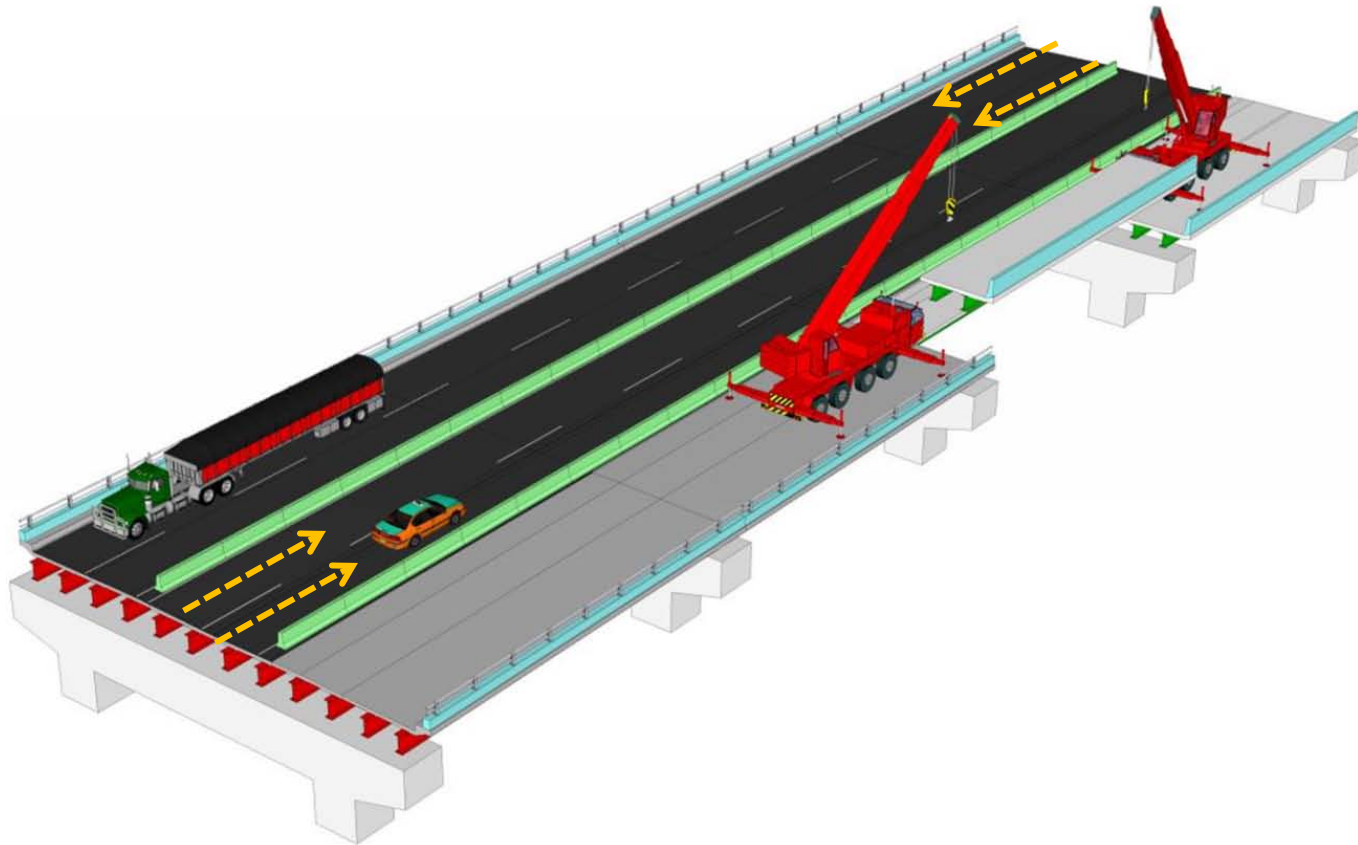
Risk of damaging girders during saw-cutting and chipping;

Accelerated Rehabilitation Plan

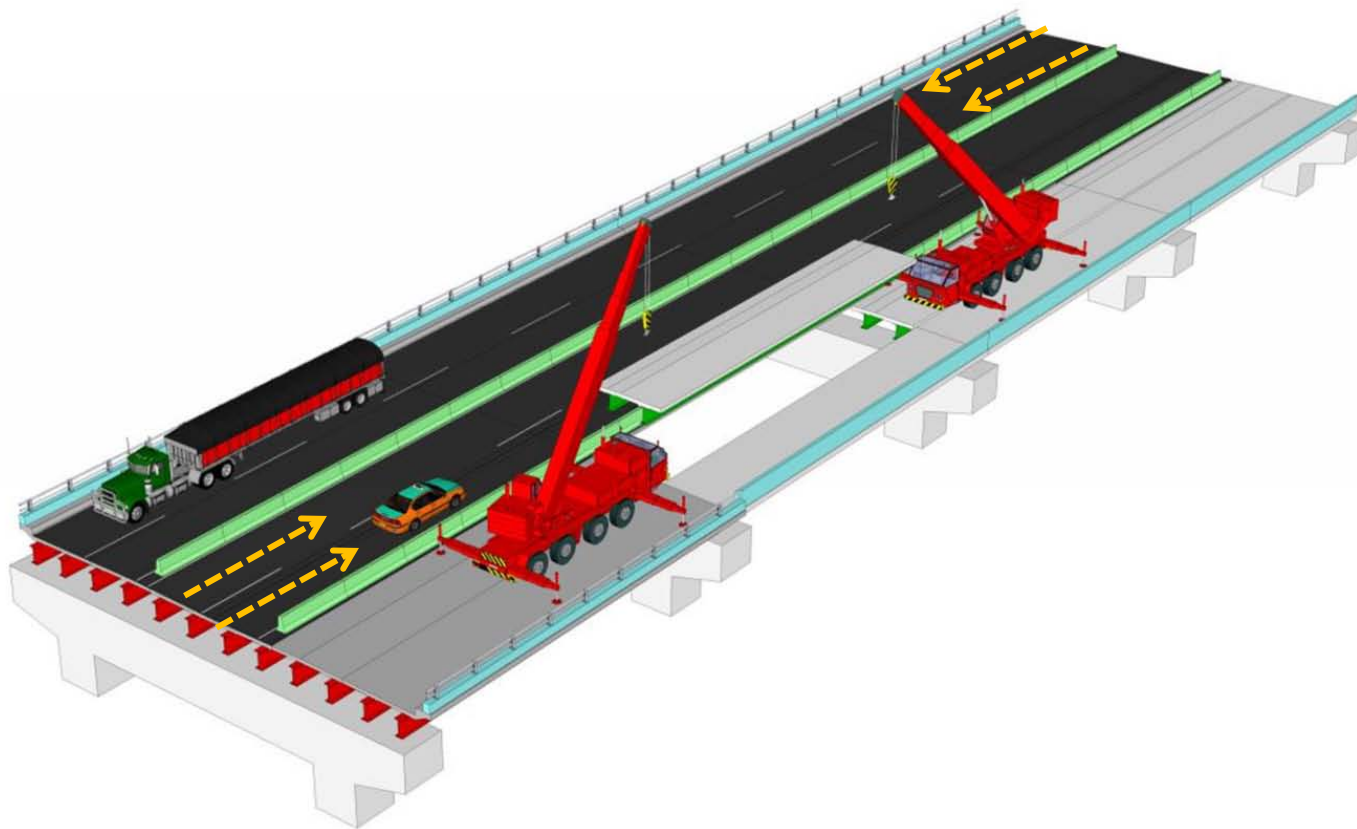
Accelerated Reconstruction Approach



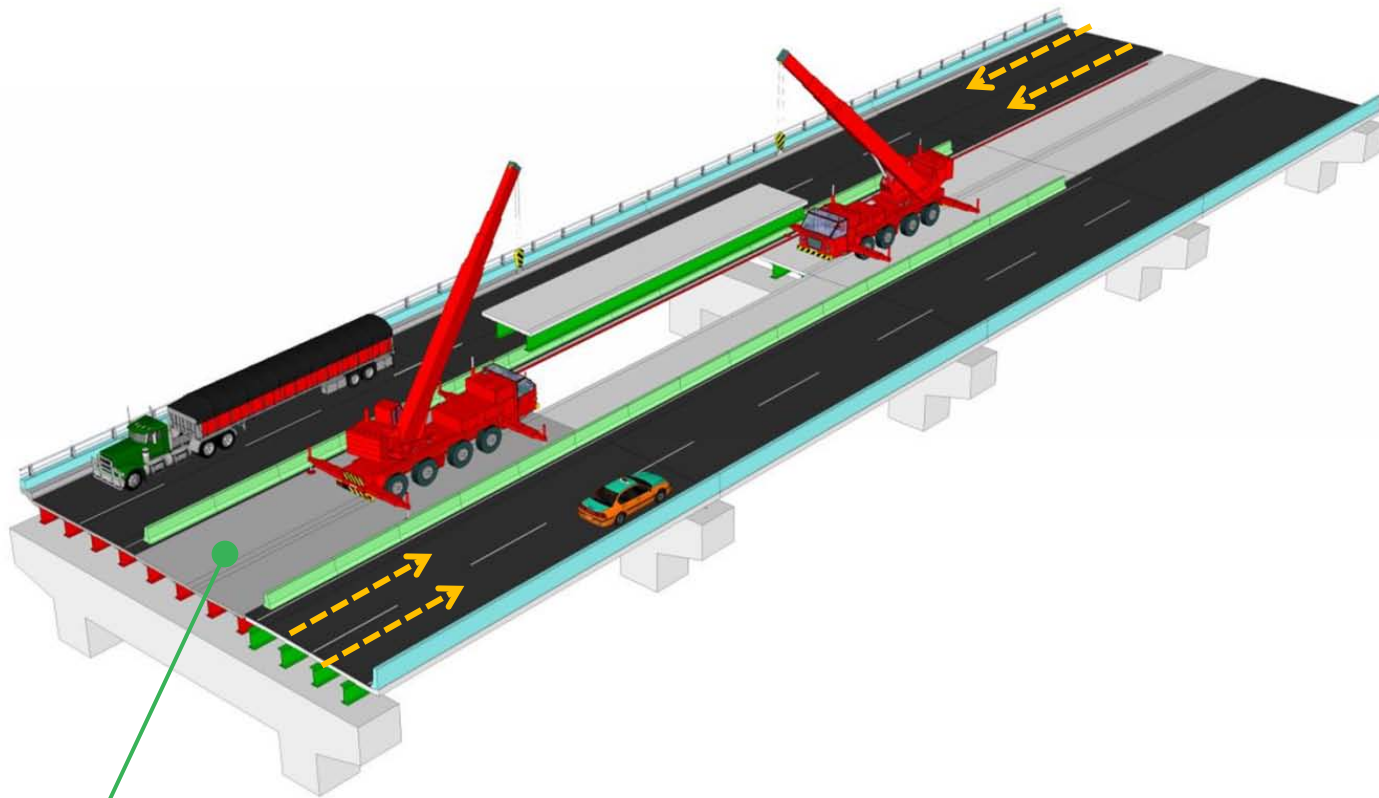
Accelerated Reconstruction Approach



Accelerated Reconstruction Approach



Accelerated Reconstruction Approach



Typical duration for 2 lane reconstruction (8 metres X 400 metres):
2 months ie. 6 months for entire section*

Note: * - represents a reduction in time by about 40% over conventional reconstruction

Accelerated Reconstruction Approach

Montreal: Jacques Cartier Bridge Rehabilitation



Prefabrication Facility



Placement of Prefabricated Deck-Girder Section

Accelerated Reconstruction Approach

Massachusetts: I-93



Accelerated Construction Conclusions

Advantages

Less weather dependent.

Mitigates noise, dust, vibrations

Highest quality end product due to prefabrication in controlled environment

Traffic delays and public disruption on the Expressway is minimized by reducing the duration of lane closures thereby lowering the user cost

Disadvantages

Unforeseen risks inherent with unconventional methods exist.

Capital cost premium

Traffic Congestion Assessment

Traffic Impact Analysis



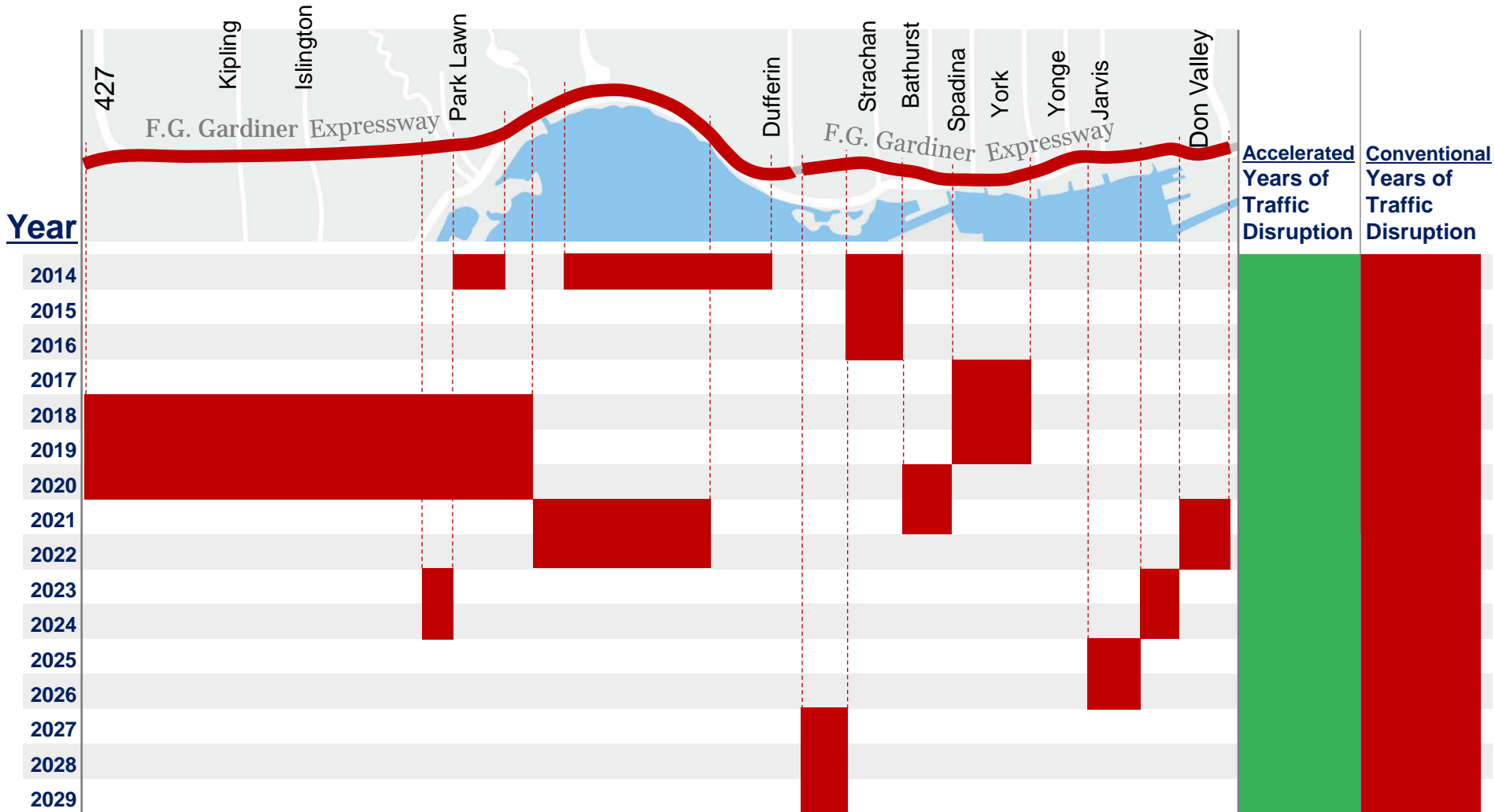
- 30 minute queue delay assumes diversion rates of up to 45% in some areas
- There is not enough spare capacity on parallel routes to accommodate diverted Gardiner traffic
- 30% diversion requires a very aggressive public education strategy
- 40% diversion is extremely difficult to achieve, requiring a significant diversion to other modes of travel

Assumptions Used to Develop User Impact Costs



- One lane closure in each direction
- 24 hour profile developed based on peak hour traffic
- QUEWZ queuing methodology used
- 30 minute average delay for both Gardiner and diverted traffic
- Average delay and queued traffic calculated for each hour of the day
- Average value of time for the commuter of \$20/hr

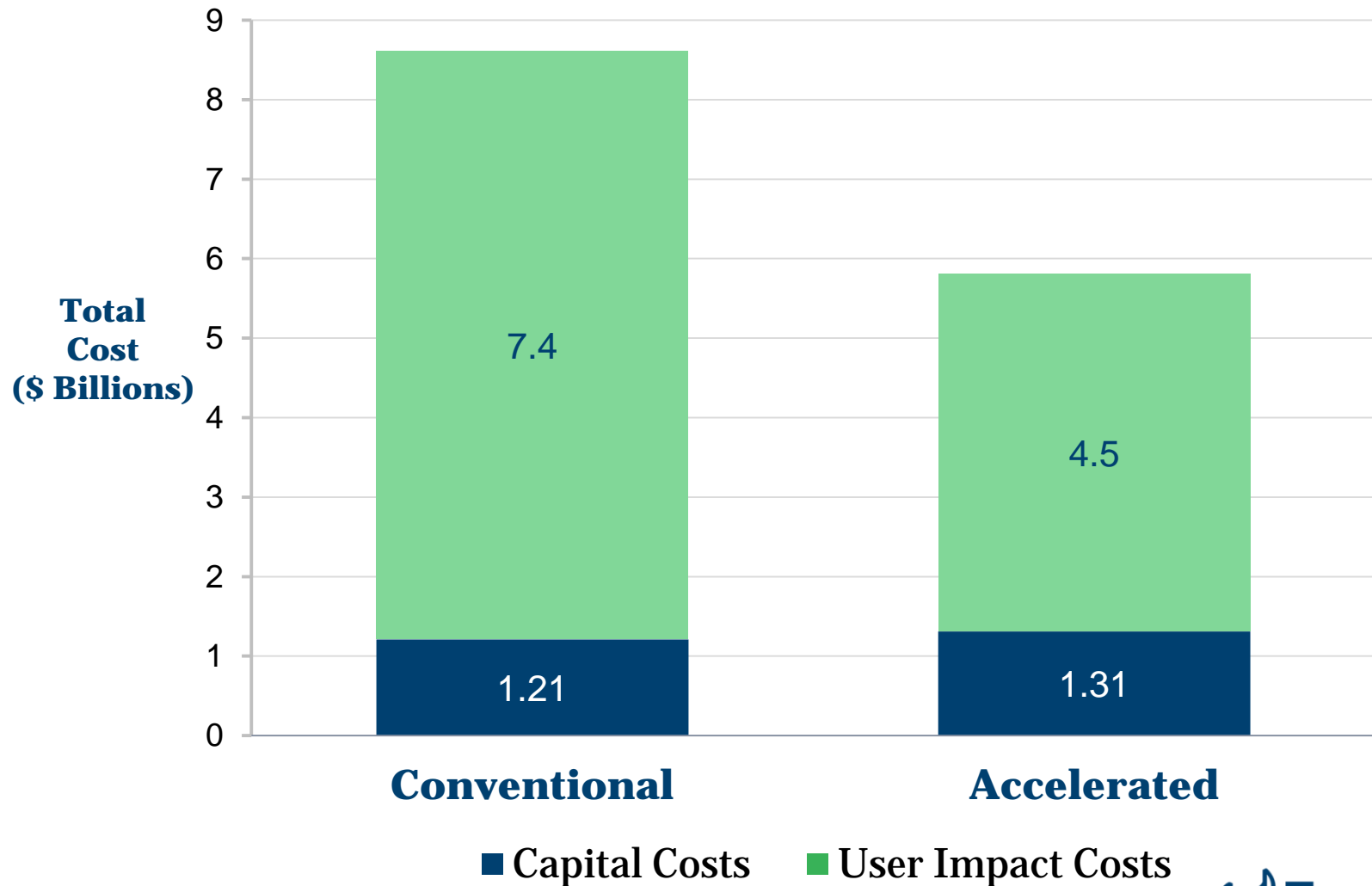
Mainline traffic impacts



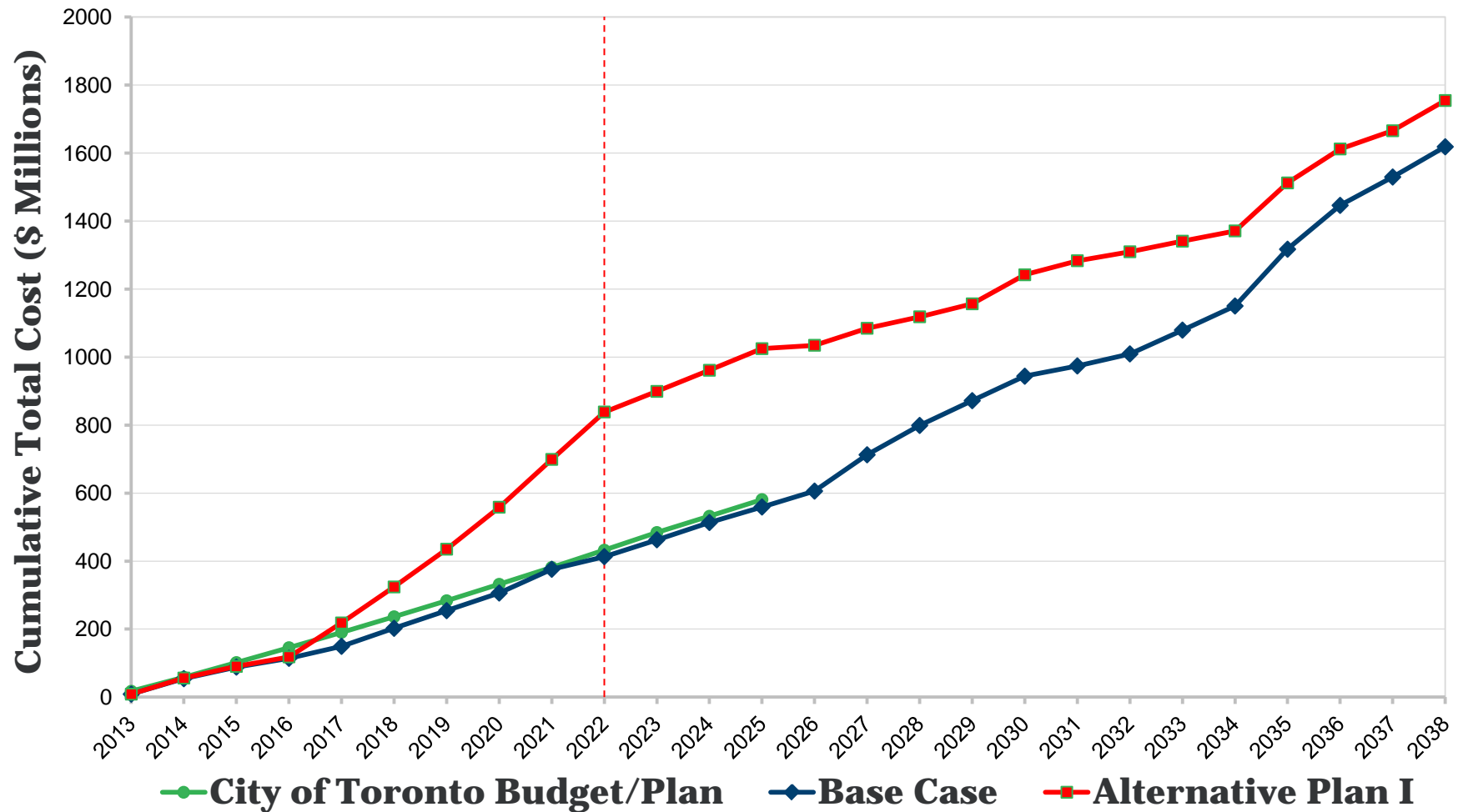
Traffic Impacts – Location and Duration

Scheduling and Financial Implications

Summary of Total Costs (Capital & User Impact): Conventional versus Accelerated Construction



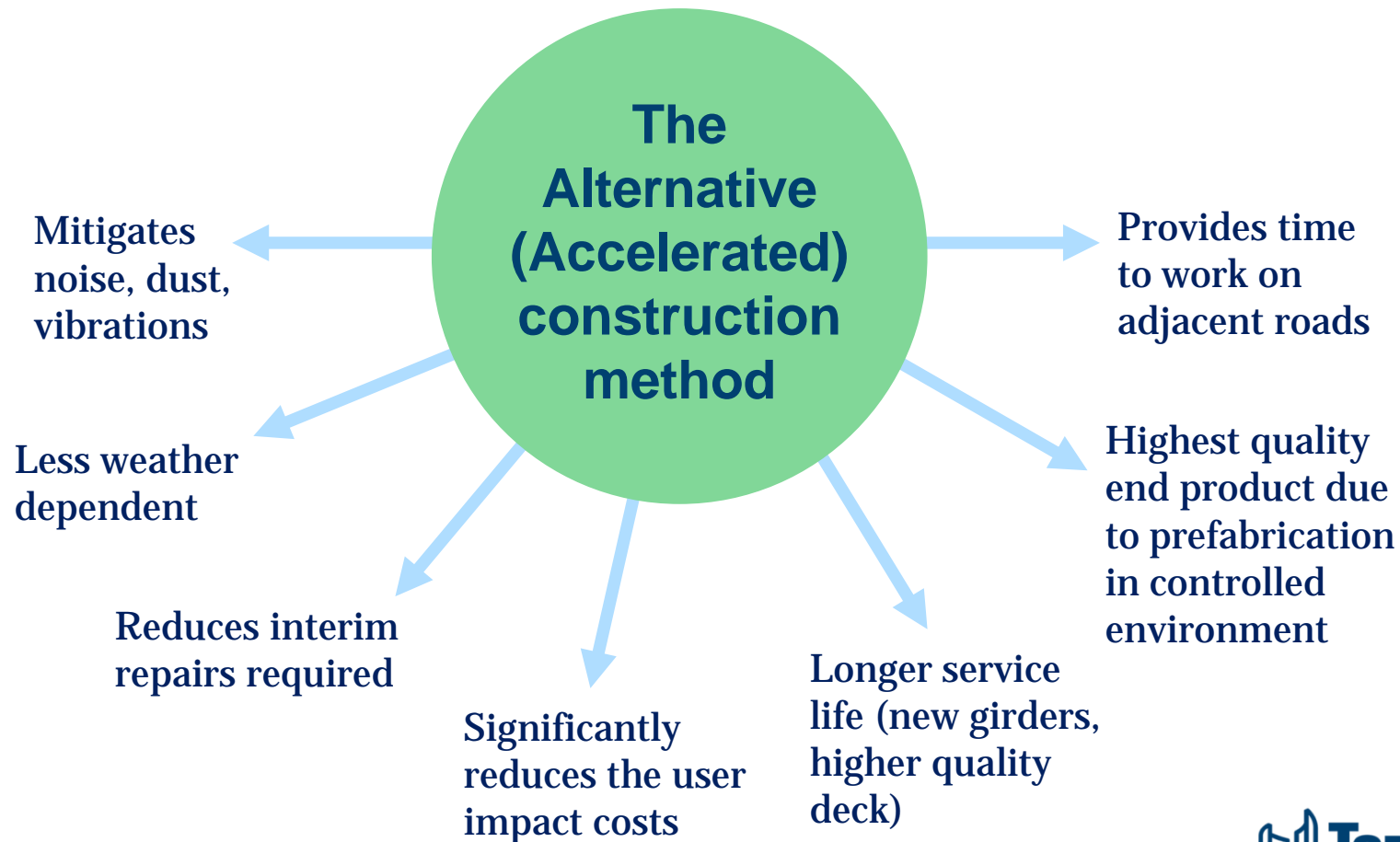
Cumulative Total Costs of Construction Options and Transportation Services' Capital Budget/Plan



Recommendations

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- Approve the accelerated approach for the rehabilitation of the F.G. Gardiner Expressway:



Recommendations

- Report back through Transportation Services' 2015 Capital Budget and 2016 to 2024 Capital Plan on:
 - procurement approach & project delivery schedule
 - multi-year cash flow requirements & financing strategy
- Update the Strategic Plan in the event that City Council opts for either the remove, replace or improve options in the Gardiner East EA
- Proceed with the conventional construction approach for the West Deck (Exhibition Place to west of Bathurst Street) given that “at-grade” construction activity is planned for the 2014; and the estimated 3 year lead time to begin construction if the accelerated approach is approved