

CCE AWARDS 2020

**Norman Bethune Avenue and Aristotle Avenue,
Detailed Design and Construction Administration**

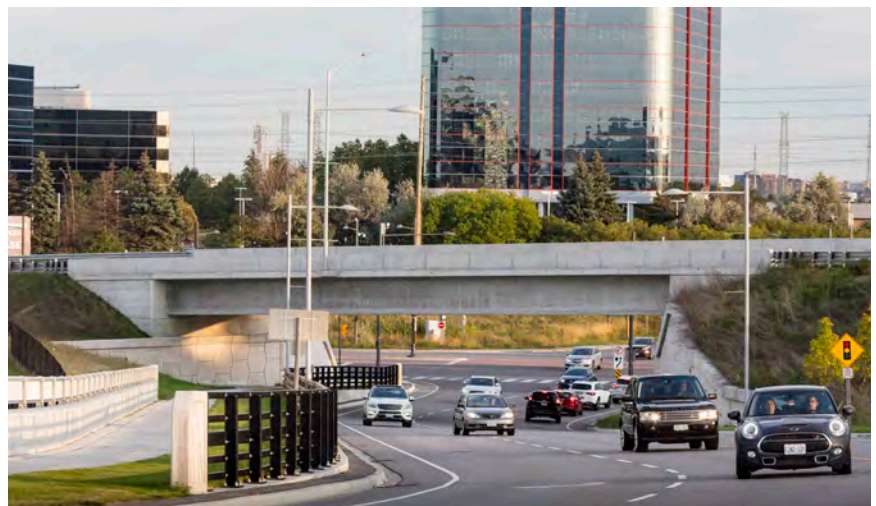
*"The Norman Bethune Avenue and Aristotle Avenue road links **have transformed** the local trade and educational node by **improving the overall transportation network** for the area, connecting key commercial, employment and educational uses in the Markham and Richmond Hill communities, accommodating pedestrians and cyclists on dedicated facilities, whilst being **sympathetic to the natural heritage** of the surrounding Rouge River tributary system."*

- Kevin Phillips, AECOM Project Manager

Project Overview

York Region retained AECOM to develop a complex detailed design for new roads, structures and a watermain within a compressed and aggressive eight-month design schedule, and then subsequently oversee the construction.

These area improvements promote a dynamic urban multi-modal transportation spine network that is safer, healthier, walkable and bikeable; reflective of the natural heritage of the surrounding environment and promote the economic vibrancy of educational, commercial and employment opportunities in the area.



Summary

Project Objectives, Solutions and Achievements

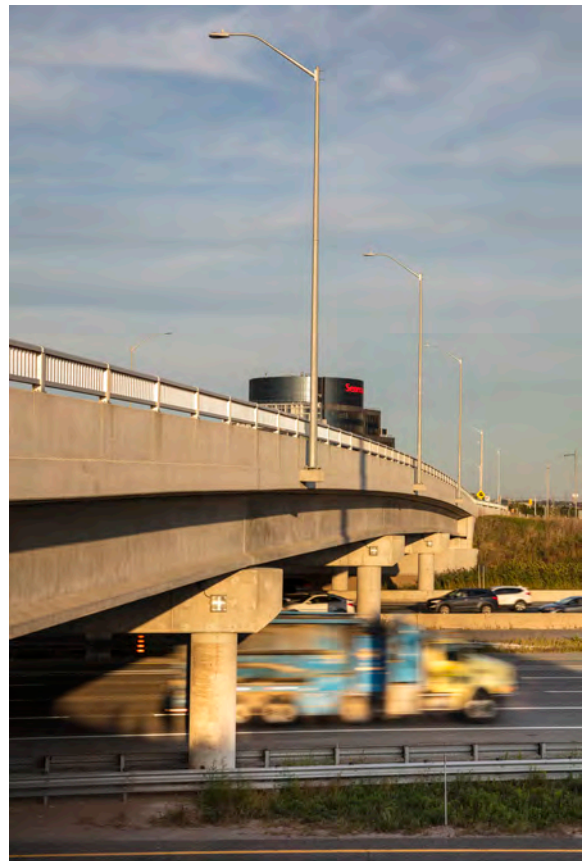
Historically the transportation network surrounding the Highway 404 / Highway 7 interchange area in York Region was characterized by highly congested traffic operations on the arterial roads and at the freeway ramp terminal, and with poor network connectivity for vehicles, pedestrians and cyclists. Given that the area is one of the four major employment mega zones in the Greater Toronto Area (GTA), the area municipalities comprising York Region, along with Richmond Hill and Markham embarked on an ambitious multi-jurisdictional transportation plan in the 2000s to transform and improve the road network around this interchange to relieve road congestion, link business areas, support public transit service, and enhance cycling and pedestrian movement.

At the time of the visioning and planning for the area transportation plan, Highway 7 experienced significant traffic congestion, the Highway 404 ramp terminals had vehicle queues that extended well beyond the intersections and in fact affected upstream operations, and Highway 404 was an east-west barrier to multi-modal travel since there were no provisions for pedestrians or cyclists. Cycling and walking felt uncomfortable and unsafe along Highway 7 in the area since there were no sidewalks or bikeways, and some of the corridor was unattractive and lacked greenery.

A new road crossing of Highway 404 (Norman Bethune Avenue) and connecting road link (Aristotle Avenue) would support growth of the area, facilitate movements of all road users, create a more robust and connected street network and create a vibrant, active and transit-friendly streetscape to encourage walking, cycling and transit use in the study area.

The objectives were to:

- Lessen the significant barrier effect that Highway 404 has on east-west movement, which causes congestion on the regional road network, impacts transit operations, and affects the growth and economic vitality of the area.
- Address the lack of roadway, sidewalks, cycling and transit connections across Highway 404 for the movement of all road users (pedestrians, cyclists, transit vehicles, cars and trucks).



Summary (continued)

In early 2015, York Region (on behalf of a tri-party group comprising the City of Markham, the City of Richmond Hill, and York Region) initiated the study and design for the area transportation improvements. AECOM led the detailed design of the new road, Aristotle Avenue, which is an extension from the northbound off-ramp at the Highway 404 / Highway 7 interchange, with an emphasis on a multimodal transportation design to accommodate motorists, cyclists, and pedestrians.

The design plan also included refinements to the detailed design of the proposed new multi-span mid-block crossing overpass of Highway 404 north of Highway 7 (Norman Bethune Avenue, extending from East Pearce Street in the City of Richmond Hill through to Centurian Drive in the City of Markham) in order to accommodate the tie-in intersection of Aristotle Avenue.

Construction Administration services were also provided for the entire project. AECOM coordinated and worked with various utilities for their own individual relocation plans, managed the preferred contractor for the construction, and acted for York Region to monitor project costs and timelines.



Innovation

This assignment included the full detailed design and contract package for Aristotle Avenue which included design adjustments to the new Norman Bethune Avenue design in order to accommodate a new intersection. The key project elements of this \$58 million design and construction project included:

- New east-west collector road (Norman Bethune Avenue), with four lanes, bicycle lanes, sidewalks and trees, and four-span girder structure over Highway 404.
- New north-south collector road (Aristotle Avenue) with two lanes, a multi-use path, and a bridge at the re-aligned westbound Highway 404 on-ramp. A separate vertical control was provided along the multi-use path for safer and more comfortable cycling and walking.
- Realignment of the westbound on-ramp.
- Realignment and relocation of an existing 600mm concrete pressure pipe trunk watermain. The relocation was a significant sub-project which required special design considerations to mitigate impacts and address geotechnical issues, including micro-tunneling boring machine technology with three shafts to minimize impacts to motorists and address a high water-table creating hydro-static design challenges; and construction of three new chambers, incorporating valves, plant, and fibre-optic communications, to future-proof and facilitate monitoring and servicing.
- A significant underground structural stormwater superpipe storage tank under Aristotle Avenue in lieu of a proposed dry stormwater pond to address flooding near active Ministry of Transportation Ontario (MTO) ramps.

In order to address York Region's municipal commitment to deliver the highly complex detail design within a compressed eight-month schedule, the project team dedicated significant resources managing the schedule and coordinating municipal and stakeholder engagement.

At project outset, AECOM participated in Schedule Workshops to prioritize key milestones and tasks, and to identify a critical schedule path. These workshops included project management, lead engineers, designers, and construction administrators to address timing and operational constraints (i.e. Enbridge gas main closure / service constraints in winter months, watermain constraints for high-use summer periods, minimizing construction noise during exams at adjacent Seneca College, and MTO's anticipated Highway 404 construction).

Schedule adherence continued to be a priority even after completion of the detailed design and contract package. Due to new design requests after tender award, AECOM delivered a significant re-design of the watermain construction methodology including three new chambers and an advanced supervisory control and data acquisition (SCADA) computer system for gathering and analyzing real time data. This was completed on an aggressive schedule to avoid construction delays and a costly delay claim from the contractor to York Region.



Complexity

Aside from being a technically challenging project involving significant contributions and innovation from unique specialists such as tunneling experts and fishway designers; the development of the detailed design and delivery of construction administration services addressed key project complexities and challenges:

- Design and construction staging plan within a very limited footprint accommodating all required design features, construction adjacent to and over Highway 404 with minimal to no disruption of traffic, removing a fish barrier along the Rouge River tributary, and staging complex utility relocations in a limited time frame.
- Delivering the detailed design and contract package in an extremely aggressive eight-month schedule to meet political commitments for a tender ready package by the end of 2015.
- Multi-jurisdictional coordination and upper-tier governance further challenged the project schedule requiring significant consultation to balance competing interests and ensure all design comments were addressed:
 - MTO for crossing of Highway 404, realignment of the westbound on-ramp, and modifications to the Highway 7 off-ramp terminal, and ensuring that the project works did not conflict with upcoming MTO work along Highway 404;
 - Seneca College for land acquisition, facility reconstruction, and operations impacts;
 - Cities of Richmond Hill and Markham for design and construction requirements since these municipalities will ultimately own the municipal infrastructure.

Previous experience with MTO and other key stakeholders in the project area provided a significant level of understanding of design standards, requirements, and expectations, ensuring that the design package and construction met all approving authorities needs within the compressed design schedule.



Social and / or Economic Benefits

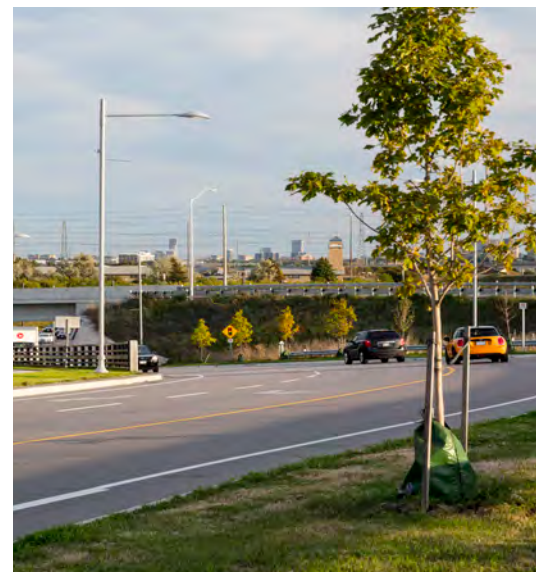
Home to a vibrant commercial and employment hub, including leading Information and Communication Technology (ICT) companies, the Highway 404 / Highway 7 interchange area is one of four major employment mega zones in the Greater Toronto Area (GTA). Transforming the road network around the interchange provides improved transportation network accessibility while reducing congestion along Highway 7 and connects key employment areas and business parks impacting over 30,000 jobs in the immediate area while improving the flow of traffic in the surrounding employment areas impacting close to 100,000 jobs.

The transportation design and construction investments help achieve the vision to:

- Encourage a greater mix of land uses and maintain diverse commercial spaces for retail, educational, office and employment uses in order to enhance the vibrancy of the area community;
- Serve as a catalyst for area community building including the \$4-billion redevelopment of the 175-acre Buttonville Airport lands for potentially up to 24,000 jobs and 7,000 residents, and also implementation of the Seneca College Markham Campus Master Plan to expand service offerings and intensify the college supporting a vibrant 24/7 campus environment;
- Create opportunities for transit-supportive intensification;
- Eliminate the Highway 404 barrier and enhance connectivity between the City of Richmond Hill and the City of Markham;
- Include dedicated bike facilities, safer sidewalks, and an enhanced public realm, while maintaining capacity for vehicles; and
- Integrate stormwater management measures into the design to enhance the natural heritage and biodiversity of the area.



“Improving transportation options and connecting our community with other parts of the GTA are top priorities for Richmond Hill,” **said Richmond Hill Mayor Dave Barrow.** “This new flyover creates a much-needed connection between our heavily-populated employment areas and will improve the movement of drivers, cyclists and pedestrians through the area.”



Environmental Benefits

The unique design elements of the new east-west collector road (Norman Bethune Avenue) to minimize impacts and improve environmental conditions included:

- Modifications to existing online stormwater management ponds along Rouge River tributary, including draining one pond to facilitate construction. Fish were captured and relocated to reduce potential fish mortality;
- New in-water retaining walls instead of embankment fill to reduce the impacts on the ponds and fish habitat. This required creative foundation approaches to support the retaining walls, and to minimize the construction footprint in the pond to lessen fish habitat impacts and mortality;
- New structural culvert with fishway ladder to eliminate an existing weir restricting upstream fish movement, thereby improving fish vitality and upstream biodiversity of the Rouge River tributary system.
- Create opportunities for transit-supportive intensification;
- New bike facilities, safer sidewalks, and enhanced public realm, while maintaining capacity for vehicles.

The project integrates and enhances the natural heritage and biodiversity of the area and contributes to enhanced community environmental goals by reducing traffic congestion, pollution and by providing for other non-automobile modes.

“The City of Markham is proud to have initiated this project, working with area landowners and leading the design process,” **said Markham Mayor Frank Scarpitti.** “This overpass is vital infrastructure, needed to tackle the number one issue facing residents in York Region, it will relieve congestion along Highway 7 and provide a safe option for cyclists and pedestrians. It has set a precedent as to how we can work together and achieve solutions for multi-jurisdictional projects.”



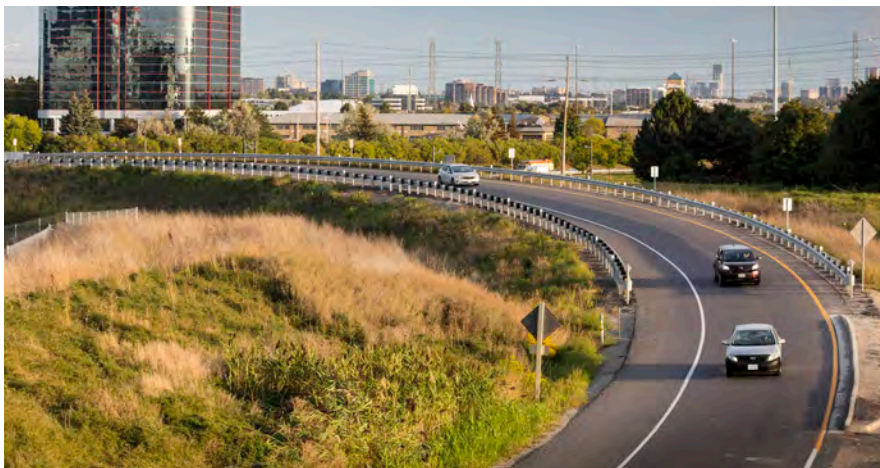
Meeting Client's Needs

At the time of visioning and planning for the area transportation plan, Highway 7 experienced significant traffic congestion. The Highway 404 ramp terminals had queues extending well beyond the intersections and in fact affected upstream operations, and Highway 404 was an east-west barrier to multi-modal travel since there were no provisions for pedestrians or cyclists. Cycling and walking felt uncomfortable and unsafe along Highway 7 since there were no sidewalks or bikeways, and some of the corridor was unattractive and lacked greenery.

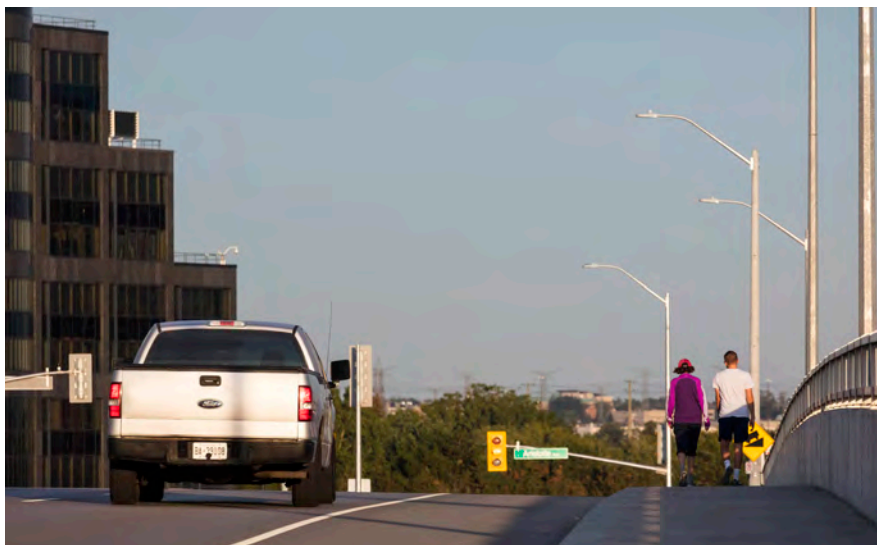
AECOM's multi-modal design for the Highway 404 crossing (Norman Bethune Avenue) and connecting road (Aristotle Avenue) supports growth of the area, facilitates movements of all road users, creates a more robust and connected street network and creates a vibrant, active and transit-friendly streetscape to encourage walking, cycling and transit use.

This was all completed whilst addressing significant environmental and engineering design challenges and addressing York Region's municipal commitment to deliver the highly complex detail design within a compressed eight-month schedule.

"Funding the transformation of two of our urban growth centres in Markham and Richmond Hill demonstrates our commitment to economic growth and strengthens our transit investments along Highway 7," **said York Region Chairman and CEO Wayne Emmerson at the time of project opening.** "As we plan for the future, York Region continues to prioritize interconnected systems for mobility while working with our cities and towns to ensure local infrastructure improvements can effectively handle the increased demands of our planned population and employment growth."



The area has left its unattractive and underutilized present conditions behind, and will continue to evolve based on the newly constructed dynamic urban multi-modal transportation spine network that is safer and healthy, walkable, bikeable, and accessible, with educational, commercial and employment opportunities in the area, and reflective of the natural heritage of the surrounding environment.



About AECOM

AECOM is the world's premier infrastructure firm, delivering professional services throughout the project lifecycle – from planning, design and engineering to consulting and construction management. We partner with our clients in the public and private sectors to solve their most complex challenges and build legacies for generations to come. On projects spanning transportation, buildings, water, governments, energy and the environment, our teams are driven by a common purpose to deliver a better world. AECOM is a Fortune 500 firm with revenue of approximately US\$20.2 billion during fiscal year 2019. See how we deliver what others can only imagine at aecom.com and [@AECOM](https://twitter.com/AECOM).