

# Major Mackenzie Drive Culvert Replacement and Pedestrian/Cycling Underpass Addition

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The Regional Municipality of York (York Region) recently undertook an emergency culvert replacement for a large 50-year-old corrugated steel pipe arch (CSPA) culvert in the City of Vaughan. The culvert conveys the West Don River under Major Mackenzie Drive, one of the busiest urban arterial roads in York Region. The condition of the existing culvert required a temporary full closure of Major Mackenzie Drive to safely and efficiently carry out the work, which had to be completed within a two-month timeframe in order to comply with environmental in-water work timing restrictions.

During consultations with the City of Vaughan, it was requested that the project incorporate critical pieces of City infrastructure. This included a second perched culvert to facilitate pedestrian and cycling passage under Major Mackenzie Drive. This pedestrian/cycling underpass would eventually connect to the City of Vaughan's proposed trail system.

Precast concrete was selected as the material of choice for this project for the following reasons:

- Both culverts could be manufactured in advance of the road being closed. This presented a significant scheduling advantage over cast-in-place construction methods.
- Ease of installation during construction. It was anticipated that the Region's general contractor would work around the clock to reopen the road as quickly as possible. Having the precast units available on site significantly accelerated the installation process.
- Using precast products assured the Region that quality would not be compromised as a result of



*Waterproofing and backfilling*

the compressed schedule. It also provided York Region and the City of Vaughan with long service life infrastructure.

- Given the significant timing constraints, the Region opted to pre-order the culverts directly from a supplier through a tender process. This was done in advance of having a general contractor on board, as the rest of the road design was still being completed.

Prior to the culvert manufacturing project being tendered, the Region's design consultant, HDR Corporation, reached out to a number of precast concrete producers to obtain feedback on the design. This ensured that both structures had the appropriate details the concrete precast manufacturers required and helped minimize issues during the production phase. This was an important step as the schedule allowed very little room for issues during the manufacturing phase. The culvert units had to be ready for installation as soon as the Region's general contractor was able to expose the existing culvert.

# Major Mackenzie Drive Culvert

In early April 2019, DECAST was awarded the contract to design, manufacture and deliver the culvert components for this project. The timeline for project delivery was very tight as all the structural elements for both culverts had to be produced by June 30, 2019 in order to meet the eight-week construction schedule. Any delays in the delivery of the culvert units could have resulted in the general contractor being unable to proceed and stopping work while the road remained closed.



*Completed culverts*

DECAST was able to assure York Region that the timeline would be met. The design for both structures was produced by DECAST and submitted to York Region for review and approval. The ability to have the structure designed and manufactured at DECAST enabled a very quick turnaround with respect to having the structural elements put into production shortly after the design approval.

The West Don River culvert had a 6,000mm span and 3,500mm rise and was designed for an earth cover of 5 metres. A total of 29 pieces were produced at 38,800 kgs/piece and two pieces at 57,100 kgs/piece. The pedestrian/cycling underpass had a 6,000mm span and 3,000mm rise and an earth cover of 2.2 metres. A total of 22 pieces were produced at 37,755 kgs/piece.

DECAST also provided delivery of these wide/escorted loads. This was a key aspect to ensuring the accelerated schedule would be maintained. At the Region's request, all deliveries were made overnight in order to minimize further impacts to commuter and local traffic during busy daytime hours. The expertise that DECAST was able to bring to the table in terms of logistics was invaluable. They were able to ship all 53 precast units for both culverts in five days.

The contract to install the culverts and reinstate the road was awarded to Coco Paving Inc. through a tender process. Major Mackenzie Drive was closed to the public on June 17, 2019 and was reopened eight weeks later on August 12, 2019. During this time, the project team was able to:

- Excavate the existing 8-metre-high road embankment (approximately 10,000 cubic metres of soil) to expose and safely remove the deteriorated CSPA culvert
- Construct a temporary diversion of the West Don River to allow work "in the dry"
- Install the new river culvert and the new pedestrian/cycling culvert using a large 600 tonne crane
- Realign the West Don River to the new drainage culvert location
- Install a new oil-grit separator unit to treat storm run-off prior to entering the watershed
- Install a new 5-metre-high RSS wall
- Install, test and commission a new 400mm watermain connection within the project limits
- Install a new and upgraded storm sewer system within the project limits
- Reinstall the embankment and pavement structure for Major Mackenzie Drive

Coco Paving Inc.'s level of commitment to the success of this project cannot be understated. Without their continuous dedication and willingness to work around the clock, this project could have easily turned into a public relations disaster.

## Major Mackenzie Drive Culvert



*Night culvert installation*

York Region would also like to acknowledge the key role that DECAST played in the delivery of this infrastructure project. Their expertise in engineering, manufacturing and delivery of the precast structural elements had a significant contribution and was critical to the success of this project.