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Consulting Engineers

December 21, 2018

Alex Quinn, Construction Engineer
Halifax Regional Municipality Parks Capital
Project Parks & Recreation
P.O. Box 1749
Halifax, NS
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Dear Mr. Quinn:

RE: HRM, Parks Bridge – Nichols Lake Trail

INTRODUCTION

CBCL Limited (CBCL) was retained by Halifax Regional Municipality (HRM) to provide preliminary options, costs and recommendations for a structure to cross Nichols Run, Halifax, NS. Nichols Lake Trail is part of the Western Common Wilderness Common Master Plan. Phase 1 of the regional park is currently under construction with roughly 2240 meters of trail completed thus far ending at two water courses. This report is intended to identify possible crossing types and associated costs for one of the crossings. It is assumed that the trail will be completed to Nichols Run up to the same standard of trail that Phase 1 is currently constructed which essentially entails a contractor completing the trail to subgrade.

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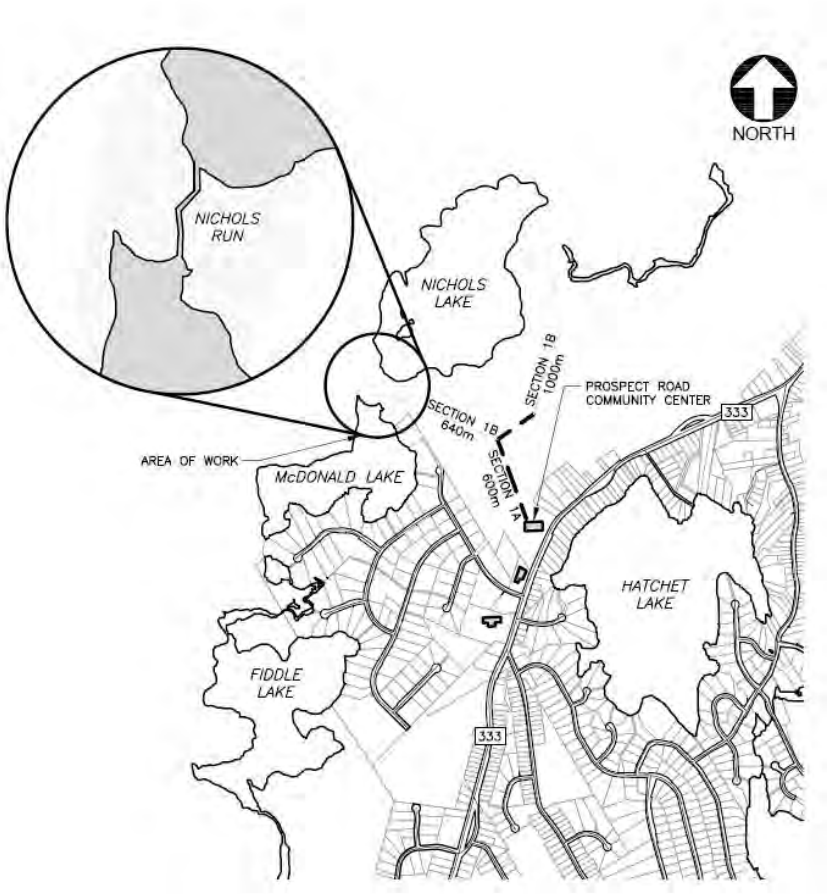
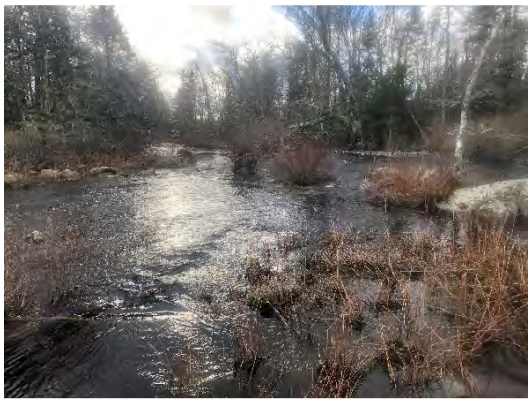


Figure 1 - Nichols Lake Trail and Surrounding Area

SITE INVESTIGATION

A site visit was complete on Nov 21, 2018. The purpose of this site visit was to identify feasible crossing locations and structure types. Nichols Run is approximately 200m in length, flowing from Nichols Lake in a southwardly direction to McDonald Lake. Both sides, as well as the entrance and exit of Nichols Run were inspected for possible abutment locations, span lengths and pier locations. Nichols Run fans out and separates as it progresses downstream from Nichols Lake.

The watercourse entrance is wide and relatively shallow compared to just downstream where the channel narrows, see Picture 1. The river bottom consists of medium to large size boulders which made accurate depth measurements unobtainable. The depth varied greatly throughout ranging from a few inches to several feet between boulders. The watercourse just downstream from Nichols Lake was measured at 17m wide directly beyond the existing trail and is the preferred crossing location, see Picture 2. The temporary construction area where the trail currently ends can be incorporated to the regional park as a trail destination or resting area completed with benches or picnic tables and scenic views of Nichols Lake.



Picture 1 - South from Nichols Lake

Picture 2 - Crossing Location looking east

There is a string of very large boulders located roughly half way between the two bodies of water. The lower reach of the watercourse separates and forks around several small island land masses created by trees, shrubs and boulders. The watercourse is considerably wider in the lower half increasing the span lengths and number of piers required to cross, see Picture 3. The watercourse exit into McDonald Lake is wide with thick vegetation on either side, see Picture 4. The flow on the east was shallow and weaves through low areas between trees. A canoe portage path connecting Nichols Lake to McDonald Lake was also located on the east side of Nichols Run. Pictures 7 and 8 are panoramic views of the East and West river banks taken in the lower reach of Nichols Run.

At the time of the inspection, mid-November, the water levels appeared to be in the higher part of its range. The high water mark was hard to recognize on adjacent trees, boulders and surrounding landscape. It is possible the water level could rise during spring and could flood portions the approach areas. Several photos were located in an online trail review, www.halifaxtrails.ca, showing Nichols Run during the summer months. The photos show the lower water levels as the watercourse mostly dry, see Pictures 9, 10 and 11 located at the end of the report. See Figure 2 for the general arrangement and picture locations.

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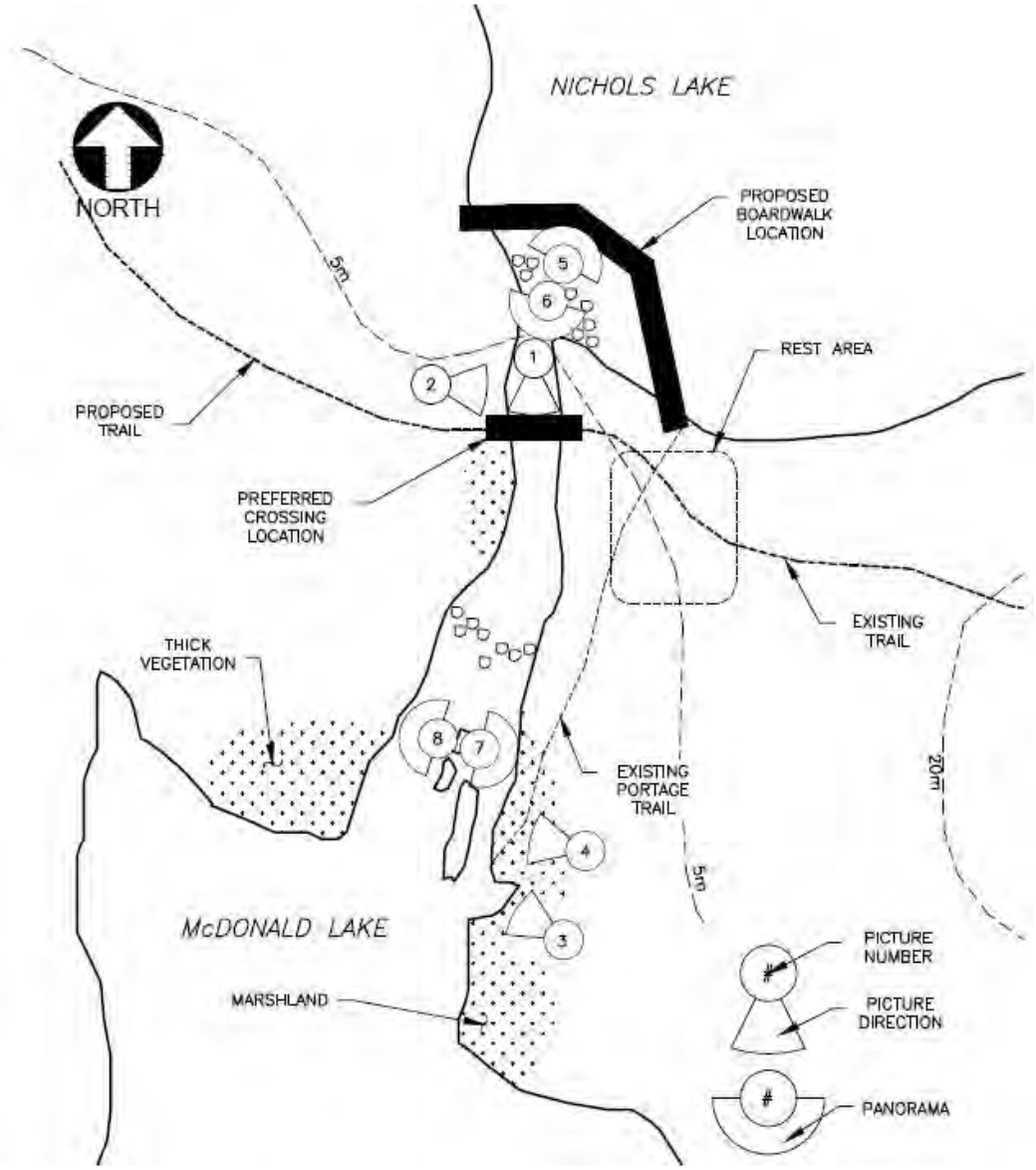

Figure 2 - General Arrangement and Picture Locations

Picture 3 - Entrance to McDonald Lake

Picture 4 - Lower reach of Nichols Run

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Picture 5 - Nichols Lake North, Boardwalk Location - Panoramic

Picture 6 - Entrance to Nichols Run – Panoramic

Picture 7 - Nichols Run East - Panoramic

Picture 8 - Nichols Run West - Panoramic

OPTION 1 – PERMANENT CROSSING TO TYPICAL TRAIL

A permanent crossing could be constructed just below Nichols Lake at the preferred location. The permanent crossing would be a single span steel structure eliminating the need for piers.

Option 1.1 – Prefabricated Bridge lifted into place

A 20m long by 2m wide prefabricated single span bridge provided by a company such as Algonquin Bridge or Eagle Bridge. The bridge could be constructed of two identical halves to allow for easy transport on public roads. The two halves would be assembled at or near the Prospect Road Community Center. The assembled bridge would then be lifted into place by way of helicopter - preliminary research indicates costs in the range of $20,000.00 - $30,000.00 with an hourly rate of $10,000.00 per hour. This would require temporary supports mid span until the structure is completed.

Option 1.2 – Prefabricated Bridge assembled on-site

A 20m long by 2m wide prefabricated single span structure provided by Algonquin Bridge, Eagle Bridge or similar. The bridge would be constructed of several smaller sections allowing for conventional transport with ATV and trailer or small work truck along the existing trail. Another alternative is to mount a set of dolly wheels to the underside of the structure and tow it to location using an excavator. The structure could be delivered to site in two halves completed with decking and rail. Excavator tracks make it possible to maneuver the structure down to Nichols Run without excessively widening the trail. However, some sections will need to be widened due to the size of the machine. Depending on the final design weight a 50 ton excavator may be required to swing the structure into place. The remainder of the bridge could then be fastened in place. This is the more labour intensive option and would require early planning and coordination during the design phase.

Both Options 1.1 and 1.2 require cast-in place concrete abutments. The concrete would likely have to be mixed on location. Gravels are already being brought to Nichols Run for trail construction therefore, it seems reasonable to bring the aggregate and supplies to location. This will be costly as all necessary tools, mixers and formwork would also need to be transported to site. The abutment on the west side can be accessed, formed and poured during the dry months of summer by crossing Nichols Run. A temporary timber/plywood crossing may need to be constructed on the river bed to provide workers a way to the other side.

OPTION 2 – TIMBER CROSSING TO TYPICAL TRAIL

Two 10m spans by 2.4m wide wooden structure located at the preferred location, just south of Nichols Lake, which is constructed largely out of timber. A detailed design would be required to determine whether large solid sawn timbers or steel w-shapes will be used for the stringers. The decking, railing and abutments will be constructed out of timber. The temporary crossing would require two spans which creates the need for a pier to be constructed at mid span in Nichols Run.

The pier can be constructed out of gabion baskets or timber cribbing. The flow in Nichols Run is significant enough, at times, to wash away any small leveling gravels placed for the crib or baskets. The pier will require poured in place concrete on the river bed. Environmental permitting may be required and construction can be completed during the dry months of summer.

Option 3 – Pedestrian Only to Rough Trail

A pedestrian only crossing would be similar in appearance to Option 2, using primarily timber for the construction of the railings, deck, stringers, piers and abutments. The width of the bridge is reduced to 1m wide which will minimize the costs and limit off highway vehicle traffic.

The trail on the east leading up to Nichols Run is completed using gravels to match the current level of construction. The trail on the west leaving Nichols Run will be a rough, informal trail through the forested area around Nichols Lake. This option limits the ability of trail construction as the structure is will not be designed for construction equipment.

Option 4 – Boardwalk / Floating Structure

A boardwalk structure located near the mouth of Nichols Run in Nichols Lake is preferred over the watercourses exit into McDonald Lake. The boardwalk would be roughly 50m long, the width will vary depending on float manufacturer. The boardwalk would require lateral support as it is subject to water and ice thrusting forces. Lateral support could be provided by mooring balls or stones placed in the water with rope or chains attached to the boardwalk. Helical piles are not considered a viable option for this location due to the size and amount of boulders present.

The floating boardwalk option maybe considered as a seasonal option. If the boardwalk was left in place during winter it could be damaged, significantly reducing the service life of the structure. If the boardwalk is removed during winter it removes the ability to safely cross Nichols Run and creates additional reoccurring maintenance costs associated with the removal and storage of the boardwalk. It is possible to leave the dock parked in Nichols Lake for the winter. It would be required that it's moved away from the watercourse entrance until spring. The structure could be floated further out into Nichols Lake or stored near the beach area. The beach area also presents itself as a temporary construction area, from which the structure could be floated into place.

Cost Estimates

Class D estimates for each option are outlined in the table below.

OPTION	ESTIMATE*
1.1 – Permanent pre-fabricated steel lifted into place	TBD
1.2 – Permanent steel fabricated on site	TBD
2.0 – Timber structure	TBD
3.0 – Pedestrian only timber structure	TBD
4.0 – Floating boardwalk	TBD

*Cost estimates in progress

Recommendations

It is our understanding that HRM has assigned a yearly budget to work associated with this master plan. We are not recommending any particular option as the intent of this report is to allow HRM to make informed decisions moving forward with the trail construction. We understand that this report may not address all possible options for the crossings under study. CBCL would be happy to arrange meet at HRM's convenience to discuss the contents of this report as well other questions HRM may have.

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Closure

CBCL Limited is pleased to submit this report for the crossing on Nichols Lake Trail. Please do not hesitate to contact us if you have any questions or concerns.

Yours truly,

CBCL Limited

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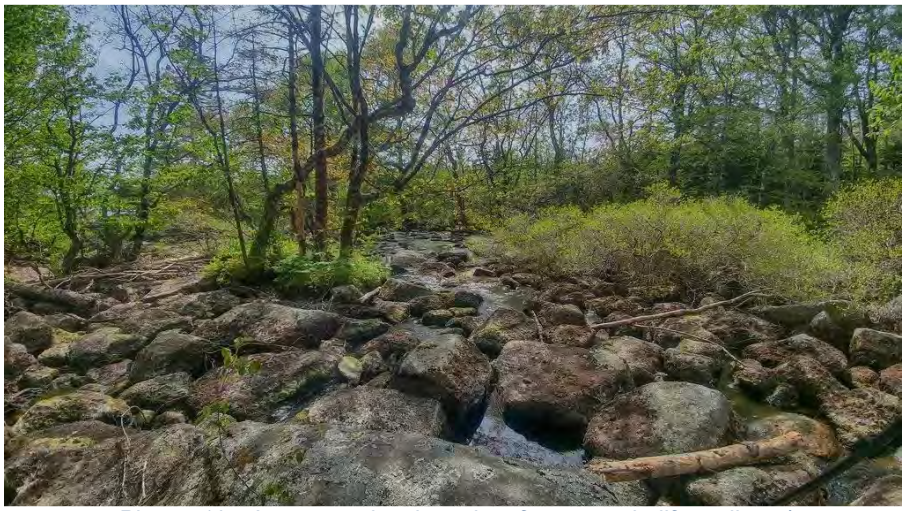
Picture 9 – Low water levels - taken from www.halifaxtrails.ca/



Picture 10 – Low water levels - taken from www.halifaxtrails.ca/

Picture 11 – Low water levels - taken from www.halifaxtrails.ca/