

Perth Road at Buck Lake

Township of South Frontenac

Project number: 60514225

November 27 2017

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Quality information

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Revision History

Revision	Revision date	Details	Authorized	Name	Position
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1. Introduction

The Township of South Frontenac recognizes that additional parking is required at the Buck Lake boat ramp. The Township would like to increase parking availability for the boat launch area and improve manoeuvrability for vehicles unloading boats. Addressing parking concerns provides an opportunity to improve the roadway.

Perth Road, in the vicinity of the Buck Lake boat ramp, is a two lane arterial road with a posted speed of 60 km/h. The vertical alignment of the road increases to the north and to the south of the boat ramp. There are horizontal curves to both the north and south, restricting sight distance on the approach to the boat ramp from the south. The posted speed reflects the horizontal curvature but the context of the roadway as a rural arterial road does not necessarily indicate to drivers that a speed of 60km/h is the appropriate speed. Anecdotal evidence has indicated that drivers have difficulty navigating the curves and often leave the roadway. As a result speed management measures were considered as part of this project.

The gravel shoulders along Perth Road are eroding and the granular material is sliding into the lake. The embankments are subsiding and the guiderail at the top of the embankment is curving outward as the material supporting the guiderail is lost. The guiderail becomes less effective as a safety feature if the ground material is unstable.

There is also no designated pedestrian space for the people who walk along the roadway from their parked vehicle to the boat launch. Improvements to the roadway should consider providing pedestrian facilities for increased safety.

2. Concept Development

Two general concepts were considered to address the issues identified. Road widening was considered to allow more width for parking and unloading space and an auxiliary, off-street parking area was considered at a location near the boat launch.

A preliminary discussion was held with the Cataraqui Region Conservation Authority(Andrew Schmidt), which indicated that fill in the lake would not be permitted for the purposes of road widening to allow additional parking. However, measures to address erosion control would be acceptable. Reviewing the gradient of the slopes and the material used for the embankments are methods that could be considered for addressing the erosion problem. A head wall around the culvert would also be an acceptable method to provide erosion control.

Considering the information provided by the Cataraqui Region Conservation Authority, two concept designs were prepared. The road widening design is provided in Figure 1 and shifts the centreline to the east to provide additional space on the west side of the road for parking (3.0m paved shoulder). On the east side of the road, a 1.5m wide paved shoulder is provided south of the boat ramp. On the west side of the road, the cable guiderail is maintained in its current location with some minor adjustments.

The auxiliary parking area design is provided in Figure 2. This design uses land owned by the Township of South Frontenac to provide a parking area separate from the roadway. The private access driveway from Perth Road is converted to the access to the gravel parking area and a new access to Perth Road is created further to the north. The dual access locations facilitate ingress and egress for vehicles pulling boat trailers. The parking design provides a loop around the outside of the parking area for ease of movement for vehicles with boat trailers.

3. Recommended Plan

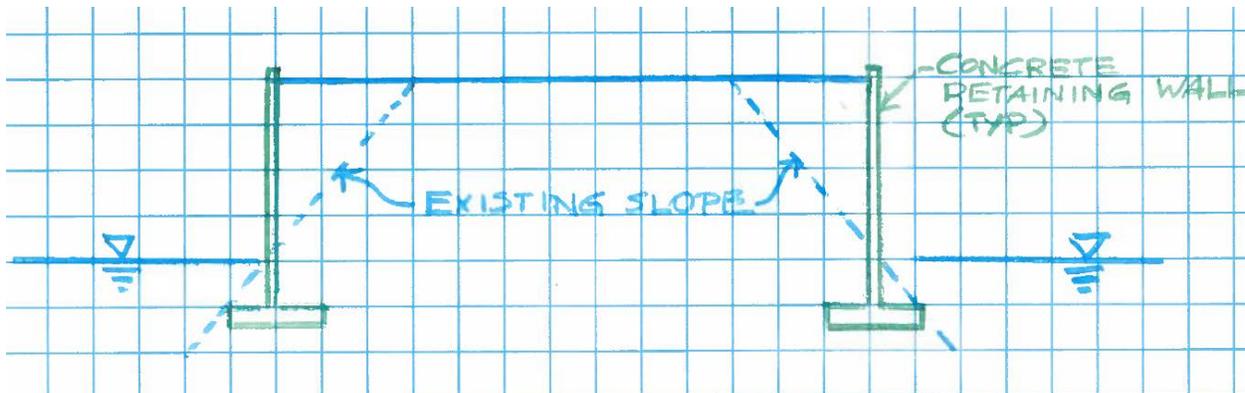
The topography of the area requires considerable rock excavation for the creation of the auxiliary parking area. Few parking spaces can be created in the parking area due to the need for manoeuvring space. For these reasons the road widening option was carried forward.

Several enhancements to the road widening design were developed, based on discussions with the Township of South Frontenac staff.

The recommended design is provided in Figure 3. This design improves the horizontal curvature of the road by excavating rock on the east and west sides of the road to the south of the boat launch. The access driveway to private residences requires realignment as part of the road realignment. On the west side of the road, a 3.0m paved shoulder with a mountable curb is provided for parking. A 1.8m paved shoulder with barrier curb is provided on the east side of the road as a pedestrian walkway. The curbs on both sides of the road and paved shoulders are traffic calming measures that help to remind drivers that they are in an area where pedestrians and manoeuvring vehicles may be encountered. This is intended to encourage reduced traffic speeds in the area.

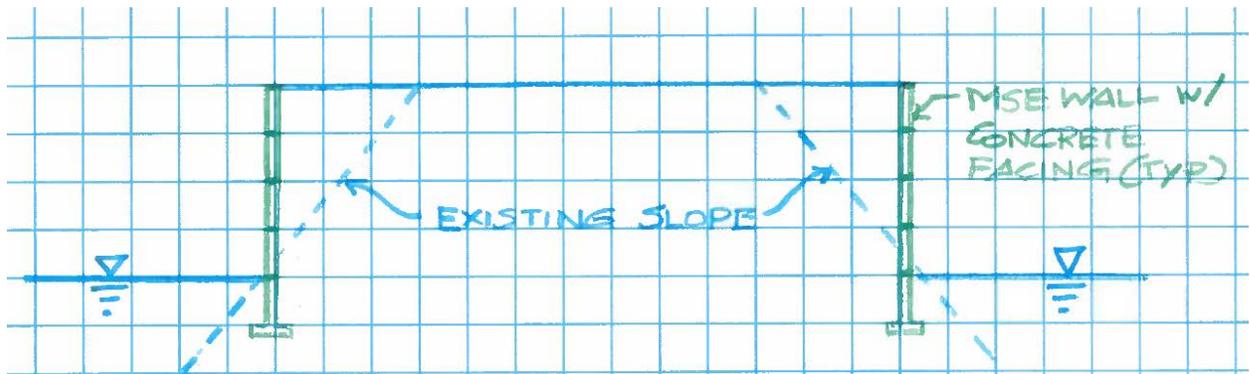
A retaining wall was included in the design to address the erosion problem. The wall location is illustrated in Figure 3. Three retaining wall options were considered and are described below with conceptual sketches that are not to scale.

Concrete Retaining Wall: Vertical reinforced concrete retaining wall with footing. The height of the wall depends on the horizontal space needed and the slope of the remaining embankments. It is recommended to cast the retaining wall to at least 150mm above the finished grade. The footing needs to be cast below the frost depth, which is around 1.6 m below grade at this location.



Benefits	Drawbacks
Maximizes road platform space	Environmentally unpleasing due to concrete face
Can be constructed without disturbing the traffic	Expensive
Barriers can be installed on top of the wall so that the area available will be maximized	If not full height, it will not stop the erosion but instead will prevent the eroded debris from falling into the lake
Allowing an opening for the existing CSP culvert is easy	Footing needs to be built under lake bed
	Special design and wider footing are required at areas of poor soil

Mechanically Stabilized Earth (MSE) Vertical wall with Concrete Facing: These walls consist of granular soil used as backfill, reinforcing mesh or strips, and precast concrete blocks that are assembled on top of each other forming an interlocking gravity earth retaining wall. MSE walls have alternating layers of reinforcement and compacted soil behind a facing element to form a composite material which acts integrally to restrain lateral forces. MSE walls are gravity structures that are relatively flexible and can tolerate horizontal and vertical deformations. A geotextile layer is used to prevent the erosion of the wall fill material through gaps at the wall face. Leveling pads are required underneath the bottom layer of MSE wall and these are generally specified as unreinforced concrete.

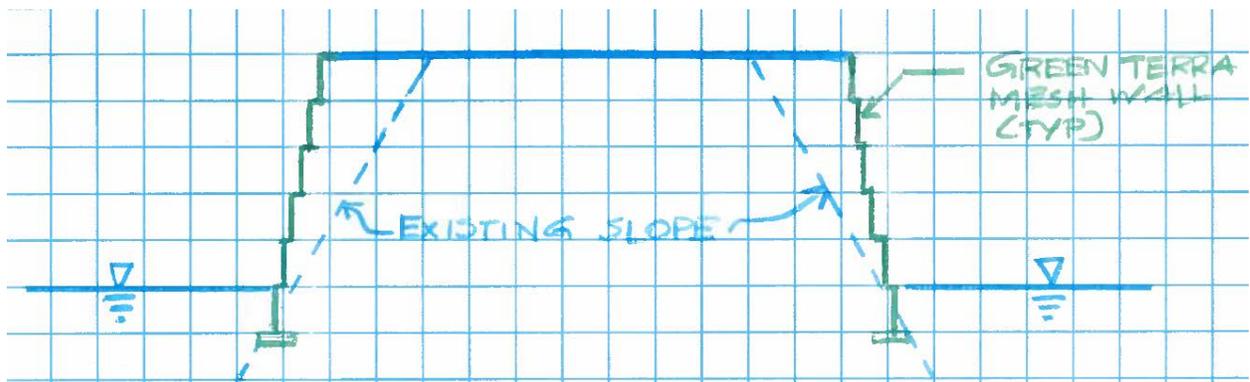


Benefits

Drawbacks

Not as expensive as concrete retaining wall	Environmentally unpleasing due to concrete facing
Depending on the height required, may be constructed without disturbing the traffic	Barriers can only be installed at an offset from the edge of MSE wall
No need for big footing so lake encroachment and excavations will be minimal	Allowing an opening for the existing CSP culvert is relatively complex
Fast and simple construction	Most probably partial road removal will be needed to install the soil reinforcements
Can be built in areas of poor soil	Traffic staging will be required during construction
Use of heavy equipment is reduced	
Does not require specialized labour	
Maximizes road platform space	

Green Terramesh Wall with Vegetated Facing: Almost vertical (usually 70 degrees) MSE wall with vegetated facing. These walls are technically and structurally similar to the MSE vertical walls mentioned above, with different slope and facing.



Benefits	Drawbacks
Environmentally pleasing due to vegetated (green) facing	Allowing an opening for the existing CSP culvert is relatively complex
Not as expensive as concrete wall	Barriers can only be installed at an offset from the edge of MSE wall
No need for big footing so lake encroachment and excavations will be minimal	Most probably some road excavation will be needed to install the soil reinforcements
Fast and simple construction	Traffic staging will be required during construction
Can be built in areas of poor soil	
Use of heavy equipment is reduced	

Following a discussion with the Township, it was decided that the preferred wall option is the mechanically stabilized earth vertical wall. The length of the wall will be determined through a geotechnical analysis to be completed in preliminary design. Various architectural enhancements will be investigated in the preliminary and detailed design phases to improve the aesthetics for the wall.

4. Conclusion

A concept design was prepared that addresses the issues of parking, erosion control, pedestrian safety, speed control, and horizontal road alignment. The recommended concept plan is provided in Figure 3. A Class 'D' cost estimate of \$2,200,000 is provided for budgetary purposes. The cost estimate will be refined as the preliminary design and the detailed design is prepared. This cost estimate includes earth and rock excavation, removal of existing asphalt, granular for shoulders, asphalt for full width road paving, curb and gutter, retaining wall, guide rail, the concrete boat ramp and asphalt driveway leading to the boat ramp and a 50% contingency. Engineering design is not included. Because the length of retaining wall is unknown until a geotechnical investigation is completed, the expected maximum cost for the retaining wall is \$651,000 (included in the overall cost estimate). Should the minimum length of retaining wall be required only at the culvert, the cost would be \$90,000.

A variation of the recommended option maintains the existing horizontal alignment, as shown in Figure 1. With this option, the rock excavation is reduced and the road reconstruction is shortened therefore the Class 'D' cost estimate is \$1,850,000.



BUCK LAKE PUBLIC LAUNCH

Figure 1 - Road Widening Option

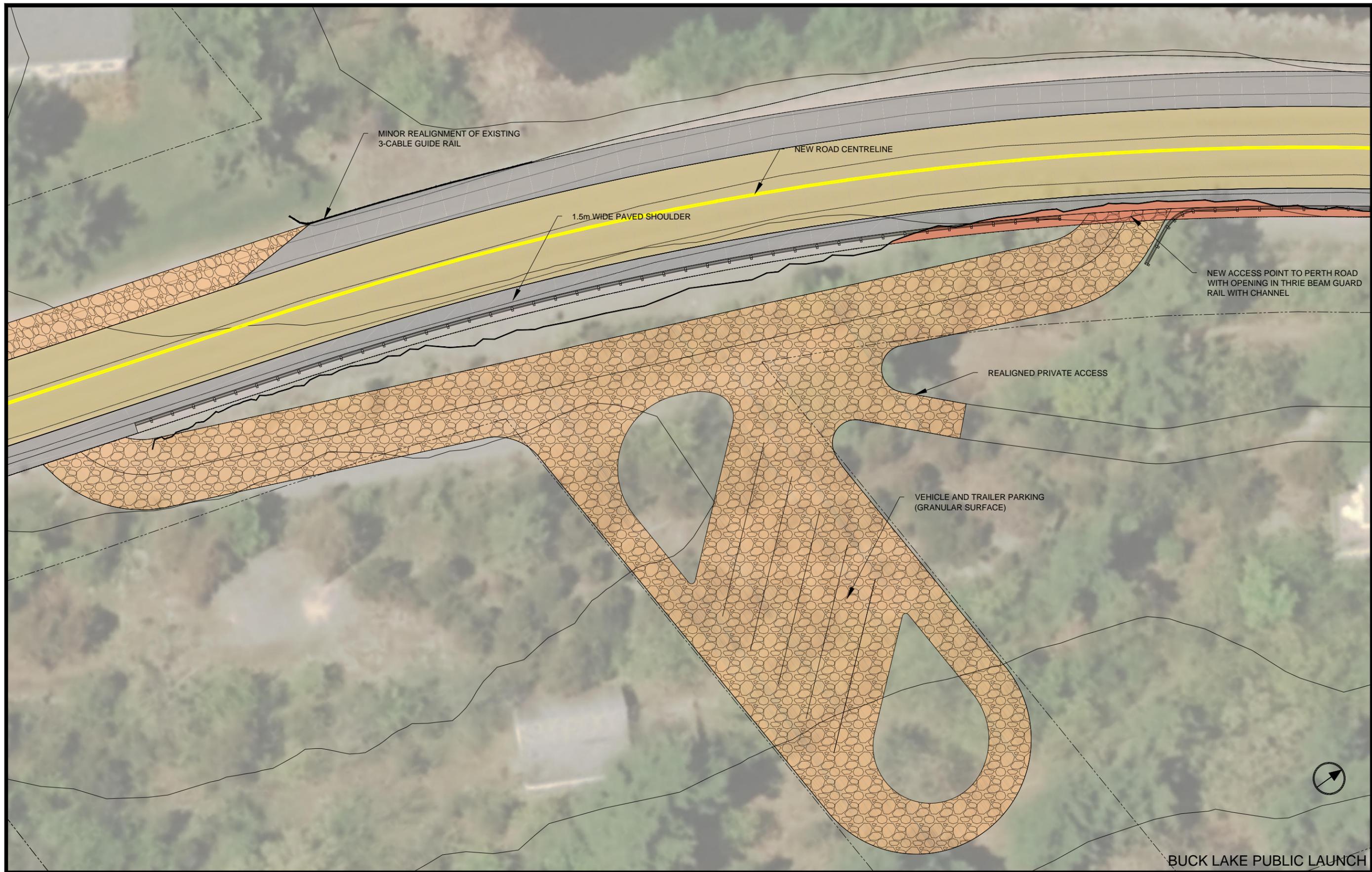


Figure 2 - Auxiliary Parking Area Option

