

Subject: Operation of the Rice Road and Hwy 20 Storm Water Management Pond in East Fonthill

Recommendation:

BE IT RESOLVED THAT Council receive Report #2021-0048, Operation of the Rice Road and Highway 20 Storm Water Management Pond in East Fonthill, for information;

AND THAT Council authorize Staff to complete further engineering studies including an updated erosion survey of the outlet of the Storm Water Management Pond at an estimated value of \$7,950 (plus HST);

AND THAT Council direct Staff to fund the additional erosion study from the 2021 Capital Account RD-04-21 (Engineering);

AND THAT Council direct Staff to prepare a report regarding the findings of the Engineering Analysis including recommendations.

Background:

At the November 2nd, 2020, meeting of Council, a resolution was made instructing staff to prepare a report regarding the design and performance of the storm water management facility located at Hwy 20 and Rice Road. Of particular concern was the impact that the storm water management facility was having with respect to erosion on the outlet located north of Hwy 20. This outlet is significant since it outlets storm water from a portion of the East Fonthill development into the headwaters of the 12 Mile Creek. The 12 Mile Creek is a sensitive water course and concerns have been brought to council regarding the quantity and quality of water discharging into its headwaters from various stakeholders including Trout Unlimited Niagara Chapter, Pelham Cares, and the Fonthill Lions Club.

The proposed Village of East Fonthill development is located in the East Fonthill area of the Town of Pelham. The site is located directly west of Rice

Road (Regional Road 54), north of Port Robinson Road and The River Realty development lands, east of Station Street, and south of Regional Road 20. The lands that comprise of the Village of East Fonthill include the commercial plazas south of Hwy 20 (Market Place and Shops on 20), Wellspring, the Meridian Community Centre, the Better Life Development, Hwy 20 (between Pelham Street and Rice Road), and some residential development to the west of the commercial plazas. The lands that contribute to the Rice Road and Hwy 20 SWM facility are only a portion of the Village of East Fonthill development. The lands that contribute directly to the Rice Road and Hwy 20 SWM facility include the two commercial plazas (Market Place and the Shops on 20), a portion of the Park Place North residential development, the Better Life residential development, the Regional Road right of way on Hwy 20 between Pelham Street and Rice Road and a pre-existing development located at the south east corner of Rice Road and Hwy 20 intersection.

In essence the Rice Road and Hwy 20 storm water management facility receives storm runoff from everything north of the Food Basics Plaza. The remainder of the East Fonthill subdivision drains into other storm water management facilities that outlet into the Singers Drain.

In June of 2015, Upper Canada Consultants prepared a Storm water management plan for the Village of East Fonthill subdivision (see Appendix A – Village of East Fonthill Storm water Management Plan, June 2015).

The proposed Village of East Fonthill development site consists of approximately 18.75 hectares of development area, a watercourse channel block and two storm water management facility blocks. The proposed storm water management blocks convey flows to the respective storm water outlets at the 12 Mile Creek and the Singers Drain.

The storm water management plan was designed to control the post-development storm water flows to both outlets (12 Mile Creek and Singers Drain) to pre-development levels with two (2) storm water management facilities within the subject lands of The Village of East Fonthill.

The storm water management wet pond facility, located at the southwest corner of the intersection of Regional Road 20 (Canboro Road) and Regional

Road 54 (Rice Road), discharges peak storm water flows to Twelve Mile Creek from a total drainage area of 27.07 hectares with an overall imperviousness of 85%.

The storm water management pond was designed to receive peak storm water flows from approximately 14.78 hectares of Town of Pelham lands and approximately 12.29 hectares conveyed from the adjacent Regional Roads (Hwy 20 and Rice Road). (See Appendix B - Drainage Area Plan for the storm water shed for the Rice Road and Hwy 20 SWM pond).

Lands internal to the drainage area are serviced with a conventional storm water management system, including both a minor and major system. The storm water system shall include concrete curb and gutter, asphalt pavement, grassed swales, concrete catch basins, and storm sewers. Major storm water flows, beyond the design capacity of the storm sewers, shall be conveyed overland within the paved portion of the road, and convey storm water flows to the storm water outlets.

Analysis:

All new developments within the province of Ontario are required to provide storm water management according to provincial and municipal policies including: (1) Storm water Quality Guidelines for New Development (MOEE/MNR, May 1991); and (2) Storm water Management Planning and Design Manual (MOE, March 2003).

Based on the comments and outstanding policies from the various agencies including the Town of Pelham, Niagara Region, Niagara Peninsula Conservation Authority (NPCA), and the Ministry of Environment (MOE), the following site specific considerations were identified within the Fontheil East Secondary Plan report and have been used in the design of the storm water management plan:

(1) The northern outlet receiving waters (Twelve Mile Creek) is considered Type 1 (Critical) fish habitat. Based on this fish habitat and corresponding NPCA criteria, the MOE level of protection for new developments within this watershed is to be Enhanced (Level 1).

(2) The northern outlet receiving waters (Twelve Mile Creek) is considered a Cold Water Fishery. Based on this fish habitat, storm water thermal mitigation measures are required to minimize the increase in temperature associated with any storm water management controls.

(3) The Municipal Class Environmental Assessment (EA) and associated Part II Order for Regional Road 20 required that flows from the previously reconstructed road be provided with storm water quantity controls within the adjacent storm water management facility located at Hwy 20 and Rice Road.

(4) The eastern outlet receiving waters (Singers Drain) are considered Type 2 (Important) fish habitat. Based on this fish habitat and corresponding NPCA criteria, the MOE level of protection for new developments within this watershed shall be Normal (Level 2).

(5) The downstream outlets (Singer's Drain and Twelve Mile Creek) contain natural elements and, therefore, downstream erosion controls are considered necessary in compliance with the 25mm MOE erosion guidelines.

(6) The downstream outlets (Singer's Drain and Twelve Mile Creek) contain lands that would be negatively impacted by increased flooding levels, and, therefore, storm water quantity control is considered necessary to maintain the downstream peak water elevations.

Based on the above policies and site specific considerations, the following storm water management criteria were established for these outlets as part of the storm water management design:

(1) Storm water quality controls are to be provided for the internal storm system conveying storm water flows to Twenty Mile Creek to provide Enhanced (Level 1) Protection according to MOE guidelines.

(2) Storm water quality controls are to be provided for the internal storm system conveying storm water flows to Singer's Drain to provide Normal (Level 2) Protection according to MOE guidelines.

(3) Storm water thermal improvements are to be provided for storm water flows to Twelve Mile Creek.

(4) Storm water erosion controls are to be provided to detain and release the 25mm storm event volume for a minimum of 24 hours.

(5) Quantity controls are to be provided for the outlet to limit the future post- development peak flows from the 25mm, five and 100-year storm events to pre- development peak flow levels.

A variety of storm water management alternatives are available to control the quantity and quality of storm water runoff. Most of these are described in the Storm Water Management Planning and Design Manual (MOE, March 2003). Alternatives for the East Fonthill site considered as part of the storm water management design included the following: lot level controls, vegetative alternatives, infiltration alternatives, and surface storage controls. General comments on each category are provided below:

(1) Lot Level Controls: Lot level controls are not usually suitable as the primary control facility for quality control. They are generally used to enhance storm water quality levels in conjunction with other types of control facilities.

(2) Vegetative Alternatives: Vegetative storm water management practices are generally not suitable as the primary control facility for quantity or quality controls. They are generally used to reduce the rate of runoff and to enhance storm water quality in conjunction with other types of control facilities.

(3) Infiltration Alternatives: Where soils are suitable, infiltration alternatives can be very effective in providing both quality and quantity controls. However, infiltration rates generally limit the use of these techniques. Soils in the East Fonthill site are predominantly clay with infiltration rates of less than 12 mm/hr. Infiltration alternatives may provide some quality benefits. Due to the low infiltration rates and large development site, infiltration alternatives were not considered feasible as primary control facilities for this site.

(3) Surface Storage: Surface storage techniques can be very effective in

providing both quality and quantity control. Wetlands are generally the most efficient for water quality control, however require more maintenance than a wet pond and are more subject to negative public perception. Both the onsite and additional offsite lands will generate sufficient storm water to maintain a permanent pool. Therefore, two wet ponds were recommended as storm water management facilities to provide quality and quantity protection for the two storm water outlets.

(5) Thermal Controls: Surface storage techniques can be very effective in providing both quality and quantity controls, however solar radiation results in increased water temperatures that can have negative impacts upon the downstream habitat, specifically the Cold Water Fishery designation of Twelve Mile Creek. Vegetative cover can mitigate some of these effects, and proper landscape design including shade trees is important. A more aggressive measure that was considered in the design of the north SWM pond outlet (Hwy 20 and Rice Road) included directing low flow through underground clear stone filter beds to cool the outflow water through thermal transfer.

Based on the above considerations there were special considerations given to the design and construction of the Storm Water Management Pond for the discharge water into the 12 Mile Creek. Of particular importance and concern were design measures to mitigate against Quantity (flow) concerns, Temperature concerns and Quality concerns (sediment reduction). (See Appendix C - Upper Canada Design Brief dated February 2021).

With respect to reduction of flows, the Ministry of Environment (as it then was), Town of Pelham design standards, and NPCA regulations require that future storm water flow from the proposed development projects are equal to or less than the storm water flows that occurred prior to development. The storm water management pond at Rice Road and Hwy 20 was designed recognizing that the downstream headwaters of the 12 Mile Creek were experiencing significant erosion prior to development taking place. As a result, the SWM facility was over-designed to reduce the peak flows (25mm rain event) by 90 percent and by 62 percent for the 100-year design storm event.

The Ministry of Environment requires that the volume of storm water

produced by a 25mm rain event be detained and released slowly over a minimum period of 24 hours.

The wet pond facility provides approximately 4,592 m³ of permanent pool storage to provide storm water quality improvements and a total active storage volume of 23,897 m³ to detain storm water flows up to and including the 100-year design storm event.

Further, the facility was designed and constructed with both a 225mm orifice control in which a smaller outlet is provided to reduce the amount of discharge. In addition, flow controls are achieved by the implementation of a geothermal bed where flows entering the pond are forced through a series of perforated pipes and clear stone contained around the perimeter of the SWM pond. The geothermal beds act to provide storage and reduce quantities as well as reduce the temperature of the storm water. The Rice Road and Highway 20 SWM facility is designed to retain the storm water for 24.8 hours prior to discharge into the downstream outlet.

During the planning and design process, there was recognition that 12 Mile Creek supports a cold-water fishery and that temperature increases normally associated with standing water in the pond needs to be reduced. In the design of the SWM pond, this issue was addressed through the implementation of a geothermal bed and the strategic planting of trees and aquatic vegetation.

The geothermal bed acts to reduce the temperature of the storm water discharge by forcing the water entering the pond through a series of perforated pipes and clear stone wrapped in geotextile. The storm water trickles through the stone bed that is at a temperature below the surface temperature and acts to cool the water.

In addition, the pond block was heavily vegetated including numerous trees of various species. The plantings and aquatic vegetation play an important role in providing shade and reducing the increase in temperature associated with the exposed water surface. (See Appendix D - Design drawings and Landscaping Plans for Rice Road and Hwy 20 Stormwater Management Facility).

The storm water management pond also functions to reduce the sediment contained in the storm water being discharged into the outlet of the 12 Mile Creek. Due to the sensitive nature of the outlet, the Ministry of Environment required an enhanced level of design, which included the removal of 80 percent of the total suspended solids in the storm water. This requirement is a result of the critical aquatic environment of the 12 Mile Creek.

Approval for the design and construction of the Rice Road Hwy 20 SWM facility was received from the MECP, NPCA, Niagara Region and the Town of Pelham.

In 2007, prior to the reconstruction of Hwy 20 the Region retained WSP (formerly Jagger Hims Limited) to complete monitoring of the storm water outlet at Rice Road in response to a Part 2 order initiated during the Municipal Class Environmental Assessment process related to the widening of Hwy 20. The monitoring was a requirement from the Ministry of Environment in response to the Part 2 order. The Region monitored the outlet from 2007 (pre-construction) to 2016 (post SWM Pond construction). The monitoring included water quality and water quantity including the measurement for suspended solids, chemical analysis, temperature, quantity flows and erosion impacts. (See Appendix E - Monitoring report completed for Niagara Region).

The results of the monitoring indicated that post SWM Pond construction peak flows were attenuated to pre-Regional Road 20 redevelopment levels or better, temperature measurements reflected the changes in seasonal temperatures and were similar to pre-construction temperatures and water quality was generally similar to pre-construction measurements. With regard to downstream erosion, surveys of the downstream outlet showed erosion and accretion was generally less than 0.5 m with small areas of greater erosion/accretion in some locations.

As part of the MOE approval for the East Fontheill development SWM Pond at Rice Road and Hwy 20, the Town of Pelham was required to continue with the monitoring for a period of 5 years following the construction of the pond.

The construction of the SWM pond commenced in June of 2015 with successful completion in October of 2015.

Upper Canada Consultants and the Town of Pelham retained the services of WSP Canada Limited to complete the hydrologic monitoring of the storm water management pond. The monitoring included surface water flow monitoring and surface water quality. The monitoring that was completed considered the same parameters as identified above save and except the erosion monitoring. Pre-construction monitoring was conducted from March to May of 2015 with post-construction monitoring beginning in October of 2016 following the one-year construction maintenance period. (See Appendix F - Rice Road Storm Water Management Monitoring Reports completed for the Town of Pelham, dated 2017 and 2018).

Recently, Staff retained the services of WSP to review the monitoring completed from 2007 to present and provide a summary of the performance of the SWM pond located at Rice Road and Hwy 20. (See Appendix G - East Fonthill Development Storm water Management Pond Monitoring Data Review report).

Based on the data presented in the assessment completed by WSP the following conclusions were made:

- 1) The average and maximum total suspended solids concentrations in the effluent are lower in the post pond-construction monitoring than the pre-development monitoring.
 - 2) The average and maximum electronically and manually measured temperatures in the effluent and downstream locations are lower in the post pond-construction monitoring than the pre-development monitoring, with the exception of the average manual temperatures at the downstream location, which are greater in the post pond-construction period. It was noted that the database is limited for manual measurements at the downstream location during the development/construction and post pond-construction monitoring periods.
 - 3) Peak flow rates in the effluent and downstream location are lower in the post pond-construction monitoring than the pre-development monitoring.
 - 4) Erosion monitoring has indicated the erosion/accretion in the surveyed
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reach is generally less than 0.5 m between April 2007 and April 2016.

In general, the conclusion from WSP regarding the performance of the Rice Road SWM Pond is that the pond is effectively attenuating peak total suspended solids concentrations, temperatures, and flow rates to pre-development levels or better.

Financial Considerations:

There are no financial considerations as this report is for information only. Should council wish to proceed with additional engineering studies there will be additional costs involved which will need to be included as part of the 2022 Capital Budget request.

The Town of Pelham has retained the services of WSP to continue with the annual monitoring of the SWM pond. The annual cost to complete this work is \$3,450 (plus HST), which is being funded through the annual capital-engineering project (RD04-21).

Since the scope of WSP's assignment does not include erosion monitoring it is recommended that a new erosion survey be completed. The last erosion survey was completed in 2015 by WSP on behalf of Niagara Region. The estimated cost to complete a new erosion survey is \$7,950 (Plus HST). There are sufficient funds available in the 2021 Capital Budget under account RD04-21 to complete this work. Staff recommends that the Town's procurement policy be waived in this particular instance to provide a direct award to WSP. WSP has the prior knowledge, experience and available data (from previous monitoring assignments) to complete this assignment efficiently and provide continuity when summarizing and comparing previous monitoring reports and studies.

Alternatives Reviewed:

There were no alternatives reviewed in the preparation of this report, as its basic purpose is to provide information on the history, design and operating function of the Rice Road and Hwy 20 SWM Facility.

Strategic Plan Relationship: Risk Management

The design and monitoring program of the Rice Road and Hwy 20 SWM facility was completed to reduce risk and provide for the appropriate quantity and quality control features taking into consideration the sensitive environment related to the 12 Mile Creek.

Consultation:

Staff consulted with the following agencies and professional firms in the preparation of this report:

Upper Canada Consultants (Professional Engineers and Designers)

WSP Canada (Professional Engineers)

Region of Niagara Transportation and Engineering Department

Region of Niagara Planning Department

Town of Pelham Engineering Department

Town of Pelham Planning Department

Other Pertinent Reports/Attachments:

Appendix A – Village of East Fonthill Storm water Management Plan, June 2015

Appendix B - Drainage Area Plan for the storm water shed for the Rice Road and Hwy 20 SWM pond

Appendix C - Upper Canada Consultants Design Brief dated February, 2021

Appendix D - Design drawings and Landscaping Plans for Rice Road Hwy 20 Stormwater Management Facility

Appendix E - Monitoring report completed for Niagara Region

Appendix F - Rice Road Storm Water Management Monitoring Reports

completed for the Town of Pelham, dated 2017 and 2018

Appendix G - East Fonthill Development Storm water Management Pond
Monitoring Data Review report

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