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August 7, 2015

Via: Email (acampbell@innisfil.ca)

Mr. Andrew Campbell
Deputy CAO and Town Engineer
Town of Innisfil
2101 Innisfil Beach Road
Innisfil ON L9S 1A1

Dear Mr. Campbell:

Re: South Innisfil Creek Drain Peer Review
Project No.: 300037163.0000

As directed through our meetings, telephone conversations and email correspondence and in accordance with our proposal to carry out a Peer Review of the documentation for the South Innisfil Creek Drain dated April 7, 2015, we provide the following report.

It is noted that the writer has considerable familiarity with the South Innisfil Creek Drain and Branches extending over the period from the late 1970's to 2005 including past maintenance and repair work on the South Innisfil Creek Drain through to assisting the Town of Innisfil with procuring the engineering services to undertake a new engineer's report under Section 78 of the Drainage Act to consider improvements to the South Innisfil Creek and Branches.

As detailed in our proposal it was recommended that the Peer Review proceed in two phases with the first phase providing comments on the documentation, the process and the general concepts as set out in the report as well as general compliance with the Drainage Referee's Orders, including our interpretation of those Orders. The following report will provide our comments and recommendation which result from the document review. It was proposed that the second phase, which we would carry out subject to the Town's direction, would be the technical review including the hydrologic and hydraulic modeling as well as a review of the estimated cost of the work to consider possible alterations to the work to mitigate the capital costs of the proposed improvement. The second phase would be more technically orientated.

Generally our document review has included the various Orders issued by the Ontario Drainage Referee, the Preliminary Drainage Report for the South Innisfil Creek Drain and Branches, the Final Drainage Report for the South Innisfil Creek Drain and Branches, correspondence received from Dillon Consulting as well as from representation of the property owners within the South Innisfil Creek catchment area. We have also had verbal discussions with representatives of Dillon, representatives of the property owners and involved agencies.

1.0 Background – Document Review

1.1 Drainage History

The South Innisfil Creek Drain was first created over 100 years ago under a report prepared by M. Gaviller, OLS in February 1903. The last major report for the repair and improvement to the Drain was prepared by D.H. Weir, P.Eng., dated November 9, 1956. The work included cleanouts, bridge crossings, straightening and improvements of the South Innisfil Creek Drain from the 5th Line road bridge downstream to the 5th Sideroad bridge. In that same report three branches were constructed, namely the 10th Sideroad Branch, the 3rd Line Branch Drain and the 3rd Line Branch Drain Spur. Branch A and Branch B of the South Innisfil Creek Drain located in Concession 1 were created under a separate report by D.H. Weir, P.Eng. in 1954. The outlet of the South Innisfil Creek Drain is a natural watercourse known locally as the Innisfil Creek which is a tributary of the Nottawasaga River.

The Township of Innisfil and later the Town of Innisfil carried out significant maintenance on the South Innisfil Creek Drain in the late 1970's and in 2004 respectively with the removal of obstructions and a bottom cleanout. Other minor repairs were completed throughout that time period to remove obstructions or beaver dams as required.

Although the drain provided an outlet for upstream runoff, the drain had insufficient capacity to contain larger storm events that exceeded the original design criteria of the existing drain. Specific large rainfall events resulted in flooding of the market garden lands and the loss of crops. These events contributed to the affected property owners requesting an improvement to the Drain which was a matter placed before the Ontario Drainage Referee in 2004.

1.2 Ontario Drainage Referee Order – March 31, 2005

The initial Order of the Ontario Drainage Referee which appears to be dated the 31st day of March 2005 and which was a result of a hearing which commenced in November 2004 and was concluded in March 2005 was quite specific in its direction to the Town of Innisfil. The court ordered that the Town of Innisfil forthwith appoint an Engineer acceptable to the applicants pursuant to Section 78 of the Drainage Act in order to carry out the activities and reports contemplated by the Order.

The Engineer being appointed was to prepare and complete preliminary and final reports under The Act in order to alter, improve and/or extend the South Innisfil Creek Drain and in particular to address the concerns of flooding in the area known as the Market Garden Lands area which is adjacent to the Drain. The Order further requested that the Engineer "consider" in the preparation of both the preliminary and final reports the incorporation and repair/improvement as required of the channel joining the Drain and the Innisfil Creek and Nottawasaga River drainage works situated downstream, the repair and improvement of the Drain to provide the required capacity and the addition of one or more stormwater management facilities to the Drain. Further, that incorporation/improvement as required be considered of the original outlet (Branch A of the Drain) of the Hnydczak Drain, the incorporation improvement replacement or removal of all crossings on the Drain and the necessity of additional crossings and the requirements of the Nottawasaga Valley Conservation Authority (NVCA) and the Department of Fisheries and Oceans (DFO). The Order set out that once the preliminary report was prepared that a hearing date would be set for the Court to review the preliminary report. There were a

number of other interim requirements within the March 2005 Order for the removal of obstructions or work to improve the inlet capacity of specific road crossing culverts.

In general, the Order was very specific with respect to the actions required by the Town of Innisfil around the appointment of an Engineer to prepare a report and specific with respect to the matters to which the Engineer was to "consider" in the preparation of the preliminary and final reports.

1.3 Preliminary Engineers Report

Pursuant to the March 31, 2005 Order the Town of Innisfil appointed the engineering firm of Dillon Consulting Limited to prepare the Preliminary Drainage Report. As the Preliminary Drainage Report for the South Innisfil Creek and Branches as prepared by Dillon Consulting Limited dated February 2006 is part of the public record we will not go into a detailed description of the content but rather note a few highlights.

The preliminary report provided a reasonable history of the Drain including previous studies undertaken for this drainage system as well as a description of the watershed and the observations noted by the Drainage Engineer during his inspection of the drainage system. The review included the South Innisfil Creek Drain as well as the South Innisfil Creek Branches (3rd Line Branches and 10th Sideroad Branch) as well as the Hnydczak Outlet Relief Drain. The preliminary report set out three options for the proposed drain improvements which provided varying levels of flood protection for storm events. There was no specific work proposed downstream of Highway 89. It was clearly set out and justified in the report that the objective was to provide protection for a one in two year return period storm.

Generally Option No. 1 in the Preliminary Engineer's Report required improvements to the South Innisfil Creek Drain and Branches accomplished by widening, deepening and increasing the drain side slopes where possible. Option No. 1 recommended a drain overflow area adjacent to the South Innisfil Creek Drain between County Road 89 and the 5th Sideroad. The total estimated cost for Option No. 1 as set out in the February 2006 Preliminary Engineer's Report was approximately $2.2 M. It is noted that Dillon went through a cost benefit analysis based on the cost set out in that Preliminary Report and determined that the benefit cost analysis was positive.

The Preliminary Report went on to describe Option No. 2 and No. 3 which were the addition of alternative overflow areas situated upstream of the Market Garden Land area. Option No. 2 was the addition of an overflow area located immediately upstream of the benefit area and muck soil region that is south of the 4th Line. Option No. 3 included the construction of an overflow area in the vicinity of the 5th Line. The additional cost of Option No. 2 and Option No. 3 was approximately $3.0 M and $2.7 M respectively as per the Preliminary Engineers Report. A cost benefit analysis was also carried out for Option No. 2 and Option No. 3 in the report as well as a description of the level of flood protection that would be provided by each.

The Preliminary Report indicated that the final Engineer's Report would follow with one of those options or variation thereof following the outcome of the hearings, meetings and decision from the Court of the Drainage Referee.

1.4 Ontario Drainage Referee Order – August 31, 2006

Once prepared and as set out in the initial Order the presentation of the Preliminary Report was heard by the Court of the Drainage Referee on the 24th day of July, 2006.

The Preliminary Report set out three options for recommended improvements to the South Innisfil Creek Drain and Branches. It is noted that Option No. 2 was the recommended option by the Drainage Engineer during the hearing although there was acknowledgement that some of the costs relative to Option No. 2 were somewhat uncertain.

The Drainage Referee heard from various affected property owners as well as agents of the owners. The Drainage Referee provided a judgment indicating the options to be pursued in the complete (final) report were Option No. 1 and Option No. 3. The actual Order went on to require the Town of Innisfil to retain the engineering firm of Dillon Consulting Limited to prepare a complete Drainage Report adopting Option No. 1 and Option No. 3 of the Preliminary Report including a full assessment schedule and an allowance schedule following which the Municipality was to conduct a public meeting of Council to consider the report.

It is noted that the total anticipated cost to implement Option No 1 and Option No 3 as described in the 2006 Preliminary Engineers report would have been approximately $4.9 M.

The Order of the Drainage Referee dated August 31,' 2006 was considerably more specific in its direction to the Engineer than the initial Order dated March 31, 2005. Whereas the initial Order indicated that certain matters should be "considered", the second Order provided clear direction that the Drainage Report was to adopt Option No. 1 and Option No. 3 as set out in the Preliminary Report thereby virtually dictating to the Drainage Engineer how the works would proceed from that point forward.

1.5 Final Engineers Report

Following the Order of the Ontario Drainage Referee issued on August 31, 2006 which provided very specific direction to the Drainage Engineer and the Municipality and which allowed for very limited change in the scope of work, the Final Engineer's Report was prepared as submitted in August, 2013 by Dillon Consulting. As with the Preliminary Engineer's Report the Final Engineer's Report is part of the public record and we will not go through the details of the report but rather address a number of highlights.

The Final Engineer's Report provides a brief description of the background as well as summarized the content of the Preliminary Report. It also provided details with respect to the Drainage Referee's decision and Order which set out that the Municipality was to retain Dillon Consulting Limited to prepare a complete Drainage Report adopting Option No. 1 and Option No. 3 of the Preliminary Report. The report also addressed and included the history of this drainage system, previous studies, description of the watershed, a survey of the existing conditions and various design considerations that went into the preparation of the report. The report provided a general description of the hydrologic and hydraulic analysis that was undertaken as part of the preparation of the report to meet the objective of controlling a one in two year event for this drainage system.

The recommended improvements to the Drain were set out within the report and included on the drawings and specifications attached to the report. This included improvements to the South Innisfil Creek Drain commencing at the 15th Line and extending upstream to the 5th Line, the Hnydczak Outlet Relief Drain, the 3rd Line Branch Drain, the 3rd Line Branch Drain Spur, and Overflow Area No. 1 all of which were generally proposed as Option No. 1 in the Preliminary Engineers Report. The Final Engineers Report also included the overflow area in the vicinity of the 5th Line which was anticipated as Option No. 3 in the Preliminary Report. The updated cost estimates provided in the Final Engineer's Report for Option No. 1 and Option No. 3 was approximately $6.7 M.

The rationale for the assessment schedule was set out within the Engineer's Report as well as direction relative to future maintenance of the Drain. The drawings included an overall plan of the Drain as well as a detailed profile and typical cross sections of the Drain as well as details of the proposed culvert and bridge crossings.

1.6 Concerns of the Public

By the time the Final Engineers Report was completed in August 2013 it was apparent that there were a number of problems with the wording of the Referee's Order of 2006, that the estimated costs of the work had exceeded expectations and there were issues with the extent of work proposed. Council held a public meeting to consider the report on October 2, 2013 at which time the concerns of the public were clearly reinforced. Council deferred the consideration of the report and directed staff to commence an application to the Referee for reconsideration of the previous Order.

Generally the comments from the property owners can be categorized around the overall increase in cost from the Preliminary Report as prepared in 2006 to the 2013 Final Report, the construction of Overflow Area No. 1 and Overflow Area No. 3 as set out in the Engineer's Report and the level of protection that would be provided as well as the proposed work on the 10th Sideroad and 3rd Line Branches. It is apparent that there was some concern relative to the extent of communications between the Drainage Engineer and the property owners during the time period that the Final Engineer's Report was being prepared. We note again that in defense of the Final Engineer's Report that the Ontario Drainage Referee's decision of 2006 left very little room for considering alternate courses of action.

We have reviewed those comments and taken those comments into consideration in the preparation of our review comments which will follow in this report.

1.7 Ontario Drainage Referee Order – November 14, 2014

This matter went before the Ontario Drainage Referee in November 2014 with a subsequent Order being issued by the Drainage Referee on November 4, 2014 which ordered that as a result of the unforeseen cost increases occurring between the Order of the Referee O'Brien dated August 31, 2006 which set out the requirements that Option No. 1 and No. 3 be adhered to as contained in the Final Engineers Report dated August 15, 2013 are to no longer bind the Town of Innisfil or its Engineers appointed from time to time and further that the Town of Innisfil is ordered to retain the services of a Drainage Engineer to review the said report of August 15, 2013 and to suggest alternatives including but not limited to improvements to alleviate flooding and options that may provide for phasing, maintenance and repair and that the

Order of Referee O'Brien dated August 31, 2006 is thereby amended accordingly. As a result of this latest Order of the Referee, the Town of Innisfil and appointed Drainage Engineer are no longer bound by the very specific Order as issued by Referee O'Brien dated August 31, 2006.

1.8 Current Status of Drain

The Order of the Ontario Drainage Referee of November 4, 2014 provided direction that the Town of Innisfil or its Engineers were no longer bound by the decision of the Order of the Referee O'Brien dated August 31, 2006. With Council's decision to defer consideration of the Engineer's Report, the Referee's decision of November 14, 2014, supplementary information from the public and the consultants and Council's direction to staff to have this Peer Review completed, a decision on a course of action is pending.

We are aware that Town staff met with some of the major stake holders on the South Innisfil Creek Drain in February, 2015 from which a list of concerns, comments and recommendations were developed relative to this project moving forward.

The alternatives available to Council will include referring the report back to the Engineer (Dillon) for their reconsideration with or without specific requests to have certain issues considered or the appointment of a new Drainage Engineer with respect to preparing a new Engineers Report on this matter.

It is noted that the combined effect of the Orders of the Ontario Drainage Referee are that a new report and By-Law for the South Innisfil Creek Drain and Branches is still required. We would also note that from a practical and logistic perspective a new report and By-Law are necessary to facilitate future maintenance and repairs of the South Innisfil Creek Drain and Branches. Consequently, the matter eventually must lead to a new report and By-Law.

2.0 Supplementary Correspondence and Communications

2.1 Dillon Consulting

We contacted Dillon Consulting in June to provide notice that we had been retained by the Town of Innisfil to carry out the Peer Review on this project. A message was left for Mr. Dennis McCready in this regard.

Memorandums were provided by Dillon Consulting to the Town of Innisfil all dated February 3, 2015 which provided further design detail and recommendations and possible alternative considerations to the Town relative to this matter. Included were comments on the limits and the maximum assessment to maintain a positive cost benefit ratio and further identified that the maximum assessment as set out in the August 15, 2013 report was still below the calculated limit. Also included were the results of modifying the typical cross sections of the proposed channel to reduce the width and to remove the 0.4 m free board which was provided in the original design which accommodated the 1:2 year storm event. Providing low flow crossings for some of the field crossings, having properties share crossings and phasing the project were also suggested as possible cost saving measures. We note that the estimates provided in the memorandum for a reduced channel cross section and the use of low flow crossings reduced the cost to approximately $5.0 M which is very close to the estimated cost

set out in the Preliminary Engineers Report of $4.9M for Option No. 1 and Option No. 3 and prepared several years earlier.

A second memorandum of February 3, 2015 provided information relative to the Highway 400 culverts and the effect on the flood levels if the culverts were completely removed and replaced with an open Drain. A third memo provided specific responses to comments made by one of the major benefitting property owners on the Drain.

Correspondence from Dillon Consulting to the Town of Innisfil dated February 25, 2015 provided some of the chronology of the project as well as provided a general response to some of the comments provided by Mr. John Kuntze, P.Eng., of K. Smart & Associates as a representative of one of the property owners.

We arranged and participated in a teleconference with Dennis McCready, P.Eng., and Jerome Trudell, P.Eng., of Dillon Consulting to review some of the details of the Final Engineer's Report. We were able to discuss in more detail some of the cost saving options they had presented in their February 3, 2015 memorandums including specific discussions regarding the reduced channel cross section, shared use of bridges, reducing foundation costs for bridges, the Highway 400 culvert crossings and agency requirements associated with the proposed work.

2.2 K. Smart & Associates, J Kuntze, P.Eng.

We also note that John Kuntze, P.Eng., of K Smart & Associates a Drainage Engineer practicing in the Province of Ontario was retained by one of the property owners and provided comments dated February 18, 2015.

Mr. Kuntze provided comments regarding the extension of the Main Drain to Concession 15, the cross section and design grades of the drain, overflow areas No. 1 and No. 3, the Highway 400 culverts, farm crossings and the proposed work on the 10th Sideroad and 3rd Line Branches.

We contacted Mr. John Kuntze and had a verbal discussion around his numerous comments on the Final Engineer's Report and his recommendations with respect to future steps on this Municipal Drain. This provided an opportunity to better understand the comments provided and as he is representing one of the larger benefitting property owners, have a clearer awareness of the property owner's concerns.

2.3 Dianne Hogarth

We were contacted independently by Dianne Hogarth who we understand has maintained an interest in the South Innisfil Creek Drain and the history of the Drain at least over the last decade. Ms. Hogarth provided extensive verbal comments in regard to the history of the project.

3.0 Contact with Agencies

As part of our review we contacted Sarah Schmied, Environmental Planner of the Sustainable Transportation Group URS Canada Inc. Consulting Engineers and Geoscientists who have been retained by the Ministry of Transportation of Ontario to undertake the study for the future improvements to the Highway 400 Corridor from 1 kilometre south of Highway 89 to the junction

of Highway 11. We discussed with Ms. Schmied what the timing for future improvements may be for the Highway 400 Improvements and what specifics might be planned around the various water crossings that cross Highway 400 within this study area. At this point in time we understand that this is a preliminary study which will only address the conceptual details of future work on this section of Highway 400.

It was apparent through our review of the report that considerable liaison had occurred between the NVCA and Dillon Consulting. We have contacted Mr. Glenn Switzer at the NVCA to have discussions around the NVCA's view relative to the modeling and hydraulic characteristics of this drainage system. Specifically we discussed with Mr. Switzer the overflow areas and the Highway 400 crossings. Although the NVCA has reviewed the modeling it is now some time ago and it was resolved that we should look at the modeling to satisfy ourselves on the merits of the overflow areas and the influence of the Highway 400 crossings on upstream flood levels.

4.0 Review Comments and Recommendations

Our review of the documentation forwarded regarding this matter as described above as well as our verbal discussions and our past knowledge of this drainage area have generated the following comments and recommendations for the Town of Innisfil's consideration. We have categorized our comments and recommendations around the principle components of the proposed work in the following sections.

4.1 Drain Cross Section

Based on the information provided by Dillon we note that the proposed reduction in the channel cross section as described in their memorandum of February 3, 2015 reduces the cost of the Main Drain improvement by approximately $500,000. The proposed reduction in cross section removes the 0.4 m of freeboard which was included in the original design which provided some margin of safety. We understand the reduced cross section will still accommodate the 1 in 2 year storm event which has been the established design criteria for this drainage system.

We would note that the 0.4 m of freeboard provided a margin of safety against flooding for the 1 in 2 year event storm and provided additional capacity within the channel for larger storm events. Removal of the freeboard removes the margin of safety and would theoretically result in any storm larger than the 1 in 2 year event overtopping the banks of the drain and potentially causing flooding of the adjoining lands.

A detailed review of the modeling inputs and the model will allow Burnside to confirm the capacity of the proposed channel and to determine if further cost savings can be found in this regard. It is also noted that the reduced cross section impacts less land on either side off the existing drain. Considering the nature and value of the crops being grown in the market garden farm area, all efforts to minimize the land required should be considered.

On the basis of the information provided by Dillon, we recommend that efforts be made to reduce the channel cross section as proposed by Dillon and the modeling be reviewed to provide confirmation.

4.2 Overflow Area No. 1

Burnside would like to better understand the benefits of Overflow Area No. 1 and the need for that area to provide “sufficient outlet” for this Municipal Drain. We believe a review of the model may provide some clarity in this regard. It is noted however that the creation of a flood storage area is being provided by the construction of Overflow Area No. 1 and yet the report requires that lands immediately upstream which are currently being flooded and therefore providing flood storage are being bermed to prevent the flooding of adjoining lands. Specifically we note that lands which currently flood between the 5th Sideroad and Highway 400 are being bermed to contain the flood water within the channel. This applies to the lands immediately above Hwy 400 as well.

Without the benefit of reviewing the model to date this seems to be a contradiction. The speculation is that there would be merit in allowing flood storage to continue where it currently occurs and avoid the construction of storage in one area and constraining berms in another.

We recommend that Phase 2 of our review be authorized to allow Burnside to confirm the need for Overflow Area No. 1.

4.3 Highway 400 Crossings

The Highway 400 and Reive Road culvert crossing have been long considered by the upstream owners as a significant restriction to the outlet capacity of the Drain. We understand that the hydraulic model for the drain indicates that for a 2-year storm event that the backwater levels only extend to the 2nd Line. If the culverts were completely removed the water levels upstream of the 2nd Line would be unaffected. However, we understand the perception that from a practical logistic perspective that lowering of these culverts or at least providing a supplementary lower culvert may benefit the upstream lands.

Obviously as the Hwy 400 culvert crossings are of prime concern to the property owners, a technical review of the model in regard to these crossings is warranted. It is noted that Dillon suggested that consideration could be given to boring a small diameter culvert (800 mm diameter was suggested) at the grade of the proposed drain bottom. We support that this should be modeled as an option to determine the benefit.

We note that any work on the Hwy 400 and Reive Road crossings will be very expensive and although such work if required by the Final Engineers Report would be included in the overall total cost of the project, that Section 26 requires the cost of road crossings to be assessed to the respective road authority and therefore inclusion of this work would not adversely affect the cost assessed to the property owners on the Drain.

As the cost of any work will be significant, there will need to be strong technical evidence provided to the MTO to satisfy them that the work is required as any proposal to adjust the crossings will be heavily scrutinized by the Ministry.

4.4 Sharing Farm Crossings

There are four major farm crossings on the Main Drain portion of the South Innisfil Creek Drain which are to be replaced within the Engineers Report as currently written. For the most part these crossings serve the Market Garden Lands. An option has been presented by Dillon since the Final Engineers Report was submitted to consider low flow crossings rather than the larger and more expensive bridge crossings to reduce the overall cost. There has been general feedback that low flow crossings would not provide the required level of service for the frequent crossing required by the Market Garden Land. Dillon had also proposed that "shared" crossings be considered where one crossing would serve 2 properties with the anticipation that the crossings would be placed on the property lines and hence accessible to both owners.

We support and recommend that efforts need to be made to reduce the number of bridge replacements on private property. This will require some discussions with the adjoining owners and possible access agreements to address the very minor encroachments on the adjoining land to make use of the full width of the crossing. It is also noted that the general response was that low flow crossing would not be acceptable. In the past and based on the latest available imagery for the area, there was/is a property on the downstream edge of the Market Garden area which is not used extensively. This raises a question whether a reduced standard of crossing (low flow crossing) could be considered for this property.

We believe that efforts should be made to reduce the number of crossings and type of crossings which would have a positive impact on the overall cost of the Drain. It is noted that reducing the number of crossings may have a positive effect on the hydraulic capacity of the Drain as well.

4.5 Farm Crossing Foundations

The original geotechnical investigation and subsequent report dated February 19, 2007 as prepared by Golder Associates provided a general description of the proposed farm crossings. Each crossing was proposed to consist of a low profile 8350 mm span x 3300 mm rise corrugated steel pipe bottomless arch supported on a concrete slab extending 600 mm wider than the culvert spans with the slab embedded a minimum of 600 mm below the drain bottom. It was further recommended that the native materials be sub-excavated a minimum of 0.5 m below the proposed founding elevations and replaced with compacted granular fill.

Additional field investigation was carried out and a report dated February 2013 prepared by Golder pertaining to the construction of the proposed farm crossings. It is stated in the second report that "*the subsurface conditions are not capable of supporting the shallow raft foundations originally proposed by Dillon without inducing unacceptable settlements (greater than 25 mm)".* It is further stated that "*if settlement of the crossing structures is not acceptable, the structures should be supported on deep foundations extending into the hard clayey till and dense to very dense silt and silty sand deposits".*

As a result of the above, the design of the proposed farm crossings as set out in the Final Engineers Report include deep pile foundations to support the 8052 x 3049 corrugated steel pipe bottomless arch structures.

The geotechnical reports have not quantified the anticipated maximum settlement that may occur but have only stated it may be greater than 25 mm. If the anticipated settlement was in the order of magnitude of 25 mm we believe that this amount of settlement could be acceptable for a farm crossing. It may not be acceptable for a road crossing but for a farm crossing we believe settlement in this order can be accommodated.

Burnside recommends that Golder be approached to determine the maximum anticipated settlement for the proposed crossings and that consideration be given to accommodating the anticipated settlement in the design to remove the need for the deep foundations for the proposed structures.

4.6 Proposed Grade Line

It was noted through our review and was also identified by representatives of the property owners that the proposed grade line downstream of Hwy 89 is actually below the existing bottom of the watercourse. However, there was no work proposed in the Engineers Report on this section of the Drain.

We also note that the original Drain grade from 400 culverts upstream was at a profile of 0.04% and downstream of 400 was 0.05% to the 5th Sideroad. Although these grades are not consistent with the proposed grades as shown in the report drawings it is acknowledged that the hydraulic modeling may have dictated the optimum grades in this area.

We concur and recommend that if the Drain is to extend downstream to the 15th Line and if the existing channel bottom is indeed above the proposed grade line that work to correct this should be undertaken concurrently with the rest of the improvements. The alternative could place the Town in the position that maintenance would be required immediately after the rest of the work is completed. It would seem much more efficient to have it done concurrently with the rest of the work.

With regard to the profile grade, it is anticipated that the technical review of the modeling will assist in determining the optimum profile grade line for the Drain.

4.7 Overflow Area No. 3

This overflow area is located immediately south of the 5th Line and west of the South Innisfil Creek Drain. It is to provide detention storage during the 1 in 2 year storm to attenuate the flows and increase the downstream conveyance capacity. It is approximately 6 hectares and would provide approximately 50,000 cubic metres of storage. The Engineers Report states that "*the 5th Line Overflow Area* (Overflow area No 3) *reduces the magnitude of the drain improvements downstream and lessens the severity of possible flooding from larger storm events exceeding the 1 in 2 year storm."*

We recommend that Phase 2 of our review be authorized to allow the technical review of the hydraulic modeling and for Burnside to provide technical comments on the merits of constructing Overflow Area No. 3.

4.8 3rd Line Branch Drain

We note that the Engineers Report requires significant improvements to the 3rd Line Branch Drain and the 3rd Line Branch Drain Spur including deepening and the replacement of the majority of crossing culverts. It is noted that the public have suggested that there has not been any specific and identified problems with the 3rd Line Branches as they currently exist. We expect that the 3rd Line Branches do require cleaning as to the best of our knowledge they have not been maintained in recent history. As they are part of the current By-Law which adopted D. H. Weir's 1954 report, there is limited documentation available to provide direction relative to any future maintenance.

Although there has been suggestions that the 3rd Line Branches could be addressed in a separate future Engineers Report under Section 78 of the Drainage Act, we believe this would place the Town in a position where they would not be able to maintain the 3rd Line Branches until such a report was prepared and the subsequent By-Law passed. As the 3rd Line Branches were part of the original drainage system and included in the current By-Law A40, we recommend that it would be more efficient and practical to include in the new report and By-Law for the South Innisfil Creek Drain and Branches.

We have noted that there are approximately a dozen new replacement crossing culverts proposed on the 3rd Line Branches. Many of the culvert replacements proposed are a result of lowering the grade of the Drain bottom and are providing significantly longer structures thereby providing much wider platform widths on the crossings. We would raise the question whether providing a design that may more closely represent a maintenance project but inclusion in the report to facilitate the cleanout and future maintenance may be an appropriate course of action.

We recommend that the proposed profile grade for the 3rd Line Branches be revisited in an effort to reduce the number of replacement culverts required, that the required platform width of the crossings be reviewed and that similar to the Main Drain crossing that opportunities to share crossings between property owners be considered. Any reductions in the number of culvert replacements and the extent of deepening of the drain would facilitate a reduction in the overall cost

4.9 10th Sideroad Branch

There are less crossings existing and proposed on the 10th Sideroad Branch although a significant change in drain depth and cross section is proposed. Based on our document review with specific reference to comments from the public, we note very little communication with respect to this Branch.

Our comments above regarding to the 3rd Line Branches related to the inclusion of the Drain Branches in the new report and By-Law apply to the 10th Sideroad Branch as well.

We recommend that communications with the property owners affected by the 10th Sideroad Branch be undertaken to further determine the level of improvement required on this Branch and that possible revisions to the scope of the required improvement be considered towards reducing the amount of work required. Further that the 10th Sideroad Branch continue to be part of the Engineers Report for the South Innisfil Creek Drain and Branches.

4.10 Hnydczak Outlet Relief Drain

A significant deepening of the channel downstream of the Hwy 400 crossing culverts is proposed in the Engineers Report which we anticipate will improve the capacity of the Hnydczak Outlet Relief Drain. It is anticipated that this will hydraulically allow more of the runoff flows from the upstream Hnydzcak Drain to be directed through the Relief Drain and hence provide more capacity for the South Innisfil Creek Drain to accommodate upstream flows. It is anticipated that the model demonstrates the effect of the proposed work on the Hnydzcak Outlet Relief Drain.

The effect of providing a low flow culvert at the lower elevation of the upstream Hnydzcak Drain under the Hwy 400 and Reive Road has not been addressed within the Engineers Report although we expect this analysis could be easily undertaken within the hydraulic model.

We recommend that Burnside be authorized to proceed with Phase 2 of this review which will allow confirmation of the positive affect of the proposed work and to complete an analysis of the influence of placing a small culvert at a lower elevation to supplement the existing crossings.

5.0 Summary

The initial March 31, 2005 Order of the Ontario Drainage Referee set out clear direction for the appointment of a Drainage Engineer to prepare a new Engineers Report under Section 78 of the Drainage Act to contemplate improvements to the South Innisfil Creek Drain and Branches and to consider specific improvements and/or changes to the Drain. The Preliminary Engineers Report of 2006 set out proposed works and provided estimated costs based on the preliminary engineering completed to date. The second Order of the Ontario Drainage Referee was very specific regarding the works that were to be included and required the Engineer to include Option No. 1 and Option No. 3 as set out in the Preliminary Report to be implemented. The estimated cost for the anticipated work based on the 2006 estimates (Options No. 1 and No. 3) was approximately $4.9 M.

The Final Engineers Report followed the Order of the Referee to implement Option No. 1 and Option No. 3. As a result of inflation affecting the cost of construction, work required to address agency requirements around fisheries and the natural environment, unanticipated foundation costs for structure foundations and the rise in land value which affected the amount of allowances to be paid, the cost estimate in the 2013 report increased to $6.7 M. To some extent such a cost increase should not be unexpected considering the contributing factors. It is noted that some preliminary analysis of possible cost saving measures actually completed by Dillon produced a preliminary cost estimate of approximately $5.0 M which is only marginally over the 2006 estimate of $4.9 M.

We acknowledge that any of the above cost estimates place a heavy financial burden on the affected property owners even though the cost benefit ratio as calculated by Dillon is still positive. We believe that there should be continued efforts to reduce the scope of the work that affects the individual property assessments and yet maintains the level of service established by the 1 in 2 year storm event design criteria. Further, Burnside is optimistic that through the specific analysis of the drain components described in the previous sections that some cost savings can be found to make the South Innisfil Creek Drain and Branches improvement project more palatable.

There are recommendations included above that identify the need to carry out Phase 2 of the review which is the technical review of the hydrologic and hydraulic modeling of the Drain and the review of the details cost estimates for the proposed work.

As an aside, we would note that the desire to have the South Innisfil Creek Drain improved was driven by a number of storm events that were centered over this drainage area and exceeded the capacity of the Drain. Those storm events were in fact larger than the design criteria of a 1 in 2 year storm event which is the design criteria for this drain and the typical design criteria used for Municipal Drains across Ontario. The improvements proposed will assist to mitigate the effect of larger storm events larger than the design criteria. The area to the best of our knowledge has escaped any recent storm events that have caused similar damage. It should be anticipated that such a similar event may occur again at some point and consequently we caution that lowering the level of service relative to the drain capacity would not be appropriate.

If you have any questions or require clarification in regard to matters discussed above, please contact our office.

Yours truly,

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DMcN:lm

Enclosure(s) None