

CRH Canada Group Inc. 2300 Steeles Ave W, 4th floor Concord, Ontario L4K 5X6 Canada

T. 905-761-7100 **F.** 905-761-7200

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Mr. Shawn Persaud Township of Tiny 130 Balm Beach Road West Tiny, ON L0L 2J0 November 13, 2019

Dear Mr. Persaud:

RE: Letter of Objection to an Application for a Category 3 Class A Licence under the Aggregate Resources Act – North ½ of Lot 80, Concession 1, W.P.R & Part of Original Road Allowance between lots 80 and 81, Concession 1, W.P.R, Township of Tiny, County of Simcoe (Cedarhurst Quarries and Crushing Limited (c/o CRH Canada Group Inc.)

Thank you very much for meeting with CRH on September 12, 2019 to discuss the status of the Township's technical review and we appreciated your acceptance of our October 4, 2019 follow up responses. On October 29, 2019 we received and reviewed the following peer review comments: Burnside Hydrological Peer Review dated September 11, 2019; Burnside Traffic Impact Peer Review dated September 11, 2019; Aercoustics Acoustic Peer Review dated July 10, 2019; Burnside Site Operation Peer Review dated September 11, 2019; and Severn Sound Environmental Association Natural Environment Peer Review dated September 27, 2019. Enclosed in attachment one is a chart summarizing the current status of the technical issues and additional CRH responses. Can the Township please provide these responses and attachments to the Township peer review team for confirmation that this addresses all outstanding issues.

We trust that this information adequately addresses the Township's outstanding comments. CRH will now update the site plans with the commitments as outlined in this letter, and provide a copy to the Township and MNRF.

If you have any questions, please do not hesitate to call.

Respectfully submitted,

Jessica Ferri, MCIP, RPP

Manager, Policy and Planning CRH Canada Group Inc.

Attachments:

- 1. Figure 1 CRH Response
- 2. Memorandum prepared by Goodban Ecological Consulting Inc., 2018 and 2019 Surveys for Eastern Whip-poor-will, August 29, 2019
- 3. Traffic Impact Study prepared by C.F. Crozier & Associates Inc., October 4, 2019
- 4. Letter prepared by GHD regarding Professional Opinion Regarding Neighboring Domestic Wells, September 25, 2019
- 5. Letter prepared by GHD regarding Response to Hydrogeological Comments #1, #2, and #3f, September 23, 2019
- 6. Sign-off from MECP regarding Whip-poor-will memo dated October 25, 2019

Attachment 1



Figure 1: CRH Response

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	Township Comment	CRH Response June 20, 2019	Status of Issue Based on September 12, 2019 Meeting	Peer Review Responses provided to CRH October 29, 2019	CRH Response Nov 7, 2019
			Hydrogeological		
	The hydrogeological assessment completed by GHD does provide some additional information on the geology in the vicinity of the sump pond/wash pond, however there is no discussion on how water levels in the ponds relate to levels in the local aquitard, the Newmarket Till and the Upper Thorncliffe.	The sump and wash ponds are located on the adjacent Teedon Pit. Discussion on how the ponds relate to the geology is not related to the pit extension application. For reference, we have included an electronic copy of the report prepared by GHD for the Teedon Pit titled "Category 1 Permit-to-take-Water Renewal Application – Supporting Hydrologic and Hydrogeologic Study".	CRH maintains the position that the wash plant is unrelated to the extension application. The wash plant and pond are located on the existing pit and is governed by MECP. If MECP does not permit the renewal of the existing permit, CRH will still proceed with the extension application as proposed. At our September 12, 2019 meeting, the Township requested the borehole logs for all drill holes in the vicinity of the wash pond, cross section drawings and a memo from GHD summarizing the reasons that the washing operation will not adversely impact wells. As requested, please see attached letters from GHD: • Letter dated September	Additional comments from Burnside dated September 11, 2019: "Although the wash pond and sump are not located on the proposed new pit site, the wash ponds and sump will eventually be used to wash the aggregate extracted from the new pit. As result, the existing wash ponds and sump are integral to the operation at the proposed new pit. Therefore, their impact on groundwater and surface water resources in the area should be considered as part of the new pit application. The information presented in the PTTW renewal application documentation does not provide the necessary site-specific information to	The wash plant and pond are located on the existing pit and is governed by MECP. If MECP does not permit the renewal of the existing permit, CRH will still proceed with the extension application as proposed. At our September 12, 2019 meeting, the Township requested the borehole logs for all drill holes in the vicinity of the wash pond, cross section drawings and a memo from GHD summarizing the reasons that the washing operation will not adversely impact wells. CRH submitted this requested information on October 4, 2019. Please see attached letters from GHD: • Letter dated September 25, 2019



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			25, 2019 regarding Professional Opinion Regarding Neighboring Domestic Wells • Letter dated September 23, 2019 regarding Response to Hydrogeological Comments #1, #2, and #3f	assess the impacts due to the on-going use of the wash pond and associated infrastructure to wash material from the proposed expansion. Burnside reviewed a January 8, 2019 GHD letter to CRH from GHD (Hydrogeological Assessment-Location of Water Table) which is available on https://www.dufferinaggregates.com/resourcecentre The report provides Borehole logs for some of the holes drilled in 2018 and includes cross sections. This information should be presented in a stand-alone documents that addresses impacts of the wash pond."	regarding Professional Opinion Regarding Neighboring Domestic Wells • Letter dated September 23, 2019 regarding Response to Hydrogeological Comments #1, #2, and #3f
2.	The addition of the new wells improves the understanding of the geology on the existing pit site and in the proposed pit extension area. The following additional information is required for Burnside to complete their peer	Please refer to the GHD report mentioned above as it addresses the requested information.	See response to Item 1 for the outstanding items the Township has requested.	Additional comment from Burnside September 11, 2019: "The PTTW report does not include any information from the boreholes/monitoring wells drilled in 2018. Several of the boreholes/monitoring wells are in close proximity	The PTTW report is not part of the extension application. CRH has provided this requested information on October 4, 2019. Please see attached letters from GHD: • Letter dated September 25, 2019 regarding Professional



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	 A table showing the dates that the manual water level data was collected and hydrographs showing the results for each well; Borehole logs for the wells so that the geology can be seen at each location. Based on the cross sections, it appears that the sump pond/wash pond is effectively isolated from the underlying aquifer. The borehole logs would assist us with the interpretation of the extent of the silt and clay aquitard; and A "regional" cross section that includes the reported depths of the wells reportedly impacted by previous operations at the quarry. 			of the wash pond and would be helpful in confirming the presence of silt/clay aquitard that may be present."	Opinion Regarding Neighboring Domestic Wells • Letter dated September 23, 2019 regarding Response to Hydrogeological Comments #1, #2, and #3f
3(a)	Burnside recommends that:	The proposed Teedon Pit Extension is an above water pit. GHD concluded	Requested information has been provided. See response to Item 1.	Additional comment from Burnside September 11, 2019:	The extension application is for a Category 3 Pit above the water table.



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• The current condition of nearby domestic wells be established, including the well depth and condition of the casing/screen, the well yield and general water quality. that there would be no impact to local wells. To date there have been three (3) domestic well surveys completed: the first in 2015 was completed by Alpha Environmental where 27 wells were included: the second in 2017, was conducted by GHD on behalf of CRH where 5 were included; and the third, in 2018 included 78 domestic well surveys which was also conducted by GHD on behalf of CRH. For your information we have also included this report titled "2018 Domestic Well Survey" electronically.

"The majority of well concerns reported by residents were related to the presence of silt in their wells which many believed were the result of leakage from the wash pond. In their documentation of the domestic well survey GHD indicates the "the presence of the Local Aquitard would isolate the aggregate washing operations from the deeper aquifer". GHD should use the water level and geologic information from all the wells on the existing site and proposed expansion area to create cross sections that show the lateral and vertical extent of the Local Aguitard and how it relates to the domestic wells with reported siltation problems. Groundwater flow maps using the water level data from the site will be helpful in showing which domestic wells are downgradient of the existing and proposed site."

Neighbour well complaints are unrelated to extraction above the water table. For information purposes CRH has provided the Township with all additional work done completed by CRH. In addition, CRH forwarded the MECP letters that concur with the study's findings that well complaints are not caused by existing Teedon Pit operations. CRH has provided this information on October 4. 2019. Please see attached letters from GHD:

- Letter dated September 25, 2019 regarding Professional Opinion Regarding Neighboring Domestic Wells
- Letter dated September 23, 2019 regarding Response to Hydrogeological Comments #1, #2, and #3f



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3(b)	Manual monitoring be done at least monthly and that Automatic Water level Recorders (AWLR's) be installed so that the peak spring water levels in 2019 can be captured and used to confirm that the proposed Teedon Pit Extension pit floor elevation is 1.5 m above the high-water table.	AWLR's have already been installed in all the monitoring wells at both the Teedon Pit and the proposed extension lands. CRH commits to revising Note #42 on the proposed Teedon Pit Extension operations plan to reflect the Town's request to have AWLRs loggers installed and for the wells to be monitored monthly.	Item resolved.
3(c)	• An additional monitoring well be installed between MW9-18 and MW8-18 to provide data on the water table as there are no other wells on the Teedon Pit Extension property that are completed in the sand aquifer. Similarly, an additional well should be installed along the eastern edge of the proposed extraction area. Wells on the Teedon Pit to the south should be included in the	CRH commits to revise the Teedon Pit Extension site plans to include the additional following note: "One year prior to extraction commencing, two additional monitoring wells shall be installed. One between MW9-18 and MW8-18 and the second shall be installed along the eastern edge of the extraction area". The additional monitoring wells referenced above will be added to Note #42	Item resolved.



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	monitoring program.	and to the monitoring well schematic on the Teedon Pit Extension operations plan.	
3(d)	The Monitoring Program should include provisions to modify operations in the event the pit floor is less than 1.5 m above the water table.	The Teedon Pit Extension operations plan Note #44 already indicates that operations will be modified based on measured water levels. Note #44 states: "Extraction shall remain 1.5 metres above the established water table. In the event the water level data indicates the maximum depth of extraction is less than 1.5 metres above the established water table, the maximum depth of extraction shall be adjusted accordingly to maintain the 1.5 metre depth."	Item resolved.
3(e)	 Additional data be collected using AWLR's to confirm the water table elevation until the Teedon Pit Extension 	As noted in response to 3(b) and 3(c), the AWLR loggers have already been installed and Note #42 on the Teedon Pit	Item resolved.



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	begins operations. Water level collection only began in June 2018 and may have missed peak spring water levels.	Extension Operations Plan will be revised to reflect this, the requirement for monthly monitoring, as well as the addition of the 2 monitoring wells.			
3(f)	• Testing be completed to evaluate the connection between the existing wash pond and the underlying aquifer. This may require the installation of additional shallow monitoring wells near the wash pond so that the water table can be monitored, and vertical gradients can be calculated. If it is found that the pond has the potential to impact groundwater water quality/quantity, then consideration should be given to the installation of a liner.	The testing and monitoring requirements for the wash pond are not related to the Teedon Pit Extension and are subject to the PTTW application process. For reference refer to the GHD report titled "Category 1 Permitto-take-Water Renewal Application – Supporting Hydrologic and Hydrogeologic Study".	See response to Item 1.	Additional comment from Burnside September 11, 2019: "The wash pond will be used to wash material from the proposed pit expansion and the comment above should be addressed." The reference to the "comment above should be addressed" is the same comment as shown in the left column.	No washing of aggregates is proposed on the extension property. Please refer to the response to Item 1.



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Traffic

4(a) The Application material did not include a Traffic Impact Study, however it did include some traffic-

did include some trafficrelated information.

• In order to determine the impacts on Darby Road and on the Highway 93 intersection, a Traffic Impact Study (TIS) must be provided. It is acknowledged that the licensed extraction rate and truck volumes are not proposed to increase, however the length that the pit will be in operation will change. Based on the maximum annual extraction volume of 600,000 tonnes, it will take an additional 17 years of operation to exhaust the Teedon Pit Extension supply {assuming the existing Teedon Pit is near the end of its life). This should be a

consideration in

As requested, CRH commits to conducting a Traffic Impact
Assessment which will assist in determining the maneuverability conditions of Darby Road and will assess the intersection at Highway 93 & Darby Road. This will be completed and submitted to the Township for review.

Enclosed please find a copy of the traffic impact study prepared by C.F. Crozier & Associates Inc. dated October 4, 2019.



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	determining the revised traffic impact. • The alignment of Darby Road has a sharp bend at its intersection with Highway 93. The sight distances at this intersection are limited by the horizontal alignment on Highway 93. The traffic operations at the intersection of Darby Road and Highway 93 should be confirmed in the TIS. Safety issues (collision history) should be reviewed for the haul route (and intersection) to determine if there have been any incidents from the existing Teedon Pit operations.				
4(b)	• A scenario with 15 trucks idling close to the entrance before 5:00 am will impact the functionality of Darby Road in this area. This matter needs to be addressed.	A scenario with 15 trucks idling close to the entrance before 5:00 am is a scenario that should not occur. CRH encourages the Township to post no stopping signs along Darby Road to	Enclosed please find the TIS and please note the following information - The Township has agreed to install No Stopping signs along Darby Road at CRH's expense. CRH also commits to cover the cost	Additional comment from Burnside September 11, 2019: "The anticipated TIS report should confirm the measures proposed to address the potential for off-	CRH suggests the Township install "no parking" signs along Darby Road at CRH's expense. CRH also commits to cover the cost for paid OPP officers to monitor and ticket trucks in the



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prevent this from occurring. CRH is prepared to cover the costs for the signage. If there are concerns related to the existing pit or proposed pit CRH remains committed to work with the Township and surrounding residents to ensure this is not happening. If required, CRH could open its gates earlier to avoid truck queuing on Darby Road.

Item #5 from the Township of Tiny Staff Report (dated February 28, 2019) notes that there is no basis given for the estimate of 20 trucks incoming and ongoing from the pit on the worst peak hour. The model prepared in the Acoustic Assessment Report identified 20 trucks (40 passes) as being the maximum amount of trucks permitted in order to comply with MECP NPC-300 for Class 2 and 3 areas.

for paid OPP officers to monitor and ticket trucks in the event the No Stopping signs are not being adhered to. CRH also commits to communicate the hours of operation to its customers and truck drivers to prevent trucks from arriving prior to 5 am.

As discussed at our meeting, during peak hours at the existing pit, there have been 20 trucks (40 truck trips) per hour and subject to approval of the extension, this will now be the maximum trips permitted in any given hour.

site queuing, as well as confirm whether off-site queuing has been observed under existing operations.

The response suggests that the noise criteria will limit the truck volume to 40 trips in the peak hour. This maximum rate should be confirmed in the anticipated TIS and set out in the site plan agreement, along with monitoring provisions to ensure that this maximum is adhered to. The TIS should also provide an estimation of the peak hour truck trips that are currently experienced at the existing pit, to provide a sensitivity analysis as to whether the future traffic impacts are expected to increase, as compared to existing conditions."

event the No Stopping signs are not being adhered to.. CRH continues to commit to communicate the hours of operation to its customers and truck drivers to prevent trucks from arriving prior to 5 am.

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As discussed at our meeting on September 12, 2019, during peak hours at the existing pit, there have been 20 trucks (40 truck trips) per hour and subject to approval of the extension, this will now be the maximum trips permitted in any given hour.



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It is noted that the Township has been approached by the Sarjeant Company Limited regarding a proposal to use the existing CRH entrance for their two pits. It is the Township's understanding that no formal application has been made to the MNRF

relative to this proposal.

The potential Sarjeant proposal is unrelated to the proposed Teedon Pit Extension. As previously discussed with the

Township, this scenario would require major site plan amendment under the Aggregate Resources Act to both Sargent and CRH's existing Teedon Pit site plans. No application has been made to the MNRF and if ever an application was to be submitted, the Township, County, and the public would be circulated for comment.

No application has been submitted and there are no plans to submit such an application.

Although no application has been submitted, the Teedon Pit site plans will only permit a maximum of 15 trucks (30 truck trips) per hour prior to 7:00 am and 20 trucks (40 truck trips) per hour during daytime hours. This is the maximum number of trucks that can exist on the site per hour regardless of the origin of trucks.

Additional comment from Burnside September 11, 2019:

"The anticipated TIS report should confirm CRH's position with respect to the potential interconnection between the two pits, as well as whether such interconnection could have merit from a traffic impact perspective. It is noted that the Township does not support the joint use of the Darby Road entrance for interconnection of the Sarjeant and CRH pits."

No application has been submitted and there are no plans to submit such an application.

Although no application has been submitted, the Teedon Pit site plans will only permit a maximum of 15 trucks (30 truck trips) per hour prior to 7:00 am and 20 trucks (40 truck trips) per hour during daytime hours. This is the maximum number of trucks that can exist on the site per hour regardless of the origin of trucks.

Noise

5(a) A scenario with 15 trucks idling close to the entrance of the pit was modelled and it was found to have the potential to cause an objectionable noise impact. This matter needs to be addressed.

CRH is unclear why the Township's noise peer reviewer modelled this scenario. As noted above, a scenario with 15 trucks idling close to the entrance before 5:00 am is a scenario that should not occur. CRH

Item resolved.



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		encourages the Township to post no stopping signs along Darby Road to assist in preventing this from occurring. CRH is prepared to cover the costs for the signage. If there are concerns related to the existing pit or proposed pit CRH remains committed to working with the Township and surrounding residents to ensure this is not happening. If required, CRH could open its gates earlier to avoid truck queuing on Darby Road.	
5(b)	The following additional information is required for Aercoustics to complete their peer review: •The operator should confirm that a 10 m high working face, which was modeled in all worst-case scenarios that forms an integral part of the noise control design,	CRH confirms that this is feasible based on the planned loader sizes and required safety and labour laws.	Item resolved.



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	can be maintained at all times and is feasible in the context of the planned front-end loader sizes, according to safety (working face structure) and labour laws (i.e. permitted height above the top of extended bucket).		
5(c)	Restrictions on the number of permitted equipment and maximum sound level permitted should be incorporated in the licensing document.	As requested, CRH commits to including the equipment list and its associated maximum sound power into the proposed site plans and under the section titled "Equipment to be used Onsite and Noise/Air Mitigation". In addition, this equipment list and sound power readings are identified in Section 2.0 of the Acoustical Assessment Report.	Item resolved.
5(d)	 Modelling parameters for the surrounding foliage such as height of trees and elevation of the ground relative to the 	Please see attached memorandum from Theakston Environmental.	Item resolved.



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	existing topography at each point of the foliage object should be provided.			
5(e)	Confirmation is required to be provided that the noise reduction due to foliage is reasonable for 12 months.	Please see attached memorandum from Theakston Environmental.	Item resolved.	
5(f)	• There are acoustic barrier requirements and other noise controls outlined in the noise study which apply to the existing Licence. It should be confirmed whether requirements and noise controls will be implemented on the existing Licence and whether they will be feasible to implement and/or enforce.	CRH has submitted a minor site plan amendment to MNRF to permit the construction of the acoustic berms and restrict the location of the genset trailer on-site so that this can be completed immediately.	Item resolved.	
	Site Operation			
6.	The Operational Plan - Imported Materials, Note 50 specifies that "where	Note #49 on the proposed Teedon Pit Extension operations plan, states	Item resolved.	



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	the imported material is not being placed within 1.5 metres of the surface, the criteria under Table 1 for Sodium absorption ratio and electrical conductivity do not have to be met." With the local groundwater sensitivity, we would recommend that Note 50 be replaced with "No fill shall be imported and disposed of at the site other than to establish slopes as specified in the Rehabilitation Plan."	that "clean inert fill may be imported to facilitate the establishment of side slopes." CRH confirms that we will modify this note and add a new note to the rehabilitation page to state that "no fill shall be imported and disposed of at the site other than to establish slopes as specified in the Rehabilitation Plan."		
7.	Considering the above noted point, the Township recommends that asphalt recycling be removed as a permitted use at the existing licensed Teedon Pit.	An asphalt recycling note does not exist on the proposed Teedon Pit Extension site plans and is unrelated to the extension application.	Item resolved. CRH commits to further revise the Teedon Pit Extension site plans to prohibit the storage of asphalt in the extension.	
8.	The Rehabilitation Plan - Tree Planting Schematic proposes an agricultural use in the pit floor, however, fertilizers and	There are several areas within the Township where agriculture is within 1.5m of the water table. To enhance biodiversity	Item resolved.	



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	other agricultural chemicals used for normal farming practices may negatively impact the aquifer especially considering the final depth of extraction will be a maximum of 1.5 metre above the established groundwater table. It is recommended that the rehabilitation plan be revised to remove this proposed use and replace it with a tree planting plan.	after extraction is complete, CRH will commit to revise Note #5 and Note #6 on the proposed Teedon Pit Extension Rehabilitation Plan to reflect the continuation of the setback and slope tree planting to the pit floor.		
			Natural Environment	
9.	Table 2 of the NETR lists Species At Risk (SAR) with potential to occur in the study area. Since this table does not include endangered bats, it is not clear that SAR bats and their habitat (e.g., snags/cavity trees suitable for bat roosting or maternity sites) were considered in the preparation of the NETR, and clarification or	MNRF is satisfied with the work related to Species at Risk as it relates to the Endangered Species Act with the exception of whip-poor-will surveys. CRH has committed to do the whip-poor-will surveys this spring/ early summer and provide the survey results to MNRF.		Please see the attached email providing confirmation from MECP that they have no concerns related to the whip-poorwill survey.



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	additional information may be required. The SSEA defers to the Ministry of Natural Resources and Forestry (MNRF) on issues related to the Endangered Species Act, and understands that MNRF will be reviewing the proposal.			
10.	The NETR references the MNRF's Significant Wildlife Habitat Technical Guide (2000), and indicates that the Significant Wildlife Habitat (SWH) Criteria Schedules for Ecoregion 6E (MNRF 2015) were also consulted. The SWH Ecoregion Schedules provide specific criteria for identifying candidate and confirmed SWH. Clarification is required regarding the following types of SWH: • Amphibian Breeding Habitat (Woodland) -	See attached memorandum from Goodban Ecological Consulting.	Item resolved.	



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according to the NETR, swamp community SWDM4a is within approximately 120 m of the proposed extraction area (see Figure 5), and several amphibian species including wood frog, spring peeper and gray treefrog were documented on site (section 5.4). As per the **SWH Ecoregion** Schedule, if these amphibians are present in sufficient numbers, the wetland plus a 230m radius of woodland area would be considered SWH and the NETR would have to address any potential negative impacts. The NETR does not discuss whether or not this area qualifies as candidate or confirmed SWH, and further information is required. • Woodland Area-Sensitive Bird Breeding Habitat - area-sensitive

bird species were documented in the



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	NETR at station 3 and 4 (see Attachment E, Point Count Data Summary), however these station locations were not included in the SWH mapping shown on Figure 8. Further explanation is required.		
11.	Planting as proposed for Forest Edge Management should include follow-up survival assessments of planted stock. Replacement planting should be undertaken, if necessary due to poor stock survival.	CRH will commit to adding the following to the forest edge management zone A and B on the Teedon Pit Extension operation plan: "The forest edge management zones shall be monitored for survival in the first, second and fifth years after planting. Replacement planting should be undertaken if survival is less than 60% for each species."	Item resolved. As requested CRH will change the "should" to "shall". The revised note will read: "The forest edge management zones shall be monitored for survival in the first, second and fifth years after planting. Replacement planting shall be undertaken if survival is less than 60% for each species."
12.	Survival assessments for rehabilitation tree planting of setbacks and side slopes:	Note #7 on the Teedon Pit Extension Rehabilitation Plan already requires a one (1) and two (2) year assessment. CRH	Item resolved.



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	 Survival assessments should be done at years one, two and five (freeto-grow assessment), as is currently the practice of tree planting agencies like Trees Ontario/Forests Ontario, rather than just in the first and second year after planting as indicated in the NETR. The bullet regarding replacement planting if survival is less than 60% should be modified to indicate that 60% survival of each species is required to ensure post-planting species diversity. 	commits to modifying this note to also require the five (5) year assessment. In addition, the note will be modified to require 60% survival of each species.	
13.	The SSEA would like to be provided with information on the projected timing of extraction for the site. If extraction is anticipated to be a considerable ways off, then management of forested areas on site may be	Tree Clearing Schematic Note #3 on the proposed Teedon Pit Extension Operations Plan indicates that "as extraction progresses north tree clearing shall occur as required to advance extraction and minimize the disturbed area". The	Item resolved.



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appropriate; in addition, the species proposed for use in rehabilitation planting should be reassessed at a later date, to ensure that they are still appropriate and practical for climate and site conditions, according to the best available information at that time.

Management Plan is focussed on the enhancement of trees that will remain and trees to be planted. Management plans for trees to be removed is not beneficial to the site.

The trees proposed for the rehabilitation planting are appropriate. Tree Planting Schematic (Reforestation of Side Slopes) Note #4 on the proposed Teedon Pit Rehabilitation Plan will be revised to include the following at the end of the note:

"...or other appropriate species recommended by a qualified ecologist at the time of planting."



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In addition, item #3 from the Township of Tiny Staff Report (dated February 28, 2019) also included additional comments from the Burnside peer review response dated February 15, 2019 (Appendix #5 of Staff Report) regarding recommendations 1, 2, 3 and 4 from Burnside's February 24, 2016 letter to the Township. The recommendations are addressed below:

	Township Comment	CRH Response June 20, 2019	Status of Issue Based on September 12, 2019 Meeting
14	The current condition of nearby domestic wells should be established, including the well depth and condition of the casing/screen, and the well yield and general water quality. The work should be completed by the proponent using an independent qualified consultant.	Please see response to comment #3(a) on page #2 of this response.	See response to issue 3(a).
15	The monitoring network at the Teedon Pit should be expanded to include a staff gauge in the wash pond, a nested well with screens completed at a variety of depths (to monitor change in gradients during use of the wash pond), along with a number of wells completed in the aquifer(s) that are used by domestic wells in the area. A professional geoscientist (or equivalent) should be present during the drilling of the wells to describe the geology and select the intervals for monitoring well completion.	Please see response to comment #1 on page #1 of this response.	Item resolved.
16	The proponent should provide additional information such as cross sections to confirm that the monitoring wells are completed at similar depths as domestic	Please see response to comment #3(a) on page #2 of this response.	See response to Issue 1.



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	wells in the area and will provide the necessary information to confirm that aquifers used by domestic wells are not being adversely impacted by the use of the well or wash pond on-site.		
17	An appropriate on-site monitoring network will eliminate the need for on-going monitoring of domestic wells.	Since 2016, modifications have been made to the monitoring network. Please refer to the revised ARA site plans for the updated monitoring network as well as the proposed modifications outlined in this letter to the monitoring network.	See response to 3(b), 3(c), 3(d) and 15.

Attachment 2



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The proposed licence area appears to have strong suitability as potential habitat for the Eastern Whip-poor-will, a threatened species listed on the Species at Risk in Ontario (SARO) List. The roadside Whip-poor-will survey conducted on July 4, 2018 covered a broad area but there were no point counts conducted directly within the proposed licence boundary. To best assess the presence of Whip-poor-will during the breeding season, two surveys preferably within different lunar cycles are recommended.

Additionally, Whip-poor-will vocalizations are most common in the early part of the breeding season and have been shown to decrease in July. As a result, MNRF requests that an additional whip-poor-will survey be completed that would include the area within the licence boundary and would incorporate two different lunar cycles between the period from late May to early July.

We note that the Forked Three-awned Grass, an endangered species listed on the SARO list, was found on the subject property. Your company has registered for this species under Section 23.14 of Ontario Regulation 242/08 of the Endangered Species Act. We have no further comment on this matter.

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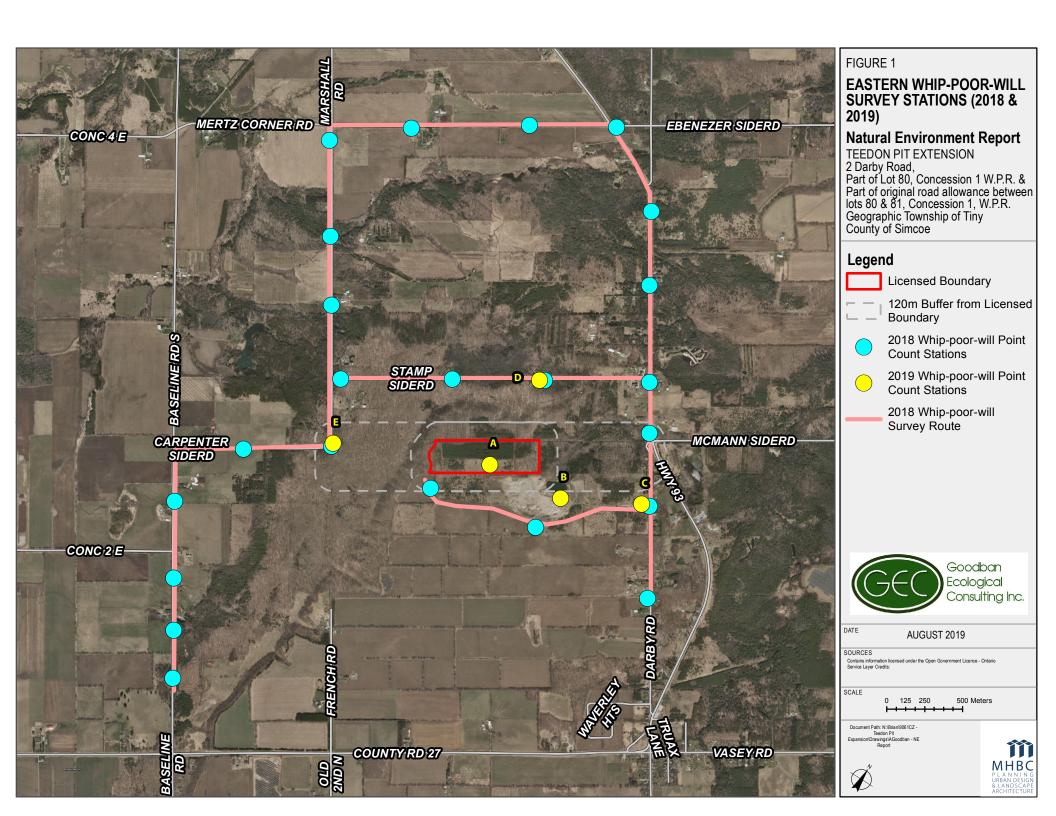
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Attachment 3

TRAFFIC IMPACT STUDY

DARBY ROAD AND HIGHWAY 93 INTERSECTION IMPROVEMENTS TOWNSHIP OF TINY

PREPARED FOR: CRH CANADA GROUP INC.

PREPARED BY:

C.F. CROZIER & ASSOCIATES INC. 40 HURON STREET, SUITE 301 COLLINGWOOD, ONTARIO L9Y 4R3

OCTOBER 4, 2019

CFCA FILE NO. 1028-5282

The material in this report reflects best judgment in light of the information available at the time of preparation. Any use which a third party makes of this report, or any reliance on or decisions made based on it, are the responsibilities of such third parties. C.F. Crozier & Associates Inc. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.



1.0 Executive Summary

C.F. Crozier & Associates Inc. (Crozier) was retained by CRH Canada Group Inc. (CRH) to prepare a Traffic Impact Study to assess traffic operations as a result of comments from the Township of Tiny on the proposed Teedon Pit Extension. The Teedon Pit is located at 40 Darby Road in the Township of Tiny and the proposed Teedon Pit Extension is adjacent to the existing Teedon Pit.

CRH is proposing an extension of the existing Teedon Pit operations to replace reserves for future customer supply. The annual licensed extraction rate and annual truck volumes associated with the Teedon Pit are not proposed to increase.

Based on existing conditions, there are currently maneuverability constraints on Darby Road at Highway 93 for heavy trucks travelling to and from the Teedon Pit. Trucks on Darby Road were observed utilizing the entire width of the roadway when traversing the curve on Darby Road at Highway 93, which has resulted in the roadside shoulders being rutted from tire tracks.

This study reviews the following main aspects of the intersection of Darby Road / McMann Sideroad and Highway 93 from a transportation engineering perspective:

- •Á Traffic operations under existing conditions and future conditions;
- •Á Sight distance availability and requirements;
- •Á Traffic safety (i.e. collision history and trends); and
- •Á Intersection improvements to improve truck operations.

The intersection is currently operating at acceptable levels of service with minor delays and no capacity constraints and is expected to continue operating acceptably in the 20-year horizon.

The available intersection sightlines on Highway 93 at the west approach (Darby Road) of the intersection exceed minimum sight distance requirements for both northbound and southbound movements.

The observed collision rate at the intersection is low and does indicate any collision trends that require attention.

Therefore, no issues pertaining to intersection capacity, sight distance or collision trends were identified at the intersection of Darby Road / McMann Sideroad and Highway 93 related to the existing operation or proposed extension

To improve heavy truck turning operations at Darby Road and Highway 93, the widening of Darby Road at the west approach of the intersection is recommended. This design would mitigate truck turning maneuverability issues and allow for simultaneous inbound and outbound truck turning movements.

A functional design for the Highway 93 and Darby Road intersection improvements is included as **Appendix J.**

In conclusion, the proposed extension of the Teedon Pit operations is supportable from a transportation operations and safety perspective, with the implementation of the noted intersection improvements.

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Figure 2: Boundary Road Network

Figure 3: 2019 Existing Traffic Volumes

Figure 4: 2039 Future Traffic Volumes

2.0 Introduction

2.1 Background

C.F. Crozier & Associates Inc. (Crozier) was retained by CRH Canada Group Inc. (CRH) to prepare a Traffic Impact Study to assess traffic operations as a result of comments from the Township of Tiny on the proposed Teedon Pit Extension. The Teedon Pit is located at 40 Darby Road in the Township of Tiny and the proposed Teedon Pit Extension is adjacent to the existing Teedon Pit.

CRH is proposing an extension of the existing Teedon Pit operations to replace reserves for future customer supply. The annual licensed extraction rate of 600,000 tonnes and annual truck volumes associated with the Teedon Pit are not proposed to increase, and if the extension is approved, the annual tonnage of 600,000 will be an annual limit for the Teedon Pit and Extension combined.

The proposed hours of operation of the Teedon Pit and extension will be as follows:

- •Á **Shipping:** Monday to Friday between 5:00 a.m. 7:00 p.m., and Saturday from 5:00 a.m. 4:00 p.m.
- •Á Site Preparation, Extraction, Processing and Rehabilitation: Monday to Friday between 7:00 a.m. 7:00 p.m.
- •Á Extraction and Processing: Saturday from 9:00 a.m. 4:00 p.m.

Between the hours of 5:00 a.m. – 7:00 a.m. only shipping is permitted and may include a maximum of 15 highway trucks per hour (30 truck trips) and a maximum of one shipping loader in combination with the existing Teedon Pit (license #3670).

Between the hours of 7:00 a.m. – 7:00 p.m., highway trucks are limited to 20 trucks per hour (40 passes per hour) in combination with the existing Teedon Pit (license #3670).

There will be no operations on Sundays or statutory holidays. There are no time restrictions for site maintenance and equipment servicing.

Based on existing conditions, there are currently maneuverability constraints on Darby Road at Highway 93 for heavy trucks travelling to and from the Teedon Pit. Existing operations are discussed further in Section 3.4. This Traffic Impact Study analyzes truck operations at the intersection of Darby Road / McMann Sideroad and Highway 93 associated with the Teedon Pit and analyzes potential intersection improvements to improve truck operations.

Highway 93 is under the jurisidiction of the Ministry of Transportation of Ontario (MTO). Therefore, this Traffic Impact Study is also subject to review by the MTO.

2.2 Purpose and Scope

The purpose of a typical Traffic Impact Study is to evaluate the potential impacts of traffic generated by future development and to recommend mitigation measures on the external road network to support the development, if required. However, the application filed by the client has indicated that the licensed extraction rate and truck volumes associated with the Teedon Pit are not proposed to increase.

Therefore, this study reviews the following main aspects of the intersection of Darby Road / McMann Sideroad and Highway 93 from a transportation engineering perspective:

- •Á Traffic operations under existing conditions and future conditions;
- •Á Sight distance availability and requirements;
- •Á Traffic safety (i.e. collision history and trends); and
- •Á Intersection improvements to improve truck operations.

The study has been completed in accordance with the "Guidelines for the Preparation of Traffic Impact Studies (MTO, September 2014)" as well as agreed upon terms of reference with MTO staff. **Appendix A** contains the correspondence with the MTO.

3.0 Existing Conditions

3.1 Teedon Pit

The existing Teedon Pit is located at 40 Darby Road to the south of the intersection of Darby Road / McMann Sideroad and Highway 93 and is bound by the proposed pit extension to the north, agricultural lands to the south and west, and Darby Road to the east.

Figure 1 contains the Site Location Plan.

3.2 Study Intersections

The Traffic Impact Study analyzes the intersection of Darby Road / McMann Sideroad and Highway 93.

3.3 Boundary Road Network

The boundary road network at the site frontage is described in **Table 1**.

Table 1: Boundary Road Network

Factoria		Roadway	
Feature	Darby Road	Highway 93	McMann Sideroad
Direction	Two-way (north-south) 1	Two-way (north-south)	Two-way (east-west)
Classification	Local Road	Provincial Highway	Local Road
Jurisdiction	Township of Tiny	МТО	Township of Tay
Area Type	Rural	Rural	Rural
Speed Limit	50 km/h	80 km/h	80 km/h (assumed)
Number of lanes	Two	Two	Two
Surface type	Asphalt	Asphalt	Granular
Median type	None	None	None
Pedestrian / Cycling Facilities	None	None	None

Note 1: While Darby Road spans primarily north-south, the roadway spans east-west at its intersection at Highway 93.

The intersection of Darby Road / McMann Sideroad and Highway 93 is unsignalized with side-street stop control at the east and west approaches of the intersection. There are auxiliary northbound and southbound right-turn tapers on Highway 93 at the intersection to allow right-turning traffic to decelerate and not interfere with through traffic.

There is a sharp horizontal curve on Darby Road approaching Highway 93.

Figure 2 illustrates the existing boundary road network, including lane configurations, storage lengths, and intersection control.

3.4 Field Observations

Field observations by Crozier staff in at the west approach of the intersection of Darby Road / McMann Sideroad and Highway 93 indicate that trucks on Darby Road are utilizing the entire width of the roadway when traversing the curve on Darby Road at Highway 93, and that the roadside shoulders are rutted from tire tracks. While there were no opposing vehicles turning from Highway 93 to Darby Road when heavy trucks were traversing Darby Road, field observations indicate that the road width of the west approach would not be sufficient to accommodate both a truck turning and any opposing vehicles.

3.5 Traffic Data

Turning movement counts were conducted by Spectrum Traffic Data Inc. staff at the intersection of Darby Road / McMann Sideroad and Highway 93 on Saturday June 1, 2019 between 5:00 a.m. – 4:00 p.m., and Tuesday June 4, 2019 between 5:00 a.m. – 7:00 p.m. These time periods reflect the proposed hours of operation for the Teedon Pit.

The traffic count data is contained in **Appendix B**. **Figure 3** illustrates the 2019 existing traffic volumes that were recorded.

Intersection analysis was conducted utilizing peak hour factors (PHFs) as calculated for each intersection during each time period. **Table 2** outlines the calculated peak hour factors at each intersection during each peak hour.

Table 2: Peak Hour Factors

Intersection	Peak Hour	Peak Hour Factor
Darby Road / McMann	Weekday 4:15 p.m. – 5:15 p.m.	0.91
Sideroad and Highway 93	Saturday 11:00 a.m. – 12:00 p.m.	0.92

3.6 Traffic Modelling

The boundary road network was modelled in Synchro 9.2 using existing roadway geometrics, collected traffic data, and default modelling parameters such as ideal saturation flow rates and lost time values.

The assessment of intersections is based on the "Highway Capacity Manual (HCM)" methodology. Intersections are assessed using a Level of Service (LOS) metric with ranges of delay assigned a letter from "A" to "F"; "A" representing low delays and "F" representing heavy delays. The LOS definitions for signalized and unsignalized intersections are included in **Appendix C**.

3.7 Intersection Operations

The existing intersection operations at the intersection of Darby Road / McMann Sideroad and Highway 93 were analyzed using the existing traffic volumes illustrated in **Figure 3**. Detailed capacity analysis worksheets are included in **Appendix D**.

Table 3 outlines the 2019 existing traffic operations.

Table 3: 2019 Existing Traffic Operations

Intersection	Control	Peak Hour	Level of Service 1	Control Delay	Critical v/c ratio ²	95 th Percentile Queue Length > Storage Length
Darby Road / McMann Sideroad	Stop	Weekday	С	21.6 s (WBLTR)	0.02 (EBLTR)	None
and Highway 93	(Minor)	Saturday	С	16.3 s (EBLTR)	0.03 (EBLTR)	None

Note 1: The Level of Service of a signalized intersection is based on the average control delay per vehicle (Synchro/ICU).

The Level of Service of a stop-controlled intersection is based on the delay associated with the critical minor road approach (HCM2000).

Note 2: The critical v/c ratio is considered to be the maximum v/c ratio for movements at the intersection. In addition, all v/c ratios greater than 0.85 for movements are outlined and highlighted.

The intersection of Darby Road / McMann Sideroad and Highway 93 is currently operating at LOS "C" during the weekday and Saturday peak periods with minor control delays and no critical volume-to-capacity ratios nor 95th percentile queue lengths. These operations indicate that the intersection is currently operating at satisfactory levels of service with reserve capacity for future traffic growth.

4.0 Future Conditions

4.1 Horizon Years

This study analyzes future traffic conditions for a 20-year horizon (2039).

4.2 Truck Traffic Volumes

It is noted that the existing traffic counts reflect the existing permitted maximum truck volume of 20 trucks per hour (40 truck trips) associated with the Teedon Pit between the hours of 7:00 a.m. – 7:00 p.m. As the Teedon Pit extension does not propose an increase in truck volumes, no additional truck forecasts were conducted for the Teedon Pit extension under future conditions.

4.3 Growth Rate

Historical growth rates were derived from Annual Average Daily Traffic (AADT) and Summer Average Daily Traffic (SADT) on Highway 93 in the study area to forecast future traffic volumes. The latest AADT data available is for 2016; thus, growth rates from 2012 to 2016 were analyzed. **Appendix E** contains the growth rate data and analysis.

The AADT from 2012 to 2016 yielded a growth rate of 1.0% compounded annually and the SADT from 2012 to 2016 yielded a growth rate of 0.6% compounded annually. Therefore, a growth rate of 1.0% compounded annually was applied to through traffic on Highway 93 to forecast 2039 future traffic volumes.

Figure 4 illustrates the 2039 future traffic volumes.

4.4 Signal Warrant Analysis

A signal warrant analysis was conducted for the intersection of Darby Road / McMann Sideroad and Highway 93 under 2039 future volumes. The analysis followed the procedures specified in Chapter 4 of the "Ontario Traffic Manual – Book 12", March 2012. Justifications 1 (Minimum Vehicular Volume), 2 (Delay to Cross Traffic), 3 (Combination of Justifications 1 and 2), and 4 (4-Hour Volume) were selected as the most appropriate warrants with which to assess the intersection of Darby Road / McMann Sideroad and Highway 93.

Signal warrant analysis was conducted for both the weekday and Saturday periods to determine signal requirements. The highest eight hours of each day were used in the analysis with each hour volume increased by approximately 1.22 (1% compounded annually over 20 years) to reflect 2039 future conditions.

As the posted speed limit on Highway 93 is 80 km/h, a "free flow" type was applied to traffic flow on Highway 93 for the signal warrant analysis.

Table 4 outlines the results of the signal warrant analysis.

Table 4: Signal Warrant Analysis Results

Location	Flow Type	Horizon Year	Number of Lanes on Major Road	Time Period	% Warranted	Traffic Signals Warranted?
Darby Road / McMann	Free Flow	2039	Two	Weekday	9%	No
Sideroad and Highway 93	riee riow	2039	Two	Saturday	5%	No

The results of the signal warrant analysis indicate that traffic signals are not warranted at the intersection of Darby Road / McMann Sideroad and Highway 93 under 2039 future traffic conditions. This is attributed to the low turning volumes from Darby Road and McMann Sideroad onto Highway 93.

Appendix F contains the signal warrant sheets.

4.5 Left-Turn Lane Warrant Analysis

Auxiliary left-turn lane warrant analysis was conducted for the intersection of Darby Road / McMann Sideroad and Highway 93 under 2039 future traffic conditions. The analysis was conducted using the Ministry of Transportation (MTO)'s "Design Supplement for TAC Geometric Design Guide for Canadian Roads – June 2017." The northbound and southbound left-turn movements were analyzed for left-turn lane requirements.

The design speed of a roadway in an urban environment is typically 10-20 km/h greater than the posted speed limit. The posted speed limit on Highway 93 is 80 km/h. Therefore, a design speed of 100 km/h was assumed for the left-turn lane warrant analysis.

The weekday and Saturday peak hours of the intersection of Darby Road / McMann Sideroad and Highway 93 reflect the peak hours of the traffic volumes on Highway 93 given the comparably lower volumes on Darby Road and McMann Sideroad. However, the weekday and Saturday peak hour volumes do not reflect the highest northbound and southbound left-turn volumes at the intersection. Therefore, for the purposes of conservative analysis, the highest hourly northbound and southbound left-turn volumes observed at the intersection for both the weekday and Saturday time periods were analyzed. The volumes were increased by approximately 1.22 (1% compounded annually over 20 years) to reflect 2039 future conditions.

Table 5 outlines the results of the left-turn lane warrant analysis.

Table 5: Left-Turn Lane Warrant Analysis Results

Location	Movement	Design Speed	Horizon Year	Number of Lanes on Major Road	Left-Turn Lane Storage Requirement?
Darby Road / McMann Sideroad	Northbound left- turn	100 km/h	2039	Two	None
and Highway 93	Southbound left- turn	100 km/h	2039	Two	None

The results of the left-turn lane analysis indicate that no exclusive left-turn lanes are warranted on Highway 93 at Darby Road under 2039 future traffic conditions. This is attributed to the low turning volumes from Highway 93 to Darby Road and McMann Sideroad not triggering the minimum requirements for left-turn lanes.

Appendix G contains the left-turn warrant analysis worksheets.

4.6 Intersection Operations

The future intersection operations at the study intersections were analyzed using the 2039 future traffic volumes outlined in **Figure 4.** Detailed capacity analysis worksheets are included in **Appendix D**.

Table 6 outlines the 2039 future traffic operations, respectively.

95th Percentile Level of Critical Control Intersection Control **Peak Hour** Queue Lenath > Service 1 Delay v/c ratio 2 Storage Length 29.0 s 0.03 Darby Road / Weekday D None Stop (WBLTR) (EBLTR) McMann Sideroad (Minor) 19.6 s 0.04 and Highway 93 Saturday С None (EBLTR) (EBLTR)

Table 6: 2039 Future Traffic Operations

The intersection of Darby Road / McMann Sideroad and Highway 93 is expected to change from LOS "C" to "D" during the weekday peak period under 2039 future traffic conditions with an increase in control delay of 7.4 seconds and increase in volume-to-capacity ratio of 0.01. These operations are attributed to 20 years of steady traffic growth on Highway 93. However, these operations are still considered acceptable.

Therefore, the intersection of Darby Road / McMann Sideroad and Highway 93 is expected to operate satisfactorily from a capacity perspective.

5.0' Sight Distance Analysis

The available sightlines at the west approach of Darby Road / McMann Sideroad and Highway 93 were measured and compared to the standards set out in the Transportation Association of Canada (TAC) Geometric Design Guide for Canadian Roads (GDGCR).

The design speed of a roadway in an urban environment is typically 10-20 km/h greater than the posted speed limit. The posted speed limit on Highway 93 is 80 km/h. Therefore, a design speed of 100 km/h was assumed for the sight distance analysis.

Given the truck traffic at the west approach of Darby Road / McMann Sideroad and Highway 93, a combination truck (WB-19 or WB-20 tractor semi-trailer) was used as the design vehicle for determining sight distance requirements. It is noted that the trucks entering and exiting the Teedon Pit will consist of Pony Pup trailers which would result in a total truck length of approximately 17-18 metres (less than

Note 1: The Level of Service of a signalized intersection is based on the average control delay per vehicle (Synchro/ICU).

The Level of Service of a stop-controlled intersection is based on the delay associated with the critical minor road approach (HCM2000).

Note 2: The critical v/c ratio is considered to be the maximum v/c ratio for movements at the intersection. In addition, all v/c ratios greater than 0.85 for movements are outlined and highlighted.

the length of a typical WB-19 or WB-20 tractor semi-trailer). Therefore, the base time gap of 11.5 seconds used in the analysis below can be considered conservative.

Table 7 outlines the sight distance analysis for the proposed site accesses.

Table 7: Sight Distance Analysis

Feature	Darby Road
Access Type	Full Moves
Assumed Design Speed	100 km/h
Vehicle Type	Combination Truck (WB-19 or WB-20)
Base Time Gap	11.5 s ¹
Additional Time Gap	None
Grade of Roadway	Less than 3%
Horizontal Alignment of Roadway	Curve
Sight Distance Required	320 m ²
Measured Sight Distance	Approx. 350 m to south
Mediored signi Distance	> 500 m to north
Minimum Sight Distance Satisfied?	Yes

Note 1: Time gap for left-turning combination trucks from a stop onto a two-lane highway with no median and with a grade less than 3%. Value from Table 9.9.3 in the GDGCR.

Therefore, safety issues pertaining to sight distance were not identified at the intersection of Darby Road / McMann Sideroad and Highway 93.

6.0 Collision Analysis

The Township of Tiny requested that collision analysis be conducted for the intersection of Darby Road / McMann Sideroad and Highway 93 to identify and address any collision trends at the intersection.

The MTO provided Crozier with collision history for the intersection of Darby Road / McMann Sideroad and Highway 93 from 2013 to 2019. **Appendix H** contains the collision history provided by the MTO.

The collision history within the last five years (i.e. 2015 to 2019) was analyzed. **Table 8** summarizes the collision history within the last five years.

Note 2: Sight distance values calculated from Intersection Sight Distance equation 9.9.1 in the GDGCR.

Table 8: Five-Year Collision History

Date and Time of Collision	Collision Type	Location	Injury?	Road Conditions	Description	Notes
December 24, 2018 11:32 a.m.	Turning	Darby Road at Highway 93	Property Damage Only	Snow covered	Driver 1 (northbound) on Highway 93 slid into Driver 2 on Highway 93 waiting to turn left	N/A
May 4, 2017 6:30 p.m.	Single- Manned Vehicle (SMV) / Other	Darby Road north of Highway 93	Minor	Wet	Driver 1 (southbound) on Highway 93 struck cable guide rail, skidded and rolled over; struck Driver 2	Driver 1 impaired

As outlined above, there have been two reported collisions at the intersection of Darby Road / McMann Sideroad and Highway 93 within the last five-years. The following formula from the Highway Safety Manual (published by the American Association of State Highway and Transportation Officials) was used to quantify the collision rate at the intersection:

$$RMEV = (A * 1,000,000) / V$$

Where:

RMEV = Rate per million entering vehicles

A = number of collisions (total or by type) occurring in a single year at the location

V = daily volume * 365

A value of 0.4 was applied to the "A" parameter to reflect two collisions within the last five years. The latest AADT observed on Highway 93 is 7,750 vehicles per day.

The collision rate at the intersection of Darby Road / McMann Sideroad and Highway 93 was determined to be approximately 0.14 collisions per million entering vehicles. A collision rate of 1.5 collisions per million entering vehicles is commonly used as a general rule-of-thumb to indicate collision issues at an intersection. Therefore, the observed collision rate of 0.14 collisions per million entering vehicles is low.

Additionally, both reported collisions are attributed to wet or snow-covered road conditions. It is further noted that one of the collisions involved an impaired driver, indicating that these collisions are more attributed to human error than intersection characteristics. It is also noted that neither of these collisions involved heavy trucks.

Therefore, safety issues pertaining to collision trends were not identified at the intersection of Darby Road / McMann Sideroad and Highway 93.

7.0 Intersection Geometrics Analysis

The existing geometrics at the intersection of Darby Road / McMann Sideroad and Highway 93 were evaluated to identify opportunities to improve heavy truck turning operations and maneuverability.

To address this existing condition, the widening of Darby Road at the west approach of the intersection of Darby Road and Highway 93 is recommended while maintaining the existing horizontal

alignment. The widening of the roadway within the horizontal curve would improve heavy truck maneuverability to and from the Teedon Pit.

Field observations by Crozier staff identified an Enbridge Natural Gas Pipeline marker adjacent to Darby Road in the vicinity of the road widening. This pipeline has not been considered as part of the functional design (see **Appendix J**) but will be co-ordinated with Enbridge Inc. directly during the detailed design stage.

7.1 Implementation of Road Widening

A vehicle turning analysis was conducted for a WB-20 tractor semi-trailer turning onto and from Darby Road at Highway 93 to determine the required extents for the widening of Darby Road. **Appendix I** contains the vehicle turning analysis for a WB-20 tractor semi-trailer turning onto and from Darby Road at Highway 93.

As discussed earlier, the trucks entering and exiting the Teedon Pit will consist of Pony Pup trailers which would result in a total truck length of approximately 17-18 metres (less than the length of a typical WB-19 or WB-20 tractor semi-trailer). Therefore, the use of a WB-20 tractor semi-trailer in the vehicle turning analysis is considered conservative.

Additionally, best practices from the TAC GDGCR were incorporated into the intersection improvements. The TAC GDGCR recommends the implementation of a recovery taper beyond the intersection in conjunction with a right-turn taper to allow turning vehicles to safely return to the through lane. The implementation of a recovery taper on Highway 93 south of Darby Road would allow for an increased curb radius for heavy truck turning movements and allow turning trucks to gradually transition into the through lane. While the TAC GDGCR recommends a recovery taper length of 30 metres and offset of 1.5 metres, a recovery taper length of 50 metres and offset of 3.0 metres was included to accommodate heavy truck right-turn movements from Darby Road onto Highway 93 without navigating over the shoulder or into the opposing northbound lane on Highway 93.

Table 9 outlines the recommended geometrics at the intersection of Darby Road and Highway 93 to mitigate heavy truck turning maneuverability issues and allow simultaneous inbound and outbound truck turning movements.

Location	Parameter	Recommended Value
Darby Road (west of Highway 93)	Pavement Width	14.0 metres (7.0 metre lanes)
Darby Road at Highway 93 (west approach)	Curb Radii	17 metres (northwest intersection corner) 15 metres (southwest intersection corner)
Highway 93 (south of Darby Road)	Recovery Taper	50 metres (length) 3.0 metres (offset)

Table 9: Recommended Geometrics at Darby Road and Highway 93

It is recommended that the existing Darby Road centreline be maintained, and that the roadway be widened on both sides. This approach would maintain the geometric alignment between Darby Road and McMann Sideroad. If Darby Road were to be widened entirely on one side of the roadway, the roadway centreline would shift and result in a skewed intersection approach opposite McMann Sideroad which could lead to potential vehicle-vehicle conflicts.

Appendix J contains the functional design for the Darby Road and Highway 93 intersection improvements.

The proposed intersection design can occur within the existing right-of-way (ROW) limits.

8.0 Conclusions

The analysis contained within this report has resulted in the following key findings at the intersection of Darby Road / McMann Sideroad and Highway 93:

- •Á The intersection is currently operating at acceptable levels of service with minor delays and no capacity constraints.
- •Á The intersection is expected to continue operating at acceptable levels of service with minor delays and no capacity constraints in the 20-year horizon.
- •A The available intersection sightlines on Highway 93 at the west approach (Darby Road) of the intersection exceed minimum sight distance requirements for both northbound and southbound movements.
- •Á The observed collision rate at the intersection is low and does indicate any collision trends that require attention.
- •Á Therefore, no issues pertaining to intersection capacity, sight distance or collision trends were identified at the intersection of Darby Road / McMann Sideroad and Highway 93 related to the existing operations or proposed extension.

To improve heavy truck turning operations at Darby Road and Highway 93, the widening of Darby Road at the west approach of the intersection is recommended. This design would mitigate truck turning maneuverability issues and allow for simultaneous inbound and outbound truck turning movements.

A functional design for the Highway 93 and Darby Road intersection improvements is included as **Appendix J.**

In conclusion, the proposed extension of the Teedon Pit operations is supportable from a transportation operations and safety perspective, with the implementation of the noted intersection improvements.

Respectfully submitted by,

C.F. CROZIER & ASSOCIATES INC.

Alexander J. W. Fleming, MBA, P.Eng.

Associate

C.F. CROZIER & ASSOCIATES INC.

Darren J. Loro, C.E.T.

Transportation Technologist

/DL

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APPENDIX A

Correspondence

Darren Loro

From: Tuen, Nelson (MTO) < Nelson.Tuen@ontario.ca>

Sent: Friday, July 26, 2019 4:57 PM

To: Darren Loro

Cc: Janke, Aaron (MTO); Peter Dorton

Subject: FW: Darby Road and Highway 93 TIS Proposed Terms of Reference (1028-5282)

Attachments: Hwy 93 - Darby Road - Collision History.xlsx

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From: Janke, Aaron (MTO) Sent: July 26, 2019 8:58 AM

To: Dorton, Peter (MTO) <Peter.Dorton@ontario.ca>; Tuen, Nelson (MTO) <Nelson.Tuen@ontario.ca> **Cc:** Akhtar, Usman (MTO) <Usman.Akhtar@ontario.ca>; lannacito, Phil (MTO) <Phil.lannacito@ontario.ca>

Subject: RE: Darby Road and Highway 93 TIS Proposed Terms of Reference (1028-5282)

The TOR sounds good. Please note we have had complaints at this intersection due to truck traffic related to the below concerns (poor geometry).

Nelson – Please provide the collision history.

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From: Dorton, Peter (MTO) Sent: July-26-19 8:55 AM To: Janke, Aaron (MTO) < Aaron.Janke@ontario.ca>

Cc: Akhtar, Usman (MTO) <Usman.Akhtar@ontario.ca>; lannacito, Phil (MTO) <Phil.lannacito@ontario.ca>

Subject: FW: Darby Road and Highway 93 TIS Proposed Terms of Reference (1028-5282)

From: Darren Loro <dloro@cfcrozier.ca>

Sent: July 25, 2019 4:46 PM

To: Dorton, Peter (MTO) < Peter. Dorton@ontario.ca>

Cc: Alex Fleming <afleming@cfcrozier.ca>; Ryan MacLaughlan <<u>rmaclaughlan@cfcrozier.ca</u>> **Subject:** RE: Darby Road and Highway 93 TIS Proposed Terms of Reference (1028-5282)

Hi Peter,

I've attached a map showing Darby Road and the Teedon Pit in relation to Highway 93. The map also includes a key plan showing the site location in relation to the surrounding area.

Hope this helps,

Darren Loro C.E.T. | Technologist C.F. Crozier & Associates Consulting Engineers 40 Huron Street, Suite 301 | Collingwood, ON L9Y 4R3 cfcrozier.ca | dloro@cfcrozier.ca

tel: 705.446.3510 ext: 142



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From: Dorton, Peter (MTO) < Peter. Dorton@ontario.ca>

Sent: Thursday, July 25, 2019 4:37 PM **To:** Darren Loro <dloro@cfcrozier.ca>

Cc: Alex Fleming <afleming@cfcrozier.ca>; Ryan MacLaughlan <<u>rmaclaughlan@cfcrozier.ca</u>> **Subject:** RE: Darby Road and Highway 93 TIS Proposed Terms of Reference (1028-5282)

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From: Darren Loro < dloro@cfcrozier.ca>

Sent: July 25, 2019 4:32 PM

To: Dorton, Peter (MTO) < Peter.Dorton@ontario.ca>

Cc: Alex Fleming <afleming@cfcrozier.ca>; Ryan MacLaughlan rmaclaughlan@cfcrozier.ca>

Subject: Darby Road and Highway 93 TIS Proposed Terms of Reference (1028-5282)

Good afternoon Peter,

We have been retained by CRH Canada Group Inc. (CRH) to prepare a Traffic Impact Study to assess traffic operations associated with the Teedon Pit located at 40 Darby Road in the Township of Tiny. CRH is proposing an expansion of the existing Teedon Pit operations to allow for longer extraction periods, although the licensed extraction rate and truck volumes associated with the Teedon Pit are not proposed to increase.

There are currently maneuverability constraints on Darby Road for heavy trucks travelling to and from the Teedon Pit. Field observations by Crozier staff at the west approach of the intersection of Darby Road and Highway 93 indicate that trucks on Darby Road are utilizing the entire width of the roadway when traversing the curve on Darby Road at Highway 93, and that the roadside shoulders were rutted from tire tracks.

The Township requires a Traffic Impact Study that analyzes truck operations at the intersection of Darby Road and Highway 93 associated with the Teedon Pit and analyzes potential intersection improvements to improve truck operations. Given the proximity to Highway 93, we understand that the MTO will also require a Traffic Impact Study.

Our proposed Terms of Reference for the Traffic Impact Study is outlined below:

- 1. Traffic counts have already been conducted at the intersection of Darby Road and Highway 93 on Saturday June 1, 2019 between 5:00 a.m. 4:00 p.m., and Tuesday June 4, 2019 between 5:00 a.m. 7:00 p.m. These time periods reflect the proposed hours of operation for the Teedon Pit.
- 2. Existing traffic operations at Darby Road and Highway 93 will be analyzed during the weekday and Saturday peak hours using Synchro 9.2.
- 3. The Township estimates that based on the maximum annual extraction volume of 600,000 tonnes, it would take approximately 17 years of operation to exhaust the Teedon Pit supply. However, this estimate also assumes that the existing Teedon Pit is nearing the end of its life. Accordingly, analysis of the 20-year horizon (2039) will be conducted to allow for a buffer on the 17-year estimate and result in more conservative analysis.
- 4. Future background traffic growth will be calculated using growth rates calculated from Annual Average Daily Traffic (AADT) and Summer Average Daily Traffic volumes on Highway 93 in the study area.
- 5. 2039 future traffic operations at Darby Road and Highway 93 will be analyzed during the weekday and Saturday peak hours.
- Sight distance availability will be analyzed at the west approach of Darby Road at Highway 93 to compare to the
 minimum sight distance requirements set out in the MTO's "Design Supplement for TAC Geometric Design Guide
 for Canadian Roads- June 2017".
- 7. Traffic safety will be analyzed at the intersection of Darby Road and Highway 93. The following traffic safety components will be analyzed:
 - a. Collision trends and counter-measures to address, if required
 - b. Vehicle turning requirements for heavy trucks at the west approach of Darby Road and Highway 93
 - c. Auxiliary left-turn lane requirements on Highway 93
 - d. Intersection control (traffic signal warrant analysis will be conducted)
- 8. The analysis contained in this TIS will lead to recommendations for intersection improvements at Darby Road and Highway 93 to optimize traffic safety.

We would like to request the collision history for the intersection of Darby Road and Highway 93 for us to complete our <u>analysis</u>. If you could forward this request or direct us to the appropriate contact, that would be much appreciated!

If the proposed Terms of Reference is satisfactory to the MTO, we will begin preparing the TIS immediately.

Alex and Ryan (copied) are both on vacation next week. However, if you have any questions or wish to discuss further within the next week, please do not hesitate to give me a call.

Cheers, Darren

Darren Loro C.E.T. | Technologist C.F. Crozier & Associates Consulting Engineers 40 Huron Street, Suite 301 | Collingwood, ON L9Y 4R3 cfcrozier.ca | dloro@cfcrozier.ca

tel: 705.446.3510 ext: 142



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APPENDIX B

Traffic Data



Turning Movement Count
Location Name: DARBY RD & HWY 93
Date: Tue, Jun 04, 2019 Deployment Lead: Theo Daglis

Crozier & Associates

Turning Movement Count (1 . DARBY RD & HWY 93)

Start Time			ı	N Approa HWY 93						E Appro)			S	Approac HWY 93					W	Approa DARBY R	ch RD		Int. Total (15 min)	Int. Total (1 hr)
Start Time	Right N:W	Thru N:S	Left N:E	U-Turn N:N	Peds N:	Approach Total	Right E:N	Thru E:W	Left E:S	U-Turn E:E	Peds E:	Approach Total	Right S:E	Thru S:N	Left S:W	U-Turn S:S	Peds S:	Approach Total	Right W:S	Thru W:E	Left W:N	U-Turn W:W	Peds W:	Approach Total		
05:00:00	0	41	0	0	0	41	0	0	0	0	0	0	0	9	0	0	0	9	0	0	0	0	0	0	50	
05:15:00	0	43	0	0	0	43	0	0	0	0	0	0	0	5	0	0	0	5	0	0	0	0	0	0	48	
05:30:00	0	32	0	0	0	32	0	0	0	0	0	0	0	16	0	0	0	16	0	0	0	0	0	0	48	
05:45:00	0	47	0	0	0	47	0	0	0	0	0	0	0	25	0	0	0	25	0	0	0	0	0	0	72	218
06:00:00	0	72	0	0	0	72	0	0	0	0	0	0	0	35	0	0	0	35	0	0	0	0	0	0	107	275
06:15:00	0	76	1	0	0	77	0	0	1	0	0	1	0	57	1	0	0	58	0	0	0	0	0	0	136	363
06:30:00	0	62	0	0	0	62	0	0	0	0	0	0	0	71	0	0	0	71	0	0	1	0	0	1	134	449
06:45:00	1	66	0	0	0	67	0	0	0	0	0	0	0	54	0	0	0	54	0	0	2	0	0	2	123	500
07:00:00	0	83	0	0	0	83	0	0	0	0	0	0	0	63	4	0	0	67	1	0	0	0	0	1	151	544
07:15:00	0	126	1	0	0	127	0	0	0	0	0	0	0	94	0	0	0	94	3	0	0	0	0	3	224	632
07:30:00	1	100	1	0	0	102	2	0	0	0	0	2	0	132	1	0	0	133	1	0	1	0	0	2	239	737
07:45:00	2	96	0	0	0	98	0	0	0	0	0	0	0	106	2	0	0	108	1	1	1	0	0	3	209	823
08:00:00	0	100	0	0	0	100	2	0	0	0	0	2	0	95	3	0	0	98	4	0	0	0	0	4	204	876
08:15:00	0	90	0	0	0	90	1	0	0	0	0	1	1	109	1	0	0	111	2	0	1	0	0	3	205	857
08:30:00	0	76	0	0	0	76	0	0	0	0	0	0	0	96	1	0	0	97	0	0	2	0	0	2	175	793
08:45:00	0	89	1	0	0	90	0	0	0	0	0	0	0	77	2	0	0	79	2	0	1	0	0	3	172	756
09:00:00	2	84	0	0	0	86	0	0	0	0	0	0	0	70	3	0	0	73	1	0	3	0	0	4	163	715
09:15:00	1	86	0	0	0	87	0	0	0	0	0	0	0	67	2	0	0	69	3	0	1	0	0	4	160	670
09:30:00	0	80	0	0	0	80	0	0	0	0	0	0	0	83	1	0	0	84	1	0	1	0	0	2	166	661
09:45:00	0	65	1	0	0	66	1	0	0	0	0	1	0	68	1	0	0	69	0	1	4	0	0	5	141	630
10:00:00	2	59	0	0	0	61	0	0	0	0	0	0	0	68	1	0	0	69	2	0	2	0	0	4	134	601
10:15:00	0	90	0	0	0	90	0	0	0	0	0	0	1	72	5	0	0	78	0	0	1	0	0	1	169	610
10:30:00	1	81	0	0	0	82	2	0	0	0	0	2	0	71	3	0	0	74	1	0	1	0	0	2	160	604
10:45:00	2	68	0	0	0	70	0	0	1	0	0	1	0	73	1	0	0	74	5	0	1	0	0	6	151	614
11:00:00	1	67	0	0	0	68	0	0	0	0	0	0	0	76	2	0	0	78	1	0	2	0	0	3	149	629
11:15:00	1	70	0	0	0	71	0	0	0	0	0	0	0	58	1	0	0	59	2	0	2	0	0	4	134	594
11:30:00	0	59	0	0	0	59	0	0	1	0	0	1	0	82	1	0	0	83	5	0	0	0	0	5	148	582
11:45:00	0	72	0	0	0	72	0	0	0	0	0	0	1	59	0	0	0	60	2	0	0	0	0	2	134	565
12:00:00	0	83	0	0	0	83	0	0	0	0	0	0	0	69	0	0	0	69	0	0	1	0	0	1	153	569
12:15:00	1	82	0	0	0	83	0	0	0	0	0	0	0	72	2	0	0	74	0	1	1	0	0	2	159	594
12:30:00	1	72	0	0	0	73	0	0	0	0	0	0	0	70	2	0	0	72	3	0	0	0	0	3	148	594



Turning Movement Count Location Name: DARBY RD & HWY 93

Date: Tue, Jun 04, 2019 Deployment Lead: Theo Daglis

12:45:00	1	76	0	0	0	77	0	0	0	0	0	0	0	84	0	0	0	84	1 1	0	1	0	0	2	163	623
13:00:00	0	83	0	0	0	83	0	0	0	0	0	0	0	51	4	0	0	55	0	0	1	0	0	1	139	609
13:15:00	0	83	0	0	0	83	0	0	0	0	0	0	0	71	2	0	0	73	3	0	3	0	0	6	162	612
13:30:00	4	79	0	0	0	83	0	0	0	0	0	0	0	73	3	0	0	76	2	0	0	0	0	2	161	625
13:45:00	0	72	0	0	0	72	0	0	0	0	0	0	0	66	2	0	0	68	5	0	1	0	0	6	146	608
14:00:00	1	75	0	0	0	76	0	0	0	0	0	0	0	89	1	0	0	90	2	0	1	0	0	3	169	638
14:15:00	0	99	0	0	0	99	1	0	0	0	0	1	0	83	0	0	0	83	0	0	1	0	0	1	184	660
14:30:00	1	91	1	0	0	93	0	0	0	0	0	0	0	92	0	0	0	92	1	0	1	0	0	2	187	686
14:45:00	3	61	0	0	0	64	1	0	0	0	0	1	1	80	1	0	0	82	0	0	1	0	0	1	148	688
15:00:00	0	104	0	0	0	104	0	0	0	0	0	0	0	69	0	0	0	69	1	0	1	0	0	2	175	694
15:15:00	0	103	1	0	0	104	0	1	0	0	0	1	0	89	0	0	0	89	1	0	0	0	0	1	195	705
15:30:00	1	103	0	0	0	104	1	0	0	0	0	1	0	98	0	0	0	98	0	0	0	0	0	0	203	721
15:45:00	1	89	1	0	0	91	0	0	0	0	0	0	0	95	0	0	0	95	1	0	0	0	0	1	187	760
16:00:00	2	94	1	0	0	97	2	0	0	0	0	2	0	110	0	0	0	110	0	0	0	0	0	0	209	794
16:15:00	0	129	0	0	0	129	0	0	0	0	0	0	0	109	0	0	0	109	1	0	0	0	0	1	239	838
16:30:00	0	131	2	0	0	133	0	0	0	0	0	0	0	112	0	0	0	112	0	0	0	0	0	0	245	880
16:45:00	0	110	2	0	0	112	1	0	0	0	0	1	1	102	0	0	0	103	0	0	0	0	0	0	216	909
17:00:00	1	122	0	0	0	123	0	0	1	0	0	1	0	136	0	0	0	136	0	0	4	0	0	4	264	964
17:15:00	2	110	0	0	0	112	0	0	0	0	0	0	0	100	0	0	0	100	0	0	0	0	0	0	212	937
17:30:00	1	88	0	0	0	89	0	0	0	0	0	0	0	87	0	0	0	87	0	0	0	0	0	0	176	868
17:45:00	0	63	0	0	0	63	0	0	0	0	0	0	0	107	1	0	0	108	0	0	0	0	0	0	171	823
18:00:00	0	60	1	0	0	61	1	0	0	0	0	1	1	103	0	0	0	104	1	0	0	0	0	1	167	726
18:15:00	2	76	0	0	0	78	0	0	0	0	0	0	0	74	0	0	0	74	0	0	2	0	0	2	154	668
18:30:00	0	64	1	0	0	65	0	0	0	0	0	0	0	83	0	0	0	83	0	0	0	0	0	0	148	640
18:45:00	0	41	0	0	0	41	1	0	0	0	0	1	1	51	1	0	0	53	0	0	1	0	0	1	96	565
Grand Total	36	4523	15	0	0	4574	16	1	4	0	0	21	7	4316	55	0	0	4378	59	3	47	0	0	109	9082	-
Approach%	0.8%	98.9%	0.3%	0%		-	76.2%	4.8%	19%	0%		-	0.2%	98.6%	1.3%	0%		-	54.1%	2.8%	43.1%	0%		-	-	-
Totals %	0.4%	49.8%	0.2%	0%		50.4%	0.2%	0%	0%	0%		0.2%	0.1%	47.5%	0.6%	0%		48.2%	0.6%	0%	0.5%	0%		1.2%	-	-
Heavy	2	382	5	0		-	4	0	1	0		-	3	363	47	0		-	50	1	6	0		-	-	-
Heavy %	5.6%	8.4%	33.3%	0%		-	25%	0%	25%	0%		-	42.9%	8.4%	85.5%	0%		-	84.7%	33.3%	12.8%	0%		-	-	-
Bicycles	-	-	-	-		-	-	-	-	-		-	-	-	-	-		-	-	-	-	-		-	-	-



Turning Movement Count Location Name: DARBY RD & HWY 93 Fig. Jun 24, 2019. Pooley most Local Theo Doo

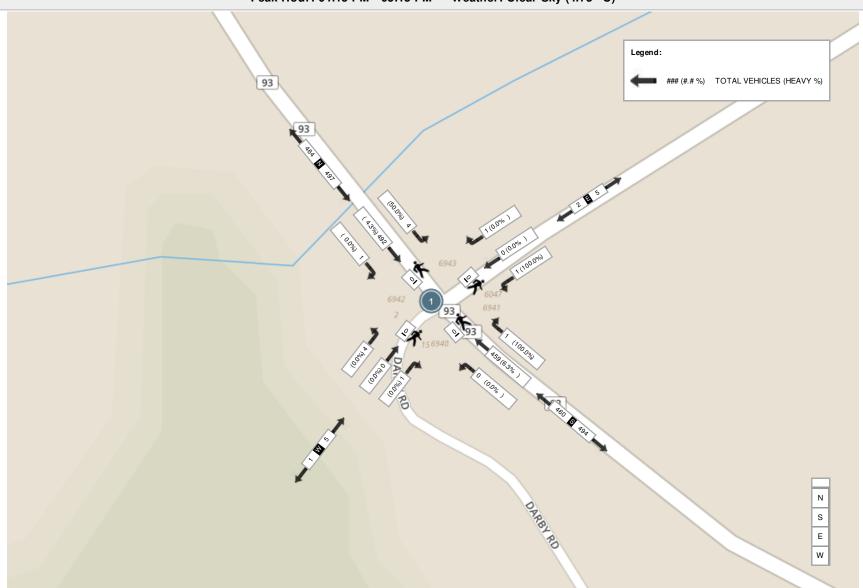
Crozier & Associates

Date: Tue, Jun 04, 2019 Deployment Lead: Theo Daglis

							Pea	ak H	our: (4:15 F	PM - (05:15 PM	Weat	her: C	Clear	Sky (4.73	°C)							
Start Time				N Approa HWY 93					MCI	E Approa)				S Approa						W Appro DARBY			Int. Total (15 min)
	Right	Thru	Left	U-Turn	Peds	Approach Total	Right	Thru	Left	U-Turn	Peds	Approach Total	Right	Thru	Left	U-Turn	Peds	Approach Total	Right	Thru	Left	U-Turn	Peds	Approach Total	
16:15:00	0	129	0	0	0	129	0	0	0	0	0	0	0	109	0	0	0	109	1	0	0	0	0	1	239
16:30:00	0	131	2	0	0	133	0	0	0	0	0	0	0	112	0	0	0	112	0	0	0	0	0	0	245
16:45:00	0	110	2	0	0	112	1	0	0	0	0	1	1	102	0	0	0	103	0	0	0	0	0	0	216
17:00:00	1	122	0	0	0	123	0	0	1	0	0	1	0	136	0	0	0	136	0	0	4	0	0	4	264
Grand Total	1	492	4	0	0	497	1	0	1	0	0	2	1	459	0	0	0	460	1	0	4	0	0	5	964
Approach%	0.2%	99%	0.8%	0%		-	50%	0%	50%	0%		-	0.2%	99.8%	0%	0%		-	20%	0%	80%	0%		-	-
Totals %	0.1%	51%	0.4%	0%		51.6%	0.1%	0%	0.1%	0%		0.2%	0.1%	47.6%	0%	0%		47.7%	0.1%	0%	0.4%	0%		0.5%	-
PHF	0.25	0.94	0.5	0		0.93	0.25	0	0.25	0		0.5	0.25	0.84	0	0		0.85	0.25	0	0.25	0		0.31	-
Heavy	0	21	2	0		23	0	0	1	0		1	1	29	0	0		30	0	0	0	0		0	-
Heavy %	0%	4.3%	50%	0%		4.6%	0%	0%	100%	0%		50%	100%	6.3%	0%	0%		6.5%	0%	0%	0%	0%		0%	<u> </u>
Lights	1	471	2	0		474	1	0	0	0		1	0	430	0	0		430	1	0	4	0		5	-
Lights %	100%	95.7%	50%	0%		95.4%	100%	0%	0%	0%		50%	0%	93.7%	0%	0%		93.5%	100%	0%	100%	0%		100%	-
Single-Unit Trucks	0	18	1	0		19	0	0	1	0		1	0	8	0	0		8	0	0	0	0		0	-
Single-Unit Trucks %	0%	3.7%	25%	0%		3.8%	0%	0%	100%	0%		50%	0%	1.7%	0%	0%		1.7%	0%	0%	0%	0%		0%	-
Buses	0	1	1	0		2	0	0	0	0		0	1	11	0	0		12	0	0	0	0		0	-
Buses %	0%	0.2%	25%	0%		0.4%	0%	0%	0%	0%		0%	100%	2.4%	0%	0%		2.6%	0%	0%	0%	0%		0%	-
Articulated Trucks	0	2	0	0		2	0	0	0	0		0	0	10	0	0		10	0	0	0	0		0	-
Articulated Trucks %	0%	0.4%	0%	0%		0.4%	0%	0%	0%	0%		0%	0%	2.2%	0%	0%		2.2%	0%	0%	0%	0%		0%	-
Bicycles on Road	0	0	0	0		0	0	0	0	0		0	0	0	0	0		0	0	0	0	0		0	-
Bicycles on Road %	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	-

Turning Movement Count
Location Name: DARBY RD & HWY 93
Date: Tue, Jun 04, 2019 Deployment Lead: Theo Daglis

Peak Hour: 04:15 PM - 05:15 PM Weather: Clear Sky (4.73 °C)





Turning Movement Count Location Name: DARBY RD & HWY 93 Date: Sat, Jun 01, 2019 Deployment Lead: Theo Daglis

Crozier & Associates

Turning Movement Count (1 . DARBY RD & HWY 93)

									Τι	ırning	ι Mo	vement Cou	ınt (1	. DA	RBY	RD &	HWY	93)								
O			ı	N Approa HWY 93						Approac					:	S Approa HWY 93						N Appro a			Int. Total (15 min)	Int. Total (1 hr)
Start Time	Right N:W	Thru N:S	Left N:E	U-Turn N:N	Peds N:	Approach Total	Right E:N	Thru E:W	Left E:S	U-Turn E:E	Peds E:	Approach Total	Right S:E	Thru S:N	Left S:W	U-Turn S:S	Peds S:	Approach Total	Right W:S	Thru W:E	Left W:N	U-Turn W:W	Peds W:	Approach Total		
05:00:00	0	5	0	0	0	5	0	0	0	0	1	0	0	4	0	0	0	4	0	0	0	0	0	0	9	
05:15:00	0	13	0	0	0	13	0	0	0	0	0	0	0	4	0	0	0	4	0	0	0	0	0	0	17	
05:30:00	0	5	0	0	0	5	0	0	0	0	0	0	0	9	0	0	0	9	0	0	0	0	0	0	14	
05:45:00	0	13	0	0	0	13	0	0	0	0	0	0	0	10	0	0	0	10	0	0	1	0	0	1	24	64
06:00:00	0	14	0	0	0	14	0	0	0	0	0	0	0	22	0	0	0	22	0	0	0	0	1	0	36	91
06:15:00	0	18	1	0	0	19	0	0	0	0	0	0	0	20	0	0	0	20	0	0	0	0	0	0	39	113
06:30:00	0	19	0	0	0	19	0	0	0	0	0	0	0	30	0	0	0	30	0	0	0	0	0	0	49	148
06:45:00	0	38	0	0	0	38	0	0	0	0	0	0	0	13	0	0	0	13	0	0	0	0	0	0	51	175
07:00:00	0	35	0	0	0	35	0	0	0	0	0	0	0	25	0	0	0	25	0	0	0	0	0	0	60	199
07:15:00	0	47	0	0	0	47	0	0	0	0	0	0	0	28	0	0	0	28	0	0	0	0	0	0	75	235
07:30:00	0	35	0	0	0	35	1	0	0	0	0	1	0	33	0	0	0	33	0	1	1	0	0	2	71	257
07:45:00	1	49	0	0	0	50	0	0	0	0	0	0	0	24	0	0	0	24	1	0	0	0	0	1	75	281
08:00:00	0	37	0	0	0	37	0	0	0	0	0	0	0	33	0	0	0	33	0	0	0	0	0	0	70	291
08:15:00	1	48	0	0	0	49	1	0	0	0	0	1	1	45	0	0	0	46	0	0	1	0	0	1	97	313
08:30:00	0	44	0	0	0	44	0	0	0	0	0	0	0	60	0	0	0	60	1	0	1	0	0	2	106	348
08:45:00	0	46	0	0	0	46	0	0	0	0	0	0	0	49	0	0	0	49	0	0	0	0	0	0	95	368
09:00:00	0	47	0	0	0	47	0	0	0	0	0	0	0	47	0	0	0	47	0	0	0	0	0	0	94	392
09:15:00	1	71	0	1	0	73	0	0	1	0	0	1	0	51	0	0	0	51	0	0	0	0	0	0	125	420
09:30:00	1	55	0	0	0	56	0	0	0	0	0	0	0	93	0	0	0	93	0	0	0	0	0	0	149	463
09:45:00	2	58	0	0	0	60	2	0	0	0	0	2	0	81	0	0	0	81	0	0	1	0	0	1	144	512
10:00:00	1	65	2	0	0	68	0	0	0	0	0	0	0	58	0	0	0	58	0	0	2	0	0	2	128	546
10:15:00	0	71	0	0	0	71	0	0	0	0	0	0	0	86	0	0	0	86	0	0	1	0	0	1	158	579
10:30:00	0	74	0	0	0	74	1	0	0	0	0	1	0	69	0	0	0	69	0	0	1	0	0	1	145	575
10:45:00	0	74	0	0	0	74	0	0	0	0	0	0	0	84	0	0	0	84	0	0	0	0	0	0	158	589
11:00:00	3	66	0	0	0	69	2	0	0	0	0	2	0	92	0	0	0	92	0	0	1	0	0	1	164	625
11:15:00	2	95	1	0	0	98	0	0	0	0	0	0	0	73	1	0	0	74	0	0	1	0	0	1	173	640
11:30:00	0	77	1	0	0	78	2	0	0	0	0	2	0	87	0	0	0	87	0	0	6	0	0	6	173	668
11:45:00	2	83	0	0	0	85	0	0	0	0	0	0	0	103	0	0	0	103	0	0	1	0	0	1	189	699
12:00:00	0	83	0	0	0	83	1	0	0	0	0	1	0	76	0	0	0	76	0	0	1	0	0	1	161	696
12:15:00	1	86	0	0	0	87	0	0	0	0	0	0	0	67	0	0	0	67	0	0	1	0	0	1	155	678
12:30:00	2	80	1	0	0	83	0	0	0	0	0	0	2	95	1	0	0	98	1	0	1	0	0	2	183	688
						Ì						İ						Ì						Ì		



Turning Movement Count Location Name: DARBY RD & HWY 93

Crozier & Associates

Date: Sat, Jun 01, 2019 Deployment Lead: Theo Daglis , ,

12:45:00	1	78	0	0	0	79	2	0	1	0	0	3	2	80	0	0	0	82	0	0	0	0	0	0	164	663
13:00:00	2	81	0	0	0	83	0	0	0	0	0	0	1	81	1	0	0	83	1	0	0	0	0	1	167	669
13:15:00	2	70	0	0	0	72	0	0	0	0	0	0	0	90	0	0	0	90	0	0	0	0	0	0	162	676
13:30:00	0	68	0	0	0	68	1	0	0	0	0	1	0	81	0	0	0	81	0	0	0	0	0	0	150	643
13:45:00	0	79	0	0	0	79	0	0	0	0	0	0	0	80	0	0	0	80	0	0	1	0	0	1	160	639
14:00:00	1	81	1	0	0	83	0	0	0	0	0	0	0	62	0	0	0	62	0	0	0	0	0	0	145	617
14:15:00	0	74	0	0	0	74	0	0	0	0	0	0	0	72	0	0	0	72	0	0	0	0	0	0	146	601
14:30:00	0	85	0	0	0	85	0	1	0	0	0	1	0	84	0	0	0	84	0	0	0	0	0	0	170	621
14:45:00	0	71	0	0	0	71	0	1	0	0	0	1	0	76	0	0	0	76	0	0	0	0	0	0	148	609
15:00:00	1	64	0	0	0	65	0	0	0	0	0	0	0	82	0	0	0	82	0	0	2	0	0	2	149	613
15:15:00	0	87	2	0	0	89	0	0	0	0	0	0	0	80	0	0	0	80	0	0	0	0	0	0	169	636
15:30:00	3	58	0	0	0	61	0	0	0	0	0	0	1	68	0	0	0	69	0	1	0	0	0	1	131	597
15:45:00	1	74	0	0	0	75	0	0	1	0	0	1	0	85	0	0	0	85	0	0	0	0	0	0	161	610
Grand Total	28	2521	9	1	0	2559	13	2	3	0	1	18	7	2592	3	0	0	2602	4	2	24	0	1	30	5209	-
Approach%	1.1%	98.5%	0.4%	0%			72.2%	11.1%	16.7%	0%		-	0.3%	99.6%	0.1%	0%		-	13.3%	6.7%	80%	0%		-		-
Totals %	0.5%	48.4%	0.2%	0%		49.1%	0.2%	0%	0.1%	0%		0.3%	0.1%	49.8%	0.1%	0%		50%	0.1%	0%	0.5%	0%		0.6%	-	-
Heavy	0	56	1	0		-	0	0	0	0		-	0	55	1	0		-	0	0	0	0		-	-	-
Heavy %	0%	2.2%	11.1%	0%		-	0%	0%	0%	0%		-	0%	2.1%	33.3%	0%		-	0%	0%	0%	0%		-	-	-
Bicycles	-	-	-	-		-	-	-	-	-		-	-	-	-	-		-	-	-	-	-		-	-	-
Bicycle %	-	-	-	-		-	-	-	-	-		-	-	-	-	-		-	-	-	-	-		-	-	-



Turning Movement Count Location Name: DARBY RD & HWY 93 Sat Jun 01 2019 Deployment Lead: Theo Dadi

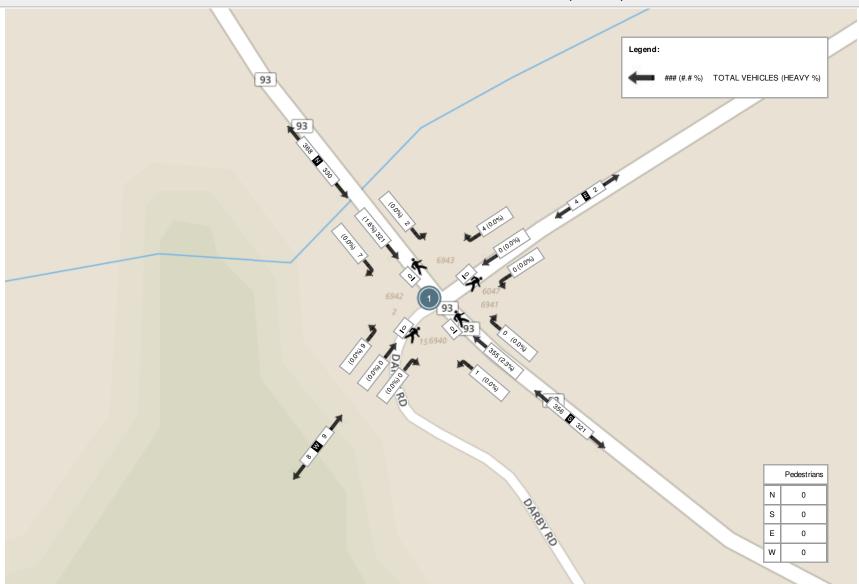
Crozier & Associates

Date: Sat, Jun 01, 2019 Deployment Lead: Theo Daglis

						1	Peak	Hou	r: 11	:00 AI	VI - 1	2:00 PM \	Weath	er: F	ew Cl	ouds	(10.4	2 °C)							
Start Time				N Approa HWY 93			E Approach MCMANN SIDEROAD				S Approach HWY 93					W Approach DARBY RD				Int. Tota (15 min)					
	Right	Thru	Left	U-Turn	Peds	Approach Total	Right	Thru	Left	U-Turn	Peds	Approach Total	Right	Thru	Left	U-Turn	Peds	Approach Total	Right	Thru	Left	U-Turn	Peds	Approach Total	
11:00:00	3	66	0	0	0	69	2	0	0	0	0	2	0	92	0	0	0	92	0	0	1	0	0	1	164
11:15:00	2	95	1	0	0	98	0	0	0	0	0	0	0	73	1	0	0	74	0	0	1	0	0	1	173
11:30:00	0	77	1	0	0	78	2	0	0	0	0	2	0	87	0	0	0	87	0	0	6	0	0	6	173
11:45:00	2	83	0	0	0	85	0	0	0	0	0	0	0	103	0	0	0	103	0	0	1	0	0	1	189
Grand Total	7	321	2	0	0	330	4	0	0	0	0	4	0	355	1	0	0	356	0	0	9	0	0	9	699
Approach%	2.1%	97.3%	0.6%	0%		-	100%	0%	0%	0%		-	0%	99.7%	0.3%	0%		-	0%	0%	100%	0%		-	
Totals %	1%	45.9%	0.3%	0%		47.2%	0.6%	0%	0%	0%		0.6%	0%	50.8%	0.1%	0%		50.9%	0%	0%	1.3%	0%		1.3%	-
PHF	0.58	0.84	0.5	0		0.84	0.5	0	0	0		0.5	0	0.86	0.25	0		0.86	0	0	0.38	0		0.38	<u>.</u>
Heavy	0	5	0	0		5	0	0	0	0		0	0	8	0	0		8	0	0	0	0		0	-
Heavy %	0%	1.6%	0%	0%		1.5%	0%	0%	0%	0%		0%	0%	2.3%	0%	0%		2.2%	0%	0%	0%	0%		0%	-
Lights	7	316	2	0		325	4	0	0	0		4	0	347	1	0		348	0	0	9	0		9	-
Lights %	100%	98.4%	100%	0%		98.5%	100%	0%	0%	0%		100%	0%	97.7%	100%	0%		97.8%	0%	0%	100%	0%		100%	-
Single-Unit Trucks	0	2	0	0		2	0	0	0	0		0	0	4	0	0		4	0	0	0	0		0	-
Single-Unit Trucks %	0%	0.6%	0%	0%		0.6%	0%	0%	0%	0%		0%	0%	1.1%	0%	0%		1.1%	0%	0%	0%	0%		0%	-
Buses	0	0	0	0		0	0	0	0	0		0	0	0	0	0		0	0	0	0	0		0	-
Buses %	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	-
Articulated Trucks	0	3	0	0		3	0	0	0	0		0	0	4	0	0		4	0	0	0	0		0	-
Articulated Trucks %	0%	0.9%	0%	0%		0.9%	0%	0%	0%	0%		0%	0%	1.1%	0%	0%		1.1%	0%	0%	0%	0%		0%	-
Pedestrians	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
Pedestrians%	-	-	-	-	0%		-	-	-	-	0%		_	_	-	-	0%		-	-	-	-	0%		-

Turning Movement Count
Location Name: DARBY RD & HWY 93
Date: Sat, Jun 01, 2019 Deployment Lead: Theo Daglis

Peak Hour: 11:00 AM - 12:00 PM Weather: Few Clouds (10.42 °C)



APPENDIX C

Level of Service Definitions

Level of Service Definitions

Two-Way Stop Controlled Intersections

Control Delay per Vehicle (seconds)	Interpretation						
.10	EXCELLENT. Large and frequent gaps in						
≤ 10	traffic on the main roadway. Queuing on the minor street is rare.						
	VERY GOOD. Many gaps exist in traffic on						
> 10 and < 15	the main roadway. Queuing on the minor						
, 10 dilla = 10	street is minimal.						
	GOOD. Fewer gaps exist in traffic on the						
> 15 and ≤ 25	main roadway. Delay on minor approach						
	becomes more noticeable.						
05 05	FAIR. Infrequent and shorter gaps in traffic						
> 25 and ≤ 35	on the main roadway. Queue lengths						
	develop on the minor street.						
25 and < 50	POOR. Very infrequent gaps in traffic on						
> 35 ana ≤ 50	the main roadway. Queue lengths become noticeable.						
	UNSATISFACTORY. Very few gaps in traffic on the main roadway. Excessive delay						
> 50	with significant queue lengths on the						
	minor street.						
	Vehicle (seconds) ≤ 10 > 10 and ≤ 15 > 15 and ≤ 25 > 25 and ≤ 35 > 35 and ≤ 50						

Adapted from Highway Capacity Manual 2000, Transportation Research Board

Level of Service Definitions

Signalized Intersections

Level of Service	Control Delay per Vehicle (seconds)	Interpretation
А	≤ 10	EXCELLENT. Extremely favourable progression with most vehicles arriving during the green phase. Most vehicles do not stop and short cycle lengths may contribute to low delay.
В	> 10 and ≤ 20	VERY GOOD. Very good progression and/or short cycle lengths with slightly more vehicles stopping than LOS "A" causing slightly higher levels of average delay.
С	> 20 and ≤ 35	GOOD. Fair progression and longer cycle lengths lead to a greater number of vehicles stopping than LOS "B".
D	> 35 and ≤ 55	FAIR. Congestion becomes noticeable with higher average delays resulting from a combination of long cycle lengths, high volume-to-capacity ratios and unfavourable progression.
E	> 55 and ≤ 80	POOR. Lengthy delays values are indicative of poor progression, long cycle lengths and high volume-to-capacity ratios. Individual cycle failures are common with individual movement failures also common.
F	> 80	UNSATISFACTORY. Indicative of oversaturated conditions with vehicular demand greater than the capacity of the intersection.

Adapted from Highway Capacity Manual 2000, Transportation Research Board

APPENDIX D

Detailed Capacity Analysis Worksheets

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		4			4			4	7		ની	7
Traffic Volume (veh/h)	4	0	1	1	0	1	0	459	1	4	492	1
Future Volume (Veh/h)	4	0	1	1	0	1	0	459	1	4	492	1
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	4	0	1	1	0	1	0	504	1	4	541	1
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	1054	1054	541	1054	1054	504	542			505		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1054	1054	541	1054	1054	504	542			505		
tC, single (s)	7.1	6.5	6.2	8.1	6.5	6.2	4.1			4.6		
tC, 2 stage (s)		0.0	V. <u>L</u>	0	0.0	V. <u>L</u>				1.0		
tF (s)	3.5	4.0	3.3	4.4	4.0	3.3	2.2			2.7		
p0 queue free %	98	100	100	99	100	100	100			100		
cM capacity (veh/h)	205	227	545	135	227	572	1037			853		
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2	1001			000		
Volume Total												
	5	2	504	1	545	1						
Volume Left	4	1	0	0	4	0						
Volume Right	1	1	0	1700	0	1						
cSH	234	219	1037	1700	853	1700						
Volume to Capacity	0.02	0.01	0.00	0.00	0.00	0.00						
Queue Length 95th (m)	0.5	0.2	0.0	0.0	0.1	0.0						
Control Delay (s)	20.7	21.6	0.0	0.0	0.1	0.0						
Lane LOS	C	C			A							
Approach Delay (s)	20.7	21.6	0.0		0.1							
Approach LOS	С	С										
Intersection Summary												
Average Delay			0.2									
Intersection Capacity Utilizati	on		42.8%	IC	U Level of	of Service			Α			
Analysis Period (min)			15									

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		4			4			र्स	7		र्स	7
Traffic Volume (veh/h)	9	0	0	0	0	4	1	355	0	2	321	7
Future Volume (Veh/h)	9	0	0	0	0	4	1	355	0	2	321	7
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	10	0	0	0	0	4	1	386	0	2	349	8
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	745	741	349	741	749	386	357			386		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	745	741	349	741	749	386	357			386		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	97	100	100	100	100	99	100			100		
cM capacity (veh/h)	330	346	699	334	342	666	1213			1184		
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2						
Volume Total	10	4	387	0	351	8						
Volume Left	10	0	1	0	2	0						
Volume Right	0	4	0	0	0	8						
cSH	330	666	1213	1700	1184	1700						
Volume to Capacity	0.03	0.01	0.00	0.00	0.00	0.00						
Queue Length 95th (m)	0.7	0.1	0.0	0.0	0.0	0.0						
Control Delay (s)	16.3	10.4	0.0	0.0	0.1	0.0						
Lane LOS	С	В	A	0.0	А							
Approach Delay (s)	16.3	10.4	0.0		0.1							
Approach LOS	C	В	0.0		V. .							
Intersection Summary												
Average Delay			0.3									
Intersection Capacity Utilizati	ion		35.4%	IC	Ulevelo	of Service			Α			
Analysis Period (min)			15	10	.5 250010	J. 001 VI00			/\			
raidiyolo i ollou (IIIII)			10									

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		4			4			4	7		4	7
Traffic Volume (veh/h)	4	0	1	1	0	1	0	560	1	4	600	1
Future Volume (Veh/h)	4	0	1	1	0	1	0	560	1	4	600	1
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	4	0	1	1	0	1	0	615	1	4	659	1
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	1283	1283	659	1283	1283	615	660			616		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1283	1283	659	1283	1283	615	660			616		
tC, single (s)	7.1	6.5	6.2	8.1	6.5	6.2	4.1			4.6		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	4.4	4.0	3.3	2.2			2.7		
p0 queue free %	97	100	100	99	100	100	100			99		
cM capacity (veh/h)	142	166	467	90	166	495	938			769		
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2						
Volume Total	5	2	615	1	663	1						
Volume Left	4	1	0	0	4	0						
Volume Right	1	1	0	1	0	1						
cSH	165	152	938	1700	769	1700						
Volume to Capacity	0.03	0.01	0.00	0.00	0.01	0.00						
Queue Length 95th (m)	0.7	0.3	0.0	0.0	0.1	0.0						
Control Delay (s)	27.4	29.0	0.0	0.0	0.1	0.0						
Lane LOS	D	D	0.0	0.0	A	0.0						
Approach Delay (s)	27.4	29.0	0.0		0.1							
Approach LOS	D	D	0.0		0.1							
Intersection Summary												
Average Delay			0.2									
Intersection Capacity Utilizat	tion		48.5%	IC	CU Level o	of Service			Α			
Analysis Period (min)			15	10	. 5 25 701 (,,			

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		4			4			4	7		ર્ન	7
Traffic Volume (veh/h)	9	0	0	0	0	4	1	433	0	2	392	7
Future Volume (Veh/h)	9	0	0	0	0	4	1	433	0	2	392	7
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	10	0	0	0	0	4	1	471	0	2	426	8
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	907	903	426	903	911	471	434			471		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	907	903	426	903	911	471	434			471		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	96	100	100	100	100	99	100			100		
cM capacity (veh/h)	256	278	633	260	276	597	1136			1101		
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2						
Volume Total	10	4	472	0	428	8						
Volume Left	10	0	1	0	2	0						
Volume Right	0	4	0	0	0	8						
cSH	256	597	1136	1700	1101	1700						
Volume to Capacity	0.04	0.01	0.00	0.00	0.00	0.00						
Queue Length 95th (m)	1.0	0.01	0.00	0.00	0.00	0.00						
	19.6	11.1			0.0							
Control Delay (s)			0.0	0.0		0.0						
Lane LOS	C	11 1	A		Α							
Approach LOS	19.6 C	11.1	0.0		0.1							
Approach LOS	C	В										
Intersection Summary												
Average Delay			0.3									
Intersection Capacity Utilizati	on		39.5%	IC	CU Level of	of Service			Α			
Analysis Period (min)			15									

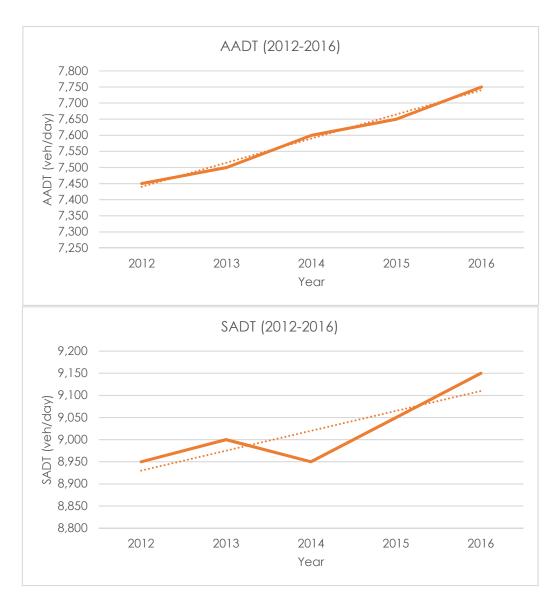
APPENDIX E

MTO Growth Rate Analysis

Growth Rate Calculations

Highway 93 - Highway 400 - End of NA

Year	AADT	% increase	SADT	% increase
2012	7,450		8,950	
2013	7,500	0.7%	9,000	0.6%
2014	7,600	1.3%	8,950	-0.6%
2015	7,650	0.7%	9,050	1.1%
2016	7,750	1.3%	9,150	1.1%
Average	% increase	1.0%		0.6%



APPENDIX F

Signal Warrant Analysis Worksheets

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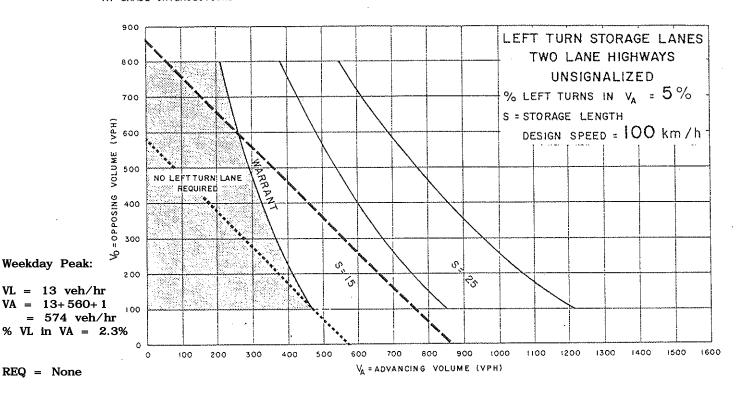
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APPENDIX G

Left-Turn Lane Warrant Analysis Worksheets



Saturday Peak:

TRAFFIC SIGNALS MAY BE WARRANTED IN RURAL
AREAS OR URBAN AREAS WITH RESTRICTED FLOW

VL = 1 veh/hr VA = 1+433+0 = 434 veh/hr % VL in VA = 0.0%

TRAFFIC SIGNALS MAY BE WARRANTED IN

"FREE FLOW" URBAN AREAS

REQ = None

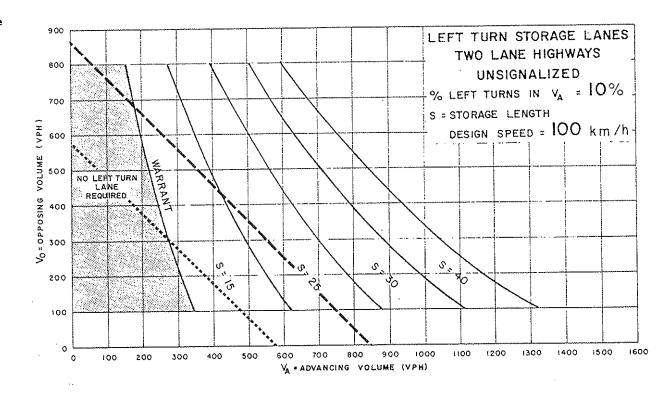


Figure EA-22

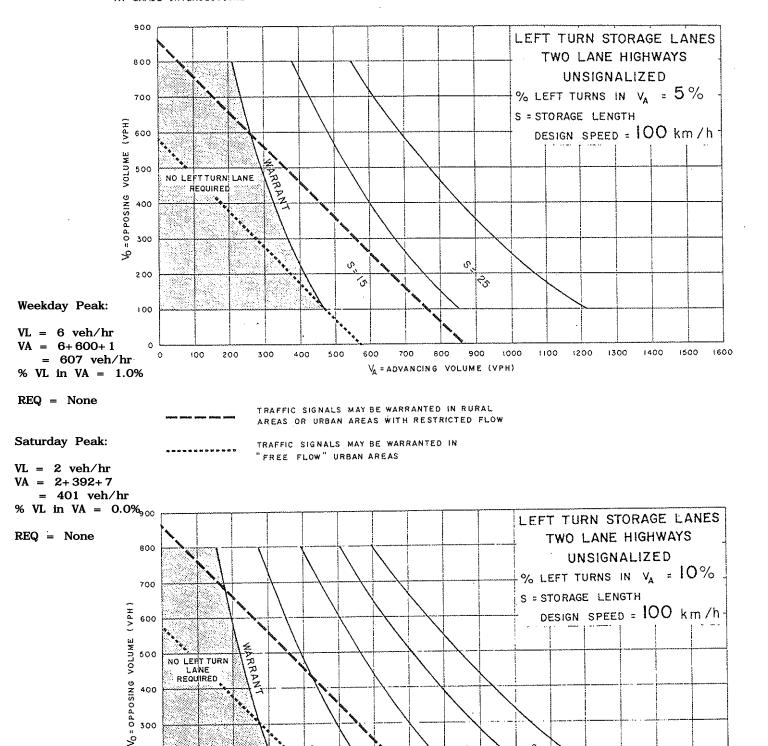


Figure EA-22

700

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VA + ADVANCING VOLUME (VPH)

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S

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1100

1200

1300

1400

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APPENDIX H

Collision History

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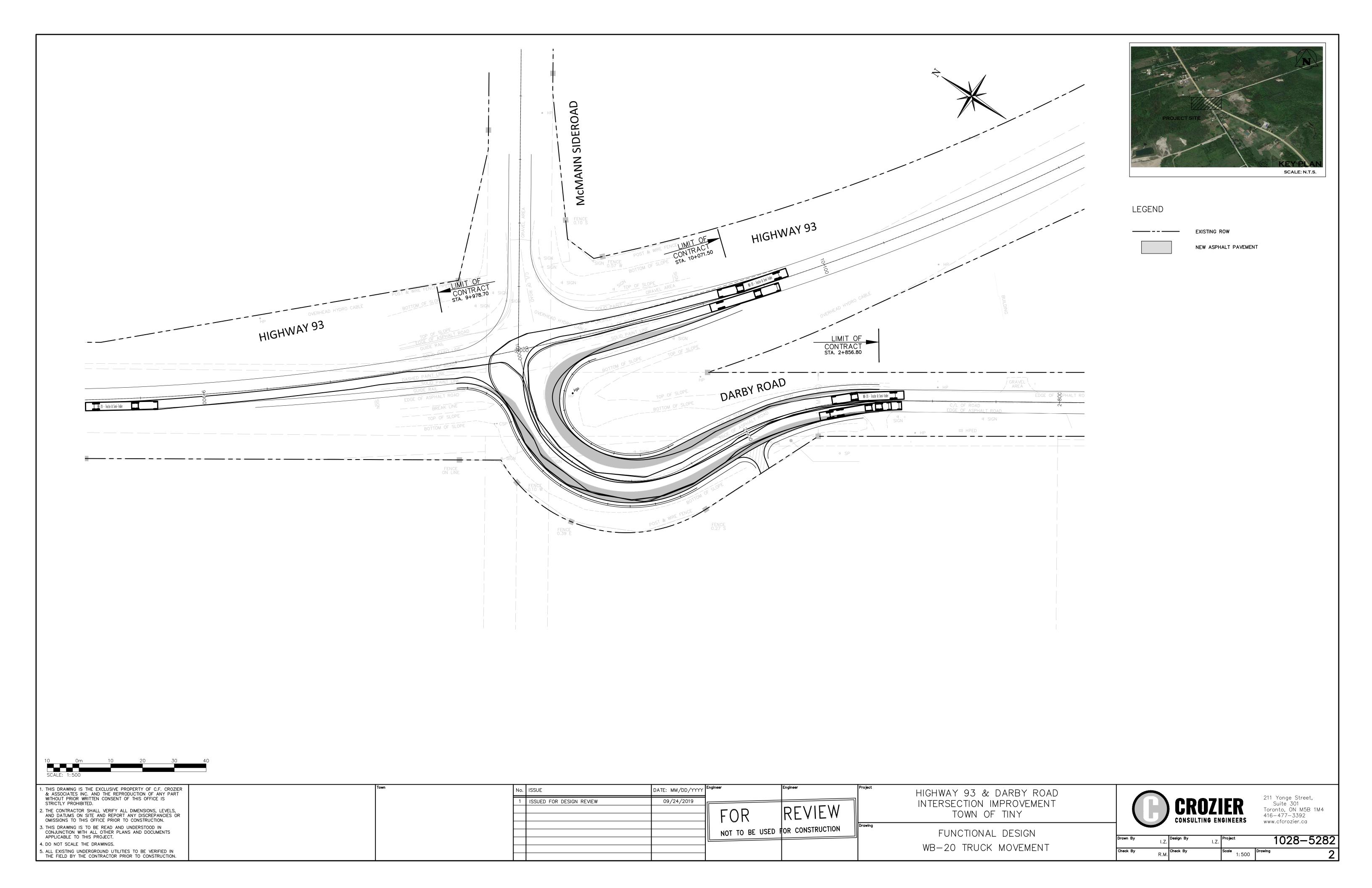
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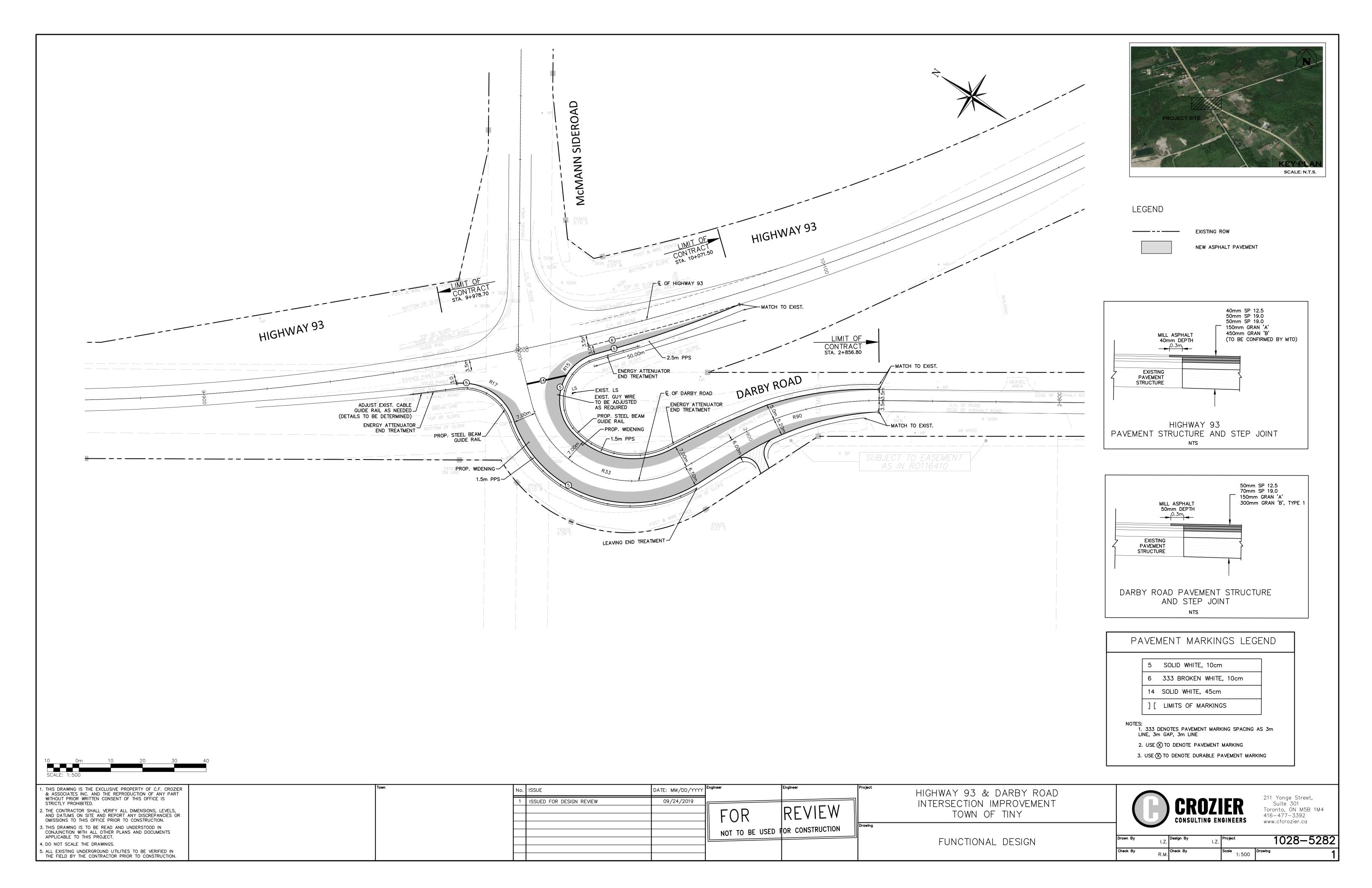
APPENDIX I

Vehicle Turning Analysis

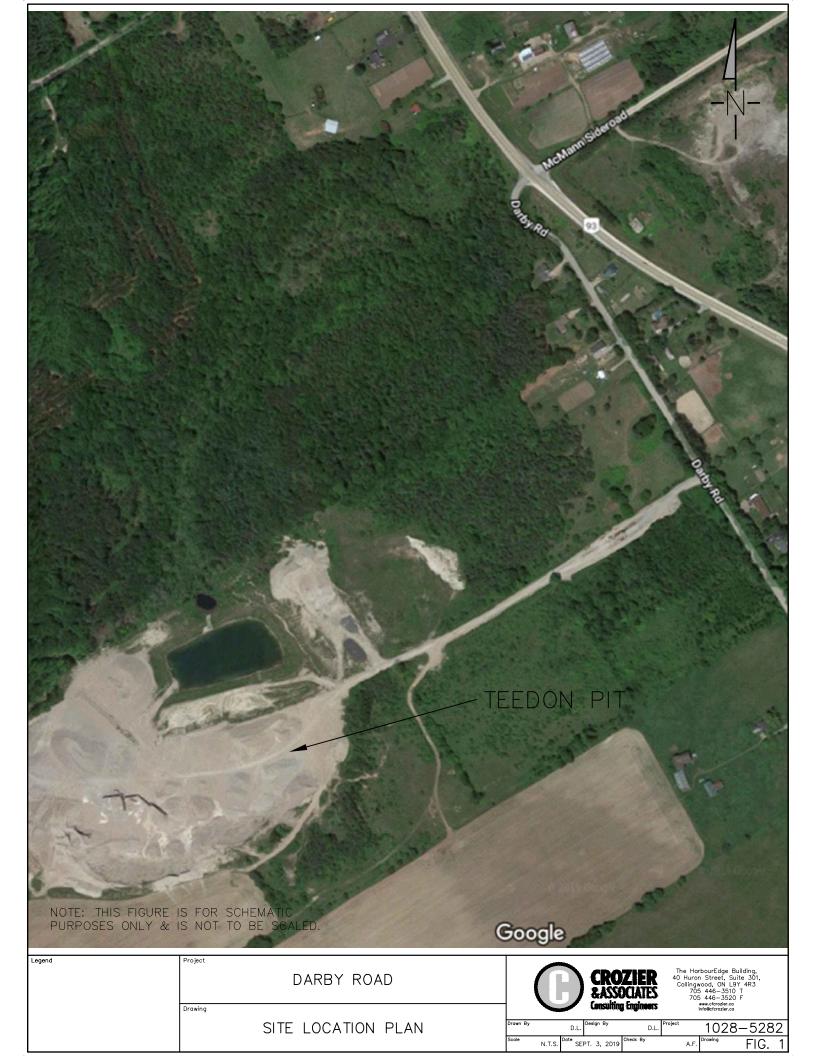


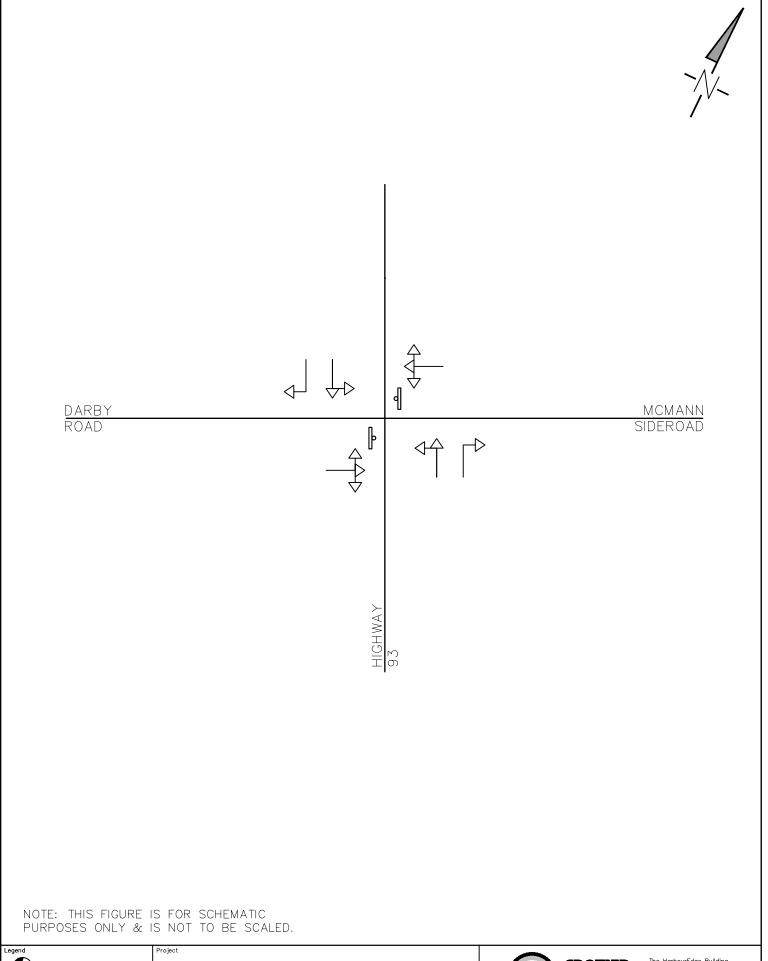
APPENDIX J

Functional Design – Darby Road and Highway 93



FIGURES





SIGNAL CONTROL

STOP CONTROL

Drawing

BOUNDARY ROAD NETWORK

Drawing

Drawing

BOUNDARY ROAD NETWORK

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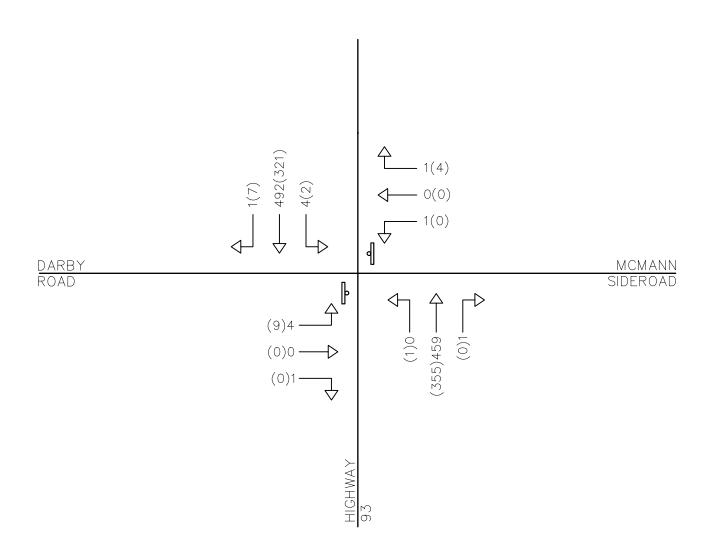
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NOTE: THIS FIGURE IS FOR SCHEMATIC PURPOSES ONLY & IS NOT TO BE SCALED.



SIGNAL CONTROL

STOP CONTROL

XX(YY) WEEKDAY (SATURDAY)
PEAK HOUR TRAFFIC
VOLUMES

| 1

DARBY ROAD

Drawing

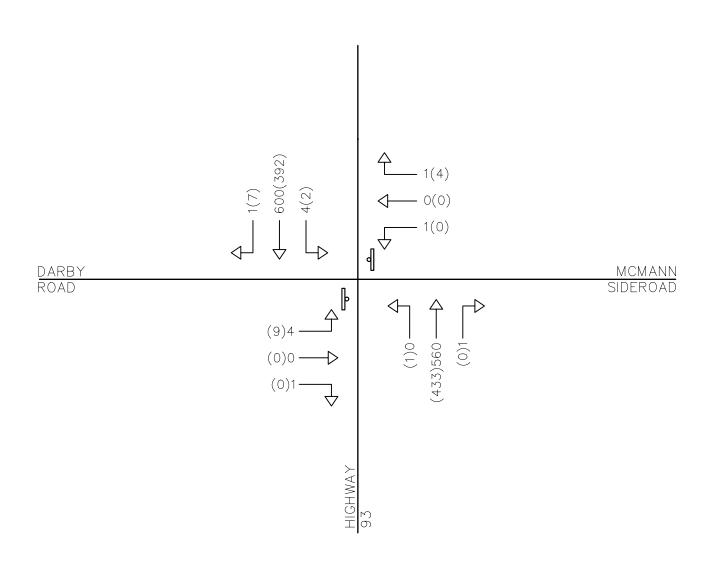
2019 EXISTING TRAFFIC VOLUMES



CROZIER &ASSOCIATES Consulting Engineers The HarbourEdge Building, 40 Huron Street, Suite 301, Collingwood, 0N L9Y 4R3 705 446—3510 T 705 446—3520 F www.cfcrozler.ca

D.L. | Design By | D.L. | Project | 1028-5282 | D.L. | Design By | D.L. | Project | 1078-5282 | D.L. | Design By | D.L. | Project | 1078-5282 | D.L. | Design By | D.L. | Project | 1028-5282 | D.L. | Design By | D.L. | Project | 1028-5282 | D.L. | Design By | D.L. | Project | 1028-5282 | D.L. | Design By | D.L. | Project | 1028-5282 | D.L. | Design By | D.L. | Project | 1028-5282 | D.L. | Design By | D.L. | Project | 1028-5282 | D.L. | Design By | D.L. | Project | 1028-5282 | D.L. | Design By | D.L. | Project | D.L. | Design By | D.L. | Project | D.L. | Design By | D.L. | Design By | D.L. | Project | D.L. | Design By | D.L. | Design By | D.L. | Project | D.L. | Design By | D.L. | Design By | D.L. | Design By | D.L. | Design By | D.L. | Design By | D.L. | Design By | D.L. | Design By | D.L. | Design By | D.L. | Design By | D.L. | Design By | D.L. | Design By | D.L. | Design By | D.L. | Design By | D.L. | Design By | D.L. | Design By | D.L. | Design By | D.L. | Design By | D.L. | Design By | D.L. | Design By | D.L. | Design By | D.L. | Design By | D.L. | Design By | D.L. | Design By | D.L. | Design By | D.L. | Design By | D.L. | Design By | D.L. | Design By | D.L. | Design By | D.L. | Design By | D.L. | Design By | D.L. | Design By | D.L. | Design By | D.L. | Design By | D.L. | Design By | D.L. | Design By | D.L. | Design By | D.L. | Design By | D.L. | Design By | D.L. | Design By | D.L. | Design By | D.L. | Design By | D.L. | Design By | D.L. | Design By | D.L. | Design By | D.L. | Design By | D.L. | Design By | D.L. | Design By | D.L. | Design By | D.L. | Design By | D.L. | Design By | D.L. | Design By | Design By | Design By | D.L. | Design By | Design By | D.L. | Design By | Design By | Design By | Design By | Design By | Design By | Design By | Design By | D.L. | Design By | Design By | Design By | Design By | Design By | Design By | Design By | Design By | Design By | Design By | Design By | Design By | Design By | Design By | Design By | Design By | Design By | Design By | Design By | Design By | Design By





NOTE: THIS FIGURE IS FOR SCHEMATIC PURPOSES ONLY & IS NOT TO BE SCALED.

Legend

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SIGNAL CONTROL

STOP CONTROL

WEEKDAY (SATURDAY) PEAK HOUR TRAFFIC VOLUMES DARBY ROAD

Drawing

2039 FUTURE TRAFFIC VOLUMES



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Travin By D.L. Design By D.L. Project 1028-5282 cole N.T.S. Date SEPT. 3, 2019 Check By A.F. Drawing FIG. 4

Attachment 4





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@chg', \$ 'Ub X', % z̄ 7 cb WYgg]cb '% EK 'D'F z̄ Hck bg\] [d`c ZH]bm z̄ 7 ci bhnic ZG]a Wc Y''
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1.Á Introduction

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2.Á Previous Investigations

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I do not believe that the water well impacts of the three water well interference complaintants are due to the water takings associated with the Permit for the Teedon Pit.

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 CÁH€€Á; *EŠÁ, @Bk@Ár¢&^^å•Ác@ÁL) æðā ÁÖ¦ā\ā *Áræ*¦ÁÛ æðā ÁÛæð åæða•Á; ÁG€€Á; *EŠDÁÁ
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- •Á Tæ) *æ) ^• ^Á; ¦Ác@ Á; [• cÁ; æ; cÁv•• Ác@æ) ÁCEÉÁ; *EŠÁs` cÁæcÁFFÌ JÁT æ; @æ) ÁÜ[æ; Á; æ; ÁGJÁ; *EŠÁ

V@^Á'¦[`}叿e^¦Á`æþāĉ ÁsæææÁ&[||^&c^åÁ¦[{ Ás@•^Áāç^Ás[{ ^•cã&Á¸^||•Á¸^¦^Áĉ]ā&æḥÁ;^Á'|æ&ãæḥÁs^][•ã•Á *¦[`}叿e^¦Áæ)åÁæò^Á&[}•ã•c^}cÁ¸ão@Á¸`à|ã•@°åÁ^*ā[}æþÁ'¦[`}叿e^¦Á`æþācÁ^][¦o•ÁÇĴā;*^¦Á°cÁæþÆJJJÁ Ù^ç^¦}ÁÜ[`}åÁÙc*å^DÁ;¦Áxoã•Áæò^æÉÁ

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ÕPÖĒĀ} Ás^@ṭḍ-Á; ÁÔÜPÁÔæj æåæfÕ;[ˇ]ÁQ&ĒĚ&[{]|^c°åÁæás[{^•æð;^^|Áş ÁOŒFÌÁ[¦Ás@Á,:|]^!æð•Á¸ão@Á¸^||Á*;ç^^Ásj ÁOŒFÌÁ[¦Ás@Á,:|]^!æð•Á¸ão@Á¸ão@Á¸ÃsæfÁā[{^•æð;^||Áş &|ˇå^åÁ;|]^!æð•Á¸ão@Á @æ ([¦ã&æþÁ;æc°¦Á¸^||Ás[{]|æáj o•Ás^^[}åÁs@ÁFÁ{Áæåã•ÈV@Ác°å^Áse^æás|&|ˇå^åÁìÌÁ;![]^!æð•Áæþ[}*Á Óæ•^|āj^ÁÜ[æåÁÙ[ˇœÃÔæ]^}c°¦Ábaå^![æåÊÖæèà^ÁÜ[æåÊÖæèà^ÁÜ[æåÊØA] Tæ•@æþÁÜ[æåÊÛææ]]ÂÛæå^![æåÊÄææ]åÁY[[ååÊÄæ]åÁY][æåÊÄ

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V[Λ]|æ&^Λœ@Λ´æ);αᾶ Αœ•^••{ ^}σΕς (A&[} α*φοΑω); αΑδι^α'; (Β) απομΑς αν'; Α') δω Αν', Α') δω ΕΑΘΕ (Ε΄ Αδιβων Αδιβων Α΄ Αδιβων

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- •Á U-Ás@ÁF€Á, ^||•ÉÁ, } | Á Á, Ás@Á, ^||•Ásè^Ás^^]ÁÇNG€Á, DÁsè) åÁS[ˇ |åÁ, [♂ } ŒÆ| Âs^Áse-^8♂åÁs Â,] ^ | ææð, *Á ÚY FÆJÆ
- •Á V@ÁÁÁå^^]Á, ^||•Á@æåÁæçæájæà|^Á妿, å[, }•ÁÁÁÌÁ, ÉÁHÌÁ, ÉÁHÌÁ, Áæ)åÁHÏÁ, ÉÁ
- •Á OƸ ^||Á[8ææ°åÁæð] | [¢ã[ææ°| ÁG€€Á;Áræ•óÁ;ÁÚY FË€JÁs@ææÁr¢] ^|âr} & ^åÁæÁ;æ¢ã[ˇ{Á;Á€Ē ÍÁ;Á å|æ¸å[¸}Ásˇ|ð]*Ás@ÁG€F€Á¸ˇ{]ð]*Ás°•ÓÆð;åÁr••Ás@æðÁĒ Á;Á;Ás¦æ¸å[¸}Ásˇ|ð]*Án^* |æðÁ;] ^|ææã[}Á;Á ÚY FË€JÉV@áÆá;•ãt}ã&æð;óÁtā;Ás•åt}ã&æð;óÁtā;^}Ás@Áæð*^Áææçæðiææð;|^Ás¦æ,å[¸}ÁşÁs@Á, ^||ÉÁ

V@`¦^-{|^Ê\$anÁ, æ•Á&[}&|`å^åÁs@ænÁsaÁ@ænÁsaÁ@ænÁsaÁ@ænÁs]å`^|^Ás@ænAá]}^;æná]}Á;-ÁÚY FËEJÁ,[`|åÁ^•`|oÁs,Á,ænô`¦Á ``æ);œnĉÁs[o°¦-^¦^}&^Án-^&o-Ás,Ása)^Á;^ænò`ás Ás[{ ^•œn&Á,^||•ÈÁ

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3. Conclusions

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Since extraction will remain 1.5 m above the established groundwater table, there will be no impact to private wells or groundwater resources.

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Á Á Á

Attachment A

Ministry of the Environment and Climate Change

Central Region Office Technical Support Section Water Resources Unit

5775 Yonge Street 8th Floor North York ON M2M 4J1

Tel.: 416 326-6700 Fax: 416-325-6347 Ministère de l'Environnement et de l'Action en matière de changement climatique

Région du Centre Section d'appul technique Ressource en eau

5775, rue Yonge 8 lème étage North York (Ontario) M2M 4J1

Tél: (416) 326-6700 Tèléc: (416) 325-6347



November 23, 2015

Robert E. Graham Cedarhurst Quarries & Crushing Limited 3300 King Vaughan Townline, Post Office Box 250 King, Ontario, L7B 1B2

Dear Mr. Graham

The Ministry of Environment and Climate Change (MOECC) has reviewed the three water well interference complaints (Janet Irvine, Bonnie Pauze/Jake Pigeon, and Peter Anderson) regarding the Permit to Take Water # 4317-87CNZN (Permit) for Cedarhurst Quarries & Crushing Limited (Permit Holder) at the Teedon Pit, 90 Darby Road, Tiny Township (Teedon Pit).

I have concluded the following:

- I agree that when issuing the latest Permit, the MOECC should have kept the condition
 that required monitoring the surface elevation of the wash pond that was in the original
 2008 Permit. I am requesting that Cedarhurst Quarries & Crushing Limited recommence
 with this type of monitoring effective immediately as outlined below in bullets i and ii,
 and provide the MOECC a response indicating your agreement to conduct said
 monitoring. The MOECC would also advise you that any requests to renew or amend the
 Permit will reinstate this condition.
 - i. Prior to water being taken from the Wash Pond each year, the Permit Holder shall establish a staff gauge in the Wash Pond and determine the elevation of the staff gauge. The Permit Holder shall measure and record the Wash Pond water level at the start and end of each day on which taking occurs.
 - ii. If, during the year of operation, the elevation of the staff gauge is changed, the Permit Holder shall determine the new elevation.
- The potential violations of the Permit regarding notification of well interference complaints have been forwarded to the local environmental officer who is planning on conducting a Permit inspection of the Teedon Pit in the near future.
- I believe that there have been sufficient hydrogeological investigations completed on-site to warrant the issuance of the Permit.

- I disagree with Mr. Ruland's conceptual model that silt from the wash pond is affecting local wells. It is not possible for silt to flow through a silt, sand and gravel aquifer as a silt plume as Mr. Ruland has proposed.
- I do not believe that the water well impacts of the three water well interference complainants are due to the water takings associated with the Permit for the Teedon Pit.

I have written separate letters to each of the complainants stating my above findings as well as commenting on their individual well issues. A copy of each of these letters is attached to this letter.

Should you have any questions, please do not hesitate to contact myself at (416) 325-7487 or Mr. Mihran Aslanyan, who will be taking over this file, at (416) 326-4418.

Sincerely.

Christopher R. Munro, M.Sc.Eng., P.Eng. Geological Engineer / Hydrogeologist

cc. Helen Zhang, Supervisor, Water Unit, Technical Support Section, MOECC Mihran Aslanyan, Hydrogeologist, Water Unit, Technical Support Section, MOECC Greg Athron, Environmental Officer, Barrie District, MOECC Ross Campbell, Alpha Environmental Services Prabin Sharma, Aggregates Technical Intern, MNRF Shawn Persaud, Manager of Planning & Development, Township of Tiny

Attachments: Letters to water well interference complainants (Janet Irvine, Bonnie Pauze/Jake Pigeon, and Peter Anderson)

Ministry of the Environment and Climate Change

Central Region Office Technical Support Section Water Resources Unit

5775 Yonge Street 8th Floor North York ON M2M 4J1

Tel.: 416 326-6700 Fax: 416-325-6347

November 23, 2015

Mrs. Janet Irvine 7062 Highway 93 Tiny Township, Ontario LOK 2E1

Dear Ms. Irvine

Ministère de l'Environnement et de l'Action en matière de changement climatique

Région du Centre Section d'appui technique Ressource en eau

5775, rue Yonge 8 lème étage North York (Ontario) M2M 4J1

Tél: (416) 326-6700 Téléc: (416) 325-6347



The Ministry of Environment and Climate Change (MOECC) has reviewed your water well interference complaint regarding the Permit to Take Water # 4317-87CNZN (Permit) for Cedarhurst Quarries & Crushing Limited (Permit Holder) at the Teedoh Pit, 90 Darby Road, Tiny Township (Teedon Pit). In response to your complaint a site visit was conducted on June 30, 2015, and the Permit Holder's hydrogeologist, Ross Campbell, produced a water well assessment report dated August 2015. Acting on Mrs. Pauze and Mr. Pigeon's behalf, hydrogeologist, Wilf Ruland, conducted his own assessment and presented a report on October 20, 2015. In response, Mr. Campbell, produced another report responding to Mr. Ruland's report on November 5, 2015.

I have reviewed the above noted reports as well as the documentation within the file the MOECC has for this Permit and conclude the following:

- I agree that when issuing the latest Permit in 2010, the MOECC should have kept the condition that required monitoring the surface elevation of the wash pond that was in the original 2008 Permit. I am requesting that the Permit Holder recommence with this type of monitoring and recommend that upon any requests to renew or amend the Permit that this condition be reinstated.
- The potential violations of the Permit regarding notification of well interference complaints have been forwarded to the MOECC's local environmental officer who is planning on conducting a Permit inspection of the Teedon Pit in the near future.
- I believe that sufficient hydrogeological investigations were completed on-site to warrant the issuance of the Permit when it was issued in 2010.
- I disagree with Mr. Ruland's conceptual model that silt from the wash pond is affecting local wells, including your well. It is not possible for silt to flow through a silt, sand and gravel aquifer as a silt plume as Mr. Ruland has proposed.

• I do not believe that your water well impacts are due to the water takings associated with the Permit for the Teedon Pit.

During the site visit, you showed us the sediment that was collecting on the metal filter of your hot water tank and in the toilet tank. This material did not look like the silt/clay material of Mrs. Pauze. Mr. Campbell's water quality sample resulted in no detected total suspended solids or turbidity, iron related bacteria were present, and a background bacteria count of 1000 CFU/100 mL.

It is clear from the reported bacteria level that the well is contaminated with biological material that is likely due to construction of your well at surface. The top of your well is only about 2 inches above ground surface and the well cap has an open hole on the centre of it which is designed for piping to exit; however there is no pipe or other plug sealing this hole. The wellhead has a large overturned metal bowl shaped container loosely covering it. At the present your well is vulnerable to insects, vermin, horse manure runoff, and foreign mater entering your well through the top of the well.

The materials on your filter and toilet tank are likely from either material falling into your well from the hole in your well cap or from the scaling of the inside of the well casing.

I recommend that you hire a licenced water well technician to raise the height of your well, to install a protective well cap, and inspect/disinfect/clean the inside of the well casing. Should you have any questions, please do not hesitate to contact myself at (416) 325-7487 or Mr. Mihran Aslanyan, who will be taking over this file, at (416) 326-4418.

Sincerely,

Christopher R. Munro, M.Sc.Eng., P.Eng.

Geological Engineer / Hydrogeologist

cc. Helen Zhang, Supervisor, Water Unit, Technical Support Section, MOECC Mihran Aslanyan, Hydrogeologist, Water Unit, Technical Support Section, MOECC Greg Athron, Environmental Officer, Barrie District, MOECC Robert E. Graham, Permit Holder, Cedarhurst Quarries & Crushing Limited Ross Campbell, Alpha Environmental Services Prabin Sharma, Aggregates Technical Intern, MNRF Shawn Persaud, Manager of Planning & Development, Township of Tiny Ministry of the Environment and Climate Change

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5775, rue Yonge 8 lème étage North York (Ontario) M2M 4J1

Tél: (416) 326-6700 Téléc: (416) 325-6347



November 23, 2015

Bonnie Pauze and Jake Pigeon 1189 Marshall Road PO Box 1262 Tiny Township, Ontario LOL 2J0

Dear Mrs. Pauze and Mr. Pigeon

The Ministry of Environment and Climate Change (MOECC) has reviewed your water well interference complaint regarding the Permit to Take Water # 4317-87CNZN (Permit) for Cedarhurst Quarries & Crushing Limited (Permit Holder) at the Teedon Pit, 90 Darby Road, Tiny Township (Teedon Pit). In response to your complaint a site visit was conducted on June 30, 2015, and the Permit Holder's hydrogeologist, Ross Campbell, produced a water well assessment report dated August 2015. Your hydrogeologist, Wilf Ruland, conducted his own assessment and presented a report on October 20, 2015. In response, Mr. Campbell, produced another report responding to Mr. Ruland's report on November 5, 2015.

I have reviewed the above noted reports as well as the documentation within the file the MOECC has for this Permit and conclude the following:

- I agree that when issuing the latest Permit in 2010, the MOECC should have kept the
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 this condition be reinstated.
- The potential violations of the Permit regarding notification of well interference complaints have been forwarded to the MOECC's local environmental officer who is planning on conducting a Permit inspection of the Teedon Pit in the near future.
- I believe that sufficient hydrogeological investigations were completed on-site to warrant the issuance of the Permit when it was issued in 2010.
- I disagree with Mr. Ruland's conceptual model that silt from the wash pond is affecting local wells, including your well. It is not possible for silt to flow through a silt, sand and gravel aquifer as a silt plume as Mr. Ruland has proposed.

I do not believe that your water well impacts are due to the water takings associated with the Permit for the Teedon Pit.

At the time of the site visit, it is clear that there is a silt issue with the well water at your house. I believe the silt issues with the house well and barn well are due to well construction and improper screen design. I cannot determine why the problem started in 2009; however, wells do deteriorate with age. My concern with the house well is that the silt that it is producing is likely coming from around the well screen (if a well screen is even present) and creating a void. With the house situated within a few metres of the well, I am concerned that this void may cause land subsidence that may damage or structurally compromise the house.

I strongly recommend that you hire a licensed well contractor and/or Professional Engineer/Professional Geoscientist to investigate your wells and that the appropriate actions be taken ensure that your wells stop discharging silt. Alternately, your current wells could be abandoned and a new well(s) be constructed.

Should you have any questions, please do not hesitate to contact myself at (416) 325-7487 or Mr. Mihran Aslanyan, who will be taking over this file, at (416) 326-4418.

Sincerely,

Christopher R. Munro, M.Sc.Eng., P.Eng. Geological Engineer / Hydrogeologist

cc. Helen Zhang, Supervisor, Water Unit, Technical Support Section, MOECC Mihran Aslanyan, Hydrogeologist, Water Unit, Technical Support Section, MOECC Greg Athron, Environmental Officer, Barrie District, MOECC Robert E. Graham, Permit Holder, Cedarhurst Quarries & Crushing Limited Ross Campbell, Alpha Environmental Services Prabin Sharma, Aggregates Technical Intern, MNRF Shawn Persaud, Manager of Planning & Development, Township of Tiny

Ministry of the Environment and Climate Change

Central Region Office Technical Support Section Water Resources Unit

5775 Yonge Street 8th Floor North York ON M2M 4J1

Tel.: 416 326-6700 Fax: 416-325-6347

November 23, 2015

Mr. Peter Anderson 6970 Highway 93 Tiny Township, Ontario L0K 2E1

Dear Mr. Anderson

Ministère de l'Environnement et de l'Action en matière de changement climatique

Région du Centre Section d'appui technique Ressource en eau

5775, rue Yonge 8 ième étage North York (Ontario) M2M 4J1

Tél: (416) 326-6700 Téléc: (416) 325-6347



The Ministry of Environment and Climate Change (MOECC) has reviewed your water well interference complaint regarding the Permit to Take Water # 4317-87CNZN (Permit) for Cedarhurst Quarries & Crushing Limited (Permit Holder) at the Teedon Pit, 90 Darby Road, Tiny Township (Teedon Pit). In response to your complaint a site visit was conducted on June 30, 2015, and the Permit Holder's hydrogeologist, Ross Campbell, produced a water well assessment report dated August 2015. Acting on Mrs. Pauze and Mr. Pigeon's behalf, hydrogeologist, Wilf Ruland, conducted his own assessment and presented a report on October 20, 2015. In response, Mr. Campbell, produced another report responding to Mr. Ruland's report on November 5, 2015.

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- The potential violations of the Permit regarding notification of well interference complaints have been forwarded to the MOECC's local environmental officer who is planning on conducting a Permit inspection of the Teedon Pit in the near future.
- I believe that sufficient hydrogeological investigations were completed on-site to warrant
 the issuance of the Permit when it was issued in 2010.
- I disagree with Mr. Ruland's conceptual model that silt from the wash pond is affecting local wells, including your well. It is not possible for silt to flow through a silt, sand and gravel aquifer as a silt plume as Mr. Ruland has proposed.

 I do not believe that your water well impacts are due to the water takings associated with the Permit for the Teedon Pit.

Your well is a drilled well situated with a well pit, likely an old dug well, therefore the well head is not accessible and is located below ground. Mr. Campbell's water quality sample resulted in no detected total suspended solids or turbidity, and no bacteria issues. At the time of water quality sampling there appears to be no water quality issues.

Wells that are installed in well pits can be susceptible to being flooded and material can enter the well through the top of well at these times or even around the outside of the drilled well casing if an appropriate seal is not in place. I recommend that you hire a licenced water well technician to inspect your well and to potentially raise the height of your well to above ground level, fill in the well pit with low permeable material to create a good seal from surface water, and to install a protective well cap.

Should you have any questions, please do not hesitate to contact myself at (416) 325-7487 or Mr. Mihran Aslanyan, who will be taking over this file, at (416) 326-4418.

Sincerely,

Christopher R. Munro, M.Sc.Eng., P.Eng. Geological Engineer / Hydrogeologist

cc. Helen Zhang, Supervisor, Water Unit, Technical Support Section, MOECC Mihran Aslanyan, Hydrogeologist, Water Unit, Technical Support Section, MOECC Greg Athron, Environmental Officer, Barrie District, MOECC Robert E. Graham, Permit Holder, Cedarhurst Quarries & Crushing Limited Ross Campbell, Alpha Environmental Services Prabin Sharma, Aggregates Technical Intern, MNRF Shawn Persaud, Manager of Planning & Development, Township of Tiny

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Attachment B

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Attachment *





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1.Á Introduction

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2.Á Comment #1

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 $\begin{array}{l} \text{CEA}[8\text{ca}\text{A}^{'}[] \wedge \text{A}^{'} \text{acc}^{'} | \text{acc}\text{A}^{'}) & \text{A}^{'} \text{acc}^{'} | \text{A}^{'} \text{acc}^{'} | \text{A}^{'} \text{acc}^{'} | \text{A}^{'} \text{acc}^{'} | \text{A}^{'} \text{acc}^{'} | \text{A}^{'} \text{acc}^{'} | \text{A}^{'} \text{acc}^{'} | \text{A}^{'} \text{acc}^{'} | \text{A}^{'} \text{acc}^{'} | \text{A}^{'} \text{acc}^{'} | \text{A}^{'} \text{acc}^{'} | \text{A}^{'} \text{acc}^{'} | \text{A}^{'} \text{acc}^{'} | \text{A}^{'} \text{acc}^{'} | \text{A}^{'} \text{acc}^{'} | \text{A}^{'} \text{acc}^{'} | \text{A}^{'} \text{acc}^{'} | \text{A}^{'} \text{acc}^{'} | \text{A}^{'} \text{acc}^{'} | \text{A}^{'} \text{acc}^{'} | \text{A}^{'} \text{acc}^{'} | \text{A}^{'} \text{acc}^{'} | \text{A}^{'} \text{acc}^{'} | \text{A}^{'} \text{acc}^{'} | \text{A}^{'} \text{acc}^{'} | \text{A}^{'} \text{acc}^{'} | \text{A}^{'} \text{acc}^{'} | \text{A}^{'} \text{acc}^{'} | \text{A}^{'} \text{acc}^{'} | \text{A}^{'} \text{acc}^{'} | \text{A}^{'} \text{acc}^{'} | \text{A}^{'} \text{acc}^{'} | \text{A}^{'} \text{acc}^{'} | \text{A}^{'} \text{acc}^{'} | \text{A}^{'} \text{acc}^{'} | \text{A}^{'} \text{acc}^{'} | \text{A}^{'} \text{acc}^{'} | \text{A}^{'} \text{acc}^{'} | \text{A}^{'} \text{acc}^{'} | \text{A}^{'} \text{acc}^{'} | \text{A}^{'} \text{acc}^{'} | \text{A}^{'} \text{acc}^{'} | \text{A}^{'} \text{acc}^{'} | \text{A}^{'} \text{acc}^{'} | \text{A}^{'} \text{acc}^{'} | \text{A}^{'} \text{acc}^{'} | \text{A}^{'} \text{acc}^{'} | \text{A}^{'} \text{acc}^{'} | \text{A}^{'} \text{acc}^{'} | \text{A}^{'} \text{acc}^{'} | \text{A}^{'} \text{acc}^{'} | \text{A}^{'} \text{acc}^{'} | \text{A}^{'} \text{acc}^{'} | \text{A}^{'} \text{acc}^{'} | \text{A}^{'} \text{acc}^{'} | \text{A}^{'} \text{acc}^{'} | \text{A}^{'} \text{acc}^{'} | \text{A}^{'} \text{acc}^{'} | \text{A}^{'} \text{acc}^{'} | \text{A}^{'} \text{acc}^{'} | \text{A}^{'} \text{acc}^{'} | \text{A}^{'} \text{acc}^{'} | \text{A}^{'} \text{acc}^{'} | \text{A}^{'} \text{acc}^{'} | \text{A}^{'} \text{acc}^{'} | \text{A}^{'} \text{acc}^{'} | \text{A}^{'} \text{acc}^{'} | \text{A}^{'} \text{acc}^{'} | \text{A}^{'} \text{acc}^{'} | \text{A}^{'} \text{acc}^{'} | \text{A}^{'} \text{acc}^{'} | \text{A}^{'} \text{acc}^{'} | \text{A}^{'} \text{acc}^{'} | \text{A}^{'} \text{acc}^{'} | \text{A}^{'} \text{acc}^{'} | \text{A}^{'} \text{acc}^{'} | \text{A}^{'} \text{acc}^{'} | \text{A}^{'} \text{acc}^{'} | \text{A}^{'} \text{acc}^{'} | \text{A}^{'} \text{acc}^{'} | \text{A}^{'} \text{acc}^{'} | \text{A}^{'} \text{acc}^{'} | \text{A}^{'} \text{acc}^{'} | \text{A}^{'} \text{acc}^{'} | \text{A}^{'} \text{acc}^{'} | \text{A}^{'} \text{acc}^{'} | \text{A}^{'} \text{acc}^{'} | \text{A}^{'} \text{acc}^{'} | \text{A}^{'} \text{acc}^{'} | \text{A}^{'} \text{acc$

3.Á Comment #2

Hck bgl Jdfg A Uf W & z & 7 ca a Ybh

V @ Áscå å ãtāj } Á; Ás@ Á; ^ j, ^ l| • Áā] ! [ç^ • Ás@ Á; å^ l • cæ) å āj * Á; Ás@ Á; ^ [|[* ^ Á; } Ás@ Á; ¢ã cāj * Á; ãó Úãc Áse) å Áāj Ás@ Á] ! [] [• ^ å Á; ãcÁ ¢c² } • āj } Ásc ^ æð Aíj | l [] āj * Áscå å ãtāj } æþÁāj - ¡ ! { ææāj } Áār Á ^ ˇ ã ^ å Áq ! ÁÓ ˇ ! } • ãå ^ Áq Ásq [{] | ^ c ^ Ás@ ã Á] ^ \ Á ^ çã ¸ kÁ
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- •Á OZÁzæà|^Á Q; ¾ *Ác@ Áåæe^•Ás@ænÁc@ Á; æ) *æhÁ æe^¦Ár°ç^|ÁåæææÁ æ Á&[||^&c^åÁæ) åÁ@ å¦[*¦æ] @ Á Q; ¾ *Á c@Á^•`|o•Á[¦Áræ&@Á,^|EÁ

8 i ZYf]bfg'>i bY'&\$z\\$\% FYgdcbgY'

Ú|^æ•^Á^~\Áf Ás@ ÁÕPÖÁ^][¦ơÁ ^}ơã}}^aÁsæà[ç^Ásæ Ásósæåå¦^••^•Ás@ Á^~~`^• e^åÆ; f;{ ææã}ÈÁ

; <8 FYgdcbgY

Ùdæaātaaj @akakaj å kāj • d`{ ^} cæaāj} Á[*•Áse^Áj, ![çãa^å kāj ÁOtccæ&@, ^} oÁÓÁ[; Ás@Á, [}ād[tāj*Á, ^||•Ás[{]|^c^å kāj ÁOtccæ&@, ^} oÁÓÁ[; Ás@Á, [}ād[tāj*Á, ^||•Ás[{]|^c^å kāj ÁOtccæ&@, ^} oÁÓÁ[; As@Á, [}ād[tāj*Á, ^||•Ás[{]|^c^å kāj ÁOtccæ&@, ^} oÁÓÁs@æÁ, ^; ^ksu[{]|^c^å kāj ÁOtFiì DÁO, Áæaå åāāj} Ďáo@ Ás[; ^@, |^Ás[{]|^c^å kāj ÁOtFiì ĎÁO PFÉÌ ĎÁ
ÓPGÉÌ ĎÁOPHÉÌ ĎÁS å ÁÓPI ÉÌ DÁA ^å; [*^[|[*ās Ási]••É^8cāj}•Ás@æÁs &[;][; æc Ása|Ás@ÁOtFì Á; [}ād[tāj*Á, ^||Áæaå åÁs[; ^@, |^Ás@æÁs]å ÁhÉÁ

FFFÍÍHÍØ:I:8EÁ



P^å¦[*^[|[*3&Á&¦[••Ë^8cqī]}ÁOEEŒÁ¸@&@éœéÁs@Á*]^¦qī][•^åÁ^][¦c^åÁs^]c@Á;-Ás@Ás[{ ^•cæÁ¸^||•Á ;@&@éœç^ÁœæáÁs[{]|æájo•Áse^Á;¦[çãs^åÁsjÁOEcæ&@ ^}cÁÔÈÁU|^æ•^Á;[c^Ás@Á;||[¸ã;*Á;¦Ás@áÁs|[••Ë^8cqī])kÁ

- •Á V@Á, | []^\can •Áseb^Áseb^ÁsebA, | [{ Ás@Á, |^] seb^åA@å|[*^[|[*a&Ásk][••Ë•^8ca[} }sebAs[`}åseb^Áseb}åAseb^Áse@\^-[\^Á |^]\^•^}oÁse]]|[¢a[see^Ás[}åäaa[}•ÈÁ
- •Á U}|^Áç [Áţ-Áx@Áţ:[]^:can•Á@æåÁş ææ^:Áş^||Á^&[:å•Á[:&ææ^åÁQC=ÁÖæbà^ÁæġåÁi€Î GÁP¸^ÁJHDÁş @ặ^Áx@Á
 ā¸-[;{ææã}}Áţ:|Áx@Áţc@:Á¸:[]^:can•Áş ææÁţàææå¸^åÁ;[{Áştơ\;çan¸•Áåˇ:|ā¸*Á¸:^çāţˇ•Áå[{^•œæÁş ææ^:Áş^||Á
 •ˇ;c^^•ÈÁ

4.Á Comment #3f

Hck bg | Jdfg A UFW & z & 7 ca a Ybh

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8 i ZYf]bfg'>i bY'&\$z\\$\% FYgdcbgY'

 $V@Ac^{\bullet} \circ aj^{*} / Ac \Rightarrow aA_{i} [] \tilde{a}[| \tilde{a}]^{*} / A^{``} \tilde{a}^{*} (^) \circ A_{i} | Ac @A_{i} \otimes A_{i} [Ac @A_{i} \otimes A_{i} (Ac @A_{i} (Ac @A_{i} \otimes A_{i} (Ac @A_{i} (A$

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FFFÍÍHÍØ:IÆÉÁ



ÕPÖÁ

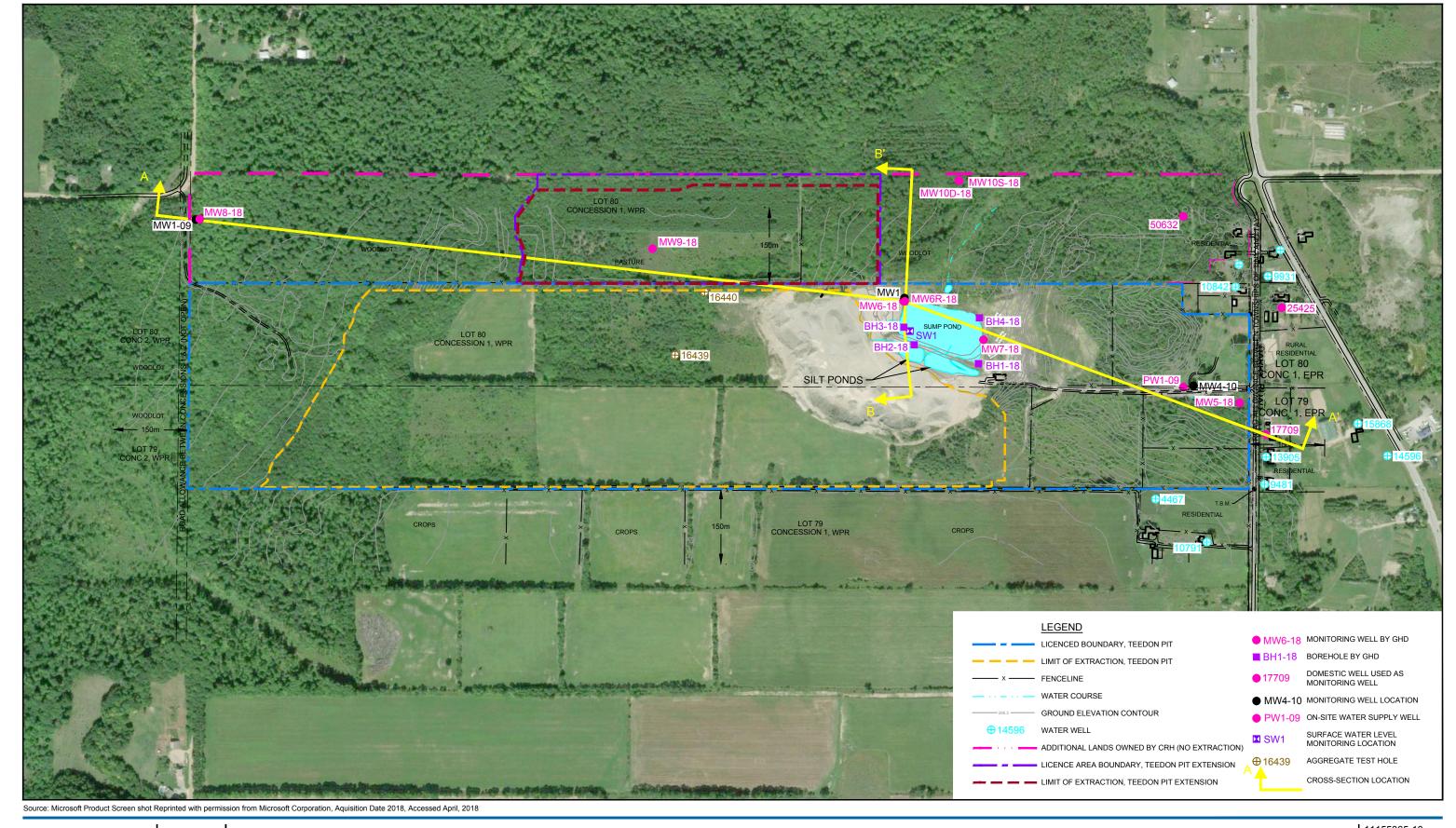
Á GARY I, LAGOS
Á PRAOTISING MÉMBER
Á 1841

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8& KÁ $S^{\bar{a}}$ ÁT ã & @\|\EÔÜPÁÔæ\; æ å æ EÖ\\[`] ÁQ & EÁ EO\\ aa\) ÉT PÓÔÁ





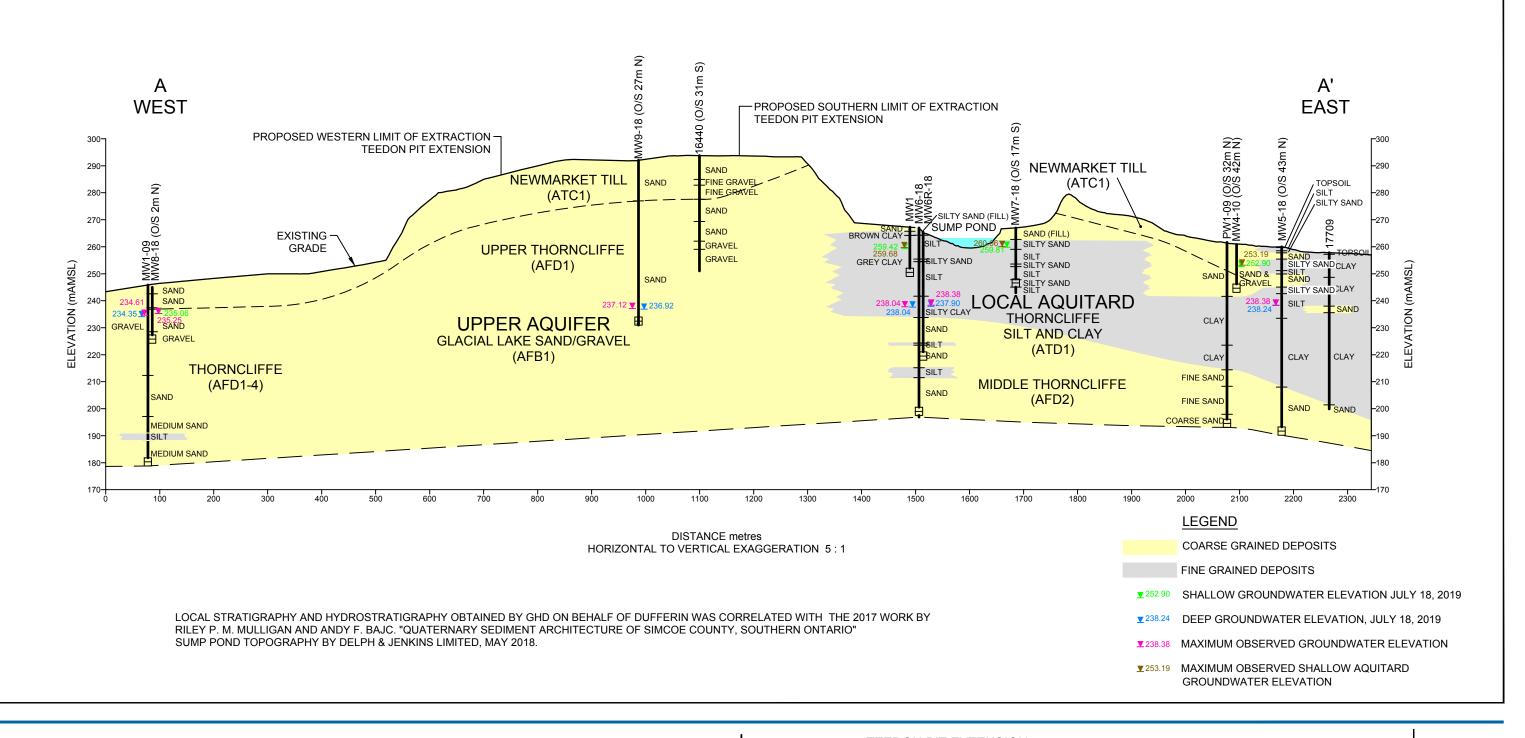




TEEDON PIT EXTENSION TOWNSHIP OF TINY, COUNTY OF SIMCOE, ONTARIO

11155365-10 Sept 19, 2019

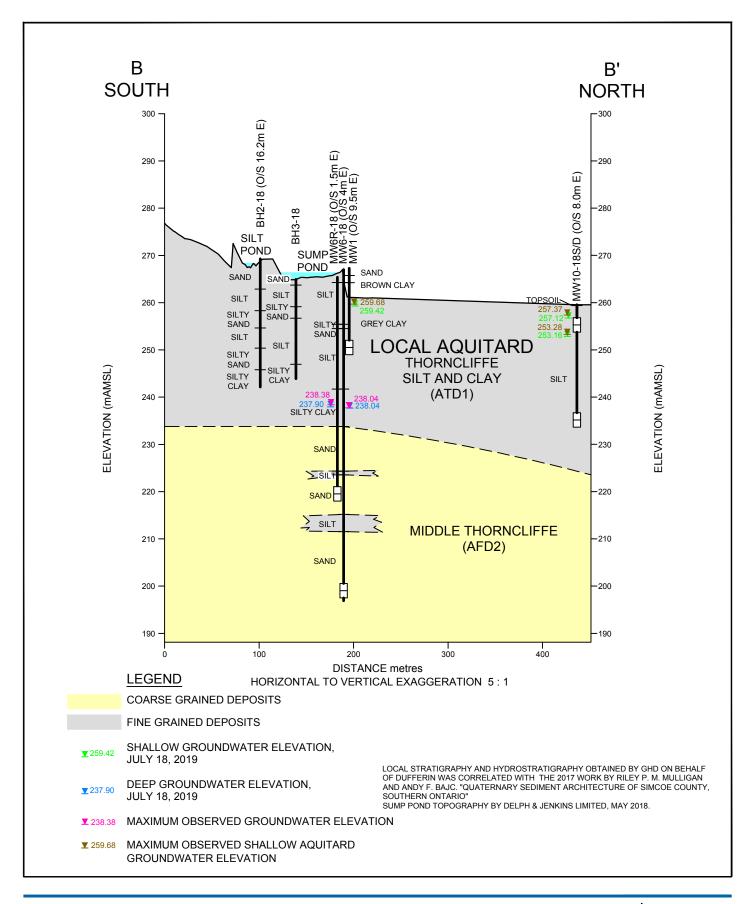
HYDROGEOLOGIC CROSS-SECTION LOCATIONS





TEEDON PIT EXTENSION TOWNSHIP OF TINY, COUNTY OF SIMCOE, ONTARIO

Sept 19, 2019





TEEDON PIT EXTENSION TOWNSHIP OF TINY, COUNTY OF SIMCOE, ONTARIO

11155365-10

Sept 19, 2019

	PW1-09			MW1			MW1-09			MW4-10	
GS =	260.00	From Site Plan	GS =	263.00	From Site Plan	GS =	247.50	From Site Plan	GS =	260.00	From Site Plan
GS =	260.72	March 15, 2018 Survey	GS =	267.45	March 15, 2018 Survey	GS =	245.45	From July 19, 2018 Survey	GS =	260.60	March 15, 2018 Survey
REF =	260.62	From Nov 1 Inspection	REF =	263.20	From Nov 1 Photo (estimate)	REF =	247.96	From Nov 1 Inspection	REF =	260.82	From Inspection
REF =	261.32	March 15, 2018 Survey	REF =	267.64	March 15, 2018 Survey	REF =	246.04	From July 19, 2018 Survey	REF =	261.31	March 15, 2018 Survey
Date/Time	Depth to Water (m)	Groundwater Elevation (m AMSL)	Date/Time	Depth to Water (m)	Groundwater Elevation (m AMSL)	Date/Time	Depth to Water (m)	Groundwater Elevation (m AMSL)	Date/Time	Depth to Water (m)	Groundwater Elevation (m AMSL)
-	-	-	-	-	-	6/3/2009 11:23	11.52	234.53	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-

REF =	260.62	From Nov 1 Inspection	REF =	263.20	From Nov 1 Photo (estimate)	REF =	247.96	From Nov 1 Inspection	REF =	260.82	From Inspection
REF =	261.32	March 15, 2018 Survey	REF =	267.64	March 15, 2018 Survey	REF =	246.04	From July 19, 2018 Survey	REF =	261.31	March 15, 2018 Survey
Date/Time	Depth to Water (m)	Groundwater Elevation (m AMSL)	Date/Time	Depth to Water (m)	Groundwater Elevation (m AMSL)	Date/Time	Depth to Water (m)	Groundwater Elevation (m AMSL)	Date/Time	Depth to Water (m)	Groundwater Elevation (m AMSL)
-	-	-	-	-	-	6/3/2009 11:23	11.52	234.53	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	7/7/2009 11:30	8.20	259.44	7/7/2009 13:00	11.60	234.44	-	-	-
7/15/2009 09:00	23.09	238.23	-	-	-	-	-	-	-	-	-
7/20/2009 13:00	23.10	238.22	7/20/2009 16:08	8.31	259.33	7/20/2009 13:35	11.65	234.39	-	-	-
7/29/2009 10:51	23.07	238.25	-	-	-	-	-	-	-	-	-
8/14/2009 13:23	23.05	238.27	8/14/2009 12:42	8.18	259.46	8/14/2009 14:38	11.67	234.37	-	-	-
-	-	-	3/18/2010 10:43	8.22	259.42	3/18/2010 11:23	11.96	234.08	-	-	-
3/22/2010 07:53	23.43	237.89	3/22/2010 8:04	8.24	259.40	3/22/2010 8:36	11.96	234.08	-	-	-
3/30/2010 11:35	23.44	237.88	3/30/2010 12:13	8.22	259.42	3/30/2010 1:23	11.91	234.13	-	-	-
-	-	-	-	-	-	-	-	-	8/4/2010 14:36	8.80	252.51
8/19/2010 13:25	23.50	237.82		-	-	8/19/2010 15:00	12.04	234.00	8/19/2010 11:10	8.85	252.46
10/19/2010 12:20	23.58	237.74	10/19/2010 12:50	8.48	259.16	10/19/2010 13:58	12.15	233.90	10/19/2010 12:35	9.98	Not Used
5/12/2011 12:10	23.55	237.77	5/12/2011 12:45	8.27	259.37	5/12/2011 13:42	11.80	234.24	5/12/2011 12:25	8.57	252.74
8/4/2011 14:23	23.43	237.90	8/4/2011 15:08	8.17	259.47	8/4/2011 15:30	11.90	234.14	8/4/2011 14:45	8.44	252.87
10/28/2011 11:54	23.48	237.84	10/28/2011 12:33	8.29	259.35	10/28/2011 13:15	12.05	233.99	10/28/2011 12:17	8.73	252.58
	-	-	7/30/2012 15:58	8.51	259.13	7/30/2012 16:26	12.15	233.89	7/30/2012 15:38	8.89	252.42
8/23/2012 15:09	30.87	230.45	8/23/2012 14:38	8.44	259.20	8/23/2012 13:00	12.24	233.81	8/23/2012 14:58	9.00	252.32
11/6/2012 11:41	23.80	237.52	11/6/2012 12:10	8.21	259.43	11/6/2012 12:50	12.36	233.69	11/6/2012 11:39	9.18	252.13
6/11/2013 12:25	30.79	230.53	6/11/2013 13:09	8.12	259.52	6/11/2013 14:52	11.84	234.20	6/11/2013 12:47	8.45	252.86
8/23/2014 11:05	23.08	238.24	8/23/2014 10:50	8.36	259.28	8/23/2014 13:20	11.79	234.25	8/23/2014 11:55	8.22	253.09
10/25/2014 10:04	23.16	238.16	10/25/2014 9:49	8.41	259.23	10/25/2014 9:18	11.89	234.15	10/25/2014 10:18	8.41	252.90
3/16/2017 14:20	23.61	237.71	3/16/2017 14:00	8.14	259.50	3/16/2017 15:47	12.03	234.01	3/16/2017 14:10	8.89	252.42
	-	-		-	-	-	-	-	-	-	-
10/5/2017 09:53	30.45	230.87	10/5/2017 10:24	8.06	259.58	10/5/2017 11:45	11.74	234.30	10/5/2017 09:58	8.33	252.98
11/1/2017 11:35	23.15	238.17	11/1/2017 12:35	7.96	259.68	11/1/2017 14:00	11.84	234.20	11/1/2017 12:00	8.49	252.82
4/5/2018 11:44	23.23	238.09	4/5/2018 11:13	8.12	259.52	4/5/2018 11:13	11.78	234.26	4/5/2018 11:13	8.59	252.72
4/20/2018 00:00	23.18	238.14	4/20/2018 10:41	8.08	259.56	4/20/2018 0:00	11.71	234.33	4/20/2018 00:00	8.47	252.84
6/14/2018 13:15	23.03	238.29	6/14/2018 13:47	8.12	259.52	6/14/2018 15:10	11.43	234.61	6/14/2018 13:20	8.15	253.16
6/18/2018 12:21	22.97	238.35	6/18/2018 13:20	8.17	259.47	6/18/2018 17:20	11.48	234.56	6/18/2018 12:14	8.12	253.19
-	-	-	-	-	-	-	-	-	-	-	-
7/19/2018 16:20	30.32	231.00	7/19/2018 12:31	8.28	259.36	7/19/2018 10:14	11.86	234.18	7/19/2018 16:30	8.24	253.07
9/6/2018 14:08	30.25	231.07	9/6/2018 15:19	8.32	259.32	9/6/2018 17:35	11.82	234.22	9/6/2018 14:00	8.50	252.81
-	-	-	-	-	-	10/2/2018 11:10	11.88	234.16	-	-	-
	-	-		-	-	- -	-	-	-	-	-
10/10/2018 12:15	23.17	238.15	10/10/2018 12:59	8.37	259.27	10/10/2018 16:40	11.94	234.10	10/10/2018 12:05	8.65	252.66
10/30/2018 13:43	30.73	230.59	10/30/2018 13:20	8.34	259.30	10/30/2018 14:30	11.98	234.06	10/30/2018 13:43	8.80	252.51
4/4/2019 15:00	23.40	237.92	4/4/2019 14:35	8.27	259.37	4/4/2019 8:50	12.03	234.01	4/4/2019 15:00	8.89	252.42
7/18/2019 10:12	23.17	238.15	7/18/2019 11:00	8.22	259.42	7/18/2019 9:15	11.69	234.35	7/18/2019 10:12	8.41	252.90

Note: PW1-09 was resurveyed on March 15, 2018. All hydraulic monitoring data has been re-calculated from this survey data.

Note: MW1 was resurveyed on March 15, 2018. All hydraulic monitoring data has been re-calculated from this survey data.

Note: MW1-09 was re-surveyed on July 19, 2018. All hydraulic monitoring data has been re-calculated from this survey data.

Note: MW4-10 was resurveyed on March 15, 2018. All hydraulic monitoring data has been re-calculated from this survey data.

 MW5-18
 MW6-18
 MW6R-18
 MW7-18

 256.39
 April 18, 2018 Survey
 GS =
 267.60
 April 18, 2018 Survey
 GS =
 267.57
 October 11, 2018 Survey
 GS =
 266.83
 April 18, 2018 Survey

REF =	257.19	April 18, 2018 Survey	REF =	268.43	April 18, 2018 Survey	REF =	268.20	October 11, 2018 Survey	REF =	267.56	April 18, 2018 Survey
Date/Time	Depth to Water (m)	Groundwater Elevation (m AMSL)	Date/Time	Depth to Water (m)	Groundwater Elevation (m AMSL)	Date/Time	Depth to Water (m)	Groundwater Elevation (m AMSL)	Date/Time	Depth to Water (m)	Groundwater Elevation (m AMSL)
Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed
Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed
Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed
Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed
Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed
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Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed
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Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed
Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed
4/20/2018 9:02	19.04	238.15	4/20/2018 10:37	18.81	Issue	Not Installed	Not Installed	Not Installed	4/20/2018 10:04	7.66	259.90
6/14/2018 12:15	18.83	238.36	6/14/2018 13:44	11.82	Issue	Not Installed	Not Installed	Not Installed	6/14/2018 13:40	7.50	260.06
6/18/2018 12:01	18.81	238.38	6/18/2018 13:40	11.80	Issue	Not Installed	Not Installed	Not Installed	6/18/2018 13:00	7.54	260.02
-	-	-	6/27/2018 12:00	11.70	Issue	Not Installed	Not Installed	Not Installed	-	-	-
7/19/2018 16:35	19.33	237.86	7/19/2018 13:39	11.55	Issue	Not Installed	Not Installed	Not Installed	7/19/2018 11:06	7.63	259.93
9/6/2018 16:32	19.21	237.98	9/6/2018 15:45	29.43	Issue	Not Installed	Not Installed	Not Installed	9/6/2018 16:22	7.65	259.91
10/2/2018 08:55	19.14	238.05	10/2/2018 09:16	30.70	237.74	Not Installed	Not Installed	Not Installed	-	-	-
10/3/2018 12:08	18.98	238.22	10/3/2018 11:42	30.73	237.70	10/3/2018 11:48	29.82	238.38	-	-	-
10/10/2018 15:40	18.97	238.22	10/10/2018 13:06	30.76	237.67	10/10/2018 13:12	30.24	237.96	10/10/2018 12:33	7.75	259.81
10/30/2018 13:56	19.43	237.76	10/30/2018 13:20	30.68	237.75	10/30/2018 13:20	30.34	237.86	10/30/2018 13:10	7.77	259.79
4/4/2019 15:20	19.20	237.99	4/4/2019 14:35	30.79	237.64	4/4/2019 14:35	30.58	237.63	4/4/2019 14:25	7.83	259.73
7/18/2019 10:12	18.95	238.24	7/18/2019 11:00	30.39	238.04	7/18/2019 11:00	30.30	237.90	7/18/2019 10:52	7.75	259.81
• . • . • . • . •					• ·						- ·

GS =

MW8-18 MW9-18 MW10S-18 MW10D-18 From July 19 2018 Survey From July 19 2018 Survey June 13, 2018 Survey June 13, 2018 Survey GS = 245.35 GS = 291.58 GS = 259.44 GS = 259.55 June 13, 2018 Survey June 13, 2018 Survey REF = 245.88 REF = 292.50 REF = 260.42 June 13, 2018 Survey REF = 260.52 June 13, 2018 Survey

KEF =	240.00	From July 19 2018 Survey	KEF =	292.50	June 13, 2018 Survey	REF =	200.42	June 13, 2018 Survey	KEF =	200.32	June 13, 2018 Survey
Date/Time	Depth to Water	Groundwater Elevation	Date/Time	Depth to Water	Groundwater Elevation	Date/Time	Depth to Water	Groundwater Elevation	Date/Time	Depth to Water	Groundwater Elevation
	(m)	(m AMSL)		(m)	(m AMSL)		(m)	(m AMSL)		(m)	(m AMSL)
Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed
Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed
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Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed
Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed
Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed
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Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed
Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed
Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed
Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed
Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed
Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed
Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed	Not Installed
6/14/2018 15:09	10.66	235.22	6/14/2018 14:04	55.38	237.12	6/14/2018 14:30	3.05	257.37	6/14/2018 7:24	7.24	253.28
6/18/2018 17:20	10.63	235.25	6/18/2018 14:15	55.39	237.11	6/18/2018 15:00	3.18	257.24	6/18/2018 15:05	7.26	253.26
- 7/19/2018 10:26	- 10.78	- 235.10	- 7/19/2018 15:55	- 55.41	- 237.09	- 7/19/2018 16:12	3.56	- 256.86	- 7/19/2018 16:12	- 7.47	- 253.05
9/6/2018 17:30	10.76		9/6/2018 14:30	55.55	236.95	9/6/2018 14:47	3.66	256.76	9/6/2018 14:50	7.63	252.89
10/2/2018 08:30	10.98	234.97 234.91	10/2/2018 09:48	55.61	236.90	9/0/2010 14.47	3.00 -		9/0/2010 14.50	7.03	252.69
10/2/2010 00.30		-	10/2/2010 09.40	-	230.90	-		-	-		
	10.65					10/10/2019 15:25	- 2.67	- 256 75	10/10/2019 15:20	- 7.67	- 252.95
10/10/2018 16:45	10.65	235.23	10/10/2018 14:37	55.64	236.86	10/10/2018 15:25	3.67	256.75	10/10/2018 15:20	7.67	252.85
10/30/2018 14:30	11.03	234.85	10/30/2018 10:00	55.72	236.78	10/30/2018 11:00	3.55	256.87	10/30/2018 11:00	7.64	252.88
4/4/2019 8:50	11.09	234.79	4/4/2019 10:00	55.93	236.57	4/4/2019 13:50	2.94	257.48	4/4/2019 13:50	7.32	253.20
7/18/2019 9:15	10.82	235.06	7/18/2019 11:32	55.59	236.92	7/18/2019 11:18	3.30	257.12	7/18/2019 11:18	7.36	253.16

Table 1

	#50632			#25425			#17709	
GS =	260.50	From Site Plan	GS =	254.00	From Site Plan	GS =	256.00	From Site Plan
GS =	260.48	From July 19 2018 Survey	REF =	254.50	Estimated	GS =	256.73	From July 19 2018 Survey
REF =	261.05	From Inspection				REF =	256.40	From Inspection
REF =	261.12	From July 19 2018 Survey				REF =	257.27	From July 19 2018 Survey
Date/Time	Depth to Water (m)	Groundwater Elevation (m AMSL)	Date/Time	Depth to Water (m)	Groundwater Elevation (m AMSL)	Date/Time	Depth to Water (m)	Groundwater Elevation (m AMSL)
No Access	No Access	No Access	6/3/2009 10:00	4.36	250.14	6/3/2009 13:08	19.70	236.70
No Access	No Access	No Access	6/4/2009 14:12	4.37	250.13	-	-	-
No Access	No Access	No Access	7/7/2009 13:34	4.53	249.97	7/7/2009 13:50	19.00	237.40
No Access	No Access	No Access	-	-	-	-	-	-
No Access	No Access	No Access	7/20/2009 14:55	4.63	249.87	7/20/2009 15:10	19.01	237.39
No Access	No Access	No Access	-	-	-	-	-	-
No Access	No Access	No Access	8/14/2009 14:10	4.56	249.94	8/14/2009 13:45	19.06	237.34
No Access	No Access	No Access	3/18/2010 12:25	4.83	249.68	3/18/2010 13:45	19.32	237.08
No Access	No Access	No Access	3/22/2010 9:30	4.85	249.65	3/22/2010 9:09	19.33	237.07
No Access	No Access	No Access	3/30/2010 13:02	4.91	249.59	3/30/2010 12:42	19.36	237.04
No Access	No Access	No Access	-	-	-	-	-	-
8/19/2010 14:13	23.21	237.84	-	-	-	-	-	-
10/19/2010 13:05	28.79	232.26	10/19/2010 14:40	5.28	249.22	10/19/2010 14:58	19.53	236.87
5/12/2011 14:18	26.60	234.45	5/12/2011 14:50	5.33	249.17	5/12/2011 15:08	22.75	233.65
8/4/2011 15:58	23.28	237.77	8/4/2011 16:20	5.28	249.22	8/4/2011 16:33	19.35	237.05
10/28/2011 13:39	23.71	237.34	10/28/2011 13:56	5.06	249.44	10/28/2011 14:10	19.40	237.00
7/30/2012 16:51	24.65	236.40	7/30/2012 17:16	5.36	249.14	7/30/2012 17:30	20.73	235.67
8/23/2012 13:32	24.66	236.40	8/23/2012 13:50	5.48	249.02	8/23/2012 14:19	20.05	236.35
11/6/2012 13:16	23.95	237.10	11/6/2012 13:35	5.36	249.14	11/6/2012 13:48	20.30	236.10
6/11/2013 14:00	23.43	237.62	6/11/2013 13:44	4.71	249.79	6/11/2013 13:27	19.90	236.50
8/23/2014 14:40	22.25	238.81	8/23/2014 12:25	4.75	249.75	8/23/2014 12:15	18.94	237.46
10/25/2014 11:06	22.92	238.13	10/25/2014 10:50	4.88	249.62	10/25/2014 10:39	19.03	237.37
3/16/2017 12:30	24.22	236.83	3/16/2017 13:06	4.63	249.87	3/16/2017 13:30	19.54	236.86
-	-	-	No Access	No Access	No Access	7/14/2017 13:15	18.98	237.42
10/5/2017 11:15	30.45	230.60	No Access	No Access	No Access	10/5/2017 10:50	19.45	236.95
11/1/2017 10:30	26.68	234.37	No Access	No Access	No Access	11/1/2017 11:15	19.17	237.23
4/5/2018 11:13	24.59	236.46	No Access	No Access	No Access	4/5/2018 11:13	19.16	237.24
-	-	-	No Access	No Access	No Access	-	-	-
6/14/2018 14:55	22.77	238.28	No Access	No Access	No Access	No Access	No Access	No Access
6/18/2018 17:00	24.77	236.28	No Access	No Access	No Access	6/18/2018 16:00	18.83	237.57
-	-	-	-	-	-	-	-	-
7/19/2018 16:40	23.55	237.57	No Access	No Access	No Access	7/19/2018 10:00	19.25	238.02
9/6/2018 17:00	28.65	232.47	No Access	No Access	No Access	9/6/2018 16:50	19.40	237.87
-	-	-	No Access	No Access	No Access	-	-	<u>-</u>
-	-	-	-	-	-	-	-	-
10/10/2018 16:20	23.32	237.80	No Access	No Access	No Access	10/10/2018 16:00	19.00	238.27
10/30/2018 14:10	28.76	232.36	No Access	No Access	No Access	10/30/2018 14:02	19.50	237.77
4/4/2019 15:45	23.09	238.03	No Access	No Access	No Access	4/4/2019 15:30	19.35	237.92
7/18/2019 9:45	28.17	232.95	No Access	No Access	No Access	7/18/2019 10:00	19.10	238.17

Note: #50632 was re-surveyed on July 19, 2018. All hydraulic monitoring data has been re-calculated from this survey data.

Note: #17709 was re-surveyed on July 19, 2018. All hydraulic monitoring data has been re-calculated from this survey data.

Table 2 Page 1 of 6

	SW1	
GS =	NA	
REF =	264.37	Top of Staff Gauge - 2017
REF =	264.60	Top of Staff Gauge - 2018
REF =	264.59	Top of 1.0m Elevation - July 19 2018 Survey
REF =	264.85	Top of TBAR - July 19 2018 Survey

8/21/2017	Date/Time	Depth to Water (m)	Groundwater Elevation (m AMSL)
8/22/2017 0.22 263.59 8/23/2017 0.23 263.60 8/24/2017 0.25 263.62 8/24/2017 0.31 263.68 8/28/2017 0.31 263.74 8/29/2017 0.41 263.78 8/30/2017 0.49 263.86 8/31/2017 0.55 263.92 9/01/2017 0.60 263.97 9/05/2017 0.59 263.96 9/06/2017 0.49 263.86 9/07/2017 0.49 263.86 9/07/2017 0.49 263.86 9/07/2017 0.49 263.86 9/07/2017 0.49 263.86 9/07/2017 0.38 263.75 9/11/2017 0.38 263.75 9/11/2017 0.27 263.64 9/13/2017 0.21 263.58 9/14/2017 0.26 263.63 9/15/2017 0.24 263.61 9/19/2017 0.24 263.61 9/19/2017 0.24 263.61 9/20/2017 0.21 263.58 9/21/2017 0.24 263.61 9/20/2017 0.21 263.58 9/21/2017 0.24 263.61 9/20/2017 0.21 263.58 9/21/2017 0.24 263.61 9/20/2017 0.21 263.58 9/21/2017 0.21 263.58 9/22/2017 0.20 263.57 9/26/2017 0.21 263.58 9/22/2017 0.20 263.57 9/26/2017 0.20 263.57 9/26/2017 0.20 263.57 9/26/2017 0.20 263.57 9/26/2017 0.16 263.53 10/02/2017 0.16 263.53 10/02/2017 0.16 263.53 10/02/2017 0.16 263.53 10/02/2017 0.16 263.53 10/02/2017 0.16 263.53 10/02/2017 0.16 263.53 10/02/2017 0.16 263.53 10/02/2017 0.16 263.53 10/02/2017 0.16 263.53 10/02/2017 0.16 263.53 10/02/2017 0.16 263.53 10/02/2017 0.16 263.53 10/02/2017 0.16 263.53 10/02/2017 0.16 263.53 10/02/2017 0.19 263.56 10/11/2017 0.19 263.56 10/11/2017 0.19 263.56 10/11/2017 0.18 263.55 10/11/2017 0.18 263.55 10/11/2017 0.18 263.55		. ,	,
8/23/2017	8/21/2017	0.20	
8/24/2017	8/22/2017	0.22	
8/25/2017	8/23/2017		263.60
8/28/2017	8/24/2017	0.25	263.62
8/29/2017	8/25/2017	0.31	263.68
8/30/2017	8/28/2017		263.74
8/31/2017	8/29/2017	0.41	263.78
9/01/2017	8/30/2017	0.49	263.86
9/05/2017 0.59 263.96 9/06/2017 0.49 263.86 9/07/2017 0.44 263.81 9/08/2017 0.38 263.75 9/11/2017 0.33 263.70 9/12/2017 0.27 263.64 9/13/2017 0.21 263.58 9/14/2017 0.26 263.63 9/15/2017 0.24 263.61 9/19/2017 0.24 263.61 9/19/2017 0.21 263.58 9/21/2017 0.21 263.58 9/21/2017 0.21 263.68 9/21/2017 0.21 263.58 9/21/2017 0.21 263.58 9/21/2017 0.21 263.58 9/21/2017 0.21 263.58 9/21/2017 0.21 263.58 9/22/2017 0.21 263.58 9/22/2017 0.20 263.57 9/25/2017 0.20 263.57 9/26/2017 0.21 263.58 9/27/2017 0.20 263.57 9/26/2017 0.10 263.58 9/27/2017 0.21 263.58 9/27/2017 0.21 263.58 9/27/2017 0.20 263.57 9/26/2017 0.21 263.58 9/27/2017 0.21 263.58 9/27/2017 0.21 263.58 9/27/2017 0.21 263.58 9/27/2017 0.22 263.59 9/28/2017 0.16 263.53 10/03/2017 0.16 263.53 10/03/2017 0.16 263.53 10/03/2017 0.12 263.49 10/04/2017 0.15 263.54 10/05/2017 0.14 263.51 10/06/2017 0.15 263.52 10/10/2017 0.19 263.56 10/11/2017 0.19 263.56 10/11/2017 0.19 263.56 10/11/2017 0.18 263.55 10/18/2017 0.18 263.55 10/18/2017 0.11 263.48 10/19/2017 0.11 263.48 10/19/2017 0.11 263.48	8/31/2017	0.55	263.92
9/06/2017	9/01/2017	0.60	263.97
9/07/2017 0.44 263.81 9/08/2017 0.38 263.75 9/11/2017 0.33 263.70 9/12/2017 0.27 263.64 9/13/2017 0.21 263.58 9/14/2017 0.26 263.63 9/15/2017 0.30 263.67 9/18/2017 0.24 263.61 9/20/2017 0.21 263.58 9/21/2017 0.21 263.58 9/21/2017 0.21 263.58 9/22/2017 0.30 263.67 9/25/2017 0.20 263.57 9/26/2017 0.21 263.58 9/27/2017 0.22 263.59 9/28/2017 0.16 263.53 9/29/2017 0.16 263.53 10/03/2017 0.16 263.53 10/03/2017 0.16 263.53 10/04/2017 0.15 263.54 10/05/2017 0.14 263.51 10/10/2017 0.13 263.52 10/11/2017 0.19 263.56 10/11/2017 0.19<	9/05/2017	0.59	263.96
9/08/2017 0.38 263.75 9/11/2017 0.33 263.70 9/12/2017 0.27 263.64 9/13/2017 0.21 263.58 9/14/2017 0.26 263.63 9/15/2017 0.30 263.67 9/18/2017 0.24 263.61 9/19/2017 0.24 263.61 9/20/2017 0.21 263.58 9/21/2017 0.21 263.58 9/22/2017 0.30 263.67 9/25/2017 0.20 263.57 9/26/2017 0.21 263.58 9/27/2017 0.22 263.59 9/28/2017 0.16 263.53 9/29/2017 0.16 263.53 10/02/2017 0.16 263.53 10/03/2017 0.16 263.53 10/03/2017 0.16 263.53 10/04/2017 0.17 263.54 10/05/2017 0.14 263.51 10/10/2017 0.13 263.50 10/11/2017 0.19 263.56 10/12/2017 0.14	9/06/2017	0.49	263.86
9/11/2017 0.33 263.70 9/12/2017 0.27 263.64 9/13/2017 0.21 263.58 9/14/2017 0.26 263.63 9/15/2017 0.30 263.67 9/18/2017 0.24 263.61 9/20/2017 0.21 263.58 9/21/2017 0.21 263.58 9/21/2017 0.21 263.58 9/22/2017 0.30 263.67 9/25/2017 0.20 263.57 9/26/2017 0.21 263.58 9/27/2017 0.21 263.58 9/27/2017 0.22 263.59 9/28/2017 0.16 263.53 10/02/2017 0.16 263.53 10/02/2017 0.16 263.53 10/03/2017 0.12 263.49 10/04/2017 0.17 263.54 10/05/2017 0.14 263.51 10/10/2017 0.13 263.52 10/10/2017 0.13 263.56 10/12/2017 0.14 263.51 10/16/2017 0.1	9/07/2017	0.44	263.81
9/12/2017 0.27 263.64 9/13/2017 0.21 263.58 9/14/2017 0.26 263.63 9/15/2017 0.30 263.67 9/18/2017 0.24 263.61 9/19/2017 0.21 263.58 9/21/2017 0.21 263.58 9/22/2017 0.30 263.67 9/25/2017 0.20 263.57 9/26/2017 0.21 263.58 9/27/2017 0.22 263.59 9/28/2017 0.16 263.53 9/29/2017 0.16 263.53 10/02/2017 0.16 263.53 10/03/2017 0.16 263.53 10/04/2017 0.12 263.49 10/04/2017 0.17 263.54 10/05/2017 0.14 263.51 10/06/2017 0.13 263.52 10/11/2017 0.19 263.56 10/12/2017 0.14 263.51 10/13/2017 0.18 263.55 10/18/2017 0.18 263.55 10/18/2017 0		0.38	263.75
9/13/2017 0.21 263.58 9/14/2017 0.26 263.63 9/15/2017 0.30 263.67 9/18/2017 0.24 263.61 9/19/2017 0.21 263.58 9/21/2017 0.21 263.58 9/21/2017 0.21 263.58 9/22/2017 0.30 263.67 9/25/2017 0.20 263.57 9/26/2017 0.21 263.58 9/27/2017 0.22 263.59 9/28/2017 0.16 263.53 10/02/2017 0.16 263.53 10/03/2017 0.16 263.53 10/03/2017 0.12 263.49 10/04/2017 0.17 263.54 10/05/2017 0.14 263.51 10/06/2017 0.13 263.52 10/11/2017 0.19 263.56 10/12/2017 0.14 263.51 10/13/2017 0.19 263.56 10/16/2017 0.18 263.55 10/18/2017 0.18 263.55 10/18/2017	9/11/2017	0.33	263.70
9/14/2017 0.26 263.63 9/15/2017 0.30 263.67 9/18/2017 0.24 263.61 9/19/2017 0.21 263.58 9/21/2017 0.21 263.58 9/22/2017 0.30 263.67 9/25/2017 0.20 263.57 9/26/2017 0.21 263.58 9/27/2017 0.22 263.59 9/28/2017 0.16 263.53 9/29/2017 0.16 263.53 10/02/2017 0.16 263.53 10/03/2017 0.12 263.49 10/04/2017 0.17 263.54 10/05/2017 0.14 263.51 10/06/2017 0.13 263.52 10/10/2017 0.13 263.50 10/11/2017 0.19 263.56 10/12/2017 0.14 263.51 10/16/2017 0.18 263.55 10/18/2017 0.18 263.55 10/18/2017 0.11 263.48 10/19/2017 0.18 263.55	9/12/2017	0.27	263.64
9/15/2017 0.30 263.67 9/18/2017 0.24 263.61 9/19/2017 0.21 263.58 9/21/2017 0.21 263.58 9/22/2017 0.30 263.67 9/25/2017 0.20 263.57 9/26/2017 0.21 263.58 9/27/2017 0.22 263.59 9/28/2017 0.16 263.53 9/29/2017 0.16 263.53 10/02/2017 0.16 263.53 10/03/2017 0.12 263.49 10/04/2017 0.17 263.54 10/05/2017 0.14 263.51 10/06/2017 0.15 263.52 10/10/2017 0.13 263.56 10/11/2017 0.19 263.56 10/13/2017 0.19 263.56 10/16/2017 0.18 263.55 10/18/2017 0.18 263.55 10/18/2017 0.11 263.48 10/19/2017 0.18 263.55	9/13/2017	0.21	263.58
9/18/2017 0.24 263.61 9/19/2017 0.21 263.58 9/21/2017 0.21 263.58 9/21/2017 0.21 263.58 9/22/2017 0.30 263.67 9/25/2017 0.20 263.57 9/26/2017 0.21 263.58 9/27/2017 0.22 263.59 9/28/2017 0.16 263.53 9/29/2017 0.16 263.53 10/02/2017 0.16 263.53 10/03/2017 0.12 263.49 10/04/2017 0.17 263.54 10/05/2017 0.14 263.51 10/06/2017 0.15 263.52 10/10/2017 0.13 263.56 10/12/2017 0.14 263.51 10/13/2017 0.19 263.56 10/16/2017 0.18 263.55 10/18/2017 0.18 263.55 10/18/2017 0.11 263.48 10/19/2017 0.18 263.55	9/14/2017	0.26	263.63
9/19/2017 0.24 263.61 9/20/2017 0.21 263.58 9/21/2017 0.21 263.58 9/22/2017 0.30 263.67 9/25/2017 0.20 263.57 9/26/2017 0.21 263.58 9/27/2017 0.22 263.59 9/28/2017 0.16 263.53 9/29/2017 0.16 263.53 10/02/2017 0.16 263.53 10/03/2017 0.12 263.49 10/04/2017 0.17 263.54 10/05/2017 0.14 263.51 10/06/2017 0.15 263.52 10/10/2017 0.13 263.50 10/11/2017 0.19 263.56 10/12/2017 0.14 263.51 10/13/2017 0.19 263.56 10/17/2017 0.18 263.55 10/18/2017 0.18 263.55 10/18/2017 0.11 263.48 10/19/2017 0.18 263.55	9/15/2017	0.30	263.67
9/20/2017 0.21 263.58 9/21/2017 0.21 263.58 9/22/2017 0.30 263.67 9/25/2017 0.20 263.57 9/26/2017 0.21 263.58 9/27/2017 0.22 263.59 9/28/2017 0.16 263.53 9/29/2017 0.16 263.53 10/02/2017 0.16 263.53 10/03/2017 0.12 263.49 10/04/2017 0.17 263.54 10/05/2017 0.14 263.51 10/06/2017 0.15 263.52 10/10/2017 0.13 263.50 10/11/2017 0.19 263.56 10/12/2017 0.14 263.51 10/13/2017 0.19 263.56 10/16/2017 0.18 263.55 10/17/2017 0.18 263.55 10/18/2017 0.11 263.48 10/19/2017 0.18 263.55	9/18/2017	0.24	263.61
9/21/2017 0.21 263.58 9/22/2017 0.30 263.67 9/25/2017 0.20 263.57 9/26/2017 0.21 263.58 9/27/2017 0.22 263.59 9/28/2017 0.16 263.53 9/29/2017 0.16 263.53 10/02/2017 0.16 263.53 10/03/2017 0.12 263.49 10/04/2017 0.17 263.54 10/05/2017 0.14 263.51 10/06/2017 0.15 263.52 10/10/2017 0.13 263.50 10/11/2017 0.19 263.56 10/12/2017 0.14 263.51 10/13/2017 0.19 263.56 10/16/2017 0.18 263.55 10/17/2017 0.18 263.55 10/18/2017 0.11 263.48 10/19/2017 0.18 263.55	9/19/2017	0.24	263.61
9/22/2017 0.30 263.67 9/25/2017 0.20 263.57 9/26/2017 0.21 263.58 9/27/2017 0.22 263.59 9/28/2017 0.16 263.53 9/29/2017 0.16 263.53 10/02/2017 0.16 263.53 10/03/2017 0.12 263.49 10/04/2017 0.17 263.54 10/05/2017 0.14 263.51 10/06/2017 0.15 263.52 10/10/2017 0.13 263.50 10/11/2017 0.19 263.56 10/12/2017 0.14 263.51 10/13/2017 0.19 263.56 10/16/2017 0.18 263.55 10/17/2017 0.18 263.55 10/18/2017 0.11 263.48 10/19/2017 0.18 263.55	9/20/2017	0.21	263.58
9/25/2017 0.20 263.57 9/26/2017 0.21 263.58 9/27/2017 0.22 263.59 9/28/2017 0.16 263.53 9/29/2017 0.16 263.53 10/02/2017 0.16 263.53 10/03/2017 0.12 263.49 10/04/2017 0.17 263.54 10/05/2017 0.14 263.51 10/06/2017 0.15 263.52 10/10/2017 0.13 263.50 10/11/2017 0.19 263.56 10/12/2017 0.14 263.51 10/13/2017 0.19 263.56 10/16/2017 0.18 263.55 10/17/2017 0.18 263.55 10/18/2017 0.11 263.48 10/19/2017 0.18 263.55	9/21/2017	0.21	263.58
9/26/2017 0.21 263.58 9/27/2017 0.22 263.59 9/28/2017 0.16 263.53 9/29/2017 0.16 263.53 10/02/2017 0.16 263.53 10/03/2017 0.12 263.49 10/04/2017 0.17 263.54 10/05/2017 0.14 263.51 10/06/2017 0.15 263.52 10/10/2017 0.13 263.50 10/11/2017 0.19 263.56 10/12/2017 0.14 263.51 10/13/2017 0.19 263.56 10/16/2017 0.18 263.55 10/17/2017 0.18 263.55 10/18/2017 0.11 263.48 10/19/2017 0.18 263.55	9/22/2017	0.30	263.67
9/27/2017 0.22 263.59 9/28/2017 0.16 263.53 9/29/2017 0.16 263.53 10/02/2017 0.16 263.53 10/03/2017 0.12 263.49 10/04/2017 0.17 263.54 10/05/2017 0.14 263.51 10/06/2017 0.15 263.52 10/10/2017 0.13 263.50 10/11/2017 0.19 263.56 10/12/2017 0.14 263.51 10/13/2017 0.19 263.56 10/16/2017 0.18 263.55 10/17/2017 0.18 263.55 10/18/2017 0.11 263.48 10/19/2017 0.18 263.55	9/25/2017	0.20	263.57
9/28/2017 0.16 263.53 9/29/2017 0.16 263.53 10/02/2017 0.16 263.53 10/03/2017 0.12 263.49 10/04/2017 0.17 263.54 10/05/2017 0.14 263.51 10/06/2017 0.15 263.52 10/10/2017 0.13 263.50 10/11/2017 0.19 263.56 10/12/2017 0.14 263.51 10/13/2017 0.19 263.56 10/16/2017 0.18 263.55 10/17/2017 0.18 263.55 10/18/2017 0.11 263.48 10/19/2017 0.18 263.55	9/26/2017	0.21	263.58
9/29/2017 0.16 263.53 10/02/2017 0.16 263.53 10/03/2017 0.12 263.49 10/04/2017 0.17 263.54 10/05/2017 0.14 263.51 10/06/2017 0.15 263.52 10/10/2017 0.13 263.50 10/11/2017 0.19 263.56 10/12/2017 0.14 263.51 10/13/2017 0.19 263.56 10/16/2017 0.18 263.55 10/17/2017 0.18 263.55 10/18/2017 0.11 263.48 10/19/2017 0.18 263.55	9/27/2017	0.22	263.59
10/02/2017 0.16 263.53 10/03/2017 0.12 263.49 10/04/2017 0.17 263.54 10/05/2017 0.14 263.51 10/06/2017 0.15 263.52 10/10/2017 0.13 263.50 10/11/2017 0.19 263.56 10/12/2017 0.14 263.51 10/13/2017 0.19 263.56 10/16/2017 0.18 263.55 10/17/2017 0.18 263.55 10/18/2017 0.11 263.48 10/19/2017 0.18 263.55	9/28/2017	0.16	263.53
10/03/2017 0.12 263.49 10/04/2017 0.17 263.54 10/05/2017 0.14 263.51 10/06/2017 0.15 263.52 10/10/2017 0.13 263.50 10/11/2017 0.19 263.56 10/12/2017 0.14 263.51 10/13/2017 0.19 263.56 10/16/2017 0.18 263.55 10/17/2017 0.18 263.55 10/18/2017 0.11 263.48 10/19/2017 0.18 263.55	9/29/2017	0.16	263.53
10/04/2017 0.17 263.54 10/05/2017 0.14 263.51 10/06/2017 0.15 263.52 10/10/2017 0.13 263.50 10/11/2017 0.19 263.56 10/12/2017 0.14 263.51 10/13/2017 0.19 263.56 10/16/2017 0.18 263.55 10/17/2017 0.18 263.55 10/18/2017 0.11 263.48 10/19/2017 0.18 263.55	10/02/2017	0.16	263.53
10/05/2017 0.14 263.51 10/06/2017 0.15 263.52 10/10/2017 0.13 263.50 10/11/2017 0.19 263.56 10/12/2017 0.14 263.51 10/13/2017 0.19 263.56 10/16/2017 0.18 263.55 10/17/2017 0.18 263.55 10/18/2017 0.11 263.48 10/19/2017 0.18 263.55	10/03/2017	0.12	263.49
10/06/2017 0.15 263.52 10/10/2017 0.13 263.50 10/11/2017 0.19 263.56 10/12/2017 0.14 263.51 10/13/2017 0.19 263.56 10/16/2017 0.18 263.55 10/17/2017 0.18 263.55 10/18/2017 0.11 263.48 10/19/2017 0.18 263.55	10/04/2017	0.17	263.54
10/10/2017 0.13 263.50 10/11/2017 0.19 263.56 10/12/2017 0.14 263.51 10/13/2017 0.19 263.56 10/16/2017 0.18 263.55 10/17/2017 0.18 263.55 10/18/2017 0.11 263.48 10/19/2017 0.18 263.55	10/05/2017	0.14	263.51
10/11/2017 0.19 263.56 10/12/2017 0.14 263.51 10/13/2017 0.19 263.56 10/16/2017 0.18 263.55 10/17/2017 0.18 263.55 10/18/2017 0.11 263.48 10/19/2017 0.18 263.55	10/06/2017	0.15	263.52
10/12/2017 0.14 263.51 10/13/2017 0.19 263.56 10/16/2017 0.18 263.55 10/17/2017 0.18 263.55 10/18/2017 0.11 263.48 10/19/2017 0.18 263.55	10/10/2017	0.13	263.50
10/13/2017 0.19 263.56 10/16/2017 0.18 263.55 10/17/2017 0.18 263.55 10/18/2017 0.11 263.48 10/19/2017 0.18 263.55	10/11/2017	0.19	263.56
10/16/2017 0.18 263.55 10/17/2017 0.18 263.55 10/18/2017 0.11 263.48 10/19/2017 0.18 263.55	10/12/2017	0.14	263.51
10/17/2017 0.18 263.55 10/18/2017 0.11 263.48 10/19/2017 0.18 263.55	10/13/2017	0.19	263.56
10/18/2017 0.11 263.48 10/19/2017 0.18 263.55	10/16/2017	0.18	263.55
10/19/2017 0.18 263.55	10/17/2017	0.18	263.55
	10/18/2017	0.11	263.48
10/20/2017 0.17 263.54	10/19/2017	0.18	263.55
	10/20/2017	0.17	263.54

Table 2Page 2 of 6

	SW1	
GS =	NA	
REF =	264.37	Top of Staff Gauge - 2017
REF =	264.60	Top of Staff Gauge - 2018
REF =	264.59	Top of 1.0m Elevation - July 19 2018 Survey
REF =	264.85	Top of TBAR - July 19 2018 Survey

Date/Time	Depth to Water (m)	Groundwater Elevation (m AMSL)
10/23/2017	0.15	263.52
10/24/2017	0.21	263.58
10/25/2017	0.17	263.54
10/26/2017	0.24	263.61
10/27/2017	0.19	263.56
10/30/2017	0.21	263.58
10/31/2017	0.22	263.59
11/01/2017	0.28	263.65
11/02/2017	0.25	263.62
11/03/2017	0.29	263.66
11/06/2017	0.29	263.66
11/07/2017	0.36	263.73
11/08/2017	0.34	263.71
11/09/2017	0.36	263.73
11/13/2017	0.33	263.70
11/14/2017	0.40	263.77
11/16/2017	0.39	263.76
11/17/2017	0.33	263.70
11/20/2017	0.31	263.68
11/21/2017	0.31	263.68
11/22/2017	0.40	263.77
11/23/2017	0.36	263.73
11/24/2017	0.31	263.68
11/27/2017	0.39	263.76
11/28/2017	0.34	263.71
11/29/2017	0.31	263.68
11/30/2017	0.33	263.70 263.67
12/01/2017 12/04/2017	0.30 0.33	263.67 263.70
4/20/2018 0:00	Ice on Pond	Ice on Pond
5/7/2018 7:00	0.39	263.99
5/8/2018 12:00	0.37	263.97
5/9/2018 7:00	0.37	263.97
5/10/2018 7:00	0.27	263.87
5/11/2018 7:00	0.22	263.82
5/14/2018 7:00	0.17	263.77
5/15/2018 7:00	0.21	263.81
5/16/2018 7:00	0.15	263.75
5/17/2018 7:00	0.15	263.75
5/18/2018 7:00	0.11	263.71
5/22/2018 7:00	0.17	263.77
5/23/2018 7:00	0.15	263.75
5/24/2018 7:00	0.15	263.75

Table 2 Page 3 of 6

	SW1	
GS =	NA	
REF =	264.37	Top of Staff Gauge - 2017
REF =	264.60	Top of Staff Gauge - 2018
REF =	264.59	Top of 1.0m Elevation - July 19 2018 Survey
REF =	264.85	Top of TBAR - July 19 2018 Survey

Date/Time	Depth to Water (m)	Groundwater Elevation (m AMSL)
5/25/2018 7:00	0.16	263.76
5/28/2018 7:00	0.14	263.74
5/29/2018 0:00	0.16	263.76
5/30/2018 7:00	0.18	263.78
5/31/2018 7:00	0.13	263.73
6/1/2018 7:00	0.17	263.77
6/4/2018 7:00	0.14	263.74
6/5/2018 7:00	0.16	263.76
6/6/2018 7:00	0.10	263.70
6/7/2018 7:00	0.07	263.67
6/8/2018 7:00	0.15	263.75
6/11/2018 7:00	0.16	263.76
6/12/2018 7:00	0.17	263.77
06/13/2018 07:00	0.14	263.74
06/14/2018 07:00	0.17	263.77
06/15/2018 07:00	0.20	263.8
06/18/2018 07:00	0.16	263.76
06/19/2018 00:00	0.10	263.7
06/20/2018 00:00	0.15	263.75
06/21/2018 07:00	0.14	263.74
06/22/2018 00:00	0.13	263.73
06/25/2018 00:00	0.17	263.77
06/26/2018 11:17	0.11	263.71
06/27/2018 00:00	0.17	263.77
06/28/2018 00:00	0.12	263.72
07/03/2018 00:00	0.21	263.81
07/04/2018 00:00	0.15	263.75
07/05/2018 00:00	0.16	263.76
07/06/2018 00:00	0.21	263.81
07/09/2018 00:00	0.17	263.77
07/10/2018 00:00	0.12	263.72
07/11/2018 00:00	0.10	263.7
07/12/2018 00:00	0.12	263.72
07/13/2018 00:00	0.14	263.74
07/16/2018 00:00	0.10	263.7
07/17/2018 00:00	0.08	263.68
07/18/2018 00:00	0.04	263.64
07/19/2018 09:18	0.06	263.65
07/20/2018 00:00	0.10	263.69
07/23/2018 00:00	0.10	263.69
07/24/2018 00:00	0.12	263.71
07/25/2018 00:00	0.13	263.72
07/26/2018 00:00	0.17	263.76

Table 2Page 4 of 6

	SW1	
GS =	NA	
REF =	264.37	Top of Staff Gauge - 2017
REF =	264.60	Top of Staff Gauge - 2018
REF =	264.59	Top of 1.0m Elevation - July 19 2018 Survey
REF =	264.85	Top of TBAR - July 19 2018 Survey

Date/Time	Depth to Water (m)	Groundwater Elevation (m AMSL)
07/07/00/00 00	. ,	
07/27/2018 00:00	0.13	263.72
07/30/2018 00:00	0.13	263.72
07/31/2018 00:00	0.16	263.75
08/01/2018 00:00	0.11	263.70
08/02/2018 00:00	0.13	263.72
08/03/2018 00:00	0.10	263.69
08/07/2018 00:00	0.12	263.71
08/08/2018 00:00	0.10	263.69
08/09/2018 00:00	0.10	263.69
08/10/2018 00:00	0.11	263.70
08/13/2018 00:00	0.12	263.71
08/14/2018 00:00	0.12	263.71
08/15/2018 00:00	0.12	263.71
08/16/2018 00:00	0.13	263.72
08/17/2018 00:00	0.16	263.75
08/20/2018 00:00	0.19	263.78
08/21/2018 00:00	0.13	263.72
08/22/2018 00:00	0.23	263.82
08/23/2018 00:00	0.17	263.76
08/24/2018 00:00	0.21	263.80
08/27/2018 00:00	0.17	263.76
08/28/2018 00:00	0.27	263.86
08/29/2018 00:00	0.26	263.85
08/30/2018 00:00	0.24	263.83
08/31/2018 00:00	0.20	263.79
09/04/2018 00:00	0.23	263.82
09/05/2018 00:00	0.20	263.79
09/06/2018 00:00	0.10	263.69
09/07/2018 00:00	0.11	263.70
09/10/2018 00:00	0.11	263.70
09/11/2018 00:00	0.05	263.64
09/12/2018 00:00	0.04	263.63
09/13/2018 00:00	0.07	263.66
09/14/2018 00:00	0.09	263.68
09/17/2018 00:00	0.15	263.74
09/18/2018 00:00	0.16	263.75
09/19/2018 00:00	0.16	263.75
09/20/2018 00:00	0.14	263.73
09/21/2018 00:00	0.07	263.66
09/24/2018 00:00	0.13	263.72
09/25/2018 00:00	0.09	263.68
09/26/2018 00:00	0.12	263.71
09/28/2018 00:00	0.16	263.75

Table 2Page 5 of 6

Historical Manual Surface Water Elevations Dufferin Teedon Pit Township of Tiny, County of Simcoe, Ontario

	SW1	
GS =	NA	
REF =	264.37	Top of Staff Gauge - 2017
REF =	264.60	Top of Staff Gauge - 2018
REF =	264.59	Top of 1.0m Elevation - July 19 2018 Survey
REF =	264.85	Top of TBAR - July 19 2018 Survey

Date/Time	Depth to Water (m)	Groundwater Elevation (m AMSL)
10/01/2018 00:00	0.18	263.77
10/02/2018 00:00	0.15	263.74
10/03/2018 00:00	0.17	263.76
10/04/2018 00:00	0.16	263.75
10/05/2018 00:00	0.15	263.74
10/09/2018 00:00	0.12	263.71
10/10/2018 13:40	0.08	263.67
10/11/2018 00:00	0.10	263.69
10/12/2018 00:00	0.12	263.71
10/15/2018 00:00	0.17	263.76
10/16/2018 00:00	0.12	263.71
10/17/2018 00:00	0.10	263.69
10/18/2018 00:00	0.11	263.70
10/19/2018 00:00	0.12	263.71
10/22/2018 00:00	0.14	263.73
10/23/2018 00:00	0.15	263.74
10/24/2018 00:00	0.17	263.76
10/25/2018 00:00	0.14	263.73
10/26/2018 00:00	0.16	263.75
10/29/2018 00:00	0.19	263.78
10/30/2018 13:35	0.10	263.69
10/31/2018 00:00	0.17	263.76
11/01/2018 00:00	0.16	263.75
11/02/2018 00:00	0.21	263.80
11/05/2018 00:00 11/06/2018 00:00	0.21 0.21	263.80 263.80
11/07/2018 00:00	0.19	263.78
11/08/2018 00:00	0.19	263.75
11/09/2018 00:00	0.10	263.79
11/12/2018 00:00	0.21	263.80
11/13/2018 00:00	0.19	263.78
11/14/2018 00:00	0.18	263.77
11/15/2018 00:00	0.19	263.78
11/16/2018 00:00	0.19	263.78
11/19/2018 00:00	0.24	263.83
11/23/2018 00:00	0.23	263.82
11/30/2018 00:00	0.24	263.83
12/03/2018 00:00	0.29	263.88
12/04/2018 00:00	0.29	263.88
12/05/2018 00:00	0.28	263.87
12/06/2018 00:00	0.27	263.86
12/10/2018 00:00	0.24	263.83
12/11/2018 00:00	0.20	263.79

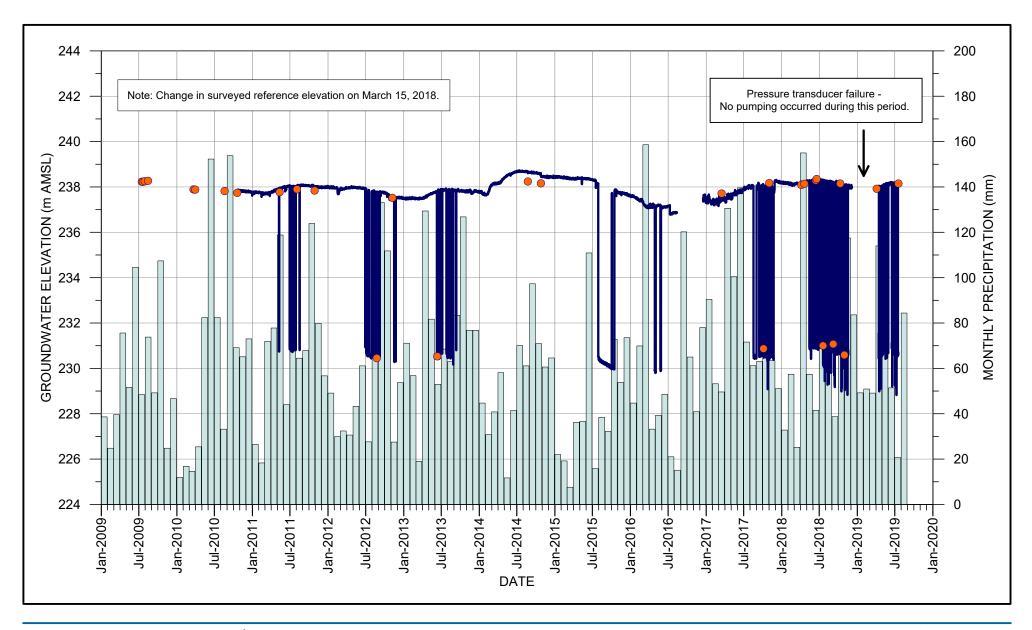
Table 2 Page 6 of 6

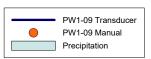
Historical Manual Surface Water Elevations Dufferin Teedon Pit Township of Tiny, County of Simcoe, Ontario

	SW1	
GS =	NA	
REF =	264.37	Top of Staff Gauge - 2017
REF =	264.60	Top of Staff Gauge - 2018
REF =	264.59	Top of 1.0m Elevation - July 19 2018 Survey
REF =	264.85	Top of TBAR - July 19 2018 Survey

Depth to Water (m)	Groundwater Elevation (m AMSL)
0.20	263.79
0.18	263.77
0.39	263.98
0.16	263.75
	(m) 0.20 0.18 0.39

Attachment A

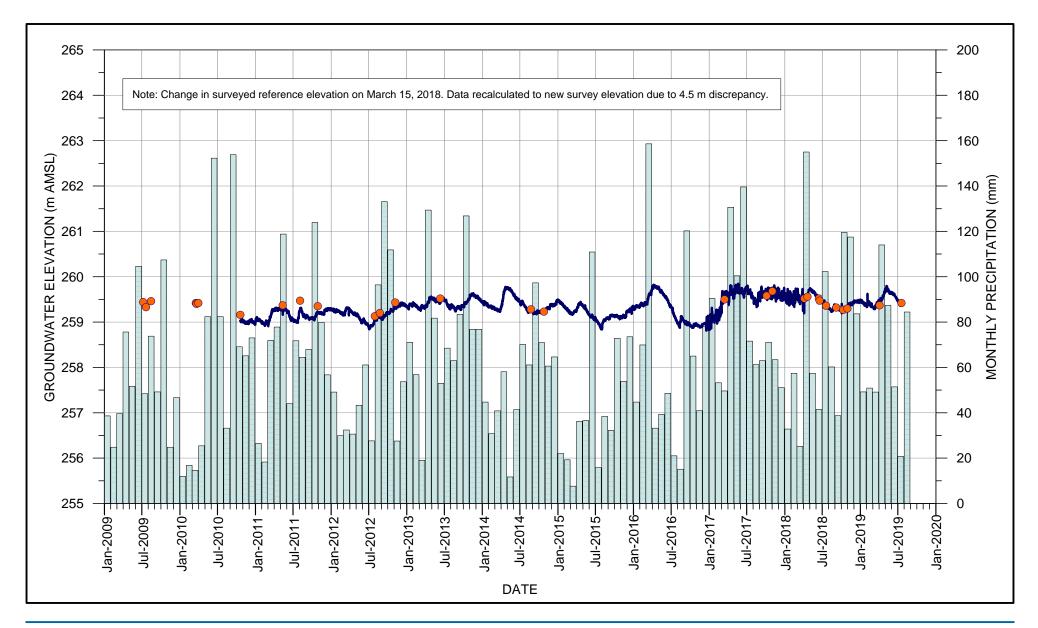






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FIGURE 1 PW1-09 HYDROGRAPH

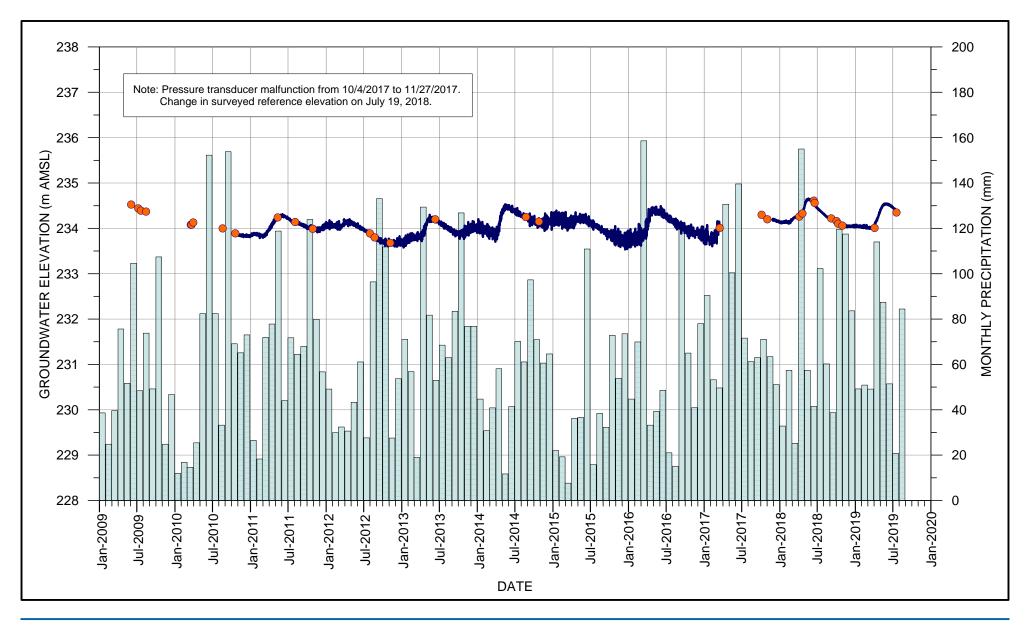


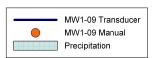




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FIGURE 2 MW1 HYDROGRAPH

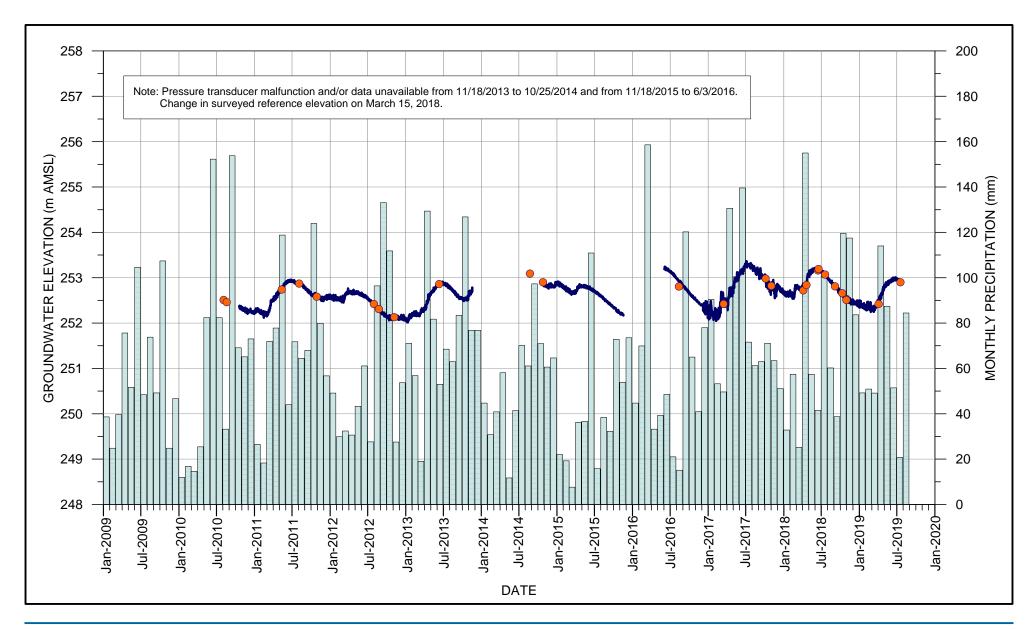


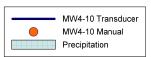




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FIGURE 3 MW1-09 HYDROGRAPH

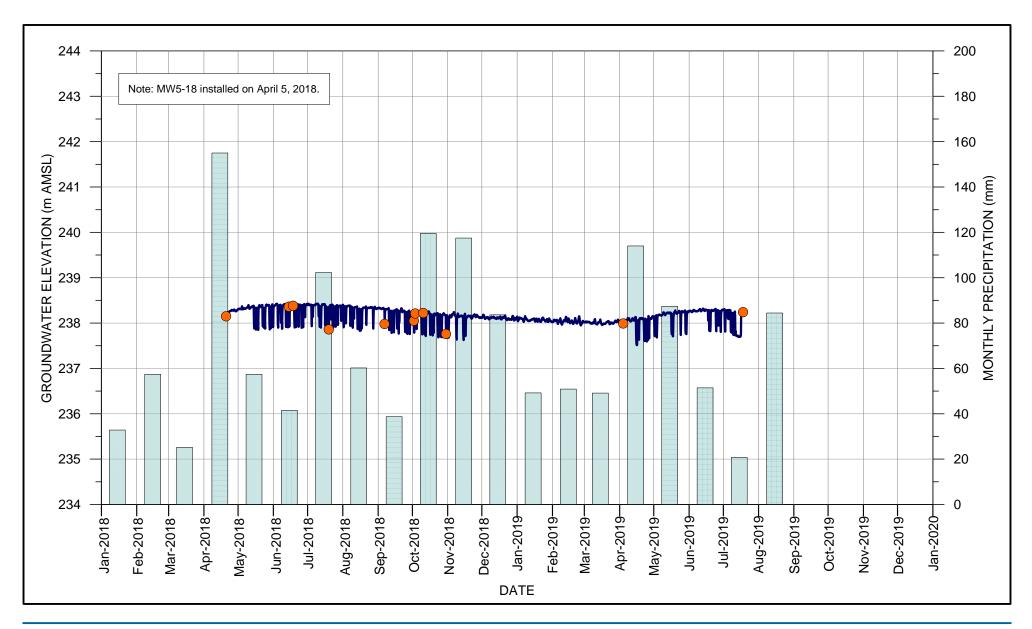


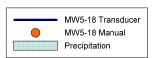




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FIGURE 4 MW4-10 HYDROGRAPH

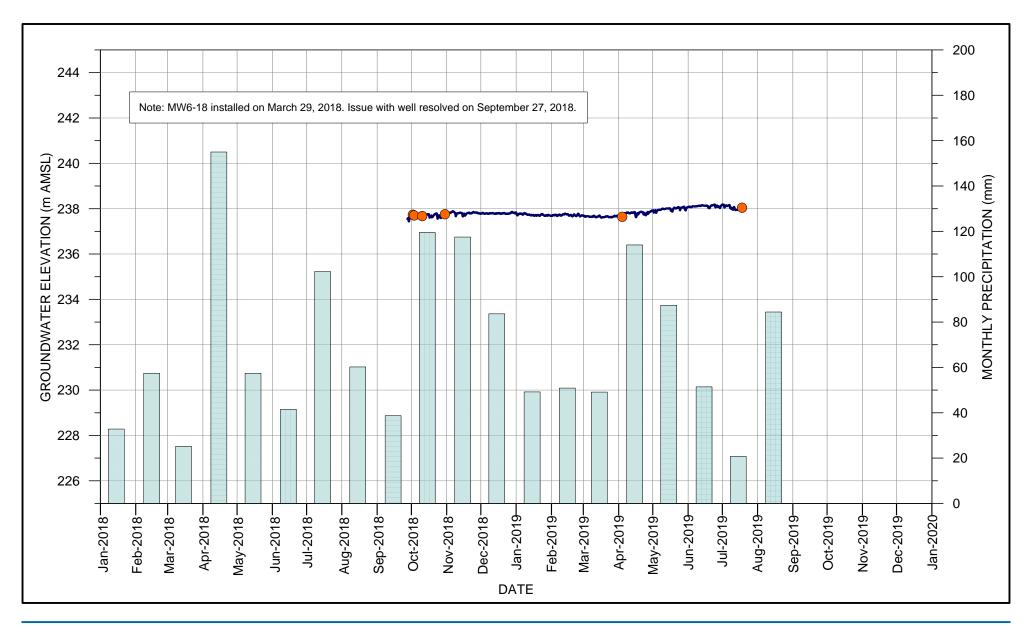


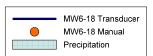




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FIGURE 5 MW5-18 HYDROGRAPH

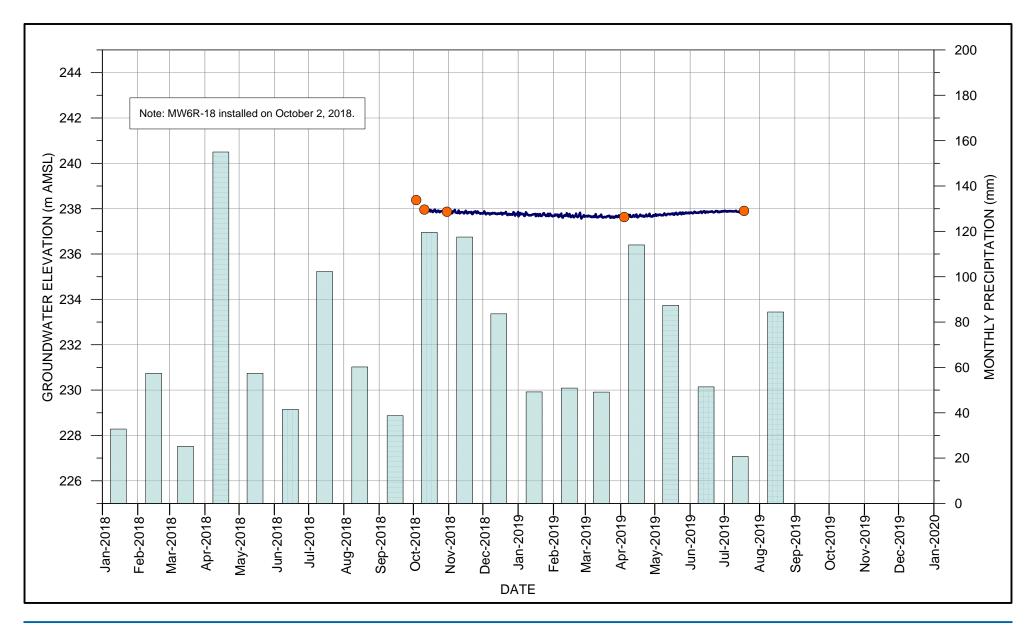


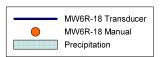




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FIGURE 6 MW6-18 HYDROGRAPH

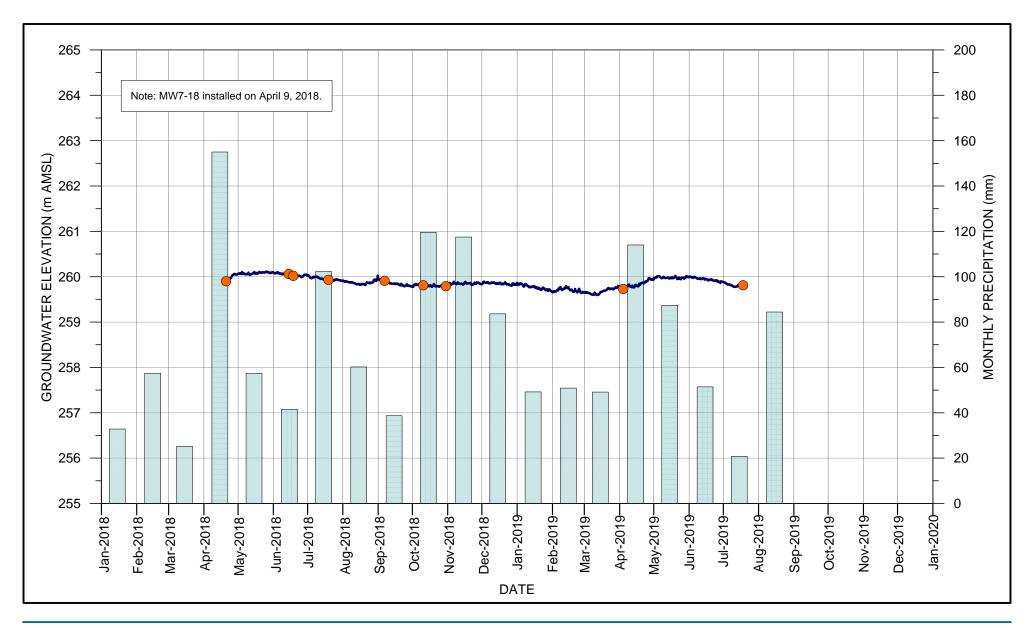


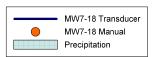




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FIGURE 7 MW6R-18 HYDROGRAPH

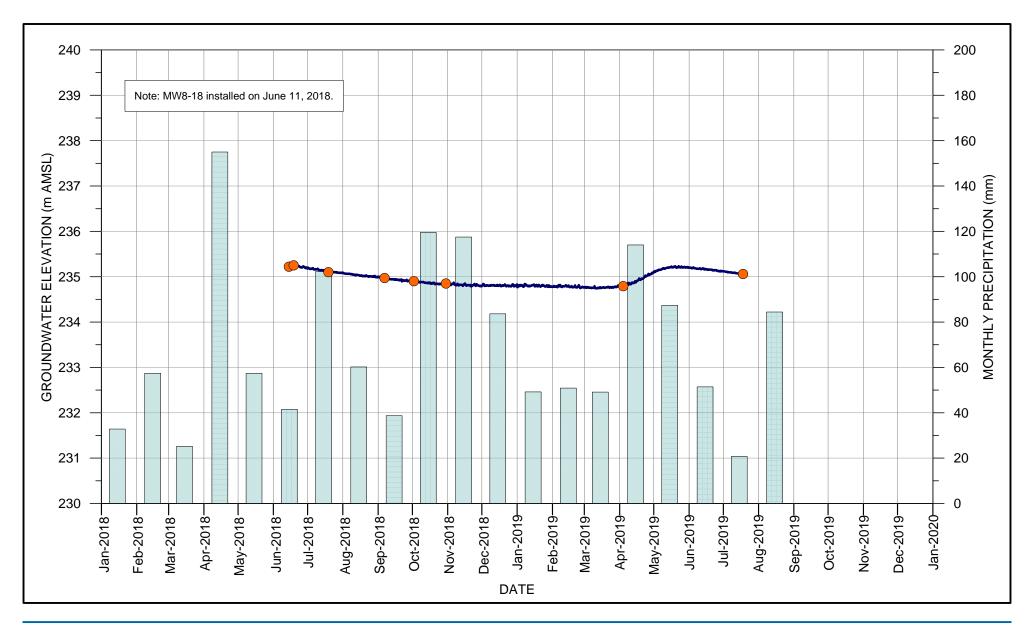


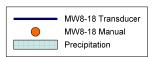




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FIGURE 8 MW7-18 HYDROGRAPH

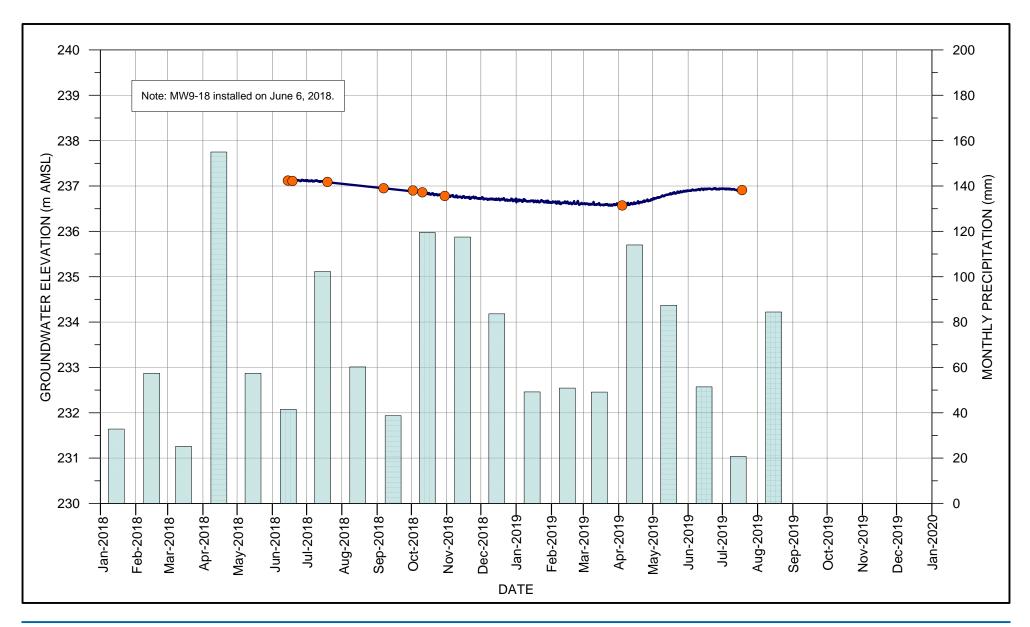


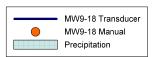




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FIGURE 9 MW8-18 HYDROGRAPH

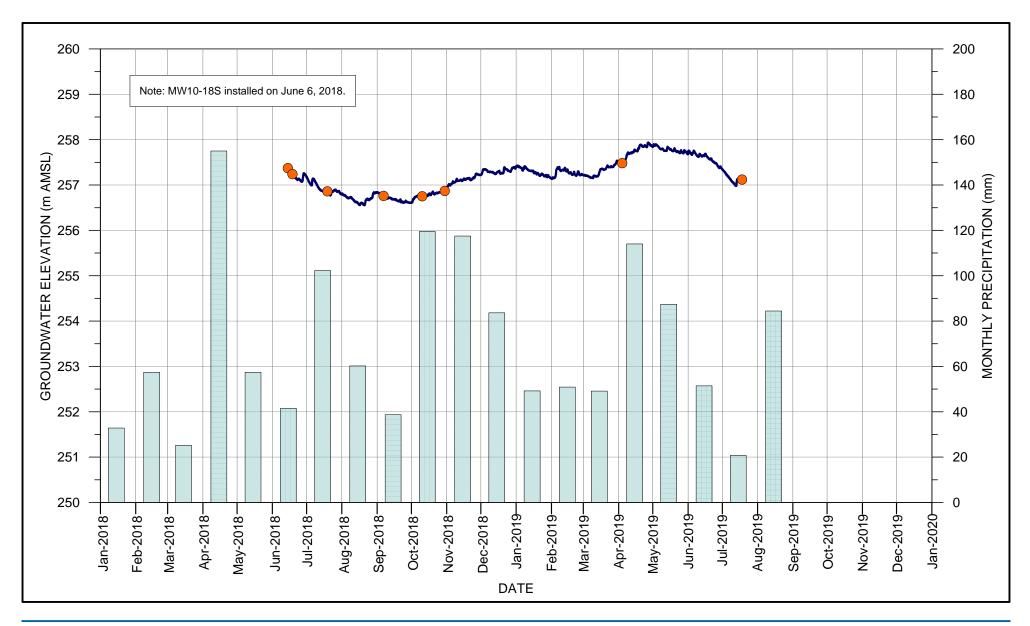


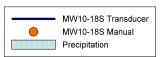




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FIGURE 10 MW9-18 HYDROGRAPH

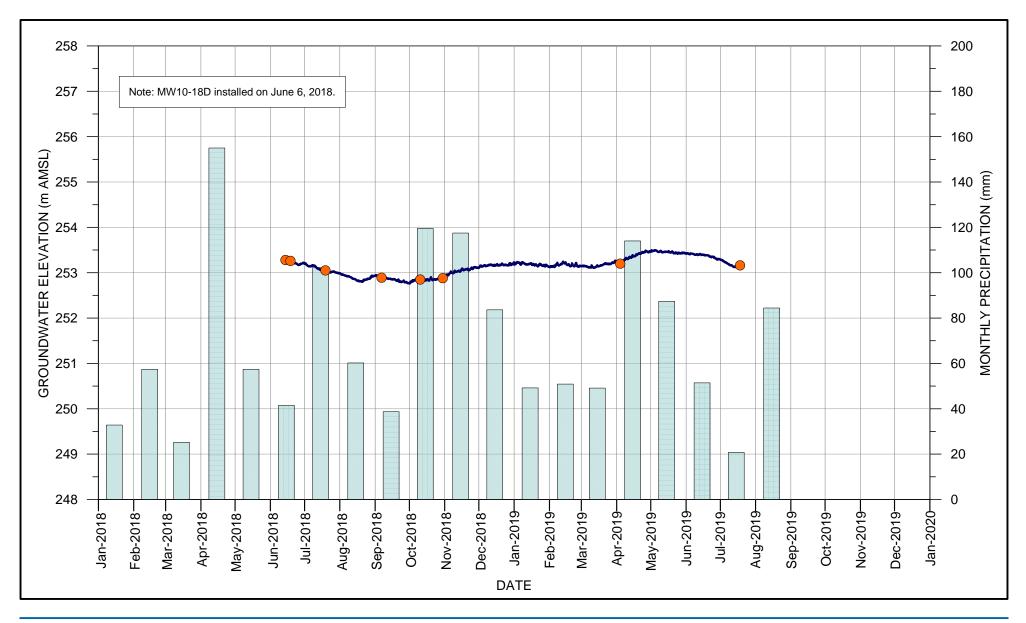


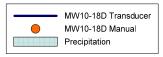




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FIGURE 11 MW10-18S HYDROGRAPH

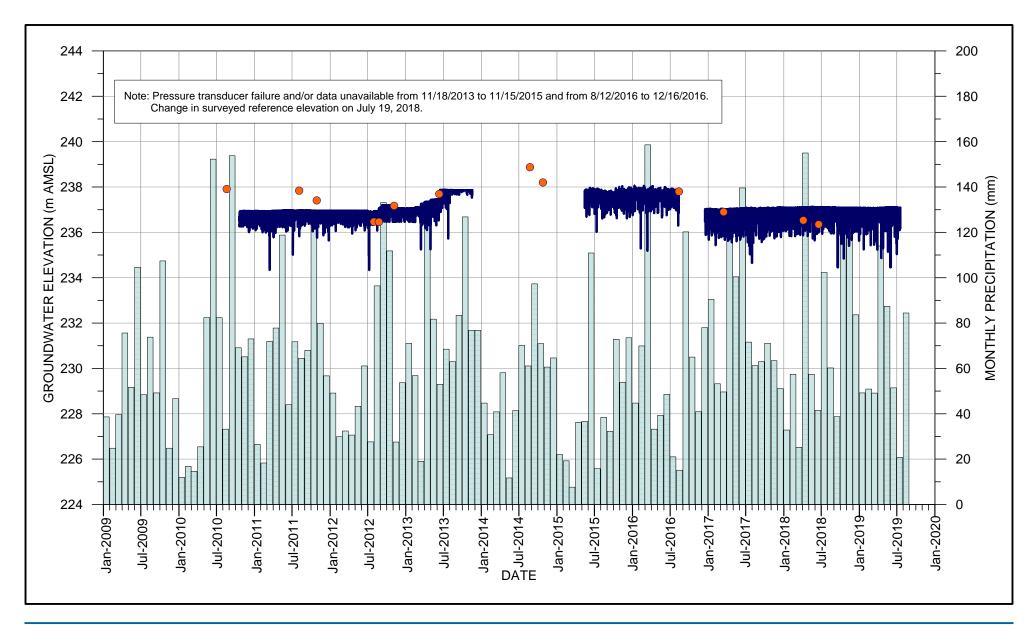


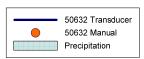




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FIGURE 12 MW10-18D HYDROGRAPH

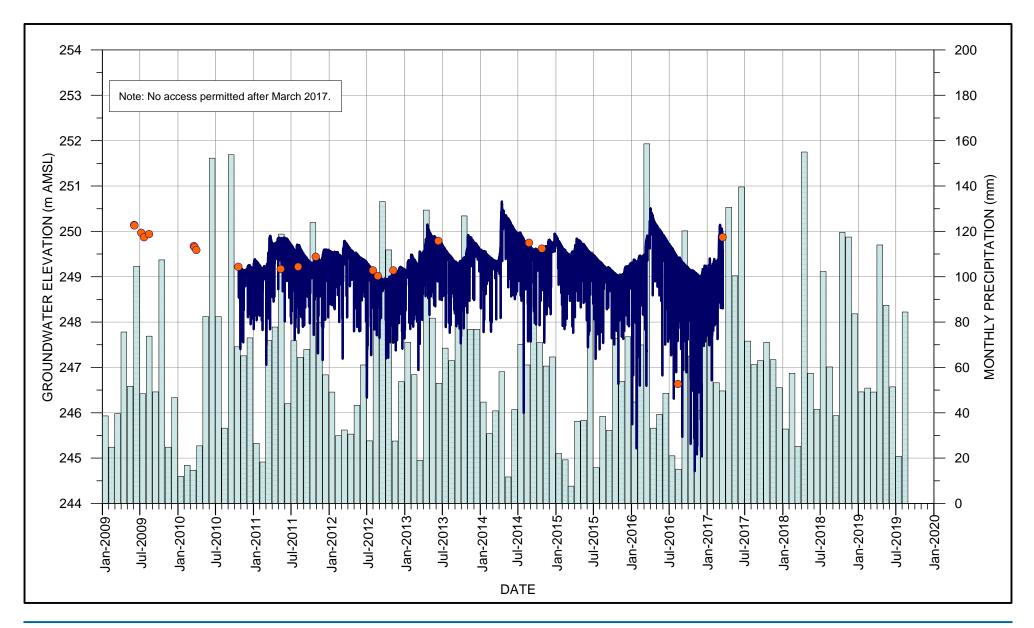


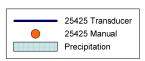




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FIGURE 13 #50632 HYDROGRAPH

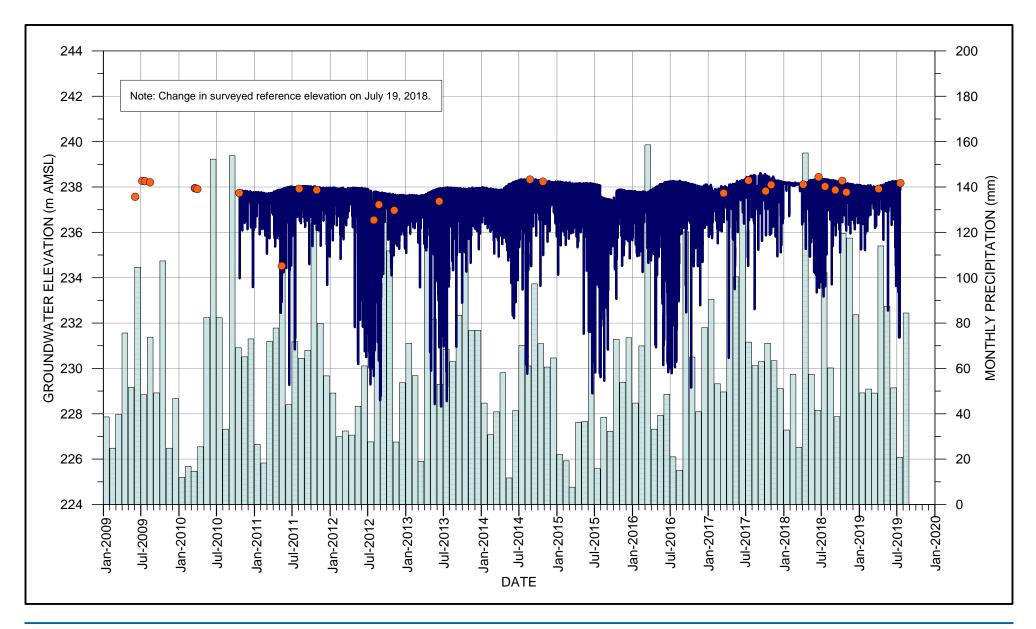






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FIGURE 14 #25425 HYDROGRAPH

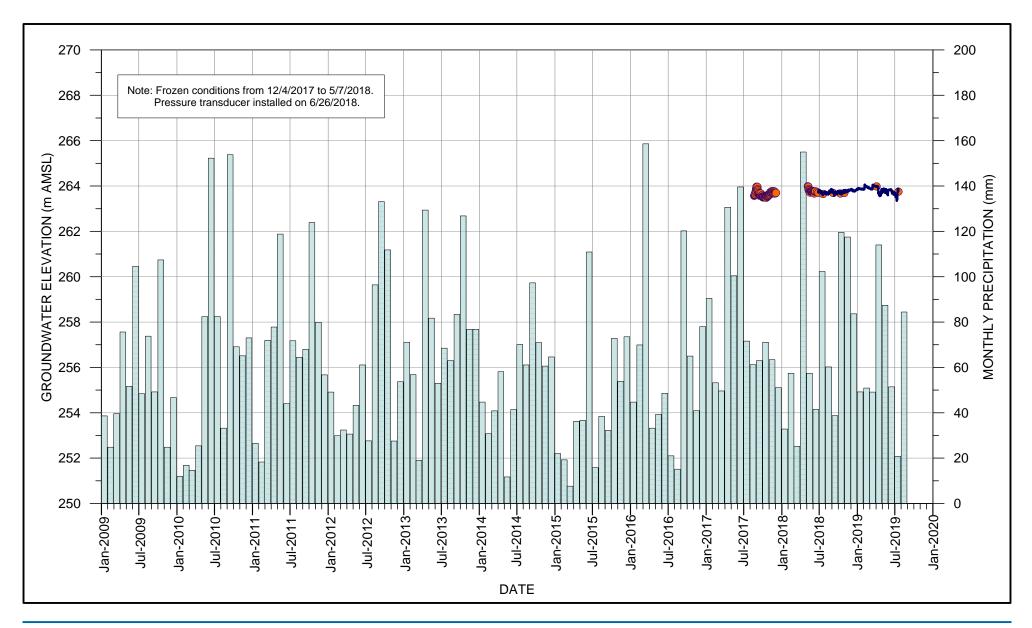


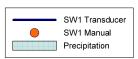




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FIGURE 15 #17709 HYDROGRAPH



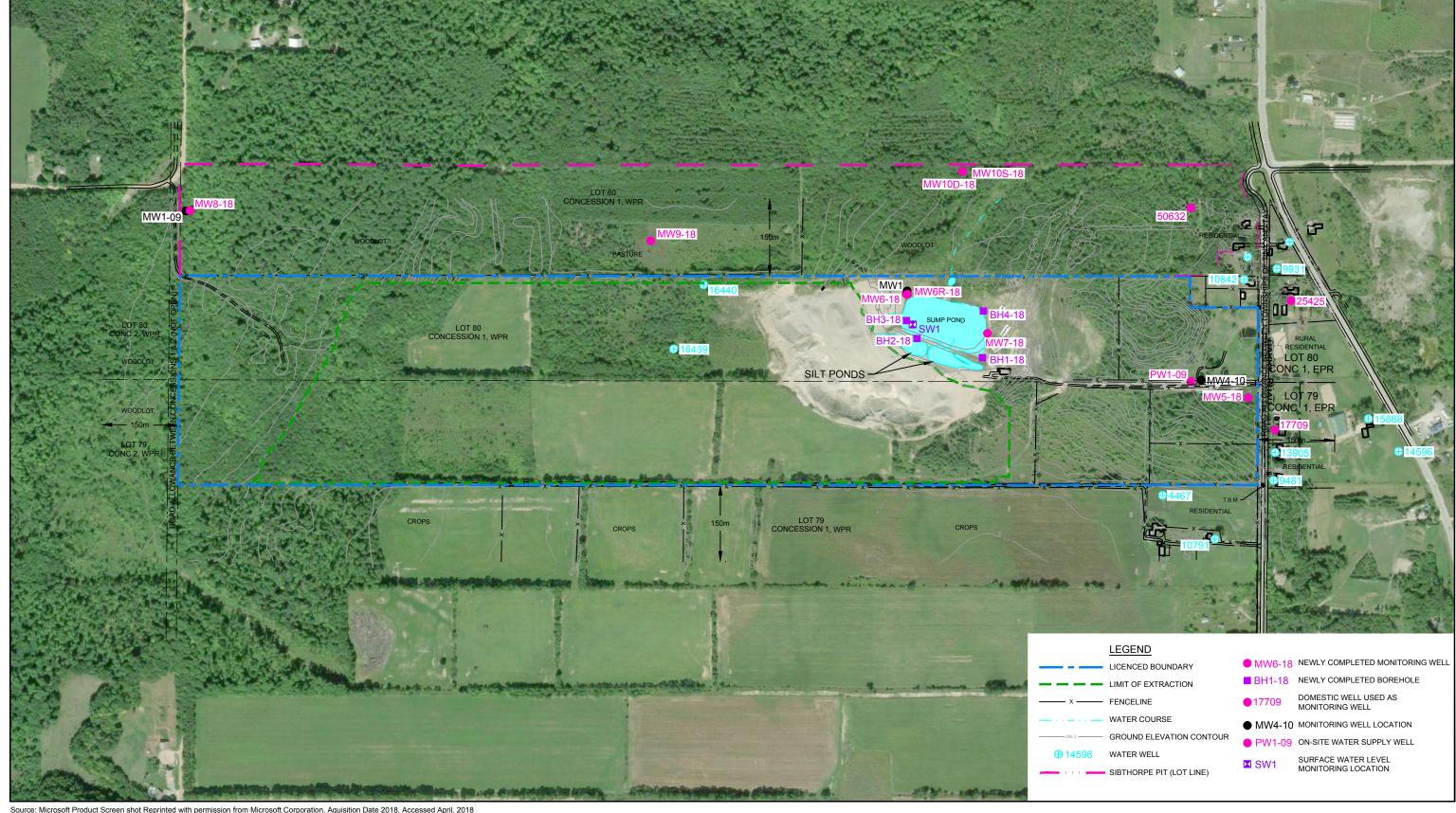




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FIGURE 16 SW1 HYDROGRAPH

Attachment B



Source: Microsoft Product Screen shot Reprinted with permission from Microsoft Corporation, Aquisition Date 2018, Accessed April, 2018





DUFFERIN TEEDON PIT TOWNSHIP OF TINY, COUNTY OF SIMCOE, ONTARIO

11155365-10 Oct 30, 2018

2018 MONITORING WELL AND BOREHOLE LOCATIONS



Page 1 of 2

PROJECT NAME: CRH-TEEDON PIT HOLE DESIGNATION: MW5-18
PROJECT NUMBER: 11155365 DATE COMPLETED: 5 April 2018
CLIENT: CRH CANADA GROUP INC DRILLING METHOD: SONIC

LOCATION: TINY TOWNSHIP, ONTARIO FIELD PERSONNEL: K. VANDER MEULEN

PTH BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. m	MONITORING WELL			SAMPLE	
	NORTHING: 4945106.2 TOP OF RISE EASTING: 592450.79 GROUND SURFACE	R 257.19		NUMBER	NTERVAL	REC (%)	
	TOPSOIL ML-SILT, some clay, loose, brown, oxidized, wet	256.08	CONCRETE BENTONITE	1RS	=	71	
	SM-SILTY SAND, compact, very fine grained, dilatant, poorly graded, brown, wet SP-SAND, with silt, trace gravel, compact, very	254.10	GROUT	2RS		100	
6	fine grained, poorly graded, brown, wet SM-SILTY SAND, trace clay, compact, very fine grained, slightly dilatant, poorly graded, brown, wet	251.82	51mm PVC WELL CASING	3RS		100	
8	ML-SILT, with very fine sand, compact, dilatant,	247.55	152mm BOREHOLE				
10 12	brown, wet SP-SAND, trace silt, compact, fine grained, poorly graded, brown, wet	246.33		4RS		100	
14				5RS		100	
16	SM-SILTY SAND (Till), with gravel, trace clay, compact, very fine grained, poorly graded, grey, very moist to wet	241.45		6RS		100	
18	ML-SILT, trace clay, compact, dilatant, grey, wet - with clay at 18.90m BGS	239.01		7RS		100	
20				8RS		100	
24	- with clay at 24.99m BGS			9RS		100	
28	CL-SILTY CLAY, stiff, low plasticity, slightly dilatant, grey, wet	229.87		10RS		100	
30 32				11RS		100	
34				12RS		100	
36 38	- medium plasticity at 38.10m BGS			13RS		100	
40	modern precion, at 55. for 1550			14RS		100	



Page 2 of 2

PROJECT NAME: CRH-TEEDON PIT
PROJECT NUMBER: 11155365
CLIENT: CRH CANADA GROUP INC
LOCATION: TINY TOWNSHIP, ONTARIO

HOLE DESIGNATION: MW5-18
DATE COMPLETED: 5 April 2018
DRILLING METHOD: SONIC

FIELD PERSONNEL: K. VANDER MEULEN

PTH BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. m	MONITORING WELL			SAMPLE	·
B00				NUMBER	INTERVAL	REC (%)	
2	- 51mm medium sand seam at 44.20m BGS			15RS		100	
6				16RS		100	
0				17RS		100	
2	SP-SAND, compact, very fine grained, poorly graded, grey, wet	204.42		18RS		100	
6				19RS		100	
8 0	- fine grained at 60.05m BGS			20RS		100	
2	- ilile grained at 00.03111 BGS			21RS		100	
6	- trace gravel, trace to with silt at 65.53m BGS		BENTONITE	22RS		100	
8			PELLETS SAND PACK 51mm PVC	23RS		100	
0	END OF BOREHOLE @ 69.19m BGS	186.59	WELL SCREEN WELL DETAILS Screened interval:				
2			189.64 to 186.59m 66.75 to 69.80m BGS Length: 3.05m				
6			Diameter: 51mm Slot Size: 0.010 Material: PVC SCH 80 Seal:				
8			190.86 to 190.25m 65.53 to 66.14m BGS Material: BENTONITE PELLETS				
72 74 76 78 80			Sand Pack: 190.25 to 186.59m 66.14 to 69.80m BGS Material: SAND				



Page 1 of 2

PROJECT NAME: CRH-TEEDON PIT
PROJECT NUMBER: 11155365
CLIENT: CRH CANADA GROUP INC

LOCATION: TINY TOWNSHIP, ONTARIO

HOLE DESIGNATION: MW6-18
DATE COMPLETED: 29 March 2018

DRILLING METHOD: SONIC

FIELD PERSONNEL: K. VANDER MEULEN

PTH BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. m	MONITORING WELL		Τ.	SAMPLE	
100	NORTHING: 4944916.15 TOP OF EASTING: 591778.54 GROUND SUI	268.43 267.60		NUMBER	INTERVAL	REC (%)	
	SM-SILTY SAND (FILL), little gravel, compact, very fine grained, poorly graded, brown, moist		CONCRET	1RS		60	
2	ML-SILT, trace clay, trace very fine sand,	264.86	BENTONI GROUT	TE 2RS		100	
4	compact, brown, moist - no clay or sand at 3.66m BGS		51mm PV WELL CA:	C 3RS SING		100	
3	- dilatant, wet at 6.10m BGS		152mm BOREHOL	.E 4RS		100	
10		256.02		5RS		100	
12	SM-SILTY SAND, compact, very fine grained, poorly graded, brown, wet	255.10				1	
14	ML-SILT, trace clay, compact, dilatant, grey, wet			6RS		100	
16	- with clay, very moist to wet at 16.76m BGS			7RS		100	
18	- trace clay at 17.98m BGS					1	
20	- with clay at 20.42m BGS			8RS		100	
22				9RS		100	
24		242.30				-	
26	CL-SILTY CLAY, stiff, low plasticity, grey, wet - medium plasticity at 25.91m BGS			10RS		100	
28				11RS		100	
30						_	
32		224.22		12RS		100	
34	SP-SAND, with coarse gravel, compact, medium grained, poorly graded, grey, wet - trace gravel, fine grained at 33.83m BGS	234.38		13RS		100	
36							
38				14RS		100	
40	- trace silt, very fine grained at 39.62m BGS					1	



Page 2 of 2

PROJECT NAME: CRH-TEEDON PIT
PROJECT NUMBER: 11155365
CLIENT: CRH CANADA GROUP INC
LOCATION: TINY TOWNSHIP, ONTARIO

HOLE DESIGNATION: MW6-18
DATE COMPLETED: 29 March 2018

DRILLING METHOD: SONIC

FIELD PERSONNEL: K. VANDER MEULEN

PTH	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV.	MONITORING WELL			SAMPLE
BGS		m		NUMBER	INTERVAL	REC (%)
12		224.93		15RS		100
44	ML-SILT, dense, dilatant, grey, wet SP-SAND, trace silt, compact, very fine grained, poorly graded, grey, wet	224.93		16RS		100
46				17RS		100
48						
50				18RS		100
52 54	ML-SILT, compact, dilatant, grey, wet	215.78		19RS		100
56	SP-SAND, trace silt, compact, very fine grained, poorly graded, grey, wet, dark layering	212.13		20RS		100
58	poorly graded, grey, wet, dark layering					
60				21RS		100
62	fine grained, grey at 61.87m BGSfine grained, brown at 62.79m BGS			22RS		100
64			BENTONITE	23RS		100
66			PELLETS 51mm PVC WELL SCREEN			
70		197.50	SAND PACK	24RS		100
72	END OF BOREHOLE @ 70.10m BGS		WELL DETAILS Screened interval: 201.15 to 198.11m			
			66.45 to 69.49m BGS Length: 3.05m Diameter: 51mm			
74 76 78 80			Slot Size: 0.010 Material: PVC SCH 80 Seal:			
78			202.37 to 201.76m 65.23 to 65.84m BGS Material: BENTONITE PELLETS Sand Pack:			
80			201.76 to 197.50m 65.84 to 70.10m BGS Material: SAND			



Page 1 of 2

PROJECT NAME: CRH-TEEDON PIT
PROJECT NUMBER: 11155365
CLIENT: CRH CANADA GROUP INC

LOCATION: TINY TOWNSHIP, ONTARIO

HOLE DESIGNATION: MW6R-18
DATE COMPLETED: October 2, 2018

DRILLING METHOD: SONIC FIELD PERSONNEL: G. LAGOS

EPTH BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. m	MONITORING WELL			SAMF	PLE
	NORTHING: 4944916.96 TOP OF RISEI EASTING: 591780.6 GROUND SURFACE	R 268.20		NUMBER	INTERVAL	REC (%)	
2 4	SM-SILTY SAND (FILL), little gravel, compact, very fine grained, poorly graded, brown, moist ML-SILT, trace clay, trace very fine sand, compact, brown, moist - no clay or sand at 3.66m BGS - dilatant, wet at 6.10m BGS	264.82	CONCRETE BENTONITE GROUT 51mm PVC WELL CASING 152mm BOREHOLE				
3 10 12 14	SM-SILTY SAND, compact, very fine grained, poorly graded, brown, wet ML-SILT, trace clay, compact, dilatant, grey, wet	255.99 255.07					
18 20 22	- with clay, very moist to wet at 16.76m BGS - trace clay at 17.98m BGS - with clay at 20.42m BGS						
24 26 28 30	CL-SILTY CLAY, stiff, low plasticity, grey, wet - medium plasticity at 25.91m BGS	242.27					
34 36 38	SP-SAND, with coarse gravel, compact, medium grained, poorly graded, grey, wet - trace gravel, fine grained at 33.83m BGS	234.34					
40	- trace silt, very fine grained at 39.62m BGS						



Page 2 of 2

PROJECT NAME: CRH-TEEDON PIT
PROJECT NUMBER: 11155365
CLIENT: CRH CANADA GROUP INC

LOCATION: TINY TOWNSHIP, ONTARIO

HOLE DESIGNATION: MW6R-18
DATE COMPLETED: October 2, 2018

DRILLING METHOD: SONIC FIELD PERSONNEL: G. LAGOS

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV.	MONITORING WELL			SAME	'LE
				NUMBER	INTERVAL	REC (%)	
- 42		224.90					
- 44	ML-SILT, dense, dilatant, grey, wet SP-SAND, trace silt, compact, very fine grained, poorly graded, grey, wet	224.13	BENTONITE PELLETS				
46			SAND PACK				
48	END OF BOREHOLE @ 48.77m BGS	218.80	51mm PVC WELL SCREEN				
- 50			Screened interval: 222.15 to 219.10m				
52			45.42 to 48.46m BGS Length: 3.05m Diameter: 51mm Slot Size: 0.010				
54			Material: PVC Seal: 223.37 to 222.76m				
- 56			44.20 to 44.81m BGS Material: BENTONITE PELLETS Sand Pack:				
- 58			222.76 to 218.80m 44.81 to 48.77m BGS Material: SAND				
- 60 - 62							
- 64							
- 66							
- 68							
- 70							
- 72							
- 74							
- 76							
- 78							
- 80							
	OTES: MEASURING POINT ELEVATIONS MAY CHANGE; R						



Page 1 of 1

HOLE DESIGNATION: PROJECT NAME: CRH-TEEDON PIT PROJECT NUMBER: 11155365 DATE COMPLETED: 9 April 2018 CLIENT: CRH CANADA GROUP INC DRILLING METHOD: SONIC

LOCATION: TINY TOWNSHIP, ONTARIO

FIELD PERSONNEL: K. VANDER MEULEN

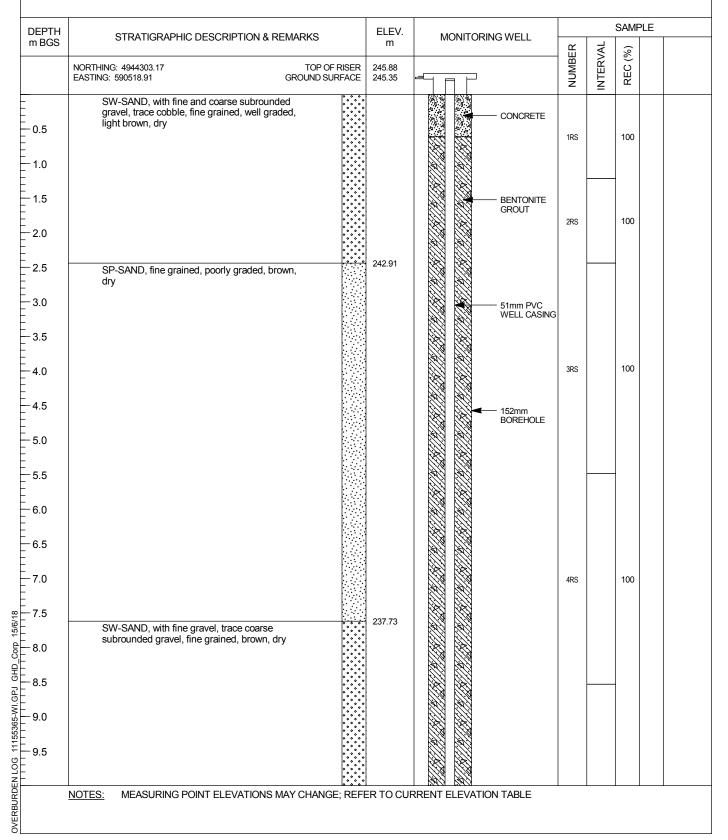
MW7-18

DEPTH n BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV.	MONITORING WELL			SAMPLE
600	NORTHING: 4944937.13 TOP OF RISER GROUND SURFACE			NUMBER	INTERVAL	REC (%)
2	SP-SAND (FILL), with silt, compact, very fine grained, poorly graded, brown, moist		CONCRETE BENTONITE GROUT	1RS		67
,	SM-SILTY SAND, loose, very fine grained, poorly graded, dilatant, brown, wet	262.57	51mm PVC WELL CASING	2RS		60
3	ML-SILT, trace very fine sand, loose, dilatant,	258.91	152mm BOREHOLE	3RS		100
10	grey, wet			4RS		100
12	SM-SILTY SAND, compact, very fine grained, slightly dilatant, poorly graded, grey, wet	253.42		5RS		100
6	ML-SILT, compact, dilatant, grey, wet - trace to with clay at 15.85m BGS			6RS		100
8	SM-SILTY SAND, compact, very fine grained, slightly dilatant, poorly graded, grey, wet	247.63	BENTONITE PELLETS 51mm PVC	7RS		100
2	ML-SILT, with clay, compact, grey, wet	244.89	WELL SCREEN	8RS		100
24	END OF BOREHOLE @ 24.08m BGS	242.75	WELL DETAILS			
26			Screened interval: 247.94 to 244.89m 18.90 to 21.95m BGS Length: 3.05m			
28			Diameter: 51mm Slot Size: 0.010 Material: PVC SCH 80			
32			Seal:			
34			Sand Pack: 248.55 to 242.75m 18.29 to 24.08m BGS			
36			Material: SAND			
38						
40						



Page 1 of 3

PROJECT NAME: CRH-TEEDON PIT HOLE DESIGNATION: MW8-18
PROJECT NUMBER: 11155365 DATE COMPLETED: 11 June 2018
CLIENT: CRH CANADA GROUP INC DRILLING METHOD: SONIC
LOCATION: TINY TOWNSHIP, ONTARIO FIELD PERSONNEL: S. MOLONEY





Page 2 of 3

PROJECT NAME: CRH-TEEDON PIT
PROJECT NUMBER: 11155365
CLIENT: CRH CANADA GROUP INC
LOCATION: TINY TOWNSHIP, ONTARIO

HOLE DESIGNATION: MW8-18
DATE COMPLETED: 11 June 2018
DRILLING METHOD: SONIC
FIELD PERSONNEL: S. MOLONEY

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS		ELEV. m	MONITORING WELL			SAMPL	E
			Ш		NUMBER	INTERVAL	REC (%)	
10.5					5RS		75	
11.5 12.0 12.5								
13.0					6RS		20	
14.0								
5.0	- medium grained, with fine grained, wet at 14.63m BGS							
5.5								
6.0	GP-SANDY GRAVEL/GRAVEL, with fine sand,		228.89	BENTONITE	7RS		100	
17.0 17.5	fine and coarse subrounded to subangular gravel, well graded, grey, wet			PELLETS				
18.0		000		SAND PACK				
8.5								
7.5 8.0 8.5 9.0 9.5				SAND PACK	8RS		100	



Page 3 of 3

PROJECT NAME: CRH-TEEDON PIT
PROJECT NUMBER: 11155365
CLIENT: CRH CANADA GROUP INC
LOCATION: TINY TOWNSHIP, ONTARIO

HOLE DESIGNATION: MW8-18
DATE COMPLETED: 11 June 2018
DRILLING METHOD: SONIC
FIELD PERSONNEL: S. MOLONEY

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. m	MONITORING WELL	SAMPLE				
		'''		NUMBER	INTERVAL	REC (%)		
- 20.5			SCREEN					
- 21.0	END OF BOREHOLE @ 20.73m BGS	224.62	WELL DETAILS Screened interval:					
21.5			227.67 to 224.62m 17.68 to 20.73m BGS Length: 3.05m					
22.0			Diameter: 51mm Slot Size: 0.010 Material: PVC					
- 22.5			Seal: 229.19 to 228.28m 16.15 to 17.07m BGS					
23.0			Material: BENTONITE CHIPS Sand Pack: 228.28 to 224.62m					
- 23.5			17.07 to 20.73m BGS Material: SAND					
24.0								
24.5								
- 25.0								
- 25.5								
- 26.0								
- 26.5								
- 27.0								
- 27.5								
- 28.0								
- 28.5								
- 29.0								
- 29.5								
NO.	TES: MEASURING POINT ELEVATIONS MAY CHANGE; REF	ER TO CU	 RRENT ELEVATION TABLE					



Page 1 of 7

PROJECT NAME: CRH-TEEDON PIT
PROJECT NUMBER: 11155365
CLIENT: CRH CANADA GROUP INC
LOCATION: TINY TOWNSHIP, ONTARIO

HOLE DESIGNATION: MW9-18
DATE COMPLETED: 6 June 2018
DRILLING METHOD: SONIC

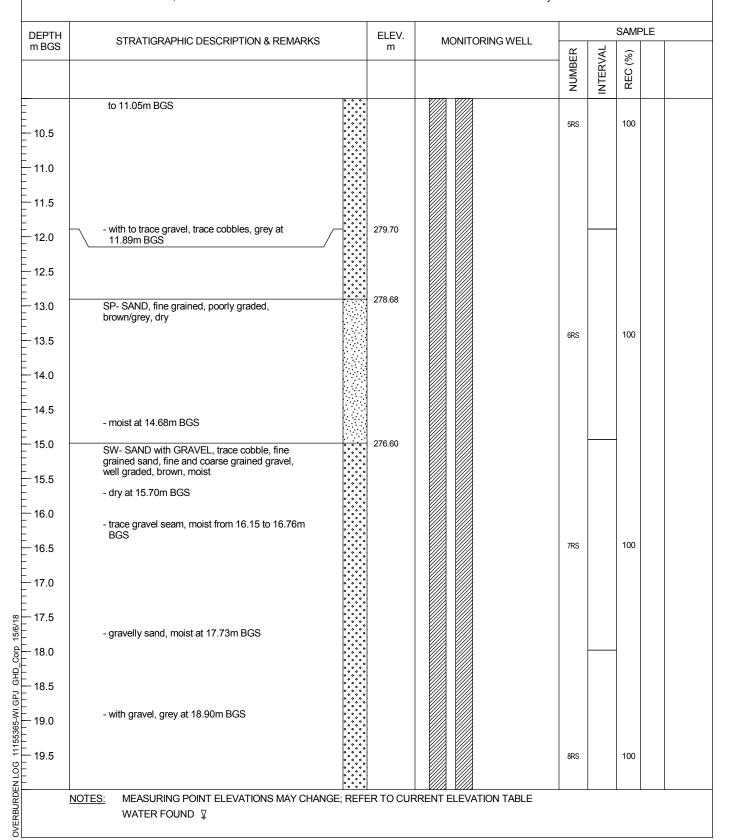
DEPTH n BGS	STRATIGRAPHIC DESCRIPTION & REMARKS		ELEV. m	MONITORIN	IG WELL	~		SAMPLE	<u>-</u>
	NORTHING: 4944734.11 TOP OF EASTING: 591302.29 GROUND SUF		292.50 291.58	100		NUMBER	INTERVAL	REC (%)	
0.5	TOPSOIL, sandy silt, loose, fine grained sand, dark brown, dry	1/. 21.1/		-	- CONCRETE				
1.0	SM- SAND, with silt, with to trace fine and coarse gravel, loose, fine grained, well graded, brown, dry		290.97						
1.5						1RS		56	
- 2.0 - 2.5				_	- Bentonite Grout				
- 3.0	SW- SAND, with gravel, trace silt, compact, fine grained, fine and coarse subrounded gravel, light brown, dry		288.84		<i></i>				
- 3.5	- gravelly sand, fine to medium sand from 3.61 to 6.48m BGS				- 51 mm PVC WELL CASING	2RS		100	
- 4.0 - 4.5									
- 5.0					- 152 mm BOREHOLE	3RS		100	
- 5.5									
- 6.0									
- 6.5 - 7.0	- silty sand, with gravel, with cobbles seam, fine grained, dry from 6.50 to 7.32m BGS	*****							
-7.5						4RS		100	
- 8.0									
8.5	fine to medium grained, fine gravel, brown		282.74						
9.0	fine grained, fine and coarse gravel, trace cobbles, light grey		<u> </u>				_		
- 9.5	- silt seam, very fine grained, light grey from 9.91								
	NOTES: MEASURING POINT ELEVATIONS MAY CHANGE	_k*^*^* E: REFEI	R TO CUE	I WWA WWA RRENT ELEVATIO	N TABLE				



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PROJECT NAME: CRH-TEEDON PIT
PROJECT NUMBER: 11155365
CLIENT: CRH CANADA GROUP INC
LOCATION: TINY TOWNSHIP, ONTARIO

HOLE DESIGNATION: MW9-18
DATE COMPLETED: 6 June 2018
DRILLING METHOD: SONIC





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PROJECT NAME: CRH-TEEDON PIT
PROJECT NUMBER: 11155365
CLIENT: CRH CANADA GROUP INC
LOCATION: TINY TOWNSHIP, ONTARIO

HOLE DESIGNATION: MW9-18
DATE COMPLETED: 6 June 2018
DRILLING METHOD: SONIC

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS		ELEV. m	MONITORING WELL		SAMPLE			
					NUMBER	INTERVAL	REC (%)		

20.5									

21.0		*****					-		
21.5									
22.0		****							
22.0									
22.5					9RS		100		
23.0									
23.5		****							
23.3		****							
24.0		*****							

24.5									
25.0									
25.0		****							
25.5	trace pilt agam, fine to you fine grained from				10RS		100		
	- trace silt seam, fine to very fine grained from 25.60 to 26.44m BGS				loks	'	100		
26.0									
26.5									
20.5									
27.0									
27.5									
28.0									
20.0									
28.5									
	 trace silt seam, fine to very fine grained from 28.65 to 29.03m BGS 				11RS	•	100		
29.0									
29.5									
29.0									



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PROJECT NAME: CRH-TEEDON PIT
PROJECT NUMBER: 11155365
CLIENT: CRH CANADA GROUP INC
LOCATION: TINY TOWNSHIP, ONTARIO

HOLE DESIGNATION: MW9-18
DATE COMPLETED: 6 June 2018
DRILLING METHOD: SONIC

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS		ELEV.	MONITORING WELL	~		SAMPLE	
					NUMBER	INTERVAL	REC (%)	
30.5								
31.0	 with to trace silt, fine and coarse subrounded gravel, subrounded, well graded, light grey at 30.91m BGS 							
31.5	30.91111 000	****			12RS		100	
32.0								
32.5								
33.0								
33.5		, , , , , , , , , , , , , , , , , , ,						
34.0								
34.5					13RS		70	
35.0								
35.5								
36.0	- gravelly sand to sand with gravel, grav at	****						
36.5	- gravelly sand to sand with gravel, grey at 36.27m BGS	****						
37.0		****						
37.5					4,500		100	
38.0					14RS		100	
38.5								
39.0								
39.5								
	- silty sand, with gravel, very fine grained, light							



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PROJECT NAME: CRH-TEEDON PIT PROJECT NUMBER: 11155365 CLIENT: CRH CANADA GROUP INC LOCATION: TINY TOWNSHIP, ONTARIO

MW9-18 HOLE DESIGNATION: DATE COMPLETED: 6 June 2018 DRILLING METHOD: SONIC

FIELD PERSONNEL: Shawn Moloney

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS		ELEV. m	MONITORING WELL		SAMPLE		
11 000			111		NUMBER	INTERVAL	REC (%)	
	grey at 39.93m BGS							
40.5		****						
40.5								
		****			15RS		100	
-41.0								
41.5		*****						
-42.0								
	- sand with gravel medium grained brown-grey						1	
- 42.5	 sand, with gravel, medium grained, brown-grey at 42.37m BGS 	•••••						
		• • • • • • • • • • • • • • • • • • •						
-43.0	- fine grained at 42.98m BGS							
-43.5	- gravelly sand seam, trace cobbles, fine							
	 gravelly sand seam, trace cobbles, fine grained, fine and coarse subrounded to subangular gravel, well graded from 43.48 to 							
-44.0	44.20m BGS	*****			16RS		100	
- 44.5								
-								
- 45.0	 medium grained, with fine grained at 44.88m BGS 							
	000							
- 45.5		****					-	
45.5								
46.0								
-46.0								
40.5								
46.5								
					17RS		100	
-47.0		\$ \$ \$ \$ \$			1/100			
- 47.5								
-48.0								
		• • • • • • • • • • • • • • • • • • •						
- 48.5							1	
-49.0								
		[*****						
49.5								
1		°°°°°		V//A V///A	1	I	1 1	1



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PROJECT NAME: CRH-TEEDON PIT
PROJECT NUMBER: 11155365
CLIENT: CRH CANADA GROUP INC
LOCATION: TINY TOWNSHIP, ONTARIO

HOLE DESIGNATION: MW9-18
DATE COMPLETED: 6 June 2018
DRILLING METHOD: SONIC

FIELD PERSONNEL: Shawn Moloney

EPTH BGS	STRATIGRAPHIC DESCRIPTION & REMARKS		ELEV. m	l N	MONITOR	RING WELL	n'		SAMPLE	<u> </u>
							NUMBER	INTERVAL	REC (%)	
50.5	•	***					18RS		100	
30.3										
51.0	- gravel, with sand seam from 50.98 to 51.21m BGS									
51.5										
- 52.0										
- 52.5	- fine grained at 52.17m BGS									
-53.0							19RS		100	
- 53.5										
- 54.0										
- 54.5	- wet at 54.56m BGS			₽						
- 55.0	- fine grained sand seam, poorly graded,									
	brown-grey from 55.02 to 56.08m BGS									
- 55.5										
- 56.0	- medium grained at 56.08m BGS						20RS		100	
- 56.5						BENTONITE PELLETS				
- 57.0										
- 57.5										
- 57.5 - 58.0 - 58.5 - 59.0 - 59.5						— SAND PACK				
- 58.0										
- 58.5										
- 59.0		• ` • ` •				— 51mm PVC	21RS		100	
- 59.5						WELL SCREEN				



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PROJECT NAME: CRH-TEEDON PIT
PROJECT NUMBER: 11155365
CLIENT: CRH CANADA GROUP INC
LOCATION: TINY TOWNSHIP, ONTARIO

HOLE DESIGNATION: MW9-18
DATE COMPLETED: 6 June 2018
DRILLING METHOD: SONIC

FIELD PERSONNEL: Shawn Moloney

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV.	MONITORING WELL			SAMF	LE
				NUMBER	INTERVAL	REC (%)	
60.5	FND OF BODELIOLE @ 60 66m BCS	230.93					
61.0	END OF BOREHOLE @ 60.66m BGS		WELL DETAILS Screened interval: 233.98 to 230.93m				
61.5			57.61 to 60.66m BGS Length: 3.05m Diameter: 51mm				
62.0			Slot Size: 10 Material: Sch. 80 PVC Seal:				
62.5			236.11 to 234.59m 55.47 to 57.00m BGS Material: BENTONITE PELLETS				
63.0			Sand Pack: 234.59 to 230.93m 57.00 to 60.66m BGS				
63.5			Material: SILICA SAND No.2 Seal:				
64.0			290.97 to 234.59m 0.61 to 57.00m BGS Material: BENTONITE GROUT				
64.5			Seal: 291.58 to 290.97m				
65.0			0.00 to 0.61m BGS Material: CONCRETE				
65.5							
66.0							
66.5							
67.0							
67.5							
- 68.0							
- 68.5							
69.0							
69.5							
 <u>NO</u>	NTES: MEASURING POINT ELEVATIONS MAY CHANGE; RE WATER FOUND ↓	 FER TO CUI	 RRENT ELEVATION TABLE				



Page 1 of 3

PROJECT NAME: CRH-TEEDON PIT

PROJECT NUMBER: 11155365 CLIENT: CRH CANADA GROUP INC

LOCATION: TINY TOWNSHIP, ONTARIO

HOLE DESIGNATION: MW10D-18

DATE COMPLETED: 6 June 2018

DRILLING METHOD: SONIC

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. m	MONITORING WELL			SAMPLE	
	NORTHING: 4945177 TOP OF RISER EASTING: 591741.82 GROUND SURFACE	260.52 259.55		NUMBER	INTERVAL	REC (%)	
0.5 1.0 1.5 2.0	TOPSOIL, with silt, trace sand, trace organics, dark brown, moist ML-SILT, trace very fine sand, medium dilatancy, brown, moist to wet - highly dilatant, wet at 0.69m BGS - no sand, grey at 1.22m BGS	259.39	CONCRETE BENTONITE GROUT	1RS		100	
2.53.03.54.0	- trace very fine sand at 3.56m BGS			2RS		100	
4.5 5.0	- trace to no sand at 4.27m BGS - trace very fine sand at 5.13m BGS		51mm PVC WELL CASING				
5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0	- with clay seam, hard, low plasticity at 7.82m BGS		152mm BOREHOLE	3RS		100	



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PROJECT NAME: CRH-TEEDON PIT

PROJECT NUMBER: 11155365

CLIENT: CRH CANADA GROUP INC

BRILL

LOCATION: TINY TOWNSHIP, ONTARIO

HOLE DESIGNATION: MW10D-18

DATE COMPLETED: 6 June 2018

DRILLING METHOD: SONIC

DEPTH	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV.	MONITORING WELL			SAMPLE	
m BGS		m		NUMBER	INTERVAL	REC (%)	
10.5				4RS		100	
11.5 12.0 12.5 13.0				5RS		100	
14.0							
15.0 15.5 16.0	- trace very small clay lenses 1 to 2cm, medium dilatancy at 15.24m BGS						
16.5 17.0				6RS		100	
17.5							
17.5 18.0 18.5 19.0 19.5				700		100	
19.5	NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; RI			7RS		100	



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PROJECT NAME: CRH-TEEDON PIT
PROJECT NUMBER: 11155365
CLIENT: CRH CANADA GROUP INC

LOCATION: TINY TOWNSHIP, ONTARIO

HOLE DESIGNATION: MW10D-18

DATE COMPLETED: 6 June 2018

DRILLING METHOD: SONIC

EPTH BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV.	MONITORING WELL		1	SAMPI	.E
1 500		m		NUMBER	INTERVAL	REC (%)	
20.5							
21.0							
21.5			BENTONITE CHIPS				
22.0				8RS		100	
22.5				013		100	
23.0	- with clay seam, hard, low plasticity, moist to dry from 23.01 to 23.32m BGS						
23.5			SAND PACK				
24.0							
24.5			51mm PVC WELL SCREEN				
25.0			SCREEN	9RS		100	
25.5							
26.0	END OF BOREHOLE @ 25.91m BGS	233.64	WELL DETAILS			_	
26.5			Screened interval: 236.69 to 233.64m				
27.0			22.86 to 25.91m BGS Length: 3.05m Diameter: 51mm				
			Slot Size: 0.010 Material: PVC Seal:				
28.0			238.82 to 237.30m 20.73 to 22.25m BGS Material: BENTONITE CHIPS				
27.5 28.0 28.5 29.0 29.5			Sand Pack: 237.30 to 233.64m 22.25 to 25.91m BGS				
28.5			Material: SAND				
29.0							
29.5 <u>N</u>							



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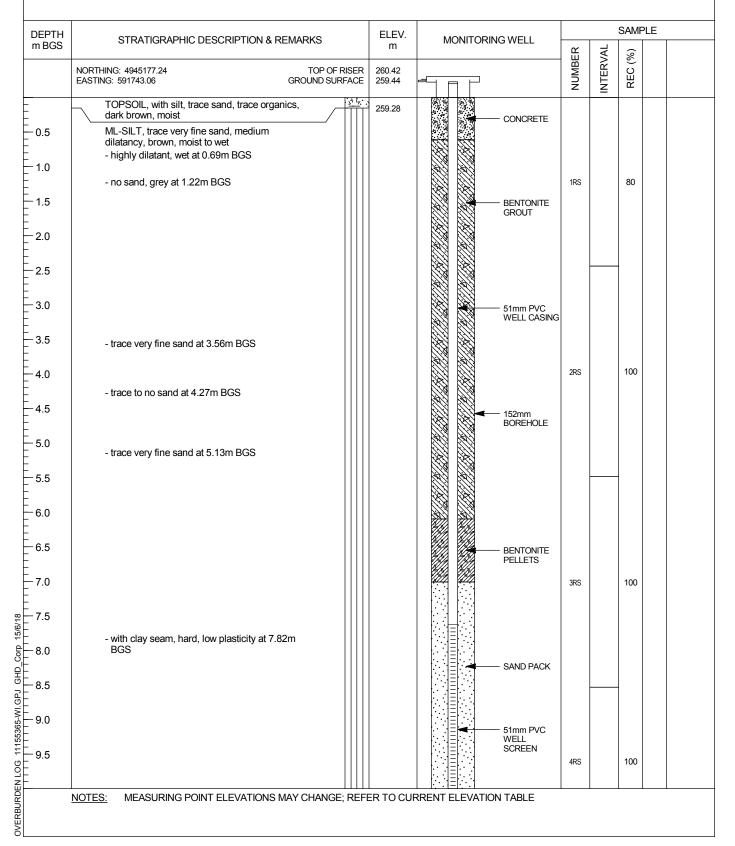
PROJECT NAME: CRH-TEEDON PIT PROJECT NUMBER: 11155365

CLIENT: CRH CANADA GROUP INC LOCATION: TINY TOWNSHIP, ONTARIO

HOLE DESIGNATION: MW10S-18

DATE COMPLETED: 6 June 2018

DRILLING METHOD: SONIC





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PROJECT NAME: CRH-TEEDON PIT
PROJECT NUMBER: 11155365
CLIENT: CRH CANADA GROUP INC

LOCATION: TINY TOWNSHIP, ONTARIO

DATE COMPLETED: 6 June 2018

MW10S-18

DRILLING METHOD: SONIC

HOLE DESIGNATION:

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. m	MONITORING WELL			SAMP	
		"'		NUMBER	INTERVAL	REC (%)	
10.5		248.77					
- 11.0	END OF BOREHOLE @ 10.67m BGS		WELL DETAILS Screened interval: 251.82 to 248.77m				
11.5			7.62 to 10.67m BGS Length: 3.05m Diameter: 51mm				
12.0			Slot Size: 0.010 Material: PVC Seal:				
12.5			253.34 to 252.43m 6.10 to 7.01m BGS Material: BENTONITE CHIPS				
13.0			Sand Pack: 252.43 to 248.77m 7.01 to 10.67m BGS Material: SAND				
13.5			Material. SAND				
14.0							
14.5							
15.0							
15.5							
16.0							
16.5							
17.0							
- 17.5							
- 18.0 - 18.5							
- 19.0							
- 19.5							
19.0							
NO	TES: MEASURING POINT ELEVATIONS MAY CHANGE; RE	FER TO CUI	RRENT ELEVATION TABLE				



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PROJECT NAME: CRH-TEEDON PIT HOLE DESIGNATION: BH1-18
PROJECT NUMBER: 11155365 DATE COMPLETED: 12 April 2018
CLIENT: CRH CANADA GROUP INC DRILLING METHOD: SONIC

LOCATION: TINY TOWNSHIP, ONTARIO FIELD PERSONNEL: K. VANDER MEULEN

DEPTH n BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. m	BOREHOLE			SAMPLE	
	NORTHING: 4944891.79 GROUND SURFACE EASTING: 591971.55	268.88		NUMBER	INTERVAL	REC (%)	
- 2	SW-SAND (FILL), with gravel, with silt, odd cobble, compact, fine to medium grained, well graded, brown, moist			1RS		56	
- 4	SM-SILTY SAND, compact, very fine grained,	264.31	■ 152mm BOREHOLE	2RS		100	
-6	slightly dilatant, poorly graded, brown, wet			3RS		100	
- 10				4RS		100	
- 12 - 14		254.25	T52mm BOREHOLE BACKFILLED WITH BENTONITE GROUT	5RS		100	
- 16	ML-SILT, trace very fine sand, compact, dilatant, grey, wet	254.25		6RS		100	
- 18 - 20	- little clay content from 19.81 to 20.73m BGS			7RS		100	
- 22	- little clay content at 21.34m BGS			8RS		100	
- 24 - 26	END OF BOREHOLE @ 24.38m BGS	244.49		9RS		100	
- 28							
- 30 - 32							
- 34							
- 36							
- 38							
-40	NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFE	ER TO CURF	RENT ELEVATION TABLE				



Page 1 of 1

HOLE DESIGNATION: PROJECT NAME: CRH-TEEDON PIT PROJECT NUMBER: 11155365 DATE COMPLETED: 10 April 2018 CLIENT: CRH CANADA GROUP INC DRILLING METHOD: SONIC

LOCATION: TINY TOWNSHIP, ONTARIO

FIELD PERSONNEL: K. VANDER MEULEN

BH2-18

Northino: 3444854.4 GROUND SURFACE 269.26	EPTH BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV.	BOREHOLE			SAMPLE	
28 END OF BOREHOLE @ 27.13m BGS 30 242.13	1862		CE 269.26		NUMBER	INTERVAL	REC (%)	
8 END OF BOREHOLE @ 27.13m BGS 0 242.13	!	very fine to medium grained, well graded, brown,			1RS		33	
END OF BOREHOLE @ 27.13m BGS 242.13				152mm BOREHOLE	2RS		50	
END OF BOREHOLE @ 27.13m BGS		ML-SILT, trace very fine sand, compact, dilatant, brown, wet	262.86		3RS		100	
END OF BOREHOLE @ 27.13m BGS		SM-SILTY SAND, compact, very fine grained,	258.29		4RS		100	
END OF BOREHOLE @ 27.13m BGS			254.63	BACKFILLED WITH RENTONITE	5RS		100	
END OF BOREHOLE @ 27.13m BGS	3	ML-SILT, compact, dilatant, grey, wet	204.00	GROUT	6RS		100	
END OF BOREHOLE @ 27.13m BGS		SM-SILTY SAND, compact, very fine grained,	250.36		7RS		100	
END OF BOREHOLE @ 27.13m BGS		Silgritiy dilatarit, pooriy graded, grey, wet			8RS		100	
END OF BOREHOLE @ 27.13m BGS	ļ	CL-SILTY CLAY, stiff, low plasticity, grey, very moist to wet	245.79		uno			
		END OF BOREHOLE @ 27.13m BGS	242.13		9RS		100	
	!							



Page 1 of 1

PROJECT NAME: CRH-TEEDON PIT HOLE DESIGNATION: BH3-18
PROJECT NUMBER: 11155365 DATE COMPLETED: 10 April 2018
CLIENT: CRH CANADA GROUP INC DRILLING METHOD: SONIC

LOCATION: TINY TOWNSHIP, ONTARIO FIELD PERSONNEL: K. VANDER MEULEN

EPTH BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV.	BOREHOLE			SAMPLE	1
BGS	NORTHING: 4944872.89 GROUND SURFACE EASTING: 591807.36	m 264.93		NUMBER	INTERVAL	REC (%)	
	SP-SAND (FILL), with silt, cobble, loose, very fine grained, poorly graded, brown, wet ML-SILT, compact, dilatant, brown, wet	263.71		1RS			
			■ 152mm BOREHOLE	2RS		100	
	SM-SILTY SAND, compact, very fine grained, slightly dilatant, poorly graded, grey, wet	259.14 256.70		3RS		100	
)	ML-SILT, compact, dilatant, grey, wet		BACKFILLED WITH	4RS		100	
<u>2</u> 1	- with clay, low plasticity, grey from 12.19 to 14.33m BGS - trace very fine sand at 14.33m BGS		BACKFILLED WITH BENTONITE GROUT	5RS		100	
6	- trace very line sand at 14.33m BGS - trace clay at 16.76m BGS			6RS		100	
3	CL-SILTY CLAY, firm, low to medium plasticity, grey, very moist to wet	246.95		7RS		100	
<u>!</u>	END OF BOREHOLE @ 21.03m BGS	243.90					
; }							
<u>!</u>							
)							



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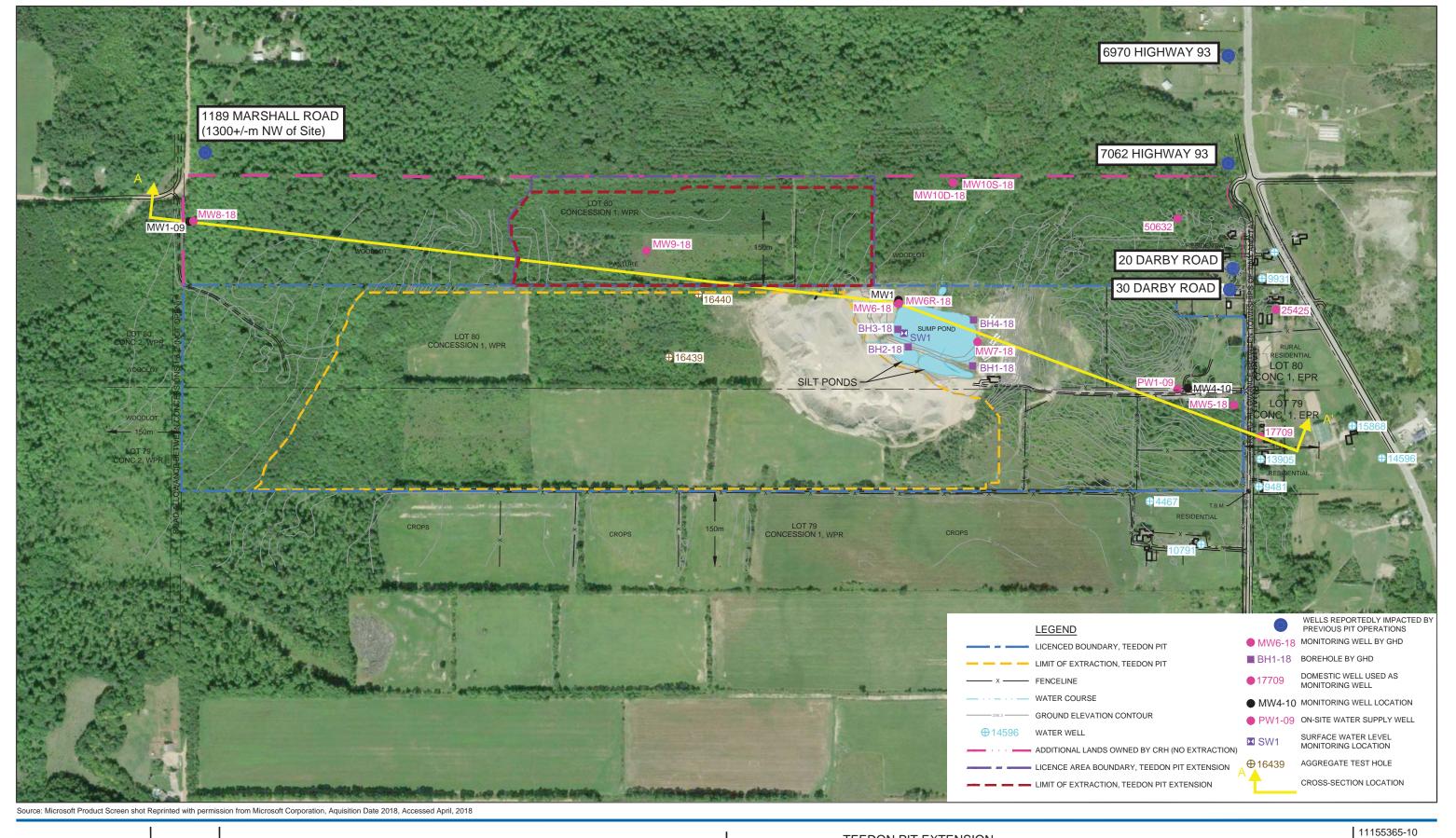
PROJECT NAME: CRH-TEEDON PIT
PROJECT NUMBER: 11155365
CLIENT: CRH CANADA GROUP INC
LOCATION: TINY TOWNSHIP, ONTARIO

HOLE DESIGNATION: BH4-18
DATE COMPLETED: 15 April 2018
DRILLING METHOD: SONIC

FIELD PERSONNEL: K. VANDER MEULEN

EPTH BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV.	BOREHOLE			SAMPLE	=
000	NORTHING: 4944969.53 GROUND SURFACE EASTING: 591923.8	m 265.43		NUMBER	INTERVAL	REC (%)	
	SW/GW-SAND/GRAVEL (FILL, roadway), compact, fine to medium grained, well graded, brown, moist TOPSOIL	264.52 264.21		1RS	_	44	
ı	SM-SILTY SAND, compact, very fine grained, poorly graded, dark brown, moist		■ 152mm BOREHOLE	2RS		50	
6	- dilatant, wet at 5.79m BGS			3RS		100	
10	- grey at 8.84m BGS		BACKFILLED WITH BENTONITE GROUT	4RS		100	
12	ML-SILT, compact, dilatant, grey, wet	253.85	WITH BENTONITE GROUT				
14	- trace to little clay content at 14.33m BGS			5RS		100	
16				6RS		100	
18	SM-SILTY SAND, compact, very fine grained, dilatant, poorly graded, grey, wet	246.53		7RS		100	
22	END OF BOREHOLE @ 21.03m BGS	244.40					
24							
26							
28							
30							
32 34							
36							
38							
40							

Attachment C



0 70 140 210m

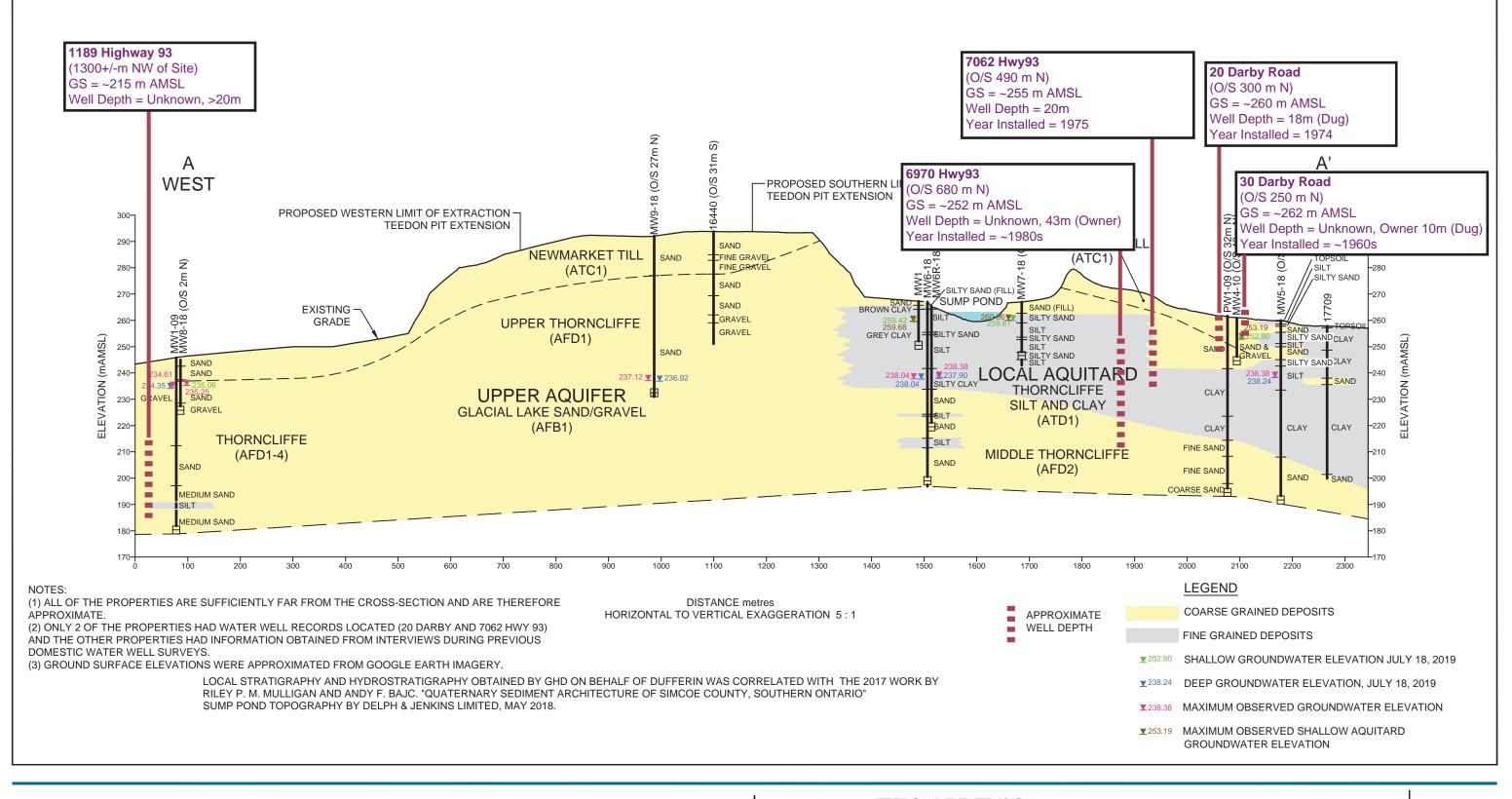


GHD

TEEDON PIT EXTENSION TOWNSHIP OF TINY, COUNTY OF SIMCOE, ONTARIO

Sept 19, 2019

HYDROGEOLOGIC CROSS-SECTION LOCATIONS





TEEDON PIT EXTENSION TOWNSHIP OF TINY, COUNTY OF SIMCOE, ONTARIO

Sept 19, 2019

Attachment (

From: Scheifley, Jody (MECP) Sent: October 25, 2019 1:33 PM

To: Nadon, Mallory (MECP) < <u>Mallory.Nadon@ontario.ca</u>> **Cc:** Heeney, Paul (MECP) < <u>Paul.Heeney@ontario.ca</u>>

Subject: RE: AGGREGATES - Teedon Pit Extension, Township of Tiny, Simcoe County

Hi Mallory,

I would recommend with the absence of any whop-poor-will (survey conducted as per protocol) that MECP would have no outstanding concern with the Teedon Pit extension.

Jody Scheifley

Management Biologist | Permissions and Compliance Section, Species at Risk Branch Ministry of Environment, Conservation and Parks 519-371-8422 1450 7TH Avenue East Owen Sound, Ontario, N4K 2Z1