April 17, 2024

Koren Lam, MSc.
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Lanark County
99 Christie Lake Road
Perth, ON K7H 3C6

Re: Response to Hydrogeological and Terrain Analysis Comments
Grizzly Homes 4th Line Franktown Subdivision - Lanark County File No. 09-T-22004

Dear Ms. Lam,

Egis Canada Ltd. has reviewed the comments prepared by GEMTEC Consulting Engineers and Scientists Limited dated December 1, 2023 and we are pleased to be providing you with this letter of response together with an updated Hydrogeological Assessment and Terrain Analysis Report.

As written in our office's February 8, 2024 comment-response letter that addresses other comments received, it is our hope that this resubmission will enable the Township to proceed with the preparation of draft conditions related to Hydrogeology in support of Draft Plan of Subdivision approval.

1.0 GEMTEC CONSULTING ENGINEERS AND SCIENTISTS LIMITED

1.1 Water Quality and Quantity

1. The McIntosh Perry report does not provide an assessment of the regional groundwater flow direction. This should be assessed through background reports such as wellhead protection areas reports, or from static water levels obtained from water well records, for example.

   ***EGIS Response**: Section 2.3 of the report has been updated to include regional groundwater flow.*

   ***GEMTEC Response**: Comment Partially Addressed. The assessment for regional flow should reference source materials for determination of regional flows.*

   EGIS Response: Section 2.3 of the report has been updated to include specific references to mapping used to estimate the regional groundwater flow direction. This assessment is made based on the positioning of major landforms and waterbodies in the vicinity of the Site, as well as topography and relief.

2. No information is presented from the upgradient or downgradient residential properties. Given that the shallow groundwater flow direction may be influenced by surface water bodies at the Site, GEMTEC suggests sampling a few houses to the north, east and south of the Site.

***EGIS Response**: Section 3.3 summarizes the additional samples collected from four (4) surrounding properties, located at 9477 Hwy 15, 9493 Hwy 15, 9578 Hwy 15, and 220 Perth Road, to characterize the groundwater surrounding the Site. The groundwater results are included in Table 7, appended to the report.*

***GEMTEC Response**: Additional Investigation Warranted. GEMTEC acknowledges that additional sampling was completed at four neighbouring residential properties which provides suitable spatial coverage around the subject site. The background sampling included a limited parameter set, which were selected to assess surface water impacts, although a full suite of 'subdivision package' parameters should have been collected as to characterize the background water quality of existing water supply wells (refer to Section 4.4.1 in MECP Procedure D-5-5 for minimum testing requirements). The testing must meet the minimum testing requirements outlined in MECP Procedure D-5-5. No information on the well construction details to indicate if the samples are representative of the proposed water supply aquifer or homeowner interviews are presented, which if available should be incorporated into the report (Section 4.4.1 of MECP Procedure D-5-5 indicates that where there are wells in nearby established developments, information should be obtained from residents). Given the hydrogeologically sensitivity of the Site, background homeowner sampling (with minimum parameter set outlined in D-5-5 and homeowner interviews) must be considered. For example, three of the four private wells tested have field measured electrical conductivity greater than measured in on-site test wells, which poses the question, are there issues with chlorides in the water supply aquifer?*

EGIS Response: Egis (formerly McIntosh Perry) has completed additional sampling at three (3) neighbouring properties for a full suite of subdivision parameters. It is noted that several landowners with whom we had previously communicated with were not available for re-sampling. Well Records for the sampled properties could not be identified during the last round of sampling nor when discussing with neighbours, which is a reality of relying on third parties to provide information. Egis has updated the report to include details of our homeowner interviews. It is noted that without well construction details (which are not available due to the lack of well records in the area), a definite analysis of specific trends such as elevated EC compared to on-site wells, discrepancies between field and laboratory readings, etc. may not be possible. A probable explanation is that private wells along Highway 15 may be subject to road salt impacts from road runoff, however full verification of offsite groundwater trends is not within the scope of this study. It is Egis' professional opinion that on-site wells will continue to provide groundwater at an acceptable quality and quantity, and that any adverse impacts generated by offsite road salting operations, private sewage treatment, or fertilizing of agricultural fields would have already been noted in the on-site test wells. Additionally, the level of road salting along Highway 15 is expected to be far more intense than winter maintenance activities within the proposed subdivision itself. Longer well casings (12 m) in on-site test wells and future supply wells are expected to provide additional protection as well.

3. Some discrepancies between the well construction described in Section 3.3.2 and the well records were noted (see comment response for all discrepancies).

***EGIS Response**: The well records have been reviewed and Section 3.3.2 has been updated accordingly.*

***GEMTEC Response**: Comment addressed.*

4. TW3 did not recover past 95% within 24 hours and the report mentions it is assumed that atmospheric pressure changes and further well development over the pumping and recovery period may have contributed to the failure to fully recover past 95%. Mcintosh Perry should have monitored water levels in the pumping well and observation wells (this comment is applicable to all wells, not just TW3) and the atmospheric pressure during the pumping test and recovery period using water level loggers and a barologger. In the absence of pressure data it is not possible to support this affirmation. Water levels in each well should have been monitored with a barometric pressure logger in order to obtain synchronous pumping well and observation well data during the pumping tests and recovery periods. Given the easy access to pressure transducer technology, the distance or obstacles between observation wells should not be reason not to acquire the data throughout the tests.

   ***EGIS Response**: Understood. For all future pumping tests, McIntosh Perry will utilize level loggers and a barologger in the pumping well and observation wells.*

   ***GEMTEC** Response: Comment partially addressed. It is recommended that McIntosh Perry state that whether in their professional opinion, all test wells meet D-5-5 water quantity requirements, are capable of repeat pumping (at the minimum required test rate) and the tested well yields are representative of those that can be expected in the long-term.*

   MP Response: Egis has updated the report to include further discussion regarding the test wells and the D-5-5 water quality requirements, however we do not see any issues with our existing water quantity and long-term yield calculations. We have included a specific assertation of our professional opinion on this matter.

5. McIntosh Perry's report does not present a substantiated assessment of well interference based on distance-drawdown obtained from pumping test data or based on a simulation using conservative aquifer properties obtained during the completion of the pumping tests. The report should demonstrate that well interference will not be a problem for the subdivision or neighbouring well users if 30 wells are to be present in the subdivision. Potential effects of seasonal fluctuations should also be discussed.

   ***EGIS Response**: The Theis equation theory has been added to Section 3.4.6, which estimates the cumulative drawdown across the Site generated by all proposed wells (30 total). The theoretical drawdown across the Site, assuming all wells were pumping for 365 days, was calculated to be 0.369 m which is well within the available head for all test well locations.*

   Additionally, to assess the potential effects of seasonal fluctuations, McIntosh Perry installed a Solonist level logger® 3001 and a Solonist barologger® 3001 in TW5 from April 18 to May 29, 2023 (42 days total). A fluctuation of 1.95 m was observed across the 42-day period. Please see Section 3.4.6.

***GEMTEC Response**: Additional discussion warranted. The revised report does not discuss or provide a professional opinion as to whether neighbouring well users (which may have shallower wells) may be negatively impacted, nor a discussion of potential seasonal fluctuations. No comments on the significance of the observed 1.95 metre water level fluctuations were provided. Based on the information presented, the well yield is expected to be more than sufficient to support the proposed development, but nevertheless the revised report should provide a professional opinion supported by their assessment.*

EGIS Response: Egis (formerly McIntosh Perry) has updated the report to include a specific professional opinion outlining that we believe neighbouring well users (with potentially shallower wells) are not expected to be negatively impacted by the proposed subdivision. Additionally, potential effects of seasonal fluctuations and water level fluctuations within the testing period has been discussed further.

6. GEMTEC is in the opinion that McIntosh Perry does not provide sufficient justification that neighbouring water well users won't be affected, and it is recommended that McIntosh Perry comment on the potential impact on neighbouring water well owners of an approximate 2.2 metre drawdown that may potentially compound due to well interference.

   ***EGIS Response**: Please see answer 5 above and refer to section 3.4.6 of the updated report.*

   ***GEMTEC Response**: Refer as response 5 above.*

   EGIS Response: Egis (previously McIntosh Perry) has provided additional discussion within the report. See additional response in answer 5, above.

7. A private well survey and private well water sampling program should be conducted in order to assess background conditions prior to construction of the proposed development. Given the hydrogeological sensitivity of the area, the private well survey and sampling program would provide key information pertaining to the well performance and water quality on properties where wells and septic systems have been present for a significant period of time.

   ***EGIS Response**: Section 3.3 summarizes the additional samples collected from four (4) surrounding properties, located at 9477 Hwy 15, 9493 Hwy 15, 9578 Hwy 15, and 220 Perth Road, to characterize the groundwater surrounding the Site. The groundwater results are included in Table 7, appended to the report.*

   ***GEMTEC Response**: Additional investigation warranted. Refer to comment 2.*

   EGIS Response: Egis (formerly McIntosh Perry) has completed additional sampling at three (3) neighbouring properties for a full suite of subdivision parameters. Well Records for these properties were not identified during the last round of sampling when discussing with neighbours, which is a reality of relying on third parties to provide information. Specific well records found on the MECP's WWIS database could not be definitively linked with the wells sampled, however based on inspection

of 15 well records obtained from the area, well depths appear to largely range from approximately 70-103 feet. Driller-reported 1-hr pumping tests were all at acceptable rates (7-20 GPM) with minimal drawdown and/or rapid recovery.

On-site well TW2 has a depth of 100 feet, which is likely comparable to many offsite wells in the vicinity. Analytical data from TW2 do not show issues with chloride or sodium that are seen in some offsite wells, which again reinforces Egis' opinion that salt-related impacts to some offsite wells may be related to road salting activities, well construction (i.e. wellheads installed below grade), and/or softening. Egis has updated the report to include details of our homeowner interviews.

8. GEMTEC suggests testing using a colorimeter with a method capable of obtaining a detection limit for free chlorine and total chlorine in the order of 0.02 mg/L.

   ***EGIS Response**: Understood. A colorimeter will be used for all future groundwater samples. Additionally, all groundwater samples collected in April and May of 2023 utilized a Hach DR900 colorimeter for confirmation of zero chlorine residual following disinfection of the sampling tap. Section 3.2 of the report has been updated.*

   ***GEMTEC Response**: Comment addressed.*

9. Based on the elevated nitrate concentrations detected in TW3 GEMTEC's opinion that additional testing and discussion is warranted sampling should be carried out in the wells and a private well should be carried out on properties surrounding the site.

   ***EGIS Response**: Additional testing and sampling was completed in April and May of 2023. Section 3.3 of the report has been updated.*

   GEMTEC Response: Additional discussion warranted. Refer to comment 2.

   EGIS Response: Additional sampling was completed on-Site, as well neighbouring properties. The report has been updated accordingly.

10. Given the known presence of the Beckwith VOC plume it is GEMTEC's opinion that proposed developments in the Beckwith Township should also include VOCs in the list of parameters analyzed as part of the groundwater quality assessment conducted in the test wells.

    ***EGIS Response**: As per the request outlined above, McIntosh Perry collected additional analysis of VOCs from two (2) on-Site non-adjacent test wells (TW2 and TW5). As per Table 7 appended to the report, VOC concentrations were below the detection limit.*

    ***GEMTEC** Response: Comment addressed.*

11. GEMTEC agrees that the hardness concentrations are within treatable limits. McIntosh Perry should inform future homeowners that the groundwater is considered to be hard and the health considerations with the use of conventional water softeners (ie. Increased sodium concentrations).

    ***EGIS Response**: Section 5.4 of the report has been updated.*

    ***GEMTEC Response**: Comment addressed.*

12. The report must specify a minimum recommended casing length in order to isolate the water supply aquifer from the shallow bedrock and provide a rationale based on the distribution of nitrate concentrations, location of potential nitrate and other contaminant sources, water found depth, etc.

    MP Response: McIntosh Perry has updated Section 6.1 to include a minimum casing length for all future wells constructed at the proposed subdivision.

    GEMTEC Response: Comment partially addressed. The well casing recommendations have been updated; however, a rationale of the recommended casing depth has not been provided. It is recommended that the Conceptual Lot Development Plan be updated to include a buffer around the proposed septic system locations to confirm sufficient setbacks from both on-site and off-site water supply wells. It is noted that given the hydrogeological sensitivity of the subject site, the separation distance between wells and septic systems should be maximized (i.e., increased from the minimum required 15 metres to at least 30 metres).

    EGIS Response: A rationale of the recommended casing depth has been included in the updated report. Additionally, the Conceptual Lot Development Plan has been updated to show a 30 m setback.

1.2 Surface Water Impacts

13. Surface water features are present within the proposed development. As per MECP Procedure D-5-4-section 5.3 (d), McIntosh Perry should comment on the potential impact of the on-site discharge of sewage effluent into surface water.

    ***EGIS Response**: Given that space was available, the Conceptual Lot Development Plan was updated to ensure a minimum 30m setback (instead of a minimum of 15m setback) for sewage systems from the unevaluated wetlands, which represents a doubling the minimum requirements of the Ontario Building Code from a surface water body. Given this, it is expected that sewage effluent sub-surface discharge from properly designed and constructed sewage systems will not negatively impact local surface water bodies.*

    GEMTEC Response: Comment partially addressed. It is understood that an Environmental Impact Statement (EIS) has been completed for the subject site. The report should reference the findings of the EIS study with regards to wetland boundaries and recommended setbacks.

EGIS Response: Egis (McIntosh Perry) has reviewed the EIS completed by Gemtec for the Site. As stated in the EIS, Section 7.1 Unevaluated Wetlands, "*Septic systems shall be installed no closer than 30 m from the high water mark of any surface water feature and not located in areas of exposed bedrock*".

1.3 Terrain Analysis and Septic Impact Assessment

14. Grain size analysis should have been completed in order to provide additional information required for the soil classification for private sanitary servicing and to support the assessment of potential water quality impacts relative to private septic systems.

    ***EGIS Response**: McIntosh Perry has submitted samples TP6-SS1 (brown sand) and TP2-SS1 (gravelly sand/sandy gravel) to the lab for grain size analysis. Additionally, sample TP12-SS2 (clay, trace sand, trace gravel) for a hydrometer test. A review of the laboratory particle size analysis have resulted in an adjustment to the soil descriptions included in Hydrogeological Assessment and Terrain Analysis (Rev.1), namely:*

    - *Soil previously described as Brown sand is now described as Gravelly Sand trace silt/clay;*
    - *Soil previously described as gravelly sand/sandy gravel is now described as sandy gravel/gravelly sand some silt/clay;*
    - *Soil previously described as clay, trace sand, trace gravel is now described as silty gravelly sand trace clay Laboratory results are included in Appendix H of Hydrogeological Assessment and Terrain Analysis (Rev.1).*

    ***GEMTEC Response**: Comment addressed.*

15. MP concludes that the property can accommodate a subdivision of up to 30 lots to proceed while ensuring the ODWO of 10 mg/L for nitrate-nitrogen is not exceeded, with a calculated concentration of 9.9 mg/L at the Site Boundary. In order for GEMTEC to agree with MPs conclusion, the following additional information should first be obtained.

    ***GEMTEC Response**: No comment provided to comment 15 (assumed to have been joined with comment 16), response in comment 16 below.*

    EGIS Response: Third round of sampling supports 30 lots.

16. The background nitrate concentration of 2.5 mg/L should be confirmed through additional seasonal sampling and nearby private well water sampling.

    ***EGIS Response**: Two additional rounds of samples were collected in the Spring of 2023, with results generally in line with previous results when accounting for natural variations that may occurs between years and seasons. The highest recorded background nitrate (2.8 mg/L for TW3 in April 2023) was used as part of the predictive nitrate assessment.*

***GEMTEC Response**: Additional discussion warranted. Refer to comment 12. GEMTEC acknowledges that additional samples were collected; however, no discussion on the potential sources of nitrates and the seasonality of nitrate in the water supply aquifer was provided (report limited to indicating if there were increases or decreases following additional sampling events. A professional statement supported by the sampling data must be provided that confirms the background nitrate concentrations are considered to be representative and are not increasing (i.e., has MP completed sufficient sampling to provide justification that seasonality has been addressed).*

EGIS Response: Egis has included a professional statement that confirms background nitrate concentrations are not increasing and are considered to be representative, as suggested by our most recent sampling data.

17. Grain size analysis should be conducted in order to confirm the assumptions used in the soil parameters for the nitrate dilution calculations.

***EGIS Response**: McIntosh Perry has submitted samples TP6-SS1 (brown sand) and TP2-SS1 (gravelly sand/sandy gravel) to the lab for grain size analysis. The results were used to adjust the infiltration factor.*

***GEMTEC Response**: Comment addressed.*

18. Water surplus data used in the nitrate dilution calculation should be obtained from a station that is closer to the subject site, such as the Carleton-Place climate data station.

***EGIS Response**: The 1981-2010 Climate Normals available for Carleton Place do not meet the "3 and 5 rule" per the United Nation's World Meterological Organization (WMO) 30 Year Standard Normals. The water surplus (Ws) value was based based on 1981-2010 Climate Normal data for Ottawa's MacDonald -Cartier Int'l A (YOW) station (Site Climate ID: 6106000), which represents the nearest weather station to the site with data quality that meets the "3 and 5 rule" per the United Nation's World Meterological Organization (WMO) 30 Year Standard Normals. In addition, the weather station is at approximately the same latitude as the Site, which is relevant given that prevailing weather patterns in Eastern Ontario generally travel west to east.*

***GEMTEC Response**: Comment addressed.*

19. The MP report does not make recommendations pertaining to a minimum well casing depth that would be required to isolate the upper bedrock (receiving aquifer) from the bedrock supply aquifer. Given the hydrogeological sensitivity of the site, protective measures are required for septic systems and such measures should be presented in the report.

***EGIS Response**: Areas with less than 0.25m of soil under the topsoil have been identified as bedrock in the report; in these areas, it is recommended that an imported clay layer (minimum 0.1m in depth) be installed on the bedrock surface before placing leaching bed fill for sewage systems to prevent the possibility of*

short-circuiting of sewage effluent to the underlying bedrock aquifer. McIntosh Perry has updated Section 6.1 to include a minimum casing length for all future wells constructed at the proposed subdivision.

***GEMTEC Response**: Comment partially addressed. Refer to comment 12 above. Given the hydrogeological sensitivity of the subject site, it is recommended that all future septic systems include an imported clay liner with a minimum thickness of 150 millimetres.*

EGIS Response: Areas with less than 0.25m of soil under the topsoil have been identified as bedrock in the report; in these areas, the recommendation in the report has been updated so that an imported clay layer (minimum **0.15m** in depth) be installed on the bedrock surface before placing leaching bed fill for sewage systems to prevent the possibility of short-circuiting of sewage effluent to the underlying bedrock aquifer. Given the variability of overburden soil thickness on-site (i.e. 0.17m to 1.7m total depth), it is Egis's professional opinion that a blanket recommendation for an imported clay liner on all lots is not the preferred solution where thicker overburden thickness is present. In addition to recommended imported clay liner where thin soils are present, given the hydrogeological sensitivity of the site, the report has been updated to present an alternative mitigation measure to the lots where greater than 0.25m of soil under the topsoil is present, which consists of increasing the minimal vertical clearance requirements to high ground water table or rock by an additional 300mm in addition to the minimum requirements by the OBC or BMEC-approvals for the selected type of Class 4 sewage system used in individual sewage system designs for each lot (i.e. min. 900mm vertical separation requirement for absorption trench as per § 8.7.3.2 of the Ontario Build Code (OBC) becomes min. 1200mm, while min. 600mm vertical separation for Type A Dispersal Beds as per 8.7.7.1.(6).(d) becomes 900mm). This recommendation will ensure further effluent polishing in the vertical unsaturated zone below the leaching bed.

20. Given the presence of nitrate in the aquifer at the site at concentrations of up to 2.5 mg.L despite the lack of obvious sources besides private septic systems and distant agricultural land, it is GEMTEC's opinion that a study needs to be carried out to determine whether there is a connection between the shallow bedrock and the aquifer.

    ***GEMTEC Response**: Additional Discussion Warranted - refer to comment 12. It is noted that the 'study' requirements were discussed with McIntosh Perry in a technical consultation on March 9, 2023. GEMTEC acknowledged that additional field investigations are not necessarily required, if McIntosh Perry provides rationale and a professional opinion establishing the potential source and seasonality of background nitrate concentrations in the water supply aquifer. As per MECP Procedure D-5-4, (paraphrased) the consultant must determine the representative exiting background nitrate nitrogen levels in the receiving groundwater and discuss the existing background nitrate-nitrogen concentrations relative to nitrate sources and the susceptibility of groundwater contamination. This information was not provided in the revised report.*

    EGIS Response: Egis is of the opinion that background nitrate concentrations in the area are being influenced by existing private sewage treatment systems along Highway 15, and to a lesser extent, application of fertilizer on agricultural properties within the area. The immediate area surrounding the

proposed subdivision is developed, and the nitrate concentrations are observed to be stable and/or decreasing since 2021. Egis has made an explicit statement in our report regarding our opinion that nitrate concentrations are not expected to increase due to existing external factors, such as existing septic systems at neighboring properties.

1.4 Editorial

21. GEMTEC provided several editorial comments for consideration.

    ***EGIS Response**: The specific editorial comments were addressed.*

    ***GEMTEC Response**: Comment partially addressed. It is recommended that the final report be reviewed to correct editorial items (e.g., two Table 6 in the report, Table 8 field parameter measurement have inconsistent units between test wells, cumulative impact assessment calculations referenced in text as Appendix E, actually located in Appendix G etc.)*

    EGIS Response: Egis (formerly McIntosh Perry) has updated editorial items listed above in the updated report.

2.0 CLOSING

We trust that the responses provided above, and the enclosed updated reporting adequately address the comments provided. Aas stated within the preamble to this letter, it is our hope that this resubmission will enable the approval authorities to proceed with the preparation of draft conditions in support of Draft Plan of Subdivision approval.

Sincerely,

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