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September 15, 2022

Project Number 21-3-8438

Mr. Jeff Mycyk
5905 Earls court Crescent
Manotick, Ontario
K4M 1K2

Via email: jmycyk@gmail.com

**Response to Ganaraska Conservation's Hydrogeology Review Comments
Proposed Garden Hill Residential Development**

Dear Jeff,

In their review dated June 28, 2022, the GRCA requested additional detail regarding the potential impacts of the development site, including reduction in infiltration potentially leading to reduced interflow and baseflow discharge, raised or lowered water levels in shallow aquifers, changes in shallow groundwater flow direction, and creation of preferential pathways that may increase susceptibility of contamination in the subsurface. The GRCA also requested additional detail on the proposed groundwater monitoring program.

With respect to the comment on the water balance, we note that this was covered in the stormwater management report and that the hydrogeology report was focused on water supply and onsite sewage treatment. Development will result in changes to the site grading as well as the construction of impervious surfaces (roads, driveways, and roof areas). While the stormwater management design is modelled to match pre-development infiltration (refer to the Servicing and Stormwater Management Report prepared by Monument Geomatics and dated September 9, 2022, the development-related changes may slightly alter the shallow groundwater hydrology (i.e., they will cause a slight localized lowering of the shallow groundwater table in some areas and a slight increase in others) by increasing infiltration in some areas (i.e., where clean roof water is directed to pervious surfaces) and will reduce infiltration in others (for example where runoff from roadways is directed to the stormwater pond rather than being allowed to infiltrate directly). We note that the water supply aquifer is isolated by a thick stratum of low permeability silt and clay and that the proposed grading (refer to the attached Preliminary Grading Plan) and site servicing will not compromise this isolating layer and create preferential pathways that could increase the risk of contamination to the confined aquifer.

With respect to the proposed groundwater monitoring program, no adverse effects to water quantity are predicted but substantial and genuine concern was raised by neighbouring residents during consultation. The monitoring and contingency plans should be sufficiently comprehensive to provide assurance to these residents that their water supply will not be adversely affected. In addition, any shallow wells located downgradient from the proposed development are potentially susceptible to water quality impacts from the proposed development. While such impacts are not predicted, they cannot be ruled out so the monitoring program must be sufficiently comprehensive to identify any water quality impact in downgradient wells and be combined with adequate mitigation measures that

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could be implemented in the (admittedly unlikely) event that adverse water quality impacts are identified.

The Pre- and Post-Development monitoring program will include the ongoing monitoring of water levels for a cross-section of wells upgradient, within, and downgradient of the proposed development (see the attached Figure 1 for an illustration of possible locations – actual locations will be selected based on interviews with individual homeowners). Monitoring of water levels will include the installation of datalogging pressure transducers within residential wells using a direct read cable to minimize the need to repeatedly access private wells. Water quality analysis will be conducted for all wells on at least three separate occasions prior to development and annually thereafter for the downgradient wells. Water quality analysis will include bacteriological analysis (*Escherichia coli* and total coliform bacteria) and chemical analysis which will include pH, total hardness, total alkalinity; calcium, magnesium, sodium; potassium; iron, manganese; chloride; sulphate; nitrate (NO₃-N); nitrite (NO₂-N), ammonia/ammonium NH₃-N; conductivity; dissolved solids; suspended solids, and colour.

A summary of the proposed monitoring program is provided on the following table:

Table 1: Proposed Monitoring Program

Wells	Description	Monitoring	Frequency
W1 to W5	Upgradient wells	Water levels Groundwater Chemistry	Hourly – On-going with downloads once per year Three rounds of testing during the pre-construction period
W6 and W7	Within-development wells	Water levels Groundwater Chemistry	Hourly – On-going with downloads once per year Three rounds of testing during the pre-construction period
W8 to W10	Downgradient wells	Water levels Groundwater Chemistry	Hourly – On-going with downloads once per year Three rounds of testing during the pre-construction period. Annually thereafter

Note 1: All data obtained from neighbouring homes monitored as part of this program is to be made available to the respective homeowner. Annual data summaries for the monitoring program are to be provided to the Municipality/GRCA but details with respect to specific locations are to be kept confidential unless required to address a specific question or complaint.

Note 2: Monitoring will continue for a minimum of five years after full development.



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Monitoring is typically accompanied by a contingency plan along with appropriate action thresholds or triggers to address short- and long-term impacts. Our recommended trigger/contingency plan is summarized in point form below along with notes regarding its interpretation.

Table 2: Trigger/Contingency Plan

Impact	Trigger	Action
Well interference	Complaint of well interference by resident within zone of influence (roughly the area shown on Figure 1)	<ul style="list-style-type: none"> ■ Immediately (within 24 hours) supply the affected resident with potable bottled water if necessary ■ Engage Qualified Person (QP - P.Ge o or P.Eng) to assess the complaint ■ Continue to supply potable bottled water (if necessary) until the complaint can be assessed by the QP
Water quality impact	Complaint of water quality impact by resident within zone of influence (roughly the area shown on Figure 1)	<ul style="list-style-type: none"> ■ Immediately (within 24 hours) supply the affected resident with potable bottled water ■ Engage Qualified Person (QP - P.Ge o or P.Eng) to assess the complaint ■ Continue to supply potable bottled water until the complaint can be assessed by the QP
Water quality impact (downgradient wells)	Detection of a statistically significant increase in nitrogen species exceeding ODWS	<ul style="list-style-type: none"> ■ Immediately (within 24 hours) supply the affected resident with potable bottled water and/or install adequate point-of-use treatment system ■ Engage Qualified Person (QP - P.Ge o or P.Eng) to assess the situation and determine appropriate mitigation which might include replacement of a shallow dug well with a properly constructed drilled well

Note 1: Supply of bottled water to be discontinued on the recommendation of the QP if the QP is able to make a clear unambiguous determination that the complainants' water shortage has not been caused by the proposed residential development. If well interference is confirmed to be the cause of the complainants' water shortage, continue to provide potable bottled water until an alternate source of comparable water can be implemented (e.g., delivery to a holding tank, drilling a new well).

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Note 2: A water shortage due to a general seasonal decline in the groundwater table is not considered to be well interference. The presence and magnitude of such a general decline is to be assessed based on the MECP and GRCA's regional water well monitoring network.

Note 3: A List of emergency contacts will be provided to ensure any complaint is addressed without delay.

Finally, financial assurance may be requested by the Municipality to ensure that sufficient funds are available to implement the recommended contingency measures. This may take the form of posting an irrevocable letter of credit with the Municipality or GRCA in an amount sufficient to address potential impacts. A worst-case scenario might involve the replacement of downgradient dug wells with drilled wells (say 3 well replacements and/or provision of bottled water). A reasonable assurance would be in the neighbourhood of \$50,000 with this amount reduced progressively once post-construction monitoring confirms the prediction of no adverse effects to neighbouring wells.

I trust that this brief letter is helpful in addressing GRCA's comments. Please contact us at your convenience if you have any questions of points that require clarification.

Yours very truly,

**THE GREER GALLOWAY GROUP INC.
CONSULTING ENGINEERS**

Charles Mitz, M.Eng., Ph.D., P.Geo.
Senior Project Manager






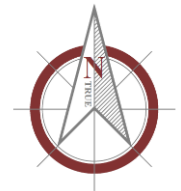
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NOTES:

- 1) Base drawing and information: obtained from the Ontario Ministry of Natural Resources and Forestry (MNRF); "Make a Map" Natural Heritage Areas; <https://www.gisapplication.lrc.gov.on.ca/>, accessed April 2021

LEGEND:

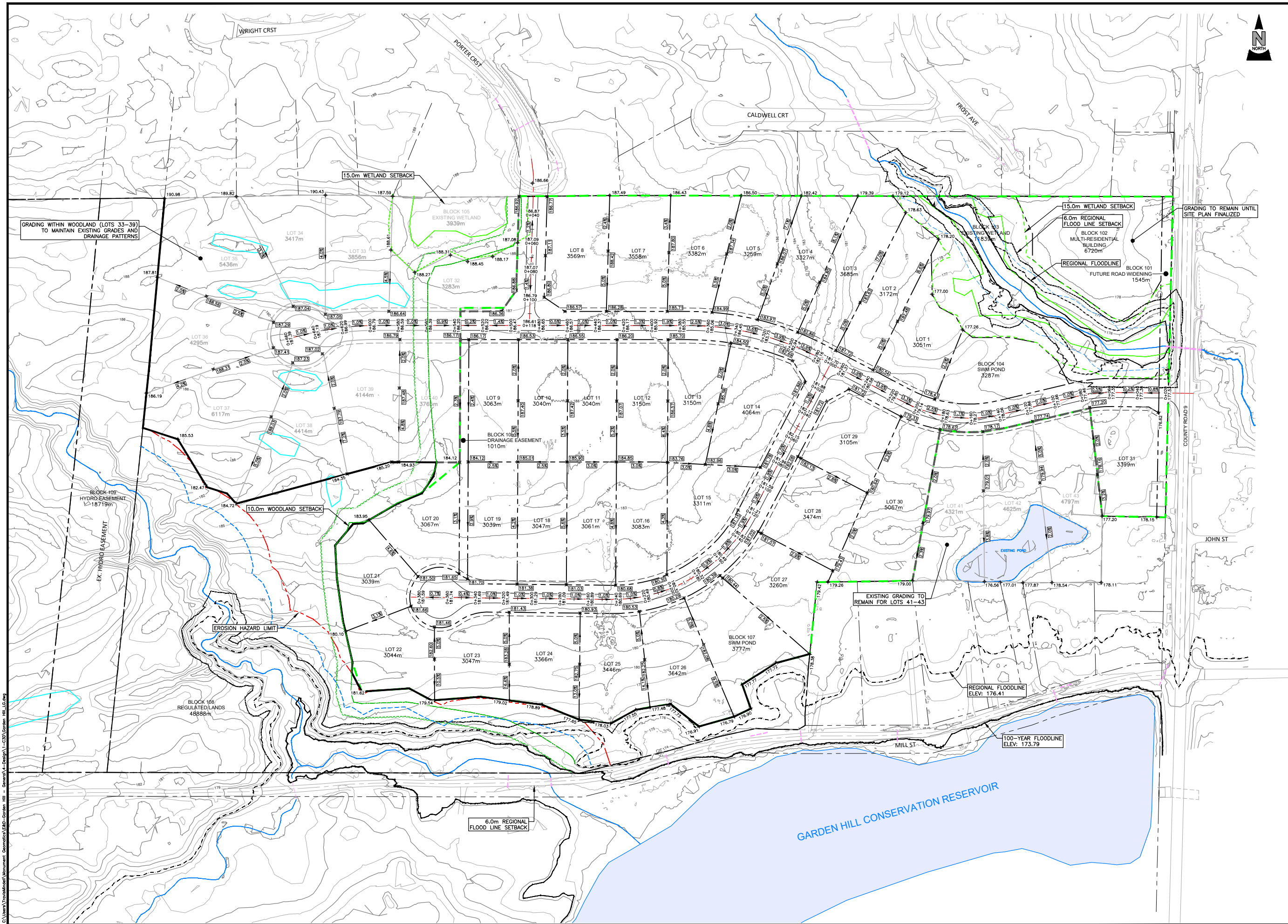
-  Upgradient wells (select five at roughly the locations illustrated)
-  Within-development wells
-  Downgradient wells (select three based on potential vulnerability. May increase the number of locations based on detailed well assessment)



PROJECT 2138438:
**PROPOSED RESIDENTIAL DEVELOPMENT –
GARDEN HILL**

FIGURE 1:
**SITE PLAN SHOWING PROPOSED PRE- AND POST
DEVELOPMENT MONITORING PROGRAM**



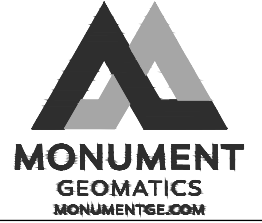


LEGEND

- EXISTING**
- EX TEST PIT & DRILL HOLE
 - EX BENCHMARK & SURVEY HUBS
 - EX SIB/IB & CM's
 - EX LEGAL LINE
 - EX LEGAL R.O.W. & EASEMENT
 - EX SANITARY & MANHOLE
 - EX SANITARY FORCE MAIN
 - EX STORM & MANHOLE
 - EX SINGLE & DOUBLE CATCHBASIN d/w CB LEADS
 - EX CATCHBASIN MANHOLE
 - EX CULVERT
 - EX FIRE HYDRANT & VALVE ASSEMBLY
 - EX WATERMAIN & VALVE
 - EX BLOW-OFF ASSEMBLY
 - EX CURB STOP
 - EX ROAD & SIDEWALK
 - EX ROAD SIGN(S)
 - EX SHOULDER
 - EX TOP OF SLOPE
 - EX TOE OF SLOPE
 - EX DITCH or SWALE
 - EX FENCE
 - EX OVERHEAD LINES
 - EX UNDERGROUND LINES
 - EX POWER POLE & ANCHOR
 - EX GAS MAIN
- PROPOSED**
- PR LEGAL LINE
 - PR LEGAL R.O.W. & EASEMENT
 - PR SANITARY & MANHOLE
 - PR STORM & MANHOLE
 - PR SINGLE & DOUBLE CATCHBASIN d/w CB LEADS
 - PR CATCHBASIN MANHOLE
 - PR CULVERT
 - PR DITCH or SWALE
 - PR FIRE HYDRANT & VALVE ASSEMBLY
 - PR WATERMAIN & VALVE
 - PR GRAVEL SHOULDER
 - PR ASPHALT
 - PR CURB & SIDEWALK
 - PR GRAVEL
 - PR ROAD SIGN(S)
 - EX / PR ELEVATIONS
 - PR GRADES

1.	22/09/01	SECOND SUBMISSION	C.O.
NO.	DATE (D/M/Y)	REVISION	BY

NOT FOR CONSTRUCTION



MONUMENT PROJECT No.:	21-0135
DRAWN:	T.M.
DESIGNED:	T.M.
CHECKED:	P.Q.
ENGINEER:	-
DATE:	22/09/01
H SCALE:	1:1250
V SCALE:	N/A

MISTRAL LAND DEVELOPMENTS INC.
 GARDEN HILL ESTATES
 MUNICIPALITY OF PORT HOPE
 LOT GRADING PLAN

DRAWING No. **LG**

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