July 14, 2010 Project No. 08-1170-5050

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MONITORING PROGRAM FOR POTABLE GROUNDWATER RESOURCES
PROPOSED BIG BAY POINT DEVELOPMENT
INNISFIL, ONTARIO

Dear Madam,

Kimvar Enterprises Inc. ("Kimvar") has retained Golder Associates Ltd. to develop and implement the following proposed monitoring program to establish a baseline and evaluate potential impacts from Stage 1 of the construction of the proposed Big Bay Point Development (or "Site") in Innisfil, Ontario, on adjacent potable groundwater resources. The location of the Site is shown on Figure 1, attached.

1.0 PURPOSE AND REGULATORY REQUIREMENTS

The proposed monitoring program has been developed specifically in response to Draft Plan Condition 4 (o) and Official Plan Amendment 17, Sections 8.13.2 (m) and 8.13.8 (c), which relate to potential impacts to existing private wells (i.e., potable groundwater resources). To summarize, the main component of the proposed monitoring program is the collection of monitoring data from a series of sentry wells at the property boundary to establish a baseline, and to identify potential impacts of construction of Stage 1 of the proposed development on private water wells. It is understood that progression to a subsequent phase of the proposed development cannot proceed until any negative impacts to existing private water wells from the current phase are remedied to the satisfaction of the Town in consultation with the County of Simcoe and the Ontario Ministry of Environment ("MOE"). The sentry wells are proposed at on-Site locations outside of the development footprint in order to provide the ability for consistent monitoring data (i.e., water quantity and quality) in the long term.

In addition to the monitoring program we have developed to satisfy Condition 4 (o) of the Subdivision Conditions and Sections 8.13.2 (m) and 8.13.8 (c), we understand that other members of the consulting team, including Beacon Environmental, Hutchinson Environmental Sciences Limited and Schollen & Company Inc. have developed monitoring programs to address Subdivision conditions 4 (p) and 4 (q) and sections 8.13.2 (n) and sections of 8.13.8 with respect to potential impacts to water quality in the resort basin, Lake Simcoe and to natural heritage features, which have been provided under separate cover.

Some components of the program cannot be provided in detail in this document until additional subsurface investigation and assessment of potential impacts are completed. It is not prudent at this time to identify those monitoring requirements without the detailed supporting studies to which they are related. In these instances, the rationale and/or general information is provided in this document along with the proposed timeline for additional details to be provided.

An additional multi-disciplinary program of subsurface investigation(s) for geotechnical, hydrogeological, and soil/groundwater environmental quality purposes is currently being developed, to be completed in the coming months, and is anticipated for submission in the fall of 2010, in accordance with the latest project progress matrix. The purposes of these additional investigations are: to provide information to complete detailed design of the proposed development and construction methods; to characterize, delineate and address potential soil and groundwater quality issues; to support an application to the Ministry of the Environment ("MOE") for any required temporary water takings/transfers for construction in excess of 50,000 L/day (i.e., for both groundwater and surface water); and to investigate the potential for implementation of measures to enhance post-development recharge or mitigate against potential construction impacts. Portions of these additional investigations will provide additional information upon which to base modifications to the monitoring program outlined herein.

In particular, the Permit To Take Water application ("PTTW") will include a multi-disciplinary impact assessment to identify any potential impacts to groundwater (including private water wells), surface water and natural heritage resources, and geotechnical impacts to existing structures as per the current MOE guidance for filing PTTW applications. An application for a PTTW would include a monitoring, mitigation and contingency plan to monitor for, identify, and address any significant impacts to these features that are identified. The monitoring program outlined herein will at that time be revised as appropriate based on the pending subsurface data, results of a desk-top review and survey of existing private well resources, and the data collected during the pre-construction period. Data to be collected based on the monitoring program proposed to date will be important in developing the future monitoring protocols.

2.0 BACKGROUND

Based on our current understanding of the proposed works, anticipated Stage 1 work is to include earthworks (i.e., site grading and excavation of the new marina basin on the east end of the Site, relocation of excavated soil for golf course construction on the west end of the Site), construction of major subsurface infrastructure (e.g., main storm and sanitary sewers, pumping stations, forcemains, and main roads), and construction of the major storm water management ponds.

The potential short-term impacts to potable groundwater resources will be typical of a construction project requiring large-scale earthworks and construction of subsurface utilities and potential positive dewatering activities. It is generally expected that potential impacts to existing potable groundwater resources as a result of construction activities, if any, will be temporary and will abate as subsurface construction activities cease and groundwater conditions stabilize in their vicinity. In this regard, temporary impacts to shallow groundwater resources are the most likely. Shallow groundwater resources are the most susceptible to varying climatic conditions with the potential for significant seasonal water level fluctuations over the course of a year, and can be relatively unprotected from surficial sources of contamination such as septic systems. As such, pre-existing challenges with shallow groundwater supplies are common and should be expected in the vicinity of the Site. Deeper confined aquifers utilized by deep drilled wells are not generally as susceptible to climatic factors and therefore have relatively consistent water levels and are relatively protected from surficial sources of contamination. It is expected that most drilled wells in the vicinity of the Site utilize confined aquifers located deeper than the inverts of the proposed Site development infrastructure, and will not be influenced by Site construction activities, such as temporary dewatering. Temporary effects to shallow or deep private wells such as siltation may be possible as a result of vibrations from construction equipment, but these effects should diminish upon the termination of such activities. Based on the data collected to date, permanent impacts to existing potable groundwater resources as a result of the proposed construction activities are not expected.

Nevertheless, it is prudent to conduct a monitoring program in the vicinity of the Site to assess the potential for impacts of the proposed development during construction on adjacent groundwater resources, and to develop a plan to address any identified impacts appropriately. This letter includes a proposed monitoring, contingency and mitigation plan to assess for and respond to impacts to groundwater resources as a result of the proposed construction activities.

The potential long-term impacts to potable groundwater resources are being evaluated as part of a water balance assessment to be completed as part of the pending investigations. Potential impacts to be considered

include reduction in groundwater levels (e.g., in shallow aquifers) as a result of a reduction in post-development recharge rates, and to groundwater quality as a result of road de-icing and nutrient application practices. The scope of this monitoring program does not at this time address monitoring for potential long-term impacts. It is expected that the sentry wells will be able to provide monitoring of groundwater resources in the long term. A specific monitoring program (parameters, duration), will be provided as part of the water balance report expected to be completed within the 2010 calendar year.

3.0 PROPOSED MONITORING PROGRAM

3.1 Overview

The proposed monitoring program for groundwater resources is comprised of the following major components:

- Identification of the locations and characteristics of potable water supply aquifers and private wells in the vicinity of the Site;
- Construction of a sentry well network which intersects the shallow and deep overburden aquifers at the perimeter of the Site. The sentry wells will be located outside of the development footprint but inside the property line, and therefore between the development and off-Site groundwater users;
- Monitoring of the sentry well network prior to, during, and post Stage 1 construction activities, with the ability to monitor the sentry well network in the long term;
- Implementation of a resolution process for concerns or complaints arising from adjacent private well owners; and
- Implementation of a contingency and mitigation plan to respond to confirmed impacts to groundwater resources as a result of the proposed development.

Generally, it is proposed to rely mainly on monitoring data from a network of sentry wells to evaluate the impacts, if any, to existing potable groundwater resources arising from the construction of the proposed development. Being located on-Site, should potential declines in water quantity or quality be observed in the sentry well network, the data can be used i) as an early detection mechanism for more frequent monitoring, ii) to modify any related construction activities, and iii) to implement any relevant contingency or mitigation measures. This may occur prior to the observation of any significant impacts in the private wells themselves.

The use of sentry well monitoring data also removes the potential complications arising from the collection and interpretation of monitoring data from the private wells. A dataset reliant on a private well network can be affected by factors including:

- willingness of the owners to participate in a monitoring program;
- well owner absence (e.g., restrictions on the collection of data when the owner is not present);
- water use prior to or during monitoring (i.e., the recording, and subsequent interpretation, of non-static water levels);
- poor well construction resulting in un-safe conditions to access wells (e.g., the introduction of foreign materials into the well interior);
- well inaccessibility (e.g., buried well heads, sealed well heads, artesian flows, deteriorated well caps/crocks); and
- well owner activities (e.g., introduction of foreign materials, artificial well recharge).

Some of the sentry wells will be located outside of the anticipated zone of influence of construction activities, and will be used to monitor seasonal background trends in groundwater levels. The background data will be

compared with sentry well data (and where necessary, private well data) closer to active construction areas to assess the potential impact of construction activities.

A summary of the proposed monitoring program is also provided in the attached Table 1. Each of the program components is described in more detail below.

3.2 Identification of Utilized Aquifers

The purpose of this task is to finalize the location and depth of the sentry wells to be installed around the perimeter of the Site and documentation of existing private water supplies. It includes two main components: i) a desktop review and ii) a door-to-door private well survey.

A desktop review of available information sources collected as part of our previous supporting studies at the Site will be completed to summarize known information concerning conceptual hydrostratigraphy in the area, including major aquitards and utilized aquifers. This is expected to include a review of:

- published information from the MOE Water Well Record database on file with Golder;
- Site-specific reports and plans (e.g., topographic and legal surveys) prepared by Golder and others in support of the proposed development; and
- Published geologic and topographic mapping, geological reports and the South Simcoe Groundwater Study.

In summary, the portions of the desktop review completed to date indicates relatively un-used surficial, unconfined aquifers, and the predominance of drilled private wells utilizing the confined “A1” (at approximately elevation 210 m to 215 m in the vicinity of the proposed marina basin) and “A2” (at approximately elevation 185 m in the vicinity of the proposed marina basin) aquifers. For comparison, the invert of the proposed marina basin is approximately elevation 217 m.

It is also proposed to complete a door-to-door private water well survey for all residents located within 150 m of the proposed construction activities, which is the maximum expected “effective zone of influence” (i.e., construction-related drawdown of more than 0.5 m). However, the survey will be expanded up to 500 m from the Site in areas where potential shallow unconfined groundwater supplies may be proximal to the future marina basin, including:

- the residential properties southeast of the Site in the Maple Grove/Glenhaven Beach subdivision north of 13th Line (e.g., Linda Street, Kimberly Street, Edna Street and Maple Grove Road); and
- the residential properties east of the Site on West Street, East Street, South Street, Sideroad 30, Minnetonka Road, and Tijou Woods Place.

The door-to-door private well survey will be voluntary, and administered in the form of a questionnaire and property sketch completed in person by Golder staff with well owners. The survey will be completed on weekdays during mid-afternoon to evening hours, with two attempts made per residence. The survey form will request the owner to provide basic well information concerning well construction and location, and existing water quantity and quality data. The survey results will be summarized to identify utilized aquifers and to establish reported baseline conditions in these aquifers and at individual wells. The survey will also ask each well owner to provide written consent to future monitoring of water quality and quantity, if selected. If the two attempts are unsuccessful, the survey form will be left at the residence with instructions for completion by mail, fax, e-mail, or in a telephone conversation with Golder staff.

3.3 Sentry Well Network Construction

Based on our understanding of the local hydrostratigraphy, it is proposed to utilize selected existing monitoring wells as sentry wells, and to construct new sentry wells, at 18 locations around the perimeter of the Site to permit long-term monitoring (i.e., SW1 to SW18). It is noted that three additional sentry well locations (i.e., SW19 to SW21) are proposed at the eastern boundary of the Environmental Protection lands, but relate to the PTTW

impact assessment and not specifically to potential impacts to private water supplies, and are not discussed further in this document.

Ten of these locations will include one or two shallow sentry wells (to monitor conditions in shallow unconfined aquifers or within the upper-most aquitard) and a deep sentry well (to monitor conditions in the deeper confined "A1" or "A2" aquifers, or an equivalent depth if the aquifer is not found). The remaining 8 locations will include one or two shallow sentry wells. Installation of the 10 deep sentry wells by water well rig has been completed at the time of writing, and 18 existing shallow monitoring wells are proposed for re-use as shallow sentry wells. The installation of an additional 4 shallow monitoring wells is pending.

Monitoring of water levels in the new sentry wells will begin as soon as possible to document pre-construction conditions prior to the start of Stage 1 activities in January 2011. It is also noted that Golder has also been monitoring all existing on-Site monitoring wells (including those to be re-used in the sentry well program) monthly since April 2010, and is aware of data from previous years collected by both Golder and AECOM/Gartner Lee Limited. This data will be useful to document pre-construction conditions and identify the seasonal fluctuation in water levels that can be expected.

The boreholes will be drilled and sentry wells installed by a specialist drilling subcontractor, who is also a MOE-licensed Water Well Contractor, with monitoring in the field by Golder. In this regard it is expected that three subcontractors will be required. A shallow soil specialist drill-rig equipped with hollow stem augers is proposed for the installation of the shallow wells, and a water well specialist equipped with rotary drilling (or equivalent) for the installation of the deep sentry wells. A shallow soil specialist contractor with manually portable drilling equipment may be required for some areas with restricted access near environmentally protected areas or due to wet ground conditions. For the shallow wells, standard penetration testing and soil sampling will be carried out at regular intervals of depth in each of the boreholes using conventional split spoon sampling equipment. The soil sampling program will be designed to further characterize shallow aquifer properties and depths.

Each of the new sentry wells, whether shallow or deep, will consist of a nominal 50 mm diameter PVC screen and riser pipe completed with an above-grade lockable protective casing set in concrete. Where both shallow and deep wells are present at one location, they will be completed in separate boreholes.

Dedicated water quality sampling equipment (e.g., a Waterra footvalve and tubing) and an automatic pressure transducer with a data logger ("loggers") to continuously monitor water levels will be installed in most of the sentry wells. There are five locations where logger installation is not proposed, comprised of four shallow existing nested monitoring well locations where the upper screen will be monitored by a logger and the lower screen will be monitored manually at the time of data logger download, and of a fifth existing flowing well location where discharge rates will be measured by a bucket and stopwatch method.

3.4 Sentry Well Monitoring Program

At this time, a "base" sentry well monitoring program is proposed. Additional monitoring of either quantity and/or quality may be proposed upon the completion of the additional subsurface investigations as discussed below.

The monitoring program for the sentry wells is currently comprised of pre-, during and post Stage 1 components. At this time it is understood that the Stage 1 period will extend from January 2011 to Fall 2012, beginning with grading and then bulk excavation of the proposed marina basin. Therefore, the pre-construction period will occur from the construction of the sentry wells to January 2011, and the post-construction period will extend from the completion of the pre-development subsurface works (e.g., marina construction, underground servicing) through the resolution of any private well interference issues.

The purpose of monitoring water levels in the sentry wells is to identify any reduction to water levels at the Site boundary related to construction (as interpreted by comparison to current background trends and pre-construction seasonal fluctuations) that would indicate an unacceptable reduction in available drawdown in adjacent private water wells. The "base" water level monitoring program will include the loggers set to record hourly water level measurements in all sentry wells through the entire monitoring program. Water level data will

be regularly downloaded from the loggers on a quarterly basis, at which time a reference point will be re-calibrated.

The frequency of datalogger data collection and download during and post-construction, and triggers for further action should impacts be identified, will be provided subsequent to the available results of pre-construction monitoring activities and pending subsurface investigations at the Site, and will be recommended as part of the monitoring program in the supporting document for the PTTW application in Fall 2010.

The purpose of monitoring water quality in the sentry wells is to characterize and document pre-construction water quality, to monitor for changes in water quality during construction that may indicate an unacceptable change in water quality in adjacent private wells, and documentation of post-construction water quality. It is recognized that any construction dewatering activities will induce an inward groundwater flow from off-Site properties onto the Site. Characterization of on-Site contamination issues through a Phase I and II Environmental Site Assessment program is on-going and it is intended that any identified contamination issues present on-Site will be cleaned-up prior to the construction on Site. It is not expected that there will be a risk of off-Site migration of subsurface environmental impact during the construction of Phase I of the development.

At this time, the “base” water quality monitoring program will include sampling twice prior to construction, and once post-construction, for the following parameters:

- Volatile organic compounds (“VOC”) to be completed twice prior to construction to confirm the absence of potential environmental contaminants subsequent to pending environmental investigations to be completed at the Site; and
- Escherichia coli (“E. coli”), total coliforms, and a typical well water quality package including nutrients, major anions and cations, general chemistry and metals parameters to characterize groundwater quality particularly with respect to parameters commonly cause problems in private water supplies.

The water quality samples will be collected in accordance with generally accepted environmental sampling protocols, and analyzed by an accredited analytical laboratory.

A proposed list of parameters and monitoring frequency to be completed in the sentry wells during and post-construction, and triggers for further action should impacts be identified, will be provided pending the results of the pre-construction sampling and of the environmental site assessment activities, and will be recommended in the supporting document for the PTTW application in Fall 2010.

3.5 Private Well Monitoring and Complaint Resolution Process

As stated in Section 3.2, private well owners will be asked for their consent to the future monitoring of their well, as required. It is not proposed to regularly monitor all surveyed private wells for the reasons discussed above. However, where significant concerns are voiced by a well owner, or requests are made for monitoring of a private well, or where potential impacts to water quality or quality are predicted, private well monitoring will occur at selected locations commensurate with the predicted impact. It is expected that this will generally consist of the installation of a logger in the well and the collection of untreated water quality samples for analysis. All activities involving access of, installation of equipment in, or modification to, a private well will be completed by a licensed Water Well Contractor, and will require the express written consent of the well owner. The well owner will also be responsible to provide access to the well interior to allow monitoring or other activities to be completed.

Details concerning the location, frequency, parameters and duration of private well monitoring will be evaluated based on the results of the findings of the door-to-door survey, the results of the pre-construction monitoring, and pending the findings of proposed subsurface investigations at the Site. The details of private well monitoring will be included in the supporting document for the PTTW application in Fall 2010.

During construction, well owners will be provided with a contact for notification of any complaints of water loss or quality impairment in their well. This is expected to be the Site Supervisor/Project Manager, or person in a similar role, that is to be notified of any other public complaints or concerns. A procedure will be set up for this

contact to notify Kimvar and the project hydrogeologist with the details of the complaint. At that time the project hydrogeologist will also notify the local MOE office, and if applicable the local Health Unit (in instances related to water quality), of the occurrence and of the plan for investigation and resolution. Copies of related written correspondence will be provided to the Town of Innisfil and the County of Simcoe, if requested. The project hydrogeologist will work with the MOE and the well owner toward resolution of the complaint.

Complaints are proposed to be dealt with on a case-by-case basis. The method of investigation will be specific to the complaint, but will generally involve assessment of the data from the sentry well monitoring program and comparison to conditions reported at the complainant's well. Resulting actions could include:

- Provision of an immediate potable water supply prior to and during the completion of an investigation;
- Collection of water level or water quality data from the complainant's well to assess current conditions;
- Monitoring of water levels and/or quality for a period of time;
- Assessment of the potential for reported impacts to be related to Site activities;
- Expansion of the sentry well and/or private well monitoring program, including the number of monitoring locations, frequency of data collection, and number of parameters monitored;
- Where actual impacts related to Site activities are suspected or confirmed by the project hydrogeologist, the temporary provision of potable water supplies; and
- Where actual permanent impacts related to Site activities are confirmed by the project hydrogeologist, the provision of a permanent solution for potable supply.

Additional information concerning the proposed contingency and mitigation measures is provided in the following section. The details of the investigation and/or resolution of the complaint will be communicated to the MOE, the Health Unit if applicable, and to the Town of Innisfil and the County of Simcoe or other interested regulatory agencies upon request.

Additional details of the complaint procedure will be provided in the supporting document for the PTTW application in Fall 2010, and will include the communication process, timing of response, provision of water prior to and during an investigation, a typical and maximum investigation lengths, procedures for resolution if the investigation is inconclusive, and procedures for temporary water supply provision and permanent water supply replacement or treatment.

3.6 Contingency and Mitigation Program

Based on the results of the sentry well monitoring program and any concerns/complaints received from private well owners, the following general contingency and mitigation measures may be applicable:

- Where a reduction in available drawdown or alteration of water quality in a sentry well as a result of construction activities is predicted to potentially result in a significant off-Site reduction in available drawdown or impairment of water quality in off-Site private water supplies:
  - the scope of the monitoring program may be expanded to obtain and assess information from the sentry well and private well networks;
  - an assessment may be completed to relate the observed effect in the sentry well with a related Site activity. Where appropriate and possible, alteration to, or cessation of, the activity will be recommended to Kimvar and the Contractor to alleviate the effect on groundwater resources. For example, this could include the relocation or cessation of temporary pumping activities. Where possible, mitigation measures will be implemented to alleviate the effect of the activity on groundwater resources. For example, this could include the relocation of the discharge point for temporary pumping activities, or the installation of a cut-off wall/barrier to truncate drawdown effects; and

  - an investigation of potentially affected private wells may be initiated to ground truth the predicted effect, and to complete private well monitoring activities as appropriate;

- Where a 25% reduction in available drawdown in a private well is assessed to be the result of construction activities:
  - Increased monitoring and assessment of conditions in the nearby sentry or private wells and the affected well will occur;
  - Kimvar and the Contractor will be notified to put a subcontractor to supply temporary water supplies to the affected well owner on standby;
- Where a 50% reduction in available drawdown in a private well is assessed to be the result of construction activities and where the well owner reports an impairment of water supply:
  - Increased monitoring and assessment of conditions in the nearby sentry or private wells and the affected well will occur;
  - The Contractor (with notice to Kimvar) will mobilize a subcontractor to install a temporary water supply for the affected well owner, subject to the permission of the well owner. Provision of the temporary supply will continue until temporarily impacted water levels return to acceptable levels. Where permanent unacceptable impacts are identified, a permanent solution may be implemented (e.g., provision of an alternate water supply);
- Where a change in water quality as a result of construction activities is confirmed to result in an impairment to water quality (e.g., a previously un-observed exceedance of a health-related drinking water standard):
  - Increased monitoring and assessment of conditions in the nearby sentry well(s) and the affected well will occur; and
  - The Contractor (with notice to Kimvar) will mobilize a subcontractor to install a temporary water supply for the affected well owner, subject to the permission of the well owner. Provision of the temporary supply will continue until quality returns to pre-existing or acceptable conditions. Where unacceptable permanent impacts are identified, a permanent solution may be implemented (e.g., treatment systems, provision of an alternate water supply).

Details of the proposed contingency and mitigation plan will be provided upon assessment of the available pre-construction monitoring data and information from the pending subsurface investigations in the supporting document for the PTTW application in Fall 2010.

4.0 REPORTING

Following the completion of the pre-construction monitoring program at the end of 2010, a Pre-Construction Monitoring Report will be prepared which documents the monitoring program purpose, methods, data, trends, assessment and interpretation. The report will document baseline information relative to which future impact assessments will be considered. The report will also contain any refined recommendations for the monitoring program during and post Phase 1 construction.

During construction, a brief Interim Update Memorandum will be prepared on a semi-annual basis to provide a summary of the findings of the monitoring program, any identified impacts to private water supplies and their resolution, and any private well owner complaints and their resolution.

After Phase 1 subsurface construction and post-construction monitoring activities are complete (expected approximately at the end of 2012), a Post-Construction Monitoring Report will be prepared. The report will document the purpose, methods, data, trends, and interpretation for the monitoring program, and will provide documentation of any contingency, mitigation or remedial activities that were implemented. The report will provide any recommendations for future monitoring programs, including long-term monitoring, based on the

information collected to that date. It is understood that the satisfactory resolution of any private water supply related issues will be required before approvals are provided to proceed to the next phase of development, in accordance with the provisions of OPA 17, Zoning By-law No. 029-05 and the subdivision conditions.

All reporting is proposed for distribution to the Town of Innisfil, the County of Simcoe, any other interested regulatory agency, and as applicable to the MOE and the local Health Unit.

5.0 CLOSURE

We trust this submission meets your current requirements. Please provide us with any comments you may have which will be used to finalize this document. Please contact the undersigned with any questions.

Yours truly,

GOLDER ASSOCIATES LTD.

DRAFT **DRAFT**

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S. D. Lytle, P.Geo.
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CMK/SDL/gr

cc: Ms. Susan Rosenthal, Davies Howe Partners

Attachments: Table 1: Big Bay Point Resort Development – Proposed Monitoring Program Matrix – Groundwater Resources – 2nd Revision

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