











provide clearance for the proposed buildings. The open channel should be properly decommissioned, including removing sediment build-up and restoration to design grades with approved fill material. Geotechnical oversight, including inspection and testing will be required for this work.

### **Site Excavations and Groundwater Control**

All work associated with design and construction relative to excavations must be carried out in accordance with the Occupational Health and Safety Act (OHSA). Based on the documented sand and gravel soils and fill material which is expected to be present in the area, and in accordance with Section 226 of Ontario Regulation 213/91, the soils are generally classified as Type 3 soil above the stabilized groundwater level. Excavations which extend through or terminate in Type 3 soil, temporary excavation side slopes must be cut back at a maximum inclination of 1H:1V from the base of the excavation.

In the event that construction occurs in seasonally wet conditions or when frozen soil conditions are present, care will be required to maintain safe excavation side slopes, and suitable excavation bases. The contractor should use a reasonable effort to direct surface run-off away from open excavations. It should be noted that, if wet seams or zones are encountered, some sloughing may be expected.

Where excavations extend below the stabilized groundwater level, soils are expected to behave as a Type 4 soil, with sloughing occurring and slopes requiring a maximum gradient of 3H:1V or flatter. Excavation support should be anticipated to provide safe and stable excavations for workers. Further, excavation support and cut-off systems may need to be considered to limit water from entering the excavations, and to limit the amount of groundwater pumping required for the construction.

It should be noted that for projects requiring positive groundwater control with a removal rate in excess of 50,000 litres per day, a submission to the Environmental Activity and Sector Registry (EASR) will be required, and a Permit to Take Water (PTTW) will be required for volumes in excess of 400,000 litres per day. The dewatering volumes are subject to seasonal variations in the water table, and will also vary depending on the construction staging. The water-bearing sand soils have a moderate to high soil permeability.

It is understood that the developer intends for the new buildings to be set at a suitable elevation for building foundations to remain above the stabilized groundwater level. The geotechnical and hydrogeological assessment for the property will determine the stabilized groundwater level, and anticipated seasonal fluctuation. However, anecdotally, it is understood that water levels in the ponds have not varied much more than 0.5 to 0.6 m over the past few years.

### **Building Foundations**

As noted above, subgrade soils in the area of the future buildings will need to be assessed to determine their suitability to support new building foundations. This will be determined through the geotechnical investigation for the site. In the event that the existing fill thickness, composition or consistency is not deemed to be suitable to support new building foundations, and if it is not deemed practical to (partially) excavate, replace or recompact the soils to support new buildings, consideration may be given to supporting future buildings on a deep foundation system set on the underlying natural undisturbed subgrade soils.

The undisturbed natural subgrade soils which are in a compact to dense state in the Komoka area can typically support building foundations with a design net bearing pressure in the range of 200 to 325 kPa, without significant subgrade improvement required. The soil bearing capacity (including serviceability limit state – SLS, and ultimate limit state – ULS) will be verified as part of the geotechnical investigation to support the proposed development.

Engineered fill should consist of suitable, compactable, inorganic soils, which are free of topsoil, organics and miscellaneous debris. Any material proposed for use as engineered fill must be examined and approved by the geotechnical consultant, prior to use onsite.

In the event that construction occurs in seasonally wet conditions, care will be required to maintain safe excavation side slopes, and suitable excavation bases. Site grades should be maintained during area grading activities to promote drainage, to minimize ponding of surface water on the engineered fill mat and to direct surface run-off away from the excavation. Rutting by construction equipment should be kept to a minimum, where possible.

### **Seismic Design Considerations**

Multi-storey building must be designed in accordance with the Ontario Building Code, and site characterization for seismic response will be required from a geotechnical standpoint. Based on the geological mapping and our experience with soil conditions in the general area, the natural, undisturbed subgrade soils, in a compact to dense state are generally expected to be considered to be Site Class C or Site Class D, based on Section 4.1.8.4 and Table 4.1.8.4.A of the Ontario Building Code.

Confirmation of the Seismic Site Classification can be provided when the field program for the Geotechnical Investigation is complete, so that it can be incorporated into the building design, as appropriate

### **Site Pavements**

The development is expected to be accessed via an internal roadway connecting to Komoka Road. It is anticipated that site pavements (including curbs and sidewalks) can be constructed following typical construction practices.

Once the site preparation work is completed, the exposed subgrade soils within the roadways are expected to be comprised of re-compacted soils. The road subgrade should be thoroughly proof-rolled and reviewed by the geotechnical consultant. In the event that loose or soft areas are noted, additional work may be required to sub excavate and replace unstable soils with suitable compactable material. In general terms, subgrade soils supporting site pavements should be compacted to a minimum level of 98 percent SPMDD.

Good drainage provisions will optimize pavement performance. The finished pavement surface should be free of depressions and should be sloped (preferably at a minimum grade of two percent) to provide effective surface drainage.

### **Recommendations and Next Steps**

The Municipality and Conservation Authority have identified the need for a Geotechnical Investigation and Hydrogeological Assessment to support the proposed development. Once planning approvals are secured, it is recommended that scoping of the geotechnical and hydrogeological field program be completed, in consultation with the relevant approval authorities to ensure that the potential issues and concerns related to the proposed development can be adequately assessed and to provide technical guidance to inform the detailed design elements of proposed development.

At a minimum, the Geotechnical Investigation to be completed at the site should include the following elements:

- A summary of soil and groundwater conditions observed in sampled test holes, including detailed borehole logs and stabilized groundwater measurements;
- The results of any laboratory testing used to characterize the soil conditions at the site;
- Geotechnical comments and recommendations for the following:
  - Site Preparation, including subgrade preparation, re-use of onsite soils (if appropriate) and engineered fill placement;
  - Excavations, including excavation support recommendations;
  - Groundwater Control, including typical dewatering operations, and any operations which may be expected to require permitting (EASR or PTTW) from MECP;

- Foundation design, including soil bearing capacity, allowable settlements, frost protection requirements;
- Basement and/or concrete slab on grade construction, including lateral earth pressures, r foundation wall backfill and underfloor fill, modulus of subgrade reaction;
- Foundation drainage and waterproofing/damproofing recommendations;
- Elevator pit/shaft recommendations, including water-proofing and buoyancy recommendations, if required;
- Site servicing installation, including recommendations for pipe bedding, trench backfill and suitability of excavated soils for re-use;
- Seismic design considerations;
- Site Pavements, including recommended pavement component thicknesses and the need for pavement subdrains (if applicable);
- Recommendations for sediment and erosion control measures at the site, to prevent uncontrolled sediment discharge/release into the open pond area; and,
- Recommendations for inspection and testing to provide geotechnical certification of the construction.

As part of the scoping procedure for the Hydrogeological Assessment, an understanding of the stormwater management strategy for the village of Komoka is required. A number of options are currently being considered for the area, however a commitment has not been provided as to when a preferred strategy will be selected or implemented. Based on anecdotal evidence from the landowner, and consistent with the characteristics of allow unconfined aquifers, shallow groundwater conditions can be highly reactive to changes in water levels within the ponds, which can be influenced by a number of factors. If the preferred SWM strategy for the village of Komoka involves increasing flows directed into the existing pond, the stabilized water level at the site may be altered to accommodate the increased flows. Similarly, if downstream outlets for the pond or other downstream features restrict the natural flows which occur, this can also impact the stabilized groundwater level at the site. Similarly, groundwater quality will be influenced by changes in the stormwater being directed to the pond. The scope of the work must be appropriate to characterize the groundwater conditions with regard to the details of the proposed development, to accurately identify constraints (if applicable) and to incorporate suitable recommendations for site specific SWM design and infiltration opportunities.

There is a significant benefit to having as much information as possible available about the preferred stormwater management strategy for the site when scoping the field program for the hydrogeological work at the site. LDS would be pleased to assist in preparing scoping documents for review and consideration by all parties, when planning approvals are secured.

Monitoring wells installed at the site to monitor stabilized groundwater levels must be installed in accordance with the requirements of Ontario Regulation 903. This regulation identifies that only certified and qualified well drilling technicians are permitted to direct the installation of wells, in accordance with the Ontario Water Resources Act. When wells are no longer deemed to be required, they should be decommissioned in accordance with the same regulation. Decommissioning a well which is no longer in use helps to ensure the safety of those in the vicinity of the well, prevents surface water infiltration into an aquifer via the well, prevents the vertical movement of water within a well, conserves aquifer yield and hydraulic head and can potentially remove a physical hazard.





## Closing

The format and content of this letter has been guided to address specific client needs. LDS has provided this document to provide a geotechnical overview on the proposed development and to comments on the feasibility of developing the site.

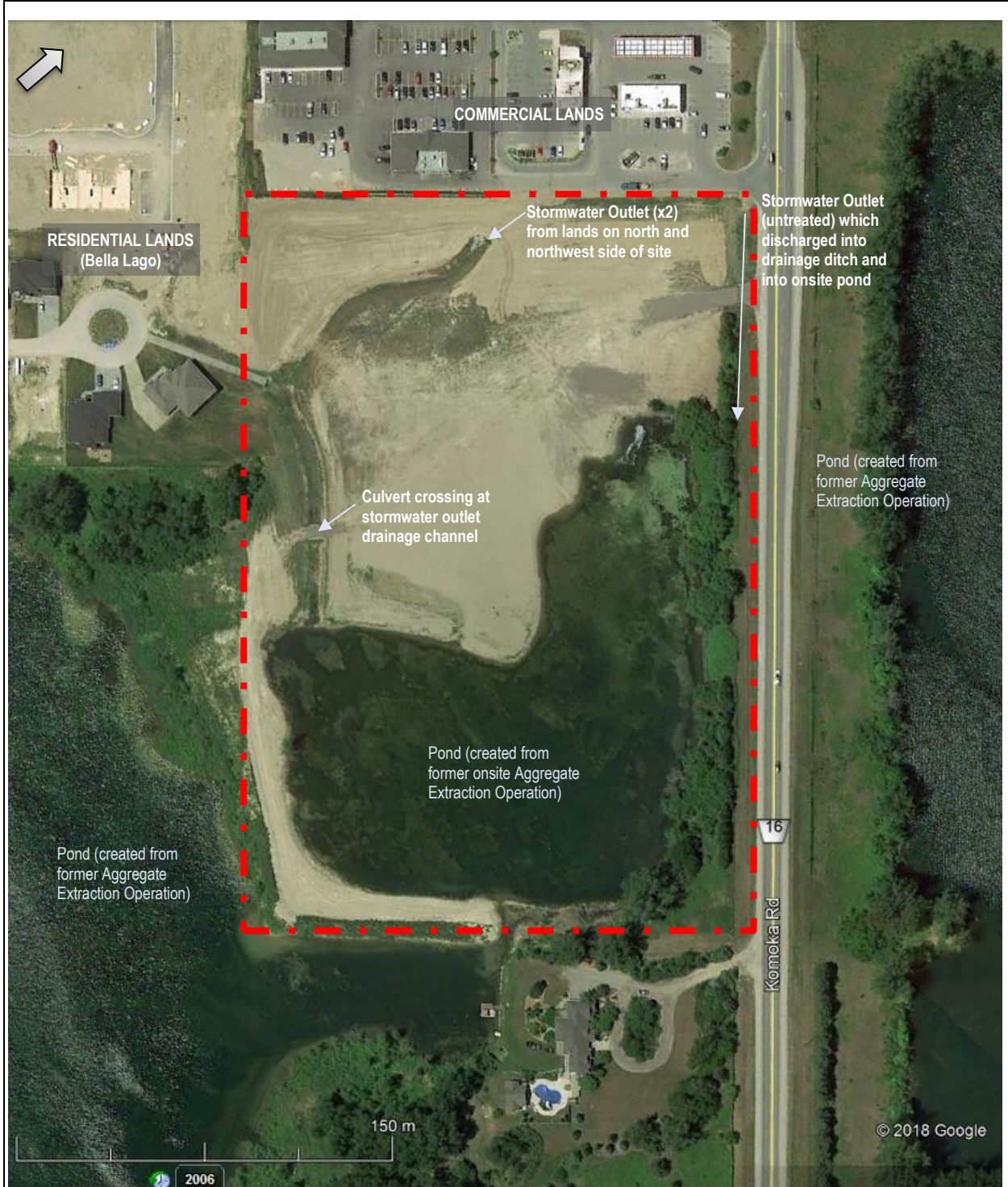
Based on our review of the available published information, and our understanding of the soil and groundwater conditions which are typical for the area and anticipated at the site, it is our opinion that the north part of the site is suitable for future development. The existing pond in the south part of the site provides a beneficial amenity space, and also provides an opportunity to supplement the stormwater design elements of the site.


Respectfully,

LDS CONSULTANTS INC.




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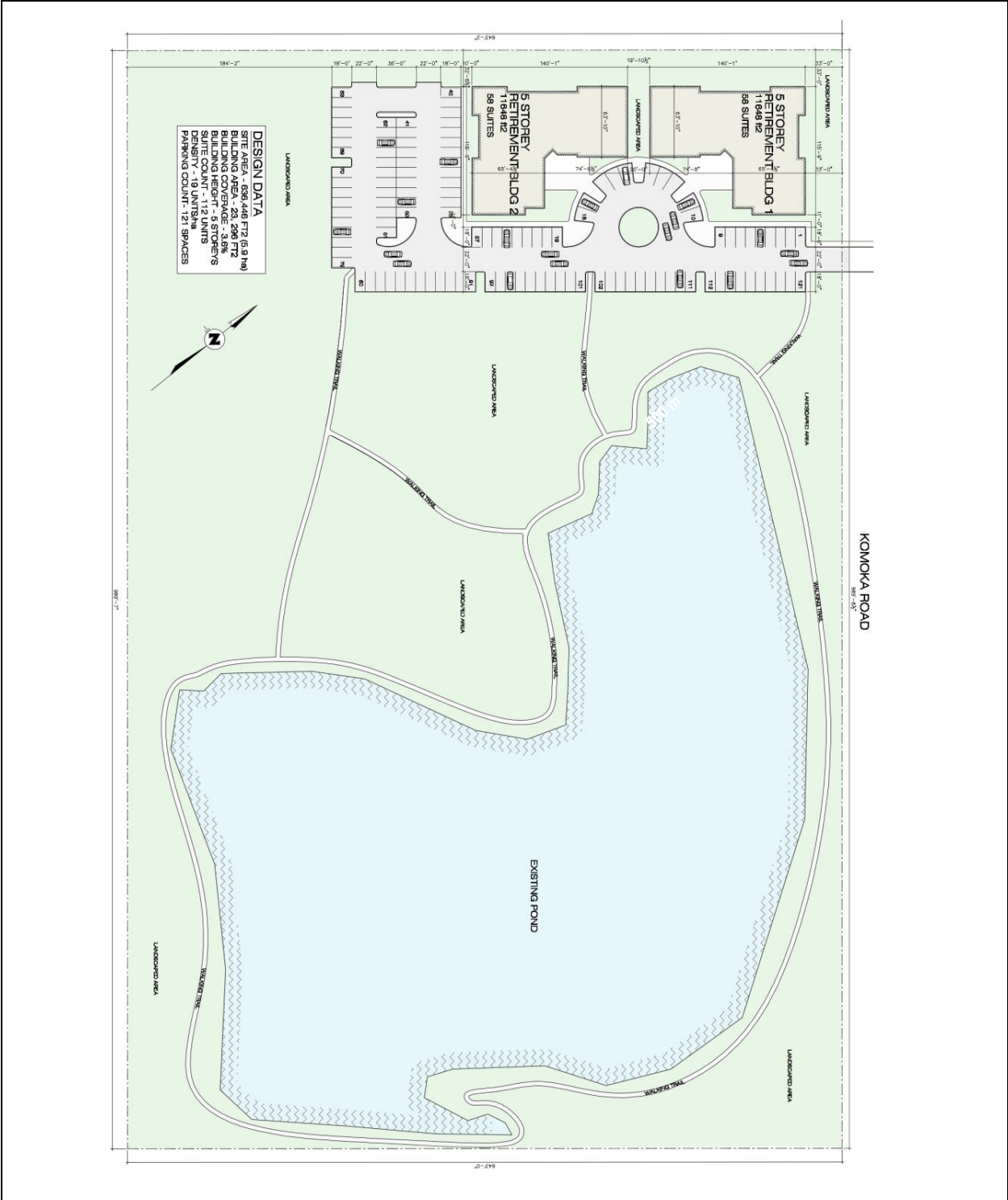



<b>PROJECT NAME</b> Geotechnical Design Brief	<b>PROJECT LOCATION</b> 22447 Komoka Road, Komoka	<b>SCALE</b> As Shown	<b>PROJECT NO.</b> GE-00240
	<b>DRAWING NAME</b> Site Features	<b>DATE</b> May 2019	<b>DRAWING NO.</b> 1




**Legend**  
 ● MECP Well

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	<b>DRAWING NAME</b> MECP Well Record Location Plan	<b>DATE</b> May 2019	<b>DRAWING NO.</b> 2



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	<p><b>DRAWING NAME</b> Conceptual Site Layout Plan (prepared by others)</p>	<p><b>DATE</b> May 2019</p>	<p><b>DRAWING NO.</b> 3</p>



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	<b>DRAWING NAME</b> Preliminary Site Plan (prepared by Zedd Architecture)	<b>DATE</b> May 2019	<b>DRAWING NO.</b> 4