

Final Report

Desktop Hydrogeological Investigation

530, 550, 588 Kerr Street and 131, 171 Speers Road,
Town of Oakville, Ontario



Prepared for Urban Strategies Inc.
by IBI Group

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1 Introduction

IBI Group Professional Services (Canada) Inc. (IBI Group) has been retained by Urban Strategies Inc. to complete a Desktop Hydrogeological Investigation on behalf of April Investments Limited (owner of 588 Kerr Street), 527079 Ontario Limited (owner of 530 Kerr Street), Trans County Development Corporation Limited (owner of 131 Speers Road), and Oakville Development (2010) Inc. (owner of 550 Kerr Street) (together known as the 'landowners'). This document is in support of an Official Plan Amendment (OPA) process to permit the redevelopment of lands municipally addressed 530, 550, 580 Kerr Street, 131 and 171 Speers Road (together known as the 'subject site' or 'Site'), in the Town of Oakville (the 'Town') and Halton Region (the 'Region').

1.1 Project Description

The Site is located within the jurisdiction of Conservation Halton, the Regional Municipality of Halton (Halton Region), and the Town of Oakville. The Site is located at the southeast quadrant of the intersection

The Site is comprised of five properties located along Kerr Street and Speers Road and municipally identified as 530, 550, 580 Kerr Street, 131 Speers Road, and 171 Speers Road. The Site is located approximately 600m southeast of Highway 403 and 150m south of the Sixteen Mile Creek. The location of the Site is shown on **Figure 1**.

The Site is 194,200 m² in area and is bounded by the Canadian National (CN) Railway corridor to the north, Kerr Street to the east, Speers Road to the south, and a single-story industrial building to the west. The Site is currently occupied by a commercial plaza and buildings containing a variety of retail and commercial uses and associated parking areas.

It is our understanding that the Site is planned to be redeveloped into a compact, complete community with multiple mid-rise to high-rise mixed use buildings that will have heights ranging from 8 to 28 storeys. The Comprehensive Development Plan as part of the Proposal, plans for a public park at the central location of the Site and associated driveway and paved surfaces. It is assumed that the proposed plans for development will also include the construction of underground parking levels. The exact number of underground parking levels and their corresponding finished floor elevations (FFE) were not available for review at this time.

The Proposal will be municipally serviced for water and sewer after construction.

1.2 Objectives

The objective of this hydrogeological overview is to provide background information on the existing geological and hydrogeological setting and potential groundwater receptors.

This will include a preliminary assessment of potential impacts to the natural environment and other groundwater users resulting from the Proposal, an assessment of the potential need for construction dewatering, and identification of source water protection-related regulations that may need to be considered in the development.

2 Methodology

The background review of local geological and hydrogeological conditions was developed through a review of existing reports and available geological information. This included:

- On-line mapping by York Peel Durham Toronto (YPDT) Oak Ridges Moraine Groundwater (ORMP) including interpolated groundwater flow directions and depth to groundwater

- Geological and hydrogeological Information from Ontario Geological Survey (OGS), including:
 - Surficial Geology
 - Paleozoic Bedrock Geology
 - Physiography
- Ministry of Natural Resources and Forestry (MNR) Natural Heritage Information Centre (NHIC) and Topographic Mapping
- Ministry of the Environment, Conservation and Parks (MECP) Well Records
- Available Environmental Reports, including:
 - Golder Associates Ltd. (GAL), 2012. Phase Two Environmental Site Assessment Report, 550 Kerr Street, Oakville, Ontario.
 - Golder Associates Ltd. (GAL), 2019. Phase One Environmental Site Assessment Report, 550 Kerr Street, Oakville, Ontario.
 - RiskCheck Environmental Ltd., Phase I Environmental Site Assessment, 560-588 Kerr Street, Oakville, Ontario.

3 Background Setting

3.1 Topography and Drainage

The Site is approximately 100m south of Sixteen Mile Creek and is located within the Sixteen Mile Creek Watershed, which is under the jurisdiction of Conservation Halton.

Available MNR topographic mapping indicates that the local topography at the Site is relatively flat with a gentle slope to the southeast toward Lake Ontario. The mapped ground surface elevation ranged from approximately 105m above sea level (masl) in the northwest portion of the Site, to 102masl in the southeast portion of the Site. The topography on the east side of Kerr Street slopes towards the Sixteen Mile Creek. Overland flow drainage at the Site generally follows the existing topography, with the Site draining south/southwest towards the Sixteen Mile Creek and/or Lake Ontario.

3.2 Physiography

The Site is located in the Iroquois Plains physiographic region. The Iroquois Plains physiographic region represents shallow lacustrine sand deposits overlying shallow associated with Glacial Lake Iroquois occupies the lowland bordering Lake Ontario. In the area of the Site, the Iroquois Plain deposits are relatively thin and overlie shale bedrock (Chapman and Putnam, 1984).

A physiographic map is included as **Figure 2**.

3.3 Regional Geology

A review of available geological mapping by the OGS was completed (accessed: Jan 2022) to determine an understanding of the geological conditions present in the area surrounding the Site.

The Quaternary sediments (overburden) units that overlie the bedrock in the area of the Site area from youngest to oldest consist of:

- Coarse-grained glaciolacustrine (sand, gravel) Lake Iroquois Sand Deposits
- Clay to silt-textured till (Halton Till)

The OGS mapping indicates that the majority of the Site has Paleozoic bedrock at surface, indicating negligible overburden. Halton Till has been mapped predominantly south of Speers Road near the Site and glaciolacustrine sands were mapped approximately 2km south of the Site near Lake Ontario. It should be noted that the OGS mapping provides geological conditions at a regional scale and, as such, local variations may occur.

A brief description of the underlying stratigraphic units is provided below:

Lake Iroquois Sand Deposits: The nearby Lake Iroquois deposits are comprised of coarse-textured glaciolacustrine deposits consisting of sand, gravel, minor silt and clay, foreshore and basinal deposit.

Halton Till: The Halton Till predominantly consists of silt to silty clay matrix and will typically overlie the local weathered or sound bedrock. The Halton Till was deposited approximately 13,000 years ago during the last glacial advance in the area. This till acts as an aquitard of regional extent. Based on the Study Area location, the thickness of Halton Till is expected to be relatively thin (<5m) to absent.

A map of the regional surficial geology is included as **Figure 3**.

Bedrock: The bedrock geology was formed in the Upper Ordovician period and consist of the Queenston Formation. This formation is characterized primarily by red shale, with minor amounts of green shale, siltstone, sandstone, and limestone. The shales are known to be of low yield and will act as a regional aquitard. The Queenston Formation acts as an aquitard of regional scale.

This unit conformably overlies shales and interbedded limestones of the Georgian Bay Formation. The Georgian Bay Formation has been mapped approximately 100m northeast of the Site along Sixteen Mile Creek. Based on the proximity to the Georgian Bay Formation, the Queenston Formation may be relatively shallow in the area of the Site.

A bedrock geology map is included as **Figure 4**.

3.4 Regional Hydrogeology

Mapping from the ORMGP indicates that regional shallow groundwater flow in the area is in a southeast direction towards Sixteen Mile Creek and Lake Ontario (**Figure 5**). The depth to shallow groundwater was estimated to range from approximately 4 to 7mbg and is within the shale bedrock.

It should be noted that this interpolation is based on existing wells in the MECP database and, as such, may not adequately capture shallow perched conditions. Based on the local stratigraphy, a shallow perched water table at or above the bedrock surface is possible.

A map of the depths to shallow groundwater based on ORMGP mapping is provided as **Figure 6**.

3.5 Local Groundwater Users

A MECP well records search conducted around the Site identified 131 well records within 500m (Study Area) of the Site. Based on the MECP well records, the majority of wells were classified as monitoring or observation wells. Zero (0) municipal or domestic supply wells were identified in the area. The search results are summarized in **Table 1**, below.

Table 1 Summary of Private Well Uses within 500 m of the Site

WELL USE	NUMBER OF WELLS
Observation / Test Hole / Monitoring	78
Abandoned	13
Unknown	40
Total	131

A number of available well logs from the Site were reviewed by IBI Group. The logs reviewed indicated shallow bedrock ranging from approximately 1.5mbgs to 2.4mbgs. The bedrock was noted to be red shale, presumably belonging to the Queenston Formation.

A summary of the permitted water takers within the Study area is provided in **Table 2**, below.

Table 2 Permitted Water Taking within 500m of the Site

PERMIT NUMBER	DATE	PURPOSE	SOURCE	SURFACE WATER / GROUNDWATER	MAXIMUM PERMITTED WATER TAKING RATE (L/DAY)
0772-AF3HTJ	November 8, 2016 - March 31, 2019	Dewatering	Groundwater	Groundwater	400,000

There were no municipal or domestic supply wells identified within the Study Area.

3.6 Source Water Protection

The Site is located within an Intake Protection Zone 2 (IPZ-2) associated with surface water taking for the Oakville Water Purification Plant (WPP). Intake protection zones are areas that may contribute water to the municipal drinking water systems and through which contaminants may reach the pumping station. IPZ-2 is delineated using a combination of hydrodynamic modelling within the lake and the time-of-travel calculations within in-land pathways that discharge near the lake intakes points. Three-dimensional modelling was used to delineate a zone with a time of travel for water to reach the intake point within two hours. Two hours has been set as the minimum amount of time needed for operators of the water treatment plants to react to a contamination concern.

An area of the Site fronting Kerr Street is also located within an Event-Based Area (EBA) associated with the Oakville WPP surface water intake. An EBA is similar to an IPZ, however is related to potential spills that could reach and contaminate the surface water intake point, which in turn would be a significant threat to quality of drinking water supplied by surface water. Any spills relating to pipeline fuel or oil spills within the Site area has been identified as a potential threat to the nearby drinking water supply system. It is recommended that any handling and storage of pipeline fuels and/or oil during the construction and post-construction period be completed using industry best management practices, including the preparation of a spill containment plan prior to commencing any construction works. The storage of pipeline fuels and/or oil during and after construction should be within a confinement that is sealed and would prevent any release of the substance into the natural environment during an incidental spill. It is advisable that handling of any such substances should be avoided during construction, if possible.

The site is not located within a Significant Groundwater Recharge Area (SGRA) or Highly Vulnerable Aquifer (HVA) according to the MECP's Source Water Protection Atlas.

3.7 Natural Heritage Features

The Site is located within a well-developed commercial and urban area in the Town of Oakville. The closest surface water feature to the Site is the Sixteen Mile Creek, which is located approximately 125m northeast of the Site. Sixteen Mile Creek drains southeast towards Lake Ontario, which is located approximately 2km southeast of the Site.

A review of the Ministry of the Natural Resource and Forestry (MNRF) Natural Heritage Mapping (2021) indicates that there are no natural heritage features located within the Site boundary. There are no Provincially Significant Wetlands (PSWs) or wetland complexes present, Significant Woodlands (greater than 0.5ha), or Significant Life or Earth Science ANSIs identified within the 500m of the Site.

3.8 Background Reports

A Phase Two Environmental Sites Assessment (ESA) was completed at 550 Kerr Street, Oakville ON in 2021 by GAL. The report indicated that a Phase II ESA had been previously completed at the Site in 2012 by Malroz. Engineering Inc. (Malroz). During the 2019 investigation, GAL advanced nine (9) boreholes of which seven (7) were completed as monitoring wells.

The subsurface conditions at the 550 Kerr Street site were described as follows:

- Fill materials, including asphalt occurred to approximately 1.5mbgs.

- Sandy silt, silty and clayey silt was encountered beneath the fill and extended to depths ranging between 2.8 and 3.5m bgs. The material was noted to be non-cohesive.
- Shale bedrock was noted to be grey shale interpreted to be Georgian Bay Formation.
- Groundwater levels range from approximately 2 to 12m bgs and was both perched above the bedrock and within the deeper bedrock units, where bedrock was cored.
- The relatively large difference in water levels in the overburden and shale bedrock wells demonstrate that there is a significant downward vertical gradient. As a result, the overburden was interpreted to represent an unconfined aquifer and the shallow bedrock shale units were interpreted to represent an aquitard. The deeper shale unit would be considered a confined aquifer.
- Groundwater flow direction in both the shallow overburden aquifer and deep bedrock aquifer was noted to be in a southeast to east direction.
- Based on single-well response testing, the hydraulic conductivities of the overburden and bedrock units were estimated to be 1×10^{-5} m/d and 2×10^{-7} m/s respectively.
- Groundwater impacts were identified across the Site. Impacts included volatile organic compounds (VOCs), benzene, toluene, ethylbenzene, and xylene (BTEX), trihalomethanes (THM), and petroleum hydrocarbons (PHCs). The VOC, BTEX and THM impacts extended across the Site and to a depth within the bedrock of at least 15 m bgs. Lateral and vertical delineation of these impacts has not been achieved.

The review of this previous investigation was useful in determining an understanding of the subsurface soil and groundwater conditions at the 550 Kerr Street property and for developing a preliminary understanding of potential implications on the remaining properties. Further investigation will be required on the other properties to confirm these inferences.

4 Discussion and Analysis

4.1 Groundwater Control Requirements

It is our understanding that the proposed plans for development will include the construction of underground parking levels, however the exact number of underground levels and their corresponding finished floor elevations (FFE) were not available for review at this time. As discussed in **Section 3.8**, the groundwater level is inferred to range from 2m to 12m below existing grade. If the base of excavation during the construction period and the invert level of the foundation drainage system during the post-construction period are situated below the prevailing groundwater table, there will be a requirement for groundwater control and dewatering.

Based on the anticipated subsurface soil and groundwater conditions, the requirements for groundwater control and dewatering are expected to be modest. However, it is recommended that a site-specific subsurface investigation be completed to evaluate the hydrostratigraphic conditions and groundwater levels at the Site. Based on this information, the requirements for groundwater control and dewatering during the construction and post-construction periods can be assessed and water taking permitting needs will be confirmed, as follows:

- If the anticipated dewatering rates during construction range from 50,000 L/day and 400,000 L/day, an Environmental Activity and Sector Registry (EASR) Posting with the MECP will be required prior to commencing any dewatering operations.
- If the estimated dewatering rates are greater than 400,000 L/day, then a Permit to Take Water (PTTW) Registration will be required.

During the post-construction period, if the subdrain flow rates are greater than 50,000 L/day, then a PTTW Registration will be required.

Based on the estimated rate of dewatering during and after construction and the quality of groundwater, potential options for discharge of the pumped water will be recommended, including feasibility of discharge into the municipal sewer system, discharge into the natural environment, re-infiltration of the pumped water and/or hauling the water offsite through a specialized subcontractor. As noted in **Section 3.8**, groundwater contamination has been identified on at least one property and this will require consideration during construction dewatering, in terms of groundwater treatment / disposal options and appropriate health and safety measure.

Notwithstanding issues related to potential groundwater contamination, if the anticipated dewatering rates are considered to be relatively moderate to high, then options to obtain a sewer discharge agreement would be considered most feasible, however if the expected rates are estimated to be low, then the option to haul of the water off-site can be considered. Infiltration measures are not considered feasible due to the shallow overburden soils overlying shale bedrock.

4.2 Water Balance Assessment

Currently, the Site area is predominantly comprised of buildings and paved hard surfaces, with a very small area comprising of landscaping and vegetation. The proposed plan for development at the Site is not considered to cause significant reduction in soil infiltration within the existing pervious area at the Site. As discussed in **Section 3.5**, the Site is not located within a SGRA, and as such the proposed plan for development is not anticipated to cause any significant impacts to recharge of groundwater in the area. The requirement for Low Impact Development techniques to maintain pre-development recharge is considered unlikely; however, this should be discussed with Conservation Halton and Halton Region staff during future development application stages.

5 Summary and Conclusions

A summary of the hydrogeological overview is provided below:

- The local topography at the Site is relatively flat with a gentle slope to the southeast toward Lake Ontario. The topography on the east side of Kerr Street slopes towards Sixteen Mile Creek.
- The Site is located in the Iroquois Plains physiographic region, which lacustrine sand deposits. In the area of the Site, the Iroquois Plain deposits are relatively thin and overlie shale bedrock.
- Quaternary mapping suggests that the Site is overlain by shallow Halton Till deposits overlying shale bedrock. Previously borehole drilling completed on 550 Kerr Street indicates that the overburden thickness ranges between approximately 2.8m and 3.5m at that site.
- OGS mapping indicates that the uppermost bedrock unit is Queenston Formation shale; however, the 550 Kerr Street investigation interpreted that the Georgian Bay Formation shale may be the uppermost bedrock unit.
- Groundwater was noted to range from approximately 2 to 12mgbs in the 550 Kerr Street Investigation and was flowing in an east to southeast direction. Downward vertical hydraulic gradients were inferred.
- Hydraulic conductivity testing completed at 550 Kerr Street indicated values of $1 \times 10^{-5} \text{m/s}$ and $2 \times 10^{-7} \text{m/s}$ for local overburden and bedrock units, respectively.
- Based on the observed and mapped groundwater levels, construction dewatering will likely be required for any future subsurface excavations. Dewatering rates may be modest; however, additional groundwater investigations will be required to confirm dewatering rates and discharge

options. The presence of groundwater contamination across some of the Site should be considered when planning potential dewatering requirements.

- The Site is within the Intake Protection Zone 2 (IPZ-2) for the for Oakville WPP surface water intake and an Event Based Area for handling and storage of pipeline fuel and/or oil. It is recommended that best management practices be deployed during and following construction for the storage and handling of these substances to prevent any spill into the natural environment, and subsequently into the surface water intake point.
- The site is not located within a Significant Groundwater Recharge Area (SGRA) or Highly Vulnerable Aquifer (HVA). The proposed plans for development are not anticipated to significantly alter the soil infiltration rates at the Site, and thus impacts related to reduction to groundwater recharge at the Site and the surrounding area is not anticipated.
- The requirement for Low Impact Development techniques to maintain pre-development recharge is considered unlikely; however, this should be discussed with Conservation Halton and Halton Region staff during future development application stages.

6 References

Chapman, L.J. and Putnam, D.F. (1984). *The Physiography of Southern Ontario*, 3rd ed. Ontario Geological Survey. Toronto: Ontario Ministry of Natural Resources.

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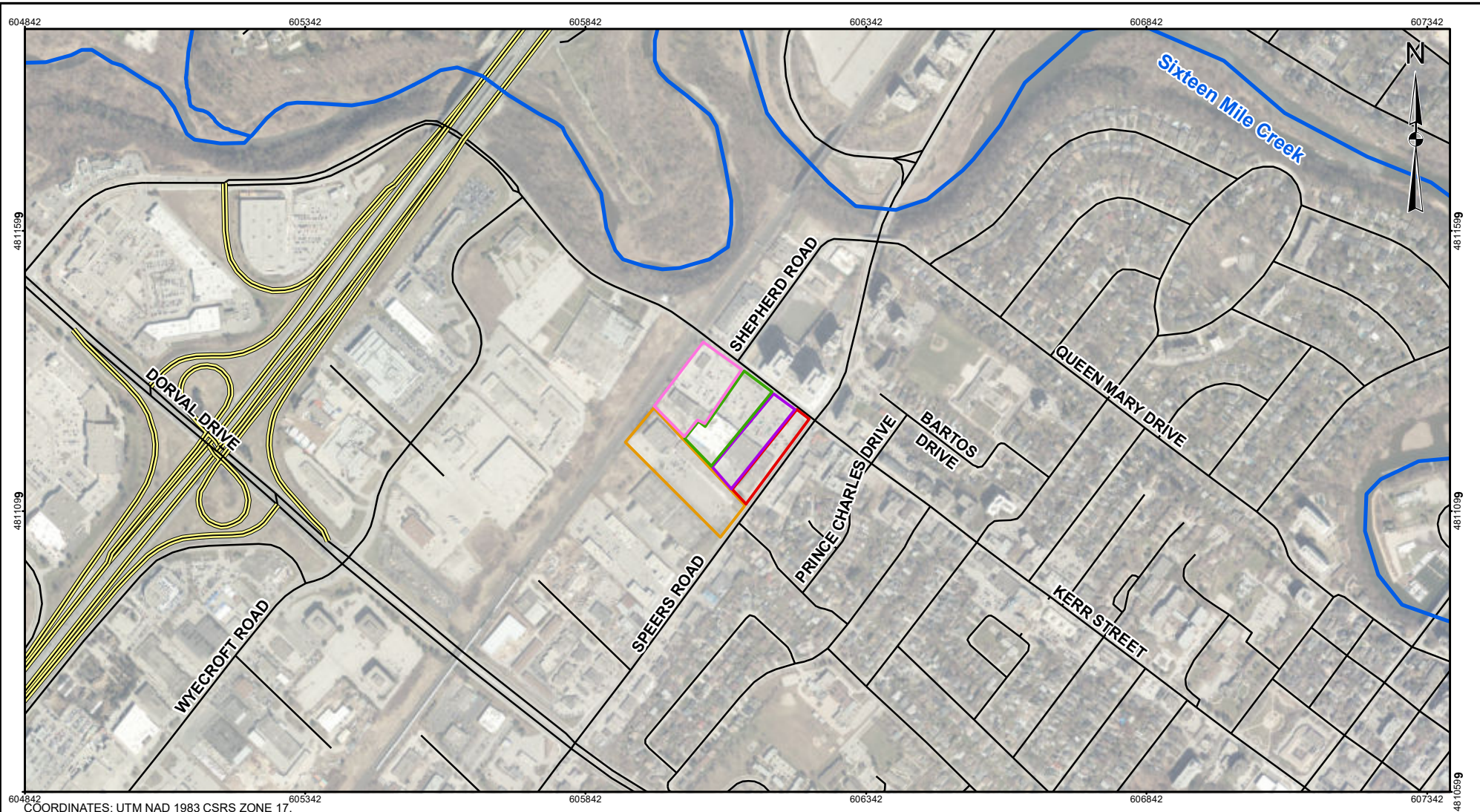
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Figures



COORDINATES: UTM NAD 1983 CSRS ZONE 17.

LEGEND

- | | | | |
|--|-----------------|--|-----------------|
| | 530 Kerr Street | | Watercourse |
| | 131 Speers Road | | 550 Kerr Street |
| | 171 Speers Road | | 588 Kerr Street |
| | | | Arterial Street |
| | | | Highway |

REFERENCE

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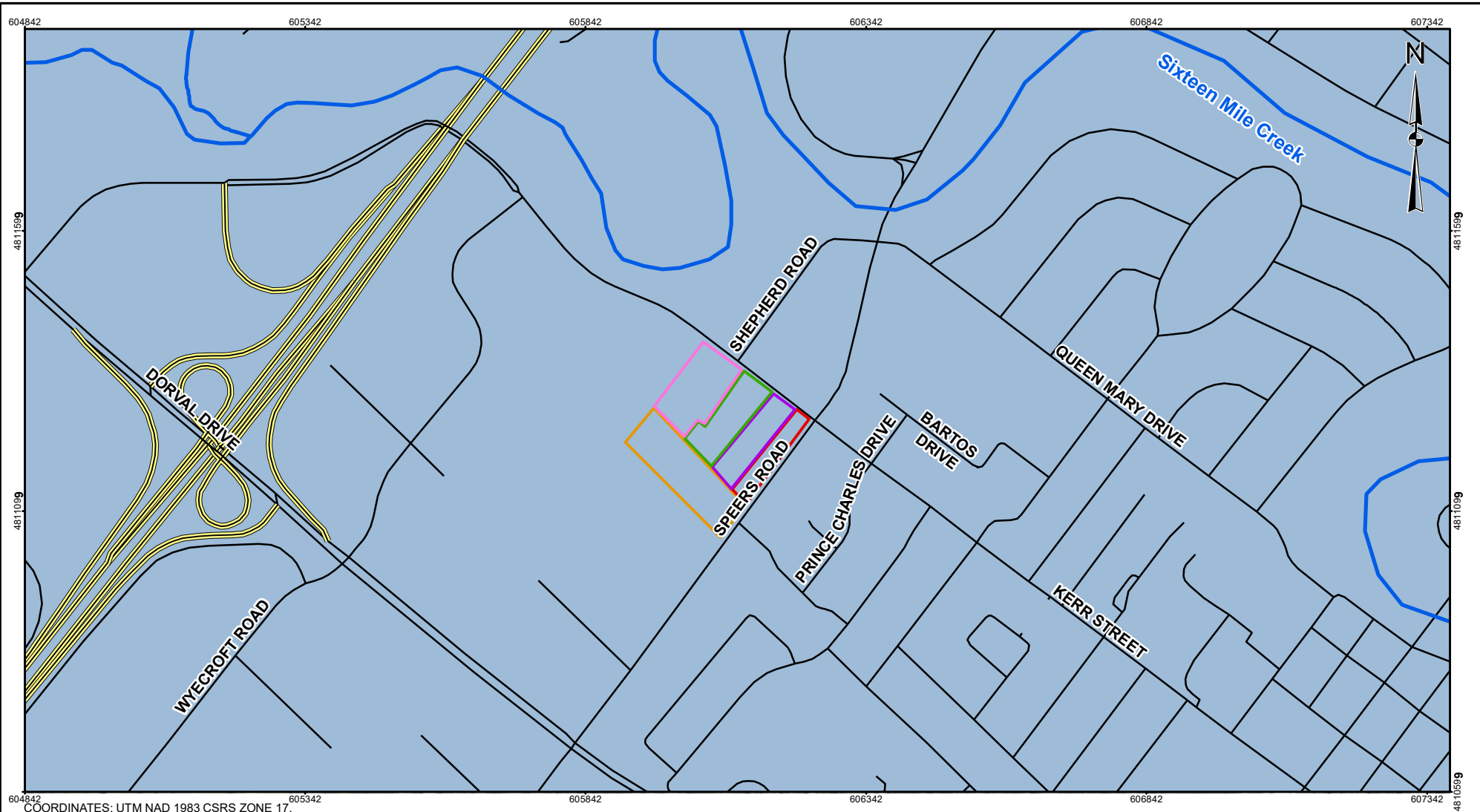
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PROJECT Desktop Hydrogeological Investigation
 131, 171 Speers Road and 530, 550, 588 Kerr Street,
 Oakville, Ontario

TITLE **SITE LOCATION MAP**

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FIGURE 1



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 COORDINATES: UTM NAD 1983 CSRS ZONE 17.

LEGEND

- | | | | |
|-----------------|-----------------|-----------------------------|----------------|
| Property | 530 Kerr Street | Street | Watercourse |
| 131 Speers Road | 550 Kerr Street | Arterial Street | |
| 171 Speers Road | 588 Kerr Street | Highway | |
| | | | |
| | | Physiographic Region | Iroquois Plain |



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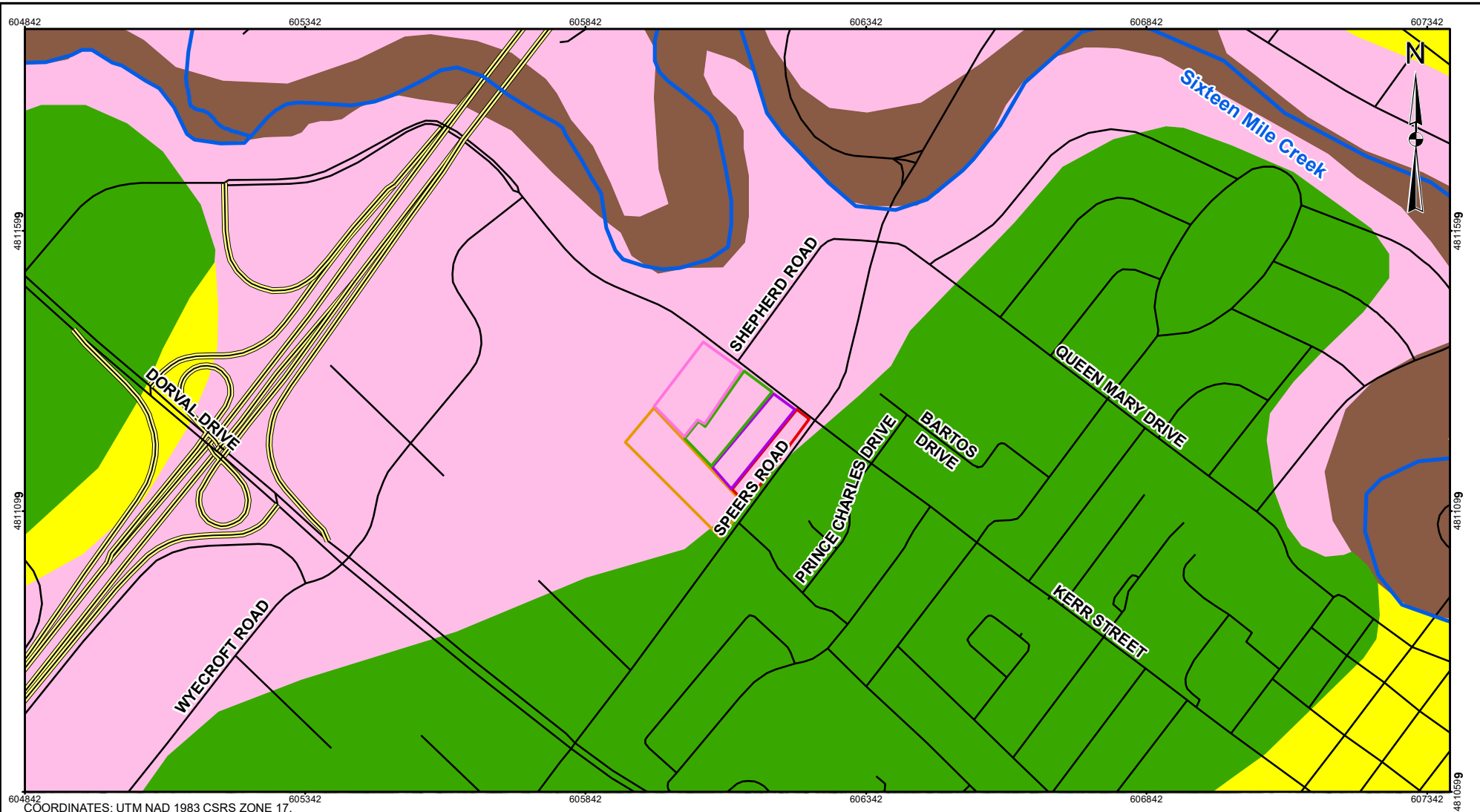
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TITLE **REGIONAL PHYSIOGRAPHY**

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FIGURE 2

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 COORDINATES: UTM NAD 1983 CSRS ZONE 17.

LEGEND

- | | | |
|-----------------|--------------------------|---|
| 131 Speers Road | Watercourse | 3 Paleozoic bedrock |
| 171 Speers Road | Arterial Street | 5d Till |
| 530 Kerr Street | Highway | 9, 9b Coarse-textured glaciolacustrine deposits |
| 550 Kerr Street | Surficial Geology | 19 Modern alluvial deposits |
| 588 Kerr Street | | |

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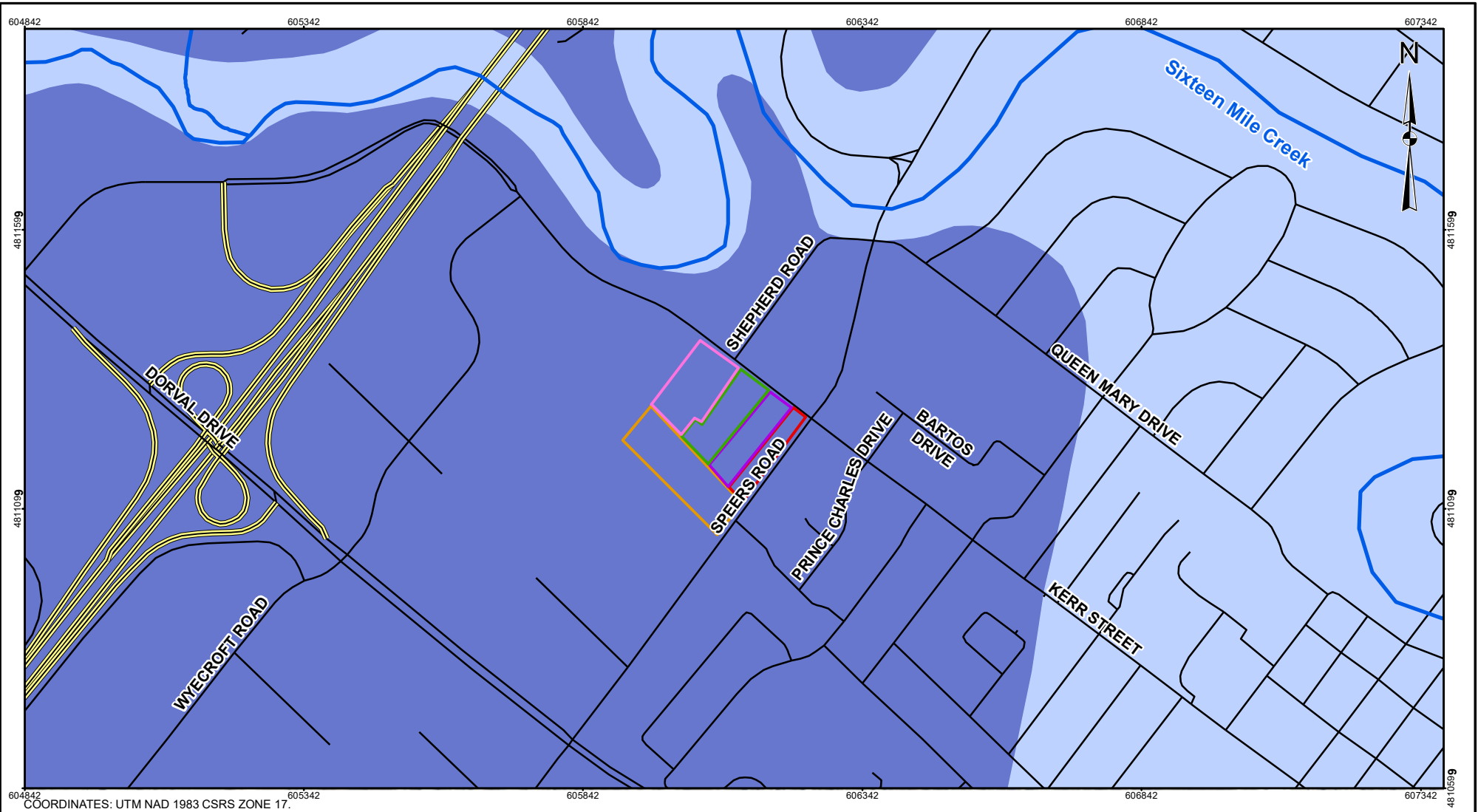
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TITLE **SURFICIAL GEOLOGY**

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FIGURE 3



LEGEND

- | | | |
|-----------------|-----------------|--------------------------|
| 131 Speers Road | Watercourse | Bedrock Formation |
| 171 Speers Road | Arterial Street | Georgian Bay Formation |
| 530 Kerr Street | Highway | Queenston Formation |
| 550 Kerr Street | | |
| 588 Kerr Street | | |

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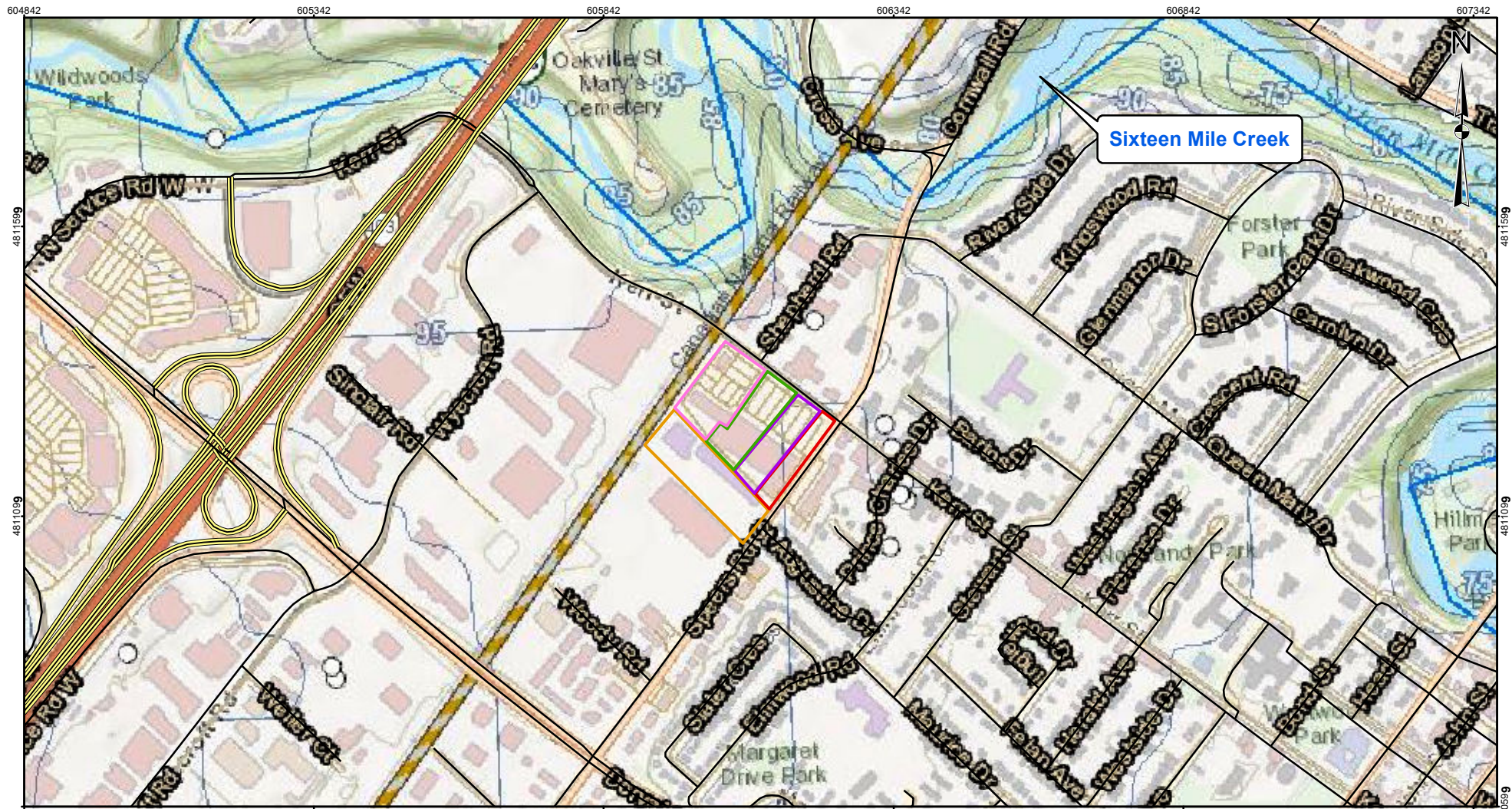
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TITLE **REGIONAL BEDROCK GEOLOGY**

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FIGURE 4



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 COORDINATES: UTM NAD 1983 CSRS ZONE 17.

LEGEND

- Property
- 530 Kerr Street Street
- 131 Speers Road
- 550 Kerr Street
- 171 Speers Road
- 588 Kerr Street
- Arterial Street
- Highway

REFERENCE

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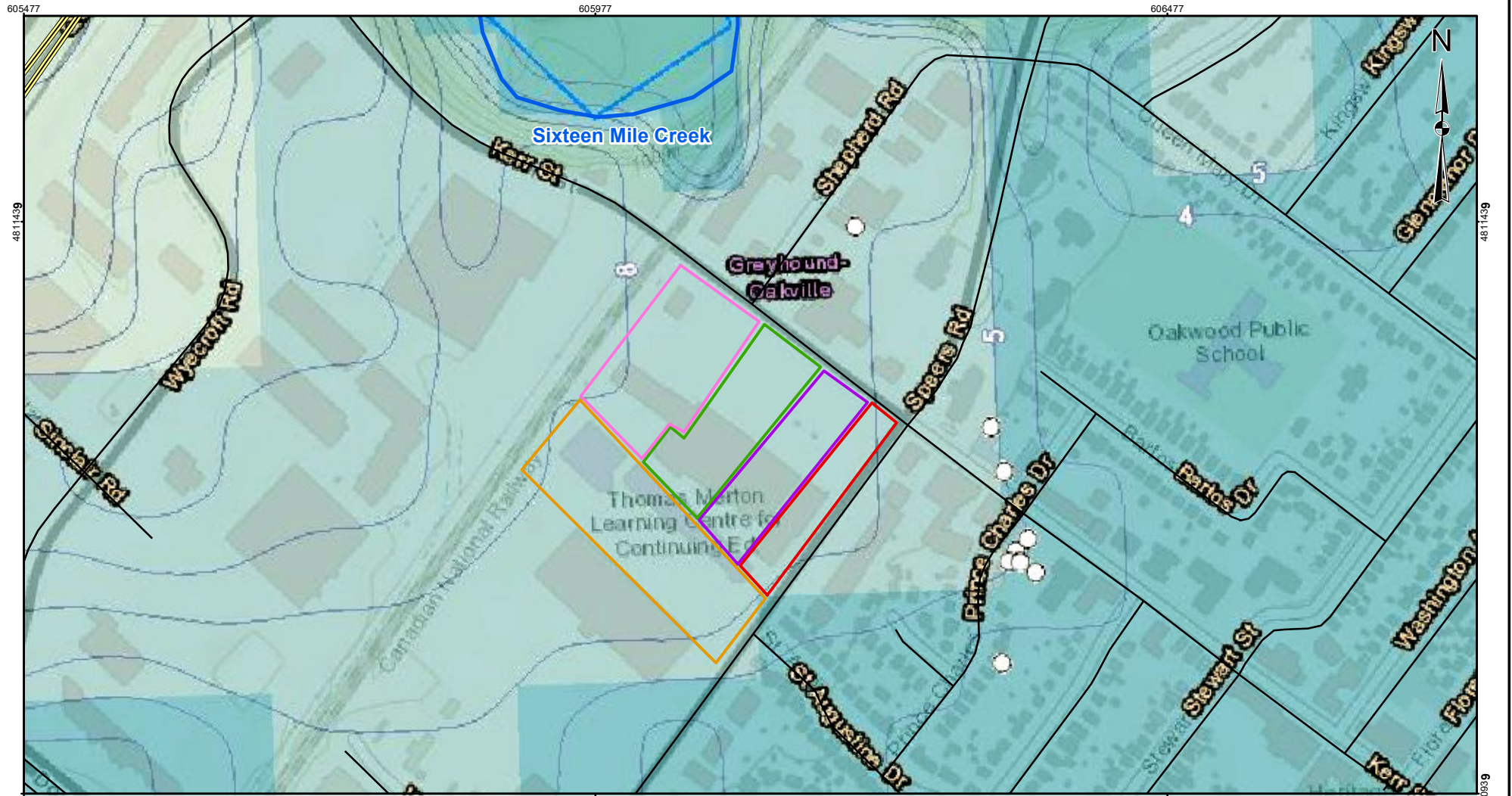


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TITLE **WATER TABLE ELEVATION**

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LEGEND

Property	Watercourse	Depth to Water (m)
131 Speers Road	Street	1 - 5.5
171 Speers Road	Arterial Street	5.5 - 13.9
530 Kerr Street	Highway	13.9 - 24.8
550 Kerr Street		24.8 - 37.7
588 Kerr Street		37.7 - 51.8

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TITLE **DEPTH TO GROUNDWATER**

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FIGURE 6