



January 30, 2018

Michael Boucher
Manager of Planning
Phoenix Homes
18 Bentley Ave.
Ottawa, ON K2E 6T8

Email:
MBoucher@phoenixhomes.ca

**Re: OTT-00234493-A0 Desktop Hydrogeological Study
1208 Old Montreal Road, Ottawa, Ontario**

Dear Mr. Boucher:

1.0 Introduction

EXP Services Inc. (EXP) is pleased to present this letter report outlining the results of the Desktop Hydrogeological Study of the area surrounding the property located at 1208 Old Montreal Road, in Ottawa, Ontario, herein referred to as the Site. The Site has an approximate area of 15 ha, and is bisected by a tributary to Cardinal Creek. EXP understands that Phoenix Homes is proposing to develop the Site with multiple residential units.

2.0 Scope of Work

The scope of work for this Desktop Hydrogeological Study included a review of topographical and geological maps, source-water protection zone mapping, and Ontario Ministry of the Environment and Climate Change (MOECC) Water Well Records. EXP also reviewed existing engineering reports for the Site, prepared by EXP in 2016. These items were reviewed to provide details regarding the local and regional hydrogeological regime, including details on the local aquifers, the bedrock geology, anticipated groundwater flow directions, potential groundwater recharge and/or discharge zones, etc.

3.0 Background Information Review

3.1 Review of Existing Maps

Topographical Maps

The topography of the Site and the surrounding area was reviewed on the City of Ottawa's interactive online mapping application, geoOttawa, as well as the Rideau Valley Conservation Authority (RVCA)'s interactive online mapping application, GeoPortal. Both mapping tools show a relatively level portion of the property, on the north side of the tributary to Cardinal Creek, with an elevation of approximately 85 mASL with steep slopes to the northwest (toward Old Montreal Road) and to the south (toward a tributary of Cardinal Creek). On the south side of the tributary to Cardinal Creek, the Site is relatively flat, with an elevation of approximately 87 mASL. The tributary to Cardinal Creek, which bisects the Site, is located within a deep ravine, with a base elevation of approximately 64 – 72 mASL (southwest to northeast). The elevation of Old Montreal Road fronting the Site is approximately 72 – 76 mASL. The general topography of the area continues to slope gradually downwards in a northwesterly direction, toward Cardinal Creek. The slope steepens in proximity to Cardinal Creek, with an elevation of approximately 46 mASL noted approximately 400 m northwest of the Site.

Paleozoic (Bedrock) Geological Mapping

The bedrock geology of the area was reviewed using the Miscellaneous Release Data (MRD) MRD219 map entitled “*Paleozoic Geology Map of Southern Ontario*”, published by The Ontario Geological Survey, and dated 2007. A review of MRD219 revealed that the bedrock beneath the Site comprises two bedrock formations from the Simcoe Group. The bedrock consists of limestone and dolostone from the Gull River Formation, and limestone, with minor shales from the Bobcaygeon Formation. A bedrock fault was shown beneath the southwestern corner of the Site (beneath the wooded area adjacent to agricultural portion of the Site).

Surficial Geological Mapping

The surficial geology of the area was reviewed using the MRD128 map entitled “*Surficial Geology of Southern Ontario*”, published by The Ontario Geological Survey, and dated 2003. A review of MRD128 revealed that three surficial geological units are present on the Site, including: 1) massive to well laminated, fine-textured glaciomarine deposits of silt and clay, minor sand and gravel; 2) colluvial deposits including boulders, scree, talus, undifferentiated landslide materials; and 3) Paleozoic bedrock.

Physiographic Mapping

The physiography of the area was reviewed using the MRD228 map entitled “*The Physiography of Southern Ontario*”, published by The Ontario Geological Survey, and dated 2007. A review of MRD228 revealed that the Site and the surrounding area is situated within the physiographic region known as the Clay Plains.

3.2 MOECC Water Well Record Review

The MOECC’s online water well mapping tool was used to search for water wells located within a 250 m radius of the center of the northern portion of the Site (i.e., the portion located to the north of the tributary to Cardinal Creek). Using the online mapping tool, EXP identified nine (9) bedrock water wells within the 250 m radius (two well abandonment records were also found). No overburden water wells were identified. A review of the water well records revealed that the depth to bedrock was shown to range from approximately 3 m to 29 m from ground surface, with a geometric mean depth to bedrock of approximately 14.8 m from ground surface. Water found (i.e. water bearing fractures) varied from approximately 19.8 m to 82.9 m from ground surface, with a geometric mean value of approximately 36.5 m from ground surface.

3.3 Rideau Valley Conservation Authority Resources

The RVCA’s interactive online mapping application, GeoPortal was reviewed for regulatory conditions that may apply to the Site. A review of the mapping on GeoPortal revealed that approximately 10 ha of the Site’s total 15 ha size is regulated under O.Reg. 174/06. This regulation, entitled “*Development, Interference with Wetlands and Alterations to Shorelines and Watercourses Regulation*”, requires RVCA approval for any development proposed within the regulated areas.

3.4 Mississippi-Rideau Source Protection Region Hydrogeological Resources

The Mississippi-Rideau Source Protection Region online mapping tool was reviewed to determine if the Site is located within a source-water protection zone, a wellhead protection area (WPA), a significant groundwater recharge area (SGRA), or a highly vulnerable aquifer zone (HVA). Based on our review, the Site is not located in any of these regulated areas.

3.5 Previous Engineering Reports

EXP reviewed several existing engineering reports for discussion of the Site's hydrogeological conditions. The following reports were reviewed:

1. EXP Services Inc. *Preliminary Geotechnical Investigation, Proposed Residential Subdivision, 1154-1208 Old Montreal Road, Ottawa, Ontario*. November 7, 2016.
2. EXP Services Inc. *Phase I Environmental Site Assessment, 1154, 1172, 1176, 1180, and 1208 Old Montreal Road, Ottawa, Ontario*. August 19, 2016.
3. EXP Services Inc. *Phase II Environmental Site Assessment, 1208 Old Montreal Road, Ottawa, Ontario*. September 13, 2016.

A review of Section 4.7 in the report entitled "*Preliminary Geotechnical Investigation, Proposed Residential Subdivision, 1154-1208 Old Montreal Road, Ottawa, Ontario*" revealed that a perched water table was encountered in Boreholes 1, 3 and 7 at a depth of 1.3 m to 2.5 m below the existing ground surface, i.e. Elev. 84.3 m to 81.8 m. The natural groundwater table had not stabilized during the time interval near which observations were made. Based on a review of the natural moisture content of the soil samples, the groundwater table is estimated to be at a depth of 3 m to 4 m below the existing ground surface, i.e. Elev. 83.6 m to 77.5 m.

A review of Section 3.9.2 in the report entitled "*Phase I Environmental Site Assessment, 1154, 1172, 1176, 1180, and 1208 Old Montreal Road, Ottawa, Ontario*" revealed that the local groundwater flow direction was anticipated to be west towards Cardinal Creek, located 300 m from the Site.

A review of Section 5.2 in the report entitled "*Phase II Environmental Site Assessment, 1208 Old Montreal Road, Ottawa, Ontario*" revealed that groundwater was encountered at a depth of 1.34 m to 5.90 m below the ground surface in environmental monitoring wells installed on the northern portion of the Site. Based on the water levels measured on September 8, 2016, the principal direction of groundwater flow in the overburden materials was to the northwest.

4.0 Hydrogeological Setting

Based on the information reviewed during the completion of this Desktop Hydrogeological Study, it is anticipated that the shallow overburden groundwater beneath the northern and southern portions of the Site likely flows towards the northwest, while the shallow overburden groundwater beneath the area middle portion of the site likely flows toward the ravine containing the tributary to Cardinal Creek, which bisects the Site. The shallow/intermediate bedrock groundwater flow direction is anticipated to be northwest toward the Ottawa River, located approximately 1.2 km northwest of the Site.

Given the higher elevation of the Site compared to properties to the north, it is possible that the Site acts as a shallow groundwater recharge zone. However, as discussed above, the Site is not considered to be an SGRA. The fine-grained nature of the overburden materials present at the Site limits the surface water infiltration potential, and hence limits groundwater recharge.

5.0 References

- Armstrong, D.K. and Dodge, J.E.P. 2007. *Paleozoic Geology Map of Southern Ontario*; Ontario Geological Survey, Miscellaneous Release--Data 219.
- Chapman, L.J. and Putnam, D.F. 2007. *The Physiography of Southern Ontario*; Ontario Geological Survey, Miscellaneous Release--Data 228.

- The Ontario Geological Survey. 2003. *Surficial Geology of Southern Ontario*.

6.0 Conclusions and Closure

EXP conducted a Desktop Hydrogeological Study for the subject site, which involved the review of various online mapping tools, MOECC water well records, and previous engineering reports. Beneath any fill, the Site is anticipated to be underlain by fine-grained overburden deposits up to 20 m thick (in locations), which are in turn underlain by Paleozoic bedrock consisting of limestone and dolostone, and/or limestone with minor shales.

A review of MOECC water well records revealed nine (9) bedrock water wells within the 250 m radius (two well abandonment records were also found). It is not known if these water wells are still in use. The water well records also revealed that the depth to bedrock was shown to range from approximately 3 m to 29 m from ground surface, while water found (i.e. water bearing fractures) varied from approximately 19.8 m to 82.9 m from ground surface.

With respect to groundwater flow directions, it is anticipated that the shallow overburden groundwater beneath the northern and southern portions of the Site likely flows towards the northwest, while the shallow overburden groundwater beneath the area middle portion of the site likely flows toward the ravine containing the tributary to Cardinal Creek, which bisects the Site. The shallow/intermediate bedrock groundwater flow direction is anticipated to be northwest toward the Ottawa River, located approximately 1.2 km northwest of the Site.

A review of the RVCA's GeoPortal indicated that a large portion of the Site is regulated under Section 28 of O.Reg. 174/06, which means that any development proposed within the regulated areas will require RVCA approval.

We trust that this letter report meets your needs. Should you have any questions, please do not hesitate to contact this office.

Yours truly,
EXP Services Inc.



Robert Renaud, M.Sc., P.Geol.
Senior Geoscientist
Earth & Environment

RR/MGM:kmr



Mark McCalla, P.Geol.
Senior Geoscientist
Earth & Environment

