REPORT

Water Report Level 2

Lafarge Goodwood Pit Extension

Submitted to:

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1.0 INTRODUCTION

Golder Associates Ltd. (Golder) was retained by Lafarge Canada Inc. (Lafarge) to prepare a Water Report Level 2 in support of Class A Pit Below Water aggregate licensing application for the proposed Goodwood Pit Extension (the Site). The Site is located at 4900 4th Concession Road in the Township of Uxbridge, Regional Municipality of Durham (Figure 1). The Site is located immediately north of the existing Lafarge Goodwood Pit and is intended to be an extension of that active operation.

The objectives of this study are to 1) characterize the existing hydrogeological and hydrological conditions in the vicinity of the Site; and 2) assess the potential impacts, if any, of the proposed below water extraction on groundwater and surface water resources.

The Study considers three Site conditions:

1) Existing Scenario;

2) Operational Scenario; and

3) Rehabilitated Scenario.

1.1 Policy Considerations

This Study has been prepared to address the requirements of:

- Aggregate Resources of Ontario Standards: A compilation of the four standards adopted by Ontario Regulation 244/97 under the Aggregate Resources Act (August 2020). Pertinent considerations for this report include:
  - A description of the physical setting including local geology, hydrogeology, and surface water systems;
  - “Maximum predicted water table”;
  - Potential effects of the operation on any ground water and surface water features located within the zone of influence, including but not limited to: water wells; springs; aquifers; and surface water; and
  - Monitoring plans.
- The Growth Plan for the Greater Gold Horseshoe (2017);
- Lake Simcoe Protection Plan (2009);
- South Georgian Bay Lake Simcoe Source Protection Plan (Approved 2015, Amended 2018);
- The Provincial Policy Statement (2014);
- Township of Uxbridge Official Plan (Office Consolidation January 2014);
- Durham Regional Official Plan (Consolidation May 2017); and
- Oak Ridges Moraine Conservation Plan (2002).

Key hydrogeologic/hydrologic considerations set out by the above policies include:

- Water resources will be protected, maintained, and, where applicable, enhanced and there will be no unacceptable impacts;
- Identify an appropriate monitoring program to protect water resources;
- Proposed contingency and mitigative measures that will be implemented if unforeseen impacts occur;
- Minimize potential negative impacts, including cross-subwatershed impacts, and identify surface water and groundwater features;
- Ensure municipal drinking water supply and designated vulnerable areas are protected;
- Protect vulnerable surface water and groundwater sensitive features and their hydrogeologic/hydrologic functions;
- Maintain linkages and related functions between surface water features and groundwater features;
- Promote efficient and sustainable use of water resources, including practices for water conservation sustaining water quality;
- Describe how the connectivity between key hydrogeologic/hydrologic features will be maintained before, during and after extraction;
- Describe how private and agricultural water supplies will be protected;
-
- Demonstrate no negative impact to groundwater recharge and discharge;
- Describe measures to protect water resources from contamination from on-Site equipment; and
- Ensure there are no adverse thermal impacts to sensitive nearby water features.

2.0 PROPOSED DEVELOPMENT

A brief overview of the Operations and Rehabilitated Scenarios is provided below. are included in Appendix A.

2.1 Operational Scenario

The proposed licence area is approximately 17.9 hectares (ha) with an extraction area limit of 15.4 ha (Figure 2). Approximately 5.7 ha will be below water. Setbacks are as follows: 15 m along the north boundary, a 30 m setback along the eastern boundary, and no setback along the south and west boundary where the Site is adjacent to the existing Goodwood Pit. The pit lake depth will reach a minimum elevation of approximately 310 masl, corresponding to roughly 38 m to 32 m below current ground surface.

Annual tonnage from the Goodwood Extension will not exceed the current limit of 1,177,000 tonnes per year at the existing Goodwood Pit. Extraction will begin in the Phase 1 area to the west and progress easterly to Phase 2. Operations will be serviced by loaders, a screening plant, and a portable crushing plant. Future extraction of aggregate below the water table may utilize a dragline method. Extracted material would be temporarily stockpiled near the face of the extraction with pore water allowed to drain back into the subsurface.

The Site Operations will not require any pumping or active dewatering.

No fuel will be stored on-Site.

2.2 Rehabilitated Scenario

The proposed Rehabilitated Scenario will consist of a 5.7 ha centrally located pond with 3:1 re-vegetated side slopes reaching the Site setbacks. The Site will be separated from the original (i.e. existing) Goodwood Pit via a small topographic divide along its southern perimeter. The future pond water elevation is estimated to be approximately 321 to 322 metres above sea level (masl), as described further below.

3.0 PHYSICAL SETTING

The following subsections provide a general overview of the Site and surrounds physical setting under the Existing Scenario.

3.1 Climate

The Site is located approximately 22 kilometres (km) west of the Environment Canada (EC) Port Perry climate station. The Port Perry period of record spans 21 years (1984 – 2005) and is a reasonably proximal dataset to characterize average climatological conditions in the vicinity of the Site.

Based on the Port Perry station data, average annual precipitation is 874 millimetres per year (mm/yr) and the average annual temperature is 6 degrees Celsius. Based on Site land use, the evapotranspiration per EC data is 558 mm/yr with a resulting surplus of 316 mm/yr.

3.2 Existing Land Use

Site land use is largely cropland with the approximate eastern third being used as an equestrian facility. Several barn structures are located centrally within the Site. The Site perimeter and a minor portion of its interior is tree plantation.

North of the Site lies the Canadian National Railway (CNR) corridor; beyond that are large estate properties or farmland on Wagg Road (Figure 1). South and west of the Site is the existing Lafarge Goodwood Pit. Several privately owned residential properties are located beyond the southeast corner of the Site on the west side of Concession Road 4 and immediately east of Concession Road 4. Part Lot 20, at the southeast corner of Wagg Road and Concession Road 4, is licensed by S.A.S.E. Aggregates for a Class A Pit Above Water aggregate extraction.

3.3 Topography and Drainage

The Site lies just north of the topographic crest of the Oak Ridges Moraine (ORM), a major physiographic landform in the region (Figure 1). A ground elevation high of approximately 348 masl exists in the southwest corner of the Site whereas a low of approximately 342 masl occurs in the northeast portion of the Site (Figure 2).

There are no permanent surface water features on-Site. According to the property tenant, who has occupied the land since 2001, flowing surface water (i.e. runoff) is typically observed only during the spring melt. During this period, the runoff either: 1) ponds within localized depressions and infiltrates; or 2) exits the Site via topographic lows at the north, east and south of the Site (Figure 2). Additional details regarding local drainage patterns are described Section 5 Water Budget.

Regionally, the Site is located within the Pefferlaw River subwatershed, which itself lies within the Lake Simcoe watershed. The only naturally occurring surface water features mapped within 1 km of the Site are two small

wetland areas located to the northeast along the rail corridor (described herein as “Wetland 1” and Wetland 2”) and a third wetland to the northwest (“Wetland 3”) (Figure 1). None of these wetlands have been evaluated as Provincially Significant. Previous studies have indicated that Wetlands 1 and 2 are perched above the water table (Harden, 2014), a conclusion that aligns with our assessment of aquifer groundwater levels in the area. The same is likely true for Wetland 3, given that proximal well records (MECP, 20211) list water table depths greater than 20 m below ground surface in this area. Based on our review of local drainage patterns, Wetlands 1 and 2 have no hydrologic relationship to the Site. However, Wetland 3 has some relevance to the Study as described later in Section 5 Water Budget.

3.4 Geology and Hydrostratigraphy

The Site aggregate resource is located within the Oak Ridges Moraine Aquifer Complex (ORAC). The ORAC is generally comprised of sands and gravels with localized deposits of finer grained materials. Regional studies suggest that the ORAC is over 50 m thick in this area (Earthfx, 2006). The ORAC is underlain by the Newmarket Till, a thick and regionally extensive aquitard. Figure 3 provides a geologic / hydrostratigraphic cross-section based on Site borehole logs and Ministry of Environment, Conservation and Parks (MECP) Water Well Information System (WWIS) database well records (MECP, 2021[1]).

3.5 Regional Recharge and Groundwater Flow

Regional groundwater modelling undertaken for the Regional Municipality of Durham suggests that recharge rates in the vicinity of the Site are on the order of 200 mm/yr (Earthfx, 2010).

Based on the same study, the Site is inferred to be just downgradient of a regional groundwater divide within the ORAC, with groundwater flowing in a generally northwards direction through the Site at groundwater elevations in the +/- 320 masl range (Earthfx, 2010).

3.6 Water Users

The MECP WWIS indicates that there are 31 water wells within 500 m of the Site (Figure 4). The wells are drilled to depths ranging from 28 mbgs to 57 mbgs, with the exception of one observation well which has a depth of 9 mbgs. The majority of the wells are completed within sand/gravel units which are presumed to be part of the ORAC. The primary use for most wells is classed as “Domestic” (27 wells); the remaining wells are “Livestock” (1 well), “Observation Wells” (1 well), and “Unknown” (2 wells). A domestic supply well, Well ID 1909612, is located on the property.

According the MECP Permit To Take Water database (MECP, 2021[2]), the closest large water user in the area is Wyndance Golf Club (ClubLink Corporation), with the water source mapped about 1.6 km southeast of the Site. The Wyndance Golf Club has a permit (2872-A8YKPF) to withdraw up to 4,900 m^3/d of groundwater for irrigation and communal supply purposes.

3.7 Source Water Protection and Regulated Area Considerations

The Site’s location within the South Georgian Bay Lake Simcoe Source Protection Region is examined as part of this Study. Using the Lake Simcoe Region Conservation Authority (LSRCA) interactive mapping tool (accessed online August 2019), the Site’s address was input into the Vulnerable Area Search query with the following result:

> *“This property is not in a vulnerable area. Policies found in the South Georgian Bay Lake Simcoe (SGBLS) Source Protection Plan do not apply.”*

The closest source water protection vulnerable area is a community of Uxbridge municipal Wellhead Protection Area (WHPA), which lies over 6 km northeast of the Site and is thus not a concern in this Study.

In addition, the Site lies external to any LSRCA Regulated Area drainages as governed under O. Reg. 179/06.

4.0 FIELD PROGRAM

A Site field program was initiated in 2018 with the objectives of characterizing hydrogeologic conditions at the Site, including: geologic units, water levels, hydraulic conductivity and water quality. The following subsections describe the methodology and results of the field program in detail.

4.1 Borehole Drilling

The Site monitoring network includes three monitoring wells (MW18-01, MW18-02, and MW18-03) as shown on Figure 2. Note that the on-Site domestic well cannot be readily monitored as the well is shut-in with live electrical. A monitoring well summary is provided in Table 1; detailed borehole logs are provided in Appendix B. The following is noted:

Well Location. The monitoring wells are strategically placed near the Site corners to establish Site-wide water level patterns. The well locations and elevations were surveyed by a professional land surveyor.

Construction. The wells were constructed in April 2018. Boreholes were advanced by Choice Sonic Drilling using a SDC 550 track mounted Sonic drill rig. Core barrel dimensions were 165 mm outer diameter / 114 mm inner diameter. Borehole depths ranged from 36.9 metres below ground surface (mbgs) to 38.1 mbgs. The boreholes were completed as monitoring wells using 50.8 mm diameter Schedule 40 PVC pipe with approximately 6.1 m lengths of 10-slot screens positioned within the ORAC / saturated target resource. The pipe stick ups were enclosed within a protective steel casing cemented into the ground and locked. The wells were developed upon installation.

Geology and Hydrostratigraphy. A cross-section illustrating Site geology is provided in Figure 3. In general, the subsurface conditions from hole to hole primarily consists of sand to sand and gravel with the exception of shallow (<3 mbgs) topsoil samples, some of which are observed to contain silty or clayey components. The borehole logs support the conceptual hydrostratigraphy of an unconfined sand and gravel aquifer (ORAC).

4.2 Water Level Measurements

Groundwater level monitoring at the Site began in May 2018 with monthly monitoring events occurring thereafter. All water level monitoring is conducted manually using a water level probe. Water levels are listed in Table 1 whereas groundwater hydrographs are illustrated on Figure 5. Lastly, an inferred high water table map for the unconfined sand and gravel aquifer is provided in Figure 6. The following observations are noted:

- Depth to water ranges from 23.65 mbgs to 26.77 mbgs depending on the well and the time of year. (Table 1). Correspondingly, groundwater elevations range from 319.96 masl to 322.25 masl with a Site-wide average of approximately 321 masl. The groundwater elevations are approximately 11 m to 12 m above the proposed final extraction elevation of 310 masl.
- Groundwater levels at each well fluctuate between approximately +/- 0.4 m during the period of record (Figure 5). Water levels remain fairly stable during May 2018 to March 2019 whereupon they somewhat steadily rise into the summer of 2020 with the highest recorded water levels occurring in July - August 2020. Thereafter water levels being to decline for the remainder of 2020 and into 2021 and 2022. This water table rise/fall

trend, spanning the course of several years, is perhaps less common than the shorter annual rise and fall often observed in other areas of Ontario. It is speculated that this behaviour is, at least in part, attributable to the relatively thick unsaturated zone providing a moderated response to surficial infiltration.

- An inferred high-water table map is developed using water levels measured during the July 31, 2020 event (Figure 6). Consistent with other monitoring events, the on-Site flow pattern during this period is from roughly south to north / northeast. The highest water level occurs to the southeast at MW18-02 (322.25 masl) and the lowest water level occurs to the northeast at MW18-01 (320.97 masl). Under these circumstances the flow gradient across the Site may reach up to 4E-3 m/m, or 0.4%.

Table 1: Monitoring Well Summary and Groundwater Levels

Well ID	MW18-01		MW18-02		MW18-03	
East83/North83	645,890	4,879,758	645,868	4,879,445	645,315	4,879,385
Ground Elev (masl)	343.74		346.43		346.63	
Pipe Elev (masl)	344.62		347.34		347.47	
Well Depth (mbgs)	36.88		38.10		36.88	
Date	**Water Level (mbgs)**	**Groundwater Elev (masl)**	**Water Level (mbgs)**	**Groundwater Elev (masl)**	**Water Level (mbgs)**	**Groundwater Elev (masl)**
22-May-18	24.44	320.18	25.89	321.45	26.12	321.36
27-Jun-18	24.39	320.23	25.85	321.49	26.10	321.38
17-Jul-18	24.41	320.21	25.86	321.48	26.13	321.34
10-Aug-18	24.42	320.20	25.85	321.49	26.12	321.35
17-Sep-18	24.38	320.24	25.79	321.55	26.07	321.41
22-Oct-18	24.44	320.19	25.84	321.50	26.14	321.33
29-Nov-18	24.48	320.14	25.88	321.46	26.16	321.31
20-Dec-18	24.41	320.22	25.83	321.51	26.07	321.40
07-Feb-19	24.43	320.20	25.84	321.50	26.12	321.36
25-Mar-19	24.40	320.22	25.86	321.48	26.17	321.31
23-Apr-19	24.26	320.36	25.73	321.61	25.99	321.49
14-May-19	24.28	320.34	25.73	321.61	25.98	321.50
10-Jun-19	24.15	320.47	25.61	321.73	25.85	321.62
18-Jul-19	24.14	320.48	25.57	321.77	25.86	321.61
16-Aug-19	24.03	320.59	25.46	321.89	25.76	321.72
13-Sep-19	24.02	320.6	25.43	321.91	25.73	321.74

Well ID	MW18-01		MW18-02		MW18-03	
16-Oct-19	23.95	320.67	25.38	321.96	25.62	321.85
28-Nov-19	24.10	320.524	25.48	321.86	25.78	321.694
23-Dec-19	23.99	320.635	25.39	321.96	25.65	321.82
10-Jan-20	24.02	320.6	25.42	321.92	25.69	321.78
26-Feb-20	23.88	320.74	25.28	322.06	25.58	321.89
17-Mar-20	23.87	320.75	25.26	322.08	25.52	321.95
31-Jul-20	23.65	320.97	25.09	322.25	25.42	322.05
26-Aug-20	23.66	320.96	25.09	322.25	25.42	322.06
29-Sep-20	23.69	320.94	25.12	322.22	25.42	322.05
29-Oct-20	23.75	320.88	25.19	322.15	25.47	322.00
26-Nov-20	23.74	320.88	25.19	322.15	25.45	322.03
23-Dec-20	23.81	320.81	25.24	322.10	25.56	321.91
26-Feb-21	23.94	320.68	25.38	321.97	25.73	321.74
31-Mar-21	23.96	320.66	25.40	321.94	25.68	321.79
30-Apr-21	24.00	320.624	25.45	321.90	25.71	321.757
17-May-21	24.036	320.584	25.53	321.81	25.79	321.68
25-Jun-21	24.09	320.53	25.53	321.81	25.91	321.56
31-Aug-21	24.18	320.44	25.63	321.71	26.1	321.37
27-Sep-21	24.2	320.42	25.6	321.74	26.1	321.37
28-Oct-21	24.22	320.4	25.66	321.68	26.16	321.31
29-Nov-21	24.36	320.26	25.795	321.55	26.16	321.31
22-Dec-21	24.25	320.37	25.8	321.54	26.1	321.37
29-Sep-22	24.59	320.03	26.03	321.31	26.77	320.7
26-Oct-22	24.57	320.05	26.05	321.29	26.38	321.09
29-Nov-22	24.67	319.96	26.13	321.22	26.52	320.95
16-Dec-22	24.64	319.98	26.12	321.22	26.45	321.02

4.3 Hydraulic Conductivity

Hydraulic conductivity is a parameter that quantifies the ease with which water may travel through soil. The hydraulic conductivity of coarser-grained material, such as that found on-Site, may be estimated from laboratory derived grain size distribution curves using the commonly employed Hazen Method as follows (Fetter, 2001):

$$K = C\ (d_{10})^2$$

Where:

- K is hydraulic conductivity in m/s;
- C is an empirical coefficient, which takes a value between 0.8 and 1.2 for medium to coarse sands (1.0 is used herein); and
- d_{10} is the diameter of the 10th percentile grain size of the material (effective grain size) in cm.

Grain size data for Site soils are obtained from a preceding resource evaluation study (Lafarge, 2017) and are supplied in Appendix C. A total of 25 below-water samples are assessed to provide an understanding of the saturated hydraulic conductivity of the ORAC at the Site.

In summary, the Hazen Method calculations yielded aquifer material hydraulic conductivities ranging from 6E-5 m/s to 1E-3 m/s with a geometric mean of 2E-4 m/s.

Assuming a flow gradient of 4E-3 m/m (see prior section), an effective porosity of 0.25, and a hydraulic conductivity range of 6E-5 m/s to 1E-3 m/s, the groundwater velocity at the Site is estimated to range from 9.6E-7 m/s (0.08 m/day) to 1.6E-5 m/s (1.4 m/day).

4.4 Water Quality

Baseline groundwater quality conditions were evaluated by taking water samples from the three monitoring wells and the on-Site domestic well (“PW”) during September and October 2018. Follow up sampling events occurred during April 2019 and October 2020. The samples were collected using dedicated Waterra Model D-25 inertial pumps and 16-millimetre (5/8 inch) inside diameter polyethylene tubing. Prior to sampling, the wells were purged of a minimum of three well volumes and allowed to recover to their approximate static water level at the time of sampling. The samples were collected in pre-supplied laboratory bottles, placed in coolers and delivered within twenty-four hours to an accredited laboratory.

The groundwater samples were analysed for the following parameters:

- Inorganic water quality parameters including metals;
- Microbiology / bacteria;
- Polycyclic Aromatic Hydrocarbons (PAHs);
- Volatile Organic Compounds (VOCs); and
- Petroleum hydrocarbons (PHC) (F1 – F4).

The water quality analysis results are provided in Appendix D. Parameter concentrations were compared to “Table 2: Full Depth Generic Site Condition Standards [SCS] in a Potable Ground Water Condition” from the

Ministry of Environment, Conservation and Parks (MECP) *Soil, ground water and sediment standards for use under Part XV.1 of the Environmental Protection Act*, dated July 1, 2011. The following is noted:

- None of the inorganic parameters including metals were detected at concentrations greater than the Table 2 SCS criteria.
- Chlorides were found in all wells, suggesting impacts from road salting.
- Nitrate was found in MW18-03, suggesting impacts from fertilizer application to farm fields.
- Hardness as ($CaC0_3$) was greater than 200 mg/L, indicating hard water.
- Sodium was found to be above the Ontario Drinking Water Standard (ODWS) guideline of 20 mg/L for people on sodium restricted diets at MW18-01; however, sodium at the domestic well was less than 20 mg/L.
- Total dissolved solids (TDS) was found to be above the ODWS aesthetic objective of 500 mg/L at MW18-01.
- E. Coli bacteria was present in MW18-01 and total coliforms were found in MW18-03. The presence of bacteria in these wells may be as a result of fertilizer application or faecal waste from farm animals.
- PAHs were not detected in the two wells tested (MW18-02 and MW18-03).
- VOCs were not detected in the four wells.
- PHCs (F3 fraction) were found at MW18-01 in September 2018 at a concentration of 2,400 ug/L, notably above the Table 2 SCS criteria of 500 ug/L. Additionally, PHCs (F2 and F3) were detected at MW18-03 in October 2018 but at concentrations below Table 2 SCS criteria. The location of the PHC detects could suggest that the railway corridor is a potential source. We further note that the on-Site domestic well and upgradient well MW18-02 did not have PHCs. The results of subsequent PHC-focused sampling events are summarized as follows:
  - April 2019: Sampling at all wells did not detect any PHCs except for MW18-03 which had PHC F3 at a concentration below Table 2 SCS.
  - October 2020: Well MW18-03 could not be sampled as a result of the waterra tubing snapping in the well. Sampling at all the remaining wells did not detect any PHCs except for MW18-01 which had a PHC F3 concentration at the Table 2 SCS limit of 500 ug/L.
  - May 2021: Sampling at all wells did not detect any PHCs.

  The sampling regime to-date generally suggests that the presence of PHC has been declining at tested wells and, as of the most recent sampling event, is no longer detected. As such, the historic presence of PHC is not considered a factor in this licence application. Nonetheless, we recommend continued confirmatory water quality sampling during operations (Section 8).

5.0 WATER BUDGET

A Site water budget was conducted to estimate the average annual water balance for Existing and Rehabilitated Scenarios. The Operational Scenario was not explicitly considered because the range of its potential effects are captured between the Existing and Rehabilitated Scenario results.

5.1 Approach

The water budget employs Environment Canada procedures (Johnstone and Louie, 1983) and is governed by the following generalized formula:

Rainfall + Snowmelt – Evapotranspiration – Change in Soil Storage = Surplus

The Environment Canada Port Perry station data (1984 – 2005) provides monthly water budget summaries used to infer average annual climatic conditions at the Site. These water budget summaries contain monthly average precipitation, evapotranspiration and surplus values (in mm) for a range of water holding capacities (WHC). For temperate regions, the change in soil storage is relatively stable year-round and represents a minor component of the annualized water budget; as such, it is ignored in this analysis.

The Site's average annual precipitation (rainfall + snowmelt) totals approximately 874 mm/yr. Whereas precipitation values are independent of the Site's physical characteristics, evapotranspiration – and thus surplus – depends on the selected WHC for a given catchment. WHCs are specific to the soil type and land use and may be applied using Table 3.1 of the *Ministry of Environment (MOE) Stormwater Management Planning and Design Manual* (MOE, 2003). The following WHCs are implemented at the Site:

- 150 mm for moderately rooted crops and pasture areas;
- 250 mm for forested areas;
- 100 mm for the pit side;
- Limited evaporation for impermeable surfaces (Surplus = 90% Precipitation); and
- 0 mm for pond water (Potential ET = Actual ET).

Our approach further separates surplus into infiltration and runoff. Infiltration estimates for each land use may be obtained using the infiltration factors shown in Table 3.1 of MOE, 2003. Current and future land use at the Site is identified as either Crop Land (the farm fields), Pasture (sloped and flat), Forest (natural and rehabilitated), Impermeable (rooftops) and Pond Area (flooded extraction area below groundwater table). The infiltration factor for each land use is estimated as the sum of the cover, soil type, and topography factors. Infiltration factors represent the proportion of surplus becoming infiltration with the remainder of the surplus going to runoff. Since the Rehabilitated Site is internally draining (i.e. no discharge from pit bottom to surface), any runoff within the berm area will eventually become infiltration as it reports to the pit. Any infiltration that reaches the saturated groundwater system is assumed to join the regional groundwater system. Infiltration factors applied in this analysis are shown in Table 2.

Table 2: Land Use Water Budget Input Data

VEGETATION COVER	Water Holding Capacity (mm)	Infiltration Factor			
		COVER FACTOR	SOIL TYPE COVER	TOPOGRAPHY FACTOR	FINAL INFILTRATION FACTOR
Crop Land	150	0.1	0.4	0.2	***0.7***
Pasture	150	0.15	0.4	0.2	***0.75***

VEGETATION COVER	Water Holding Capacity (mm)	Infiltration Factor			
		COVER FACTOR	SOIL TYPE COVER	TOPOGRAPHY FACTOR	FINAL INFILTRATION FACTOR
Forest and Rehab, Vegetation	250	0.2	0.4	0.2	***0.8***
Rooftops/ Impermeable surfaces	3	0	0	0	***0***
Rehab Pit Sidewall	100	0.1	0.4	0.1	***0.6***
Pit Pond	AET = PET	-	-	-	***1***

5.2 Catchment Areas

Site catchment (i.e. drainage) areas are delineated for Existing and Rehabilitated Scenarios based on topographic mapping provided by MHBC (Appendix A).

5.2.1 Existing Scenario

Under the Existing Scenario the Site is divided into three catchments based on the direction of natural drainage (Figure 7):

- Catchment 101 (6.3 ha) draining south towards the existing Lafarge Goodwood pit. The existing pit floor appears to have no natural outlet, suggesting it drains internally to infiltration with no external runoff;
- Catchment 102 (2.8 ha) draining north across a low point along the rail line, and from there draining northwest to Wetland 3 approximately 600 m northwest of the Site; and
- Catchment 103 (8.8 ha) draining to the east via sheet flow to a roadside ditch, across Concession Road 4 via culvert and then infiltrating within adjacent farm field.

The Existing scenario includes a combination of Pasture, Cropland, and Impermeable areas (i.e. rooftops, roads). Pertinent characteristics of the Existing Scenario catchment are summarized in Table 3.

Table 3: Existing Scenario Land Use

CATCHMENT	Cropland (ha)	Pasture (ha)	Forest and Rehab. Vegetation (ha)	Rooftops and Impermeable Surfaces (ha)	Rehab Pit Sidewall (ha)	Pond, Wetland, and Flooded Quarry (ha)	Total (ha)
101 - Existing South	5.4	0.0	0.8	0.0	0.0	0.0	*6.3*
102 - Existing North	0.8	1.7	0.2	0.1	0.0	0.0	*2.8*
103 - Existing East	0.0	7.2	1.1	0.5	0.0	0.0	*8.8*
Total	***6.2***	***8.9***	***2.1***	***0.6***	***0.0***	***0.0***	***17.9***

5.2.2 Rehabilitated Scenario

The Rehabilitated Scenario contemplates a 5.7 ha pit pond with surrounding rehabilitated pit slopes (9.7 ha), assumed to be pasture-type land with long grasses, draining towards the pond (Figure 8). Setback areas outside of the extraction boundary which used to drain to the north and east (2.1 ha) would continue to drain externally to the north and east. The southerly setback area which used to drain south to the adjacent pit (0.5 ha) would be cut off from the adjacent pit and would instead drain to the pond. In the Rehabilitated Scenario all surplus within the former extraction area is considered infiltration – whether that occurs within the rehabilitated sloping or into the pond itself (the pond being a manifestation of the groundwater table at surface). Pertinent characteristics of the Rehabilitated Scenario catchment are summarized in Table 4.

Table 4: Rehabilitated Scenario Land Use

CATCHMENT	Cropland (ha)	Pasture (ha)	Forest and Rehab. Vegetation (ha)	Rooftops and Impermeable Surfaces (ha)	Rehab Pit Sidewall (ha)	Pond, Wetland, and Flooded Quarry (ha)	Total (ha)
201 - Buffer South	0.0	0.4	0.1	0.0	0.0	0.0	*0.5*
202 - Buffer North	0.0	0.4	0.1	0.0	0.0	0.0	*0.5*
203 - Buffer East	0.0	1.5	0.1	0.0	0.0	0.0	*1.6*
204 - Rehab Pit	0.0	0.0	0.0	0.0	9.7	5.7	*15.4*
Total	***0.0***	***2.2***	***0.3***	***0.0***	***9.7***	***5.7***	***17.9***

5.3 Results

5.3.1 Existing Scenario

The water budget results for the Existing Scenario catchments are listed in Table 5 in both mm/yr and m^3/yr. As mentioned previously, the Port Perry climate station records an average annual precipitation of 874 mm/yr (156,300 m^3/yr). Under the Existing Scenario, the overall Site water budget results in an area-weighted average evapotranspiration rate of 558 mm/yr (99,800 m^3/yr) and corresponding surplus of 316 mm/yr (56,600 m^3/yr) as determined based on data obtained from the Environment Canada dataset and land use information. Based on the catchment infiltration factors, an infiltration rate of 214 mm/yr (38,300 m^3/yr) is estimated with a corresponding runoff of 102 mm/yr (18,300 m^3/yr).

On an individual catchment scale, the runoff for Catchment 101 (5,400 m^3/yr), Catchment 102 (2,600 m^3/yr) and Catchment 103 (10,300 m^3/yr) are notable in that these are flow exiting the Site. Catchment 101 contributes runoff to the exiting Lafarge Goodwood pit, Catchment 102 contributes runoff to (ultimately) Wetland 3, and Catchment 103 contributes runoff to the agricultural field east of the Site adjacent to Concession Road 4.

Table 5: Existing Scenario Results

CATCHMENT	TOTAL AREA	PRECIPITATION		EVAPO-TRANSPIRATION		SURPLUS		INFILTRATION		RUNOFF	
	(HA)	MM/YR	M^3/YR	MM/YR	M^3/YR	MM/YR	M^3/YR	MM/YR	M^3/YR	MM/YR	M^3/YR
101 - Existing South	6.3	874	54,800	574	36,000	300	18,800	214	13,400	86	5,400
102 - Existing North	2.8	874	24,300	562	15,600	312	8,700	218	6,100	94	2,600
103 - Existing East	8.8	874	77,300	545	48,200	329	29,100	213	18,800	116	10,300
TOTAL	***17.9***	***874***	***156300***	***558***	***99,800***	***316***	***56,600***	***214***	***38,300***	***102***	***18,300***

5.3.2 Rehabilitated Scenario

The water budget results for the Rehabilitated Scenario catchments are listed in Table 6. Site rainfall remains unchanged (874 mm/yr or 156,300 m^3/yr), but there is a slight increase in overall evapotranspiration (567 mm/yr or 101,400 m^3/yr), reflecting the increased evaporation from the surface of the pond. It follows that total surplus under the Rehabilitated Conditions (55,000 m^3/yr) remains similar to the Existing Scenario (56,6000 m^3/yr). Total infiltration under Rehabilitated Conditions (53,500 m^3/yr) is significantly greater than the Existing Conditions infiltration (38,300 m^3/s). Conversely, there is a reduced runoff in the Rehabilitated Conditions (1,500 m^3/yr) as opposed to the Existing Conditions (18,300 m^3/yr), as the proposed extraction area would drain internally under Rehabilitated Conditions.

On an individual catchment scale, the runoff exiting the Site to the north (300 m^3/yr), south (0 m^3/yr), and east (1,200 m^3/yr) are reduced relative to the Existing Scenario. The implications of the runoff reductions are discussed in Section 6 Impact Assessment.

Table 6: Rehabilitated Scenario Results

CATCHMENT	TOTAL AREA	PRECIPITATION		EVAPO-TRANSPIRATION		SURPLUS		INFILTRATION		RUNOFF	
	(HA)	MM/YR	M^3/YR	MM/YR	M^3/YR	MM/YR	M^3/YR	MM/YR	M^3/YR	MM/YR	M^3/YR
201 - Buffer South	0.5	874	4,000	571	2,600	303	1,400	303	1,400	0	0
202 - Buffer North	0.5	874	3,900	576	2,600	298	1,300	226	1,000	71	300
203 - Buffer East	1.6	874	13,900	572	9,100	302	4,800	227	3,600	75	1,200
204 - Rehab Pit	15.4	874	134,500	566	87,100	308	47,500	308	47,500	0	0
TOTAL	***17.9***	***874***	***156,300***	***567***	***101,400***	***307***	***55,000***	***299***	***53,500***	***8***	***1,500***

6.0 IMPACT ASSESSMENT

The impact assessment seeks to estimate potential changes to the hydrogeologic / hydrologic system as a result of Site Operations and Rehabilitation Scenarios and the effect these changes may have on groundwater users / receptors. Our analysis focuses on impacts to the following:

- Groundwater levels;
- Baseflow;
- Water well quantities;
- Baseflow to water features;
- Aquifer vulnerability and groundwater quality;
- Groundwater temperature; and
- Site water budget.

6.1 Groundwater Levels

The below-water operation will not involve any pumping or active dewatering. Rather, the majority of pore water removed during extraction will eventually return to the aquifer via passive drainage within the stockpiled material.

Thus, the principal mechanism for Site development to instigate long-term effects on groundwater levels is exposing the water table to the atmosphere. Below-water aggregate extraction results in the eventual creation of a permanent pond that will tend to "flatten" water levels in its vicinity. The area upgradient of the pond experiences water level drawdown whereas the area downgradient of the pond experiences water level rise. Typically, only drawdown is of concern with respect to water quantity impacts. Under this paradigm the Rehabilitation Scenario provides the "worst-case" outcome with respect to long-term drawdown.

It is notable that the positioning of the (eventual) pond at the existing Goodwood Pit to the south would tend to ameliorate long-term Site drawdown because of the water level rise induced at the existing Goodwood Pit's northerly pond edge. However, for the purposes of this impact assessment, such an effect is conservatively not taken into account, and the drawdown effect of the Site pond is examined in isolation.

The Rehabilitation Scenario pond level is expected to approximate the average groundwater level within its area. Under high water table conditions (Figure 6), the water level within the pond area is estimated to be 322 masl based on the contouring program Surfer (Golden Software, 2015). The average annual water level would be close to, but less than, 322 masl (likely between 321 masl to 322 masl). Thus, for the purposes of this impact assessment, an estimate of future drawdown along the upgradient (southern) perimeter of the pond may be obtained by taking the existing upgradient high groundwater elevation of 322.25 masl (at MW18-02) and subtracting the future pond level of 322 masl resulting in a drawdown of 0.25 m at the upgradient pond perimeter. Likewise, a water level *increase* of approximately 0.25 m could be expected along the downgradient (northern) perimeter of the future pond. Water level changes of similar magnitude could be expected during different times of the year as the pond and surrounding groundwater levels would jointly rise and fall over a seasonal time scale.

To estimate the extent of the pond's lateral zone of influence (i.e. where drawdown reaches zero) we use the analytical method *Simple analytical equations for estimating ground water inflow to a mine pit* (Marinelli and

Niccoli, 2000). An illustration of this method along with Site specific inputs and calculations are provided in Appendix E. In summary, the inputs are as follows:

- The pit pond area is expected to be 5.7 ha, or 57,000 m^2. The effective radius is approximated as:
  - $A_{pond} = pi * r_e^2$
  - $r_e = [(57{,}000\ m^2) / (3.14)]^{1/2}$
  - $r_e = 135$ m
- Recharge is assumed to be 214 mm/yr per the Site water budget;
- The hydraulic conductivity of the ORAC is assumed to be 2E-4 m/s per grain size analysis;
- The pit pond floor is assumed to be 310 masl. As a result, under high water table conditions:
  - The initial (i.e. pre extraction) saturated thickness is 322.25 m – 310 m = 12.25 m
  - The final (i.e. post extraction) saturated thickness is 322 m – 310 m = 12 m.
  - Note that 12.25 m minus 12 m results in the aforementioned drawdown of 0.25 m.

Based on the above inputs, the 0.25 m drawdown is calculated to decrease to a point of zero drawdown approximately 474 m from the centre of the pit pond (Figure 9).

6.2 Baseflow

Baseflow is the groundwater contribution of total flow to a surface water feature. Baseflow changes as a result of below-water extraction are related to water level changes (see above). A surface water receiver downgradient of a water level decline may experience decreased baseflow to that feature; conversely, a surface water feature downgradient of a water level rise may experience increased baseflow. Typically, only baseflow decrease is of concern within the context of impact assessment.

The only mapped surface water features in the area lie several hundred metres downgradient of the Site and these features are either known or suspected to be perched above the water table. As such, there are no significant baseflow contributions at these locations. Nonetheless, as water levels will rise downgradient of the pit pond, any theoretical groundwater receptors downgradient would receive a slight increase in baseflow and as such would not experience an adverse effect to water quantity.

6.3 Well Water Quantities

There are four MECP well records within the drawdown zone of influence (Figure 9); one of these is an observation well (7307824) and is not considered in the context of water quantity impacts. The available water column in the remaining water supply wells is compared to the estimated drawdown at each well location as inferred from the previously described analytical calculations (Table 7). Drawdown at the wells is <0.01 m with a corresponding <0.1% reduction in available column. Such minor reductions will not impact well operation. Nonetheless, in the unlikely event that a neighbouring well owner perceives an adverse impact to their well, Lafarge should develop a Water Well Complaint Action Plan. A suggested plan is provided in Section 6.3.1.

Table 7: Water Well Records In Drawdown Zone of Influence

Well ID	Construct Date	Depth (mbgs)	Static Level (mbgs)	Water Column (m) [1]	Distance From Pit Pond (m)	Estimated Drawdown (m)	Reduction In Water Column
1917600	Apr-05	54.9	25.4	29.4	400	<0.01	<0.1%
4602905	Feb-62	35.1	8.2	26.8	450	<0.01	<0.1%
1907003	Jun-84	27.7	14.3	13.4	455	<0.01	<0.1%

Note 1: Water Column = Well Depth – Static Water Level

6.3.1 Water Well Compliant Action Plan

The EMP should include a Water Well Complaint Action Plan. If a water well complaint regarding a domestic well is received by Lafarge within 500 metres of the Site the following actions should be taken:

- The licensee will contact local MECP-licensed well contractors in the event of a well malfunction and the well owner will be immediately offered a temporary water supply at the licensee's expense if the issue cannot be expediently determined and rectified.
- The designated contractor will respond to the well owner and propose a plan to rectify the problem as expediently as possible. The well owner must then provide authorization of the work.
- If the issue raised by the well owner is related to loss of water supply the licensee will have a consultant/contractor determine the likely cause, which can result from a number of factors, including climatic conditions such as drought (owner's expense), pump failure (owner's expense), extended overuse of the well (owner's expense) or the lowering of the water level in the well from extraction activities (Lafarge expense).
- Data from the Site monitoring network shall be consulted as part of the review to determine groundwater level behaviour. This assessment process will be carried out at the expense of Lafarge and the results provided to the well owner.
- The consultant/contractor will be able to readily determine if pump failure is the problem and, should the well owner choose to have the pump repaired or replaced at their expense, the contractor would correct the situation for the well owner.
- If it has been determined that extraction activities did not cause the water supply interference, then the licensee shall provide 24 hours' notice and thereafter discontinue the temporary water supply.
- If it has been determined that extraction activities caused the water supply interference, then the licensee shall continue to supply water to the well owner at the licensee's expense until the problem is rectified and the water supply is restored. The following mitigation measures shall be considered and the appropriate measure(s) implemented at the expense of the licensee:
  - Adjust pump pressure;
  - Lowering of the pump to take advantage of existing water storage within the well;

- Deepening of the well to increase the available water column;
- Widening of the well to increase the available storage of water;
- Relocation of the well to another unaffected area on the property; or
- Drilling of multiple low yield wells.

6.4 Water Quality

The Operational Scenario will not involve the on-Site storage of any fuels, oils or potentially hazardous materials that could be released into the groundwater system. Therefore, water quality is not expected to be adversely impacted. Nonetheless, a Best Management Practices (BMP) manual should be employed to address any potential spills from equipment on-Site and will minimize the potential for aquifer contamination.

It bears mentioning that the Rehabilitated Scenario represents an opportunity to improve water quality as the resulting land use will negate the application of fertilizers and/or pesticides on what would otherwise be crop land.

6.5 Water Temperature

The exposure of the water table to the atmosphere may result in an increase in groundwater temperatures emanating from the Site during summer. This can occasionally be a concern for aquatic species or habitat that require the influx of cool groundwater within a certain temperature range in order to maintain ecological function.

Prior studies in Ontario have indicated that thermal plumes originating from below-water pits typically do not migrate farther than 120 m to 250 m downgradient of the pit pond before their effect becomes negligible (Yang, 1995 and Markle and Schincariol, 2007). No aquatic habitat lies within these distances from the pit pond and therefore the off-Site migration of a thermal plume will not cause any adverse impacts.

6.6 Site Water Budget

As noted in Section 5, the transition from Existing Scenario to Operations and ultimate Rehabilitated Scenario will result in some losses to off-Site runoff as a result of re-grading and land form changes as follows (with reference to Table 6 versus Table 7):

- Catchment 101 (South): The elimination of southerly off-Site runoff (5,400 m^3/yr to zero) to the existing Lafarge Goodwood Pit is considered inconsequential as the location of this water (infiltration to the groundwater system via an open pit / pond) is the same under both Existing and Rehabilitated Scenarios.
- Catchment 102 (North): The decrease in northerly off-Site runoff (2,600 m^3/yr to 300 m^3/yr) may result in a corresponding decrease in inflow to Wetland 3. This reduction may be put into context by comparing the post-extraction decrease in overall catchment. Based on a GIS analysis, the total catchment area to Wetland 3 is approximately 41.6 hectares. The Rehabilitated Condition would result in a loss of catchment of 2.3 ha, or 6% of the total catchment. Given the consistency in land form over the catchment, it is reasonable to assume that this loss in catchment would result in a corresponding 6% reduction in flows, and these reductions would occur largely during the spring freshet when water has been observed to flow off-Site and there is sufficient surface water flow to the wetland. Other than spring freshet the site does not provide surface flow to the Wetland. This is considered a minor loss from a hydrological perspective. The significance of the runoff decrease on natural environment receptors within Wetland 3 is evaluated by under separate cover in the *Natural Environment Reports* (WSP 2023).

- Catchment 103 (East): The decrease in easterly off-Site runoff (10,300 m^3/yr to 1,200 m^3/yr) will result in a decrease in flow to the adjacent farm field across Concession Road 4 during the spring freshet. This action may provide an overall benefit to the land form by mitigating excessive flooding during spring.

7.0 CONCLUSIONS

A Water Report Level 1 and 2 has been prepared in support of a Class A Pit Below Water licensing application for the proposed Goodwood Pit Extension (the Site). Existing, Operational and Rehabilitated Scenarios were considered. The Study involved two main aspects: 1) the establishment of baseline conditions for the Existing Scenario through background data review and field program data collection; and 2) an impact assessment for proposed Operations and Rehabilitated Scenarios. The following conclusions are drawn from the Study:

7.1 Existing Scenario

- Average annual precipitation in the Site vicinity is 874 mm/yr. Evapotranspiration is estimated to be 558 mm/yr with a resulting surplus of 316 mm/yr. The majority of this surplus becomes infiltration (214 mm/yr) with the remainder becoming runoff (102 mm/yr).
- There are no permanent surface water features on-Site. However, flowing surface water (i.e. runoff) is observed during the spring freshet. During this period the runoff either 1) ponds within localized depressions and infiltrates; or 2) exits the Site via topographic lows at the north, east and south of the Site.
- There are three wetlands that are mapped within 1 km of the Site. All are inferred to be perched and not connected to the saturated groundwater system. The only wetland that has any hydrologic connection to the Site is “Wetland 3”, located to the northwest. This wetland receives a small portion of its water supply (6%) from runoff leaving the Site in a northerly direction during spring freshet when there is sufficient surface water flow to this wetland.
- The Site aggregate resource is located within the Oak Ridges Moraine Aquifer Complex (ORAC). The ORAC is generally comprised of sands and gravels with localized deposits of finer grained materials. Site drilling suggests the ORAC is at least 37 m thick in the vicinity of the Site. Estimated aquifer hydraulic conductivity ranges from 6E-5 m/s to 1E-3 m/s with a geometric mean of 2E-4 m/s.
- The Site is inferred to be just downgradient of a regional groundwater divide within the ORAC, with groundwater flowing in a generally north to northeasterly direction through the Site at elevations in the 322 to 320 masl range. Depth to groundwater at the Site ranges from 26 m to 24 m.
- There are 30 water wells within 500 m of the Site. All the wells are drilled and completed within the ORAC at depths ranging from 28 mbgs to 57 mbgs. The majority of wells are classed as “Domestic”.
- Tested groundwater quality generally met Table 2 SCS criteria. However, impacts from surficial contaminants were evident in elevated chloride, nitrate, and bacteria levels. Petroleum hydrocarbons (PHCs) were initially found in several wells; however, subsequent sampling suggested a general decline in concentrations with the most recent sampling event in May 2021 indicating non-detect in all wells.
- The Site is not located within, nor does it interact with, any Source Protection Plan vulnerable area or any LSRCA Regulated Area.

7.2 Operational and Rehabilitated Scenarios

- The below-water operation will not involve any pumping or active dewatering. Rather, the majority of pore water "removed" during extraction will eventually return to the aquifer via passive drainage within the stockpiled material.
- Below-water aggregate extraction will result in the eventual creation of a permanent pond that will flatten water levels in its immediate vicinity. The area upgradient of the pond (south) will incur water level drawdown whereas the area downgradient of the pond (north) will incur water level rise. The magnitude of water level change is estimated to be on the order of 0.25 m at the pit pond with a zone of influence extending approximately 474 m from the centre of the pond to a point of zero drawdown.
- There is not expected to be any adverse impacts to baseflow at groundwater receptors as result of the aforementioned minor water level changes.
- There is not expected to be any adverse impacts to water quantity at surrounding private water wells as a result of the aforementioned minor water level changes.
- There will be no on-Site storage of any fuels, oils or potentially hazardous materials that could be released into the groundwater system; as such there is not expected to be any adverse impacts to water quality.
- The exposure of the water table to the atmosphere may result in a minor increase in groundwater temperatures emanating from the Site during summer. However, there are no groundwater-dependent aquatic habitats within the thermal zone of influence (120 m to 250 m) downgradient of the Site and thus no receptors will be adversely impacted.
- The transition from Existing Scenario to Operations and ultimate Rehabilitated Scenario will result in some losses to off-Site runoff as a result of re-grading and landform changes:
  - Catchment 101 (South): The elimination of southerly off-Site runoff (5,400 m^3/yr to zero) to the existing Lafarge Goodwood Pit is considered inconsequential as the location of this water (infiltration to the groundwater system via an open pit / pond) is the same under both Existing and Rehabilitated Scenarios.
  - Catchment 102 (North): The decrease in northerly off-Site runoff (2,600 m^3/yr to 300 m^3/yr) may result in a corresponding decrease in inflow to Wetland 3. However, this is estimated to be only a 6% overall reduction in flow to the wetland and is thus considered a minor loss.
  - Catchment 103 (East): The decrease in easterly off-Site runoff (10,300 m^3/yr to 1,200 m^3/yr) will result in a decrease in flow to the adjacent farm field across Concession Road 4 during the spring freshet. This action may provide an overall benefit to the land form by mitigating excessive flooding during spring.
- This Water Report Level 1 and 2 has addressed all hydrological / hydrogeological policy considerations as set forth in Section 1.1.

8.0 RECOMMENDATIONS

The following is recommended:

- Groundwater monitoring shall continue through Operations. The following tasks shall be carried out:
  - Monthly manual groundwater level monitoring at the three on-Site monitoring wells.

  - Annual groundwater quality sampling for general chemistry, metals, bacteria, petroleum hydrocarbons and volatile organic compounds.

- The Site domestic well will need to be decommissioned per O.Reg. 903 by a licensed well contractor either prior to extraction or at such time that extraction encroaches on the well location
- A complaint response program will be in place for residential wells within the potential draw down zone influence (i.e., 4639, 4709, 4840 and 4860 Concession Road 4) during extraction to address any complaints for surrounding residents concerning the supply of their water wells. In the event of unanticipated impacts to the water wells as a result of pit operations, mitigation and contingency measures will be implemented to restore the affected quantity or quality of the groundwater supply.
- Prior to extraction below water, a door-to-door water well survey shall be conducted to confirm baseline conditions at private wells within 500 m of the Site.

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Signature Page

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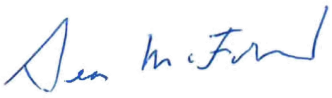

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DEH/HW/SM/rk

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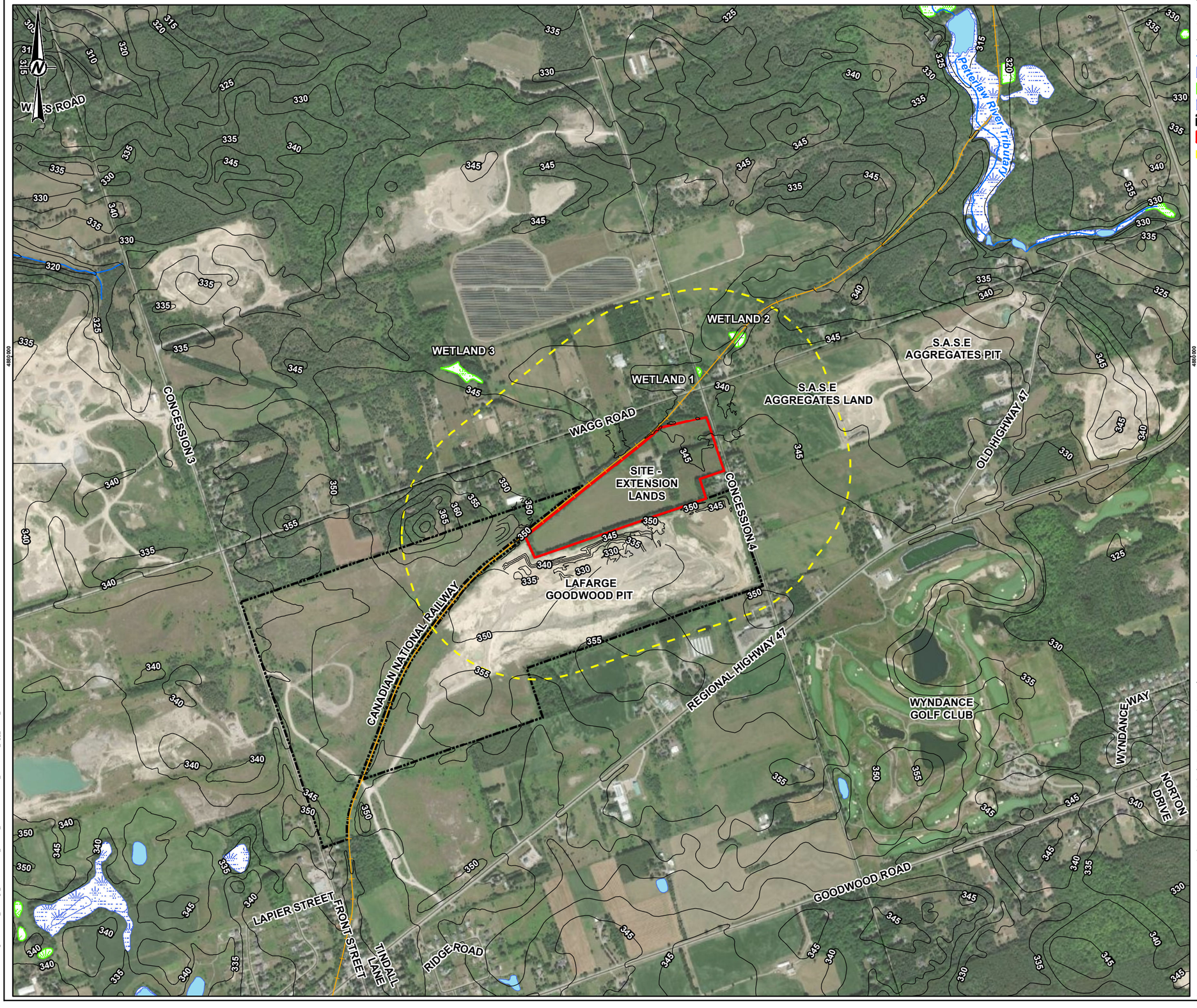
FIGURES



LEGEND

- RAILWAY
- CONTOUR (5 m INTERVAL)
- WATERCOURSE
- WATERBODY
- UNEVALUATED WETLAND
- PROVINCIALLY SIGNIFICANT WETLAND
- EXISTING GOODWOOD PIT SITE BOUNDARY
- SITE BOUNDARY
- 500 m BUFFER AROUND SITE

KEY MAP

0 500 1,000

1:15,000 METRES

REFERENCE(S)

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   SOURCE: ESRI, MAXAR, EARTHSTAR GEOGRAPHICS, AND THE GIS USER COMMUNITY
4. PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83 COORDINATE SYSTEM: UTM ZONE 17N

CLIENT
LAFARGE CANADA INC.

PROJECT
GOODWOOD PIT EXTENSION
4900 CONCESSION ROAD 4, TOWNSHIP OF UXBRIDGE

TITLE
SITE AND SURROUNDS

CONSULTANT

wsp

YYYY-MM-DD	2023-05-19
DESIGNED	SO
PREPARED	SO/JT
REVIEWED	DH
APPROVED	

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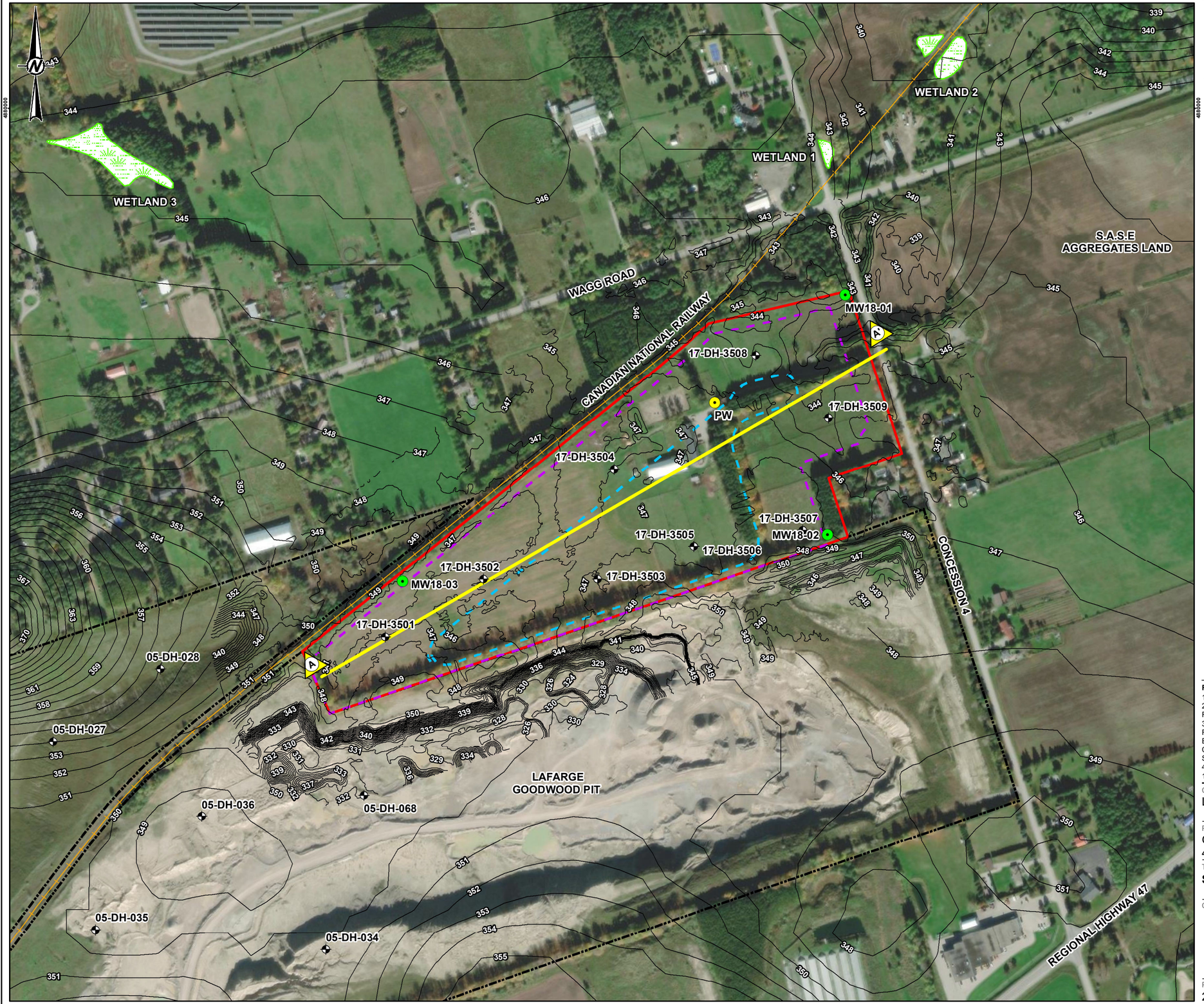

LEGEND

- ON-SITE DOMESTIC WELL LOCATION
- MONITORING WELL LOCATION
- RESOURCE EVALUATION BOREHOLE
- CONTOUR (1m INTERVAL)
- CROSS SECTION LINE
- RAILWAY
- EXISTING GOODWOOD PIT SITE BOUNDARY
- SITE BOUNDARY
- LIMIT OF EXTRACTION
- APPROXIMATE BELOW WATER (PIT POND) EXTENTS
- UNEVALUATED WETLAND

0 100 200 300

1:5,000 METRES

REFERENCE(S)

1. BASEDATA: MNRF LIO OBTAINED APRIL 2019
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4. PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83 COORDINATE SYSTEM: UTM ZONE 17N

CLIENT
LAFARGE CANADA INC.

PROJECT
GOODWOOD PIT EXTENSION
4900 CONCESSION ROAD 4, TOWNSHIP OF UXBRIDGE

TITLE
SITE DETAIL

CONSULTANT

wsp

YYYY-MM-DD	2023-05-19
DESIGNED	SO
PREPARED	SO/JT
REVIEWED	DH
APPROVED	

PROJECT NO.	CONTROL	REV.	FIGURE
21453907	0001	1	2

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

25mm

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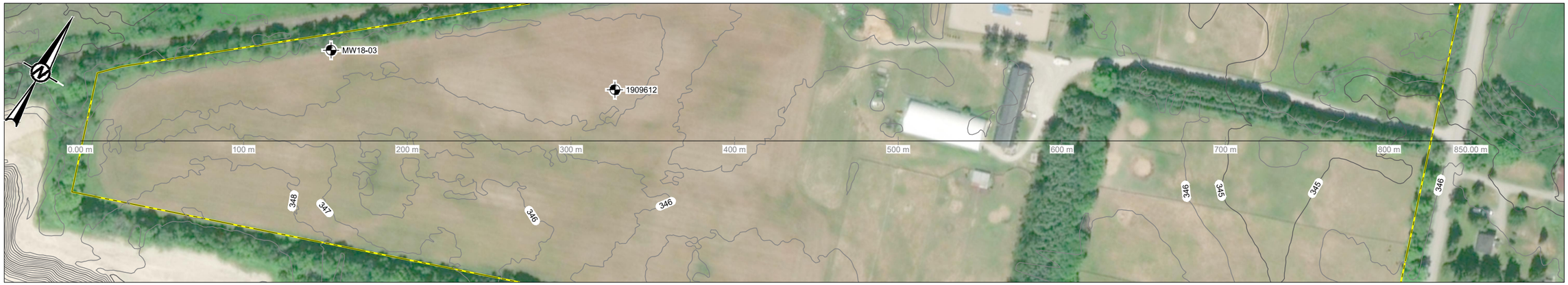
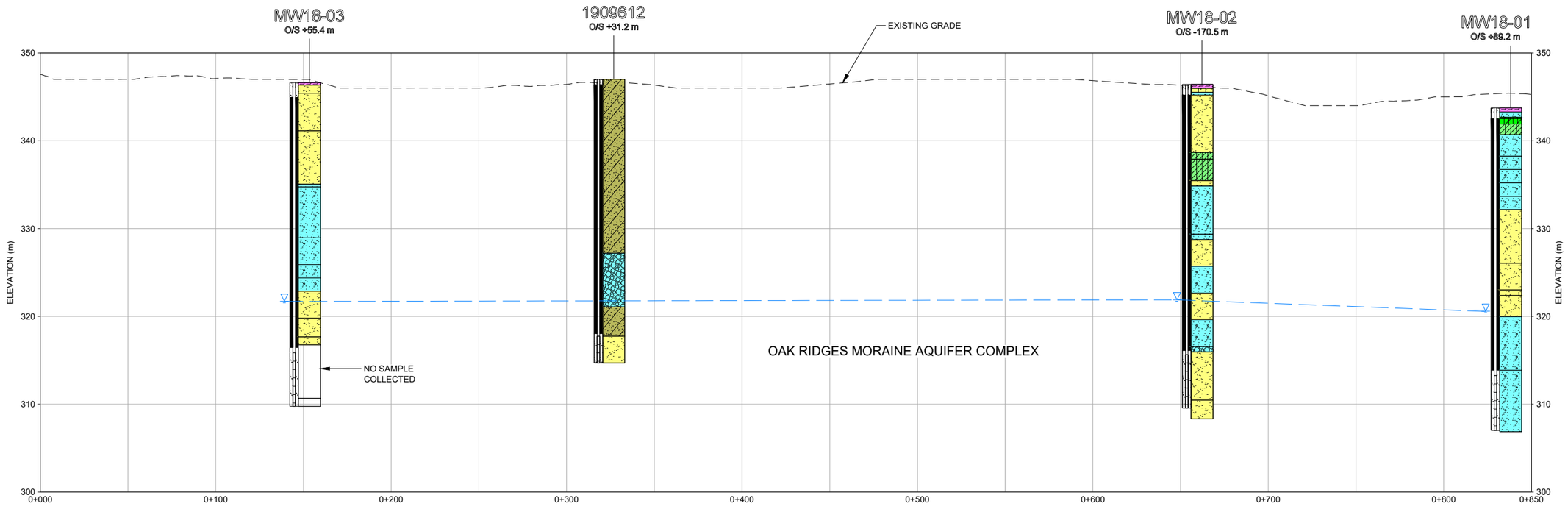
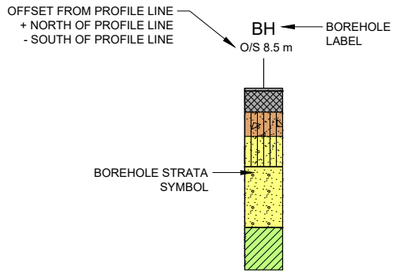




LEGEND

- MONITORING WELL LOCATION
- INFERRED WATER TABLE
- SITE BOUNDARY

SOIL PATTERN AND GENERIC SHADING



- ORGANICS / TOPSOIL
- GRAVEL
- SAND AND GRAVEL
- SAND
- SILTY SAND
- SILTY CLAY
- CLAYEY SILT
- CLAYEY SAND

0 50 100
1:2,500 HORIZONTAL METRES

0 10 20
1:500 VERTICAL METRES

REFERENCE(S)

1. TOPOGRAPHIC INFORMATION COMPILED BY GEOOPTIC (A DIVISION OF AEON EGMOND LTD.) PRODUCED FROM AERIAL PHOTOGRAPHY FLOWN JULY 19, 2018. MAPPING IS PRODUCED IN REAL WORLD SCALE AND COORDINATES (NAD83 UTM ZONE 17N). CONTOUR INTERVAL IS 1M. ALL ELEVATIONS ARE GEODETIC.
2. BASE MAP - © 2018 MICROSOFT CORPORATION © 2018 DIGITALGLOBE ©CNES (2018) DISTRIBUTION AIRBUS DS
3. PRODUCED BY GOLDER ASSOCIATES LTD UNDER LICENCE FROM ONTARIO MINISTRY OF NATURAL RESOURCES, © QUEENS PRINTER 2018
4. PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83 COORDINATE SYSTEM: UTM ZONE 17

CLIENT
LAFARGE CANADA INC.

CONSULTANT
wsp

YYYY-MM-DD	2019-09-10
DESIGNED	
PREPARED	STB
REVIEWED	DH
APPROVED	

PROJECT
GOODWOOD PIT EXTENSION

TITLE
SITE CROSS SECTION A - A'

PROJECT NO.	CONTROL	REV.	FIGURE
1894152	1894152	A	3

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

0 25 mm

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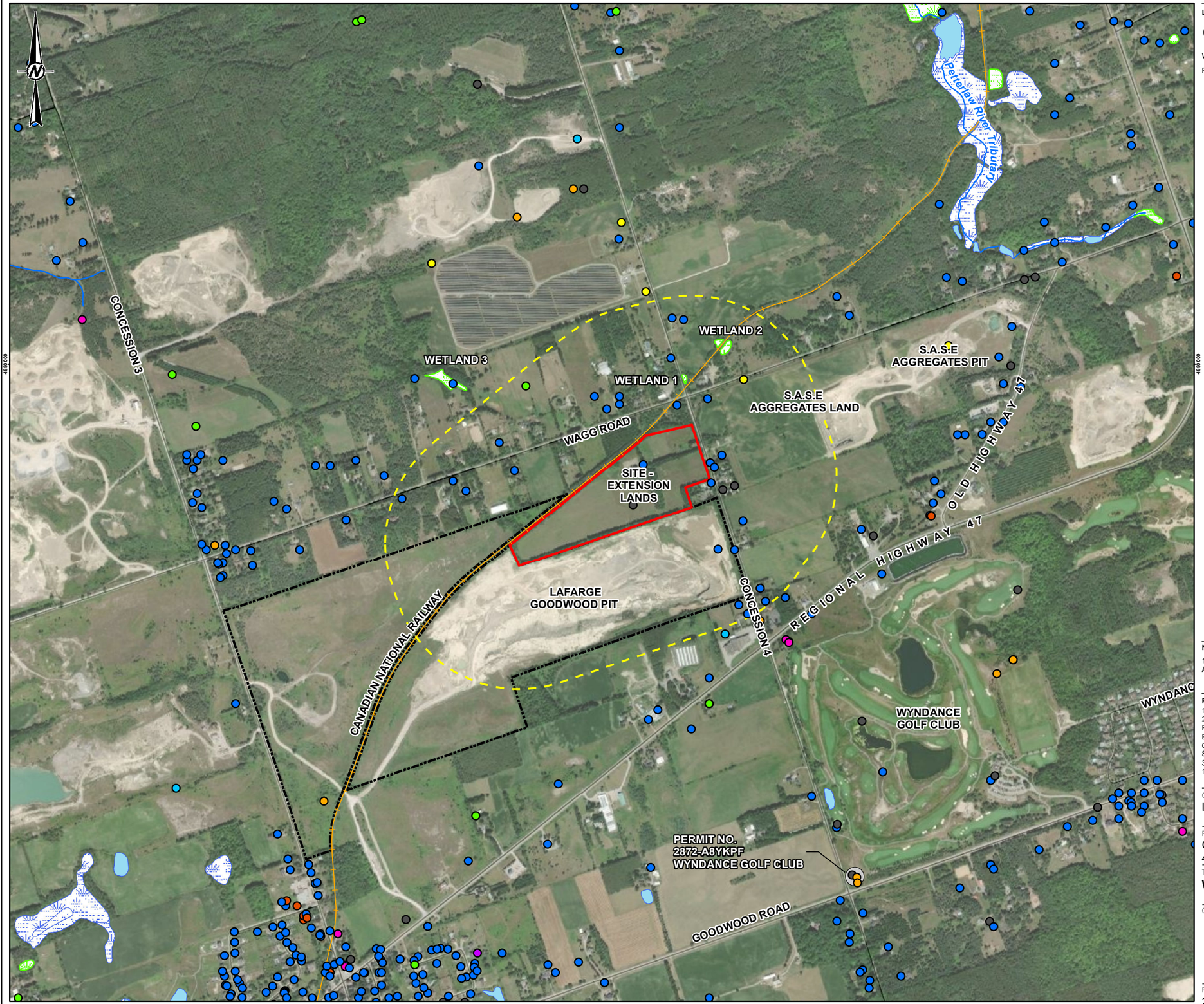

LEGEND

- PERMIT TO TAKE WATER LOCATION
- WATER WELL LOCATION
- PRIMARY USE
  - COMMERICAL
  - DEWATERING
  - DOMESTIC
  - INDUSTRIAL
  - IRRIGATION
  - LIVESTOCK
  - MONITORING
  - NOT USED
  - PUBLIC
  - UNKNOWN
- RAILWAY
- WATERCOURSE
- WATERBODY
- UNEVALUATED WETLAND
- PROVINCIALLY SIGNIFICANT WETLAND
- EXISTING GOODWOOD PIT SITE BOUNDARY
- SITE BOUNDARY
- 500 M BUFFER AROUND

0 500 1,000

1:15,000 METRES

NOTE(S)

1. ONLY MECP WELL RECORDS WITH UTM RELIABILITY CODE OF <=6 (ACCURACY WITHIN 1 KM) ARE SHOWN

REFERENCE(S)

1. BASEDATA: MNRF LIO OBTAINED APRIL 2019
2. IMAGERY: SOURCES: ESRI, HERE, GARMIN, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY
   SOURCE: ESRI, MAXAR, EARTHSTAR GEOGRAPHICS, AND THE GIS USER COMMUNITY
3. PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83 COORDINATE SYSTEM: UTM ZONE 17N

CLIENT
LAFARGE CANADA INC.

PROJECT
GOODWOOD PIT EXTENSION
4900 CONCESSION ROAD 4, TOWNSHIP OF UXBRIDGE

TITLE
WATER USERS

CONSULTANT

wsp

YYYY-MM-DD	2023-05-19
DESIGNED	SO
PREPARED	SO/JT
REVIEWED	DH
APPROVED	

PROJECT NO.	CONTROL	REV.	FIGURE
21453907	0001	1	4

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

0 25mm

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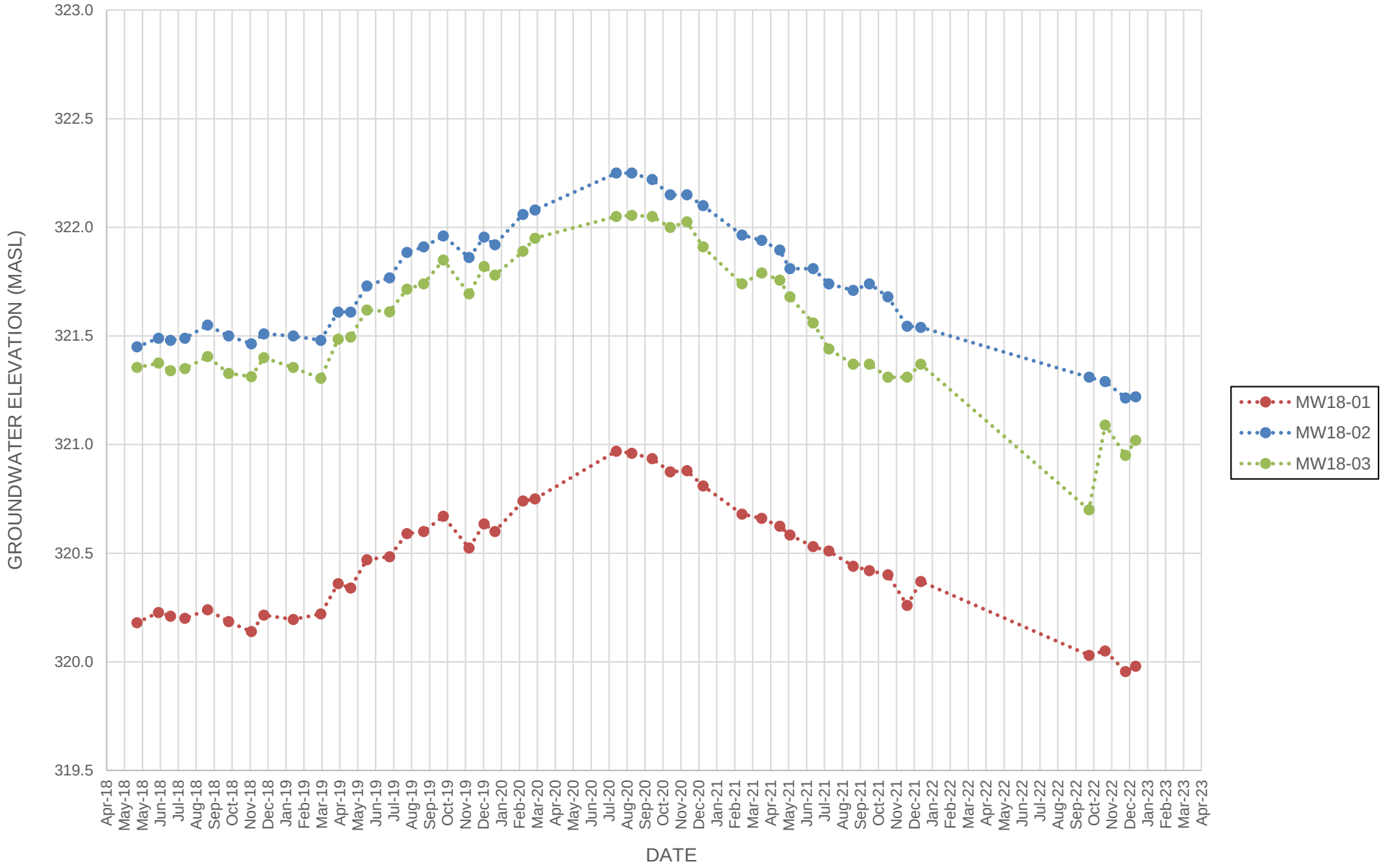

NOTES

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LAFARGE CANADA INC.

WSP Canada Inc.
BARRIE, ONTARIO, CANADA

GROUNDWATER HYDROGRAPHS

MAY 2023	PROJECT: 21453907	FIGURE: 5

LEGEND

- MECP WATER WELL LOCATION
- On-Site Domestic Well Location
- Monitoring Well Location
- Resource Evaluation Borehole
- Groundwater Contour (0.2 masl interval)
- DH — Measured Groundwater Elevation
- RAILWAY
- EXISTING GOODWOOD PIT SITE BOUNDARY
- SITE BOUNDARY
- LIMIT OF EXTRACTION
- APPROXIMATE BELOW WATER (PIT POND) EXTENTS
- UNEVALUATED WETLAND

0 100 200 300

1:5,000 METRES

NOTE(S)

1. SITE GROUNDWATER ELEVATIONS REFLECT OBSERVED HIGH WATER TABLE AS MEASURED DURING JULY 31, 202.
2. INDIVIDUAL MECP WELL RECORD STATIC WATER LEVELS SPAN TIME PERIOD OF 1958 TO 2017 AND MAY NOT BE REFLECTIVE OF CURRENT CONDITIONS. WATER LEVELS ARE THUS POSTED FOR ILLUSTRATION PURPOSES ONLY.

REFERENCE(S)

1. BASEDATA: MNRF LIO OBTAINED APRIL 2019
2. IMAGERY: SOURCES: ESRI, HERE, GARMIN, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY
SOURCE: ESRI, MAXAR, EARTHSTAR GEOGRAPHICS, AND THE GIS USER COMMUNITY
3. PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83 COORDINATE SYSTEM: UTM ZONE 17N

CLIENT
LAFARGE CANADA INC.

PROJECT
GOODWOOD PIT EXTENSION
4900 CONCESSION ROAD 4, TOWNSHIP OF UXBRIDGE

TITLE
INFERRED WATER TABLE

CONSULTANT

wsp

YYYY-MM-DD	2023-05-19
DESIGNED	SO
PREPARED	SO/JT
REVIEWED	DH
APPROVED	

PROJECT NO.	CONTROL	REV.	FIGURE
21453907	0001	1	6

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI B

0 25mm

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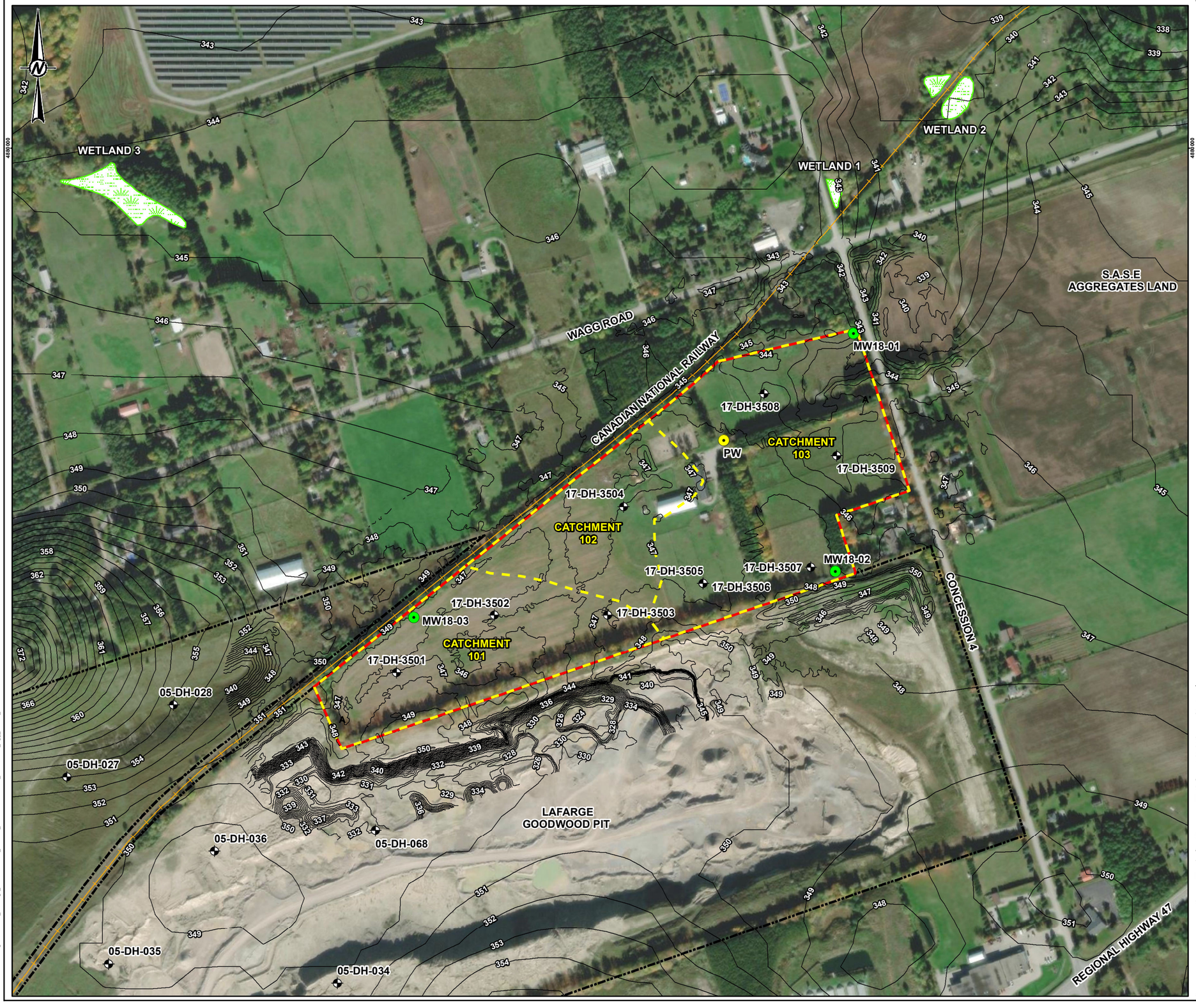

LEGEND

- ON-SITE DOMESTIC WELL LOCATION
- MONITORING WELL LOCATION
- RESOURCE EVALUATION BOREHOLE
- CONTOUR (1m INTERVAL)
- RAILWAY
- EXISTING SCENARIO CATCHMENT
- EXISTING GOODWOOD PIT SITE BOUNDARY
- SITE BOUNDARY
- UNEVALUATED WETLAND

Catchment	Area (ha)	Drainage Direction
101	6.3	South
102	2.8	North
103	8.8	East

0 100 200 300

1:5,000 METRES

REFERENCE(S)

1. BASEDATA: MNRF LIO OBTAINED APRIL 2019
2. IMAGERY: SOURCES: ESRI, HERE, GARMIN, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY
SOURCE: ESRI, MAXAR, EARTHSTAR GEOGRAPHICS, AND THE GIS USER COMMUNITY
3. PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83 COORDINATE SYSTEM: UTM ZONE 17N

CLIENT
LAFARGE CANADA INC.

PROJECT
GOODWOOD PIT EXTENSION
4900 CONCESSION ROAD 4, TOWNSHIP OF UXBRIDGE

TITLE
EXISTING SCENARIO CATCHMENT AREAS

CONSULTANT

wsp

YYYY-MM-DD	2023-05-19
DESIGNED	SO
PREPARED	SO/JT
REVIEWED	DH
APPROVED	

PROJECT NO.	CONTROL	REV.	FIGURE
21453907	0001	1	7

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

0 25mm

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LEGEND

- MONITORING WELL LOCATION
- RESOURCE EVALUATION BOREHOLE
- CONTOUR (1M INTERVAL)
- RAILWAY
- REHABILITATION SCENARIO CATCHMENT
- EXISTING GOODWOOD PIT SITE BOUNDARY
- SITE BOUNDARY
- PIT POND (321 – 322 MASL)
- LIMIT OF EXTRACTION
- UNEVALUATED WETLAND

Catchment	Area (ha)	Drainage Direction
201	0.5	South
202	0.5	North
203	1.6	East
204	15.37	Centrally to Pond

0 100 200 300

1:5,000 METRES

NOTE(S)

1. EXISTING LAFARGE GOODWOOD PIT AS SHOWN SUBJECT TO FUTURE CHANGE.

REFERENCE(S)

1. BASEDATA: MNRF LIO OBTAINED APRIL 2019
2. IMAGERY: SOURCES: ESRI, HERE, GARMIN, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY
SOURCE: ESRI, MAXAR, EARTHSTAR GEOGRAPHICS, AND THE GIS USER COMMUNITY
3. PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83 COORDINATE SYSTEM: UTM ZONE 17N

CLIENT
LAFARGE CANADA INC.

PROJECT
GOODWOOD PIT EXTENSION
4900 CONCESSION ROAD 4, TOWNSHIP OF UXBRIDGE

TITLE
REHABILITATED SCENARIO CATCHMENT AREAS

CONSULTANT

YYYY-MM-DD	2023-05-19
DESIGNED	SO
PREPARED	SO/JT
REVIEWED	DH
APPROVED	

PROJECT NO.	CONTROL	REV.	FIGURE
21453907	0001	1	8

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

25mm

0

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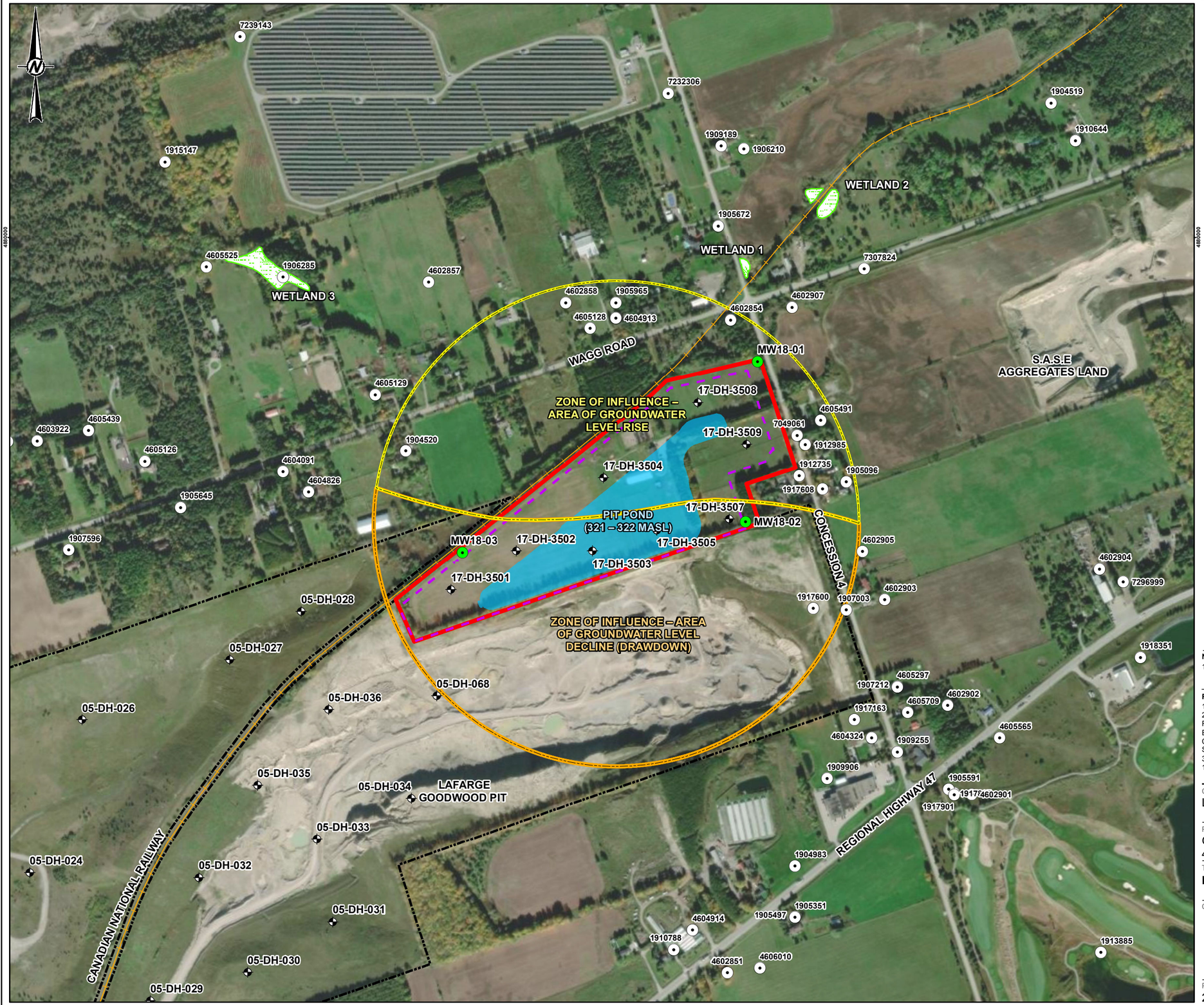


LEGEND

- MECP WATER WELL LOCATION
- MONITORING WELL LOCATION
- RESOURCE EVALUATION BOREHOLE
- RAILWAY
- EXISTING GOODWOOD PIT SITE BOUNDARY
- SITE BOUNDARY
- ZONE OF INFLUENCE – AREA OF GROUNDWATER LEVEL DECLINE (DRAWDOWN)
- ZONE OF INFLUENCE – AREA OF GROUNDWATER LEVEL RISE
- PIT POND (321 – 322 MASL)
- LIMIT OF EXTRACTION
- UNEVALUATED WETLAND

0 250 500

1:7,500 METRES

NOTE(S)

1. EXISTING LAFARGE GOODWOOD PIT AS SHOWN SUBJECT TO FUTURE CHANGE.

REFERENCE(S)

1. BASEDATA: MNRF LIO OBTAINED APRIL 2019
2. IMAGERY: SOURCES: ESRI, HERE, GARMIN, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY
   SOURCE: ESRI, MAXAR, EARTHSTAR GEOGRAPHICS, AND THE GIS USER COMMUNITY
3. PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83 COORDINATE SYSTEM: UTM ZONE 17N

CLIENT
LAFARGE CANADA INC.

PROJECT
GOODWOOD PIT EXTENSION
4900 CONCESSION ROAD 4, TOWNSHIP OF UXBRIDGE

TITLE
PIT POND ZONE OF INFLUENCE

CONSULTANT

wsp

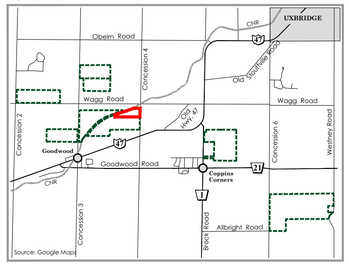
YYYY-MM-DD	2023-05-19
DESIGNED	SO
PREPARED	SO/JT
REVIEWED	DH
APPROVED	

PROJECT NO.	CONTROL	REV.	FIGURE
21453907	0001	1	9

APPENDIX A

Draft Site Plans

Key Plan



Subject Lands

Additional Lands Licensed by Applicant

north

SCALE
0 1 2 3
KILOMETRES

Plan Scale 1:2,000

Notes

A. General
1. This site plan is prepared under the Aggregate Resources Act (ARA) Aggregate Resources of Ontario: Site Plan Standards August 2020.
2. Area Calculations:
   Licence Area: ±17.9 hectares (44.2 acres)
   Limit of Extraction: ±15.4 hectares (38.1 acres)
3. All references to north, south, east and west on this site plan are based on site north (not true north).
4. All measurements shown are in metres unless specified otherwise.

B. References
1. Topographic information compiled by GeoOptic (a Division of Aeon Egmond Ltd.) produced from aerial photography flown July 19, 2018. Mapping is produced in real world scale and coordinates (NAD83 UTM Zone 17N). Contour interval is 1m. All elevations shown are in metres above sea level (masl). Contours for existing site (Licence #6593) from drone flight flown by Lafarge, October 2020.
2. The licence boundary was established using property boundary compiled from Plan of Survey prepared by: H.F. Grander Co. Ltd., Ontario Land Surveyor, October 5, 1971 (Plan 40R-6692).
3. Existing zoning on and within 120 metres of the licence is from the Township of Uxbridge Zoning By-law 81-19 (as amended). Office Consolidation July 2020. The site is currently zoned Rural (RU).
4. Land use information and structures identified on or within 120 metres of the site boundary was determined using July 2018 aerial imagery and 2018/2020 site visits.

C. Drainage
1. Surface drainage on and within 120 metres of the licence boundary is by overland flow in the directions shown by arrows on the plan view, or by infiltration.

D. Groundwater
1. The water table elevation on site ranges generally between ±321.7 masl in the southwest portion of the site to ±320.6 masl in the northeast portion of the site or approximately 20 metres below the existing ground surface. The existing water table elevations are shown in each cross section on this drawing and drawing 3 of 3.

E. Site Access and Fencing
1. There is an existing field access from Concession Road 4.
2. Post and wire fencing (unless noted otherwise) exists in the locations shown on the plan view.

F. Aggregate Related Site Features
1. There are no existing aggregate operations or features on-site such as processing areas with stationary or portable equipment, stockpiles, recyclable materials, scrap, haul roads, fuel storage, berms or excavation faces.

G. Cross Sections
1. As shown on this page.
2. Cross section locations are identified on the plan view for each drawing.

H. Technical Reports - References
1. Hydrogeology: "Water Report Level 2, Lafarge Goodwood Pit Extension" July 2021 (Source: Golder Associates Ltd.)
2. Natural Environment: "Proposed Goodwood Pit Extension Natural Environment Level 1 and 2 Technical Report", November 2020 (Source: Golder Associates Ltd.)
3. Noise: "Noise Impact Study - Project: 18200 Goodwood Pit Extension, Township of Uxbridge, Ontario" August 20, 2021 (Source: Aercoustics Engineering Ltd.)
4. Archaeology: Review and Entry into the Ontario Public Register of Archaeological Reports: Archaeological Assessment Report Entitled, "Stage 3 Archaeological Assessment: Goodwood Location 1 (BaGt-45), Lafarge Goodwood Extension Property, Part of Lot 20, Concession 3, Geographic Township of Uxbridge, former Ontario County, now Regional Municipality of Durham, Ontario ", Dated Jul 13, 2021, Filed with MHSTCI Toronto Office on Jul 14, 2021. MHSTCI Project Information Form Number P256-0670-2021, MHSTCI File Number 0009350.

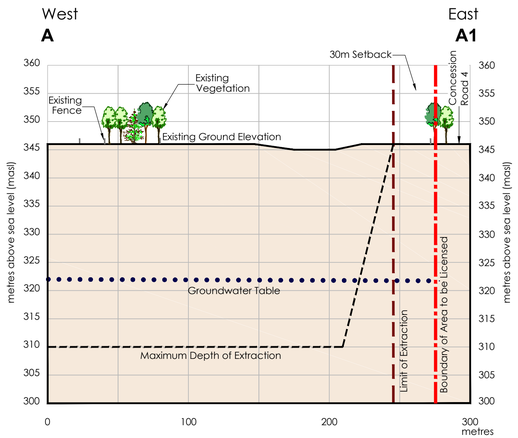
I. Other Reports - References
1. Air Quality Assessment: "Lafarge Goodwood Pit Extension, Goodwood Ontario, Air Quality Assessment" June 29, 2021 (Source: RWDI Air Inc.)

Legal Description

PART OF LOT 20
CONCESSION 3
Township of Uxbridge
Region of Durham

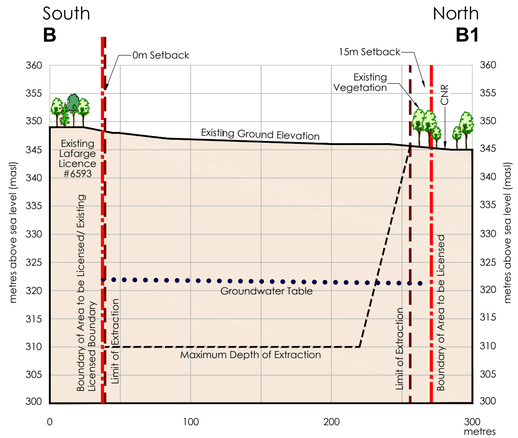
Legend

- Boundary of Area to be Licensed
- Existing Licensed Boundary — GOODWOOD PIT - LICENCE #6593
- Existing Fence — POST & WIRE FENCE UNLESS OTHERWISE NOTED
- Public Road
- Private Driveway/ Laneway
- Farm/Field Access
- MW18-01 Monitoring Wells — FROM GOLDER ASSOCIATES LTD. 2019
- Parcel Fabric — (LOCATION APPROXIMATE)
- Hydro Pole
- A1 Cross Sections — SEE PAGE 1 AND 3 OF 3 FOR EXISTING AND REHABILITATED CROSS SECTIONS
- Limit of Extraction — ALL SETBACKS ARE DRAWN TO SCALE AND SHOW LABELLED DISTANCES
- Existing Extraction Limit — GOODWOOD PIT - LICENCE #6593
- Contour and Elevation — METRES ABOVE SEA LEVEL
- Spot Height Elevation — METRES ABOVE SEA LEVEL
- Building/Structure — LOCATION AND USE FOR BUILDINGS ON-SITE AND WITHIN 120m ARE SHOWN ON THIS PAGE.
- Existing Vegetation
- Direction of Surface Drainage
- Groundwater Table — (SEE NOTE D, ON THIS PAGE)
- Site 2 (BaGt-45) Archaeological Site



Section A-A1 - Existing Conditions

Horizontal Scale 1:2,000
Vertical Exaggeration 4x



Section B-B1 - Existing Conditions

Site Plan Amendments

No.	Date	Description	By

MHBC PLANNING URBAN DESIGN & LANDSCAPE ARCHITECTURE
200 - 540 BINGEMANS CENTRE DR. KITCHENER, ON. N2B 3X9 | P: 519.576.3650 F: 519.576.0121 | WWW.MHBCPLAN.COM

NDMNRF Approval Stamp

Stamp

CAITLIN M. POST — REGISTERED PROFESSIONAL PLANNER — R.P.P.

north

Applicant's Signature

LAFARGE Building better cities™

Chris Galway
Senior Land Manager - East Central Ontario
Lafarge Canada Inc.

Project

Goodwood Pit Extension

Lafarge Canada Inc.
6509 Airport Road, Mississauga Ontario, L4V 1S7
Tel: (905) 738-7732 Fax: (905) 738-7092

NDMNRF Licence Reference No.

Pre-approval review:

For Submission to NDMNRF- January 2022

Plan Scale: **See Plan**
HORIZONTAL SCALE
50 0 50 100
METRES

Plot Scale 1:2.0 [1mm = 2.0 units] MODEL

Drawn By D.G.S.
Checked By C.P.

File No. **9526HC**

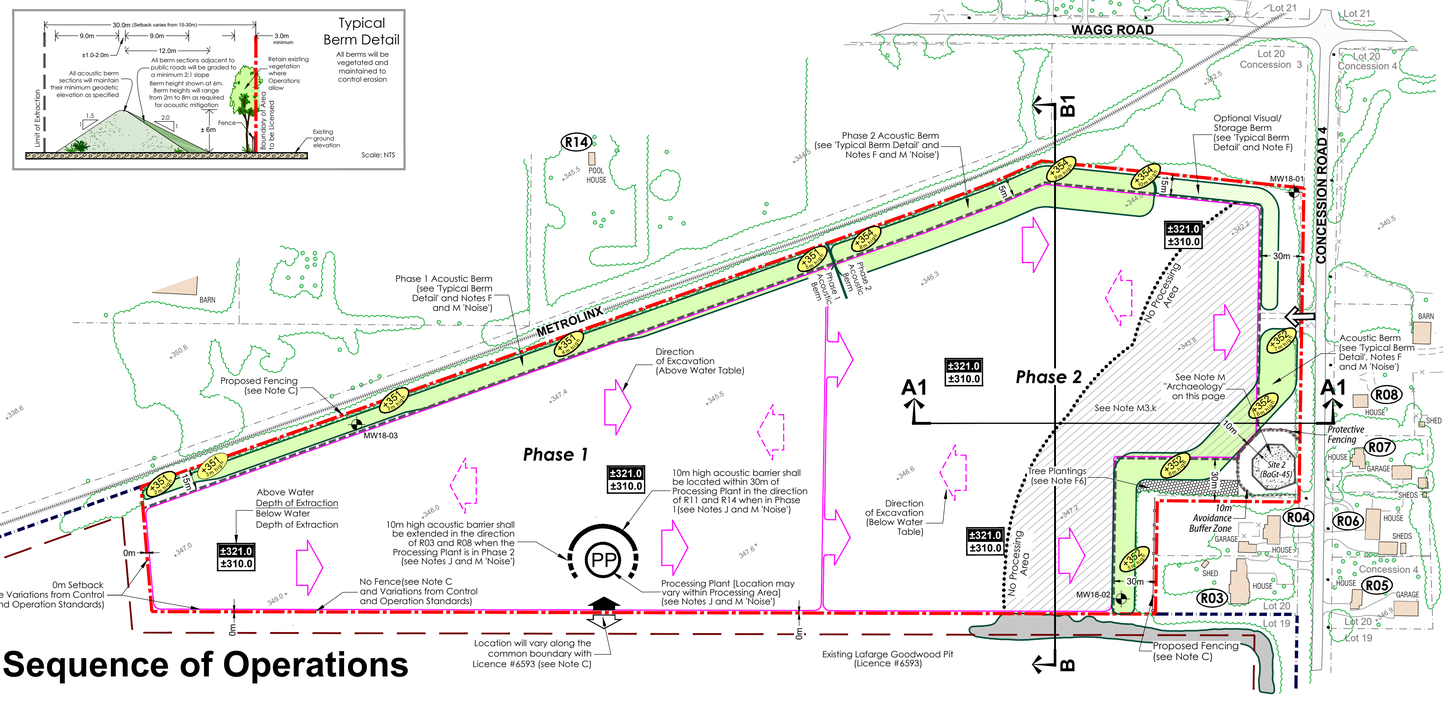
File Name

EXISTING FEATURES PLAN

Drawing No.

1 OF 3

K:\9526HC-Lafarge-Goodwood Pit Extension-Uxbridge\A\Exfeplan 1of3 January2022.dwg



A. General

1. Area Calculations:
   Licence Area ±17.9 hectares (44.2 acres)
   Limit of Extraction ±15.1 hectares (37.3 acres)
2. The total tonnage to be excavated annually from this site, in conjunction with the existing Goodwood Pit Licence #6593, will not exceed 1,177,000 tonnes.
3. No buildings or structures (including a scale and scale house) are proposed.
4. The water table elevation on site ranges generally between ±321.7 masl in the southwest portion of the site to ±320.6 masl in the northeast portion of the site or approximately 20 metres below the existing ground surface. The existing water table elevations are shown in each cross section on this drawing and drawing 3 of 3.
5. Setbacks will be as shown and labelled on the Sequence of Operations Diagram on this page and page 1 of 3. There will be a 0m setback along the southern property boundary adjacent to Licence #6593 (see Section N Variations from Control and Operation Standards)
6. Agricultural production may continue in areas not under extraction.
7. Source Water Protection: The site is located in the Lake Simcoe and Couchiching/Black River Source Protection Area. The site is not mapped as being located in a Well Head Protection Area (WHPA), but is located in a Significant Groundwater Recharge Area and a Highly Vulnerable Aquifer Area. Mitigation measures are outlined in the Hydrogeology notes under Section M Report Recommendations.

B. Hours of Operation

1. Hours of Operation are as described in the Noise notes under Section M Report recommendations.

C. Site Access and Fencing

1. The existing field access on Concession Road 4 may be utilized for monitoring and agricultural access. The access shall be kept closed during hours of non-operation and shall be maintained throughout the life of the licence. Aggregate trucks shall not be permitted to access the site at this location.
2. The site shall be accessed through the common licence boundary with existing licence #6593 and no gate shall be required (see Section N Variations from Control and Operation Standards). The location shown on the plan view is approximate only and may occur anywhere on the common licence boundary during the life of the operation.
3. Portions of the north and west (along Metrolinx right of way) and east (Concession 4 Road) licence boundary that are not currently fenced shall be fenced with post and wire fencing, at least 1.2 metres in height, prior to site preparation commencing.
4. Fencing shall not be required where the licence abuts existing licence #6593 (see Section N Variations from Control and Operation Standards) and in these locations, the boundary will be demarcated by ±1.2m high marker posts that are visible from one to the other. If conditions in or around the licensed property change or if either licensed site is surrendered or sold, a 1.2m high fence will be installed. All fencing shall be maintained for the life of the extraction operation.

D. Drainage

1. Drainage of undisturbed areas will continue in the directions shown on drawing 1 of 3.

E. Site Preparation

1. Prior to site preparation, a Spills Contingency Plan shall be developed to address any potential spills from equipment on-site.
2. Timber resources will be salvaged for use as saw logs, fence posts and fuel wood where appropriate. Non-merchantable timber, stumps and brush will be used in for aquatic habitat enhancement or mulched for use in progressive rehabilitation in this licence or existing Licence #6593. Excess material not required for uses mentioned above will be burned (with applicable permits).
3. Topsoil and overburden shall be stripped and stored separately in accordance with the Sequence of Operations diagram.
4. Topsoil and overburden shall be placed in berms or used immediately for progressive rehabilitation in this licence or adjacent Licence #6525 (see Section N Variations from Control and Operation Standards).
5. Excess topsoil and overburden not required for immediate use in berms or rehabilitation may be temporarily stockpiled on the pit floor or in Licence #6593. Topsoil and overburden stockpiles shall be located within the limit of extraction and remain a minimum of 30 metres from the licence boundary (except where the licence boundary abuts existing Licence #6593 (see Section N Variations from Control and Operation Standards) and 90 metres from a property with a residential use.
6. Temporary topsoil and overburden stockpiles which remain for more than one year shall have their slopes vegetated to control erosion. Seeding shall not be required if these stockpiles have vegetated naturally in the first year.

F. Berms and Screening

1. Berms shall be constructed to the elevation specified in the locations shown on the plan view prior to extraction/processing operations in each Phase. Locations and heights for all berms are provided on the Sequence of Operations diagram, this page. The heights/elevations shown are the minimum required. Overburden may be stored in separate berms throughout the extraction area.
2. Berm side slopes shall not exceed 1.5:1 on the interior and 2:1 on the exterior facing a public road. Berms that are not adjacent to a public road shall have side slopes not exceeding 1:5:1. See 'Typical Berm Detail' on this page.
3. Berms shall not be located within three metres of the licence boundary except where adjacent to existing Licence #6593 (see Section N Variations from Control and Operation Standards).
4. All proposed berms will be constructed in accordance with the 'Typical Berm Detail' on this page, and will be vegetated and maintained to control erosion using a low maintenance grass/legume seed mixture (e.g. MTO Seed Mix) composed of Creeping red Fescue, Perennial Ryegrass, Kentucky Bluegrass and White Clover. Temporary erosion control will be implemented as required.
5. Berms shall be maintained throughout the operational life of the pit.
6. Trees will be planted on the southeast side of the berm adjacent to the residences on Concession Road 4 to enhance the existing treed area. These trees are to be established within one (1) year of licence issuance. Trees will be maintained and/or replaced if required, throughout the operation of the pit.
7. Existing vegetation within the setbacks shall be maintained except where noise attenuation berms are required.

G. Site Dewatering

1. No existing or proposed surface water diversions or discharge has and/or will occur on the proposed extraction area. There will be no dewatering or pumping of water in the extraction area as ponds are included in the final rehabilitation plan.

H. Extraction Sequence

1. This plan depicts a schematic operations sequence for this property. Extraction, stripping and rehabilitation areas shown are schematic and may vary. Phases do not represent any specific or equal time period. The direction of extraction will generally be in accordance with the Sequence of Operations diagram shown on this page. Rehabilitation will be progressive and proceed as limits of extraction (area and depth) are reached. Notwithstanding the operation and rehabilitation notes, demand for certain products or blending of materials may require minor deviations in the extraction and rehabilitation sequence. Any major deviations from the operations sequence shown will require approval from MNRF.

2. Phase 1 - Above Water Extraction
   a. Site preparation in Phase 1 to include: establishing fencing around the licensed boundary prior to extraction (subject to overrides); removal of vegetation where necessary; initial stripping of overburden/topsoil and construct berms as shown.
   b. Initial set up of portable processing plant on pit floor.
   c. Continue with stripping of overburden/topsoil as shown. Store any excess material in optional storage berms in areas within the limit of extraction or as shown on the Sequence of Operations.
   d. Begin Phase 1 above water extraction in an easterly direction and to the elevations as shown.
   e. All extraction, processing and transportation equipment operating within this Phase shall comply with the restrictions identified in Noise notes under Section M Report Recommendations.
   f. Phase 1 above water extraction may be extracted to a depth of 321.0 masl.
   g. All Phase 2 berms to be in place prior to extraction in Phase 2.
   h. Prepare Phase 2 for extraction and ensure all requirements in Sections 'C' through 'G' of this drawing are met.

3. Phase 2 - Above Water Extraction
   a. Complete stripping of overburden/topsoil and construction of Phase 2 berms. Excess material shall be used for progressive rehabilitation in existing licence #6593 or stockpile in this licence for future rehabilitation.
   b. The portable processing plant may be relocated to Phase 2.
   c. Begin Phase 2 above water extraction in an easterly direction and to the elevations as shown.
   d. Commence progressive rehabilitation of side slope along north boundary of Phase 1.
   e. Extract Phase 2 in an easterly direction from Phase 1.
   f. All extraction, processing and transportation equipment operating within this Phase shall comply with the restrictions identified in Noise notes under Section M Report Recommendations.
   g. Phase 2 may be extracted to a depth of 321.0 masl.

4. Phase 2 - Below Water Extraction
   a. Begin Phase 2 below water extraction in a westerly direction and to the elevations as shown.
   b. Continue progressive rehabilitation of side slope along north boundary of Phase 1.
   c. All extraction, processing and transportation equipment operating within this Phase shall comply with the restrictions identified in Noise notes "d", "f", "j" and "k" under Section M Report Recommendations.
   d. Phase 2 below water extraction may go to a maximum depth of 310.0 masl.
   e. Initiate progressive rehabilitation of Phase 2 along east and northeast portion of the phase, adjacent to Concession 4 Road.

5. Phase 1 - Below Water Extraction
   a. Continue below water extraction in Phase 1 from Phase 2 in a westerly direction and to the elevations as shown.
   b. Continue progressive rehabilitation of side slope along west boundary of Phase 1 and initiate rehabilitation work along side slopes adjacent to the properties along Concession 4 Road, in the southeast portion of the phase.
   c. Phase 1 below water extraction may go to a maximum depth of 310.0 masl.

6. Phase 3 (not shown)
   a. Complete extraction activities.
   b. Complete progressive rehabilitation and final rehabilitation of the site.
   c. Remove all machinery, scrap and internal haul roads from site.

I. Extraction Details

7. The maximum depth of extraction is as shown on the plan view. Extraction will occur in 3 lifts (2 lifts above the water table and 1 lift below the water table) through the two phases as shown on the Sequence of Operations Diagram on this page and in accordance with the Ministry of Labour requirements. Below water extraction will occur through the use of a dragline or excavator. The proposed pit floor is to be located at an elevation of 310 masl or ±33 m to ±39 m below the existing ground surface. The proposed pit is to be an extension of the existing Lafarge pit to the south and west.
8. Extraction shall be permitted in two Phases simultaneously to allow for transition between Phases.
9. Aggregate stockpiles will be located on the pit floor (interim and final elevations) and will move throughout the life of the operations of the pit. Stockpiles will not be located within 30m of the Licensed boundary, except along the southern shared licence boundary with Licence #6593, as outlined in the Variations from Control and Operation Standards table on this page.
10. Internal haul road locations will vary as extraction progresses and will be located on the pit floor.

J. Equipment and Processing

1. The equipment used on site for aggregate operations is listed in Note M Report Recommendations 'Noise', Table B and may include: Portable Processing Plant, One Dragline or Excavator, Two Extraction Loaders, Two Shipment Loaders, Highway Trucks and Conveyors.
2. All processing equipment will be portable (crusher and screener) and subject to the noise controls and be located in close proximity to the extraction face in these Phases in order to maximize acoustical shielding. Within this area, the processing equipment shall remain a minimum of 30 metres from the licence boundary (except where the licence boundary abuts existing licence #6593 - see Section N Variations from Control and Operation Standards).
3. No permanent processing areas are proposed on site. Portable processing equipment, crushing and screening may be used on site and will be located below grade on the pit floor adjacent to the active pit face. All processing equipment is subject to applicable permitting under MOE Environmental Compliance Approvals. See Note M 'Noise' and Sequence of Operations diagram for location of processing plant and limit of 'No Processing Areas'
4. Berms that encroach within the limit of extraction shall be removed, and the underlying aggregate may be extracted, as part of final extraction/rehabilitation of the site.

K. Fuel Storage

1. No fuel or associated products will be stored on site. Mobile fuelling will occur in accordance with the Gasoline Handling Act, as amended, the Gasoline Handling Code and regulations, as amended, and Liquid Fuels Handling Code.

L. Scrap and Recycling

1. There will be no on-site scrap storage. Temporary scrap storage will be located within the scrap storage area in the existing pit (Licence #6593) and will be removed on an on-going basis. No recycling is proposed.

M. Report Recommendations

1. **Hydrogeology: "Level1/2 Hydrology and Hydrogeology Study, Lafarge Goodwood Pit Extension" September, 2019 (Source: Golder Associates Ltd.)**
   - Groundwater monitoring shall continue through Operations to confirm the conclusions of the impact assessment. The following tasks shall be carried out:
     - -Monthly manual groundwater level monitoring at the three on-Site monitoring wells.
     - -Annual groundwater quality sampling for general chemistry, metals, bacteria, petroleum hydrocarbons and volatile organic compounds.
   - The Site domestic well will be decommissioned per O.Reg. 903 by a licensed well contractor either prior to extraction or at such time that extraction encroaches on the well location.
   - A groundwater monitoring program and a complaint response program will be in place for residential wells within the potential draw down zone influence (i.e., 4639, 4709, 4840 and 4860 Concession Road 4) during extraction to address any complaints for surrounding residents concerning the supply of their water wells. In the event of unanticipated impacts to the water wells as a result of pit operations, mitigation and contingency measures will be implemented to restore the affected quantity or quality of the groundwater supply
   - A door-to-door water well survey shall be conducted to confirm baseline conditions at private wells within 500 m of the Site.

2. **Natural Environment: "Proposed Goodwood Pit Extension Natural Environment Level 1 and 2 Technical Report", November 2020 (Source: Golder Associates Ltd.)**

Standard best management practices to mitigate disturbance or damage to adjacent natural features include the following:

- Avoid removal of vegetation during the migratory bird nesting period (April 5 - August 26; ECCC 2019). Where vegetation removal cannot be avoided during this period, precede disturbance with a nesting survey by a qualified biologist and implement appropriate activity buffers around any active nests found during the survey until the young have fledged.
- Remove the barn and trees on the site outside of the bat maternity roosting period (May 1 - July 31) to minimize adverse impacts on bats (not SAR) that may be roosting in these features.

3. **Noise: "Noise Impact Study - Project: 18200 Goodwood Pit Extension, Township of Uxbridge, Ontario" January 5, 2021 (Source: Aercoustics Engineering Ltd.)**

The following noise controls are recommended:

General

a. The Hours of operation are limited as described in Table A. There will be no operations on Public Holidays as per the Employment Standards Act. The pit will not operate on Sundays except as required by a specific contract. A response to emergencies is not limited by the hours of operations shown on the site plan.

Table A: Operating Hours

Time of Day	Day of Week	Operations
06:00 to 07:00	Monday to Saturday	Shipping and Loading Operations Only
07:00 to 19:00	Monday to Saturday	Full Operation - Extraction, Processing, Loading and Shipping

b. The aggregate pit equipment shall satisfy the noise emissions levels listed in Table B. If desired, the two Quiet Extraction Loaders (maximum 70 dBA each) may be replaced by one regular Extraction Loader (maximum 74 dBA) wherever the Extraction Loaders are permitted.

Table B: Reference Sound Pressure Levels of Aggregate Pit Equipment within Extension

Equipment	Number Permitted	Reference Sound Pressure Level @ 30m (dBA)
Portable Processing Plant	1	85
Extraction Loader	2	70
Shipment Loader	1	67*
Dragline or Excavator	1	73
Conveyors	--	44**
Highway Trucks	--	66

* The shipment loaders were assumed to operate at a 50% duty cycle.
** Reference sound level for conveyors is reported in dBA per metre at a distance of 30m.

c. The sound emissions of all construction equipment involved in site preparation shall comply with the sound level limits specified in the MECP publication NPC-115 "Construction Equipment".
d. New equipment technology or different configurations may allow proposed changes to any portion of the extraction and processing operations including additional equipment to operate on the site, equipment to be substituted, and/or different berm heights, while still meeting the applicable sound level limits. Changes may be permitted to the site operations and noise controls provided that the changes still meet the sound level limits, as confirmed through documentation prepared by a Professional Engineer specializing in noise control. Prior to any modification, notification shall be given to the MNRF.
e. An acoustic barrier is required to be solid, with no gaps or openings, and shall satisfy a minimum area density of 20 kg/m2. It could take the form of a pit face, stockpile, acoustic fence, ISO containers, a combination of these, or any other construction satisfying the requirements of an acoustic barrier.
f. Extraction in Phases 1 and 2 shall proceed generally in a northeasterly direction with the extraction loaders operating within 30 m of the working face. The working face shall have a minimum height of 7 metres. All equipment shall remain on the pit floor.
g. During all processing operations, a 10 m high acoustic barrier shall be located within 30m of the Portable Processing Plant, between the plant and Receptors R11 and R14. In addition, a 9m high acoustic barrier shall be located within 30m of the Portable Processing Plant, between the plant and Receptors R03 and R08. These barriers can be satisfied by a working face or stockpiles.
h. During below water extraction, only a single Extraction Loader shall operate near the Dragline or Excavator, or at the working face.

Noise: (cont'd)

Phase 1

i. Prior to extraction in Phase 1, an acoustic barrier with a minimum top of barrier elevation of 351 m a.s.l. shall be installed, extending the full length along the north boundary of Phase 1, as shown on the site plan. This barrier shall remain in place for the project lifetime.

Phase 2

j. Prior to extraction in Phase 2, an acoustic barrier with a minimum top of barrier elevation of 354 m a.s.l. shall be installed, extending the length along the north boundary of Phase 2, meeting the acoustic barrier along the north boundary of Phase 1, as shown on the site plan. An acoustic barrier with a minimum top barrier elevation of 352 m a.s.l shall be installed extending the length along the east boundary of Phase 2, as shown on the site plan. A gap in the barrier extending 100 m in each direction from the northeast corner of the site is permitted. This barrier shall remain in place for the remainder of the project lifetime.
k. No processing shall occur in the lands located within a 160 m radius of Receptors R03, R04, R07, and R08 as shown on the site plan.

4. Archaeology: Review and Entry into the Ontario Public Register of Archaeological Reports: Archaeological Assessment Report Entitled, "Stage 3 Archaeological Assessment: Goodwood Location 1 (BaGt-45), Lafarge Goodwood Extension Property, Part of Lot 20, Concession 3, Geographic Township of Uxbridge, former Ontario County, now Regional Municipality of Durham, Ontario " Dated Jul 13, 2021, Filed with MHSTCI Toronto Office on Jul 14, 2021, MHSTCI Project Information Form Number P256-0670-2021, MHSTCI File Number 0009350

1. Should previously undocumented archaeological resources be discovered that may be a new archaeological site and therefore subject to Section 48(1) of the Ontario Heritage Act, the proponent or person discovering the archaeological resources must cease alteration of the site immediately and engage a licensed consultant archaeologist to carry out archaeological fieldwork, in compliance with Section 48(1) of the Ontario Heritage Act.
2. The Cemeteries Act, R.S.O. 1990 c. C4 and the Funeral, Burial and Cremation Services Act, 2001, S.O. 2002, c.33 (when proclaimed in force) requires that any person discovering human remains must notify the police or coroner and the Deputy Registrar of the Cemeteries Regulation Unit at the Ministry of Consumer and Commercial Relations (416) 326-8392.

5. Air Quality Assessment: "Lafarge Goodwood Pit Extension, Goodwood Ontario, Air Quality Assessment" June 29, 2021 (Source: RWDI Air Inc.)

The pit must operate in accordance with the operating standards pertaining to dust outlined in section 0.12 (2)Ontario Regulation 244/97, which include:

a. The licensee or permittee shall apply water or another provincially approved dust suppressant to internal haul roads and processing areas, as necessary to mitigate dust, if the pit or quarry is located within 1,000 metres of a sensitive receptor.
b. The licensee or permittee shall equip any processing equipment that creates dust with dust suppressing or collection devices if it is located within 300 metres of a sensitive receptor.
c. The licensee or permittee shall obtain an environmental compliance approval under the Environmental Protection Act where required to carry out operations at the pit or quarry.
d. The site will operate in accordance with Lafarge's Best Management Practices Plan for The Control of Fugitive Dust Emissions, which may be amended from time to time, considering actual impacts and operational considerations. The recommendations in the BMPP are based on the maximum daily production rates. At lower production rates, the control measures specified in the BMPP can be reduced accordingly, provided dust remains mitigated on site.

N. Variations from Control and Operation Standards

O.Reg 244/97 Section 0.13	Variation	Rational
(3)(a)	Fencing will not be required along the southern and western boundaries of the area to be licensed where it is coincident with the existing boundary for Licence #6593.	The common licensed boundary will be demarcated by ±1.2m high marker posts that are visible from one to the other. If conditions in or around the licensed property change or if either licensed site is surrendered or sold, a 1.2m high fence will be installed.
(1)1& (1)2	No gate at the operational entrance/exit to site.	Operational entrance/exit to site is coincident with the existing boundary for Licence #6593.
(1)10.i	Setback reduced to 0m from 15m along south and southwest limit of site.	Material can be extracted along the common boundary and for rehabilitation to transition between licences. A site plan amendment for existing licence #6593 is required.
(1)13.i	Stockpiling/processing may take place within 30m from the boundary of the south limit of the site but not within 90m of adjacent residential lands to the east.	The adjacent licence #6593 is owned by the same licensee.
(1)16	Berms may be located within 3m of the boundary of adjacent Licence #6593.	The adjacent licence #6593 is owned by the same licensee.
(1)17 & (1)18	Topsoil/overburden stripped in the operation of this site may be used in the rehabilitation of the adjacent Lafarge Licence (#6593)	This will allow stripped material from site preparation to be used for progressive rehabilitation in the existing licence.
(1)19.i	Below water side slopes may vary from a slope that is at least three horizontal metres for every vertical metre (3:1).	Below water slopes will stabilize at the natural angle of repose, which is estimated to range from 2:1 - ±3 to 1.

Legal Description

PART OF LOT 20, CONCESSION 3
Township of Uxbridge, Region of Durham

Legend

- Boundary of Area to be Licensed
- Limit of Extraction — ALL SETBACKS ARE DRAWN TO SCALE AND SHOW LABELLED DISTANCES
- Existing Fence — POST & WIRE FENCE UNLESS OTHERWISE NOTED
- Spot Height Elevation — METRES ABOVE SEA LEVEL
- Building/Structure — LOCATION AND USE FOR BUILDINGS ON-SITE AND WITHIN 120m ARE SHOWN ON THIS PAGE.
- Existing Vegetation
- Farm/Field Access — NO AGGREGATE HAULAGE
- MW18-01 Monitoring Wells — FROM GOLDER ASSOCIATES LTD. 2019
- Existing Berm
- Parcel Fabric — (LOCATION APPROXIMATE)
- Site 2 (BaGt-45) Archaeological Site
- A1 Cross Sections — SEE PAGE 1 AND 3 OF 3 FOR EXISTING AND REHABILITATED CROSS SECTIONS
- Tree Plantings — ALSO SEE NOTE F7
- Existing Licensed Boundary — GOODWOOD PIT - LICENCE #6593
- Existing Extraction Limit — GOODWOOD PIT - LICENCE #6593
- Operational Entrance — NO GATE (SEE NOTE C2 AND VARIATIONS FROM CONTROL AND OPERATIONS STANDARDS TABLE)
- Direction of Excavation (Above Water)
- Direction of Excavation (Below Water) — REFER TO NOTES (THIS PAGE) FOR ADDITIONAL DETAILS
- Proposed Fence — 1.2m HIGH POST & WIRE FENCE UNLESS OTHERWISE NOTED
- ±321.0 ±310.0 Elevation — ABOVE WATER DEPTH OF EXTRACTION MAXIMUM DEPTH OF BELOW WATER EXTRACTION/PIT FLOOR (masl)
- R1 Noise Receptor — ALSO SEE NOTE M3 'NOISE' FOR ADDITIONAL DETAILS
- Proposed Acoustic Berm — ALSO SEE "TYPICAL BERM DETAIL" (THIS PAGE)
- Optional Visual/Storage Berm — ALSO SEE "TYPICAL BERM DETAIL" (THIS PAGE)
- No Processing — ALSO SEE NOTE M 'NOISE' FOR ADDITIONAL DETAILS
- PP Portable Processing Plant with Barrier — ALSO SEE NOTE M 'NOISE'

Site Plan Amendments

No.	Date	Description	By

MHBC PLANNING URBAN DESIGN & LANDSCAPE ARCHITECTURE
200 - 540 BINGEMANS CENTRE DR. KITCHENER, ON. N2B 3X9 | P. 519.576.3650 P. 519.576.0121 | WWW.MHBCPLAN.COM

NDMNRF Approval Stamp

Stamp

CAITLIN M. PRICE — REGISTERED PROFESSIONAL PLANNER — R.P.P. — CERTIFICATE OF AUTHORIZATION

north

LAFARGE Building better cities™

Applicant's Signature

Chris Galway
Senior Land Manager - East Central Ontario
Lafarge Canada Inc.

Project

Goodwood Pit Extension

Lafarge Canada Inc.
6509 Airport Road, Mississauga Ontario, L4V 1S7
Tel: (905) 738-7732 Fax: (905) 738-7092

NDMNRF Licence Reference No.

Pre-approval review:

For Submission to NDMNRF- January 2022

Plan Scale **1:2,000 (Arch D)**

SCALE
50 0 50 100
METRES

Plot Scale 1:2.0 [1mm = 2.0 units] MODEL

Drawn By D.G.S.
Checked By J.P.
File No. **9526HC**

File Name

OPERATIONAL PLAN

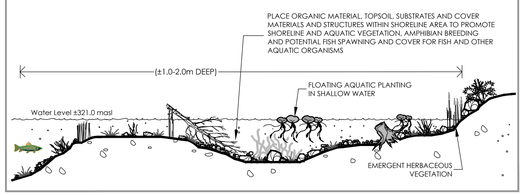
Drawing No.

2 OF 3

K:\9526HC-Lafarge-Goodwood Pit Extension-Uxbridge\A\Operplan 2of3 January2022.dwg

SHALLOW SHORELINE/LITTORAL AREA DETAIL

N.T.S.



Drawing Scale 1:2,000

NODAL TREE AND SHRUB PLANTING DETAIL

N.T.S.

- PLANTING AREAS WILL CONSIST OF NODAL PLANTING CELLS CONTAINING A MIXTURE OF CONIFEROUS AND DECIDUOUS SPECIES PLANTED AS SEEDLINGS.
- SPECIES SHALL INCLUDE BUT ARE NOT LIMITED TO: WHITE PINE, BASSWOOD, TREMBLING ASPEN, AND WHITE BIRCH WITH A SECONDARY FOCUS ON SPECIES SUCH AS ALTERNATE-LEAVED DOGWOOD, CHOKECHERRY, HIGH BUSH CRANBERRY, NANNYBERRY AND SERVICEBERRY.

PROGRESSIVE REHABILITATION SEQUENCE

1 SEQUENCE OF REHABILITATION (See Note B1 on this page)

Legend

- Boundary of Area to be Licensed
- Existing Licensed Boundary — GOODWOOD PIT - LICENCE #6593
- Contour and Elevation — METRES ABOVE SEA LEVEL
- Spot Height Elevation — METRES ABOVE SEA LEVEL
- Existing Vegetation
- Field Access
- Groundwater Table — (SEE NOTE F AND CROSS SECTIONS ON THIS PAGE)
- Cross Sections — SEE PAGE 1 AND 3 OF 3 FOR EXISTING AND REHABILITATED CROSS SECTIONS
- Limit of Extraction — ALL SETBACKS ARE DRAWN TO SCALE AND SHOW LABELLED DISTANCES
- Existing Extraction Limit — GOODWOOD PIT - LICENCE #6593
- Proposed Contour — METRES ABOVE SEA LEVEL (m A.S.L.)
- Proposed Spot Elevation — MAXIMUM DEPTH OF EXTRACTION PROPOSED PIT FLOOR (m A.S.L.)
- Maximum Depth of Extraction
- Proposed Pond — METRES ABOVE SEA LEVEL (m A.S.L.)
- Proposed Shallow Littoral Area — (SEE DETAIL ON THIS PAGE)
- Nodal Planting Areas — SEE ALSO PAGE 2 OF 3 NOTE M "NATURAL ENVIRONMENT"
- Vegetation/Trees — EXISTING/PROPOSED AS INDICATED

A. General

1. Area Calculations:
   - Licence Area ±17.9 hectares (44.2 acres)
   - Limit of Extraction ±15.1 hectares (37.3 acres)
2. The rehabilitated landform of this site will include: pond, shallow shoreline/littoral area zone, 3:1 side slopes and an area that will be backfilled to original grade. Nodal tree and shrub plantings will also be part of rehabilitation.

B. Phasing

1. Rehabilitation will be progressive following the direction of extraction and proceed as limits of extraction (area and depth) are reached. The sequence of rehabilitation will follow the "Sequence of Operations" diagram located on page 2 of 3. The above water side slopes in Phase 1 and Phase 2 will be rehabilitated prior to below water extraction commencing in Phase 2. This will involve grading to a 3:1 slope and covering the area with a minimum of 150mm of topsoil/ organic matter. Below water side slopes will be rehabilitated as below water excavation proceeds across the site. The area to be backfilled to original grade adjacent to Concession 4 Road will be the final stage of land form rehabilitation on site (See 'Progressive Rehabilitation Sequence' on this page). Minor deviations/ variations in operational/ rehabilitation sequence will be permitted in order to adjust for any variable resource and market conditions.

C. Slopes and Grading

1. Topsoil and overburden will be used in the progressive rehabilitation of the side slope areas. Above water side slope areas will be covered with a minimum150mm of topsoil/organic matter. Overburden/soil will be used to backfill pit faces to desired finished grades (i.e. 3:1 slope). Importation of excess soil will be required to achieve the rehabilitated landform as shown.

2. Importation of fill/excess soil:
   - 1.1. Excess soil (topsoil) as defined in Ontario Regulation 406/19 under the Environmental Protection Act, may be imported to this site for top dressing of side slopes and backfilled area along Concession 4 Road.
   - 1.2. Excess soil imported for the rehabilitation purposes described above shall meet the soil quality standards set out in Table 1: "Full Depth Background Site Condition Standards", of the Rules for Soil Management and Excess Soil Quality Standards published by the Ministry of Environment, Conservation and Parks, as amended from time to time.
   - 1.3. The maximum total amount of excess soil, specifically topsoil, that may be imported to this site for rehabilitation purposes is 50,000 m^3.
   - 1.4. The licensee shall ensure that the acceptance and reuse of excess soil imported for rehabilitation purposes is compliant with Part I: Rules for Soil Management of the "Rules for Soil Management and Excess Soil Quality Standards published by the Ministry of Environment, Conservation and Park and as amended from time to time.

D. Proposed Vegetation and Rehabilitated Features

1. All nodal tree and shrub plantings and side-slope seeding will consist of native non invasive vegetation species. All ground covers on overburden piles and side slopes will be established as part of the phased stripping operations that proceed extraction and will be maintained and replaced should it fail to establish itself to control erosion.
2. Shallow Shoreline / Shallow Littoral Area
   The following recommendations shall be incorporated into the planting design. All plantings (i.e., nodal plantings) included in the rehabilitation plan shall be locally native, non-invasive species that create habitat in the short term and promote natural succession processes. Recommended shoreline and aquatic plants include shrubs such as red-osier dogwood (Cornus sericea) and slender willow (Salix petiolaris), and herbaceous plants such as water plantain (Alisma plantago-aquatica), lake sedge (Carex lacustris), swamp milkweed (Asclepias incarnata), softstem bulrush (Schoenoplectus tabernaemontani), and cattail (Typha spp.). Shallow littoral/wetland habitats should be created through construction of submerged benches up to 2 m deep. Shallow emergent marsh vegetation (i.e. herbaceous species listed above) shall be planted in water ±0.15 m deep and extend ±5 m from the shore and be interspersed with cover structures (e.g., boulders and root wads) in the shallow shoreline littoral/wetland areas. Organic material and topsoil shall be added to the shoreline areas to promote shoreline vegetation, and the placement of basking logs (i.e. large woody debris) and rubble/boulders along the shoreline is recommended to create turtle basking areas, waterfowl nesting areas and bird perching sites (see "Shallow Shoreline Detail" and "Shoreline Wetland Detail" this page). Shoreline and Aquatic plantings will coincide with the final stages of site rehabilitation.

3. Side Slopes, Setbacks & Backfilled Areas
   Side slope and backfilled areas will be covered with a minimum 150mm of topsoil/organic matter and seeded. Terrestrial nodal plantings on the side slope and within the setback areas shall include a mixture of coniferous and deciduous tree species to promote species diversity and provide a variety of species to compensate for any substrate deficiencies. Recommended species include white pine, basswood, trembling aspen (Populus tremuloides) and white birch (Betula papyrifera) with a secondary focus on species such as choke cherry (Prunus virginiana), alternate-leaved dogwood (Cornus alternifolia), highbush cranberry (Viburnum opulus), nannyberry (Viburnum lentago) and serviceberry (Amelanchier spp.). It is recommended that ash (Fraxinus spp.) species be avoided in rehabilitation plantings due to the invasion of the emerald ash borer. The establishment of nodal planting areas/cells will occur progressively and generally follow the sequence of extraction and side slope/setback grading and seeding. Vegetation shall be replaced should it fail to establish and prevent erosion.

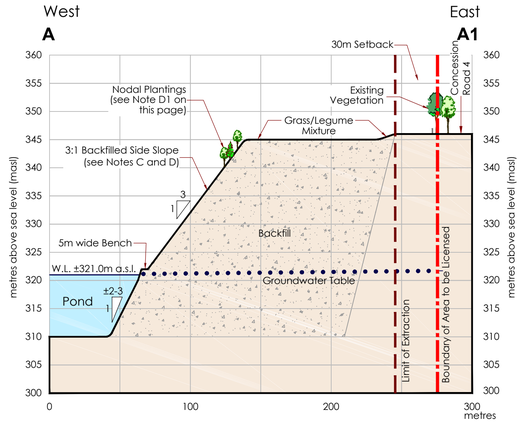
4. Rehabilitated Landform
   The proposed rehabilitation includes an opportunity to enhance the biological diversity of the local landscape by providing a feature that will attract migratory waterfowl and provide elements that will be of value to locally resident wildlife. Rehabilitation of this site involves the creation of ±5.3 ha. of lake and ±9.7 ha. of terrestrial landform comprised of overburden side slopes, setback areas and an area backfilled to original grade for future development opportunity. The final pit landform will be in accordance with the drawing as shown on this page.

E. Drainage

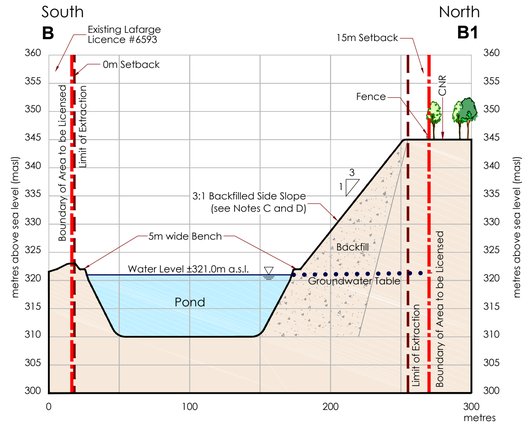
1. Final surface drainage will follow the rehabilitated contours as shown and be directed towards the post-extraction pond.

F. Final Rehabilitation

1. No buildings or structures associated with aggregate operations will remain on site.
2. There will be no internal roads remaining on the site.
3. The water level of the proposed lake (± 321m a.s.l.) and the post extraction ground water table, are as shown on pages 1 and 3 of 3 as per hydrogeological/hydrological assessments.



Section A-A1 - Rehabilitated Conditions



Section B-B1 - Rehabilitated Conditions

Horizontal Scale 1:2,000
Vertical Exaggeration 4x

Legal Description

PART OF LOT 20
CONCESSION 3
Township of Uxbridge
Region of Durham

Site Plan Amendments

No.	Date	Description	By

MHBC PLANNING URBAN DESIGN & LANDSCAPE ARCHITECTURE
200 - 540 BINGEMANS CENTRE DR. KITCHENER, ON. N2B 3X9 | P: 519.576.3650 F: 519.576.0121 | WWW.MHBCPLAN.COM

NDMNRF Approval Stamp

Stamp

CAITLIN M. POST — REGISTERED PROFESSIONAL PLANNER — R.P.P.

north

LAFARGE Building better cities™

Applicant's Signature

Chris Galway
Senior Land Manager - East Central Ontario
Lafarge Canada Inc.

Project

Goodwood Pit Extension

Lafarge Canada Inc.
6509 Airport Road, Mississauga Ontario, L4V 1S7
Tel: (905) 738-7732 Fax: (905) 738-7092

NDMNRF Licence Reference No.

Pre-approval review:

For Submission to NDMNRF- January 2022

Plan Scale: **See Plan**

HORIZONTAL SCALE
50 0 50 100
METRES

Plot Scale 1:2.0 [1mm = 2.0 units] MODEL

Drawn By D.G.S.

Checked By J.P.

File No. **9526HC**

File Name

REHABILITATION PLAN

Drawing No.

3 OF 3

K:\9526HC-Lafarge-Goodwood Pit Extension-Uxbridge\A\Rehaplan 3of3 January2022.dwg

APPENDIX B

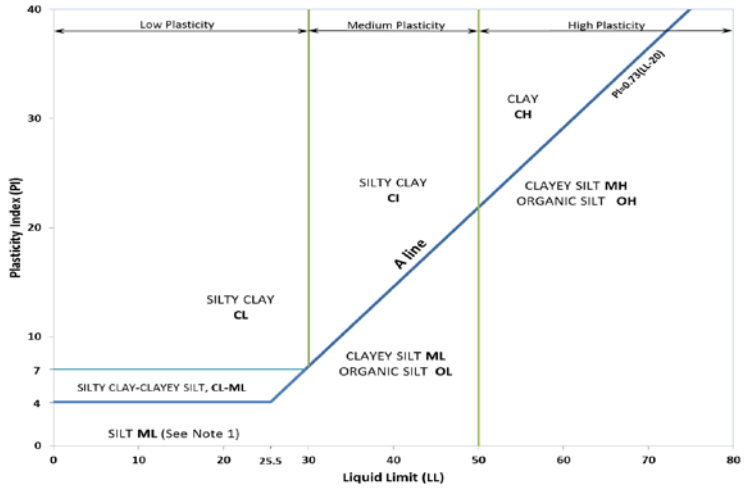
Borehole Logs

METHOD OF SOIL CLASSIFICATION

The WSP Canada Inc. Soil Classification System is based on the Unified Soil Classification System (USCS)

Organic or Inorganic	Soil Group	Type of Soil		Gradation or Plasticity	$Cu = \frac{D_{60}}{D_{10}}$	$Cc = \frac{(D_{30})^2}{D_{10} x D_{60}}$	Organic Content	USCS Group Symbol	Group Name
INORGANIC (Organic Content ≤30% by mass)	COARSE-GRAINED SOILS (>50% by mass is larger than 0.075 mm)	GRAVELS (>50% by mass of coarse fraction is larger than 4.75 mm)	Gravels with ≤12% fines (by mass)	Poorly Graded	<4	≤1 or ≥3	≤30%	GP	GRAVEL
				Well Graded	≥4	1 to 3		GW	GRAVEL
			Gravels with >12% fines (by mass)	Below A Line	n/a			GM	SILTY GRAVEL
				Above A Line	n/a			GC	CLAYEY GRAVEL
		SANDS (≥50% by mass of coarse fraction is smaller than 4.75 mm)	Sands with ≤12% fines (by mass)	Poorly Graded	<6	≤1 or ≥3		SP	SAND
				Well Graded	≥6	1 to 3		SW	SAND
			Sands with >12% fines (by mass)	Below A Line	n/a			SM	SILTY SAND
				Above A Line	n/a			SC	CLAYEY SAND

Organic or Inorganic	Soil Group	Type of Soil	Laboratory Tests	Field Indicators					Organic Content	USCS Group Symbol	Primary Name
				Dilatancy	Dry Strength	Shine Test	Thread Diameter	Toughness (of 3 mm thread)			
INORGANIC (Organic Content ≤30% by mass)	FINE-GRAINED SOILS (≥50% by mass is smaller than 0.075 mm)	SILTS (Non-Plastic or PI and LL plot below A-Line on Plasticity Chart below)	Liquid Limit <50	Rapid	None	None	>6 mm	N/A (can't roll 3 mm thread)	<5%	ML	SILT
				Slow	None to Low	Dull	3mm to 6 mm	None to low	<5%	ML	CLAYEY SILT
				Slow to very slow	Low to medium	Dull to slight	3mm to 6 mm	Low	5% to 30%	OL	ORGANIC SILT
			Liquid Limit ≥50	Slow to very slow	Low to medium	Slight	3mm to 6 mm	Low to medium	<5%	MH	CLAYEY SILT
				None	Medium to high	Dull to slight	1 mm to 3 mm	Medium to high	5% to 30%	OH	ORGANIC SILT
		CLAYS (PI and LL plot above A-Line on Plasticity Chart below)	Liquid Limit <30	None	Low to medium	Slight to shiny	~ 3 mm	Low to medium	0% to 30% (see Note 2)	CL	SILTY CLAY
			Liquid Limit 30 to 50	None	Medium to high	Slight to shiny	1 mm to 3 mm	Medium		CI	SILTY CLAY
			Liquid Limit ≥50	None	High	Shiny	<1 mm	High		CH	CLAY
HIGHLY ORGANIC SOILS (Organic Content >30% by mass)		Peat and mineral soil mixtures							30% to 75%	PT	SILTY PEAT, SANDY PEAT
		Predominantly peat, may contain some mineral soil, fibrous or amorphous peat							75% to 100%		PEAT



Note 1 – Fine grained materials with PI and LL that plot in this area are named (ML) SILT with slight plasticity. Fine-grained materials which are non-plastic (i.e. a PL cannot be measured) are named SILT.
Note 2 – For soils with <5% organic content, include the descriptor "trace organics" for soils with between 5% and 30% organic content include the prefix "organic" before the Primary name.

Dual Symbol — A dual symbol is two symbols separated by a hyphen, for example, GP-GM, SW-SC and CL-ML.
For non-cohesive soils, the dual symbols must be used when the soil has between 5% and 12% fines (i.e. to identify transitional material between "clean" and "dirty" sand or gravel.
For cohesive soils, the dual symbol must be used when the liquid limit and plasticity index values plot in the CL-ML area of the plasticity chart (see Plasticity Chart at left).

Borderline Symbol — A borderline symbol is two symbols separated by a slash, for example, CL/CI, GM/SM, CL/ML.
A borderline symbol should be used to indicate that the soil has been identified as having properties that are on the transition between similar materials. In addition, a borderline symbol may be used to indicate a range of similar soil types within a stratum.

ABBREVIATIONS AND TERMS USED ON RECORDS OF BOREHOLES AND TEST PITS

PARTICLE SIZES OF CONSTITUENTS

Soil Constituent	Particle Size Description	Millimetres	Inches (US Std. Sieve Size)
BOULDERS	Not Applicable	>300	>12
COBBLES	Not Applicable	75 to 300	3 to 12
GRAVEL	Coarse Fine	19 to 75 4.75 to 19	0.75 to 3 (4) to 0.75
SAND	Coarse Medium Fine	2.00 to 4.75 0.425 to 2.00 0.075 to 0.425	(10) to (4) (40) to (10) (200) to (40)
SILT/CLAY	Classified by plasticity	<0.075	< (200)

MODIFIERS FOR SECONDARY AND MINOR CONSTITUENTS

Percentage by Mass	Modifier
>35	Use 'and' to combine major constituents (*i.e.,* SAND and GRAVEL)
> 12 to 35	Primary soil name prefixed with "gravelly, sandy, SILTY, CLAYEY" as applicable
> 5 to 12	some
≤ 5	trace

PENETRATION RESISTANCE

Standard Penetration Resistance (SPT), N:

The number of blows by a 63.5 kg (140 lb) hammer dropped 760 mm (30 in.) required to drive a 50 mm (2 in.) split-spoon sampler for a distance of 300 mm (12 in.). Values reported are as recorded in the field and are uncorrected.

Cone Penetration Test (CPT)

An electronic cone penetrometer with a 60° conical tip and a project end area of 10 cm^2 pushed through ground at a penetration rate of 2 cm/s. Measurements of tip resistance (q_t), porewater pressure (u) and sleeve frictions are recorded electronically at 25 mm penetration intervals.

Dynamic Cone Penetration Resistance (DCPT); N_d:

The number of blows by a 63.5 kg (140 lb) hammer dropped 760 mm (30 in.) to drive uncased a 50 mm (2 in.) diameter, 60° cone attached to "A" size drill rods for a distance of 300 mm (12 in.).

PH: Sampler advanced by hydraulic pressure
PM: Sampler advanced by manual pressure
WH: Sampler advanced by static weight of hammer
WR: Sampler advanced by weight of sampler and rod

SAMPLES

AS	Auger sample
BS	Block sample
CS	Chunk sample
DD	Diamond Drilling
DO or DP	Seamless open ended, driven or pushed tube sampler – note size
DS	Denison type sample
GS	Grab Sample
MC	Modified California Samples
MS	Modified Shelby (for frozen soil)
RC	Rock core
SC	Soil core
SS	Split spoon sampler – note size
ST	Slotted tube
TO	Thin-walled, open – note size (Shelby tube)
TP	Thin-walled, piston – note size (Shelby tube)
WS	Wash sample

SOIL TESTS

w	water content
PL , w_p	plastic limit
LL , w_L	liquid limit
C	consolidation (oedometer) test
CHEM	chemical analysis (refer to text)
CID	consolidated isotropically drained triaxial test[1]
CIU	consolidated isotropically undrained triaxial test with porewater pressure measurement[1]
D_R	relative density (specific gravity, Gs)
DS	direct shear test
GS	specific gravity
M	sieve analysis for particle size
MH	combined sieve and hydrometer (H) analysis
MPC	Modified Proctor compaction test
SPC	Standard Proctor compaction test
OC	organic content test
SO_4	concentration of water-soluble sulphates
UC	unconfined compression test
UU	unconsolidated undrained triaxial test
V (FV)	field vane (LV-laboratory vane test)
γ	unit weight

1. Tests anisotropically consolidated prior to shear are shown as CAD, CAU.

NON-COHESIVE (COHESIONLESS) SOILS

Compactness[2]

Term	SPT 'N' (blows/0.3m)[1]
Very Loose	0 to 4
Loose	4 to 10
Compact	10 to 30
Dense	30 to 50
Very Dense	>50

1. SPT 'N' in accordance with ASTM D1586, uncorrected for the effects of overburden pressure.
2. Definition of compactness terms are based on SPT 'N' ranges as provided in Terzaghi, Peck and Mesri (1996). Many factors affect the recorded SPT 'N' value, including hammer efficiency (which may be greater than 60% in automatic trip hammers), overburden pressure, groundwater conditions, and grainsize. As such, the recorded SPT 'N' value(s) should be considered only an approximate guide to the soil compactness. These factors need to be considered when evaluating the results, and the stated compactness terms should not be relied upon for design or construction.

Field Moisture Condition

Term	Description
Dry	Soil flows freely through fingers.
Moist	Soils are darker than in the dry condition and may feel cool.
Wet	As moist, but with free water forming on hands when handled.

COHESIVE SOILS

Consistency

Term	Undrained Shear Strength (kPa)	SPT 'N'[1,2] (blows/0.3m)
Very Soft	<12	0 to 2
Soft	12 to 25	2 to 4
Firm	25 to 50	4 to 8
Stiff	50 to 100	8 to 15
Very Stiff	100 to 200	15 to 30
Hard	>200	>30

1. SPT 'N' in accordance with ASTM D1586, uncorrected for overburden pressure effects; approximate only.
2. SPT 'N' values should be considered ONLY an approximate guide to consistency; for sensitive clays (e.g., Champlain Sea clays), the N-value approximation for consistency terms does NOT apply. Rely on direct measurement of undrained shear strength or other manual observations.

Water Content

Term	Description
w < PL	Material is estimated to be drier than the Plastic Limit.
w ~ PL	Material is estimated to be close to the Plastic Limit.
w > PL	Material is estimated to be wetter than the Plastic Limit.

Unless otherwise stated, the symbols employed in the report are as follows:

I. GENERAL

π	3.1416
ln x	natural logarithm of x
$\log_{10}$	x or log x, logarithm of x to base 10
g	acceleration due to gravity
t	time

II. STRESS AND STRAIN

γ	shear strain
Δ	change in, e.g. in stress: $\Delta\sigma$
ε	linear strain
ε_v	volumetric strain
η	coefficient of viscosity
υ	Poisson's ratio
σ	total stress
σ'	effective stress ($\sigma' = \sigma - u$)
σ'_{vo}	initial effective overburden stress
$\sigma_1, \sigma_2, \sigma_3$	principal stress (major, intermediate, minor)
σ_{oct}	mean stress or octahedral stress $= (\sigma_1 + \sigma_2 + \sigma_3)/3$
τ	shear stress
u	porewater pressure
E	modulus of deformation
G	shear modulus of deformation
K	bulk modulus of compressibility

III. SOIL PROPERTIES

(a) Index Properties

$\rho(\gamma)$	bulk density (bulk unit weight)*
$\rho_d(\gamma_d)$	dry density (dry unit weight)
$\rho_w(\gamma_w)$	density (unit weight) of water
$\rho_s(\gamma_s)$	density (unit weight) of solid particles
γ'	unit weight of submerged soil ($\gamma' = \gamma - \gamma_w$)
D_R	relative density (specific gravity) of solid particles ($D_R = \rho_s / \rho_w$) (formerly G_s)
e	void ratio
n	porosity
S	degree of saturation

* Density symbol is ρ. Unit weight symbol is γ where $\gamma = \rho g$ (i.e. mass density multiplied by acceleration due to gravity)

(a) Index Properties (continued)

w	water content
w_l or LL	liquid limit
w_p or PL	plastic limit
I_p or PI	plasticity index = $(w_l - w_p)$
NP	non-plastic
w_s	shrinkage limit
I_L	liquidity index = $(w - w_p) / I_p$
I_C	consistency index = $(w_l - w) / I_p$
e_{max}	void ratio in loosest state
e_{min}	void ratio in densest state
I_D	density index = $(e_{max} - e) / (e_{max} - e_{min})$ (formerly relative density)

(b) Hydraulic Properties

h	hydraulic head or potential
q	rate of flow
v	velocity of flow
i	hydraulic gradient
k	hydraulic conductivity (coefficient of permeability)
j	seepage force per unit volume

(c) Consolidation (one-dimensional)

C_c	compression index (normally consolidated range)
C_r	recompression index (over-consolidated range)
C_s	swelling index
C_α	secondary compression index
m_v	coefficient of volume change
c_v	coefficient of consolidation (vertical direction)
c_h	coefficient of consolidation (horizontal direction)
T_v	time factor (vertical direction)
U	degree of consolidation
σ'_p	pre-consolidation stress
OCR	over-consolidation ratio = σ'_p / σ'_{vo}

(d) Shear Strength

τ_p, τ_r	peak and residual shear strength
ϕ'	effective angle of internal friction
δ	angle of interface friction
μ	coefficient of friction = tan δ
c′	effective cohesion
c_u, s_u	undrained shear strength ($\phi = 0$ analysis)
p	mean total stress $(\sigma_1 + \sigma_3)/2$
p′	mean effective stress $(\sigma'_1 + \sigma'_3)/2$
q	$(\sigma_1 - \sigma_3)/2$ or $(\sigma'_1 - \sigma'_3)/2$
q_u	compressive strength $(\sigma_1 - \sigma_3)$
S_t	sensitivity

Notes: 1 $\tau = c' + \sigma' \tan \phi'$

2 shear strength = (compressive strength)/2

PROJECT: 1894152

LOCATION: N 4879757.60; E 645890.30

RECORD OF BOREHOLE: MW18-01

BORING DATE: April 11, 2018

SHEET 1 OF 2

DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm

HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80)	SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-10} 10^{-8} 10^{-6} 10^{-4})	WATER CONTENT PERCENT (Wp, W, Wl) (8 16 24 32)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		343.74									
0	CSD 550 165 mm O.D., 114 mm I.D., Sonic	TOPSOIL, trace rootlets; brown; non-cohesive, moist		0.00 / 343.28	1	DO							Casing
		SAND and GRAVEL, coarse, trace silt; brown; non-cohesive, moist		0.46 / 342.67	2	DO							#2 Silica Sand
		CLAYEY SILT, some sand, trace gravel; light brown; non-cohesive, moist			3	DO							
				1.22 / 341.91	4	DO							
2		CLAYEY SILT, trace sand, trace gravel; light brown; non-cohesive, moist		1.83	5	DO							
		SILTY CLAY, trace sand; light brown; cohesive, w~PL			6	DO							
				340.69									
		SAND and GRAVEL, coarse, trace silt; light brown; non-cohesive, moist		3.05	7	DO							
4					8	DO							
				338.25									
		SAND and GRAVEL, coarse, trace silt; dark brown to light brown; non-cohesive, moist		5.49	9	DO							
6				336.73									
		SAND and GRAVEL, coarse; dark brown to light brown; non-cohesive, moist		7.01	10	DO							
8				335.21									
		SAND and GRAVEL, coarse; dark brown; non-cohesive, moist		8.53	11	DO							
				333.68									
10		SAND and GRAVEL, coarse; brown to light brown; non-cohesive, moist		10.06	12	DO							Bentonite
				332.16									
		SAND, fine, trace silt; light brown; non-cohesive, moist		11.58									
12													
					13	DO							
14													
16													
				326.06									
		SAND, fine; light brown; non-cohesive, moist		17.68									
18					14	DO							
20		*CONTINUED NEXT PAGE*											

DEPTH SCALE

1 : 100

GOLDER
MEMBER OF WSP

LOGGED: JC

CHECKED:

GTA-BHS 001 S:\CLIENTS\LAFARGEHOLCIM\ON_UXBRIDGE_4THCONCESSION_4900\02_DATA\GINT\1894152.GPJ GAL-MIS.GDT 7/21/21

PROJECT: 1894152

RECORD OF BOREHOLE: MW18-01

SHEET 2 OF 2

LOCATION: N 4879757.60; E 645890.30

BORING DATE: April 11, 2018

DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm

HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-10} 10^{-8} 10^{-6} 10^{-4}) / WATER CONTENT PERCENT (Wp — W — Wl) (8 16 24 32)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		--- CONTINUED FROM PREVIOUS PAGE ---									
20	CSD 550 165 mm O.D., 114 mm I.D., Sonic	SAND, fine; light brown; non-cohesive, moist		323.01	14	DO					
		SAND, fine, trace silt; brown; non-cohesive, moist		20.73 322.40	15	DO					
22		SAND, fine; light brown; non-cohesive, moist		21.34 319.97	16	DO					
24		SAND and GRAVEL, coarse; brown; non-cohesive, moist to wet		23.77 313.87	17	DO					May 22, 2018 ▽ Bentonite
26											
28											
30		SAND and GRAVEL, coarse; dark brown; non-cohesive, wet		29.87							#2 Silica Sand
32					18	DO					
34											PVC Screen
36					19	DO					
		END OF BOREHOLE		306.86 36.88							
38		NOTES: 1. Groundwater measured in open borehole at a depth of 24.5 m below ground surface upon completion of drilling. 2. Groundwater measured in monitoring well at a depth of 23.6 m below ground surface on May 22, 2018.									
40											

DEPTH SCALE

1 : 100

GOLDER
MEMBER OF WSP

LOGGED: JC

CHECKED:

GTA-BHS 001 S:\CLIENTS\LAFARGEHOLCIM\ON_UXBRIDGE_4THCONCESSION_4900\02_DATA\GINT\1894152.GPJ GAL-MIS.GDT 7/21/21

PROJECT: 1894152

RECORD OF BOREHOLE: MW18-02

SHEET 1 OF 3

LOCATION: N 4879444.70; E 645868.30

BORING DATE: April 10, 2018

DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm

HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-10} 10^{-8} 10^{-6} 10^{-4}) / WATER CONTENT PERCENT (Wp — W — Wl) (8 16 24 32)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		346.43							
0	CSD 550	TOPSOIL, trace rootlets; brown, moist		0.00 / 345.97	1	DO					Casing
		SILTY SAND, trace gravel; brown; non-cohesive, moist		0.46 / 345.52	2	DO					#2 Silica Sand
		SAND and GRAVEL, coarse; brown and grey; non-cohesive, moist		0.91	3	DO					
		SAND, fine, trace gravel; light brown; non-cohesive, moist		1.22	4	DO					
2					5	DO					
4					6	DO					
6					7	DO					
				338.66							
8		SILTY CLAY, trace sand; light brown; cohesive, w~PL		7.77 / 337.90	8	DO					
		SILTY CLAY, some sand; light brown; cohesive, w~PL		8.53	9	DO					
10											Bentonite
				335.46							
		SAND, trace silt; light brown; non-cohesive, moist		10.97 / 334.85	10	DO					
12		SAND and GRAVEL, coarse; brown to light brown and grey; non-cohesive, moist		11.58	11	DO					
14											
16					12	DO					
				329.36							
		SAND and GRAVEL, coarse; light brown and grey; non-cohesive, moist		17.07 / 328.75	13	DO					
18		SAND, coarse; dark brown to light brown; non-cohesive, moist		17.68	14	DO					
20		*CONTINUED NEXT PAGE*									

DEPTH SCALE

1 : 100

GOLDER
MEMBER OF WSP

LOGGED: JC

CHECKED:

GTA-BHS 001 S:\CLIENTS\LAFARGEHOLCIM\ON_UXBRIDGE_4THCONCESSION_4900\02_DATA\GINT\1894152.GPJ GAL-MIS.GDT 7/21/21

PROJECT: 1894152

RECORD OF BOREHOLE: MW18-02

SHEET 2 OF 3

LOCATION: N 4879444.70; E 645868.30

BORING DATE: April 10, 2018

DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm

HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80)	SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-10} 10^{-8} 10^{-6} 10^{-4})	WATER CONTENT PERCENT (Wp — W — Wl) (8 16 24 32)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		--- CONTINUED FROM PREVIOUS PAGE ---											
20	CSD 550 165 mm O.D., 114 mm I.D., Sonic	SAND, coarse; dark brown to light brown; non-cohesive, moist		325.70	14	DO							
		SAND and GRAVEL, coarse; dark brown to light brown and grey; non-cohesive, moist		20.73									
22					15	DO							
				322.66									
24		SAND, coarse; brown; non-cohesive, moist		23.77									
					16	DO							Bentonite / May 22, 2018
26				319.61									
		SAND and GRAVEL, coarse; dark brown to brown; non-cohesive, moist		26.82									
28					17	DO							
				316.56									
30		GRAVEL, coarse, trace sand; brown; non-cohesive, moist		29.87									
				315.95									#2 Silica Sand
		SAND, fine to coarse, trace gravel; dark brown to light brown; non-cohesive, moist to wet		30.48									
32													
					18	DO							
34													PVC Screen
36				310.46									
		SAND to SAND and GRAVEL, coarse; brown to grey; non-cohesive, wet		35.97									
					19	DO							
38				308.33									
		END OF BOREHOLE		38.10									
		NOTES:											
		1. Groundwater measured in open borehole at a depth of 25.9 m below ground surface upon completion of drilling.											
40		*CONTINUED NEXT PAGE*											

DEPTH SCALE

1 : 100

GOLDER
MEMBER OF WSP

LOGGED: JC

CHECKED:

GTA-BHS 001 S:\CLIENTS\LAFARGEHOLCIM\ON_UXBRIDGE_4THCONCESSION_4900\02_DATA\GINT\1894152.GPJ GAL-MIS.GDT 7/21/21

PROJECT: 1894152

LOCATION: N 4879444.70; E 645868.30

RECORD OF BOREHOLE: MW18-02

SHEET 3 OF 3

BORING DATE: April 10, 2018

DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm

HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	SOIL PROFILE: STRATA PLOT	SOIL PROFILE: ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-10} 10^{-8} 10^{-6} 10^{-4}) / WATER CONTENT PERCENT (Wp — W — Wl) (8 16 24 32)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
40		*--- CONTINUED FROM PREVIOUS PAGE ---*									
		2. Groundwater measured in monitoring well at a depth of 25.0 m below ground surface on May 22, 2018.									
42											
44											
46											
48											
50											
52											
54											
56											
58											
60											

DEPTH SCALE

1 : 100

GOLDER
MEMBER OF WSP

LOGGED: JC

CHECKED:

GTA-BHS 001 S:\CLIENTS\LAFARGEHOLCIM\ON_UXBRIDGE_4THCONCESSION_4900\02_DATA\GINT\1894152.GPJ GAL-MIS.GDT 7/21/21

PROJECT: 1894152

LOCATION: N 4879384.90; E 645314.80

RECORD OF BOREHOLE: MW18-03

SHEET 1 OF 2

BORING DATE: April 12, 2018

DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm

HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-10} 10^{-8} 10^{-6} 10^{-4}) / WATER CONTENT PERCENT (Wp, W, Wl) (8 16 24 32)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		346.63							
0	CSD 550	TOPSOIL, trace rootlets, trace organics; dark brown; moist		0.00	1	DO					Casing
		SAND, fine, trace silt; brown to light brown; non-cohesive, moist		0.30 / 345.41	2	DO					#2 Silica Sand
2		SAND, fine; light brown; non-cohesive, moist		1.22	3	DO					
					4	DO					
4					5	DO					
				341.14							
6		SAND, fine, trace silt; light brown; non-cohesive, moist		5.49							
8					6	DO					
10	165 mm O.D., 114 mm I.D., Sonic										Bentonite
				335.05							
		SAND and GRAVEL, coarse, trace cobbles; dark brown; non-cohesive, moist		11.58	7	DO					
12		SAND and GRAVEL, coarse; dark brown to light brown; non-cohesive, moist		11.89							
14					8	DO					
16											
				328.95							
18		SAND and GRAVEL, coarse; dark brown to light brown; non-cohesive, moist		17.68	9	DO					
20		*CONTINUED NEXT PAGE*									

DEPTH SCALE

1 : 100

GOLDER
MEMBER OF WSP

LOGGED: JC

CHECKED:

GTA-BHS 001 S:\CLIENTS\LAFARGEHOLCIM\ON_UXBRIDGE_4THCONCESSION_4900\02_DATA\GINT\1894152.GPJ GAL-MIS.GDT 7/21/21

PROJECT: 1894152

LOCATION: N 4879384.90; E 645314.80

RECORD OF BOREHOLE: MW18-03

BORING DATE: April 12, 2018

SHEET 2 OF 2

DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm

HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-10} 10^{-8} 10^{-6} 10^{-4}) / WATER CONTENT PERCENT (Wp — W — Wl) (8 16 24 32)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		--- CONTINUED FROM PREVIOUS PAGE ---									
20	CSD 550 165 mm O.D., 114 mm I.D., Sonic	SAND and GRAVEL, coarse; dark brown to light brown; non-cohesive, moist		325.90	9	DO					
		SAND and GRAVEL, coarse; dark brown; non-cohesive, moist		20.73	10	DO					
22				324.38							
		SAND and GRAVEL, coarse; light brown; non-cohesive, moist		22.25	11	DO					
				322.86							
24		SAND, coarse, some gravel, trace silt; light brown; non-cohesive, moist		23.77	12	DO					Bentonite ▽ May 22, 2018
26				319.81							
		SAND, coarse, trace gravel; brown to light brown and grey; non-cohesive, moist		26.82	13	DO					
28				317.67							
		SAND, fine, trace gravel, trace silt; grey; non-cohesive, moist		28.96	14	DO					
				316.76							
30		No Sample Collected		29.87							#2 Silica Sand
32					15	DO					
34											PVC Screen
				310.66							
36		No Sample Collected		35.97	16	DO					
				309.75							
		END OF BOREHOLE		36.88							
38		NOTES:									
		1. Groundwater measured in open borehole at a depth of 26.1 m below ground surface upon completion of drilling.									
		2. Groundwater measured in monitoring well at a depth of 25.3 m below ground surface on May 22, 2018.									
40											

DEPTH SCALE

1 : 100

GOLDER
MEMBER OF WSP

LOGGED: JC

CHECKED:

GTA-BHS 001 S:\CLIENTS\LAFARGEHOLCIM\ON_UXBRIDGE_4THCONCESSION_4900\02_DATA\GINT\1894152.GPJ GAL-MIS.GDT 7/21/21

Ministry of the Environment
Ontario

The Ontario Water Resources Act

WATER WELL RECORD

1. PRINT ONLY IN SPACES PROVIDED
2. CHECK ☒ CORRECT BOX WHERE APPLICABLE

11 — 1909612 — MUNICIP 19012 — CON. CON 103

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON. BLOCK, TRACT, SURVEY, ETC.	LOT
Durham	Uxbridge	3	20

[redacted] 4900 Conc 4.
81 Goodwood, Ontario LOC 1A0

DATE COMPLETED: DAY 20 MO 12 YR 88

UTM/NG 17 79 38 83 — RC — ELEVATION 345 — RC — BASIN CODE

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	DEPTH - FEET TO
Brown	Clay	Sand	Layers	0	65
Brown	Gravel		Loose & Dry	65	85
Yellow	Clay	Strips of Sand	Packed	85	96
Brown	Sand		Clean & Fine	96	106

31
32

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
96'	1 ☒ FRESH 2 ☐ SALTY — 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS
	1 ☐ FRESH 2 ☐ SALTY — 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS
	1 ☐ FRESH 2 ☐ SALTY — 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS
	1 ☐ FRESH 2 ☐ SALTY — 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS
	1 ☐ FRESH 2 ☐ SALTY — 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS

51 CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	DEPTH - FEET TO
6 1/4	1 ☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE 5 ☐ PLASTIC	.188	5'-	96'
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE 5 ☐ PLASTIC			
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE 5 ☐ PLASTIC			

SCREEN

SIZE(S) OF OPENING (SLOT NO.)	DIAMETER	LENGTH
8	6 INCHES	10 FEET
MATERIAL AND TYPE	DEPTH TO TOP OF SCREEN	
S.S.	96 FEET	

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	DEPTH SET AT - FEET TO	MATERIAL AND TYPE (CEMENT GROUT LEAD PACKER, ETC.)

71 PUMPING TEST

PUMPING TEST METHOD	PUMPING RATE	DURATION OF PUMPING
1 ☐ PUMP 2 ☒ BAILER	12 GPM	2 HOURS 30 MINS

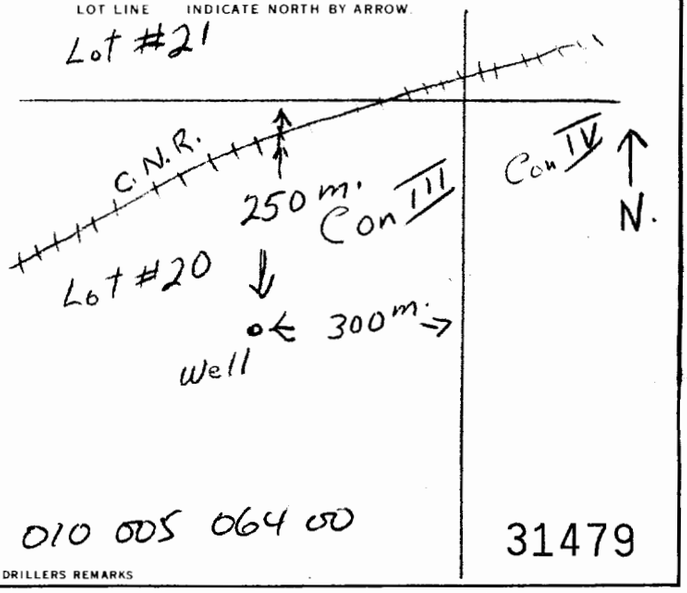
STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING	15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
75 FEET	86 FEET	1 ☒ PUMPING 2 ☐ RECOVERY	86 FEET	86 FEET	86 FEET	86 FEET

IF FLOWING, GIVE RATE	PUMP INTAKE SET AT	WATER AT END OF TEST
GPM	FEET	1 ☒ CLEAR 2 ☐ CLOUDY

RECOMMENDED PUMP TYPE	RECOMMENDED PUMP SETTING	RECOMMENDED PUMPING RATE
☐ SHALLOW ☒ DEEP	95 FEET	15 GPM

LOCATION OF WELL

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



010 005 064 00

31479

DRILLERS REMARKS

FINAL STATUS OF WELL

1 ☒ WATER SUPPLY — 5 ☐ ABANDONED, INSUFFICIENT SUPPLY
2 ☐ OBSERVATION WELL — 6 ☐ ABANDONED, POOR QUALITY
3 ☐ TEST HOLE — 7 ☐ UNFINISHED
4 ☐ RECHARGE WELL — 9 ☐ DEWATERING

WATER USE

1 ☒ DOMESTIC — 5 ☐ COMMERCIAL
2 ☐ STOCK — 6 ☐ MUNICIPAL
3 ☐ IRRIGATION — 7 ☐ PUBLIC SUPPLY
4 ☐ INDUSTRIAL — 8 ☐ COOLING OR AIR CONDITIONING
☐ OTHER — 9 ☐ NOT USED

METHOD OF CONSTRUCTION

1 ☒ CABLE TOOL — 6 ☐ BORING
2 ☐ ROTARY (CONVENTIONAL) — 7 ☐ DIAMOND
3 ☐ ROTARY (REVERSE) — 8 ☐ JETTING
4 ☐ ROTARY (AIR) — 9 ☐ DRIVING
5 ☐ AIR PERCUSSION — ☐ DIGGING ☐ OTHER

CONTRACTOR

NAME OF WELL CONTRACTOR: Sauder Well Drilling Ltd.
WELL CONTRACTOR'S LICENCE NUMBER: 4743
ADDRESS: R.R. # 4 UXBRIDGE, Ontario LOC 1K0
NAME OF WELL TECHNICIAN: Ab Sauder
WELL TECHNICIAN'S LICENCE NUMBER: T-0241
SIGNATURE OF TECHNICIAN/CONTRACTOR: Ab. Sauder
SUBMISSION DATE: DAY 30 MO 12 YR 88

OFFICE USE ONLY

DATA SOURCE
CONTRACTOR: 4743
DATE RECEIVED: JAN 04 1989
DATE OF INSPECTION
INSPECTOR
REMARKS
WDE

MINISTRY OF THE ENVIRONMENT COPY

FORM NO. 0506 (11/86) FORM 9

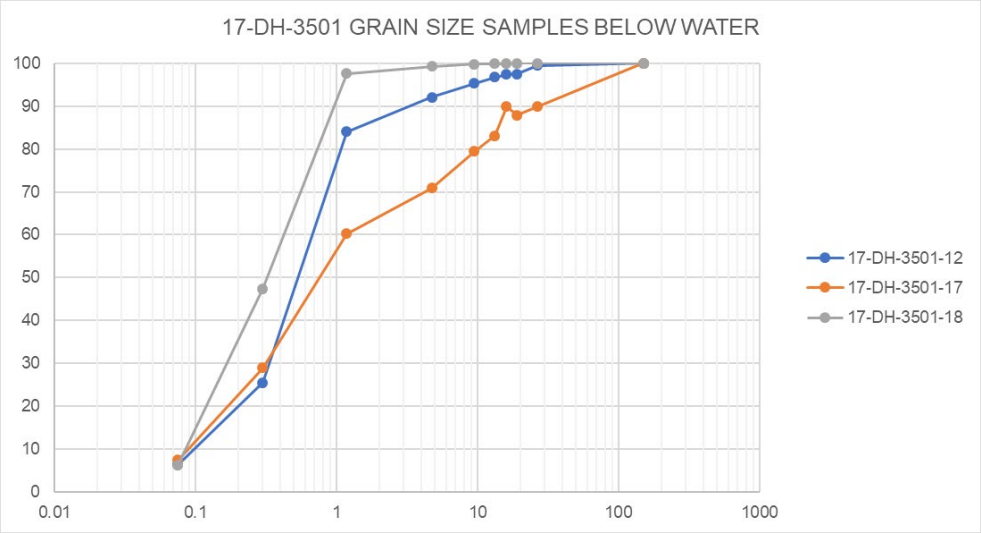
APPENDIX C

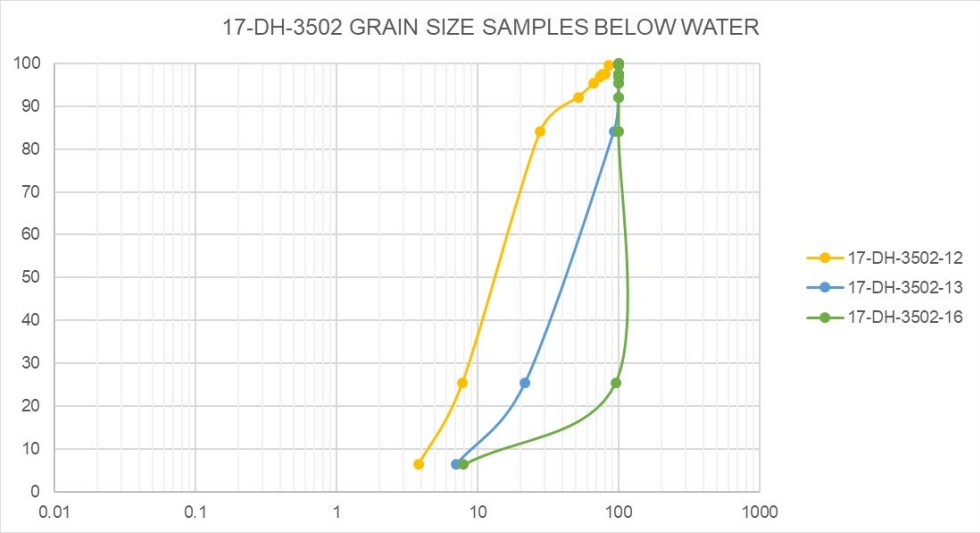
Grain Size Data

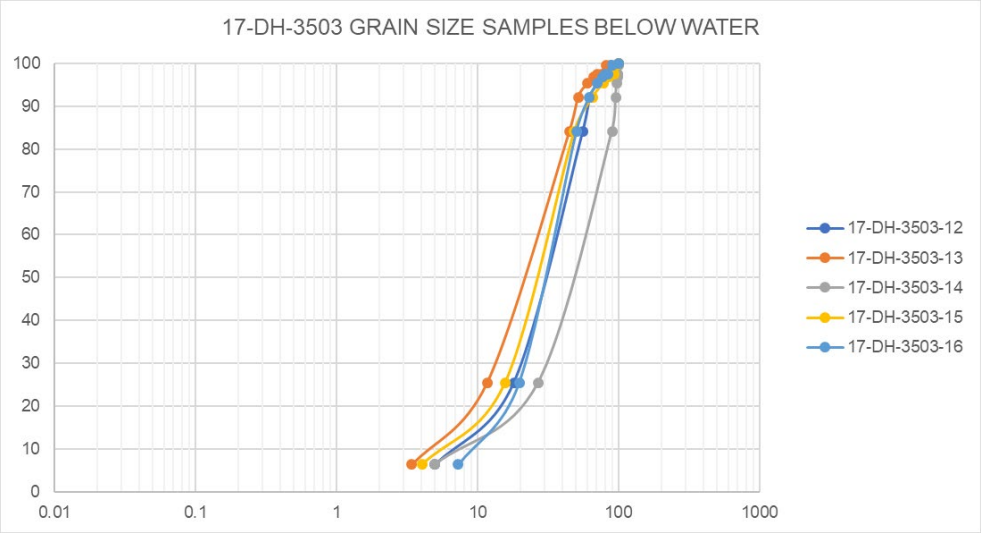
21453907 LAFARGE GOODWOOD PIT EXTENSION: GRAIN SIZE ANALYSIS SUMMARY BELOW WATER SAMPLES

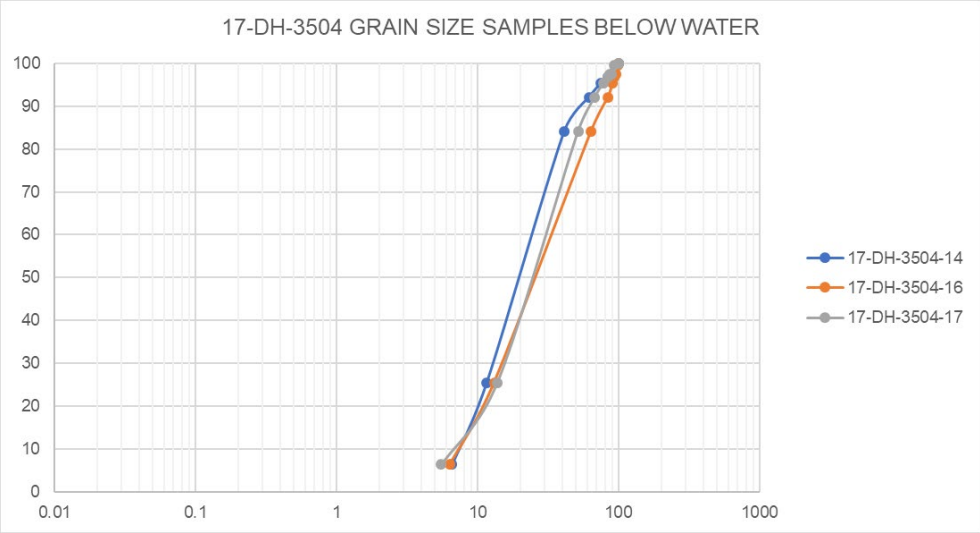
Sample	Depth To (mbgs)	d_{10} (mm)	K (m/s)
17-DH-3501-12	19.51	0.1	1.E-04
17-DH-3501-17	32.92	0.09	8.E-05
17-DH-3501-18	35.05	0.085	7.E-05
17-DH-3502-12	21.95	0.38	1.E-03
17-DH-3502-13	23.17	0.13	2.E-04
17-DH-3502-16	28.65	0.079	6.E-05
17-DH-3502-19	33.22	0.12	1.E-04
17-DH-3503-12	27.13	0.15	2.E-04
17-DH-3503-13	28.04	0.28	8.E-04
17-DH-3503-14	30.18	0.11	1.E-04
17-DH-3503-15	31.39	0.19	4.E-04
17-DH-3503-16	33.22	0.10	1.E-04
17-DH-3504-14	22.25	0.26	7.E-04
17-DH-3504-16	24.99	0.25	6.E-04
17-DH-3504-17	27.13	0.22	5.E-04
17-DH-3505-13	27.13	0.09	8.E-05
17-DH-3505-14	28.35	0.09	8.E-05
17-DH-3505-15	30.18	0.16	3.E-04
17-DH-3505-16	31.7	0.15	2.E-04
17-DH-3507-15	28.35	0.11	1.E-04
17-DH-3507-16	30.18	0.16	3.E-04
17-DH-3507-17	33.22	0.12	1.E-04
17-DH-3507-20	-	0.09	8.E-05
17-DH-3508-12	25.91	0.19	4.E-04
17-DH-3508-13	26.82	0.36	1.E-03

Geomean:	*2E-04*
Max:	*1E-03*
Min:	*6E-05*









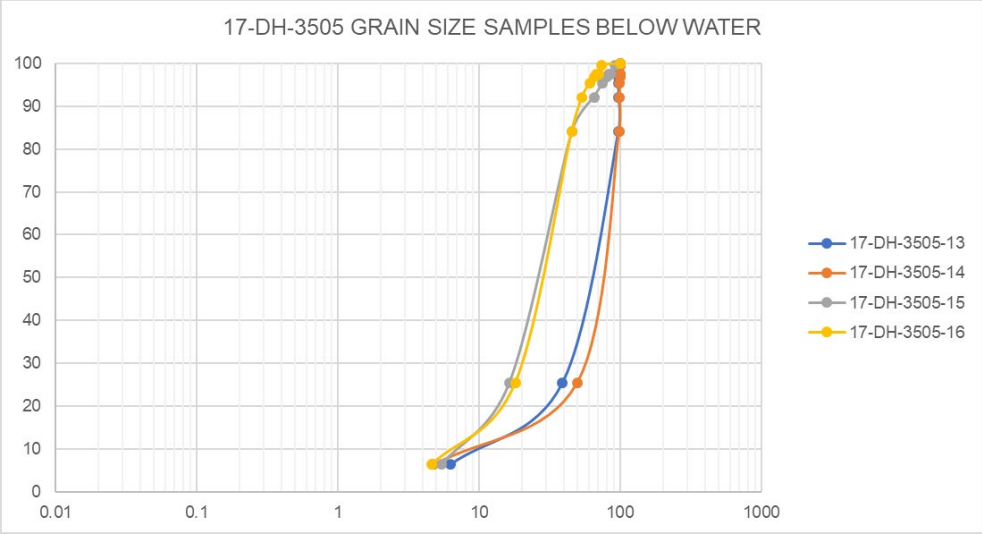
LAFARGE GOODWOOD PIT EXTENSION: GRAIN SIZE ANALYSIS

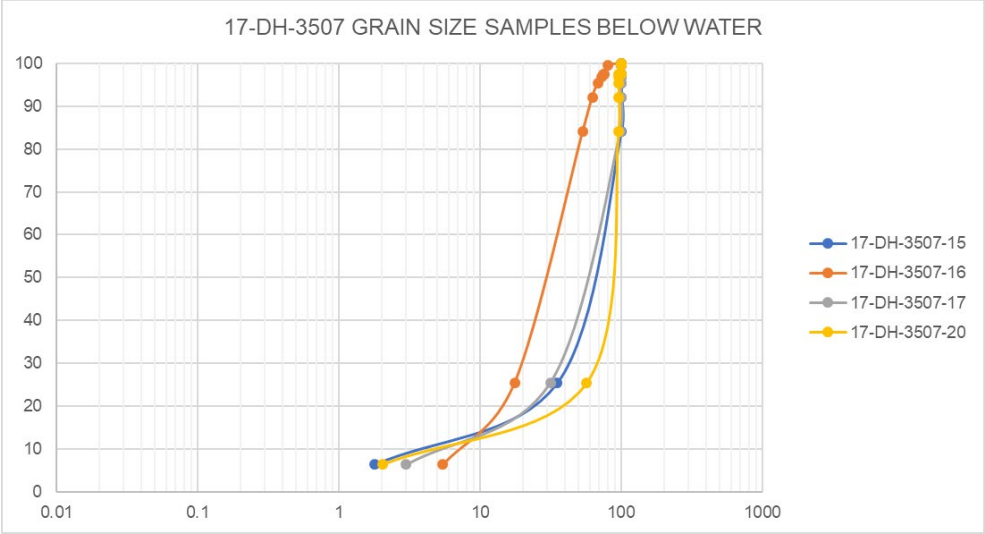
GOLDER

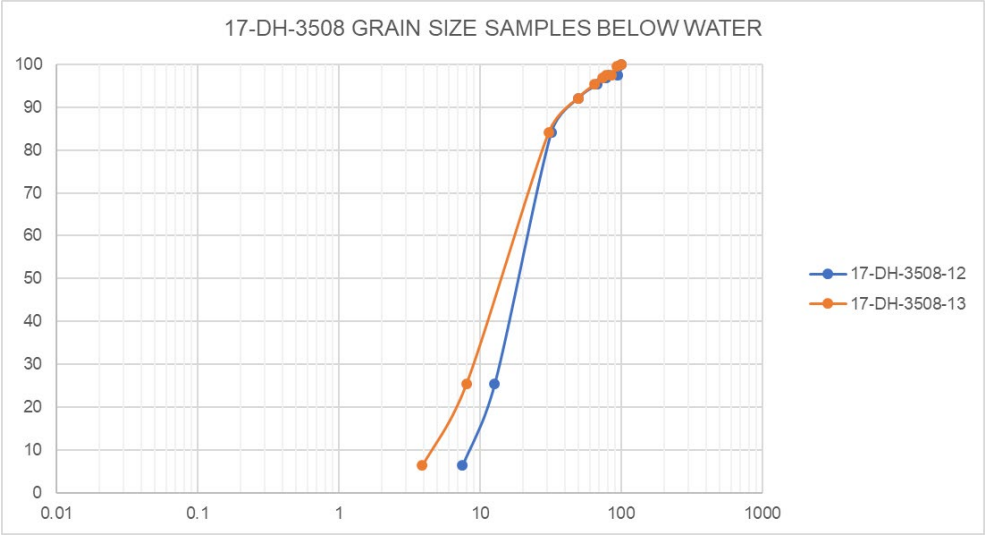
Golder Associates Ltd.
BARRIE, ONTARIO, CANADA

GRAIN SIZE CURVES (07-DH-3501, 07-DH-3502, 07-DH-3503, 07-DH-3504)

SEPTEMBER 2019	PROJECT: 1894152	FIGURE: C1







LAFARGE GOODWOOD PIT EXTENSION: GRAIN SIZE ANALYSIS

GOLDER

Golder Associates Ltd.
BARRIE, ONTARIO, CANADA

GRAIN SIZE CURVES (07-DH-3505, 07-DH-3507, 07-DH-3508)

SEPTEMBER 2019	PROJECT: 1894152	FIGURE: C2

APPENDIX D

Water Quality Results

CADUCEON™ ENVIRONMENTAL LABORATORIES
Client committed. Quality assured.

CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: G84846 **REPORT No. B18-28353 (i)**

Report To:

Golder Associates Ltd.
121 Commerce Park Drive, Unit L,
Barrie ON. L4N 8X1 Canada
Attention: Devin Hannan

Caduceon Environmental Laboratories
110 West Beaver Creek Rd Unit 14
Richmond Hill ON L4B 1J9
Tel: 289-475-5442
Fax: 289-562-1963

DATE RECEIVED: 18-Sep-18
DATE REPORTED: 25-Sep-18
SAMPLE MATRIX: Groundwater

JOB/PROJECT NO.: Lafarge - Goodwood Pit
P.O. NUMBER: 1894152 (2000)
WATERWORKS NO.

Parameter	Qty	Site Analyzed	Analyst Initials	Date Analyzed	Lab Method	Reference Method
Alkalinity (as CaCO3)	3	Holly Lane	SYL	19-Sep-18	A-ALK-03 (o)	SM 2320B
Conductivity	3	Holly Lane	SYL	19-Sep-18	A-COND-02 (o)	SM 2510B
Anions	3	Holly Lane	VSC	19-Sep-18	A-IC-01 (o)	SM4110C
pH	3	Holly Lane	SYL	19-Sep-18	A-PH-01 (o)	SM 4500H
B - Bacteriological	3	Barrie	SAN	20-Sep-18	B-EC-001 (b)	SM9222B
Chromium (VI)	3	Holly Lane	JGC	21-Sep-18	D-CRVI-01 (o)	MOE E3056
Mercury	3	Holly Lane	PBK	24-Sep-18	D-HG-02 (o)	SM 3112 B
Metals - ICP-OES	3	Holly Lane	TPR	20-Sep-18	D-ICP-01 (o)	SM 3120
Metals - ICP-MS	3	Holly Lane	TPR	20-Sep-18	D-ICPMS-01 (o)	EPA 200.8
Calculation	3	Holly Lane	JGC	21-Sep-18	D-Ion Balance	Calc.

O. Reg. 153 - Soil, Ground Water and Sediment Standards
Tbl. 2 - PGW - Table 2 - Potable Ground Water

Christine Burke
Lab Manager

R.L. = Reporting Limit
Test methods may be modified from specified reference method unless indicated by an *
Site Analyzed=K-Kingston,W-Windsor,O-Ottawa,R-Richmond Hill,B-Barrie

CADUCEON™ ENVIRONMENTAL LABORATORIES
Client committed. Quality assured.

CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: G84846 **REPORT No. B18-28353 (i)**

Report To:

Golder Associates Ltd.
121 Commerce Park Drive, Unit L,
Barrie ON. L4N 8X1 Canada
Attention: Devin Hannan

Caduceon Environmental Laboratories
110 West Beaver Creek Rd Unit 14
Richmond Hill ON L4B 1J9
Tel: 289-475-5442
Fax: 289-562-1963

DATE RECEIVED: 18-Sep-18
DATE REPORTED: 25-Sep-18
SAMPLE MATRIX: Groundwater

JOB/PROJECT NO.: Lafarge - Goodwood Pit
P.O. NUMBER: 1894152 (2000)
WATERWORKS NO.

	Client I.D.		MW 18-01	MW 18-02	PW		O. Reg. 153	
	Sample I.D.		B18-28353-1	B18-28353-2	B18-28353-3		Tbl. 2 - PGW	
	Date Collected		17-Sep-18	17-Sep-18	17-Sep-18			
Parameter	**Units**	**R.L.**						
E coli	cfu/100mL	1	2	< 2	< 2			
pH @25°C	pH Units		7.76	7.95	8.14			
Conductivity @25°C	mS/cm	0.001	1.05	0.515	0.46			
Alkalinity(CaCO3) to pH4.5	mg/L	5	233	179	168			
Carbonate (as CaCO3)	mg/L	5	< 5	< 5	< 5			
Bicarbonate(as CaCO3)	mg/L	5	233	179	168			
Hydroxide (as CaCO3)	mg/L	5	< 5	< 5	< 5			
Hardness (as CaCO3)	mg/L	1	359	248	223			
Chloride	µg/L	500	158000	25100	15100		790000	
Fluoride	µg/L	100	< 100	< 100	< 100			
Sodium	µg/L	200	84500	10900	7000		490000	
Antimony	µg/L	0.1	5.0	0.6	< 0.1		6	
Arsenic	µg/L	0.1	0.3	0.1	< 0.1		25	
Barium	µg/L	1	118	49	41		1000	
Beryllium	µg/L	0.1	< 0.1	< 0.1	< 0.1		4	
Boron	µg/L	5	27	7	< 5		5000	
Cadmium	µg/L	0.015	< 0.015	< 0.015	< 0.015		2.7	
Chromium	µg/L	2	< 2	< 2	< 2		50	
Chromium (VI)	µg/L	2	< 2 [1]	< 2 [1]	< 2 [1]		25	
Cobalt	µg/L	0.1	< 0.1	< 0.1	< 0.1		3.8	
Copper	µg/L	2	< 2	< 2	2		87	
Lead	µg/L	0.02	0.05	0.04	0.10		10	
Mercury	µg/L	0.02	< 0.02	< 0.02	< 0.02		0.29	

O. Reg. 153 - Soil, Ground Water and Sediment Standards
Tbl. 2 - PGW - Table 2 - Potable Ground Water

Christine Burke
Lab Manager

R.L. = Reporting Limit
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Site Analyzed=K-Kingston,W-Windsor,O-Ottawa,R-Richmond Hill,B-Barrie

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CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: G84846 **REPORT No. B18-28353 (i)**

Report To:

Golder Associates Ltd.
121 Commerce Park Drive, Unit L,
Barrie ON. L4N 8X1 Canada
Attention: Devin Hannan

Caduceon Environmental Laboratories
110 West Beaver Creek Rd Unit 14
Richmond Hill ON L4B 1J9
Tel: 289-475-5442
Fax: 289-562-1963

DATE RECEIVED: 18-Sep-18
DATE REPORTED: 25-Sep-18
SAMPLE MATRIX: Groundwater

JOB/PROJECT NO.: Lafarge - Goodwood Pit
P.O. NUMBER: 1894152 (2000)
WATERWORKS NO.

	Client I.D. / Sample I.D. / Date Collected		MW 18-01 B18-28353-1 17-Sep-18	MW 18-02 B18-28353-2 17-Sep-18	PW B18-28353-3 17-Sep-18		O. Reg. 153 Tbl. 2 - PGW	
Parameter	**Units**	**R.L.**						
Molybdenum	µg/L	0.1	0.6	0.4	0.3		70	
Nickel	µg/L	10	< 10	< 10	< 10		100	
Selenium	µg/L	1	< 1	< 1	< 1		10	
Silver	µg/L	0.1	< 0.1	< 0.1	< 0.1		1.5	
Thallium	µg/L	0.05	< 0.05	< 0.05	< 0.05		2	
Uranium	µg/L	0.05	0.87	0.76	0.78		20	
Vanadium	µg/L	0.1	0.4	0.2	0.2		6.2	
Zinc	µg/L	5	< 5	< 5	12		1100	
Anion Sum	meq/L		10.2	5.08	4.56			
Cation Sum	meq/L		10.9	5.47	4.78			
% Difference	%		3.61	3.66	2.35			
Ion Ratio	AS/CS		0.930	0.929	0.954			
Sodium Adsorption Ratio	-		1.94	0.301	0.203			
TDS(ion sum calc.)	mg/L	1	570	277	246			
Conductivity (calc.)	µmho/cm		1050	516	456			
TDS(calc.)/EC(actual)	-		0.544	0.537	0.534			
EC(calc.)/EC(actual)	-		1.00	1.00	0.990			
Langelier Index(25°C)	S.I.		0.693	0.620	0.741			

1 . Chromium (VI) result is based on total chromium

O. Reg. 153 - Soil, Ground Water and Sediment Standards
Tbl. 2 - PGW - Table 2 - Potable Ground Water

Christine Burke
Lab Manager

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Tel: 289-475-5442
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DATE RECEIVED: 18-Sep-18
DATE REPORTED: 25-Sep-18
SAMPLE MATRIX: Groundwater

JOB/PROJECT NO.: Lafarge - Goodwood Pit
P.O. NUMBER: 1894152 (2000)
WATERWORKS NO.

Summary of Exceedances

O. Reg. 153 - Soil, Ground Water and Sediment Standards
Tbl. 2 - PGW - Table 2 - Potable Ground Water

Christine Burke
Lab Manager

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C.O.C.: G84846 **REPORT No. B18-28353 (ii)**

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110 West Beaver Creek Rd Unit 14
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DATE RECEIVED: 18-Sep-18
DATE REPORTED: 25-Sep-18
SAMPLE MATRIX: Groundwater

JOB/PROJECT NO.: Lafarge - Goodwood Pit
P.O. NUMBER: 1894152 (2000)
WATERWORKS NO.

Parameter	Qty	Site Analyzed	Analyst Initials	Date Analyzed	Lab Method	Reference Method
PHC(F2-F4)	3	Kingston	KPR	20-Sep-18	C-PHC-W-001 (k)	MOE E3421
VOC's	3	Richmond Hill	FAL	19-Sep-18	C-VOC-02 (rh)	EPA 8260
PHC(F1)	3	Richmond Hill	FAL	19-Sep-18	C-VPHW-01 (rh)	MOE E3421

O. Reg. 153 - Soil, Ground Water and Sediment Standards
Tbl. 2 - PGW - Table 2 - Potable Ground Water

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Richmond Hill ON L4B 1J9
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DATE RECEIVED: 18-Sep-18
DATE REPORTED: 25-Sep-18
SAMPLE MATRIX: Groundwater

JOB/PROJECT NO.: Lafarge - Goodwood Pit
P.O. NUMBER: 1894152 (2000)
WATERWORKS NO.

	Client I.D.		MW 18-01	MW 18-02	PW		O. Reg. 153	
	Sample I.D.		B18-28353-1	B18-28353-2	B18-28353-3		Tbl. 2 - PGW	
	Date Collected		17-Sep-18	17-Sep-18	17-Sep-18			
Parameter	**Units**	**R.L.**						
Acetone	µg/L	30	< 30	< 30	< 30		2700	
Benzene	µg/L	0.5	< 0.5	< 0.5	< 0.5		5	
Bromodichloromethane	µg/L	2	< 2	< 2	< 2		16	
Bromoform	µg/L	5	< 5	< 5	< 5		25	
Bromomethane	µg/L	0.5	< 0.5	< 0.5	< 0.5		0.89	
Carbon Tetrachloride	µg/L	0.2	< 0.2	< 0.2	< 0.2		0.79	
Monochlorobenzene (Chlorobenzene)	µg/L	0.5	< 0.5	< 0.5	< 0.5		30	
Chloroform	µg/L	1	< 1	< 1	< 1		2.4	
Dibromochloromethane	µg/L	2	< 2	< 2	< 2		25	
Dichlorobenzene,1,2-	µg/L	0.5	< 0.5	< 0.5	< 0.5		3	
Dichlorobenzene,1,3-	µg/L	0.5	< 0.5	< 0.5	< 0.5		59	
Dichlorobenzene,1,4-	µg/L	0.5	< 0.5	< 0.5	< 0.5		1	
Dichlorodifluoromethane	µg/L	2	< 2	< 2	< 2		590	
Dichloroethane,1,1-	µg/L	0.5	< 0.5	< 0.5	< 0.5		5	
Dichloroethane,1,2-	µg/L	0.5	< 0.5	< 0.5	< 0.5		1.6	
Dichloroethylene,1,1-	µg/L	0.5	< 0.5	< 0.5	< 0.5		1.6	
Dichloroethene, cis-1,2-	µg/L	0.5	< 0.5	< 0.5	< 0.5		1.6	
Dichloroethene, trans-1,2-	µg/L	0.5	< 0.5	< 0.5	< 0.5		1.6	
Dichloropropane,1,2-	µg/L	0.5	< 0.5	< 0.5	< 0.5		5	
Dichloropropene, cis-1,3-	µg/L	0.5	< 0.5	< 0.5	< 0.5			
Dichloropropene, trans-1,3-	µg/L	0.5	< 0.5	< 0.5	< 0.5			

O. Reg. 153 - Soil, Ground Water and Sediment Standards
Tbl. 2 - PGW - Table 2 - Potable Ground Water

Christine Burke
Lab Manager

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Report To:

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121 Commerce Park Drive, Unit L,
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Attention: Devin Hannan

Caduceon Environmental Laboratories
110 West Beaver Creek Rd Unit 14
Richmond Hill ON L4B 1J9
Tel: 289-475-5442
Fax: 289-562-1963

DATE RECEIVED: 18-Sep-18
DATE REPORTED: 25-Sep-18
SAMPLE MATRIX: Groundwater

JOB/PROJECT NO.: Lafarge - Goodwood Pit
P.O. NUMBER: 1894152 (2000)
WATERWORKS NO.

	Client I.D.		MW 18-01	MW 18-02	PW		O. Reg. 153 Tbl. 2 - PGW	
	Sample I.D.		B18-28353-1	B18-28353-2	B18-28353-3			
	Date Collected		17-Sep-18	17-Sep-18	17-Sep-18			
Parameter	**Units**	**R.L.**						
Dichloropropene 1,3-cis+trans	µg/L	0.5	< 0.5	< 0.5	< 0.5		0.5	
Ethylbenzene	µg/L	0.5	< 0.5	< 0.5	< 0.5		2.4	
Dibromoethane,1,2-(Ethylene Dibromide)	µg/L	0.2	< 0.2	< 0.2	< 0.2		0.2	
Hexane	µg/L	5	< 5	< 5	< 5		51	
Methyl Ethyl Ketone	µg/L	20	< 20	< 20	< 20		1800	
Methyl Isobutyl Ketone	µg/L	20	< 20	< 20	< 20		640	
Methyl-t-butyl Ether	µg/L	2	< 2	< 2	< 2		15	
Dichloromethane (Methylene Chloride)	µg/L	0.3	< 0.3	< 0.3	< 0.3		50	
Styrene	µg/L	0.5	< 0.5	< 0.5	< 0.5		5.4	
Tetrachloroethane,1,1,1,2-	µg/L	0.5	< 0.5	< 0.5	< 0.5		1.1	
Tetrachloroethane,1,1,2,2-	µg/L	0.5	< 0.5	< 0.5	< 0.5		1	
Tetrachloroethylene	µg/L	0.5	< 0.5	< 0.5	< 0.5		1.6	
Toluene	µg/L	0.5	< 0.5	< 0.5	< 0.5		24	
Trichloroethane,1,1,1-	µg/L	0.5	< 0.5	< 0.5	< 0.5		200	
Trichloroethane,1,1,2-	µg/L	0.5	< 0.5	< 0.5	< 0.5		4.7	
Trichloroethylene	µg/L	0.5	< 0.5	< 0.5	< 0.5		1.6	
Trichlorofluoromethane	µg/L	5	< 5	< 5	< 5		150	
Vinyl Chloride	µg/L	0.5	< 0.5	< 0.5	< 0.5		0.5	
Xylene, m,p-	µg/L	1.0	< 1.0	< 1.0	< 1.0			
Xylene, o-	µg/L	0.5	< 0.5	< 0.5	< 0.5			

O. Reg. 153 - Soil, Ground Water and Sediment Standards
Tbl. 2 - PGW - Table 2 - Potable Ground Water

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121 Commerce Park Drive, Unit L,
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Attention: Devin Hannan

Caduceon Environmental Laboratories
110 West Beaver Creek Rd Unit 14
Richmond Hill ON L4B 1J9
Tel: 289-475-5442
Fax: 289-562-1963

DATE RECEIVED: 18-Sep-18
DATE REPORTED: 25-Sep-18
SAMPLE MATRIX: Groundwater

JOB/PROJECT NO.: Lafarge - Goodwood Pit
P.O. NUMBER: 1894152 (2000)
WATERWORKS NO.

	Client I.D.		MW 18-01	MW 18-02	PW		O. Reg. 153 Tbl. 2 - PGW	
	Sample I.D.		B18-28353-1	B18-28353-2	B18-28353-3			
	Date Collected		17-Sep-18	17-Sep-18	17-Sep-18			
Parameter	**Units**	**R.L.**						
Xylene, m,p,o-	µg/L	1.1	< 1.1	< 1.1	< 1.1		300	
PHC F1 (C6-C10)	µg/L	50	< 50	< 50	< 50		750	
PHC F2 (>C10-C16)	µg/L	50	< 50	< 50	< 50		150	
PHC F3 (>C16-C34)	µg/L	400	**2400**	< 400	< 400		500	
PHC F4 (>C34-C50)	µg/L	400	< 400	< 400	< 400		500	

O. Reg. 153 - Soil, Ground Water and Sediment Standards
Tbl. 2 - PGW - Table 2 - Potable Ground Water

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Richmond Hill ON L4B 1J9
Tel: 289-475-5442
Fax: 289-562-1963

DATE RECEIVED: 18-Sep-18
DATE REPORTED: 25-Sep-18
SAMPLE MATRIX: Groundwater

JOB/PROJECT NO.: Lafarge - Goodwood Pit
P.O. NUMBER: 1894152 (2000)
WATERWORKS NO.

Summary of Exceedances

Table 2 - Potable Ground Water

MW 18-01	Found Value	Limit
PHC F3 (>C16-C34) (µg/L)	2400	500

O. Reg. 153 - Soil, Ground Water and Sediment Standards
Tbl. 2 - PGW - Table 2 - Potable Ground Water

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Fax: 289-562-1963

DATE RECEIVED: 18-Sep-18
DATE REPORTED: 25-Sep-18
SAMPLE MATRIX: Groundwater

JOB/PROJECT NO.: Lafarge - Goodwood Pit
P.O. NUMBER: 1894152 (2000)
WATERWORKS NO.

Parameter	Qty	Site Analyzed	Analyst Initials	Date Analyzed	Lab Method	Reference Method
SVOC	1	Kingston	sge	24-Sep-18	C-NAB-W-001 (k)	EPA 8270

O. Reg. 153 - Soil, Ground Water and Sediment Standards
Tbl. 2 - PGW - Table 2 - Potable Ground Water

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Tel: 289-475-5442
Fax: 289-562-1963

DATE RECEIVED: 18-Sep-18
DATE REPORTED: 25-Sep-18
SAMPLE MATRIX: Groundwater

JOB/PROJECT NO.: Lafarge - Goodwood Pit
P.O. NUMBER: 1894152 (2000)
WATERWORKS NO.

	Client I.D.		MW 18-02				O. Reg. 153	
	Sample I.D.		B18-28353-2				Tbl. 2 - PGW	
	Date Collected		17-Sep-18					
Parameter	**Units**	**R.L.**						
Acenaphthene	µg/L	0.05	< 0.05				4.1	
Acenaphthylene	µg/L	0.05	< 0.05				1	
Anthracene	µg/L	0.05	< 0.05				2.4	
Benzo(a)anthracene	µg/L	0.05	< 0.05				1	
Benzo(a)pyrene	µg/L	0.01	< 0.01				0.01	
Benzo(b)fluoranthene	µg/L	0.05	< 0.05				0.1	
Benzo(b+k)fluoranthene	µg/L	0.1	< 0.1					
Benzo(g,h,i)perylene	µg/L	0.05	< 0.05				0.2	
Benzo(k)fluoranthene	µg/L	0.05	< 0.05				0.1	
Chrysene	µg/L	0.05	< 0.05				0.1	
Dibenzo(a,h)anthracene	µg/L	0.05	< 0.05				0.2	
Fluoranthene	µg/L	0.05	< 0.05				0.41	
Fluorene	µg/L	0.05	< 0.05				120	
Indeno(1,2,3,-cd)pyrene	µg/L	0.05	< 0.05				0.2	
Methylnaphthalene,1-	µg/L	0.05	< 0.05				3.2	
Methylnaphthalene,2-	µg/L	0.05	< 0.05				3.2	
Methylnaphthalene 2-(1-)	µg/L	0.07	< 0.07				3.2	
Naphthalene	µg/L	0.05	< 0.05				11	
Phenanthrene	µg/L	0.05	< 0.05				1	
Pyrene	µg/L	0.05	< 0.05				4.1	

O. Reg. 153 - Soil, Ground Water and Sediment Standards
Tbl. 2 - PGW - Table 2 - Potable Ground Water

Christine Burke
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Tel: 289-475-5442
Fax: 289-562-1963

DATE RECEIVED: 18-Sep-18
DATE REPORTED: 25-Sep-18
SAMPLE MATRIX: Groundwater

JOB/PROJECT NO.: Lafarge - Goodwood Pit
P.O. NUMBER: 1894152 (2000)
WATERWORKS NO.

Summary of Exceedances

O. Reg. 153 - Soil, Ground Water and Sediment Standards
Tbl. 2 - PGW - Table 2 - Potable Ground Water

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Final Report

C.O.C.: G75461 **REPORT No. B18-32587 (i)**

Report To:

Golder Associates Ltd.
121 Commerce Park Drive, Unit L,
Barrie ON. L4N 8X1 Canada
Attention: Devin Hannan

Caduceon Environmental Laboratories
112 Commerce Park Drive
Barrie ON L4N 8W8
Tel: 705-252-5743
Fax: 705-252-5746

DATE RECEIVED: 22-Oct-18
DATE REPORTED: 02-Nov-18
SAMPLE MATRIX: Groundwater

JOB/PROJECT NO.: Lafarge - Goodwood Pit
P.O. NUMBER: 1894152/2000/2030
WATERWORKS NO.

			Client I.D.		MW 18-03			
			Sample I.D.		B18-32587-1			
			Date Collected		22-Oct-18			
Parameter	**Units**	**R.L.**	**Reference Method**	**Date/Site Analyzed**				
Total Coliform	cfu/100mL	1	SM9222B	22-Oct-18/B	10			
E coli	cfu/100mL	1	SM9222B	22-Oct-18/B	0			
pH @25°C	pH Units		SM 4500H	26-Oct-18/O	8.09			
Conductivity @25°C	µmho/cm	1	SM 2510B	26-Oct-18/O	497			
Alkalinity(CaCO3) to pH4.5	mg/L	5	SM 2320B	26-Oct-18/O	190			
Carbonate (as CaCO3)	mg/L	5	SM 2320B	26-Oct-18/O	< 5			
Bicarbonate(as CaCO3)	mg/L	5	SM 2320B	26-Oct-18/O	190			
Hydroxide (as CaCO3)	mg/L	5	SM 2320B	26-Oct-18/O	< 5			
Hardness (as CaCO3)	mg/L	1	SM 3120	02-Nov-18/O	239			
Chloride	mg/L	0.5	SM4110C	23-Oct-18/O	11.8			
Fluoride	mg/L	0.1	SM4110C	23-Oct-18/O	< 0.1			
Nitrate (N)	mg/L	0.1	SM4110C	23-Oct-18/O	4.7			
Nitrite (N)	mg/L	0.1	SM4110C	23-Oct-18/O	< 0.1			
Sodium	mg/L	0.2	SM 3120	02-Nov-18/O	3.1			
Antimony	mg/L	0.0001	EPA 200.8	23-Oct-18/O	< 0.0001			
Arsenic	mg/L	0.0001	EPA 200.8	23-Oct-18/O	0.0003			
Barium	mg/L	0.001	SM 3120	02-Nov-18/O	0.053			
Beryllium	mg/L	0.0001	EPA 200.8	23-Oct-18/O	< 0.0001			
Boron	mg/L	0.005	SM 3120	02-Nov-18/O	0.009			
Cadmium	mg/L	0.000015	EPA 200.8	23-Oct-18/O	< 0.000015			
Chromium	mg/L	0.002	SM 3120	02-Nov-18/O	< 0.002			
Chromium (VI)	mg/L	0.002	MOE E3056	24-Oct-18/O	< 0.002			
Cobalt	mg/L	0.0001	EPA 200.8	23-Oct-18/O	< 0.0001			
Copper	mg/L	0.002	SM 3120	02-Nov-18/O	< 0.002			
Lead	mg/L	0.00002	EPA 200.8	23-Oct-18/O	0.00003			

Christine Burke
Lab Manager

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CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: G75461 **REPORT No. B18-32587 (i)**

Report To:

Golder Associates Ltd.
121 Commerce Park Drive, Unit L,
Barrie ON. L4N 8X1 Canada
Attention: Devin Hannan

Caduceon Environmental Laboratories
112 Commerce Park Drive
Barrie ON L4N 8W8
Tel: 705-252-5743
Fax: 705-252-5746

DATE RECEIVED: 22-Oct-18
DATE REPORTED: 02-Nov-18
SAMPLE MATRIX: Groundwater

JOB/PROJECT NO.: Lafarge - Goodwood Pit
P.O. NUMBER: 1894152/2000/2030
WATERWORKS NO.

			Client I.D.		MW 18-03			
			Sample I.D.		B18-32587-1			
			Date Collected		22-Oct-18			
Parameter	**Units**	**R.L.**	**Reference Method**	**Date/Site Analyzed**				
Mercury	mg/L	0.00002	SM 3112 B	30-Oct-18/O	< 0.00002			
Molybdenum	mg/L	0.0001	EPA 200.8	23-Oct-18/O	0.0141			
Nickel	mg/L	0.01	SM 3120	02-Nov-18/O	< 0.01			
Selenium	mg/L	0.001	EPA 200.8	23-Oct-18/O	< 0.001			
Silver	mg/L	0.0001	EPA 200.8	23-Oct-18/O	< 0.0001			
Thallium	mg/L	0.00005	EPA 200.8	23-Oct-18/O	< 0.00005			
Uranium	mg/L	0.00005	EPA 200.8	23-Oct-18/O	0.00164			
Vanadium	mg/L	0.0001	EPA 200.8	23-Oct-18/O	0.0003			
Zinc	mg/L	0.005	SM 3120	02-Nov-18/O	< 0.005			
Anion Sum	meq/L		Calc.	02-Nov-18/O	5.13			
Cation Sum	meq/L		Calc.	02-Nov-18/O	4.94			
% Difference	%		Calc.	02-Nov-18/O	1.89			
Ion Ratio	AS/CS		Calc.	02-Nov-18/O	1.04			
Sodium Adsorption Ratio	-		Calc.	02-Nov-18/O	0.0872			
TDS(ion sum calc.)	mg/L	1	Calc.	02-Nov-18/O	266			
Conductivity (calc.)	µmho/cm		Calc.	02-Nov-18/O	484			
TDS(calc.)/EC(actual)	-		Calc.	02-Nov-18/O	0.536			
EC(calc.)/EC(actual)	-		Calc.	02-Nov-18/O	0.975			
Langelier Index(25°C)	S.I.		Calc.	02-Nov-18/O	0.745			

Christine Burke
Lab Manager

R.L. = Reporting Limit
Test methods may be modified from specified reference method unless indicated by an *
Site Analyzed=K-Kingston,W-Windsor,O-Ottawa,R-Richmond Hill,B-Barrie

CADUCEON ENVIRONMENTAL LABORATORIES
Client committed. Quality assured.

CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: G75461 **REPORT No. B18-32587 (ii)**

Report To:

Golder Associates Ltd.
121 Commerce Park Drive, Unit L,
Barrie ON. L4N 8X1 Canada
Attention: Devin Hannan

Caduceon Environmental Laboratories
112 Commerce Park Drive
Barrie ON L4N 8W8
Tel: 705-252-5743
Fax: 705-252-5746

DATE RECEIVED: 22-Oct-18
DATE REPORTED: 02-Nov-18
SAMPLE MATRIX: Groundwater

JOB/PROJECT NO.: Lafarge - Goodwood Pit
P.O. NUMBER: 1894152/2000/2030
WATERWORKS NO.

			Client I.D.		MW 18-03			
			Sample I.D.		B18-32587-1			
			Date Collected		22-Oct-18			
Parameter	**Units**	**R.L.**	**Reference Method**	**Date/Site Analyzed**				
Acetone	µg/L	30	EPA 8260	24-Oct-18/R	< 30			
Benzene	µg/L	0.5	EPA 8260	24-Oct-18/R	< 0.5			
Bromodichloromethane	µg/L	2	EPA 8260	24-Oct-18/R	< 2			
Bromoform	µg/L	5	EPA 8260	24-Oct-18/R	< 5			
Bromomethane	µg/L	0.5	EPA 8260	24-Oct-18/R	< 0.5			
Carbon Tetrachloride	µg/L	0.2	EPA 8260	24-Oct-18/R	< 0.2			
Monochlorobenzene (Chlorobenzene)	µg/L	0.5	EPA 8260	24-Oct-18/R	< 0.5			
Chloroform	µg/L	1	EPA 8260	24-Oct-18/R	< 1			
Dibromochloromethane	µg/L	2	EPA 8260	24-Oct-18/R	< 2			
Dichlorobenzene,1,2-	µg/L	0.5	EPA 8260	24-Oct-18/R	< 0.5			
Dichlorobenzene,1,3-	µg/L	0.5	EPA 8260	24-Oct-18/R	< 0.5			
Dichlorobenzene,1,4-	µg/L	0.5	EPA 8260	24-Oct-18/R	< 0.5			
Dichlorodifluoromethane	µg/L	2	EPA 8260	24-Oct-18/R	< 2			
Dichloroethane,1,1-	µg/L	0.5	EPA 8260	24-Oct-18/R	< 0.5			
Dichloroethane,1,2-	µg/L	0.5	EPA 8260	24-Oct-18/R	< 0.5			
Dichloroethylene,1,1-	µg/L	0.5	EPA 8260	24-Oct-18/R	< 0.5			
Dichloroethene, cis-1,2-	µg/L	0.5	EPA 8260	24-Oct-18/R	< 0.5			
Dichloroethene, trans-1,2-	µg/L	0.5	EPA 8260	24-Oct-18/R	< 0.5			
Dichloropropane,1,2-	µg/L	0.5	EPA 8260	24-Oct-18/R	< 0.5			
Dichloropropene, cis-1,3-	µg/L	0.5	EPA 8260	24-Oct-18/R	< 0.5			
Dichloropropene, trans-1,3-	µg/L	0.5	EPA 8260	24-Oct-18/R	< 0.5			
Dichloropropene 1,3-cis+trans	µg/L	0.5	EPA 8260	24-Oct-18/R	< 0.5			
Ethylbenzene	µg/L	0.5	EPA 8260	24-Oct-18/R	< 0.5			

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Lab Manager

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CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: G75461 **REPORT No. B18-32587 (ii)**

Report To:

Golder Associates Ltd.
121 Commerce Park Drive, Unit L,
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Attention: Devin Hannan

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DATE RECEIVED: 22-Oct-18
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SAMPLE MATRIX: Groundwater

JOB/PROJECT NO.: Lafarge - Goodwood Pit
P.O. NUMBER: 1894152/2000/2030
WATERWORKS NO.

			Client I.D.		MW 18-03			
			Sample I.D.		B18-32587-1			
			Date Collected		22-Oct-18			
Parameter	**Units**	**R.L.**	**Reference Method**	**Date/Site Analyzed**				
Dibromoethane,1,2- (Ethylene Dibromide)	µg/L	0.2	EPA 8260	24-Oct-18/R	< 0.2			
Hexane	µg/L	5	EPA 8260	24-Oct-18/R	< 5			
Methyl Ethyl Ketone	µg/L	20	EPA 8260	24-Oct-18/R	< 20			
Methyl Isobutyl Ketone	µg/L	20	EPA 8260	24-Oct-18/R	< 20			
Methyl-t-butyl Ether	µg/L	2	EPA 8260	24-Oct-18/R	< 2			
Dichloromethane (Methylene Chloride)	µg/L	0.3	EPA 8260	24-Oct-18/R	< 0.3			
Styrene	µg/L	0.5	EPA 8260	24-Oct-18/R	< 0.5			
Tetrachloroethane,1,1,1,2-	µg/L	0.5	EPA 8260	24-Oct-18/R	< 0.5			
Tetrachloroethane,1,1,2,2-	µg/L	0.5	EPA 8260	24-Oct-18/R	< 0.5			
Tetrachloroethylene	µg/L	0.5	EPA 8260	24-Oct-18/R	< 0.5			
Toluene	µg/L	0.5	EPA 8260	24-Oct-18/R	< 0.5			
Trichloroethane,1,1,1-	µg/L	0.5	EPA 8260	24-Oct-18/R	< 0.5			
Trichloroethane,1,1,2-	µg/L	0.5	EPA 8260	24-Oct-18/R	< 0.5			
Trichloroethylene	µg/L	0.5	EPA 8260	24-Oct-18/R	< 0.5			
Trichlorofluoromethane	µg/L	5	EPA 8260	24-Oct-18/R	< 5			
Vinyl Chloride	µg/L	0.5	EPA 8260	24-Oct-18/R	< 0.5			
Xylene, m,p-	µg/L	1.0	EPA 8260	24-Oct-18/R	< 1.0			
Xylene, o-	µg/L	0.5	EPA 8260	24-Oct-18/R	< 0.5			
Xylene, m,p,o-	µg/L	1.1	EPA 8260	24-Oct-18/R	< 1.1			
PHC F1 (C6-C10)	µg/L	50	MOE E3421	24-Oct-18/R	< 50			
PHC F2 (>C10-C16)	µg/L	50	MOE E3421	24-Oct-18/K	80			
PHC F3 (>C16-C34)	µg/L	400	MOE E3421	24-Oct-18/K	400			
PHC F4 (>C34-C50)	µg/L	400	MOE E3421	24-Oct-18/K	< 400			

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Lab Manager

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CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: G75461 **REPORT No. B18-32587 (iii)**

Report To:

Golder Associates Ltd.
121 Commerce Park Drive, Unit L,
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Attention: Devin Hannan

Caduceon Environmental Laboratories
112 Commerce Park Drive
Barrie ON L4N 8W8
Tel: 705-252-5743
Fax: 705-252-5746

DATE RECEIVED: 22-Oct-18
DATE REPORTED: 02-Nov-18
SAMPLE MATRIX: Groundwater

JOB/PROJECT NO.: Lafarge - Goodwood Pit
P.O. NUMBER: 1894152/2000/2030
WATERWORKS NO.

			Client I.D.		MW 18-03			
			Sample I.D.		B18-32587-1			
			Date Collected		22-Oct-18			
Parameter	**Units**	**R.L.**	**Reference Method**	**Date/Site Analyzed**				
Acenaphthene	µg/L	0.05	EPA 8270	25-Oct-18/K	< 0.05			
Acenaphthylene	µg/L	0.05	EPA 8270	25-Oct-18/K	< 0.05			
Anthracene	µg/L	0.05	EPA 8270	25-Oct-18/K	< 0.05			
Benzo(a)anthracene	µg/L	0.05	EPA 8270	25-Oct-18/K	< 0.05			
Benzo(a)pyrene	µg/L	0.01	EPA 8270	25-Oct-18/K	< 0.01			
Benzo(b)fluoranthene	µg/L	0.05	EPA 8270	25-Oct-18/K	< 0.05			
Benzo(b+k)fluoranthene	µg/L	0.1	EPA 8270	25-Oct-18/K	< 0.1			
Benzo(g,h,i)perylene	µg/L	0.05	EPA 8270	25-Oct-18/K	< 0.05			
Benzo(k)fluoranthene	µg/L	0.05	EPA 8270	25-Oct-18/K	< 0.05			
Chrysene	µg/L	0.05	EPA 8270	25-Oct-18/K	< 0.05			
Dibenzo(a,h)anthracene	µg/L	0.05	EPA 8270	25-Oct-18/K	< 0.05			
Fluoranthene	µg/L	0.05	EPA 8270	25-Oct-18/K	< 0.05			
Fluorene	µg/L	0.05	EPA 8270	25-Oct-18/K	< 0.05			
Indeno(1,2,3,-cd)pyrene	µg/L	0.05	EPA 8270	25-Oct-18/K	< 0.05			
Methylnaphthalene,1-	µg/L	0.05	EPA 8270	25-Oct-18/K	< 0.05			
Methylnaphthalene,2-	µg/L	0.05	EPA 8270	25-Oct-18/K	< 0.05			
Methylnaphthalene 2-(1-)	µg/L	0.07	EPA 8270	25-Oct-18/K	< 0.07			
Naphthalene	µg/L	0.05	EPA 8270	25-Oct-18/K	< 0.05			
Phenanthrene	µg/L	0.05	EPA 8270	25-Oct-18/K	< 0.05			
Pyrene	µg/L	0.05	EPA 8270	25-Oct-18/K	< 0.05			

Christine Burke
Lab Manager

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AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
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CLIENT NAME: GOLDER ASSOCIATES LTD.
121 COMMERCE PARK DRIVE, UNIT L
BARRIE, ON L4N8X1
(705) 722-4492

ATTENTION TO: Devin Hannan

PROJECT: 1894152(2110)

AGAT WORK ORDER: 19T460288

TRACE ORGANICS REVIEWED BY: Pinkal Patel, Report Reviewer

DATE REPORTED: May 01, 2019

PAGES (INCLUDING COVER): 5

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*NOTES

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.

AGAT Laboratories

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Certificate of Analysis

AGAT WORK ORDER: 19T460288

PROJECT: 1894152(2110)

CLIENT NAME: GOLDER ASSOCIATES LTD.

ATTENTION TO: Devin Hannan

SAMPLING SITE:

SAMPLED BY:

O. Reg. 153(511) - PHCs F1 - F4 (Water)

DATE RECEIVED: 2019-04-25

DATE REPORTED: 2019-05-01

		SAMPLE DESCRIPTION:		MW18-01	MW18-02	MW18-03	PW	DUP
		SAMPLE TYPE:		Water	Water	Water	Water	Water
		DATE SAMPLED:		2019-04-24	2019-04-24	2019-04-24	2019-04-24	2019-04-24
Parameter	Unit	G / S	RDL	154946	154947	154948	154949	154950
Benzene	µg/L	5.0	0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Toluene	µg/L	24	0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Ethylbenzene	µg/L	2.4	0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Xylene Mixture	µg/L	300	0.20	<0.20	<0.20	<0.20	<0.20	<0.20
F1 (C6 - C10)	µg/L	750	25	<25	<25	<25	<25	<25
F1 (C6 to C10) minus BTEX	µg/L	750	25	<25	<25	<25	<25	<25
F2 (C10 to C16)	µg/L	150	100	<100	<100	<100	<100	<100
F3 (C16 to C34)	µg/L	500	100	<100	<100	110	<100	120
F4 (C34 to C50)	µg/L	500	100	<100	<100	<100	<100	<100
Gravimetric Heavy Hydrocarbons	µg/L	500	500	NA	NA	NA	NA	NA
Surrogate	Unit	Acceptable Limits						
Terphenyl	%	60-140		60	62	112	61	72

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Table 2: Full Depth Generic Site Condition Standards in a Potable Ground Water Condition - Potable Ground Water - All Types of Property Uses - Coarse Textured Soils
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

154946-154950 The C6-C10 fraction is calculated using Toluene response factor.
Xylenes total is a calculated parameter. The calculated value is the sum of m&p-Xylene and o-Xylene.
C6–C10 (F1 minus BTEX) is a calculated parameter. The calculated value is F1 minus BTEX.
The C10 - C16, C16 - C34, and C34 - C50 fractions are calculated using the average response factor for n-C10, n-C16, and nC34.
Gravimetric Heavy Hydrocarbons are not included in the Total C16 - C50 and are only determined if the chromatogram of the C34 - C50 Hydrocarbons indicated that hydrocarbons >C50 are present.
The chromatogram has returned to baseline by the retention time of nC50.
Total C6-C50 results are corrected for BTEX contribution.
This method complies with the Reference Method for the CWS PHC and is validated for use in the laboratory.
nC6 and nC10 response factors are within 30% of Toluene response factor.
nC10, nC16 and nC34 response factors are within 10% of their average.
C50 response factor is within 70% of nC10 + nC16 nC34 average.
Linearity is within 15%.
Extraction and holding times were met for this sample.
Fractions 1-4 are quantified with the contribution of PAHs. Under Ontario Regulation 153/04, results are considered valid without determining the PAH contribution if not requested by the client.
NA = Not Applicable

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
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Quality Assurance

CLIENT NAME: GOLDER ASSOCIATES LTD.

AGAT WORK ORDER: 19T460288

PROJECT: 1894152(2110)

ATTENTION TO: Devin Hannan

SAMPLING SITE:

SAMPLED BY:

Trace Organics Analysis

RPT Date: May 01, 2019

PARAMETER	Batch	Sample Id	DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
			Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 153(511) - PHCs F1 - F4 (Water)															
Benzene	146693		< 0.20	< 0.20	NA	< 0.20	105%	50%	140%	85%	60%	130%	119%	50%	140%
Toluene	146693		< 0.20	< 0.20	NA	< 0.20	108%	50%	140%	80%	60%	130%	114%	50%	140%
Ethylbenzene	146693		< 0.10	< 0.10	NA	< 0.10	104%	50%	140%	75%	60%	130%	106%	50%	140%
Xylene Mixture	146693		< 0.20	< 0.20	NA	< 0.20	89%	50%	140%	76%	60%	130%	103%	50%	140%
F1 (C6 - C10)	146693		< 25	< 25	NA	< 25	98%	60%	140%	89%	60%	140%	81%	60%	140%
F2 (C10 to C16)		TW	< 100	< 100	NA	< 100	94%	60%	140%	72%	60%	140%	62%	60%	140%
F3 (C16 to C34)		TW	< 100	< 100	NA	< 100	98%	60%	140%	85%	60%	140%	87%	60%	140%
F4 (C34 to C50)		TW	< 100	< 100	NA	< 100	96%	60%	140%	96%	60%	140%	92%	60%	140%

Comments: Tap water analysis has been performed as QC sample testing for duplicate and matrix spike due to insufficient sample volume.
When the average of the sample and duplicate results is less than 5x the RDL, the Relative Percent Difference (RPD) will be indicated as Not Applicable (NA).

Certified By:

AGAT Laboratories

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Method Summary

CLIENT NAME: GOLDER ASSOCIATES LTD.

AGAT WORK ORDER: 19T460288

PROJECT: 1894152(2110)

ATTENTION TO: Devin Hannan

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Trace Organics Analysis			
Benzene	VOL-91-5010	MOE PHC-E3421	P&T GC/MS
Toluene	VOL-91-5010	MOE PHC-E3421	P&T GC/MS
Ethylbenzene	VOL-91-5010	MOE PHC-E3421	P&T GC/MS
Xylene Mixture	VOL-91-5010	MOE PHC-E3421	P&T GC/MS
F1 (C6 - C10)	VOL-91- 5010	MOE PHC-E3421	P&T GC/FID
F1 (C6 to C10) minus BTEX	VOL-91-5010	MOE PHC-E3421	P&T GC/FID
F2 (C10 to C16)	VOL-91-5010	MOE PHC-E3421	GC/FID
F3 (C16 to C34)	VOL-91-5010	MOE PHC-E3421	GC/FID
F4 (C34 to C50)	VOL-91-5010	MOE PHC-E3421	GC/FID
Gravimetric Heavy Hydrocarbons	VOL-91-5010	MOE PHC-E3421	BALANCE
Terphenyl	VOL-91-5010	MOE PHC-E3421	GC/FID

AGAT Laboratories

5835 Coopers Avenue
Mississauga, Ontario L4Z 1Y2
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webearth.agatlabs.com

Chain of Custody Record

If this is a Drinking Water sample, please use Drinking Water Chain of Custody Form (potable water consumed by humans)

Laboratory Use Only

Work Order #: 19T460288

Cooler Quantity: Med

Arrival Temperatures: 3.7 | 3.5 | 3.7
2.5 | 2.7 | 2.3

Custody Seal Intact: ☐ Yes ☐ No ☐ N/A

Notes:

Report Information:

Company: Golder Associates
Contact: Devin Hannan
Address: 121 Commerce Park Drive Unit L, Barrie, ON
Phone: 705-722-4492 Fax:
Reports to be sent to:
1. Email: dhannan@golder.com
2. Email: jcornell@golder.com

Project Information:

Project: 1894152 (210)
Site Location: Lafarge Goodwood
Sampled By: J. Cornell
AGAT Quote #: PO:
Please note: If quotation number is not provided, client will be billed full price for analysis.

Invoice Information:

Bill To Same: Yes ☒ No ☐

Company:
Contact:
Address:
Email:

Regulatory Requirements:

☐ No Regulatory Requirement

(Please check all applicable boxes)

☒ Regulation 153/04
Table 2 (Indicate One)
☐ Ind/Com
☐ Res/Park
☐ Agriculture

Soil Texture (Check One)
☐ Coarse
☐ Fine

☐ Sewer Use
☐ Sanitary
☐ Storm

Region _____ (Indicate One)
☐ MISA

☐ Regulation 558
☐ CCME
☐ Prov. Water Quality Objectives (PWQO)
☐ Other
_____ (Indicate One)

Is this submission for a **Record of Site Condition?** ☐ Yes ☒ No

Report Guideline on *Certificate of Analysis* ☒ Yes ☐ No

Turnaround Time (TAT) Required:

Regular TAT ☒ 5 to 7 Business Days

Rush TAT (Rush Surcharges Apply)

☐ 3 Business Days ☐ 2 Business Days ☐ Next Business Day

OR Date Required (Rush Surcharges May Apply):

Please provide prior notification for rush TAT
**TAT is exclusive of weekends and statutory holidays*

For 'Same Day' analysis, please contact your AGAT CPM

Sample Matrix Legend

B	Biota
GW	Ground Water
O	Oil
P	Paint
S	Soil
SD	Sediment
SW	Surface Water

Sample Identification	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Comments/ Special Instructions	Field Filtered - Metals, Hg, CrVI (Y/N)	O. Reg 153: Metals and Inorganics (☐ All Metals ☐ 153 Metals (excl. Hydrides) ☐ Hydride Metals ☐ 153 Metals (Incl. Hydrides))	O. Reg 153: ORPs: ☐ B-HWS ☐ Cl ☐ CN ☐ Cr^{6+} ☐ EC ☐ FOC ☐ Hg ☐ pH ☐ SAR	O. Reg 153: Full Metals Scan	O. Reg 153: Regulation/Custom Metals	O. Reg 153: Nutrients: ☐ TP ☐ NH_3 ☐ TKN ☐ NO_3 ☐ NO_2 ☐ NO_3+NO_2	O. Reg 153: Volatiles: ☐ VOC ☐ BTEX ☐ THM	O. Reg 153: PHCs F1 - F4	O. Reg 153: ABNs	O. Reg 153: PAHs	O. Reg 153: PCBs: ☐ Total ☐ Aroclors	O. Reg 153: Organochlorine Pesticides	O. Reg 153: TCLP: ☐ M&I ☐ VOCs ☐ ABNs ☐ B(a)P ☐ PCBs	O. Reg 153: Sewer Use
MW18-01	04/24/19	11:40	4	GW		N							X						
MW18-02		12:15	4										X						
MW18-03		1:00	4										X						
PW		1:30	4										X						
DUP		1:00	4										X						

Samples Relinquished By (Print Name and Sign)	Date	Time	Samples Received By (Print Name and Sign)	Date	Time
Jason Cornell/Jason Cornell	04/24/19	4:00 PM		April 25/19	9:25
	April 25/19	3:55			

Page 1 of 1

Nº: T087519

78 151 1 015

Pink Copy - Client | Yellow Copy - AGAT | White Copy- AGAT

Date Issued: March 16, 2018

Your Project #: 21453907
Site Location: GOODWOOL
Your C.O.C. #: 827225-01-01

Attention: Dawn Hoyle

Golder Associates Ltd
121 Commerce Park Drive
Unit L
Barrie, ON
CANADA L4N 8X1

Report Date: 2021/05/28
Report #: R6651649
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BV LABS JOB #: C1D2546
Received: 2021/05/17, 14:44

Sample Matrix: Water
Samples Received: 6

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Petroleum Hydro. CCME F1 & BTEX in Water	6	N/A	2021/05/20	CAM SOP-00315	CCME PHC-CWS m
Petroleum Hydrocarbons F2-F4 in Water (1)	5	2021/05/19	2021/05/20	CAM SOP-00316	CCME PHC-CWS m

Remarks:

Bureau Veritas is accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Bureau Veritas are based upon recognized Provincial, Federal or US method compendia such as CCME, MELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Bureau Veritas' profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Bureau Veritas in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Bureau Veritas liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Bureau Veritas has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Bureau Veritas, unless otherwise agreed in writing. Bureau Veritas is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Bureau Veritas, results relate to the supplied samples tested.

Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) All CCME PHC results met required criteria unless otherwise stated in the report. The CWS PHC methods employed by Bureau Veritas Laboratories conform to all prescribed elements of the reference method and performance based elements have been validated. All modifications have been validated and proven equivalent following “Alberta Environment’s Interpretation of the Reference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil Validation of Performance-Based Alternative Methods September 2003”. Documentation is available upon request. Modifications from Reference Method for the Canada-wide Standard for Petroleum Hydrocarbons in Soil-Tier 1 Method: F2/F3/F4 data reported using validated cold solvent extraction instead of Soxhlet extraction.

Your Project #: 21453907
Site Location: GOODWOOL
Your C.O.C. #: 827225-01-01

Attention: Dawn Hoyle

Golder Associates Ltd
121 Commerce Park Drive
Unit L
Barrie, ON
CANADA L4N 8X1

Report Date: 2021/05/28
Report #: R6651649
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BV LABS JOB #: C1D2546
Received: 2021/05/17, 14:44

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Ema Gitej, Senior Project Manager
Email: emese.gitej@bureauveritas.com
Phone# (905)817-5829
==========
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BV Labs Job #: C1D2546
Report Date: 2021/05/28

Golder Associates Ltd
Client Project #: 21453907
Site Location: GOODWOOL
Sampler Initials: D.S

PETROLEUM HYDROCARBONS (CCME)

BV Labs ID		POX994		
Sampling Date		2021/05/17 08:00		
COC Number		827225-01-01		
	UNITS	TRIP BLANK	RDL	QC Batch
BTEX & F1 Hydrocarbons				
F1 (C6-C10)	ug/L	<25	25	7361905
F1 (C6-C10) - BTEX	ug/L	<25	25	7361905
Surrogate Recovery (%)				
1,4-Difluorobenzene	%	105		7361905
4-Bromofluorobenzene	%	87		7361905
D10-o-Xylene	%	102		7361905
D4-1,2-Dichloroethane	%	103		7361905

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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BV Labs Job #: C1D2546
Report Date: 2021/05/28

Golder Associates Ltd
Client Project #: 21453907
Site Location: GOODWOOL
Sampler Initials: D.S

O.REG 153 PHCS, BTEX/F1-F4 (WATER)

BV Labs ID		POX989	POX990	POX991	POX992	POX993		
Sampling Date		2021/05/17 09:25	2021/05/17 09:25	2021/05/17 10:25	2021/05/17 11:30	2021/05/17 12:15		
COC Number		827225-01-01	827225-01-01	827225-01-01	827225-01-01	827225-01-01		
	UNITS	MW18-03	DUPE-1	PW	MW18-02	MW18-01	RDL	QC Batch
BTEX & F1 Hydrocarbons								
F1 (C6-C10)	ug/L	<25	<25	<25	<25	<25	25	7361905
F1 (C6-C10) - BTEX	ug/L	<25	<25	<25	<25	<25	25	7361905
F2-F4 Hydrocarbons								
F2 (C10-C16 Hydrocarbons)	ug/L	<100	<100	<100	<100	<100	100	7360004
F3 (C16-C34 Hydrocarbons)	ug/L	<200	<200	<200	<200	<200	200	7360004
F4 (C34-C50 Hydrocarbons)	ug/L	<200	<200	<200	<200	<200	200	7360004
Reached Baseline at C50	ug/L	Yes	Yes	Yes	Yes	Yes		7360004
Surrogate Recovery (%)								
1,4-Difluorobenzene	%	103	102	104	103	103		7361905
4-Bromofluorobenzene	%	95	81	90	93	95		7361905
D10-o-Xylene	%	99	105	105	99	106		7361905
D4-1,2-Dichloroethane	%	105	108	104	106	105		7361905
o-Terphenyl	%	81	88	87	89	88		7360004

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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BV Labs Job #: C1D2546
Report Date: 2021/05/28

Golder Associates Ltd
Client Project #: 21453907
Site Location: GOODWOOL
Sampler Initials: D.S

TEST SUMMARY

BV Labs ID: POX989
Sample ID: MW18-03
Matrix: Water

Collected: 2021/05/17
Shipped:
Received: 2021/05/17

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Petroleum Hydro. CCME F1 & BTEX in Water	HSGC/MSFD	7361905	N/A	2021/05/20	Abdikarim Ali
Petroleum Hydrocarbons F2-F4 in Water	GC/FID	7360004	2021/05/19	2021/05/20	Ravinder Gaidhu

BV Labs ID: POX990
Sample ID: DUPE-1
Matrix: Water

Collected: 2021/05/17
Shipped:
Received: 2021/05/17

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Petroleum Hydro. CCME F1 & BTEX in Water	HSGC/MSFD	7361905	N/A	2021/05/20	Abdikarim Ali
Petroleum Hydrocarbons F2-F4 in Water	GC/FID	7360004	2021/05/19	2021/05/20	Ravinder Gaidhu

BV Labs ID: POX991
Sample ID: PW
Matrix: Water

Collected: 2021/05/17
Shipped:
Received: 2021/05/17

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Petroleum Hydro. CCME F1 & BTEX in Water	HSGC/MSFD	7361905	N/A	2021/05/20	Abdikarim Ali
Petroleum Hydrocarbons F2-F4 in Water	GC/FID	7360004	2021/05/19	2021/05/20	Ravinder Gaidhu

BV Labs ID: POX992
Sample ID: MW18-02
Matrix: Water

Collected: 2021/05/17
Shipped:
Received: 2021/05/17

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Petroleum Hydro. CCME F1 & BTEX in Water	HSGC/MSFD	7361905	N/A	2021/05/20	Abdikarim Ali
Petroleum Hydrocarbons F2-F4 in Water	GC/FID	7360004	2021/05/19	2021/05/20	Ravinder Gaidhu

BV Labs ID: POX993
Sample ID: MW18-01
Matrix: Water

Collected: 2021/05/17
Shipped:
Received: 2021/05/17

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Petroleum Hydro. CCME F1 & BTEX in Water	HSGC/MSFD	7361905	N/A	2021/05/20	Abdikarim Ali
Petroleum Hydrocarbons F2-F4 in Water	GC/FID	7360004	2021/05/19	2021/05/20	Ravinder Gaidhu

BV Labs ID: POX994
Sample ID: TRIP BLANK
Matrix: Water

Collected: 2021/05/17
Shipped:
Received: 2021/05/17

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Petroleum Hydro. CCME F1 & BTEX in Water	HSGC/MSFD	7361905	N/A	2021/05/20	Abdikarim Ali

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BV Labs Job #: C1D2546
Report Date: 2021/05/28

Golder Associates Ltd
Client Project #: 21453907
Site Location: GOODWOOL
Sampler Initials: D.S

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	11.0°C

Sample POX994 [TRIP BLANK] : Sample analyzed for F1/BTEX as per client request.

Results relate only to the items tested.

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Report Date: 2021/05/28

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Site Location: GOODWOOL
Sampler Initials: D.S

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
7360004	RGA	Matrix Spike	o-Terphenyl	2021/05/19		91	%	60 - 130
			F2 (C10-C16 Hydrocarbons)	2021/05/19		98	%	60 - 130
			F3 (C16-C34 Hydrocarbons)	2021/05/19		95	%	60 - 130
			F4 (C34-C50 Hydrocarbons)	2021/05/19		97	%	60 - 130
7360004	RGA	Spiked Blank	o-Terphenyl	2021/05/19		91	%	60 - 130
			F2 (C10-C16 Hydrocarbons)	2021/05/19		101	%	60 - 130
			F3 (C16-C34 Hydrocarbons)	2021/05/19		99	%	60 - 130
			F4 (C34-C50 Hydrocarbons)	2021/05/19		100	%	60 - 130
7360004	RGA	Method Blank	o-Terphenyl	2021/05/19		89	%	60 - 130
			F2 (C10-C16 Hydrocarbons)	2021/05/19	<100		ug/L	
			F3 (C16-C34 Hydrocarbons)	2021/05/19	<200		ug/L	
			F4 (C34-C50 Hydrocarbons)	2021/05/19	<200		ug/L	
7360004	RGA	RPD	F2 (C10-C16 Hydrocarbons)	2021/05/19	NC		%	30
			F3 (C16-C34 Hydrocarbons)	2021/05/19	NC		%	30
			F4 (C34-C50 Hydrocarbons)	2021/05/19	NC		%	30
7361905	AAI	Matrix Spike	1,4-Difluorobenzene	2021/05/19		100	%	70 - 130
			4-Bromofluorobenzene	2021/05/19		99	%	70 - 130
			D10-o-Xylene	2021/05/19		102	%	70 - 130
			D4-1,2-Dichloroethane	2021/05/19		101	%	70 - 130
			F1 (C6-C10)	2021/05/19		82	%	60 - 140
7361905	AAI	Spiked Blank	1,4-Difluorobenzene	2021/05/19		101	%	70 - 130
			4-Bromofluorobenzene	2021/05/19		98	%	70 - 130
			D10-o-Xylene	2021/05/19		103	%	70 - 130
			D4-1,2-Dichloroethane	2021/05/19		99	%	70 - 130
			F1 (C6-C10)	2021/05/19		82	%	60 - 140
7361905	AAI	Method Blank	1,4-Difluorobenzene	2021/05/19		103	%	70 - 130
			4-Bromofluorobenzene	2021/05/19		91	%	70 - 130
			D10-o-Xylene	2021/05/19		99	%	70 - 130
			D4-1,2-Dichloroethane	2021/05/19		105	%	70 - 130
			F1 (C6-C10)	2021/05/19	<25		ug/L	
			F1 (C6-C10) - BTEX	2021/05/19	<25		ug/L	
7361905	AAI	RPD	F1 (C6-C10)	2021/05/19	NC		%	30
			F1 (C6-C10) - BTEX	2021/05/19	NC		%	30

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

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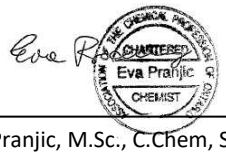
BV Labs Job #: C1D2546
Report Date: 2021/05/28

Golder Associates Ltd
Client Project #: 21453907
Site Location: GOODWOOL
Sampler Initials: D.S

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by:



Ewa Pranjic, M.Sc., C.Chem, Scientific Specialist

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APPENDIX E

Groundwater Zone of Influence Calculations

Inflow to the Open Pit (1)
Based on Equations by Marinelli and Niccoli (2000)

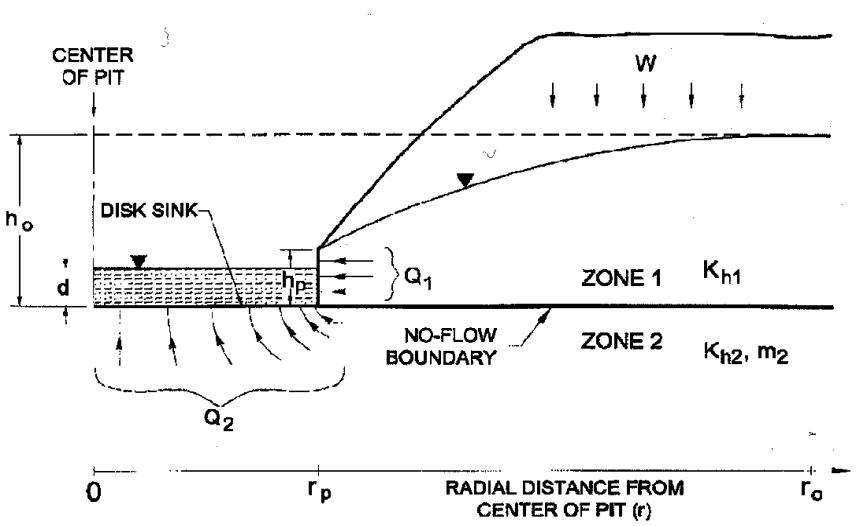

Figure 2. Pit inflow analytical model.

Marinelli, F., and W. L. Niccoli. 2000. Simple analytical equations for estimating ground water inflow to a mine pit. Ground Water 38, no. 2: 311-314.

(A) $$h_o = \sqrt{h_p^{\,2} + \frac{W}{K_{h1}}\left[r_o^2 \ln\left(\frac{r_o}{r_p}\right) - \frac{\left(r_o^2 - r_p^2\right)}{2}\right]},$$

(B) $$Q_1 = W\pi\left(r_o^2 - r_p^2\right),$$

(C) $$Q_2 = 4r_p\left(\frac{K_{h2}}{m_2}\right)\left(h_0 - d\right),$$

(D) $$m_2 = \sqrt{\frac{K_{h2}}{K_{v2}}}$$

Input Parameters

W (m/s)	6.8E-09	recharge flux
Kh1 (m/s)	2.0E-04	horizontal hydraulic conductivity in Zone 1
Kh2 (m/s)	2.0E-04	horizontal hydraulic conductivity in Zone 2
Kv2 (m/s)	2.0E-04	vertical hydraulic conductivity in Zone 2
ho (m)	12.25	initial saturated thickness above the base of Zone 1
hp (m)	12.0	saturated thickness at the pit wall
rp (m)	135	effective pit radius
d (m)	12.00	depth of the pit lake

Inflow to the Open Pit (2)
Based on Equations by Marinelli and Niccoli (2000)

Inflow from Zone 1

ro (m)	474.0	radius of influence calculated by iterating equation A / goalseek

(known ho)		(ho calculated using eq. A)
12.2500	=	12.251

Drawdown with Distance
Based on Equations by Marinelli and Niccoli (2000)

r (m)	=	450.0	selected distance from pit centre
H (m) at r	=	12.25	head at selected distance from pit centre
Drawdown (m) at r	=	0.001	drawdown at selected distance from pit centre

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