Environmental Remedial Action Plan

424 Churchill Avenue North, Ottawa, Ontario

Churchill Properties Inc.

145 Select Avenue,

Scarborough, Ontario

M1V 5M8

August 19, 2025
Ref No. 02103035.000

ENGLOBE

Churchill Properties Inc.

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1 Introduction

Churchill Properties Inc. retained Englobe Corp. (Englobe) to complete an Environmental Remedial Action Plan (RAP) for the property located at 424 Churchill Avenue North, Ottawa, Ontario. The Property is located on the northwest corner of the intersection of Byron Avenue and Churchill Avenue North, in Ottawa, Ontario and is irregular in shape, with a total area of approximately 1,006 square metres (0.1 hectares, **see Figure 1**), hereinafter referred to as *'the Property'*.

The RAP takes into consideration the Ministry of the Environment, Conservation and Parks (MECP) guidance document "*Management of Excess Soil – A Guide for Best Management Practices*" January 2014 and should be overseen by a Qualified Person (other than risk assessment) as defined under O.Reg. 153/04 Part II Section 5.

Phase One and Phase Two Environmental Site Assessments were conducted at the Property to assess subsurface soil and groundwater conditions. Exceedances of the applicable Site Condition Standards were noted in the earth fill (i.e. soil) and groundwater at the Property. As such, this remedial action plan is being conducted to determine the most appropriate next steps whether remediation or Risk Assessment.

The RAP was prepared to summarize the actions that will be completed for the Property such that a Record of Site Condition (RSC) may be filed for the Property to support the proposed residential development including an eight (8) storey, 70 unit mid-rise apartment building with a 2-level parking garage with one level underground and one level at grade.

2 Site Description

The Site is located at 424 Churchill Avenue North in Ottawa, Ontario, in an area zoned as TM H(24) - Traditional Mainstreet Zone. The Site is currently vacant and the Property occupies an area of approximately 1006 m^2 (0.1 hectares). At the time of the environmental work programs, the property was developed with a single-storey, single-tenant commercial building, with one underground basement level, and an asphalt parking lot. The building, which had a footprint area of approximately 350 m^2, has since been demolished but was formerly operated as a dry cleaner and laundromat (Laundry Land). These buildings have since been demolished. The Site is bordered to the North by Danforth Avenue, to the East by Churchill Avenue North, to the South by Byron Avenue, and to the West by 352 Danforth Avenue.

It is understood that the proposed redevelopment of the Property includes development of a seven (7) storey, 58 unit mid-rise apartment building with a 3-level underground parking garage.

In accordance with Ontario Regulation 153/04 (O. Reg. 153/04), the Property is currently in mixed Commercial Property Use as defined by the Ontario Ministry of the Environment, Conservation (MECP). As the development plans require a change to Residential Land Use under O.Reg 153/04, a more sensitive land use, a Record of Site Condition is a mandatory requirement of the MECP.

3 Summary of Associated Documents

The RAP is based on the following documents, these documents are summarized in the following sections:

1. “Phase One Environmental Site Assessment Update, 424 Churchill Avenue North, Ottawa, Ontario”, prepared by Englobe Corp., dated July 11, 2025.
2. “Phase Two Environmental Site Assessment Update, 424 Churchill Avenue North, Ottawa, Ontario”, prepared by Englobe Corp., dated July 11, 2025.
3. “Off-Site Management Agreement (OSMA) Letter, 424 Churchill Avenue North, Ottawa, Ontario”, prepared by Englobe Corp., dated May 12, 2025.
4. “Hydrogeological Assessment Report, 424 Churchill Avenue North, Ottawa, Ontario”, prepared by Englobe Corp. dated December 2023
5. “Recommendations and Vibration Estimations for Urban Blasting Applications, 424 Churchill Avenue, Ottawa, Ontario” prepared by Groupe Blastforce Canada Inc. dated. August 1, 2025

3.1 Phase One ESA Update (Englobe 2025)

Based upon review of historical information for the site during the Phase One ESA, the following Potentially Contaminating Activities (PCAs) as provided in Table 2 of Schedule D of O.Reg. 153/04, have been identified and are as still applicable to the site:

Location of PCA	PCA	Potential APEC (Yes/No)	Justification
424 Churchill Avenue North On the Property	37. Operation of Dry Cleaning Equipment (where chemicals are used)	Yes (APEC 1)	Site Reconnaissance: Former Dry-cleaner and laundromat identified. On-Site building demolished in May 2025. PCA has potential to cause and APEC on the Property.
424 Churchill Avenue North On the Property	PCA Others 1. Application of salt for de-icing purposes for the safety of vehicular or pedestrian traffic	Yes (APEC 2)	Site Reconnaissance: asphalt parking and driveway where de icing activities occurred. PCA has potential to cause and APEC on the Property.

Location of PCA	PCA	Potential APEC (Yes/No)	Justification
Byron Avenue South Side of Byron Avenue, South of the Property	46. Rail Yards, Tracks and Spurs	No	Down-gradient PCA does not have potential to cause an APEC on the Property due to distance from the Property.
412 Churchill Avenue North 35m North of the Property	31. Ink Manufacturing, Processing and Bulk Storage	Yes (APEC 3)	Upgradient PCA does have potential to cause an APEC on the Property due to distance from the Property.
	33. Metal Treatment, Coating, Plating and Finishing	Yes (APEC 3)	Upgradient PCA does have potential to cause an APEC on the Property due to distance from the Property.
408 Churchill Avenue North 40m North of the Property	28. Gasoline and Associated Products Storage in Fixed Tanks	Yes (APEC 3)	Upgradient PCA does have potential to cause an APEC on the Property due to distance from the Property.
352 Richmond Road 50m North of the Property	37. Operation of Dry Cleaning Equipment (where chemicals are used)	Yes (APEC 3)	Upgradient PCA does have potential to cause an APEC on the Property due to distance from the Property.
345 Ravenhill Avenue 60m South of the Property	28. Gasoline and Associated Products Storage in Fixed Tanks	No	Down-gradient PCA does not have potential to cause an APEC on the Property due to distance from the Property.
518 Byron Avenue 87m Southwest of the Property	PCA Others 3 - Spill	No	Down-gradient PCA does not have potential to cause an APEC on the Property due to distance from the Property.
326 Richmond Road 82m Northeast of the Property	31. Ink Manufacturing, Processing and Bulk Storage	Yes (APEC 3)	Upgradient PCA does have potential to cause an APEC on the Property due to distance from the Property.
337 Richmond Road 90m North of the Property	10. Commercial Autobody Shops	Yes (APEC 3)	Upgradient PCA does have potential to cause an APEC on the Property due to distance from the Property.
	PCA Others. 2 - Salt Storage	Yes (APEC 3)	Upgradient PCA does have potential to cause an APEC on the Property due to distance from the Property.

Location of PCA	PCA	Potential APEC (Yes/No)	Justification
449 Churchill Avenue North 113m South of the Property	28. Gasoline and Associated Products Storage in Fixed Tanks	No	Down-gradient PCA does not have potential to cause an APEC on the Property due to distance from the Property.
357 Richmond Road 119m Northwest of the Property	37. Operation of Dry Cleaning Equipment (where chemicals are used)	No	Down-gradient PCA does not have potential to cause an APEC on the Property due to distance from the Property.
450 Churchill Avenue 105m South of the Property	28. Gasoline and Associated Products Storage in Fixed Tanks	No	Down-gradient PCA does not have potential to cause an APEC on the Property due to distance from the Property.
347 Richmond Road 133m Northwest of the Property	28. Gasoline and Associated Products Storage in Fixed Tanks	No	Down-gradient PCA does not have potential to cause an APEC on the Property due to distance from the Property.
372 Richmond Road 80m West of the Property	28. Gasoline and Associated Products Storage in Fixed Tanks	No	Down-gradient PCA does not have potential to cause an APEC on the Property due to distance from the Property.
312 Richmond Road 133m Northeast of the Site	37. Operation of Dry Cleaning Equipment (where chemicals are used)	No	Upgradient PCA does not have potential to cause an APEC on the Property due to distance from the Property.
300 Richmond Road 133m Northeast of the Site	10. Commercial Autobody Shops	No	Upgradient PCA does not have potential to cause an APEC on the Property due to distance from the Property.
314 Richmond Road 125m Northeast of the Site	54. Textile Manufacturing and Processing	No	Upgradient PCA does not have potential to cause an APEC on the Property due to distance from the Property.

Location of PCA	PCA	Potential APEC (Yes/No)	Justification
384 Richmond Road 141m West of the Property	37. Operation of Dry Cleaning Equipment (where chemicals are used)	No	Down-gradient PCA does not have potential to cause an APEC on the Property due to distance from the Property.
371 Richmond Road 132m Northwest of the Property	10. Commercial Autobody Shops	No	Down-gradient PCA does not have potential to cause an APEC on the Property due to distance from the Property.
388 Richmond Road 155m West of the Property	PCA Others 3 - Spill	No	Down-gradient PCA does not have potential to cause an APEC on the Property due to distance from the Property.
319 Richmond Road 115m Northeast of the Property	28. Gasoline and Associated Products Storage in Fixed Tanks	No	Upgradient PCA does not have potential to cause an APEC on the Property due to distance from the Property.
	10. Commercial Autobody Shops	No	Upgradient PCA does not have potential to cause an APEC on the Property due to distance from the Property.
389 Danforth Avenue 168m West of the Property	PCA Others 5 - Spill	No	Down-gradient PCA does not have potential to cause an APEC on the Property due to distance from the Property.
298 Richmond Road 230m Northeast of the Property	28. Gasoline and Associated Products Storage in Fixed Tanks	No	Upgradient PCA does not have potential to cause an APEC on the Property due to distance from the Property.
	10. Commercial Autobody Shops	No	Upgradient PCA does not have potential to cause an APEC on the Property due to distance from the Property.
383 Winona Avenue 186m Northeast of the Property	31. Ink Manufacturing, Processing and Bulk Storage	No	Upgradient PCA does not have potential to cause an APEC on the Property due to distance from the Property.

Location of PCA	PCA	Potential APEC (Yes/No)	Justification
311 Richmond Road 170m Northeast of the Property	31. Ink Manufacturing, Processing and Bulk Storage	No	Upgradient PCA does not have potential to cause an APEC on the Property due to distance from the Property.
394 Richmond Road 185m West of the Property	10. Commercial Autobody Shops	No	Down-gradient PCA does not have potential to cause an APEC on the Property due to distance from the Property.
376 Madison Avenue 173m Northwest of the Property	10. Commercial Autobody Shops	No	Down-gradient PCA does not have potential to cause an APEC on the Property due to distance from the Property.
376 Churchill Avenue 174m North of the Property	28. Gasoline and Associated Products Storage in Fixed Tanks	No	Cross-gradient PCA does not have potential to cause an APEC on the Property due to distance from the Property.
	31. Ink Manufacturing, Processing and Bulk Storage	No	Cross-gradient PCA does not have potential to cause an APEC on the Property due to distance from the Property.
	PCA Others 4 – Manufacturing	No	Cross-gradient PCA does not have potential to cause an APEC on the Property due to distance from the Property.
307/307 A Richmond Road 180m Northeast of the Property	28. Gasoline and Associated Products Storage in Fixed Tanks	No	Upgradient PCA does not have potential to cause an APEC on the Property due to distance from the Property.
	10. Commercial Autobody Shops	No	Upgradient PCA does not have potential to cause an APEC on the Property due to distance from the Property.
377 Churchill Avenue 175m North of the Property	34. Metal Fabrication	No	Cross-gradient PCA does not have potential to cause an APEC on the Property due to distance from the Property.
375 Churchill Avenue 183m North of the Property	54. Textile Manufacturing and Processing	No	Cross-gradient PCA does not have potential to cause an APEC on the Property due to distance from the Property.

Location of PCA	PCA	Potential APEC (Yes/No)	Justification
393 Richmond Road 200m West of the Property	PCA Others 4 - Manufacturing	No	Down-gradient PCA does not have potential to cause an APEC on the Property due to distance from the Property.
433 Roosevelt Avenue 194m Southwest of the Property	10. Commercial Autobody Shops	No	Down-gradient PCA does not have potential to cause an APEC on the Property due to distance from the Property.
397 Richmond Road 200m West of the Property	39. Paints Manufacturing, Processing and Bulk Storage	No	Down-gradient PCA does not have potential to cause an APEC on the Property due to distance from the Property.
277 Richmond Road 250m Northeast of the Property	10. Commercial Autobody Shops	No	Upgradient PCA does not have potential to cause an APEC on the Property due to distance from the Property.
348 Whitby Avenue 217m North of the Property	PCA Others 3 – Spill	No	Cross-gradient PCA does not have potential to cause an APEC on the Property due to distance from the Property.
363 Churchill Avenue 220m North of the Property	31. Ink Manufacturing, Processing and Bulk Storage	No	Cross-gradient PCA does not have potential to cause an APEC on the Property due to distance from the Property.
	PCA Others 3 – Spill	No	Cross-gradient PCA does not have potential to cause an APEC on the Property due to distance from the Property.
364 Churchill Avenue 227m North of the Property	31. Ink Manufacturing, Processing and Bulk Storage	No	Cross-gradient PCA does not have potential to cause an APEC on the Property due to distance from the Property.
276 Richmond Road 250m Northeast of the Property	10. Commercial Autobody Shops	No	Upgradient PCA does not have potential to cause an APEC on the Property due to distance from the Property.

Location of PCA	PCA	Potential APEC (Yes/No)	Justification
282 Richmond Road 250m Northeast of the Property	37. Operation of Dry Cleaning Equipment (where chemicals are used)	No	Upgradient PCA does not have potential to cause an APEC on the Property due to distance from the Property.
290 Picton Avenue 250m Northeast of the Property	43. Plastics (including Fibreglass) Manufacturing and Processing	No	Upgradient PCA does not have potential to cause an APEC on the Property due to distance from the Property.
400 Athlone Avenue 250m East of the Property	PCA Others 3 – Spill	No	Upgradient PCA does not have potential to cause an APEC on the Property due to distance from the Property.
416 Richmond Rd 250m West of Property	31.Ink Manufacturing, Processing and Bulk Storage	No	Down-gradient PCA does not have potential to cause an APEC on the Property due to distance from the Property.
	28. Gasoline and Associated Products Storage in Fixed Tanks	No	Down-gradient PCA does not have potential to cause an APEC on the Property due to distance from the Property.

Based on the PCAs identified at the Site the following Areas of Potential Environmental Concern were identified on the property as potentially housing soil and groundwater impacts in excess of the Applicable MECP Site Condition Standards

APEC	Location of PCA	PCA	COPCs	Media Potentially Impacted
APEC 1: Southern portion of Site around Site building	On-Site Property	PCA 37: Operation of Dry-Cleaning Equipment (where chemicals are used)	VOCs, PAHs, BTEX, PHCs	Soil & Groundwater
APEC 2: Parking Lot area surrounding Site building	On-Site Property	PCA Others 1: De-icing Activities	Soil: Na+, Cl-, GW: SAR, EC	Soil & Groundwater
APEC 3: Northern Property Boundary	412-414 Churchill Avenue North 35m North of Site	PCA 31: Ink Manufacturing, processing and bulk Storage	PHCs (F1-F4), VOCs, BTEX, PAH	Soil & Groundwater
		PCA 33: Metal Treatment, coating,	Metals, As, Sb, Se (Hydride Forming	

		plating and finishing	Metals), PHCs (F1-F4), VOCs, BTEX, PAH	
	408 Churchill Avenue North 40m North of Site	PCA 28: Gasoline and associated products storage in fixed tanks	Metals, As, Sb, Se (Hydride Forming Metals), PHCs (F1-F4), VOCs, BTEX, PAH	
	352 Richmond Road 50m North of Site	PCA 37: Operation of Dry-Cleaning Equipment (where chemicals are used)	VOCs, PAHs, BTEX	
	326 Richmond Road 82m Northeast of Site	PCA 31: Ink Manufacturing, processing and bulk Storage	PHCs (F1-F4), VOCs, BTEX, PAH	
	337 Richmond Road 95m North of Site	PCA 10: Commercial Auto Body Shops	Metals, As, Sb, Se (Hydride Forming Metals), PHCs (F1-F4), VOCs, BTEX, PAH	
		PCA Other 2: Salt Storage	Soil: Na+, Cl-, GW: SAR, EC	

3.1.1 Potential Contaminants of Concern

Based upon the applicable PCAs and APECs identified in the Phase One ESA, the following Potential Contaminants of Concern (PCoCs) were identified:

- Metals (M)
- Metals, Hydride-Forming As, Se and Sb (HFMs)
- Other Regulated Parameters (ORPs)
    - Electrical conductivity (EC)
    - Sodium Absorption Ratio (SAR)
    - Boron, hot water soluble
    - Chloride
    - Sodium
    - Cyanide
    - Mercury
    - Hexavalent Chromium
    - pH

- Polycyclic Aromatic Hydrocarbons (PAHs)
- Petroleum Hydrocarbons (PHCs)
- Volatile Organic Compounds (VOCs)
- Benzene, Toluene, Ethylbenzene, Xylenes (BTEX)

Based on the findings of the Phase One ESA a Phase Two ESA was recommended for the Property to investigate soil and groundwater quality at the Site.

3.2 Phase Two ESA Update (Englobe 2025)

Based on the findings of the Phase One ESA Englobe conducted a Phase Two ESA at the Property. The findings of the Phase Two ESA are summarized as follows. A copy of the Phase Two ESA Update is provided in Attachment 1.

3.2.1 Applicable Site Condition Standards

The applicable soil and ground water standards for the Property were determined to be those in Table 7 of the April 15, 2011 Ontario Ministry of Environment, Conservation and Parks (MECP) "*Soil, Ground Water and Sediment Standards for use under part XV.1 of the Environmental Protection Act*" for Residential/Parkland/Institutional land use for shallow soils in non-potable ground water condition for medium/fine textured soil (MECP Table 7 SCS).

The rationale and choice of the applicable standards considered Sections 35, 41 and 43.1 of O. Reg. 153/04.

These are the applicable standards for the following reasons:

- The use of the Property is proposed for redevelopment as Residential Land Use under O.Reg 153/04 as amended.
- Bedrock is located at a depth of less than 2 m across the Property.
- The Property is in the City of Ottawa, which obtains its potable water from surface water sources (Ottawa River).
- The soil is considered medium/fine under O.Reg. 153/04, based on the grain size analysis.
- The land parcel is not located within 30 m of a surface water body.
- The land parcel is not located in or adjacent to a provincial park or an area of natural significance.

In 2024, Englobe notified the City of Ottawa (City) clerk of the intention to use non-potable ground water standards. The City had no objection to the use of the non-potable standards, as noted in the Phase Two ESA report.

3.2.2 Soil Quality

As part of the subsurface investigation for the Phase Two ESA soil samples from beneath the Site were collected analysed for the Potential Contaminants of Concern (PCoCs) as outlined below:

Sample ID	Depth / Elev. (m) / (mASL)	Strata	Date Sampled	Metals	HFMs	PHCs	BTEX	VOCs	pH	PAHs
MW21-01 SS2	0.9-1.2	Native	April 21, 2021			✓	✓	✓		

Sample ID	Depth / Elev. (m) / (mASL)	Strata	Date Sampled	Metals	HFMs	PHCs	BTEX	VOCs	pH	PAHs
MW21-02 SS2	0.9-1.0	Naïve	April 21, 2021			✓	✓	✓	✓	
MW21-03 SS2	0.3-0.8	Fill	April 22, 2021			✓	✓	✓		
MW23-01 SS1	0.3-0.9	Fill	July 11, 2023	✓	✓	✓	✓	✓	✓	✓
MW23-03 SS1	0.15-0.45	Fill	July 20, 2023	✓	✓	✓	✓	✓	✓	✓
MW23-04 SS1	0-0.3	Fill	July 12, 2023	✓	✓	✓	✓	✓	✓	✓
MW25-01A	0.1-0.75	Fill	March 28, 2025	✓	✓	✓	✓	✓	✓	✓
MW25-02A	0.1-0.75	Fill	March 27, 2025	✓	✓	✓	✓	✓	✓	✓
MW25-03	0.1-0.75	Fill	March 27, 2025	✓	✓	✓	✓	✓	✓	✓
MW25-04A	0.1-0.6	Fill	March 26, 2025	✓	✓	✓	✓	✓	✓	✓
DUP				✓	✓	✓	✓	✓	✓	✓
MW25-05	0.1-0.6	Fill	March 26, 2025	✓	✓	✓	✓	✓	✓	✓

Notes:

- PHCs - Petroleum Hydrocarbons
- PAHs -Polycyclic Aromatic Hydrocarbons
- VOCs - Volatile Organic Compounds
- HFMs - Hydride Metals
- BTEX - Benzene, Toluene, Ethylbenzene, Xylene
- Metals - Includes ORPs - Other Regulated Parameters (for soil include B-HWS, CN-, CrVI, Hg, pH) (for ground water include CN-, CrVI, Hg, pH)

The results of the chemical analysis for MECP Table 7 SCS exceedances are summarized below.

- Metals and Inorganics, Barium at MW23-01 (0.3-0.9 mbgs), Copper and Zinc at MW25-5 (0.4-0.6 mbgs, and Lead at MW25-5 (0.4-0.6 mbgs), MW25-3 (0.03-0.4 mbgs), and MW23-04 (0-0.4 mbgs):
  - Horizontal delineation achieved by MW25-2A, MW25-1A, MW25-4A, MW23-03, the northern, western and southern property boundaries.
  - Vertical delineation was achieved by Bedrock ranging from 0.1-1.2 mbgs across the Site.
- Petroleum Hydrocarbons (PHCs) F4 (Gravimetric) at MW23-01 (0.3-0.9 mbgs):
  - Lateral delineation was achieved by MW21-01, MW25-1A, MW21-02, and MW23-04.
  - Vertical delineation was achieved by Bedrock ranging from 0.1-1.2 mbgs across the Site.
- Polycyclic Aromatic Hydrocarbons (PAHs):
  - Lateral delineation was achieved by MW23-01, MW25-1A, MW23-03, and the southern property boundary
  - Vertical delineation was achieved by Bedrock ranging from 0.1-1.2 mbgs across the Site.

These exceedances of the MECP Table 7 SCS in soil at the Site were all observed in the soil on Site which ranges from 0 to 1.2 mbgs or bedrock. These impacts are vertically delineated by bedrock. Though some soil samples at the Site meet the MECP Table 7 SCS, it is assumed that all the fill material across the Site is impacted. The proposed development at the Site, which includes a 58-unit mid-rise apartment building with a 3-level underground parking garage covering a majority of the Site, will result in the

removal of all fill material and bedrock from the Site from property line to property line. As such, all exceedances of metals and inorganics of the Table 7 SCS will be removed from the Site to facilitate the proposed development.

3.2.3 Groundwater Quality

As part of the subsurface investigation for the Phase Two ESA groundwater samples from beneath the Site were collected analysed for the Potential Contaminants of Concern (PCoCs) as outlined below:

Monitoring Well	Screen Sample Elevation (mASL)	Sampling Date	Metals	HFMs	PHCs (F1-F4)	BTEX	VOCs	PAHs	OCPs	PCBs
MW21-01	67.32-64.27	2021-04-30	-	-	✓	✓	✓	-	-	-
MW21-02	68.58-65.53	2021-04-30	-	-	✓	✓	✓	-	-	-
MW21-03	65.60-62.55	2021-04-30	-	-	✓	✓	✓	-	-	-
		2023-08-15	✓	✓	✓	✓	✓	✓	-	-
MW23-01	61.52-58.47	2023-08-28	✓	✓	✓	✓	✓	✓	-	-
		2023-11-28	-	-	✓	✓	✓	-	-	-
MW23-11 (DUP OF MW23-01)		2023-08-28	✓	✓	✓	✓	✓	✓	-	-
MW23-02	67.42-64.37	2023-08-28	-	-	✓	✓	-	-	-	-
		2023-11-29	-	-	✓	✓	✓	-	-	-
		2024-01-25	-	-	-	✓	✓	-	-	-
MW23-20 (DUP OF MW23-02)		2023-08-28	-	-	✓	✓	-	-	-	-
MW23-02 (2)		2023-09-13	-	-	-	-	✓	✓	✓	✓
MW23-03	69.77-66.72	2023-08-14	✓	✓	✓	✓	✓	✓	-	-
		2023-08-24	-	-	✓	✓	-	-	-	-
MW23-04	70.62-67.57	2023-08-14	✓	✓	✓	✓	✓	✓	-	-
MW24-1	47.82-44.77	2024-01-25	-	-	✓	✓	✓	-	-	-
MW25-1A	67.84-64.8	2025-04-17	✓	✓	✓	✓	✓	✓	-	-
MW25-1B	62.6-59.5	2025-04-21	-	-	✓	✓	✓	-	-	-
MW25-2A	68.84-65.90	2025-04-16	✓	✓	✓	✓	✓	✓	-	-
DUP 250416 (DUP OF MW25-2A)			✓	✓	✓	✓	✓	✓	-	-
MW25-2B	63.95-61.0	2025-04-17	-	-	✓	✓	✓	-	-	-

Monitoring Well	Screen Sample Elevation (mASL)	Sampling Date	Metals	HFMs	PHCs (F1-F4)	BTEX	VOCs	PAHs	OCPs	PCBs
MW25-3	63.45-60.4	2025-04-17	✓	✓	✓	✓	✓	✓	-	-
MW25-4A	68.4-65.00	2025-04-17	✓	✓	✓	✓	✓	✓	-	-
MW25-4B	63.45-60.5	2025-04-21	-	-	✓	✓	✓	-	-	-
MW25-5	68.45-65.4	202-04-21	✓	✓	✓	✓	✓	-	-	-

Notes:

- PHCs - Petroleum Hydrocarbons
- PAHs -Polycyclic Aromatic Hydrocarbons
- VOCs - Volatile Organic Compounds
- HFM - Hydride Metals
- OCP - Organochloride Pesticides
- BTEX - Benzene, Toluene, Ethylbenzene, Xylene
- Metals - Includes ORPs - Other Regulated Parameters (for soil include B-HWS, CN-, CrVI, Hg, pH) (for ground water include CN-, CrVI, Hg, pH)
- PCBs - Polychlorinated Biphenyls

The results of the chemical analysis are summarized below:

Based on the groundwater data obtained from the Site between April 2021 and March 2025 the exceedances of the MECP Table 7 SCS have been delineated as described below. Lateral delineation of groundwater impacts is illustrated in Figures 10, 11, 12, and 13:

- Petroleum Hydrocarbons (PHCs), PHC F1 at MW23-02:
  - Lateral delineation was achieved by MW25-2A, MW25-1A, MW23-01, and MW23-04,
  - Vertical delineation was achieved by MW25-3 and MW24-1
- Petroleum Hydrocarbons (PHCs), PHC F2 and F3 at MW21-01:
  - Lateral delineation was achieved by MW25-4A, MW25-5, MW23-01, MW24-1 and the northern Property boundary. Non-Standard Delineation will be applied to address PHC F2 and PHC F3 impacts in groundwater at the Site.
  - Vertical delineation was achieved by MW25-4A, MW25-4B, and MW24-1
- Volatile Organic Compounds (VOCs) including BTEX
  - VOC impacts have been vertically delineated by MW25-3 and MW24-1. Due to the groundwater impact observed in some of the monitoring wells located on the property boundaries. Non-Standard Delineation will be applied to address VOC impacts in groundwater at the Site.

3.2.4 Phase Two ESA Conclusions

Soil and groundwater exceedances of the applicable MECP Table 7 SCS were identified across the Site. Based on the findings of the Phase One and Two ESA these exceedances are due to a combination of on-Site and off-Site sources of contamination. The Phase Two ESA concluded that additional action is required at the Site in the form of remediation and/or Risk Assessment before a Record of Site Condition (RSC) could be filed for the Property.

It should be noted that all sixteen (16) monitoring wells on-Site were decommissioning by a licensed well contractor following O. Reg. 903. Englobe was in attendance to witness the well decommissioning

and a well decommissioning report has been prepared in accordance with the regulation and is presented in Attachment 2.

3.3 Off-Site Management Agreement (OSMA) Letter (Englobe 2025)

Englobe conducted an Off-Site Migration Study for the Site on behalf of Churchill Properties Inc. for submission to the Corporation of the City of Ottawa to evaluate potential for off-Site migration of soil and groundwater exceeding the applicable MECP SCS.

Englobe field personnel collected groundwater level measurements from the installed monitoring wells on multiple occasions between 2021 and 2025. The groundwater levels are provided in the Table below.

Sample Location	Elevation at ground surface (masl)	Measurement Date (dd/mm/yyyy)	Groundwater Depth (m bgs)	Groundwater Elevation (masl)
MW21-01	75.423	22/04/2021	10.92	64.50
		29/04/2021	6.46	68.96
		05/10/2023	6.07	69.35
MW21-02	75.457	29/04/2021	6.80	68.66
		08/15/2023	5.65	69.81
		05/10/2023	6.68	68.78
MW21-03	75.416	22/04/2021	10.83	64.59
		29/04/2021	6.92	68.50
		15/08/2023	6.71	68.71
MW23-01	75.268	14/08/2023	5.89	69.38
		28/08/2023	7.00	68.27
		05/10/2023	6.47	66.80
		28/11/2023	13.57	61.70
		07/04/2025	11.95	63.32
		09/04/2025	12.55	62.72
MW23-02	73.571	14/08/2023	3.90	69.67
		28/08/2023	4.60	68.97
		13/09/2023	3.90	69.67
		28/11/2023	4.83	68.74
		25/01/2024	3.9	69.67
MW23-03	75.923	14/08/2023	6.20	69.72
		28/08/2023	6.89	69.03
MW23-04	75.752	14/08/2023	5.90	69.85
		05/10/2023	6.79	68.96
		07/04/2025	5.52	70.23
		09/04/2025	5.62	70.13
MW24-1	75.376	01/24/2024	11.44	63.94
		01/25/2024	11.33	64.05
		07/04/2025	11.14	64.24
		09/04/2025	21.30	54.08
MW25-1A	74.922	28/03/2025	5.31	69.61
		01/04/2025	4.76	70.16
		07/04/2025	4.86	70.06
		09/04/2025	4.90	70.02

Sample Location	Elevation at ground surface (masl)	Measurement Date (dd/mm/yyyy)	Groundwater Depth (m bgs)	Groundwater Elevation (masl)
MW25-1B	74.912	28/03/2025	11.39	63.52
		01/04/2025	11.52	63.39
		07/04/2025	11.50	63.41
		09/04/2025	11.47	63.44
MW25-2A	75.942	28/03/2025	6.40	69.54
		01/04/2025	5.63	70.31
		07/04/2025	5.76	70.18
		09/04/2025	5.78	70.16
MW25-2B	75.903	28/03/2025	7.10	68.80
		01/04/2025	6.85	69.05
		07/04/2025	6.28	69.62
		09/04/2025	5.84	70.06
MW25-3	75.154	28/03/2025	8.42	66.73
		01/04/2025	8.60	66.55
		07/04/2025	12.62	62.53
		09/04/2025	13.53	61.62
MW25-4A	75.322	28/03/2025	5.97	69.35
		01/04/2025	5.45	69.87
		07/04/2025	5.46	69.86
		09/04/2025	5.40	69.92
MW25-4B	75.357	28/03/2025	13.59	61.77
		01/04/2025	13.62	61.74
		07/04/2025	13.66	61.70
		09/04/2025	14.00	61.36
MW25-5	75.53	28/03/2025	6.16	69.38
		01/04/2025	5.58	69.96
		07/04/2025	5.60	69.94
		09/04/2025	5.60	69.94

Based on measured groundwater elevation data, The QP is of the opinion that the groundwater conditions observed on April 29, 2021, October 5, 2023, and March 28, 2025 are the most representative of the stabilized groundwater elevations at the Site accounting for temporal and seasonal variation across multiple years. Based on the stabilized groundwater elevations observed on these dates the flow direction of the shallow aquifer on the Site is toward the south-southwest.

Based on the analytical results of the Phase Two ESA and the measured direction of groundwater flow the OSMA letter concluded that there is potential for impacted groundwater to move off-Site to adjacent properties. However, it maintains that these concerns will be addressed through a combination of building design, site remediation and/or risk assessment.

3.4 Hydrogeological Investigation (Englobe 2023)

To facilitate the construction of the proposed building, an excavation extending below the observed groundwater levels is anticipated. Based on Englobe's understanding of the proposed development and the Site-specific stratigraphy, the excavation is expected to extend into the existing limestone bedrock (12 mbgs), at an approximate elevation of 63.8 masl.

Given that the founding depth of the proposed foundations will extend up to approximately 12 mbgs, the building should be shored by a watertight caisson wall and the basement should be fully waterproof 'bath-tub' design (without external perimeter drains) to avoid potential adverse impacts due to moisture

movements in the immediate areas around the proposed building footprint. Therefore, no estimates of long-term steady-state groundwater inflow to a perimeter drainage system for the underground levels are not provided.

The conclusions of the Hydrogeological Investigation are as follows:

- Based on the estimated daily groundwater-taking volumes, a short term Category III Permit To Take Water (PTTW) will be required.
- Based on the groundwater analytical results, it is anticipated that treatment of dewatering effluent will be required during the short term (excavation phase) to reduce the concentrations of the various chlorinated VOCs to below the City By-Law limits before discharge to the municipal sewer system. It is recommended that the contractor retain the services of a specialized dewatering water treatment contractor to supply, maintain, and monitor a suitable water treatment system operated under Environmental Compliance Approval. The construction contractor is solely responsible for obtaining a permit from the City of Ottawa for the discharge of water to the sanitary or storm sewer. The dewatering contractor, AquaTech, has provided a Dewatering Pumping Plan which has been attached to this report (Attachment 3).
- During the construction, the hydraulic gradients between the planned excavation area within the Site and surrounding properties are expected to change given the lowering of the groundwater table with groundwater extraction and resulting in the formation of a hydraulic sink with faster contaminant travel times. Further, the potential presence of man-made preferential pathways and interconnected bedrock fracture pathways within the Site and surrounding area could accelerate the movement of groundwater. Thus, based on this assessment and estimated radius of influence of groundwater dewatering ranging from 40 m (average case scenario) to 171 m (worst case scenario), the potential for the mobilization of chlorinated VOCs as a result of groundwater dewatering could not be ruled out during the construction. Englobe recommends that the appropriate engineered groundwater control systems to minimize groundwater extraction be selected in consultation with a qualified geotechnical engineer and specialized contractor considering the space requirements, the cost, the depth to bedrock, soil conditions, and availability of materials.
- It is recommended that the excavation and dewatering designs for this project focus on providing watertight shoring in order to eliminate the groundwater migration during the short term (excavation phase). For the long term, it is recommended that the building be constructed as water tight with a waterproofed raft foundation and waterproofed foundation walls, to prevent groundwater migration to and from the Property.
- Groundwater quality is variable over time, the municipal sewer use program may require supplemental groundwater sampling results at the time of sewer use permit application. The municipal sewer use Program may also require an assessment of chemical parameters not tested in this assessment.

3.5 Recommendations and Vibration Estimations for Urban Blasting Applications Rock Removal Report (Blastforce 2025)

Bedrock blasting to facilitate construction of the proposed building will be conducted in three (3) phases to remove an estimated 5,500m^3 of bedrock to facilitate construction of building structural components;

- Phase 1: implementation of line-drilling along the perimeter zone where bench blasting will take place to limit overbreak past the dig lines and reduce the propagation of blasting-induced vibrations outside the excavation
- Phase 2: Drilling and mechanical excavation of an attenuation trench parallel to the boundary of the neighbouring building to the wet of the Site (352 Danforth Avenue).
- Phase 3: Drilling, blasting and excavation of the rock mass contented within the perimeter zone to the desired grade and elevation.

4 Excess Soil Removal

The Site excavation/grading for the future buildings and foundations will generate excess soil requiring environmental characterisation prior to off-site removal for either reuse and/or disposal. The areas of the Property where excavation and soil management activities will take place are hereinafter referred to as "the Project Area". The excess soil generated in the Project Area should be managed in accordance with the following regulatory and guidance documents relating to on-site and excess soil management in the Province of Ontario:

- Ontario Ministry of Environment, Conservation and Parks (MECP). **Ontario Regulation 406/19 – On-Site and Excess Soil Management.** Filed December 4, 2019, as amended (O.Reg. 406/19); and,
- Ontario Ministry of Environment, Conservation and Parks (MECP). **Rules for Soil Management and Excess Soil Quality Standards** . Updated February 19, 2024, as amended (Soil Rules).

4.1 Excess Soil Reuse Planning (O.Reg. 406/19)

Per current regulatory requirements, prior to off-site removal of excess soil from the Project Area, the "Project Leader" is responsible for ensuring the following Excess Soil Reuse Planning activities are conducted in accordance with the Soil Rules and O.Reg. 406/19.

Design and Planning Stage (Pre-construction Stage)

Task # 1. Assessment of Past Uses (APU).

Task # 2. Sampling and Analysis Plan (SAP).

Task # 3. Soil Characterization Report (SCR).

Construction Stage

Task # 4. Excess Soil Destination Assessment Report (ESDAR)

Task # 5. Develop and Implement Tracking System

Task # 6. File a notice on the Registry

It is noted that the Soil Rules requires a Qualified Person (QP) to be retained by the Project Leader to supervise the completion of Tasks 1 to 4 (as noted above). Tasks 5 and 6 may be completed by the Project Leader directly without input from the QP. The "Project Leader" is defined in O.Reg. 406/19 as per the following interpretation:

> *"Project leader" means, in respect of a project, the person or persons who are ultimately responsible for making decisions relating to the planning and implementation of the project.*

4.1.1 Activities during Pre-construction Stage

4.1.1.1 Assessment of Past Uses (APU)

As per the Soil Rules, the APU is required to achieve the following objectives:

- To determine the likelihood of contaminants that have affected soil to be excavated.

- Identify areas of potential environmental concern (APEC) and locations where soil or crushed rock is to be excavated that could have been affected by potentially contaminating activities (PCA).
- Identify the contaminants of potential concern (COPCs) if any APECs are identified.

Given the previous Phase One ESA (March 2023) completed by Englobe at the Property, per the provisions of O.Reg. 406/19, it may be used by the QP in lieu of preparation of a separate APU for the Project Area.

4.1.1.2 Sampling and Analysis Plan (SAP)

Based on the APECs and COPCs identified in the Phase One ESA (March 2023) at the Property and the exceedances identified in the Phase Two ESA (September 2023), the excess soil that will be generated will be subject to additional excess soil focused sampling and chemical analysis to satisfy the minimum sampling frequencies and testing parameters required by O.Reg. 406/19.

The objective of the SAP will be to identify the following:

- Soil suitable to be reused in the Project Area.
- Soil to be deposited at a Class 1 soil management site or at a landfill or dump: and,
- Potential reuse sites having regard to the excess soil quality standards.

The SAP will include the following elements:

- Identify areas of the Property that must be investigated.
- In consultation with the Property Owner and/or their representative, the QP will identify each area at the Property where excavation of soil or crushed rock is planned and identify areas that will not be subject to sampling with rationale.
- Determine the location, concentration, and extent of contaminants in the soil to be excavated by sampling undisturbed soil (or stockpiles where this is not feasible); and
- Characterize the distribution of contaminants in stockpiles of soil or stockpiles or stormwater management pond sediment.
- The SAP will include a statement of declaration by the QP.

4.1.1.3 Soil Characterization Report (SCR)

An estimate of the total volume of soil on-site requiring off-site removal is not yet confirmed, as it is dependent on the size/volume of the remedial excavation and the Client's selected approach to management of the non-impacted fill on-site (i.e., soil meeting applicable SCS) for the purpose of ground improvement works prior to construction of the future building.

Depending on the total volume of excess soil generated, additional soil samples are required to be analysed to meet the minimum excess soil sampling frequency specified by O.Reg. 406/19. The number of soil samples planned to be collected for excess soil characterisation purposes will also consider and take into account the soil samples previously collected during the Phase Two ESA (September 2023) and the future confirmatory soil samples that will be taken during the planned soil remediation program on-site. Furthermore, the method of excess soil sampling (such as test pitting, borehole drilling, stockpile sampling) is also unknown and should be determined by the QP and Client to meet the needs of the project.

Following the completion of the planned excess soil investigation, and review and analysis of the laboratory's analytical results, a report should be prepared by the QP that will summarize and discuss the results. Any potential exceedances of the soil standards should be evaluated and discussed by the QP. The

environmental soil quality should be compared to the MECP's excess soil quality standards (ESQS), as found in the Soil Rules document, to assess potential off-site reuse options for the excess soil.

The SCR should include the QP's review and evaluation of excess soil quality related information, and as per the Soil Rules, it should consist of cross-sections, figures, tables, and descriptions that illustrate the following within the planned excavation area:

- APECs with dimensions within the Property and the area that is subject to sampling with dimensions, and identification of each APEC from which soil or crushed rock is to be excavated, with dimensions and the related PCA(s).
- Sub-surface investigation methods; and stratigraphy from ground surface to the deepest planned excavation; and, approximate depth to the water table.
- Information relating to where samples were taken, tables with soil identification, quality, and comparison to applicable excess soil quality standards; and, laboratory certificates of analysis and QA/QC results.
- A description of delineation and rationale as to the extent of sampling.
- Findings, conclusions, and signatures from a qualified person (QP); and, a declaration statement by the QP.

4.1.2 Activities during Construction

4.1.2.1 Excess Soil Destination Assessment Report (ESDAR):

Following the review of the SCR by the Project Leader and the construction team, including the earthworks contractor, the QP's preparation of the ESDAR will require assistance and consultation from the Project Leader, and earthworks contractor. The selection of specific off-site re-use sites (where the excess soil is planned to be deposited/placed) to be documented in the ESDAR is not the responsibility of the QP and is typically the responsibility of the earthworks contractor. The QP at the Project Area should however provide direction on the general type or class of re-use/disposal sites that may accept the site soils.

To meet Section 13 of O.Reg. 406/19, the ESDAR should be prepared by the QP prior to removal of excess soil from the Project Area and should include the following information:

- The estimated volume and quality of excess soil to be removed.
- The types of processing of soil that have been conducted at the Property (Project Area) in respect of the soil that will be excess soil.
- The approximate date the excess soil will leave the Property and the approximate date when all excess soil will have been removed from the Property.
- Information for each reuse site, Class 1 soil management site, local waste transfer facility, landfill or dump where excess soil will be deposited.
- Information for each reuse site, Class 2 soil management site or local waste transfer facility where excess soil will be stored: and,
- Contingency measures to be implemented in the event excess soil cannot be deposited at an intended reuse site, including instructions to be provided to the operator of a vehicle to ensure that excess soil is not deposited at an unplanned site and the location of an alternate site at which excess soil may be deposited if not returned to the project area, Class 2 soil management site or local waste transfer facility.

4.1.2.2 Develop and Implement Tracking System

The earthworks contractor should develop and implement a tracking system that satisfies the requirements of O.Reg. 406/19 so that each load of excess soil removed off-site from the Project Area is adequately tracked. The tracking system is required to comply with Section 16 Tracking System of the regulation and Part 5 (Tracking System) of Section B (Excess Soil Reuse Planning) in the Soil Rules. Additionally, the regulatory requirements in Section 18 Hauling Records and Section 28 Records Retention of O.Reg. 406/19 should also be satisfied for each load of soil removed off-site and each record generated relating on-site and excess soil management at the Project Area. Responsibilities for record retention apply to each party involved in on-site and excess soil management.

4.1.2.3 Filing a Notice on Excess Soil Registry

As of January 1, 2023, per Section 8 of O.Reg. 406/19, prior to any soil movement, a Project Leader at a Project Area is required to file a notice on the publicly accessible excess soil registry (operated by the Resource Productivity and Recovery Association [RPRA]). The notice should be filed for the Project Area prior to construction activities (specifically soil movement) taking place on the Project Area. In addition, the notice should be updated within thirty (30) days of the last soil movement off-site to reflect the actual work that was carried out on-site. The registration fees, based on the $\$/m^3$ rates set by the RPRA, that must be paid by the Project Leader prior to filing the notice on the registry are available on the registry website.

4.2 Exportation of Impacted Excess Soil

As indicated in this report, the impacted fill material that is currently on-site and which exceeds the applicable SCS for the Property (i.e., 2011 MECP Table 7 SCS) should be excavated and properly disposed of off-site at a MECP licensed (soil) waste disposal site.

4.3 Importation of Earth Fill Material

Earth fill material is expected to be imported into the Property for the purpose of construction activities associated with the current site redevelopment plan. In addition to generating excess soil requiring off-site removal, based on the receipt and reuse of imported soil, the Property will also act as a “Reuse Site” for deposit of excess soils generated at other construction sites and which are then imported to the Property. At present, the estimated volume of fill material required to be imported to the Property is currently unknown.

4.3.1 Qualified Person Services during Importation Periods

During the soil importation period, it is recommended that a Qualified Person (QP) be engaged by the Owner/Operator of the Reuse Site (i.e., Churchill Properties Inc) to represent the Reuse Site to ensure environmental compliance with current excess soils regulations and guidance documents. The following tasks are recommended to be carried out by the QP during the periods of importation of earth fill:

- Preparation of a Fill Management Plan (FMP).
- QP Review and Approval of Proposed Sources of Earth Fill.
- On-site inspection of the placement of imported fill and environmental audit sampling of imported fill (at the discretion of the owner/operator of the Reuse Site).

The volume of fill material required to be imported to the Property may trigger a regulatory requirement for the Owner/Operator of the Reuse Site to file and update a notice for the on excess soils registry. Reuse sites

receiving above 10,000 m^3 of imported soil are required by O.Reg. 406/19 to file a notice on the excess soil registry, per current provisions in the regulation. It is noted that the notice for a “the Reuse Site” is separate to a notice for a “Project Area”. The notice for the Reuse Site is required to be filed prior to the first load of soil being received at the Reuse Site and is required to be updated within thirty (30) days post-construction (i.e., last load received) to reflect actual work that was carried out on-site. The registration fees, based on the $/$m^3$ rates set by the RPRA, that must be paid by the Owner/Operator of the Reuse Site prior to filing the notice are available on the excess soil registry website.

4.3.2 Backfilling of Excavated Area with Imported Fill

The remedial excavation area and other construction related excavation areas should be backfilled with imported fill material meeting the applicable SCS for the Property (i.e., 2011 MECP Table 3 ICC Standards) and meeting Table 3.1 Full Depth Excess Soil Quality Standards in a Non-Potable Ground Water Condition for Industrial/Commercial/community Property Use (Table 3.1 ICC ESQS).

The backfilling and placement of the imported soil material should be conducted in accordance with the geotechnical engineer’s recommendations. In general, the backfill material should be placed and constructed as engineered fill. Prior to the placement of the engineered fill on-site, it is recommended that any weathered/disturbed native soils present be stripped from beneath the excavation areas, and that the subgrade be proof rolled to while inspected and approve by the geotechnical engineer.

4.4 Reuse of Site Soils

Following the remedial excavation, the remaining fill material on-site that meets the applicable SCS may be reused on-site provided it is geotechnically suitable. The remaining fill material should be stripped and stockpiled for reuse on-site as engineered fill in accordance with the geotechnical engineer’s recommendations. It is noted that the construction of the engineered fill in the localized remedial excavation areas on-site would be carried out in conjunction with the engineered fill to be placed in all the remaining areas on-site.

If the remaining material is not suitable for reuse on-site from a geotechnical perspective, it should be directed to an appropriate off-site reuse location described in the ESDAR in accordance with its environmental soil quality classification, per the SCR for the Project Area. As such, depending on the construction approach adopted, fill material that is geotechnically suitable and meets the applicable SCS for the Property may either be reused on-site (i.e., within the Property limits) or sent off-site for reuse at an approved reuse site.

5 Remedial Options

Based on the information presented in the above sections there are considered to be two options to address soil and groundwater impacts observed on the Site in excess of the MECP Table 7 SCS including:

1. Soil Remediation and Groundwater Treatment
2. Risk Assessment

5.1 Soil Remediation and Groundwater Treatment

5.1.1 Soil Remediation

The most appropriate remediation method is through the physical removal of impacted soil material. As the proposed redevelopment of the Property requires excavation of in-situ material, the impacted material will be removed off site during the construction phase. Subject to a Toxicity Characteristic Leachate Procedure (TCLP), the impacted soil material should be disposed of as non-hazardous waste.

Based upon the extents of horizontal and vertical soil contamination confirmed by the subsurface investigation as illustrated in Figures 1 to 13C, the approximate quantity of impacted material to be removed is 1,100 m^3. The MECP Table 7 SCS exceedances were identified across a majority of the Property during the subsurface investigations detailed in the Phase Two ESA (July 2025).

The proposed excavation for the three (3) underground parking levels will extend from property line to property line. Confirmatory sampling after removal of soil materials would not be required as no soils would be remaining on the Site as the excavation to support development of the proposed residential building would extend into bedrock across the Site.

The impacted soil material should be handled and disposed of by the excavating company in accordance with the provincial and municipal regulations as outlined in Section 4. The Contractor will be required to implement a soils tracking system and provide weigh bills and pit trip tickets for any imported fill used to restore the excavations.

5.1.2 Groundwater Treatment

Removal of Site soils is expected to reduce concentrations of COCs in groundwater. However, it is not expected to reduce concentrations to a level to allow for filing an RSC against the MECP generic standards. As such, groundwater treatment would also be required.

Due to the location of the groundwater table within the bedrock, groundwater treatment is not considered a viable option for the Site. This is because due to the nature of groundwater within bedrock there is no certainty or warranty provided that will guarantee the effectiveness of in-situ groundwater treatment to reduce concentrations of COCs in groundwater to levels meeting the applicable MECP Table 7 SCS. Therefore, filing a RSC on generic standards is considered unlikely.

5.2 Risk Assessment

Risk Assessment (RA) is a MECP accepted scientific approach for the assessment and management of contamination. In short, an RA identifies the risks posed to future Site receptors, both human and ecological, by impacted soil and groundwater, taking into account proposed uses and pathways for

exposure, and determines whether unacceptable risks exist. This process assists in determining what may be needed to address and manage the risks. An RA develops property specific standards (PSSs), which are often less stringent than generic standards, because the RA considers site-specific information (e.g., site characteristics, applicable exposure pathways and receptors) that are more relevant than the assumptions used to develop generic SCS. Importantly, the RA process, including the PSS, confers the same level of protection as the generic SCS, but is specific to the RA site.

Following completion of the RA, a Certificate of Property Use (CPU) will be developed. The CPU summarizes the site conditions, outlines potential restrictions to property use and describes requirements for risk management measures (RMMs). The CPU typically provides a program for installing and maintaining measures to ensure they remain in place to mitigate exposure to contaminants present at the Site. The CPU would be registered on the title so that future owners or others with interest in the property are made aware of the condition and RMMs.

Although the impacted soil material will be removed off site during the construction phase to facilitate building construction the Risk Assessment will be conducted to consider the soil and groundwater exceedances identified in the Phase Two ESA.

Based on the Site information provided in this report the proposed RMMs required at the Site to mitigate potential risks conferred by impacted soil and groundwater exceeding the applicable MECP SCS would include:

1. Vapour Mitigation Measures to mitigate/prevent migration of volatile vapours from soil and groundwater into the proposed building including;
    a. Construction of an underground parking garage;
    b. Construction of a Sub-slab vapour venting system; and
    c. Installation of a sub-slab vapour barrier
        i. A Sub-Slab Vapour Monitoring Program to monitor the effectiveness of the Vapour mitigation measures and ensure vapours are not entering the building at levels of concern.
2. Surface barrier systems consisting of hard and fill caps to prevent access direct to soil and groundwater beneath the Site
3. Waterproofed raft foundation and waterproofed foundation walls for the proposed building, which will act to prevent groundwater migration to and from the Property.
4. A groundwater monitoring program is recommended to monitor groundwater quality post completion of the proposed building.
5. A Health and Safety Plan (H&SP) to be implemented during all intrusive, below grade construction or maintenance activities potentially coming into contact with or exposing Site soil or groundwater
6. A Soil and Groundwater Management Plan (SGWMP) to properly manage soil and groundwater during construction and maintenance activities, and to ensure there are no adverse effects to human and ecological receptors.

A copy of the Risk Management Plan (RMP) for the Site is provided in Attachment 4 and provides full details regarding the recommended risk management measures to mitigate exposure of future site users to on-Site COCs and to prevent off-Site migrations of COCs in groundwater to and from the property.

As discussed above, a groundwater monitoring plan is proposed to be implemented at the Site post development to monitor concentrations of COCs in groundwater at the Site Boundaries. This will include the installation of four (4) new monitoring wells at the property upon Site redevelopment. The location of the proposed monitoring wells related to the Groundwater Monitoring Program Risk Management Measure (RMM) as well as details about the RMM are provided in Attachment 4 of this report.

6 Conclusions

This report outlines the potential remedial options available to address soil and groundwater impacts in excess of the MECP Table 7 SCS at the Site. Based on the findings of this report the following conclusions are presented:

- Remediation of soil and groundwater is not considered viable because of the uncertainty surrounding the effectiveness of in-situ treatment of groundwater flowing through bedrock.
- There are no uncertainties surrounding the ability to adequately mitigate and manage soil and groundwater exceedances of the applicable MECP Table 7 SCS using a risk assessment approach. As such, Risk Assessment is the recommended remedial option for the Site.
- The Risk Assessment option will include the formation of a Risk Management Plan (RMP) which will recommend Risk Management Measures (RMMs) for the Site which will be mandated to be installed/constructed when the RA is accepted, and the CPU is registered to the Property Title.
- Treatment of dewatering effluent will be conducted during the short term (excavation phase) to reduce the concentrations of the various chlorinated VOCs to below the City By-Law limits before discharge to the municipal sewer system.
- For the long term, the building will be constructed as watertight with a waterproofed raft foundation and waterproofed foundation walls, to prevent groundwater migration to and from the Property.
- The impacted soil material will be removed off site during the construction phase to facilitate building construction. Removal of soil from the Site will be required to be conducted as specified by O.Reg 406.
- Bedrock blasting will be conducted in three phases. Phase 1 encompasses implementation of line-drilling along the perimeter zone where bench blasting will take place to limit overbreak past the dig lines and reduce the propagation of blasting-induced vibrations outside the excavation. Phase 2 includes drilling and mechanical excavation of an attenuation trench parallel to the boundary of the neighbouring building to the wet of the Site (352 Danforth Avenue). Phase 3 covers drilling, blasting and excavation of the rock mass contented within the perimeter zone to the desired grade and elevation.
- The RMMs recommended for the property includes, watertight building design (waterproofed raft foundation and foundation walls), Vapour mitigation system, underground parking garage, sub-slab vapour barrier, surface barrier system, H&SP, SGWMP, Sub-slab vapour monitoring program, groundwater monitoring program.

Figures

eNGLOBe

Note

1. This drawing shall be read in conjunction with the associated technical report.

Revision	Date	Issue	Approval
E	06/19/2025	Preliminary	

Client: Churchill Properties Inc.

Site: 424 Churchill Avenue North, Ottawa, ON

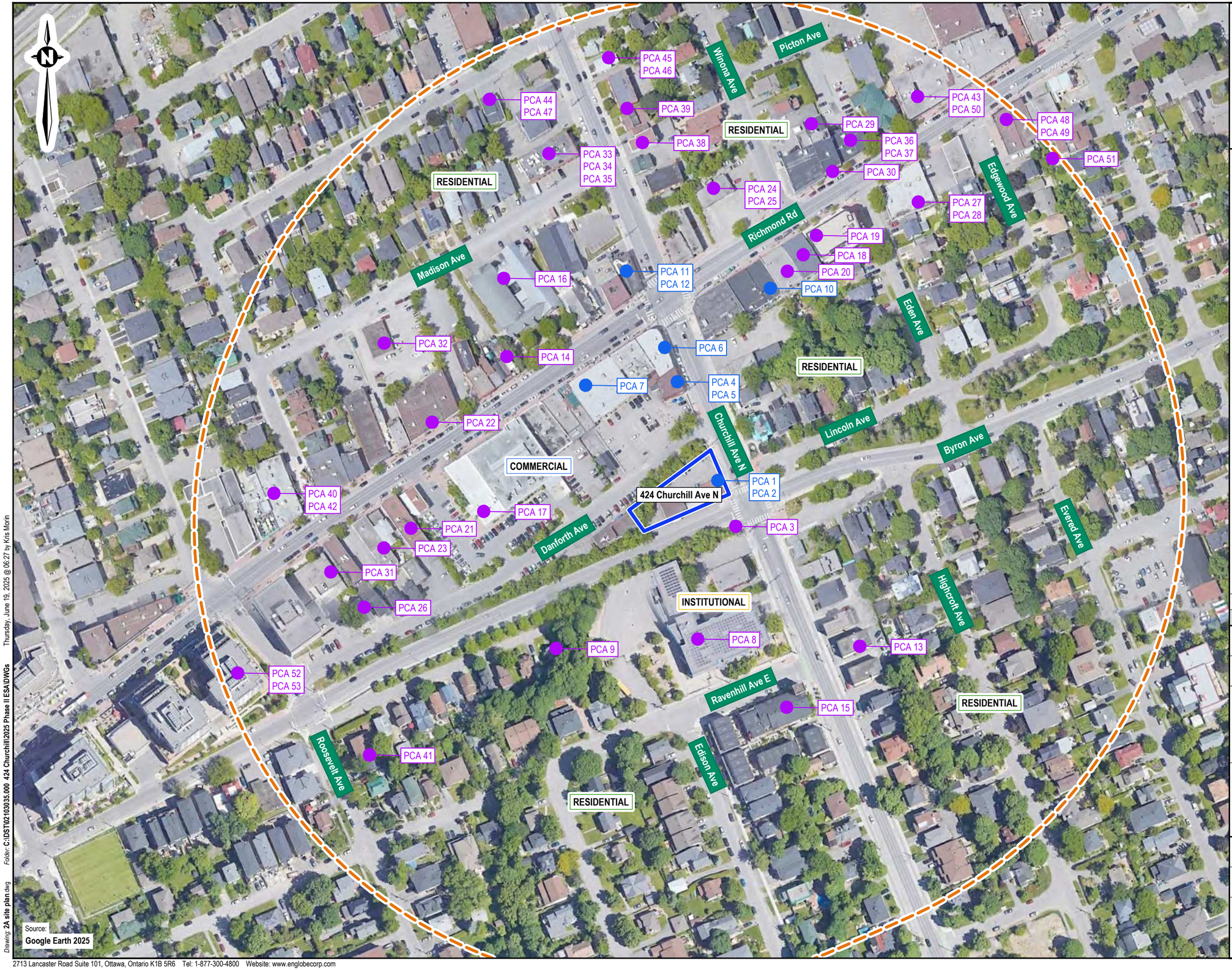
Report Title: Phase Two Environmental Site Assessment

Drawing Title: Site Location Map

Designed By: C.O.	Date: June 2025
Drawn By: K.M.	Project No.: 02103035.000
Approved By:	Figure No.: 1
Scale: As shown	

2713 Lancaster Road Suite 101, Ottawa, Ontario K1B 5R6 Tel: 1-877-300-4800 Website: www.englobecorp.com

Drawing: 1 site location.dwg Folder: C:\DST\02103035.000 424 Churchill\2025 Phase II ESA\DWGs Thursday, June 19, 2025 @ 06:25 by Kris Morin



Source:
Google Earth 2025

Note

1. This drawing shall be read in conjunction with the associated technical report.
2. Refer to Fig. 2B for PCA details.

Legend

- Phase One, Phase Two and Record of Site Condition (RSC) Property Boundary
- Phase One Study Area
- PCA — Potentially Contaminating Activity
- PCA — Potentially Contaminating Activity Contributing to APEC

1:2 000

0 20 40 60 80 100 m

0 1:1 5 cm

Scale accurate when printed at 100% using paper size ANSI full bleed B (11.0 x 17.0 Inches)

Revision	Date	Issue	Approval
E	06/19/2025	Preliminary	

Client: Churchill Properties Inc.

Site: 424 Churchill Avenue North, Ottawa, ON

Report Title: Phase Two Environmental Site Assessment

Drawing Title: Potentially Contaminating Activities (PCAs)

Designed By: C.O.	Scale: As shown
Drawn By: K.M.	Date: June 2025
Approved By:	Project No.: 02103035.000

Figure No.: 2A

2713 Lancaster Road Suite 101, Ottawa, Ontario K1B 5R6 Tel: 1-877-300-4800 Website: www.englobecorp.com

Drawing: 2A site plan.dwg Folder: C:\DST\02103035.000 424 Churchill\2025 Phase II ESA\DWGs Thursday, June 19, 2025 @ 06:27 by Kris Morin

PCA ID	O.Reg 153/04 PCA No.	PCA Property Address	Historical and/or Current Activities
PCA 1	37. - Operation of dry cleaning equipment (where chemicals are used)	424 Churchill Avenue North	Presence of laundromat and dry cleaning facility
PCA 2	Undefined PCA - Application of salt for de-icing purposes for the safety of vehicular or pedestrian traffic	424 Churchill Avenue North	Application of salt for de-icing purposes for the safety of vehicular or pedestrian traffic
PCA 3	46. - Rail yards, tracks and spurs	Byron Avenue	Historical presence of an electric rail line right of way
PCA 4	31. - Ink manufacturing, processing and bulk storage	412 Churchill Avenue North	Historical presence of commercial printers (Westboro Printers Ltd. from 1965 to 1996)
PCA 5	33. - Metal treatment, coating, plating and finishing	412 Churchill Avenue North	Historical presence of a plate making and engraver workshop (Albert & Son Engravers)
PCA 6	28. - Gasoline and associated products storage in fixed tanks	408 Churchill Avenue North	Record of 3000 Gallon fuel oil UST in 1958
PCA 7	37. - Operation of dry cleaning equipment (where chemicals are used)	354 Richmond Road	Historical presence of dry cleaner
PCA 8	28. - Gasoline and associated products storage in fixed tanks	345 Ravenhill Avenue	Record of 3000 Gallon bunker oil UST in 1951
PCA 9	Undefined PCA - Spill	518 Byron Avenue	Historic 400 L furnace oil spill
PCA 10	31. - Ink manufacturing, processing and bulk storage	322 Richmond Road	Valberg Imaging
PCA 11	10. - Commercial autobody shops	337 Richmond Road	Record of motor vehicle repair shops (Westboro Police Village) including record of heavy equipment storage
PCA 12	Undefined PCA - Salt storage	337 Richmond Road	Record of salt and sand storage
PCA 13	28. - Gasoline and associated products storage in fixed tanks	449 Churchill Avenue North	Record of historic fuel oil UST, previously leaking and removed in 1973
PCA 14	37. - Operation of dry cleaning equipment (where chemicals are used)	357 Richmond Road	Record of laundries and cleaners (superior services store)
PCA 15	28. - Gasoline and associated products storage in fixed tanks	450 Churchill Avenue North	Record of 3000 Gallon fuel oil UST in 1958
PCA 16	28. - Gasoline and associated products storage in fixed tanks	347 Richmond Road	Record of 1000 Gallon fuel oil AST in concrete bunker in 1953
PCA 17	28. - Gasoline and associated products storage in fixed tanks	372 Richmond Road	Historical presence of gasoline service station
PCA 18	37. - Operation of dry cleaning equipment (where chemicals are used)	312 Richmond Road	Record of laundries and cleaners (Corley Cleaners)
PCA 19	10. - Commercial autobody shops	300 Richmond Road	Historic records of auto body garages
PCA 20	54. - Textile manufacturing and processing	314 Richmond Road	Cut and sew clothing manufacturing
PCA 21	37. - Operation of dry cleaning equipment (where chemicals are used)	384 Richmond Road	Record of laundries and cleaners (Palmer Cleaners)
PCA 22	10. - Commercial autobody shops	371 Richmond Road	Record of motor vehicle repair shops (Westboro Motor Sales Ltd.)
PCA 23	Undefined PCA - Spill	388 Richmond Road	Historic records of fuel spills
PCA 24	28. - Gasoline and associated products storage in fixed tanks	319 Richmond Road	Historical presence of gasoline service station with USTs
PCA 25	10. - Commercial autobody shops	319 Richmond Road	Historical presence of general automotive repair shop in 2013 (Avenues Garage Ltd.)
PCA 26	Undefined PCA - Spill	389 Danforth Avenue	Historical record of fuel spill of unknown volume
PCA 27	28. - Gasoline and associated products storage in fixed tanks	298 Richmond Road	Two records of 2 fuel oil USTs
PCA 28	10. - Commercial autobody shops	298 Richmond Road	Record of motor vehicle repair shop
PCA 29	31. - Ink manufacturing, processing and bulk storage	383 Winona Avenue	Presence of commercial printing facility
PCA 30	31. - Ink manufacturing, processing and bulk storage	311 Richmond Road	Presence of commercial printing facility
PCA 31	10. - Commercial autobody shops	394 Richmond Road	Record of motor vehicle repair shop (Archie Macdonald Ltd. New and Used Cars)
PCA 32	10. - Commercial autobody shops	376 Madison Avenue	Record of motor vehicle repair shop (Lytle Roboring Services Ltd.)
PCA 33	28. - Gasoline and associated products storage in fixed tanks	376 Churchill Avenue North	Record of oil UST
PCA 34	31. - Ink manufacturing, processing and bulk storage	376 Churchill Avenue North	Records of publishing and commercial printing industries
PCA 35	Undefined PCA - Manufacturing	376 Churchill Avenue North	Record of industrial machinery manufacturing
PCA 36	28. - Gasoline and associated products storage in fixed tanks	307 Richmond Road	Record of fuel oil UST in 1963 and fuel oil AST in 1953
PCA 37	10. - Commercial autobody shops	307 Richmond Road	Record of motor vehicle repair shops (unnamed auto body repairs)
PCA 38	34. - Metal manufacturing	377 Churchill Avenue North	Record of jewelry and silverware manufacturing
PCA 39	54. - Textile manufacturing and processing	375 Churchill Avenue North	Presence of cut and sew clothing company
PCA 40	Undefined PCA - Manufacturing	393 Richmond Road	Wood counter manufacturing
PCA 41	10. - Commercial autobody shops	433 Roosevelt Avenue	Record of motor vehicle repair shop (The Registered Trimmer)
PCA 42	39. - Paints manufacturing, processing and bulk storage	397 Richmond Road	Record of paint storage (Stained Glass Stuff)
PCA 43	10. - Commercial autobody shops	277 Richmond Road	Record of motor vehicle repair shops (unnamed auto body repairs)
PCA 44	Undefined PCA - Spill	348 Whitby Avenue	Record of historic furnace oil spill of unknown quantity
PCA 45	31. - Ink manufacturing, processing and bulk storage	363 Churchill Avenue North	Record of combined publishing and printing (Saratime Publishings Inc.)
PCA 46	Undefined PCA - Spill	363 Churchill Avenue North	Record of historic 140 L hydraulic fluid spill
PCA 47	31. - Ink manufacturing, processing and bulk storage	364 Churchill Avenue North	Historic record of plate-making, typesetting and bindery industry operations (Metrotype Graphics Ltd.)
PCA 48	10. - Commercial autobody shops	276 Richmond Road	Unnamed gas and auto repair centre
PCA 49	37. - Operation of dry cleaning equipment (where chemicals are used)	282 Richmond Road	Record of laundries and cleaners (Sparkle Cleaners)
PCA 50	43. - Plastics (including Fibreglass) manufacturing and processing	290 Picton Avenue	Historic plastic product manufacturing
PCA 51	Undefined PCA - Spill	400 Athlone Avenue	Record of historic hydraulic fluid spill of unknown quantity
PCA 52	31. - Ink manufacturing, processing and bulk storage	416 Richmond Road	Historic commercial printing operations
PCA 53	28. - Gasoline and associated products storage in fixed tanks	416 Richmond Road	Historic record of UST

ENGLOBE

Note

1. This drawing shall be read in conjunction with the associated technical report.
2. Refer to Fig. 2A for PCA locations.

Revision	Date	Issue	Approval
E	06/19/2025	Preliminary	

Client
Churchill Properties Inc.

Site
424 Churchill Avenue North, Ottawa, ON

Report Title
Phase Two Environmental Site Assessment

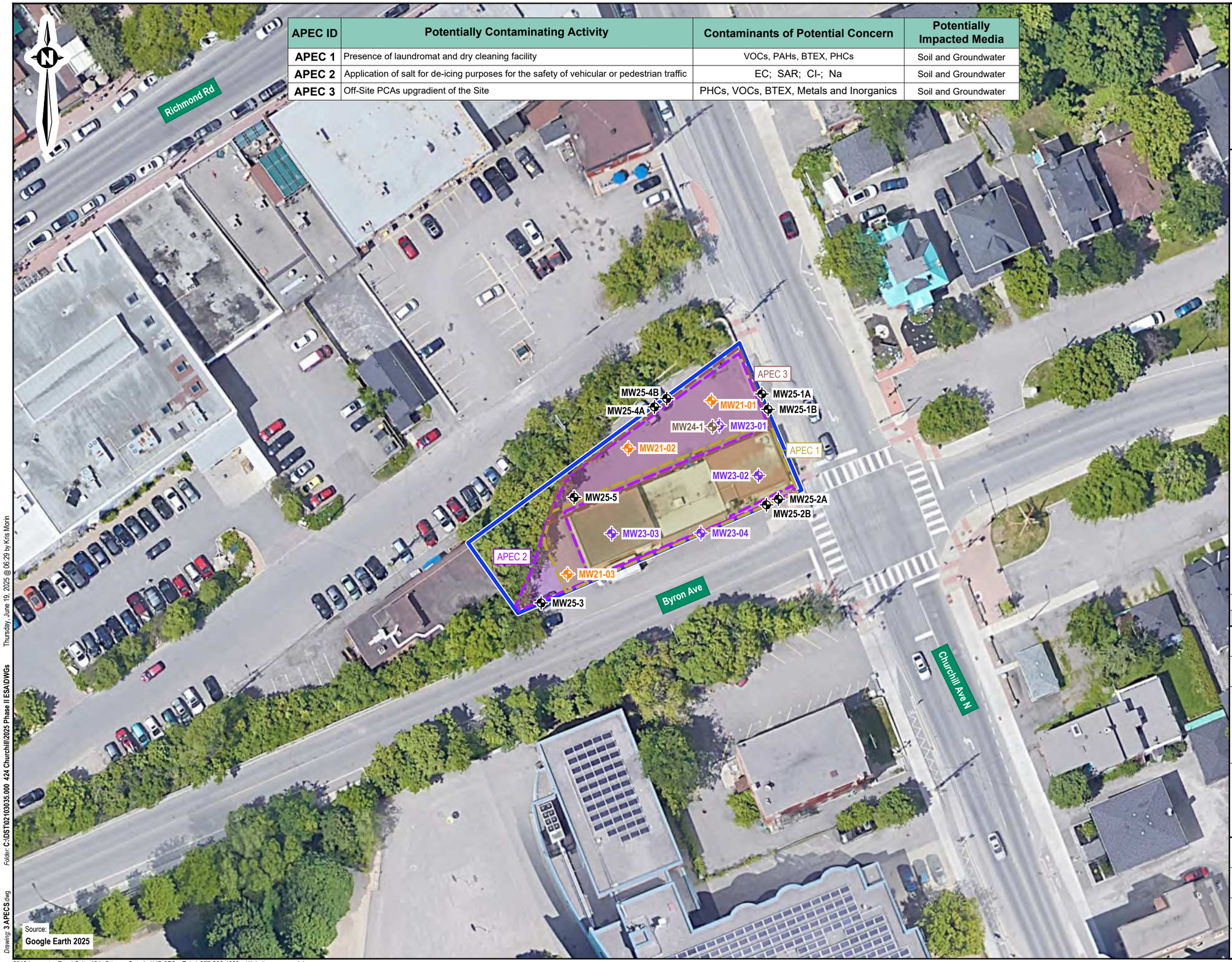
Drawing Title
PCA Details

Designed By: C.O.	Scale:
Drawn By: K.M.	Date: June 2025
Approved By:	Project No.: 02103035.000

Figure No.
2B

2713 Lancaster Road Suite 101, Ottawa, Ontario K1B 5R6 Tel: 1-877-300-4800 Website: www.englobecorp.com

APEC ID	Potentially Contaminating Activity	Contaminants of Potential Concern	Potentially Impacted Media
APEC 1	Presence of laundromat and dry cleaning facility	VOCs, PAHs, BTEX, PHCs	Soil and Groundwater
APEC 2	Application of salt for de-icing purposes for the safety of vehicular or pedestrian traffic	EC; SAR; Cl-; Na	Soil and Groundwater
APEC 3	Off-Site PCAs upgradient of the Site	PHCs, VOCs, BTEX, Metals and Inorganics	Soil and Groundwater



Source: Google Earth 2025

Note

1. This drawing shall be read in conjunction with the associated technical report.

Legend

- RSC Property Boundary
- APEC 1
- APEC 2
- APEC 3
- Location of Monitoring Well (Englobe, 2021)
- Location of Monitoring Well (Englobe, 2023)
- Location of Deep Monitoring Well (Englobe, 2024)
- Location of Monitoring Well (Englobe, 2025)

1:600

0 10 20 30 m

0 1:1 5 cm

Scale accurate when printed at 100% using paper size ANSI full bleed B (11.0 x 17.0 Inches)

Revision	Date	Issue	Approval
E	06/19/2025	Preliminary	

Client: Churchill Properties Inc.

Site: 424 Churchill Avenue North, Ottawa, ON

Report Title: Phase Two Environmental Site Assessment

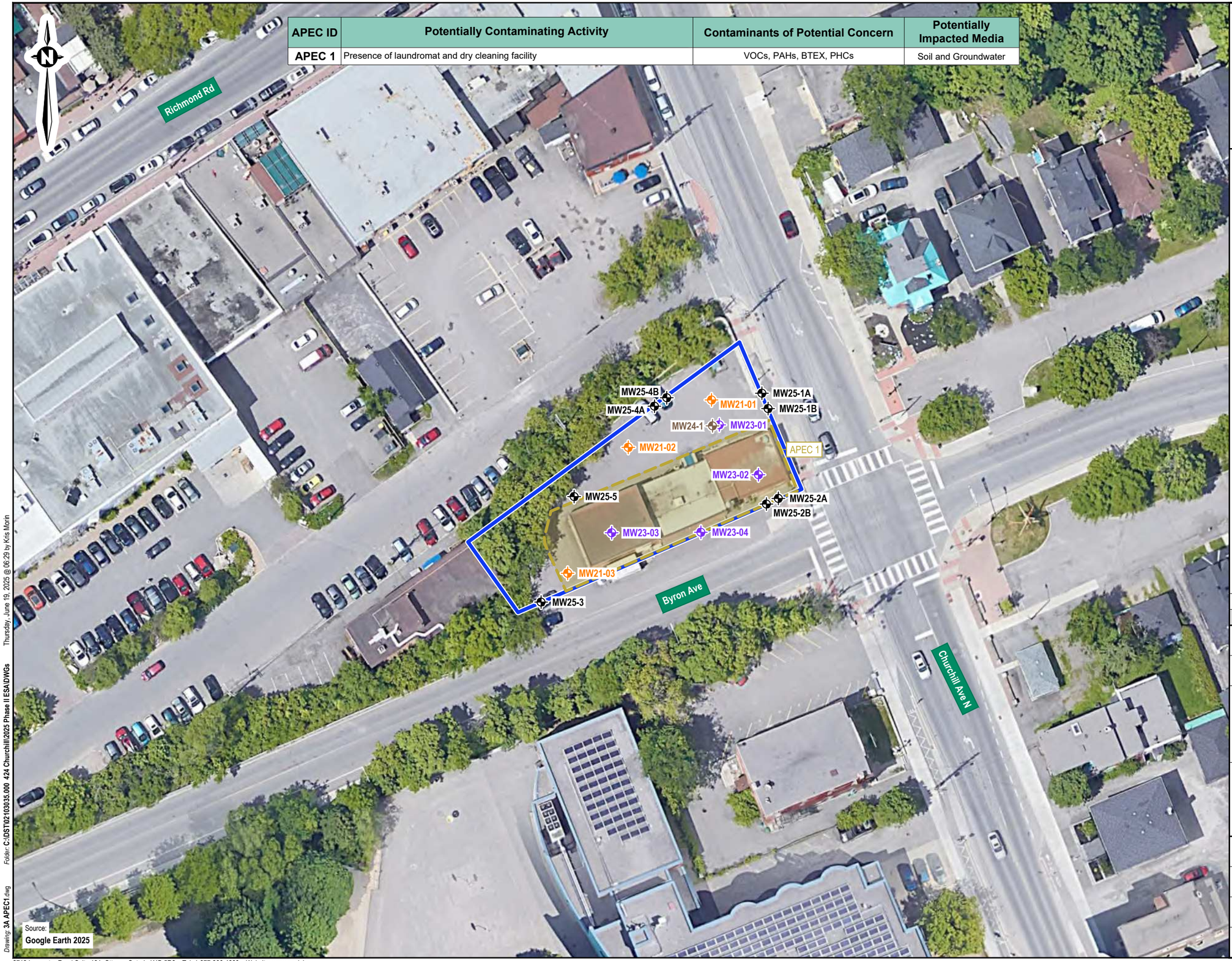
Drawing Title: Areas of Potential Environmental Concern

Designed By: C.O.	Scale: As shown
Drawn By: K.M.	Date: June 2025
Approved By:	Project No.: 02103035.000
Figure No.: 3	

Drawing: 3 APECS.dwg Folder: C:\DST\02103035.000 424 Churchill\2025 Phase II ESA\DWGs Thursday, June 19, 2025 @ 06:29 by Kris Morin

2713 Lancaster Road Suite 101, Ottawa, Ontario K1B 5R6 Tel: 1-877-300-4800 Website: www.englobecorp.com

APEC ID	Potentially Contaminating Activity	Contaminants of Potential Concern	Potentially Impacted Media
APEC 1	Presence of laundromat and dry cleaning facility	VOCs, PAHs, BTEX, PHCs	Soil and Groundwater



ENGLOBE

Note

1. This drawing shall be read in conjunction with the associated technical report.

Legend

- RSC Property Boundary
- APEC 1
- Location of Monitoring Well (Englobe, 2021)
- Location of Monitoring Well (Englobe, 2023)
- Location of Deep Monitoring Well (Englobe, 2024)
- Location of Monitoring Well (Englobe, 2025)

1:600

0 10 20 30 m

0 1:1 5 cm

Scale accurate when printed at 100% using paper size ANSI full bleed B (11.0 x 17.0 Inches)

Revision	Date	Issue	Approval
E	06/19/2025	Preliminary	

Client: **Churchill Properties Inc.**

Site: **424 Churchill Avenue North, Ottawa, ON**

Report Title: **Phase Two Environmental Site Assessment**

Drawing Title: **Areas of Potential Environmental Concern**

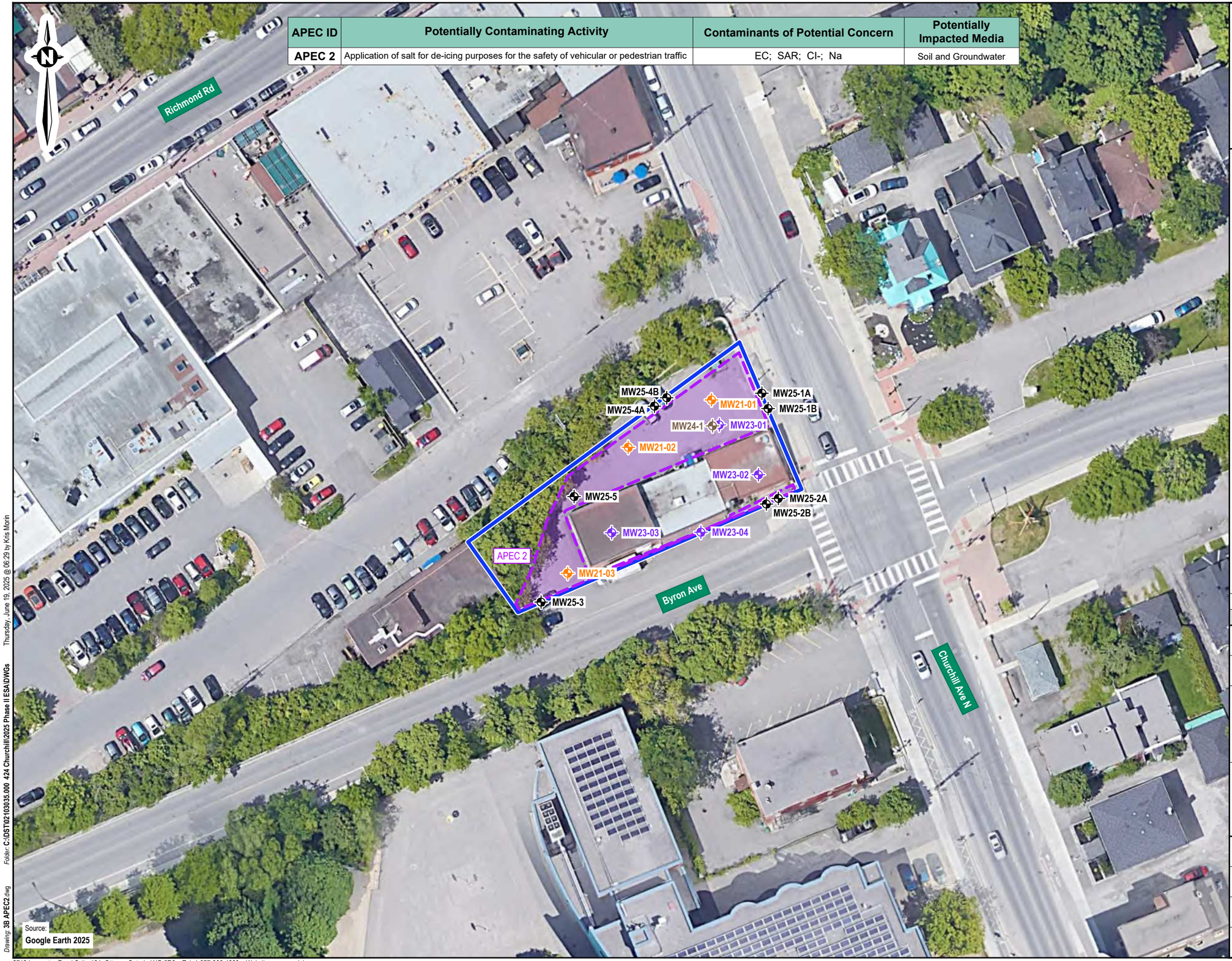
Designed By	Scale
C.O.	As shown
Drawn By	**Date**
K.M.	June 2025
Approved By	**Project No.**
	02103035.000

Figure No. **3A**

Drawing: 3A APEC1.dwg Folder: C:\DST\02103035.000 424 Churchill\2025 Phase II ESA\DWGs Thursday, June 19, 2025 @ 06:29 by Kris Morin

2713 Lancaster Road Suite 101, Ottawa, Ontario K1B 5R6 Tel: 1-877-300-4800 Website: www.englobecorp.com

APEC ID	Potentially Contaminating Activity	Contaminants of Potential Concern	Potentially Impacted Media
APEC 2	Application of salt for de-icing purposes for the safety of vehicular or pedestrian traffic	EC; SAR; Cl-; Na	Soil and Groundwater



Note

1. This drawing shall be read in conjunction with the associated technical report.

Legend

- RSC Property Boundary
- APEC 2
- Location of Monitoring Well (Englobe, 2021)
- Location of Monitoring Well (Englobe, 2023)
- Location of Deep Monitoring Well (Englobe, 2024)
- Location of Monitoring Well (Englobe, 2025)

1:600

0 10 20 30 m

0 1:1 5 cm

Scale accurate when printed at 100% using paper size ANSI full bleed B (11.0 x 17.0 Inches)

Revision	Date	Issue	Approval
E	06/19/2025	Preliminary	

Client
Churchill Properties Inc.

Site
424 Churchill Avenue North, Ottawa, ON

Report Title
Phase Two Environmental Site Assessment

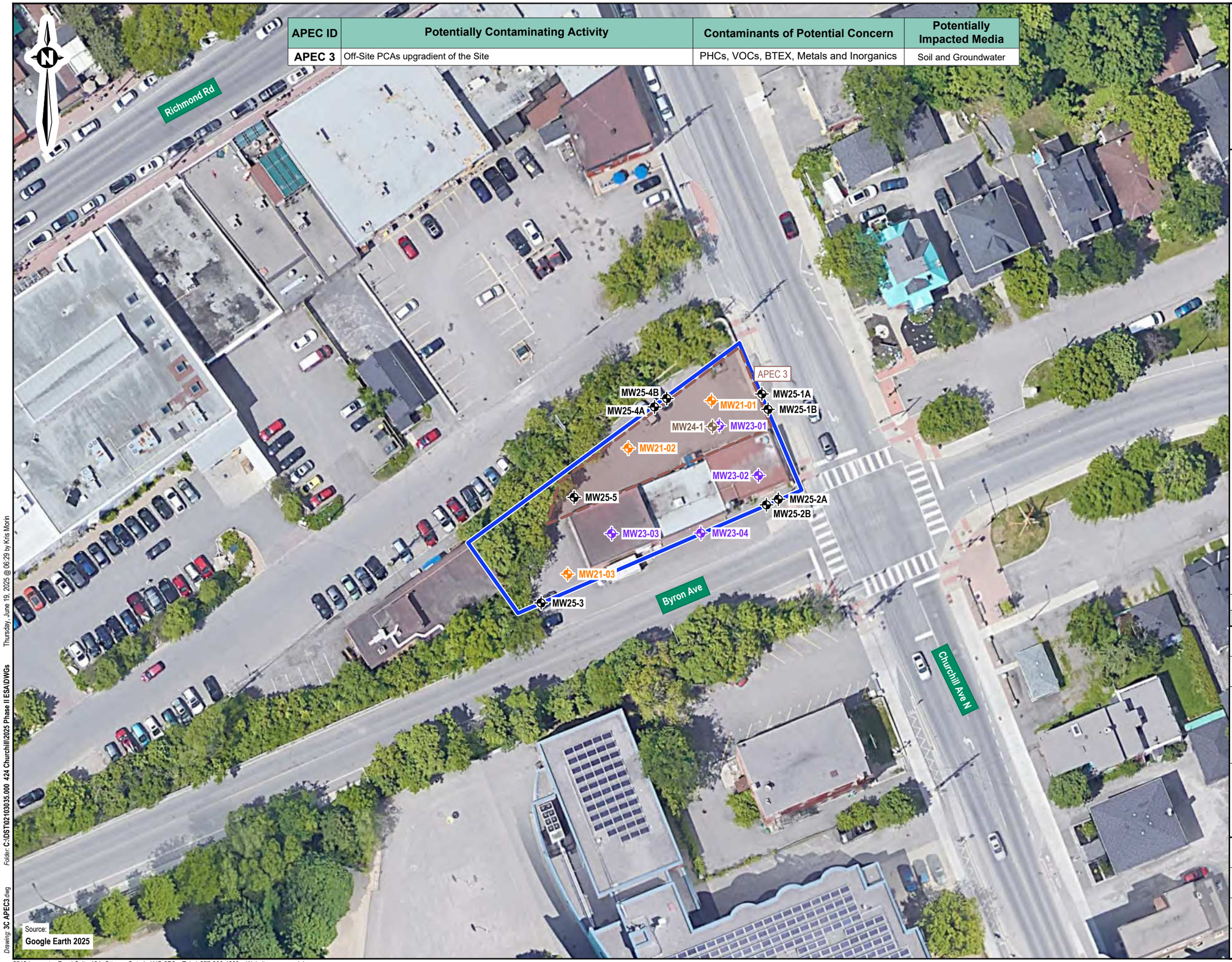
Drawing Title
Areas of Potential Environmental Concern

Designed By	Scale
C.O.	As shown
Drawn By	**Date**
K.M.	June 2025
Approved By	**Project No.**
	02103035.000
Figure No.	
3B	

Drawing: 3B APEC2.dwg Folder: C:\DST\02103035.000 424 Churchill\2025 Phase II ESA\DWGs Thursday, June 19, 2025 @ 06:29 by Kris Morin

2713 Lancaster Road Suite 101, Ottawa, Ontario K1B 5R6 Tel: 1-877-300-4800 Website: www.englobecorp.com

APEC ID	Potentially Contaminating Activity	Contaminants of Potential Concern	Potentially Impacted Media
APEC 3	Off-Site PCAs upgradient of the Site	PHCs, VOCs, BTEX, Metals and Inorganics	Soil and Groundwater



Note

1. This drawing shall be read in conjunction with the associated technical report.

Legend

- RSC Property Boundary
- APEC 3
- Location of Monitoring Well (Englobe, 2021)
- Location of Monitoring Well (Englobe, 2023)
- Location of Deep Monitoring Well (Englobe, 2024)
- Location of Monitoring Well (Englobe, 2025)

1:600

0 10 20 30 m

0 1:1 5 cm

Scale accurate when printed at 100% using paper size ANSI full bleed B (11.0 x 17.0 Inches)

Revision	Date	Issue	Approval
E	06/19/2025	Preliminary	

Client: Churchill Properties Inc.

Site: 424 Churchill Avenue North, Ottawa, ON

Report Title: Phase Two Environmental Site Assessment

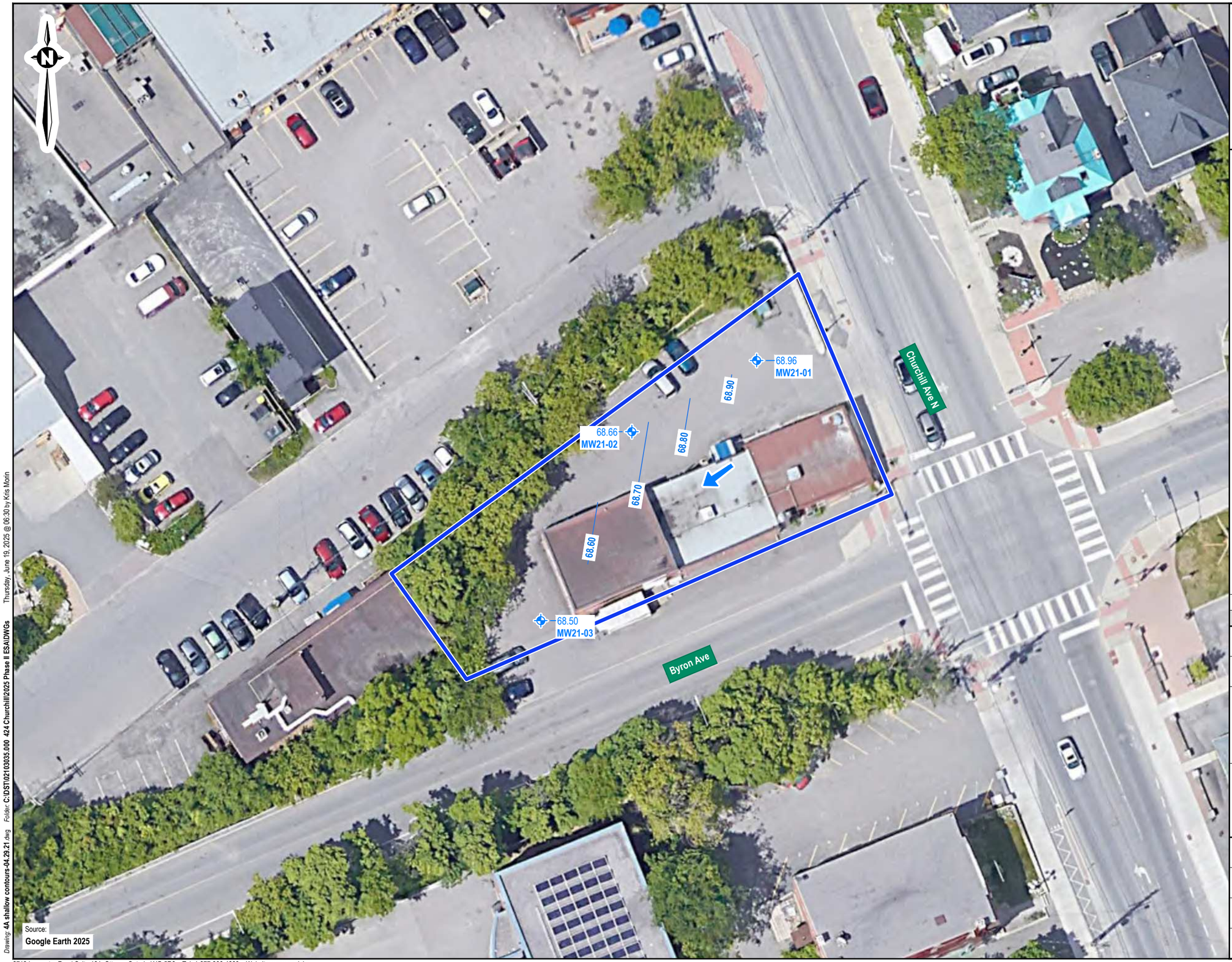
Drawing Title: Areas of Potential Environmental Concern

Designed By	Scale
C.O.	As shown
Drawn By	**Date**
K.M.	June 2025
Approved By	**Project No.**
	02103035.000

Figure No. 3C

Drawing: 3C APEC3.dwg Folder: C:\DST\02103035.000 424 Churchill\2025 Phase II ESA\DWGs Thursday, June 19, 2025 @ 06:29 by Kris Morin

2713 Lancaster Road Suite 101, Ottawa, Ontario K1B 5R6 Tel: 1-877-300-4800 Website: www.englobecorp.com



Note

1. This drawing shall be read in conjunction with the associated technical report.

Legend

- Phase One, Phase Two and Record of Site Condition (RSC) Property Boundary
- Approximate Location of Monitoring Well
- 69.88 Measured Groundwater Elevation (masl) (April 29, 2021)
- Groundwater Contour (masl) (April 29, 2021)
- Interpreted Groundwater Flow Direction (April 29, 2021)

1:400

0 4 8 12 16 20 m

0 1:1 5 cm

Scale accurate when printed at 100% using paper size ANSI full bleed B (11.0 x 17.0 Inches)

Revision	Date	Issue	Approval
E	06/19/2025	Preliminary	

Client: **Churchill Properties Inc.**

Site: **424 Churchill Avenue North, Ottawa, ON**

Report Title: **Phase Two Environmental Site Assessment**

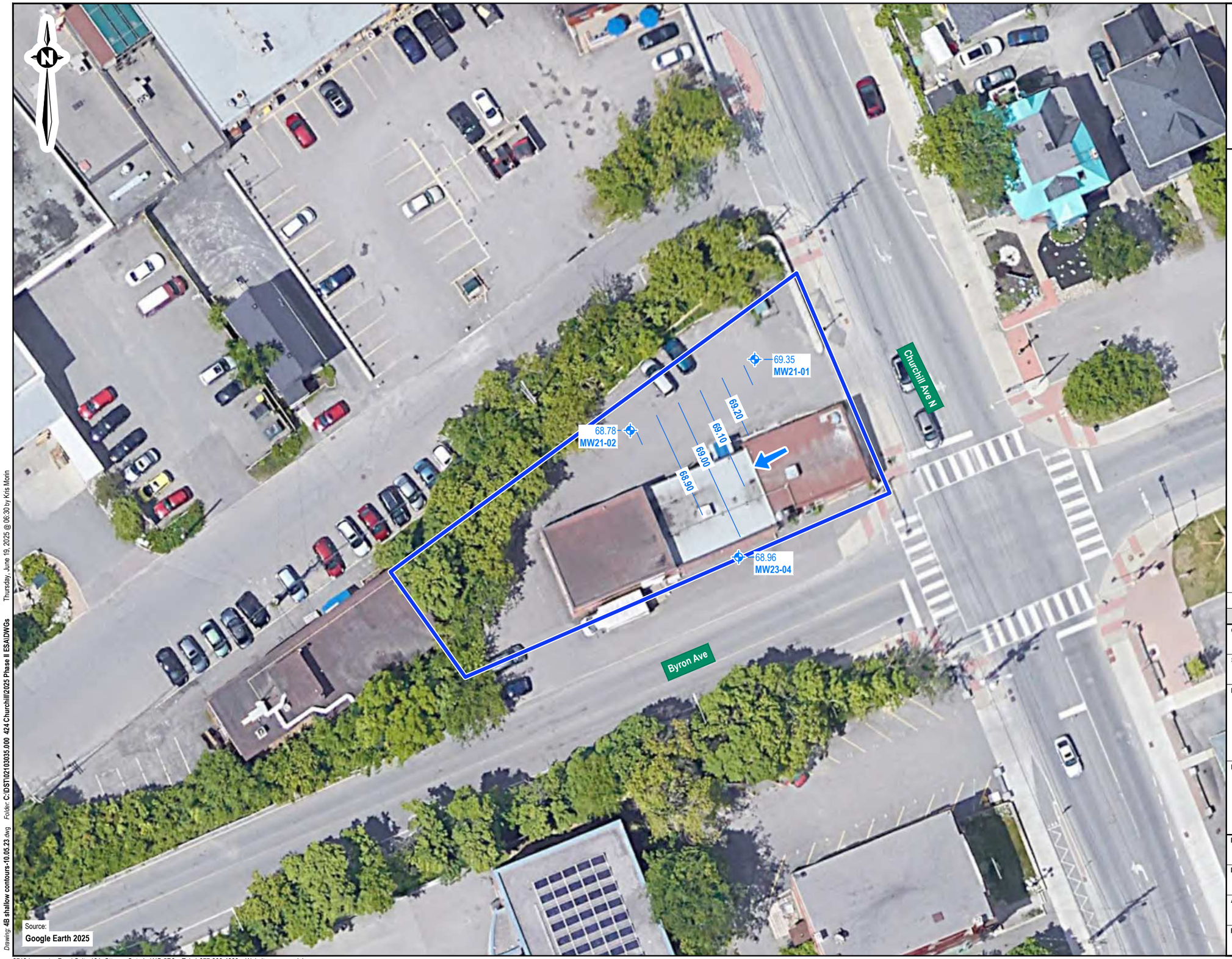
Drawing Title: **Shallow Aquifer Groundwater Contours and Interpreted Flow Direction - April 29, 2021**

Designed By: C.O.	Scale: As shown
Drawn By: K.M.	Date: June 2025
Approved By:	Project No.: 02103035.000

Figure No.: **4A**

Drawing: 4A shallow contours-04.29.21.dwg Folder: C:\DST\02103035.000 424 Churchill\2025 Phase II ESA\DWGs Thursday, June 19, 2025 @ 06:30 by Kris Morin

2713 Lancaster Road Suite 101, Ottawa, Ontario K1B 5R6 Tel: 1-877-300-4800 Website: www.englobecorp.com



Note

1. This drawing shall be read in conjunction with the associated technical report.

Legend

- Phase One, Phase Two and Record of Site Condition (RSC) Property Boundary
- Approximate Location of Monitoring Well
- 69.88 Measured Groundwater Elevation (masl) (October 5, 2023)
- Groundwater Contour (masl) (October 5, 2023)
- Interpreted Groundwater Flow Direction (October 5, 2023)

1:400

0 4 8 12 16 20 m

0 1:1 5 cm

Scale accurate when printed at 100% using paper size ANSI full bleed B (11.0 x 17.0 Inches)

Revision	Date	Issue	Approval
E	06/19/2025	Preliminary	

Client: **Churchill Properties Inc.**

Site: **424 Churchill Avenue North, Ottawa, ON**

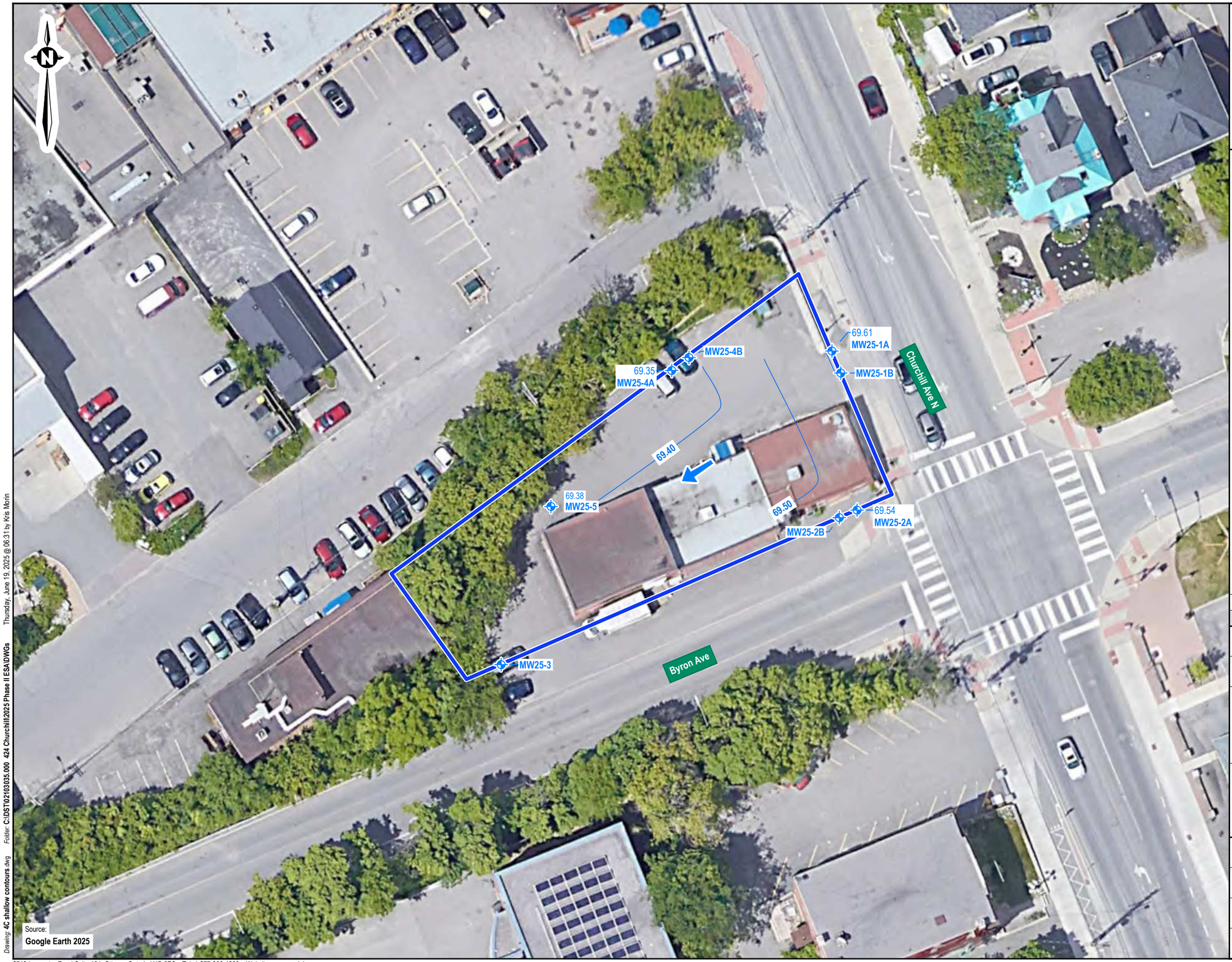
Report Title: **Phase Two Environmental Site Assessment**

Drawing Title: **Shallow Aquifer Groundwater Contours and Interpreted Flow Direction - October 5, 2023**

Designed By	Scale
C.O.	As shown
Drawn By	**Date**
K.M.	June 2025
Approved By	**Project No.**
	02103035.000

Figure No. **4B**

Drawing: 4B shallow contours-10.05.23.dwg Folder: C:\DST\02103035.000 424 Churchill\2025 Phase II ESA\DWGs Thursday, June 19, 2025 @ 06:30 by Kris Morin



Note

1. This drawing shall be read in conjunction with the associated technical report.

Legend

- Phase One, Phase Two and Record of Site Condition (RSC) Property Boundary
- Approximate Location of Monitoring Well
- 69.88 Measured Groundwater Elevation (masl) (March 2025)
- Groundwater Contour (masl) (March 2025)
- Interpreted Groundwater Flow Direction (March 2025)

1:400

0 4 8 12 16 20 m

0 1:1 5 cm

Scale accurate when printed at 100% using paper size ANSI full bleed B (11.0 x 17.0 Inches)

Revision	Date	Issue	Approval
E	06/19/2025	Preliminary	

Client: **Churchill Properties Inc.**

Site: **424 Churchill Avenue North, Ottawa, ON**

Report Title: **Phase Two Environmental Site Assessment**

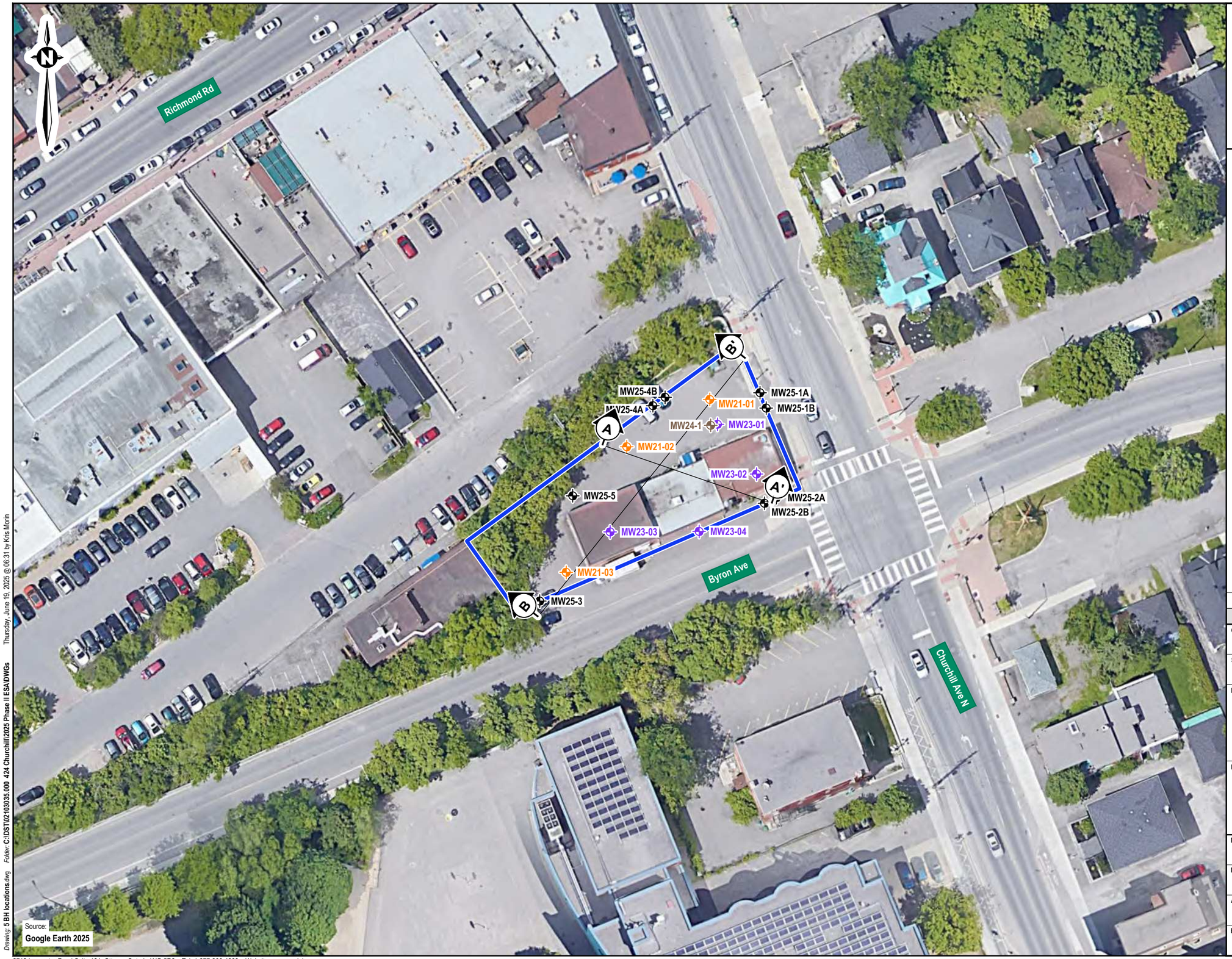
Drawing Title: **Shallow Aquifer Groundwater Contours and Interpreted Flow Direction - March 28, 2025**

Designed By	Scale
C.O.	As shown
Drawn By	**Date**
K.M.	June 2025
Approved By	**Project No.**
	02103035.000

Figure No. **4C**

Drawing: 4C shallow contours.dwg Folder: C:\DST\02103035.000 424 Churchill\2025 Phase II ESA\DWGs Thursday, June 19, 2025 @ 06:31 by Kris Morin

2713 Lancaster Road Suite 101, Ottawa, Ontario K1B 5R6 Tel: 1-877-300-4800 Website: www.englobecorp.com



Note

1. This drawing shall be read in conjunction with the associated technical report.

Legend

- Phase One, Phase Two and Record of Site Condition (RSC) Property Boundary
- Location of Monitoring Well (Englobe, 2021)
- Location of Monitoring Well (Englobe, 2023)
- Location of Deep Monitoring Well (Englobe, 2024)
- Location of Monitoring Well (Englobe, 2025)
- Cross Section Reference

1:600

0 10 20 30 m

0 1:1 5 cm

Scale accurate when printed at 100% using paper size ANSI full bleed B (11.0 x 17.0 Inches)

Revision	Date	Issue	Approval
E	06/19/2025	Preliminary	

Client: Churchill Properties Inc.

Site: 424 Churchill Avenue North, Ottawa, ON

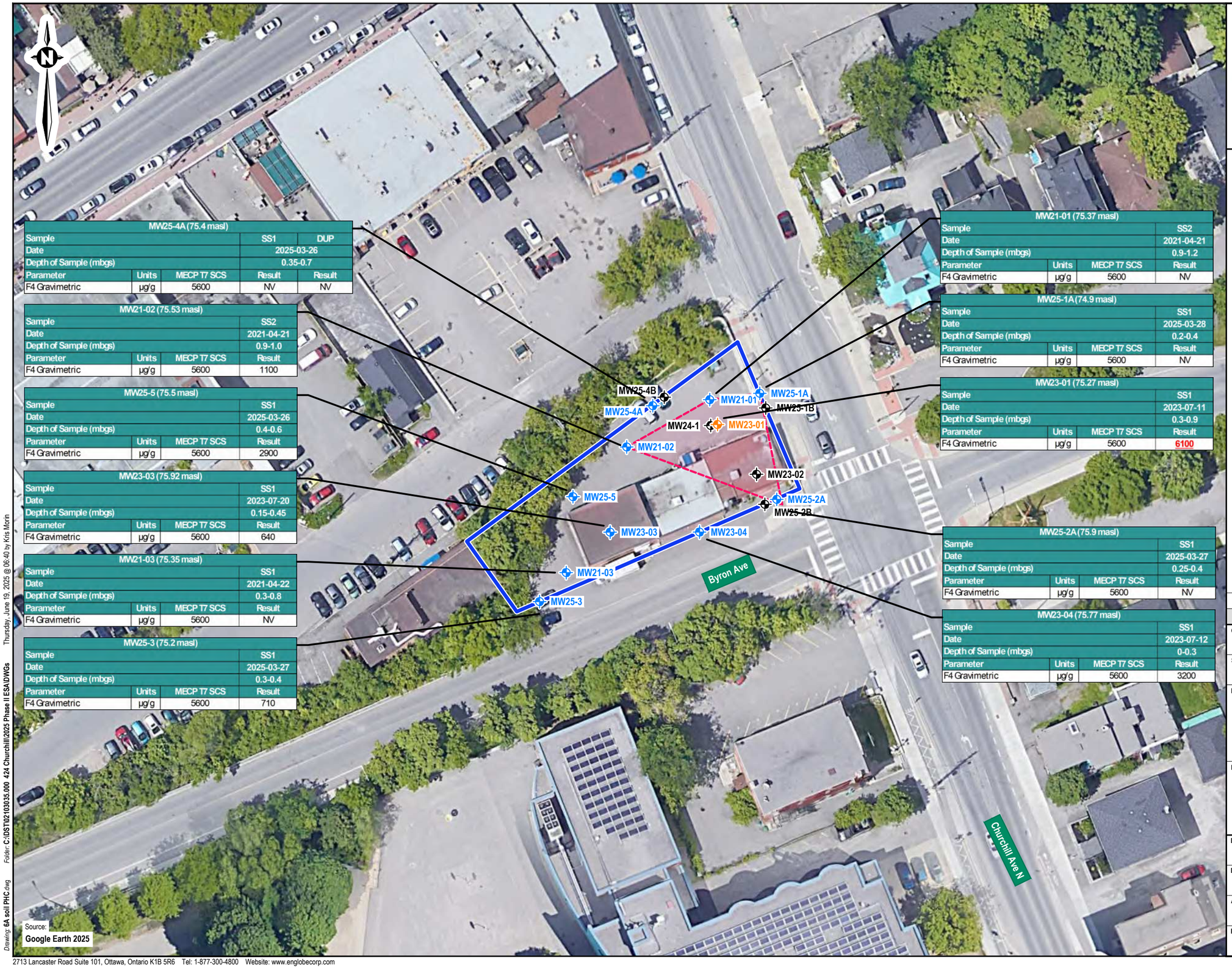
Report Title: Phase Two Environmental Site Assessment

Drawing Title: Cross Section Locations

Designed By: C.O.	Scale: As shown
Drawn By: K.M.	Date: June 2025
Approved By:	Project No.: 02103035.000

Figure No.: 5

Drawing: 5 BH locations.dwg Folder: C:\DST\02103035.000 424 Churchill\2025 Phase II ESA\DWGs Thursday, June 19, 2025 @ 06:31 by Kris Morin



Note

1. This drawing shall be read in conjunction with the associated technical report.
2. NV: Sample reached baseline at C50, Sample meets SCS

Legend

- Phase One, Phase Two and Record of Site Condition (RSC) Property Boundary
- Soil Sample Meets Applicable Table 7 SCS for PHCs
- Soil Sample Exceeeds Applicable Table 7 SCS for PHCs
- Soil Sample Not Analyzed
- Inferred Extent of PHC Contamination in Soil

1:600

0 10 20 30 m

0 1:1 5 cm

Scale accurate when printed at 100% using paper size ANSI full bleed B (11.0 x 17.0 Inches)

Revision	Date	Issue	Approval
E	06/19/2025	Preliminary	

Client: **Churchill Properties Inc.**

Site: **424 Churchill Avenue North, Ottawa, ON**

Report Title: **Phase Two Environmental Site Assessment**

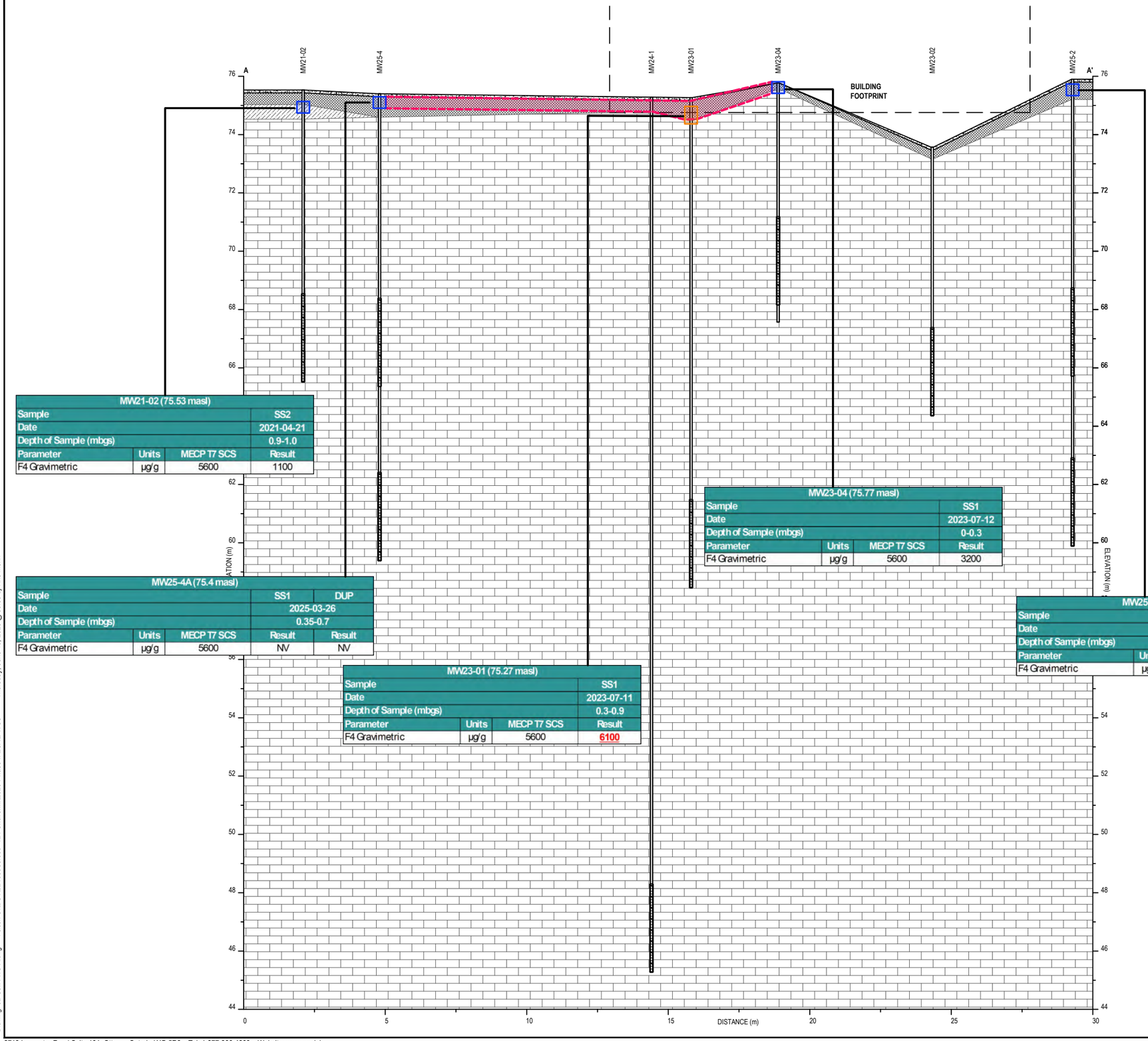
Drawing Title: **PHCs in Soil**

Designed By	Scale
C.O.	As shown
Drawn By	**Date**
K.M.	June 2025
Approved By	**Project No.**
	02103035.000

Figure No.: **6A**

Drawing 6A soil PHC.dwg Folder: C:\DST\02103035.000 424 Churchill\2025 Phase II ESA\DWGs Thursday, June 19, 2025 @ 06:40 by Kris Morin

2713 Lancaster Road Suite 101, Ottawa, Ontario K1B 5R6 Tel: 1-877-300-4800 Website: www.englobecorp.com



MW21-02 (75.53 masl)			
Sample			SS2
Date			2021-04-21
Depth of Sample (mbgs)			0.9-1.0
Parameter	Units	MECP T7 SCS	Result
F4 Gravimetric	µg/g	5600	1100

MW23-04 (75.77 masl)			
Sample			SS1
Date			2023-07-12
Depth of Sample (mbgs)			0-0.3
Parameter	Units	MECP T7 SCS	Result
F4 Gravimetric	µg/g	5600	3200

MW25-4A (75.4 masl)				
Sample			SS1	DUP
Date			2025-03-26	
Depth of Sample (mbgs)			0.35-0.7	
Parameter	Units	MECP T7 SCS	Result	Result
F4 Gravimetric	µg/g	5600	NV	NV

MW23-01 (75.27 masl)			
Sample			SS1
Date			2023-07-11
Depth of Sample (mbgs)			0.3-0.9
Parameter	Units	MECP T7 SCS	Result
F4 Gravimetric	µg/g	5600	6100

MW25-2A (75.9 masl)			
Sample			SS1
Date			2025-03-27
Depth of Sample (mbgs)			0.25-0.4
Parameter	Units	MECP T7 SCS	Result
F4 Gravimetric	µg/g	5600	NV

Note

1. This drawing shall be read in conjunction with the associated technical report.
2. Vertical delineation achieved by bedrock located 0.1 - 1.2 mbgs across the Site.

Legend

- Asphalt
- Fill
- Sandy Silt
- Limestone Bedrock
- Monitoring Well Screened Interval
- Soil Sample Exceeds MECP Table 7 SCS for PHCs
- Soil Sample Meets MECP Table 7 SCS for PHCs
- Inferred Extents of PHC Contamination in Soil

Revision	Date	Issue	Approval
E	06/19/2025	Preliminary	

Client: **Churchill Properties Inc.**

Site: **424 Churchill Avenue North, Ottawa, ON**

Report Title: **Phase Two Environmental Site Assessment**

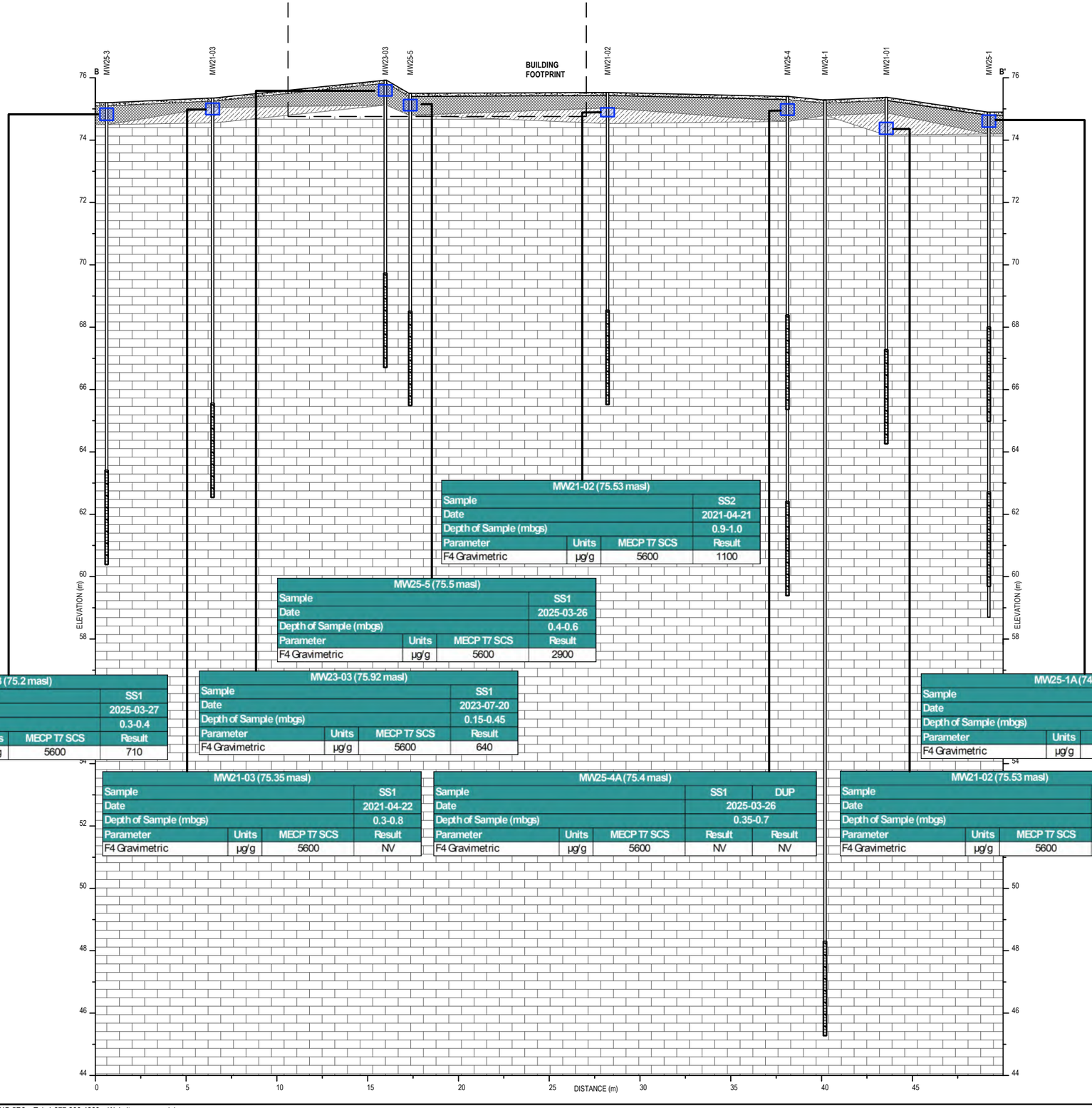
Drawing Title: **Cross Section A-A' - PHCs in Soil**

Designed By	Scale
C.O.	As shown
Drawn By	**Date**
K.M.	June 2025
Approved By	**Project No.**
	02103035.000

Figure No.: **6B**

Drawing: 6B soil PHC A.dwg Folder: C:\DST\02103035.000 424 Churchill\2025 Phase II ESA\DWGs Thursday, June 19, 2025 @ 06:39 by Kris Morin

2713 Lancaster Road Suite 101, Ottawa, Ontario K1B 5R6 Tel: 1-877-300-4800 Website: www.englobecorp.com



MW21-02 (75.53 masl)			
Sample			SS2
Date			2021-04-21
Depth of Sample (mbgs)			0.9-1.0
Parameter	Units	MECP T7 SCS	Result
F4 Gravimetric	µg/g	5600	1100

MW25-5 (75.5 masl)			
Sample			SS1
Date			2025-03-26
Depth of Sample (mbgs)			0.4-0.6
Parameter	Units	MECP T7 SCS	Result
F4 Gravimetric	µg/g	5600	2900

MW25-3 (75.2 masl)			
Sample			SS1
Date			2025-03-27
Depth of Sample (mbgs)			0.3-0.4
Parameter	Units	MECP T7 SCS	Result
F4 Gravimetric	µg/g	5600	710

MW23-03 (75.92 masl)			
Sample			SS1
Date			2023-07-20
Depth of Sample (mbgs)			0.15-0.45
Parameter	Units	MECP T7 SCS	Result
F4 Gravimetric	µg/g	5600	640

MW25-1A (74.9 masl)			
Sample			SS1
Date			2025-03-28
Depth of Sample (mbgs)			0.2-0.4
Parameter	Units	MECP T7 SCS	Result
F4 Gravimetric	µg/g	5600	NV

MW21-03 (75.35 masl)			
Sample			SS1
Date			2021-04-22
Depth of Sample (mbgs)			0.3-0.8
Parameter	Units	MECP T7 SCS	Result
F4 Gravimetric	µg/g	5600	NV

MW25-4A (75.4 masl)				
Sample			SS1	DUP
Date			2025-03-26	
Depth of Sample (mbgs)			0.35-0.7	
Parameter	Units	MECP T7 SCS	Result	Result
F4 Gravimetric	µg/g	5600	NV	NV

MW21-02 (75.53 masl)			
Sample			SS2
Date			2021-04-21
Depth of Sample (mbgs)			0.9-1.0
Parameter	Units	MECP T7 SCS	Result
F4 Gravimetric	µg/g	5600	1100

ENGLOBE

Note

1. This drawing shall be read in conjunction with the associated technical report.
2. Vertical delineation achieved by bedrock located 0.1 - 1.2 mbgs across the Site.

Legend

- Asphalt
- Fill
- Sandy Silt
- Limestone Bedrock
- Monitoring Well Screened Interval
- Soil Sample Exceeds MECP Table 7 SCS for PHCs
- Soil Sample Meets MECP Table 7 SCS for PHCs
- Inferred Extents of PHC Contamination in Soil

Revision	Date	Issue	Approval
E	06/19/2025	Preliminary	

Client: **Churchill Properties Inc.**

Site: **424 Churchill Avenue North, Ottawa, ON**

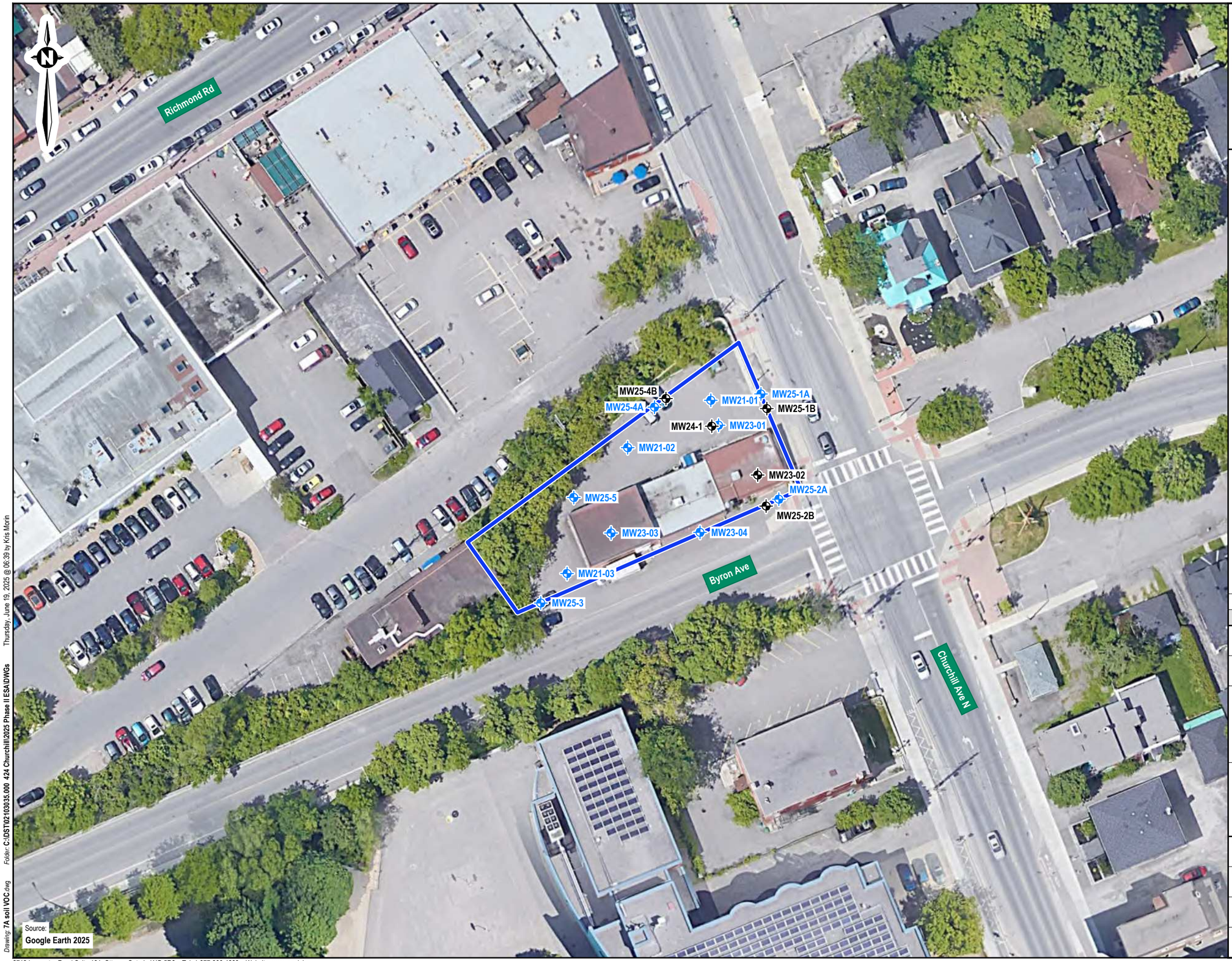
Report Title: **Phase Two Environmental Site Assessment**

Drawing Title: **Cross Section B-B' - PHCs in Soil**

Designed By: C.O.	Scale: As shown
Drawn By: K.M.	Date: June 2025
Approved By:	Project No.: 02103035.000

Figure No.: **6C**

2713 Lancaster Road Suite 101, Ottawa, Ontario K1B 5R6 Tel: 1-877-300-4800 Website: www.englobecorp.com



Note

1. This drawing shall be read in conjunction with the associated technical report.

Legend

- Phase One, Phase Two and Record of Site Condition (RSC) Property Boundary
- Soil Sample Meets Applicable Table 7 SCS for VOCs
- Soil Sample Not Analyzed

1:600

0 10 20 30 m

0 1:1 5 cm

Scale accurate when printed at 100% using paper size ANSI full bleed B (11.0 x 17.0 Inches)

Revision	Date	Issue	Approval
E	06/19/2025	Preliminary	

Client: **Churchill Properties Inc.**

Site: **424 Churchill Avenue North, Ottawa, ON**

Report Title: **Phase Two Environmental Site Assessment**

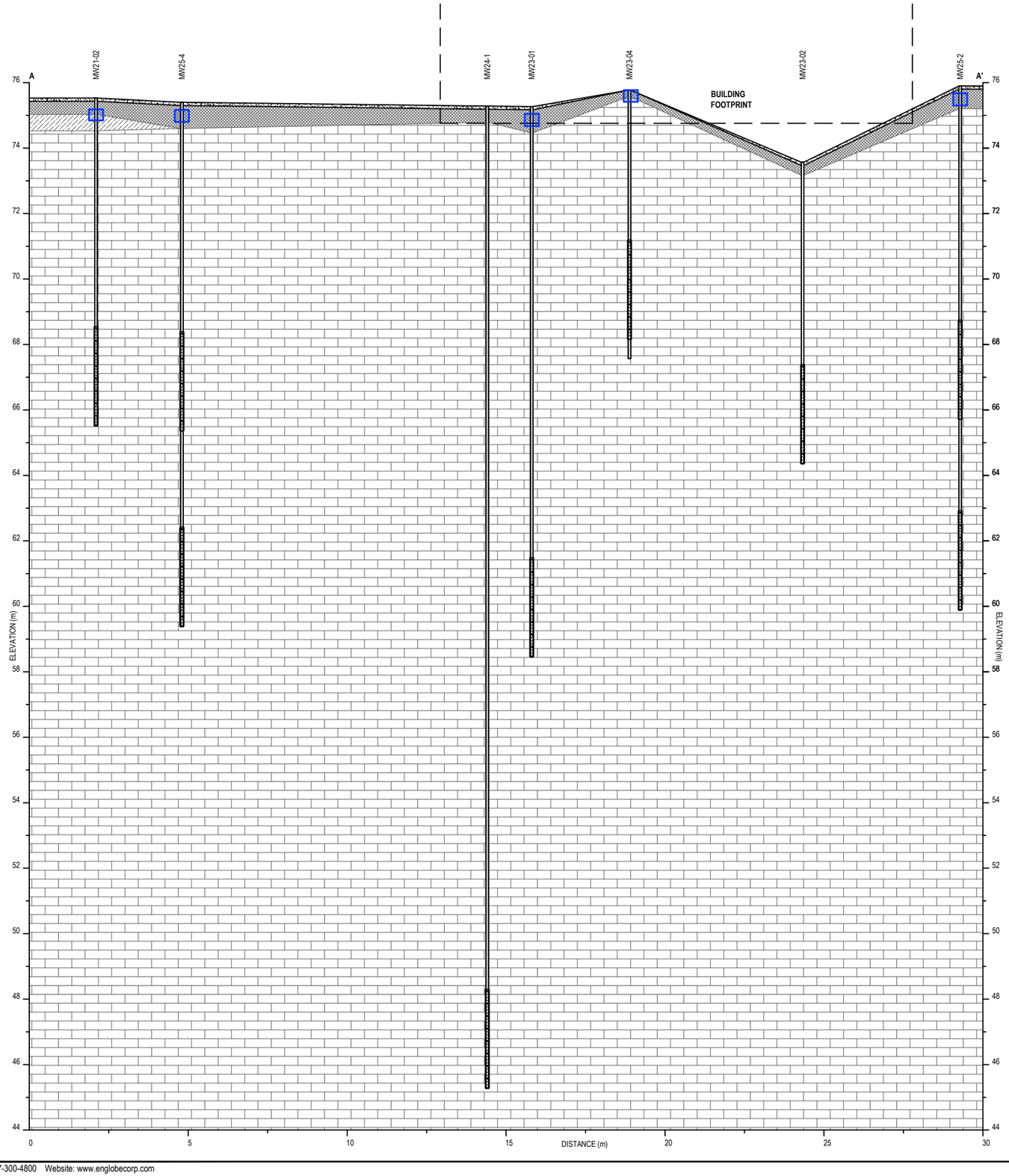
Drawing Title: **VOCs in Soil**

Designed By: C.O.	Scale: As shown
Drawn By: K.M.	Date: June 2025
Approved By:	Project No.: 02103035.000

Figure No. **7A**

Drawing: 7A soil VOC.dwg Folder: C:\DST\02103035.000 424 Churchill\2025 Phase II ESA\DWGs Thursday, June 19, 2025 @ 06:39 by Kris Morin

2713 Lancaster Road Suite 101, Ottawa, Ontario K1B 5R6 Tel: 1-877-300-4800 Website: www.englobecorp.com



Note

1. This drawing shall be read in conjunction with the associated technical report.

Legend

- Asphalt
- Fill
- Sandy Silt
- Limestone Bedrock
- Monitoring Well Screened Interval
- Soil Sample Exceeds MECP Table 7 SCS for VOCs
- Soil Sample Meets MECP Table 7 SCS for VOCs
- Inferred Extents of VOCs Contamination in Soil

Revision	Date	Issue	Approval
E	06/19/2025	Preliminary	

Client: **Churchill Properties Inc.**

Site: **424 Churchill Avenue North, Ottawa, ON**

Report Title: **Phase Two Environmental Site Assessment**

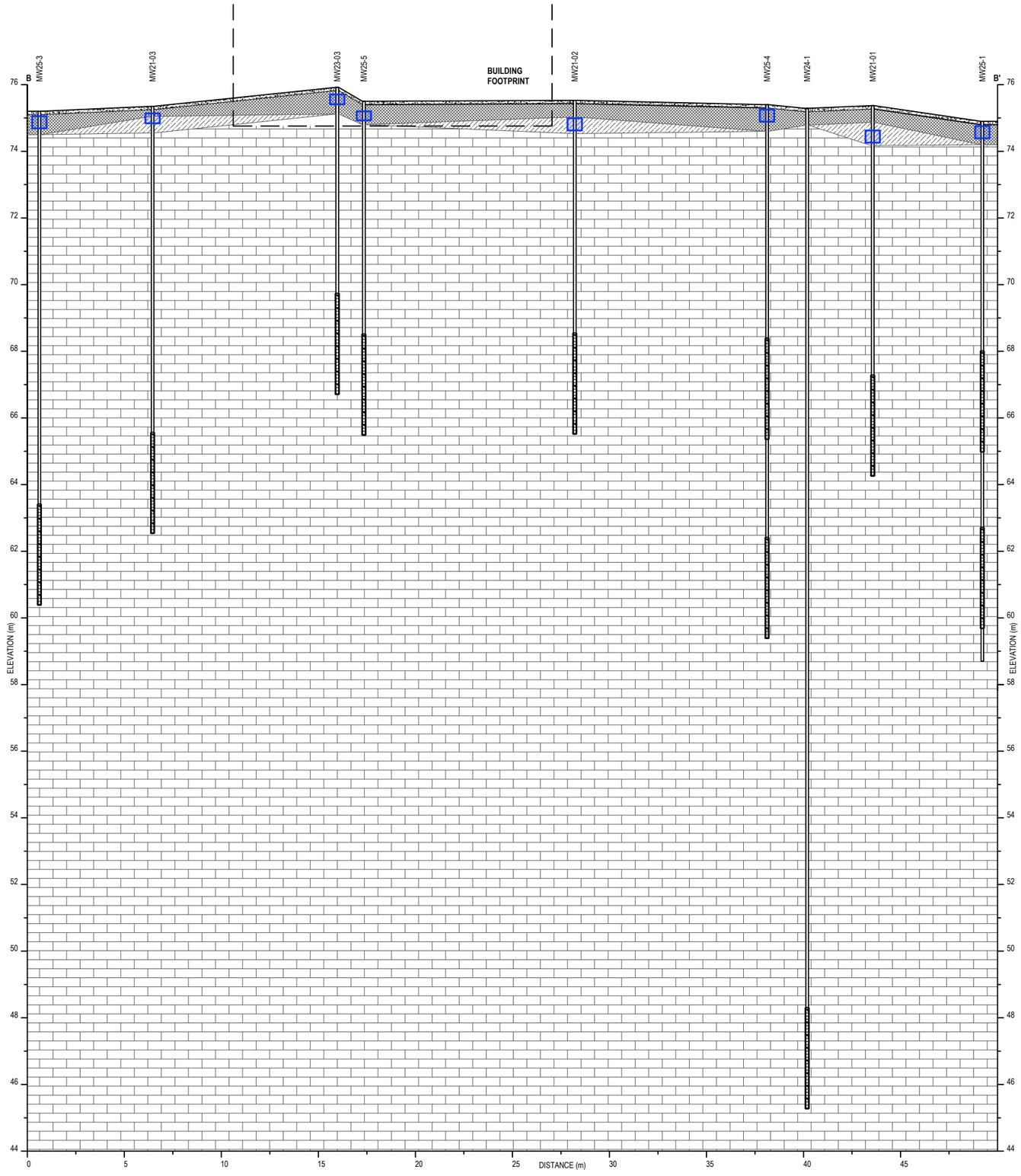
Drawing Title: **Cross Section A-A' - VOCs in Soil**

Designed By: C.O.	Scale: As shown
Drawn By: K.M.	Date: June 2025
Approved By:	Project No.: 02103035.000

Figure No.: **7B**

2713 Lancaster Road Suite 101, Ottawa, Ontario K1B 5R6 Tel: 1-877-300-4800 Website: www.englobecorp.com

Drawing: 7B soil VOC A.dwg Folder: C:\DST\02103035.000 424 Churchill\2025 Phase II ESA\DWGs Thursday, June 19, 2025 @ 06:39 by Kris Morin



Note

1. This drawing shall be read in conjunction with the associated technical report.

Legend

- Asphalt
- Fill
- Sandy Silt
- Limestone Bedrock
- Monitoring Well Screened Interval
- Soil Sample Exceeds MECP Table 7 SCS for VOCs
- Soil Sample Meets MECP Table 7 SCS for VOCs
- Inferred Extents of VOCs Contamination in Soil

Revision	Date	Issue	Approval
E	06/19/2025	Preliminary	

Client
Churchill Properties Inc.

Site
424 Churchill Avenue North, Ottawa, ON

Report Title
Phase Two Environmental Site Assessment

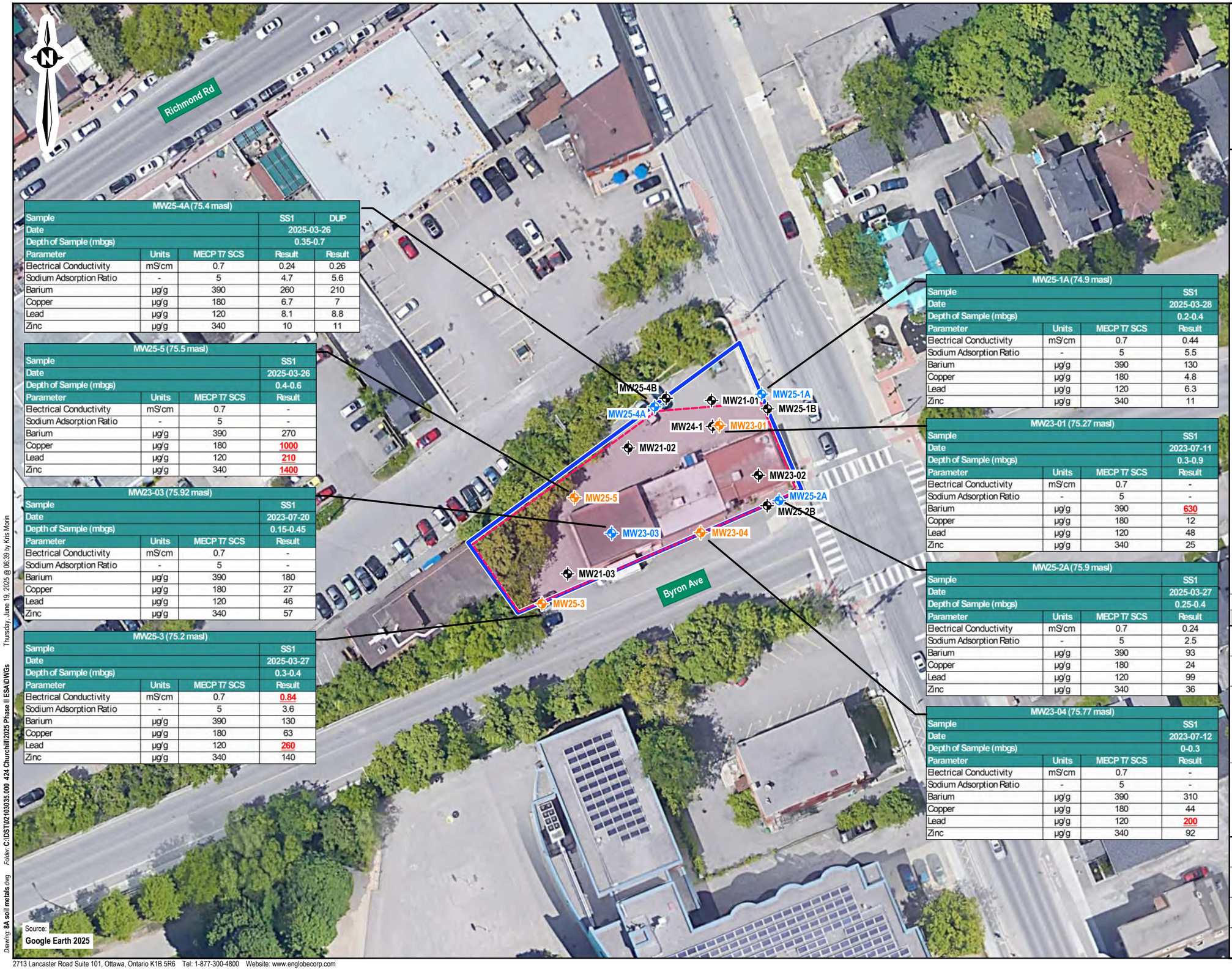
Drawing Title
Cross Section B-B' - VOCs in Soil

Designed By: C.O.	Scale: As shown
Drawn By: K.M.	Date: June 2025
Approved By:	Project No.: 02103035.000

Figure No. **7C**

Drawing: 7C soil VOC B.dwg Folder: C:\DST\02103035.000 424 Churchill\2025 Phase II ESA\DWGs Thursday, June 19, 2025 @ 06:39 by Kris Morin

2713 Lancaster Road Suite 101, Ottawa, Ontario K1B 5R6 Tel: 1-877-300-4800 Website: www.englobecorp.com



MW25-4A (75.4 masl)				
Sample			SS1	DUP
Date			2025-03-26	
Depth of Sample (mbgs)			0.35-0.7	
Parameter	Units	MECP T7 SCS	Result	Result
Electrical Conductivity	mS/cm	0.7	0.24	0.26
Sodium Adsorption Ratio	-	5	4.7	5.6
Barium	µg/g	390	260	210
Copper	µg/g	180	6.7	7
Lead	µg/g	120	8.1	8.8
Zinc	µg/g	340	10	11

MW25-5 (75.5 masl)			
Sample			SS1
Date			2025-03-26
Depth of Sample (mbgs)			0.4-0.6
Parameter	Units	MECP T7 SCS	Result
Electrical Conductivity	mS/cm	0.7	-
Sodium Adsorption Ratio	-	5	-
Barium	µg/g	390	270
Copper	µg/g	180	**1000**
Lead	µg/g	120	**210**
Zinc	µg/g	340	**1400**

MW23-03 (75.92 masl)			
Sample			SS1
Date			2023-07-20
Depth of Sample (mbgs)			0.15-0.45
Parameter	Units	MECP T7 SCS	Result
Electrical Conductivity	mS/cm	0.7	-
Sodium Adsorption Ratio	-	5	-
Barium	µg/g	390	180
Copper	µg/g	180	27
Lead	µg/g	120	46
Zinc	µg/g	340	57

MW25-3 (75.2 masl)			
Sample			SS1
Date			2025-03-27
Depth of Sample (mbgs)			0.3-0.4
Parameter	Units	MECP T7 SCS	Result
Electrical Conductivity	mS/cm	0.7	**0.84**
Sodium Adsorption Ratio	-	5	3.6
Barium	µg/g	390	130
Copper	µg/g	180	63
Lead	µg/g	120	**260**
Zinc	µg/g	340	140

MW25-1A (74.9 masl)			
Sample			SS1
Date			2025-03-28
Depth of Sample (mbgs)			0.2-0.4
Parameter	Units	MECP T7 SCS	Result
Electrical Conductivity	mS/cm	0.7	0.44
Sodium Adsorption Ratio	-	5	5.5
Barium	µg/g	390	130
Copper	µg/g	180	4.8
Lead	µg/g	120	6.3
Zinc	µg/g	340	11

MW23-01 (75.27 masl)			
Sample			SS1
Date			2023-07-11
Depth of Sample (mbgs)			0.3-0.9
Parameter	Units	MECP T7 SCS	Result
Electrical Conductivity	mS/cm	0.7	-
Sodium Adsorption Ratio	-	5	-
Barium	µg/g	390	**630**
Copper	µg/g	180	12
Lead	µg/g	120	48
Zinc	µg/g	340	25

MW25-2A (75.9 masl)			
Sample			SS1
Date			2025-03-27
Depth of Sample (mbgs)			0.25-0.4
Parameter	Units	MECP T7 SCS	Result
Electrical Conductivity	mS/cm	0.7	0.24
Sodium Adsorption Ratio	-	5	2.5
Barium	µg/g	390	93
Copper	µg/g	180	24
Lead	µg/g	120	99
Zinc	µg/g	340	36

MW23-04 (75.77 masl)			
Sample			SS1
Date			2023-07-12
Depth of Sample (mbgs)			0-0.3
Parameter	Units	MECP T7 SCS	Result
Electrical Conductivity	mS/cm	0.7	-
Sodium Adsorption Ratio	-	5	-
Barium	µg/g	390	310
Copper	µg/g	180	44
Lead	µg/g	120	**200**
Zinc	µg/g	340	92

Note

1. This drawing shall be read in conjunction with the associated technical report.
2. -: Parameter not analyzed

Legend

- Phase One, Phase Two and Record of Site Condition (RSC) Property Boundary
- Soil Sample Meets Applicable Table 7 SCS for Metals
- Soil Sample Exceeeds Applicable Table 7 SCS for Metals
- Soil Sample Not Analyzed
- Inferred Extent of Metal Contamination in Soil

1:600

0 10 20 30 m

0 1:1 5 cm

Scale accurate when printed at 100% using paper size ANSI full bleed B (11.0 x 17.0 Inches)

Revision	Date	Issue	Approval
E	06/19/2025	Preliminary	

Client: **Churchill Properties Inc.**

Site: **424 Churchill Avenue North, Ottawa, ON**

Report Title: **Phase Two Environmental Site Assessment**

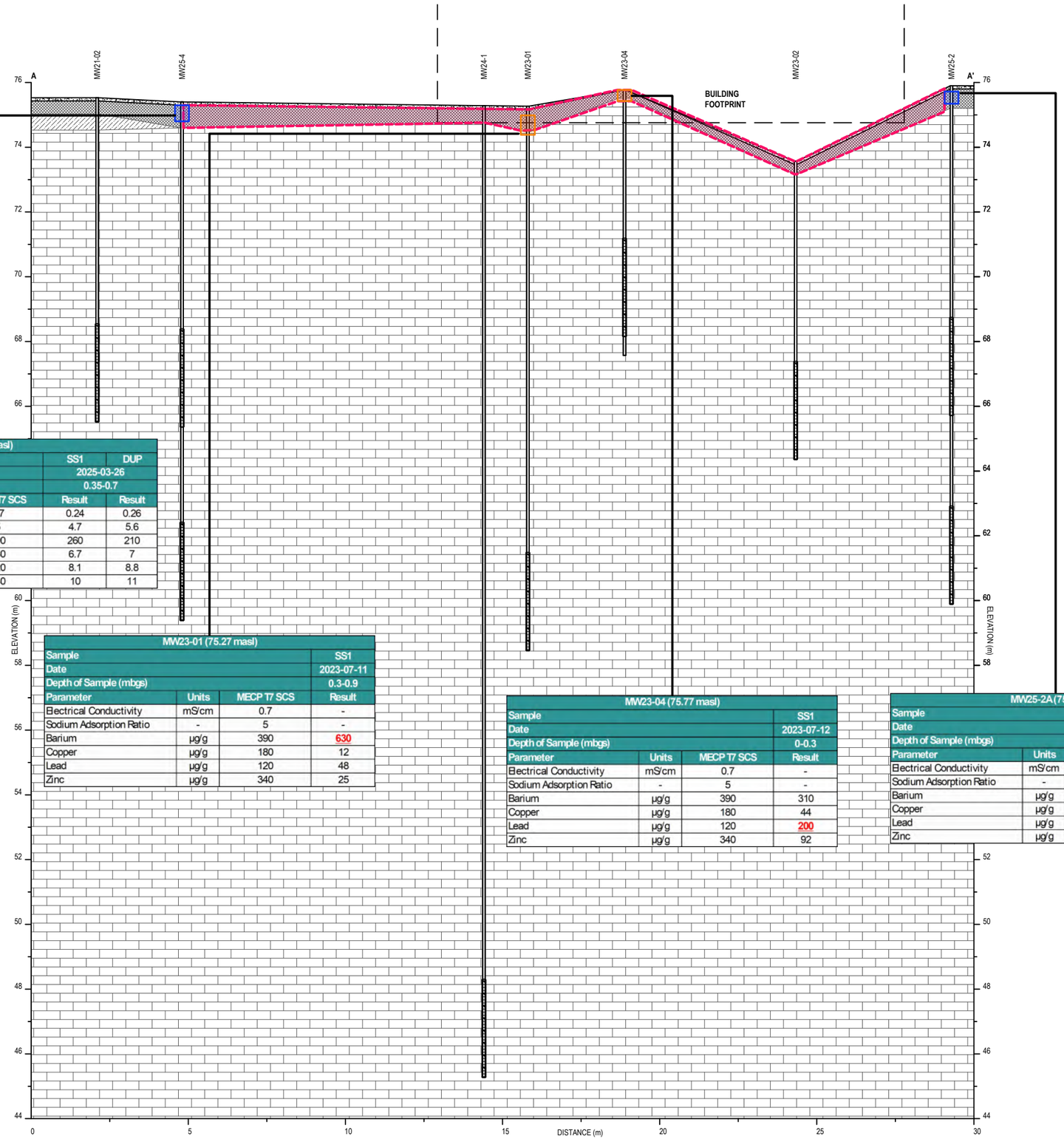
Drawing Title: **Metals, Hydride Forming Metals (HFMs), EC, and SAR in Soil**

Designed By	Scale
C.O.	As shown
Drawn By	**Date**
K.M.	June 2025
Approved By	**Project No.**
	02103035.000

Figure No. **8A**

2713 Lancaster Road Suite 101, Ottawa, Ontario K1B 5R6 Tel: 1-877-300-4800 Website: www.englobecorp.com

Drawing: 8A soil metals.dwg Folder: C:\DST\02103035.000 424 Churchill\2025 Phase II ESA\DWGs Thursday, June 19, 2025 @ 06:39 by Kris Morin



MW25-4A (75.4 masl)				
Sample			SS1	DUP
Date			2025-03-26	
Depth of Sample (mbgs)			0.35-0.7	
Parameter	Units	MECP T7 SCS	Result	Result
Electrical Conductivity	mS/cm	0.7	0.24	0.26
Sodium Adsorption Ratio	-	5	4.7	5.6
Barium	µg/g	390	260	210
Copper	µg/g	180	6.7	7
Lead	µg/g	120	8.1	8.8
Zinc	µg/g	340	10	11

MW23-01 (75.27 masl)			
Sample			SS1
Date			2023-07-11
Depth of Sample (mbgs)			0.3-0.9
Parameter	Units	MECP T7 SCS	Result
Electrical Conductivity	mS/cm	0.7	-
Sodium Adsorption Ratio	-	5	-
Barium	µg/g	390	630
Copper	µg/g	180	12
Lead	µg/g	120	48
Zinc	µg/g	340	25

MW23-04 (75.77 masl)			
Sample			SS1
Date			2023-07-12
Depth of Sample (mbgs)			0-0.3
Parameter	Units	MECP T7 SCS	Result
Electrical Conductivity	mS/cm	0.7	-
Sodium Adsorption Ratio	-	5	-
Barium	µg/g	390	310
Copper	µg/g	180	44
Lead	µg/g	120	200
Zinc	µg/g	340	92

MW25-2A (75.9 masl)			
Sample			SS1
Date			2025-03-27
Depth of Sample (mbgs)			0.25-0.4
Parameter	Units	MECP T7 SCS	Result
Electrical Conductivity	mS/cm	0.7	0.24
Sodium Adsorption Ratio	-	5	2.5
Barium	µg/g	390	93
Copper	µg/g	180	24
Lead	µg/g	120	99
Zinc	µg/g	340	36

Note

1. This drawing shall be read in conjunction with the associated technical report.
2. Analytical results on this figure include the following method groups: Metals, As, Se, Sb
3. Vertical delineation achieved by bedrock located 0.1 - 1.2 mbgs across the Site.

Legend

- Asphalt
- Fill
- Sandy Silt
- Limestone Bedrock
- Monitoring Well Screened Interval
- Soil Sample Exceeds MECP Table 7 SCS for Metals
- Soil Sample Meets MECP Table 7 SCS for Metals
- Inferred Extents of Metals Contamination in Soil

Revision	Date	Issue	Approval
E	06/19/2025	Preliminary	

Client: **Churchill Properties Inc.**

Site: **424 Churchill Avenue North, Ottawa, ON**

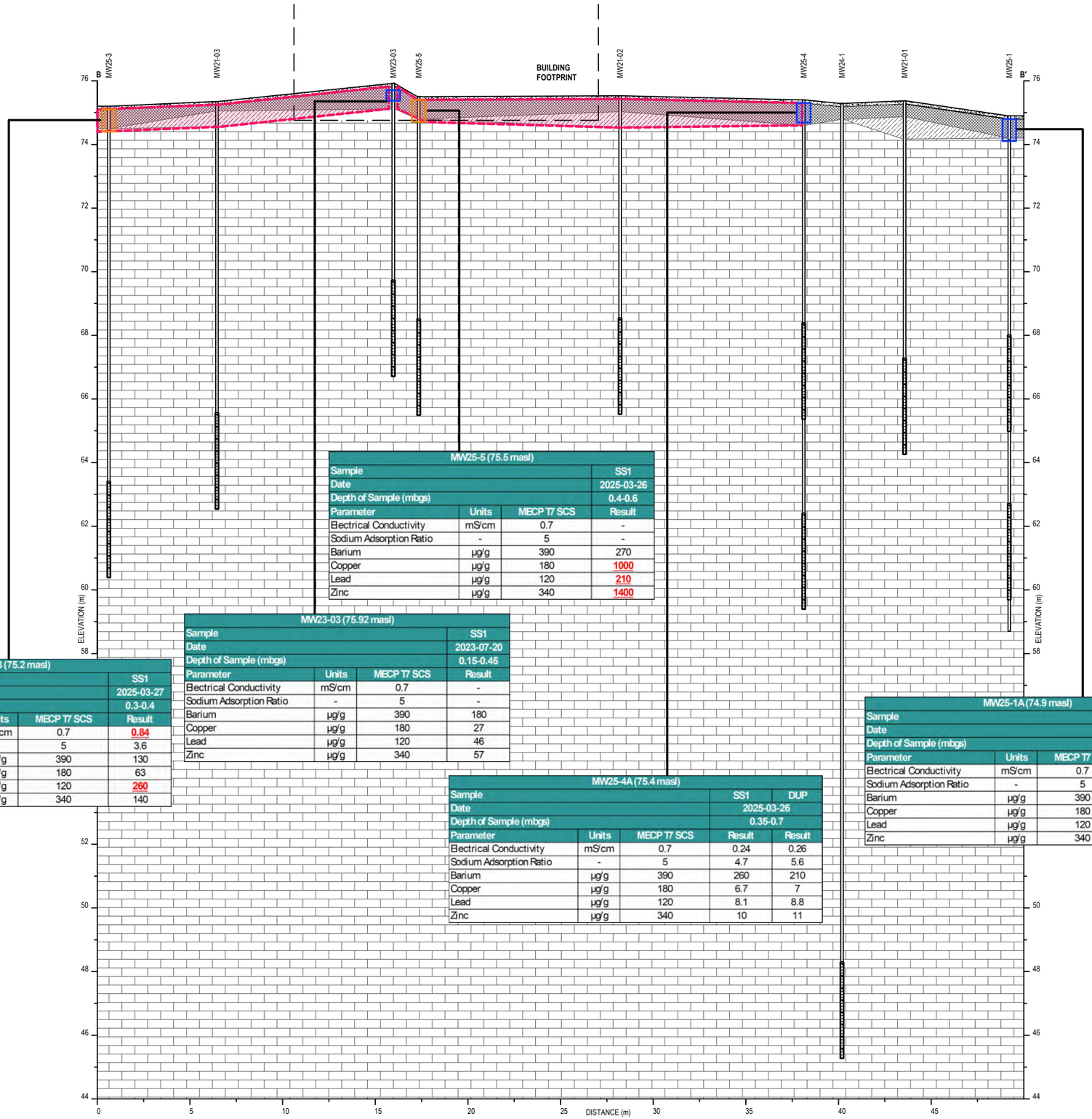
Report Title: **Phase Two Environmental Site Assessment**

Drawing Title: **Cross Section A-A' - Metals, Hydride-Forming Metals (HFMs), EC, and SAR in Soil**

Designed By	Scale
C.O.	As shown
Drawn By	**Date**
K.M.	June 2025
Approved By	**Project No.**
	02103035.000

Figure No.: **8B**

Drawing: 8B soil metals A.dwg Folder: C:\DST\02103035.000 424 Churchill\2025 Phase II ESA\DWGs Thursday, June 19, 2025 @ 06:38 by Kris Morin



MW25-5 (75.5 masl)			
Sample			SS1
Date			2025-03-26
Depth of Sample (mbgs)			0.4-0.6
Parameter	Units	MECP T7 SCS	Result
Electrical Conductivity	mS/cm	0.7	-
Sodium Adsorption Ratio	-	5	-
Barium	µg/g	390	270
Copper	µg/g	180	1000
Lead	µg/g	120	210
Zinc	µg/g	340	1400

MW25-3 (75.2 masl)			
Sample			SS1
Date			2025-03-27
Depth of Sample (mbgs)			0.3-0.4
Parameter	Units	MECP T7 SCS	Result
Electrical Conductivity	mS/cm	0.7	0.84
Sodium Adsorption Ratio	-	5	3.6
Barium	µg/g	390	130
Copper	µg/g	180	63
Lead	µg/g	120	260
Zinc	µg/g	340	140

MW23-03 (75.92 masl)			
Sample			SS1
Date			2023-07-20
Depth of Sample (mbgs)			0.15-0.45
Parameter	Units	MECP T7 SCS	Result
Electrical Conductivity	mS/cm	0.7	-
Sodium Adsorption Ratio	-	5	-
Barium	µg/g	390	180
Copper	µg/g	180	27
Lead	µg/g	120	46
Zinc	µg/g	340	57

MW25-4A (75.4 masl)				
Sample			SS1	DUP
Date			2025-03-26	
Depth of Sample (mbgs)			0.35-0.7	
Parameter	Units	MECP T7 SCS	Result	Result
Electrical Conductivity	mS/cm	0.7	0.24	0.26
Sodium Adsorption Ratio	-	5	4.7	5.6
Barium	µg/g	390	260	210
Copper	µg/g	180	6.7	7
Lead	µg/g	120	8.1	8.8
Zinc	µg/g	340	10	11

MW25-1A (74.9 masl)			
Sample			SS1
Date			2025-03-28
Depth of Sample (mbgs)			0.2-0.4
Parameter	Units	MECP T7 SCS	Result
Electrical Conductivity	mS/cm	0.7	0.44
Sodium Adsorption Ratio	-	5	5.5
Barium	µg/g	390	130
Copper	µg/g	180	4.8
Lead	µg/g	120	6.3
Zinc	µg/g	340	11

Note

1. This drawing shall be read in conjunction with the associated technical report.
2. Analytical results on the figure include the following method groups: Metals, As, Se, Sb
3. Vertical delineation achieved by bedrock located 0.1 - 1.2 mbgs across the Site.

Legend

- Asphalt
- Fill
- Sandy Silt
- Limestone Bedrock
- Monitoring Well Screened Interval
- Soil Sample Exceeds MECP Table 7 SCS for Metals
- Soil Sample Meets MECP Table 7 SCS for Metals
- Inferred Extents of Metals Contamination in Soil

Revision	Date	Issue	Approval
E	06/19/2025	Preliminary	

Client: **Churchill Properties Inc.**

Site: **424 Churchill Avenue North, Ottawa, ON**

Report Title: **Phase Two Environmental Site Assessment**

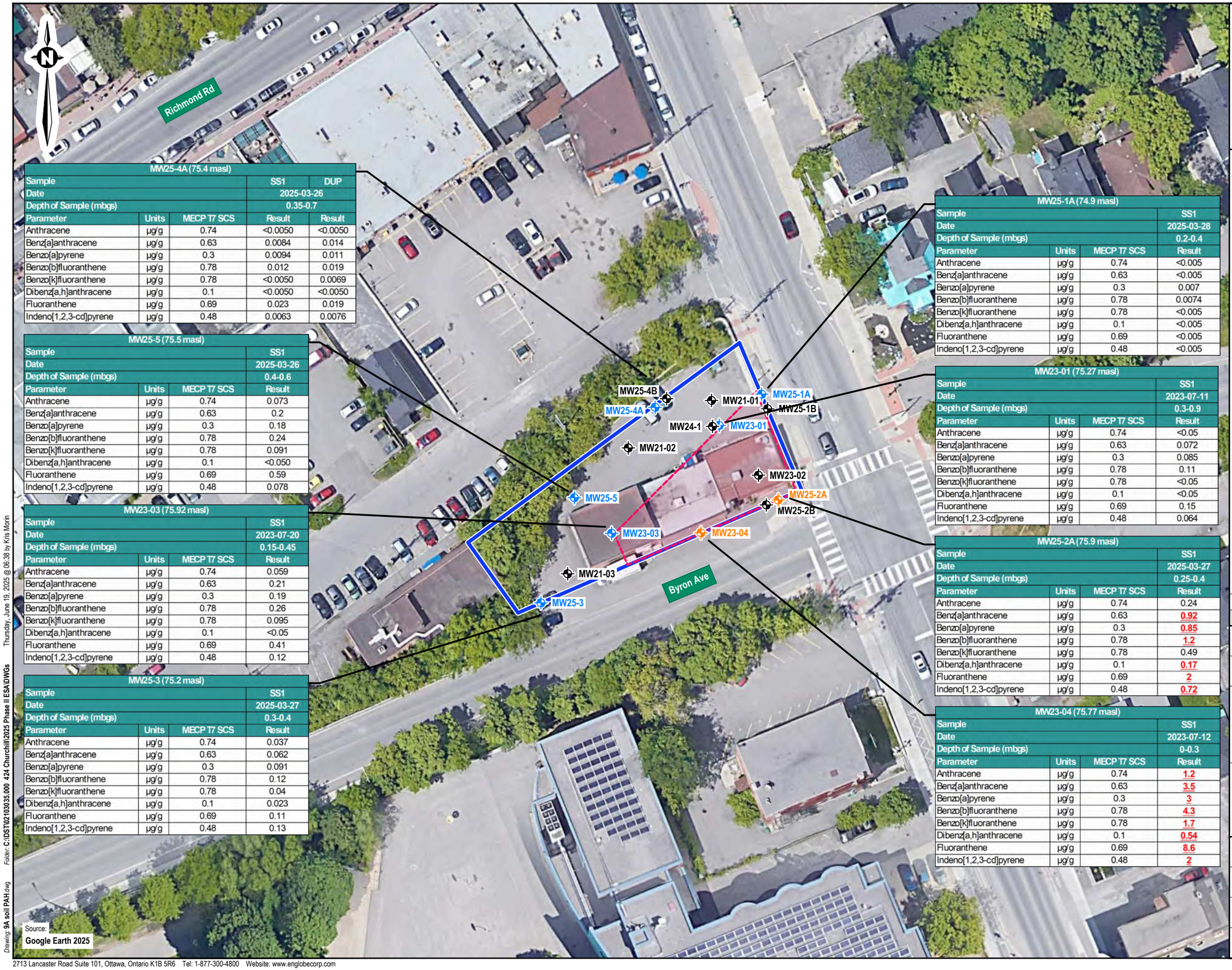
Drawing Title: **Cross Section B-B' - Metals, Hydride-Forming Metals (HFMs), EC, and SAR in Soil**

Designed By: C.O.	Scale: As shown
Drawn By: K.M.	Date: June 2025
Approved By:	Project No.: 02103035.000

Figure No.: **8C**

2713 Lancaster Road Suite 101, Ottawa, Ontario K1B 5R6 Tel: 1-877-300-4800 Website: www.englobecorp.com

Drawing: 8C soil metals B.dwg Folder: C:\DST\02103035.000 424 Churchill\2025 Phase II ESA\DWGs Thursday, June 19, 2025 @ 06:38 by Kris Morin



MW25-4A (75.4 masl)

Sample			SS1	DUP
Date			2025-03-26	
Depth of Sample (mbgs)			0.35-0.7	
Parameter	Units	MECP T7 SCS	Result	Result
Anthracene	µg/g	0.74	<0.0050	<0.0050
Benz[a]anthracene	µg/g	0.63	0.0084	0.014
Benzo[a]pyrene	µg/g	0.3	0.0094	0.011
Benzo[b]fluoranthene	µg/g	0.78	0.012	0.019
Benzo[k]fluoranthene	µg/g	0.78	<0.0050	0.0069
Dibenz[a,h]anthracene	µg/g	0.1	<0.0050	<0.0050
Fluoranthene	µg/g	0.69	0.023	0.019
Indeno[1,2,3-cd]pyrene	µg/g	0.48	0.0063	0.0076

MW25-5 (75.5 masl)

Sample			SS1
Date			2025-03-26
Depth of Sample (mbgs)			0.4-0.6
Parameter	Units	MECP T7 SCS	Result
Anthracene	µg/g	0.74	0.073
Benz[a]anthracene	µg/g	0.63	0.2
Benzo[a]pyrene	µg/g	0.3	0.18
Benzo[b]fluoranthene	µg/g	0.78	0.24
Benzo[k]fluoranthene	µg/g	0.78	0.091
Dibenz[a,h]anthracene	µg/g	0.1	<0.050
Fluoranthene	µg/g	0.69	0.59
Indeno[1,2,3-cd]pyrene	µg/g	0.48	0.078

MW23-03 (75.92 masl)

Sample			SS1
Date			2023-07-20
Depth of Sample (mbgs)			0.15-0.45
Parameter	Units	MECP T7 SCS	Result
Anthracene	µg/g	0.74	0.059
Benz[a]anthracene	µg/g	0.63	0.21
Benzo[a]pyrene	µg/g	0.3	0.19
Benzo[b]fluoranthene	µg/g	0.78	0.26
Benzo[k]fluoranthene	µg/g	0.78	0.095
Dibenz[a,h]anthracene	µg/g	0.1	<0.05
Fluoranthene	µg/g	0.69	0.41
Indeno[1,2,3-cd]pyrene	µg/g	0.48	0.12

MW25-3 (75.2 masl)

Sample			SS1
Date			2025-03-27
Depth of Sample (mbgs)			0.3-0.4
Parameter	Units	MECP T7 SCS	Result
Anthracene	µg/g	0.74	0.037
Benz[a]anthracene	µg/g	0.63	0.062
Benzo[a]pyrene	µg/g	0.3	0.091
Benzo[b]fluoranthene	µg/g	0.78	0.12
Benzo[k]fluoranthene	µg/g	0.78	0.04
Dibenz[a,h]anthracene	µg/g	0.1	0.023
Fluoranthene	µg/g	0.69	0.11
Indeno[1,2,3-cd]pyrene	µg/g	0.48	0.13

MW25-1A (74.9 masl)

Sample			SS1
Date			2025-03-28
Depth of Sample (mbgs)			0.2-0.4
Parameter	Units	MECP T7 SCS	Result
Anthracene	µg/g	0.74	<0.005
Benz[a]anthracene	µg/g	0.63	<0.005
Benzo[a]pyrene	µg/g	0.3	0.007
Benzo[b]fluoranthene	µg/g	0.78	0.0074
Benzo[k]fluoranthene	µg/g	0.78	<0.005
Dibenz[a,h]anthracene	µg/g	0.1	<0.005
Fluoranthene	µg/g	0.69	<0.005
Indeno[1,2,3-cd]pyrene	µg/g	0.48	<0.005

MW23-01 (75.27 masl)

Sample			SS1
Date			2023-07-11
Depth of Sample (mbgs)			0.3-0.9
Parameter	Units	MECP T7 SCS	Result
Anthracene	µg/g	0.74	<0.05
Benz[a]anthracene	µg/g	0.63	0.072
Benzo[a]pyrene	µg/g	0.3	0.085
Benzo[b]fluoranthene	µg/g	0.78	0.11
Benzo[k]fluoranthene	µg/g	0.78	<0.05
Dibenz[a,h]anthracene	µg/g	0.1	<0.05
Fluoranthene	µg/g	0.69	0.15
Indeno[1,2,3-cd]pyrene	µg/g	0.48	0.064

MW25-2A (75.9 masl)

Sample			SS1
Date			2025-03-27
Depth of Sample (mbgs)			0.25-0.4
Parameter	Units	MECP T7 SCS	Result
Anthracene	µg/g	0.74	0.24
Benz[a]anthracene	µg/g	0.63	0.92
Benzo[a]pyrene	µg/g	0.3	0.85
Benzo[b]fluoranthene	µg/g	0.78	1.2
Benzo[k]fluoranthene	µg/g	0.78	0.49
Dibenz[a,h]anthracene	µg/g	0.1	0.17
Fluoranthene	µg/g	0.69	2
Indeno[1,2,3-cd]pyrene	µg/g	0.48	0.72

MW23-04 (75.77 masl)

Sample			SS1
Date			2023-07-12
Depth of Sample (mbgs)			0-0.3
Parameter	Units	MECP T7 SCS	Result
Anthracene	µg/g	0.74	1.2
Benz[a]anthracene	µg/g	0.63	3.5
Benzo[a]pyrene	µg/g	0.3	3
Benzo[b]fluoranthene	µg/g	0.78	4.3
Benzo[k]fluoranthene	µg/g	0.78	1.7
Dibenz[a,h]anthracene	µg/g	0.1	0.54
Fluoranthene	µg/g	0.69	8.6
Indeno[1,2,3-cd]pyrene	µg/g	0.48	2

Note

1. This drawing shall be read in conjunction with the associated technical report.

Legend

- Phase One, Phase Two and Record of Site Condition (RSC) Property Boundary
- Soil Sample Meets Applicable Table 7 SCS for PAHs
- Soil Sample Exceeeds Applicable Table 7 SCS for PAHs
- Soil Sample Not Analyzed
- Inferred Extent of PAH Contamination in Soil

1:600

0 10 20 30 m

0 1:1 5 cm

Scale accurate when printed at 100% using paper size ANSI full bleed B (11.0 x 17.0 Inches)

Revision	Date	Issue	Approval
E	06/19/2025	Preliminary	

Client: **Churchill Properties Inc.**

Site: **424 Churchill Avenue North, Ottawa, ON**

Report Title: **Phase Two Environmental Site Assessment**

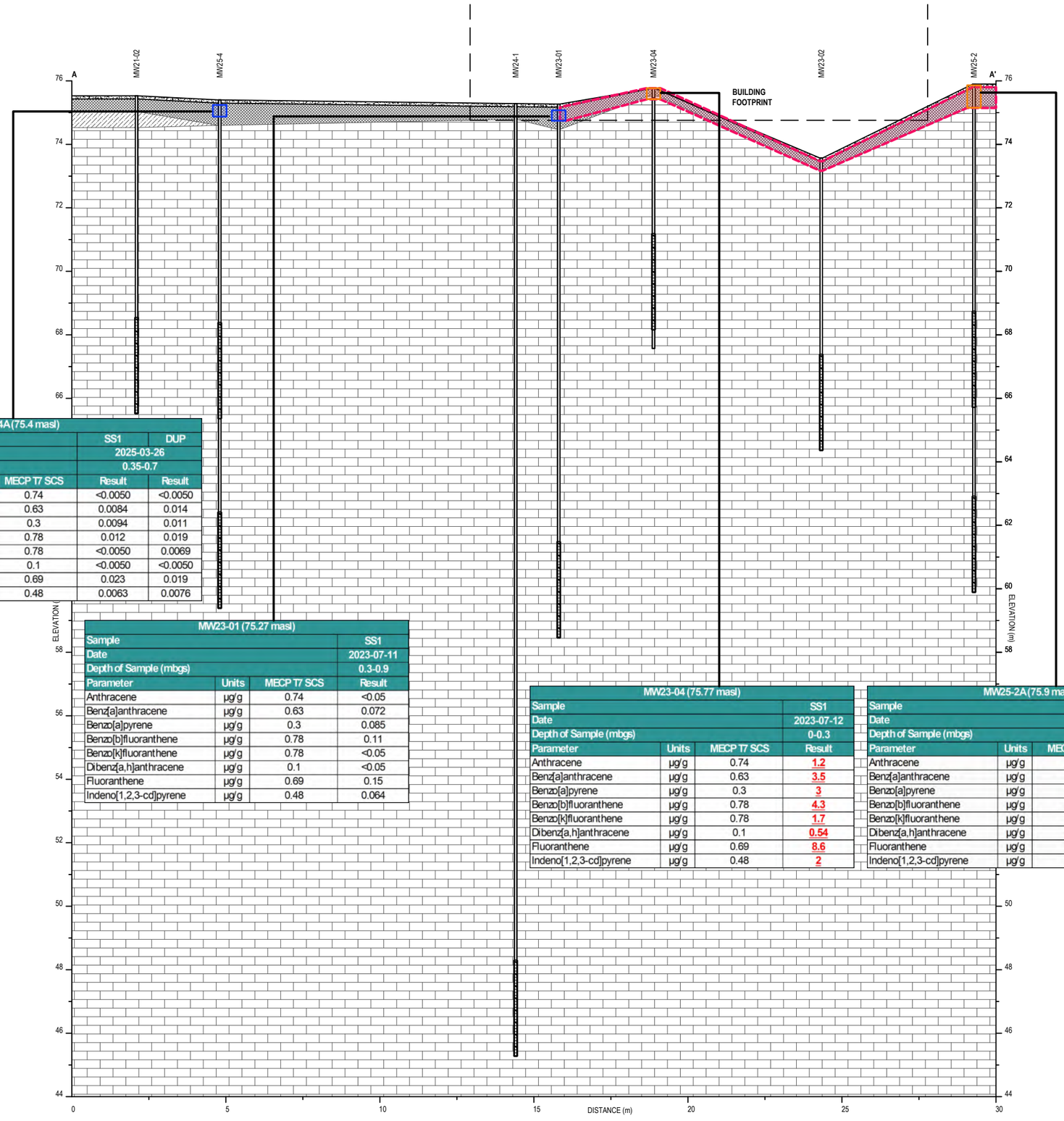
Drawing Title: **PAHs in Soil**

Designed By	Scale
C.O.	As shown
Drawn By	**Date**
K.M.	June 2025
Approved By	**Project No.**
	02103035.000

Figure No.: **9A**

Drawing 9A soil PAH.dwg Folder: C:\DST\02103035.000 424 Churchill\2025 Phase II ESA\DWGs Thursday, June 19, 2025 @ 06:38 by Kris Morin

2713 Lancaster Road Suite 101, Ottawa, Ontario K1B 5R6 Tel: 1-877-300-4800 Website: www.englobecorp.com



MW25-4A (75.4 masl)				
Sample			SS1	DUP
Date			2025-03-26	
Depth of Sample (mbgs)			0.35-0.7	
Parameter	Units	MECP T7 SCS	Result	Result
Anthracene	µg/g	0.74	<0.0050	<0.0050
Benz[a]anthracene	µg/g	0.63	0.0084	0.014
Benzo[a]pyrene	µg/g	0.3	0.0094	0.011
Benzo[b]fluoranthene	µg/g	0.78	0.012	0.019
Benzo[k]fluoranthene	µg/g	0.78	<0.0050	0.0069
Dibenz[a,h]anthracene	µg/g	0.1	<0.0050	<0.0050
Fluoranthene	µg/g	0.69	0.023	0.019
Indeno[1,2,3-cd]pyrene	µg/g	0.48	0.0063	0.0076

MW23-01 (75.27 masl)			
Sample			SS1
Date			2023-07-11
Depth of Sample (mbgs)			0.3-0.9
Parameter	Units	MECP T7 SCS	Result
Anthracene	µg/g	0.74	<0.05
Benz[a]anthracene	µg/g	0.63	0.072
Benzo[a]pyrene	µg/g	0.3	0.085
Benzo[b]fluoranthene	µg/g	0.78	0.11
Benzo[k]fluoranthene	µg/g	0.78	<0.05
Dibenz[a,h]anthracene	µg/g	0.1	<0.05
Fluoranthene	µg/g	0.69	0.15
Indeno[1,2,3-cd]pyrene	µg/g	0.48	0.064

MW23-04 (75.77 masl)			
Sample			SS1
Date			2023-07-12
Depth of Sample (mbgs)			0-0.3
Parameter	Units	MECP T7 SCS	Result
Anthracene	µg/g	0.74	1.2
Benz[a]anthracene	µg/g	0.63	3.5
Benzo[a]pyrene	µg/g	0.3	3
Benzo[b]fluoranthene	µg/g	0.78	4.3
Benzo[k]fluoranthene	µg/g	0.78	1.7
Dibenz[a,h]anthracene	µg/g	0.1	0.54
Fluoranthene	µg/g	0.69	8.6
Indeno[1,2,3-cd]pyrene	µg/g	0.48	2

MW25-2A (75.9 masl)			
Sample			SS1
Date			2025-03-27
Depth of Sample (mbgs)			0.25-0.4
Parameter	Units	MECP T7 SCS	Result
Anthracene	µg/g	0.74	0.24
Benz[a]anthracene	µg/g	0.63	0.92
Benzo[a]pyrene	µg/g	0.3	0.85
Benzo[b]fluoranthene	µg/g	0.78	1.2
Benzo[k]fluoranthene	µg/g	0.78	0.49
Dibenz[a,h]anthracene	µg/g	0.1	0.17
Fluoranthene	µg/g	0.69	2
Indeno[1,2,3-cd]pyrene	µg/g	0.48	0.72

Note

1. This drawing shall be read in conjunction with the associated technical report.
2. Vertical delineation achieved by bedrock located 0.1 - 1.2 mbgs across the Site.

Legend

- Asphalt
- Fill
- Sandy Silt
- Limestone Bedrock
- Monitoring Well Screened Interval
- Soil Sample Exceeds MECP Table 7 SCS for PAHs
- Soil Sample Meets MECP Table 7 SCS for PAHs
- Inferred Extents of PAH Contamination in Soil

Revision	Date	Issue	Approval
E	06/19/2025	Preliminary	

Client: **Churchill Properties Inc.**

Site: **424 Churchill Avenue North, Ottawa, ON**

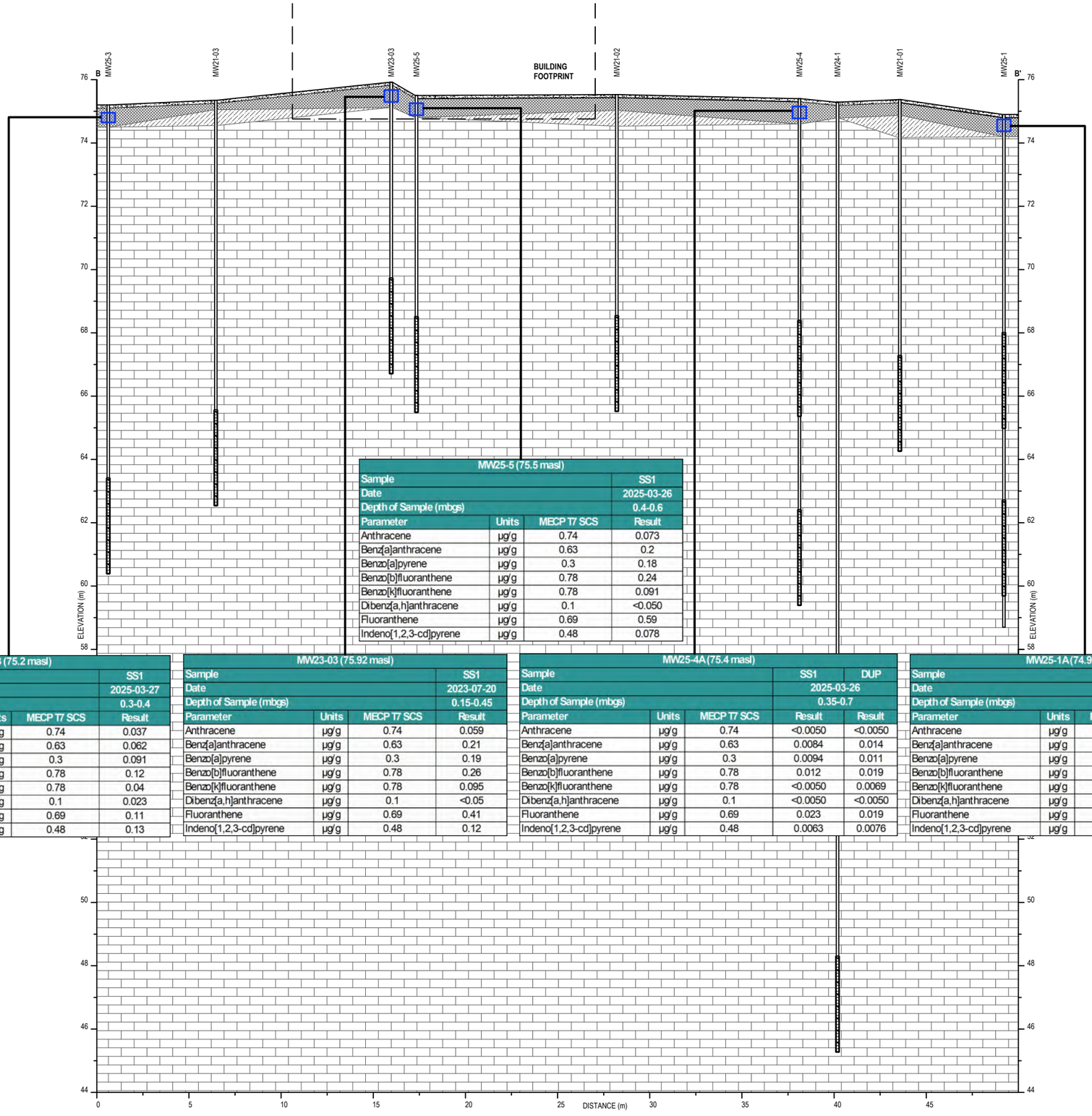
Report Title: **Phase Two Environmental Site Assessment**

Drawing Title: **Cross Section A-A' - PAHs in Soil**

Designed By	Scale
C.O.	As shown
Drawn By	**Date**
K.M.	June 2025
Approved By	**Project No.**
	02103035.000

Figure No.: **9B**

2713 Lancaster Road Suite 101, Ottawa, Ontario K1B 5R6 Tel: 1-877-300-4800 Website: www.englobecorp.com



MW25-5 (75.5 masl)			
Sample			SS1
Date			2025-03-26
Depth of Sample (mbgs)			0.4-0.6
Parameter	Units	MECP T7 SCS	Result
Anthracene	µg/g	0.74	0.073
Benz[a]anthracene	µg/g	0.63	0.2
Benzo[a]pyrene	µg/g	0.3	0.18
Benzo[b]fluoranthene	µg/g	0.78	0.24
Benzo[k]fluoranthene	µg/g	0.78	0.091
Dibenz[a,h]anthracene	µg/g	0.1	<0.050
Fluoranthene	µg/g	0.69	0.59
Indeno[1,2,3-cd]pyrene	µg/g	0.48	0.078

MW25-3 (75.2 masl)			
Sample			SS1
Date			2025-03-27
Depth of Sample (mbgs)			0.3-0.4
Parameter	Units	MECP T7 SCS	Result
Anthracene	µg/g	0.74	0.037
Benz[a]anthracene	µg/g	0.63	0.062
Benzo[a]pyrene	µg/g	0.3	0.091
Benzo[b]fluoranthene	µg/g	0.78	0.12
Benzo[k]fluoranthene	µg/g	0.78	0.04
Dibenz[a,h]anthracene	µg/g	0.1	0.023
Fluoranthene	µg/g	0.69	0.11
Indeno[1,2,3-cd]pyrene	µg/g	0.48	0.13

MW23-03 (75.92 masl)			
Sample			SS1
Date			2023-07-20
Depth of Sample (mbgs)			0.15-0.45
Parameter	Units	MECP T7 SCS	Result
Anthracene	µg/g	0.74	0.059
Benz[a]anthracene	µg/g	0.63	0.21
Benzo[a]pyrene	µg/g	0.3	0.19
Benzo[b]fluoranthene	µg/g	0.78	0.26
Benzo[k]fluoranthene	µg/g	0.78	0.095
Dibenz[a,h]anthracene	µg/g	0.1	<0.05
Fluoranthene	µg/g	0.69	0.41
Indeno[1,2,3-cd]pyrene	µg/g	0.48	0.12

MW25-4A (75.4 masl)				
Sample			SS1	DUP
Date			2025-03-26	
Depth of Sample (mbgs)			0.35-0.7	
Parameter	Units	MECP T7 SCS	Result	Result
Anthracene	µg/g	0.74	<0.0050	<0.0050
Benz[a]anthracene	µg/g	0.63	0.0084	0.014
Benzo[a]pyrene	µg/g	0.3	0.0094	0.011
Benzo[b]fluoranthene	µg/g	0.78	0.012	0.019
Benzo[k]fluoranthene	µg/g	0.78	<0.0050	0.0069
Dibenz[a,h]anthracene	µg/g	0.1	<0.0050	<0.0050
Fluoranthene	µg/g	0.69	0.023	0.019
Indeno[1,2,3-cd]pyrene	µg/g	0.48	0.0063	0.0076

MW25-1A (74.9 masl)			
Sample			SS1
Date			2025-03-28
Depth of Sample (mbgs)			0.2-0.4
Parameter	Units	MECP T7 SCS	Result
Anthracene	µg/g	0.74	<0.005
Benz[a]anthracene	µg/g	0.63	<0.005
Benzo[a]pyrene	µg/g	0.3	0.007
Benzo[b]fluoranthene	µg/g	0.78	0.0074
Benzo[k]fluoranthene	µg/g	0.78	<0.005
Dibenz[a,h]anthracene	µg/g	0.1	<0.005
Fluoranthene	µg/g	0.69	<0.005
Indeno[1,2,3-cd]pyrene	µg/g	0.48	<0.005

Note

1. This drawing shall be read in conjunction with the associated technical report.
2. Vertical delineation achieved by bedrock located 0.1 - 1.2 mbgs across the Site.

Legend

- Asphalt
- Fill
- Sandy Silt
- Limestone Bedrock
- Monitoring Well Screened Interval
- Soil Sample Exceeds MECP Table 7 SCS for PAHs
- Soil Sample Meets MECP Table 7 SCS for PAHs
- Inferred Extents of PAH Contamination in Soil

Revision	Date	Issue	Approval
E	06/19/2025	Preliminary	

Client: **Churchill Properties Inc.**

Site: **424 Churchill Avenue North, Ottawa, ON**

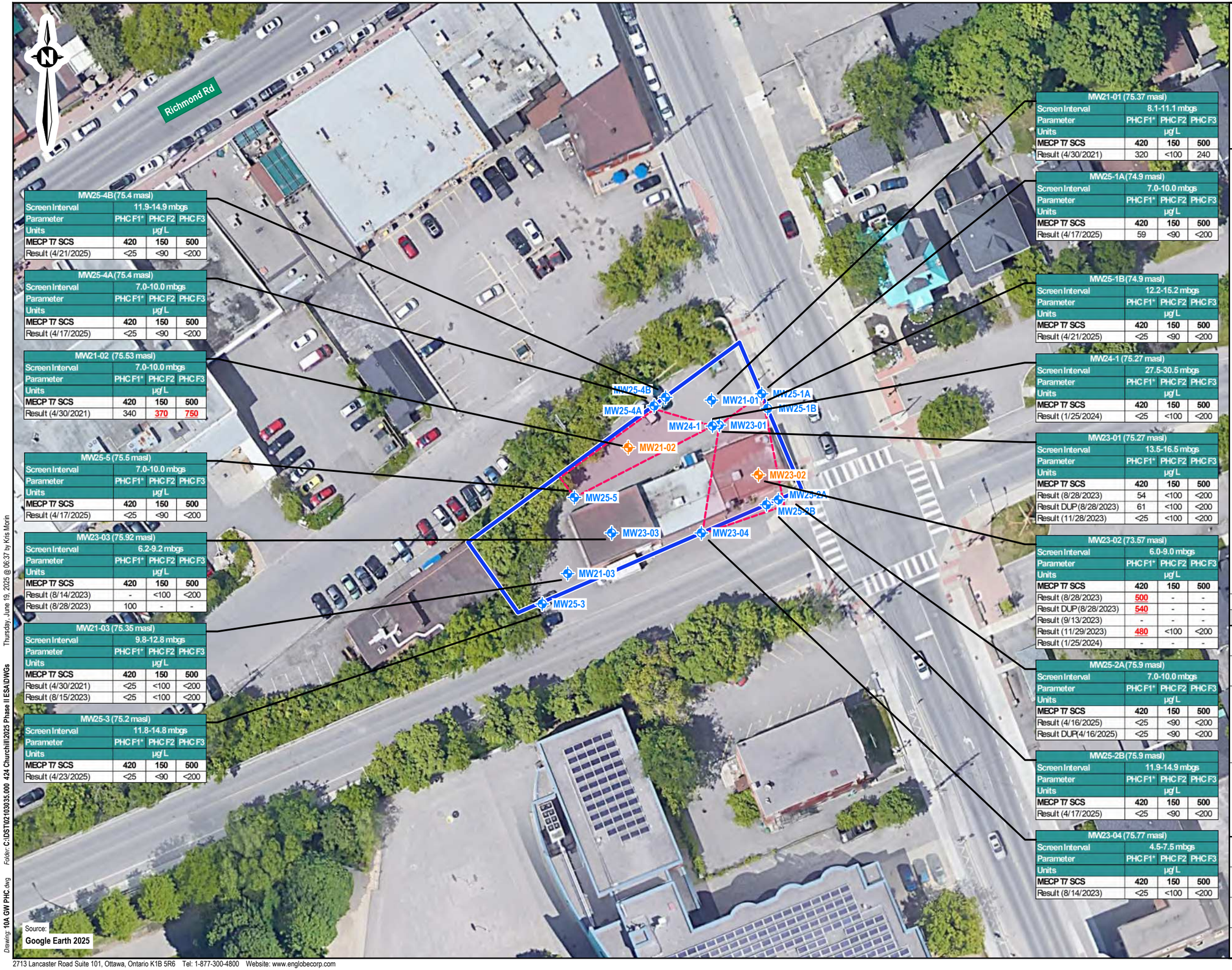
Report Title: **Phase Two Environmental Site Assessment**

Drawing Title: **Cross Section B-B' - PAHs in Soil**

Designed By: C.O.	Scale: As shown
Drawn By: K.M.	Date: June 2025
Approved By:	Project No.: 02103035.000
Figure No.: **9C**	

2713 Lancaster Road Suite 101, Ottawa, Ontario K1B 5R6 Tel: 1-877-300-4800 Website: www.englobecorp.com

Drawing: 9C soil PAH B.dwg Folder: C:\DST\02103035.000 424 Churchill\2025 Phase II ESA\DWGs Thursday, June 19, 2025 @ 06:37 by Kris Morin



MW25-4B (75.4 masl)			
Screen Interval	11.9-14.9 mbgs		
Parameter	PHC F1*	PHC F2	PHC F3
Units	µg/L		
MECP T7 SCS	420	150	500
Result (4/21/2025)	<25	<90	<200

MW25-4A (75.4 masl)			
Screen Interval	7.0-10.0 mbgs		
Parameter	PHC F1*	PHC F2	PHC F3
Units	µg/L		
MECP T7 SCS	420	150	500
Result (4/17/2025)	<25	<90	<200

MW21-02 (75.53 masl)			
Screen Interval	7.0-10.0 mbgs		
Parameter	PHC F1*	PHC F2	PHC F3
Units	µg/L		
MECP T7 SCS	420	150	500
Result (4/30/2021)	340	370	750

MW25-5 (75.5 masl)			
Screen Interval	7.0-10.0 mbgs		
Parameter	PHC F1*	PHC F2	PHC F3
Units	µg/L		
MECP T7 SCS	420	150	500
Result (4/17/2025)	<25	<90	<200

MW23-03 (75.92 masl)			
Screen Interval	6.2-9.2 mbgs		
Parameter	PHC F1*	PHC F2	PHC F3
Units	µg/L		
MECP T7 SCS	420	150	500
Result (8/14/2023)	-	<100	<200
Result (8/28/2023)	100	-	-

MW21-03 (75.35 masl)			
Screen Interval	9.8-12.8 mbgs		
Parameter	PHC F1*	PHC F2	PHC F3
Units	µg/L		
MECP T7 SCS	420	150	500
Result (4/30/2021)	<25	<100	<200
Result (8/15/2023)	<25	<100	<200

MW25-3 (75.2 masl)			
Screen Interval	11.8-14.8 mbgs		
Parameter	PHC F1*	PHC F2	PHC F3
Units	µg/L		
MECP T7 SCS	420	150	500
Result (4/23/2025)	<25	<90	<200

MW21-01 (75.37 masl)			
Screen Interval	8.1-11.1 mbgs		
Parameter	PHC F1*	PHC F2	PHC F3
Units	µg/L		
MECP T7 SCS	420	150	500
Result (4/30/2021)	320	<100	240

MW25-1A (74.9 masl)			
Screen Interval	7.0-10.0 mbgs		
Parameter	PHC F1*	PHC F2	PHC F3
Units	µg/L		
MECP T7 SCS	420	150	500
Result (4/17/2025)	59	<90	<200

MW25-1B (74.9 masl)			
Screen Interval	12.2-15.2 mbgs		
Parameter	PHC F1*	PHC F2	PHC F3
Units	µg/L		
MECP T7 SCS	420	150	500
Result (4/21/2025)	<25	<90	<200

MW24-1 (75.27 masl)			
Screen Interval	27.5-30.5 mbgs		
Parameter	PHC F1*	PHC F2	PHC F3
Units	µg/L		
MECP T7 SCS	420	150	500
Result (1/25/2024)	<25	<100	<200

MW23-01 (75.27 masl)			
Screen Interval	13.5-16.5 mbgs		
Parameter	PHC F1*	PHC F2	PHC F3
Units	µg/L		
MECP T7 SCS	420	150	500
Result (8/28/2023)	54	<100	<200
Result DUP (8/28/2023)	61	<100	<200
Result (11/28/2023)	<25	<100	<200

MW23-02 (73.57 masl)			
Screen Interval	6.0-9.0 mbgs		
Parameter	PHC F1*	PHC F2	PHC F3
Units	µg/L		
MECP T7 SCS	420	150	500
Result (8/28/2023)	500	-	-
Result DUP (8/28/2023)	540	-	-
Result (9/13/2023)	-	-	-
Result (11/29/2023)	480	<100	<200
Result (1/25/2024)	-	-	-

MW25-2A (75.9 masl)			
Screen Interval	7.0-10.0 mbgs		
Parameter	PHC F1*	PHC F2	PHC F3
Units	µg/L		
MECP T7 SCS	420	150	500
Result (4/16/2025)	<25	<90	<200
Result DUP (4/16/2025)	<25	<90	<200

MW25-2B (75.9 masl)			
Screen Interval	11.9-14.9 mbgs		
Parameter	PHC F1*	PHC F2	PHC F3
Units	µg/L		
MECP T7 SCS	420	150	500
Result (4/17/2025)	<25	<90	<200

MW23-04 (75.77 masl)			
Screen Interval	4.5-7.5 mbgs		
Parameter	PHC F1*	PHC F2	PHC F3
Units	µg/L		
MECP T7 SCS	420	150	500
Result (8/14/2023)	<25	<100	<200

Source:
Google Earth 2025

ENGLOBE

Note

1. This drawing shall be read in conjunction with the associated technical report.
2. *: Higher of PHC F1 and PHC F1 minus BTEX concentrations
3. -: Parameter not analyzed on specified date.

Legend

- Phase One, Phase Two and Record of Site Condition (RSC) Property Boundary
- Groundwater Sample Meets Applicable Table 7 SCS for PHCs
- Groundwater Sample Exceeds Applicable Table 7 SCS for PHCs
- Inferred Extent of PHC Contamination in Groundwater

1:600

0 10 20 30 m

0 1:1 5 cm

Scale accurate when printed at 100% using paper size ANSI full bleed B (11.0 x 17.0 Inches)

Revision	Date	Issue	Approval
E	06/19/2025	Preliminary	

Client
Churchill Properties Inc.

Site
424 Churchill Avenue North, Ottawa, ON

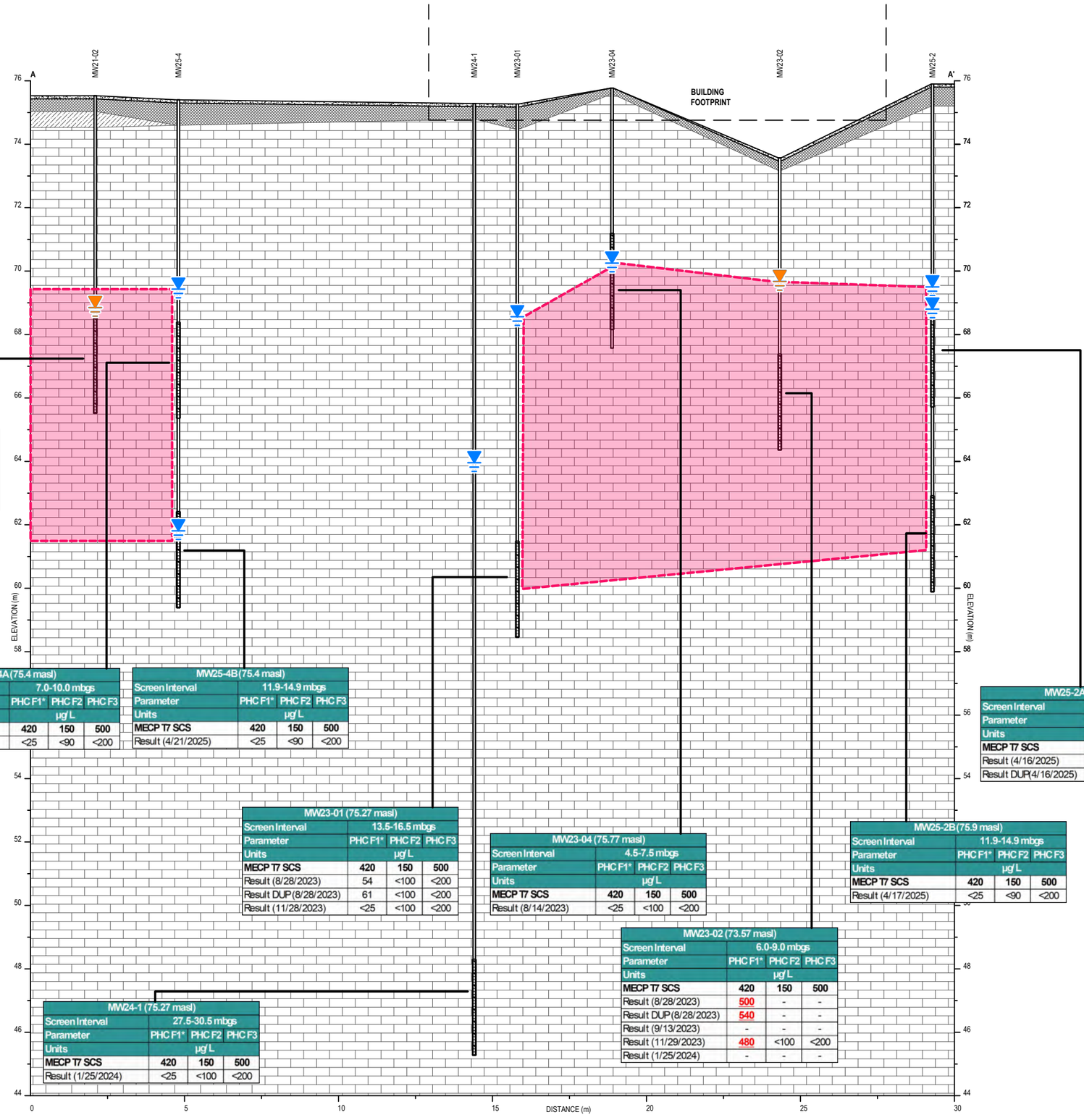
Report Title
Phase Two Environmental Site Assessment

Drawing Title
PHCs in Groundwater

Designed By	Scale
C.O.	As shown
Drawn By	**Date**
K.M.	June 2025
Approved By	**Project No.**
	02103035.000

Figure No.
10A

Drawing: 10A GW PHC.dwg Folder: C:\DST\02103035.000 424 Churchill\2025 Phase II ESA\DWGs Thursday, June 19, 2025 @ 06:37 by Kris Morin



MW21-02 (75.53 masl)			
Screen Interval	7.0-10.0 mbgs		
Parameter	PHC F1*	PHC F2	PHC F3
Units	µg/L		
MECP T7 SCS	420	150	500
Result (4/30/2021)	340	370	750

MW25-4A (75.4 masl)			
Screen Interval	7.0-10.0 mbgs		
Parameter	PHC F1*	PHC F2	PHC F3
Units	µg/L		
MECP T7 SCS	420	150	500
Result (4/17/2025)	<25	<90	<200

MW25-4B (75.4 masl)			
Screen Interval	11.9-14.9 mbgs		
Parameter	PHC F1*	PHC F2	PHC F3
Units	µg/L		
MECP T7 SCS	420	150	500
Result (4/21/2025)	<25	<90	<200

MW23-01 (75.27 masl)			
Screen Interval	13.5-16.5 mbgs		
Parameter	PHC F1*	PHC F2	PHC F3
Units	µg/L		
MECP T7 SCS	420	150	500
Result (8/28/2023)	54	<100	<200
Result DUP (8/28/2023)	61	<100	<200
Result (11/28/2023)	<25	<100	<200

MW23-04 (75.77 masl)			
Screen Interval	4.5-7.5 mbgs		
Parameter	PHC F1*	PHC F2	PHC F3
Units	µg/L		
MECP T7 SCS	420	150	500
Result (8/14/2023)	<25	<100	<200

MW24-1 (75.27 masl)			
Screen Interval	27.5-30.5 mbgs		
Parameter	PHC F1*	PHC F2	PHC F3
Units	µg/L		
MECP T7 SCS	420	150	500
Result (1/25/2024)	<25	<100	<200

MW23-02 (73.57 masl)			
Screen Interval	6.0-9.0 mbgs		
Parameter	PHC F1*	PHC F2	PHC F3
Units	µg/L		
MECP T7 SCS	420	150	500
Result (8/28/2023)	500	-	-
Result DUP (8/28/2023)	540	-	-
Result (9/13/2023)	-	-	-
Result (11/29/2023)	480	<100	<200
Result (1/25/2024)	-	-	-

MW25-2A (75.9 masl)			
Screen Interval	7.0-10.0 mbgs		
Parameter	PHC F1*	PHC F2	PHC F3
Units	µg/L		
MECP T7 SCS	420	150	500
Result (4/16/2025)	<25	<90	<200
Result DUP (4/16/2025)	<25	<90	<200

MW25-2B (75.9 masl)			
Screen Interval	11.9-14.9 mbgs		
Parameter	PHC F1*	PHC F2	PHC F3
Units	µg/L		
MECP T7 SCS	420	150	500
Result (4/17/2025)	<25	<90	<200

Note

1. This drawing shall be read in conjunction with the associated technical report.

Legend

- Asphalt
- Fill
- Sandy Silt
- Limestone Bedrock
- Monitoring Well Screened Interval
- GW Sample Exceeds MECP Table 7 SCS for PHCs
- GW Sample Meets MECP Table 7 SCS for PHCs
- Inferred Extents of PHC Contamination in Groundwater

E	06/19/2025	Preliminary	
Revision	Date	Issue	Approval

Client: **Churchill Properties Inc.**

Site: **424 Churchill Avenue North, Ottawa, ON**

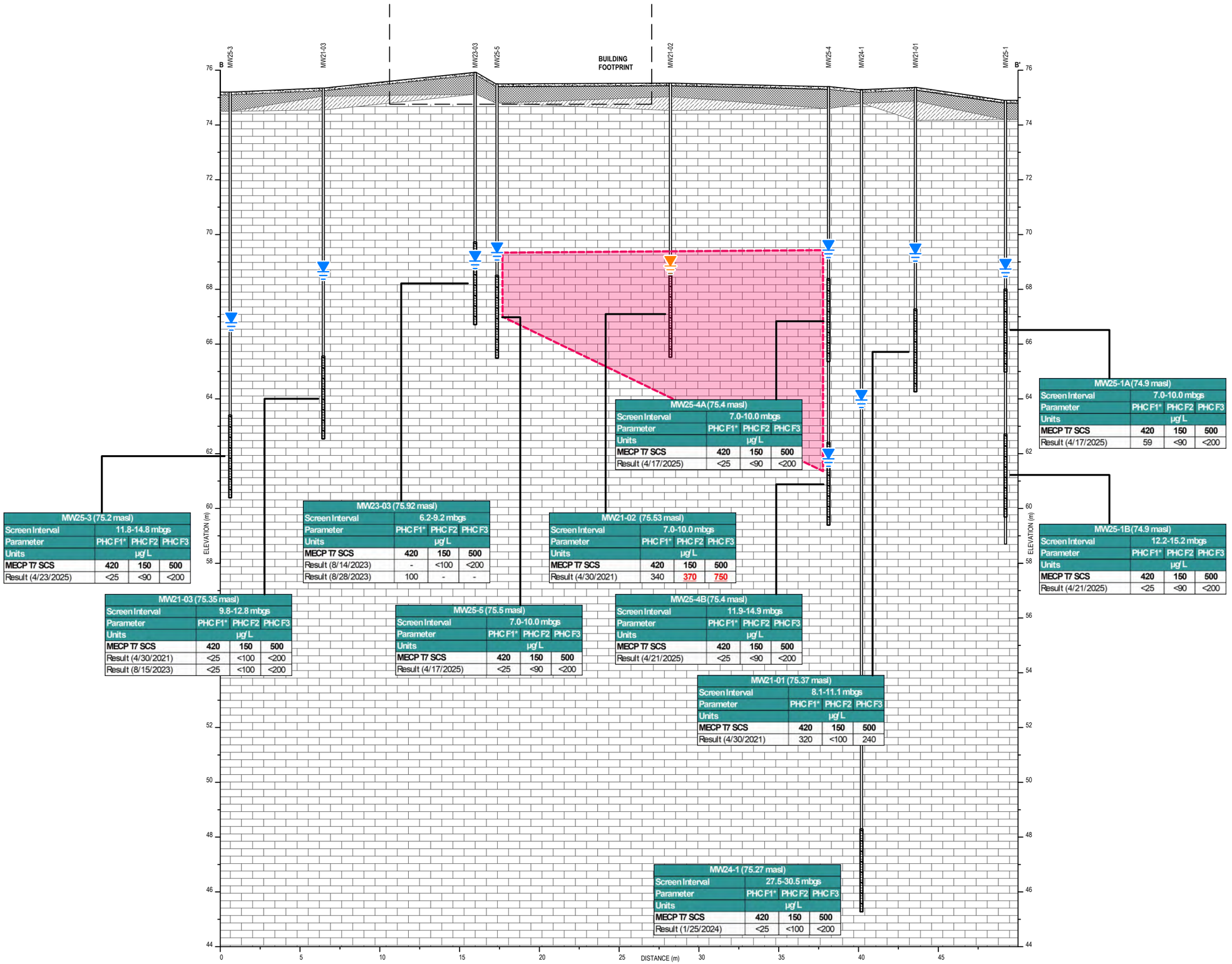
Report Title: **Phase Two Environmental Site Assessment**

Drawing Title: **Cross Section A-A' - PHCs in Groundwater**

Designed By	Scale
C.O.	As shown
Drawn By	**Date**
K.M.	June 2025
Approved By	**Project No.**
	02103035.000

Figure No.: **10B**

Drawing: 10B GW PHC A.dwg Folder: C:\DST\02103035.000 424 Churchill\2025 Phase II ESA\DWGs Thursday, June 19, 2025 @ 06:37 by Kris Morin



MW25-4A (75.4 masl)			
Screen Interval	7.0-10.0 mbgs		
Parameter	PHC F1*	PHC F2	PHC F3
Units	µg/L		
MECP T7 SCS	420	150	500
Result (4/17/2025)	<25	<90	<200

MW25-1A (74.9 masl)			
Screen Interval	7.0-10.0 mbgs		
Parameter	PHC F1*	PHC F2	PHC F3
Units	µg/L		
MECP T7 SCS	420	150	500
Result (4/17/2025)	59	<90	<200

MW25-3 (75.2 masl)			
Screen Interval	11.8-14.8 mbgs		
Parameter	PHC F1*	PHC F2	PHC F3
Units	µg/L		
MECP T7 SCS	420	150	500
Result (4/23/2025)	<25	<90	<200

MW23-03 (75.92 masl)			
Screen Interval	6.2-9.2 mbgs		
Parameter	PHC F1*	PHC F2	PHC F3
Units	µg/L		
MECP T7 SCS	420	150	500
Result (8/14/2023)	-	<100	<200
Result (8/28/2023)	100	-	-

MW21-02 (75.53 masl)			
Screen Interval	7.0-10.0 mbgs		
Parameter	PHC F1*	PHC F2	PHC F3
Units	µg/L		
MECP T7 SCS	420	150	500
Result (4/30/2021)	340	370	750

MW25-1B (74.9 masl)			
Screen Interval	12.2-15.2 mbgs		
Parameter	PHC F1*	PHC F2	PHC F3
Units	µg/L		
MECP T7 SCS	420	150	500
Result (4/21/2025)	<25	<90	<200

MW21-03 (75.35 masl)			
Screen Interval	9.8-12.8 mbgs		
Parameter	PHC F1*	PHC F2	PHC F3
Units	µg/L		
MECP T7 SCS	420	150	500
Result (4/30/2021)	<25	<100	<200
Result (8/15/2023)	<25	<100	<200

MW25-5 (75.5 masl)			
Screen Interval	7.0-10.0 mbgs		
Parameter	PHC F1*	PHC F2	PHC F3
Units	µg/L		
MECP T7 SCS	420	150	500
Result (4/17/2025)	<25	<90	<200

MW25-4B (75.4 masl)			
Screen Interval	11.9-14.9 mbgs		
Parameter	PHC F1*	PHC F2	PHC F3
Units	µg/L		
MECP T7 SCS	420	150	500
Result (4/21/2025)	<25	<90	<200

MW21-01 (75.37 masl)			
Screen Interval	8.1-11.1 mbgs		
Parameter	PHC F1*	PHC F2	PHC F3
Units	µg/L		
MECP T7 SCS	420	150	500
Result (4/30/2021)	320	<100	240

MW24-1 (75.27 masl)			
Screen Interval	27.5-30.5 mbgs		
Parameter	PHC F1*	PHC F2	PHC F3
Units	µg/L		
MECP T7 SCS	420	150	500
Result (1/25/2024)	<25	<100	<200

Note

1. This drawing shall be read in conjunction with the associated technical report.

Legend

- Asphalt
- Fill
- Sandy Silt
- Limestone Bedrock
- Monitoring Well Screened Interval
- GW Sample Exceeds MECP Table 7 SCS for PHCs
- GW Sample Meets MECP Table 7 SCS for PHCs
- Inferred Extents of PHC Contamination in Groundwater

Revision	Date	Issue	Approval
E	06/19/2025	Preliminary	

Client: **Churchill Properties Inc.**

Site: **424 Churchill Avenue North, Ottawa, ON**

Report Title: **Phase Two Environmental Site Assessment**

Drawing Title: **Cross Section B-B' - PHCs in Groundwater**

Designed By	Scale
C.O.	As shown
Drawn By	**Date**
K.M.	June 2025
Approved By	**Project No.**
	02103035.000

Figure No.: **10C**

Drawing: 10C GW PHC B.dwg Folder: C:\DST\02103035.000 424 Churchill\2025 Phase II ESA\DWGs Thursday, June 19, 2025 @ 06:37 by Kris Morin

2713 Lancaster Road Suite 101, Ottawa, Ontario K1B 5R6 Tel: 1-877-300-4800 Website: www.englobecorp.com

MW24-1 (75.27 masl)

Screen Interval	27.5-30.5 mbgs						
Parameter	Beznene	1,1-DCE	cis-1,2-DCE	trans-1,2-DCE	PCE	TCE	VC
Units	µg/L						
MECP T7 SCS	0.5	0.5	1.6	1.6	0.5	0.5	0.5
Result (1/25/2024)	0.39	<0.2	<0.5	<0.5	<0.2	<0.2	<0.2

MW25-4B (75.4 masl)

Screen Interval	11.9-14.9 mbgs						
Parameter	Beznene	1,1-DCE	cis-1,2-DCE	trans-1,2-DCE	PCE	TCE	VC
Units	µg/L						
MECP T7 SCS	0.5	0.5	1.6	1.6	0.5	0.5	0.5
Result (4/21/2025)	0.65	<0.2	24	<0.5	<0.2	0.47	5

MW25-4A (75.4 masl)

Screen Interval	7.0-10.0 mbgs						
Parameter	Beznene	1,1-DCE	cis-1,2-DCE	trans-1,2-DCE	PCE	TCE	VC
Units	µg/L						
MECP T7 SCS	0.5	0.5	1.6	1.6	0.5	0.5	0.5
Result (4/17/2025)	0.91	<0.2	210	1.5	0.25	0.51	60

MW21-02 (75.53 masl)

Screen Interval	7.0-10.0 mbgs						
Parameter	Beznene	1,1-DCE	cis-1,2-DCE	trans-1,2-DCE	PCE	TCE	VC
Units	µg/L						
MECP T7 SCS	0.5	0.5	1.6	1.6	0.5	0.5	0.5
Result (4/30/2021)	<0.2	0.66	860	12	890	160	31

MW25-5 (75.5 masl)

Screen Interval	7.0-10.0 mbgs						
Parameter	Beznene	1,1-DCE	cis-1,2-DCE	trans-1,2-DCE	PCE	TCE	VC
Units	µg/L						
MECP T7 SCS	0.5	0.5	1.6	1.6	0.5	0.5	0.5
Result (4/17/2025)	<0.17	0.62	390	8.4	1.1	5.7	95

MW23-03 (75.92 masl)

Screen Interval	6.2-9.2 mbgs						
Parameter	Beznene	1,1-DCE	cis-1,2-DCE	trans-1,2-DCE	PCE	TCE	VC
Units	µg/L						
MECP T7 SCS	0.5	0.5	1.6	1.6	0.5	0.5	0.5
Result (8/14/2023)	<0.2	2	940	14	9.6	23	88
Result (8/28/2023)	<0.2	-	-	-	-	-	-

MW21-03 (75.35 masl)

Screen Interval	9.8-12.8 mbgs						
Parameter	Beznene	1,1-DCE	cis-1,2-DCE	trans-1,2-DCE	PCE	TCE	VC
Units	µg/L						
MECP T7 SCS	0.5	0.5	1.6	1.6	0.5	0.5	0.5
Result (4/30/2021)	<0.2	<0.2	1.5	<0.5	32	2	<0.2
Result (8/15/2023)	<0.17	<0.2	<0.5	<0.5	2.4	0.72	<0.2

MW25-3 (75.2 masl)

Screen Interval	11.8-14.8 mbgs						
Parameter	Beznene	1,1-DCE	cis-1,2-DCE	trans-1,2-DCE	PCE	TCE	VC
Units	µg/L						
MECP T7 SCS	0.5	0.5	1.6	1.6	0.5	0.5	0.5
Result (4/23/2025)	<0.17	<0.20	<0.50	<0.50	0.23	<0.20	<0.20

Source: Google Earth 2025

MW21-01 (75.37 masl)

Screen Interval	8.1-11.1 mbgs						
Parameter	Beznene	1,1-DCE	cis-1,2-DCE	trans-1,2-DCE	PCE	TCE	VC
Units	µg/L						
MECP T7 SCS	0.5	0.5	1.6	1.6	0.5	0.5	0.5
Result (4/30/2021)	<0.2	<0.2	220	3.7	930	100	7

MW25-1A (74.9 masl)

Screen Interval	7.0-10.0 mbgs						
Parameter	Beznene	1,1-DCE	cis-1,2-DCE	trans-1,2-DCE	PCE	TCE	VC
Units	µg/L						
MECP T7 SCS	0.5	0.5	1.6	1.6	0.5	0.5	0.5
Result (4/17/2025)	0.57	0.61	300	4.5	120	98	41

MW25-1B (74.9 masl)

Screen Interval	12.2-15.2 mbgs						
Parameter	Beznene	1,1-DCE	cis-1,2-DCE	trans-1,2-DCE	PCE	TCE	VC
Units	µg/L						
MECP T7 SCS	0.5	0.5	1.6	1.6	0.5	0.5	0.5
Result (4/21/2025)	<0.17	<0.2	50	0.93	2.2	4.9	0.7

MW23-01 (75.27 masl)

Screen Interval	13.5-16.5 mbgs						
Parameter	Beznene	1,1-DCE	cis-1,2-DCE	trans-1,2-DCE	PCE	TCE	VC
Units	µg/L						
MECP T7 SCS	0.5	0.5	1.6	1.6	0.5	0.5	0.5
Result (8/28/2023)	0.22	1.2	630	4.7	13	110	100
Result DUP (8/28/2023)	0.25	1.2	590	4.6	12	110	100
Result (11/28/2023)	<0.17	<0.2	40	0.69	0.57	1.2	7.3

MW23-02 (73.57 masl)

Screen Interval	6.0-9.0 mbgs						
Parameter	Beznene	1,1-DCE	cis-1,2-DCE	trans-1,2-DCE	PCE	TCE	VC
Units	µg/L						
MECP T7 SCS	0.5	0.5	1.6	1.6	0.5	0.5	0.5
Result (8/28/2023)	0.33	-	-	-	-	-	-
Result DUP (8/28/2023)	0.38	-	-	-	-	-	-
Result (9/13/2023)	<0.2	<0.2	16	1.7	720	44	0.96
Result (11/29/2023)	<0.17	0.25	33	0.94	1400	120	4
Result (1/25/2024)	<0.2	<0.2	27	1.4	730	51	3.2

MW25-2A (75.9 masl)

Screen Interval	7.0-10.0 mbgs						
Parameter	Beznene	1,1-DCE	cis-1,2-DCE	trans-1,2-DCE	PCE	TCE	VC
Units	µg/L						
MECP T7 SCS	0.5	0.5	1.6	1.6	0.5	0.5	0.5
Result (4/16/2025)	0.33	<0.2	11	1.1	39	25	0.22
Result DUP(4/16/2025)	0.28	<0.2	11	0.97	31	23	<0.2

MW25-2B (75.9 masl)

Screen Interval	11.9-14.9 mbgs						
Parameter	Beznene	1,1-DCE	cis-1,2-DCE	trans-1,2-DCE	PCE	TCE	VC
Units	µg/L						
MECP T7 SCS	0.5	0.5	1.6	1.6	0.5	0.5	0.5
Result (4/17/2025)	<0.17	<0.2	5.4	1.1	17	5.3	<0.2

MW23-04 (75.77 masl)

Screen Interval	4.5-7.5 mbgs						
Parameter	Beznene	1,1-DCE	cis-1,2-DCE	trans-1,2-DCE	PCE	TCE	VC
Units	µg/L						
MECP T7 SCS	0.5	0.5	1.6	1.6	0.5	0.5	0.5
Result (8/14/2023)	<0.17	<0.2	<0.5	<0.5	8.4	0.65	<0.2

Note

1. This drawing shall be read in conjunction with the associated technical report.
2. -: Parameter not analyzed on specified date.
3. 1,1-DCE: 1,1-Dichloroethylene
4. cis-1,2-DCE: cis-1,2-Dichloroethylene
5. trans-1,2-DCE: trans-1,2-Dichloroethylene
6. PCE: Tetrachloroethylene
7. TCE: Trichloroethylene
8. VC: Vinyl chloride

Legend

- Phase One, Phase Two and Record of Site Condition (RSC) Property Boundary
- Groundwater Sample Meets Applicable Table 7 SCS for VOCs
- Groundwater Sample Exceeds Applicable Table 7 SCS for VOCs
- Inferred Extent of VOC Contamination in Groundwater

1:600

0 10 20 30 m

0 1:1 5 cm

Scale accurate when printed at 100% using paper size ANSI full bleed B (11.0 x 17.0 Inches)

Revision	Date	Issue	Approval
E	06/19/2025	Preliminary	

Client: Churchill Properties Inc.

Site: 424 Churchill Avenue North, Ottawa, ON

Report Title: Phase Two Environmental Site Assessment

Drawing Title: VOCs in Groundwater

Designed By	Scale
C.O.	As shown
Drawn By	Date
K.M.	June 2025
Approved By	Project No.
	02103035.000

Figure No. 11A

Drawing: 11A GW VOC.dwg Folder: C:\DST\02103035.000 424 Churchill\2025 Phase II ESA\DWGs Thursday, June 19, 2025 @ 06:37 by Kris Morin

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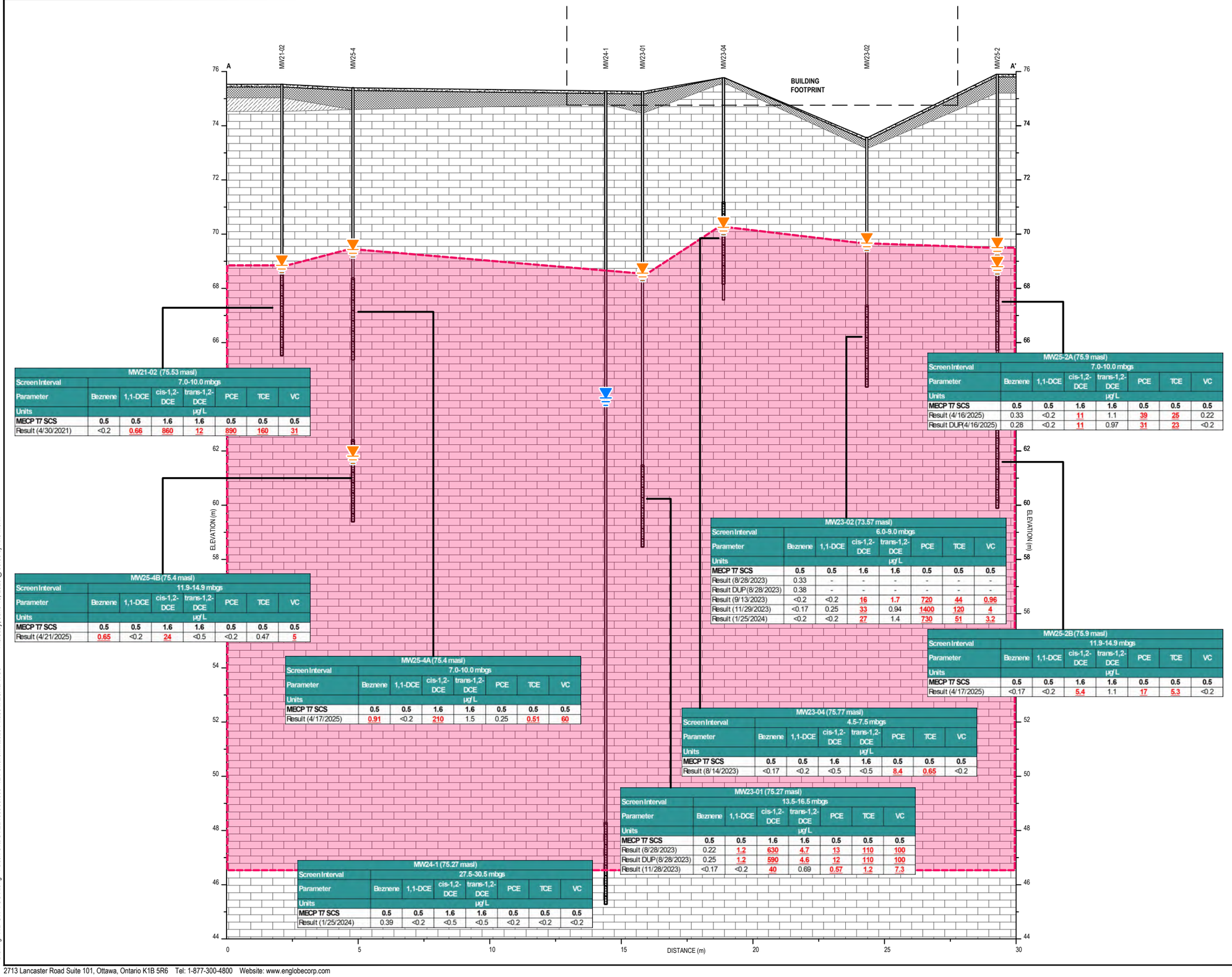


MW21-02 (75.53 masl)							
Screen Interval	7.0-10.0 mbgs						
Parameter	Benzene	1,1-DCE	cis-1,2-DCE	trans-1,2-DCE	PCE	TCE	VC
Units	µg/L						
MECP T7 SCS	**0.5**	**0.5**	**1.6**	**1.6**	**0.5**	**0.5**	**0.5**
Result (4/30/2021)	<0.2	0.66	860	12	890	160	31

MW25-2A (75.9 masl)							
Screen Interval	7.0-10.0 mbgs						
Parameter	Benzene	1,1-DCE	cis-1,2-DCE	trans-1,2-DCE	PCE	TCE	VC
Units	µg/L						
MECP T7 SCS	**0.5**	**0.5**	**1.6**	**1.6**	**0.5**	**0.5**	**0.5**
Result (4/16/2025)	0.33	<0.2	11	1.1	39	25	0.22
Result DUP(4/16/2025)	0.28	<0.2	11	0.97	31	23	<0.2

MW23-02 (73.57 masl)							
Screen Interval	6.0-9.0 mbgs						
Parameter	Benzene	1,1-DCE	cis-1,2-DCE	trans-1,2-DCE	PCE	TCE	VC
Units	µg/L						
MECP T7 SCS	**0.5**	**0.5**	**1.6**	**1.6**	**0.5**	**0.5**	**0.5**
Result (8/28/2023)	0.33	-	-	-	-	-	-
Result DUP(8/28/2023)	0.38	-	-	-	-	-	-
Result (9/13/2023)	<0.2	<0.2	16	1.7	720	44	0.96
Result (11/29/2023)	<0.17	0.25	33	0.94	1400	120	4
Result (1/25/2024)	<0.2	<0.2	27	1.4	730	51	3.2

MW25-4B (75.4 masl)							
Screen Interval	11.9-14.9 mbgs						
Parameter	Benzene	1,1-DCE	cis-1,2-DCE	trans-1,2-DCE	PCE	TCE	VC
Units	µg/L						
MECP T7 SCS	**0.5**	**0.5**	**1.6**	**1.6**	**0.5**	**0.5**	**0.5**
Result (4/21/2025)	0.65	<0.2	24	<0.5	<0.2	0.47	5

MW25-2B (75.9 masl)							
Screen Interval	11.9-14.9 mbgs						
Parameter	Benzene	1,1-DCE	cis-1,2-DCE	trans-1,2-DCE	PCE	TCE	VC
Units	µg/L						
MECP T7 SCS	**0.5**	**0.5**	**1.6**	**1.6**	**0.5**	**0.5**	**0.5**
Result (4/17/2025)	<0.17	<0.2	5.4	1.1	17	5.3	<0.2

MW25-4A (75.4 masl)							
Screen Interval	7.0-10.0 mbgs						
Parameter	Benzene	1,1-DCE	cis-1,2-DCE	trans-1,2-DCE	PCE	TCE	VC
Units	µg/L						
MECP T7 SCS	**0.5**	**0.5**	**1.6**	**1.6**	**0.5**	**0.5**	**0.5**
Result (4/17/2025)	0.91	<0.2	210	1.5	0.25	0.51	60

MW23-04 (75.77 masl)							
Screen Interval	4.5-7.5 mbgs						
Parameter	Benzene	1,1-DCE	cis-1,2-DCE	trans-1,2-DCE	PCE	TCE	VC
Units	µg/L						
MECP T7 SCS	**0.5**	**0.5**	**1.6**	**1.6**	**0.5**	**0.5**	**0.5**
Result (8/14/2023)	<0.17	<0.2	<0.5	<0.5	8.4	0.65	<0.2

MW23-01 (75.27 masl)							
Screen Interval	13.5-16.5 mbgs						
Parameter	Benzene	1,1-DCE	cis-1,2-DCE	trans-1,2-DCE	PCE	TCE	VC
Units	µg/L						
MECP T7 SCS	**0.5**	**0.5**	**1.6**	**1.6**	**0.5**	**0.5**	**0.5**
Result (8/28/2023)	0.22	1.2	630	4.7	13	110	100
Result DUP(8/28/2023)	0.25	1.2	590	4.6	12	110	100
Result (11/28/2023)	<0.17	<0.2	40	0.69	0.57	1.2	7.3

MW24-1 (75.27 masl)							
Screen Interval	27.5-30.5 mbgs						
Parameter	Benzene	1,1-DCE	cis-1,2-DCE	trans-1,2-DCE	PCE	TCE	VC
Units	µg/L						
MECP T7 SCS	**0.5**	**0.5**	**1.6**	**1.6**	**0.5**	**0.5**	**0.5**
Result (1/25/2024)	0.39	<0.2	<0.5	<0.5	<0.2	<0.2	<0.2

Note

1. This drawing shall be read in conjunction with the associated technical report.

Legend

- Asphalt
- Fill
- Sandy Silt
- Limestone Bedrock
- Monitoring Well Screened Interval
- GW Sample Exceeds MECP Table 7 SCS for VOCs
- GW Sample Meets MECP Table 7 SCS for VOCs
- Inferred Extents of VOC Contamination in Groundwater

Revision	Date	Issue	Approval
E	06/19/2025	Preliminary	

Client: **Churchill Properties Inc.**

Site: **424 Churchill Avenue North, Ottawa, ON**

Report Title: **Phase Two Environmental Site Assessment**

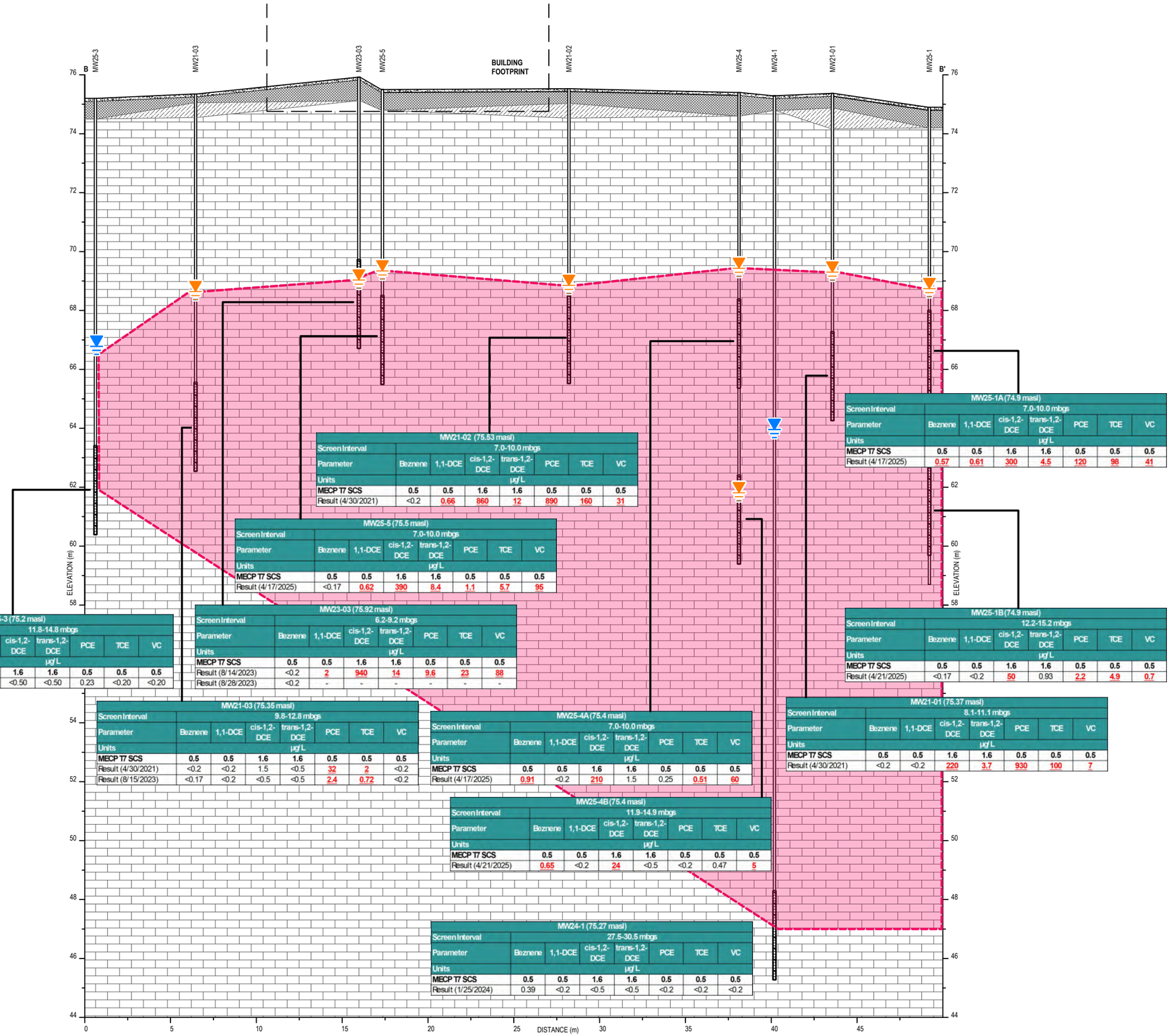
Drawing Title: **Cross Section A-A' - VOCs in Groundwater**

Designed By	Scale
C.O.	As shown
Drawn By	**Date**
K.M.	June 2025
Approved By	**Project No.**
	02103035.000

Figure No.: **11B**

Drawing: 11B GW VOC A.dwg Folder: C:\DST\02103035.000 424 Churchill\2025 Phase II ESA\DWGs Thursday, June 19, 2025 @ 06:36 by Kris Morin

2713 Lancaster Road Suite 101, Ottawa, Ontario K1B 5R6 Tel: 1-877-300-4800 Website: www.englobecorp.com



MW21-02 (75.53 masl)							
Screen Interval	7.0-10.0 mbgs						
Parameter	Benzene	1,1-DCE	cis-1,2-DCE	trans-1,2-DCE	PCE	TCE	VC
Units	µg/L						
MECP T7 SCS	0.5	0.5	1.6	1.6	0.5	0.5	0.5
Result (4/30/2021)	<0.2	0.66	860	12	890	160	31

MW25-1A (74.9 masl)							
Screen Interval	7.0-10.0 mbgs						
Parameter	Benzene	1,1-DCE	cis-1,2-DCE	trans-1,2-DCE	PCE	TCE	VC
Units	µg/L						
MECP T7 SCS	0.5	0.5	1.6	1.6	0.5	0.5	0.5
Result (4/17/2025)	0.57	0.61	300	4.5	120	98	41

MW25-5 (75.5 masl)							
Screen Interval	7.0-10.0 mbgs						
Parameter	Benzene	1,1-DCE	cis-1,2-DCE	trans-1,2-DCE	PCE	TCE	VC
Units	µg/L						
MECP T7 SCS	0.5	0.5	1.6	1.6	0.5	0.5	0.5
Result (4/17/2025)	<0.17	0.62	390	8.4	1.1	5.7	95

MW25-3 (75.2 masl)							
Screen Interval	11.8-14.8 mbgs						
Parameter	Benzene	1,1-DCE	cis-1,2-DCE	trans-1,2-DCE	PCE	TCE	VC
Units	µg/L						
MECP T7 SCS	0.5	0.5	1.6	1.6	0.5	0.5	0.5
Result (4/23/2025)	<0.17	<0.20	<0.50	<0.50	0.23	<0.20	<0.20

MW23-03 (75.92 masl)							
Screen Interval	6.2-9.2 mbgs						
Parameter	Benzene	1,1-DCE	cis-1,2-DCE	trans-1,2-DCE	PCE	TCE	VC
Units	µg/L						
MECP T7 SCS	0.5	0.5	1.6	1.6	0.5	0.5	0.5
Result (8/14/2023)	<0.2	2	940	14	9.6	23	88
Result (8/28/2023)	<0.2	-	-	-	-	-	-

MW25-1B (74.9 masl)							
Screen Interval	12.2-15.2 mbgs						
Parameter	Benzene	1,1-DCE	cis-1,2-DCE	trans-1,2-DCE	PCE	TCE	VC
Units	µg/L						
MECP T7 SCS	0.5	0.5	1.6	1.6	0.5	0.5	0.5
Result (4/21/2025)	<0.17	<0.2	50	0.93	2.2	4.9	0.7

MW21-03 (75.35 masl)							
Screen Interval	9.8-12.8 mbgs						
Parameter	Benzene	1,1-DCE	cis-1,2-DCE	trans-1,2-DCE	PCE	TCE	VC
Units	µg/L						
MECP T7 SCS	0.5	0.5	1.6	1.6	0.5	0.5	0.5
Result (4/30/2021)	<0.2	<0.2	1.5	<0.5	32	2	<0.2
Result (8/15/2023)	<0.17	<0.2	<0.5	<0.5	2.4	0.72	<0.2

MW25-4A (75.4 masl)							
Screen Interval	7.0-10.0 mbgs						
Parameter	Benzene	1,1-DCE	cis-1,2-DCE	trans-1,2-DCE	PCE	TCE	VC
Units	µg/L						
MECP T7 SCS	0.5	0.5	1.6	1.6	0.5	0.5	0.5
Result (4/17/2025)	0.91	<0.2	210	1.5	0.25	0.51	60

MW21-01 (75.37 masl)							
Screen Interval	8.1-11.1 mbgs						
Parameter	Benzene	1,1-DCE	cis-1,2-DCE	trans-1,2-DCE	PCE	TCE	VC
Units	µg/L						
MECP T7 SCS	0.5	0.5	1.6	1.6	0.5	0.5	0.5
Result (4/30/2021)	<0.2	<0.2	220	3.7	930	100	7

MW25-4B (75.4 masl)							
Screen Interval	11.9-14.9 mbgs						
Parameter	Benzene	1,1-DCE	cis-1,2-DCE	trans-1,2-DCE	PCE	TCE	VC
Units	µg/L						
MECP T7 SCS	0.5	0.5	1.6	1.6	0.5	0.5	0.5
Result (4/21/2025)	0.65	<0.2	24	<0.5	<0.2	0.47	5

MW24-1 (75.27 masl)							
Screen Interval	27.5-30.5 mbgs						
Parameter	Benzene	1,1-DCE	cis-1,2-DCE	trans-1,2-DCE	PCE	TCE	VC
Units	µg/L						
MECP T7 SCS	0.5	0.5	1.6	1.6	0.5	0.5	0.5
Result (1/25/2024)	0.39	<0.2	<0.5	<0.5	<0.2	<0.2	<0.2

Note

1. This drawing shall be read in conjunction with the associated technical report.

Legend

- Asphalt
- Fill
- Sandy Silt
- Limestone Bedrock
- Monitoring Well Screened Interval
- GW Sample Exceeds MECP Table 7 SCS for VOCs
- GW Sample Meets MECP Table 7 SCS for VOCs
- Inferred Extents of VOC Contamination in Groundwater

Revision	Date	Issue	Approval
E	06/19/2025	Preliminary	

Client: **Churchill Properties Inc.**

Site: **424 Churchill Avenue North, Ottawa, ON**

Report Title: **Phase Two Environmental Site Assessment**

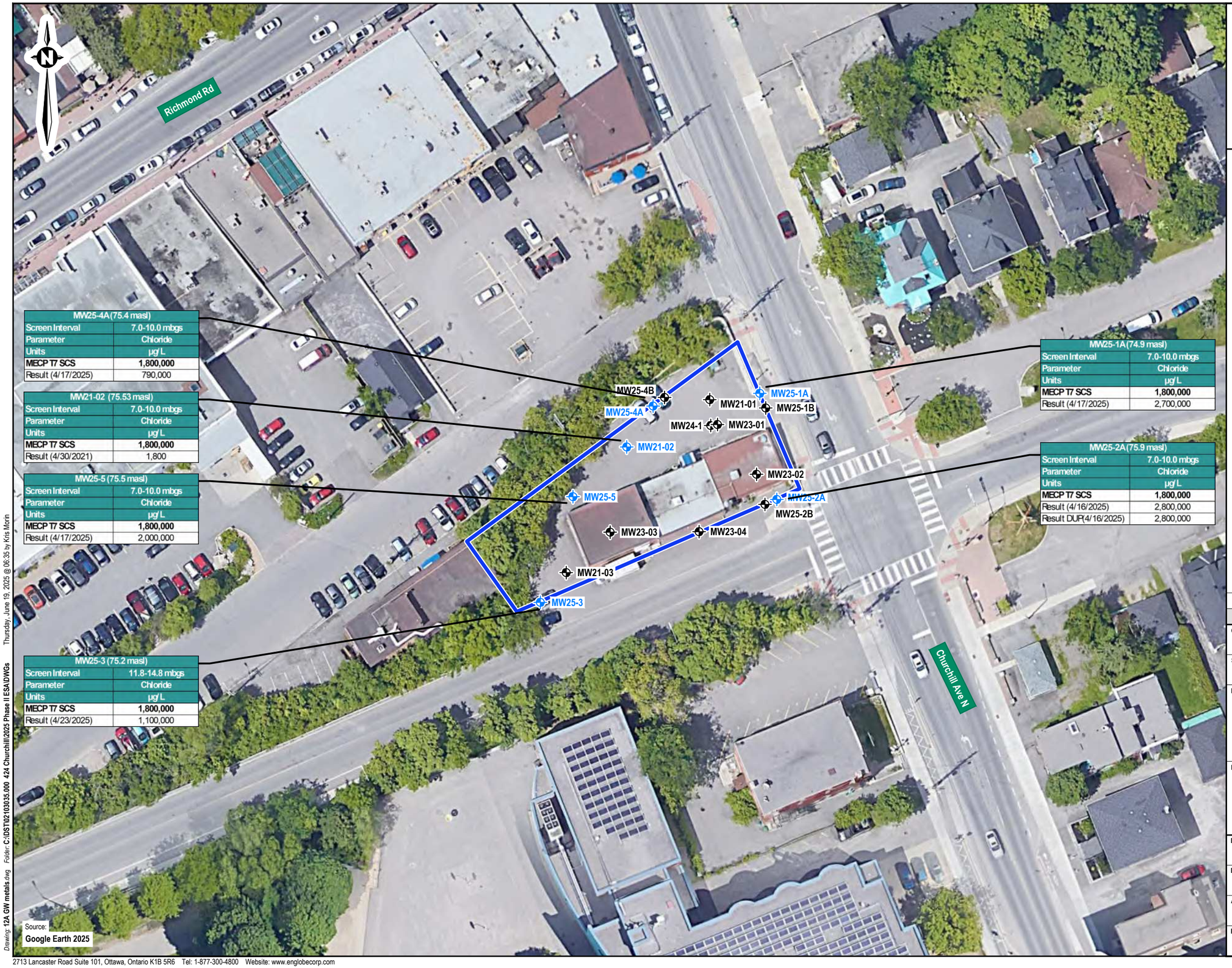
Drawing Title: **Cross Section B-B' - VOCs in Groundwater**

Designed By	Scale
C.O.	As shown
Drawn By	**Date**
K.M.	June 2025
Approved By	**Project No.**
	02103035.000

Figure No.: **11C**

Drawing: 11C GW VOC B.dwg Folder: C:\DST\02103035.000 424 Churchill\2025 Phase II ESA\DWGs Thursday, June 19, 2025 @ 06:35 by Kris Morin

2713 Lancaster Road Suite 101, Ottawa, Ontario K1B 5R6 Tel: 1-877-300-4800 Website: www.englobecorp.com



ENGLOBE

Note

1. This drawing shall be read in conjunction with the associated technical report.

Legend

- Phase One, Phase Two and Record of Site Condition (RSC) Property Boundary
- Groundwater Sample Meets Applicable Table 7 SCS for Metals and Inorganics
- Groundwater Sample Exceeds Table 7 SCS for Metals and Inorganics
- Groundwater Sample Not Analyzed

1:600

0 10 20 30 m

0 1:1 5 cm

Scale accurate when printed at 100% using paper size ANSI full bleed B (11.0 x 17.0 Inches)

Revision	Date	Issue	Approval
E	06/19/2025	Preliminary	

Client: Churchill Properties Inc.

Site: 424 Churchill Avenue North, Ottawa, ON

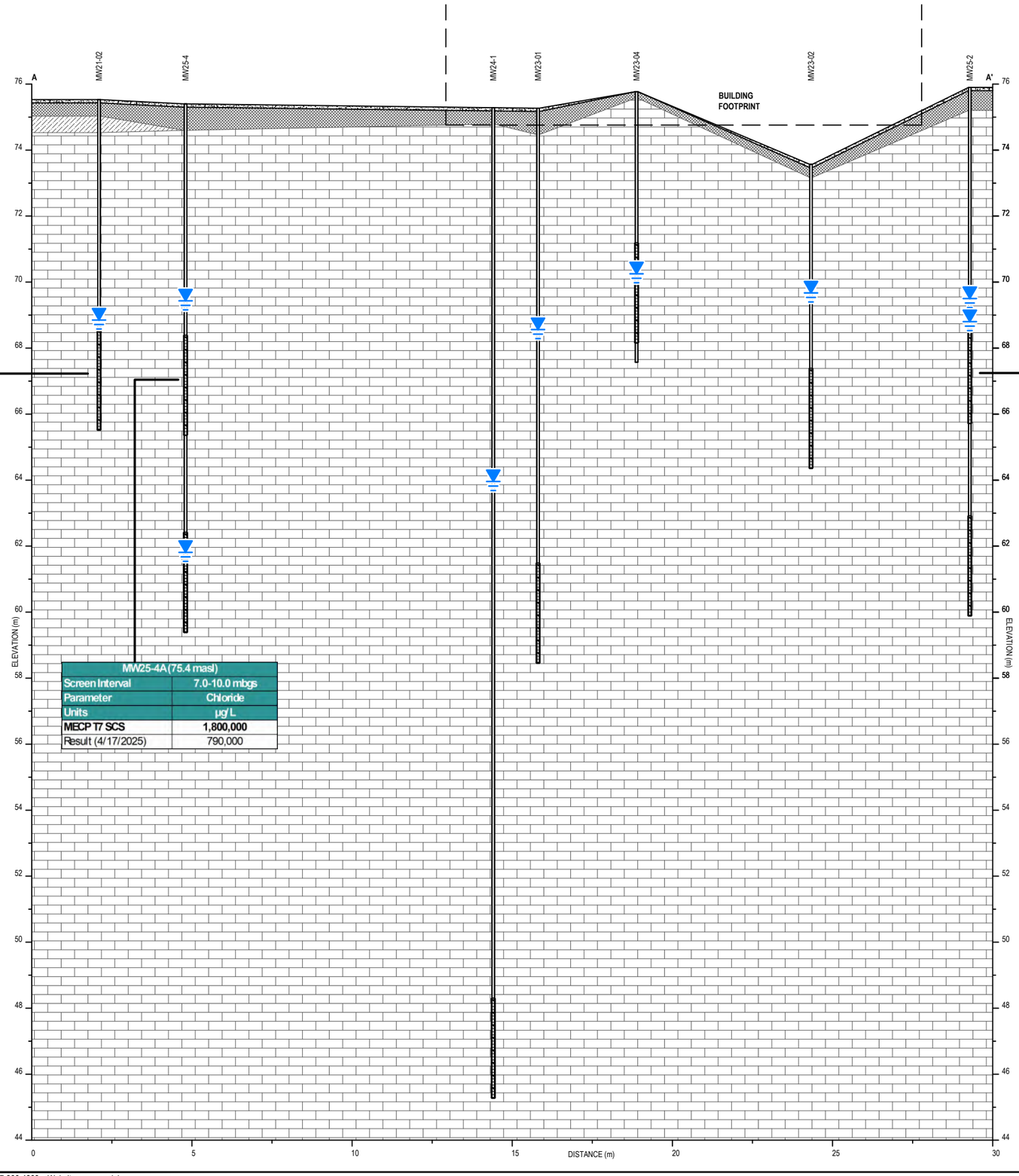
Report Title: Phase Two Environmental Site Assessment

Drawing Title: Metals, Hydride-Forming Metals (HFMs), Na+ and Cl- in Groundwater

Designed By: C.O.	Scale: As shown
Drawn By: K.M.	Date: June 2025
Approved By:	Project No.: 02103035.000
Figure No.: 12A	

Drawing: 12A GW metals.dwg Folder: C:\DST\02103035.000 424 Churchill\2025 Phase II ESA\DWGs Thursday, June 19, 2025 @ 06:35 by Kris Morin

2713 Lancaster Road Suite 101, Ottawa, Ontario K1B 5R6 Tel: 1-877-300-4800 Website: www.englobecorp.com



MW21-02 (75.53 masl)	
Screen Interval	7.0-10.0 mbgs
Parameter	Chloride
Units	µg/L
MECP T7 SCS	1,800,000
Result (4/30/2021)	1,800

MW25-4A(75.4 masl)	
Screen Interval	7.0-10.0 mbgs
Parameter	Chloride
Units	µg/L
MECP T7 SCS	1,800,000
Result (4/17/2025)	790,000

MW25-2A(75.9 masl)	
Screen Interval	7.0-10.0 mbgs
Parameter	Chloride
Units	µg/L
MECP T7 SCS	1,800,000
Result (4/16/2025)	2,800,000
Result DUP(4/16/2025)	2,800,000

Note

1. This drawing shall be read in conjunction with the associated technical report.
2. Analytical results on this figure include the following method groups: Metals, As, Se, Sb

Legend

- Asphalt
- Fill
- Sandy Silt
- Limestone Bedrock
- Monitoring Well Screened Interval
- GW Sample Exceeds MECP Table 7 SCS for Metals
- GW Sample Meets MECP Table 7 SCS for Metals
- Inferred Extents of Metals Contamination in Groundwater

Revision	Date	Issue	Approval
E	06/19/2025	Preliminary	

Client: **Churchill Properties Inc.**

Site: **424 Churchill Avenue North, Ottawa, ON**

Report Title: **Phase Two Environmental Site Assessment**

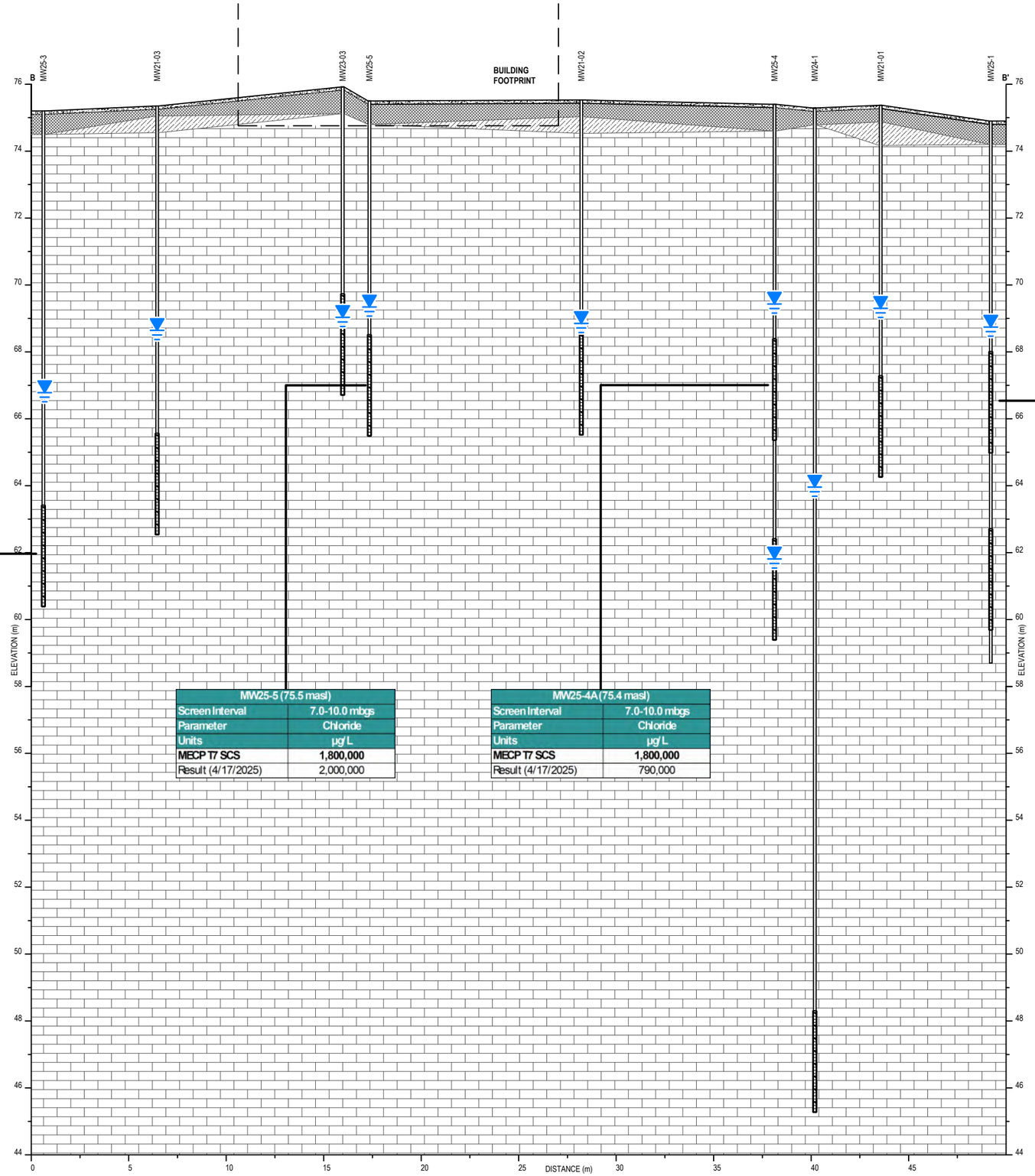
Drawing Title: **Cross Section A-A' - Metals, Hydride-Forming Metals (HFMs), Na+ and Cl- in Groundwater**

Designed By	Scale
C.O.	As shown
Drawn By	**Date**
K.M.	June 2025
Approved By	**Project No.**
B.W.	02103035.000

Figure No. **12B**

Drawing: 12B GW Metals A.dwg Folder: C:\DST\02103035.000 424 Churchill\2025 Phase II ESA\DWGs Thursday, June 19, 2025 @ 06:35 by Kris Morin

2713 Lancaster Road Suite 101, Ottawa, Ontario K1B 5R6 Tel: 1-877-300-4800 Website: www.englobecorp.com



MW25-3 (75.2 masl)	
Screen Interval	11.8-14.8 mbgs
Parameter	Chloride
Units	µg/L
MECP T7 SCS	1,800,000
Result (4/23/2025)	1,100,000

MW25-5 (75.5 masl)	
Screen Interval	7.0-10.0 mbgs
Parameter	Chloride
Units	µg/L
MECP T7 SCS	1,800,000
Result (4/17/2025)	2,000,000

MW25-4A (75.4 masl)	
Screen Interval	7.0-10.0 mbgs
Parameter	Chloride
Units	µg/L
MECP T7 SCS	1,800,000
Result (4/17/2025)	790,000

MW25-1A (74.9 masl)	
Screen Interval	7.0-10.0 mbgs
Parameter	Chloride
Units	µg/L
MECP T7 SCS	1,800,000
Result (4/17/2025)	2,700,000

Note

1. This drawing shall be read in conjunction with the associated technical report.
2. Analytical results on this figure include the following method groups: Metals, As, Se, Sb

Legend

- Asphalt
- Fill
- Sandy Silt
- Limestone Bedrock
- Monitoring Well Screened Interval
- GW Sample Exceeds MECP Table 7 SCS for Metals
- GW Sample Meets MECP Table 7 SCS for Metals
- Inferred Extents of Metals Contamination in Groundwater

Revision	Date	Issue	Approval
E	06/19/2025	Preliminary	

Client: **Churchill Properties Inc.**

Site: **424 Churchill Avenue North, Ottawa, ON**

Report Title: **Phase Two Environmental Site Assessment**

Drawing Title: **Cross Section B-B' - Metals, Hydride-Forming Metals (HFMs), Na+ and Cl- in Groundwater**

Designed By	Scale
C.O.	As shown
Drawn By	**Date**
K.M.	June 2025
Approved By	**Project No.**
B.W.	02103035.000

Figure No.: **12C**

Drawing: 12C GW Metals B.dwg *Folder:* C:\DST\02103035.000 424 Churchill\2025 Phase II ESA\DWGs *Thursday, June 19, 2025 @ 06:35 by Kris Morin*

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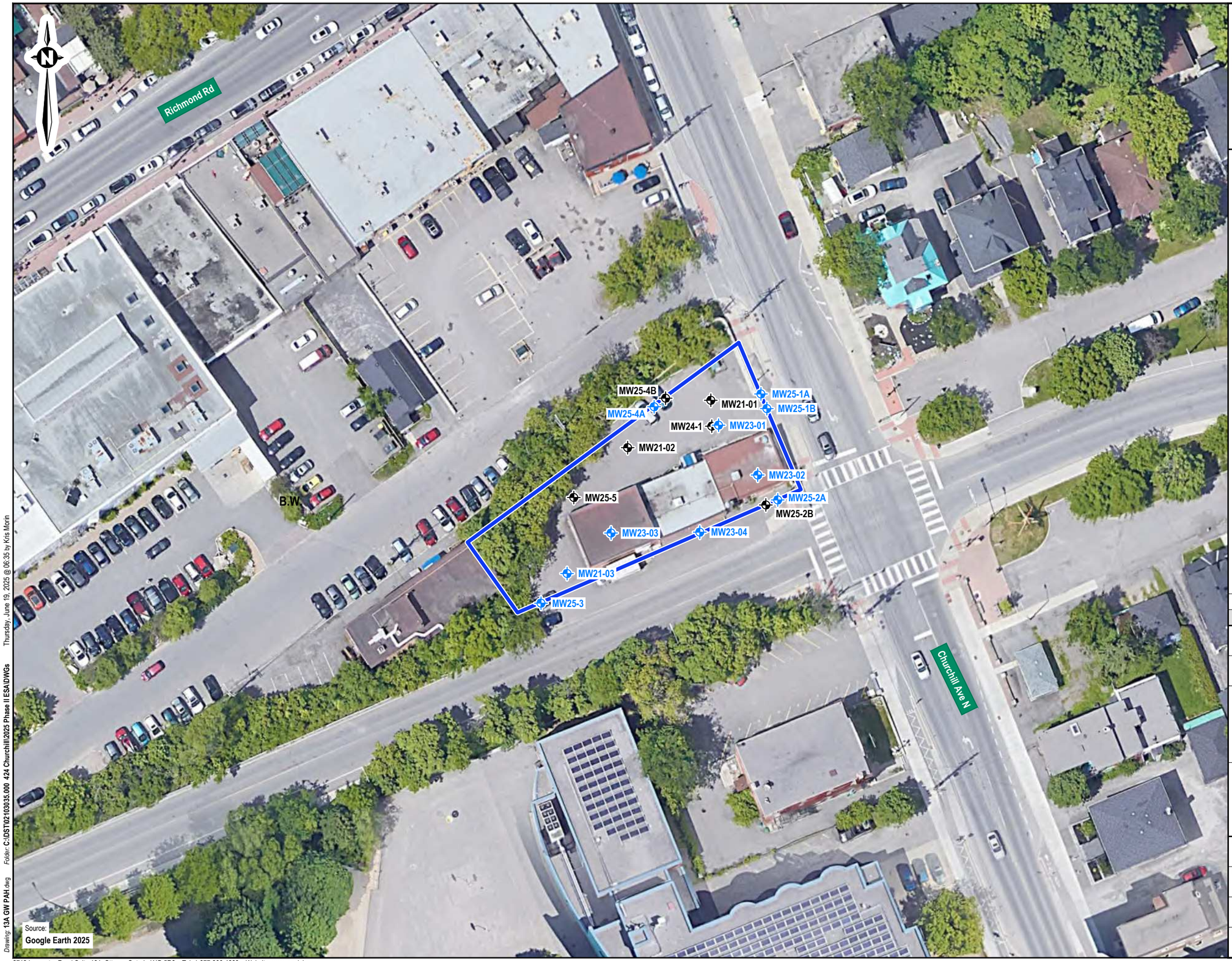

Note

1. This drawing shall be read in conjunction with the associated technical report.

Legend

- Phase One, Phase Two and Record of Site Condition (RSC) Property Boundary
- Groundwater Sample Meets Applicable Table 7 SCS for PAHs
- Groundwater Sample Not Analyzed

1:600

0 10 20 30 m

0 1:1 5 cm

Scale accurate when printed at 100% using paper size ANSI full bleed B (11.0 x 17.0 Inches)

Revision	Date	Issue	Approval
E	06/19/2025	Preliminary	

Client: **Churchill Properties Inc.**

Site: **424 Churchill Avenue North, Ottawa, ON**

Report Title: **Phase Two Environmental Site Assessment**

Drawing Title: **PAHs in Groundwater**

Designed By: C.O.	Scale: As shown
Drawn By: K.M.	Date: June 2025
Approved By: B.W.	Project No.: 02103035.000

Figure No. **13A**

Drawing: 13A GW PAH.dwg Folder: C:\DST\02103035.000 424 Churchill\2025 Phase II ESA\DWGs Thursday, June 19, 2025 @ 06:35 by Kris Morin

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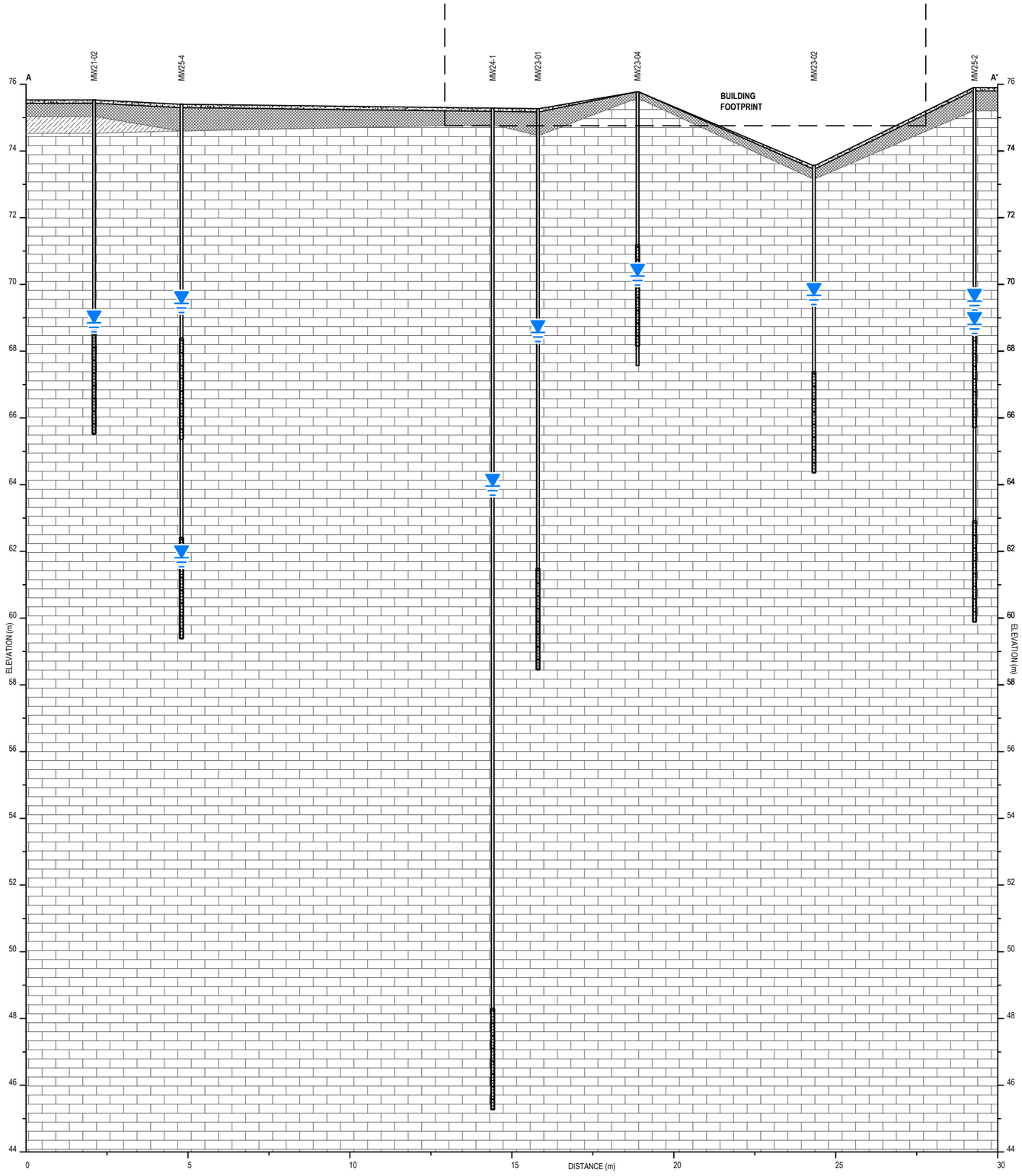

Note

1. This drawing shall be read in conjunction with the associated technical report.

Legend

- Asphalt
- Fill
- Sandy Silt
- Limestone Bedrock
- Monitoring Well Screened Interval
- GW Sample Exceeds MECP Table 7 SCS for PAHs
- GW Sample Meets MECP Table 7 SCS for PAHs
- Inferred Extents of PAH Contamination in Groundwater

Revision	Date	Issue	Approval
E	06/19/2025	Preliminary	

Client
Churchill Properties Inc.

Site
424 Churchill Avenue North, Ottawa, ON

Report Title
Phase Two Environmental Site Assessment

Drawing Title
Cross Section A-A' - PAHs in Groundwater

Designed By	Scale
C.O.	As shown
Drawn By	**Date**
K.M.	June 2025
Approved By	**Project No.**
B.W.	02103035.000

Figure No.
13B

Drawing: 13B GW PAH A.dwg *Folder:* C:\DST\02103035.000 424 Churchill\2025 Phase II ESA\DWGs Thursday, June 19, 2025 @ 06:34 by Kris Morin

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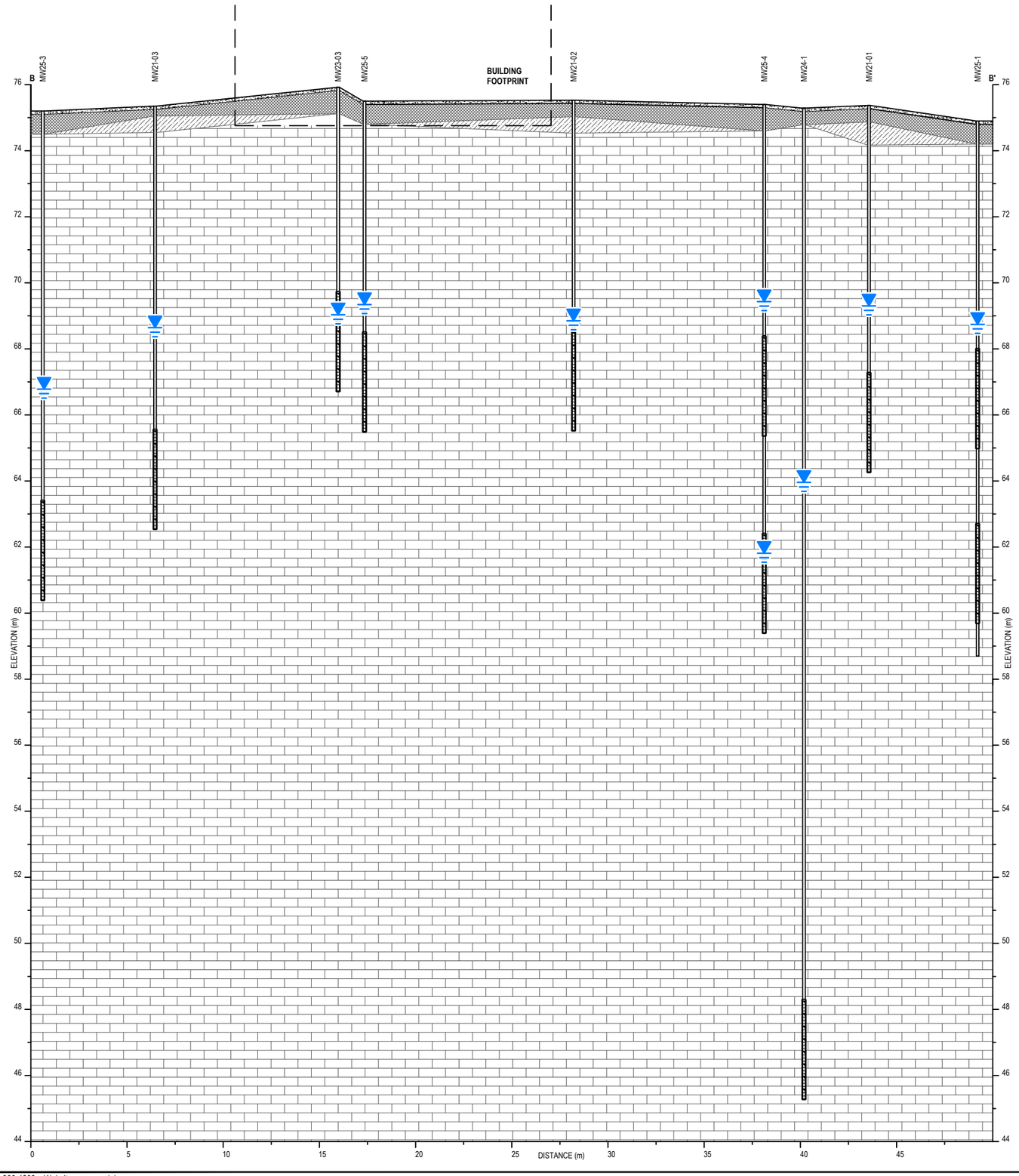

Note

1. This drawing shall be read in conjunction with the associated technical report.

Legend

- Asphalt
- Fill
- Sandy Silt
- Limestone Bedrock
- Monitoring Well Screened Interval
- GW Sample Exceeds MECP Table 7 SCS for PAHs
- GW Sample Meets MECP Table 7 SCS for PAHs
- Inferred Extents of PAH Contamination in Groundwater

Revision	Date	Issue	Approval
E	06/19/2025	Preliminary	

Client
Churchill Properties Inc.

Site
424 Churchill Avenue North, Ottawa, ON

Report Title
Phase Two Environmental Site Assessment

Drawing Title
Cross Section B-B' - PAHs in Groundwater

Designed By	Scale
C.O.	As shown
Drawn By	**Date**
K.M.	June 2025
Approved By	**Project No.**
B.W.	02103035.000

Figure No.
13C

Drawing: 13C GW PAH B.dwg *Folder:* C:\DST\02103035.000 424 Churchill\2025 Phase II ESA\DWGs Thursday, June 19, 2025 @ 06:34 by Kris Morin

2713 Lancaster Road Suite 101, Ottawa, Ontario K1B 5R6 Tel: 1-877-300-4800 Website: www.englobecorp.com

Attachment 1
Dewatering Pumping Plan

ENGLOBE

AQUATECH®

Dewatering Pumping Plan

JOB 25-919 – 424 Churchill Ave. North

Prepared By: Bradley Sheppard

Date: July 8th ,2025

Prepared For:

GSI Properties

TABLE OF CONTENTS

2510 Del Zotto Ave, Ottawa, ON K1T 3V7

AQUATECHDEWATERING.COM | Telephone: (613) 822-9990

INTRODUCTION

Aquatech Dewatering Company is pleased to provide this dewatering plan to service all the dewatering and water treatment requirements for the above project in Ottawa, ON.

BACKGROUND INFORMATION

The dewatering and groundwater treatment scope of work for this project is to be performed by GSI Properties, with Aquatech Dewatering acting as a subcontractor for the supply of the dewatering and treatment equipment for the site. The development of 424 Churchill Ave and the resulting contaminated water from excavation efforts, is driving the need for an on-site groundwater treatment system. The dewatering system engineered by Aquatech Dewatering was based primarily on the follow files provided by GSI Properties:

- Phase I & II Environmental Site Assessment – 424 Churchill Avenue North, Ottawa, Ontario

SCOPE OF WORK

Hydrogeological Conditions

The provided flow rate is 5.83 m^3/hr (25.7 USGPM) of water fed to the treatment system from the excavations. The water will be discharged into a live sanitary service line connecting to the existing property or one of the following existing manholes (MHSA27544 or MHSA61069). The full treatment system below was designed for the maximum flow rate of 5.83 m^3/hr but can be scaled as needed depending on the flow requirements throughout the project.

WTP Requirements	
Parameters	**Details**
Flow Rate	5.83 m^3/hr (25.7 USGPM)
Discharge Distance	~ 50 m
Duration of Work	Estimated at 7 months
Exceedance Handling	PHC, VOC

Excavation Dewatering

The excavation pit will house Aquatech's 2-inch submersible pump which will pump all the construction groundwater to the treatment system on site. The exact location of all sumps and dewatering lines will need to be field fitted and adjusted throughout the project. Below is a schematic of the dewatering /treatment system from the excavation to the discharge location

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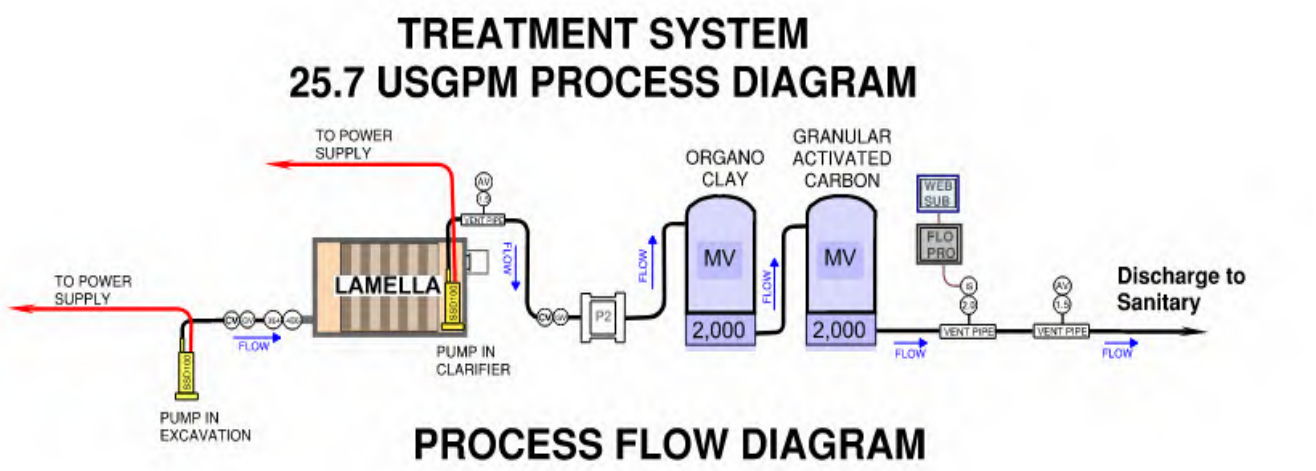

Water Treatment System

The on-site treatment system will be based on the above parameters/findings. GSI Properties would like to commence this project with a 25.7 USGPM treatment system. All water discharged from the treatment system will be tested to ensure that it meets the City of Sewer Use Agreement prior to discharging. GSI Properties is responsible for groundwater and discharge testing.

Systems Monitoring & Maintenance

GSI Properties will be completing all general monitoring and basic system maintenance throughout the entirety of the project. Aquatech's flow monitoring equipment is programed to upload flow monitoring reports to the Scada Core. After system commissioning, GSI Properties will receive flow monitoring report via emailed from Aquatech or by accessing the Scada Core dashboard directly on the web. Sampling of the water before it enters the treatment system, and after it leaves the treatment system will be necessary to ensure that the treatment system has effectively removed the contaminants of concern and remaining compliant with the City of Ottawa sewer discharge requirements.

PROPOSED WATER TREATMENT SYSTEM BREAKDOWN

Design Parameters	
Parameters	**Details**
Design Flow Rate	25.7 USGPM
Suction Lift	~4m
Discharge Distance	~50m
Duration of Work	Estimated 7 months
Exceedances	PHCs , VOCs
Discharging to	Sanitary
Power Requirements	115V / 240V Single Phase

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25.7 USGPM Water Treatment System

- (two) 2" Submersible Pumps
- Suction hose to the treatment system
- (one) Lamella 60AQLC filtration tank
- (one) P2 Duplex Bag Filtration Unit (5 micron)
- (two) 2000 lb. Media Vessels
    - Media: Organo Clay – 4000lbs for one vessel
    - Media GAC: - 2000lbs for one vessel
- Aquaflo Flow monitoring System with Web Subscription
- Multiple Check and Gate Valves for throttling
- Multiple 45 & 90-Degree Elbows
- Sewage Air/Vac Relief & Drains

Construction Dewatering Plan Details

The water treatment system will process all groundwater incoming flows, which will be set up to process at a maximum of 30 USGPM. If new contaminants are present or if discharge criteria aren't being achieved, then further modifications to the treatment system may be required. All dewatering equipment must be winterized prior to freezing temperatures. The layout and description of the system is as follows:

1. GSI Properties is to install a sump pit in a strategic location as work progresses. The active sump pit will direct groundwater directly the treatment system.
2. Any electric submersible pump in the excavation will be controlled to the desired flow rate using gate valves.
3. Each sump is to be constructed with a clear stone base and a sleeve to accommodate the pumps.
4. One electric submersible pump will be installed in the last section of the Lamella tank (elevated from the bottom), to move the water on through the rest of the treatment system. The pump will operate using floats controls that will turn on and off the pumps as required.
5. The water will then pass through one P2 bag filtration unit which will filter out suspended particles down to 5 micron. Filter bags will be changed out by GSI Properties daily (or as needed)
6. The water will then be further advanced through two 2000 lb media vessels in series. The first vessel will contain Organo Clay media, and the second vessel will contain GAC Carbon media. Both media are highly effective in eliminating the reported organic contaminants.
7. Once the water has been treated, it will pass through a Flopro Monitoring System that will monitor the discharge following flow rate and publish data.
8. GSI will sample the water as needed to satisfy the City of Ottawa Sewer Use Agreement requirements.

** All filtrate or settlement in the lamella tanks will be disposed of via a vac truck. Bag filters will be disposed of to a waste management bin supplied by GSI Properties. GSI Properties will dispose of waste accordingly. **

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SPILL RESPONSE, PREVENTION, CONTROL, AND CLEANUP

A spill is defined in the Ontario Environmental Protection Act as a discharge "into the natural environment, from or out of a structure, vehicle or other container, that is abnormal in quality or quantity in light of all the circumstances of the discharge". During this project, it is our intent to prevent all spills of hazardous and non-hazardous substances through policies and procedures that will control risk factors that would lead to a spill. Preventative measures are the best means to avoid accidental release to air, land or water. If an unpreventable spill does occur, the Ministry of the Environment and Climate Chance (MOECC) Spills Action Centre at 1-800-268-6060 will be notified by the designated reporting person. as well as the facility representative as soon as the spill becomes known.

Spill response materials should be available wherever hazardous materials are used or stored. These spill response materials should be suitable in type and quantity to the type and quantity of hazardous materials being used at that location. Upon detection of a release or spill of a hazardous substance, take the following steps as soon as possible to prevent risk to people or the environment.

Secure the area – Establish a hazard zone that will keep non-emergency personnel away from danger. If necessary, arrange for a worker to patrol the zone to keep observers at a safe distance.

Assess the situation – The condition should be assessed for potential fire; danger to humans, property and the environment; determine if evacuation or spill containment is required; determine what equipment and materials are required and what immediate action can be taken to contain the situation.

Identify Product(s) – Refer to the Material Safety Data Sheets for detailed clean-up procedures, health hazards and personal protective equipment to be used. Labels and symbols on containers can be used to identify the products involved. Also shipping documents can be used to identify products.

Response – Establish a command post and establish lines of communication. Rescue casualties where possible and evacuate if necessary. Maintain control of the site. If additional information is required, contact CANUTEC, this agency provides an advisory service and is staffed by professionals trained in interpreting information and providing emergency response advice.

Reporting – Report the situation to E.O.R., MOE Spill Action Line and any other involved parties. The Supervisor is to prepare a written report, to include the cause of spill; location, size and characteristics of area affected; actions taken in sequence; time sequence from detection to cleanup; follow-up monitoring and reclamation needs (if any); Consultant report (if any).

Clean-up Contractors – The following is a list of licensed clean-up contractors.

- Tomlinson Environmental Services - 1(844) 992 –1069 ex. 5

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INSPECTION PROGRAM

The treatment system is designed to operate automatically; however, it does require frequent inspections to ensure consistent performance. Aquatech will train the customer's staff on proper operating procedures of the system so they can correct any minor deficiencies. The customer will be operating the system daily, however, Aquatech can perform a "system check" by a qualified technician upon request. Any minor deficiencies spotted during the system check, will be dealt with during visit. As a part of the inspection program, the system operator (GSI Properties), will be responsible for water quality sampling to verify the effectiveness of the system to treat the groundwater, and to monitor the contaminants that are present. The samples will be taken at both the system inlet and system outlet so that contamination levels after treatment can be compared.

INSPECTION, REPAIR, AND MAINTENANCE PROGRAM

The treatment system is expected to be deployed for an estimated 7-month period. During this time the system operator will be responsible for routine repair and maintenance as required. Should one of the pumps fail, Aquatech can supply a replacement pump upon request.

Based on a 25.7 USGPM system, the following daily maintenance could be required based on contamination and turbidity within the influent water.

- Daily bag filter change outs (45 mins at a minimum depending on influent TSS)
- Daily system check (1 hr)
- As needed treatment vessel backwashing of 2,000 lb media vessels (2 hrs)

Typically, a qualified technician would complete these tasks on a specified schedule throughout the duration of the project. Aquatech can train the onsite personnel to complete these tasks as required.

CONTINGENCY PLANS AND PROCEDURES

The treatment system is designed to treat contaminants of concern; however, an upset condition can occur due to the nature of filtration & treatment systems.

Immediate Response

1. Safety First: Ensure the safety of personnel and the surrounding environment. If there is an immediate threat to health or safety, initiate emergency response procedures, including evacuation if necessary.
2. Isolate the System: Identify and isolate the affected part of the water treatment system to prevent further contamination or adverse impacts. Shut off valves, divert flow, or take other appropriate measures to contain the issue.
3. Notification: Notify the project manager and relevant stakeholders about the situation.
4. Confirm: Collect a confirmatory sample for rush analysis to verify the initial finding.

Assess and Investigate

1. Documentation: Document details of the adverse impact, including the time, date, affected area, and any observed symptoms or anomalies.
2. Root Cause Analysis: Initiate an investigation to determine the root cause of the adverse impact. Evaluate equipment logs, operational records, and any available data to identify the source of the issue.
3. Sampling and Analysis: Conduct sampling and laboratory analysis to assess the extent of the impact and identify the contaminants or parameters that caused the problem.
4. Risk Assessment: Assess the potential risks to the environment, including soil, groundwater, and air quality. Consult with environmental experts, regulatory agencies, and relevant stakeholders to determine the severity and immediate actions required.

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Communication and Notification

1. Internal Communication: Notify all relevant personnel, including operators, management, and environmental remediation experts, about the adverse impact. Clearly communicate their roles and responsibilities in addressing the situation.
2. External Communication, if applicable: Prepare a communication strategy to inform the public, nearby communities, regulatory agencies, and stakeholders about the adverse impact. Develop clear and concise messages that address the situation, potential risks, and the steps being taken to mitigate the issue.
3. Regulatory Reporting: Comply with all regulatory reporting requirements. Notify the appropriate regulatory agencies about the adverse impact, providing all necessary information and updates as required.

Mitigation and Remediation

1. Containment and Control: Implement measures to prevent further adverse impacts to the environment. This may include implementing additional treatment equipment systems, temporary storage, or hauling to waste.
2. Remediation Plan: Develop a detailed plan to remediate the adverse impact and restore the water treatment system to normal operation. This may involve equipment repairs, replacement, or modifications as necessary.
3. Monitoring and Sampling: Increase the frequency of monitoring and sampling to assess the progress of remediation efforts and ensure compliance with environmental standards and regulations.
4. Environmental Restoration: Collaborate with environmental experts and regulatory agencies to develop a plan for restoring the affected environment, including soil and groundwater remediation, habitat restoration, and other necessary measures, if required.

Evaluation and Prevention

1. Lessons Learned: Conduct a thorough evaluation of the adverse impact incident, including the response actions, effectiveness of the contingency plan, and areas for improvement.
2. Plan Updates: Revise the contingency plan based on lessons learned and recommendations from the incident evaluation. Ensure that the plan addresses the identified weaknesses and includes updated contact information, procedures, and response protocols.
3. Training and Preparedness: Provide additional training to personnel based on the lessons learned. Regularly conduct drills and exercises to test the revised plan and enhance preparedness for future incidents.

COMPLAINT PROCEDURES

Aquatech is a 24/7 emergency response company. Should Aquatech receive any public complaints they will be handled through our daily operations/service staff or our on-call operations/service staff for any afterhours concerns or complaints.

Complaint Procedure

1. Acknowledge the complaint:
   - Upon receiving a public complaint, promptly acknowledge it to let the individual know that their concerns have been received.
   - Thank them for bringing the issue to your attention and assure them that their complaint will be addressed.
2. Gather relevant information:
   - Request the necessary details from the complainant, such as their contact information, the nature of the complaint, any supporting evidence, and the date and location of the incident.
   - Ensure that you have all the relevant facts to investigate the complaint thoroughly.
3. Assign responsibility:
   - Determine the appropriate department or individual responsible for handling the specific complaint.
   - Assign the complaint to the relevant person to ensure a prompt and effective response.
4. Conduct a thorough investigation:
   - Review the information provided by the complainant and gather any additional relevant data or evidence.

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- Interview any witnesses or parties involved in the incident, if applicable.
- Maintain accurate records of the investigation process, including dates, times, and actions taken.

5. Provide a timely response:
   - Respond to the complainant within a reasonable timeframe, usually within a specific number of business days.
   - Address the complaint professionally, acknowledging the issues raised and providing a clear and concise explanation of the findings.
   - If necessary, offer an apology for any mistakes or inconveniences caused.
6. Offer solutions or remedies:
   - Based on the investigation, propose appropriate solutions or remedies to address the complainant's concerns.
   - If feasible, provide options to resolve the issue and ensure that the complainant's needs are met to the best extent possible.
7. Follow up and close the loop:
   - Monitor the progress of implementing the proposed solutions or remedies.
   - Communicate with the complainant to ensure their satisfaction with the resolution or address any further questions or concerns they may have.
   - Keep a record of the resolution and document the closure of the complaint.
8. Evaluate and learn from the complaint:
   - Analyze the complaint and its underlying causes to identify potential areas for improvement in processes, policies, or training.
   - Share insights and recommendations with relevant stakeholders to prevent similar complaints in the future.
9. Maintain confidentiality and professionalism:
   - Ensure the privacy and confidentiality of the complainant's personal information throughout the process.
   - Always treat the complainant with respect and professionalism, regardless of the outcome.
10. Continuous improvement:
    - Regularly review and update the complaint handling procedure to incorporate feedback, address any identified gaps, and improve the overall complaint management process.
    - Provide training and resources to staff members involved in complaint handling to enhance their skills and effectiveness.

Remember, each complaint is an opportunity to improve and enhance the public's trust and satisfaction. By following this procedure, you can demonstrate a commitment to addressing concerns and fostering positive relationships with the public.

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COMPANY PERSONNEL ACKNOWLEDGEMENT

I, Bradley Sheppard, have completed and reviewed this dewatering pumping plan in its entirety, for the Block 2 Major Utilities Relocation, Ottawa ON. All drawings and equipment specifications have been completed and attached below in the appendices.

Bradley Sheppard | BASc. (Eng) | Project Manager

Aquatech Dewatering Company

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APPENDIX A – EQUIPMENT SPECIFICATIONS

2510 Del Zotto Ave, Ottawa, ON K1T 3V7

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AQCL125 TANKS

TECHNICAL SPECIFICATIONS

AQLC125

LAMELLA CLARIFIER

Effective sediment filtration solution with 80% more efficiency than conventional 70,000 gallon weir tanks

80%
MORE SPACE EFFICIENT THAN 18,000 GAL TANKS

<5 NTU
WITH CHEMICAL DOSING; 50 NTU WITHOUT DOSING

SPECIFICATIONS

Flow Capacity	125 USGPM | 30m³/h
Filtration Efficiency	<50 NTU without dosing <5 NTU with chemical/ poylmer dosing
Dimensions (LxWxH)	13.2 x 6 x 7 Ft 4 x 1.8 x 2.1 m
Additional Sizes	AQLC250, AQLC60

FEATURES

- Removal of sediment and associated contaminants
- Units can be used in parallel and/or in series
- 2x more settling area than a 18,000 gal weir tank
- Easy cleaning and maintenance with removable coalescing media and sludge hopper
- Compatible with SCADA and 24/7 remote monitoring systems for remote chemical dosing control and water quality compliance monitoring
- Easy to transport and minimal set-up required

SPACE EFFICIENCY VS 18,000 GAL TANK

info@aquosis.ca | aquosis.ca

AQUOSIS

2510 Del Zotto Ave, Ottawa, ON K1T 3V7

AQUATECHDEWATERING.COM | Telephone: (613) 822-9990

2” SSD100 – Submersible Pump

TECHNICAL DATA	AVENGER SERIES	SSD-100
STANCOR	Dwg: DS-A13-005 Rev: 2 Date: 01/16	

MOTOR SPECIFICATIONS

Motor Design	Induction
Motor Type	Enclosed submersible
Insulation Class	Class B
Motor Protection	Bi-metallic Thermal Switch
Bi-Metallic Temp Trip	120° C ± 5° C
Service Factor	1.3
Voltage Tolerance	± 10% from nominal

MOTOR DATA, 60Hz

Model	Phase	Output Power BHP	Volts	Full Load Amps	Locked Rotor Amps	NEMA Code Letter	Power Factor 100% Load	Motor Efficiency 100% Load	Pole/ Speed (rpm)
SSD-100	1	1.0	115	12	60	H	0.99	0.695	2/3450
	1	1.0	208	6.6	33	H	0.98	0.694	2/3450
	1	1.0	230	6	30	H	0.98	0.694	2/3450
	3	1.0	208	3.7	18.5	H	0.84	0.724	2/3450
	3	1.0	230	3.4	17	H	0.84	0.724	2/3450
	3	1.0	460	2	10	J	0.88	0.742	2/3450
	3	1.0	575	1.5	7.5	J	0.81	0.726	2/3450

MATERIALS OF CONSTRUCTION

Discharge Connection	Cast Iron (FC 15)
Motor Housing	AISI 304 Stainless Steel
Oil Chamber	Aluminum (ADC 12)
Volute	Cast Iron (FC 20)
External Hardware	AISI 304 Stainless Steel
O-Rings	NBR
Motor Shaft	Stainless Steel(410)
Upper Bearing	Single row, doubled sealed
Lower Bearing(s)	Single row, doubled sealed
Upper Shaft Seal	CA/CE (carbon/ceramic)
Lower Shaft Seal	SIC/SIC (silicon carbide/silicon carbide)
Impeller	Hytrel (steel coated with thermoplastic polyester elastomer)

DIMENSIONS, WEIGHT, AND MISC.

Pump weight single phase	33lbs (15kg)
Pump weight three phase	33lbs (15kg)
Maximum submergence	33 feet (10m)
Discharge size, standard	2 inch NPT female vertical
Maximum temp. of pumped fluid	104°F (40°C)
Inlet Opening	6mm

CABLE SPECIFICATIONS

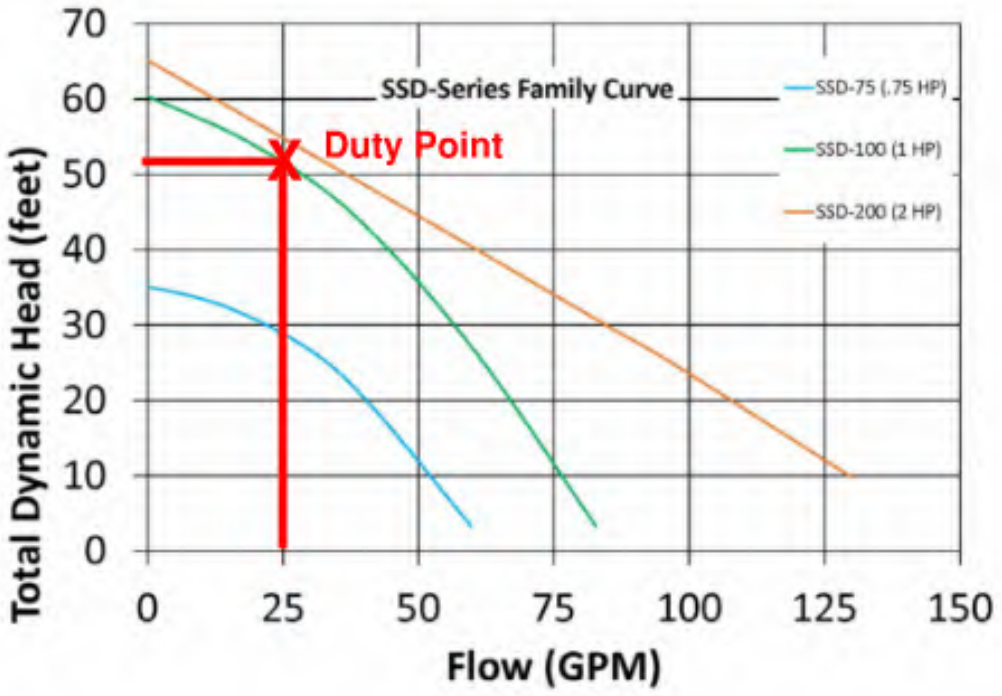
MODEL	PHASE/VOLTAGE	POWER CABLE	LENGTH	OUTER JACKET
SSD-100	1Ø-115V	SJTW 14/3	50feet (15m)	NBR
	1Ø-208V	SJTW 16/3	50feet (15m)	NBR
	1Ø-230V	SJTW 16/3	50feet (15m)	NBR
	3Ø-208V	STOW 16/4	50feet (15m)	NBR
	3Ø-230V	STOW 16/4	50feet (15m)	NBR
	3Ø-460V	STOW 16/4	50feet (15m)	NBR
	3Ø-575V	STOW 16/4	50feet (15m)	NBR

Power cable suitable for all standard voltages listed in “MOTOR DATA” section.

Specifications subject to change without notice

Stancor, Inc. 515 Fan Hill Road, Monroe, CT 06468 Tel: 203-268-7513 Fax : 203-268-7958 www.stancorpumps.com

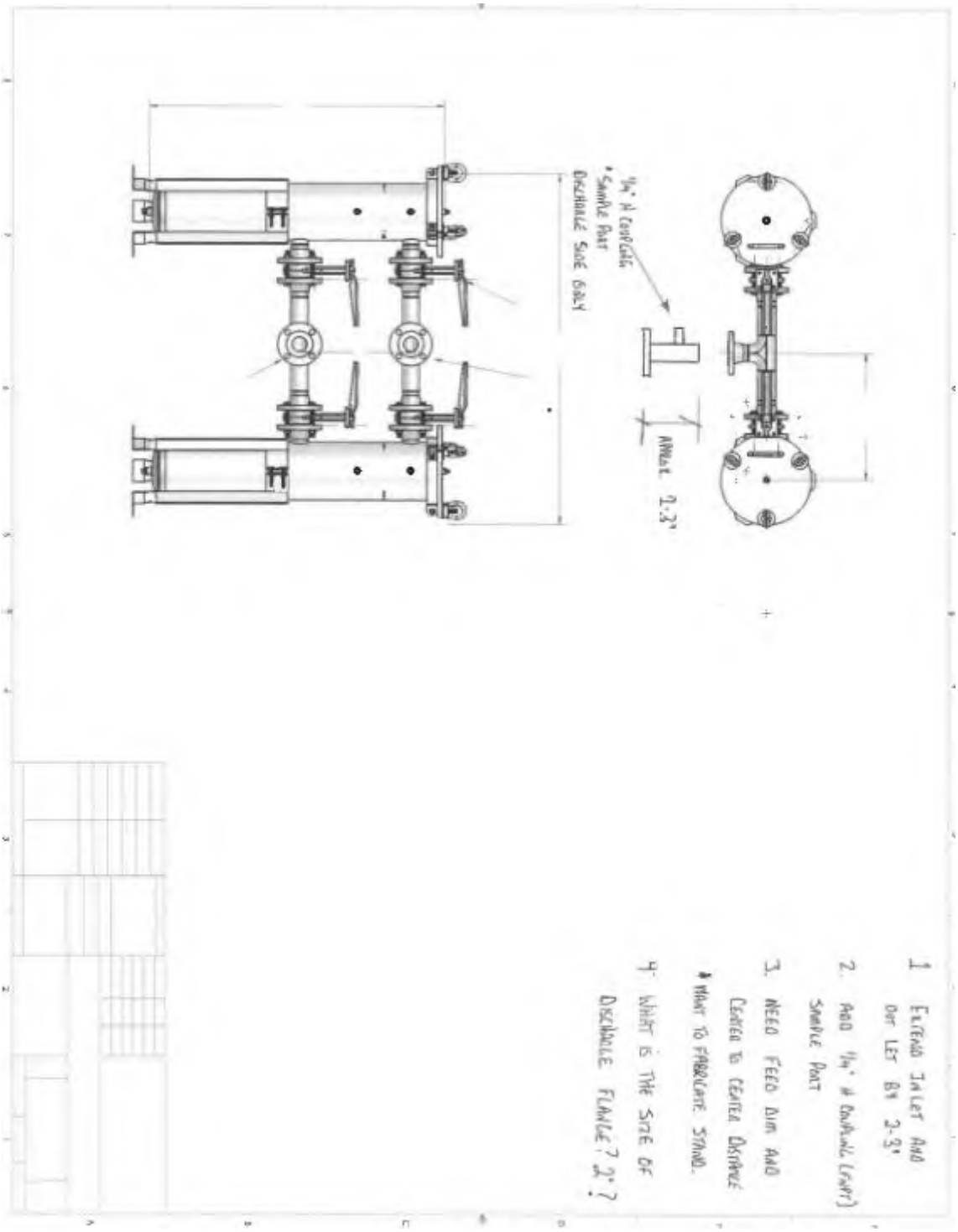
PERFORMANCE CURVE	Avenger Series	SSD Series
Dwg: DS-A13-013	Rev:	Date: 07/16



Specifications subject to change without notice

Stancor, L.P. 515 Fan Hill Road, Monroe, CT 06468 Tel: 203-268-7513 Fax : 203-268-7958 www.stancorpumps.com

P2 Duplex Bag Filter Unit



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P2 Duplex Bag Filters - 5 Micron

Nova Filtration Technologies

STANDARD FELT LIQUID FILTER BAGS

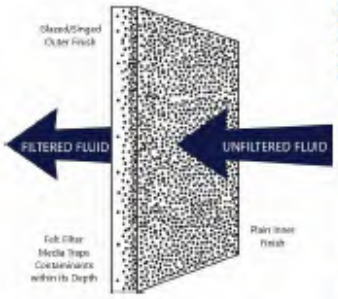
FEATURES:

- Micron Ratings From 1 To 200
- All Industry Standard & Custom Sizes Available
- Broad Chemical Compatibility
- High Flow/Low Pressure Drop
- Sewn Or Fully-Welded Construction With Handles On All Bags
- Choice Of Steel Or Plastic Flange
- Temperature Ratings: 200°F (PO), 275°F (PE), 425°F (HT) & 500°F (Teflon®)

FELT BAG MATERIALS:

Constructed using 100% synthetic fibers in Polypropylene, Polyester, Nomex® & Teflon®. The proper combinations of fiber diameters, weights and thicknesses result in an economical depth filter media. To reduce fiber migration, Polypropylene bags are treated with a glazed finish, while Polyester & Nomex® bags are singed.

- Polypropylene & Polyester Materials Meet FDA Regulations For Food Contact Under CFR21, Section 177.1520
- Silicone-Free Construction
- High Dirt Holding Capacity & Low Cost
- Ability To Remove Both Solid & Gelatinous Particles
- Glazed/Singed Finish On Polypropylene & Polyester Reduces Fiber-Shedding



BAG DIMENSIONS

Size	Diam.	Length
P1	7.06"	16.5"
P2	7.06"	32.0"
P3	4.12"	8.0"
P4	4.12"	14.0"
P5	4.12"	24.0"
P7	5.50"	15.0"
P8	5.50"	21.0"
P9	5.50"	31.0"
P11	8.50"	16.0"
P12	8.50"	32.0"
C1	7.31"	16.5"
C2	7.31"	32.5"
RP-1	8.0"	30.0"
RP-2	8.0"	40.0"
PC-1	9.0"	20.0"
PC-2	9.0	30.0"
X1	4.35"	8.0"
X2	4.35"	14.0"
XO1	6.0"	22.0"

BUILDING A PART NUMBER

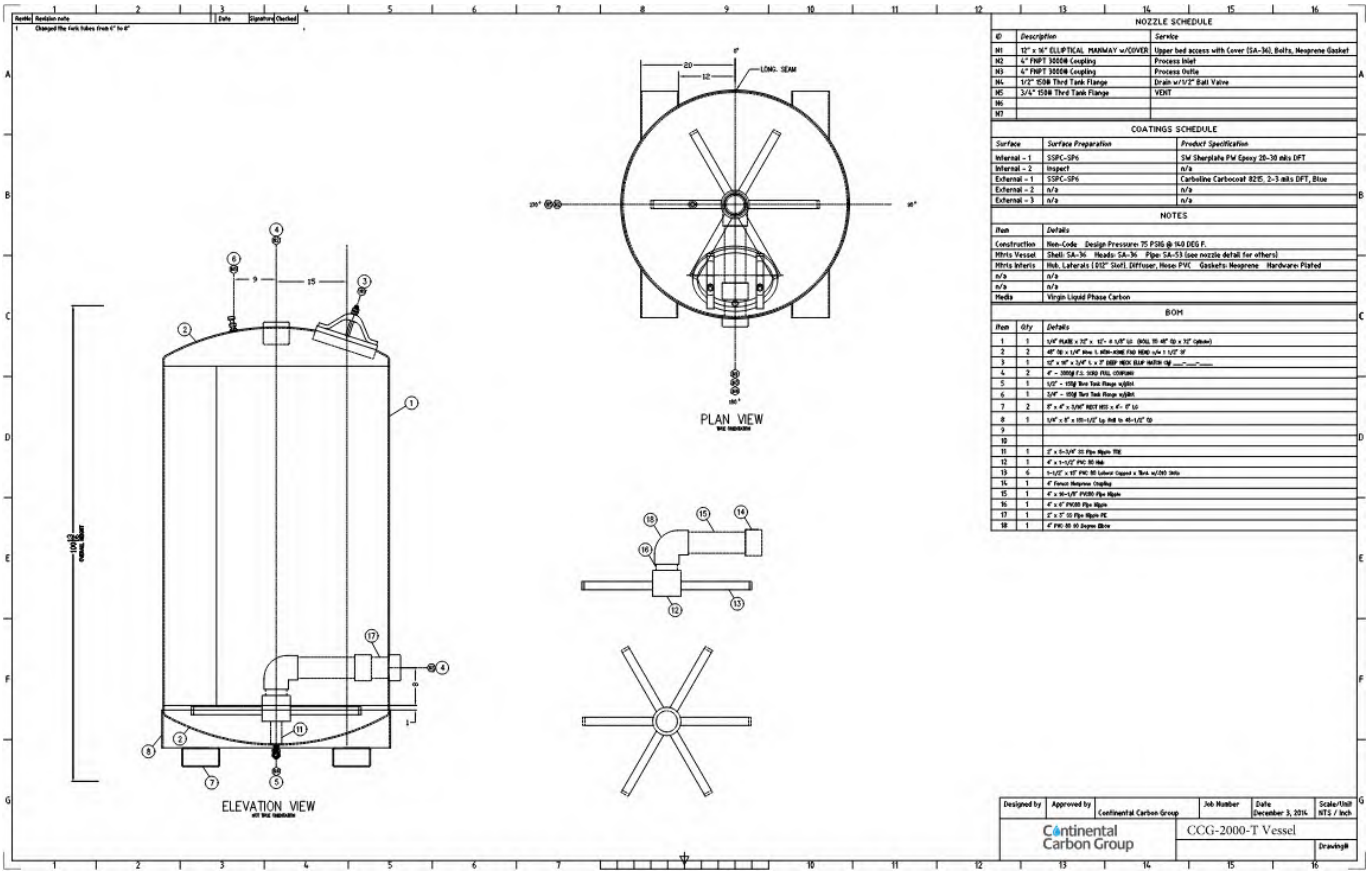
Media Type	Micron Rating		Bag Dimensions	Ring/Flange Styles	
PE	10		P2	S	
Polyester = PE	1	50	See "Bag Dimensions" Chart	Galvanized Steel = S	F-Flange = F
Polypropylene = PO	3*	75		Stainless Steel = SS	OSS Flange = OSS
Nomex® = HT	5	100		Polypropylene Ring = PP	Drawstring = DS
Teflon® = PTFE	10	200		Titanium = T	No Ring = NR
	25			P Flange = P	Santoprene = E

* 3 Micron not offered in Nomex® & Teflon® **Custom configurations may be available upon request

1-1367 Osprey Drive, Ancaster ON L9G4V5 Ph: (905)-304-8157 Fax: (905)304-9227 info@novafiltrationtech.com

Visit Nova Filtration Technologies' website for all your filtration needs. www.novafiltrationtech.com

2,000 lbs Multimedia Vessels



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Remote Monitoring

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AQUATECHDEWATERING.COM | Telephone: (613) 822-9990

Save Money and Achieve Your End Results with Real-Time Data

- ✓ Anticipate and resolve issues and delays before they happen
- ✓ Manage your risk with full awareness of whats going on on-site
- ✓ Make live adjustments to your system to achieve maximum performance
- ✓ Maintain records of your environmental compliance due diligence

1

CONTINUOUS REMOTE MONITORING

High-resolution data provides the full picture and is reliable

2

CUSTOM ALERTS

Set custom call, text, or email alerts

3

CENTRAL DASHBOARD FOR ALL PARAMETERS & SITES

One central cloud-based platform for monitoring and accessing all your data

AQ Dewatering & Pumping Solutions

AquatechDewatering.com | 1-877-907-7852

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AQUATECHDEWATERING.COM | Telephone: (613) 822-9990

DISCHARGE AGREEMENT COMPLIANCE

TAMPER-PROOF, SECURE DATA

Our monitoring platform remotely collects on-site data from multiple instruments in various applications.

Access your data from your smartphone or computer, and receive alerts when user-defined thresholds are exceeded.

- Tamper-Proof, Secure Data
- Non-Resettable
- Remote Monitoring
- Cloud-Based Data

MONITORING DASHBOARD & ALERTS

24/7 REMOTE ACCESS TO DATA
Access anywhere with internet

CUSTOM ALARMS
Custom thresholds and notifications per user

USER PERMISSIONS
Set custom permissions for different viewers

INSTRUMENT TRACKING
Centralized location to track all live instruments on-site

BACKED-UP SECURE DATA
Backed up to two servers

AQ Dewatering & Pumping Solutions

AquatechDewatering.com | 1-877-907-7852

2510 Del Zotto Ave, Ottawa, ON K1T 3V7

AQUATECHDEWATERING.COM | Telephone: (613) 822-9990

INSTRUMENTATION

Integrated and highly accurate instrumentation, selected for specific application requirements

BASE MONITORING PLATFORM

- Collect data from multiple instruments
- Non-resettable data
- Telemetry-ready
- Flexible power options
- Rugged build

REMOTE DASHBOARD & ALERTS

- Central location for all project data
- Unlimited data storage
- Access and share data anytime
- Customizable alarms notify you in real-time via sms/email/call

BYPASS MONITORING PARAMETERS

WATER & WASTEWATER FLOW

Accurate doppler/ultrasonic sensors for both partially-full and full pipes, and fits multiple pipe diameters

VACUUM & PRESSURE

Suction/Header Line Vacuum, Discharge Pressure Level

SURCHARGE/FLUID LEVEL

Depth for Water, Oil and Wastewater

HIGH & LOW LEVEL

Trigger for Water/Wastewater Level

ADDITIONAL MONITORING PARAMETERS

PUMP OPERATIONS

Engine Speed & Temperature, Fuel Level, Oil Pressure, Power

WATER QUALITY

Multi-Parameter Instruments for:
Turbidity, TSS, pH, Temperature, DO, ORP, TDS, RDO, Barometric Pressure, Salinity, Conductivity, Chloride, Nitrate, Ammonium, , Rhodamine WT, Chlorophyll, Blue Green Algae

RAIN LEVEL

Accumulated Rainfall

AIR QUALITY & WEATHER

Dust, Temperature, Gases, Wind Speed/ Direction, Rainfall, Humidity, Sunlight

NOISE & VIBRATION

Noise level, Shock/ Pulsation Level

SERVICES

SOLUTION PACKAGING

We integrate instruments that best match your unique project

ON-SITE SERVICE

System design, installation, maintenance and troubleshooting

TRAINING & SUPPORT

Full technical support and both on-site/in-shop training

AQ Dewatering & Pumping Solutions

AquatechDewatering.com | 1-877-907-7852

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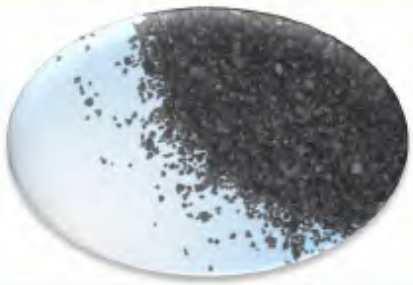
APPENDIX B – CUT SHEET

CARBONE CANADA INC.
40e 1979 - 2019
Carbone Activé & Produits liés
Activated Carbon & Related Products
300 Rue Brosseau
St-Jean-sur-Richelieu (Québec) Canada J3B 2E9
Tél.: (450) 348-1807 • Fax: (450) 348-3311
accarbon@accarbone.com

PRODUCT SPECIFICATION

ACTIVATED CARBON
TYPE: BC-830
BITUMINOUS COAL BASED CARBON



TYPICAL PROPERTIES

Iodine Number (ASTM D-4607)	920-980 mg/g
Moisture Content (ASTM D-2867)	5% Maximum (as packed)
Particle Size (ASTM D-2862)	8 x 30 US Mesh, 90% Minimum; 2.38 – 0.595 mm
Water Soluble Ash	< 1%
Hardness (ASTM D-3802)	90-95%
Apparent Density	0.44 - 0.54 g/cc; 28-33.lbs/ft^3
Ash Content	12-15%
Carbon Tetrachloride Activity (ASTM D3467)	60%
Methylene Blue No.	160-200 mg/g

NOTES

- ***A.C. Carbone is continually improving its products and updating its product specifications. Please contact A.C. Carbone for a detailed review of your application before proceeding.***

- Unless otherwise specified, particle size distribution will be 5% maximum on the top screen and 5% maximum through the bottom screen.
- In the event the moisture exceeds our 5% maximum, A.C. Carbone Canada will weight adjust to the 5% limit.
- Dust and fines may be present in product due to the nature of this product. A.C. Carbone controls and minimizes dust content and fines to the best of its ability.
- Generation of dust and fines can be increased from handling and transportation, please review the MSDS.

- **ALL INFORMATION IS GIVEN IN GOOD FAITH, WITHOUT GUARANTEE.**
- **An MSDS is available upon request.**

CARBONE CANADA INC.
40e 1979 - 2019
Carbone Activé & Produits liés
Activated Carbon & Related Products
300 Rue Brosseau
St-Jean-sur-Richelieu (Québec) Canada J3B 2E9
Tél.: (450) 348-1807 • Fax: (450) 348-3311
accarbon@accarbone.com

PRODUCT SPECIFICATION

ORGANOPHILIC CLAY
GRADE: MZM-830-P
MODIFIED CLAY MEDIA PURE

TYPICAL PROPERTIES

pH stable range	4-10
Moisture Content (ASTM D-2867)	10 - 20% Maximum
Particle Size (ASTM D-2862)	8 x 30 US Mesh
Hardness (ASTM D-3802)	90%
Density	55 - 59 lbs/ft^3
Thermally Stable, °F	33-170
Mohs Scale	4.0
Specific Surface, ft^2 /g	431

NOTES

-Modified Zeolite Media (MZM-830-P), also commonly known as organo-clay is composed of 100% organically modified Zeolite.
-MZM-830-P is designed specifically to remove high-molecular-weight hydrocarbons, chlorinated hydrocarbons and heavy metals. Because it absorbs oils and grease outside the basic zeolite particle, it is not subject to pore plugging and has a capacity of up to 70% of its own weight.
-MZM-830-P works well upstream of activated carbon to extend the life of the carbon.
-Non swelling as with conventional clays

- ***A.C. Carbone is continually improving its products and updating its product specifications. Please contact A.C. Carbone for a detailed review of your application before proceeding.***

- Dust and fines may be present in product due to the nature of this product. A.C. Carbone controls and minimizes dust content and fines to the best of its ability.
- Generation of dust and fines can be increased from handling and transportation, please review the MSDS.

- **ALL INFORMATION IS GIVEN IN GOOD FAITH, WITHOUT GUARANTEE.**
- **An MSDS is available upon request.**

Rev.02

Attachment 2
Blastforce Canada Report

ENGLOBE

Groupe Blastforce Canada Inc.

424 Churchill Avenue (corner Byron Avenue)
Ottawa, ON

Technical Report

Recommendations and vibration estimations for urban blasting applications

BBA Document No. / Rev.: 64620004-000000-4M-ERA-0007-R00
August 1, 2025

FINAL

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BBAconsultants.com

Contributed by:
Paulo Gamez Campos, EIT /CPI (OIQ)

Prepared and checked by:
Riccardo Del Bosco, P.Eng.
PEO No. 100569037

REVISION HISTORY

Revision	Document Status – Revision Description	Date
R00	Final	2025-08-01

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Appendix A: OPSS 120

Appendix B: Third-party Requirements in the Vicinity of Natural Gas Facilities Standard (Enbridge Gas inc.)

Appendix C: Technical data sheets (Explosives and accessories)

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1. Introduction

BBA has been mandated by Groupe Blastforce Canada Inc. to review and provide recommendations on the proposed drilling and blasting parameters required to undertake the rock excavation process for the residential development project located at 424 Churchill Avenue, Ottawa (ON). The footprint and approximate location of the planned excavation site are displayed in Figure 1. Standard bench blasting practices will be employed for cutting and fragmenting the rock mass to the planned design elevation required for structural components such as footings and foundation walls. The estimated volume of rock (banked) subjected to drilling and blasting for this project is ≈ 5,500 m^3.

Figure 1: Overall project location and footprint

The drilling and blasting process will occur in three (3) successive phases:

- Phase 1 - Includes the implementation of line-drilling along the perimeter of the zone where bench blasting will take place. The line-drilling is intended to serve two (2) main purposes, namely, to limit overbreak past the dig lines and reduce the propagation of blasting-

induced vibrations outside of the excavation perimeter. Line-drilling will be completed using 90mm-diameter drill holes spaced at every 200mm (center-to-center);

- Phase 2 will include the drilling and mechanical excavation of an attenuation trench implemented parallel to / along the boundary of the existing and neighbouring commercial building located to the West of the site (352 Danforth Ave.). The attenuation trench must be fully excavated to proper depth (i.e.: ≈ 2 ft or 0.6 m deeper than the projected blasthole depth) in order to be considered effective;
- Phase 3 encompasses the drilling, blasting and excavation of the rock mass contained within the perimeter of the zone to the desired grade and elevation.

Figure 2 displays the projected locations or areas for the three (3) main phases of work described previously, namely the projected line-drilling axes, the mechanically excavated attenuation trench, and the bench blasting activities.

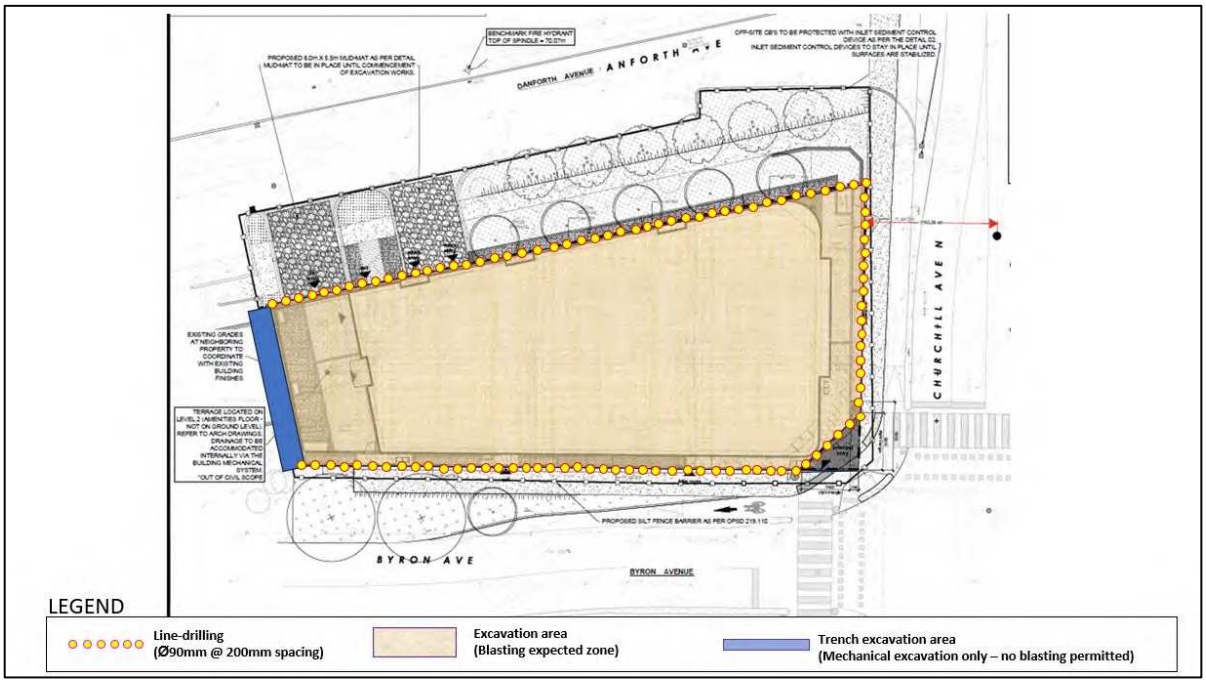


Figure 2: Projected phases of work leading to drilling and blasting activities

Given the site's urban setting as well as its proximity to neighbouring buildings, infrastructure, and utility lines, the principal aim of this review is to ensure the proposed drilling and blasting parameters and proposed methods abide to applicable regulations and that the necessary precautions are taken to mitigate the risk of damaging any private or public infrastructure in the vicinity of the excavation limit.

2. Methodology

The proposed blasting activities must comply with the *OPSS 120 – General Specification for the use of explosives – Municipal edition* (Nov. 2019 or most recent edition), as well as any additional standards, regulations, or contractual agreements in place.

Following the review of the supplied civil plans for the project, BBA confirms that existing service lines (i.e.: electrical, telecom, water, sanitary, storm, and gas) are present in the vicinity of the excavation site. Most of the underground facilities nearest to the site are located along the east axis of the site, running parallel to Churchill Avenue and along the North axis of the site, running parallel to Danforth Avenue. Additional details related to minimum distances between blasting zones and existing infrastructure will be provided in the upcoming sections of this report.

Vibrations generated by blasting activities must be measured using a network of seismographs placed at adequate locations surrounding the site. The seismographs must be calibrated and equipped with standard triaxial ISEE geophones. The blasting contractor must be advised of the vibration results to adjust loading parameters (if required to do so). If changes brought upon the blasting parameters do not mitigate or reduce the vibration spectrum below the designated thresholds, the Contractor will have to resort to mechanical means of rock breakage to achieve the design excavation depth.

2.1 Basis of calculations

Given the absence of site-specific geological attenuation constants, which in part define the transmissibility of blasting-induced ground vibrations towards surrounding infrastructure, an empirical formula developed through an extensive U.S.B.M (United States Bureau of Mines) study and refined by Holmberg-Persson is commonly used to estimate the vibration amplitudes generated by blasting events. The equation for the model and its variables are displayed below:

$$\boldsymbol{V = K \left(\frac{d}{\sqrt{w}} \right)^{\alpha}}$$

Where:

V : Peak Particle Velocity (mm/sec);

d : Distance separating the explosive charge and the area of concern (m);

K & a : Confinement and geological attenuation constants;

w : Explosive charge detonated per delay (kg).

To establish the K and a (site-specific) attenuation constants, blasting vibration data and parameters (i.e.: charge per delay and distance separating blasting events and monitoring locations) must be compiled, processed and analyzed accordingly as blasting operations progress.

Due to the absence of these specific variables (i.e., new site), the U.S.B.M. has established, following substantial field-based studies and compilations, typical attenuation constants that can be integrated into the equation to adequately predict ground vibration amplitudes stemming from blasting events. The equation, including the U.S.B.M. derived constants, is shown below:

$$\mathbf{V = 1143 \left(\frac{d}{\sqrt{w}}\right)^{-1.6}}$$

The following equation does not consider the frequency spectrum and therefore cannot predict the dominant vibration frequency at a specific point of interest. As a result, while completing this report, BBA assumes the blasting events will generate dominant frequencies in the > 40 Hz range. The blasting parameters have therefore been developed based on a 50 mm/s maximum vibration amplitude. Upon the start of operations, scaled-down blasting events can be foreseen to monitor the vibration amplitudes and frequency spectrums recorded at specific locations around the site using designated seismographs. This form of continuous monitoring will allow the blasting contractor to adjust the actual maximum charge per delay based on the distances between blasting events and all infrastructure and facilities subjected to vibration control.

In accordance with the OPSS 120, the blast designs reviewed in the following report assume dominant frequencies generated by blasting events will be > 40 Hz; therefore, the design vibration threshold (peak particle velocity) for all surrounding infrastructure and utilities is therefore assumed to be **50 mm/s**. Vibration monitoring will validate the dominant frequency spectrums obtained during blasting activities and provide additional guidance on the applicable peak particle velocity threshold.

2.2 Site overview and critical distances

Table 1 presents the shortest horizontal distances between the excavation boundaries and the nearest surrounding infrastructure, including private, commercial, and public elements. These structures were included in the analysis due to their proximity to the excavation site. For reference, the locations of the closest underground public utilities, such as sanitary sewers, storm

sewers, and water mains, are also shown. The distances portrayed correspond to the shortest horizontal distances separating excavation boundaries and identified infrastructure.

Table 1: Distances from critical residential, commercial, and underground (private/public) infrastructure

Infrastructure	Location	Distance (from bench blasting activities)	PPV threshold	Special considerations?
Existing Building	West of excavation zone	≥ 0,1 m	50 mm/s (at dom. freq. >40 Hz)	Attenuation trench in place, at least 2m wide (excavated mechanically to proper depth prior to blasting activities). In areas within 3 meters of the building, double decking will be implemented
Gas line	East (Chruchill Avenue)	≥ 17 m		
Telecom (Bell)		-		
Telecom (TV)		-		
Watermain (Ø300 mm)		≥ 14 m		
Sanitary sewer (Ø250 mm)		≥ 13 m		
Storm sewer (Ø675 mm)		≥ 11 m		
Electrical (100mm Hydro)		≥ 5,3 m		
Gas line	South (Byron Avenue)	-	50 mm/s (at dom. freq. >40 Hz)	
Sanitary sewer (Ø250 mm)		-		
Telecom (Rogers)		≥ 4,79 m		Mechanical excavation required due to proximity to infrastructureTo implement in areas within 12 meters of infrastructure (To be determined)
Storm sewer (Ø675 mm)		-		
Watermain (Ø300 mm)		-		
Electrical		-		
Gas line	North (Danforth Avenue)	≥ 16 m	50 mm/s (at dom. freq. >40 Hz)	
Sanitary sewer (Ø225 mm)		≥ 14 m		
Telecom (Bell)		-		
Storm sewer (Ø675 mm)		-		
Watermain (Ø150 mm)		≥ 13 m		
Telecom (TV)		-		
Electrical		≥ 4 m		
Building 349 Danforth Avenue		≥ 18,5 m		

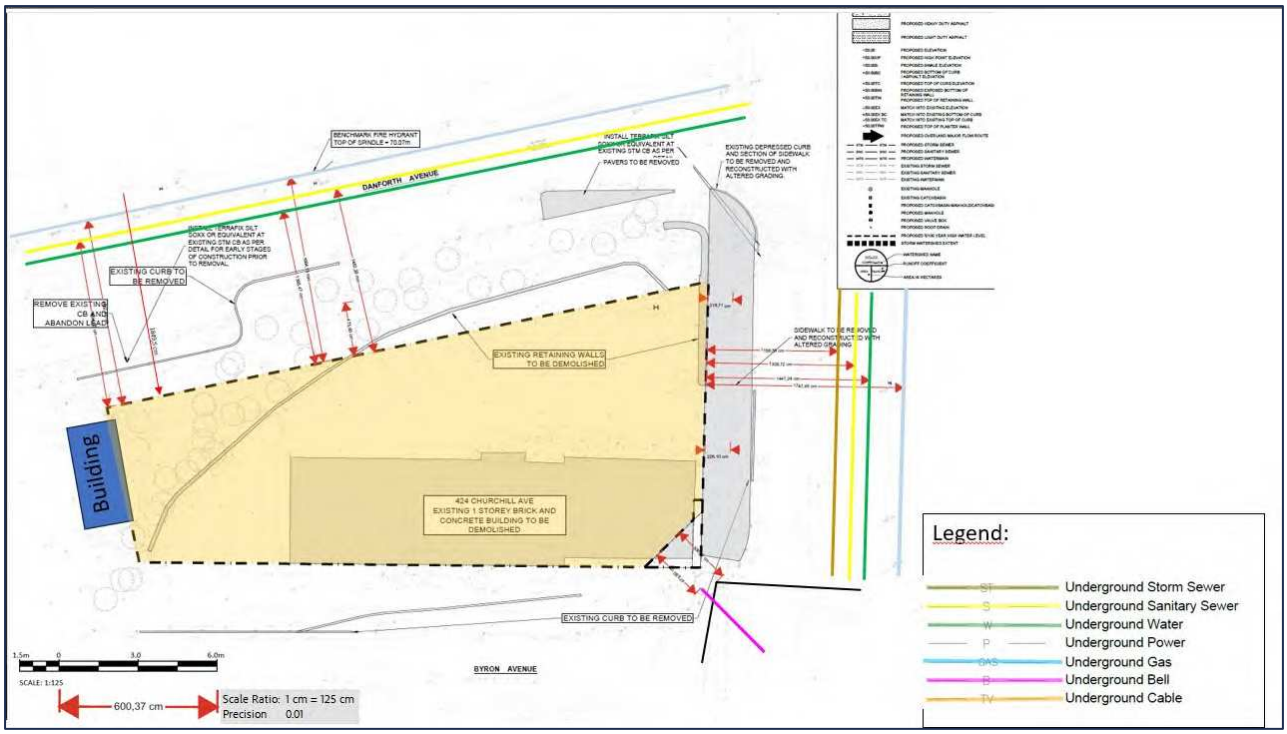


Figure 3: Plan view (civil drawings) used to identify critical surface and underground infrastructure and estimate distances relative to blasting activities (not all shown for clarity - see Table 1 for additional information)

3. Blast design parameters

Bench blasting design parameters have been established based on the required depth of cut range of 2.4 m:

- Scenario #1 (2.4 m cut) provides a decking option to reduce the unitary charge to ≈1.3 kg/delay (if required) due to proximity with sensitive infrastructure;
- Scenario #2 (2.4 m cut) considers a single column charge - equivalent to ≈ 3.1 kg/delay;
- Scenario #3 (3 m cut) considers a single column charge - equivalent to ≈ 3.9 kg/delay.

The provided scenarios are calculated empirically, and monitoring will confirm that the vibration amplitudes and frequencies are maintained within the applicable tolerances.

It is likely that a portion of the rock breakage requirements in areas closest to the existing service lines will have to be undertaken by mechanical means (i.e.: hydraulic rock-breaker). The areas

subjected to these constraints will be verified and confirmed through vibration monitoring initiatives.

The applicable blasting design scenarios are detailed in Table 2. The following scenarios have been developed to provide both operational flexibility as well as increased vibration control measures when blasting is taking place in proximity to critical infrastructure. It is the responsibility of the blasting contractor to establish the distances to the nearest infrastructure prior to each blasting event and adapt the loading configurations accordingly.

As operations progress, the compilation of vibration readings obtained from the network of seismographs monitoring the site may be used to review critical separation distances and to refine the site-based and additional attenuation factors being applied. It is also recommended to begin blasting operations as far as possible from existing and monitored infrastructure to validate the predicted (estimated) vibration amplitudes as well as the effectiveness of the vibration attenuation measures in place (i.e.: line-drilling).

Table 2: Blast design scenarios

Description	Units	Loading scenarios and parameters		
		1	2	3
		2.4 m cut - 2 decked charges	2.4 m cut - single charge	3 m cut - single charge
Blast type [**T**: Trench, **B**: Bench]		B	B	B
Rock density	[kg/m^3]	2700	2700	2700
Hole Diameter	[in]	2.5	2.5	2.5
	[mm]	64	64	64
Bench height	[m]	2.4	2.4	3
Sub-drill	[m]	0	0	0
Average Hole Depth	[m]	2.4	2.4	3
Stemming length - rock only	[m]	**1.2**	**1.2**	**1.5**
Total equivalent stemming length	[m]	**1.2**	**1.2**	**1.5**
Stemming / Explosive Diameter ratio	[-]	**24.0**	**24.0**	**30.0**
Scaled Depth Of Burial	[-]	**1.12**	**1.12**	**1.35**
Burden	[m]	1.2	1.5	1.5
Spacing	[m]	1.2	1.5	1.5
Theoretical Volume Per Hole	[m^3]	3.5	5.4	6.8
Number of Decked Charges	[un]	2	1	1
Total Inert Deck Length	[m]	0.3	0	0
Available Explosive column length	[m]	0.9	1.2	1.5
Explosive Products				
Explosive ID #1	[-]	Powerfrac 50 x 400	Powerfrac 50 x 400	Powerfrac 50 x 400
Explosive ID #2	[-]	Fortel Ultra 50 x 400	Fortel Ultra 50 x 400	Fortel Ultra 50 x 400
AVG Density - Explosive #1	[g/cm^3]	1.37	1.37	1.37
AVG Density - Explosive #2	[g/cm^3]	1.28	1.28	1.28
Charge Ø - Explosive #1	[mm]	50	50	50
Charge Ø - Explosive #2	[mm]	50	50	50
Deck A (BOTTOM CHARGE)				
Charge length - Explosive #1	[m]	0.40	0.40	0.50
Charge length - Explosive #2	[m]	0.0	0.80	1.00
Charge Summary DECK A (BOTTOM CHARGE)	[kg]	**1.08**	**3.09**	**3.86**
	[m]	0.40	1.20	1.50
Deck B (MID-COLUMN)				
Charge length - Explosive #1	[m]	0.3	0.0	0.00
Charge length - Explosive #2	[m]	0.2	0.00	0.00
Charge Summary DECK B (MID-COLUMN)	[kg]	**1.31**	**0.00**	**0.00**
	[m]	0.50	0.00	0.00
Summary of Drilling & Loading Parameters				
Drilling Yield	[m^3/m]	1.4	2.3	2.3
Explosive Charge Summary	**[m]**	**1.2**	**1.2**	**1.5**
	[kg/hole]	2.4	3.1	3.9
	[kg/delay]	**1.3**	**3.1**	**3.9**
	[kg/m.lin]	2.7	2.6	2.6
Theoretical Powder Factor Per Hole	[kg/m^3]	0.69	0.57	0.6
Initiation System	[-]	NONEL	NONEL	NONEL
Use of Blasting Mats	[-]	YES	YES	YES
Estimated seperation distances @ given vibration thresholds (USBM standard - K:1143, α: -1.6)				
Required seperation distance for **50 mm/s**	[m]	8	12	14

Figure 4 shows the projected excavation area identified using colour-coded zones representing the proposed rock fragmentation methods and designs based on critical distances to infrastructure.

Figure 4: Excavation area identified with proposed rock fragmentation methods (sectors)

A summary of the drilling and loading parameters and additional recommendations are provided below:

- Drilling depth range: 2.4 m to 3 m;
- Drilling diameters: 65 mm;
- Stemming height: ≥ 1.2 m;
- Charge length: ≤ 1.2 m;
- Type of explosives: Packaged emulsion (Ø50 mm) and/or extra-gelatinous dynamite (Ø50 mm);
- Primer: Extra-gelatinous dynamite and/or cast primer;
- Detonators / initiation system: NONEL 25/500 ms;
- Use of blasting mats (min. 3 layers) for every blasting event;

- The use of decked charges must be considered if the allowable charge per delay at a given distance cannot be maintained or if vibration limits are exceeded. Depending on the size of the blasting events and the measured vibration readings, alternate initiation systems may have to be considered for certain scenarios composed of multiple decked charges to ensure dominant frequencies are maintained within acceptable levels;
- Zones approaching critical infrastructure may initially be restricted to mechanical excavation due to the blasting-induced vibrations projected to be above the 50 mm/s threshold. The dimensions and locations of these preliminary zones are subject to change as vibration recordings are compiled and actual site attenuation parameters are determined.

The technical data sheets for the packaged explosive products, accessories and initiation system have been included in Appendix C.

4. Analysis

4.1 Vibration estimations

The following table summarize the estimated vibration amplitude (PPV) as a function of the distance separating the blasting event and critical infrastructure, as well as the assigned unitary charge per delay. The values presented in this table are estimates and shall be validated though the vibration monitoring program that will be in place for the duration of the blasting activities. Loading configurations can also be subject to change based on actual field conditions and the trends identified through the vibration monitoring program for the project.

Table 3: PPV estimation table per loading scenario

Scenarios	#1 2.4 m cut - decked charge	#2 2.4 m cut - column charge	#3 3 m cut - column charge
Distance	Charge Per Delay 1,4 Kg Estimated Vibration	Charge Per Delay 3,1 Kg Estimated Vibration	Charge Per Delay 3,9 Kg Estimated Vibration
[m]	[mm/s]	[mm/s]	[mm/s]
3	258,0	487,2	585,5
4	162,8	307,5	369,5
5	113,9	215,2	258,6
6	85,1	160,7	193,1
7	66,5	125,6	150,9
8	53,7	101,4	121,9
9	44,5	84,0	101,0
10	37,6	71,0	85,3
12	28,1	53,0	63,7
14	21,9	41,4	49,8
16	17,7	33,5	40,2
18	14,7	27,7	33,3
20	12,4	23,4	28,1
30	6,5	12,2	14,7
40	4,1	7,7	9,3
50	2,9	5,4	6,5
60	2,1	4,0	4,9
70	1,7	3,2	3,8
80	1,3	2,5	3,1
90	1,1	2,1	2,5
100	0,94	1,8	2,1
150	0,49	0,93	1,12
200	0,31	0,59	0,71
250	0,22	0,41	0,49
300	0,16	0,31	0,37
350	0,13	0,24	0,29
400	0,10	0,19	0,23

For information purposes only, Table 4 consists of a general guideline for establishing permissible maximum charge per delay configurations assuming a 50 mm/s peak particle velocity (PPV) threshold. This table is displayed for reference only to provide guidance in case minor adjustments to explosive charge configurations must be considered during the project. The maximum charge per delay range has been exaggerated to illustrate the potential attenuation linked to separation distances.

Table 4: Quantity-distance calculations for 50 mm/s

Maximum charge per delay estimation in order to respect a fixed vibration limit		
Vibration limit	50	mm/s
K	1143.00	
Alpha	-1.60	

Distance	Maximum Charge per delay
m	kg
1	No blasting
1.5	No blasting
2	No blasting
3	0.2
4	0.3
5	0.5
6	0.7
7	1.0
8	1.3
9	1.6
10	2.0
12	2.9
15	4.5
17	5.8
20	8.0
25	12.5
30	18.0
35	24.5
40	32.0
45	40.5
50	50.0
55	60.5

5. Instrumentation

A network of seismographs must be deployed to accurately measure blasting-induced vibrations (and air overpressure if applicable) at critical infrastructure and other sensitive receptors. A combination of fixed and mobile vibration monitoring stations is recommended for added flexibility and accuracy. Multiple recording units also facilitate measurements along the different axes of the projected excavation zone, rendering subsequent modelling and vibration prediction more accurate. Instrumentation should be prioritized for inhabited structures and infrastructure closest to blasting activities.

Instantel seismographs, more specifically the Series III (MiniMate Plus) or the MicroMate are typically the instruments of choice for vibration monitoring initiatives; however, other brands of monitoring equipment can also be deployed assuming that the specification of the alternate equipment follows overall compliance. All units and sensors deployed for vibration and air over-pressure monitoring must have valid calibration certificates.

Figure 5 shows the proposed locations for seismographs, strategically placed to ensure optimal coverage of the study area and accurate monitoring of ground vibrations.

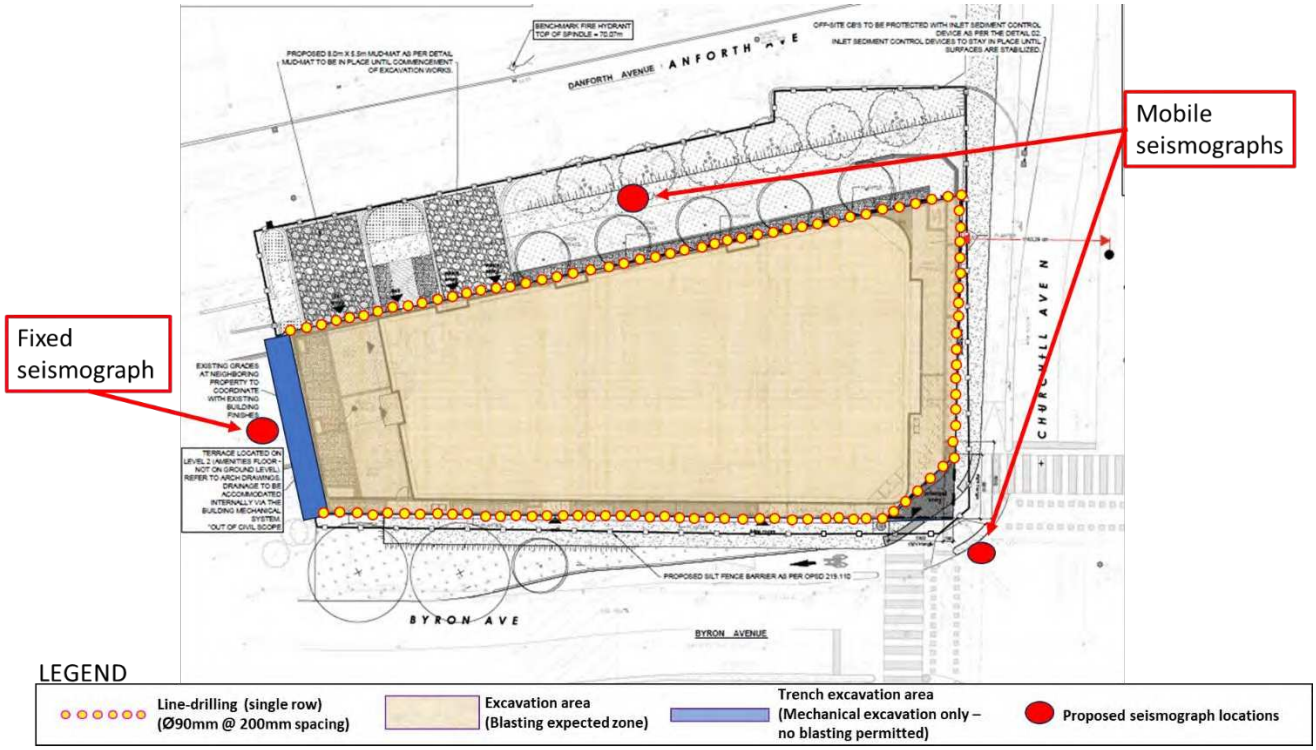


Figure 5: Proposed Locations for Seismographs

Blast monitoring shall be reported daily to ensure that any exceedances, if any, are managed and rectified prior to continuing blasting activities.

It is BBA's understanding that vibration monitoring (including seismograph locations and deployment) for the project will be undertaken by a third-party supplier and/or Blastforce Canada Inc. BBA remains available to support efforts linked to blasting vibration compilation and predictive modelling, if these initiatives are ever deemed necessary or required during the project.

6. Discussion

The drilling and blasting contractor must abide by the regulations and standards in place for blasting in proximity to both public and private infrastructure.

When operating near conduits, underground public utilities or other nearby structures, the contractor must adapt the excavation process to mitigate any risk of damaging adjacent infrastructure. Generally, if deemed permissible, a 5 m minimum standoff distance is recommended between controlled blasting events and critical infrastructure, however this distance may vary as a function of site layout and conditions, as well as through vibration monitoring. Rock fragmentation by mechanical means may be required at distances ≤5 m assuming vibration monitoring is in place. At the event of an exceedance, the work will be stopped, and an alternative method must be employed. The use of explosives is evidently prohibited in this area.

Infrastructure such as public utilities, as well as residential and commercial buildings in proximity to the site are subjected to the vibration thresholds stipulated in the OPSS 120 (50 mm/s: ≥40Hz).

The blast vibration data recorded throughout the entirety of the project must be preserved and analyzed periodically as it will be used as a primary reference for establishing alternate blasting scenarios, if deemed necessary over the course of the work.

7. Additional control measures

- All vibration data recorded over the duration of the project should be stored and periodically analysed to determine the actual site attenuation constants, and facilitate adjustments to the blast design parameters, if required;
- Blasthole positions must be established by a qualified and competent person, and must be verified by the blaster-in-charge;
- Blasting operations should begin by completing a scaled-down blasting pattern (4 to 6 holes only, ideally single row) located as far as possible from critical infrastructure. Monitoring equipment shall be used to record vibration data at these locations to allow adjustments to be made once blasting operations reach full-scale. If possible, near-field vibration monitoring (i.e.: measurements taken at short distances from the blasting event) can be implemented during these trial blasts in order to characterize overall vibration transmissibility in the rock mass prior to approaching sensitive receptors.

- The driller must complete a log recording all pertinent information relating to the drilling conditions and status of the blast holes being drilled. Information such as the intersection of voids, joint sets, and seams of softer rock, as well as the presence of water and broken ground in the collared area of the pattern must be reported and documented;
- The burden for all holes along the first row of the blasting event must be measured and validated (visually);
- Loading parameters of the blastholes along the first row must be adjusted according to the actual (measured) burden and actual site conditions;
- Blasthole stemming heights must be adjusted accordingly and at times individually to account for the actual topography of the blast pattern;
- Stemming material consists of crushed angular stone (5-7mm net);
- Ensure the as-loaded explosive column or decked charge does not surpass the allowable charge weight per hole;
- A detailed blasting journal must be completed for each individual blasting event;
- All blastholes must be drilled and oriented vertically – no angled holes are permitted;
- Properly identify the blast perimeter during loading operations;
- Properly delineate and identify the blast area and location;
- Fragmented rock material located at the free face(s) of a blasting pattern must be excavated to expose the toe (floor) elevation achieved by the previous blasting event, measure the actual burden distance, and facilitate blast movement. Additional fly rock control measures can be implemented by backfilling the trenched area with loose (non-compacted) material or rock fill;
- All regulations and standards pertaining to controlling and monitoring carbon monoxide emissions from blasting activities must be followed by the blasting contractor;
- Regulations pertaining to safety distances for drilling and blasting activities in proximity to suspended overhead power lines (if applicable) must also be respected;
- It is the responsibility of the drill and blast contractor as well as that of the general contractor to ensure the appropriate blast clearance zone is established and respected prior to undertaking blasting protocol;
- As per the contractor's procedure, audible signals emitted from an air horn or siren will be used to communicate the onset of blasting activities on the site. The signal sequence is the following:
  - Prior to blasting: 12 x rapid siren signals (in line);
  - 30 seconds prior to blasting: pause (silence);

  - Blast initiation;
  - All clear post-blast: 1 x extended siren signal;
- Blasting mats must be used for every blasting event. Blast mat layering and placement are the responsibility of the blaster-in-charge and must follow best-practice guidelines. Blasting mats must be in good working condition (i.e.: fully intact along the exposed surfaces) and clear of any embedded rock debris;
- If applicable, the attenuation trench or line-drilling holes need to kept empty of any fill material and water to promote the desired vibration attenuation effects.

8. Conclusion

BBA has analysed the blasting parameters that will be used to facilitate the rock excavation process for the above-mentioned project. Following our review, and according to the information available when compiling the report, the proposed methods and design criteria provide sufficient control measures to ensure compliance with applicable provincial and municipal regulations relating to blasting vibrations.

Appendix A: OPSS 120

GENERAL SPECIFICATION FOR THE USE OF EXPLOSIVES

TABLE OF CONTENTS

120.01 SCOPE

This specification covers the requirements for the use of explosives.

120.01.01 Specification Significance and Use

This specification is written as a municipal-oriented specification. Municipal-oriented specifications are developed to reflect the administration, testing, and payment policies, procedures, and practices of many municipalities in Ontario.

Use of this specification or any other specification shall be according to the Contract Documents.

120.01.02 Appendices Significance and Use

Appendices are not for use in provincial contracts as they are developed for municipal use, and then, only when invoked by the Owner.

Appendices are developed for the Owner's use only.

Inclusion of an appendix as part of the Contract Documents is solely at the discretion of the Owner. Appendices are not a mandatory part of this specification and only become part of the Contract Documents as the Owner invokes them.

Invoking a particular appendix does not obligate an Owner to use all available appendices. Only invoked appendices form part of the Contract Documents.

The decision to use any appendix is determined by an Owner after considering their contract requirements and their administrative, payment, and testing procedures, policies, and practices. Depending on these considerations, an Owner may not wish to invoke some or any of the available appendices.

120.02 REFERENCES

When the Contract Documents indicate that municipal-oriented specifications are to be used and there is a municipal-oriented specification of the same number as those listed below, references within this specification to an OPSS shall be deemed to mean OPSS.MUNI, unless use of a provincial-oriented specification is specified in the Contract Documents. When there is not a corresponding municipal-oriented specification, the references below shall be considered to be the OPSS listed, unless use of a provincial-oriented specification is specified in the Contract Documents.

This specification refers to the following standards, specifications, or publications:

Ontario Ministry of Transportation Publications

Ontario Traffic Manual (OTM):
Book 7 - Temporary Conditions

Department of Fisheries and Oceans (DFO) Publication

Guidelines for the Use of Explosives in or Near Canadian Fisheries Waters, 1998

International Society of Explosives Engineers (ISEE)

Performance Specifications for Blasting Seismographs, 2011 Edition

120.03 DEFINITIONS

For the purpose of this specification, the following definitions apply:

Blaster means a competent person knowledgeable, experienced, and trained in the handling, use, and storage of explosives and their effect on adjacent property and persons.

Blast Monitoring Consultant means a consulting engineering firm with a minimum of five years experience related to blasting retained by the Contractor to provide blast monitoring services. The blast monitoring consultant shall be a third party that is not owned or corporately affiliated with the Contractor responsible for the Work.

Consulting Engineering Firm means a firm or an individual that has been issued a Certificate of Authorization and a Consulting Engineer designation by the Professional Engineers Ontario.

Designated Blast Area means the area where the Contractor has notified, in writing, and provided information to all Utilities, public and private property owners, and as the area where the Contractor has made arrangements to evacuate all persons whose safety might be threatened by the blasting operation.

Fish Habitat means as defined by the Fisheries Act.

Flyrock means rock that becomes airborne as a direct result of a blast.

NAV CANADA means the company that owns and operates Canada's civil air navigation service (ANS).

Peak Particle Velocity (PPV) means the maximum component velocity in millimetres per second that ground particles move as a result of energy released from explosive detonations.

Pre-Blast Survey means a detailed record, accompanied by film or video as necessary, of the condition of private or public property, prior to the commencement of blasting operations.

120.04 DESIGN AND SUBMISSION REQUIREMENTS

120.04.01 Design Requirements

A blast design shall be prepared by an individual or firm with a minimum five years experience and be certified by an Engineer. The blast design shall include, as a minimum, the following:

a) Design PPV and design peak sound pressure level at 250 m radius or nearest Utility, residence, structure, or facility.

b) Number, pattern, orientation, spacing, size, and depth of drill holes.

c) Collar and toe load, number and time of delays, and mass and type of charge per delay.

d) Setback distances to affected fish habitat.

e) The explosive products to be used.

f) The designated blast area.

120.04.02 Submission Requirements

The following shall be submitted to the Contract Administrator:

a) A minimum of two weeks prior to the use of explosives:

   i. The name and statement of experience of the firm carrying out the blasting.
   ii. The name of the blaster including a record of experience and safety training.
   iii. The name of the individual or firm responsible for the blast design, including a record of experience and statement of qualifications.
   iv. A letter from an Engineer certifying the design.
   v. The name of the blast monitoring consultant, including a record of experience and a record of qualifications.
   vi. A certificate of insurance indemnifying the Owner from all claims and damages arising from the use of explosives.

b) A minimum of 48 hours prior to the use of explosives:

   i. A letter signed by the Engineer certifying the blast design indicating the areas for which the blast design has been completed.
   ii. A letter signed by the blaster indicating receipt of the blast design and agreement that the blasting shall be according to the design.
   iii. A letter signed by the Contractor certifying that a pre-blast survey has been carried out in accordance with the Pre-Blast Survey subsection and a copy of the pre-blast survey.
   iv. A copy of the blast design, including all items shown in the Design Requirements subsection.
   v. The designated blast area.
   vi. A blasting schedule.
   vii. A list of all locations to be monitored.
   viii. Proof of calibration of all monitoring equipment.

c) Upon request, any blasting permits, approvals, and agreements required for the use of explosives or to carry out blasting operations.

120.05 MATERIALS

120.05.01 Explosives

Only explosive products approved for use in Canada shall be used.

120.06 EQUIPMENT

120.06.01 Detonation Apparatus

Detonation apparatus shall be of the type approved by the detonation system manufacturer for the type of blasting operation to be undertaken. All apparatus shall be kept in working order and shall be thoroughly inspected before and after each blasting operation.

All wiring connected to electrical detonation apparatus shall be properly insulated.

120.06.02 Monitoring Equipment

All monitoring equipment shall be capable of measuring and recording ground vibration PPV up to 200 mm/s in the vertical, transverse, and radial directions. The equipment shall have been calibrated within the last 12 months either by the manufacturer or other qualified agent. Proof of calibration shall be submitted to the Contract Administrator prior to commencement of any monitoring operations.

Monitoring equipment shall be according to ISEE Performance Specifications for Blasting Seismographs.

120.07 CONSTRUCTION

120.07.01 General

Blasting shall be carried out only during daylight hours and at a time when atmospheric conditions provide clear observation of the blast when practical from a minimum distance of 1,000 m. Blasting shall not be conducted on Sundays, statutory holidays, or during electrical storms.

Blasting shall not be carried out within 30 m of concrete placed less than 72 hours when the ambient temperature falls below 20 °C or for 36 hours when the ambient temperature is continuously greater than 20 °C, unless otherwise authorized by the Contract Administrator.

Protection of fish and fish habitat shall be according to the Guidelines for the Use of Explosives in or Near Canadian Fisheries Waters.

120.07.02 Radio-Frequency Hazards

Prior to blasting, investigations shall be done to determine if radio-frequency hazards exist. When such hazards exist, necessary precautions shall be taken.

120.07.03 Pre-Blast Survey

A pre-blast survey shall be prepared for all buildings, Utilities, structures, water wells, and facilities likely to be affected by the blast according to Table 1 where explosives are to be used. The standard inspection procedure shall include the provision of an explanatory letter to the owner or occupant and owner with a formal request for permission to carry out an inspection.

The pre-blast survey shall include, as a minimum, the following information:

a) Type of structure, including type of construction and if possible, the date when built.

b) Identification and description of existing differential settlements, including visible cracks in walls, floors, and ceilings, including a diagram, if applicable, room-by-room. All other apparent structural and cosmetic damage or defect shall also be noted. Defects shall be described, including dimensions, wherever possible.

c) Digital photographs or digital video or both, as necessary, to record areas of significant concern.

Photographs and videos shall be clear and shall accurately represent the condition of the property. Each photograph or video shall be clearly labelled with the location and date taken.

A copy of the pre-blast survey limited to a single residence or property, including copies of any photographs or videos that may form part of the report shall be provided to the owner of that residence or property, upon request.

120.07.04 Notification

120.07.04.01 General

A minimum of 15 Business Days prior to blasting, the Contractor shall provide written notice to Utilities and all owners and tenants of improved property within 250 m of the right-of-way in the vicinity of the blast. The notice shall include a blasting schedule, information about the audible blast warning system, and contact name for questions or other concerns.

The Contractor shall ensure that a competent person is available to receive, document, and deal with public inquiries before and after blasting operations.

A minimum 48 hours prior to blasting, sufficient detail regarding the blasting operations shall be provided to NAV CANADA and the Contract Administrator.

120.07.04.02 Utilities

Authorities of all likely affected Utilities shall be notified a minimum of 72 hours prior to blasting.

120.07.04.03 Properties

Not more than five Business Days and not less than four hours prior to each blast, the Contractor shall provide notice of the blasting schedule to all owners and tenants of buildings or facilities within 150 m of the blast. All blasts scheduled for the following seven Days may be included in one notice. The notice shall include information about the audible blast warning system.

When blasting operations may incur property damage or require temporary evacuation, notification shall include evacuation information and instructions. The Contractor shall take all reasonable steps to ensure that the property owner acknowledges, by their signature, that they have received the information and shall comply with any evacuation requirements. When such signature is withheld, the Contractor shall maintain records showing the date and time that the information was delivered.

120.07.05 Monitoring

120.07.05.01 General

The Contractor shall employ a blast monitoring consultant to carry out monitoring for PPV, peak sound pressure levels, and water overpressures as required. During each blast, ground vibration PPV and the peak sound pressure level shall be monitored at 250 m from the area of the blast or at the closest portion of any Utility, residence, structure, or facility. Water overpressure in affected fish habitats shall be monitored adjacent to the shore closest to the blast. The monitoring equipment shall be repositioned as required.

120.07.05.02 Ground Vibration

Ground vibration as measured by PPV shall be limited to the maximum levels shown in Table 2. Should readings from any two consecutive blasts exceed these values or any single reading exceed these values by more than 30 mm/s, the blast operation shall cease until a revised blast design, certified by the Engineer, has been submitted to the Contract Administrator.

120.07.05.03 Water Overpressure

Instantaneous pressure change as measured by water overpressure in or near fish habitat shall not exceed 100 kPa.

120.07.05.04 Trial Blasts

The Contractor shall confirm the suitability of the blast design for the ground vibration PPV limits and sound pressure levels by carrying out a minimum of three limited test blasts at locations agreed upon by the Contract Administrator and the Contractor. The trial blasts shall be carried out with appropriate blast vibration and noise level monitoring equipment. Based on the results, the initial blast design shall be revised as necessary.

120.07.06 Protective Measures

Immediately prior to the blast, the designated blast area shall be cleared of all vehicular and pedestrian traffic.

All traffic shall be stopped and prevented from entering the area until the blaster gives permission. Traffic control shall be according to the Ontario Traffic Manual, Book 7. Signs shall be posted to inform the public of blasting operations and to turn off radio transmitters. Audible blast warning devices, capable of alerting workers and the public up to a radius of 1,000 m, shall be used before and after blasting.

Blasting mats or other suitable means of controlling flyrock shall be used to limit potential hazardous effects of the blast.

120.07.06.01 Protection of Utility Lines

Where temporary rearranging and shielding of utility lines are detailed within the Contract Documents, such temporary rearranging and shielding is the minimum protection required. The Contractor shall remain responsible for any unauthorized disruptions of service and any damage to utilities arising out of the Contractor's work, notwithstanding such protection. The Utility authorities shall carry out the temporary rearranging and shielding of lines as detailed within the Contract Documents and more extensive rearranging and shielding if requested to do so by the Contractor. The cost of all such protective measures, together with the cost of restoring the lines to their original state and location, shall be at the expense of the Contractor, and shall be billed to the Contractor by the Utility authority.

Notwithstanding the preceding paragraph, the Utility authorities shall, subject to the Contractor's obligation under the Contract to assume responsibility for disruption of services and damage, consider alternative measures which the Contractor may suggest. Such alternative measures, if approved by the Utility authorities in writing, shall be provided at the Contractor's expense and billed to the Contractor by the Utility authority.

Whenever, in the opinion of the Utility authority, standby crews are necessary during blasting operations, the Contractor shall make the necessary arrangements with the Utility authority and the cost of such crews and equipment shall be billed to the Contractor by the Utility authority. These measures shall apply to those utilities located within all rock blasting areas.

120.07.07 Records

A post-blast record shall be prepared and signed by the blaster for each blast completed. The post-blast record shall report the following conditions and be made available to the Contract Administrator for site review:

a) The date, time, and location of the blast.

b) The wind direction and approximate speed at the time of the blast.

c) The general atmospheric conditions at the time of the blast.

d) The actual blast details.

e) PPV, peak sound pressure level, and water overpressure results of each blast.

A report summarizing the results of the ground vibration and peak sound pressure levels shall be submitted to the Contract Administrator at the end of each work day that blasting was carried out.

120.07.08 Damage

Upon completion of blasting or immediately following the receipt of a complaint, a site condition survey shall be performed to determine if any damage has resulted. The Contractor shall record all incidents of any damage or injury, which shall be reported immediately in writing to the Contract Administrator. All other complaints shall be reported to the Contract Administrator in writing within 24 hours of receipt. Each complaint report shall include the name and address of the complainant, time received, and description of the circumstances that led to the complaint.

120.07.09 Management of Excess Material

Management of excess material shall be according to the Contract Documents.

120.10 BASIS OF PAYMENT

Payment at the Contract price for the appropriate tender items that requires the use of explosives shall be full compensation for all labour, Equipment, and Material to do the work.

When the Contract contains separate items for work required by this specification, payment shall be at the Contract prices and according to the specifications for such work.

The cost of standby crews and equipment required by Utility authorities shall be the responsibility of the Contractor.

120.10.01 Claims

The Contractor shall be responsible for the management of all claims and payment arising from the hauling, handling, use of, and storing of explosives and all effects, directly or indirectly related to the blasting operation.

TABLE 1
Radius of Pre-Blast Survey

Depth of Rock Excavation	Radius of Pre-Blast Survey from Blast Site
< 5 m	75 m
≥ 5 – 10 m	150 m
> 10 m	150 m If no buildings exist within 150 m, the closest building within 500 m

TABLE 2
Maximum Peak Particle Velocity Values

Element	Frequency Hz	Peak Particle Velocity (PPV) mm/s
Structures and Pipelines	≤ 40	20
	> 40	50
Concrete and Grout < 72 hours from placement	N/A	10

Appendix 120-A, November 2019
FOR USE WHILE DESIGNING MUNICIPAL CONTRACTS

Note: This is a non-mandatory Commentary Appendix intended to provide information to a designer, during the design stage of a contract, on the use of the OPS specification in a municipal contract. This appendix does not form part of the standard specification. Actions and considerations discussed in this appendix are for information purposes only and do not supersede an Owner's design decisions and methodology.

Designer Action/Considerations

This specification should be included on all projects that require the use of explosives.

The designer should determine if Utility authorities have any special measures or minimum offset distances and include them in the Contract Documents.

The designer should identify if there are site-specific conditions or environmental issues that may affect blasting design and alter monitoring requirements, pre-blast survey limits, pre-blast survey requirements, or notification limits as necessary, and include them in the Contract Documents.

The designer should provide names of Utility authorities and contacts involved in the Contract.

The designer should ensure that the General Conditions of Contract and the 100 Series General Specifications are included in the Contract Documents.

Related Ontario Provincial Standard Drawings

No information provided here.

Appendix B: Third-party Requirements in the Vicinity of Natural Gas Facilities Standard (Enbridge Gas inc.)

Third-Party Requirements in the Vicinity of Natural Gas Facilities Standard

STANDARD

2024-01-31
ST-1E-30A8-8E30.1.2.1
Enbridge Inc.

Table of Contents

Third-Party Requirements in the Vicinity of Natural Gas Facilities Standard

1 Introduction

This document is intended for anyone involved in planning or carrying out work in the vicinity of Enbridge Gas Distribution and Storage's (GDS) network. It summarizes the requirements to be followed and specifies the technical requirements aimed at protecting GDS's facilities, and by extension, ensuring public and worker safety.

Within this document, "third party" refers to an individual or organization that is not employed by, or performing work under, contract to GDS. These requirements are applicable to work done by individuals such as homeowners, landowners, other utility companies, excavators, constructors, and contractors.

Third parties must follow the regulations and legislation applicable to their work in addition to these requirements. It is understood that all legal provisions applicable to work carried out around natural gas facilities take precedence over this document.

The terms "gas lines", "gas pipelines", and "mains" used throughout this document apply equally to natural gas mains and service lines, as well as any other component of GDS's natural gas systems found on public or private land.

All work in the vicinity of gas facilities must adhere to the requirements set forth in this document. Work includes, but is not limited to, any ground disturbance in the vicinity of facilities or equipment crossing. Ground disturbance includes, but is not limited to, activities associated with excavation, directional drilling, blasting, piling, compaction, boring, ploughing, grading, backfilling, and hand digging.

A locate of the facilities must be requested at least five business days prior to beginning any work. Locates are required before ground disturbance takes place.

2 Terms and Definitions

The following is a list of terms found in this document and their definitions.

applicant: The owner of the proposed work.

blaster: The person or persons responsible for setting the charges and performing the blast.

blasting, surface: An operation involving the excavation of rock foundations for various types of structures, grade construction for highways or railroads, or canals (trenches) for water supply or collection purposes.

blasting, tunnel: Operations involving the piercing of below-ground (generally horizontal) opening in rock.

compaction: Any vibration-generating operation that will result in a potential increase of the density of soils or controlled backfill materials. The means to increase the density may be static or dynamic.

constructor: A person who undertakes a project for an owner and includes an owner who undertakes all or part of a project by himself or by more than one employer (as defined by Occupational Health & Safety Act).

contractor or excavator: Any individual, partnership, corporation, public agency, or other entity that intends to dig, bore, trench, grade, excavate, hammer into, or break ground with mechanical equipment or explosives in the vicinity of a gas pipeline or related facility.

EGI: Enbridge Gas Inc.

facility: Any Enbridge Gas Distribution, Transmission, Storage pipeline, main, service, regulator station or storage facility and its related components.

Gas Distribution and Storage (GDS): Enbridge Gas Distribution and Storage, Gazifère Inc., Niagara Gas Transmissions Limited, 2193914 Canada Limited.

ground disturbance: Any work, operation, or activity on or under the existing surface resulting in a disturbance or displacement of the soil or ground cover. Ground disturbance can include, but is not limited to: activities associated with excavation, directional drilling, blasting, piling, compaction, boring, ploughing, grading, backfilling, and hand digging.

hand dig: To excavate using either a shovel with a wooden or fiberglass handle, or using hydro vacuum excavation equipment. The use of picks, bars, stakes, or other earth piercing devices are not considered hand digging.

independent engineering consultant: A professional engineer who is registered with the provincial or state professional engineering association and a holder of a certificate of authorization (C of A).

locate service provider: Any entity that performs locates under the terms of a locate service agreement.

pile: Any vertical or slightly slanted structural member introduced or constructed in the soil in order to transmit loads and forces from the superstructure to the subsoil; the structural member can also be used as a component of a retaining wall system.

pile driving: The placement of piles carried out by gravity hammer, vibratory hammer, auger, pressing, screwing, or any combinations of the above methods.

positive identification: Visually locating (daylighting, exposing, digging test holes to determine) the location, depth, and size of a below-grade facility by using either vacuum excavating or hand digging. This includes elevation or alignment changes that can alter the depth or direction of the pipe (e.g., 45° and 90° elbows, fittings, plugs, weldolets, flanges, branch piping, known abandoned facilities, etc.).

pre-Engineering review: A process by which third parties can request a pre-engineering review for any potential conflict analysis.

professional engineer: An engineer registered and licensed with the provincial professional engineering association in the jurisdiction in which the engineer is practicing.

rural: All areas outside urban areas.

temporary support: The support of gas pipelines before or during an excavation to protect the pipeline from its own weight and to minimize deflection stresses.

third party: An individual or organization that is not employed by or performing work under contract to GDS (e.g., homeowners, other utility companies, contractor, excavators, constructors, etc.).

urban: An area with a population of at least 1,000 and a density of 400 or more people per square kilometer.

vital pipeline: A subset of pipelines that are critical to the safe and reliable operation of the natural gas system. Damages to vital mains could result in significant negative impact to public and worker safety or significant customer outages. This subset of mains consists of CER-regulated (Canada Energy Regulator) pipelines, transmission pipelines, and select distribution pipelines.

3 General Requirements

3.1 CER-Regulated Pipelines and Vital Pipelines

The CER regulates natural gas, oil, and commodity pipelines that extend beyond provincial, territorial, or national boundaries. All work in the prescribed area (within 30 m [100 ft] from each side of the CER-regulated pipeline) must be reviewed by the applicable CER-regulated operating company prior to commencing. This review is a regulatory requirement of the CER.

Mains are designated as vital pipelines by GDS. These include, but are not limited to, any pipeline NPS 16 or larger, transmission pipelines, CER-regulated pipelines, all pipelines operated by Storage and Transmission Operations (STO), and select distribution pipelines. The designation of a vital pipeline may change at the discretion of GDS. Vital Pipelines will be identified through locates. In these requirements, special considerations for CER-regulated pipelines and vital pipelines will be highlighted.

All work within 5 m (16 ft) from either side of lines operated by STO must be approved by GDS prior to commencing. For all other vital pipelines, all ground disturbance work within 3 m (10 ft) from either side of the vital pipeline must be approved by GDS prior to commencing. Approval by GDS may include specific conditions that third parties must follow. GDS may require representation on site for any ground disturbance work within the vicinity of vital pipelines and CER-regulated pipelines.

3.2 When Observation Is Required

A GDS representative is required to be on site to ensure the excavation or third-party activity is being safely completed near a pipeline when:

- Excavation with mechanical equipment will occur within 5 m (16 ft) of CER-regulated pipelines and all lines operated by STO.
- Excavation with mechanical equipment may take place within 3 m (10 ft) of vital pipelines and pipeline segments.
  Once the pipeline is exposed, mechanical excavation is then permitted up to 1 m (3.3 ft) from the pipeline.
- It is anticipated that blasting will take place within 30 m (100 ft) of any pipeline.
- Any other situations which requires observation, as deemed necessary by EGI.

3.3 Safe Excavation

Mechanical excavation is not permitted within 5 m (16 ft) of CER-regulated pipelines and 3 m (10 ft) of vital pipelines, unless verified visually. After the exact location of the main is verified visually, mechanical excavation is allowed up to 1.0 m (3.3 ft) from the pipeline. Within 1 m (3.3 ft) of the CER-regulated or vital pipeline, only hand digging or hydro-excavation is allowed.

Mechanical excavation may not begin within 3 m (10 ft) of the pipe until:

- The pipe has been exposed by the excavator, under the supervision of GDS, by hand at the point of crossing, or the pipeline company has located the pipe and confirmed that it is at least 0.6 m deeper than the proposed excavation.
- The excavation is parallel, or the pipe has been exposed by handto confirm the location of the pipe.

For all non-vital pipelines, mechanical excavation is not allowed within 1 m (3.3 ft) of the locate marks of the pipeline, until the exact location of the pipeline has been visually verified. The excavator must expose the pipeline by hand digging or hydro-excavation. Once the pipeline is exposed, mechanical excavation is then permitted up to 0.3 m (1 ft) from the pipeline. Within 0.3 m (1 ft) of any pipeline, only hand digging or hydro-excavation is permitted.

Only handheld compaction equipment may be used within 1 m (3.3 ft) of the sides or top of all gas pipelines. When ground conditions make hand excavation impractical (e.g., frost), the pipeline company may permit excavation to within 1 m (3.3 ft) of the pipeline if the pipeline company considers it safe to do so and directly supervises the excavation.

Spoil from excavation must not be piled on the pipeline or its easement.

3.4 Minimum Cover Requirements

Table 3-1: Minimum Cover Requirements on page 8 defines mains and services cover requirements. In all cases where the depth of cover requirements cannot be met, contact GDS to review depth of the cover requirements.

Table 3-1: Minimum Cover Requirements

Pipeline	Location	Minum Cover m (ft)
Mains	Under traveled surfaces (roads), road crossings	1.2 m (4 ft)
	Right-of-ways	1 m (3.3 ft)
	Highways	1.5 m (5 ft)
	Water crossings, and below drainage and irrigation ditches	1.2 m (4 ft)
Services	Private property	0.5 m (1.6 ft)
	Road crossings	0.9 m (2.9 ft)

3.5 Points of Thrust

Additional precautions may need to be taken when working in the vicinity of points of thrust. Points of thrust occur at pipeline fittings such as elbows (45° or 90°), end caps, weld tees, reducers, closed valves, and reduced port valves. If a point of thrust is identified through the locate process, GDS may require additional time to review the proposed work area. In the event that the excavation involves exposing a point of thrust or exposing an area near a point of thrust, GDS may provide written specific instructions that are to be followed. Failure to follow these instructions can result in significant harm to persons, property, or the environment.

3.6 Repair of Damaged Pipe and Pipe Coating

In all cases where the pipeline or the pipeline coating is damaged by construction activities, GDS must be contacted immediately and the excavation left open until GDS personnel have made the necessary repairs.

3.7 Encroachment

Permanent awnings and roof structures are prohibited above GDS's facilities within public rights-of-way or GDS's rights-of-way. GDS will not accept responsibility for any damages resulting from maintenance or operation of its facilities to encroaching structures within the public or GDS rights-of-way. Examples of encroaching structures include: bus shelters, street benches, and garbage bins.

GDS requires approval for all permanent structures to be built within 7 m (22.9 ft) of GDS's vital pipelines. This requirement is in place to allow GDS sufficient access and working space should an inspection or repair be needed.

3.8 Tree Planting

When planting trees, the gas pipeline in and near the area of excavation must be located to ensure enough clearance is maintained between the pipeline and the tree.

For all vital pipelines (including CER and transmission pipelines), trees or large shrubs must maintain a horizontal clearance between the edge of the root ball or open bottom container to the adjacent edge of the existing pipelines of not less than 3.0 m (10 ft), or as specified in any applicable easement agreement.

For all other pipelines, a minimum horizontal clearance of 1.2 m (4 ft) is recommended between the edge of the root ball or open bottom container and adjacent edge of the existing gas pipeline.

In cases where the recommended clearance cannot be achieved, GDS may specify the installation of a root deflector.

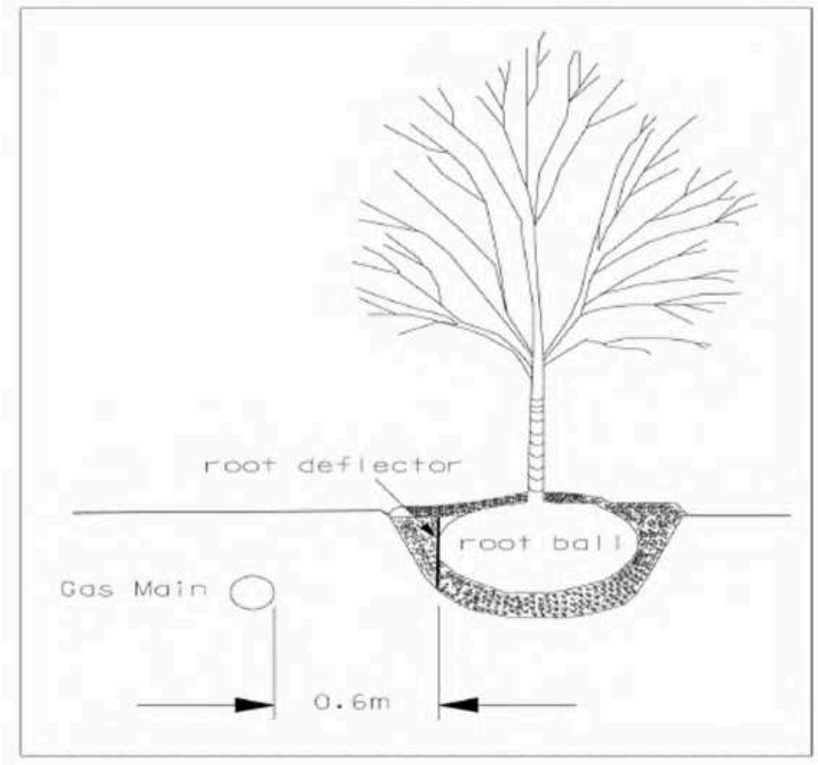
3.8.1 Root Deflectors

A root deflector is a physical barrier placed between tree roots and pipelines to prevent damage to the pipelines. A root deflector can be made from 1/4 in thick rigid plastic, fiberglass, or other non-degradable material. The root deflector is intended to prevent the root tips from attaching to the gas main.

Typically, root deflectors are straight barriers or encircle the tree. If installed as a straight barrier, the root deflector should be installed at a minimum 0.6 m (2 ft) from the pipeline on the tree-side of the pipeline. Also, it should extend parallel to the pipeline in both directions for 1.2 m (4 ft) measured from the centre of the tree trunk.

Root deflectors usually have a collar to keep the top of the deflector at ground level, and extend down to the bottom of the root-ball as shown in Figure 1: Example of a Root Deflector.

Figure 3-1: Example of a Root Deflector



3.9 Sewer and Drain Cleaning

Prior to sewer clearing activity using mechanical cutting or high pressure jetting equipment, the third party should call into Ontario One Call at 1-800-400-2255 for a

cross bore sewer safety inspection. An EGI employee or contractor will attempt to attend the site within two hours to complete the inspection.

4 Minimum Clearance from Other Structures

The following clearances must be maintained between the circumference of the gas pipeline and other underground structures:

Table 4-1: Minimum Clearance Between Gas Pipelines (Less than NPS 16) and Other Underground Structures

Direction	Minimum Clearance m (ft)
Horizontal	0.6 m (2 ft)
Vertical	0.3 m (1 ft)

Table 4-2: Minimum Clearance Between CER-regulated Pipelines and Vital Pipelines and Other Underground Structures

Direction	Minimum Clearance m (ft)
Horizontal	1 m (3.3 ft)
Vertical	0.6 m (2 ft)

Additional clearance or mitigation may be required for installations (such as transit systems or power transformers) that will introduce DC stray current interference or AC fault hazards.

Note

For all pipelines (including vital pipelines), when drilling parallel to the pipeline, a minimum horizontal clearance measured from the edge of the pipeline to the edge of the final bore hole of 1 m (3.3 ft) is required.

5 Pipeline Location Verification

5.1 Surface Road Work

Surface road work applies to ground disturbance on travelled roadways related to the removal of hard-surfaces only. For any ground disturbance work, locates must be obtained prior to commencing and the excavator must ensure accuracy of the locate by reviewing the locate paperwork with the physical locate markings. Surface road work can be completed without the requirement to positively identify EGI pipelines, provided no mechanical equipment will be used within 1 m (3.3 ft) horizontally of the located pipelines. If mechanical excavation is required within 1 m (3.3 ft) of the locate during any surface road work or work that will take place deeper than removal of the hard surface, the excavator must follow rules outlined in 5.2 Subgrade Road Work on page 11 for positive identification requirements.

5.2 Subgrade Road Work

Subgrade road work is any road work exceeding the depth required for removal of the hard surface that enters the sub-surface. The boundary area for the pipeline is the distance that is identified off the locate marks of the pipeline and applicable boundary areas are highlighted in Table 5-1: Boundary Areas on page 11.

Table 5-1: Boundary Areas

Pipeline	Boundary Area
Vital pipelines (≥ NPS 24)	3 m (10 ft)
Vital pipelines (< NPS 24)	2 m (6 ft)
Non-vital pipelines (all sizes)	1 m (3 ft)

Note

Work within the boundary areas must comply with the positive identification requirements set in Table 8-2: Pipeline Location Verification Requirements for Vital Pipelines on page 21 and Table 8-3: Pipeline Location Verification Requirements for All Other Pipelines on page 21.

If these guidelines cannot be complied with, the excavator must submit a variance request work package. No variance will be provided for work within 1 m (3.3 ft) of any pipeline. The variance work package must include, at a minimum, the following information:

- Pre-Engineering design.
- Location of EGI facilities with respect to proposed excavation area (vertical and horizontal offsets).
- Location of proposed excavation area (vertical and horizontal offsets off permanent landmarks).
- Pipeline protection plan.

If a variance is requested, the excavator must also provide a physical barrier (e.g., silt fence), which would denote the boundary of the pipeline, where possible.

8.2 Drilling Parallel to Pipelines on page 20 and Table 8-3: Pipeline Location Verification Requirements for All Other Pipelines on page 21 indicate GDS's minimum requirements for the verification of the pipeline location based on the nature of the work. The frequency and location of test holes may change at the discretion of GDS. Additional test holes may be required to sufficiently confirm the location of the pipeline (e.g., regulator stations).

Note

Non-mechanical equipment must be used when working within 1 m (3.3 ft) of any pipeline. If mechanical equipment is required for use around non-vitals, the pipeline must be positively identified using hand tools or hydro-excavation. Once the non-vital pipeline location has been visually identified through positive identification requirements listed in the 8.2 Drilling Parallel to Pipelines on page 20 and Table 8-3: Pipeline Location Verification Requirements for All Other Pipelines on page 21, mechanical equipment can be used up to 0.3 m (1 ft) of the non-vital pipeline and 1 m (3.3 ft) of a vital pipeline.

When using hydro-vacuum excavation as an alternative to hand digging, see 9 Hydro-Excavation on page 24 for safe operating practices.

6 Operation of Heavy Equipment

6.1 General

Additional precautions are necessary when equipment in excess of the weights listed in Table 5: Vehicle Load Restrictions is operated in the vicinity of buried facilities where no pavement exists or where grading operations are taking place.

Table 6-1: Vehicle Load Restrictions

Pipe Material	Weight/Axle Maximum Allowable Load kg (lb)
Plastic	7,000 kg (15,400 lb)
Steel	10,000 kg (22,046 lb)

Prior to any crossing, the location of the gas main must first be staked out by a GDS representative.

The excavator is responsible for confirming the location and depth of the main. Test hole spacing must not exceed 50 m (160 ft).

6.2 Equipment Moving Across the Pipeline

Crossing locations for heavy equipment must be kept to a minimum.

The crossing locations must be determined by GDS after reviewing:

- The nature of the construction operation.
- The types and number of equipment involved.
- The line and depth of the existing gas main.

The use of equipment is contingent upon the review by GDS. Once the crossing locations have been established, heavy equipment is restricted to crossing at these locations only. It is the responsibility of the third party to inform their personnel of the crossing location restrictions.

Pipelines may require additional protection at crossing locations by constructing berms or installing steel plates over the pipeline.

Unless expressly allowed by the temporary crossing consent, equipment that crosses pipelines must be subject to the following conditions:

- The numbers of crossings back and forth must be kept to a minimum.
- Equipment must not remain stationary on top of a pipeline.
- Equipment must not cross with loaded side boom or other unbalanced loads.
- Equipment must cross perpendicular (not parallel) to the pipeline. The crossing angle for installations must be within 45° to 90° (with preference for as close to perpendicular as possible).
- Equipment must operate at slow speeds when crossing a pipeline in order to minimize loading impact.
- Existing cover over a pipeline must not be reduced; any loss of cover (e.g., due to rutting) must be promptly restored prior to crossing.
- Vibratory compaction equipment must not operate within 1.2 m (4 ft) of a pipeline.

6.3 Equipment Moving Along the Pipeline

Heavy equipment can be operated parallel to existing pipelines provided that a minimum offset of both:

- 1 m (3.3 ft) is maintained on pipeline sizes less than NPS 16.
- 2 m (6.6 ft) on pipeline sizes NPS 16 and larger, unless otherwise directed by GDS.

Only lightweight, rubber-tired equipment may be operated directly over the existing gas pipelines, unless a minimum pipe cover of twice the pipe diameter or 1 m (3.3 ft) (whichever is greater) can be verified. The use of all other equipment is contingent upon review and approval by GDS.

Unless expressly allowed by the temporary crossing consent, equipment moving along pipelines is subject to the following conditions:

- Equipment must operate at slow speeds when moving along a pipeline.
- Existing cover over a pipeline must not be reduced; any loss of cover (e.g., due to rutting) must be promptly restored prior to moving along the pipeline.
- Vibratory compaction equipment must not operate within 1.2 m (4 ft) of a pipeline.

Note

When crossing perpendicular to a pipeline that is smaller than NPS 16 (excluding vital pipelines), the vertical clearance outlined in Table 4-1: Minimum Clearance Between Gas Pipelines (Less than NPS 16) and Other Underground Structures on page 10 may be used as long as all positive identification requirements are also followed.

Note

When crossing perpendicular to a pipeline that is NPS 16 or larger, or crossing any CER-regulated pipelines or vital pipelines, a minimum vertical clearance of 1 m (3.3 ft) is required; 8 Horizontal Directional Drilling on page 19.

7 Support of Gas Pipelines

7.1 General

The support requirements specified in this section are the minimum requirements. GDS must be notified regarding the support of any gas main. GDS has complete discretion in the approval of any support system. Additionally, if a pipeline is to be exposed for longer than one month, approval must be sought from GDS and work must follow the requirements outlined in 3 General Requirements on page 6. Third parties must not depart from these support requirements unless a professional engineer working for or on behalf of the third party has designed an alternative method. Any alternative method must be comparable to these specifications and be, in the opinion of the professional engineer, consistent with good engineering practices. The alternative specification must be documented, approved by a professional engineer and provided to GDS for review prior to the commencement of work. The third party is responsible for the adequate support of the buried gas pipelines exposed during excavation according to this section.

Prior to any crossing, the location of the gas main must first be staked out by a GDS representative.

7.2 Support of Gas Pipelines Perpendicular to Excavation

Temporary support refers to the support of gas pipelines prior to or at the time of excavation to protect the pipeline from deflection due to its own weight while it is exposed. Temporary support must remain in place until the backfill material underneath the pipeline is compacted adequately to restore support of the pipeline.

Before trenching beneath a main or service, temporary support must be erected for pipelines if the unsupported span of pipe in the trench exceeds the length indicated in Table 7-1: Maximum Span without Support Beam on page 15.

Note

For pipelines larger than NPS 16, GDS must be contacted. Contact information can be found in the 12 Contact Information on page 31.

When temporary support is required, Table 7-2: Support Beam Sizes and Maximum Span Between Beam Supports on page 15 indicates the required beam for a given span. The beam must be a continuous length grade No. 1 Spruce-Pine-Fir (S-P-F) or equivalent. For spans exceeding 4.5 m (15 ft), a continuous length timber

beam may not be available. In that case, steel I-beams (or equivalents) can be used as the support beam. Steel beam selection must be certified by a professional engineer and submitted to GDS for review.

Table 7-1: Maximum Span without Support Beam

Pipe Size (NPS)	Steel m (ft)	PE (polyethylene) m (ft)
1/2	2 m (6.6 ft)	1 m (3.3 ft)
3/4 to 1-1/4	2.5 m (8.2 ft)	1.25 m (4.1 ft)
2	3 m (10 ft)	1.5 m (5 ft)
3 to 4	4.5 m (15 ft)	1.75 m (6 ft)
6	6 m (20 ft)	2 m (7 ft)
8	7 m (23 ft)	2 m (7ft)
10	8.5 m (28 ft)	-
12	10 m (33 ft)	-
16	11.5 m (38 ft)	-

Table 7-2: Support Beam Sizes and Maximum Span Between Beam Supports

	Steel	Plastic	
Pipe Size (NPS)	≤ 4.5 m	≤ 2 m	≤ 4.5 m
1/2 to 2	4 × 6	4 × 6	6 × 8
3 to 6	-	6 × 6	8 × 8

Note

In all cases where the support beam size requirements cannot be met, GDS must be contacted to review support beam requirements.

The beam must be placed above the pipe with the ends of the beam resting on firm undisturbed soil. The beam must not bear directly on the gas pipeline. The pipe must be supported from the beam with rope, canvas sling, or equivalent in a manner that will prevent damage to the pipe and coating and eliminate sag. The spacing between the ropes must not exceed 1 m (3.3 ft); see Figure 7-1: Support of Gas Pipelines Crossing Excavations on page 17.

Backfill material underneath the exposed pipeline must be compacted to a minimum of 95% compaction. Sand padding must be placed to a level 150 mm (6 in) below and above the main. For additional details, see 10 Backfilling on page 25.

Perform compaction with the loose lift height not exceeding 200 mm (8 in) or one-quarter of the trench width, whichever is less. Injecting water into the backfill beneath the pipe is not an acceptable method of compaction.

All temporary support on pipelines must be removed before backfilling. Adequate support must remain in place until the backfill material has restored support.

7.3 Support of Pipelines Parallel to Excavation

Two cases exist for pipelines parallel to an excavation:

- Trench < 1.2 m deep
- Trench > 1.2 m deep

In either instance, the pipeline must not be exposed unless it is necessary to provide direct support.

Trench wall support may not be required for excavations provided the pipeline meets all of the following criteria:

- Depth is less than 1.2 m (4 ft).
- the pipeline is at least 0.6 m (2 ft) from the edge of the excavation or outside the 45° line projected upward from the trench bottom; see Figure 7-3: Influence Lines for Gas Pipelines Adjacent to Excavations on page 19.
- Soil is stable (type 1 or 2, see Table 15-1: Soil Types on page 33)

If the pipe does not meet these requirements and the soil is soft clay or sand (soil types 3 and 4), then the excavation must be suitably shored to prevent movement of the pipe. The shoring must remain in place until the backfill material has restored support.

Trench wall support is required for excavations if any one of the following conditions exist:

- Depth is ≥ 1.2 m (4 ft).
- The pipeline is closer to the edge of the excavation than the minimum allowed distance indicated Table 7-3: Minimum Allowed Distance from Main to Excavation on page 16.
- Depth is < 1.2 m (4 ft) and the soil is unstable (type 3 or 4, see Table 15-1: Soil Types on page 33).

Note

Adequate support must remain in place until the backfill material has restored support.

Minimum distances from the edge of the trench to the pipeline in which the excavation influences pipelines are shown in Table 7-3: Minimum Allowed Distance from Main to Excavation on page 16. The pipeline must be supported if these minimum distances cannot be met.

Table 7-3: Minimum Allowed Distance from Main to Excavation

Trench Depth (m)	Soil[a] Type 1 and 2	Soil[a] Type 3 and 4
1.2 m (3.9 ft)	0.9 m (3 ft)	0.9 m (3 ft)
1.5 m (4.9 ft)	0.9 m (3 ft)	0.9 m (3 ft)
1.8 m (5.9 ft)	0.9 m (3 ft)	0.9 m (3 ft)
2.1 m (6.9 ft)	0.9 m (3 ft)	0.9 m (3 ft)
2.4 m (7.9 ft)	0.9 m (3 ft)	0.9 m (3 ft)
2.7 m (8.9 ft)	0.9 m (3 ft)	1 m (3.3 ft)
3 m (9.8 ft)	0.9 m (3 ft)	1.5 m (4.9 ft)
3.3 m (10.8 ft)	0.9 m (3 ft)	1.8 m (5.9 ft)
3.6 m (11.8 ft)	0.9 m (3 ft)	2.2 m (7.2 ft)
3.9 m (12.8 ft)	0.9 m (3 ft)	2.5 m (8.2 ft)
4.2 m (13.8 ft)	0.9 m (3 ft)	3 m (9.8 ft)
4.5 m (14.8 ft)	1 m (3.3 ft)	3.4 m (11.2 ft)

Trench Depth (m)	Soil[a] Type 1 and 2	Soil[a] Type 3 and 4
4.8 m (15.7 ft)	1.5 m (4.9 ft)	3.8 m (12.5 ft)
5.1 m (16.7 ft)	2 m (6.6 ft)	4.1 m (13.5 ft)
5.4 m (17.7 ft)	2.5 m (8.2 ft)	4.6 m (15.1 ft)
5.7 m (18.7 ft)	3 m (9.8 ft)	5 m (16.4 ft)
6 m (19.7 ft)	3.4 m (11.2 ft)	5.5 m (18 ft)

a. As defined in the Occupational Health and Safety Act.

For pipelines where the trench bottom is below the water table, the trench must be suitably shored as per the trench wall support requirements.

Any pipeline that is exposed for a length greater than indicated in Table 7-1: Maximum Span without Support Beam on page 15 requires a field assessment.

For steel and polyethylene pipelines within the minimum distances given in Table 7-3: Minimum Allowed Distance from Main to Excavation on page 16, support must remain in place until backfill material restores support.

Figure 7-1: Support of Gas Pipelines Crossing Excavations

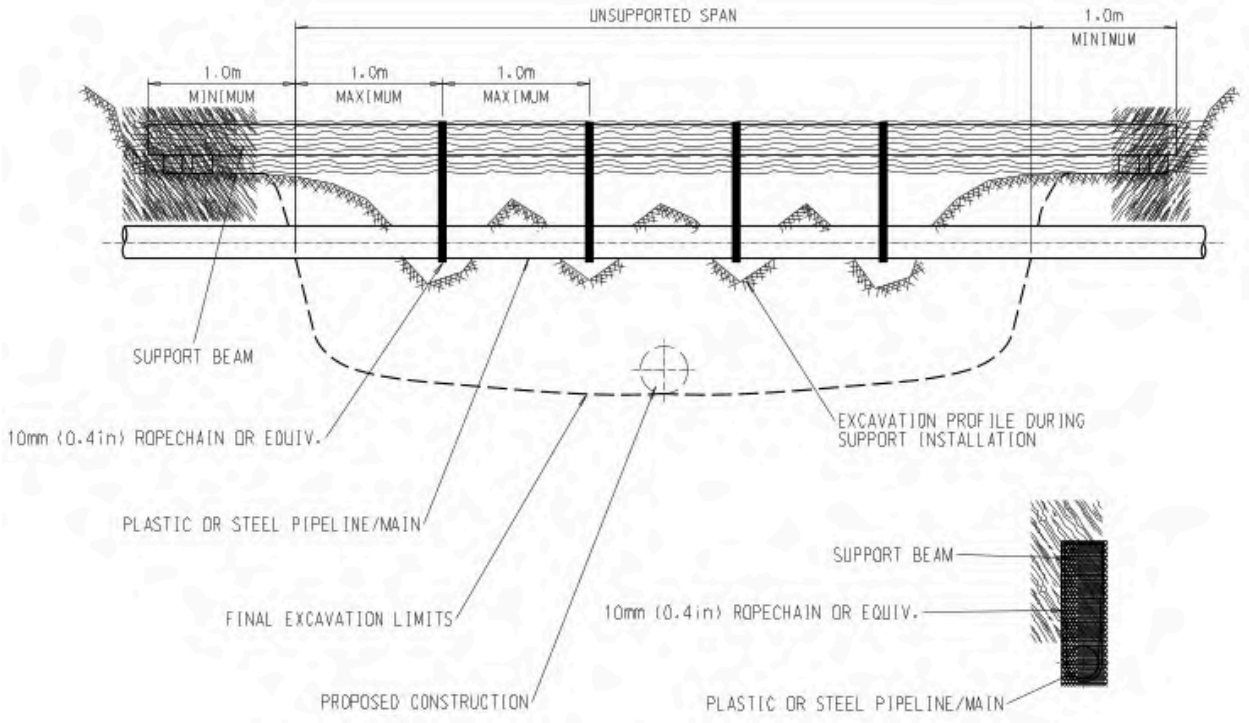
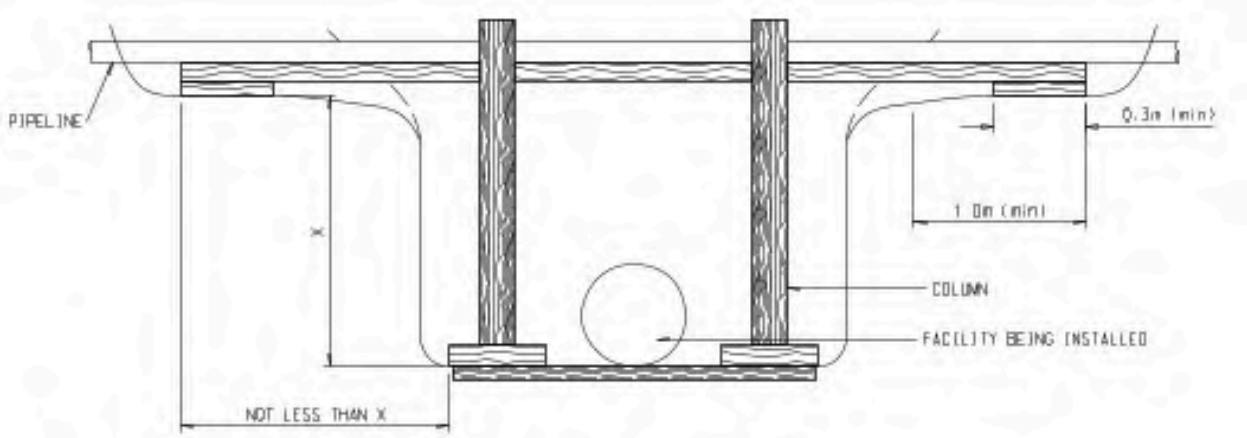


Figure 7-2: Typical Temporary Supports for Pipelines Crossing the Trench – Span Exceeds 4.5 m



NOTES:
1. LAMINATED 4X6 TIMBER BEAM REQUIRED BENEATH ALL NPS 1/2 - NPS 2.
2. LAMINATED 6X6 TIMBER BEAM REQUIRED BENEATH ALL NPS 3 - NPS 6.
3. LAMINATED 8X8 TIMBER BEAM REQUIRED BENEATH ALL NPS 8 - NPS 12.
4. COLUMN SIZE SHALL MATCH LAMINATED TIMBER BEAM REQUIREMENT.
5. COLUMN TO BE SPACED AS SPECIFIED BY PIPELINES AND STATIONS OPERATIONS ENGINEERING.
6. PLASTIC PIPE AND COATING ON STEEL PIPE TO BE PROTECTED FROM SUPPORTS AND STRAPPINGS WITH A PIECE OF RUBBER TIRE OR EQUIVALENT.
7. PLASTIC PIPE MUST BE SUITABLY STRAPPED O PREVENT MOVEMENT OFF THE BEAM.
8. ADDITIONAL SUPPORTS WILL BE REQUIRED AT MECHANICAL COUPLINGS OR VALVES.

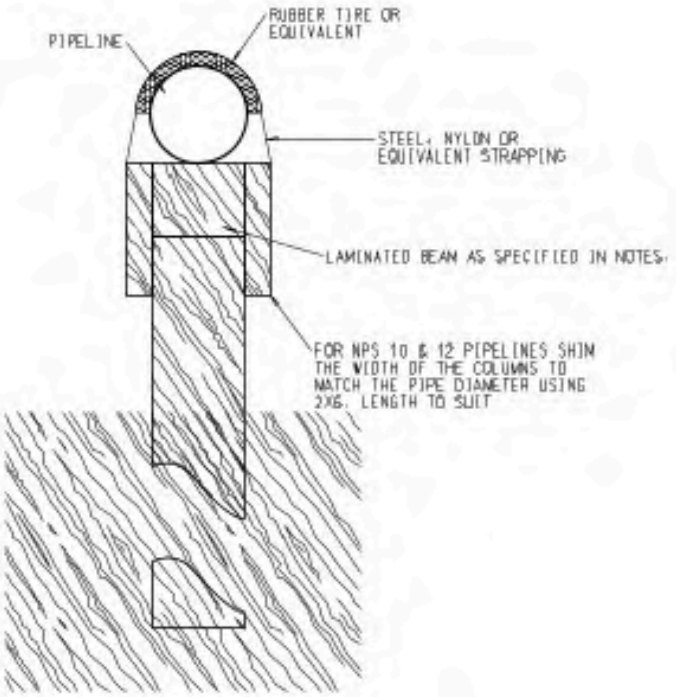
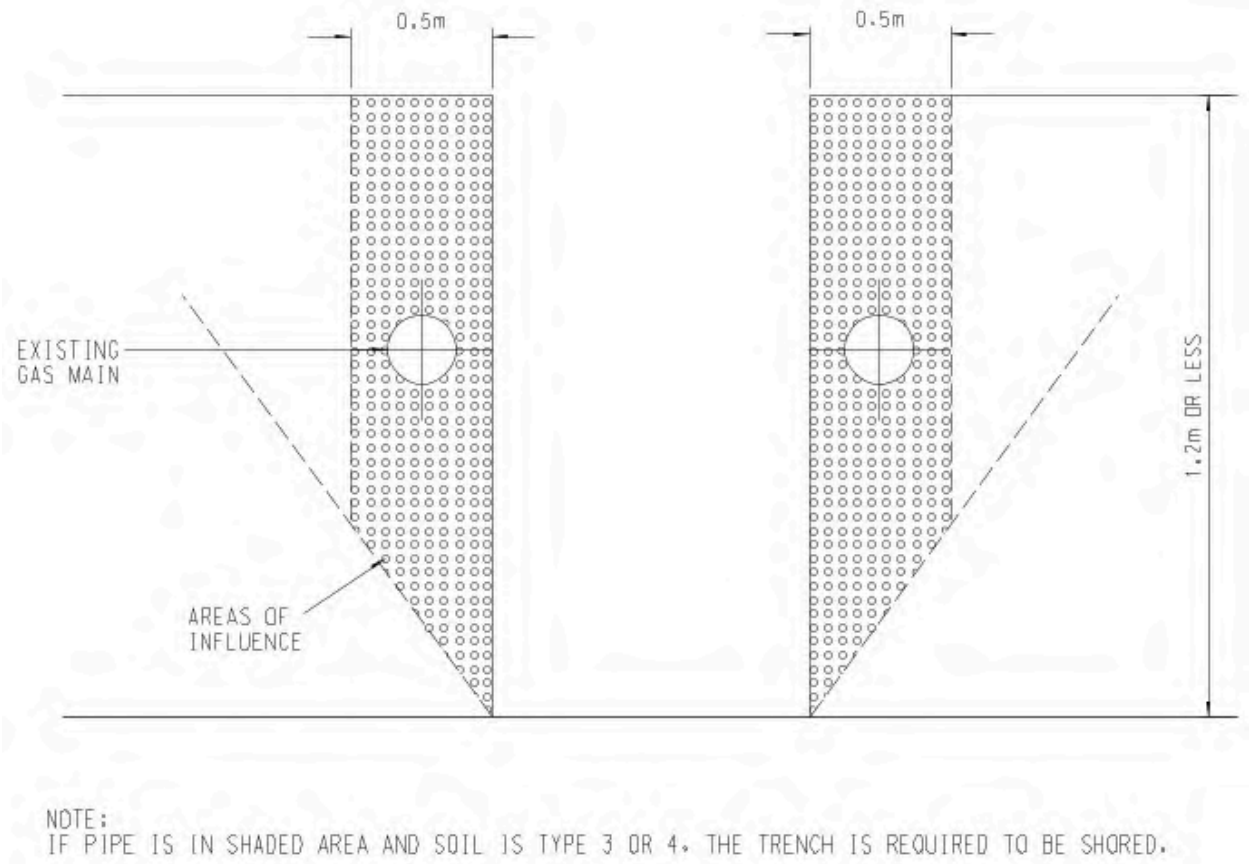


Figure 7-3: Influence Lines for Gas Pipelines Adjacent to Excavations



8 Horizontal Directional Drilling

8.1 General

Horizontal directional drilling (HDD) or directional boring is a steerable trenchless method of installing underground facilities. Trenchless technology is used where utilities being crossed are positively identified to confirm location.

For installations using any other type of drilling or augering equipment in the vicinity of gas facilities, GDS must be contacted.

In all cases, positive identification holes are required to visually verify the drill head's location (including depth) relative to the measurement of the tracking equipment. For positive identification hole requirements, see Figure 8-2: Pipeline Location Verification and Clearance Requirements for HDD for crossing all pipelines (including Vital Pipelines) on page 24. For pipeline location verification and clearance requirements for all horizontal directional drilling see Table 8-1: Pipeline Location Verification and Clearance Requirements for HDD for all Pipelines (including Vital Pipelines) on page 20.

If these guidelines cannot be complied with, a variance request work package must be submitted. No variance will be provided for work within 1 m (3.3 ft) of any pipeline. The variance work package must include, at a minimum, the following information:

- Pre-Engineering design.
- Location of EGI facilities with respect to proposed installation area (vertical and horizontal offsets).
- Location of proposed installation area (vertical and horizontal offsets off permanent landmarks).
- Pipeline protection plan.

If a variance is requested, a physical barrier (e.g., silt fence) must also be provided, which would denote the boundary of the pipeline, where possible.

Table 8-1: Pipeline Location Verification and Clearance Requirements for HDD for all Pipelines (including Vital Pipelines)

Location of Work Relative to Pipeline[a]	Required Verification of Pipe Location by Hand Digging or Hydro-Excavation
Crossing below pipeline (HDD)	All sides of pipeline (including below pipeline) exposed to 1.0 m (3.3 ft) from the pipeline's sidewalls. Additional positive identification hole at 2.0 m to 4.0 m (6.6 ft to 13.1 ft) prior to the daylight hole at the crossing, to verify depth and trajectory of drill head and backreamer.
Crossing above pipeline (HDD)	Top of pipeline and all sides exposed to 1.0 m (3.3 ft) or 1.0 m (3.3 ft) below the proposed installation. Additional positive identification hole at 2.0 m to 4.0 m (6.6 ft to 13.1 ft) prior to the positive identification hole at the crossing, to verify depth and trajectory of drill head and backreamer.

a. See Figure 8-2: Pipeline Location Verification and Clearance Requirements for HDD for crossing all pipelines (including Vital Pipelines) on page 24.

8.2 Drilling Parallel to Pipelines

When the proposed route is parallel to a natural gas pipeline at a perpendicular distance of 3 m (10 ft) or less, positive identification must be performed at intervals

of no more than 10 m (33 ft) along the drilling path so that the precise location of the drilling head and backreamers (if any) can be verified visually. These excavations must be sufficiently wide to see the entire width of the drilling head, backreamers, and structures from entry point to exit point.

Note

The location of the pipeline must be visually confirmed as per the requirements set out in Table 8-2: Pipeline Location Verification Requirements for Vital Pipelines on page 21 and Table 8-3: Pipeline Location Verification Requirements for All Other Pipelines on page 21.

Note

For all pipelines (including vital pipelines), when drilling parallel to the pipeline, a minimum horizontal clearance of 1 m (3.3 ft) is required.

Table 8-2: Pipeline Location Verification Requirements for Vital Pipelines

Location of Work Relative to Pipeline[a]	Required Verification of Pipe Location by Hand Digging or Hydro-excavation
Work parallel to pipe, within 1 m (3.3 ft)	Spacing of test holes must not exceed 4.5 m (15 ft)
Work parallel to pipe, between 1 m (3.3 ft) and boundary area of pipeline based on size	Spacing of test holes must not exceed 4.5 m (15 ft)[b]
Crossing below pipeline (open excavation)	Top and sides of pipeline, and 0.6 m (2 ft) below the pipeline
Crossing above pipeline (open excavation)	Top and sides of pipeline, or 0.6 m (2 ft) below the proposed installation

a. Test holes must expose top and sides of pipeline

b. For work parallel to pipe, between 1 m (3.3 ft) and boundary area of pipeline based on size, for rural applications, test holes must be completed for any change in direction of the pipeline every 23 m (75 ft).

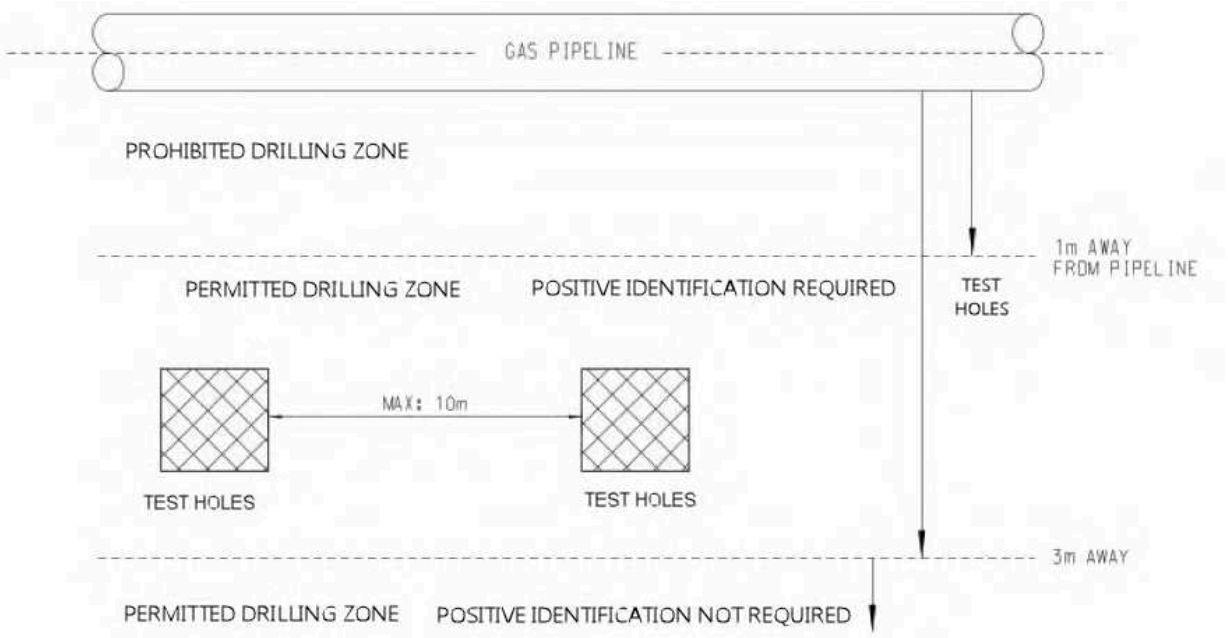
Table 8-3: Pipeline Location Verification Requirements for All Other Pipelines

Location of Work Relative to Pipeline	Required Verification of Pipe location by hand digging or hydro-excavation
Work parallel to pipe, inside of boundary area (1 m [3.3 ft])	Spacing of test holes must not exceed 4.5 m (15 ft)
Crossing below pipeline (open excavation)	For less than NPS 12: Top of pipeline and all sides of the pipeline, or 0.3 m (1 ft) below the pipeline For NPS 12 and larger: Top of pipeline and all sides of the pipeline, or 0.6 m (2 ft) below the pipeline
Crossing above pipeline (open excavation)	For less than NPS 12: Top of pipeline and all sides of the pipeline,or 0.3 m (1 ft) below the proposed installation For NPS 12 and larger: Top of pipeline and all sides of the pipeline, or 0.6 m (2 ft) below the proposed installation

No drilling installation may be performed within a distance of 1 m (3.3 ft) or less from either side of the pipeline. This buffer zone must be clearly designated and

marked off around the work area. This prohibited zone may be widened in some cases.

Figure 8-1: Drilling Parallel to Pipelines



8.3 Drilling Across Pipelines

When the proposed drill path crosses a GDS pipeline, the pipeline must be exposed to the desired depth of the crossing to ensure that the natural gas pipeline is not affected and that the required clearance is maintained during all drilling operations. All minimum clearances must be measured from the outer edge of the drill, including backreamers (if any), to the outer circumference of the pipeline.

To ensure that the directional drilling operation will not result in damage to the pipeline, the following positive identification hole requirements must be followed:

- A positive identification hole must be created that is sufficiently wide enough to see the drill head and backreamer entering the excavation at a minimum of 1 m (3.3 ft) before crossing the pipeline. See Figure 8-2: Pipeline Location Verification and Clearance Requirements for HDD for crossing all pipelines (including Vital Pipelines) on page 24 positive identification hole 1.
- A second positive identification hole must be created prior to reaching the pipeline such that the precise location of the drill head and backreamer (if any) can be verified visually. The positive identification hole must be sufficiently wide to measure the depth and trajectory of the drill head and backreamer.

See Figure 8-2: Pipeline Location Verification and Clearance Requirements for HDD for crossing all pipelines (including Vital Pipelines) on page 24 positive identification hole 2.

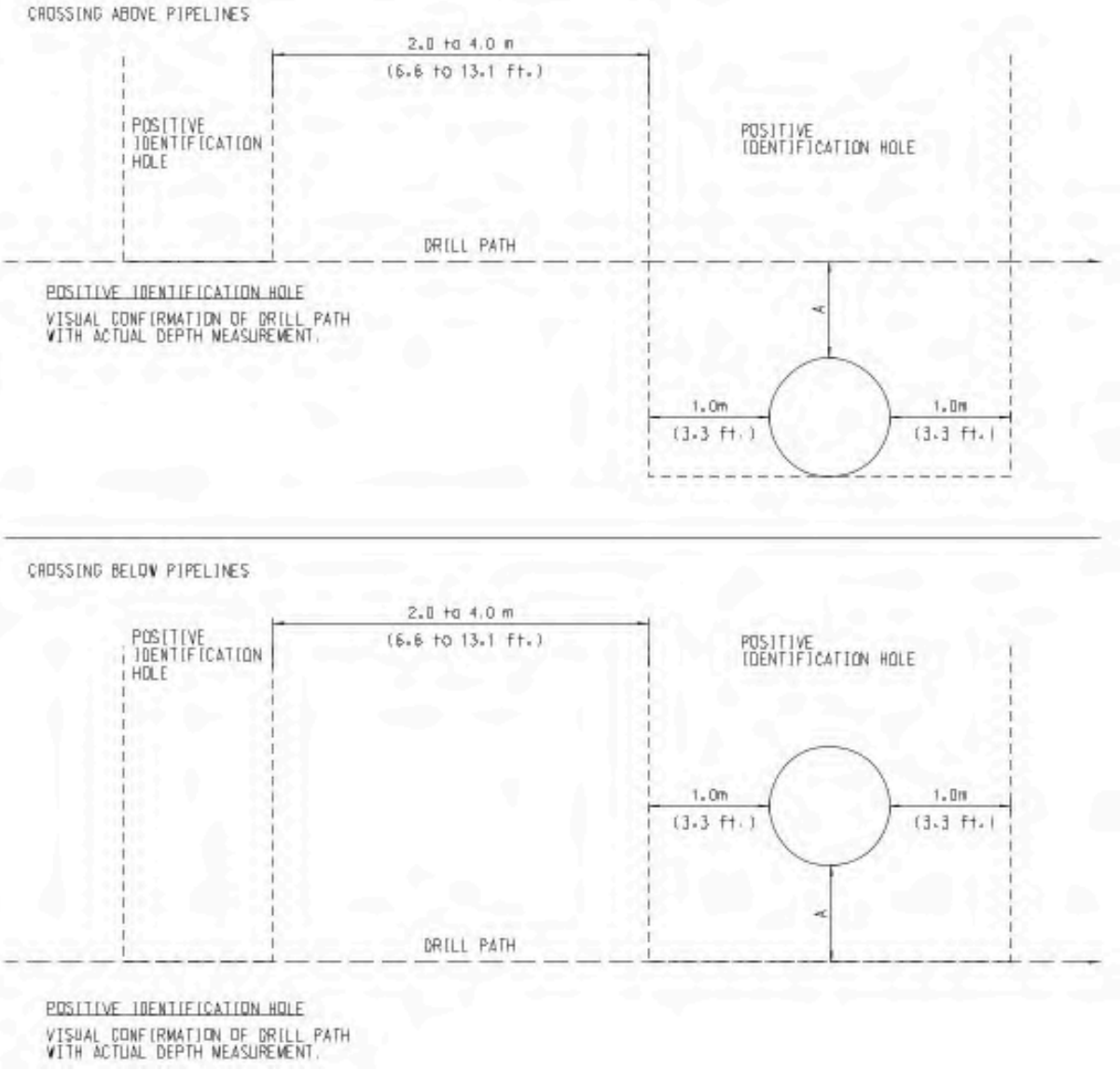
When drilling across pipelines that are smaller than NPS 16 (excluding vital pipelines), the vertical clearance, measured from the edge of the pipeline to the edge of the final bore hole, may follow the vertical clearance outlined in Table 4-1: Minimum Clearance Between Gas Pipelines (Less than NPS 16) and Other Underground Structures on page 10 as long as all positive identification requirements are also followed.

When drilling across pipelines that are NPS 16 or larger, or crossing any CER-regulated pipelines or vital pipelines, a minimum vertical clearance, measured from the edge of the pipeline to the edge of the final bore hole, of 1 m (3.3 ft.) is required.

Note

The location of the pipeline must be visually confirmed as per the requirements set out in Table 8-2: Pipeline Location Verification Requirements for Vital Pipelines on page 21 and Table 8-3: Pipeline Location Verification Requirements for All Other Pipelines on page 21. For specified minimum clearances, see 4 Minimum Clearance from Other Structures on page 10.

Figure 8-2: Pipeline Location Verification and Clearance Requirements for HDD for crossing all pipelines (including Vital Pipelines)



9 Hydro-Excavation

9.1 General

Hydro-excavation, also known as hydrovac, is the non-destructive process in which pressurized water is utilized as a method of excavation through loosening and suction of soil, rocks, and other earth materials. Hydro-excavation machines are an alternative to hand digging to locate and expose pipelines.

9.2 Hydro-Excavation Requirements

The following requirements must be met at all times when excavating with hydro-excavation technology:

- Spinning tip nozzles must be used for hydrovac excavations with water pressures that must not exceed the maximum water pressure of 17,236 kPa (2,500 psi) during excavation. Pressure measures must be permanently monitored using a calibrated device mounted on either the hydro-excavation machine (truck and pump), or the wand when using a spinning tip nozzle.
- The wand must never remain motionless during excavation. The wand must never point to the plant at any time.
- A distance of 20 cm (8 in) between the end of the pressure wand nozzle and the plant or subsoil must be maintained. The nozzle must never be inserted into the subsoil while excavating above the plant.
- Hydro-excavation equipment and nozzles must have been specifically designed for use above buried gas lines or other reasonably expected underground gas plants.
- A device capable of stopping the excavation on demand must be installed, such as an approved automatic electronic shut-off or valve on the wand.
- If heated water is used during excavation, the temperature and pressure of the water must not exceed 100 °F (38 °C) and 17,250 kPa (2,500 psi), respectively.
- The excavator must contact the gas utility if any damage to a gas plant occurs while using hydro-excavation technology or any other method of excavation.

10 Backfilling

The gas pipeline must be inspected by GDS for damages before backfilling the excavation. It is the third party's responsibility to ensure that the gas pipeline is not undermined or endangered in any way. If any damage occurs, GDS must be contacted immediately.

The following principles must be followed:

- The backfill does not harm the pipe or coating throughout the installation process and while in service.
- The use of native material (especially with respect to anode installation) and minimize haul out must be maximized.
- A reliable and stable installation must be created and the use of dams included when appropriate.

The Company permits the use of any compacting device that:

- Will compact backfill sufficiently to eliminate any settlement of the pipe or ground surface.
- Will not cause any deformation or damage to the pipe or coating.
- Will not cause any damage to any adjacent building, structure or utility.
- Will not cause any damage to any tree, shrub, tended lawn, or ground cover.

When backfilling where the finished grade has not been established, sufficient soil must be placed over the trench to allow for settlement.

Backfilling must be done in such a manner as to prevent any rocks from being placed at or near the surface of the pipe. Native excavated material must be used

as backfill unless otherwise directed by GDS. Where native material is unsuitable, 150 mm (6 in) of approved earth or sand padding must be placed over the pipe for protection, to a minimum depth of 300 mm (12 in). Each layer must be compacted thoroughly by manual tamping. Topsoil must not be used for backfilling.

Aggregate backfill must be replaced in 200 mm (8 in) layers. Each layer must be thoroughly compacted by pneumatic tampers or an equivalent method acceptable to GDS to ensure no settlement. The final layer must be smoothed down with a grader (or a rake for small scale projects) and must be tamped flush or slightly higher than the surrounding ground surface in order to prevent ponding of water and accommodate any future soil subsidence over the trench line.

Backfilling a flooded trench is not allowed. The third party is responsible for the removal of water from the trench, before backfilling. If backfilling on a slope, the backfill must first be placed from the bottom of the slope, then the filling should continue by building upwards. This prevents large voids in the backfill that can occur when the backfill is dumped from the top of a slope.

Backfill and compaction within road allowances must be completed in accordance with the local governing authority.

Unshrinkable fill or other engineered backfill material must be installed only when requested by the municipalities, local governing authority, or as directed by GDS. The approved unshrinkable fill must be batched at a ready-mix plant with a specified maximum compressive strength of 0.7 MPa at 28 days and minimum slump of 150 mm (6 in). After curing, it must be excavatable using hand tools and must meet any governing agency requirements. The pipe and valve assemblies must be sand padded before placement of unshrinkable fill. The third party must ensure that placement of the unshrinkable fill does not displace sand padding or directly contact the pipeline.

If the bulk backfill material contains rocks, stones, or frozen material, pipelines must be padded with padding material to a minimum depth of 150 mm (6 in) over the pipe and fittings. If the location requires the backfill material to be tamped, the padding material must also be tamped.

The final covering of gas pipelines must adhere to municipal requirements.

11 Blasting and Pile Driving

11.1 General

Blasting and pile driving activities in the vicinity of GDS facilities require prior approval by GDS. The Blasting and Pile Driving Form, provided by GDS, must be submitted by the owner of the proposed work for all blasting and pile-driving operations. The request must be submitted a minimum of four weeks prior to the beginning work to allow sufficient time for review.

11.2 Blasting

Before any blasting operation in the vicinity of a gas pipeline can occur, the hazards to the GDS facility must be evaluated. Responsibility for the design of the blast and any resultant damage is borne entirely by the party using the explosives.

A recognized independent blasting consultant must be retained at the applicant's expense to perform an evaluation of the blast design. The independent blasting consultant must be an independent engineering consultant specialized in blasting. A copy of the stamped consultant's validation report must be submitted to GDS for review if blasting is to occur within 30 m (100 ft) of GDS facilities.

If in the opinion of GDS or an independent blasting consultant, blasting cannot be carried out without affecting the facility's integrity, alternatives must be considered, including the replacement or relocation of the affected facility at the applicant's expense. In these situations, additional time must be allowed to obtain the necessary permits and to complete the necessary construction work. In the event a third party is affected as a result of the blasting operations, all expenses associated therewith incurred by GDS must also be at the applicant's expense.

Ontario: The third party must comply with the Ontario Provincial Standard Specification (OPSS 120 – General Specification for the Use of Explosives) in addition to GDS's blasting requirements.

Quebec: The third party must comply with Quebec's Acts regarding explosives (CQLR c E-22 and CQLR c E-22, r 1) and Safety Code (CQLR c S-2.1, r 4), in addition to GDS's blasting requirements.

11.2.1 Surface and Tunnel Blasting Application Process

For subsurface blasting application requirements, refer to the Surface Blasting section of the Blasting and Pile Driving Form.

For tunnel blasting application requirements, refer to the Surface Blasting section of the Blasting and Pile Driving Form in addition to the Tunnel Blasting section.

To assist with the preparation of the form, locates must be requested to determine the location of the facilities.

11.2.2 Guidelines for Blasting

The information provided in this section is not to be construed as an exhaustive list of performance specifications, but rather a guide for conducting blasting in the vicinity of GDS's facilities. The third party is responsible for ensuring that all blasting work is performed in a good and workmanlike manner in accordance with all applicable laws, codes, by-laws, and regulations.

The third party will be held liable for and indemnify GDS in relation to any and all damage directly or indirectly caused or arising as a result of blasting operations carried out by the applicant, its employees, contractors, or those for whom the applicant is responsible by law. Prior to blasting operations, a site meeting must be arranged with an authorized representative of the applicant and a GDS representative to confirm the location of GDS's facilities and details of the proposed blast.

GDS's pipelines must not be excavated prior to blasting. If excavation is unavoidable, then the pipeline must be properly supported according to GDS's requirements as stated in 7 Support of Gas Pipelines on page 14.

The third party must take suitable precautions to protect the exposed pipeline from fly-rock .

Explosives must be of a type that cannot propagate between holes or be desensitized due to compression pressures. Explosives must not be left in the drill hole overnight.

If a surface blast islocated less than 10 m (33 ft) from pipeline; creates its first blast hole at a depth equal to the top of the pipeline; andthe depth of subsequent blast holes exceeds one half of the horizontal distance to the closest portion of the pipeline, then the required independent blasting consultant's report must specifically address the impact of these conditions. This is not applicable for tunnel blasting operations. The blasting consultant is responsible for the monitoring of blasting vibrations with a portable seismograph capable of transmitting data instantaneously (e.g., via email or cellular) to the required reviewer in the vicinity of GDS's facilities is mandatory to confirm that predicted vibration levels are respected. On a daily basis, a copy of the seismographic report must be provided to GDS.

Peak particle velocity (PPV) must be limited to 50 mm/s (2 in/s) and maximum amplitude must be limited to 0.15 mm (0.006 in).

11.2.3 Post Blasting

A leak survey must be completed at the end of each day of blasting. Upon completion of daily blasting operations and within 30 days after the final blasting, GDS will conduct a leak survey of the pipeline at the third party's expense. Leak surveys will also be completed at the end of each day of blasting. Damage that has resulted from the blasting will be repaired at the third party's expense. A summary of all blasting operations including blasting logs, vibration control, seismograph reports, and other pertinent information must be provided to GDS by the third party daily and at the completion of blasting operations.

11.3 Pile Driving

General pile installation or compaction activities in the vicinity of GDS's facilities must be evaluated by GDS prior to beginning. Any resultant damage as a result of these activities will be borne entirely by the third party undertaking the proposed work.

If in the opinion of GDS, the particular pile installation or compaction operation cannot be carried out without affecting the pipeline or facility integrity, the following must be considered:

- Risk analysis or mitigation program for the proposed operation.
- Alternative construction methods.
- Relocation or replacement of the facility.

All costs incurred will be covered by the third party undertaking the proposed work and final approval for the work will be granted by GDS.

Piles installed using an auger must satisfy the locating and clearance requirements listed in 5 Pipeline Location Verification on page 10 and 4 Minimum Clearance from Other Structures on page 10, respectively. GDS must provide approval for the installation of piles within 3 m (10 ft) of a vital pipeline.

The third party is responsible for all costs related to customer interruption as well as costs incurred because of work delays. In the event a third party is affected as a result of the pile installation or compaction operations, all expenses associated therewith incurred by GDS will be passed to the third party.

11.3.1 Pile Driving Application Process

The application to pile drive or do compaction work must be sent to GDS via the Blasting and Pile Driving Form.

This work must be completed under the supervisor of qualified personnel. Vibration results must be provided to GDS on a daily basis.

11.3.2 Pile Installation and Compaction Work

The information provided in this section is not to be construed as an exhaustive list of performance specifications, but rather a guide for conducting pile installation and compaction work in the vicinity of GDS's facilities. The third party is responsible for ensuring that all pile installation and compaction work is performed in accordance with all applicable laws, codes, by-laws, and regulations.

Operations must not be permitted within a standoff distance of 3.0 m (10 ft) from the pipeline or other natural gas facility, unless approved by GDS.

Prior to pile installation or compaction work, a site meeting with an authorized representative of the third party and a GDS representative (for the Damage Prevention contact, see 12 Contact Information on page 31) must be arranged by the third party, to confirm the location of GDS’s facilities and the details of the proposed work.

It is recommended that during the design phase, pile installation or compaction work drawings be sent to Markups for review (see 12 Contact Information on page 31).

The pipeline should not be excavated prior to the piling or compaction operation. If excavation of the pipeline is necessary, then it must be properly supported in accordance with 7 Support of Gas Pipelines on page 14.

The following situations require the opinion of an independent professional engineer:

- Compaction of soils or backfill rated at 10,000 ft-lbs (13,600 Nm) or higher at a stand-off distance of 6 m (20 ft) or less from the pipeline.
- Pile driving at a stand-off distance of 10 m (33 ft) or less from the pipeline facility.
- High-energy dynamic compaction for the rehabilitation of soils at a stand-off distance of 30 m (100 ft) or less from the pipeline.

- Type 4 soil as defined in Article 226 of the Occupational Health and Safety Act and Regulations for Construction Projects (see Table 15-1: Soil Types on page 33).

For these situations, the appropriate number of seismographs to monitor vibrations is mandatory. The seismographs must be portable with the capability of transmitting data instantaneously (e.g., via email or cellular). This control will confirm the intensity of the vibrations generated by the pile installation or compaction work as projected. Furthermore, reports of recorded intensities must be provided on a regular basis or at the request of GDS.

The peak particle velocity (PPV) measured on the pipeline, or at the closest point of the related structure with respect to the work, must not exceed 50 mm/s (2 in/s). Furthermore, the maximum displacement for the vertical or horizontal component corresponding to the above stated vibration intensity must not exceed 50 mm (2 in) at any given length of the pipeline in question.

If the PPV or displacement limit is surpassed, all operations must stop notwithstanding any delays or costs incurred by the third party or owner of the proposed work. GDS requires that the cause of these higher vibrations or displacements be investigated. GDS may arrange for a leak survey to be conducted. GDS Engineering must approve resumption of operations. Should a situation with low energy compaction operations with a soil cover of less than 1.5 m (5 ft) above the pipeline at a stand-off distance of 3 m (10 ft) or less from a pipeline be encountered, GDS may require the opinion of an independent engineering consultant.

In addition, if a Type 3 soil (see Table 15-1: Soil Types on page 33) is present on site, GDS may require the opinion of an independent engineering consultant.

The use of an auger may be required in order to avoid the use of piles.

All operations must comply with the Provincial Occupational Health and Safety Act and Regulations for Construction Projects, other applicable laws and regulations, as well as all applicable GDS specifications, standards, and guidelines.

11.3.3 Post Pile Driving Process

The third party must send GDS the items that follow within five business days of the completion of the pile installation via pile driving or compaction operations:

- A summary of all operations.
- Pile driving and compaction logs.
- Vibration control records.
- Seismograph records.

On completion of each day's work, and approximately 30 days after all work is completed, GDS will arrange to conduct a leak survey of the facility. If damage to GDS's facilities is found, it will be repaired by the third party. An invoice will be sent to the third party responsible for the work.

12 Contact Information

Location	Contact
Enbridge Gas Inc 500 Consumers Road North York, ON M2J 1P8	Markups: Mark-Ups@enbridge.com Ontario One Call Locates: 1-800-400-2255 Damage Prevention: 1-866-922-3622 Emergency: 1-866-763-5427 and 1-877-969-0999
Enbridge Gas Inc Storage and Transmission Operations Locates (Dawn) 3332 Bentpath Line P.O. Box 1180 Dresden, ON N0P 1M0	Ontario One Call Locates: 1 (800) 400-2255 Locates: 1-800-265-5260 ext 5102236 Stacey.Smith@enbridge.com Locates: 1-800-265-5260 ext 5102184 Janice.Langstaff@enbridge.com
Enbridge Gas Inc Storage and Transmission Operations Locates (Tecumseh) 3501 Tecumseh Road, Mooretown, Ontario N0N 1M0	Field Operations: 519-312-0176 jay.moore@enbridge.com Field Operations: 519-862- 6004 jason.japp@enbridge.com Tecumseh Control Room: 519-862-6012 Emergency: 1-800-255-1431
Gazifère 706 Boulevard Greber Gatineau, QC J8V 3P8	Locates: 1-800-663-9228 Planning Dept.: 1-819-776-8804 Emergency: 1-819-771- 8321, press 1

Note

The website www.clickbeforeyoudig.com gives access to the damage prevention centres in Canada, and allows locate requests to be made for each province.

13 References

- IS_F_172 Blasting and Pile Driving Form

14 Document Governance

For document control and maintenance purposes, the following tables capture important information related to this document.

Control and Maintenance

Category	Value
Owned By	Pipeline Engineering
Review Interval	Every three years
MOC-Related	No

Revision History

Table 14-1: January 2024 Release

Release Date	Version	Project Number	RFC Number	Prepared By	Approved By
2024-01-31	1.2.1	n/a	5399	Derek Brecht, Engineer Pipeline Engineering	Todd Piercey, Manager, Pipeline Engineering
Doc ID		**Scope**	**Document & Section**		**Summary of Changes**
ST-1E-30A8-8E30		GDS	Third-Party Requirements in the Vicinity of Natural Gas Facilities Standard		Revised Figure 8-1.

Table 14-2: September 2021 Release

Release Date	Version	Project Number	RFC Number	Prepared By	Approved By
2021-09-29	1.1.1	n/a	4983	Hooman Zahedi, Supervisor, Pipeline Engineering	Todd Piercey, Manager, Pipeline Engineering
Doc ID		**Scope**	**Document & Section**		**Summary of Changes**
ST-1E-30A8-8E30		GDS	Third-Party Requirements in the Vicinity of Natural Gas Facilities Standard		Corrected typo in 11.2 Blasting

Table 14-3: June 2021 Release

Release Date	Version	Project Number	RFC Number	Prepared By	Approved By
2021-06-30	1.1.0	n/a	4922	Hooman Zahedi, Supervisor, Pipeline Engineering	Todd Piercey, Manager, Pipeline Engineering
Doc ID		**Scope**	**Document & Section**		**Summary of Changes**
ST-1E-30A8-8E30		GDS	Third-Party Requirements in the Vicinity of Natural Gas Facilities Standard		Revise tree clearance restrictions in section 3.8.

Table 14-4: April 2021 Release

Release Date	Version	Project Number	RFC Number	Prepared By	Approved By
2021-04-28	1.0.0	6513-20	None	Emily Varga, EIT I, Pipeline Engineering	Todd Piercey, Manager Pipeline Engineering

Doc ID	Scope	Document & Section	Summary of Changes
ST-1E-30A8-8E30	GDS	Third-Party Requirements in the Vicinity of Natural Gas Facilities Standard	Initial version.

15 Soil Types

Table 15-1: Soil Types

Type	Definition
Type 1	• Hard, very dense, and only able to be penetrated with difficulty by a small sharp object. • Low natural moisture content and a high degree of internal strength. • No signs of water seepage. • Can be excavated only by mechanical equipment.
Type 2	• Very stiff, dense, and can be penetrated with moderate difficulty by a small sharp object. • Low to medium natural moisture content and a medium degree of internal strength. • Damp appearance after it is excavated.
Type 3	• Stiff-to-firm and compact-to-loose in consistency or is previously-excavated soil. • Exhibits signs of surface cracking. • Exhibits signs of water seepage. • If dry, may run easily into a well-defined conical pile. • Low degree of internal strength.
Type 4	• Soft to very soft and very loose in consistency, very sensitive, and upon disturbance is significantly reduced in natural strength. • Runs easily or flows, unless it is completely supported before excavating procedures. • Almost no internal strength. • Wet or muddy. • Exerts substantial fluid pressure on its supporting system.

Appendix C: Technical data sheets (Explosives and accessories)

FICHE TECHNIQUE

Exel[MC] Handidet[MC]

Assemblages de détonateurs non électriques avec délais de surface / fond de trou combinés

Canada

Format Actual **Format Futur**

</= 8m/24ft **>/= 9m/30ft**

Description

Les assemblages Handidet[MC] non électriques avec délais de surface et délais de fond de trou combinés sont des composants faciles à utiliser dans les applications de sautage non électriques. Utilisés pour l'excavation de tranchées pour pipelines et services publics, dans les carrières, exploitations à ciel ouvert et projets de construction, les assemblages Handidet[MC] sont faciles à raccorder et à vérifier. Ils assurent la précision des séquences en surface et en fonds de trous.

Avantages

Les assemblages Handidet[MC]

- Diminuent le nombre de composants sur le site
- Permettent de modifier la conception du plan avant le tir
- Réduisent l'inventaire
- Offrent un excellent contrôle du tir
- Facilitent le raccordement – augmentent la productivité
- Permettent la vérification rapide des raccords
- Réduisent les risques de ratés dûs aux mouvements de terrain
- Fonctionnent sous toutes les conditions climatiques
- Ne s'entremêlent pas, pas de perte
- Diminuent les coûts d'exploitation

Caractéristiques

Détonateur de fond de trou	Haute puissance, charge de base de 12 grains (780 mg) de PETN (USBM 8+)
Amorce de surface	Nouveau design, peu d'éclats
Boîte-raccords	Capacité de 6 tubes, code couleur selon le délai de surface, impression indélébile de la longueur et des délais
Tube de choc Exel®	Couleur jaune vif

Durée nominale des retards	
Surface / Fond de trou (ms)	**Couleur de la boîte-raccords**
17/500	Jaune
25/475	Orange
# 25/500	Orange
42/500	Blanc
# Combinaison à micro-retard standard	

Combinaison à micro-retard standard

Fonctionnalités

Les assemblages Handidet[MC] sont :

- Des délais de surface et de fond de trou combinés
- Une nouvelle conception à faible d'énergie
- De haute précision
- Faciles et rapides à raccorder
- Munis de boîte-raccords ergonomique visibles acceptant 6 tubes
- Très voyants
- Robustes, avec nouvelle gaine résistante à l'abrasion
- Résistants à la chaleur,et au froid, enroulements en huit faciles à manipuler

Recommandations relatives à l'utilisation

Amorçage et mise à feu

Ne pas utiliser l'assemblage Handidet[MC] comme ligne de descente. Garder le tube de choc raide jusqu'à la fin du

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Exel[MC] Handidet[MC]

Assemblages de détonateurs non électriques avec délais de surface / fond de trou combinés

Canada

chargement. Éviter d'endommager le tube de choc pendant le chargement et les activités de bourrage.

Ne jamais tirer assez fort pour étirer ou briser le tube de choc. Une mise à feu prématurée pourrait se produire.

Les assemblages de détonateurs Handidet[MC] sont unidirectionnels. Ils peuvent être mis à feu à l'aide:

- de l'amorce de surface d'un autre Handidet[MC]
- un détonateur électronique Orica
- un détonateur électrique
- un système de délai de surface à tube de choc Orica

Remarque: La boîte-raccords de surface de l'assemblage Handidet[MC] renferme un dispositif explosif qui peut être mis à feu par la chaleur, un impact ou la friction. Le raccord de surface n'est pas conçu pour la mise à feu de cordeau détonant.

Emballage

Les assemblages de détonateurs Handidet[MC] sont des enroulements en forme de huit. Les assemblages sont livrés en vrac dans des caisses en carton dur.

Longueur (approximative)		Quantité par caisse		Poids par caisse Kg / lb	
Mètres	**Pieds**	**1.1B**	**1.4B**	**1.1B**	**1.4B**
4	12		90		6,9 / 15,3
5	16	100	90	7,2 / 15,9	7,4 / 16,3
7	23	75	70	6,5 / 14,4	7,0 / 15,4
8	24		70		7,4 / 16,3
9	30	65	60	6,6 / 14,5	7,0 / 15,4
12	40	50	50	6,2 / 13,6	7,0 / 15,4
15	50	45	45	6,4 / 14,1	7,2 / 15,9
18	60		36		7,1 / 15,7
21	70	35		6,4 /14,1	
25	80		25		6,3 / 13,8
30	100		25		7,0 / 15,4
37	120		20		6,7 / 14,8
45	150		15		6,2 / 13,7

Certaines combinaisons de longueur/délai peuvent ne pas être disponibles.

Entreposage et manutention

Classe du produit

Nom officiel:	Handidet[MC]
Nom d'expédition:	Assemblages de détonateur, non électriques
No ONU:	0360, PG II
Classification:	1.1B
UN ONU:	0361, PG II
Classification:	1.4B

Entreposage

Idéalement, entreposer à des températures modérées et au sec dans un dépôt bien ventilé et autorisé pour l'emmagasinage de détonateurs.

Durée de conservation

La durée de conservation maximum du Exel[MC] Handidet[MC] LP est de quatre ans, à partir de la date de fabrication, lorsqu'entreposé dans un dépôt frais, sec et bien ventilé et s'il est manipulé correctement.

Élimination

L'élimination de matières explosives peut présenter des dangers. Les méthodes d'élimination sécuritaires dépendent de la situation de l'utilisateur. Communiquez avec un technicien Orica concernant les pratiques sécuritaires.

Dénégation de responsabilité

 Les renseignements contenus dans ce document sont uniquement transmis à titre d'information et sont modifiables sans préavis. Puisque l'Orica Group ne peut anticiper ou contrôler les conditions selon lesquelles les renseignements et ses produits seront utilisés,

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Exel[MC] Handidet[MC]

Assemblages de détonateurs non électriques avec délais de surface / fond de trou combinés

Canada

l'utilisateur doit examiner les renseignements dans le contexte particulier de l'application visée. Dans les limites autorisées par la loi, l'Orica Group dénie spécifiquement toute garantie explicite ou implicite Y COMPRIS L'EXACTITUDE, L'ABSENCE DE CONTREFAÇON ET TOUTE GARANTIE EXPLICITE OU IMPLICITE QUANT À LA QUALITÉ MARCHANDE OU QUANT À LA CAPACITÉ DES PRODUITS DE SERVIR À DES FINS PARTICULIÈRES. L'Orica Group ne pourra être tenu responsable de toute perte ou tout dommage résultant de l'utilisation de ces renseignements.

Pour de plus amples renseignements, consultez : www.orica.com

Pour contacter l'administration centrale d'Orica, Amérique du Nord:
Tél.: +1 303 268 5000
Fax: +1 303 268 5250

Numéros d'urgence
Pour les urgences chimiques (24 heures) concernant le transport, un déversement, une fuite, un dégagement un incendie ou un accident:

Orica Canada, intervention d'urgence **1-877-561-3636**

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TECHNICAL DATA SHEET

Fortel™ Ultra

USA & Canada

Description

Fortel™ Ultra packaged emulsion explosive is a robust, booster sensitive explosive. The explosive is orange in color with a firm putty-like consistency.

Application

Fortel™ Ultra is a large diameter water resistant packaged explosive designed for use as a medium density column explosive in mining and general blasting work. Fortel™ Ultra can be used to build a toe charge out of water in conjunction with an Amex™ column charge.

Key Benefits

- Fortel™ Ultra is specifically formulated to reduce post blast Carbon Monoxide gasses in Underground, Surface and Construction blasting applications.
- Fortel™ Ultra is a cost efficient, emulsion formulation suitable for a range of blasting applications.
- Fortel™ Ultra improves digging and mucking efficiency in benching and other applications, even in deep holes.
- Fortel™ Ultra is pre-compression resistant with excellent heave energy.
- Fortel™ Ultra is highly water resistant, which minimizes leaching and reduces environmental impact.
- OH&S issues around the handling and storage of nitroglycerin are eliminated.
- The packaging and emulsion color of Fortel™ Ultra Provides high visibility in a range of environments.

Technical Properties

Fortel™ Ultra 65 x 400 mm (2 ½ x 16 in.)		
Cartridge Density		1.28 g/cc
Typical Velocity of Detonation[1]		5,200 m/s[3] 17,000 ft/s
Water Resistance		Excellent
Fume Class		1
Post Blast Carbon Monoxide Production		0.022 liters / kg
Relative Effective Energy (REE) [2]	Relative Weight Strength (RWS)	114
	Relative Bulk Strength (RBS)	174

Recommendations for Use

Blasthole Depth

Fortel™ Ultra is suitable for use in holes of any practical depth providing contained water does not exceed 20 m (65.6 ft.) depth.

Priming and Initiation

Fortel™ Ultra is a booster sensitive emulsion explosive and must be in direct contact with the largest possible diameter Senatel™ detonator sensitive explosive or an appropriately sized Pentex™ booster. Use of detonating cord with Fortel™ Ultra is not recommended. Detonating cord may adversely affect the performance of Fortel™ Ultra and could result in misfires in boreholes less than 75 mm (3 in.) in diameter. Consult an Orica representative before attempting to use with detonating cord.

Charging

Cartridges may be placed into blastholes intact or, where maximum energy is required, may be slit lengthways prior to loading to achieve a higher degree of coupling. Care should be taken when loading slit cartridges into wet blastholes as the explosive could bridge at the air-water interface.

Sleep-Time within Blastholes

The sleep-time in a blasthole is influenced by the extent of damage to the packaging and by the nature of any water present. Fortel™ Ultra will give good performance after two weeks immersion.

Ground Temperature

Fresh product is reliable down to –10°C (14°F) at 65 mm (2½ in.) primed in confinement with a 454 g (1 lb) cast booster.

Fortel™ Ultra

USA & Canada

Packaging

Fortel™ Ultra is distinctively packaged in high strength, tear-resistant blue Valeron plastic film, to clearly differentiate it from detonator sensitive packaged explosives. Standard cartridge sizes are as follows:

Sizes (mm)	Sizes (in.)	Cartridges per case	Film
50 x 400	2 x 16	25	Valeron
65 x 400	2½ x 16	16	Valeron
75 x 400	3 x 16	11	Valeron
90 x 400	3½ x 16	8	Valeron

Storage and Handling

Product Classification

Authorized Name: Fortel™ Ultra
Shipping Name: Explosive, Blasting, Type E
UN No: 0332
Class Code: 1.5D

All regulations pertaining to the handling and use of such explosives apply.

Storage

Store Fortel™ Ultra in a suitably licensed magazine for Class 1.5D explosives. The cases should be stacked in the manner designated on the case.

Fortel™ Ultra has a **shelf life** of up to 12 months from date of manufacture in a well ventilated, approved magazine, even in hot and humid extremes.

Fortel™ Ultra is best stored at temperatures above -15°C (5°F). This is especially important in cold weather “load and shoot” work sites where there is insufficient in-hole warm up time.

For recommended good practices in transporting, storing, handling, and using this Product, refer to the “Always and Never” booklet packed inside each case.

Transport

Fortel™ Ultra should be transported between -40°C (40°F) and +40°C (104°F).

Disposal

Disposal of explosive materials can be hazardous. Methods of safe disposal of explosives may vary depending on the user’s situation. Please contact an Orica Technical Services Representative for information on safe practices.

Safety

The post detonation fume characteristics of Fortel™ Ultra make the Product suitable for both underground and surface blasting applications. Users should ensure that adequate ventilation is provided prior to re-entry into the blast area.

Fortel™ Ultra can be initiated by extremes of shock, friction or mechanical impact. As with all explosives, Fortel™ Ultra should be handled and stored with care and must be kept clear of flame and excessive heat.

Disclaimer

For more information please visit our website: www.orica.com

Fortel™ Ultra

USA & Canada

Orica's North America headquarters can be reached at:
Tel: +1 303 268 5000
Fax: +1 303 268 5250

Emergency Telephone Numbers

For chemical emergencies (24 hour) involving transportation, spill, leak, release, fire or accidents:

Canada: Orica Canada emergency response 1-877-561-3636

USA: Chemtrec 1-800- 424-9300

Notes:

1) VOD will depend on application including explosive density, blasthole diameter and degree of confinement. The VOD range is based on minimum unconfined and calculated ideal.
2) The "Relative Effective Energy (REE) of an explosive is the energy calculated to be available to do effective blasting work. All energy values are calculated using the IDeX™ computer code owned by Orica for the exclusive use of its companies. Energy values are based on standard ANFO with a density of 0.84 g/cc and a cut-off pressure of 100Mpa. Other computer codes may give different values.
3) Unconfined at 5ºC (41ºF).

TECHNICAL DATA SHEET

Powerditch™ 1000

USA and Canada

Description

Powerditch™ 1000 is a high-energy premium specialty dynamite product that is pre-compression resistant.

Application

Powerditch™ 1000 has been formulated to reduce hole-to-hole propagation and can be utilized in various blasting applications, including; trenching, ditching, site preparation, and underwater blasting.

Key Benefits

- Powerditch™ 1000 provides superior breakage under severe conditions.
- Powerditch™ 1000 provides reduced hole-to-hole propagation.
- Impact and friction sensitivity is reduced with Powerditch™ 1000.
- Powerditch™ 1000 provides high detonation pressure.
- Excellent performance under high static pressures.
- Resistant to dynamic pre-compression.
- Powerditch™ 1000 has excellent water resistance, and is suitable for use in applications with moderate to severe water conditions.

Recommendations for Use

Priming and Initiation

Powerditch™ 1000 is recommended to be primed with a high strength detonator or 20 grain /ft detonating cord.

Technical Properties

Powerditch™ 1000 50 mm (2 in.)		
Cartridge Density (g/cc)		1.36
Velocity of Detonation[1]		5,150 m/s 16, 900 ft/s
Water Resistance		Excellent
Fume Class		1
Relative Effective Energy (REE) [2]	Relative Weight Strength (RWS)	106
	Relative Bulk Strength (RBS)	171

Packaging

Depending on size, Powerditch™ 1000 is packaged in easy to load rigid spiral wound shells, or convolute paper shells. Standard cartridge sizes are as follows:

Sizes (mm)	Sizes (in.)	Cartridge/ case	Paper Type	Kg/ case	lbs/ case
32 x 200	1¼ x 8	88	Convolute	19.16	42.25
40 x 200	1½ x 8	60	Convolute	19.05	42.01
40 x 400	1½ x 16	30	Convolute	18.51	40.81
45 x 400	1¾ x 16	20	Convolute	17.69	39.01
50 x 200	2 x 8	34	Convolute	19.28	42.51
50 x 400	2 x 16	17	Convolute/ Spiral	19.28	42.51
65 x 400	2½ x 16	10	Spiral	17.69	39.01

Powerditch™ 1000

USA and Canada

Storage and Handling

Product Classification

Authorized Name:	Powerditch™ 1000
Correct Shipping Name:	Explosive, blasting, type A
UN No:	0081
Classification:	1.1D

All regulations pertaining to the handling and use of such explosives apply.

Storage

For maximum **shelf life,** dynamite must be stored in cool, dry, and well-ventilated magazines. Dynamite that is stored under warm, wet, and/or humid conditions can deteriorate quickly, minimizing shelf life. Dynamite inventories should always be rotated, by using the oldest materials first.

For recommended good practices in transporting, storing, handling, and using this product, refer to the “Always and Never” booklet packed inside each case.

Transport

Powerditch™ 1000 should be transported between -40°F (-40°C) and 104°F (+40°C).

Disposal

Disposal of explosive materials can be hazardous. Methods of safe disposal of explosives may vary depending on the user’s situation. Please contact an Orica Technical Services Representative for information on safe practices.

Safety

The post detonation fume characteristics of Powerditch™ 1000 make the product suitable for both underground and surface blasting applications. Users should ensure that adequate ventilation is provided prior to re-entry into the blast area.

Powerditch™ 1000 can be initiated by extremes of shock, friction or mechanical impact. As with all explosives, Powerditch™ 1000 should be handled and stored with care and must be kept clear of flame and excessive heat.

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Tel: +1 303 268 5000
Fax: +1 303 268 5250

Emergency Telephone Numbers

For chemical emergencies (24 hour) involving transportation, spill, leak, release, fire or accidents:

Canada: Orica Canada emergency response 1-877-561-3636

USA: Chemtrec 1-800- 424-9300

Notes:

(1.) Unconfined at 5ºC (41ºF). VOD will depend on application including explosive density, blasthole diameter and degree of confinement. The VOD range is based on minimum unconfined and calculated ideal

(2.) The Relative Effective Energy (REE) of an explosive is the energy calculated to be available to do effective blasting work. All energy values are calculated using the IDeX™ computer code owned by Orica for the exclusive use of its companies. Energy values are

based on standard ANFO with a density of 0.84 g/cc and a cut-off pressure of 100Mpa. Other computer codes may give different values.

TECHNICAL DATA SHEET

Powerfrac™

USA & Canada

Description

Powerfrac™ is an ammonia gelatin dynamite.

Application

It is a detonator sensitive explosive designed to meet the needs of surface quarries and open pit applications. Uses include site preparation, utility work, construction projects, and as a high-energy bottom charge. Powerfrac™ explosive provides good shattering effect in hard breaking formations and is effective with heavy burdens.

Key Benefits

- Powerfrac™ detonator-sensitive explosive provides good sinking characteristics, and good shattering effect.
- The tampable paper means high loading factors; rigid cartridges make for easy loading in tough or ragged holes.
- Powerfrac™ has increased shock energy for initial crack development, excellent heave energy for muckpile displacement.
- Powerfrac™ has reliable performance in wet ground, and tough loading conditions.
- Powerfrac™ is resistant to dynamic pre-compression, and has excellent gap sensitivity.

Recommendations for Use

Priming and Initiation

Powerfrac™ is recommended to be primed with a high strength detonator or 20 grain /ft detonating cord.

Charging

In small diameter blastholes the maximum energy per meter of blasthole can be achieved by tamping the explosive with a wooden tamping rod appropriate to the hole diameter. No metal instrument should be used to tamp explosives. The primer cartridge containing a detonator must not be tamped.

Technical Properties

Powerfrac™ 50 mm (2 in.)		
Cartridge Density (g/cc)		1.37
Velocity of Detonation[1]		6,100 m/s 20,000 ft/s
Water Resistance		Excellent
Fume Class		1
Relative Effective Energy (REE)[2]	Relative Weight Strength (RWS)	113
	Relative Bulk Strength (RBS)	186

Sleep-Time within Blastholes

The sleep time in a blasthole is influenced by the extent of damage to the packaging and by the nature of any water present.

Packaging

Powerfrac™ is packaged in spiral-wound paper. Standard Cartridge sizes are as follows:

Size (mm)	Size (in.)	Kg / Case	Lbs / Case	Cart./ Case	Paper Type
25 x 200	1 x 8	19.69	43.42	140	Spiral Wound
45 x 400	1 ¾ x 16	19.78	43.61	23	Spiral Wound
50 x 200	2 x 8	18.51	40.81	34	Spiral Wound
50 x 400	2 x 16	18.51	40.81	17	Spiral Wound
65 x 400	2 ½ x 16	18.01	39.71	10	Spiral Wound

Storage and Handling

Product Classification

Authorized Name:	Powerfrac™
Correct Shipping Name:	Explosive, blasting, type A
UN No:	0081
Classification:	1.1D

All regulations pertaining to the handling and use of such explosives apply.

Shelf Life

One year from time of manufacture. For maximum **shelf life**, dynamite must be stored in cool, dry, and well-ventilated magazines. Dynamite that is stored under warm, wet, and/or humid conditions can deteriorate quickly, minimizing shelf life. Dynamite inventories should always be rotated, by using the oldest materials first.

Storage

For best results, store at moderate temperatures and dry conditions in a well ventilated, approved explosives magazine.

For recommended good practices in transporting, storing, handling, and using this product, refer to the “Always and Never” booklet packed inside each case.

Transport

Powerfrac™ should be transported between -15°C (5°F) and +30°C (86°F).

Disposal

Disposal of explosive materials can be hazardous. Methods of safe disposal of explosives may vary depending on the user’s situation. Please contact an Orica Technical Services Representative for information on safe practices.

Safety

The post detonation fume characteristics of Powerfrac™ make the product suitable for both underground and surface blasting applications. Users should ensure that adequate ventilation is provided prior to re-entry into the blast area.

Powerfrac™ can be initiated by extremes of shock, friction or mechanical impact. As with all explosives, Powerfrac™ should be handled and stored with care and must be kept clear of flame and excessive heat.

Disclaimer

For more information please visit our website: www.orica.com

Orica’s North America headquarters can be reached at:
Tel: +1 303 268 5000
Fax: +1 303 268 5250

Emergency Telephone Numbers

For chemical emergencies (24 hour) involving transportation, spill, leak, release, fire or accidents:

Canada: Orica Canada emergency response 1-877-561-3636

USA: Chemtrec 1-800- 424-9300

Notes:

(1.) Unconfined at 5ºC (41ºF). VOD will depend on application including explosive density, blasthole diameter and degree of confinement. The VOD range is based on minimum unconfined and calculated ideal.

(2.) The Relative Effective Energy (REE) of an explosive is the energy calculated to be available to do effective blasting work. All energy values are calculated using the IDeX™ computer code owned by Orica for the exclusive use of its companies. Energy values are based on standard ANFO with a density of 0.84 g/cc and a cut-off pressure of 100Mpa. Other computer codes may give different values.

TECHNICAL DATA SHEET

Senatel™ Ultrex™

USA & Canada

Description

Senatel™ Ultrex™ packaged explosive is a robust, high strength, detonator sensitive emulsion explosive. The explosive is orange in color with a firm putty-like consistency. This product is also available in High Wax (HW) formulations.

Application

Senatel™ Ultrex™ is a water resistant packaged explosive designed for use as a medium density column explosive in surface, quarry and construction, underground mining and general blasting applications.

Key Benefits

- Senatel™ Ultrex™ delivers excellent fragmentation for easy mucking.
- Senatel™ Ultrex™ reduces post-blast fumes and improves turnaround time.
- The tight diameter control specifications and wax formulation of Senatel™ Ultrex™ maximizes cartridge loader performance.
- Senatel™ Ultrex™ PMP film cartridges readily split during tamping to maximize coupling and bulk strength within a blasthole.
- Senatel™ Ultrex™ is highly water resistant which minimizes leaching and reduces environmental impact.
- OH&S issues around the handling and storage of nitroglycerin are eliminated.
- The packaging and emulsion color of Senatel™ Ultrex™ provides high visibility in a range of environments.
- Packaged in PMP, easy to tamp plastic film or high strength, tear resistant Valeron film cartridges that are ideal for ragged, medium size boreholes.

Technical Properties

Senatel™ Ultrex™		Less than 50 mm (2 in.)	Greater than 50 mm (2 in.)
Cartridge Density		1.13	1.19
Typical Velocity of Detonation[1]		4,500 m/s[3] 15,400 ft/s	5,400 m/s 17,700 ft/s
Water Resistance		Excellent	
Fume Class		1	
Relative Effective Energy (REE) [2]	Relative Weight Strength (RWS)	99	
	Relative Bulk Strength (RBS)	133	

Recommendations for Use

Priming and Initiation

An Orica high strength electric, electronic, or non-electric detonator can reliably initiate Senatel™ Ultrex™ at temperatures higher than -15°C (5°F) in diameters less than 50mm (2 in.). In diameters greater than 50mm (2 in.) or when temperatures are below -15°C (5°F), an appropriately sized Pentex™ Booster is recommended.

Use of detonating cord with Senatel™ Ultrex™ is not recommended. Detonating cord will adversely affect the performance of Senatel™ Ultrex™ and could result in misfires. Consult an Orica Technical Representative before attempting to use with detonating cord.

Charging

In small diameter blastholes the maximum energy per meter of blasthole can be achieved by tamping the explosive with a wooden tamping rod appropriate to the hole diameter. No metal instrument should be used to tamp explosives. The primer cartridge containing a detonator must not be tamped.

Senatel™ Ultrex™

USA & Canada

Sleep-Time within Blastholes

In dry blastholes, given the explosives packaging is undamaged, Senatel™ Ultrex™ may be charged and fired several months later. If the explosive packaging is damaged, the sleep-time in a blasthole is influenced by the extent of damage to the packaging and by the nature of any water present. Even with full length slitting of cartridges, the explosive will give good performance after two weeks immersion.

Packaging

Senatel™ Ultrex™ is packaged in white plastic film to clearly differentiate it from booster sensitive packaged explosives. Cartridges are packed in 25 kg (55 lb) fiberboard cartons. Standard cartridge sizes are as follows:

Sizes (mm)	Sizes (in.)	Nominal count per case	Film Type
25 x 300	1 x 12	162 (±5)	PMP
32 x 200	1¼ x 8	159 (±5)	PMP/Valeron
32 x 400	1¼ x 16	79 (±3)	PMP
40 x 200	1½ x 8	104 (±1)	PMP/Valeron
40 x 300	1½ x12	68 (±2)	PMP
40 x 400	1½ x 16	51 (±2)	PMP
40 x 600	1½ x 24	35 (±1)	PMP
45 x 400	1¾ x 16	35 (±1)	PMP/Valeron
50 x 200	2 x 8	57(±2)	Valeron
50 x 400	2 x 16	26	Valeron
65 x 400	2½ x 16	16	PMP/Valeron
75 x 400	3 x 16	12	Valeron
90 x 400	3½ x 16	9	Valeron

Storage and Handling

Product Classification

Authorized Name: Senatel™ Ultrex™
Proper Shipping Name: Explosive, blasting, type E
UN No: 0241
Classification: 1.1D

All regulations pertaining to the handling and use of such explosives apply.

Storage

Store Senatel™ Ultrex™ in a suitably licensed magazine for Class 1.1D explosives. The cases should be stacked in the manner designated on the case.

Senatel™ Ultrex™ has a **shelf life** of up to 12 months in a well ventilated, approved magazine, even in hot and humid extremes.

Senatel™ Ultrex™ is best stored at temperatures above -15°C (5°F). This is especially important in cold weather “load and shoot” worksites where there is insufficient inhole warm-up time. Senatel™ Ultrex™ should have an internal temperature of 0°C (32°F) or higher, before use with a pneumatic cartridge loading machine.

Transport

Senatel™ Ultrex™ should be transported between -40°C (-40°F) and +40°C (104°F).

Disposal

Disposal of explosive materials can be hazardous. Methods of safe disposal of explosives may vary depending on the user’s situation. Please contact an Orica Technical Services Representative for information on safe practices.

Safety

The post detonation fume characteristics of Senatel™ Ultrex™ make the product suitable for both underground and surface blasting applications. Users should ensure that adequate ventilation is provided prior to re-entry into the blast area.

Senatel™ Ultrex™ can be initiated by extremes of shock, friction or mechanical impact. As with all explosives, Senatel™ Ultrex™ should be handled and stored with care and must be kept clear of flame and excessive heat.

Senatel™ Ultrex™

USA & Canada

Disclaimer

For more information please visit our website: www.orica.com

Orica's North America headquarters can be reached at:
Tel: +1 303 268 5000
Fax: +1 303 268 5250

Emergency Telephone Numbers

For chemical emergencies (24 hour) involving transportation, spill, leak, release, fire or accidents:

Canada: Orica Canada emergency response 1-877-561-3636

USA: Chemtrec 1-800- 424-9300

Notes:

(1.) VOD will depend on application including explosive density blasthole diameter and degree of confinement. The VOD range is based on minimum unconfined and calculated ideal.

(2.) The Relative Effective Energy (REE) of an explosive is the energy calculated to be available to do effective blasting work. All energy values are calculated using the IDeX™ computer code owned by Orica for the exclusive use of its companies. Energy values are based on standard ANFO with a density of 0.84 g/cc and a cut-off pressure of 100Mpa. Other computer codes may give different values.

(3.) Unconfined at 5ºC (41ºF).

Attachment 3
Risk Management Plan

ENGLOBE

APPENDIX J

RISK MANAGEMENT PLAN
1161 KINGSTON ROAD
TORONTO, ONTARIO

File No. 02103035.000
July 2025

Englobe Corp.

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FIGURES:

1.0 INTRODUCTION

The Property is located on the northwest corner of the intersection of Churchill Avenue North and Byon Avenue in the City of Ottawa, Ontario and is irregular in shape and consists of one parcel of land at the address of 424 Churchill Avenue North. The total area of this property is approximately 1,006 m^2 (0.1 hectares). The property was formerly developed with a single storey commercial building with one underground basement level beneath the eastern portion of the building, and an asphalt parking lot. The building had a footprint area of approximately 350m2, and was occupied by a dry cleaner and laundromat (Laundry Land). The Site building was demolished in May 2025 and the property is currently vacant. The former Site building shop was serviced with municipal water via underground pipes, gas lines and municipal sanitary sewers. The surrounding areas are fully developed with the institutional, commercial and residential land uses

The Property is considered to be in Commercial Land Use as defined by the Ontario Ministry of the Environment, Conservation and Parks (MECP). It is understood that the Property will be redeveloped for mixed residential and commercial use with a 8-storey residential building with two levels of underground parking. The general location of the Property is presented on Figure 1.

Englobe has prepared a Risk Assessment (RA) for the purpose of evaluating potential risks to human and ecological receptors for the Property. The results of this RA are to be used to support the filing of a Record of Site Condition (RSC) for the Property under Ontario Regulation 153/04 (O.Reg.153/04) (as amended by O.Reg.511/09) under the Environmental Protection Act (EPA). This document (RMP) provides the design of the Risk Management Measures (RMMs), based on the potential risks evaluated in the RA.

1.1 Rationale and Objectives of Risk Management

The RA identified the Contaminants of Concern (COCs) based on historical evidence and Site investigation activities. Appropriate pathways and receptors were identified based on the current and proposed future land use for the Site and surrounding areas.

Based on the RA, RMMs are required to block exposure pathways and eliminate unacceptable risks for human and ecological receptors. The requirements for risk reduction are noted in Sections 4 and 5 of the RA document.

1.2 Risk Management Performance Objectives

Based on the results of the RA, unacceptable risks were identified for human and ecological receptors. Unacceptable risks via the following pathways as a result of soil and groundwater

exposure to the following substances and receptors were identified, which will need to be mitigated by the RMMs.

The main findings of the Human Health RA investigation were as follows:

- Residential occupants may be subjected to unacceptable health risks from potential direct contact (oral/dermal) exposure to Copper, Lead, Benzo[a]pyrene, Dibenz[a,h]anthracene, Total Carcinogenic PAHs and PHC F4 in soil. A surface barrier system is proposed as a RMM to mitigate potential risks for this receptor.
- Residential occupants may be subjected to unacceptable risk from potential indoor air inhalation exposure from volatilized cis-1,2-Dichloroethylene, trans-1,2-Dichloroethylene, Tetrachloroethylene, Trichloroethylene, Vinyl Chloride, Benzene, PHC F1 and PHC F2 from groundwater. An underground parking garage with and vapour mitigation system are proposed as RMMs to mitigate potential risks for this receptor.
- Indoor workers may be subjected to unacceptable risk from indoor air inhalation exposure from volatilized cis-1,2-Dichloroethylene, Tetrachloroethylene, Trichloroethylene, Vinyl Chloride, PHC F1 and PHC F2 from groundwater. An underground parking garage and vapour mitigation system are proposed as RMMs to mitigate potential risks for this receptor.
- Outdoor workers may be subjected to unacceptable health risk from potential direct contact exposure (oral/dermal) to Benzo[a]pyrene and Total Carcinogenic PAHs in soil. A surface barrier system is proposed as a RMM to mitigate potential risks for this receptor.
- Construction workers may be subjected to unacceptable risk from direct contact exposure to cis-1,2-Dichloroethylene, Tetrachloroethylene, Trichloroethylene and Vinyl Chloride in groundwater. A Health and Safety Plan and Soil and Groundwater Management Plan are proposed as a RMMs to mitigate potential risks for this receptor.
- Construction workers may be subjected to unacceptable risk from trench air inhalation exposure to Trichloroethylene and Vinyl Chloride in groundwater. A Health and Safety Plan and Soil and Groundwater Management Plan are proposed as a RMMs to mitigate potential risks for this receptor.
- No unacceptable risk for any receptors was determined for inhalation of volatile vapours in outdoor air sourced from either soil or groundwater for residents or the outdoor worker.
- No unacceptable risks were estimated for the construction from the inhalation of volatile vapours from soil migrating into a trench.

Based on the findings of the ERA the following conclusions are provided;

- Potential risk from direct contact soil pathways to plants and soil organisms for Copper, Lead, Zinc, Benz[a]anthracene, Indeno[1,2,3-cd]pyrene and PHC F4. An RMM in the form of a surface barrier system is proposed to mitigate potential risks from this exposure pathway.

- Potential risk from direct contact soil pathways to mammals and birds for Barium, Copper, Lead, Zinc and Fluoranthene. An RMM in the form of a surface barrier system is proposed to mitigate potential risks from this exposure pathway.
- In the absence of component values derived for Benzo[b]fluoranthene and Dibenz[a,h]anthracene, the most sensitive available value for plants and soil organisms among the PAHs–0.48 µg/g for Indeno[1,2,3-cd]pyrene–was used as a surrogate. Applying this surrogate suggests a potential for adverse effects. However, these potential effects will be mitigated through the implementation of a surface barrier system (hard and/or soft capping) as a RMM.
- In the absence of component values for mammals and birds, the potential effects of Benz[a]anthracene, Benzo[b]fluoranthene, Benzo[k]fluoranthene, Dibenz[a,h]anthracene, and Indeno[1,2,3-cd]pyrene were not quantitatively assessed in the risk assessment. However, any potential adverse effects to terrestrial wildlife receptors (mammals and birds) will be mitigated through the implementation of a surface barrier system as a RMM, involving hard and/or soft capping.
- PHC F4 is missing a mammal and birds component value and no TRVs were available, however PHCs are not typically assessed for mammals and birds as most are readily metabolized by vertebrates and thus do not tend to accumulate in tissues (CCME 2008). Nonetheless, potential negative effects to Mammals and Birds will be mitigated by the surface barrier system RMM (Hard and/or Soft Capping).
- PHC F1 and PHC F2 exceeded the GW3 component values, indicating a potential risk to on-site ecological receptors through direct contact with groundwater. However, the depth to groundwater at the Site was measured at 4.76 mbgs. Given this depth, the direct contact pathway is considered incomplete for ecological receptors, as most–including burrowing animals and plant roots–are typically limited to the upper 2.5 metres of the soil profile. Furthermore, the depth to bedrock across the Site is less than 2.5 mbgs, and it is unlikely that ecological receptors would inhabit or interact with the bedrock zone where groundwater is located. Therefore, the direct contact exposure pathway to groundwater for ecological receptors is considered functionally incomplete, and no RMMs are required for this pathway.
- None of the groundwater COCs exceeded their respective Site-Specific GW3 component values as such risk to off-Site ecological receptors due to direct contact with groundwater is considered to be negligible and an RMM is not required to mitigate this pathway.

The required reduction in exposure concentrations based on the minimum calculated effects-based standards to address soil COCs are provided in Table 1-1 and to address groundwater COCs are provided in Table 1-2. The tables below specify the required reduction in risk (as an x-fold reduction) to meet the lowest effects-based Site Condition Standards (SCS) for all pathways where risk was predicted.

The required risk reduction is a function of the final PSS divided by the minimum calculated health-based standard, which is the concentration at which no risk would be present for the pathway of concern for the COC. The health-based standard is calculated as follows and is then used as the denominator in the calculation to derive the require risk reduction.

$$\text{Health-Based Standard} = \frac{HQ_{acceptable} \text{ or } ILCR_{acceptable}}{\text{Calculated HQ or ILCR}} \times REM_{soil \text{ or } groundwater}$$

Risk reduction calculations are demonstrated in Sections 4.4.2.5 and 5.5.2.1 of the risk assessment report. Table 1-3 details the proposed RMMs and the expected risk reduction based on the experience of the QP (Professional Engineer) that will be conferred by installation of the RMMs at the Site. The use of these RMMs is sufficient to achieve the risk reductions required for each receptor and pathway outlined in Table 1-1 and Table 1-2.

Table 1-1: Risk Management Objectives for Soil

RMM and Pathway with Unacceptable Risks	COC	Final PSS (ug/g)	Health Based Standard (ug/g)	Required Risk Reduction (x-Fold)
Barrier to Site Soils - Resident Direct Contact with Soils (S1)	Copper	1.20E+03	1.99E+02	**6.03E+00**
	Lead	3.12E+02	1.09E+01	**2.87E+01**
	Benzo[a]pyrene	3.60E+00	5.65E-01	**6.37E+00**
	Dibenz[a,h]anthracene	6.48E-01	5.65E-01	**1.15E+00**
	PHC F4 Aromatic C_{34}	1.46E+03	4.89E+02	**2.98E+00**
Barrier to Site Soils - Outdoor Worker Direct Contact with Soils (S2)	Benzo[a]pyrene	3.60E+00	6.98E-01	**5.16E+00**
Barrier to Site Soils & Gardening Prohibition - All Receptors (S1)	Copper	1.20E+03	1.99E+02	**6.03E+00**
	Lead	3.12E+02	1.09E+01	**2.87E+01**
	Benzo[a]pyrene	3.60E+00	5.65E-01	**6.37E+00**
	Dibenz[a,h]anthracene	6.48E-01	5.65E-01	**1.15E+00**
	PHC F4 Aromatic C_{34}	1.46E+03	4.89E+02	**2.98E+00**
Barrier to Site Soils - Plants & Soil Invertebrates	Copper	1.20E+03	1.80E+02	**6.68E+00**
	Lead	3.12E+02	3.10E+02	**1.01E+00**
	Zinc	1.68E+03	5.00E+02	**3.36E+00**
	Benz[a]anthracene	4.20E+00	6.30E-01	**6.68E+00**
	Indeno[1,2,3-cd]pyrene	2.40E+00	4.80E-01	**5.00E+00**
	PHC F4	7.32E+03	5.60E+03	**1.31E+00**
Barrier to Site Soils - Mammals & Birds	Barium	7.56E+02	3.90E+02	**1.94E+00**
	Copper	1.20E+03	7.70E+02	**1.56E+00**
	Lead	3.12E+02	3.20E+01	**9.75E+00**
	Zinc	1.68E+03	3.40E+02	**4.94E+00**
	Fluoranthene	1.03E+01	6.90E-01	**1.49E+01**

Notes: RMM - Risk Management Measure; S&GWP - Soil and Groundwater Management Plan; H&SP - Health and Safety Plan

[a] Vapour Intrusion RMMs includes Underground Parking Structure and Sub-Slab Vapour Barrier and Venting System (VMS)

[b] The Soil and Groundwater Management Plan and Health and Safety Plan will sufficiently reduce the exposure of subsurface workers to soil and groundwater to reduce risk to acceptable levels
[c] PHC Parameter fold reductions for human receptors are the sum of all required reductions for the specific PHC sub-fractions.

Table 1-2: Risk Management Objectives from Groundwater

RMM and Pathway with Unacceptable Risks	COC	Final PSS (ug/L)	Health Based Standard (ug/L)	Required Risk Reduction (x-Fold)
Vapour Intrusion RMMs[a] - Resident Indoor Air Inhalation sourced from Groundwater (Res GW2)	Dichloroethylene, cis-1,2-	1.13E+03	9.03E+00	**1.25E+02**
	Dichloroethylene, trans-1,2-	1.68E+01	1.57E+00	**1.07E+01**
	Tetrachloroethylene	1.68E+03	4.97E-01	**3.38E+03**
	Trichloroethylene	1.92E+02	5.33E-02	**3.60E+03**
	Vinyl Chloride	3.52E+02	7.14E-03	**4.93E+04**
	Benzene	1.09E+00	1.72E-01	**6.33E+00**
	PHC F1 Aliphatic C6-C8	3.92E+02	3.02E-01	**1.30E+03**
	PHC F1 Aliphatic C8-C10	4.08E+01	3.14E-01	**1.30E+02**
	PHC F1 Aromatic C8-C10	2.15E+02	1.05E+01	**2.05E+01**
	PHC F2 Aliphatic C10-C12	1.07E+01	2.09E-01	**5.11E+01**
	PHC F2 Aliphatic C12-C16	8.88E-01	5.64E-02	**1.57E+01**
	PHC F2 Aromatic C10-C12	2.68E+02	3.59E+01	**7.47E+00**
	PHC F2 Aromatic C12-C16	1.65E+02	9.48E+01	**1.74E+00**
Vapour Intrusion RMMs[a] - Indoor Worker Indoor Air Inhalation sourced from Groundwater (Comm GW2)	Dichloroethylene, cis-1,2-	1.13E+03	1.55E+02	**7.30E+00**
	Tetrachloroethylene	1.68E+03	7.98E+00	**2.10E+02**
	Trichloroethylene	1.92E+02	8.57E-01	**2.24E+02**
	Vinyl Chloride	3.52E+02	1.15E-01	**3.07E+03**
	PHC F1 Aliphatic C6-C8	3.92E+02	5.17E+00	**7.58E+01**
	PHC F1 Aliphatic C8-C10	4.08E+01	5.38E+00	**7.58E+00**
	PHC F1 Aromatic C8-C10	2.15E+02	1.79E+02	**1.20E+00**
	PHC F2 Aliphatic C10-C12	1.07E+01	3.59E+00	**2.98E+00**
HASP & SGWMP - Construction/Sub-surface Worker Direct Contact with Groundwater (Mod GW1)	Dichloroethylene, cis-1,2-	1.13E+03	2.49E+02	**4.54E+00**
	Tetrachloroethylene	1.68E+03	3.59E+02	**4.67E+00**
	Trichloroethylene	1.92E+02	7.62E+01	**2.52E+00**
	Vinyl Chloride	3.52E+02	3.64E+01	**9.66E+00**
HASP & SGWMP - Construction/Sub-surface Worker Inhalation of	Tetrachloroethylene	1.68E+03	1.41E+03	**1.19E+00**
	Trichloroethylene	1.92E+02	2.98E+01	**6.44E+00**

RMM and Pathway with Unacceptable Risks	COC	Final PSS (ug/L)	Health Based Standard (ug/L)	Required Risk Reduction (x-Fold)
Vapours in Trench air sourced from Groundwater (Volatile GW COCs)	Vinyl Chloride	3.52E+02	2.48E+02	**1.42E+00**

Notes: RMM = Risk Management Measure; S&GWP - Soil and Groundwater Management Plan; H&SP - Health and Safety Plan
[a] Vapour Intrusion RMMs includes Underground Parking Structure and Sub-Slab Vapour Barrier and Venting System (VMS)

Table 1-3: Risk Management Measures

Proposed RMM	Impacted Medium	Mitigated Pathway / Affected Receptor	Risk Reduction
Barrier to Site Soils	Soil	S1 - Residents S2 - Outdoor Worker Plants & Soil Organisms Mammals & Birds	Complete risk mitigation where capping is present. Blocks contact with contaminated soils.
Two (2)-Level Underground Parking Garage	Groundwater	Residential GW2 - Resident & Site Visitors Commercial GW2 - Indoor Worker	Reduction in Indoor Air Concentrations* Combined RMMs are likely to provide sufficient risk reduction when working in tandem with VIMS (Below) Performance monitoring to be conducted as part of sub-slab vapour monitoring program
Vapour Mitigation System (VMS), Sub-slab Vapour Barrier and Vapour Venting System	Groundwater	Residential GW2 - Resident & Site Visitor Commercial GW2 - Indoor Worker	Reduction in Indoor Air Concentrations from Sub-Slab Vapour Barrier.* Reduction in Indoor Air Concentrations from the Active Vapour Venting System.* Combined RMMs are likely to provide sufficient risk reduction when working in tandem with one level underground parking garage (Above).* Performance monitoring to be conducted as part of sub-slab vapour monitoring program
Health & Safety Plan	Soil & Groundwater	COCs in Soil and Groundwater: Inhalation of Trench Air and Direct Contact with Groundwater - Subsurface Worker	See Note (a)
Soil & Groundwater	Soil &	COCs in Soil and	See Note (a)

Proposed RMM	Impacted Medium	Mitigated Pathway / Affected Receptor	Risk Reduction
Management Plan	Groundwater	Groundwater: Inhalation of Trench Air and Direct Contact with Groundwater – Subsurface Worker	
Waterproofed Raft Foundation and Waterproofed Foundation Walls	Groundwater	Off-Site Human and Ecological Receptors	The waterproofed raft foundation and foundation walls are expected to mitigate on and off-site migration of impacted groundwater. The effect of these RMMs will be evaluated through a groundwater monitoring program.
Administrative Landscape Restrictions prohibiting installation of vegetable gardens	Soil & Groundwater	Ingestion of Garden Produce grown in contaminated media	Complete risk mitigation where planting restriction is implemented as it blocks the pathway.

Notes: RMM – Risk Management Measure; *Exposure Reductions are based on the Professional Opinion of the QP (Professional Engineer).

(a) The Health and Safety Plan and Soil and Groundwater Management Plan will sufficiently reduce the exposure of subsurface workers to soil and groundwater to reduce risk to acceptable levels. Through mandating use of appropriate PPE in sub-grade environments, augmenting air exchange in trench environments with fans, and properly managing any soil or groundwater exposed at the Site during intrusive work.

2.0 PROPOSED RISK MANAGEMENT MEASURES

The proposed Risk Management Measures (RMMs) for the Site will consist of the following:

Designed Risk Management Measures (Section 3.0):

- Construction of a 2-level underground parking structure/storage garage under the building at the Site (Section 3.1.1). The proposed building will cover the majority of the Site and the underground parking structure/storage garage will cover the entire building area at grade.
- Provision of a passive Vapour Mitigation System (VMS) comprised of a sub-slab vapour barrier and depressurization system beneath the entire foundation slab for the building to be constructed on the Site (Section 3.1.2) .
- Provision of surface barrier systems for the entire Site (Private Property) as well as on the lands to be conveyed to the City of Toronto (Section 3.2). This is designed to mitigate potential health risks as a result of exposure to COCs in soil through direct contact pathways. The RMMs will consist of:
    - Hard cap surface barrier systems such as pavements and asphalt on both the development land and on the land to be conveyed.
    - Fill cap barrier systems such as soil, granular fill, or topsoil or a combination for use in vegetated and landscaped areas on both the development land and on the lands to be conveyed.
- Waterproofed raft foundation and waterproofed foundation walls to mitigate groundwater flow to and from the Property.
- Provision of a Health and Safety Plan for all maintenance, utility, or construction activities to ensure that workers in contact with soil and groundwater at the Site (Section 3.3) are not at risk as a result of contact with impacted soil or groundwater. These measures are needed to address construction workers that may be performing activities within a trench setting. The use of PPE is required so that they are not subjected to unacceptable risks as a result of exposure to COCs in soil through direct contact. The augmentation of trench air exchange rates with ventilating fans to mitigate risks related to the inhalation of volatile vapours from soil and groundwater COCs in a trench environment. Additionally, provisions for the protection of workers against potential NAPL exposure in groundwater are addressed.
- Provision of a Soil and Ground Water Management Plan for all activities involving daylighting or exposing impacted soil and/or groundwater, in addition to contact with soil and groundwater at the Site (Section 3.4).
- Provision of administrative landscape restrictions prohibiting the installation of vegetable gardens and/or growing garden produce on any portion of the property (Section 3.5). This measure is needed to protect residents from the potential consumption of food grown directly in impacted soils and/or groundwater.

Specific requirements for the RMMs are described in greater detail in the following sections below. Details on the Design of the Risk Management Measures are described in Section 3.0.

Monitoring, Maintenance, and Reporting of RMMs (Section 6.0):

- Monitoring of the vapour intrusion mitigation system via sub-slab vapour sampling to confirm there are no unacceptable risks due to vapour intrusion that may affect human health and to confirm the effectiveness of vapour mitigation system (Section 6.2).
- Sub-slab vapour barrier and vapour mitigation system inspection after installation. Any significant damage or deterioration to the sub-slab vapour barrier or the vapour mitigation system are to be repaired immediately to maintain barrier integrity (Section 6.3).
- Inspection of the surface barrier systems (Section 6.4).
- Annual Report (Section 6.6)
- Site Plan Report (Section 6.7)

Contingency Measures (Section 7.0):

- Provision of contingency measures where applicable

The specific requirements for the RMMs are described in greater detail below. Some of the RMMs (such as the sub-slab vapour barrier and venting system (Vapour Mitigation System [VMS])) must be implemented by the property owner as part of the construction of the building. All the RMMs must be implemented by the property owner prior to occupancy of the building. Following implementation, regular records must be maintained which document inspection and maintenance activities.

3.0 DESIGN OF RISK MANAGEMENT MEASURES

The design of the RMMs is described below.

3.1 Vapour Mitigation Measures

3.1.1 Underground Parking Structure

The Property will be redeveloped for a mix of residential and commercial property use. The proposed development includes constructing one 8-storey residential tower with two levels of underground parking and mixed commercial and residential use on the ground floor. The floors above ground level are to be constructed as residential condominium units.

The underground parking garage must be provided with adequate ventilation to meet the requirements of the Ontario Building Code (OBC) for parking garages. This building code requirement addresses vehicle exhaust (carbon monoxide). Section 6.2.2.3 of the OBC requires an air exchange rate of 3.9 liters/sec per square meter of garage floor area.

Refrain from constructing any Building on the Property unless the Building includes a Storage Garage, and:

a. The Storage Garage is constructed at or below the Grade of the Building;

b. The Storage Garage area covers the entire Building Area at Grade; and

c. The Storage Garage complies with all applicable requirements of the Building Code, such as the provisions governing

    I. design of a mechanical ventilation system as set out in Division B, Article 6.2.2.3. (Ventilation of Storage and Repair Garages) of the Building Code;

    II. interconnection of air duct systems as set out in Division B, Sentence (2) of Article 6.2.3.9. (Interconnection of Systems) of the Building Code; and . air leakage as set out in Division B, Section 5.4. (Air Leakage) of the Building Code; and

d. The mechanical ventilation system for the Storage Garage is designed to provide a continuous supply of outdoor air at a rate of not less than 3.9 litres per second for each square metre of floor area or be activated on an as-needed basis by carbon monoxide or nitrogen dioxide monitoring devices as required by the Building Code.

It is the professional opinion of the QP that the supply of continuous (separate) ventilation to the parking garage (based on 3.9 L/sec/m^2 continuous ventilation rates) in combination with the sub-slab vapour barrier and venting system would result in a sufficient reduction in the potential for vapours to form at unacceptable levels.

Therefore, 2 levels of underground parking garage with continuous ventilation as outlined in Section 6.2.2.3 of the OBC at the Site should help to effectively reduce indoor air concentrations.

3.1.2 Sub-Slab Vapour Barrier and Venting System (VMS)

A passive vapour mitigation system must be provided for the entire building, primarily to address the volatile COC impacts that are found in the soil and groundwater on the Property. The vapour mitigation system is comprised of two components including a sub-slab vapour barrier and a passive venting system installed beneath the concrete floor slab of the building. The typical details for the system are shown on Figures 2, 3 and 4. The system will include the following components from the sub-grade to beneath the foundation:

- A non-woven geotextile layer above the subgrade;
- A clean gravel venting layer above the non-woven geotextile;
- Placement of perforated collector pipes with a minimum diameter of 100 mm within the clean gravel to allow collection and venting of soil gases from beneath the floor slab;
- Placement of perforated monitoring pipe with minimum diameter of 25 mm within the clean gravel layer and above the collector pipes.
- Venting of the soil gases to a 150 mm pipe which is routed directly to the exterior of the building for passive venting at an exhaust point 3 m away from any intake;
- A clean gravel venting layer above the perforated pipes;

- A non-woven geotextile above the clean gravel venting layer;
- A vapour barrier with a minimum thickness of 40 mil above the non-woven geotextile;
- A non-woven geotextile layer above the vapour barrier. Concrete slab above the non-woven geotextile.

The vapour barrier, which will be a minimum thickness of 30 mil and is deemed to be sufficient to be used as the vapour barrier. The vapour barrier is considered sufficient to reduce vapour intrusion into the building. The vapour barrier will be resistant to the COCs identified on the Site. Information on the material and performance specifications including maximum vapour permeability and chemical resistance requirements are presented in the Product Sheet (Attachment 1) or any other alternative having the same performance specifications.

To eliminate potential gaps between the floor and wall of the vapour barrier will be sealed to the foundation walls and column footings using stainless steel batten strips and neoprene gaskets using concrete pin anchors and caulking as shown in Figure 2. A 25 mm monitoring pipe that is installed within the clean gravel venting layer beneath the floor slab (Figure 4) has two access ports for sub-slab vapour sampling.

As part of the VMS system sump pits will be covered by a metal lid with a vapour tight seal to prevent vapours from escaping between any gaps/voids between the concrete slab and metal lid. All VMS exhaust points will be placed 3m away from any mechanical or ventilation/HVAC intake to the building (Figure 3). The vent pipe risers connected to the VMS sump pits will be routed from the P3 underground parking level to the east exterior building. The exhaust location on the exterior wall is 3 m away from any intake (HVAC intake, window opening, balcony).

The design outlined above represents the minimum design requirements and the final design will be prepared and stamped by a qualified professional engineer licensed to practice in Ontario. Certifications for all components will be provided by the manufacturers to the installer. A building science consultant will be retained to provide inspection and certification that all construction items have been sealed properly to prevent potential soil vapour from entering the occupied area. The following testing and performance verifications will be done after the vapour mitigation system is installed to ensure it was installed properly:

- Field inspections by a senior technician supervised by the Qualified Person per Section 5 (2) of O. Reg. 153/04 (a QP_{ESA}/P.Eng) must be conducted to confirm that all systems, designs, and RMMs have been implemented according to the RMP.
- A certification from the manufacturer of each product has to be provided for each component to confirm that all construction items have been sealed properly to prevent potential soil vapour from entering the occupied area.

The above system will effectively eliminate entry of vapours into the building structure. The vapours will be vented from beneath the floor slab to exterior areas of the building. Exterior

vents will be a minimum of 3 metres from any air intake. Physical inspection for this system is described in Section 6.3.

3.2 Surface Barrier Systems

The proposed building covers the majority of the Property. Areas of the Property not covered by the proposed building will require either a hard cap surface barrier that will consist of concrete, asphalt, and/or unit pavers or a fill cap surface barrier that may consist of soil fill meeting the 2011 MECP Table 7 RPI Site condition standards, virgin granular material, and/or manufactured topsoil meeting the 2011 Table 7 RPI Site condition standards or a combination thereof.

The surface barriers for future construction will include the following for the Private Property (on-Site land):

- Hard Cap Barrier: Hard surface barrier systems which is the building foundation slab or a combination of hardscape barrier such as asphalt, concrete, unit paver or equivalent underlain by granular fill to bring total thickness of barrier and granular to no less than 300 mm. Figure 4A provides details of Typical Hard Cap Barrier Design for on-Site development lands.

- Fill Cap Barrier: Soft cap barrier system which is a combination of 150mm landscape barrier such as rip-rap, granular, topsoil or landscape material underlain by a geotextile material and unimpacted soil fill (e.g., MECP Table 7 RPI soil or better) to bring total thickness to of hardscape barrier and fill barrier to no less than 1 m. Figure 4B provide details of Typical Fill Cap Barrier Design for on-Site development lands.

3.3 Groundwater Migration Mitigation Measures

The on-Site building has been constructed with a waterproofed raft foundation and waterproofed foundation walls around the three(3)-level underground parking garage. The waterproofed foundation will act as a barrier to prevent groundwater flow from the Property therefore reducing or mitigating the risk to off-site receptors. These systems are considered RMMs though they were not engineered to mitigate exposure of receptors to contaminants in groundwater and their effect of mitigating groundwater migration to and from the property is theoretical. As such, a groundwater monitoring program has been recommended as part of this RMP (Section 6.5) to monitor concentrations of groundwater at the Property boundaries to confirm whether or not the theoretical assumptions about the effect of the waterproofed raft foundation, and waterproofed foundation walls are preventing groundwater from entering / leaving the Site at concentrations greater than the target levels specified in Section 6.5. If groundwater exceedances are observed during the groundwater monitoring program a contingency plan will be developed and enacted to mitigate migration of contaminants off the Site as specified in Section 7.0 of this Appendix. Figure 2 details the waterproofed raft foundation and waterproofed foundation walls as proposed at the Site

3.4 Health and Safety Plan

A Site-specific health and safety plan is required to be developed for the Site and implemented during all intrusive, below-grade construction or maintenance activities potentially coming into contact with or exposing Site soil or groundwater.

The QP_{ESA}/ P.Eng as well as a qualified Health and Safety Professional will prepare and review the Site-specific health and safety plan to address the risk identified in the RA. The qualified persons responsible for the construction will communicate the plans to the workers and consultants and note any health and safety issues identified on the Site and record all the pertinent information on a Daily Inspection Report. A copy of the health and safety plan must be maintained on the Site for the duration of the intrusive activities.

The Health and Safety Plan will require the following:

- Prepared in accordance with applicable Ministry of Labour (MOL) health and safety regulations;
- Provision of personal protective equipment (PPE) for workers to protect against exposure to soil;
    - It is expected per the Occupational Health & Safety Act (OH&S) that trenches would be dewatered prior to commencing trenching activities to prevent direct contact with groundwater in a trench environment.
- Trench environments will require augmentation of air exchange rates within the trench/excavation where workers will be entering the subsurface through use of ventilating fans. This will mitigate risks for construction/sub-surface workers due to exposure to volatile COCs in trench environments where exposure is higher because of lower wind speeds and lower rates of air exchange.
- Provision of barriers and signage at the boundaries of any area exposed to soil and groundwater beneath the surface barrier systems to limit access from any receptors without dermal and respiratory protection.
- In addition, the HASP will specifically address potential exposure to NAPL in groundwater during subsurface activities, if preset. If NAPL-contaminated groundwater is encountered during future excavation on the Site, workers should wear appropriate PPE to prevent dermal contact and incidental ingestion. This protection would consist of wearing chemical resistant gloves in addition to standard PPE and dewatering of trench environments.

All workers who may potentially be exposed to impacted soil and groundwater beneath the surface barrier systems must be provided with adequate training and information regarding potential risks. The training will include the following:

- Identification of potential risks associated with exposure to soil and groundwater;
- Confirmation of appropriate personal protection equipment to minimize exposure to impacted soil and groundwater;
- Identification of a Health and Safety Officer that will be responsible for ensuring that all workers implement the requirements of the Health and Safety Plan.

3.5 Soil and Groundwater Management Plan

A Soil and Groundwater Management Plan (SGWMP) will be prepared and implemented for the construction and maintenance activities at the Property. There may be future construction or maintenance activities at the Site which involve exposure of the underlying soil and/or groundwater. The Soil and Groundwater Management Plan is required to properly manage soil and groundwater during construction and maintenance activities, and to ensure there are no adverse effects to human and ecological receptors. The SGWMP would be prepared by or under the supervision of a Qualified Person per Section 5 (2) of O. Reg. 153/04 (a QP_{ESA}) and comply with Clauses 30 to 39 of Schedule E of O. Reg. 153/04. The consultant acting as the QP_{ESA} for the site works has prepared the soil and groundwater management plan to ensure all risks identified in the RA are addressed. The Soil and Groundwater Management Plan includes the following elements:

- The Soil and Groundwater Management Plan must be implemented for any activities which involve removal of excess soil and any groundwater from the site during construction activities and maintenance activities.
- All soil excavated at the Site must be properly characterized for off-Site disposal and/or management in accordance with the requirements of the Soil and Groundwater Management Plan and the Certificate of Property Use (CPU) for the Site. .
- Dewatering activities are likely to take place at the site and will be completed by the dewatering contractor retained by the owner. The potential for continuous groundwater seepage within the building excavation during construction is high due to the depth to groundwater. Any groundwater encountered in excavations outside of the building footprint must also be properly controlled and managed to minimize exposure to sub-surface workers and the surrounding environment. This will generally require dewatering of all excavations and pumping of groundwater into a holding tank for testing purposes. Following testing, the water will either be:
    - discharged directly into the municipal sewer system
    - treated to meet sewer use discharge criteria
    - removed off-site by a private hauling contractor licensed by MECP.
- Site construction measures must be conducted to minimize the generation of dust. This will include wetting and/or covering of exposed soils.
- All stockpiled soils (if any) must be properly contained to ensure that there is no runoff of sediment from the stockpiles.
    - Efforts will be made to minimize stockpiling of soils on-site. However, there may be a requirement for stockpiling of soil materials on the Property for the purpose of analysis, segregation and/or staging prior to further movement and placement or removal. Management of stockpiled soils onsite will be conducted in accordance with *subsection 1 Soil Storage Rules* of *Section C Soil Management Rules* in *Part I Rules for Soil Management* of the Soil Rules. The QP has made the following recommendations for stockpiling and soil storage at the Property:
        - In general, soil and crushed rock should be managed in such a way as to prevent any adverse effects associated with the receiving, processing, storage and movement of soil, including management of noise, dust, mud

tracking, leaching, run-off and erosion; and, potential outdoor air impact(s), including odour issues.

- Soil should be stored in a manner that prevents any contaminants from the soil from leaching into the ground water.
- Stockpiles of potentially impacted and impacted soil should be placed on a polyethylene or tarpaulin barrier to segregate them from the underlying soils.
- Appropriate silt and erosion control measures should be implemented on all stockpiles, which will be in place for over five (5) days. This includes covering with a polyethylene barrier or tarpaulin.
- Where site conditions allow, stockpiles of dry soil should be wetted, as required, to minimize the generation of dust.
- Stockpiles should be kept as flat as practicable and generally limited to heights of less than three (3) m to minimize potential wind and water erosion.
- Soil stored at the Property must not be stored at a location as described below:
    - Within 10 m of the property line (boundary), unless any of the following apply:
- 500 m^3 or less of excess soil is stored at any one time on the Project Area;
- Excess soil storage at the Project Area is for a period of time of less than one (1) week;
- The storage location has a physical barrier (e.g., concrete wall) between the excess soil and the property line.

- All soil excavated at the Site must be properly characterized for off-Site disposal and/or management in accordance with O.Reg 406/19 under the direct supervision of an appropriately qualified person (QP).
    - Based on the building's footprint covering the majority of the Property, no earth fill is expected to be imported to the Property for use as engineered fill. For landscaping purposes, the landscaping contractor will be importing planting mixes for use in shrub planting areas in the north portion of the Property. Sources of topsoil that will be used in the planting mixes will be reviewed by Englobe's QP prior to preparation of the planting mix to ensure it meets Table 3.1 RPI Excess Soil Quality Standards (ESQS). Englobe's review of the source site will check the frequency of samples collected against the planned volume for importation and will check that the chemical parameters selected for testing satisfy the minimum requirements of O.Reg. 406/19 and the Soil Rules. Additionally, the review will ensure all applicable COCs for the Property (424 Churchill Avenue North) have been tested and meet the above-mentioned soil acceptance criteria.

3.6 Administrative Controls

Any buildings to be constructed on the property must have the following administrative controls to manage the risk:

- Landscape restrictions prohibiting the installation of vegetable gardens and/or growing garden produce on any portion of the property. This is to protect residents from the potential consumption of food grown directly in impacted soils and/or groundwater.

4.0 DURATION OF RISK MANAGEMENT MEASURES

The Risk Management Measures must remain in place until all potential sources of impact associated with the Site have been removed or reduced to acceptable levels through other means. For the purpose of the Risk Assessment, it is assumed that the concentration of the Contaminants of Concern in the groundwater will remain at their current level for the foreseeable future. While there will be on-going degradation and dilution of some COCs, this mechanism is not considered when assessing the required duration of RMMs.

Risk Management Measures at the Site, as described in Section 3.0, must be installed and maintained in perpetuity until such time as additional investigations are conducted to demonstrate that the COCs are no longer present at levels which may require RMM.

The requirements to install and maintain the RMM must be registered on the title of the Property through the Certificate of Property Use (CPU) and Record of Site Condition (RSC). The requirements include the following conditions:

- Construction of Site-specific building. The building must conform to the Site-specific design with the requisite number of underground storage garage (a.k.a underground parking structure) levels (2 levels).
    a. The Storage Garage/parking structure is constructed at or below the Grade of the Building.
    b. The Storage Garage/parking structure area covers the entire Building Area at Grade.
    c. The Storage Garage complies with all applicable requirements of the Building Code, such as the provisions governing:
        I. design of a mechanical ventilation system as set out in Division B, Article 6.2.2.3. (Ventilation of Storage and Repair Garages) of the Building Code;
        II. interconnection of air duct systems as set out in Division B, Sentence (2) of Article 6.2.3.9. (Interconnection of Systems) of the Building Code.
- Provision of a Vapour Mitigation System (VMS) comprised of a sub-slab vapour barrier and venting system beneath the entire foundation slab for the building to be constructed on the Site as detailed in Section 3.1.2.
- Provision of surface barrier systems for the entire Site as detailed in Section 3.2.
- Provision of a Health and Safety Plan for all maintenance, utility, or construction activities to ensure that workers in contact with soil and groundwater at the Site are not at risk as a result of contact with impacted soil or groundwater as detailed in Section 3.3.

- Provision of a Soil and Ground Water Management Plan for all activities involving daylighting or exposing impacted soil and/or groundwater, in addition to contact with soil and groundwater at the Site as detailed in Section 3.4.
- Provision of administrative landscape restrictions prohibiting the installation of vegetable gardens and/or growing garden produce on any portion of the property as detailed in Section 3.5.

A Certificate of Requirement must be registered on the Property title to ensure that any person with interest in the Property is made aware of the requirements for the implementation, management, and duration of the RMMs.

The proposed RMMs (underground parking structure/garage, vapour mitigation system, and hard and fill cap surface barrier systems) are conventional engineered systems that are widely applied in the construction and development industry. These systems will be subject to on-going inspection and maintenance as noted subsequently in Section 6.0 of this document and Section 7.4 of the RA.

5.0 IMPLICATIONS FOR OFF-SITE RECEPTORS

The proposed RMMs will be effective for mitigating risks to human and ecological receptors at the Site. It is not expected that the groundwater impacts will affect the ecological off-Site receptors as none of the COCs in groundwater exceeded either their Site Specific GW3 component values and groundwater in the area of the Site is found within the bedrock. Thus, potential risk to off-Site ecological receptors and off-Site aquatic receptors was not demonstrated in the risk assessment. Furthermore, given the depth to groundwater at the Site (>4m) and the property being located in an area of Ottawa that sources potable water from the Ottawa River through the municipal water supply off-Site human receptors are not expected to come into direct contact with groundwater. However, there is potential for off-Site human receptors to come into contact with volatile vapours migrating from COCs in groundwater for which unacceptable risk was denoted in the Risk Assessment. The installation of a waterproofed raft foundation and waterproofed foundation walls on the three (3)-level underground parking structure will act as a barrier to prevent groundwater flow from the property thereby reducing or mitigating risk to off-Site receptors both human and ecological. These systems are considered RMMs though they were not engineered to mitigate exposure of receptors to contaminants in groundwater and their effect of mitigating groundwater migration is theoretical. As such, a groundwater monitoring program has been recommended as part of the RMP (Section 6.5) to monitor concentrations of COCs in groundwater at the Property boundaries to confirm the theoretical assumptions about the effect of the waterproofed foundation and foundation walls for the proposed building. If groundwater exceedances are observed during the groundwater monitoring program a contingency plan will be developed and enacted to mitigate migration of contaminants off the Site.

Soil impacts are limited due to the nature of the limited migration and the locations of the exceedances. As such, there should be no adverse effects from soil to off-Site receptors. Like groundwater potential exists for the off-Site migration of soil vapour, however, the proposed development will cover the entirety of the property from lot line to lot line and will require a sub-slab vapour mitigation system (VMS). The presence of VMS should prevent lateral migration of vapours over long distances under the building envelope toward neighboring residential sites by creating a low-pressure zone beneath the on-Site building and drawing soil vapours into the VMS. As a result, no off-site vapour risks are anticipated for off-Site buildings located within 15 metres for non-recalcitrant contaminants and 30 metres for recalcitrant contaminants. Additionally, preferential flow pathways in the form of underground utility corridors exist below Churchill Avenue North and Byron Avenue which will further contribute to reducing the concentrations of contaminants expected to be encountered at downstream properties.

6.0 MONITORING, MAINTENANCE, AND REPORTING OF RISK MANAGEMENT MEASURES

The monitoring and maintenance of the RMMs will be the responsibility of the property owner or the designated agent, following development of the Site and signing of the CPU. The RMMs will be subject to ongoing inspection and maintenance and contingency plans as summarized below.

6.1 Overview

In summary, the monitoring and maintenance requirements will include the following:

- Monitoring of the vapour mitigation system via sub-slab vapour sampling.
- Inspection of the VMS for the building (during installation and during operation).
- Inspection of the surface barrier systems.
- Implementation of appropriate Health and Safety Plans for future Site excavation activities.
- Appropriate record keeping and reporting, including the Annual Report and Site Plan Report.

6.2 Sub-Slab Vapour Monitoring

The purpose of the monitoring will be to ensure that the RMMs are operating as intended, and to demonstrate that the objectives of the vapour mitigation system (VMS) are being met. Sub-slab vapour monitoring will be conducted at two (2) locations within the underground parking structure/garage. Samples will be obtained from the vapour monitoring ports which connect to perforated monitoring pipes placed in the gravel venting layer under the floor slab as presented in Figure 4. As part of the design of the VMS for the building, sub-slab soil vapour sampling ports (i.e., monitoring ports) will be installed above the concrete slab of the P3 (lowest level) underground parking to allow monitoring of the sub-slab soil vapour quality. Each of the

monitoring ports will consist of a port (fitted with shut-off valve) that is connected to an isolated network of perforated monitoring piping that will run horizontally below the P3 Level slab-on-grade and which will be installed below a specific area of the building to allow collection of sub-slab soil vapour for chemical analysis. The collective monitoring networks will cover the entire footprint of the building at the P3 Level. Conceptual details of the VMS, including the monitoring ports and monitoring networks, are included in Figure 4.

All sub-slab soil vapour samples will be collected in accordance with the protocols and procedures outlined in the following guidance document issued by the United States Environmental Protection Agency (USEPA).

- USEPA, 'Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air, Second Edition, Compendium Method TO 15: Determination of Volatile Organic Compounds (VOCs) in Air Collected in Specially-Prepared Canisters and Analyzed by Gas Chromatography/Mass Spectrometry (GC/MS)', dated January 1999 (USEPA Method TO-15).

USEPA Method TO-15 will be utilized for sampling and chemical analysis of VOCs and PHCs found in the sub-slab soil vapour at the Property. Each sub-slab soil vapour sample will be collected using a dedicated six litre (6L) Summa or Silonite canister that is prepared by the laboratory and fitted with a flow controller set for a twenty-four (24) hour collection period. Appropriate Quality Assurance and Quality Control (QA/QC) procedures, including the use of duplicate samples and a trip blank.

It is noted that if the acceptable monitoring technique changes, the sampling method shall be revised such that it will be conducted in accordance with the accepted sampling method as per the current MECP Regulations and Standards. Future monitoring and maintenance programs will include pressure differentials and soil vapour assessment.

Sampling events must be initiated prior to occupancy of any building on the Site to obtain results that are representative of the sub-slab vapour monitoring prior to Site activities as part of a Baseline Performance Assessment that will last for a period of one year and will continue thereafter as Confirmation Monitoring for a minimum of one additional year.

Baseline Performance Monitoring will be conducted on a quarterly basis (every three months, four times a year). Confirmation monitoring performed beyond the first year will be conducted seasonally (three times per year: winter, spring, and summer).

Sub-slab vapour monitoring shall be completed for all COCs listed in Table 6-1 (and Table 7-3 of the RA). The results will be compared to the Sub-slab Vapour Target Levels (SSVTLs) developed for the COCs.

The Sub-Slab Vapour Target Levels developed for the COCs on the Property are as follows:

Table 6-1: Sub-Slab Vapour Target Levels for Volatile COCs

COC	Units	Residential Health-Based Indoor Air Criteria (HBIAC)	Sub-Slab Vapour Targets
Volatile Organic Compounds			
Dichloroethylene, 1,1-	µg/m³	4.17E+01	2.09E+03
Dichloroethylene, cis-1,2-	µg/m³	3.13E+01	1.57E+03
Dichloroethylene, trans-1,2-	µg/m³	1.25E+01	6.25E+02
Tetrachloroethylene	µg/m³	4.28E+00	2.14E+02
Trichloroethylene	µg/m³	2.71E-01	1.36E+01
Vinyl chloride	µg/m³	1.26E-01	6.30E+00
BTEX			
Benzene	µg/m³	5.06E-01	2.53E+01
Petroleum Hydrocarbons			
PHC-F1	**µg/m³**	**2.49E+03**	**1.25E+05**
Aliphatic C6-C8	µg/m³	3.13E+02	1.57E+04
Aliphatic C>8-C10	µg/m³	5.21E+02	2.61E+04
Aromatic C>8-C10	µg/m³	1.04E+02	5.20E+03
PHC-F2	**µg/m³**	**4.71E+02**	**2.36E+04**
Aliphatic C>10-C12	µg/m³	5.21E+02	2.61E+04
Aliphatic C>12-C16	µg/m³	5.21E+02	2.61E+04
Aromatic C>10-C12	µg/m³	1.04E+02	5.20E+03
Aromatic C>12-C16	µg/m³	1.04E+02	5.20E+03

Notes: All HBIAC are from MECP (updated Nov 1, 2016) MGRA Model HBIAC; Sub-slab Vapour Target = HBIAC / Generic Residential Attenuation Factor (0.02).

If the concentration for any COCs exceeds the Sub-Slab Vapour Target Levels, as shown in Table 6.1 above, the owner shall notify the MECP within five (5) business days. Upon detection of the exceedance, sampling will be repeated within fifteen (15) business days of receipt of the analytical results at all locations.

If the sub-slab vapour monitoring results of the second sampling event following the first exceedances do not indicate the presence of exceedances, then sub-slab vapour monitoring will be continued on a quarterly basis (every three months) for an additional twelve (12) month period (4 additional monitoring events).

If the results of the second sampling event indicate that exceedances of the Sub-Slab Vapour Target Levels continue to occur during the second sampling event, then indoor and ambient air monitoring shall commence along with sub-slab vapour monitoring for the COCs listed in Table 6-1 within fifteen (15) days of receipt of the analytical results. Outdoor air quality sampling will be required in conjunction with the indoor air quality sampling to account for potential influences of outdoor air, background sources, or sources resulting from vapour barrier implementation. Areas

indicating exceedances of the Sub-Slab Vapour Target Levels will require indoor air quality sampling. The indoor sampling will be conducted in accordance with the sampling method as per the current MECP Regulations and Standards and the ambient air sampling will be conducted in accordance with the MECPs' Draft Technical Guidance: Soil Vapour Intrusion Assessment September 2013 PIBS#8477 document.

A qualified person should conduct a Site inspection and determine a suitable location for the outdoor air samples. Sample locations should be representative of ambient air both upwind and downwind of the buildings, as necessary.

A qualified person should conduct a Site inspection and determine a suitable location for the indoor air samples. The indoor air sample stations should be placed in at least 2 locations on the lowest occupied level of the building.

The indoor air results will be compared to the Indoor Air Target Levels developed for the COCs as shown in Table 6-1. The ambient air results will be compared also with AAQC Standards. If the indoor air monitoring results do not indicate the presence of exceedances, then indoor air monitoring will be continued on a quarterly basis (every three months) for an additional three (3) month period (1 additional monitoring event) and the sub-slab vapour monitoring will be continued on a quarterly basis (every three months) for an additional twelve (12) month period (4 additional monitoring events).

In the event of an exceedance of the Indoor Air Target Levels, the owner shall notify the MECP within five (5) business days. Upon detection of the exceedance, sampling will be repeated within fifteen (15) business days at all locations where exceedances were noted, including outdoor air sampling.

The results of the second sampling event will be reported to the MECP within five (5) business days of receipt. If the results of the second sampling event indicate that the indoor air quality continues to exceed the Indoor Air Target Levels, then a Qualified Person will develop and submit to the MECP a detailed contingency plan within thirty (30) days of receipt of the analytical results. The contingency plan is described in Section 7.0.

If the results of the second sampling event do not indicate that the indoor air quality continues to exceed the Indoor Air Target Levels, then indoor air monitoring will be continued on a quarterly basis (every three months) for an additional three (3) month period (1 additional monitoring event) and the sub-slab vapour monitoring will be continued on a quarterly basis (every three months) for an additional twelve (12) month period (4 additional monitoring events).

Monitoring will be conducted for two years. Monitoring locations will be finalized by the QP and the Client's mechanical engineer. Note that the indoor air sampling locations, if required, will be finalized based on the locations of sub-slab vapour exceedances.

As noted above and if required, indoor air quality sampling shall continue until there is a minimum of two (2) consecutive quarters where the indoor air quality meets the Indoor Air

Target Levels, following any monitoring event where any exceedances within the sub-slab vapour monitoring are found. An application may then be made by the owner to the Director to discontinue or alter the air quality sampling program.

At the end of the second year of the initial monitoring, the Qualified Person will provide a revised monitoring plan based on the results found in the air quality at the Site.

6.3 Inspection of Vapour Mitigation System (VMS) and Underground Parking Structure

The vapour mitigation system for the future building consists of a passive venting and barrier system. The components are protected by the floor slab of the building; therefore, the requirements for inspection and maintenance would not be significant. However, an inspection and maintenance program for the VMS is required post construction of the VMS. Inspections are required to be carried out on a semi-annual basis (i.e., every 6 months). The inspection and maintenance requirements would generally consist of the following:

Vapour Barrier

Semi-annual inspection of the exposed floor areas within the building to ensure that there are no obvious cracks, distress or damage to the floor which may result in damage to the underlying venting and barrier system. There is no requirement for direct inspection of the vapor barrier. The barrier is made of durable polymer. Deterioration of material may be caused through exposure to sunlight. Since the material will be beneath the floor slab, there will be no exposure to sunlight. The expected life of the material is several hundred years, which is greater than the expected lifespan of the building.

Replacement or reinstatement of the venting and barrier system as required, in the event that there are construction activities which result in removal or disturbance of the concrete floor.

Sump Pits, Ports, Plumbing & Piping

Semi annual inspection of the exhaust port vent pipe at the exterior of the building to ensure that the insect screen is intact, and the pipe is not clogged or damaged.

All P2 Parking Level surface barriers (including floor slab and walls), and visible mechanical and plumbing components, such as sump pits, sampling ports and piping, must be inspected for evidence of repair/damage and/or breach. Any areas indicating a potential breach are required to be thoroughly inspected by a qualified person in order to determine the extent of damage, if any. Any damaged components are required to be repaired immediately to maintain the integrity of VMS.

Repair of the VMS is required to be conducted by a qualified contractor and is to be inspected by a qualified inspector under the supervision of a QP.

Walls and Floor of Parking Garage

Visual inspection of the walls and floor of the parking garage should be conducted on a semi-annual basis [once every six (6) months] to ensure that there is no visual evidence of seepage of groundwater through the walls or floor. Any areas of seepage must be promptly repaired. Settlement, voids, or obvious structural damage will be inspected by a Professional Engineer and appropriate repair measures will be implemented.

Ventilation of Parking Garage

The mechanical engineer will provide a report on ventilation performance in the parking garage for review to ensure that the requirements of the Ontario Building Code (OBC) for parking garages requiring an air exchange rate of 3.9 liters/sec per square meter of garage floor area is being met. Any indications that performance of the ventilation system is not meeting the required specifications will be repaired immediately.

Operational Monitoring

The undertaking operational monitoring, including the recording of the monitoring results, at least once before occupancy, quarterly during the first two years after occupancy and semi-annually thereafter, shall commence. Measuring of the (lower) air pressure differential below the foundation floor slab across the building area, relative to the indoor air pressure within the building being achieved by the soil vapour venting layer.

6.4 Inspection of Surface Barrier Systems

All surface barrier systems must be inspected on a quarterly basis for evidence of damage or deterioration. Any areas of significant damage or deterioration must be repaired immediately to maintain the integrity of the surface barrier.

There may be maintenance or construction activities which result in disturbance to the surface barrier systems (including utility corridors and/or trench plugs). In this case, the surface barrier systems shall be restored to the configurations noted in Figures 5a,b and 6a,b, 7 and 10 and described in Section 3.2 (Surface Barrier System).

6.5 Groundwater Monitoring Program

The purpose of the groundwater monitoring program is to assess the performance of the waterproofed raft foundation and waterproofed foundation walls in preventing migration of impacted groundwater to and from the Site. The groundwater monitoring program will be

conducted to assess groundwater quality for a period of two years to gauge performance of the Site groundwater mitigation measures.

The ground water monitoring program includes wells that are situated at the upgradient (north) and downgradient (south) boundary of the Site, as shown in Figure 5. This will provide groundwater quality information to assess potential impacts with respect to concentrations of COCs in groundwater entering and leaving the Property. The location for each monitoring well is summarized below:

Table 6-2: Groundwater Monitoring Well Locations

Well ID	Location
MW1	Northeastern corner of property
MW2	Northwestern corner of the Property
MW203	Southwestern corner of the Property
MW204	Southeastern corner of the Property

The monitoring wells will be installed on the prior to building occupancy for the purposes of the groundwater monitoring program.

Ground water quality testing will be conducted in each of the wells semi-annually (two (2) times over a one (1) year period) for a period of two consecutive years.

Groundwater monitoring shall be completed for all COCs listed in Table 6-4 below. The results will be compared to the Groundwater Property Specific Standards developed for the COCs and noted in Table 6-4 below, as well as the applicable off-site site condition standards (MECP Table 3 SCS).

Table 6-3: Property Specific Standards for COCs in Groundwater

COC	Units	Max. conc.	PSS	Basis of PSS	Off-Site SCS (Table 3 SCS)
Volatile Organic Compounds					
Dichloroethylene, 1,1-	µg/L	2.00E+00	2.40E+00	Max.+20%	1.6
Dichloroethylene, cis-1,2-	µg/L	9.40E+02	1.13E+03	Max.+20%	1.6
Dichloroethylene, trans-1,2-	µg/L	1.40E+01	1.68E+01	Max.+20%	1.6
Tetrachloroethylene	µg/L	1.40E+03	1.68E+03	Max.+20%	1.6
Trichloroethylene	µg/L	1.60E+02	1.92E+02	Max.+20%	1.6
Vinyl Chloride	µg/L	1.00E+02	3.52E+02	Theoretical Future Max.	0.5
BTEX					
Benzene	µg/L	9.10E-01	1.10E+00	Max.+20%	44
Petroleum Hydrocarbons					
PHC F1	µg/L	5.40E+02	6.48E+02	Max.+20%	750
PHC F2	µg/L	3.70E+02	4.44E+02	Max.+20%	150
PHC F3	µg/L	7.50E+02	9.00E+02	Max.+20%	500

Notes: concentrations in µg/L;PSS - Property Specific Standards

In the event of an exceedance of the applicable criteria, the owner shall notify the MECP within five (5) business days. An additional sampling round will be conducted in all wells that demonstrate an exceedance of the applicable criteria within 30 business days.

The results of the second sampling event will be provided to the MECP within a further five (5) business days of their receipt.

If the second set of samples has concentrations which continue to exceed the applicable criteria, then a Qualified Person shall develop and submit to the MECP a detailed contingency plan within 30 days of receipt of the results of the second set of samples. The nature of the proposed contingency plans, with respect to ground water monitoring, is provided in Section 7.2.4.

The Site owner may make an application to the Director of the MECP to discontinue the ground water monitoring program in the following circumstances:

If the ground water quality in all monitoring wells remains below the applicable standards for four (4) consecutive sampling events.

6.6 Annual Report

An Annual Report will be prepared by March 31 each year, documenting activities relating to the Risk Management Measures undertaken during the previous calendar year. The report will provide the results of the monitoring of sub-slab soil vapour quality and groundwater monitoring. The report will identify any soil or ground water management activities, and any contingency plans which have been implemented (as noted subsequently in Section 7.0).

The Annual Report will be prepared by a Qualified Person. The report will present the following:

- All of the factual information gathered during the monitoring activities;
- The performance of the RMMs;
- The implementation of any required contingency measures;
- Recommendations for the requirements, if any, for implementation of additional RMMs or upgrading of the current RMMs; and
- Recommendations regarding the requirements for further monitoring.

6.7 Site Plan Report

The Owner shall retain a copy of the Site plan prepared and signed by a Qualified Person prior to occupancy which will describe the Property, placement and quality of all of the barriers to Site soils. The Site plan will include a plan and cross section drawings specifying the vertical and lateral extent of the barriers. This Site plan shall be retained by the Owner for inspection upon request by a Provincial Officer. The Site plan shall be revised following the completion of any alteration to the extent of the barriers to Site soils.

6.8 Site Excavation and Construction Activities

There may be a requirement for construction or maintenance activities at the Site which involve disturbance of the surface barriers, or soil and groundwater at the Site. All future maintenance or construction activities will be subject to the Health and Safety Plan noted in Section 3.3.

6.9 Record Keeping and Reporting

All inspection and maintenance activities required under Section 6.0 must be recorded in a logbook. The logbook should be completed by the Site owner or a designated agent. The logbook should be kept as a permanent record and should be available to the MECP and other agencies for their review if requested. The logbook must identify the following:

- The name of the person and/or firm designated to conduct monitoring or maintenance activities.
- The signature of the person that conducts the monitoring or maintenance activities.
- The date of the monitoring activities.
- A brief summary of all monitoring activities which have been conducted and their outcome.
- Identification of any areas, actions or activities which require maintenance based on the inspection or monitoring activities.
- Compilation of the results of all sub-slab soil vapour quality monitoring activities, and all related correspondence with the MECP or other agencies.
- A description of the date and nature of any repair and/or maintenance activities which may be required to maintain the RMMs.
- Provision of as-built plans for any future construction activities (such as Site alterations) which require RMMs. This will include as-built plans for the VMS, surface barrier systems, and underground utilities. The as-built plans must be prepared and sealed by a Professional Engineer.

7.0 CONTINGENCY MEASURES

7.1 Overview

Monitoring programs will be conducted to assess the effectiveness and condition of the RMMs. These include the following:

- Monitoring of sub-slab vapour quality (Section 7.2.1).
- Monitoring of the condition of the RMMs (Section 7.2.2 and 7.2.3).

7.2 Contingency Plan

Monitoring programs will be conducted to assess the effectiveness and condition of the RMMs. Contingency plans are available in the event that the monitoring indicates deterioration or unacceptable performance of the RMMs. The contingency plans and appropriate action levels are provided below:

7.2.1 Sub-Slab Vapour Quality

The sub-slab vapour quality under the vapour mitigation system will be monitored. The building will be fitted with a passive vapour mitigation system which includes a vapour barrier and passive venting system. In the event the sub-slab vapour quality exceeds the Sub-Slab Vapour Target Levels noted in Table 6-1 (above) for two consecutive sampling events, then an appropriate contingency plan will be developed by a Qualified Person. As noted in Section 6.2, at the end of the second year of the initial monitoring, the Qualified Person will provide a revised monitoring program based on the results found in the air quality at the Site. A summary of potential outcomes of the monitoring, and contingency plans is provided below.

Step	Action and Results	Procedure/Contingency
1	Sub-slab vapour monitoring results do not indicate exceedances of Sub-Slab Vapour Target Levels.	• Sub-slab vapour monitoring is conducted on a quarterly basis (every three months) for the first year (4 monitoring events) and conducted seasonally (three times per year: winter, spring, and summer) for the following year.
	Sub-slab vapour monitoring results indicate exceedances of Sub-Slab Vapour Target Levels.	• The owner shall notify the MECP within five (5) business days of the exceedances. Sub-slab vapour monitoring will be repeated within fifteen (15) business days of receipt of the analytical results at all locations. Proceed to Step 2.
2	Sub-slab vapour monitoring results do not indicate exceedances of Sub-Slab Vapour Target Levels for re-sampling event.	• Sub-slab vapour monitoring will be continued quarterly basis (every three months) for an additional twelve (12) month period (4 additional monitoring events).
	Sub-slab vapour monitoring results indicate exceedances of Sub-Slab Vapour Target Levels for re-sampling event.	• Indoor and ambient air monitoring shall commence along with sub-slab vapour monitoring within fifteen (15) days of receipt of the analytical results. Only areas indicating exceedances of the

Step	Action and Results	Procedure/Contingency
		Sub-slab Vapour Screening Criteria will require indoor air quality sampling. Proceed to Step 3.
	Sub-slab vapour monitoring results indicate exceedances of Sub-Slab Vapour Target Levels for additional two re-sampling events.	• Indoor and ambient air monitoring shall commence along with sub-slab vapour monitoring within thirty (30) days of receipt of the analytical results. Only areas indicating exceedances of the Sub-slab Vapour Target Levels will require indoor air quality sampling. Proceed to Step 3.
3	Indoor air and ambient air quality do not indicate exceedances of the Indoor Air Target Levels for the COCs.	• Indoor air monitoring will be continued on a quarterly basis (every three months) for an additional three (3) month period (1 additional monitoring event). The monitoring will be discontinued if there are no further indoor air exceedances.
	Indoor air and ambient air quality indicate exceedances of the Indoor Air Target Levels for the COCs.	• The owner shall notify the MECP within five (5) business days. Upon detection of the exceedance, sampling will be repeated within fifteen (15) business days at all locations where exceedances were noted. Proceed to Step 4.
4	Indoor air and ambient air quality do not indicate exceedances of the Indoor Air Target Levels for the COCs for re-sampling event.	• Indoor air monitoring will be continued on a quarterly basis (every three months) for an additional three (3) month period (1 additional monitoring event). The monitoring will be discontinued if there are no further indoor air exceedances. Sub-slab vapour monitoring will be continued quarterly basis (every three months) for an additional twelve (12) month period (4 additional monitoring events).

	Indoor air and ambient air quality indicate exceedances of the Indoor Air Target Levels for the COCs for re-sampling event.	• A Qualified Person will develop and submit to the MECP a detailed contingency plan within thirty (30) days of receipt of the analytical results.
		• The ***"contingency plan"*** will include the following items:
		  ○ Review of all monitoring data including ground water, sub-slab, indoor air, and outdoor air monitoring results.
		  ○ Further inspection of passive venting system to determine if components are plugged or damaged.
		  ○ Conduct inspection of building floors and walls, and provide sealing of cracks or discontinuities
		• After the contingency plan is in place, sub-slab vapour monitoring, indoor air, and ambient air quality sampling will take place. Proceed to Step 5

5	Indoor air quality does not indicate exceedances of the Indoor Air Target Levels for the COCs for the sampling event after contingencies are in place.	• Indoor air monitoring will be continued on a quarterly basis (every three months) for an additional three (3) month period (1 additional monitoring event). The monitoring will be discontinued if there are no further indoor air exceedances.
	Indoor air quality indicates exceedances of the Indoor Air Target Levels for the COCs for the sampling event after contingencies are in place.	• ***"Contingency Plan"***: Adjust the flow of air and the magnitude of depressurization within the system below the floor slab. • A Qualified Person is to provide a revised air quality monitoring plan based on the results collected over the period of monitoring.

7.2.2 Vapour Mitigation System and Underground Parking Structure

Item	Action Level	Contingency Plan
Damage to floors or wall of parking garage including cracks, settlement, or voids.	Any cracks or voids of greater than 2 mm aperture and 1 m length will require action.	Cracks or voids will be repaired, as appropriate, with concrete caulking or other sealant. Settlement, voids or obvious structural damage will be inspected by a qualified Professional Engineer and appropriate repair measures will be implemented. All repair measures will be completed in accordance with the requirements of the RMM.

7.2.3 Surface Barrier Systems

There is generally no requirement for contingency plans for the surface barrier systems for future conditions. There will be a requirement for inspection, maintenance and repair of these systems if they are disturbed or damaged as noted in Section 6.4.

7.2.4 Groundwater Quality

Groundwater quality monitoring is conducted to determine the effectiveness of the waterproofed raft foundation and waterproofed foundation walls in mitigating the migration of impacted groundwater to and from the Site. . In the event that the concentrations of the COCs in the groundwater exceed the target levels listed in Table 6-3, a contingency plans will be implemented to manage potential risks to human and ecological receptors. The Table below details the action levels and contingency plan framework based on operational monitoring of groundwater to assess the effectiveness of groundwater migration mitigation measures at the Site.

Item	Action Level	Contingency Plan
Groundwater quality shows trends to increase in concentration of COCs for three consecutive sampling events, but concentrations remain below the trigger values (i.e., Table 3 SCS).	Continue groundwater monitoring program as described in Section 6.5, and continue air quality monitoring programs described in Section 6.2.	Investigate possible sources of groundwater quality impact to determine if they are related to on-Site activities or off-Site upgradient activities.
Groundwater quality exceeds the trigger values (i.e., Table 3 SCS).	Continue groundwater monitoring program as described in Section 6.5, and continue sub-slab vapour/air quality monitoring programs described in Section 6.2.	Determine if increase in groundwater concentrations could result in potential adverse effects to human or ecological receptors. Determine potential impact of exceedances of the trigger values (i.e., Table 3 SCS) on RMM (vapour mitigation system, surface barrier system, soil and groundwater management plan, health and safety plan).

Item	Action Level	Contingency Plan
Groundwater quality exceeds the trigger (i.e., Table 3 SCS) and studies indicate potential adverse effects to human or ecological receptors on-Site.	Continue groundwater monitoring program as described in Section 6.5, and continue sub-slab vapour/air quality monitoring programs described in Section 6.3.	Implement appropriate additional RMM. The appropriate measures will be designed by a Qualified Person.

8.0 FINANCIAL ASSURANCE

Financial assurance is required for the expected monitoring and maintenance of the RMMs.

Financial assurance will generally be required for the following components:

- Sub-Slab vapour quality monitoring program.
- Inspection and maintenance of surface barrier systems.
- Inspection of Vapour Mitigation System.
- Preparation of annual monitoring report.
- Preparation of Site Plan report

The costs for maintenance, monitoring and inspection are approximately $185,900. It is noted that the financial assurance is provided for a two-year period of monitoring, maintenance and inspection.

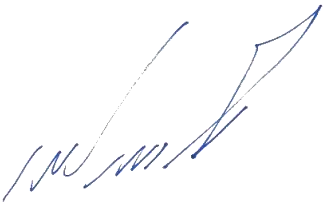
Item	*Components*	*Total*
Inspection of Vapour Mitigation System Program	2 years monitoring program – 4 events	$10,000.00
Sub-Slab Vapour Quality Monitoring	Sampling at locations for 2 years monitoring – 7 events include blanks and duplicates.	$100,000.00
Groundwater Monitoring Program	2 yar monitoring program – 4 Events	$30,000.00
Inspection of Surface Barriers	2 years – 4 events	$7,000.00
Preparation of Annual Report	Preparation of two Annual Reports	$12,000.00
Site Plan Report	Preparation of one Report	$10,000.00
Contingency Plan Report	Contingency Costs (10% Total Cost)	$13,900.00
	TOTAL (excl. HST)	**$185,900.00**

As noted above, the total cost of the monitoring, maintenance and inspection is $185,900 over the initial two-year period and is based on the schedules noted herein. This represents the financial assurance required for the proposed RMMs at the Property.

We trust that the above-noted information is sufficient for your present purposes. Should you have any questions concerning the above, please do not hesitate to contact me at your convenience.

Yours truly,

Englobe Inc.



Michael Hozjan, M.Env.Sc.
Environmental Risk Assessor

Baker Wohayeb, P.Eng., QP_{ESA}, QP_{RA}
Director

RMP Figures

ENGLOBE

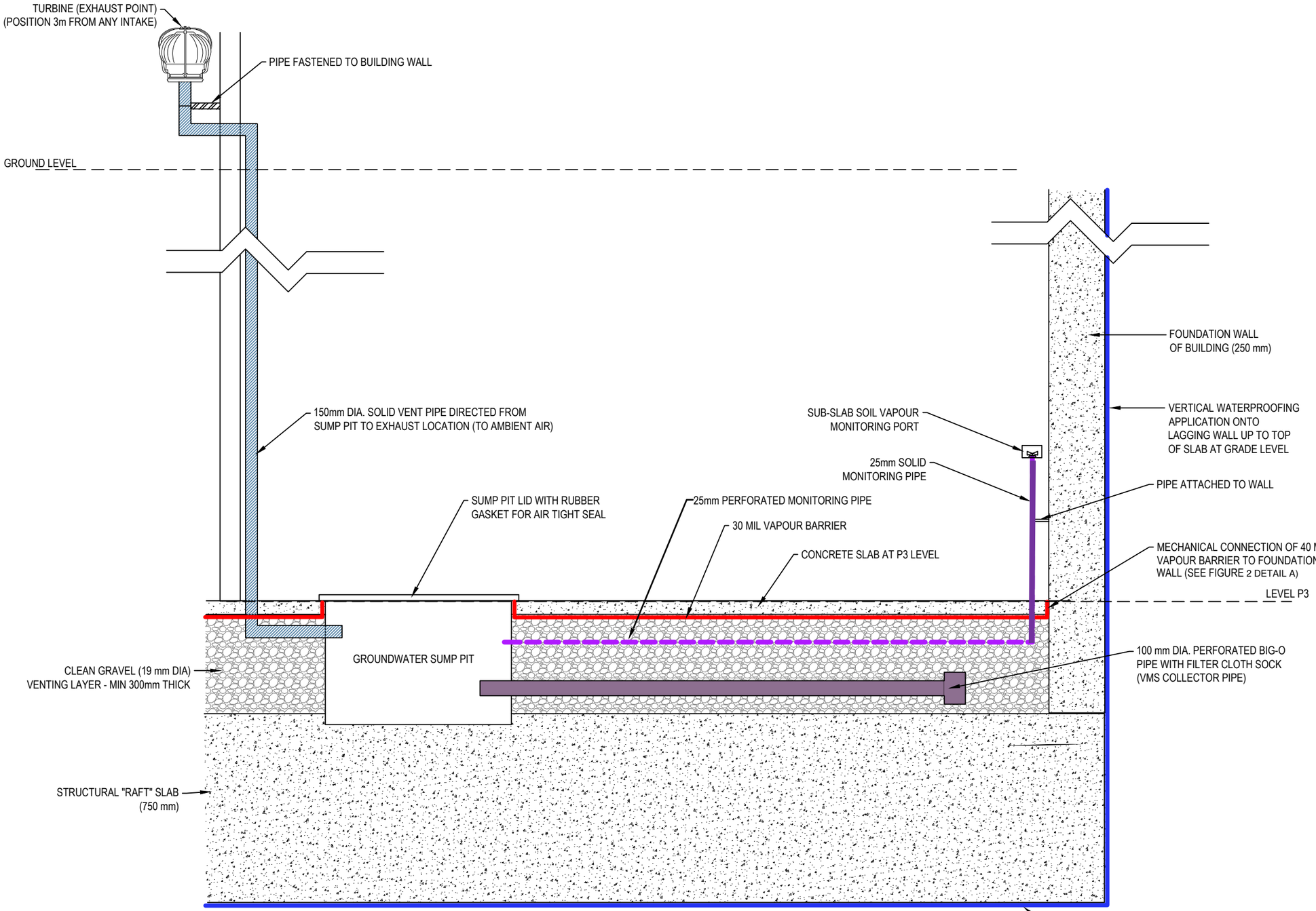
Note

1. This drawing shall be read in conjunction with the associated technical report.

A	06/18/2025	FINAL	B.W.
Revision	Date	Issue	Approval

Client: Churchill Properties Inc.	Site: 424 Churchill Avenue North, Ottawa, ON
Report Title: Risk Assessment	Designed By: M.H. / Date: June 2025
	Drawn By: K.M. / Project No.: 02103035.000
Drawing Title: Site Location Map	Approved By: B.W. / Figure No.: 1
	Scale: As shown

ENGLOBE



Note

1. This drawing shall be read in conjunction with the associated technical report.
2. Do not scale drawing.

Legend

- 100mm Perforated VMS Collector Pipe
- 50mm Vent Pipe
- 25mm Perforated Monitoring Pipe
- 40 mil Vapour Barrier
- Waterproofing
- 25mm Solid Monitoring Pipe

LICENSED PROFESSIONAL ENGINEER
B.W.
R. B. WOHAYEB
100051508
2025-07-10
PROVINCE OF ONTARIO

Revision	Date	Issue	Approval
A	01/27/2025	Preliminary	

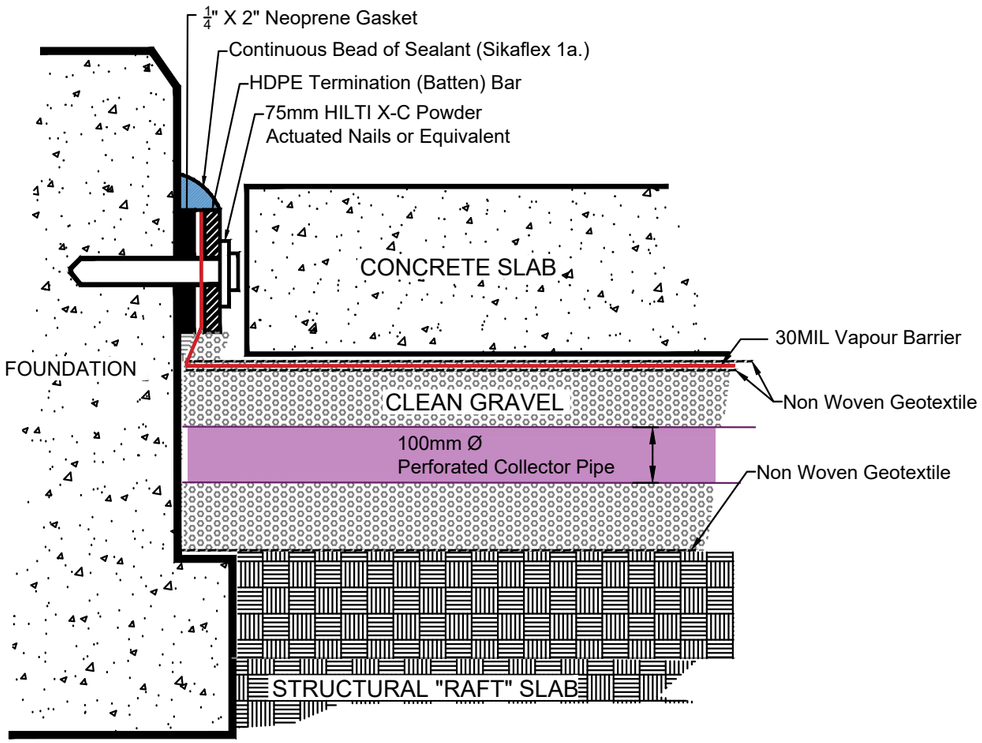
Client

Site
424 Churchill Avenue North, Ottawa, ON

Report Title
Vapour Mitigation System (VMS) Conceptual Design

Drawing Title
Section A-A'

Designed By: J.K.	Scale: NTS
Drawn By: K.M.	Date: June 2025
Approved By: B.W.	Project No.: 02103035.000
Figure No.: 2	



Detail A - Typical Mechanical Attachment of Vapour Barrier

eNGLOBe

REFERENCE:

NOTES:

LEGEND:

- 25mm Monitoring Pipe (Perforated)
- 100mm Collector Pipe (Perforated)
- 40 mil Vapour Barrier

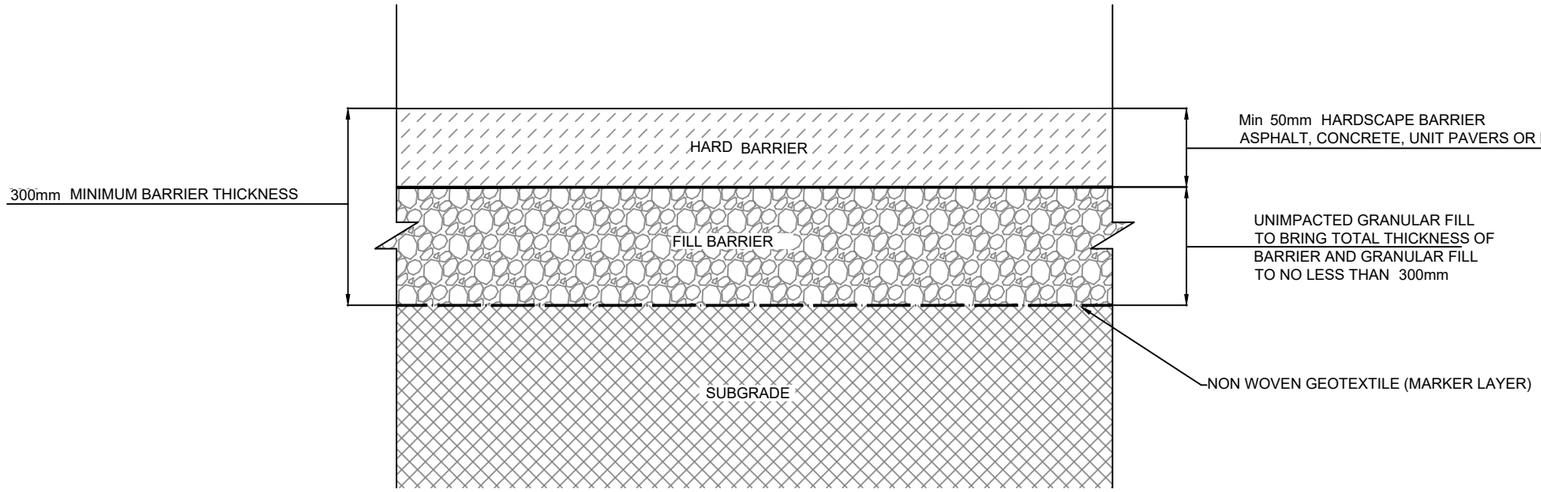
LICENSED PROFESSIONAL ENGINEER
B.W.
R. B. WOHAYEB
100051508
2025-07-10
PROVINCE OF ONTARIO

PROJECT TITLE:
VAPOUR MITIGATION SYSTEM (VMS)
CONCEPTUAL DESIGN

SITE LOCATION:
424 CHURCHILL AVENUE NORTH
OTTAWA, ONTARIO

FIGURE TITLE:
CONCEPTUAL DESIGN DETAIL A:
VAPOUR BARRIER MECHANICAL CONNECTION

REV NO.:	FILE NO.:
1	02103035.000
SCALE: N.T.S	FIGURE NO.: 3
DATE: JUNE 2025	



TYPICAL HARD CAP BARRIER - PRIVATE PROPERTY

1 NTS

Notes:

1). MINIMUM THICKNESS REQUIRED FOR RISK MANAGEMENT PURPOSES ARE SHOWN. FINAL HARD CAP DESIGN REQUIREMENTS SHOULD BE CONFIRMED BY A GEOTECHNICAL ENGINEER BASED ON STRUCTURAL SUPPORT CONSIDERATIONS.

2). GRANULAR FILL MUST BE A GRANULAR A OR B MATERIAL OR AS APPROPRIATE FOR REQUIRED STRUCTURAL CAPACITY AND MAY INCLUDE THE USE OF UNIMPACTED SOILS. "UNIMPACTED SOIL" MEANS SOIL IN WHICH ONE OR MORE CONTAMINANTS ARE PRESENT AT CONCENTRATIONS LESS THAN THE **RESIDENTIAL/PARKLAND/ INSTITUTIONAL PROPERTY USE STANDARDS WITHIN TABLE 7 "FULL DEPTH GENERIC SITE CONDITION STANDARD IN A NON-PORTABLE GROUND WATER CONDITION"** OF THE ***SOIL, GROUND WATER AND SEDIMENT STANDARDS FOR USE UNDER PART XV.1 OF THE ACT*** PUBLISHED BY THE MINISTRY AND DATED APRIL 15, 2011 FOR COARSE TEXTURED SOIL.(2011 MECP TABLE 7 STANDARDS)

3). ALL IMPORTED MATERIALS BROUGHT TO THE PROPERTY ARE REQUIRED TO MEET THE **RESIDENTIAL/PARKLAND/ INSTITUTIONAL PROPERTY USE STANDARDS WITHIN TABLE 7 "FULL DEPTH GENERIC SITE CONDITION STANDARD IN A NON-POTABLE GROUND WATER CONDITION"** OF THE ***SOIL GROUND WATER AND SEDIMENT STANDARDS FOR USE UNDER PART XV.1 OF THE ACT'*** PUBLISHED BY MECP AND DATED APRIL 15, 2011 FOR ALL TEXTURED SOIL(2011 MECP TABLE 7 STANDARDS).

ENGLOBE

REFERENCE:

NOTES:

LEGEND:

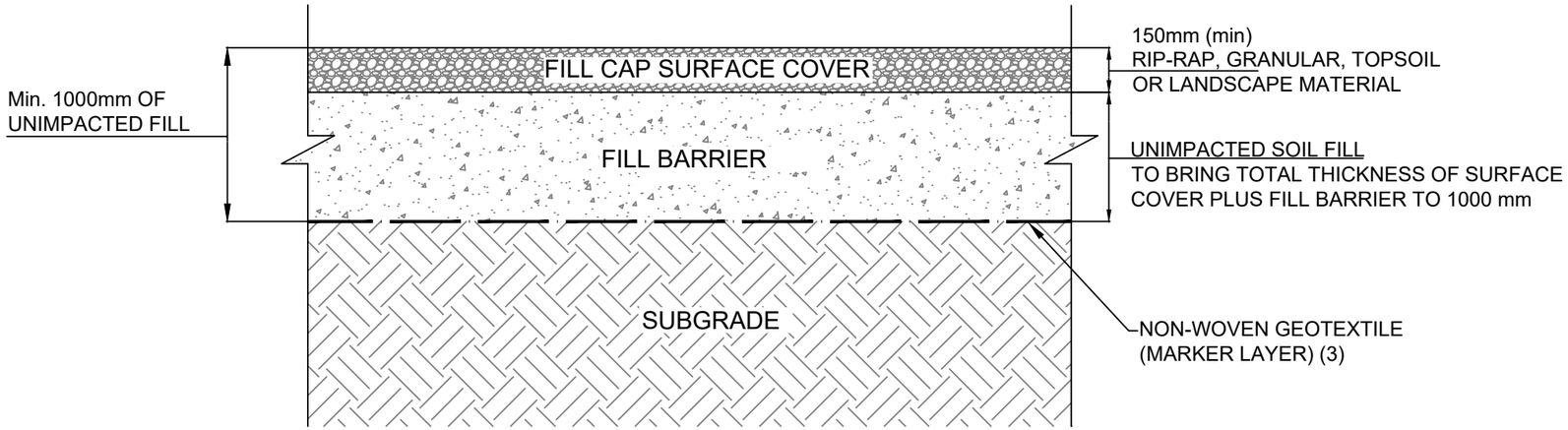
LICENSED PROFESSIONAL ENGINEER
B.W.
R. B. WOHAYEB
100051508
2025-07-10
PROVINCE OF ONTARIO

PROJECT TITLE:
Design of Risk Management Measures

SITE LOCATION:
424 CHURCHILL AVENUE NORTH
OTTAWA, ONTARIO

FIGURE TITLE:
Typical Hard Cap Barrier -
Design Concept - Private Property

REV NO.:	FILE NO.:
1	02103035.000
SCALE:	FIGURE NO.:
NTS	4a
DATE:	
June 2025	



TYPICAL FILL CAP BARRIER (LANDSCAPED AREAS) - PRIVATE PROPERTY

1

NTS

Notes:

1). SOIL FILL IN FILL CAP BARRIER MUST MEET ONE OF THE FOLLOWING STANDARDS:
- SOIL FILL QUALITY MEETING THE 2011 MECP TABLE 7 RPI STANDARDS.
- VIRGIN GRANULAR FILL IMPORTED FROM LICENSED PIT OR QUARRY AND/OR
- MANUFACTURED TOPSOIL OR GROWING MEDIA MEETING THE 2011 MECP TABLE 7 RPI STANDARDS.

2). ALL IMPORTED MATERIALS BROUGHT TO THE PROPERTY ARE REQUIRED TO MEET THE 2011 MECP TABLE 7 STANDARDS.

3). MARKER LAYER OR GEOTEXTILE IS REQUIRED AT INTERFACE WITH SUBGRADE.

4). DEEP ROOTING PLANTS WITH A ROOT SYSTEM >1 MBGS TO BE PLANTED IN RAISED PLANTING BEDS THAT CONTAIN GROWTH MEDIA MEETING TABLE 7 RPI STANDARDS. TREES AND OTHER PLANTS WITH A ROOT SYSTEM <0.4 MBGS WILL BE WITHIN THE 1000 MM FILL CAP BARRIER MEETING TABLE 7 RPI STANDARDS.

eNGLOBe

REFERENCE:

NOTES:

LEGEND:

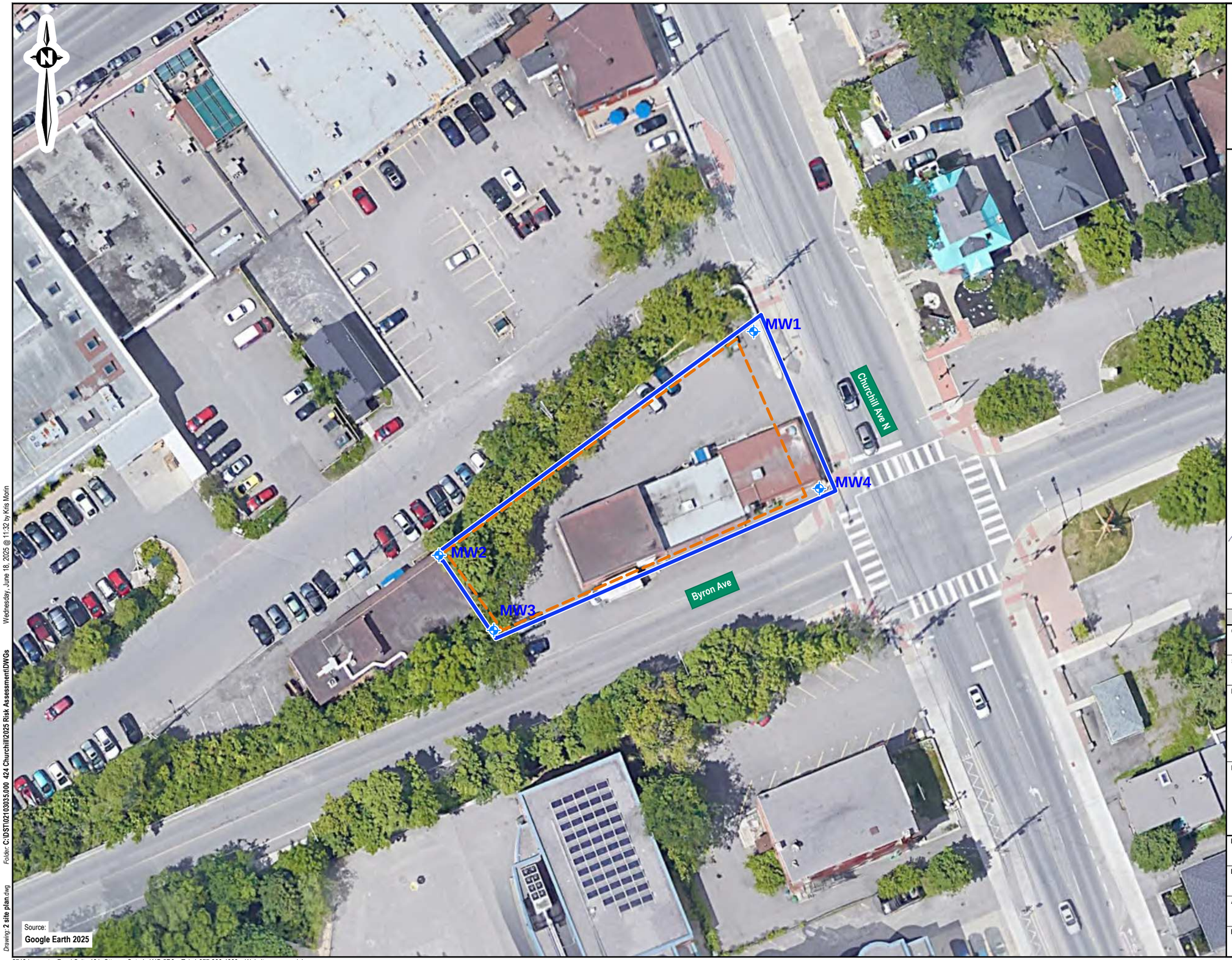
LICENSED PROFESSIONAL ENGINEER
B.W.
R. B. WOHAYEB
100051508
2025-07-10
PROVINCE OF ONTARIO

PROJECT TITLE:
Design of Risk Management Measures

SITE LOCATION:
424 CHURCHILL AVENUE NORTH
OTTAWA, ONTARIO

FIGURE TITLE:
Typical Fill Cap Barrier - Design Concept - Private Property

REV NO.:	FILE NO.:
1	02103035.000
SCALE:	FIGURE NO.:
NTS	4b
DATE:	
June 2025	



eNGLOBe

Note

1. This drawing shall be read in conjunction with the associated technical report.

Legend

- Phase One, Phase Two and Record of Site Condition (RSC) Property Boundary
- Approx Proposed Building Footprint
- Proposed Monitoring Well Location

LICENSED PROFESSIONAL ENGINEER
B.W.
R. B. WOHAYEB
100051508
2025-07-10
PROVINCE OF ONTARIO

1:500

0 5 10 15 20 25 m

0 1:1 5 cm

Scale accurate when printed at 100% using paper size ANSI full bleed B (11.0 x 17.0 Inches)

Revision	Date	Issue	Approval
A	06/18/2025	Preliminary	

Client
Churchill Properties Inc.

Site
424 Churchill Avenue North, Ottawa, ON

Report Title
Risk Assessment

Drawing Title
Groundwater Monitoring Plan
Well Placement

Designed By	Scale
M.H.	As shown
Drawn By	**Date**
K.M.	June 2025
Approved By	**Project No.**
B.W.	02103035.000

Figure No.
5

Drawing: 2 site plan.dwg Folder: C:\DST\02103035.000 424 Churchill\2025 Risk Assessment\DWGs Wednesday, June 18, 2025 @ 11:32 by Kris Morin

2713 Lancaster Road Suite 101, Ottawa, Ontario K1B 5R6 Tel: 1-877-300-4800 Website: www.englobecorp.com

Attachment 1
Soil Vapour Barrier Specifications

ENGLOBE

ABSOLUTE BARRIER® Y30BAC

HIGH PERFORMANCE LLDPE/EVOH GEOMEMBRANE GAS BARRIER

PRODUCT DESCRIPTION

Absolute Barrier® Y30BAC is a seven-layer co-extruded geomembrane consisting of very flexible, linear-low-density polyethylene (LLDPE) with an inner core of chemically resistant EVOH barrier resin, designed specifically as a barrier against radon, methane and VOCs. High strength LLDPE provides exceptional tear and impact resistance. A robust stabilization package that exceeds the industry standard; provides long-term protection from thermal oxidation and ultraviolet degradation in exposed applications.

PRODUCT USE

Absolute Barrier® Y-Series is designed to stop gas vapor migration on Brownfield sites, in residential and commercial buildings, as well as geomembrane containment and covering systems. When installed under concrete slabs as a gas barrier, a passive system is recommended to include a ventilated system with sump(s) that could be converted to an active control system with properly designed ventilation fans. Y30BAC is over 800 times less permeable to methane gas than LLDPE vapor barriers in a comparable thickness.

Absolute Barrier® performs extremely well preventing the degradation of EPS geofoam by protecting it from harsh VOCs including direct gasoline or diesel fuel contact.

Absolute Barrier® Y30BAC is a highly effective, temporary and long-term, landfill caps with VOC diffusion coefficients ranging from 40 to 240 times less than standard 80 mil HDPE geomembranes. Contaminants found in leachate and gas in municipal and hazardous waste landfills can migrate through standard HDPE; contributing to both atmospheric and groundwater contaminations. Absolute Barrier® Y-Series is an effective barrier to a wide range of VOCs including benzene, toluene, trichloroethylene, perchloroethylene, and many others.

SIZE & PACKAGING

Absolute Barrier® Y30BAC is available in 16′ c-fold or in fabricated panels up to 50,000 sq. ft. All fabricated panels are accordion folded and tightly rolled onto a heavy-duty core for ease of handling and time saving installation.

EPS Geofoam Protection

PRODUCT	PART #
ABSOLUTE BARRIER®	Y30BAC

APPLICATIONS

- EPS Geofoam Protection
- Landfill Cap
- Temporary Landfill Gas Cover
- Floating Gas Cover
- Underslab VOC Barrier
- Underslab Radon Barrier
- Underslab Methane Barrier
- Underslab Vapor Barrier
- Remediation Cover / Liner
- Leachate Collection Ponds
- Odor Control Barrier
- Secondary Containment

Absolute Barrier®

THE ULTIMATE IN GAS CONTAINMENT

ABSOLUTE BARRIER® Y30BAC

HIGH PERFORMANCE LLDPE/EVOH GEOMEMBRANE GAS BARRIER

		ABSOLUTE BARRIER® Y30BAC			
		IMPERIAL		METRIC	
PROPERTIES	TEST METHOD	MINIMUM	TYPICAL	MINIMUM	TYPICAL
Appearance		Black		Black	
Thickness	ASTM D5199	30 Mils Average	30 Mils Nominal	0.76 mm Average	0.76 mm Nominal
Weight		150 lbs/msf		732 g/m^2	
Tensile Strength at Break	ASTM D6693	85 lbs/in	100 lbs/in	149 N/cm	175 N/cm
Tensile Elongation at Break	ASTM D6693	500 %	600 %	500 %	600 %
Tear Strength	ASTM D1004	18 lbs	22 lbs	80 N	98 N
Puncture Resistance	ASTM D4833	60 lbs	75 lbs	267 N	334 N
Oxidation Induction Time (OIT) or High Pressure OIT (HPOIT)	ASTM D3895 ASTM D5885	100 min 400 min	250 min -	100 min 400 min	250 min -
Carbon Black Content [7]	ASTM D4218	2.0 %	2.3 %	2.0 %	2.3 %
Carbon Black Dispersion	ASTM D5596	Pass			
Benzene Permeance	See Note [6]	2.13 x 10^{-10} m^2/sec or 1.93 x 10^{-13} m/s			
Toluene Permeance	See Note [6]	2.95 x 10^{-10} m^2/sec or 7.77 x 10^{-14} m/s			
Ethylbenzene Permeance	See Note [6]	2.31 x 10^{-10} m^2/sec or 1.78 x 10^{-14} m/s			
M & P-Xylenes Permeance	See Note [6]	2.19 x 10^{-10} m^2/sec or 2.03 x 10^{-14} m/s			
O-Xylene Permeance	See Note [6]	2.07 x 10^{-10} m^2/sec or 1.83 x 10^{-14} m/s			
Methane Permeance	ASTM D1434	< 4.93E^{-13} m/s			
Hydrogen Sulfide	See Note [9]	1.45E^{-09} m/s			
Trichloroethylene (TCE)	See Note [6]	1.44 x 10^{-10} m^2/sec or 5.60 x 10^{-15} m/s			
Perchloroethylene (PCE)	See Note [6]	1.35 x 10^{-10} m^2/sec or 5.57 x 10^{-15} m/s			
Cold Temperature Impact	ASTM D746	-40° F		-40° C	
Maximum Static Use Temperature		180° F		82° C	
Low Temperature Bend Test	ASTM D2136	-70° F			
FACTORY SEAM REQUIREMENTS					
Bonded Seam Strength	ASTM D6392 Mod. [5]	57 lbs/in.	75 lbs/in.	100 N/cm	131 N/cm
Seam Peel Adhesion	ASTM D6392 Mod. [5]	45 lbs/in.	60 lbs/in.	79 N/cm	105 N/cm

[5] Raven Industries performs seam testing at 20" per minute.

[6] Aqueous Phase Film Permeance.

Permeation of Volatile Organic Compounds through EVOH Thin Film Membranes and Coextruded LLDPE/EVOH/LLDPE Geomembranes, McWatters and Rowe, Journal of Geotechnical and Geoenvironmental Engineering© ASCE/September 2015. (Permeation is the Permeation Coefficient adjusted to actual film thickness - calculated at 1 kg/m^3.) The study used to determine PCE and TCE is titled: Evaluation of diffusion of PCE & TCE through high performance geomembranes by Di Battista and Rowe, Queens University 8 Feb 2018.

[7] No carbon black in barrier layers.

[9] The study used to determine diffusion coefficients is titled: Hydrogen Sulfide (H_2S) Transport through Simulated Interim Covers with Conventional and Co-Extruded Ethylene-Vinyl Alcohol (EVOH) Geomembranes.

Absolute Barrier® Y30BAC is a seven-layer co-extruded geomembrane consisting of very flexible, linear-low-density polyethylene (LLDPE) with an inner core of chemically resistant EVOH barrier resin, designed specifically as a barrier against radon, methane and VOCs. High strength LLDPE provides exceptional tear and impact resistance. A robust stabilization package that exceeds the industry standard; provides long-term protection from thermal oxidation and ultraviolet degradation in exposed applications.

Note: To the best of our knowledge, unless otherwise stated, these are typical property values and are intended as guides only, not as specification limits. Chemical resistance, odor transmission, longevity as well as other performance criteria is not implied or given and actual testing must be performed for applicability in specific applications and/or conditions. VIAFLEX MAKES NO WARRANTIES AS TO THE FITNESS FOR A SPECIFIC USE OR MERCHANTABILITY OF PRODUCTS REFERRED TO, no guarantee of satisfactory results from reliance upon contained information or recommendations and disclaims all liability for resulting loss or damage. Limited Warranty available at www.viaflex.com

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