PHASE 2 INITIAL BOREHOLE DRILLING AND TESTING, SOUTH BRUCE

Air Quality Study for SB_BH01 and SB_BH02 Sites

APM-REP-01332-0427 **November 2023**

Geofirma Engineering

nwmo
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SOCIÉTÉ DE GESTION DES DÉCHETS NUCLÉAIRES

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Phase 2 Initial Borehole Drilling and Testing, South Bruce

WP01: Air Quality Study for SB_BH01 and SB_BH02

Revision: 1 (Final)

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November 27, 2023

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Revision Tracking Table

Revision	Revision Release Date	Description of Modifications/Edits
R0	July 4, 2023	Initial Release
R1	November 27, 2023	Revised to address site specific information

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APPENDICES

1 INTRODUCTION

Geofirma Engineering Ltd. (Geofirma) has been contracted by the Nuclear Waste Management Organization (NWMO) to implement several components of the NWMO Phase 2 Geoscientific Preliminary Field Investigations within the South Bruce area, near Teeswater, Ontario as part of the NWMO's Adaptive Phased Management (APM) Site Selection Phase.

One component completed by Geofirma included a drilling and testing program for two deep bedrock boreholes (SB_BH01 & SB_BH02). Borehole SB_BH01 was drilled to a total depth 880.82 metres below ground surface (mBGS) between April and September 2021. Borehole SB_BH02 was drilled to a total depth 900.57 mBGS between August 2021 and March 2022. Boreholes SB_BH01 and SB_BH02 are located approximately 4 km northwest of the community of Teeswater, Ontario (Figure 1).

To observe best practices under relevant provincial legislations, Geofirma was tasked with completing due diligence studies related to the potential for air emissions and noise emissions associated with the drilling program. Geofirma subcontracted Cambium Inc. (Cambium), based in Peterborough, Ontario to assist with the scoping and completion of this work.

The scope of work Cambium was assigned included:

- Site visit to survey work site as well as nearby potential receptors;
- Background air quality measurements;
- Review of equipment specifications and site activities (schedule of use) to identify sources of contaminants;
- Assess the significance of sources and contaminants and establish significant sources of contaminant emissions and calculated emission rates summary;
- Modelling the impact of contaminant emissions using current Ontario Ministry of Environment, Conservation and Parks approved version of the Unites States Environmental Protection Agency (USEPA) AERMOD dispersion model; and,
- Provide a summary of emissions, predicted impact on surrounding land, and conclusions based on the air quality study.

Appendix A includes the Cambium report that contains all of the technical data, modelling, discussions, and conclusions.

MUNICIPALITY OF BROCKTON
Riversdale
Little Egypt
Greenock Swamp
F012077
Salem
Kinlough
T003553
Westford
BRUCE ROAD 4
TOWNSHIP OF HURON-KINLOSS
MUNICIPALITY OF SOUTH BRUCE
F012068
Holyrood
BRUCE ROAD 1
BRUCE ROAD 6
CONCESSION 8
Kinloss Creek
SB_BH02
SB_BH01
Culross
Kinloss
Teeswater
Dickies Creek Wetland Complex
F012062
Lower Langside
T004881
Langside
Teeswater Wetland Complex
Anderson Creek Wetland Complex

LEGEND

- SB_BH01 Drill Site
- SB_BH02 Drill Site
- Municipality of South Bruce
- Municipality of Brockton
- Township of Huron-Kinloss
- Provincially Significant Wetland
- Wetland
- Waterbody
- Watercourse
- Major Road
- Local / Street
- OGSRL Well Locations

INSET MAP

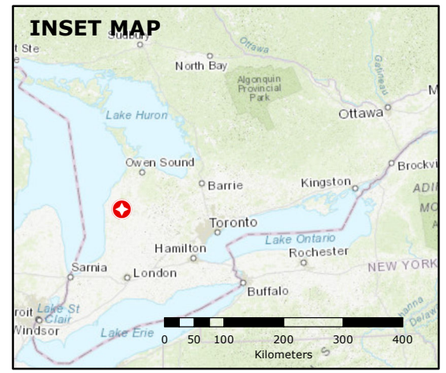

Figure 1
Location of SB_BH01 and SB_BH02 Drill Sites

Scale 1:60,000

0 500 1,000 2,000 3,000 4,000
Meters

N

Projection: NAD 1983 UTM Zone 17N

Source: NWMO, Ontario GeoBase

Service Layer Credits: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, © OpenStreetMap contributors, and the GIS User Community

PROJECT No. 20-211-1

NWMO South Bruce
Drilling and Testing

DESIGN: ADG
CAD/GIS: ADG
CHECK: SNS
REV: 1

DATE: 2021-05-12

Geofirma Engineering Ltd

F:\Data\Project\Bruce\Maps\20-211-1_SouthBruce\20-211-1_Figure1_SB_BH02_TestPlans_R1.mxd

Appendix A

Air Quality Study for Exploration Drilling Operations (Cambium, 2023)

Air Quality Study for Exploration Drilling Operations

October 3, 2023

Prepared for:
Geofirma Engineering Ltd.

Cambium Reference: 11714-001

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Version Control

Revision	Date	Revision Description	Prepared By:	Submitted To:
V1	January 12, 2022	Air Quality Study for Review	Cambium Inc.	Geofirma Engineering Ltd.
V2	February 17, 2022	Added drill rig only scenario	Cambium Inc.	Geofirma Engineering Ltd.
V3	July 4, 2023	Modified references to O. Reg. 419/05 Removed reduced operating hours	Cambium Inc.	Geofirma Engineering Ltd.
V4	October 3, 2023	Modified Air Quality Study for emissions occurring at specific drilling locations in Ontario	Cambium Inc.	Geofirma Engineering Ltd.

Executive Summary

Geofirma Engineering Ltd. has retained Cambium Inc. (Cambium) to prepare an air quality study for their exploration drilling activities (the Operations) that have occurred at two locations south of Concession Road 8 in the Municipality of South Bruce, Ontario. This report follows the Ministry of the Environment, Conservation and Parks (the Ministry's) guidance available in *Guideline A-10: Procedure for Preparing an ESDM Report* (The ESDM Procedure Document) (MOECC, 2018). The ESDM Procedure document standardizes the emission calculation, modelling, and evaluation process typical in Ontario for the Ministry's environmental approvals.

The air emissions impact assessment performed by Cambium did not indicate the presence of an adverse affect on the local air quality beyond a setback of 200 m from where the Operations occurred. The modelling and calculations we have completed demonstrate that the predicted point of impingement (POI) concentrations of process contaminants emitted by the Operations do not exceed the Ministry prescribed limits outside the prescribed setback distance. The nearest sensitive receptors (residences) at each of the Operations locations are beyond the 200 m setback distance.

The Operations involve a 'Cable Rig' for shallow drilling and a core driller for greater depths. Minimal preparation of the site is required, and the only material processed is the extracted earth from drilling.

Cambium has assessed compliance of the Operations by following section 20 standards of Ontario Regulation 419/05 *Air Pollution – Local Air Quality* (O. Reg. 419/05) and the applicable limits in the in the *Air Contaminants Benchmarks List (ACBv3)* (MECP, 2023). We have modelled the impact of the contaminant emissions using current Ministry approved version of the United States Environmental Protection Agency (USEPA) AERMOD dispersion model for the applicable time averaged POI concentrations. For Nitrogen Oxides, compliance is achieved beyond 200 m setback distance from the operations. With respect to Particulate Matter, the limits are not exceeded at any area in the vicinity of the operations. All of the sensitive receptors are beyond the 200 m setback distance from the operations; therefore, contaminant

POI concentrations do not impact the nearby sensitive receptors or other offsite areas of concern.

Cambium has found the significant sources of contaminant emissions from the Geofirma Engineering Ltd. operation include the exhaust points of engines of the equipment. The sources and contaminants we have considered negligible consistent with section 8 of O. Reg. 419/05 include road dust, drilling, and wind erosion.

Cambium calculated the emission rate estimates of all contaminants at the operating conditions that would result in their maximum rate of emission. The predicted POI concentrations from the dispersion model are presented in the following Emission Summary Table below.

Table 4: Emission Summary Table

Drill Borehole Location 1

Contaminant	CAS #	Total Facility Emission Rate (g/s)	Averaging Period	Limiting Effect	Schedule	Ministry POI Limit (µg/m³)	Min Setback to Sensitive Receptor (m)	Max POI Concentration from at Setback Distance (µg/m^3)	Percentage of Ministry POI Limit (%)	Air Dispersion Model Used
Nitrogen oxides	10102-44-0	2.38E+00	1 hour	Health	Standard	400	200	250.02	62.5%	AERMOD 21112
Nitrogen oxides	10102-44-0	2.38E+00	24 hour	Health	Standard	200	200	155.87	77.9%	AERMOD 21112
Suspended particulate matter (< 44 µm diameter)	N/A (tsp)	9.23E-02	24 hour	Visibility	Standard	120	200	6.02	5.0%	AERMOD 21112

Drill Borehole Location 2

Contaminant	CAS #	Total Facility Emission Rate (g/s)	Averaging Period	Limiting Effect	Schedule	Ministry POI Limit (µg/m³)	Min Setback to Sensitive Receptor (m)	Max POI Concentration from Source (µg/m^3)	Percentage of Ministry POI Limit (%)	Air Dispersion Model Used
Nitrogen oxides	10102-44-0	2.38E+00	1 hour	Health	Standard	400	150	305.20	76.3%	AERMOD 21112
Nitrogen oxides	10102-44-0	2.38E+00	24 hour	Health	Standard	200	150	190.66	95.3%	AERMOD 21112
Suspended particulate matter (< 44 µm diameter)	N/A (tsp)	9.23E-02	24 hour	Visibility	Standard	120	150	7.53	6.3%	AERMOD 21112

Table 4: Emission Summary Table

Drill Borehole Location 1 - Residence Receptor with Highest POI

Contaminant	CAS #	Total Facility Emission Rate (g/s)	Averaging Period	Limiting Effect	Schedule	Ministry POI Limit (µg/m³)	Distance to Sensitive Receptor (m)	Max POI Concentration from Source (µg/m^3)	Percentage of Ministry POI Limit (%)	Air Dispersion Model Used
Nitrogen oxides	10102-44-0	2.38E+00	1 hour	Health	Standard	400	397	89.22	22.3%	AERMOD 21112
Nitrogen oxides	10102-44-0	2.38E+00	24 hour	Health	Standard	200	394	35.55	17.8%	AERMOD 21112
Suspended particulate matter (< 44 µm diameter)	N/A (tsp)	9.23E-02	24 hour	Visibility	Standard	120	397	1.48	1.2%	AERMOD 21112

Drill Borehole Location 2 - Residence Receptor with Highest POI

Contaminant	CAS #	Total Facility Emission Rate (g/s)	Averaging Period	Limiting Effect	Schedule	Ministry POI Limit (µg/m³)	Distance to Sensitive Receptor (m)	Max POI Concentration from Source (µg/m^3)	Percentage of Ministry POI Limit (%)	Air Dispersion Model Used
Nitrogen oxides	10102-44-0	2.38E+00	1 hour	Health	Standard	400	422	86.07	21.5%	AERMOD 21112
Nitrogen oxides	10102-44-0	2.38E+00	24 hour	Health	Standard	200	422	28.31	14.2%	AERMOD 21112
Suspended particulate matter (< 44 µm diameter)	N/A (tsp)	9.23E-02	24 hour	Visibility	Standard	120	422	1.27	1.1%	AERMOD 21112

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1.0 Introduction and Operational Description

Cambium Inc. (Cambium) has prepared this air quality study following the standards of Ontario Regulation 419/05: *Air Pollution – Local Air Quality* and applicable guidance. This report follows the guidance provided in *Guideline A-10: Procedure for Preparing an ESDM Report* (The ESDM Procedure Document) (MOECC, 2018) that standardizes how air impacts are assessed in Ontario.

This introductory section provides a description of the operations and its activities that form the basis of our air emission rate estimates and assessment of maximum point of impingement (POI) concentrations.

1.1 Purpose and Scope of Study

This report is intended to provide an assessment of the air quality compatibility associated with the exploratory drilling operations conducted by Geofirma Engineering Ltd. to outline the predicted, potential impact on the surrounding land.

The Operations involves shallow and depth drilling using a ‘Cable Rig’ and core driller respectively. The Operations occurred at two locations south of Concession Road 8 in the municipality of South Bruce, Ontario (Sites). Please refer to Figure 1.

1.2 Description of Processes and NAICS Code

The activities of the Operations consists of exploration drilling through ground and bedrock to depths of approximately 1000 meters dependent on the core analysis. The drilling equipment is supported by a drill fluid recirculation system, a mobile office, and amenity spaces.

1.3 Description of Products and Raw Material

The Operations does not produce any materials other than the extracted core samples obtained from drilling. Significant air emissions result from the engine exhaust associated with the drilling equipment and generator.

The Operations uses the following significant equipment:

- One mobile “cable rig’ drill (not operating with the core drill).
- One 285 hp mobile core drill (not operating with the cable rig).
- One 800 kW mobile generator.

The material throughput and process information are detailed in Appendix A and Appendix B. Table 1 lists the individual sources of emissions at the Operations. Refer to Appendix C for the associated equipment specifications of the equipment.

1.4 Operating Schedule

The Operations can occur 24 hours per day throughout the year.

1.5 Facility Production Limit

Cambium has estimated the emission rates for each process from their maximum relevant usage rate, which are detailed in Appendix A.

2.0 Initial Identification of Sources and Contaminants

The following section provides an initial identification of all sources and contaminants emitted at the Operations.

2.1 Source and Contaminants Identification Table

All the emission sources and their corresponding contaminants expected for the Operations are tabulated in Table 1. The source identification codes for the significant sources defined in Table 1 have their discharge points depicted on Figure 2 and Figure 3. The significant sources of air emissions at the Operations are outlined below.

- **EG01**– Uncapped vertical exhaust of Christenson CS4002 truck mounted core drill rig.
- **EG02**– Uncapped vertical exhaust of Caterpillar 3412 diesel generator engine.

3.0 Assessment of the Significance of Contaminants and Sources

In this section, Cambium's justification for each source and contaminant identified as negligible in Table 1 has been detailed. Identifying negligible contaminants and sources allows a more detailed analysis of emissions and POI concentrations for facilities with many sources and contaminants to review.

Emission rate calculations and dispersion modelling are not required for emissions from negligible sources, or for the emission of negligible contaminants from significant sources.

3.1 Identification of Negligible Contaminants and Sources

Cambium has selected sources and contaminants from the Operations that are expected to discharge in negligible amounts by following the guidance in The ESDM Procedure Document, and the sources described in Ontario Regulation 524/98 (Environmental Compliance Approvals – Exemptions from Section 9 of the Act). We have deemed sources and contaminants negligible if they met the screening guidance provided in these documents, they are not expected to be the main contributor to the POI concentration, and if the nature of the contaminant(s) were not concerning.

Table 1 lists each negligible source and contaminant. Cambium has identified some contaminants from sources that were considered significant as negligible. Each negligible contaminant from a significant source is tabulated in Table 1. An explanation regarding the determination for each negligible source or contaminant is also included in Table 1, as required by sub paragraph 5 of subsection 26(1) of O. Reg. 419/05. For detailed explanations, refer to Appendix B. Cambium has considered the remaining sources and contaminants significant and have therefore included them in the dispersion modelling for the operations.

Cambium has not considered site preparation activities in this study that involve removing topsoil for berms and delivery of materials. Any traffic and earth material handing during the activities are insignificant. The excavated material amounts to only the volume of the extracted cores, which are not expected to produce fugitive emissions. Additionally, the drilling fluid has a vapour pressure less than 1 kPa and is therefore not expected to have significant air

emissions from its use and storage. Cambium has assumed the small generators totalling less than 50 kW powering office and amenities to be insignificant in relation to the process generator.

3.2 Rationale for Assessment

As previously mentioned, Cambium's rationale for identifying each source or contaminant as being negligible is tabulated in Table 1. The technical information required to substantiate the justifications that each of the identified sources or contaminants is negligible are presented in Appendix B.

4.0 Operating Conditions, Emission Estimating, and Data Quality

This section details the operating conditions used to estimate the Operations emissions and details the data quality assessment of emissions. Descriptions for each contaminant assessed for the Operations has been included. Cambium did not perform emission rate calculations and dispersion modelling for emissions from negligible sources or for the emission of negligible contaminants from significant sources.

4.1 Description of Operating Conditions

Cambium has followed section 20 of O. Reg. 419/05 to the assessment of the Operations. Therefore, Cambium has modelled the impact of contaminant emissions using the United States Environmental Protection Agency (USEPA) AERMOD model as the applicable time averaged maximum POI concentration for each contaminant and compared them to Schedule 3 standards of O. Reg. 419/05. The Schedule 3 standards are outlined in the *Air Contaminants Benchmarks List (ACBv3)* (MECP, 2023).

Cambium has defined the operating scenario for the Operations, which corresponds to the maximum concentration at the POI, as when all significant sources are operating simultaneously at their individual maximum rates of production. The derivation of the maximum rates of production for each contaminant of a significant source is detailed in Appendix A and occurs when both the core drill and process generator are operating together at maximum

capacity. The maximum rate of production corresponds to the maximum emission rate during the averaging period that corresponds to each contaminant.

4.2 Explanation of the Methods Used to Calculate Emission Rates

Cambium has calculated the maximum emission rates for each significant contaminant emitted from a significant source using manufacturer specifications or US EPA emission factors.

4.3 Sample Calculations

Cambium's technical rational and the sample calculations required to substantiate the emission rates presented in Table 2 are documented in Appendix A.

4.4 Assessment of Data Quality

The data quality of each emission rate estimate is documented in Table 2. Cambium's evaluation of the data quality for each source listed in Table 2 is detailed in Appendix A. We have applied conservative assumptions that correspond to the operating scenario where both the core drill and generator are emitting simultaneously at their individual maximum rates. Assuming these maximum emission rates listed in Table 2, the rates are likely an overestimate of the actual emission quantities. We expect that the resulting calculated concentration at each POI will be greater than the actual concentrations because of applying these assumptions.

5.0 Source Summary and Site Plan

The emission rate estimates for each source of significant contaminants are tabulated in Table 2. The locations of the drilled boreholes are presented on Figure 1. The locations of the significant emission sources listed in Table 2 are presented on Figure 2 and Figure 3, denoted by their corresponding source identification value.

6.0 Dispersion Modelling

How the dispersion modelling was completed for the Operations to predict the maximum POI concentrations is described in this section. Cambium has followed section 20 of

O. Reg. 419/05, and as such, have carried out the assessment of compliance with Schedule 3 standards using the USEPA, AERMOD atmospheric dispersion model.

The dispersion modelling completed for the operations conforms to Guideline A-11: *Air Dispersion Modelling Guideline for Ontario* (ADMGO) (MOECC, 2017). A general description and summary of the input data for the dispersion model is provided in Table 3.

The Ministry has identified the AERMOD modelling system as one of the approved dispersion models under O. Reg. 419/05. The software currently includes the Plume Rise Model Enhancement (PRIME) algorithms for assessing the effects of buildings on air dispersion.

The AERMOD modelling system is made up of the AERMOD dispersion model, the AERMET meteorological pre-processor, and the AERMAP terrain pre-processor.

Cambium used the following approved dispersion model and pre-processors in the assessment:

- AERMOD version 21112 dispersion model.
- AERMAP version 18081 meteorological pre-processor.
- BPIP version 04274 building downwash pre-processor.

Cambium did not use AERMET in this assessment as we used a pre-processed Ministry meteorological dataset.

6.1 Dispersion Modelling Input Summary Table

Cambium's methodology used for the approved dispersion model is summarized in Table 3.

Cambium has defined the source types as directed in Section 4.5 of the ADMGO and has classified the significant sources at the Operations as point sources. We determined the parameters required for each source according to the procedures in ADMGO. The locations of the sources are on Figure 2 and Figure 3. The locations and number of sources are designed to represent a worst-case configuration.

6.2 Coordinate System

We used the UTM coordinate system to specify model object sources, buildings, and receptors, consistent with Section 5.2.2 of the ADMGO. We defined all coordinates in the North American Datum of 1983 (NAD83).

6.3 Meteorology and Land Use Data

In this assessment, Cambium used the currently approved version of AERMOD with preprocessed surface and profile files created by the Ministry for the updated AERMET algorithm. As the Facility is in the geographical coverage of the MECP Owen Sound District, which is located in Southwestern Ontario, we used the meteorological dataset for the South Western Region (Toronto).

We characterized the land use surrounding the Drilling operations as "rural" because less than 50% of the area surrounding the Operations includes multi-family dwellings, industrial, and commercial use. With a lack of sufficient foresting surrounding the two drilling sites, the associated “Crops” meteorological files were used. Cambium used the station elevation for the Toronto International Airport as per the Ministry’s guidance.

6.4 Terrain

We obtained the terrain data for this assessment from the MECP *Map: Regional Meteorological and Terrain Data for Air Dispersion Modelling* in GeoTIFF format (MOECC, 2019). The GeoTIFF files used were cdem_dem_040P and cdem_dem_041A.

6.5 Receptors

Cambium chose receptors based on recommendations provided in Section 7.1 of the ADMGO. A uniform polar receptor grid was used that was centered over the sources of emissions. We designed the extent and density of these receptors fine enough to capture the modelled concentration maxima in both horizontal and vertical directions that would establish the minimum separation distance between the sources and sensitive receptors.

Radials outward were separated in 50 meter segments starting at 100 m and continuing to 1500 m. The angle between receptors was set to 6° to produce a grid with similar spacing to the recommended nested receptor grid.

Discrete sensitive receptors were placed at the nearest residences to the drill borehole locations. 20 discrete sensitive receptors were selected and placed at the Borehole locations.

6.6 Building Downwash

Cambium did not consider building downwash because equipment is not typically operated near buildings or include structures that would result in significant downwash.

6.7 Averaging Time and Conversions

The shortest time scale that AERMOD predicts is a 1-hour average value. Cambium has followed Schedule 3 standards of O. Reg. 419/05 that are based on varying averaging times. Any case where a standard had an averaging period that differed from the model prediction capabilities, the appropriate averaging period was converted to using the Ministry's recommended factors, as documented in the ADMGO.

Please refer to Table 2 for the averaging period associated with each contaminant.

6.8 Dispersion Modelling Options

The options used in the AERMOD dispersion model are summarized in Embedded Table 1, below.

Embedded Table 1 Options Used in AERMOD

Modelling Parameter	Description	Used in the Assessment?
DFAULT	Specified that regulatory default options will be used	No
CONC	Specifies that concentration values will be calculated	Yes
DDPLETE	Specified that dry deposition will be calculated	No
WDPLETE	Specified that wet deposition will be calculated	No
FLAT	Specifies that the non-default option of assuming flat terrain will be used	No

Modelling Parameter	Description	Used in the Assessment?
NOSTD	Specified that the non-default option of no stack tip downwash will be used	No
RELEASE	Specifies that capped and horizontal stack releases will be used	No
AVERTIME	Time averaging periods calculated	1-hour and 24-hour
URBANOPT	Allows the model to incorporate the effects of increased surface heating from an urban area on pollutant dispersion under stable atmospheric conditions	No
URBANROUGHNESS	Specifies the urban roughness length (m)	No
FLAGPOLE	Specifies that receptor heights above local ground level are allowed on the receptors	No

6.9 Dispersion Modelling Input and Output Files

The dispersion model input data is summarized in Table 3. Cambium can provide electronic copies of all the input and output files for the AERMOD model upon request.

7.0 Emission Summary Table and Conclusions

Cambium prepared this air quality study to provide a preliminary compatibility assessment of the exploratory drilling operations conducted by Geofirma Engineering Ltd. that will predict the potential impact on the surrounding land. Our assessment was carried out following compliance with Schedule 3 standards using the USEPA, AERMOD atmospheric dispersion model. This procedure would be expected in the assessment of air emissions for an ECA application.

Cambium has documented the emission rate estimates for each significant contaminant in Table 2. Inherent conservatism has been built into the emissions estimates by choosing maximum production capacity, simultaneous operation, and prudent parameters for use in the calculations. Therefore, we expect the actual emissions to be less than the modelled predictions for the Sites. A POI concentration for each significant contaminant emitted from the Operations was calculated using the conservative emission rates, and the output from the AERMOD model. The modelling results are presented in Table 4. The POI concentrations listed in Table 4 were then compared with ACBv3 limits to establish a minimum setback

distance for the Operations. There are no significant 'Contaminants with No Ministry POI Limits' emitted by the Operations.

Cambium compared the POI concentrations listed in Table 4 against the ACBv3. All predicted POI concentrations do not exceed the corresponding limits in ACBv3 at the minimum setback distance of 200 m. The POI concentrations of each contaminant at each sensitive receptor are found in Appendix D - AERMOD Dispersion Modelling Results. All sensitive receptors modelled were beyond the minimum setback distance of 200 m and all POI concentrations well below the Ministry POI Limit.

Cambium has demonstrated in this air quality study that the Operations as outlined in this report can comply with Section 20 of O. Reg. 419/05.

Respectfully submitted,

Cambium Inc.

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8.0 References

MECP. (2023). *Air Contaminants Benchmarks List: standards, guidelines and screening levels for assessing point of impingement concentrations of air contaminants.* Ministry of the Environment, Conservation and Parks.

MOECC. (2017). *Guideline A-11: Air Dispersion Modelling Guideline for Ontario.* Ontario Ministry of the Environment and Climate Change.

MOECC. (2018). *Guideline A-10: Procedure for Preparing an Emission Summary and Dispersion Modelling Report.* Ontario Ministry of the Environment and Climate Change.

MOECC. (2019). *Map: Regional Meteorological and Terrain Data for Air Dispersion Modelling.* Ministry of the Environment and Climate Change.

9.0 Standard Limitations

Limited Warranty

In performing work on behalf of a client, Cambium relies on its client to provide instructions on the scope of its retainer and, on that basis, Cambium determines the precise nature of the work to be performed. Cambium undertakes all work in accordance with applicable accepted industry practices and standards. Unless required under local laws, other than as expressly stated herein, no other warranties or conditions, either expressed or implied, are made regarding the services, work or reports provided.

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A site assessment is created using data and information collected during the investigation of a site and based on conditions encountered at the time and particular locations at which fieldwork is conducted. The information, sample results and data collected represent the conditions only at the specific times at which and at those specific locations from which the information, samples and data were obtained and the information, sample results and data may vary at other locations and times. To the extent that Cambium's work or report considers any locations or times other than those from which information, sample results and data was specifically received, the work or report is based on a reasonable extrapolation from such information, sample results and data but the actual conditions encountered may vary from those extrapolations.

Only conditions at the site and locations chosen for study by the client are evaluated; no adjacent or other properties are evaluated unless specifically requested by the client. Any physical or other aspects of the site chosen for study by the client, or any other matter not specifically addressed in a report prepared by Cambium, are beyond the scope of the work performed by Cambium and such matters have not been investigated or addressed.

Reliance

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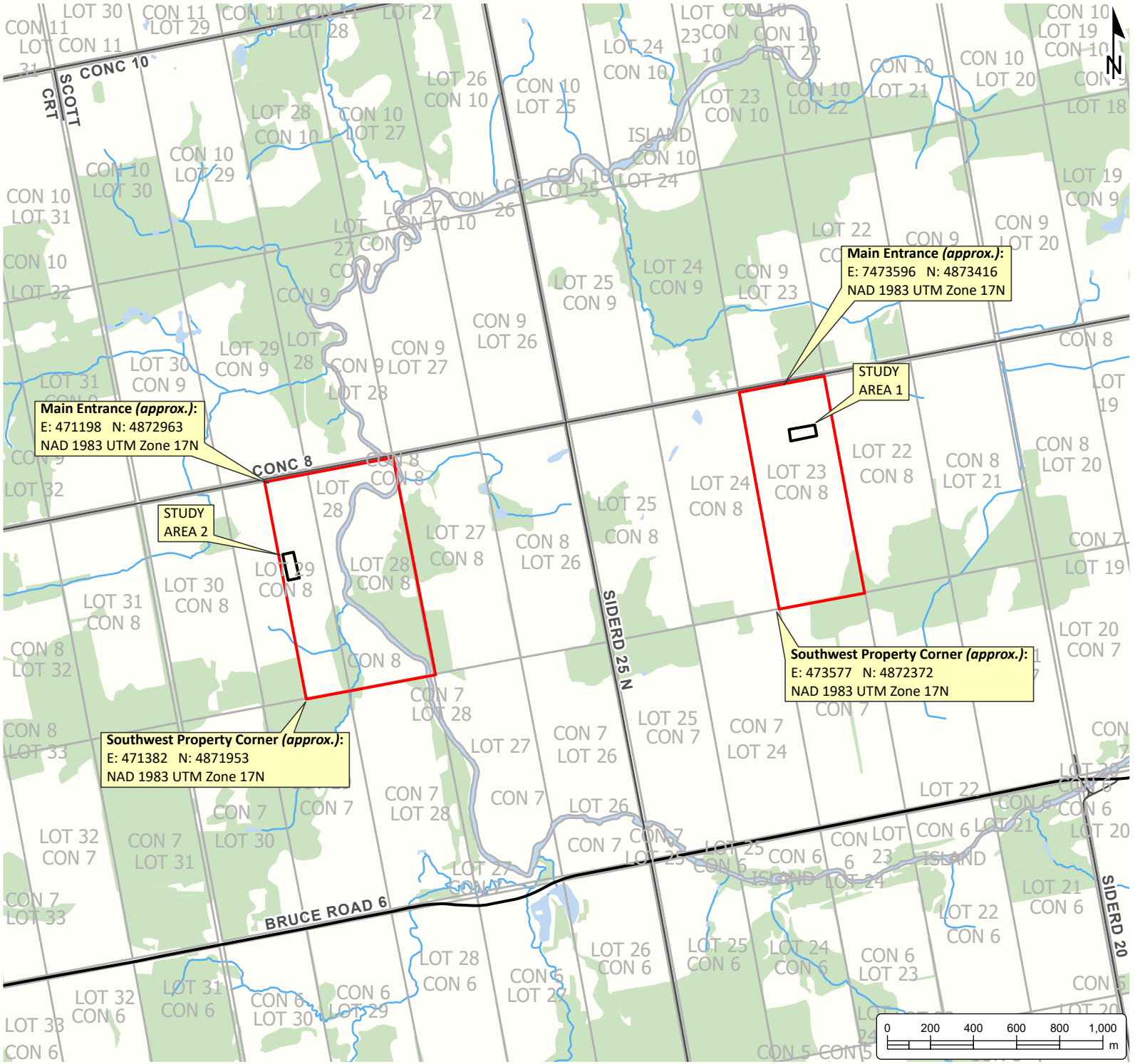
Personal Liability

The client expressly agrees that Cambium employees shall have no personal liability to the client with respect to a claim, whether in contract, tort and/or other cause of action in law. Furthermore, the client agrees that it will bring no proceedings nor take any action in any court of law against Cambium employees in their personal capacity.

Appended Figures



AIR QUALITY STUDY

GEOFIRMA ENGINEERING LTD.
Concession Road 8,
South Bruce, Ontario

LEGEND

- Major Road
- Minor Road
- Watercourse, Permanent
- Wooded Area
- Lot/Concession
- Study Area
- Site Boundary

Notes:
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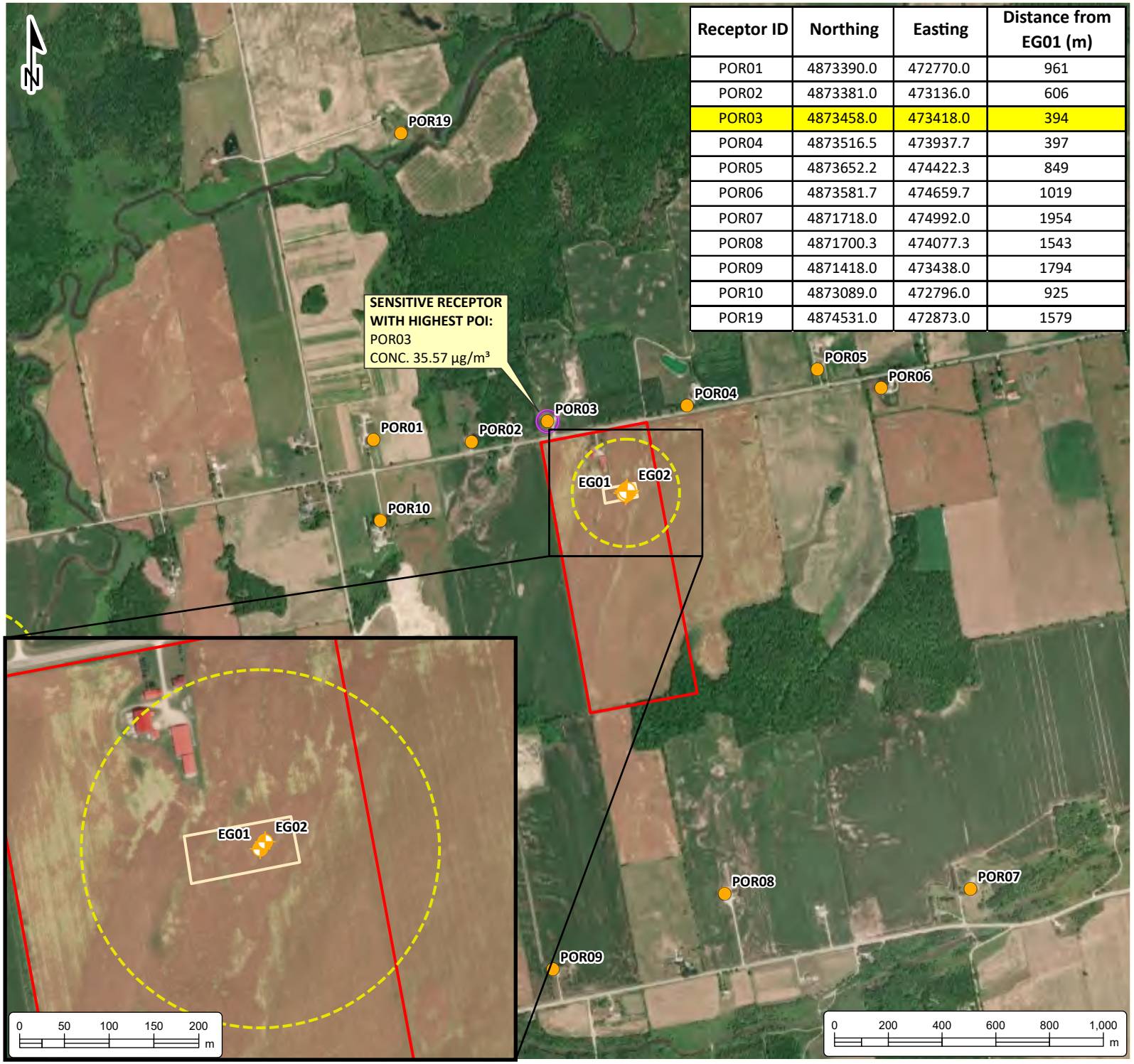
- Distances on this plan are in metres and can be converted to feet by dividing by 0.3048.
- Cambium Inc. makes every effort to ensure this map is free from errors but cannot be held responsible for any damages due to error or omissions. This map should not be used for navigation or legal purposes. It is intended for general reference use only.

CAMBIUM
194 Sophia Street
Peterborough, Ontario, K9H 1E5
Tel: (705) 742.7900 Fax: (705) 742.7907
www.cambium-inc.com

SITE LOCATION PLAN

Project No.: 11714-001		Date: September 2023	
		Rev.:	
Scale: 1:25,000		Projection: NAD 1983 UTM Zone 17N	
Created by: MAT	Checked by: SB	Figure:	1

O:\GIS\MXDs\11700-11799\11714-001 Geofirma Engineering Ltd - ECA Studies Air & Noise - South Bruce\2023-09-29 Air Quality Study.aprx



Receptor ID	Northing	Easting	Distance from EG01 (m)
POR01	4873390.0	472770.0	961
POR02	4873381.0	473136.0	606
POR03	4873458.0	473418.0	394
POR04	4873516.5	473937.7	397
POR05	4873652.2	474422.3	849
POR06	4873581.7	474659.7	1019
POR07	4871718.0	474992.0	1954
POR08	4871700.3	474077.3	1543
POR09	4871418.0	473438.0	1794
POR10	4873089.0	472796.0	925
POR19	4874531.0	472873.0	1579

AIR QUALITY STUDY

GEOFIRMA ENGINEERING LTD.
Concession Road 8,
South Bruce, Ontario

LEGEND

- Point Sources BH1
- Sensitive Receptor
- 200m Buffer to EG01
- Study Area
- Site (approximate)

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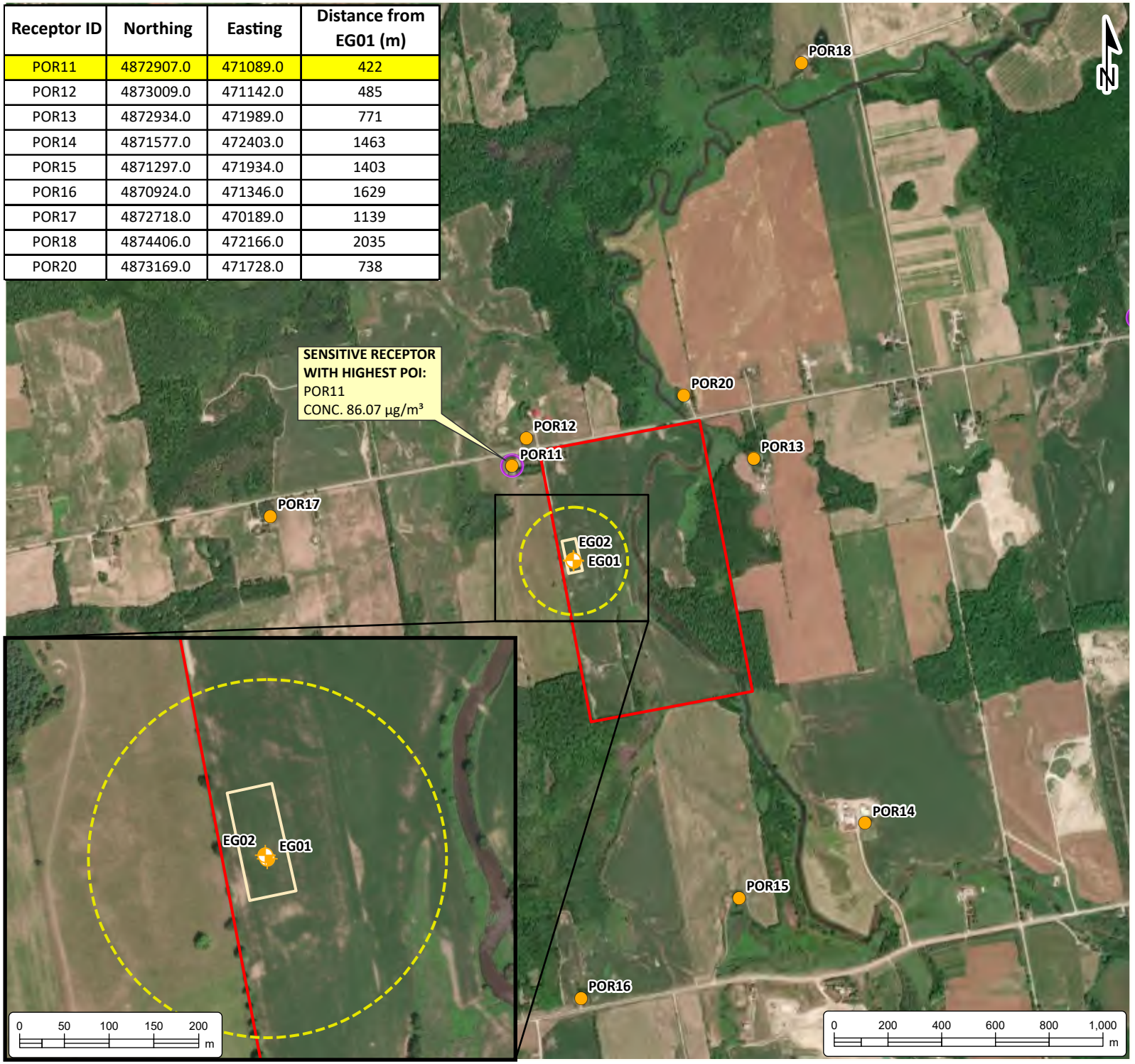
DISPERSION MODELLING PLAN - BOREHOLE 1

Project No.: 11714-001		Date: October 2023	Rev.:
Scale: 1:20,000		Projection:	
Created by: MAT	Checked by: SB	Figure: 2	

O:\GIS\MXDs\11700-11799\11714-001 Geofirma Engineering Ltd - ECA Studies Air & Noise - South Bruce\2023-09-29 Air Quality Study.aprx

Receptor ID	Northing	Easting	Distance from EG01 (m)
POR11	4872907.0	471089.0	422
POR12	4873009.0	471142.0	485
POR13	4872934.0	471989.0	771
POR14	4871577.0	472403.0	1463
POR15	4871297.0	471934.0	1403
POR16	4870924.0	471346.0	1629
POR17	4872718.0	470189.0	1139
POR18	4874406.0	472166.0	2035
POR20	4873169.0	471728.0	738



AIR QUALITY STUDY

GEOFIRMA ENGINEERING LTD.
Concession Road 8,
South Bruce, Ontario

LEGEND

- Sensitive Receptor
- Point Sources BH2
- 200m Buffer to EG02
- Study Area
- Site (approximate)

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DISPERSION MODELLING PLAN - BOREHOLE 2

Project No.:	Date:
11714-001	October 2023
Scale:	Rev.:
1:20,000	Projection:
Created by: MAT	Checked by: SB
Figure: 3	

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Appended Tables

Table 1: Sources and Contaminants Identification Table

Source Information			Expected Contaminants	Included in Modelling?	
Source ID	Source Description	General Location	Contaminant	Significant (Yes/No)	Rational
HVAC	Emissions due to all HVAC equipment at the facility	Site-wide	Products of NG Combustion	No	As per Table B-3 of The ESDM Procedure Document (MOECC, 2019a): natural gas fired boilers, water heaters, space-heaters and make-up air units when the total facility-wide heat input usage for this equipment is less than 20 million kJ/hr can be considered insignificant.
BV	General ventilation including: open spaces, washrooms, offices, etc.	Site-wide	N/A	No	Contaminant Insignigicant (less than 5% of the total propertywide emissions) relative to total emissions as outlined in Section 7.2.2 from The ESDM Procedure Document (MOECC, 2019a).
Dust	Fugitive dust from roadways, traffic, and storage piles	Site-wide	Suspended particulate matter (< 44 µm diameter)	No	The Operations are not listed in Table 7-2 or 7-3 of Section 7.4 of The ESDM Procedure Document (MOECC, 2019a). Additionally, the nature and quantity of dust generated from these sources were not deemed likely to pose a significant health risk if present
Fluid	Drilling fluid	Site-wide	Volatile Compounds	No	As per Table B-3 of The ESDM Procedure Document (MOECC, 2019a): Low temperature handling of compounds with a vapour pressure less than 1 kiloPascal can be considered insignificant.
Gen	Generators totalling less than 50 kW powering office and amenity spaces	Site-wide	Products of NG Combustion	No	Contaminant Insignigicant (less than 5% of the total propertywide emissions) relative to total emissions as outlined in Section 7.2.2 from The ESDM Procedure Document (MOECC, 2019a).
EG01	Core Drill	Adjacent to drill at Site 1 and Site 2	Nitrogen oxides	Yes	Not Applicable
EG01	Core Drill	Adjacent to drill at Site 1 and Site 2	Suspended particulate matter (< 44 µm diameter)	Yes	Not Applicable
EG02	Process generator	Adjacent to generator at Site 1 and Site 2	Nitrogen oxides	Yes	Not Applicable
EG02	Process generator	Adjacent to generator at Site 1 and Site 2	Suspended particulate matter (< 44 µm diameter)	Yes	Not Applicable

Table 2a: Source Summary Table Sorted by Contaminant

Source Data											Emissions Data					
Contaminant	CAS Number	Source ID	Type of Source	Source Description	Stack Volumetric Flow Rate (m3/s)	Stack Gas Temperature (°C)	Stack Inside Diameter (m)	Stack Height Above Grade (m)	Stack Height Above Roof (m)	Source Coordinates (x,y) (m)	Maximum Emission Rate (g/s)	Averaging Period	Emission Estimating Technique	Sample Calculation ID	Data Quality	Percentage of Overall Emissions (%)
Nitrogen oxides	10102-44-0	EG01	Point Source - Vertical Stack (uncapped)	Core Drill	0.02	500	0.12	4.00	N/A	N/A	2.36E-01	24 hour & 1 hour	EF	1	Average	9.91%
Nitrogen oxides	10102-44-0	EG02	Point Source - V	Process generator	2.31	539.4	0.23	3.50	N/A	N/A	2.15E+00	24 hour & 1	EF	1	Average	90.09%
Suspended particulate matter (< 44 µm diameter)	N/A (tsp)	EG01	Point Source - V	Core Drill	0.02	500	0.12	4.00	N/A	N/A	1.18E-02	24 hour	EF	1	Average	12.80%
Suspended particulate matter (< 44 µm diameter)	N/A (tsp)	EG02	Point Source - V	Process generator	2.31	539.4	0.23	3.50	N/A	N/A	8.05E-02	24 hour	EF	1	Average	87.20%

Table 2b: Source Summary Table Sorted by Source

Source Data											Emissions Data					
Source ID	Type of Source	Source Description	Stack Volumetric Flow Rate (m3/s)	Stack Gas Temperature (°C)	Stack Inside Diameter (m)	Stack Height Above Grade (m)	Stack Height Above Roof (m)	Source Coordinates (x,y) (m)	Contaminant	CAS Number	Maximum Emission Rate (g/s)	Averaging Period	Emission Estimating Technique	Sample Calculation ID	Data Quality	Percentage of Overall Emissions (%)
EG01	Point Source - Vertical Stack (uncapped)	Core Drill	0.02	500	0.12	4.00	N/A	N/A	Nitrogen oxides	10102-44-0	2.36E-01	24 hour & 1 hour	EF	1	Average	9.91%
EG01	Point Source - Vertical Stack (uncapped)	Core Drill	0.02	500	0.12	4.00	N/A	N/A	Suspended particulate matter (< 44 µm diameter)	N/A (tsp)	1.18E-02	24 hour	EF	1	Average	12.80%
EG02	Point Source - Vertical Stack (uncapped)	Process generator	2.31	539.4	0.23	3.50	N/A	N/A	Nitrogen oxides	10102-44-0	2.15E+00	24 hour & 1 hour	EF	1	Average	90.09%
EG02	Point Source - Vertical Stack (uncapped)	Process generator	2.31	539.4	0.23	3.50	N/A	N/A	Suspended particulate matter (< 44 µm diameter)	N/A (tsp)	8.05E-02	24 hour	EF	1	Average	87.20%

Table 3: Dispersion Modelling Input Summary Table

Relevant Section of the Regulation	Section Title	Description of How the Approved Dispersion Model was Used
Section 6	Approved Air Dispersion (include Model Versions)	Composite meteorological data by MECP v21112 AERMET v21112 (incl. in Met Data) BPIP v04274 AERMAP v18081 AERMOD v21112
Section 8	Negligible Sources	If any sources are deemed negligible they are discussed in Section 3 and Appendix B of the ESDM Report. Any negligible sources identified using the guidance provided in section 7 of The ESDM Procedure Document were not included in modelling as per section 8 of O. Reg. 419/05.
Section 9	Same Structure Contamination	Same Structure Contamination has not been assessed as the Facility is not in a multi-tenant building.
Section 10	Operating Conditions	All equipment was assumed to be operating at the maximum production rates at the same time during their applicable hours of operation. See section 4.1 and Appendix A of the ESDM report.
Section 11	Source of Contaminant Emission Rates	See section 4.2 and Appendix A of the ESDM Report for more information.
Section 12	Combined Effect of Assumptions for Operating Conditions and Emission Rates	See section 4.1 and Appendix A of the ESDM Report for more information.
Section 13	Meteorological Conditions (include AERMET Version)	The preprocessed meteorological data provided by the MECP (AERMOD v21112) was used as provided from the MECP website for the Toronto region; A meteorological data set consisting of five years (1996-2000) of hourly readings for surface and upper air conditions was used in the AERMOD model.
Section 14	Area of Modelling Coverage	The area of modelling coverage was designed to meet the requirements outlined in O. Reg. 419/05, s 14. A polar receptor grid was developed with reference to Section 7.2 of the ADMGO. The radial and angular dimensions of the grid were selected to correspond to the multi-tiered receptor grid method. Additional discrete receptors were placed at residences located nearest the emission sources.
Section 15	Stack Height for Certain New Sources of Contaminant	See Table 2 - Source Summary Table; no stack heights in this model (actual or modelled) exceed the restriction in section 15 of O.Reg. 419/05.
Section 16	Terrain Data	See Section 6.4 of the report; Terrain information for the area surrounding the facility was obtained from the MECP Ontario Digital Elevation Model Data web site. The terrain data is based on the North American Datum 1983 (NAD83) horizontal reference datum. These data were run through the AERMAP terrain pre-processor to estimate base elevations for receptors and to help the model account for changes in elevation of the surrounding terrain.

Relevant Section of the Regulation	Section Title	Description of How the Approved Dispersion Model was Used
Section 17	Averaging Periods	The appropriate averaging periods (as defined by the regulatory limits outlined in Schedule 3, and the listing of the MECP Guidelines) were modelled for each contaminant. Emission rates were calculated based on averaging periods that matched the averaging period of the respective criterion. See section 6.7 of O. Reg. 419/05.

Table 4: Emission Summary Table

Drill Borehole Location 1

Contaminant	CAS #	Total Facility Emission Rate (g/s)	Averaging Period	Limiting Effect	Schedule	Ministry POI Limit (µg/m³)	Min Setback to Sensitive Receptor (m)	Max POI Concentration from at Setback Distance (µg/m^3)	Percentage of Ministry POI Limit (%)	Air Dispersion Model Used
Nitrogen oxides	10102-44-0	2.38E+00	1 hour	Health	Standard	400	200	250.02	62.5%	AERMOD 21112
Nitrogen oxides	10102-44-0	2.38E+00	24 hour	Health	Standard	200	200	155.87	77.9%	AERMOD 21112
Suspended particulate matter (< 44 µm diameter)	N/A (tsp)	9.23E-02	24 hour	Visibility	Standard	120	200	6.02	5.0%	AERMOD 21112

Drill Borehole Location 2

Contaminant	CAS #	Total Facility Emission Rate (g/s)	Averaging Period	Limiting Effect	Schedule	Ministry POI Limit (µg/m³)	Min Setback to Sensitive Receptor (m)	Max POI Concentration from Source (µg/m^3)	Percentage of Ministry POI Limit (%)	Air Dispersion Model Used
Nitrogen oxides	10102-44-0	2.38E+00	1 hour	Health	Standard	400	150	305.20	76.3%	AERMOD 21112
Nitrogen oxides	10102-44-0	2.38E+00	24 hour	Health	Standard	200	150	190.66	95.3%	AERMOD 21112
Suspended particulate matter (< 44 µm diameter)	N/A (tsp)	9.23E-02	24 hour	Visibility	Standard	120	150	7.53	6.3%	AERMOD 21112

Table 4: Emission Summary Table

Drill Borehole Location 1 - Residence Receptor with Highest POI

Contaminant	CAS #	Total Facility Emission Rate (g/s)	Averaging Period	Limiting Effect	Schedule	Ministry POI Limit (µg/m³)	Distance to Sensitive Receptor (m)	Max POI Concentration from Source (µg/m^3)	Percentage of Ministry POI Limit (%)	Air Dispersion Model Used
Nitrogen oxides	10102-44-0	2.38E+00	1 hour	Health	Standard	400	397	89.22	22.3%	AERMOD 21112
Nitrogen oxides	10102-44-0	2.38E+00	24 hour	Health	Standard	200	394	35.55	17.8%	AERMOD 21112
Suspended particulate matter (< 44 µm diameter)	N/A (tsp)	9.23E-02	24 hour	Visibility	Standard	120	397	1.48	1.2%	AERMOD 21112

Drill Borehole Location 2 - Residence Receptor with Highest POI

Contaminant	CAS #	Total Facility Emission Rate (g/s)	Averaging Period	Limiting Effect	Schedule	Ministry POI Limit (µg/m³)	Distance to Sensitive Receptor (m)	Max POI Concentration from Source (µg/m^3)	Percentage of Ministry POI Limit (%)	Air Dispersion Model Used
Nitrogen oxides	10102-44-0	2.38E+00	1 hour	Health	Standard	400	422	86.07	21.5%	AERMOD 21112
Nitrogen oxides	10102-44-0	2.38E+00	24 hour	Health	Standard	200	422	28.31	14.2%	AERMOD 21112
Suspended particulate matter (< 44 µm diameter)	N/A (tsp)	9.23E-02	24 hour	Visibility	Standard	120	422	1.27	1.1%	AERMOD 21112

Appendix A
Supporting Calculations

Calculation 1 - Engine Combustion (EG01, EG02)

Equipment	Model[1]	Emission Standard	Rated Power (kW)	NOx Emission Factor[2] (g/kW-hr)	PM Emission Factor[2] (g/kW-hr)	NOx Emission Rate[3] (g/s)	PM Emission Rate[3] (g/s)
Core Drill (EG01)	Christenson CS4002	US EPA Nonroad Compression-Ignition Engines: Tier 3	212.5	4.00	0.20	2.36E-01	1.18E-02
Process Generator (EG02)	Caterpillar 3412	Manufacture Specifications	800.0	9.66	0.36	2.15E+00	8.05E-02

Notes:

[1] Or, similar with identical emission standards and equal to or less than the rated power.

[2] The combined NMHC and NOx standard was used where an individual standard was not applicable. Please refer to references section of the ESDM for specific standard references.

[3] Assumed continuous operation during each hour. Conversion of 3600 s/hr applied. Note, because the Cable Rig and Core Drill do not operate at the same time only the worst-case engine was assessed.

Data Quality: *Average*

Emission rates derived from emission factors developed from partially validated source testing are considered to be "Average Data Quality" as per section 9.2.3 of The ESDM Procedure Document. The manufacture's data for compliance with emission standards was assumed to meet this data quality criteria.

Appendix B
Assessment for Negligibility

Supporting Information for Assessment of Negligibility

Cambium has not considered site preparation activities in this study that involve removing topsoil for berms and delivery of materials. Any traffic and earth material handing during the activities are insignificant.

Sources were screened for negligibility using the following screening protocols listed in The ESDM Procedure Document:

- Fugitive dust from on-site roadways (Section 7.4)
- Sources listed on Table B-3 (Section 7.2.1)
- Sources that are insignificant relative to total emissions (Section 7.2.2.)

The results of the screening are discussed in greater detail below.

Fugitive Dust:

The Operations are not listed in Table 7-2 or 7-3 of Section 7.4 of The ESDM Procedure Document and accordingly dust emissions from on-site roadways, storage piles, and on-site traffic were considered as insignificant. Additionally, the nature and quantity of dust generated from these sources was not deemed likely to pose a significant health risk if present.

Sources Listed on Table B-3

Table B-3 of The ESDM Procedure Document lists sources that can be considered to be insignificant; the following sources at the Facility are listed on Table B-3:

- Maintenance welding stations
- On-site storage tanks and facilities that are used for fueling on-site vehicles
- Low temperature handling of compounds with a vapour pressure less than 1 kiloPascal (e.g. drilling fluid)
- Battery chargers
- Small maintenance and janitorial activities

Sources that are Insignificant Relative to Total Emissions:

It is understood that a source may be considered negligible if:

- The emission from one source of contaminants is similar (same contaminants and same relative proportions of contaminants) to another source of contaminants AND;
- One of the sources would have much higher emissions rates than the other AND;
- The nature of their emission is similar (resultant dispersion impact from either source are the same) then the smaller source can be classified as insignificant provided the resultant POI impact of all the contaminants does not result in non-compliance OR;
    - That the margin of compliance is so slight that if the smaller source or sources were included the aggregate POI impacts of all the contaminants would result in non-compliance.

Therefore, sources of contaminants are determined to be negligible by comparing the difference in usage rates between sources at a Facility. If the usage rate of materials in the process are much less than the usage rates in other significant sources at the same facility than the lesser source may be considered negligible.

Ventilation not directly involved with process emissions (i.e., office spaces, washrooms, etc.) were deemed to be negligible because of the low expected quantity and risk associated with their contaminant emissions relative to the site-wide releases. Additionally, Cambium has assumed the small generators totalling less than 50 kW powering office and amenities to be insignificant in relation to the process generator.

The excavated material amounts to only the volume of the extracted cores, which are not expected to produce fugitive emissions.

Appendix C
Equipment Specifications

Cat® 3412
Diesel Generator Sets

Image shown may not reflect actual configuration

Bore – mm (in)	137.2 (5.4)
Stroke – mm (in)	152.4 (6)
Displacement – L (in^3)	27.02 (1648.86)
Compression Ratio	13.0:1
Aspiration	TA
Fuel System	Pump and Lines
Governor Type	ADEM™ A5

Standby 60 Hz ekW (kVA)	Prime 60 Hz ekW (kVA)	Standby 60 Hz ekW (kVA)	Prime 60 Hz ekW (kVA)	Emissions Performance
700 (875)	635 (793)	750 (937)	680 (850)	Optimized for Low Fuel Consumption
800 (1000)	725 (906)	—	—	

Standard Features

Cat® Diesel Engine
- Designed and optimized for low fuel consumption
- Reliable performance proven in thousands of applications worldwide

Generator Set Package
- Accepts 100% block load in one step and meets other NFPA 110 loading requirements
- Conforms to ISO 8528-5 G3 load acceptance requirements
- Reliability verified through torsional vibration, fuel consumption, oil consumption, transient performance, and endurance testing

Alternators
- Superior motor starting capability minimizes need for oversizing generator
- Designed to match performance and output characteristics of Cat diesel engines

Cooling System
- Cooling systems available to operate in ambient temperatures up to 50°C (122°F)
- Tested to ensure proper generator set cooling

EMCP 4 Control Panels
- User-friendly interface and navigation
- Scalable system to meet a wide range of installation requirements
- Expansion modules and site specific programming for specific customer requirements

Warranty
- 24 months/1000-hour warranty for standby and mission critical ratings
- 12 months/unlimited hour warranty for prime and continuous ratings
- Extended service protection is available to provide extended coverage options

Worldwide Product Support
- Cat dealers have over 1,800 dealer branch stores operating in 200 countries
- Your local Cat dealer provides extensive post-sale support, including maintenance and repair agreements

Financing
- Caterpillar offers an array of financial products to help you succeed through financial service excellence
- Options include loans, finance lease, operating lease, working capital, and revolving line of credit
- Contact your local Cat dealer for availability in your region

Optional Equipment

Engine

Air Cleaner
- ❑ Single element
- ❑ Dual element
- ❑ Heavy duty

Muffler
- ❑ Industrial grade (10 dB)
- ❑ Critical grade (35 dB)

Starting
- ❑ Standard batteries
- ❑ Oversized batteries
- ❑ Heavy duty electric starter(s)
- ❑ Dual electric starter(s)
- ❑ Jacket water heater

Alternator

Output voltage
- ❑ 220V ❑ 440V
- ❑ 240V ❑ 480V
- ❑ 380V

Temperature Rise (over 40°C ambient)
- ❑ 130°C
- ❑ 105°C
- ❑ 80°C

Winding type
- ❑ Random wound

Excitation
- ❑ Self excited
- ❑ Permanent magnet (PM)

Attachments
- ❑ Anti-condensation heater
- ❑ Stator and bearing temperature monitoring and protection

Power Termination

Type
- ❑ Bus bar
- ❑ Circuit breaker
- ❑ 1600A ❑ IEC
- ❑ 2500A ❑ 3-pole
- ❑ UL ❑ 4-pole
- ❑ Manually operated
- ❑ Electrically operated

Trip Unit
- ❑ LSI

Factory Enclosure
- ❑ Weather protective
- ❑ Sound attenuated

Fuel Tank
- ❑ 317 gal (1200 L)

Control System

Controller
- ❑ EMCP 4.2
- ❑ EMCP 4.3
- ❑ EMCP 4.4

Attachments
- ❑ Local annunciator module
- ❑ Remote annunciator module
- ❑ Expansion I/O module
- ❑ Remote monitoring software

Charging
- ❑ Battery charger – 5A

Vibration Isolators
- ❑ Spring

Extended Service Options

Terms
- ❑ 2 year (prime)
- ❑ 3 year
- ❑ 5 year
- ❑ 10 year

Coverage
- ❑ Silver
- ❑ Gold
- ❑ Platinum
- ❑ Platinum Plus

Ancillary Equipment
- ❑ Automatic transfer switch (ATS)
- ❑ Uninterruptible power supply (UPS)
- ❑ Paralleling switchgear
- ❑ Paralleling controls

Certifications
- ❑ EU Certification of Conformance (CE)
- ❑ EEC Declaration of Conformity

Note: *Some options may not be available on all models. Certifications may not be available with all model configurations. Consult factory for availability.*

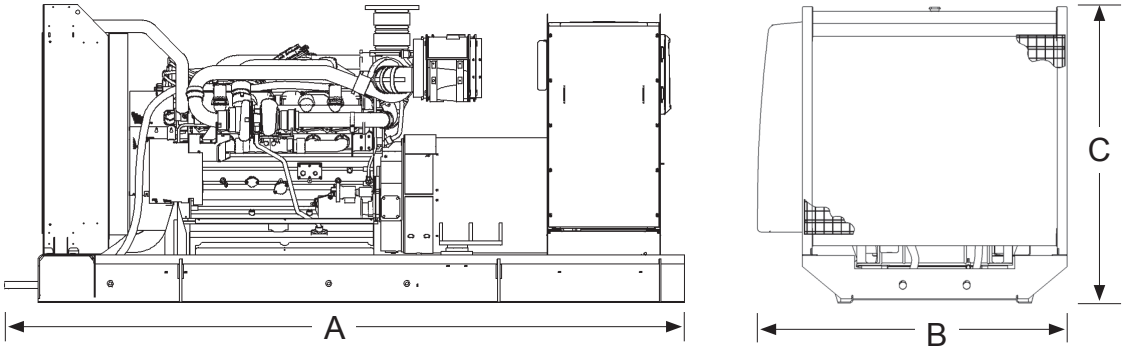
Package Performance

Performance	Standby		Prime		Standby		Prime	
Frequency	60 Hz		60 Hz		60 Hz		60 Hz	
Gen set power rating with fan	700 ekW		635 ekW		750 ekW		680 ekW	
Gen set power rating with fan @ 0.8 power factor	875 kVA		793 kVA		937 kVA		850 kVA	
Emissions	Low Fuel		Low Fuel		Low Fuel		Low Fuel	
Performance number	EM1156-01		EM1157-01		EM1162-01		EM1163-00	
Fuel Consumption								
100% load with fan – L/hr (gal/hr)	188.1	(42.0)	171.0	(45.2)	206.3	(54.5)	187.3	(49.5)
75% load with fan – L/hr (gal/hr)	144.5	(32.1)	133.0	(35.1)	156.0	(41.2)	142.7	(37.7)
50% load with fan – L/hr (gal/hr)	103.3	(22.5)	95.5	(25.2)	109.8	(29.0)	101.8	(26.9)
25% load with fan – L/hr (gal/hr)	62.9	(13.2)	59.0	(15.6)	66.2	(17.5)	62.0	(16.4)
Cooling System								
Radiator air flow restriction (system) – kPa (in. water)	0.12	(0.48)	0.12	(0.48)	0.12	(0.48)	0.12	(0.48)
Radiator air flow – m^3/min (cfm)	1464	(51700)	1464	(51700)	1464	(51700)	1464	(51700)
Engine coolant capacity – L (gal)	58.6	(15.5)	58.6	(15.5)	58.6	(15.5)	58.6	(15.5)
Radiator coolant capacity – L (gal)	90.0	(23.8)	90.0	(23.8)	90.0	(23.8)	90.0	(23.8)
Total coolant capacity – L (gal)	148.8	(39.3)	148.8	(39.3)	148.8	(39.3)	148.8	(39.3)
Inlet Air								
Combustion air inlet flow rate – m^3/min (cfm)	52.2	(1843.3)	48.5	(1712.6)	65.2	(2302.4)	59.3	(2093.9)
Exhaust System								
Exhaust stack gas temperature – °C (°F)	551.0	(1023.8)	542.5	(1008.5)	513.9	(957.0)	508.5	(947.3)
Exhaust gas flow rate – m^3/min (cfm)	153.8	(5431.1)	141.1	(4982.5)	181.9	(6423.4)	164.3	(5801.5)
Exhaust system backpressure (maximum allowable) – kPa (in. water)	6.7	(27.0)	6.7	(27.0)	6.7	(27.0)	6.7	(27.0)
Heat Rejection								
Heat rejection to jacket water – kW (Btu/min)	434	(24682)	395	(22464)	474	(26957)	431	(24510)
Heat rejection to exhaust (total) – kW (Btu/min)	700	(39810)	637	(36227)	794	(45157)	715	(40661)
Heat rejection to aftercooler – kW (Btu/min)	71	(4061)	58	(3304)	130	(7394)	106	(6028)
Heat rejection to atmosphere from engine – kW (Btu/min)	108	(6142)	94	(5334)	114	(6483)	104	(5914)
Heat rejection from alternator – kW (Btu/min)	31	(1746)	27	(1541)	28	(1592)	25	(1445)
Emissions (Nominal)								
NOx mg/Nm^3 (g/hp-h)	3936.3	(8.18)	4206.0	(8.71)	2827.4	(5.96)	2848.9	(5.97)
CO mg/Nm^3 (g/hp-h)	321.6	(0.67)	307.1	(0.64)	334.2	(0.71)	313.8	(0.66)
HC mg/Nm^3 (g/hp-h)	29.7	(0.06)	30.1	(0.06)	56.5	(0.13)	50.3	(0.12)
PM mg/Nm^3 (g/hp-h)	45.2	(0.09)	40.0	(0.08)	42.4	(0.11)	39.7	(0.10)
Emissions (Potential Site Variation)								
NOx mg/Nm^3 (g/hp-h)	4762.9	(9.90)	5089.2	(10.54)	3421.1	(7.21)	3447.2	(7.22)
CO mg/Nm^3 (g/hp-h)	601.4	(1.25)	574.3	(1.19)	625.0	(1.32)	586.8	(1.23)
HC mg/Nm^3 (g/hp-h)	56.1	(0.12)	56.9	(0.12)	106.8	(0.25)	95.1	(0.22)
PM mg/Nm^3 (g/hp-h)	88.2	(0.18)	78.0	(0.16)	82.7	(0.21)	77.4	(0.20)

Package Performance

Performance	Standby		Prime		Standby	Prime
Frequency	60 Hz		60 Hz		—	—
Gen set power rating with fan	800 ekW		725 ekW		—	—
Gen set power rating with fan @ 0.8 power factor	1000 kVA		906 kVA		—	—
Emissions	Low Fuel		Low Fuel		—	—
Performance number	EM1160-00		EM1161-01			—
Fuel Consumption						
100% load with fan – L/hr (gal/hr)	221.9	(58.6)	198.8	(52.5)	—	—
75% load with fan – L/hr (gal/hr)	165.6	(43.8)	150.6	(39.8)	—	—
50% load with fan – L/hr (gal/hr)	115.7	(30.6)	106.5	(28.1)	—	—
25% load with fan – L/hr (gal/hr)	69.4	(18.3)	64.1	(16.9)	—	—
Cooling System						
Radiator air flow restriction (system) – kPa (in. water)	0.12	(0.48)	0.12	(0.48)	—	—
Radiator air flow – m^3/min (cfm)	1464	(51700)	1464	(51700)	—	—
Engine coolant capacity – L (gal)	58.6	(15.5)	58.6	(15.5)	—	—
Radiator coolant capacity – L (gal)	90.0	(23.8)	90.0	(23.8)	—	—
Total coolant capacity – L (gal)	148.8	(39.3)	148.8	(39.3)	—	—
Inlet Air						
Combustion air inlet flow rate – m^3/min (cfm)	69.6	(2457.6)	63.0	(2224.5)	—	—
Exhaust System						
Exhaust stack gas temperature – °C (°F)	517.8	(964.0)	539.4	(1002.9)	—	—
Exhaust gas flow rate – m^3/min (cfm)	195.1	(6889.2)	139.1	(4913.4)	—	—
Exhaust system backpressure (maximum allowable) – kPa (in. water)	6.7	(27.0)	6.7	(27.0)	—	—
Heat Rejection						
Heat rejection to jacket water – kW (Btu/min)	508	(28890)	457	(25988)	—	—
Heat rejection to exhaust (total) – kW (Btu/min)	855	(48624)	764	(43445)	—	—
Heat rejection to aftercooler – kW (Btu/min)	147	(8360)	122	(6937)	—	—
Heat rejection to atmosphere from engine – kW (Btu/min)	131	(7450)	108	(6142)	—	—
Heat rejection from alternator – kW (Btu/min)	31	(1746)	27	(1541)	—	—
Emissions (Nominal)						
NOx mg/Nm^3 (g/hp-h)	2793.2	(5.95)	2837.2	(5.96)	—	—
CO mg/Nm^3 (g/hp-h)	400.2	(0.85)	317.9	(0.67)	—	—
HC mg/Nm^3 (g/hp-h)	59.2	(0.14)	54.4	(0.13)	—	—
PM mg/Nm^3 (g/hp-h)	53.1	(0.14)	40.0	(0.10)	—	—
Emissions (Potential Site Variation)						
NOx mg/Nm^3 (g/hp-h)	3379.8	(7.20)	3433.1	(7.21)	—	—
CO mg/Nm^3 (g/hp-h)	748.4	(1.59)	594.5	(1.25)	—	—
HC mg/Nm^3 (g/hp-h)	111.9	(0.26)	102.8	(0.24)	—	—
PM mg/Nm^3 (g/hp-h)	103.5	(0.27)	78.0	(0.20)	—	—

Weights and Dimensions



Standby 60 Hz ekW (kVA)	Prime 60 Hz ekW (kVA)	Standby 60 Hz ekW (kVA)	Prime 60 Hz ekW (kVA)	Dim "A" mm (in)	Dim "B" mm (in)	Dim "C" mm (in)	Dry Weight kg (lb)
700 (875)	635 (793)	—	—	4125 (162.4)	1989 (78.3)	1906 (75)	5761 (12,700)
750 (937)	680 (850)	800 (1000)	725 (906)	4125 (162.4)	1989 (78.3)	1906 (75)	6021 (13,275)

Note: *For reference only. Do not use for installation design. Contact your local Cat dealer for precise weights and dimensions.*

Ratings Definitions

Standby
Output available with varying load for the duration of the interruption of the normal source power. Average power output is 70% of the standby power rating. Typical operation is 200 hours per year, with maximum expected usage of 500 hours per year.

Prime
Output available with varying load for an unlimited time. Average power output is 70% of the prime power rating. Typical peak demand is 100% of prime rated ekW with 10% overload capability for emergency use for a maximum of 1 hour in 12. Overload operation cannot exceed 25 hours per year.

Applicable Codes and Standards
AS1359, CSA C22.2 No100-04, UL142, UL489, UL869, UL2200, NFPA37, NFPA70, NFPA99, NFPA110, IBC, IEC60034-1, ISO3046, ISO8528, NEMA MG1-22, NEMA MG1-33, 2014/35/EU, 2006/42/EC, 2014/30/EU.

Note: Codes may not be available in all model configurations. Please consult your local Cat dealer for availability.

Data Center Applications
Tier III/Tier IV compliant per Uptime Institute requirements. ANSI/TIA-942 compliant for Rated-1 through Rated-4 data centers.

Fuel Rates
Fuel rates are based on fuel oil of 35º API [16°C (60ºF)] gravity having an LHV of 42,780 kJ/kg (18,390 Btu/lb) when used at 29ºC (85ºF) and weighing 838.9 g/liter (7.001 lbs/U.S. gal.)

CS4002 Truck Mounted Core Drill

DOSECC

The newest addition to our fleet of drilling rigs, the CS4002 is an all-hydraulic diamond core drill for deep hole surface exploration drilling. It is ideally suited for drilling projects where high penetration rate and optimal core recovery are the main goals. The CS4002 has depth capacities for vertical, straight, water-filled boreholes of 8,030 feet with NQ string, 5,250 feet with HQ, and 3,440 feet with PQ.

Let DOSECC put our new CS4002 rig to work for you.

SPECIFICATIONS FOR DES' CS-4002 CORING RIG

DEPTH CAPACITY CORING*

N Wireline: 2,450 m (8,030 ft)
N Wireline: Upset Ends 2,850 m (9,350 ft)
H Wireline: 1,600 m (5,250 ft)
P Wireline: 1,050 m (3,440 ft)
*for vertical, straight and water filled hole

MAST AND FEED SYSTEM

Feed Travel: 3.35 m (11 ft)
Feed Speeds: Fast and slow with variable control
Pull Back: 200 kN (45,000 lbf)
Thrust: 89 kN (20,000 lbf)
Rod Pull Length: 6.1 m (20 ft) or 9.1 m (30 ft)
Drilling Angle: 45 To 90 Degrees
Mast Dump: 2 m (80 in)

POWER UNIT

Mfg.: Cummins Qsc Pu 8.3 Liter 6 Cylinder
Power: 212 Kw (285 Hp) @ 2,100 rpm
Type: Diesel Turbo Charged/Charge Air Cooled
Cooling: Water

HYDRAULIC PUMPS

Primary Pump: Rotation, Hoist, W/L Hoist, Fast Feed
Auxiliary Pump: Slow Feed, Chuck, Foot Clamp, Mud Mixer
Secondary Pump: Mud Pump

CHUCK ASSEMBLY

Maximum Inside Diameter: 117 mm (4 5/8 in)
Holding Capacity: 178 kN (40,000 lbf)
Operation: Spring Applied, Hydraulically Opened

DRILLHEAD

Maximum Rpm: 1,300
Maximum Torque: 6,230 nM (4,596 ft lbf)
Transmission: Four Speed, Manual Shift
Mounting: Hydraulic Powered Slide Away
Lubrication: Pressure System

MAIN HOIST

Single Line Capacity: 178 kN (40,000 lbf)
Line Speed: 36 – 71 m/min (117 - 232 fpm)
Cable Diameter: 22 mm (7/8 in)

WIRE LINE HOIST CAPACITY

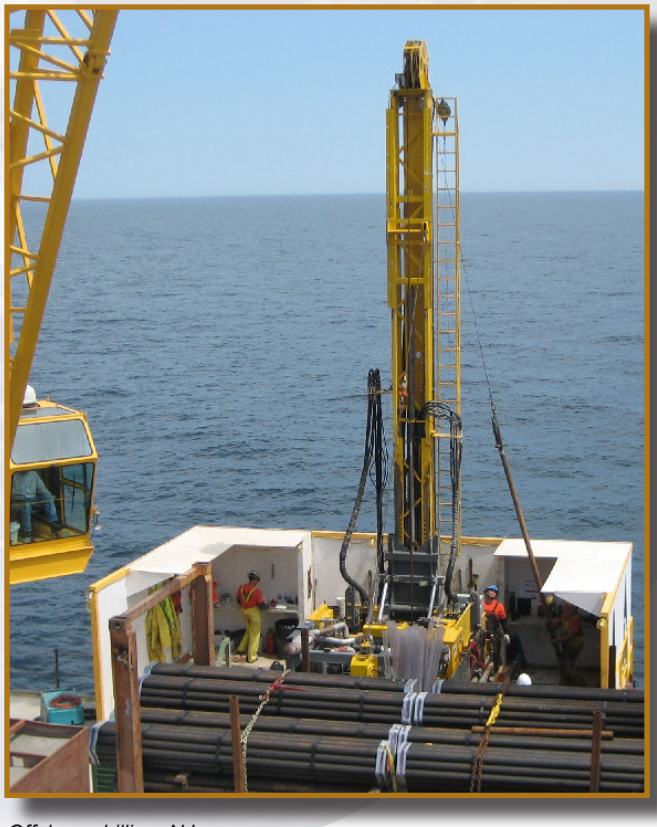
2,600 m (8,530 ft) of 6.35 m (1/4 in) cable
4,600 m (15,090 ft) of 4.76 mm (3/16 in) cable
Line Speed: Bare 1.38 m/s (272 fpm) full 5.1 m/s (1004 fpm)
Line Pull: Bare 28.5 kN (6,380 lbf) full 5.1 kN (1,151 lbf)

STANDARD EQUIPMENT

Four Hydraulic Jacks 610 mm (24 in) stroke
Hydraulic P-Size Holding Clamp
Control Panel Hydraulic Slide
High Altitude Kit
Hydraulic Mud Mixer
Fuel Tank 950 l (250 gal)
Mud Pump: Hydraulic Driven FMC W1122bcd
Max Flow: 140 lpm (37 gpm)
Max Pressure: 7.0 mpa (1,000 psi)

WEIGHT

Rig Weight: 13,380 Kg (29,500 lbs)
Truck GVW: 36,287 Kg (80,000 lbs)
Total Weight: 49,667 Kg (109,500 lbs)



Offshore drilling, NJ

Contact: Chris Delahunty
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DOSECC
P.O. Box 58857
Salt Lake City, UT 84158-0857

DOSECC

CHRISTENSEN CS4002 is an all-hydraulic operated diamond core drill.

General

The CHRISTENSEN CS4002 is an all-hydraulic diamond core drill for deep hole surface exploration drilling. The CS4002 is designed to be mounted on a truck and can also be mounted on tracks.

The CHRISTENSEN CS4002 uses well proven technology for diamond core drills together with safety improvements to provide a reliable, safe drill. An optional rod rack/helper's platform capable of stacking rods from 90 to 45 degrees, give the operator flexibility in rod handling. An optional spin-out tool avoids the use of pipe wrenches for breaking rods

Recommendations

To achieve the best results with regard to:

- high penetration
- optimal core recovery
- low drilling costs

It is of primary importance that drill rods, core barrels and coring bits are of the right type and quality, matched to the drill and to the prevailing rock conditions.

Bearing in mind the core drill's speed of rotation, its depth rating and chuck diameter, the CHRISTENSEN CS4002 is best suited to drill N to P size holes using wire line rods

Technical Specifications

Drill Mast
Feed stoke.....3.35 m (11 ft)
Mast slide.....2.0 m (80 in)
Rod pull..... 9 m (30 ft)
Mast style .....Folding
Feed pull.....200 kN (45,000 lbf)
Feed thrust.....91 kN (20,400 lbf)
Drill rod centerline location....In front of mast
Rod rack capacity (rods stacked on edge):
.....1,998 m (6,500 ft) capacity of N size rods
.....vertical to 80 degrees

Main Winch
Main winch pull.....178 kN (40,000 lbf)
Main winch speed:
... 0.6 m/sec (117 fpm) @ max displacement
.. 1.17 m/sec (232 fpm) @ min displacement
Rope size.....22 mm (7/8 in)

Drillhead
Chuck axial holding capacity:
.....178 kN (40,000 lbf)
Actuation.....Spring apply, hydraulic release
Number of jaws.....5
Drillhead .....Chain final drive plus 4 speed
.....transmission
Chuck mounting.....Bolt on
Final drive ratio 2:1
Drillhead spindle ID.....120.6 mm (4.75 in)

Wireline Winch
Drum Capacity:
-4.7 mm (3/16 in) wire rope....4,600 m (15,000 ft)
-6.3 mm (¼ in) wire rope.....2,600 m (8,530 ft)
Levelwind for even spooling .....Standard
Parking brake.....Standard
Winch position.....Raised on stand

Control Console
Console movement.....Hydraulic in and out

Weight (less truck):
.....13,864 kg (30,500 lbs)

Foot Clamp
- Hydraulically operated, self energizing foot clamp
- Easy-to-remove jaws
- Common jaws from 44.5 mm (1.75 in) to 177.8 mm (7 in)
- Casing and rod jaws for all popular sizes
- 224 mm (8.8 in) foot clamp opening
- 320 mm (12.5 in) mast bottom opening

Fig. 5.1 Foot Clamp & Optional Spin-Out Tool

Fig.5.2 Control Console & Drillhead

Diesel Engine - See Drill Manual Section II for information on the Diesel Engine

Diesel Fuel Reservoir

Capacity……950 L (250 gal)
Filling method……By hand pump
…….connected to main return filter

Hydraulic System

Hydraulic tank capacity ……500 litres (132 gal)

Max. operating pressure
- Main pump.....324 bar (4,700 psi)
- Auxiliary pump ..... 172 bar (2,500 psi)
- Secondary pump* … 207 bar (3,000 psi)

Max. flow
- Main pump.....272 l/min (72 gpm)
- Auxiliary pump .....125 l/min (33 gpm)
- Secondary pump*.....95 l/min (25 gpm)

***Note:** This is the secondary pump pressure and flow on the standard CS4002. The drill may have a different secondary pump if the mud/water pump is different than the standard FMC W1122BCD. See the addenda sheets (section 18), parts list and hydraulic schematic for the drill.

Options

• Rod rack and helper's platform for drilling angles 90 to 45 degrees. Rod rack capacity 1,998 m (6,500 ft) of N size rods, vertical to 80°, rods stacked on edge

• Spin-Out Tool for mechanized rod make-up and break-out

Depth Capacity Coring*

N Wireline .....2,450 m (8,030 ft)
N Wireline – Upset Ends……2,850 m (9,350 ft)
H Wireline.....1,600 m (5,250 ft)
H Wireline – Upset Ends……2,250 m (7,380 ft)
P Wireline.....1,050 m (3,440 ft)
* For vertical, straight, water filled hole

CS4002 Drillhead RPM and Torque Ratings at max. & min. displacements:

- At rotation pressure of 3,500 psi
- Max displacement of 145 cc
- Min displacement of 100 cc

Appendix D

AERMOD Dispersion Modelling Results

APPENDIX D - AERMOD DISPERSION MODELLING RESULTS

Drill Borehole Location 1 - Maximum POI Concentrations at Receptor Setback Distances

RECEPTOR SETBACK (m)	Max. POI Concentration of NOx 1-hr (ug/m3)	Max. POI Concentration of NOx 24-hr (ug/m3)	Max. POI Concentration of SPM 24-hr (ug/m3)
100	550.61	381.92	14.87
150	336.22	237.69	9.20
200	250.02	155.87	6.02
250	203.15	109.27	4.27
300	168.92	83.73	3.38
350	143.93	67.37	2.84
400	124.87	57.99	2.45
450	110.24	51.07	2.15
500	98.32	45.48	1.90
550	89.13	41.03	1.71
600	78.87	36.39	1.51
650	70.64	33.22	1.37
700	67.76	30.56	1.25
750	65.04	28.40	1.16
800	62.50	26.44	1.08
850	60.40	24.97	1.01
900	58.55	23.67	0.96
950	56.46	22.52	0.91
1000	54.41	21.51	0.87
1050	52.91	20.58	0.83
1100	53.01	19.68	0.79
1150	54.10	18.91	0.76
1200	54.77	18.22	0.73
1250	54.40	17.36	0.69
1300	53.95	16.82	0.67
1350	53.72	16.05	0.64
1400	53.43	15.40	0.61
1450	52.84	15.09	0.60
1500	53.11	14.84	0.59
1550	52.43	14.36	0.57

Drill Borehole Location 2 - Maximum POI Concentrations at Receptor Setback Distances

RECEPTOR SETBACK (m)	Max. POI Concentration of NOx 1-hr (ug/m3)	Max. POI Concentration of NOx 24-hr (ug/m3)	Max. POI Concentration of SPM 24-hr (ug/m3)
100	511.49	340.49	13.28
150	305.20	190.66	7.53
200	204.50	143.71	5.62
250	155.84	109.87	4.28
300	133.65	87.07	3.38
350	117.06	70.76	2.75
400	101.67	58.22	2.26
450	88.74	49.08	1.90
500	83.50	41.83	1.62
550	87.48	37.60	1.48
600	84.63	34.14	1.37
650	83.21	30.62	1.25
700	81.37	27.56	1.13
750	77.41	25.35	1.04
800	73.84	23.61	0.96
850	69.33	21.90	0.90
900	67.04	21.09	0.86
950	65.54	20.36	0.83
1000	64.28	19.50	0.79
1050	63.65	18.76	0.76
1100	62.22	18.10	0.73
1150	59.09	17.54	0.71
1200	57.28	17.04	0.69
1250	55.46	16.57	0.66
1300	54.21	16.27	0.65
1350	53.58	15.75	0.63
1400	52.97	15.18	0.61
1450	52.79	14.60	0.58
1500	52.61	14.21	0.56
1550	52.79	14.14	0.56

APPENDIX D - AERMOD DISPERSION MODELLING RESULTS
Borehole 1 - Sensitive Receptors Max. POI Concentrations

Sensitive Receptor ID	Civic Address	UTM - X (m)	UTM-Y (m)	Distance to EG01 Emission Source (m)	Max. POI Concentration of NOx 1-hr (ug/m3)	Max. POI Concentration of NOx 24-hr (ug/m3)	Max. POI Concentration of SPM 24-hr (ug/m3)
POR01	1106 CONCESSION 8	472770	4873390	960	42.48	14.30	0.56
POR02	1068 CONCESSION 8	473136	4873381	603	55.85	25.13	0.99
POR03	1036 CONCESSION 8	473418	4873458	394	85.21	35.55	1.42
POR04	984 CONCESSION 8	473937.66	4873516.47	397	89.22	35.20	1.48
POR05	934 CONCESSION 8	474422.27	4873652.18	849	49.33	20.61	0.82
POR06	907 CONCESSION 8	474659.68	4873581.68	1027	44.24	11.76	0.46
POR07	10 SIDEROAD 20A	474992	4871718	1954	46.31	7.86	0.31
POR08	1006 BRUCE ROAD 6	474077.29	4871700.34	1536	51.12	11.02	0.43
POR09	1074 BRUCE ROAD 6	473438	4871418	1795	43.59	7.51	0.30
POR10	1105 CONCESSION 8	472796	4873089	919	42.48	14.69	0.58
POR11	1273 CONCESSION 8	471089	4872907	2635	36.61	5.75	0.23
POR12	1266 CONCESSION 8	471142	4873009	2574	36.44	5.84	0.23
POR13	1185 CONCESSION 8	471989	4872934	1739	39.28	6.22	0.25
POR14	1166 BRUCE ROAD 6	472403	4871577	2077	35.75	8.24	0.32
POR15	1242 BRUCE ROAD 6	471934	4871297	2596	32.32	4.91	0.19
POR16	1292 BRUCE ROAD 6	471346	4870924	3275	31.89	5.40	0.21
POR17	1371 CONCESSION 8	470189	4872718	3552	34.29	4.57	0.18
POR18	519 SIDEROAD 25 N	472166	4874406	1963	38.33	6.45	0.26
POR19	520 SIDEROAD 25 N	472873	4874531	1579	39.75	9.50	0.38
POR20	1206 CONCESSION 8	471728	4873169	1981	36.58	7.13	0.28

Borehole 2- Sensitive Receptors Max. POI Concentrations

Sensitive Receptor ID	Civic Address	UTM - X (m)	UTM-Y (m)	Distance to EG01 Emission Source (m)	Max. POI Concentration of NOx 1-hr (ug/m3)	Max. POI Concentration of NOx 24-hr (ug/m3)	Max. POI Concentration of SPM 24-hr (ug/m3)
POR01	1106 CONCESSION 8	472770	4873390	1675	40.60	8.75	0.35
POR02	1068 CONCESSION 8	473136	4873381	1997	37.19	6.86	0.28
POR03	1036 CONCESSION 8	473418	4873458	2286	35.16	6.10	0.24
POR04	984 CONCESSION 8	473937.66	4873516.47	2790	33.37	5.82	0.23
POR05	934 CONCESSION 8	474422.27	4873652.18	3292	30.05	5.37	0.21
POR06	907 CONCESSION 8	474659.68	4873581.68	3495	28.77	5.40	0.21
POR07	10 SIDEROAD 20A	474992	4871718	3767	31.97	4.60	0.18
POR08	1006 BRUCE ROAD 6	474077.29	4871700.34	2887	37.63	7.01	0.28
POR09	1074 BRUCE ROAD 6	473438	4871418	2404	36.89	6.55	0.26
POR10	1105 CONCESSION 8	472796	4873089	1571	40.67	7.85	0.32
POR11	1273 CONCESSION 8	471089	4872907	422	86.07	28.32	1.27
POR12	1266 CONCESSION 8	471142	4873009	489	71.65	20.48	0.97
POR13	1185 CONCESSION 8	471989	4872934	771	47.29	19.27	0.76
POR14	1166 BRUCE ROAD 6	472403	4871577	1459	41.41	7.21	0.29
POR15	1242 BRUCE ROAD 6	471934	4871297	1398	42.13	12.28	0.50
POR16	1292 BRUCE ROAD 6	471346	4870924	1629	43.71	13.26	0.53
POR17	1371 CONCESSION 8	470189	4872718	1142	58.90	12.94	0.56
POR18	519 SIDEROAD 25 N	472166	4874406	2037	37.28	6.21	0.25
POR19	520 SIDEROAD 25 N	472873	4874531	2515	32.47	4.20	0.17
POR20	1206 CONCESSION 8	471728	4873169	739	42.17	14.28	0.62