REPORT

Air Quality Impact Assessment

Durham York Energy Centre

Submitted to:

Covanta Durham York Renewable Energy Limited Partnership

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Distribution List

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Glossary of Terms

AAQC – Ambient Air Quality Criteria

ACB – Air Contaminants Benchmark

AQIA – Air Quality Impact Assessment

B1 – Benchmark 1 Ontario Regulation 419/05 Air Quality Standard

B2 – Benchmark 2 Ontario Regulation 419/05 Air Quality Screening Limit

BPIP – Building Profile Input Program

CAAQS – Canadian Ambient Air Quality Standards

CEMS – Continuous Emission Monitoring System

DND – Department of National Defence

DYEC – Durham York Energy Centre

ECA – Environmental Compliance Approval

ECCC – Environment and Climate Change Canada

EPG – Emergency Power Generator

ESDM – Emission Summary and Dispersion Modelling

ESR - Environmental Screening Report

HP – Horsepower

LAI – Leaf Area Index

m^3 - cubic metre

MCR – Maximum Continuous Rating

MECP – Ministry of Environment, Conservation and Parks

mg – milligram

MSW – Municipal Solid Waste

MTO – Ministry of Transportation Ontario

NAAQS - National Ambient Air Quality Standards

NAPS – National Air Pollution Surveillance

NAVCAN – Navigation Canada

ng - Nanogram

NOx – Nitrogen Oxides

NO_2 – Nitrogen Dioxide

O_3 - Ozone

OLM – Ozone Limiting Method

O.Reg. 419/05 – Ontario Regulation 419/05

PAH – Polycyclic Aromatic Hydrocarbons

pg – Picogram

PG – Pasquil-Gifford

PGT – Pasquil-Gifford-Turner

$PM_{2.5}$ – Particulate Matter smaller than 2.5 microns in diameter

PM_{10} – Particulate Matter smaller than 10 microns in diameter

POI – Point of Impingement

ppb – parts per billion

ppm – parts per million

Rm^3 - Cubic Metre at Referenced Conditions (Typically 0%moisture, 11% oxygen and 15 °C in this AQIA)

SO_2 – Sulphur Dioxide

SPM – Secondary Particulate Matter

TEQ – Toxic Equivalents

TPA – Tonnes per Annum

TSP – Total Suspended Matter

U.S. EPA – United States Environmental Protection Agency

VOC – Volatile Organic Compound

WPCP – Water Pollution Control Plant

WRF – Weather Research and Forecasting

Executive Summary

The Durham York Energy Centre (DYEC) is a Thermal Treatment Facility that consumes a maximum of 140,000 tonnes per annum (tpa) of municipal solid waste (MSW) to generate nominally 17.5 megawatts of electrical power. The facility is co-owned by The Regional Municipality of Durham and The Regional Municipality of York (the Regions) and is operated by Covanta Durham York Renewable Energy LP (Covanta). The Regions are currently proposing a step change increase of 20,000 tonnes to allow for processing of up to 160,000 tpa of MSW (the Project). An Air Quality Impact Assessment (AQIA) was completed to document the change in air quality as a result of the Project.

The Project will not introduce any new sources of emissions to DYEC but will impact the rate of emissions from the existing 87.6 m tall stack. Emission rates for the stack were calculated using a combination of source testing data, in-stack emission limits and emission factors. Emission rates from all other sources on-site were calculated using published emission factors.

The following scenarios were considered in this assessment:

- **Scenario 1A**: Current Maximum Operating Conditions - Main Stack operating at 140,000 tpa.
- **Scenario 1B**: Current Maximum Operating Conditions plus ancillary sources - Main Stack operating at 140,000 tpa with simultaneous silo filling and diesel-fired EPG testing.
- **Scenario 2A**: Future Maximum Operating Conditions - Main Stack operating at 160,000 tpa.
- **Scenario 2B**: Future Maximum Operating Conditions plus ancillary sources - Main Stack operating at 160,000 tpa with simultaneous silo filling and diesel EPG testing.

Modelling was completed using the CALPUFF modelling system, with meteorological data generated using observation data from surface stations and large-scale mesoscale meteorological data from the Weather Research and Forecasting (WRF) model. The model predicted concentrations of approximately 90 contaminants over a receptor grid extending 40 km x 40km, centred on DYEC. Input data were reviewed and approved by Ontario Ministry of Environment, Conservation and Parks (MECP) in advance of modelling.

To provide a cumulative assessment, the predicted concentrations of each indicator compound that result from the operation of DYEC were calculated using the CALPUFF model were added to existing background air quality concentrations. Background air quality concentrations were obtained from local air quality monitoring data completed primarily at The Region of Durham's Courtice and Rundle monitoring stations. The cumulative concentrations were compared to relevant Canadian Ambient Air Quality Standards (CAAQS) and Ontario Ambient Air Quality Criteria (AAQC).

Overall, the results of the assessment indicate that the Project would result in a small overall decrease in the maximum predicted concentrations for all contaminants because of the increase stack outlet gas temperature and flowrate. Predicted cumulative concentrations of all contaminants are below the relevant air quality criteria for all Indicator Compounds, with the exception of benzo(a)pyrene during maximum operations and nitrogen dioxides during emergency diesel generator testing.

The background concentration of benzo(a)pyrene is greater than the Project Criteria before any contribution from DYEC is included due to transportation emissions from the nearby Highway 401. Emissions from DYEC contribute less than 1% to the total ambient benzo(a)pyrene concentration for all assessed scenarios. The concentrations of benzo(a)pyrene are virtually the same before and after the operations of DYEC suggesting that the facility is not a significant source of benzo(a)pyrene.

Standby generator testing occurs for up to one hour, once per week. This assessment assumes that testing occurs while DYEC is operating at maximum capacity (i.e. 140,000 or 160,000 tpa) and during meteorological conditions that result in the worst-case dispersion and is therefore very conservative. Additionally, while the maximum predicted concentration of NO_2 is greater than the CAAQS of 79 µg/m³, it is much less than the Ontario AAQC of 400 µg/m³. There is also no significant difference in the predicted concentration of NO_2 between the current and future operating scenarios.

As a result, the increase in annual throughput of DYEC by 20,000 tpa is not expected to significantly impact local air quality.

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1.0 INTRODUCTION

The Durham York Energy Centre (DYEC) is a Thermal Treatment Facility that consumes a maximum of 140,000 tonnes per annum (tpa) of municipal solid waste (MSW) and generates nominally 17.5 MW of electrical power. The facility is co-owned by The Regional Municipality of Durham and The Regional Municipality of York (the Regions) and is operated by Covanta Durham York Renewable Energy LP (Covanta).

The Regions are currently proposing a step change increase of 20,000 tonnes to allow for processing of up to 160,000 tpa of MSW (the Project). This document summarizes the potential air quality impacts of the Project as well as supports the Environmental Screening Assessment that is being completed in accordance with the Waste Management Projects Regulation (Ontario Regulation 101/07).

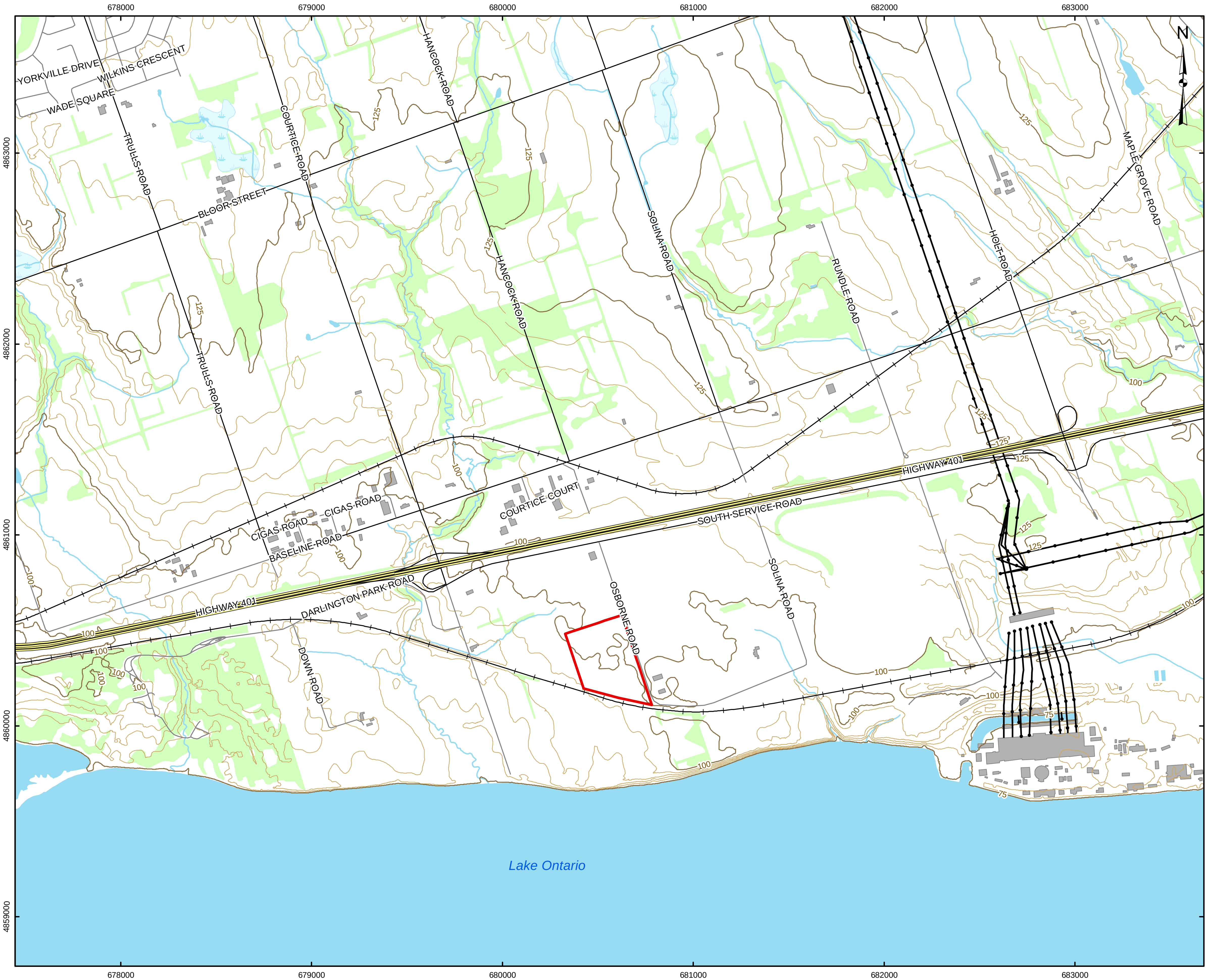
1.1 Site Description

DYEC is located at 1835 Energy Drive in Clarington, Ontario. It is 400 m south of Highway 401 and north of a CN Rail Corridor and within 500 m of the Lake Ontario Shoreline. A Site Location Plan is provided in Figure 1.

DYEC has been in commercial operation since 2016 under the multi-media Environmental Compliance Approval (ECA) 7306-8FDKNX, as amended. It is a Thermal Treatment Facility and generates electrical power from post-diversion residual waste through a steam turbine generator. Ferrous and non-ferrous metals are recovered from the ash residue for recycling. DYEC uses Martin GmbH® combustion technology to process up to 140,000 tpa of municipal solid waste and captures its energy content in the form of superheated steam used to generate electricity and potentially provide district heating to the neighbouring Courtice Waste Pollution Control Plant and Clarington Energy Park.

There are two identical combustion trains, each designed to nominally process 218 tonnes/day of Municipal Solid Waste (Maximum Continuous Rating (MCR)) referenced at 13 MJ/kg. Each train has identical boilers/furnaces and air pollution control equipment such as carbon injection, dry scrubbers and fabric filters. The treated exhaust gases are vented to a common 87.6 m stack and released into the atmosphere. A more detailed process description and process flow diagram are provided in Section 1.2 of the Environmental Screening Report (Durham and York, 2019).

The Project will increase the annual waste throughput of DYEC but no changes are proposed to the equipment or building infrastructure as part of these modifications.



LEGEND

- Major Contour (25 m)
- Minor Contour (5 m)
- Expressway
- Highway
- Major Road
- Local Road
- Railway
- Utility Line
- Watercourse
- Waterbody
- Wetland
- Woodlot
- Building Footprint
- Approximate Site Boundary

REFERENCE

Base Data - MNR NRVIS, obtained 2004, CANMAP v2006.4
Produced by Golder Associates Ltd under licence from
Ontario Ministry of Natural Resources, © Queens Printer 2008
Projection: Transverse Mercator Datum: NAD 83 Coordinate System: UTM Zone 17N

0.5 0.25 0 0.5 1

SCALE 1:20,000 KILOMETERS

PROJECT

DURHAM YORK ENERGY CENTRE
AIR QUALITY IMPACT ASSESSMENT

TITLE

SITE LOCATION PLAN

GOLDER
MEMBER OF WSP

PROJECT NO. 19117255			SCALE AS SHOWN	REV. 0.0
DESIGN	PRM	25 Aug. 2010	FIGURE: 1	
GIS	SO	8 Jan. 2020		
CHECK	KA	8 Jan. 2020		
REVIEW	AC	8 Jan. 2020		

G:\Projects\2010\10-1151-0343_Covanta\GIS\MXDs\Reporting\CofA\Air\Site_Location_Plan.mxd

1.2 Indicator Compounds

This assessment of air quality is focused on predicting changes in the airborne concentrations of Indicator Compounds which include all contaminants identified in previous air quality reports (i.e., the Emission Summary and Dispersion Modelling (ESDM) Report) (Golder, 2011), as well as additional compounds for which source testing data is routinely completed (Ortech, 2021). These substances are referred to as Indicator Compounds and are provided in Table 1, below.

Table 1: List of Indicator Compounds for the Project

Indicator Compounds			
1 – Methylnaphthalene	Benzo(b)fluorene	Dichloromethane	Particulate Matter less than 10 microns in diameter (PM10)
1,2,4 – Trichlorobenzene	Benzo(e)pyrene	Dioxins, Furans and Dioxin-like PCBs	Particulate Matter less than 2.5 microns in diameter (PM2.5)
1,2,4,5-Tetrachlorobenzene	Benzo(ghi)perylene	Ethylbenzene	Polychlorinated Biphenyls (PCB)
1,2-Dichlorobenzene	Benzo(k)fluoranthene	Ethylene Dibromide	Pyrene
2 – Methylnaphthalene	Beryllium	Fluoranthene	Selenium
2,3,4,6-Tetrachlorophenol	Biphenyl	Fluorine	Silver
2,4,6-Trichlorophenol	Boron	Formaldehyde	Sulphur Dioxide (SO2)
2,4-Dichlorophenol	Bromodichloromethane	Hexachlorobenzene	Tetrachloroethene
Acenaphthene	Bromoform	Hydrogen Chloride	Tetralin
Acenaphthylene	Bromomethane	Hydrogen Fluoride	Thallium
Acetaldehyde	Cadmium	Indeno(1,2,3 – cd)pyrene	Tin
Acrolein	Carbon Monoxide	Lead	Toluene
Aluminum	Carbon tetrachloride	Mercury	Total Chromium (and compounds)
Ammonia	Chloroform	Molybdenum	Total Suspended Particulate (TSP)
Anthracene	Chromium (hexavalent)	Naphthalene	Trichloroethane, 1,1,1 -
Antimony	Chrysene	Nickel	Trichloroethene
Arsenic	Cobalt	Nitrogen Dioxide (NO2)	Trichloroethylene, 1,1,2 -
Barium	Copper	O-terphenyl	Trichlorofluoromethane
Benzene	Dibenzo(a,c)anthracene	Pentachlorobenzene	Vanadium
Benzo(a)anthracene	Dibenzo(a,h)anthracene	Pentachlorophenol	Vinyl chloride
Benzo(a)fluorene	Dichlorodifluoromethane	Perylene	Xylenes, m-, p- and o-
Benzo(a)pyrene	Dichloroethene, 1,1 -	Phenanthrene	Zinc
Benzo(b)fluoranthene		Phosphorus	

1.3 Applicable Guidelines

1.3.1 Ambient Air Quality Criteria

The relevant air quality criteria used for screening the air quality effects of DYEC include the Ontario criteria and federal standards and objectives where provincial guidelines are not available. The Ontario Ministry of the Environment, Conservation and Parks (MECP) has set guidelines related to ambient air concentrations and are summarized in *Ontario's Ambient Air Quality Criteria* (AAQC) document (MECP, 2020). The Ontario AAQCs are characterized as desirable ambient air concentrations. They are not regulatory limits, and measured concentrations are frequently above the criteria values at various locations across Ontario due to weather conditions and long-range transportation but represent an indicator of good air quality. The Ontario AAQCs are used for screening the air quality effects in environmental assessments, studies using ambient air monitoring data, and assessment of general air quality in a community or across the province (MECP, 2020).

There are two sets of federal objectives and criteria: the National Ambient Air Quality Objectives (NAAQOs) and the Canadian Ambient Air Quality Standards (CAAQSs) (formerly National Ambient Air Quality Standards (NAAQS)). Similar to the Ontario AAQCs, the NAAQOs are benchmarks that can be used to facilitate air quality management on a regional scale and provide goals for outdoor air quality that protect public health, the environment, or aesthetic properties of the environment (CCME, 1999). The federal government has established the following levels of NAAQOs (Health Canada, 1994):

- The maximum ***Desirable*** level defines the long-term goal for air quality and provides a basis for an anti-degradation policy for unpolluted parts of the country and for the continuing development of control technology.
- The maximum ***Acceptable*** level is intended to provide adequate protection against adverse effects on soil, water, vegetation, materials, animals, visibility, personal comfort, and well-being.

The CAAQSs have been developed under the *Canadian Environmental Protection Act, 1999*, and include standards for $PM_{2.5}$, NO_2, SO_2 and ozone that must be achieved by 2020. In 2015 the standard was phased in, with the final standard phase-in date in 2020 (Government of Canada, 2013). Like the Ontario AAQCs, the CAAQSs are not regulatory limits and are used as national targets for $PM_{2.5}$, NO_2, SO_2 and ozone, excluding Quebec (CCME, 2014). These more stringent standards were adopted because, as stated by the CCME (emphasis added):

> *Canadians living in <u>heavily populated and industrialized areas</u> of the country may be exposed to potentially harmful levels of outdoor air pollutants, at concentrations that exceeded established standards.* (CCME, 2014).

However, the key aspect of "CAAQS Achievement" (i.e., compliance), as stated by the CCME, is (emphasis added):

> *Achievement of the CAAQS means that the measured air pollutant concentration in <u>an air zone</u> does not exceed the CAAQS numerical value.* (CCME, 2014).

These values are reported based on a series of monitoring stations located in airsheds across Canada and, in this context, an “air zone” refers to a local or regional sub-region of the established provincial or territorial airsheds. Currently, Southern Ontario and Southern Quebec are treated as a single Airshed (East Central) and Southern Ontario, excluding Hamilton and Sarnia, is designated as a single air zone.

For conservatism in this assessment, the lower of the NAAQO, Ontario AAQCs and the CAAQS, where applicable, were used for comparison to the maximum modelled concentrations.

1.3.2 Ontario Regulation 419/05 Air Quality limits

DYEC will also be required to demonstrate compliance with O.Reg. 419/05 air quality limits, as documented in the *Air Contaminants Benchmark (ACB) List*, dated April 2018 (MECP, 2018). The ACB list contains standards, guidelines or screening levels for approximately 5,100 contaminants and is typically used by facilities to assess their contributions of a contaminant to air as part of an ESDM report prepared under O.Reg. 419/05 to support an ECA application.

An ECA amendment application, including ESDM report, will be prepared following the completion of the Environmental Screening Assessment. O.Reg. 419/05 air quality limits are regulatory limits and apply to maximum predicted air quality concentrations from the subject facility only (i.e., not including existing background air quality) at receptors located at or beyond the property line.

The ACB list contains two kinds of benchmarks:

- Benchmark 1 (B1): O.Reg. 419/05 standards or guidelines, also referred to as Point of Impingement (POI) limits;
- Benchmark 2 (B2): Screening levels.

Contaminants released by DYEC that do not have Benchmark 1 standards or guidelines in the ACB List are considered ‘Contaminants with No Ministry POI Limits’. Where applicable, Contaminants with No Ministry POI Limits will be screened against the Benchmark 2 screening levels in the ACB List or the *de minimus* screening level.

1.3.3 Project Criteria

The criteria selected for the Project are the lower of either the Ontario AAQCs or the CAAQS. Where an Indicator Compound does not have an Ontario AAQC or CAAQS, the ACB list was used to provide a screening assessment. A comparison of the various guidelines and the selected Project Criteria is provided in Appendix A.

2.0 BACKGROUND AIR QUALITY

The background air quality represents the existing conditions of air quality before the Project. Sources which contribute to background air quality include industrial facilities, transportation, commercial and residential as well as long range transboundary air pollution. Background air quality can be described using both regional concentrations, based on publicly available data and/or information on current activities and operations for neighbouring industrial sources.

In response to condition 7(4) of the ECA for the DYEC, three ambient air monitoring stations were sited in consultation with MECP. These include:

- The Courtice Station located southwest of DYEC on the Courtice Water Pollution Control plant property,
- The Rundle Station located northeast of DYEC at the intersection of baseline road and Rundle Road, and
- The Fenceline Station on the northeast corner of the DYEC property.

The Courtice and Rundle Stations monitoring parameters are presented on Table 2. The Fenceline Station was previously used to provide measurements of metals in TSP only but was discontinued in 2020. These stations are maintained by consultants procured by the Region of Durham and are inspected regularly by the MECP. A copy of the Monitoring Plan showing the monitor locations, additional equipment descriptions and MECP approval of the Monitoring Plan for these stations is provided in Appendix B. Table 3 provides a summary of the data collection frequency for each of the DYEC monitoring stations.

Table 2: Air Quality Monitoring Parameters at the Fenceline, Courtice and Rundle Stations

Continuous Monitoring	Non-Continuous Monitoring:
Nitrogen oxides (NOx)	Total Suspended Particulate Matter (TSP)
Sulphur dioxide (SO2)	Metals (in TSP)
Particulate matter less than 2.5 microns in diameter (PM2.5)	Polycyclic Aromatic Hydrocarbons (PAHs)
	Dioxins and Furans.

Hourly wind data collected between 2015-2019 at the Courtice Station with the aid of a continuous anemometer is summarized in a wind rose in Figure 2. This diagram illustrates that the predominant wind direction over this period is from the west southwest which during the 2015-2019 period, the Courtice Station was primarily upwind of DYEC and the Rundle and Fenceline Stations were predominantly downwind of DYEC. To account for background air quality concentrations entering the local airshed, 2015-2019 data for the Courtice Station was therefore selected to describe the background air quality as it is primarily upwind of the DYEC and would avoid double counting of emissions from DYEC.

Table 3: Summary of DYEC Monitoring Stations

Station	Approximate Location	Data Collection Frequency	Relevant Parameter(s)	Start/End Date
Courtice	500 m southwest	Continuous	$PM_{2.5}$, NO_2, SO_2	May 2015-present
		Every 6 days	TSP and metals	May 2016-present
		Every 12 days	PAHs	May 2016-present
		Every 24 days	Dioxins and Furans	May 2016-present
		Continuous	Meteorological Parameters	May 2015-present
Rundle	1,900 m northeast	Continuous	$PM_{2.5}$, NO_2, SO_2	May 2015-present
		Every 6 days	TSP and metals	May 2016-present
		Every 12 days	PAHs	May 2016-present
		Every 24 days	Dioxins and Furans	May 2016-present
		Continuous	Meteorological Parameters	May 2015-present
Fenceline	0 m (northeast corner)	Every 6 days	TSP and Metals	May 2016 -2020

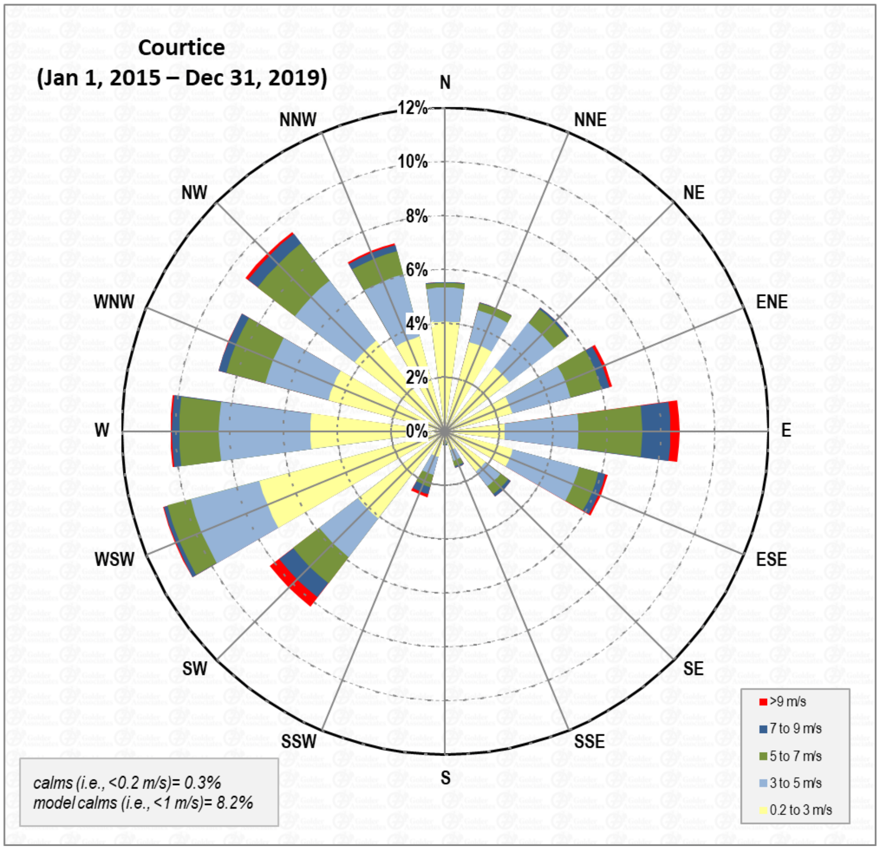


Figure 2: 2015-2019 Windrose for Courtice Station

Not all Indicator Compounds are monitored at these stations and data was supplemented with information from monitoring networks operated under the National Air Pollution Surveillance (NAPS) Network by Environment and Climate Change Canada (ECCC). The closest NAPS station to DYEC is located at Durham College, however the only Indicator Compounds that are measured at this station are NO_2 and $PM_{2.5}$, which are also measured at the Courtice and Rundle stations. The Indicator Compounds for which data is not available are primarily volatile organic compounds (VOCs). As of 2019, the NAPS website identifies only 13 stations in Ontario that measure VOCs. Three of these NAPS stations are located within 100 km of DYEC and are summarized below.

Table 4: NAPS stations within 100km that monitor VOCs

Station ID	Station name	Complete Years of Data Available	Surrounding Land Use	Proximity to DYEC
60438	Roadside -401 W Toronto	2016- 2018	Urban, Adjacent to Highway 401	65 km WSW
60440	Toronto North - Downsview	2017-2018	Urban, Close to Highway 407	60 km WNW
65101	Eagle Street and McCaffrey, Newmarket	2001-2017 (partial data for 2018)	Residential	60 km NW

As described in Table 4, the Newmarket station is the only NAPS station within 100km of DYEC for which five years of VOC monitoring data is available and was therefore carried through into the assessment for VOCs that are not monitored at Courtice or Rundle. The 2013-2017 data period was used, which is the most recent 5 year period for which data has been validated using quality control measures and is available online.

There is no monitoring data available for PM_{10} from either the Courtice or Rundle Stations, however, an approximation of the background PM_{10} concentrations can be estimated from the available $PM_{2.5}$ monitoring results. $PM_{2.5}$ is a subset of PM_{10}, and PM_{10} is a subset of TSP. It is reasonable to assume that the ambient concentrations of TSP will be greater than corresponding PM_{10} levels, and PM_{10} concentrations will be greater than the corresponding levels of $PM_{2.5}$. The mean levels of $PM_{2.5}$ in Canadian locations are found to be about 54% of the PM_{10} concentrations and about 30% of the TSP concentrations (Lall et al., 2004). By applying this ratio, the background PM_{10} concentrations for the study area was estimated.

The available air monitoring data represents the combined effect of emissions from sources near to each of the monitoring stations, as well as the effect of the emissions transported into the region. The emissions transported into the region could be considered to be the 'background air quality', which would be added to dispersion modelling results as part of the assessment.

Although gaseous monitoring equipment records concentrations in units of parts per million parts (ppm) or parts per billion parts (ppb), regulatory criteria are established on the basis of micrograms per cubic metre (µg/m³). In this section, monitoring results for gaseous compounds are presented in the units of µg/m³, to facilitate the comparison of monitoring to criteria. The conversion from ppm to µg/m³ is unique to each compound, based on the molecular weight of the compound and standard atmospheric conditions (1 atmosphere of pressure and 25°C). In contrast, particulate and metals monitoring equipment records concentrations in units of µg/m³, allowing for direct comparison to the regulatory criteria.

Appendix C includes a summary of the 24-hour and annual measured concentrations of Indicator Compounds at evaluated stations. Data presented includes the average, 75th percentile, 90th percentile and maximum of the data over the measurement period.

Table 5 provides a summary of the data carried forward into the assessment for the relevant averaging periods with comparison to the relevant Project Criteria. For the Courtice and Rundle Stations, the monitoring data was taken for the 2015-2019 data period for all contaminants that are monitored continuously ($PM_{2.5}$, NO_2 and SO_2), for all other contaminants, monitoring commenced in 2016, therefore the 2016-2019 period was used for these contaminants. For averaging periods of 24-hours or less, the 90th percentile of the data was used to represent background air quality. For annual averaging periods, the annual average was used. Data was primarily taken from the Courtice monitoring station as this is primarily upwind of DYEC and will avoid double counting. Where Courtice data is not available, data was taken form the Rundle Station. Where an indicator compound is not monitored at either location, data was taken from Newmarket NAPS Station. The measured concentrations of background air quality are below the project criteria for all Indicator Compounds, with the exception of Benzo(a)pyrene. Benzo(a)pyrene is a poly aromatic hydrocarbon (PAH) that is formed during the incomplete combustion. Significant sources of PAHs include exhaust from motor vehicles and the iron and steel industry. Exceedence of the Ontario AAQC for Benzo(a)pyrene is typical of urban settings in Southern Ontario (MECP, 2018a).

Table 5: Background Air Quality Concentrations

Indicator Compound	Averaging Period [hours]	Project Criteria [µg/m³]	Monitored Concentrations [µg/m³]			Background Air Quality Concentration [µg/m³]	Percentage of Project Criteria
			Courtice Station	Rundle Station	Newmarket Station VOC data		
1-Methylnaphthalene	24-hour	35.5	0.009	0.019	—	0.009	<1%
1,2,4 – Trichlorobenzene	24-hour	400	—	—	0.008	0.008	<1%
1,2,4,5-Tetrachlorobenzene	24-hour	1	—	—	—	—	—
1,2-Dichlorobenzene	24-hour		—	—	0.004	0.004	—
1,2-Dichlorobenzene	1-hour	30500	—	—	—	0.009	<1%
2-Methylnaphthalene	24-hour	0.1	0.015	0.037	—	0.015	15%
2,3,4,6-Tetrachlorophenol	24-hour	0.75	—	—	—	—	—
2,4,6-Trichlorophenol	24-hour	1.5	—	—	—	—	—
2,4-Dichlorophenol	24-hour	33.5	—	—	—	—	—
Acenaphthene	24-hour	0.1	0.01	0.02	—	0.01	10%
Acenaphthylene	24-hour	0.1	0.0003	0.0004	—	0.0003	<1%
Acetaldehyde	24-hour	500	—	—	—	—	—
Acetaldehyde	1/2-hour	500	—	—	—	—	—
Acrolein	1-hour	4.5	—	—	—	—	—
Acrolein	24-hour	0.4	—	—	—	—	—
Aluminum	24-hour	12	0.21	0.42	—	0.21	2%
Ammonia	24-hour	100	—	—	—	—	—
Anthracene	24-hour	0.1	0.0004	0.0016	—	0.0004	<1%
Antimony	24-hour	25	0.003	0.003	—	0.003	<1%
Arsenic	24-hour	0.3	0.002	0.002	—	0.002	<1%
Barium	24-hour	10	0.01	0.02	—	0.01	<1%

Indicator Compound	Averaging Period [hours]	Project Criteria [µg/m³]	Monitored Concentrations [µg/m³]			Background Air Quality Concentration [µg/m³]	Percentage of Project Criteria
			Courtice Station	Rundle Station	Newmarket Station VOC data		
Benzene	Annual	0.45	—	—	0.40	0.40	88%
Benzene	24-hour	2.3	—	—	0.62	0.62	27%
Benzo(a)anthracene	24-hour	0.1	0.0001	0.0001	—	0.0001	<1%
Benzo(a)fluorene	24-hour	0.1	0.0002	0.0002	—	0.0002	<1%
Benzo(a)pyrene	Annual	0.00001	0.00003	0.00003	—	0.00003	256%
Benzo(a)pyrene	24-hour	0.00005	0.00006	0.00007	—	0.00006	115%
Benzo(b)fluoranthene	24-hour	0.1	0.0001	0.0001	—	0.0001	<1%
Benzo(b)fluorene	24-hour	0.1	0.0002	0.0002	—	0.0002	<1%
Benzo(e)pyrene	24-hour	0.1	0.0002	0.0002	—	0.0002	<1%
Benzo(g,h,i)Perylene	24-hour	0.1	0.0001	0.0001	—	0.0001	<1%
Benzo(k)fluoranthene	24-hour	0.1	0.0001	0.0001	—	0.0001	<1%
Beryllium	24-hour	0.01	0.0004	0.0003	—	0.0004	4%
Biphenyl	1-hour	60	—	—	—	—	—
Boron	24-hour	120	0.01	0.01	—	0.01	<1%
Bromodichloromethane	24-hour	350	—	—	0.01	0.01	<1%
Bromoform	24-hour	55	—	—	0.02	0.02	<1%
Bromomethane	24-hour	1350	—	—	0.06	0.06	<1%
Cadmium	24-hour	0.025	0.0007	0.0007	—	0.0007	3%
Cadmium	Annual	0.005	0.0007	0.0007	—	0.0007	13%
Carbon Monoxide	1/2-hour	6000	—	—	—	—	—
Carbon Monoxide	1-Hour	15000	—	—	—	—	—
Carbon Monoxide	8-hour	6000	—	—	—	—	—
Carbon tetrachloride	24-hour	2.4	—	—	0.59	0.59	25%
Chloroform	24-hour	1	—	—	0.22	0.22	22%

Indicator Compound	Averaging Period [hours]	Project Criteria [µg/m³]	Monitored Concentrations [µg/m³]			Background Air Quality Concentration [µg/m³]	Percentage of Project Criteria
			Courtice Station	Rundle Station	Newmarket Station VOC data		
Chloroform	Annual	0.2	—	—	0.13	0.13	67%
Chromium (hexavalent)	Annual	0.00014	—	—	—	—	—
Chromium (hexavalent)	24-hour	0.07	—	—	—	—	—
Chrysene	24-hour	0.1	0.0001	0.0001	—	0.0001	<1%
Cobalt	24-hour	0.1	0.0007	0.0007	—	0.0007	<1%
Copper	24-hour	50	0.03	0.03	—	0.03	<1%
Dibenzo(a,c)anthracene	24-hour	0.1	—	—	—	—	—
Dibenzo(a,h)anthracene	24-hour	0.1	0.0001	0.0001	—	0.0001	<1%
Dichlorodifluoromethane	24-hour	500000	—	—	2.76	2.76	<1%
Dichloroethene, 1,1 -	24-hour	10	—	—	0.0004	0.0004	<1%
Dichloromethane	24-hour	220	—	—	0.49	0.49	<1%
Dichloromethane	Annual	44	—	—	0.35	0.35	<1%
Dioxins, Furans and Dioxin- like PCBs	24-hour	0.1	0.02	0.02	—	0.02	21%
Ethylbenzene	24-hour	1000	—	—	0.35	0.35	<1%
Ethylbenzene	10-minute	1900	—	—	—	1.43	<1%
Ethylene Dibromide	24-hour	3	—	—	0.002	0.002	<1%
Fluoranthene	24-hour	0.1	0.002	0.005	—	0.002	2%
Fluorene	24-hour	0.1	—	—	—	—	—
Formaldehyde	24-hour	65	—	—	—	—	—
Hexachlorobenzene	24-hour	0.011	—	—	—	—	—
Hydrogen Chloride	24-hour	20	—	—	—	—	—
Hydrogen Fluoride	24-hour	1.72	—	—	—	—	—
Hydrogen Fluoride	30-day	0.69	—	—	—	—	—

Indicator Compound	Averaging Period [hours]	Project Criteria [µg/m³]	Monitored Concentrations [µg/m³]			Background Air Quality Concentration [µg/m³]	Percentage of Project Criteria
			Courtice Station	Rundle Station	Newmarket Station VOC data		
Indeno(1,2,3-cd)Pyrene	24-hour	0.1	0.0001	0.0001	—	0.0001	<1%
Lead	24-hour	0.5	0.0041	0.0045	—	0.0041	<1%
Lead	30-day	0.2	—	—	—	—	—
Mercury	24-hour	2	—	—	—	—	—
Molybdenum	24-hour	120	0.001	0.001	—	0.001	<1%
Naphthalene	24-hour	22.5	0.04	0.05	0.07	0.04	<1%
Naphthalene	10-minute	50	—	—	—	0.17	<1%
Nickel	Annual	0.04	0.001	0.001	—	0.001	3%
Nickel	24-hour	2	0.001	0.002	—	0.001	<1%
Nitrogen Dioxides	24-hour	200	22.28	19.83	—	22.28	11%
Nitrogen Dioxides	1-hour	79	30.00	23.54	—	30.00	38%
Nitrogen Dioxides	Annual	22.5	14.04	12.48	—	14.04	62%
O-terphenyl	24-hour	0.1	0.0002	0.0002	—	0.0002	<1%
Pentachlorobenzene	24-hour	80	—	—	—	—	—
Pentachlorophenol	24-hour	20	—	—	—	—	—
Perylene	24-hour	0.1	0.0002	0.0002	—	0.0002	<1%
Phenanthrene	24-hour	0.1	0.01	0.03	—	0.01	10%
Phosphorus	24-hour	0.5	0.48	0.57	—	0.48	96%
PM_{10}	24-hour	50	24.48	28.37	—	24.48	49%
$PM_{2.5}$	24-hour	27	13.22	15.32	—	13.22	49%
$PM_{2.5}$	Annual	8.8	8.12	8.92	—	8.12	92%
Polychlorinated Biphenyls (PCB)	24-hour	0.1	—	—	—	—	—
Pyrene	24-hour	0.1	0.001	0.002	—	0.001	<1%

Indicator Compound	Averaging Period [hours]	Project Criteria [µg/m³]	Monitored Concentrations [µg/m³]			Background Air Quality Concentration [µg/m³]	Percentage of Project Criteria
			Courtice Station	Rundle Station	Newmarket Station VOC data		
Selenium	24-hour	10	0.003	0.003	—	0.003	<1%
Silver	24-hour	1	0.0017	0.0017	—	0.0017	<1%
Sulphur Dioxide	10-minute	178	11.75	4.03	—	19.41	11%
Sulphur Dioxide	1-hour	106	11.75	4.03	—	11.75	8%
Sulphur Dioxide	24-hour	150	12.64	4.08	—	12.64	8%
Sulphur Dioxide	Annual	10.5	5.26	2.34	—	5.26	50%
Tetrachloroethene	24-hour	360	—	—	0.13	0.13	<1%
Tetralin	24-hour	151.5	0.003	0.003	—	0.003	<1%
Thallium	24-hour	0.5	0.003	0.003	—	0.003	<1%
Tin	24-hour	10	0.003	0.003	—	0.003	<1%
Toluene	24-hour	2000	—	—	2.08	2.08	<1%
Total Chromium (and compounds)	24-hour	0.5	0.01	0.01	—	0.01	1%
Total Chromium (and compounds)	24-hour	5	0.01	0.01	—	0.01	<1%
Total Suspended Particulate	24-hour	120	42.93	65.16	—	42.93	36%
Total Suspended Particulate	Annual	60	26.00	35.60	—	26.00	43%
Trichloroethane, 1,1,1 -	24-hour	115000	—	—	0.03	0.03	<1%
Trichloroethene	24-hour	0.1	—	—	—	—	—
Trichloroethylene, 1,1,2 -	24-hour	12	—	—	0.15	0.15	1%
Trichloroethylene, 1,1,2 -	Annual	2.3	—	—	0.05	0.05	2%
Trichlorofluoromethane	24-hour	6000	—	—	1.77	1.77	<1%

Indicator Compound	Averaging Period [hours]	Project Criteria [µg/m³]	Monitored Concentrations [µg/m³]			Background Air Quality Concentration [µg/m³]	Percentage of Project Criteria
			Courtice Station	Rundle Station	Newmarket Station VOC data		
Vanadium	24-hour	2	0.002	0.002	—	0.002	<1%
Vinyl chloride	24-hour	1	—	—	0.004	0.004	<1%
Vinyl chloride	Annual	0.2	—	—	0.002	0.002	1%
Xylenes, m-, p- and o-	24-hour	730	—	—	0.87	0.87	<1%
Xylenes, m-, p- and o-[3]	10-minute	3000	—	—	—	3.49	<1%
Zinc	24-hour	120	0.06	0.05	—	0.06	<1%

Notes: "—" means the indicator compound is not routinely measured at this station. **Bold** values represent the monitoring data carried forward into the cumulative air quality assessment.

1. 1 hour average concentration estimated from measured 24-hour concentration using conversion factors taken from Section 4.5 of Air Dispersion Modelling Guideline for Ontario (MECP, 2017a)
2. 10 minute average concentration estimated from measured 24-hour concentration using conversion factors taken from Section 4.5 of Air Dispersion Modelling Guideline for Ontario (MECP, 2017a)
3. 10 minute average concentration estimated from measured 1-hour concentration using conversion factors taken from Section 4.5 of Air Dispersion Modelling Guideline for Ontario (MECP, 2017a)

3.0 EMISSION SOURCES

The proposed increase in annual tonnage does not introduce any new sources of emissions to DYEC. Table 6 outlines the emission sources at the DYEC, the contaminants they are expected to release and any changes to the emissions of these sources as a result of the Project.

Table 6: Emission Sources

Emission Sources	Expected Contaminants	Impact of Proposed Project	Considered in this assessment?
Emissions from air pollution control equipment on the waste processing trains, which exhaust through a single 87.6 m tall stack **(The Main Stack)**	Products of combustion, particulate matter, metals, Volatile Organic Compounds, Polyaromatic hydrocarbons, odour	Annual emissions are expected to increase as the amount of waste processed annually increases.	Yes
Fugitive emissions from transport and handling of the lime, carbon, cement and pozzolan silos **(Silo Filling)**	Particulate Matter, portland cement, calcium hydroxide, calcium oxide, carbon and silica	No Change	Yes (Particulate matter only). Particulate matter is the only contaminant that is also released from the main stack and is present in the siloed materials at a concentration greater than 1%
Testing of one 300 kW diesel emergency power generator (EPG), tested for one hour, once per week. **(EPG Testing)**	Products of combustion	No Change	Yes (Nitrogen Oxides only)
Testing of two 224 kW emergency diesel fire pumps tested independently for 30 minutes, once per week.	Products of combustion	No Change	No, the fire pumps are stand-by equipment that are used in the event of an emergency only. Testing of the fire pumps occurs for 30 minutes, weekly. All emergency equipment is tested independently, therefore only the largest generator was carried forward.
Ventilation exhaust fans for the Residual Ash Building	Particulate Matter	No Change	No, emissions from the exhaust fans represent less than 5% of all particulate matter emissions and are therefore considered negligible
Natural gas fired comfort heating equipment for administration buildings	Products of combustion	No Change	No, emissions from natural gas fired HVAC are considered negligible
Truck Traffic	Products of combustion	The proposed increase in truck traffic is approximately 4 trucks per day to a total of 27 trucks per day.	No, given the close proximity of the site to Highway 401, which has an Annual Average Daily Traffic of 98,000 (MTO, 2016)[1], the impact of the additional truck is anticipated to be negligible and will not be considered further in the AQIA.

Note:

MTO data for the 3.2 km stretch of Highway 401 between Holt Road and Courtice Road for 2016

Of the sources identified, the only emission rates that will be significantly impacted by the proposed project are emissions from the main stack. A dispersion modelling plan showing the location of the DYEC sources to be modelled is provided as Figure 4.

The proposed Project does not introduce any new sources of equipment or any modifications to the existing equipment. As a result, maximum start-up and shut down conditions remain unchanged from the existing permitted conditions and are not considered in this assessment.

The following scenarios have been considered in this assessment:

- **Scenario 1A**: Current Maximum Operating Conditions - Main Stack operating at 140,000 tpa.
- **Scenario 1B**: Current Maximum Operating Conditions plus ancillary sources - Main Stack operating at 140,000 tpa with simultaneous silo filling and diesel-fired EPG testing.
- **Scenario 2A**: Future Maximum Operating Conditions - Main Stack operating at 160,000 tpa.
- **Scenario 2B**: Future Maximum Operating Conditions plus ancillary sources - Main Stack operating at 160,000 tpa with simultaneous silo filling and diesel EPG testing.

Emissions from ancillary activities such as silo filling and diesel generator testing will not be impacted by the proposed increase in throughput but were included in Scenarios 1B and 2B to illustrate the worst case scenarios.

3.1 Emission Rates

Sample Calculations for all sources are provided in Appendix D, a brief overview of the methodology used to calculate emission rates for each source is provided in the sections below.

3.1.1 Main Stack

Emission rates of Indicator Compounds released from the main stack were calculated using a combination of, source testing data (Ortech, 2021), in-stack emission limits and emission factors. For conservatism, it was assumed that the main stack operates at maximum capacity 24/7, 365 days per year in all scenarios.

3.1.1.1 Source Testing

Source testing is completed twice annually for the main stack to measure in-stack emission concentrations in milligrams per cubic metre of exhaust air (mg/m^3), provided at reference conditions of 0% moisture, 11% oxygen and at 25°C. These in-stack concentrations were multiplied by the flow rate of the stack exhaust at the relevant operating condition (i.e., 140,000 tpa or 160,000 tpa), provided in cubic metres per second (m^3/s) at the same reference conditions to calculate an emission rate in grams per second (g/s).

3.1.1.2 In-Stack Emission Limits

The ECA for DYEC identifies in-stack emission limits for nine of the Indicator Compounds included in this assessment, a summary is provided in Table 7.

Table 7: DYEC In-Stack Emission Limits

Indicator Compound	In-Stack Emission Limit [1]
Total Suspended Particulate (Filterable)	9 mg/Rm^3
Cadmium	7 micrograms (µg)/Rm^3
Lead	50 µg/Rm^3
Mercury	15 µg/Rm^3
Dioxins and Furans	60 picograms (pg)/Rm^3 Toxic Equivalent (TEQ)
Hydrogen Chloride	9 mg/Rm^3
Sulphur Dioxide	35 mg/Rm^3
Nitrogen Oxides	121 mg/Rm^3
Carbon Monoxide	40 mg/Rm^3

Note:

1. Reference conditions of 0% moisture, 11% oxygen and 25 °C

All of the Indicator Compounds identified in Table 7 are routinely monitored through either source testing (discussed above) or a Continuous Emission Monitoring System (CEMS) to verify compliance. However, for conservatism, the in-stack emission limit was used to calculate emission rates for the 9 indicator compounds identified in Table 7.

3.1.1.3 Emission Factors

Five of the Indicator Compounds assessed are not routinely monitored through source testing and do not have in-stack emission limits, specifically:

- Aluminum;
- Boron;
- Chromium (hexavalent);
- Phosphorous; and
- Tin.

These Indicator Compounds were included in the AQIA as there is published data available indicating that they could be released as a by-product from the combustion of MSW and to maintain consistency with previous studies for DYEC including the ESDM Report (Golder, 2011). Emission rates for these Indicator Compounds were calculated using manufacturers specifications where available or information from previous studies for waste incineration emission in Ontario, including "Risk Assessment for Algonquin Power Energy from Waste Facility" (Genivar/Jacques Whitford, 2007) and "Technical Report on the Environmental Risks of Non-Hazardous Waste Landfilling and Incineration" (MECP, 1999).

3.1.2 Silo Filing

There are four silos at DYEC. Emissions occur during silo filling and are controlled by a baghouse dust collector. Each silo takes approximately four hours to fill and is filled less than once per day. A summary of the various parameters for the four silos is provided in Table 8, below.

Table 8: Silo Parameters

Parameter	Hydrated Lime Silo	Carbon Silo	Pozzolan Silo	Portland Cement Silo
Usage rate (lb/hr)	401	60	207	227
Delivery Payload (tons)	20	20	25	20
Delivery Payload (tonnes)	18.1	18.1	22.7	18.1
Fill Frequency (days)	4.2	27.8	10.1	7.3
Deliveries per year	88.8	14.1	37.3	50.7
Baghouse Filter Efficiency (g/m^3)	0.0344	0.0344	0.0344	0.0344
Baghouse Filter Flow Rate (m^3/s)	0.31	0.31	0.31	0.31

Maximum 1-hour averaged emission rates for silo filling were calculated by multiplying together the baghouse filter efficiency and flow rate to obtain an emission calculation in g/s. To calculate 24-hour averaged emission rates, the maximum 1-hour emission rate was multiplied by the maximum number of hours a silo may be filled over a 24 hour period (i.e., 4/24). Sample Calculations are provided in Appendix D. For conservatism it was assumed that all four silos are filled simultaneously on a daily basis.

3.1.3 EPG Testing

The diesel emergency power generator is tested for up to 1 hour, once per week. Maximum emissions occur when the generator is operating at 100% capacity. Emission rates for the generator were calculated using published emission factors taken from United States Environmental Protection Agency (U.S. EPA) Compilation of Emission Factors (U.S. EPA, 1996) for diesel engines. The emission factor for Nitrogen Oxides is provided in pounds per horsepower-hour power output. The maximum 1-hour emission rate was calculated by multiplying the emission factor by the maximum power output of the generator in horsepower (402 HP) and converted to the relevant units to obtain an emission rate in g/s. To calculate 24-hour and annual averaged emission rates, the maximum 1-hour emission rate was multiplied by the maximum number of hours the EPG is typically operated over a 24-hour or annual period (i.e., 1/24 and 52/365). Sample Calculations are provided in Appendix D.

4.0 MODELLING SYSTEM DESCRIPTION

The U.S. EPA CALPUFF/CALMET modelling system was selected for use in this AQIA. This model was selected both for consistency with previous air quality studies for DYEC (e.g. Golder, 2011) and also because of the tall height of the Main Stack and its proximity to the Lake Ontario, resulting in the potential for shoreline fumigation. Shoreline fumigation may occur along the shore of an ocean or a large lake (e.g. Lake Ontario). When the land is warmer than the water, a breeze forms as the warmer, lighter inland air rises. As the stable, cooler air from over the water moves inland, it is heated from below, resulting in a turbulent boundary layer of air that rises with downwind distance from the shoreline. The plume from a tall stack source located near the shoreline may intersect this turbulent layer and be rapidly mixed to the ground, a process called "fumigation," resulting in high ground level concentrations. In Ontario, CALPUFF is one of the recommended air dispersion models to accurately represent potential impacts of shoreline fumigation (MECP, 2017a).

The CALPUFF (Scire, et al., 2000a,b) model is a multi-layer, multi-species Lagrangian Gaussian puff dispersion model that can simulate the transport, transformation, and removal of pollutants under time- and space-varying meteorological conditions. The CALPUFF model can be used for both steady-state and non-steady-state meteorology. CALPUFF is extremely useful for situations such as long distance transport (>10 km) having temporally and/or spatially varying wind flow fields caused by complex terrain, non-uniform land use patterns or coastal effects, and also in conditions involving calm or very low wind speeds with variable wind directions.

The main components of the CALPUFF/CALMET Modelling System consists of

- CALMET - the meteorological model (that develops hourly wind and temperature fields on a three dimensional gridded modelling domain);
- CALPUFF - the transport and dispersion model (that transports "puffs" of material emitted from sources considered for modeling) and generates hourly concentrations, or hourly deposition fluxes, that are evaluated at receptor(s) of interest); and
- CALPOST as the post processor (that is used to process CALPUFF output files).

Figure 3 provides an overview of the CALPUFF modelling system.

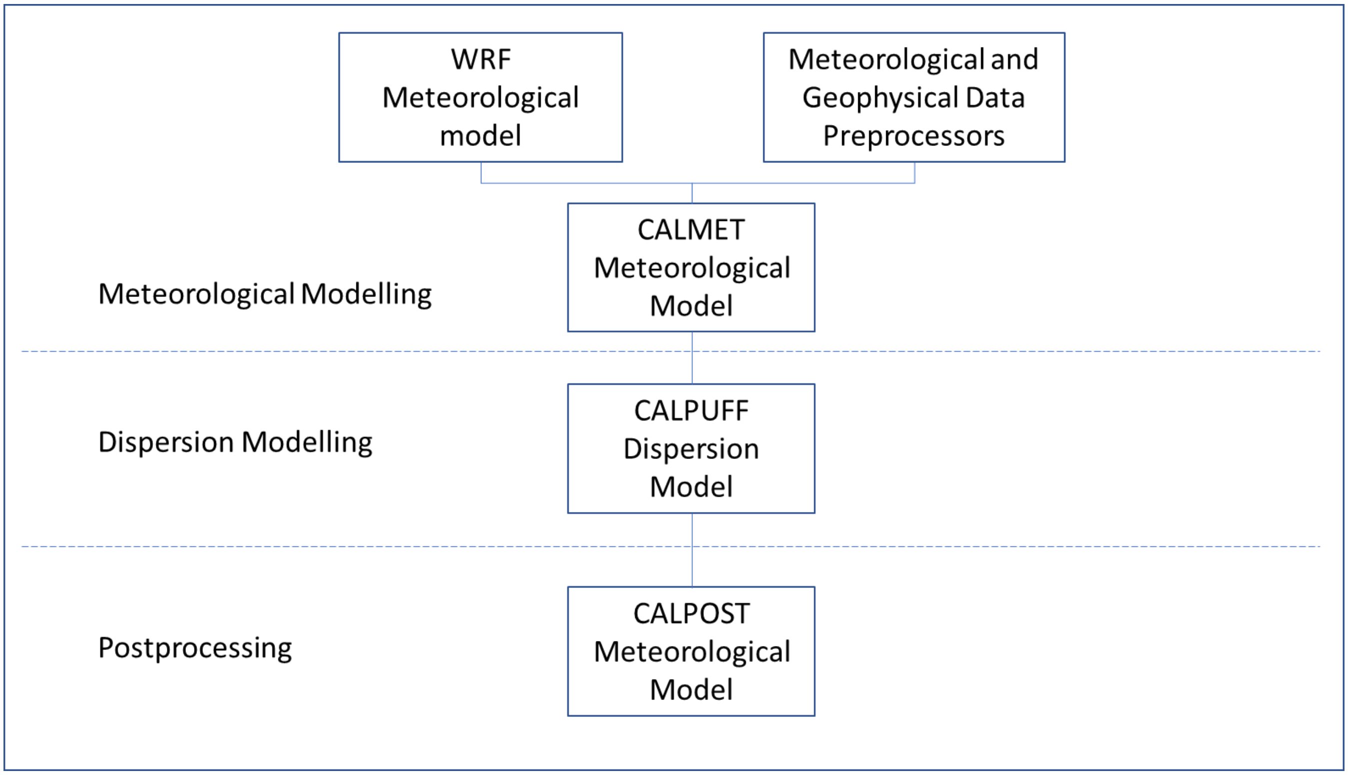


Figure 3: Overview of CALPUFF Modelling System

4.1 Major Features of CALMET

CALMET is a diagnostic meteorological model that produces three-dimensional wind fields based on parameterized treatments of terrain effects, such as slope flows, terrain blocking effects, and kinematic effects. Meteorological observations are used to determine the wind field in areas where the observations are representative. Gridded hourly meteorological data produced by Weather Research and Forecasting (WRF) model can be used as the initial guess for the wind fields. The diagnostic wind module in CALMET will determine fine scale terrain effects.

The CALMET meteorological model consists of a diagnostic wind field module and micrometeorological modules for overwater and overland boundary layers. When using large domains, the user has the option to adjust input winds to a Lambert Conformal Projection coordinate system to account for Earth's curvature. The diagnostic wind field module uses a two-step approach to the computation of the wind fields. In the first step, an initial-guess wind field is adjusted for kinematic effects of terrain, slope flows, and terrain blocking effects to produce a Step 1 wind field. The prognostic grid of meteorological data can be used for the initial guess field. The second step consists of an objective analysis procedure to introduce observational data into the Step 1 wind field to produce a final wind field.

4.1.1 Initial Wind Field

4.1.1.1 Kinematic Effects of Terrain

The approach of Liu and Yocke (1980) is used to evaluate kinematic terrain effects. The domain-scale winds are used to compute a terrain-forced vertical velocity, subject to an exponential, stability-dependent decay function. The kinematic effects of terrain on the horizontal wind components are evaluated by applying a divergence-minimization scheme to the initial guess wind field. The divergence-minimization scheme is applied iteratively until the three-dimensional divergence is less than a threshold value.

4.1.1.2 Blocking Effects

The thermodynamic blocking effects of terrain on the wind flow (i.e., wind deflecting over and around obstacles) are parameterized in terms of the local Froude number (Allwine and Whiteman, 1985). If the Froude number at a particular grid point is less than a critical value and the wind has an uphill component, the wind direction is adjusted to be tangent to the terrain.

4.1.2 CALMET Boundary Layer Models

The CALMET model contains two boundary layer models; one for application to separate overland situations and the other for application to overwater situations. As DYEC is on Lake Ontario, the use of this option was selected.

4.1.2.1 Overland Boundary Layer Model

Over land surfaces, the energy balance method of Holtslag and van Ulden (1983) is used to compute hourly field grids of the sensible heat flux, surface friction velocity, Monin-Obukhov length, and convective velocity scale. Mixing heights are determined from the computed hourly surface heat fluxes and observed temperature soundings using a modified Carson (1973) method based on Maul (1980). The model also determines field grids of Pasquil-Gifford-Turner (PGT) stability class and optional hourly precipitation rates.

4.1.2.2 Overwater Boundary Layer Model

The aerodynamic and thermal properties of water surfaces suggest that a different method is best suited for calculating the boundary layer parameters in lakeshore environment. A profile technique, using air-lake temperature differences, is used in CALMET to compute the micro-meteorological parameters in the lakeshore boundary layer. An upwind-looking spatial averaging scheme is optionally applied to the mixing heights and 3-dimensional temperature fields in order to account for important advective effects.

4.2 Major Features of CALPUFF

CALPUFF utilizes a non-steady-state, or dynamic, modelling approach, which evaluates the effects of spatial changes in the meteorological and surface characteristics, to properly evaluate the air quality changes that result from the emissions sources (Scire et al., 2000a,b). The U.S. EPA has formally accepted CALPUFF as a recommended or “Appendix A Guideline Model” (Federal Register, November 9, 2005). CALPUFF is also recommended for source-receptor distances greater than 50 km, and for use on a case-by-case basis to simulate effects of shoreline fumigation (MECP, 2017a)

CALPUFF is a non-steady-state puff dispersion model that dynamically tracks emissions from source to receptor within areas. It accounts for spatial changes in the CALMET-produced meteorological fields, variability in surface conditions (elevation, surface roughness, vegetation type, etc.), chemical transformation, wet removal due to rain and snow, dry deposition, and terrain influences on plume interaction with the surface.

By its puff-based formulation and through the use of three-dimensional meteorological data developed by the CALMET meteorological model, CALPUFF can simulate the effects of time-varying and space-varying meteorological conditions on pollutant transport from sources in complex terrain.

4.2.1 Overwater and Coastal Interaction Effects

The CALMET meteorological model contains both overwater and overland boundary layer algorithms and the effects of water bodies on plume transport, dispersion, and deposition can be simulated with CALPUFF. The puff formulation of CALPUFF is designed to handle spatial changes in meteorological and dispersion conditions, including the abrupt changes, which occur at the coastline of a major body of water, such as Lake Ontario.

4.2.2 Wet and Dry Deposition

A full resistance model is provided in CALPUFF for the computation of wet and dry deposition rates of gases and particulate matter as a function of geophysical parameters, meteorological conditions, and pollutant species. Options are provided to allow user-specified, diurnally variable deposition velocities to be used for one or more pollutants instead of the resistance model (e.g., for sensitivity testing) or to by-pass the deposition models completely. For conservatism, deposition effects were not included in this assessment.

4.2.3 Wind Shear Effects

CALPUFF contains an optional puff splitting algorithm that allows vertical wind shear effects across individual puffs to be simulated. Differential rates of dispersion and transport among the "new" puffs generated from the original well-mixed puff can substantially increase the effective rate of horizontal spread of the material.

5.0 DISPERSION MODELLING

The dispersion model and version selected for use in this assessment is the U.S. EPA CALPUFF model version 7.2.1, level 150618, and CALMET model version 6.5.0, level 150223. Further details of the inputs into each model are provided in the sections below.

5.1 Modelling Domain

The modelling domain used for this assessment covers a 40 km x 40 km surface which extends 25 km to the west, north and east of DYEC and 15 km to the south (which is dominated by Lake Ontario). A 250 m grid resolution was used to depict the variation in meteorological conditions created by the land-water interface.

Vertical profiles of wind direction, wind speed, temperature and turbulence are important because these parameters vary with elevation and influence transport and dispersion processes. In order to simulate this vertical variation, 8 layers were selected to use in the CALMET model. The vertical layers used in this study are at the heights of 0, 20, 50, 100, 200, 500, 1000, 2000 and 3300 m.

5.2 Meteorological Data Input

The following sections describe the meteorological inputs to the CALMET model. The CALMET model was executed using observation data from surface stations and large-scale mesoscale meteorological data from the Weather Research and Forecasting (WRF) model between 2014 – 2018, inclusive. The surface stations utilized as data input are outlined in Table 9. Where gaps in the data exist, the WRF data was used to complete the dataset.

The 1 km horizontal grid spacing WRF data for the model years 2014-2018 was processed and provided by Meteosim (Meteosim, 2021). A copy of the WRF Validation Report summarizing the inputs and verification is provided in Appendix E. This data was reviewed and approved by the MECP for use in this AQIA before the completion of the CALMET modelling (MECP, 2021a).

5.2.1 Meteorological Stations

Meteorology parameters are measured at a number of federally maintained meteorological stations close to the site. In addition to the federal stations, the two ambient air quality monitoring stations that were initiated in response to condition 7(4) of the ECA for the DYEC (Courtice and Rundle) both contain meteorological stations. As previously mentioned in Section 2, the Courtice and Rundle Stations are maintained by the Region of Durham and are inspected regularly by the MECP. A copy of the Monitoring Plans and MECP approval of the plan for these stations is provided in Appendix B along with copies of the calibration records.

CALMET was executed using surface station, buoy and WRF data; upper air soundings were not used.

A summary of the meteorological stations that will be considered in the CALMET modelling are provided in Table 9, below.

Table 9: Meteorological Stations to be Used in CALMET

Station name	ID	Type	CALMET Pathway	Parameters Measured
Courtice	N/A	Region of Durham	Surface	Temperature, relative humidity, Wind Speed and direction, atmospheric pressure and precipitation
Rundle	N/A	Region of Durham	Surface	Temperature, relative humidity, Wind Speed and direction, and precipitation
Buttonville	71639	ECCC/Navigation Canada (NAVCAN)	Surface	Temperature, relative humidity, Wind Speed and direction.
Cobourg	71431	ECCC	Surface	Temperature, relative humidity, Wind Speed and direction.
Oshawa	71697	ECCC	Surface	Temperature, relative humidity, Wind Speed and direction.
Toronto International Airport	71624	ECCC/NAVCAN	Surface	Temperature, relative humidity, Wind Speed and direction.
Toronto City Centre (Island Airport)	71265	ECCC	Surface	Temperature, relative humidity, Wind Speed and direction.
Trenton Airport	71621	Department of National Defence (DND)	Surface	Temperature, relative humidity, Wind Speed and direction.
Ajax	45159	National Buoy Data centre	Buoy	Temperature, Wind Speed and Direction, Air – Lake temperature difference

A meteorological data review of the Courtice and Rundle Stations was completed by Golder, prior to inclusion in the air dispersion modelling. A copy of the review and data analysis including a comparison to ECCC data from the Oshawa Station is provided in Appendix F.

5.2.2 Geophysical Data Input

To initialize the CALMET model, terrain elevation and land use data depicting the geophysical conditions in the modelling domain are required. In addition to terrain data, CALMET uses surface parameters such as surface roughness length, albedo, bowen ratio, leaf area index, soil heat flux and anthropogenic heat flux to estimate meteorological parameters. The model's pre-processor, MAKEGEO, values are assigned for each surface parameter based on land use categories. Some geophysical data parameters change throughout the year (e.g. snow cover may impact some parameters). As a result, geophysical data files were created four each of the four Ontario seasons.

5.2.2.1 Land Use

Each meteorological grid cell was assigned one (or more, in the case of mixed land use cells) land use categories defined by CALMET. For this assessment, a data file of land uses for each grid cell was provided by MECP for review and inclusion in the AQIA.

5.2.2.2 Terrain

Terrain is the vertical dimension of land surface. DYEC is located in relatively flat terrain but approximately 500m from the Lake Ontario shoreline.

Terrain data was downloaded from the MECP's database of regional terrain data for modelling (MECP, 2017b) and processed using the CALPUFF pre-processor, TERREL.

5.2.2.3 Roughness Length

Roughness length (zo) is a measure of the aerodynamic roughness of a surface and is related to the height, shape and density of the surface as well as the wind speed. Different land uses are assigned different roughness lengths within the MAKEGEO pre-processor (part of the CALMET package). A roughness length was provided for each land use, for each season in the land use data set provided by MECP for this AQIA.

5.2.2.4 Albedo

The albedo is a measure of the reflectivity of the Earth's surface. This is a very important parameter in meteorological dispersion modelling because it provides a measure of the amount of incident solar radiation that is absorbed by the Earth's atmosphere. Absorbed solar radiation is one of the driving forces for local, regional, and global atmospheric dynamics. Albedo is defined as the ratio of reflected solar radiation to the total incoming solar radiation received at the surface. Different land uses are assigned different albedos within the MAKEGEO pre-processor (part of the CALMET package). Albedo was provided for each land use, for each season in the land use data set provided by MECP for this AQIA.

5.2.2.5 Bowen Ratio

Bowen ratio is the ratio of the vertical flux of sensible heat to latent heat, where sensible heat is the transfer of heat from the surface to the atmosphere via convection and latent heat is the transfer of heat required to evaporate liquid water from the surface to the atmosphere. The Bowen ratio gives a measure of the surface heat flux and how much moisture is injected into the atmosphere. The Bowen ratio is defined as the ratio of sensible heat flux to latent heat flux. Different land uses are assigned different Bowen Ratios within the MAKEGEO pre-processor (part of the CALMET package). Bowen Ratio was provided for each land use, for each season in the land use data set provided by MECP for this AQIA.

5.2.2.6 Soil Heat Flux

The soil heat flux constant is a function of the surface properties and is used to compute the flux of heat into the soil. Anthropogenic heat flux is a function of population density and energy usage. Different land uses are assigned different soil heat fluxes within the MAKEGEO pre-processor (part of the CALMET package). Soil heat flux was provided for each land use, for each season in the land use data set provided by MECP for this AQIA.

5.2.2.7 Leaf Area Index

Leaf area index (LAI) is defined as the ratio of leaf area to soil surface area. Different land uses are assigned different leaf area indices within the MAKEGEO pre-processor (part of the CALMET package). Leaf Area Index was provided for each land use, for each season in the land use data set provided by MECP for this AQIA.

5.2.3 Meteorological Data Processing

Five full years of 3-D dispersion meteorology data (2014-2018 data period) were developed using the WRF data. A sample CALMET input file is provided in Appendix G. All CALMET input and output files were reviewed and approved for use in this AQIA prior to the commencement of CALPUFF modelling.

5.3 CALPUFF Model Source Parameters

For the 140,000 tpa Scenarios (1A and 1B), stack exhaust temperature and flow rate were taken from the current ESDM Report (Golder, 2011)

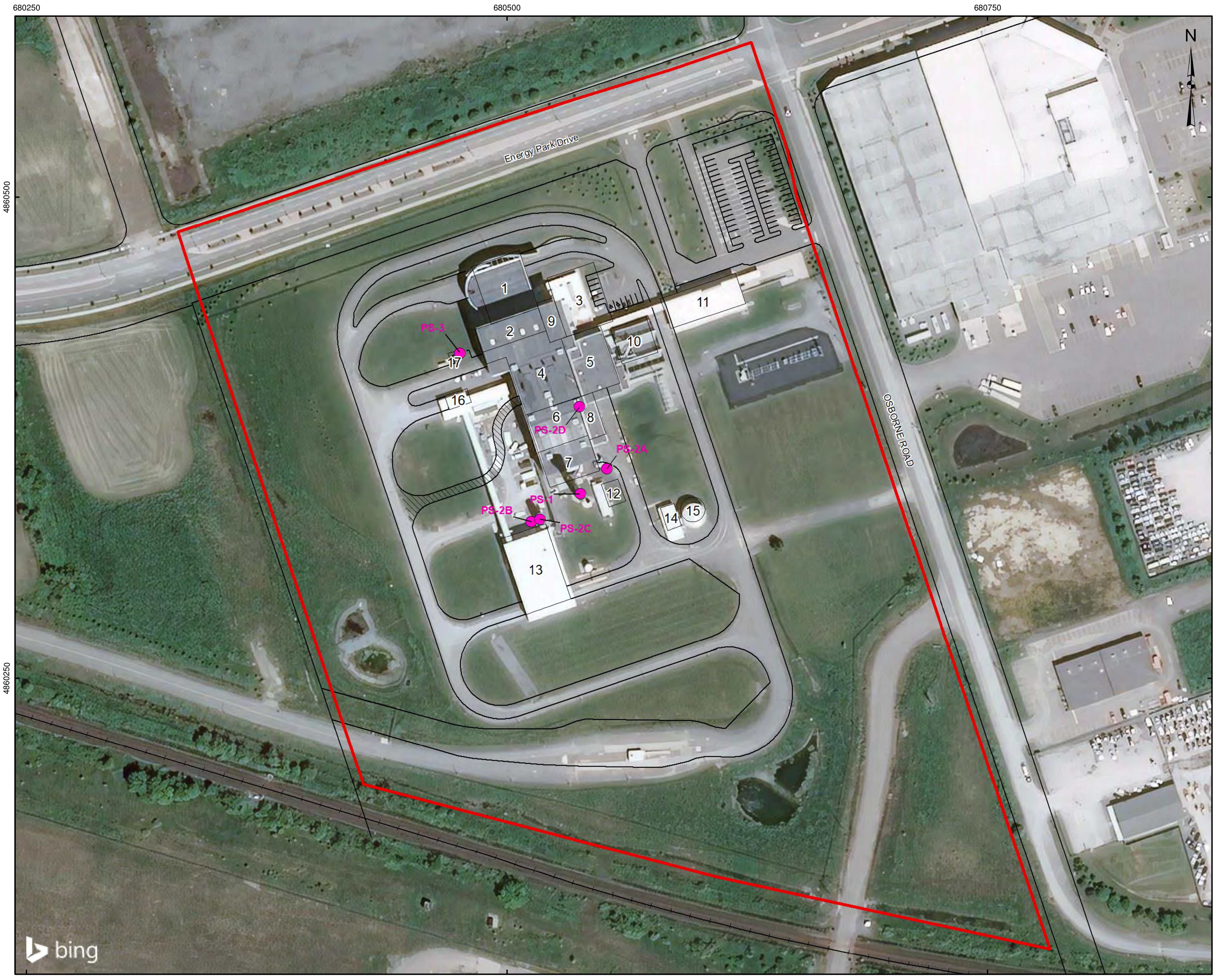
For the 160,000 tpa Scenarios (2A and 2B), exhaust flow rate and stack exhaust temperature were calculated using observed data from recent stack testing campaigns. The exhaust temperature was taken from stack testing data (Ortech, 2021) and the exhaust flow rate was calculated by multiplying the measured exhaust flow rate by the ratio of steam production at 160,000 tpa to steam production at the time of source testing (approximately 1.13).

All other source parameters are consistent with those used in the ESDM Report. A comparison of the source parameters modelled are provided in Table 10, below:

Table 10: Comparison of Modelled Source Parameters

Source	Scenario	Stack Height [m]	Stack Diameter [m]	Exit velocity [m/s]	Exhaust Temperature [K]
Main Stack	1A/1B	87.6	1.7	23.02	405.37
Main Stack	2A/2B	87.6	1.7	26.18	413.5
Carbon Silo Filling – 2A	1B/2B	5.49	0.1	38.42	Ambient
Pozzolan Silo Filling - 2B	1B/2B	4.88	0.1	38.42	Ambient
Portland Silo Filling - 2C	1B/2B	3.96	0.1	38.42	Ambient
Pebble Lime Silo Filing - 2D	1B/2B	12.4	0.1	38.42	Ambient
Stand-by generator Testing	1B/2B	3	0.2	36.92	539

The location of each modelled source is provided in Figure 4, below.

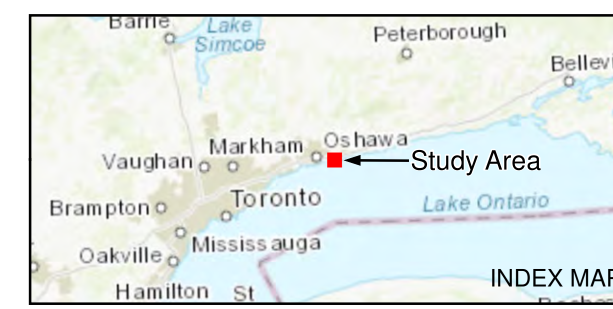


LEGEND

- Point Source
- Site Road (Paved)
- Site Road (Gravel)
- Railway
- Roof Plan
- Approximate Site Boundary

Point Source	Description
PS-1	Main Stack
PS-2A	Carbon Silo Baghouse Exhaust
PS-2B	Pozzolan Silo Baghouse Exhaust
PS-2C	Portland Cement Silo Baghouse Exhaust
PS-2D	Lime Silo Baghouse Exhaust
PS-3	Diesel Generator

ID	Building	Height (m)
1	Tipping Building	15.0
2	Refuse Building	35.1
3	Admin Building	5.3
4	Boiler Building	35.1
5	Turbine Building	19.0
6	Scrubber Building	35.1
7	Baghouse Building	25.0
8	Maintenance and Storage Building	12.1
9	Control Room	24.2
10	Air Cooled Condensers	24.7
11	Visitor Centre	11.3
12	Electrical Building	5.0
13	Residue Storage Building	17.2
14	Fire Water Pump House	10.0
15	Fire Water Tank	8.0
16	Grizzly Building	6.0
17	Diesel Genset	2.5



REFERENCE

Base Data - MNR NRVIS, obtained 2004, CANMAP v2006.4
Imagery:Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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Produced by Golder Associates Ltd under licence from

50 25 0 50 100
SCALE 1:2,000 METERS

PROJECT
DURHAM YORK ENERGY CENTRE
AIR QUALITY IMPACT ASSESSMENT

TITLE
DISPERSION MODELLING PLAN

GOLDER
MEMBER OF WSP

PROJECT NO. 19117255			SCALE AS SHOWN	REV. 0.0
DESIGN	PRM	25 Aug. 2010		
GIS	SO	8 Jan. 2020		
CHECK	KA	8 Jan. 2020		
REVIEW	AC	8 Jan. 2020		

FIGURE: 4

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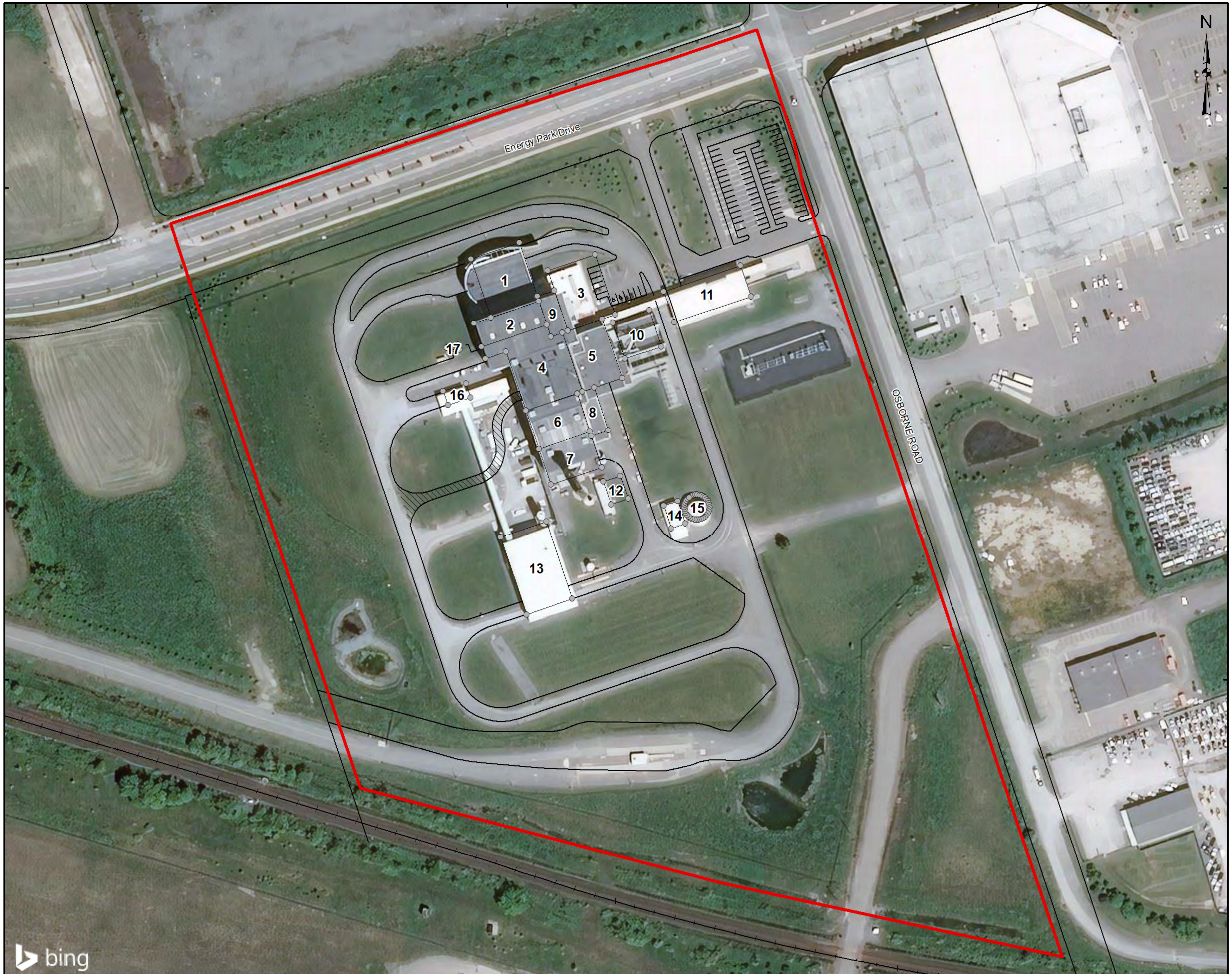
5.4 Building Downwash

Building wake effects were considered in this assessment using the U.S. EPAs Building Profile Input Program (BPIP-PRIME), another pre-processor to CALPUFF. The inputs into this pre-processor include the coordinates and heights of the buildings and stacks. The output data from BPIP-PRIME is used in the CALPUFF building wake effect calculations.

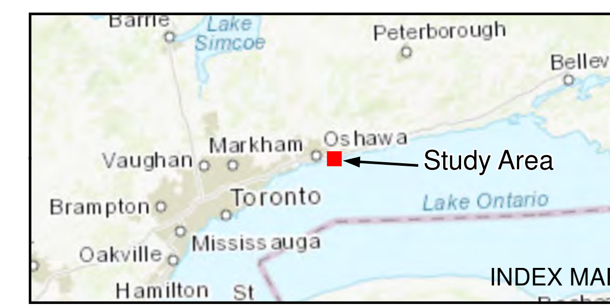
An illustration of the buildings included in the model is included in Figure 5.



LEGEND

- Site Road (Paved)
- Site Road (Gravel)
- Railway
- Roof Plan
- Approximate Site Boundary

ID	Building	Height (m)
1	Tipping Building	15.0
2	Refuse Building	35.1
3	Admin Building	5.3
4	Boiler Building	35.1
5	Turbine Building	19.0
6	Scrubber Building	35.1
7	Baghouse Building	25.0
8	Maintenance and Storage Building	12.1
9	Control Room	24.2
10	Air Cooled Condensers	24.7
11	Visitor Centre	11.3
12	Electrical Building	5.0
13	Residue Storage Building	17.2
14	Fire Water Pump House	10.0
15	Fire Water Tank	8.0
16	Grizzly Building	6.0
17	Diesel Genset	2.5



REFERENCE

Base Data - MNR NRVIS, obtained 2004, CANMAP v2006.4
Imagery: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
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Produced by Golder Associates Ltd under licence from
Ontario Ministry of Natural Resources, © Queens Printer 2008

50 25 0 50 100

SCALE 1:2,000 METERS

PROJECT

DURHAM YORK ENERGY CENTRE
AIR QUALITY IMPACT ASSESSMENT

TITLE

BUILDING LOCATION PLAN – COURTICE ROAD ENTRANCE

GOLDER
MEMBER OF WSP

PROJECT NO. 19117255		
DESIGN	PRM	25 Aug. 2010
GIS	PRM	8 Jan. 2020
CHECK	KA	8 Jan. 2020
REVIEW	AC	8 Jan. 2020

SCALE AS SHOWN REV. 0.0

FIGURE: 5

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5.5 Receptors

The receptors used in this assessment are consistent with those used in the ESDM Report (Golder, 2011) and were chosen based on recommendations provided in Section 7.1 of the Air Dispersion Modelling Guideline for Ontario (MECP, 2017a), which is in accordance with s.14 of O.Reg.419/05. Specifically, a nested receptor grid, centered around the outer edges of all the sources, was placed as follows:

a) 20 m spacing, within an area of 200 m by 200 m;

b) 50 m spacing, within an area surrounding the area described in (a) with a boundary at 300 m by 300 m outside the boundary of the area described in (a);

c) 100 m spacing, within an area surrounding the area described in (b) with a boundary at 800 m by 800 m outside the boundary of the area described in (a);

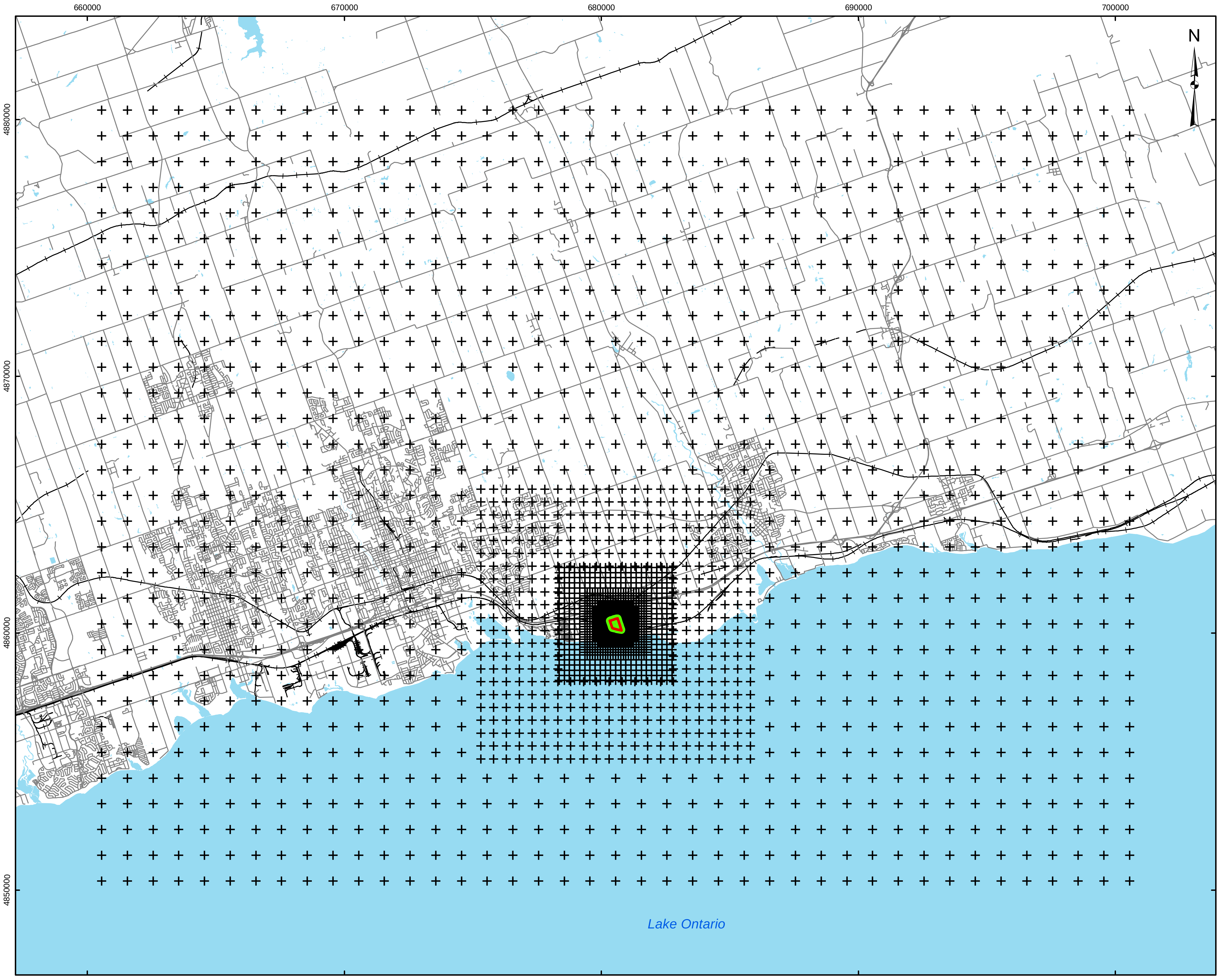
d) 200 m spacing, within an area surrounding the area described in (c) with a boundary at 1,800 m by 1,800 m outside the boundary of the area described in (a);

e) 500 m spacing, within an area surrounding the area described in (d) with a boundary at 4,800 m by 4,800 m outside the boundary of the area described in (a); and

f) 1,000 m spacing beyond the area described in (e) out to 20,000 m to the North, West and East and 10, 000 m to the South.

In addition to using the nested receptor grid, receptors were placed every 10 m along the property line. The area of modeling coverage is illustrated on Figure 6.

Discrete Receptors have also been identified at approximately 400 locations to represent current and proposed locations of interest. They include hospitals, nursing homes, schools, daycares, Senior citizen centres, the nearest residential receptors, specific watersheds and water bodies and parks. These receptors are illustrated in Figure 7.



LEGEND

- 10 m Property Boundary Receptor
- Gridded Receptor
- Road
- Railway
- Waterbody
- Approximate Site Boundary

REFERENCE

Base Data - MNR NRVIS, obtained 2004, CANMAP v2006.4
Produced by Golder Associates Ltd under licence from
Ontario Ministry of Natural Resources, © Queens Printer 2008
Projection: Transverse Mercator Datum: NAD 83 Coordinate System: UTM Zone 17N

2.5 0 2.5 5 7.5
SCALE 1:150,000 KILOMETERS

PROJECT
DURHAM YORK ENERGY CENTRE
AIR QUALITY IMPACT ASSESSMENT

TITLE
DISPERSION MODELLING
GRIDDED RECEPTORS

GOLDER
MEMBER OF WSP

PROJECT NO. 19117255			SCALE AS SHOWN	REV. 0.0
DESIGN	PRM	25 Aug. 2010	FIGURE: 6	
GIS	PRM	1 Feb. 2011		
CHECK	KA	1 Feb. 2011		
REVIEW	AC	1 Feb. 2011		

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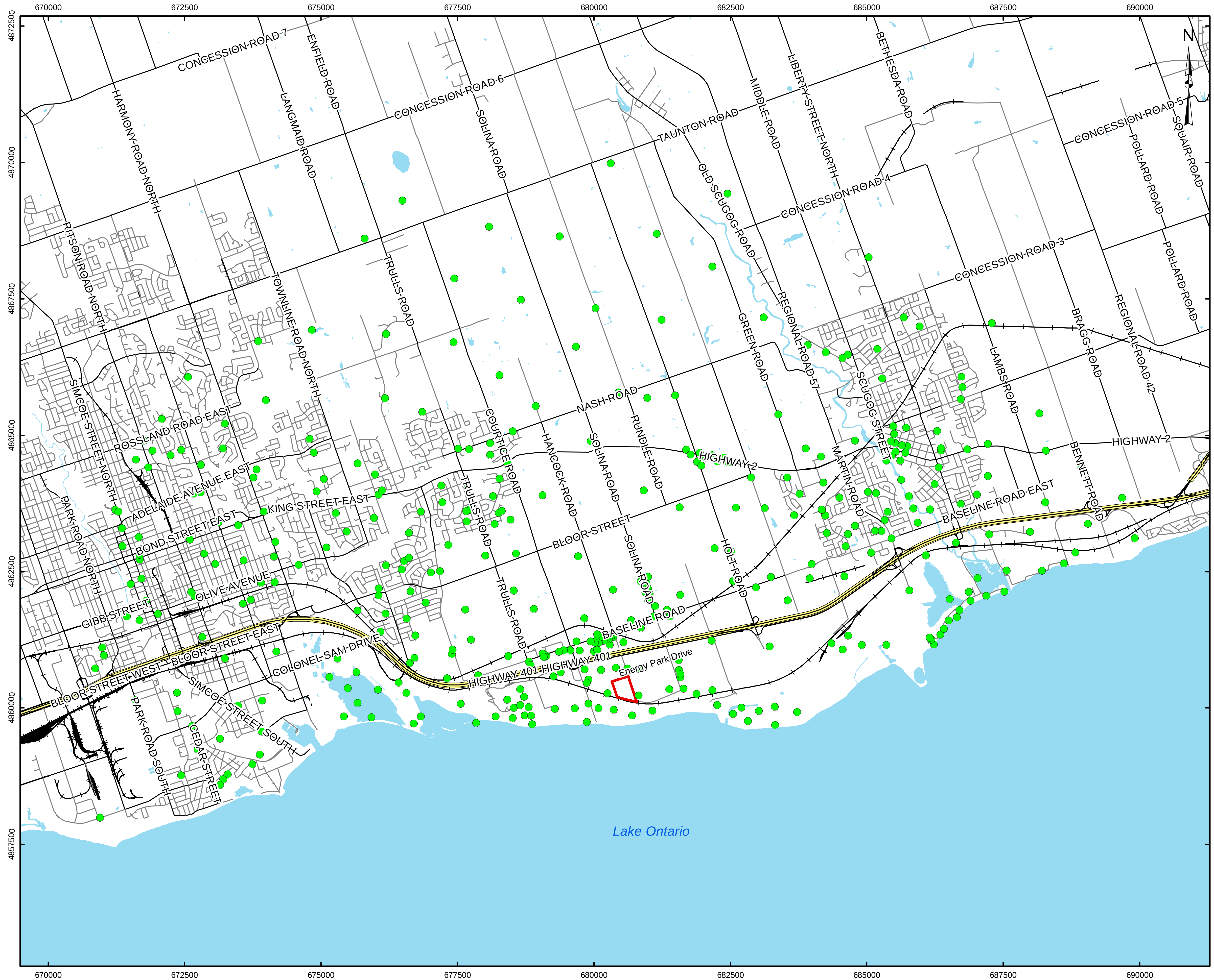

LEGEND

- Sensitive Receptor
- Expressway
- Highway
- Major Road
- Local Road
- Railway
- Waterbody
- Approximate Site Boundary

REFERENCE

Base Data - MNR NRVIS, obtained 2004, CANMAP v2006.4
Produced by Golder Associates Ltd under licence from
Ontario Ministry of Natural Resources, © Queens Printer 2008
Projection: Transverse Mercator Datum: NAD 83 Coordinate System: UTM Zone 17N

1 0.5 0 1 2 3 4

SCALE 1:70,000 KILOMETERS

PROJECT

DURHAM YORK ENERGY CENTRE
AIR QUALITY IMPACT ASSESSMENT

TITLE

DISPERSION MODELLING
SENSITIVE RECEPTORS

GOLDER
MEMBER OF WSP

PROJECT NO. 19117255			SCALE AS SHOWN	REV. 0.0
DESIGN	PRM	25 Aug. 2010		
GIS	SO	8 Jan. 2020		
CHECK	KA	8 Jan. 2020		
REVIEW	AC	8 Jan. 2020		

FIGURE: 7

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5.6 Special Modelling Considerations

5.6.1 Deposition

CALPUFF has the capability to account for wet and dry deposition of substances that would reduce ambient concentrations but the deposition algorithm was not used as a means of generating conservative levels.

5.6.2 Chemical Transformation

For the purposes of assessing project contributions to Secondary Particulate Matter (SPM) formation, chemical transformation was considered in the CALPUFF modelling of particulate matter. To model the chemical transformation of emitted NO, NO_2 and SO_2 into HNO_3, NO_3 and SO_4, CALPUFFs RIVAD/ARM3 mechanism was used. This setting requires the input of monthly background ozone concentrations. The monthly background ozone data used in the modelling of secondary particulate matter is summarized in Table 11, below. Monitoring of ozone in the area surrounding DYEC is not routinely completed, therefore, the background ozone selected for inclusion in the SPM modelling was taken from the previous Environmental Assessment (Durham and York, 2009) in consultation with MECP during their review of the CALPUFF input files for this AQIA.

Table 11: Background Ozone Concentrations used for Chemical Transformation Modelling

Month	Ozone Concentrations (ppb)
January	13.70
February	18.50
March	24.22
April	11.09
May	32.29
June	33.63
July	16.32
August	21.33
September	12.63
October	15.39
November	17.10
December	20.91

Chemical transformations were only modelled to calculate additional concentrations of particulate matter that is created as part of secondary transformations. Reported concentrations of NO_2 and SO_2 do not include the effects of depletion due to chemical transformation.

5.6.3 Thermal Internal Boundary layer

CALPUFF contains an option to account for sub-grid coastal influences on plume dispersion such as the development of a thermal internal boundary layer (TIBL). Given the proximity of the Facility to Lake Ontario (approximately 500m) and the grid size (250m), variations in coastline location within the grid cells near the proposed facility will be accounted for in the dispersion modelling. To achieve this, a digitized sub-grid coastline, extending to the boundaries of the air quality study area was included as an additional input in the dispersion modelling.

5.6.4 NOx to NO_2 Conversion

Emissions of oxides of nitrogen (NO_x) were used as inputs to the CALPUFF model. Ambient NO_2 concentrations can be calculated from modelled NO_X values using the Ozone Limiting Method (OLM) (Cole and Summerhays, 1979) provided the background ozone concentration is available. The 1-hour and 24-hour NO_2 concentrations were calculated using the background ozone conservatively determined as the 90th percentile of the 1-hour measured ground-level ozone concentration.

The OLM (Cole et al., 1979) assumes that 10% of the NOx emissions are in the form of NO_2, and the remaining 90% in the form of NO. Some or all of the NO will be converted to NO_2 by reaction with ozone (O_3). If the NO_X concentration in ppm is multiplied by 0.9 and this value is less than the ozone concentration in ppm, then the NO_2 concentration is equal to the NO_X concentration. However, if the NO_X concentration in ppm is multiplied by 0.9 and the value is equal to or greater than the ozone concentration in ppm, then the NO_2 concentration is given by the following equations:

$$NO_2(ppm) = O_3(ppm) + 0.1 * NO_X(ppm)$$

5.7 Conservative Assumptions in Modelling Approach

Table 12outlines the conservative assumptions in the modelling approach which results in an assessment that is not likely to under-predict the air quality associated with the Facility.

Table 12: Conservative Assumptions in Modelling Approach

Area	Conservative Assumption
Simultaneous operations of equipment	The modelling assessment includes all equipment to operate simultaneously at maximum capacity for up to 24 hours per day. For scenarios 1B and 2B, the emergency power generator (EPG) is being tested at maximum capacity at the same time as the combustion equipment is operating at maximum capacity and all four silos are being loaded simultaneously, which is highly unlikely to occur. The generator is only tested for one hour, once per week and silo filling occurs for up to 4 hours per day.
Particle deposition/removal processes	Wet and/or dry particle or gas deposition were not used in the assessment. This results in higher predicted concentrations.

It is assumed that the conservative emission rates, when combined with the conservative operating conditions and conservative dispersion modelling assumptions will tend to generate over-predictions of concentrations.

5.8 Modelling Files

Example CALMET and CALPUFF modelling files used in this assessment are provided in Appendix G. These files were submitted to MECP for review and approval before the models were executed. A copy of this approval is provided in Appendix G.

6.0 DISPERSION MODELLING RESULTS

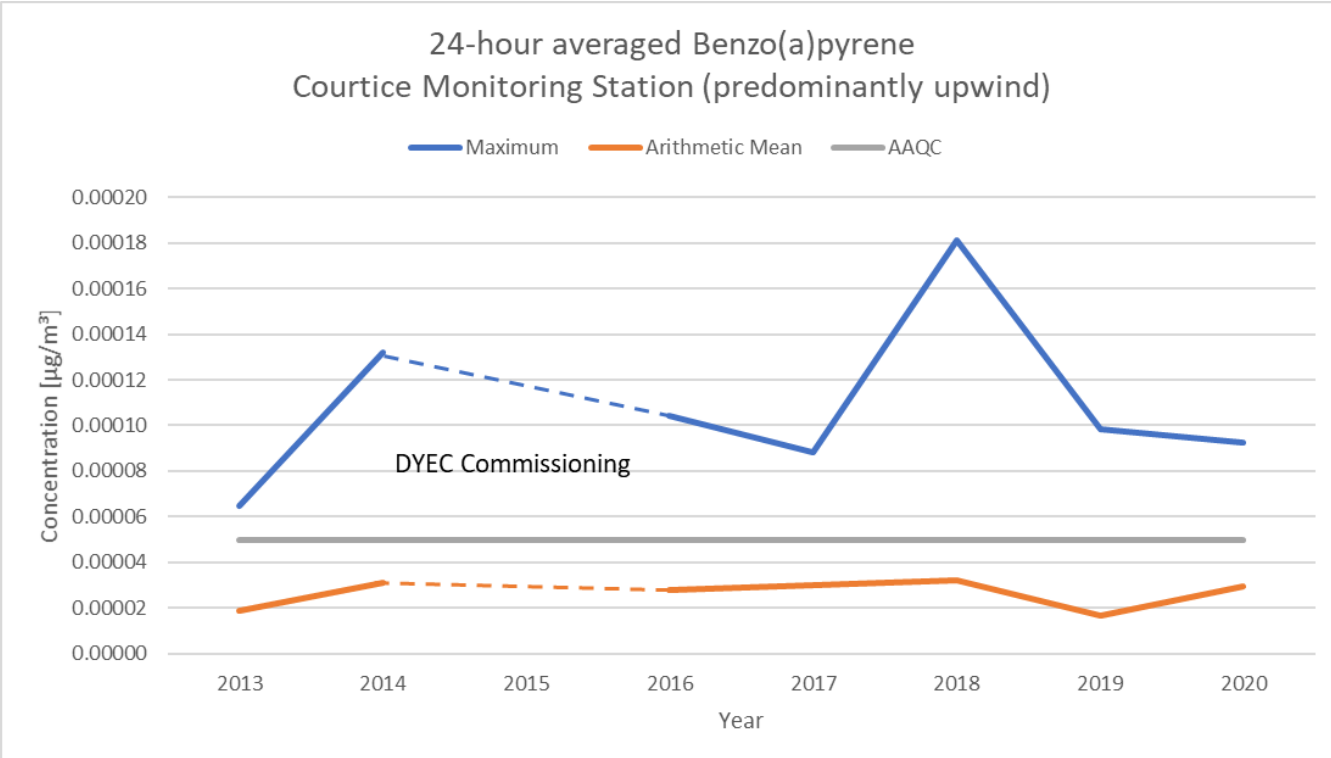
Predicted air quality concentrations were calculated for each of the 90 Indicator Compounds at each receptor for each relevant averaging periods. The majority of the Project Criteria are based on 24-hour or annual averaging periods that are easily obtained from CALPUFF outputs. Where the relevant Project Criteria is less than 1 hour, a conversion to the appropriate averaging period was completed using MECP recommended conversion factors (MECP, 2017a). In accordance with standard MECP procedures, meteorological anomalies were removed to account for rare and transient meteorological conditions. For averaging periods of 24 hours, this highest 24-hour concentration in each meteorological year was discarded. For shorter averaging periods (e.g. 1 hour) the eight hours in each meteorological data set which result in the highest 1 hour concentrations were discarded (MECP, 2017a).

The results of the air quality dispersion modelling after removal of meteorological anomalies are presented in Table 13 to Table 16, both with and without background air quality concentrations, identified in Section 2. The relevant concentrations were compared against the Project Criteria. The cumulative concentrations of all contaminants (with background added) are below the Project Criteria for all Indicator Compounds, with the exception of Benzo(a)pyrene, for both current and future scenarios and nitrogen oxides over a 1 hour averaging period during testing of the standby generator, only. As discussed in Section 2, the background concentration of Benzo(a)pyrene is above the Project Criteria before the operations of DYEC are included.

Levels of PAHs in the local air quality are significantly influenced by exhaust from motor vehicles (MECP, 2021b) and are expected to be high close to Highway 401, which is within 1km of DYEC as well as the Courtice and Rundle monitoring stations. Exceedance of the Ontario AAQC for benzo(a)pyrene is typical of urban settings in Southern Ontario (MECP, 2018a). Monitoring of benzo(a)pyrene has been completed at the Courtice and Rundle Stations since 2013, prior to DYEC commissioning in 2015 and has shown exceedences of the AAQC during periods when the stations were both upwind and downwind of DYEC. Figure 8, below illustrates the 24-hour averaged benzo(a)pyrene data monitored at the Courtice and Rundle Stations, from 2013-2020, which includes periods before and after DYEC came into operation in 2015. The maximum measured concentration and arithmetic mean of measured data for each calendar year is presented in comparison to the Ontario AAQC. Monitoring was not completed for the 2015 calendar year due to commissioning of DYEC.

The maximum concentration in each calendar year is expected to fluctuate as it is directly impacted by short term emission events and/or short term meteorological activities. The data for both Courtice and Rundle monitoring stations show fluctuation in the maximum recorded 24-hour concentration for each calendar year accordingly with no significant step change in maximum recorded concentrations following the commissioning of DYEC. The Rundle station data, which is predominantly down wind of DYEC, shows a gradual decrease in the maximum concentrations over time, including after DYEC was operational.

Comparatively, the arithmetic mean is expected to be less impacted by short term events and instead serves as an indicator of more long term trends. Figure 8 shows that there has been very little change in the arithmetic mean for each calendar year at either Courtice or Rundle monitoring Stations. In particular, there is no significant difference in the mean 24-hour concentration before or after 2015, when DYEC came into operation. Additionally, it should be noted that while the arithmetic mean for all measured data is below the AAQ,C the 90th percentile was used to represent background concentrations of benzo(a)pyrene in the cumulative assessment, as described in Section 2.0. This should therefore be considered a conservative approach.



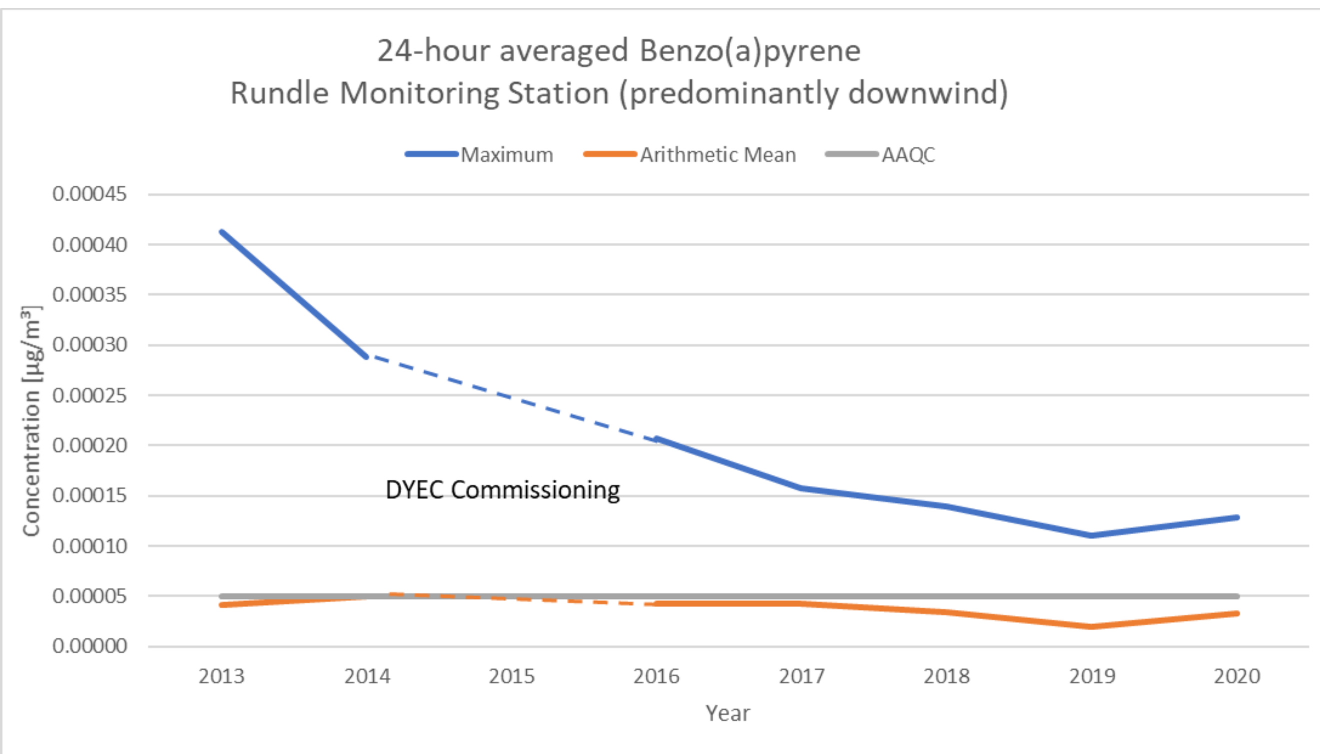


Figure 8: Comparison of 24-hour averaged Benzo(a)pyrene Concentrations by Calendar Year for Courtice and Rundle Monitoring Stations

Emissions from DYEC contribute less than 1% to the total ambient benzo(a)pyrene concentration for all assessed scenarios and represent less than 1% of both the 24-hour and Annual Ontario AAQC, as identified in Table 13 to Table 16. The assessment is conservative as it assumes that DYEC is operating at maximum capacity 24 hours per day, 365 days per year and that background concentrations of benzo(a)pyrene are consistently present at the 90th percentile.

Predicted concentrations of Nitrogen Oxides are below the CAAQS for normal operations under both the current and future scenarios but exceed the 1 hour CAAQS during stand-by diesel generator testing in both the current and future scenarios. Standby generator testing can occur for up to one hour, once per week. To identify the worst case 1-hour concentration, it was assumed that the generator may be tested at any time, therefore emissions were considered for every hour of the 5 year meteorological dataset. However, the CAAQS of 79 µg/m^3 is based on the three year average of the 98th percentile of the daily maximum 1 hour concentrations, therefore, given the frequency of the generator testing, comparing the maximum predicted 1 hour concentration from the modelling is very conservative. This assessment assumes that generator testing occurs while DYEC is operating at maximum capacity and during the hour with worst case meteorological conditions, every day of the year , which is not realistic. Additionally, while the maximum predicted concentration is greater than the CAAQS of 79 µg/m^3, it is much less than the Ontario AAQC of 400 µg/m^3, which is also used as an indicator of good air quality. Maximum NO_2 concentrations during generator testing occur at the northern property boundary along Energy Drive (the fenceline closest to the generator) and decrease with distance.

Table 13: Scenario 1A - Maximum Concentrations at all Receptors for Current Maximum Operating Conditions (140,000 tpa)

Indicator Compound	CAS No.	Total Facility Emission Rate [g/s]	Averaging Period	Project Criteria [µg/m³]	Maximum Concentration from DYEC[µg/m³]	Percentage of Project Criteria [%]	Background Concentration [µg/m³]	Maximum Concentration (Including Background) [µg/m³]	Percentage of Project Criteria [%]
1 – Methylnaphthalene	90-12-0	1.81E-07	24-hour	35.5	0.0000002	<1%	0.009	0.009	<1%
1,2,4 – Trichlorobenzene	120-82-1	8.37E-07	24-hour	400	0.000001	<1%	0.008	0.008	<1%
1,2,4,5-Tetrachlorobenzene	95-94-3	1.81E-07	24-hour	1	0.0000002	<1%	—	0.0000002	<1%
1,2-Dichlorobenzene	95-50-1	2.19E-06	1-hour	30500	0.00003	<1%	0.009	0.01	<1%
2 – Methylnaphthalene	91-57-6	3.29E-07	24-hour	0.1	0.0000004	<1%	0.015	0.015	15%
2,3,4,6-Tetrachlorophenol	58-90-2	4.20E-07	24-hour	0.75	0.0000005	<1%	—	0.0000005	<1%
2,4,6-Trichlorophenol	88-06-2	8.52E-07	24-hour	1.5	0.000001	<1%	—	0.000001	<1%
2,4-Dichlorophenol	120-83-2	4.43E-07	24-hour	33.5	0.000001	<1%	—	0.000001	<1%
Acenaphthene	83-32-9	2.07E-07	24-hour	0.1	0.0000002	<1%	0.010	0.01	10%
Acenaphthylene	208-96-8	8.40E-08	24-hour	0.1	0.0000001	<1%	0.0003	0.0003	<1%
Acetaldehyde	75-07-0	2.09E-06	24-hour	500	0.000002	<1%	—	0.000002	<1%
Acetaldehyde	75-07-0	2.09E-06	1/2-hour	500	0.00003	<1%	—	0.00003	<1%
Acrolein	107-02-8	8.42E-07	1-hour	4.5	0.0000097	<1%	—	0.0000097	<1%
Acrolein	107-02-8	8.42E-07	24-hour	0.4	0.0000010	<1%	—	0.000001	<1%
Aluminum	7429-90-5	1.69E-03	24-hour	12	0.002	<1%	0.21	0.22	2%
Ammonia	7664-41-7	2.71E-02	24-hour	100	0.03	<1%	—	0.03	<1%
Anthracene	120-12-7	8.44E-08	24-hour	0.1	0.0000001	<1%	0.0004	0.0004	<1%
Antimony	7440-36-0	2.20E-06	24-hour	25	0.000003	<1%	0.003	0.003	<1%
Arsenic	7440-38-2	1.83E-06	24-hour	0.3	0.000002	<1%	0.002	0.002	<1%
Barium	7440-39-3	6.44E-05	24-hour	10	0.0001	<1%	0.014	0.015	<1%
Benzene	71-43-2	4.92E-05	Annual	0.45	0.000003	<1%	0.40	0.40	88%
Benzene	71-43-2	4.92E-05	24-hour	2.3	0.00006	<1%	0.62	0.62	27%
Benzo(a)anthracene	56-55-3	2.07E-07	24-hour	0.1	0.00000024	<1%	0.0001	0.0001	<1%
Benzo(a)fluorene	238-84-6	2.07E-07	24-hour	0.1	0.0000002	<1%	0.0002	0.0002	<1%
Benzo(a)pyrene [as a surrogate of total Polycyclic Aromatic Hydrocarbons (PAHs)]	50-32-8	2.07E-07	Annual	0.00001	0.00000001	<1%	0.000026	0.000026	256%
Benzo(a)pyrene [as a surrogate of total Polycyclic Aromatic Hydrocarbons (PAHs)]	50-32-8	2.07E-07	24-hour	0.00005	0.0000002	<1%	0.000058	0.000058	116%
Benzo(b)fluoranthene	205-99-2	2.07E-07	24-hour	0.1	0.0000002	<1%	0.0001	0.0001	<1%

Indicator Compound	CAS No.	Total Facility Emission Rate [g/s]	Averaging Period	Project Criteria [µg/m³]	Maximum Concentration from DYEC[µg/m³]	Percentage of Project Criteria [%]	Background Concentration [µg/m³]	Maximum Concentration (Including Background) [µg/m³]	Percentage of Project Criteria [%]
Benzo(b)fluorene	243-17-4	2.07E-07	24-hour	0.1	0.0000002	<1%	0.0002	0.0002	<1%
Benzo(e)pyrene	192-97-2	2.07E-07	24-hour	0.1	0.0000002	<1%	0.0002	0.0002	<1%
Benzo(ghi)perylene	191-24-2	3.02E-07	24-hour	0.1	0.0000004	<1%	0.0001	0.0001	<1%
Benzo(k)fluoranthene	207-08-9	2.07E-07	24-hour	0.1	0.0000002	<1%	0.0001	0.0001	<1%
Beryllium	7440-41-7	1.83E-06	24-hour	0.01	0.000002	<1%	0.0004	0.0004	4%
Biphenyl	92-52-4	8.23E-07	1-hour	60	0.00001	<1%	—	0.000	<1%
Boron	7440-42-8	6.52E-03	24-hour	120	0.008	<1%	0.013	0.02	<1%
Bromodichloromethane	75-27-4	1.47E-05	24-hour	350	0.00002	<1%	0.010	0.01	<1%
Bromoform	75-25-2	1.75E-05	24-hour	55	0.00002	<1%	0.024	0.02	<1%
Bromomethane	74-83-9	1.32E-04	24-hour	1350	0.0002	<1%	0.057	0.06	<1%
Cadmium	7440-43-9	2.98E-04	24-hour	0.025	0.0004	1%	0.001	0.001	4%
Cadmium	7440-43-9	2.98E-04	Annual	0.005	0.00002	<1%	0.001	0.001	13%
Carbon Monoxide	630-08-0	1.70E+00	1/2-hour	6000	23.57	<1%	—	23.57	<1%
Carbon Monoxide	630-08-0	1.70E+00	1-Hour	15000	19.64	<1%	—	19.64	<1%
Carbon Monoxide	630-08-0	1.70E+00	8-hour	6000	5.17	<1%	—	5.17	<1%
Carbon tetrachloride	56-23-5	1.36E-04	24-hour	2.4	0.00016	<1%	0.59	0.59	25%
Chloroform	67-66-3	1.28E-04	24-hour	1	0.00015	<1%	0.22	0.22	22%
Chloroform	67-66-3	1.28E-04	Annual	0.2	0.000008	<1%	0.13	0.13	67%
Chromium (hexavalent)	7440-47-3	3.84E-05	Annual	0.00014	0.000002	2%	—	0.000002	2%
Chromium (hexavalent)	7440-47-3	3.84E-05	24-hour	0.07	0.00005	<1%	—	0.00005	<1%
Chrysene	218-01-9	9.51E-08	24-hour	0.1	0.0000001	<1%	0.001	0.0001	<1%
Cobalt	7440-48-4	2.20E-06	24-hour	0.1	0.000003	<1%	0.001	0.0007	<1%
Copper	7440-50-8	2.20E-04	24-hour	50	0.0003	<1%	0.031	0.0308	<1%
Dibenzo(a,c)anthracene	215-58-7	2.07E-07	24-hour	0.1	0.0000002	<1%	—	0.0000002	<1%
Dibenzo(a,h)anthracene	53-70-3	2.07E-07	24-hour	0.1	0.0000002	<1%	0.0001	0.0001	<1%
Dichlorodifluoromethane	75-71-8	3.15E-05	24-hour	500000	0.00004	<1%	2.757	2.76	<1%
Dichloroethene, 1,1 -	75-35-4	1.47E-05	24-hour	10	0.00002	<1%	0.0004	0.0004	<1%
Dichloromethane	75-09-02	1.38E-03	24-hour	220	0.00163	<1%	0.489	0.49	<1%
Dichloromethane	75-09-02	1.38E-03	Annual	44	0.00008	<1%	0.349	0.35	<1%
Dioxins, Furans and Dioxin- like PCBs	N/A -6	2.56E-03	24-hour	0.1 pg TEQ/m³	0.003 pg TEQ/m³	3%	0.021	0.024 pg TEQ/m³	24%
Ethylbenzene	100-41-4	4.58E-04	24-hour	1000	0.0005	<1%	0.355	0.36	<1%

Indicator Compound	CAS No.	Total Facility Emission Rate [g/s]	Averaging Period	Project Criteria [µg/m³]	Maximum Concentration from DYEC[µg/m³]	Percentage of Project Criteria [%]	Background Concentration [µg/m³]	Maximum Concentration (Including Background) [µg/m³]	Percentage of Project Criteria [%]
Ethylbenzene	100-41-4	4.58E-04	10-minute	1900	0.0087	<1%	1.426	1.44	<1%
Ethylene Dibromide	106-93-4	2.94E-05	24-hour	3	0.00003	<1%	0.002	0.002	<1%
Fluoranthene	206-44-0	3.03E-07	24-hour	0.1	0.0000004	<1%	0.002	0.002	2%
Fluorine	86-73-7	1.43E-07	24-hour	0.1	0.0000002	<1%	—	0.0000002	<1%
Formaldehyde	50-00-0	1.73E-06	24-hour	65	0.000002	<1%	—	0.000002	<1%
Hexachlorobenzene	118-74-1	8.40E-08	24-hour	0.011	0.0000001	<1%	—	0.0000001	<1%
Hydrogen Chloride	7647-01-0	3.84E-01	24-hour	20	0.45	2%	—	0.45	2%
Hydrogen Fluoride	7664-39-3	4.26E-03	24-hour	1.72	0.01	<1%	—	0.01	<1%
Hydrogen Fluoride	7664-39-3	4.26E-03	30-day	0.69	0.0008	<1%	—	0.0008	<1%
Indeno(1,2,3 – cd)pyrene	193-39-5	2.07E-07	24-hour	0.1	0.0000002	<1%	0.0001	0.0001	<1%
Lead	7439-92-1	2.13E-03	24-hour	0.5	0.003	<1%	0.004	0.007	1%
Lead	7439-92-1	2.13E-03	30-day	0.2	0.0004	<1%	—	0.0004	<1%
Mercury	7439-97-6	6.39E-04	24-hour	2	0.0008	<1%	—	0.0008	<1%
Molybdenum	7439-98-7	2.19E-04	24-hour	120	0.0003	<1%	0.001	0.0014	<1%
Naphthalene	91-20-3	2.00E-06	24-hour	22.5	0.000002	<1%	0.04	0.04	<1%
Naphthalene	91-20-3	2.00E-06	10-minute	50	0.00004	<1%	0.17	0.17	<1%
Nickel	7440-02-0	5.14E-05	Annual	0.04	0.000003	<1%	0.001	0.001	3%
Nickel	7440-02-0	5.14E-05	24-hour	2	0.0001	<1%	0.001	0.00	<1%
Nitrogen Dioxides	10102-44-0	5.16E+00	1-hour	79	41.26	52%	30.00	71.26	90%
Nitrogen Dioxides	10102-44-0	5.16E+00	24-hour	200	6.09	3%	22.28	28.37	14%
Nitrogen Dioxides	10102-44-0	5.16E+00	Annual	22.5	0.31	1%	14.04	14.36	64%
O-terphenyl	84-15-1	8.91E-08	24-hour	0.1	0.0000001	<1%	0.0002	0.0002	<1%
Pentachlorobenzene	608-93-5	8.52E-08	24-hour	80	0.0000001	<1%	—	0.0000001	<1%
Pentachlorophenol	87-86-5	4.20E-07	24-hour	20	0.0000005	<1%	—	0.0000005	<1%
Perylene	198-55-0	8.40E-08	24-hour	0.1	0.0000001	<1%	0.000	0.0002	<1%
Phenanthrene	85-01-8	1.18E-06	24-hour	0.1	0.000001	<1%	0.010	0.01	10%
Phosphorus	7723-14-0	1.96E-03	24-hour	0.5	0.0023	<1%	0.48	0.48	96%
PM_{10}	N/A -3	2.06E-01	24-hour	50	1.17	2%	24.48	25.65	51%
$PM_{2.5}$	N/A -4	1.95E-01	24-hour	27	1.10	4%	13.22	14.32	53%
$PM_{2.5}$	N/A -4	1.95E-01	Annual	8.8	0.06	<1%	8.12	8.18	93%
Polychlorinated Biphenyls (PCB)	N/A -7	2.77E-08	24-hour	0.1	0.00000003	<1%	—	0.00000003	<1%

Indicator Compound	CAS No.	Total Facility Emission Rate [g/s]	Averaging Period	Project Criteria [µg/m³]	Maximum Concentration from DYEC[µg/m³]	Percentage of Project Criteria [%]	Background Concentration [µg/m³]	Maximum Concentration (Including Background) [µg/m³]	Percentage of Project Criteria [%]
Pyrene	129-00-0	2.70E-07	24-hour	0.1	0.000000	<1%	0.001	0.0008	<1%
Selenium	7782-49-2	3.18E-05	24-hour	10	0.00004	<1%	0.003	0.0035	<1%
Silver	7440-22-4	1.83E-06	24-hour	1	0.000002	<1%	0.0017	0.0017	<1%
Sulphur Dioxide	7446-09-05	1.49E+00	10-minute	178	28.39	16%	19.41	47.80	27%
Sulphur Dioxide	7446-09-05	1.49E+00	1-hour	106	17.20	16%	11.75	28.96	27%
Sulphur Dioxide	7446-09-05	1.49E+00	24-hour	150	1.76	1%	12.64	14.40	10%
Sulphur Dioxide	7446-09-05	1.49E+00	Annual	10.5	0.09	<1%	5.26	5.35	51%
Tetrachloroethene	127-18-4	1.58E-05	24-hour	360	0.00002	<1%	0.13	0.13	<1%
Tetralin	119-64-2	2.10E-06	24-hour	151.5	0.000002	<1%	0.003	0.003	<1%
Thallium	7440-28-0	4.35E-06	24-hour	0.5	0.000005	<1%	0.003	0.003	<1%
Tin	7440-31-5	7.50E-04	24-hour	10	0.001	<1%	0.003	0.004	<1%
Toluene	108-88-3	1.81E-03	24-hour	2000	0.002	<1%	2.080	2.08	<1%
Total Chromium (and compounds)	7440-47-3	3.84E-05	24-hour	0.5	0.00005	<1%	0.005	0.0055	1%
Total Chromium (and compounds)	7440-47-3	3.84E-05	24-hour	5	0.00005	<1%	0.005	0.0055	<1%
Total Suspended Particulate	N/A -1	2.06E-01	24-hour	120	1.17	<1%	42.93	44.10	37%
Total Suspended Particulate	N/A -1	2.06E-01	Annual	60	0.06	<1%	26.00	26.06	43%
Trichloroethane, 1,1,1 -	71-55-6	1.47E-05	24-hour	115000	0.00002	<1%	0.029	0.03	<1%
Trichloroethene	86-42-0	1.47E-05	24-hour	0.1	0.00002	<1%	—	0.00	<1%
Trichloroethylene, 1,1,2 -	79-01-06	1.47E-05	24-hour	12	0.00002	<1%	0.15	0.15	1%
Trichloroethylene, 1,1,2 -	79-01-06	1.47E-05	Annual	2.3	0.000001	<1%	0.05	0.05	2%
Trichlorofluoromethane	75-69-4	9.27E-05	24-hour	6000	0.0001	<1%	1.77	1.77	<1%
Vanadium	7440-62-2	1.19E-06	24-hour	2	0.000001	<1%	0.002	0.0018	<1%
Vinyl chloride	75-01-04	2.94E-05	24-hour	1	0.00003	<1%	0.004	0.004	<1%
Vinyl chloride	75-01-04	2.94E-05	Annual	0.2	0.000002	<1%	0.002	0.002	1%
Xylenes, m-, p- and o-	1330-20-7	4.29E-03	24-hour	730	0.01	<1%	0.87	0.87	<1%
Xylenes, m-, p- and o-	1330-20-7	4.29E-03	10-minute	3000	0.08	<1%	3.49	3.57	<1%
Zinc	7440-66-6	2.32E-04	24-hour	120	0.0003	<1%	0.06	0.06	<1%

Table 14: Scenario 1B - Maximum Concentrations at all Receptors for Current Maximum Operating Conditions (140,000 tpa) plus Ancillary Sources

Indicator Compound	CAS No.	Total Facility Emission Rate [g/s]	Averaging Period	Project Criteria [µg/m³]	Maximum Concentration [µg/m³]	Percentage of Project Criteria [%]	Background Concentration [µg/m³]	Maximum Concentration (Including Background) [µg/m³]	Percentage of Project Criteria [%]
Nitrogen Dioxides	10102-44-0	6.37	1-hour	79	106.91	135%	30.00	136.91	173%
Nitrogen Dioxides	10102-44-0	5.21	24-hour	200	6.31	3%	22.30	28.61	14%
Nitrogen Dioxides	10102-44-0	5.16	Annual	22.5	0.32	1%	14.00	14.28	63%
PM_{10}	N/A -3	0.96	24-hour	50	1.19	2%	24.50	25.69	51%
$PM_{2.5}$	N/A -4	0.90	24-hour	27	1.19	4%	13.20	14.39	53%
$PM_{2.5}$	N/A -4	0.80	Annual	8.8	0.14	2%	8.12	8.26	94%
Total Suspended Particulate	N/A -1	0.96	24-hour	120	0.14	<1%	42.90	43.04	36%
Total Suspended Particulate	N/A -1	0.86	Annual	60	1.19	2%	26.00	27.19	45%

Table 15: Scenario 2A - Maximum Concentrations at all Receptors for Future Maximum Operating Conditions (160,000 tpa)

Indicator Compound	CAS No.	Total Facility Emission Rate [g/s]	Averaging Period	Project Criteria [µg/m³]	Maximum Concentration [µg/m³]	Percentage of Project Criteria [%]	Background Concentration [µg/m³]	Maximum Concentration (Including Background) [µg/m³]	Percentage of Project Criteria [%]
1 – Methylnaphthalene	90-12-0	1.90E-07	24-hour	35.5	0.0000002	<1%	0.009	0.009	<1%
1,2,4 – Trichlorobenzene	120-82-1	8.79E-07	24-hour	400	0.000001	<1%	0.008	0.008	<1%
1,2,4,5-Tetrachlorobenzene	95-94-3	1.90E-07	24-hour	1	0.0000002	<1%	—	0.0000002	<1%
1,2-Dichlorobenzene	95-50-1	2.30E-06	1-hour	30500	0.00002	<1%	0.009	0.01	<1%
2 – Methylnaphthalene	91-57-6	3.46E-07	24-hour	0.1	0.0000004	<1%	0.015	0.015	15%
2,3,4,6-Tetrachlorophenol	58-90-2	4.41E-07	24-hour	0.75	0.0000005	<1%	—	0.0000005	<1%
2,4,6-Trichlorophenol	88-06-2	8.95E-07	24-hour	1.5	0.000001	<1%	—	0.000001	<1%
2,4-Dichlorophenol	120-83-2	4.65E-07	24-hour	33.5	0.000001	<1%	—	0.000001	<1%
Acenaphthene	83-32-9	2.18E-07	24-hour	0.1	0.0000002	<1%	0.010	0.01	10%
Acenaphthylene	208-96-8	8.82E-08	24-hour	0.1	0.0000001	<1%	0.0003	0.0003	<1%
Acetaldehyde	75-07-0	2.19E-06	24-hour	500	0.000002	<1%	—	0.000002	<1%
Acetaldehyde	75-07-0	2.19E-06	1/2-hour	500	0.00003	<1%	—	0.00003	<1%
Acrolein	107-02-8	8.84E-07	1-hour	4.5	0.0000086	<1%	—	0.0000086	<1%
Acrolein	107-02-8	8.84E-07	24-hour	0.4	0.0000010	<1%	—	0.000001	<1%
Aluminum	7429-90-5	1.78E-03	24-hour	12	0.002	<1%	0.21	0.22	2%
Ammonia	7664-41-7	2.84E-02	24-hour	100	0.03	<1%	—	0.03	<1%
Anthracene	120-12-7	8.86E-08	24-hour	0.1	0.0000001	<1%	0.0004	0.0004	<1%
Antimony	7440-36-0	2.30E-06	24-hour	25	0.000003	<1%	0.003	0.003	<1%

Indicator Compound	CAS No.	Total Facility Emission Rate [g/s]	Averaging Period	Project Criteria [µg/m³]	Maximum Concentration [µg/m³]	Percentage of Project Criteria [%]	Background Concentration [µg/m³]	Maximum Concentration (Including Background) [µg/m³]	Percentage of Project Criteria [%]
Arsenic	7440-38-2	1.92E-06	24-hour	0.3	0.000002	<1%	0.002	0.002	<1%
Barium	7440-39-3	6.76E-05	24-hour	10	0.0001	<1%	0.014	0.015	<1%
Benzene	71-43-2	5.17E-05	Annual	0.45	0.000003	<1%	0.40	0.40	88%
Benzene	71-43-2	5.17E-05	24-hour	2.3	0.00006	<1%	0.62	0.62	27%
Benzo(a)anthracene	56-55-3	2.18E-07	24-hour	0.1	0.00000024	<1%	0.0001	0.0001	<1%
Benzo(a)fluorene	238-84-6	2.18E-07	24-hour	0.1	0.0000002	<1%	0.0002	0.0002	<1%
Benzo(a)pyrene [as a surrogate of total Polycyclic Aromatic Hydrocarbons (PAHs)]	50-32-8	2.18E-07	Annual	0.00001	0.00000001	<1%	0.000026	0.000026	256%
Benzo(a)pyrene [as a surrogate of total Polycyclic Aromatic Hydrocarbons (PAHs)]	50-32-8	2.18E-07	24-hour	0.00005	0.0000002	<1%	0.000058	0.000058	116%
Benzo(b)fluoranthene	205-99-2	2.18E-07	24-hour	0.1	0.0000002	<1%	0.0001	0.0001	<1%
Benzo(b)fluorene	243-17-4	2.18E-07	24-hour	0.1	0.0000002	<1%	0.0002	0.0002	<1%
Benzo(e)pyrene	192-97-2	2.18E-07	24-hour	0.1	0.0000002	<1%	0.0002	0.0002	<1%
Benzo(ghi)perylene	191-24-2	3.17E-07	24-hour	0.1	0.0000004	<1%	0.0001	0.0001	<1%
Benzo(k)fluoranthene	207-08-9	2.18E-07	24-hour	0.1	0.0000002	<1%	0.0001	0.0001	<1%
Beryllium	7440-41-7	1.92E-06	24-hour	0.01	0.000002	<1%	0.0004	0.0004	4%
Biphenyl	92-52-4	8.64E-07	1-hour	60	0.00001	<1%	—	0.000	<1%
Boron	7440-42-8	6.85E-03	24-hour	120	0.008	<1%	0.013	0.02	<1%
Bromodichloromethane	75-27-4	1.54E-05	24-hour	350	0.00002	<1%	0.010	0.01	<1%
Bromoform	75-25-2	1.84E-05	24-hour	55	0.00002	<1%	0.024	0.02	<1%
Bromomethane	74-83-9	1.39E-04	24-hour	1350	0.0002	<1%	0.057	0.06	<1%
Cadmium	7440-43-9	3.13E-04	24-hour	0.025	0.0004	1%	0.001	0.001	4%
Cadmium	7440-43-9	3.13E-04	Annual	0.005	0.00002	<1%	0.001	0.001	13%
Carbon Monoxide	630-08-0	1.79E+00	1/2-hour	6000	20.99	<1%	—	20.99	<1%
Carbon Monoxide	630-08-0	1.79E+00	1-Hour	15000	17.49	<1%	—	17.49	<1%
Carbon Monoxide	630-08-0	1.79E+00	8-hour	6000	4.71	<1%	—	4.71	<1%
Carbon tetrachloride	56-23-5	1.43E-04	24-hour	2.4	0.00016	<1%	0.59	0.59	25%
Chloroform	67-66-3	1.34E-04	24-hour	1	0.00015	<1%	0.22	0.22	22%
Chloroform	67-66-3	1.34E-04	Annual	0.2	0.000007	<1%	0.13	0.13	67%
Chromium (hexavalent)	7440-47-3	4.03E-05	Annual	0.00014	0.000002	2%	—	0.000002	2%
Chromium (hexavalent)	7440-47-3	4.03E-05	24-hour	0.07	0.00005	<1%	—	0.00005	<1%

Indicator Compound	CAS No.	Total Facility Emission Rate [g/s]	Averaging Period	Project Criteria [µg/m³]	Maximum Concentration [µg/m³]	Percentage of Project Criteria [%]	Background Concentration [µg/m³]	Maximum Concentration (Including Background) [µg/m³]	Percentage of Project Criteria [%]
Chrysene	218-01-9	9.98E-08	24-hour	0.1	0.0000001	<1%	0.0001	0.0001	<1%
Cobalt	7440-48-4	2.30E-06	24-hour	0.1	0.000003	<1%	0.001	0.0007	<1%
Copper	7440-50-8	2.30E-04	24-hour	50	0.0003	<1%	0.031	0.0308	<1%
Dibenzo(a,c)anthracene	215-58-7	2.18E-07	24-hour	0.1	0.0000002	<1%	—	0.0000002	<1%
Dibenzo(a,h)anthracene	53-70-3	2.18E-07	24-hour	0.1	0.0000002	<1%	0.0001	0.0001	<1%
Dichlorodifluoromethane	75-71-8	3.31E-05	24-hour	500000	0.00004	<1%	2.757	2.76	<1%
Dichloroethene, 1,1 -	75-35-4	1.54E-05	24-hour	10	0.00002	<1%	0.000	0.0004	<1%
Dichloromethane	75-09-02	1.45E-03	24-hour	220	0.00162	<1%	0.489	0.49	<1%
Dichloromethane	75-09-02	1.45E-03	Annual	44	0.00008	<1%	0.349	0.35	<1%
Dioxins, Furans and Dioxin- like PCBs	N/A -6	2.68E-03	24-hour	0.1 pg TEQ/m³	0.003 pg TEQ/m³	3%	0.021	0.024 pg TEQ/m³	24%
Ethylbenzene	100-41-4	4.81E-04	24-hour	1000	0.0005	<1%	0.355	0.36	<1%
Ethylbenzene	100-41-4	4.81E-04	10-minute	1900	0.0078	<1%	1.426	1.43	<1%
Ethylene Dibromide	106-93-4	3.09E-05	24-hour	3	0.00003	<1%	0.002	0.002	<1%
Fluoranthene	206-44-0	3.18E-07	24-hour	0.1	0.0000004	<1%	0.002	0.002	2%
Fluorine	86-73-7	1.50E-07	24-hour	0.1	0.0000002	<1%	—	0.0000002	<1%
Formaldehyde	50-00-0	1.81E-06	24-hour	65	0.000002	<1%	—	0.000002	<1%
Hexachlorobenzene	118-74-1	8.82E-08	24-hour	0.011	0.0000001	<1%	—	0.0000001	<1%
Hydrogen Chloride	7647-01-0	4.03E-01	24-hour	20	0.45	2%	—	0.45	2%
Hydrogen Fluoride	7664-39-3	4.47E-03	24-hour	1.72	0.01	<1%	—	0.01	<1%
Hydrogen Fluoride	7664-39-3	4.47E-03	30-day	0.69	0.0007	<1%	—	0.0007	<1%
Indeno(1,2,3 – cd)pyrene	193-39-5	2.18E-07	24-hour	0.1	0.0000002	<1%	0.0001	0.0001	<1%
Lead	7439-92-1	2.24E-03	24-hour	0.5	0.003	<1%	0.004	0.007	1%
Lead	7439-92-1	2.24E-03	30-day	0.2	0.0003	<1%	—	0.0003	<1%
Mercury	7439-97-6	6.71E-04	24-hour	2	0.0008	<1%	—	0.0008	<1%
Molybdenum	7439-98-7	2.30E-04	24-hour	120	0.0003	<1%	0.001	0.0014	<1%
Naphthalene	91-20-3	2.10E-06	24-hour	22.5	0.000002	<1%	0.04	0.04	<1%
Naphthalene	91-20-3	2.10E-06	10-minute	50	0.00003	<1%	0.17	0.17	<1%
Nickel	7440-02-0	5.39E-05	Annual	0.04	0.000003	<1%	0.001	0.001	3%
Nickel	7440-02-0	5.39E-05	24-hour	2	0.0001	<1%	0.001	0.00	<1%
Nitrogen Dioxides	10102-44-0	5.41E+00	1-hour	79	40.63	51%	30.00	70.63	89%
Nitrogen Dioxides	10102-44-0	5.41E+00	24-hour	200	6.06	3%	22.28	28.35	14%

Indicator Compound	CAS No.	Total Facility Emission Rate [g/s]	Averaging Period	Project Criteria [µg/m³]	Maximum Concentration [µg/m³]	Percentage of Project Criteria [%]	Background Concentration [µg/m³]	Maximum Concentration (Including Background) [µg/m³]	Percentage of Project Criteria [%]
Nitrogen Dioxides	10102-44-0	5.41E+00	Annual	22.5	0.28	1%	14.04	14.33	64%
O-terphenyl	84-15-1	9.35E-08	24-hour	0.1	0.0000001	<1%	0.0002	0.0002	<1%
Pentachlorobenzene	608-93-5	8.95E-08	24-hour	80	0.0000001	<1%	—	0.0000001	<1%
Pentachlorophenol	87-86-5	4.41E-07	24-hour	20	0.0000005	<1%	—	0.0000005	<1%
Perylene	198-55-0	8.82E-08	24-hour	0.1	0.0000001	<1%	0.0002	0.0002	<1%
Phenanthrene	85-01-8	1.24E-06	24-hour	0.1	0.000001	<1%	0.010	0.01	10%
Phosphorus	7723-14-0	2.06E-03	24-hour	0.5	0.0023	<1%	0.48	0.48	96%
PM_{10}	N/A -3	2.17E-01	24-hour	50	1.13	2%	24.48	25.62	51%
$PM_{2.5}$	N/A -4	2.05E-01	24-hour	27	1.06	4%	13.22	14.28	53%
$PM_{2.5}$	N/A -4	2.05E-01	Annual	8.8	0.05	<1%	8.12	8.18	93%
Polychlorinated Biphenyls (PCB)	N/A -7	2.91E-08	24-hour	0.1	0.00000003	<1%	—	0.00000003	<1%
Pyrene	129-00-0	2.83E-07	24-hour	0.1	0.000000	<1%	0.001	0.0008	<1%
Selenium	7782-49-2	3.33E-05	24-hour	10	0.00004	<1%	0.003	0.0035	<1%
Silver	7440-22-4	1.92E-06	24-hour	1	0.000002	<1%	0.0017	0.0017	<1%
Sulphur Dioxide	7446-09-05	1.57E+00	10-minute	178	25.28	14%	19.41	44.70	25%
Sulphur Dioxide	7446-09-05	1.57E+00	1-hour	106	15.32	14%	11.75	27.08	26%
Sulphur Dioxide	7446-09-05	1.57E+00	24-hour	150	1.76	1%	12.64	14.39	10%
Sulphur Dioxide	7446-09-05	1.57E+00	Annual	10.5	0.08	<1%	5.26	5.34	51%
Tetrachloroethene	127-18-4	1.66E-05	24-hour	360	0.00002	<1%	0.13	0.13	<1%
Tetralin	119-64-2	2.20E-06	24-hour	151.5	0.000002	<1%	0.003	0.003	<1%
Thallium	7440-28-0	4.56E-06	24-hour	0.5	0.000005	<1%	0.003	0.003	<1%
Tin	7440-31-5	7.87E-04	24-hour	10	0.001	<1%	0.003	0.004	<1%
Toluene	108-88-3	1.90E-03	24-hour	2000	0.002	<1%	2.080	2.08	<1%
Total Chromium (and compounds)	7440-47-3	4.03E-05	24-hour	0.5	0.00005	<1%	0.005	0.0055	1%
Total Chromium (and compounds)	7440-47-3	4.03E-05	24-hour	5	0.00005	<1%	0.005	0.0055	<1%
Total Suspended Particulate	N/A -1	2.17E-01	24-hour	120	1.13	<1%	42.93	44.07	37%
Total Suspended Particulate	N/A -1	2.17E-01	Annual	60	0.06	<1%	26.00	26.05	43%
Trichloroethane, 1,1,1 -	71-55-6	1.54E-05	24-hour	115000	0.00002	<1%	0.029	0.03	<1%
Trichloroethene	86-42-0	1.54E-05	24-hour	0.1	0.00002	<1%	—	0.00	<1%
Trichloroethylene, 1,1,2 -	79-01-06	1.54E-05	24-hour	12	0.00002	<1%	0.15	0.15	1%
Trichloroethylene, 1,1,2 -	79-01-06	1.54E-05	Annual	2.3	0.000001	<1%	0.05	0.05	2%

Indicator Compound	CAS No.	Total Facility Emission Rate [g/s]	Averaging Period	Project Criteria [µg/m³]	Maximum Concentration [µg/m³]	Percentage of Project Criteria [%]	Background Concentration [µg/m³]	Maximum Concentration (Including Background) [µg/m³]	Percentage of Project Criteria [%]
Trichlorofluoromethane	75-69-4	9.73E-05	24-hour	6000	0.0001	<1%	1.77	1.77	<1%
Vanadium	7440-62-2	1.25E-06	24-hour	2	0.000001	<1%	0.002	0.0018	<1%
Vinyl chloride	75-01-04	3.09E-05	24-hour	1	0.00003	<1%	0.004	0.004	<1%
Vinyl chloride	75-01-04	3.09E-05	Annual	0.2	0.000002	<1%	0.002	0.002	1%
Xylenes, m-, p- and o-	1330-20-7	4.51E-03	24-hour	730	0.01	<1%	0.87	0.87	<1%
Xylenes, m-, p- and o-	1330-20-7	4.51E-03	10-minute	3000	0.07	<1%	3.49	3.56	<1%
Zinc	7440-66-6	2.44E-04	24-hour	120	0.0003	<1%	0.06	0.06	<1%

Table 16: Scenario 2B - Maximum Concentrations at all Receptors for Future Maximum Operating Conditions (160,000 tpa) plus Ancillary Sources

Indicator Compound	CAS No.	Total Facility Emission Rate [g/s]	Averaging Period	Project Criteria [µg/m³]	Maximum Concentration [µg/m³]	Percentage of Project Criteria [%]	Background Concentration [µg/m³]	Maximum Concentration (Including Background) [µg/m³]	Percentage of Project Criteria [%]
Nitrogen Dioxides	10102-44-0	6.63E+00	1-hour	79	106.91	135%	30.00	136.91	173%
Nitrogen Dioxides	10102-44-0	5.47E+00	24-hour	200	6.31	3%	22.30	28.61	14%
Nitrogen Dioxides	10102-44-0	5.42E+00	Annual	22.5	0.29	1%	14.00	14.27	63%
PM_{10}	N/A -3	1.05E+00	24-hour	50	1.13	2%	24.50	25.63	51%
$PM_{2.5}$	N/A -4	9.83E-01	24-hour	27	1.13	4%	13.20	14.33	53%
$PM_{2.5}$	N/A -4	8.97E-01	Annual	8.8	0.14	2%	8.12	8.26	94%
Total Suspended Particulate	N/A -1	1.01E+00	24-hour	120	1.13	<1%	42.90	44.03	37%
Total Suspended Particulate	N/A -1	9.56E-01	Annual	60	0.14	<1%	26.00	26.14	44%

7.0 COMPARISON OF MODELLED SCENARIOS

A comparison of the modelling results from the two scenarios is presented in Appendix H. The results indicate that the change in predicted concentrations(without background) between the two scenarios is small with maximum predicted concentrations of all Indicator Compounds showing a decrease for the future maximum operating scenario (160,000 tpa) compared to the current maximum operating scenario (140,000 tpa) of up to 17%. The reduction in concentration is attributed to the increased stack outlet flow rate and temperature which would improve dispersion conditions for some meteorological conditions.

Of the 116 combinations of Indicator Compounds and averaging periods assessed, the maximum predicted concentration of 85 combinations changes by less than 1%. All predicted concentrations vary by less than 17% with all contaminants showing a decrease in predicted concentration, with the percent change dependant on the averaging period. A summary of the percentage change in maximum predicted concentration between the 140,000 tpa and 160,000 tpa operating scenarios is provided in Table 17 and presented as a series of Bar Charts in Figure 9, showing the percent change for 1-hour, 24-hour, 30-day and annual averaging periods.

Table 17: Percent Change in Maximum Predicted Concentration between the 140,000 tpa and 160,000 tpa Operating Scenarios (before addition of background concentrations)

Percent Change	Number of Indicator Compounds and Averaging Periods
<1%	85
1%-5%	4
5%-10%	14
10%-15%	11
15%-17%	2
TOTAL	**116**

The Indicator Compounds with the highest change in concentration are those with 30 day averaging periods (Lead and Hydrogen fluorides), which show a decrease of 17%. Predicted Concentrations of both Indicator Compounds are still less than 1% of the relevant Project Criteria.

Once background concentrations are added to the predicted concentrations from DYEC, the resultant cumulative concentrations vary by even less, due to the high contribution of background concentrations. The maximum change is a decrease of <1% for all contaminants for which background data was available, with the exception of 10- minute and 1-hour averaged sulphur dioxide, which shows a 6% decrease.

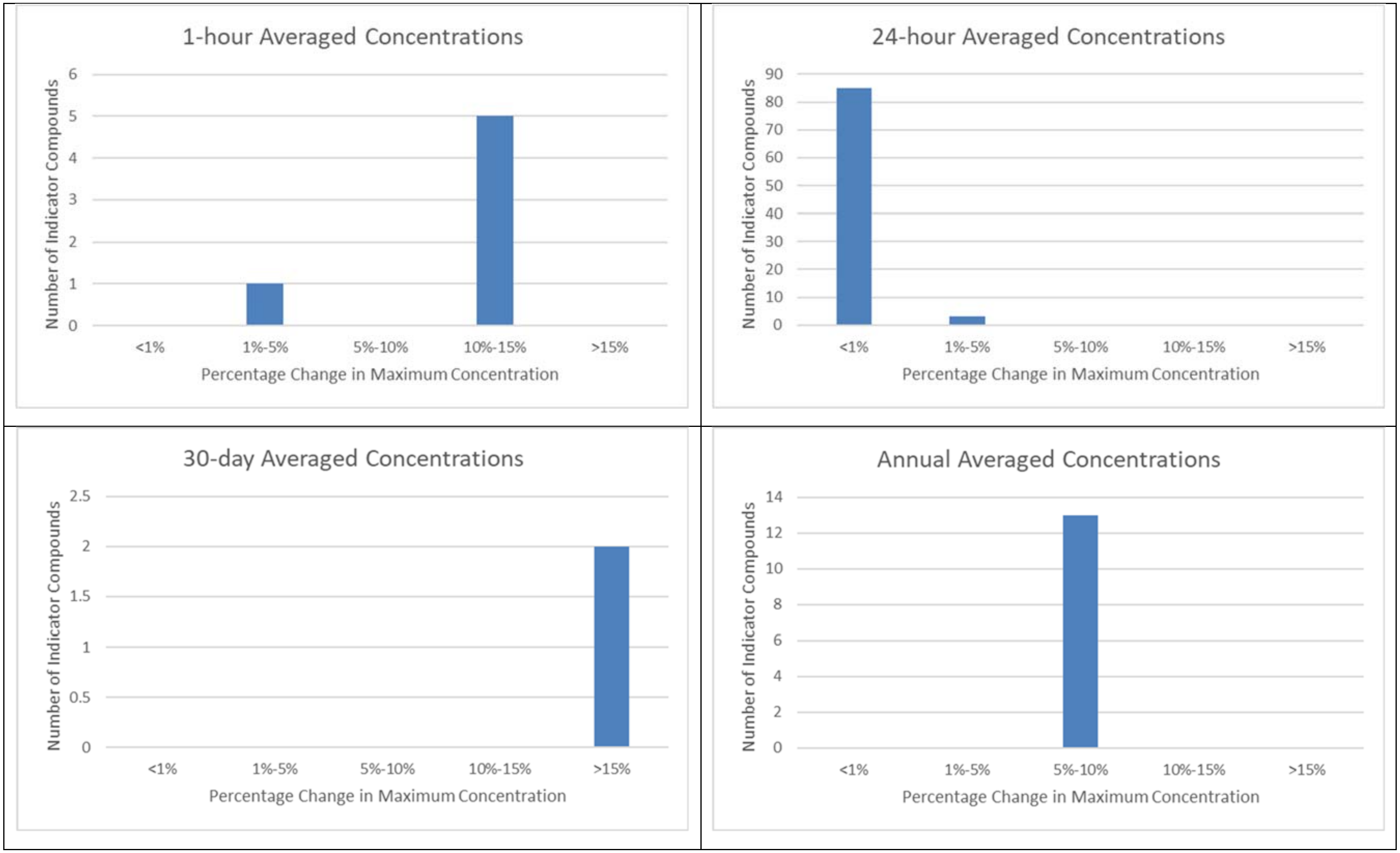


Figure 9: Percent Change in Concentration for Various Averaging Periods Assessed

8.0 CONCLUSIONS

An assessment of potential air quality impacts associated with the increase in annual processing capacity of DYEC by 20,000 tpa was completed based on modelling of maximum emissions from DYEC and the addition of ambient monitoring data to represent regional background air quality.

The results of the cumulative assessment are anticipated to represent a very conservative scenario as they assume that the meteorological conditions which result in the worst dispersion occur at the same time that maximum on-site activities take place, and during a period when ambient air quality conditions are at the 90th percentile. Ambient air quality conditions are typically lower 90% of the time. The likelihood of all these factors occurring concurrently is low.

Overall, the results of the modelling assessment indicate that the 160,000 tpa would result in a small overall decrease in the maximum predicted concentrations for all contaminants and the change in cumulative concentrations would be even less significant. The decrease is attributed to increased stack gas temperature and flowrate which improve the dispersion characteristics of the facility. Predicted cumulative concentrations of all contaminants are below the relevant air quality criteria for all Indicator Compounds, with the exception of benzo(a)pyrene during maximum operations and nitrogen dioxides during emergency diesel generator testing.

The background concentration of benzo(a)pyrene is greater than the Project Criteria before any contribution from DYEC is included due to transportation emissions from the nearby Highway 401. Emissions from DYEC contribute less than 1% to the total ambient benzo(a)pyrene concentration for all assessed scenarios. Levels of benzo(a)pyrene around the DYEC have remained steady, suggesting the DYEC is not a significant source of benzo(a)pyrene.

Standby generator testing occurs for up to one hour, once per month. This assessment assumes that testing occurs while DYEC is operating at maximum capacity (i.e. 140,000 or 160,000 tpa) and during meteorological conditions that result in the worst-case dispersion and is therefore very conservative. Additionally, while the maximum predicted concentration of NO_2 is greater than the CAAQS of 79 µg/m³, it is much less than the Ontario AAQC of 400 µg/m³. There is also no significant difference in the predicted concentration of NO_2 between the current and future operating scenarios.

As a result, the increase in annual throughput of DYEC by 20,000 tpa is not expected to significantly impact local air quality.

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APPENDIX A

Comparison of Applicable Guidelines

Indicator Compound	CAS No.	Limiting Effect	Averaging Period	Ontario AAQC [µg/m³]	National Ambient Air Quality Standards and Objectives[c] (µg/m^3)		CAAQS [µg/m³]	Ontario Regulation 419/05				Project Criteria [µg/m³]
					Desirable	Acceptable		MECP POI Limit [µg/m³]	Schedule	Source	Benchmark	
1 – Methylnaphthalene	90-12-0	Health	24-hour	—	—	—	—	35.5	Sch. 3	SL-JSL	B2	35.5
1,2,4 – Trichlorobenzene	120-82-1	Health	24-hour	400	—	—	—	400	Sch. 3	Guideline	B1	400
1,2,4,5-Tetrachlorobenzene	95-94-3	Health	24-hour	—	—	—	—	1	Sch. 3	SL-JSL	B2	1
1,2-Dichlorobenzene	95-50-1	Health	1-hour	30500	—	—	—	30500	Sch. 3	Guideline	B1	30500
2 – Methylnaphthalene	91-57-6	—	24-hour	—	—	—	—	0.1	—	De Minimus	—	0.1
2,3,4,6-Tetrachlorophenol	58-90-2	Health	24-hour	—	—	—	—	0.75	Sch. 3	SL-JSL	B2	0.75
2,4,6-Trichlorophenol	88-06-2	Health	24-hour	—	—	—	—	1.5	Sch. 3	SL-JSL	B2	1.5
2,4-Dichlorophenol	120-83-2	Health	24-hour	—	—	—	—	33.5	Sch. 3	SL-JSL	B2	33.5
Acenaphthene	83-32-9	—	24-hour	—	—	—	—	0.1	—	De Minimus	—	0.1
Acenaphthylene	208-96-8	—	24-hour	—	—	—	—	0.1	—	De Minimus	—	0.1
Acetaldehyde	75-07-0	Health	24-hour	500	—	—	—	500	Sch. 3	Standard	B1	500
Acetaldehyde	75-07-0	Health	1/2-hour	500	—	—	—	500	Sch. 3	Standard	B1	500
Aluminum	7429-90-5	Health	24-hour	—	—	—	—	12	Sch. 3	SL-JSL	B2	12
Ammonia	7664-41-7	Health	24-hour	100	—	—	—	100	Sch. 3	Standard	B1	100
Anthracene	120-12-7	—	24-hour	—	—	—	—	0.1	—	De Minimus	—	0.1
Antimony	7440-36-0	Health	24-hour	25	—	—	—	25	Sch. 3	Standard	B1	25
Arsenic	7440-38-2	Health	24-hour	0.3	—	—	—	0.3	Sch. 3	Guideline	B1	0.3
Barium	7440-39-3	Health	24-hour	10	—	—	—	10	Sch. 3	Guideline	B1	10
Benzene	71-43-2	Health	Annual	0.45	—	—	—	0.45	Sch. 3	Standard	B1	0.45
Benzene	71-43-2	—	24-hour	2.3	—	—	—	100	Sch. 6	URT	—	2.3
Benzo(a)anthracene	56-55-3	—	24-hour	—	—	—	—	0.1	—	De Minimus	—	0.1
Benzo(a)fluorene	238-84-6	—	24-hour	—	—	—	—	0.1	—	De Minimus	—	0.1
Benzo(a)pyrene [as a surrogate of total Polycyclic Aromatic Hydrocarbons (PAHs)]	50-32-8	Health	Annual	0.00001	—	—	—	0.00001	Sch. 3	Standard	B1	0.00001
Benzo(a)pyrene [as a surrogate of total Polycyclic Aromatic Hydrocarbons (PAHs)]	50-32-8	Health	24-hour	0.00005	—	—	—	0.005	Sch. 6	URT	—	0.00005
Benzo(b)fluoranthene	205-99-2	—	24-hour	—	—	—	—	0.1	—	De Minimus	—	0.1
Benzo(b)fluorene	243-17-4	—	24-hour	—	—	—	—	0.1	—	De Minimus	—	0.1
Benzo(e)pyrene	192-97-2	—	24-hour	—	—	—	—	0.1	—	De Minimus	—	0.1
Benzo(ghi)perylene	191-24-2	—	24-hour	—	—	—	—	0.1	—	De Minimus	—	0.1
Benzo(k)fluoranthene	207-08-9	—	24-hour	—	—	—	—	0.1	—	De Minimus	—	0.1
Beryllium	7440-41-7	Health	24-hour	0.01	—	—	—	0.01	Sch. 3	Standard	B1	0.01

Indicator Compound	CAS No.	Limiting Effect	Averaging Period	Ontario AAQC [µg/m³]	National Ambient Air Quality Standards and Objectives(c) (µg/m³)		CAAQS [µg/m³]	Ontario Regulation 419/05				Project Criteria [µg/m³]
					Desirable	Acceptable		MECP POI Limit [µg/m³]	Schedule	Source	Benchmark	
Biphenyl	92-52-4	Health	1-hour	60	—	—	—	60	Sch. 3	SL-JSL	B2	60
Boron	7440-42-8	Particulate	24-hour	120	—	—	—	120	Sch. 3	Standard	B1	120
Bromodichloromethane	75-27-4	Health	24-hour	—	—	—	—	350	Sch. 3	SL-JSL	B2	350
Bromoform	75-25-2	Health	24-hour	55	—	—	—	55	Sch. 3	Guideline	B1	55
Bromomethane	74-83-9	Health	24-hour	1350	—	—	—	1350	Sch. 3	Guideline	B1	1350
Cadmium	7440-43-9	Health	24-hour	0.025	—	—	—	0.025	Sch. 3	Standard	B1	0.025
Cadmium	7440-43-9	Health	Annual	0.005	—	—	—	—	—	—	—	0.005
Carbon Monoxide	630-08-0	Health	1/2-hour	—	—	—	—	6000	Sch. 3	Standard	B1	6000
Carbon Monoxide	630-08-0	Health	1-Hour	36200	15000	35000	—	—	—	—	—	15000
Carbon Monoxide	630-08-0	Health	8-hour	15700	6000	15000	—	—	—	—	—	6000
Carbon tetrachloride	56-23-5	Health	24-hour	2.4	—	—	—	2.4	Sch. 3	Standard	B1	2.4
Chloroform	67-66-3	Health	24-hour	1	—	—	—	1	Sch. 3	Standard	B1	1
Chloroform	67-66-3	Health	Annual	0.2	—	—	—	—	—	—	—	0.2
Chromium (hexavalent)	7440-47-3	Health	Annual	0.00007 (Cr in PM10)	—	—	—	0.00014	Sch. 3	Standard	B1	0.00014
Chromium (hexavalent)	7440-47-3	—	24-hour	0.00035 (Cr in PM10)	—	—	—	0.07	Sch. 6	URT	—	0.07
Chrysene	218-01-9	—	24-hour	—	—	—	—	0.1	—	De Minimus	—	0.1
Cobalt	7440-48-4	Health	24-hour	0.1	—	—	—	0.1	Sch. 3	Guideline	B1	0.1
Dibenzo(a,c)anthracene	215-58-7	—	24-hour	—	—	—	—	0.1	—	De Minimus	—	0.1
Dibenzo(a,h)anthracene	53-70-3	—	24-hour	—	—	—	—	0.1	—	De Minimus	—	0.1
Dichlorodifluoromethane	75-71-8	Health	24-hour	500000	—	—	—	500000	Sch. 3	Guideline	B1	500000
Dichloroethene, 1,1 -	75-35-4	Health	24-hour	10	—	—	—	165	Sch. 3	Standard	B1	10
Dichloromethane	75-09-02	Health	24-hour	220	—	—	—	220	Sch. 3	Standard	B1	220
Dichloromethane	75-09-02	Health	Annual	44	—	—	—	—	—	—	—	44
Dioxins, Furans and Dioxin- like PCBs	N/A -6	Health	24-hour	0.1 pg TEQ/m³	—	—	—	0.1 pg TEQ/m³	Sch. 3	Guideline	B1	0.1 pg TEQ/m³
Ethylbenzene	100-41-4	Health	24-hour	1000	—	—	—	1000	Sch. 3	Standard	B1	1000
Ethylbenzene	100-41-4	Odour	10-minute	1900	—	—	—	1900	Sch. 3	Guideline	B1	1900
Ethylene Dibromide	106-93-4	Health	24-hour	3	—	—	—	3	Sch. 3	Guideline	B1	3
Fluoranthene	206-44-0	—	24-hour	—	—	—	—	0.1	—	De Minimus	—	0.1
Fluorine	86-73-7	—	24-hour	—	—	—	—	0.1	—	De Minimus	—	0.1
Formaldehyde	50-00-0	Health	24-hour	65	—	—	—	65	Sch. 3	Standard	B1	65
Hexachlorobenzene	118-74-1	Health	24-hour	—	—	—	—	0.011	Sch. 3	SL-JSL	B2	0.011

Indicator Compound	CAS No.	Limiting Effect	Averaging Period	Ontario AAQC [µg/m³]	National Ambient Air Quality Standards and Objectives[c] (µg/m³)		CAAQS [µg/m³]	Ontario Regulation 419/05				Project Criteria [µg/m³]
					Desirable	Acceptable		MECP POI Limit [µg/m³]	Schedule	Source	Benchmark	
Hydrogen Chloride	7647-01-0	Health	24-hour	20	—	—	—	20	Sch. 3	Standard	B1	20
Hydrogen Fluoride	7664-39-3	Vegetation	24-hour	1.72	—	—	—	1.72	Sch. 3	Standard	B1	1.72
Hydrogen Fluoride	7664-39-3	Vegetation	30-day	0.69	—	—	—	0.69	Sch. 3	Standard	B1	0.69
Indeno(1,2,3 – cd)pyrene	193-39-5	—	24-hour	—	—	—	—	0.1	—	De Minimus	—	0.1
Lead	7439-92-1	Health	24-hour	0.5	—	—	—	0.5	Sch. 3	Standard	B1	0.5
Lead	7439-92-1	Health	30-day	0.2	—	—	—	0.2	Sch. 3	Standard	B1	0.2
Mercury	7439-97-6	Health	24-hour	2	—	—	—	2	Sch. 3	Standard	B1	2
Naphthalene	91-20-3	Health	24-hour	22.5	—	—	—	22.5	Sch. 3	Guideline	B1	22.5
Naphthalene	91-20-3	Odour	10-minute	50	—	—	—	50	Sch. 3	Guideline	B1	50
Nickel	7440-02-0	Health	Annual	0.02 (Ni in PM10)	—	—	—	0.04	Sch. 3	Standard	B1	0.04
Nickel	7440-02-0	—	24-hour	0.1 (Ni in PM10)	—	—	—	2	Sch. 6	URT	—	2
Nitrogen Dioxides	10102-44-0	Health	1-hour	400 (3)	—	400	79 (4)	400 (3)	Sch. 3	Standard	B1	79
Nitrogen Dioxides	10102-44-0	Health	24-hour	200 (3)	—	200	—	200 (3)	Sch. 3	Standard	B1	200
Nitrogen Dioxides	10102-44-0	Health	Annual	—	60	—	22.5	—	—	—	—	22.5
O-terphenyl	84-15-1	—	24-hour	—	—	—	—	0.1	—	De Minimus	—	0.1
Pentachlorobenzene	608-93-5	Health	24-hour	—	—	—	—	80	Sch. 3	SL-JSL	B2	80
Pentachlorophenol	87-86-5	Health	24-hour	20	—	—	—	20	Sch. 3	Guideline	B1	20
Perylene	198-55-0	—	24-hour	—	—	—	—	0.1	—	De Minimus	—	0.1
Phenanthrene	85-01-8	—	24-hour	—	—	—	—	0.1	—	De Minimus	—	0.1
Phosphorus	7723-14-0	Health	24-hour	—	—	—	—	0.5	Sch. 3	SL-MD	B2	0.5
PM_{10} (1)	N/A -3	Particulate	24-hour	50	—	—	—	—	—	—	—	50
$PM_{2.5}$	N/A -4	Particulate	24-hour	27	—	—	27 (2)	—	—	—	—	27
$PM_{2.5}$	N/A -4	Particulate	Annual	—	—	—	8.8	—	—	—	—	8.8
Polychlorinated Biphenyls (PCB)	N/A -7	Health	24-hour	—	—	—	—	0.1	—	De Minimus	—	0.1
Pyrene	129-00-0	—	24-hour	—	—	—	—	0.1	—	De Minimus	—	0.1
Selenium	7782-49-2	Health	24-hour	10	—	—	—	10	Sch. 3	Guideline	B1	10
Silver	7440-22-4	Health	24-hour	1	—	—	—	1	Sch. 3	Standard	B1	1
Sulphur Dioxide	7446-09-05	Health & Vegetation	10-minute	178	—	—	—	180	Sch. 3	Standard	B1	178
Sulphur Dioxide	7446-09-05	Health & Vegetation	1-hour	106	450	900	170.34 (5)	100	Sch. 3	Standard	B1	106
Sulphur Dioxide	7446-09-05	Health & Vegetation	24-hour	—	150	300	—	275	Sch. 3	Standard	B1	150

Indicator Compound	CAS No.	Limiting Effect	Averaging Period	Ontario AAQC [µg/m³]	National Ambient Air Quality Standards and Objectives(c) (µg/m³)		CAAQS [µg/m³]	Ontario Regulation 419/05				Project Criteria [µg/m³]
					Desirable	Acceptable		MECP POI Limit [µg/m³]	Schedule	Source	Benchmark	
Sulphur Dioxide	7446-09-05	Health & Vegetation	Annual	10.5	30	60	10.5	10	Sch. 3	Standard	B1	10.5
Tetrachloroethene	127-18-4	Health	24-hour	360	—	—	—	360	Sch. 3	Standard	B1	360
Tetralin	119-64-2	Health	24-hour	—	—	—	—	151.5	Sch. 3	SL-JSL	B2	151.5
Thallium	7440-28-0	Health	24-hour	—	—	—	—	0.5	Sch. 3	SL-JSL	B2	0.5
Tin	7440-31-5	Health	24-hour	10	—	—	—	10	Sch. 3	Standard	B1	10
Toluene	108-88-3	Odour	24-hour	2000	—	—	—	2000	Sch. 3	Guideline	B1	2000
Total Chromium (and compounds)	7440-47-3	Health	24-hour	0.00035 (Cr in PM10)	—	—	—	0.5	Sch. 3	Standard	B1	0.5
Total Chromium (and compounds)	7440-47-3	—	24-hour	0.00035 (Cr in PM10)	—	—	—	5	Sch. 6	URT	—	5
Total Particulate Matter	N/A -1	Particulate	24-hour	120	—	—	—	120	Sch. 3	Guideline	B1	120
Total Particulate Matter	N/A -1	Particulate	Annual	60	—	—	—	120	Sch. 3	Guideline	B1	60
Trichloroethane, 1,1,1 -	71-55-6	Health	24-hour	115000	—	—	—	115000	Sch. 3	Standard	B1	115000
Trichloroethene	86-42-0	—	24-hour	—	—	—	—	0.1	—	De Minimus	—	0.1
Trichloroethylene, 1,1,2 -	79-01-06	Health	24-hour	12	—	—	—	12	Sch. 3	Standard	B1	12
Trichloroethylene, 1,1,2 -	79-01-06	Health	Annual	2.3	—	—	—	—	—	—	—	2.3
Trichlorofluoromethane	75-69-4	Health	24-hour	6000	—	—	—	6000	Sch. 3	Guideline	B1	6000
Vanadium	7440-62-2	Health	24-hour	2	—	—	—	2	Sch. 3	Standard	B1	2
Vinyl chloride	75-01-04	Health	24-hour	1	—	—	—	1	Sch. 3	Standard	B1	1
Vinyl chloride	75-01-04	—	Annual	0.2	—	—	—	—	—	—	—	0.2
Xylenes, m-, p- and o-	1330-20-7	Health	24-hour	730	—	—	—	730	Sch. 3	Standard	B1	730
Xylenes, m-, p- and o-	1330-20-7	Odour	10-minute	3000	—	—	—	3000	Sch. 3	Guideline	B1	3000
Zinc	7440-66-6	Particulate	24-hour	120	—	—	—	120	Sch. 3	Standard	B1	120

Notes:

1. Interim AAQC and is provided as a guide for decision making (MECP 2020)
2. Compliance is based on the 98th percentile of the annual monitored data averaged over three years of measurements.
3. Standard is for nitrogen oxides (NOx) but is based on the health effects of NO_2.
4. Canadian ambient air quality standard for NO_2 is effective from 2025. The 1-hour standard is based on the three-year average of the 98th percentile of the daily maximum 1-hour average concentration.
5. Canadian ambient air quality standard for SO_2 is effective from 2025. The 1-hour standard is based on the three-year average of the 98th percentile of the daily maximum 1-hour average concentration.

APPENDIX B

Courtice and Rundle Monitoring Plans

METEOROLOGICAL STATION CALIBRATION DATA SHEET

Client: Durham Region　　Date: May 24, 2019

Station ID: Courtice　　Time: 14:00

Installed Equipment

Parameter	Model
Temperature	Vaisala HMP-60
Relative Humidity	Vaisala HMP-60
Wind Speed	RM Young 05103
Wind Direction	RM Young 05103
Precipitation	Texas Instruments TR-525M

Windhead Check

Calibrator: RM Young Cal (# 1114)

Wind Direction (deg from)			Wind Speed (m/s)			
Direction Setpoint	DAS Reading	Actual Reading	Speed Setpoint	DAS Reading	Theoretical Speed	Actual Speed
0	0	0.3	0.98m/s (200rpm)	0.98m/s	3.53	2.98
45	45	45.3	2.45m/s (500rpm)	2.45m/s	8.82	7.70
90	90	90.3	3.92m/s (800rpm)	3.92m/s	14.11	13.01
135	135	135	5.39m/s (1100rpm)	5.39m/s	19.40	18.21
180	180	180.3	6.86m/s (1400rpm)	6.86m/s	24.69	22.88
225	225	225	9.31m/s (1900rpm)	9.31m/s	33.52	31.41
270	270	270.3				
315	315	314.7				

Criteria Met: ■ Yes ☐ No

Comments: Error Allowance for WS component (+/- 0.72 km/h + 5% of Reference Value)

Temperature Check

Standard Thermometer: Vaisala HMI-41

Reference Temperature: 15.6　　DAS Temperature: 14.8

Criteria Met: ■ Yes ☐ No

Comments:

Barometric Pressure Check

Standard Barometer: ___Digisense Traceable____

Reference Pressure: ____29.84___________ DAS Pressure: _____29.80__________

Criteria Met: ■ Yes ☐ No

Comments: ____

____

Relative Humidity Check

Standard Humidity Instrument: ____Vaisala HMI-41_________

Reference Humidity: ____60%__________ DAS Humidity: _______ ___63%_________

Criteria Met: ■ Yes ☐ No

Comments: ____

____

Precipitation Check

Graduated Cylinder Volume: _____250 mL____ ______________

Instrument Level: ■ Yes ☐ No

Debris in inlet basin: ☐ Yes ■ No

Volume of water poured_____100 mL____ ______________

Number of tips: ____20
Multiplier from Program: ____0.1

Criteria Met: ■ Yes ☐ No

Comments: ____

____

<u>**Meteorological Station Calibration Data Sheet**</u>

Client: DYEC **Date:** 20-Dec-18

Station ID: Rundle **Operator:** SRS/NM

Installed Equipment

Parameter	Model
Data Logger	CR1000
Wind Head	RM Young
Temperature/Humidity	HMP-60
Precipitation	Texas Instruments TR-525M

<u>**Windhead Check**</u>

Calibrator: RM Young

Wind Direction (deg from)		Wind Speed (m/s)	
Direction Setpoint	DAS Reading	Speed Setpoint	DAS Reading
0	0/357	0.98	0.98
45	45/42	2.45	2.45
90	90/87	3.92	3.92
135	135/132	5.39	5.39
180	180/177	6.86	6.86
225	225/222	9.31	9.31
270	270/268		
315	315/313		

Criteria Met: ☑ Yes ☐ No

Comments:

<u>**Temperature Check**</u>

Standard Thermometer: Digisense

Reference Temperature: 4.5 degC DAS Temperature: 3.9 degC

Criteria Met: ☑ Yes ☐ No

Comments:

Barometric Pressure Check

Standard Barometer: N/A

Reference Pressure: ____ DAS Pressure: ____

Criteria Met: ☐ Yes ☐ No

Comments: There is no barometer at this location

Relative Humidity Check

Standard Humidity Instrument: Digisense

Reference Humidity: 79% DAS Humidity: 79%

Criteria Met: ☑ Yes ☐ No

Comments:

Precipitation Check

Graduated Cylinder Volume: 250 ml

Instrument Level: ☑ Yes ☐ No
Debris in inlet basin: ☐ Yes ☑ No

Volume of water poured 125 ml
Number of tips 26
Multiplier from Program 0.1

Criteria Met: ☑ Yes ☐ No

Comments:

Calibration Performed by: Steve Sanderson/ Nathan McFadden

<u>**Meteorological Station Calibration Data Sheet**</u>

Client: DYEC **Date:** 24-May-19
Station ID: Rundle **Operator:** SRS

Installed Equipment

Parameter	Model
Data Logger	CR1000
Wind Head	RM Young
Temperature/Humidity	HMP-60
Precipitation	Texas Instruments TR-525M

Windhead Check

Calibrator: ____________________

Wind Direction (deg from)		Wind Speed (m/s)	
Direction Setpoint	DAS Reading	Speed Setpoint	DAS Reading
0		0.98	
45		2.45	
90		3.92	
135		5.39	
180		6.86	
225		9.31	
270			
315			

Criteria Met: ☐Yes ☐ No

Comments: Windhead calibration was not performed as there were safety issues with lowering and raising the tower

Temperature Check

Standard Thermometer: Digisense

Reference Temperature: 18.6 degC DAS Temperature: 15.5 degC

Criteria Met: ☑ Yes ☐ No

Comments: ____________________

Barometric Pressure Check

Standard Barometer: N/A

Reference Pressure: ____________ DAS Pressure: ____________

Criteria Met: ☐ Yes ☐ No

Comments: There is no barometer at this location

Relative Humidity Check

Standard Humidity Instrument: Digisense

Reference Humidity: 60% DAS Humidity: 67%

Criteria Met: ☑ Yes ☐ No

Comments:

Precipitation Check

Graduated Cylinder Volume: 100 ml

Instrument Level: ☑ Yes ☐ No
Debris in inlet basin: ☐Yes ☑ No

Volume of water poured 100 ml
Number of tips 21
Multiplier from Program 0.1

Criteria Met: ☑ Yes ☐ No

Comments:

Calibration Performed by: Steve Sanderson

AMBIENT AIR QUALITY MONITORING PLAN

DURHAM YORK RESIDUAL WASTE STUDY

Prepared for:

The Region of Durham

605 Rossland Rd

Whitby, ON

L1N 6A3

Prepared by:

Stantec Consulting Ltd.

300-675 Cochrane Dr., West Tower,

Markham, ON L3R 0B8

May 8, 2012

Project No.: 160930024

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1 INTRODUCTION

1.1 Monitoring Objectives

The Regional Municipalities of Durham and York are proposing to construct and operate the Durham York Energy Centre (DYEC) which will be an Energy from Waste (EFW) Facility intended to provide a long-term, sustainable solution to manage municipal solid waste remaining after diversion from the Regions.

This monitoring plan was developed based on the Regional Council mandate to provide ambient monitoring in the area of the DYEC for a three year period. An ambient monitoring and reporting program was also a requirement laid out in the Provincial Minister's Notice of Approval to Proceed with the Undertaking, detailed in Condition 11 of the Notice of Approval (MOE, 2010). The purposes of the ambient monitoring program will be to:

1. Quantify any measureable ground level concentrations resulting from emissions from the DYEC cumulative to local air quality, including validating the predicted concentrations from the dispersion modelling conducted in the Environmental Assessment (Jacques Whitford, 2009a);
2. Monitor concentration levels of EFW-related air contaminants in nearby residential areas; and,
3. Quantify background ambient levels of air contaminants in the area.

1.2 Monitoring Period

The monitoring program will commence one (1) year prior to DYEC commissioning (approximately July 1, 2013) to monitor baseline air quality in the absence of emissions from the DYEC (as per Condition 11 of the Ministry of Environment (MOE) Notice of Approval). During commissioning (starting approximately July 1, 2014) continuous monitoring parameters only will be collected. When the EFW Facility is fully operational, monitoring of all contaminants will again be conducted continuously until notification from the MOE Regional Director that the monitoring is no longer required is received. Based on the Regional Council mandate, operational monitoring will be conducted for a minimum 3 year period. The need for further monitoring beyond this time frame will be determined based on the results of the monitoring program in consultation with the Ontario Ministry of Environment (MOE) and the Durham Region Medical Officer of Health (MOH).

1.3 Project Description

The proposed DYEC will process about 140,000 tonnes of municipal solid waste annually. There will be two completely independent waste processing trains at the DYEC. Each train will consist of a feed chute, stoker, integrated furnace/boiler, acid gas scrubber, a fabric filter baghouse and associated ash and residue collection systems. Steam produced in the boilers will drive a turbine-generator to produce electricity for delivery to the grid, for in-plant use and potentially to provide district heating to the neighbouring Courtice Water Pollution Control Plant and Clarington Energy Park. A site plan showing the layout of the DYEC is presented in Figure 1-1.

The following emissions sources were identified based on the preliminary design:

- A conventional stack associated with air pollution control equipment on the waste processing trains which is defined by location, base elevation, stack height, stack diameter, gas exit velocity, gas exit temperature, and contaminant emission rates (the stack typically operates on a continuous basis with relatively constant emission rates);
- One 250 kW emergency diesel generator;
- Two 224 kW emergency diesel fire pumps;
- Diesel tanks for the emergency generator and fire pumps;
- Onsite vehicle traffic;
- Comfort heating of the administration and support buildings;
- A welding station in the storage and maintenance shop; and,
- Fugitive emissions associated with refuse, fly ash and bottom ash transport and handling.

1.4 EFW Site Characteristics

The DYEC will be located on undeveloped land owned by Durham Region, located south of Highway 401 in the Municipality of Clarington (the Site). The Site is on the west side of Osborne Road north of a CN Rail corridor. There are commercial properties north of the Site. The lands east and west of the site are undeveloped commercial land, which are currently used for agricultural purposes. The Courtice Water Pollution Control Plant is south and the Darlington Nuclear Generating Station is located approximately 1.8 km to the east of the Site. The nearest major intersection is Highway 401 and Courtice Road, which is approximately 1.7 km from the Site. The location of the DYEC relative to the local area is shown in Figure 1-2.

The DYEC will be located about 750 m north of Lake Ontario. The Lake is at an elevation of approximately 70 m above mean sea level and along the shoreline there is an escarpment which is approximately 20 m above the Lake’s water level. North of the lake shore, the local topography is relatively flat with terrain elevations varying from 90 m to 100 m above mean sea level within the immediate vicinity of the Site.

A total of 391 discrete sensitive receptors in the study area were examined in the Environmental Assessment of the DYEC. These receptors included industrial areas, residences/residential areas, hospitals, schools, day cares, nursing homes, recreational areas and water bodies. A plot of the special receptors in proximity to the DYEC is shown in Figure 1-3. A listing of all special receptors can be found in Table 3-9 of the AQTSR (Jacques Whitford, 2009a). The properties adjacent to the site in all directions are current or future industrial. There are two farms each located about 500-m to the east and west of the site. The nearest residential areas to the site are located about 1.5-km to the north-west (Solinas and Baseline Roads) and about 1.5-km to the north-east (Baseline and Trulls Roads).

1.5 Report Contents

The MOE's Operations Manual for Air Quality Monitoring in Ontario (MOE, 2008) (Operations Manual) requires a monitoring plan to include the following sections:

- Purpose or objectives of the monitoring program – Section 1.1
- Expected duration of the monitoring program – Section 1.1
- Identified and suspected air emission source(s) – Sections 1.2, 1.3
- Identified and suspected receptors – Sections 1.3, 2.2
- Number and location of monitoring sites (including meteorological sites) – Section 4.2
- Air quality parameters to be monitored and the monitoring frequency – Sections 4.1, 5.1, 5.2
- Monitoring methods/instruments to be used – Section 5
- Analytical methods/procedures – Sections 5, 6
- Laboratory services support to be used – Section 6
- Dispersion model to be used (if applicable) – N/A
- Quality Assurance and Quality Control (QA/QC) plan – Section 7
- Data reporting procedures – Section 8.

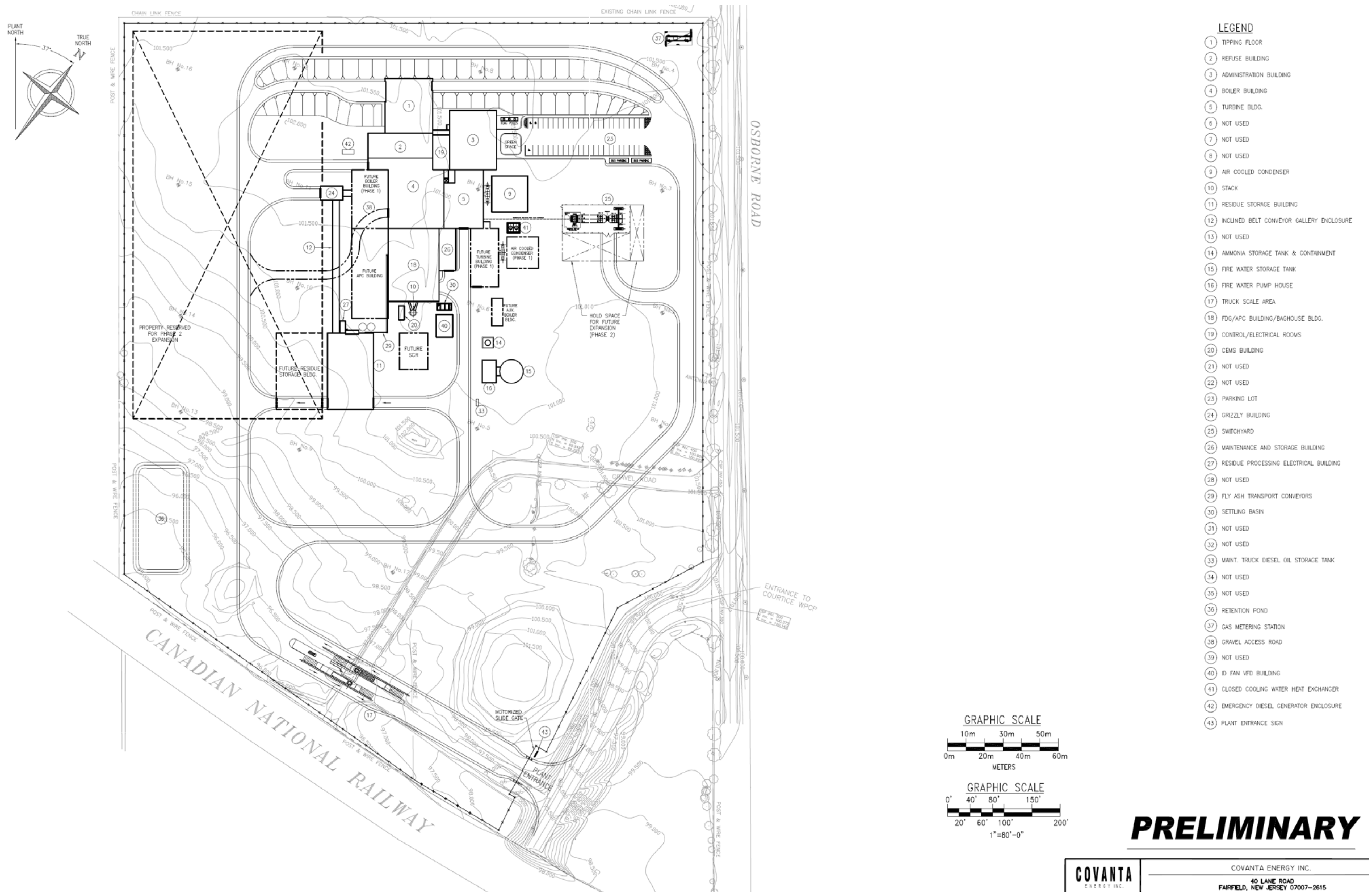
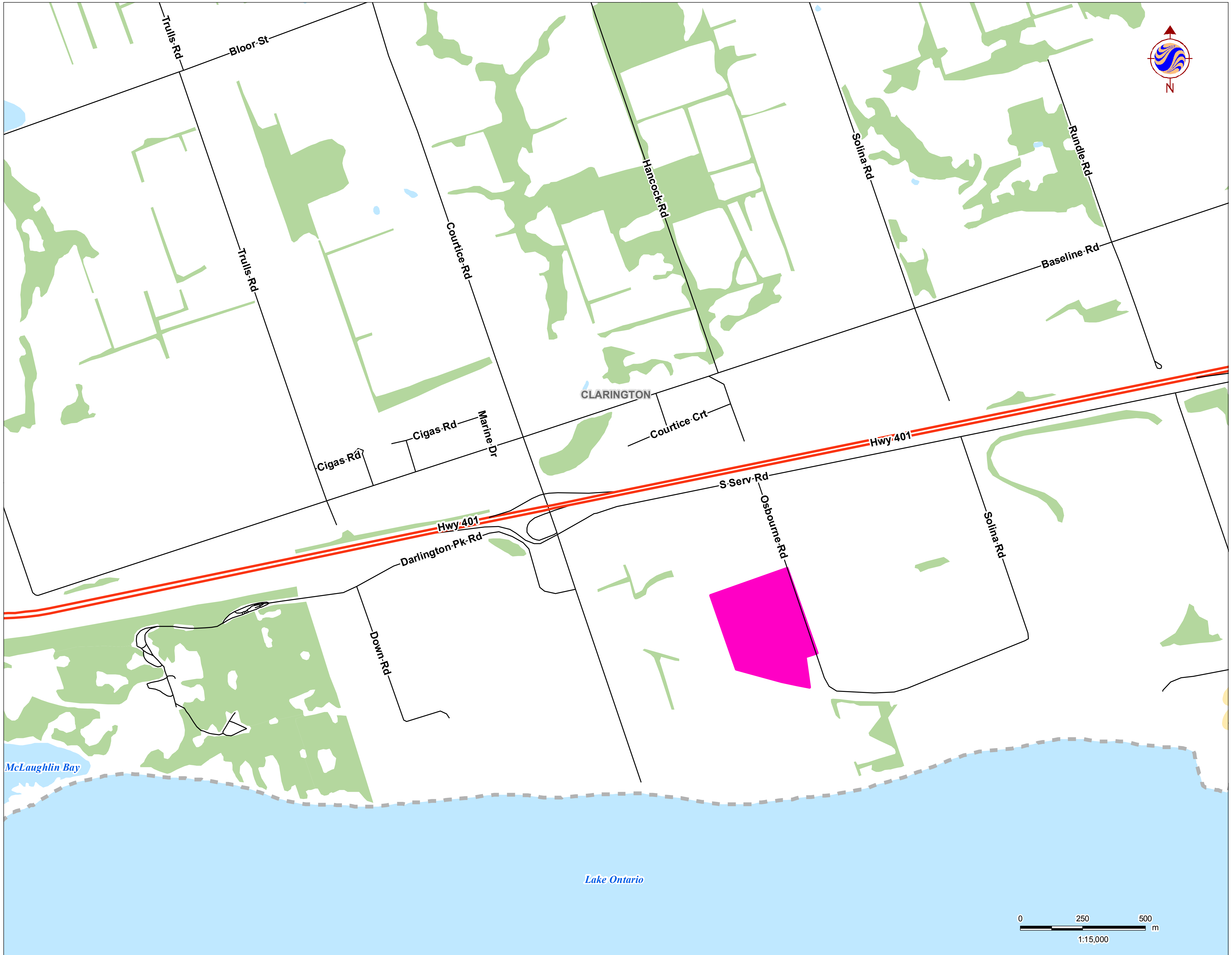


Figure 1-1 Proposed 140,000 tonnes/yr Facility Site Plan

DATE: 8/30/2011
PROJECT: 160930024



Legend

- Road
- Highway
- Proposed EFW Facility Site
- Waterbody
- Wooded Area

Notes

1. Coordinate System: UTM NAD 83 - Zone 17 (N).
2. Data provided by Ontario Ministry of Natural Resources. Copyright 2004 Queen's Printer Ontario

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January 2011
160930024

Client/Project

YORK REGION AND DURHAM REGION
RESIDUAL WASTE STUDY

Figure No.

1-2

Title

Location of EFW Facility and Surrounding Area

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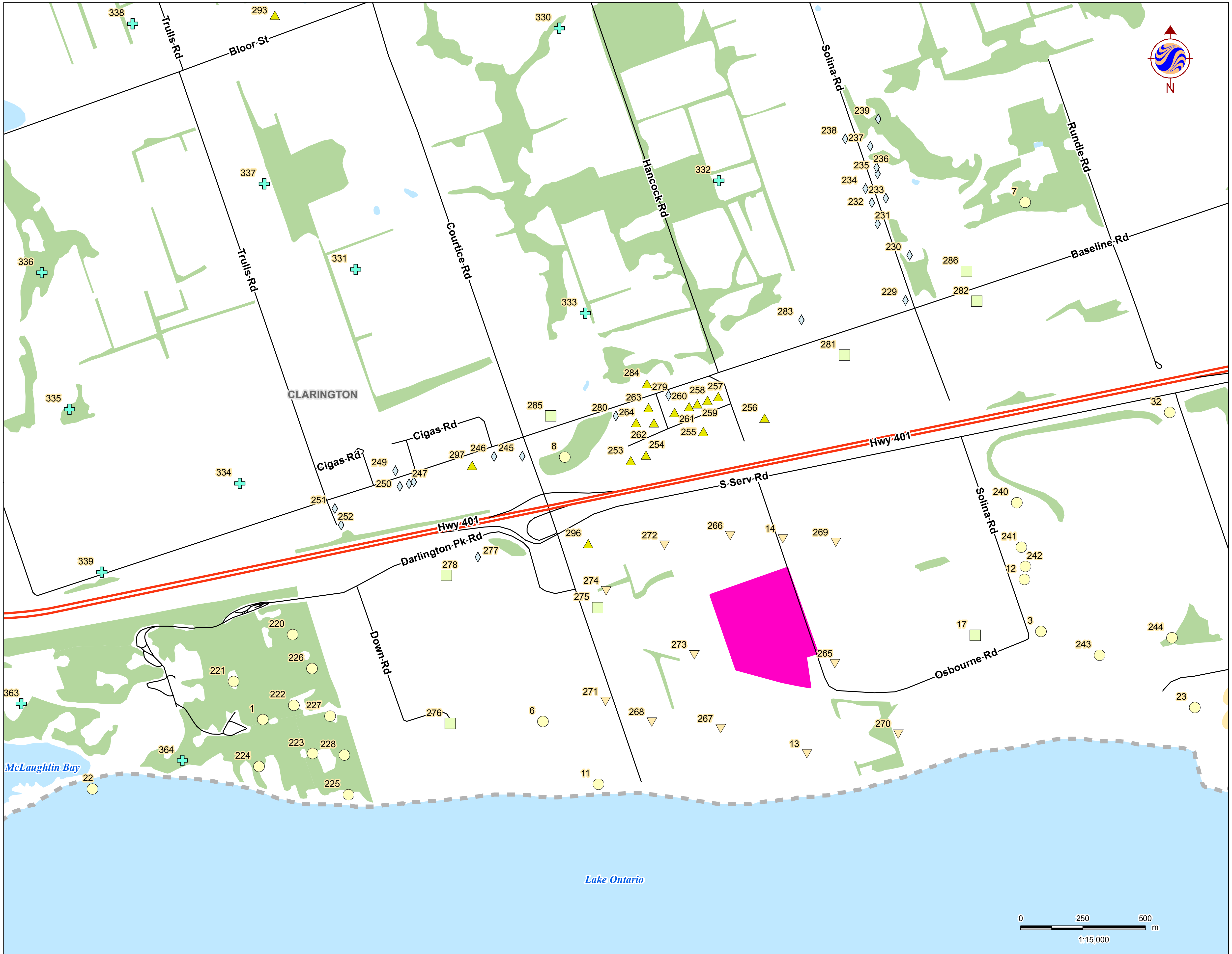
Revised on: January 7, 2011 By: sallen



Legend

- Road
- Highway
- Proposed EFW Facility Site
- Waterbody
- Wooded Area

Receptor Category

- Farm
- Commercial/Industrial
- Future Commercial/Industrial
- Natural/Recreational
- Residence
- Watershed

Notes

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RESIDUAL WASTE STUDY

Figure No.
1-3

Title
Locations of Sensitive Receptors

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Revised on: May 27, 2011 By: bcowper

2 SUMMARY OF DISPERSION MODELLING PREDICTIONS

Dispersion model predictions are an aide in the siting of monitoring stations recommended by the United States Environmental Protection Agency (40 CFR, Part 58) (US EPA). A dispersion modelling study of emissions from the DYEC was completed as part of the approved environmental assessment (EA) for this project (Jacques Whitford, 2009a). This study examined emissions of about 90 different contaminants of potential concern including criteria air contaminants, metals, PAHs, and dioxins/furans. The maximum off-property ground-level concentrations due to emissions from the DYEC were estimated using the CALPUFF dispersion model.

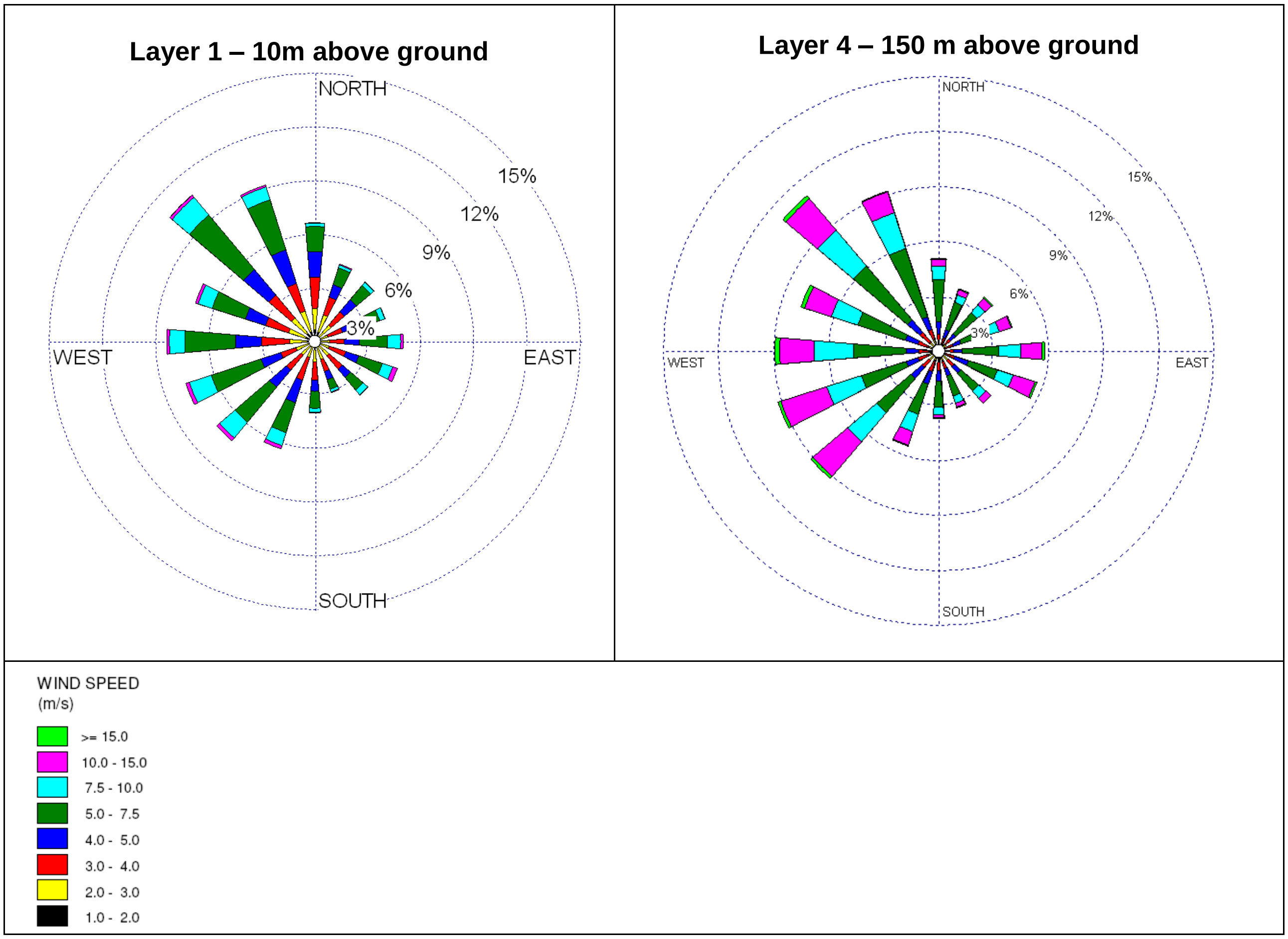
This section presents a brief overview of the dispersion modelling methodology and results relevant to the siting of the ambient monitors. Additional details can be found in the Air Quality Technical Study Report prepared for the EA (Jacques Whitford, 2009a).

2.1 Meteorological Modelling

As part of the dispersion modelling study, data from Environment Canada regional surface meteorological stations, in conjunction with modelled wind data from the Weather Research and Forecasting (WRF) model were used as inputs into the CALPUFF meteorological model. The CALMET meteorological model was run over a five year period to depict a wide range of meteorological conditions and associated dispersion conditions per the MOE's Air Dispersion Modelling Guideline for Ontario (MOE, 2009). The five years of meteorological data produced by the CALMET model were used to initialize the CALPUFF dispersion model.

Wind rose diagrams are an efficient and convenient way of summarizing wind speed and directional data. The length of the radial barbs gives the total percent frequency of winds from the indicated direction, while the portions of the barbs of different widths indicate the frequency of associated wind speed categories. Figure 2-1 below summarizes the hourly CALMET-output winds at the model grid cell nearest to the DYEC Site location. The wind data presented has been extracted from CALMET model levels 1 and 4 (which correspond to 10-m and 150-m above ground) and spans all hours in the five-year modelling period.

Figure 2-1 Summary of Winds at the Site Location



The wind rose diagrams show winds occur most frequently from the southwest and northwest directions, and occur least frequently from the south and northeast directions. During the winter months, winds occur more frequently from the west and northwest, while during the summer, the prevailing wind direction tends to be from the southwest.

2.2 Dispersion Modelling

The dispersion modelling assessment was conducted to predict the downwind concentrations of air contaminants emitted by the DYEC.

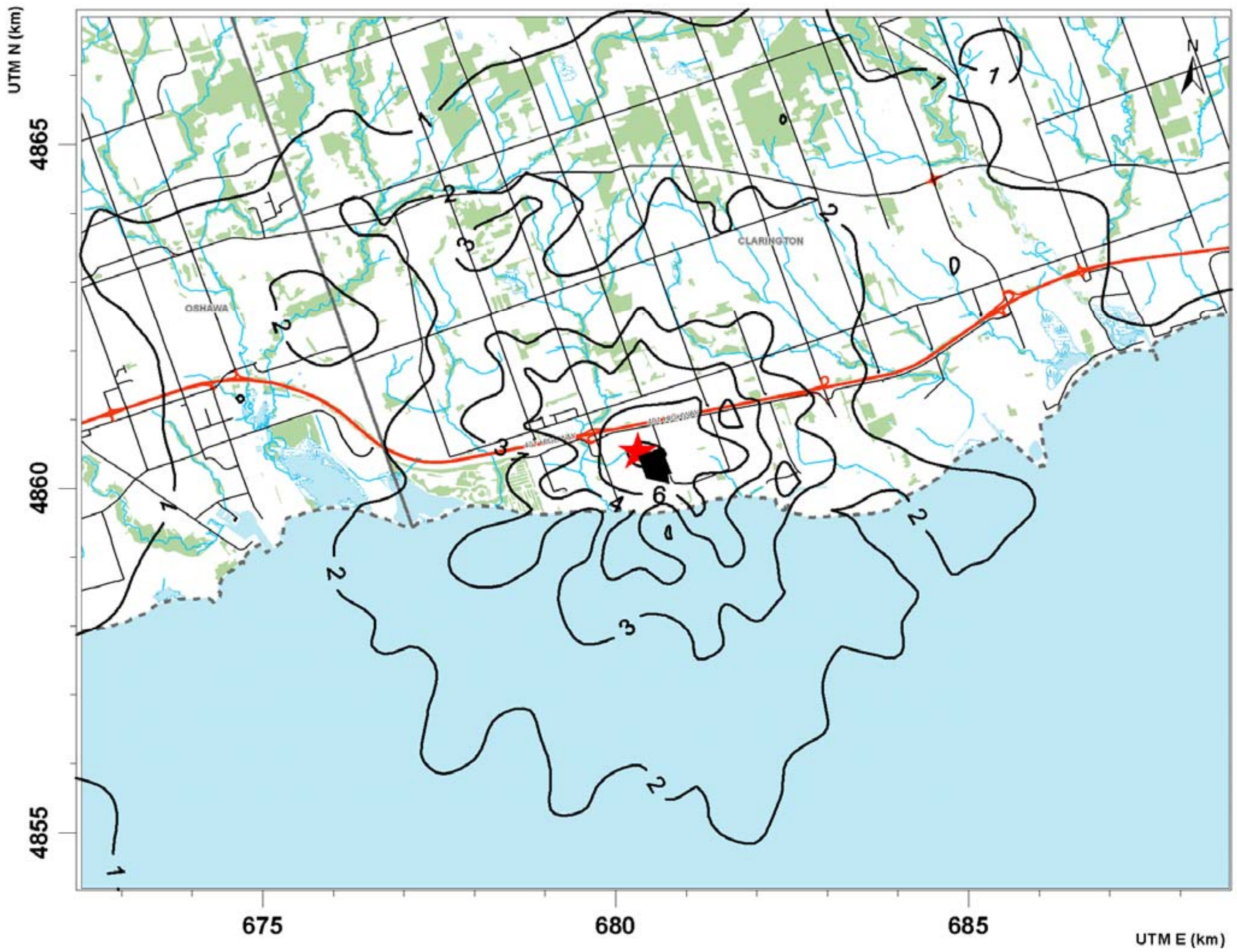
The primary emissions source in the DYEC is the 87.6 metre tall main stack. The waste processing operations in the DYEC (including the truck tipping bay and storage pit) are all enclosed and kept under negative pressure, with the air from these areas being used in the combustion process and vented to the main stack. Therefore, no low level emissions will occur from the DYEC operations with the exception of emergency diesel generator testing, road dust from vehicles on paved roads and the occasional filling of carbon/lime storage silos (which are equipped with fabric filters to minimize emissions). Therefore, the main stack is the only source of emissions of concern from the waste processing facility. The minor emissions from low level emissions sources were modeled in the EA (and ECA application) and demonstrated to be in compliance with MOE air quality criteria. As the low level emissions are of common contaminants that occur from many industrial/commercial facilities, their consideration for ambient monitoring is not required.

Contour plots showing the maximum predicted ground level concentrations for a unit emission rate (facility-wide emission rate of 1 g/s) from the DYEC stack over the five year modeling period are presented in Figures 2-2 through 2-4 for hourly, 24-hour and annual averaging periods, respectively. In all cases, the figures show results for emissions released under maximum normal Facility operation (100% capacity).

Figures 2-2 and 2-3 show that the areas with the highest predicted short-term concentrations occur to the north-west of the DYEC, within 500m of the property line. Moving beyond this 500 m radius, the predicted concentrations become gradually lower with increasing distance from the DYEC. It should be noted that the maximum predicted short-term events occur infrequently and represents a modelled worst-case hourly or daily average prediction over a five-year period.

The areas with the highest annual averaging concentrations are shown in Figure 2-4. This contour plot shows that the predicted maximum annual average concentration occurs approximately 1.5 km to the northeast of the DYEC, with another area of almost as high annual concentrations occurring about 1.5 km to the west-northwest of the DYEC.

Dispersion modelling of maximum total annual contaminant depositions was conducted to predict particulate and gaseous depositions at the special receptors considered in the air quality assessment. Plots of total annual particulate and gaseous dry depositions for a unit emission rate (1 g/s) from the facility are presented in Figures 2-5 and 2-6 for the special receptors in close proximity to the DYEC. For both particulate and gaseous, these plots show that depositions are lower in close proximity to the facility than for receptors further away. This is attributable to the high stack height (87.6-m) resulting in plume impingement more frequently occurring at distances further away from the facility than at the property line.



Legend

Maximum GLC

Facility

FIGURE 2-2

Plot of Maximum Predicted Hourly-Average Ground Level Concentrations for Normalized Facility-Wide Emission Rate

Scenario 1A (MCR, 140,000 tonnes/yr Facility)

Predicted Statistical Maximum GLC = 8.78 (μg/m^3)/(g/s)

Map Parameters
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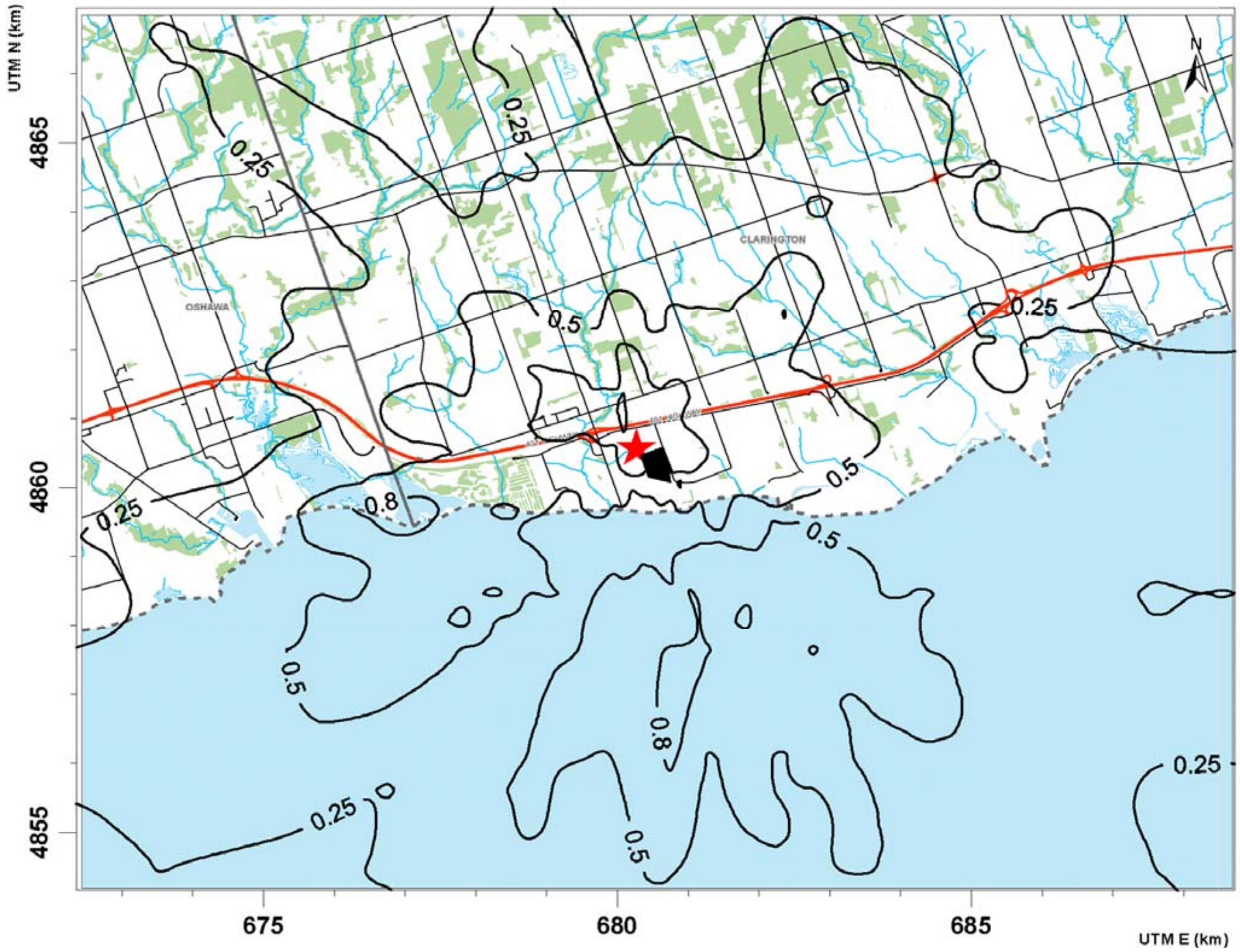
Datum: NAD 83
Zone: 17
Map Units: m
DATE: 8/30/2011
PROJECT: 160930024



Legend

Maximum GLC

Facility

FIGURE 2-3

Plot of Maximum Predicted 24-Hour-Average Ground Level Concentrations for Normalized Facility-Wide Emission Rate

Scenario 1A (MCR, 140,000 tonnes/yr Facility)

Predicted Statistical Maximum GLC = 1.21 (μg/m^3)/(g/s)

Map Parameters
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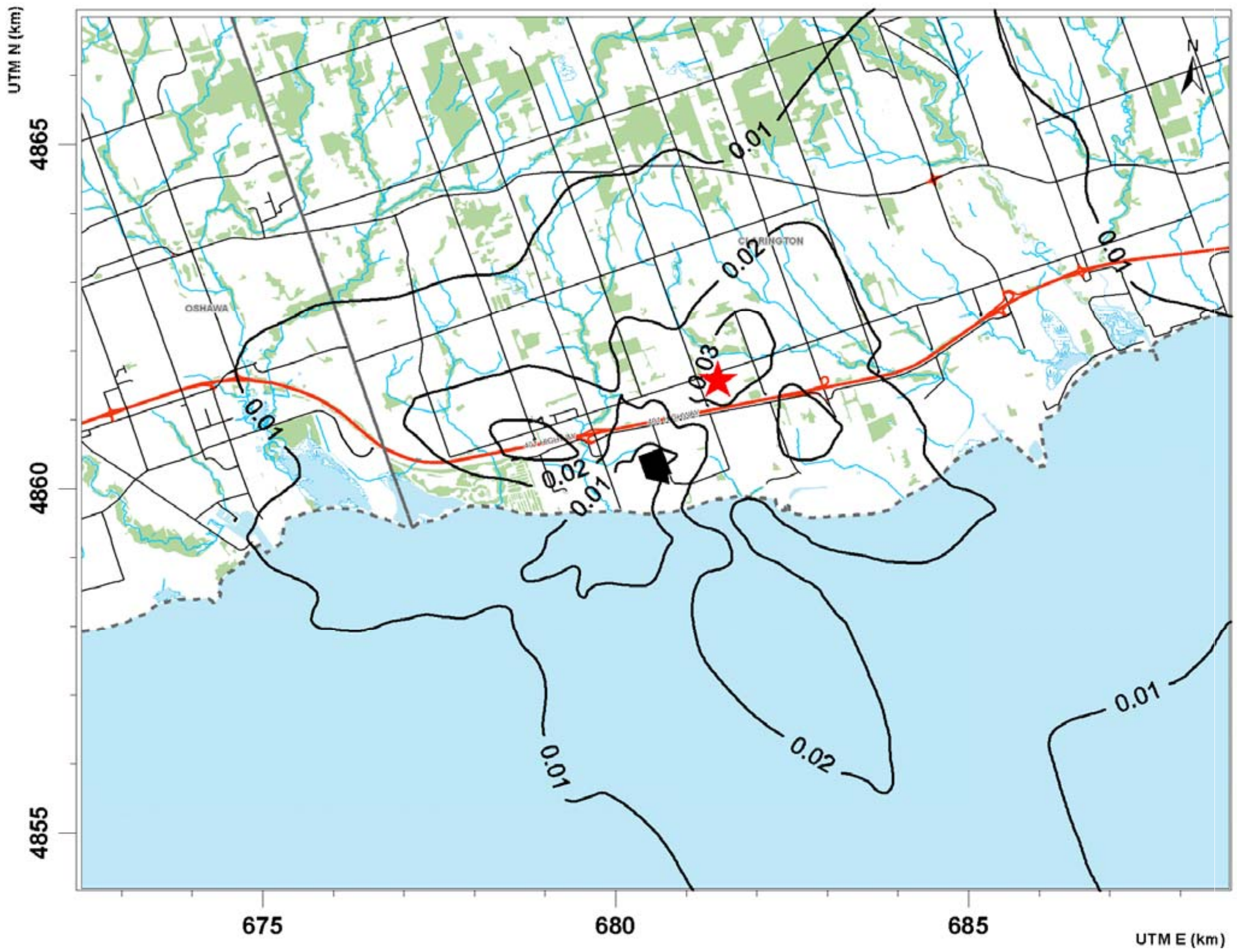
Datum: NAD 83
Zone: 17
Map Units: m
DATE: 8/30/2011
PROJECT: 160930024



Legend

Maximum GLC

Facility

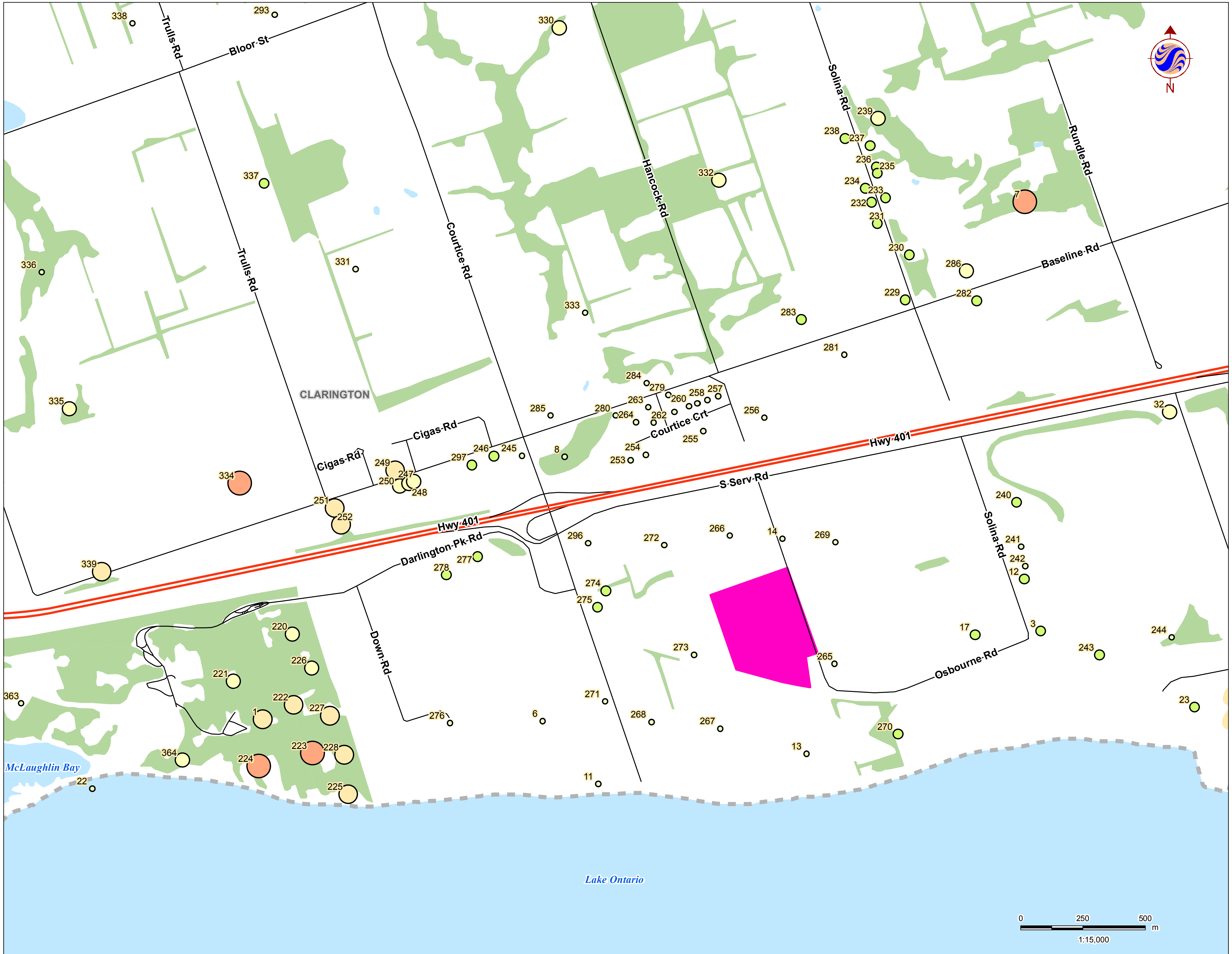
FIGURE 2-4

Plot of Maximum Predicted Annual-Average Ground Level Concentrations for Normalized Facility-Wide Emission Rate

Scenario 1A (MCR, 140,000 tonnes/yr Facility)

Predicted Statistical Maximum GLC = 0.035 ($\mu g/m^3$)/(g/s)

Map Parameters
Projection: UTM
Datum: NAD 83
Zone: 17
Map Units: m
DATE: 8/30/2011
PROJECT: 160930024



Legend

- Road
- Highway
- Proposed EFW Facility Site
- Waterbody
- Wooded Area

Deposition Particulates

ug/m2/yr/(g/s)

- 65 - 500
- 501 - 1000
- 1001 - 2500
- 2501 - 5000
- 5001 - 6150

Notes

1. Coordinate System: UTM NAD 83 - Zone 17 (N).
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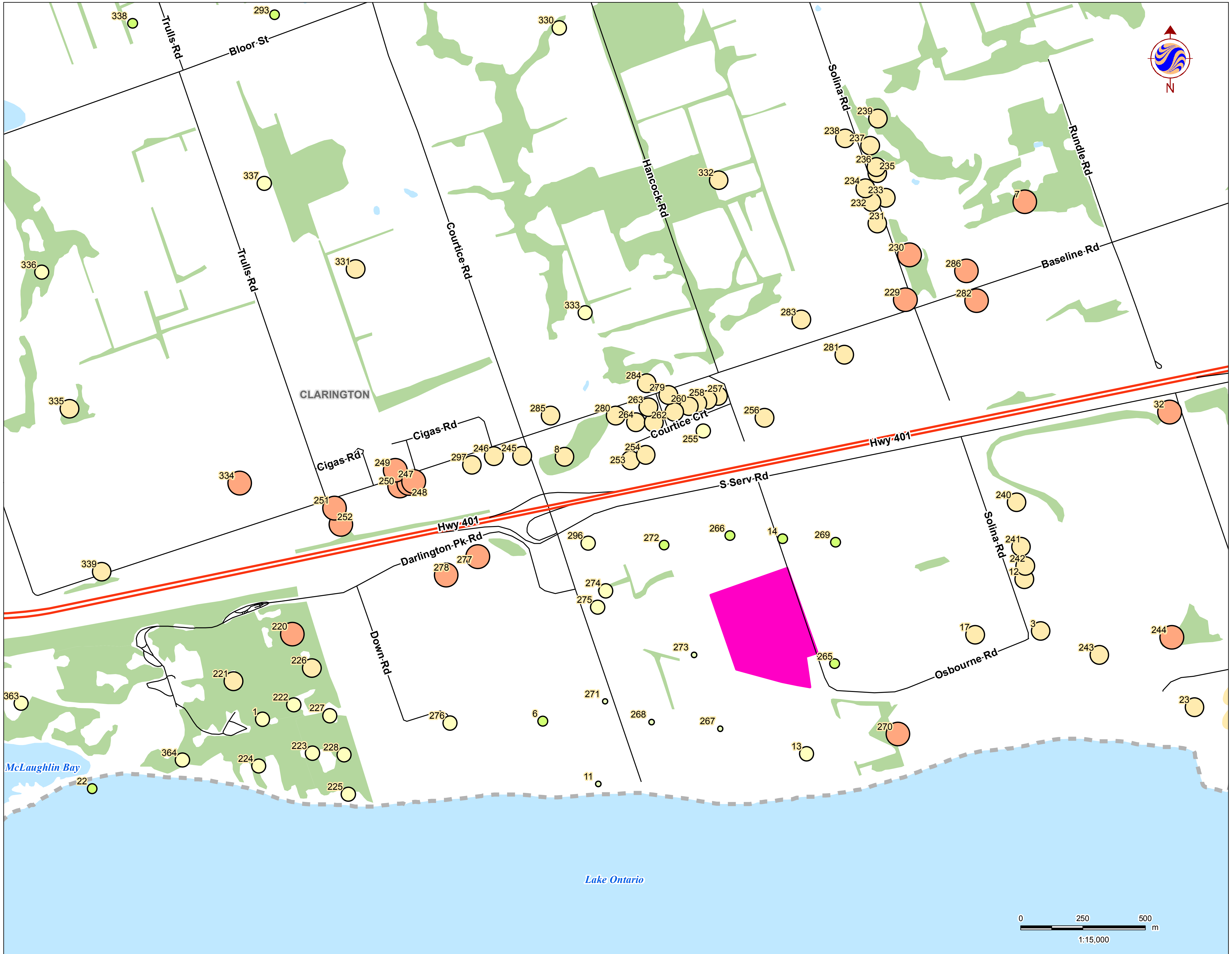
Figure No.

2-5

Title

Plot of Total Annual Particulate Dry Deposition for a Normalized Facility-Wide Emission Rate

Path: V:\01223\active_other_pcs\160930024 Durham York Ambient Monitoring\background\Methods- HF HCl NH3\Drawing\mxd\201105_Report\160930024_Fig2-5_Deposition Particulate.mxd
Revised on: May 30, 2011 By: bcowper



Legend

Road
Highway
Proposed EFW Facility Site
Waterbody
Wooded Area

Deposition Vapour

ug/m2/yr/(g/s)

- 1053 - 1500
- 1501 - 2000
- 2001 - 3000
- 3001 - 4000
- 4001 - 5503

Notes

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Figure No.

2-6

Title

Plot of Total Annual Gaseous Dry Deposition for a Normalized Facility-Wide Emission Rate

Path: V:\01223\active_other_pcs\160930024 Durham York Ambient Monitoring\background\Methods- HF HCl NH3\Drawing\mxd\201105_Report\160930024_Fig2-6_Deposition_Vapour.mxd
Revised on: May 30, 2011 By: bcowper

3 GENERAL SITING CONSIDERATIONS

3.1 Scale of Representativeness

Proper siting of monitoring stations requires a precise specification of the monitoring objective, which usually includes a desired spatial scale of representativeness. The spatial scale of representativeness is described in terms of the physical dimensions of the air parcel nearest to a monitoring station through which the pollutant concentration is reasonably uniform. The goal in siting monitoring stations is to correctly match the spatial scale represented by the sample of monitored air with the monitoring objective of the station. The scales of representativeness of most interest for local air monitoring are:

- Microscale – defines concentrations in air volumes associated with area dimensions ranging from several metres up to about 100 m.
- Middle Scale – defines the concentration typical of areas ranging in size from about 100 m to 0.5 km.
- Neighbourhood Scale – defines concentrations within extended areas with relatively uniform land use with dimensions of 0.5 to 4.0 km.
- Urban Scale – defines overall city-wide conditions with dimensions on the order of 4 to 50 km.

US Consolidated Federal Regulations, Section 40, Part 58 (40CFR Part 58), (US EPA, 2010) provide guidelines on the scales of representativeness required for specific monitoring objectives. The objective of monitoring source impact is associated with micro, middle and neighbourhood scales. Monitoring for background concentrations requires neighbourhood or regional scales of representativeness.

This monitoring plan has been developed to meet the following objectives:

1. to quantify the ground level concentration resulting from emissions from the DYEC on local air quality, including validating the predicted concentrations;
2. to monitor concentration levels in nearby residential areas; and,
3. to quantify background ambient levels in the area.

Based on the objectives listed above, the monitor should be situated to capture middle to neighbourhood scales of representativeness (hundreds of metres to 4 km). The dispersion modeling results summarized in Section 3 show the maximum predicted concentrations occur within this range for both short-term and long-term averaging periods.

3.2 Siting Requirements

The following table provides a summary of siting requirements listed in the MOE's Operations Manual (MOE, 2008) that will be followed as closely as possible for the siting of the monitor, however the final location of the station will be constrained to sites with adequate security (within a secured, fenced area), vehicle access, set-back from roadways, and access to power.

Table 3-1 Summary of Siting Criteria for Ambient Monitors

Contaminant	MOE Recommended Criteria
Sulphur Dioxide (SO_2)	3 - 15 m above ground
	> 1 m vertical and horizontal distance from supporting structure
	> 20 m from trees
	Distance from sampler to any air flow obstacle must be >2x height of obstacle above the sampler
	Unrestricted air flow in 3 of the 4 wind quadrants
	No nearby furnace or incineration flues
	Probe material - Pyrex glass or FEP Teflon
Nitrogen Dioxide (NO_2)	3 - 15 m above ground
	> 1 m vertical and horizontal distances from supporting structure
	> 20 m from trees
	Distance from sampler to any air flow obstacle must be >2x height of obstacle above the sampler
	Unrestricted air flow in 3 of the 4 wind quadrants
	Spacing from roadways varies with road traffic
	No nearby furnace or incineration flues
Total Suspended Particulate (TSP): General	2 - 15 m above ground
	> 1 m vertical and > 2 m horizontal distance from supporting structure
	> 20 m from trees
	Distance from sampler to any air flow obstacle must be >2x height of obstacle above the sampler
	Unrestricted air flow in 3 of the 4 wind quadrants
	No nearby furnace or incineration flues
	Distance from sampler to roadway should be > 20-25 m for sampler inlet heights of 2-5 m

Table 3-1 Summary of Siting Criteria for Ambient Monitors

Contaminant	MOE Recommended Criteria
Particulate Matter less than 2.5 Microns in Diameter ($PM_{2.5}$): General	2 - 15 m above ground
	> 1 m vertical and > 2 m horizontal distance from supporting structure
	> 20 m from trees
	Distance from sampler to any air flow obstacle must be >2x height of obstacle above the sampler
	Unrestricted air flow in 3 of the 4 wind quadrants
	> 5 m from chimneys with natural gas combustion emissions
	> 20 - 25 m from major roadways
PAHs and Dioxins/Furans	3 - 15 m above ground
	> 1 m vertical and > 2 m horizontal distance from supporting structure
	No nearby sources of PAHs, dioxins and furans which could interfere with sample results
Wind speed and Direction	=> 10 m height above ground
	> 1 building height (H) upwind of a building obstruction
	> 1.5 H above building roof for rooftop installation
	> 5-10 H downwind of building
	> 10 m above dense vegetative canopy
	> 2 tower side widths (D) for boom installations
Air Temperature	> 2 m height above ground
	Temperature sensor > 4 obstruction heights and > 30 m from large paved areas
	> 1 D for tower mast installations

3.3 Number of Monitors

US Consolidated Federal Regulations, Section 40, Part 58 (40CFR Part 58), Appendix D (US EPA, 2010) provides criteria for the basic air monitoring requirements including the total number of monitoring sites that will serve specific data needs. EPA notes that the optimum size of a particular network involves trade-offs among data needs and available resources. The numbers of monitoring sites recommended in Appendix D are based on population levels and contaminant being monitored. The relevant study area for the DYEC would cover the Municipality of Clarington, which has a population of 77,820 (2006 census data). The contaminants considered in 40CFR Part 58, App D relevant to the DYEC are NO_2 and $PM_{2.5}$. For NO_2 one monitoring station is recommended for areas with less than 1 million people, while for $PM_{2.5}$, 40CFR Part 58, App D recommends one monitoring station in areas with populations between 50,000 to 500,000.

Thus, based on the guideline data available from US EPA, a minimum of one monitoring station would be required. Discussions with the MOE have indicated that they will require that an upwind station and a property line monitor (for a 1-year period) are also included in the monitoring network.

Other considerations in setting the number of monitoring stations would be the presence of potentially health sensitive receptors within the scales of representativeness identified in Section 3.1 (100's of metres to 4–km). The nearest hospital to the DYEC is located about 4.8 km to the east-northeast, in a predominantly upwind direction and outside the siting area of consideration. The nearest daycare centre identified in the EA is located about 3.9 km to the north-northeast, also in a predominantly upwind direction and at the edge of the siting area of interest. The nearest primary and secondary schools are located about 4.0 and 4.7 km from the site in east-northeasterly and northeasterly directions respectively. The schools are both located in predominantly upwind directions and near the edge or outside of the siting area of interest. As all of these receptors are either outside the siting area of consideration or located considerable distances from the DYEC in predominantly upwind directions (where predicted concentration levels are considerably lower than in closer proximity to the DYEC), monitoring at these locations would not be expected to provide useful information.

Another objective of the monitoring program will be to validate the dispersion model predictions conducted in the EA. The CALPUFF model used in the air quality assessment was extensively validated against multiple ambient measurement data sets (for different emissions sources and in different terrain) prior to the model being accepted as a regulatory model by the US EPA. To adequately validate the dispersion modelling for the DYEC therefore only requires measurements upwind and downwind of the DYEC to quantify background and source contributions to ambient air quality for comparison to the model predictions. As a number of contaminant emission rates will be continuously monitored at the stack as well as at the two monitoring stations, this provides an extensive data base of measurements with which to validate the model (8760 hours of measurement/model prediction points each year).

Further discussion on the number of monitoring stations is provided in Section 4.3.

Based on the on-going results of the ambient monitoring program, the need for additional monitoring stations will be assessed and the network adjusted accordingly. If the ambient monitoring data do not agree well with the dispersion model predictions, the need for additional monitoring stations (or re-location of the existing stations) will be reviewed and assessed with the MOE.

4 CONTAMINANTS AND LOCATIONS FOR MONITORING

The proposed contaminants to be monitored were determined based on the results of the Site-Specific Human Health and Ecological Risk Assessment (HHERA) (Stantec, December 2009), conducted in support of the EA for the DYEC as well as the ambient monitoring program completed for the undertaking. The proposed locations for monitoring were determined based on the results of the Air Quality Assessment, prevailing wind direction, locations of nearby residences, and the general siting requirements outlined in Section 3.

4.1 Contaminants to be Monitored

The HHERA was prepared in support of the approved Durham and York Region's Residual Waste Planning EA.

The HHERA examined the potential for emissions from the DYEC to pose an unacceptable risk to human and ecological receptors in the short-term and long-term (i.e., after 30 years of operating the DYEC). The HHERA evaluated the potential risk from the DYEC operating at its permitted capacity of 140,000 tonnes/year (tpy). The Local Risk Assessment Study Area (LRASA) encompassed a 10 km radius from the proposed DYEC and included the evaluation of 309 receptor locations and all of the watershed areas within.

A total of 87 contaminants of potential concern (COPCs) were evaluated in the inhalation assessment and 57 of these were evaluated in a multiple pathway assessment for human and ecological receptors. The first scenario involved the evaluation of baseline conditions of COPCs in air, soil, vegetation, water and biota. Baseline Case acute (1-hr or 24-hr) and chronic (annual) risk estimates for inhalation exposure to COPCs did not exceed their regulatory benchmark, which have been developed to be protective of human health and the environment. Therefore no adverse health risk was expected from exposure to baseline air concentrations of chemicals.

The results of the multi-pathway assessment predicted that exposure to DYEC-related air emissions would have no undue carcinogenic or non-carcinogenic risk to human receptors living or visiting the LRASA while the DYEC is operating at 140,000 tpy. All hazard quotients and incremental lifetime cancer risks were below their respective government benchmarks for all chemicals and exposure scenarios. The ecological risk assessment did not predict any undue ecological risks from DYEC emissions when operating at 140,000 tpy.

Therefore, based on the results of the risk assessment, there were no COPCs that warrant any special attention or inclusion in the air monitoring program to be undertaken. However, given it is a requirement in the Minister's Notice of Approval, detailed in Condition 11 (MOE, 2010), a list of chemicals was developed based on:

- Their emission rate from the DYEC;
- Those chemicals that were already present in the ambient air at appreciable concentrations; and,
- Those that are considered to be of greatest concern to public or environmental health.

Based on these criteria, the following contaminants were chosen to be included in this monitoring program:

- Nitrogen oxides (NO_X);
- Sulphur dioxide (SO_2);
- Particulate matter less than 2.5 microns in diameter ($PM_{2.5}$);
- Metals in total suspended particulate matter (TSP);
- Polycyclic Aromatic Hydrocarbons (PAHs); and,
- Dioxins and Furans.

A full listing of speciated metals and PAHs to be analyzed is provided in Section 5 of this monitoring plan.

The maximum predicted ground level speciated PAH, dioxins and furans, and metals concentrations due to DYEC emissions are either close to or less than their method detection limits. Therefore it is not expected that appreciable changes in ambient levels of these contaminants will be detected, however they are included in the monitoring due to their potential for human health effects and because they are contaminants of concern to the public.

The contaminant list to be monitored will act as a surrogate for the greater list of chemicals that are expected to be emitted from the DYEC.

4.2 Contaminants not Monitored

The following CoPCs were not chosen to be sampled:

- Speciated VOCs;
- Hydrogen Fluoride;
- Hydrogen Chloride; and,
- Ammonia.

VOCs were not chosen to be sampled, as emissions of these contaminants are expected to occur in trace amounts and predicted ambient levels of speciated VOCs are all well below typical laboratory method detection limits for VOC CoPCs included a standard US EPA TO-15 analysis (see Table 4-1). As can be seen in this table, the maximum predicted VOC concentrations are all much less than their respective laboratory detection limits, so no detectable changes in ambient concentrations would be expected to be measured.

Table 4-1 Comparison of Maximum Predicted Speciated VOC Concentrations to Laboratory MDLs`

Contaminant	Laboratory MDL ($\mu g/m^3$)	Maximum Predicted Concentration ($\mu g/m^3$)
1,1,1-Trichloroethane	1.6	7.15E-05
1,2,4-Trichlorobenzene	14.8	2.58E-06
1,2-Dichlorobenzene	2.4	1.02E-04
Benzene	0.6	1.55E-03
Bromodichloromethane	1.3	1.26E-02
Bromoform	2.1	3.46E-03
Bromomethane	0.7	1.80E-03
Carbon Tetrachloride	1.9	2.16E-05
Chloroform	0.7	2.55E-05
Dichlorodifluoromethane (FREON 12)	1.0	4.36E-03
Ethylbenzene	0.9	5.19E-05
Ethylene Dibromide	1.3	2.03E-05
m / p-Xylene	1.6	3.02E-02
Methylene Chloride(Dichloromethane)	1.0	8.81E-03
o-Xylene	0.9	3.02E-02
Toluene	0.8	2.52E-03
Trichlorofluoromethane (FREON 11)	1.1	8.62E-03
Vinyl Chloride	0.5	2.18E-03

Similarly to VOCs, hydrogen fluoride (HF) was not chosen to be monitored as the maximum predicted 24-hour average concentration of 0.05 $\mu g/m^3$ was about two orders of magnitude less than the best available method detection limit. HF will be continuously monitored at the stack and therefore HF emissions to the environment will be well quantified.

Hydrogen chloride was not chosen to be monitored as the maximum predicted 24-hour average concentration of 0.45 $\mu g/m^3$ was about an order of magnitude less than the best available method detection limit. Also HCl will be continuously monitored at the stack and therefore HCL emissions to the environment will be well quantified.

Ammonia was also not included in the monitoring as the maximum predicted NH_3 concentration of 0.27 µg/m^3 is more than an order of magnitude less than the available method detection limit.

4.3 Monitoring Locations

Based on the results of the air quality modelling, the locations of nearby sensitive receptors, and the general siting criteria discussed in the previous sections, three monitoring stations (one downwind, one property line, and one upwind) are proposed for the ambient monitoring program. The selected downwind location takes into account the following specific considerations:

- The dominant wind direction which could result in plume transport to nearby residential receptors is southwesterly;
- The dispersion modelling predicted the highest concentrations over longer-term periods would occur within a 1 to 2 km radius measured from the Site location, with the highest predicted area of influence located to the northeast;
- The land use immediately adjacent to the site is current or future industrial;
- The majority of residential areas are located north of the Site;
- Highway 401 is located approximately 500 m north of the Site;
- There are no residential receptors located between the Site and Highway 401 in the predominant wind direction (winds blowing from southwesterly directions towards the northeast);
- As seen in Figures 2-5 and 2-6, predicted particulate and gaseous deposition is larger at receptors further away from the site as opposed to the receptors immediately adjacent to the site; and,
- The monitor(s) should be situated to capture middle to neighbourhood scales of representativeness (hundreds of metres to 4 km).

Based on these considerations, the proposed downwind ambient monitoring program will monitor the contaminants listed above at a downwind monitoring station sited northeast of the DYEC (in the area with the highest predicted annual-average concentrations). Two alternative sites in the same general area have been identified as being viable alternatives for the monitoring station, shown in Figure 4-1 as Downwind #1 (D-1) and Downwind #2 (D-2). One of these two locations will be used for the downwind monitoring site dependent on successful negotiations with the property owners. The monitoring station will measure all the air contaminants listed in Section 4.1. As can be seen in Figure 1-3, the two proposed alternatives for the downwind monitoring location are in the vicinity of the first grouping of residential receptors downwind of the DYEC in this direction. Both of these locations fall in the area where maximum annual concentrations are predicted to occur (in Figure 2-4 this is taken to be the 0.03 µg/m^3/(g/s) contour line). The highest predicted annual concentration was

0.035 µg/m^3/(g/s) so anywhere within the 0.03 contour is greater than or equal to 86% of the maximum predicted level.

Location D-1 falls on the edge of this area (on the 0.03 contour line) and would measure about 86% of the max predicted concentration, while Location D-2 falls within the 0.03 contour so would be measuring >86% of the maximum predicted level.

The receptors identified in the EA between these monitoring locations and the DYEC are either industrial (adjacent to the DYEC property) or farmland. These proposed downwind locations are also in the vicinity of elevated deposition predictions for both gaseous and particulate contaminants relative to locations closer the DYEC (see Figures 3-5 and 3-6).

MOE provided feedback on the draft ambient monitoring plan (March 2011) that they would recommend a second downwind ambient monitoring station be included in closer proximity to the site. This recommendation was premised on there being sensitive residential receptors located between locations D-1/D-2 and the Site (south of Highway 401) and that depositions would be higher closer to the Site than at locations D-1/D-2. As noted above, depositions are predicted to be greater further away from the Site than close to the property line (attributable to the very tall stack) and there are no residential receptors between the Site and Highway 401 to the north-west.

MOE has requested (Nov 30th 2011) that a second downwind monitoring station be installed in the vicinity of the plant property line (for a minimum of one year) and measure TSP and metals concentrations after construction is complete. The approximate location of this station, which will be located within the perimeter fence along the north east portion of the DYEC property (near the gas metering station) is presented in Figure 4-1.

One location for the upwind monitoring site requested by the MOE has also been identified. Based on MOE feedback, the siting of the upwind station was requested to be to the west or southwest of the DYEC in order to measure background air quality in the predominantly upwind direction. The proposed location is presented in Figure 4-1 as Upwind #1 (U-1). This location is the same site used for background monitoring during the EA from September 2007 to December of 2008. The monitoring station will continuously measure SO_2, $NO_{X,}$ and $PM_{2.5}$ as well as wind speed/direction, temperature, and relative humidity. TSP and metals will also be measured at this station. Monitoring these contaminants is expected to provide sufficient data to determine the DYEC's incremental contribution to local air quality (in an upwind/downwind analysis for facility contribution) as they will act as surrogates for all other potential contaminants. Trees which provided partial obstruction on the site during the EA sampling will be removed for the proposed sampling program.

A comparison of how these proposed locations for the monitoring stations compare to the MOE probe siting criteria for ambient monitors is presented in Table 4-1. All of the proposed locations for the stations meet the criteria. Photos of the alternative locations are shown in Figures 4-2 to 4-4 below.

In the design of the program, monitoring at a nearby soccer field east of the proposed DYEC and west of the Darlington Nuclear Power Plant was considered, due to its proximity to the DYEC Site. As the soccer field may be removed as part of a planned expansion at the Darlington Nuclear Plant, inclusion of monitoring at this location was not considered warranted due to the limited exposure time for participants at this location, and the uncertainty of its use in the near future.

Table 4-2 Comparison of Proposed Monitoring Locations to Probe Siting Criteria

Contaminant	MOE Recommended Criteria	Proposed Downwind Monitoring Station Location[1]			Proposed Upwind Monitoring Station Location (U-1)
		Alternate Location 1 (D-1)	Alternate Location 2 (D-2)	Property Line	
SO_2	3 - 15 m height above ground	> 3 m	> 3 m	NA	> 3 m
	> 1 m vertical and horizontal distance from supporting structure	Yes	Yes	NA	Yes
	> 20 m from trees	> 20 m [2]	> 20 m	NA	> 20 m [5]
	Distance from sampler to any air flow obstacle must be > 2x height of obstacle above the sampler	Yes	Yes [3]	NA	Yes
	Unrestricted air flow in 3 of the 4 wind quadrants	Yes	Yes	NA	Yes
	No nearby furnace or incineration flues	N/A	N/A	NA	N/A
	Probe material - Pyrex glass or FEP Teflon	Yes	Yes	NA	Yes
NO_2	3 - 15 m height above ground	> 3 m	> 3 m	NA	> 3 m
	> 1 m vertical and horizontal distance from supporting structure	Yes	Yes	NA	Yes
	> 20 m from trees	> 20 m [2]	> 20 m	NA	> 20 m [5]
	Distance from sampler to any air flow obstacle must be > 2x height of obstacle above the sampler	Yes	Yes [3]	NA	Yes
	Unrestricted air flow in 3 of the 4 wind quadrants	Yes	Yes	NA	Yes
	Spacing from roadways varies with road traffic	Meets criteria [4]	Meets criteria [4]	NA	Meets criteria [4]

Table 4-2 Comparison of Proposed Monitoring Locations to Probe Siting Criteria

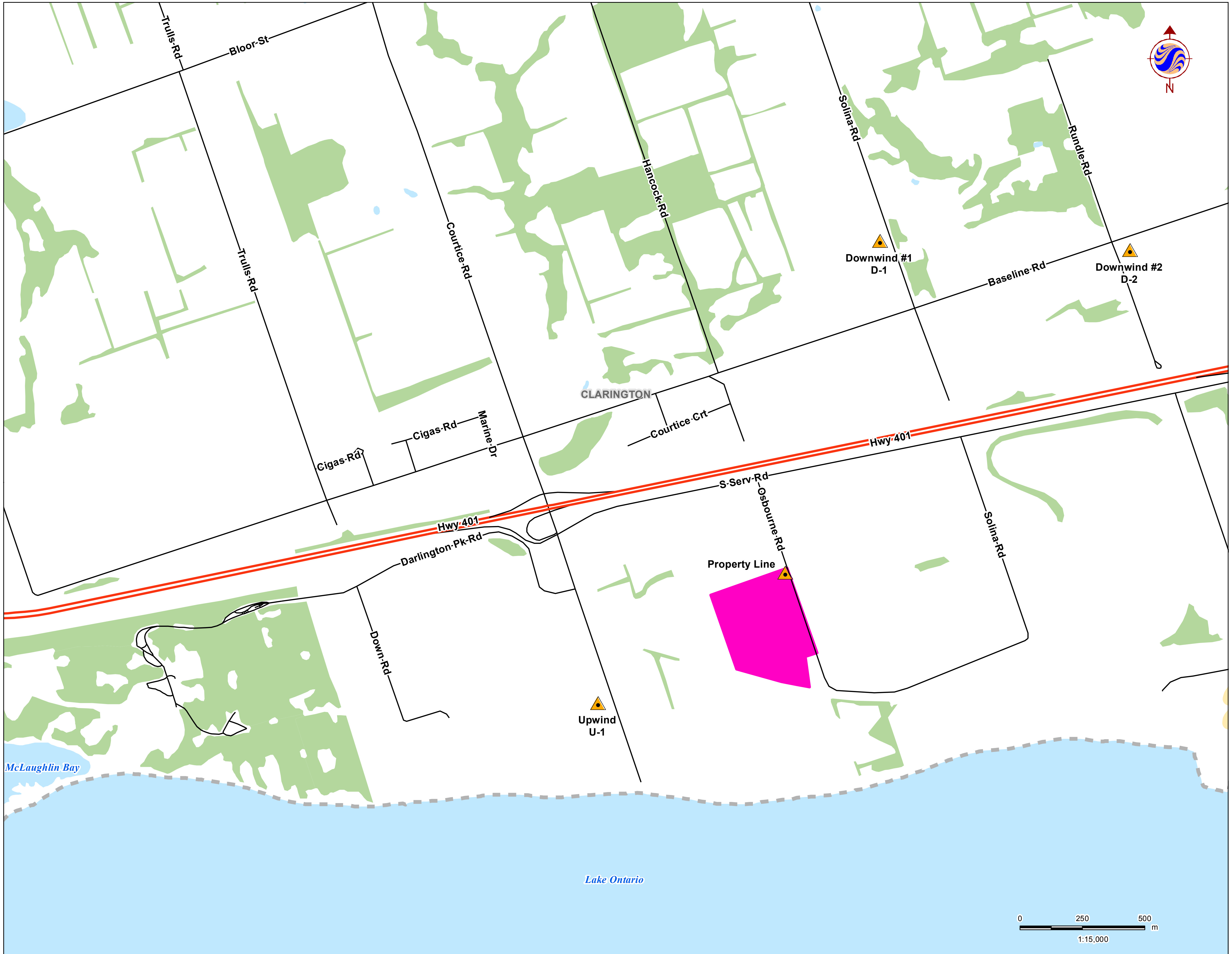
Contaminant	MOE Recommended Criteria	Proposed Downwind Monitoring Station Location[1]			Proposed Upwind Monitoring Station Location (U-1)
		Alternate Location 1 (D-1)	Alternate Location 2 (D-2)	Property Line	
	No nearby furnace or incineration flues	N/A	N/A	NA	N/A
Metals/TSP (general)	2 - 15 m height above ground	> 2 m	> 2 m	> 2 m	> 2 m
	> 1 m vertical and > 2 m horizontal distance from supporting structure	Yes	Yes	Yes	Yes
	> 20 m from trees	> 20 m [2]	> 20 m	> 20 m	> 20 m
	Distance from sampler to any air flow obstacle must be > 2x height of obstacle above the sampler	Yes	Yes [3]	Yes [3]	Yes [3]
	Unrestricted air flow in 3 of the 4 wind quadrants	Yes	Yes	Yes	Yes
	No nearby furnace or incineration flues	N/A	N/A	N/A	N/A
	Distance from sampler to roadway should be > 20-25 m for sampler inlet heights of 2-5 m	> 20 m from side road, > 500 m from Hwy. 401	> 20 m from side road, > 500 m from Hwy. 401	> 20 m from Osborne Road, >400-m from Hwy. 401	> 20 m from side road, > 500 m from Hwy. 401
$PM_{2.5}$ (general)	2 - 15 m height above ground	> 2 m	> 2 m	NA	> 2 m
	> 1 m vertical and > 2 m horizontal distance from supporting structure	Yes	Yes	NA	Yes
	> 20 m from trees	> 20 m [2]	> 20 m	NA	> 20 m [5]
	Distance from sampler to any air flow obstacle must be > 2x height of obstacle above the sampler	Yes	Yes [3]	NA	Yes
	Unrestricted air flow in 3 of the 4 wind quadrants	Yes	Yes	NA	Yes
	> 5 m from chimneys with natural gas combustion emissions	N/A	N/A	NA	NA
	> 20- 25 m from major roadways	> 20 m from side road, > 500 m from Hwy. 401	> 20 m from side road, > 500 m from Hwy. 401	NA	> 20 m from side road, > 500 m from Hwy. 401

Table 4-2 Comparison of Proposed Monitoring Locations to Probe Siting Criteria

Contaminant	MOE Recommended Criteria	Proposed Downwind Monitoring Station Location[1]			Proposed Upwind Monitoring Station Location (U-1)
		Alternate Location 1 (D-1)	Alternate Location 2 (D-2)	Property Line	
PAHs and Dioxins/ Furans	3 - 15 m height above ground	> 3 m	> 3 m	NA	NA
	> 1 m vertical and > 2 m horizontal distance from supporting structure	Yes	Yes	NA	NA
	No nearby sources of PAHs, dioxins which could interfere with sample results	Yes	Yes	NA	NA
Wind speed and Direction	=> 10 m height above ground	> 10 m	> 10 m	NA	>10 m
	> 1 building height (H) upwind of a building obstruction	Yes	Yes	NA	Yes
	> 1.5 H above building roof for rooftop installation	Yes	Yes	NA	Yes
	> 5-10 H downwind of building	Yes	Yes [3]	NA	Yes [6]
	> 10 m above dense vegetative canopy	N/A	N/A	NA	N/A
	> 2 tower side widths (D) for boom installations	N/A	N/A	NA	N/A
Air Temperature	> 2 m height above ground	> 2 m	> 2 m	NA	> 2 m
	Temperature sensor > 4 obstruction heights and > 30 m from large paved areas	Yes	Yes	NA	Yes
	> 1 D for tower mast installations	Yes	Yes	NA	Yes

Note:

1 – Final sampler locations on the potential sites are still to be determined.
2 – Alternate Location #1 has some trees located to the north of the potential sampling location, as shown in Figure 4-2. It is anticipated that a sampling location can be chosen on the potential site to meet the MOE recommended separation distance of at least 20 m.
3 – Alternate Location #2 has a one-story structure located on the site, as shown in Figure 4-3. It is anticipated that a sampling location can be chosen on the potential site to meet the MOE recommended separation distance.
4 – Both sites meet the recommended separation distances between sampler locations and roadways of different capacities as listed in the MOE document "Operations Manual for Air Quality Monitoring in Ontario".
5 – With removal of two trees, the 20-m spacing criteria can be met.
6 – The monitor will be located in a predominantly upwind location about 4H from the nearest building. Station not downwind of this building for the predominant wind direction.



Legend

- Station Location
- Road
- Highway
- Proposed EFW Facility Site
- Waterbody
- Wooded Area

Notes

1. Coordinate System: UTM NAD 83 - Zone 17 (N).
2. Data provided by Ontario Ministry of Natural Resources. Copyright 2004 Queen's Printer Ontario
3. One of D-1 or D-2 to be chosen for downwind station location.

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RESIDUAL WASTE STUDY

Figure No.

4-1

Title

Location of Proposed Monitoring Locations

Projection text in notes (2nd note should still reflect the base features copyright):
Coordinate System: NAD 1983 UTM Zone 17N

Figure 4-2 Proposed Location for the Downwind Monitoring Station – Alternative D-1

Figure 4-3 Proposed Location for the Downwind Monitoring Station – Alternative D-2

Figure 4-4 Proposed Location for the Upwind Monitoring Station – U-1

Note – photograph shows the ambient monitoring station for the EA 2008 measurements on the site.

Table 4-3 UTM Coordinates of Proposed Monitoring Locations

Location	UTM Northing (m)	UTM Easting (m)
Downwind D-1	4861915	680995
Downwind D-2	4861877	681997
Property Line [1]	~ 4860586	~ 680616
Upwind U-1	4860067	679899

1 – Location approximate. Exact location will be finalized in consultation with the MOE prior to installation.

5 INSTRUMENTATION AND DATA ACQUSITION

The measurement program at the monitoring site will include both continuous and non-continuous monitors to sample air contaminant concentrations. Monitoring for respirable particulate matter ($PM_{2.5}$), nitrogen oxides (NO_X) and sulphur dioxide (SO_2) will be conducted on a continuous basis over the duration of the ambient air monitoring program. Monitoring for metals in total suspended particulates (TSP), polycyclic aromatic hydrocarbons (PAHs) and dioxins and furans will be conducted at the downwind monitoring station with non-continuous monitors, per the methodology and analysis recommended by the MOE Operations Manual (MOE, 2008).

A 10-m meteorological tower will be installed at each station to continuously monitor wind speed, wind direction, atmospheric temperature and relative humidity. Barometric pressure will be measured at one station.

The following sections detail the continuous and non-continuous monitors proposed for this sampling program.

5.1 Continuous Ambient Monitors

5.1.1 Respirable Particulate Matter ($PM_{2.5}$)

The $PM_{2.5}$ sampler will consist of a Thermo Sharp 5030 Synchronized Hybrid Ambient Real-time Particulate Monitor (or equivalent). The sampler operates using a synchronized hybrid approach combining light scattering photometry and beta radiation attenuation for continuous $PM_{2.5}$ measurement.

Principle of Operation:	Light Scattering Photometry/Beta Attenuation
Range:	0-10 mg/m^3
Time interval:	1 minute

5.1.2 Nitrogen Oxides (NO_X)

The NO_X sampler will consist of an API Model 200E Chemiluminescence Analyzer (or equivalent) to measure continuous concentrations of nitric oxide (NO), nitrogen dioxide (NO_2) and nitrogen oxides (NO_X). The sampler operates based on the principle of chemiluminescence, where the amount of light given off during a chemical reaction is measured. Nitric oxide (NO) reacts with ozone (O_3) to produce nitrogen dioxide (NO_2), 10 %

electronically excited nitrogen dioxide (NO_2*) and oxygen. Following the NO-O3 reaction, the NO_2* molecules immediately revert to NO_2. This process creates a light emission directly proportional to the NO concentration in the sample. The intensity of the resulting light emission is then measured by a photomultiplier tube and associated electronics. An NO_2 to NO converter will be used to measure the amount of NO_X (NO + NO_2) in the sample.

Principle of Operation:	Chemiluminescence
Range:	0-1000 ppb
Time interval:	1 second

5.1.3 Sulphur Dioxide (SO_2)

The SO_2 sampler will consist of a Teledyne Monitor Labs Sulphur Dioxide Analyzer (or equivalent). The sampler operates using the principle of "Pulsed Fluorescence". Sulphur dioxide molecules absorb fluorescent energy, producing electronically excited SO_2 molecule with a known spectral decay rate to the ground state. The fluorescence emitted by the reaction is detected by a photo multiplier tube and the signal is converted proportionally to an electronic output signal which is then captured by a data logger.

Principle of Operation:	Pulsed Florescence
Range:	0-1000 ppb
Time interval:	1 second

5.2 Non-Continuous Ambient Monitors

5.2.1 Metals in Total Suspended Particulate (TSP)

Total suspended particulate matter (TSP) and metals will be collected onto pre-weighed, conditioned Teflon coated glass fibre filters for a 24-hour period using a Tisch Environmental TE-5170 volumetric-flow high volume sampler (or equivalent) measuring TSP. This monitor operates by continuously drawing a sample of ambient air through a filter onto which particulate matter is deposited. The filters will be subsequently weighed for particulate loading and analysed using the Atomic Emission Spectroscopy/Inductively Coupled Plasma (AES/ICP) technique to determine metals content. Analysis of the TSP/metals samples will be conducted by a Canadian Assurance for Laboratory Accreditation (CALA) accredited laboratory following MOE guidance. The sampling schedule will correspond with the MOE's province-wide ambient sampling schedule (one sample taken every six days).

The list of metals to be analysed is:

- Aluminum (Al)
- Antimony (Sb)
- Boron (B)
- Thallium (Tl)
- Arsenic (As)
- Barium (Ba)
- Beryllium (Be)
- Cadmium (Cd)
- Chromium (Cr) (Total)
- Cobalt (Co)
- Lead (Pb)
- Mercury (Hg)
- Manganese (Mn)
- Nickel (Ni)
- Phosphorus (Ph)
- Selenium (Se)
- Silver (Ag)
- Tin (Sn)
- Vanadium (V)
- Zinc (Zn)

Additionally, although not expected to be emitted from the DYEC in appreciable quantities (based on the literature review of EFW emissions conducted as part of the EA), to address comments received from the Ambient Air Monitoring and Reporting Working Group (AAMRWG), the following additional metals will be monitored:

- Bismuth (Bi)
- Magnesium (Mg)
- Strontium (Sr)
- Thallium (Tl)
- Uranium (U)
- Zirconium (Zr)
- Copper (Cu)
- Iron (Fe)
- Molybdenum (Mo)
- Titanium (Ti)

5.2.2 Polycyclic Aromatic Hydrocarbons (PAHs) and Dioxins and Furans

PAHs and dioxins and furans will be collected with Tisch Environmental TE-1000 mass-flow high volume air samplers (or equivalent). The samplers will be located on the roof of the instrumentation shelter to meet the required MOE siting characteristics. Each sampler is equipped with a dual chambered sampling module to contain a Teflon-coated glass fibre filter and a Poly-Urethane Foam (PUF) cartridge. PAHs will be collected for a 24-hour period at 12-day intervals and dioxins and furans will be collected, also for a 24-hour period, at 24-day intervals.

The list of PAHs to be analyzed is:

- 1-Methylnaphthalene
- 2-Methylnaphthalene
- Acenaphthene
- Acenaphthylene
- Anthracene
- Benzo(a)anthracene
- Benzo(a)fluorene
- Benzo(a)pyrene
- Benzo(b)fluoranthene
- Benzo(b)fluorene
- Benzo(e)pyrene
- Benzo(g,h,i)perylene
- Benzo(k)fluoranthene
- Chrysene
- Dibenz(a,h)anthracene
- Dibenz(a,c)anthracene
- Fluoranthene
- Indeno(1,2,3-cd)pyrene
- Naphthalene
- Biphenol
- Perylene
- Phenanthrene
- Pyrene
- Tetralin
- o-Terphenyl
- Total PAHs

The samples will be submitted to a CAL accredited laboratory. PAHs and dioxins/furans will be analyzed using Gas Chromatography/Mass Spectrometry (GC/MS) as per the protocols defined by US EPA Compendium Method TO-13A (for PAHs) and Compendium Method TO 9A (for dioxins and furans).

5.3 Data Acquisition System

In addition to instrument resident data logging registers, a rack mounted digital data acquisition system (DAS) will be installed. Although the exact DAS model has not been determined, a typical model, such as a Campbell Scientific CRX1000 station data acquisition system (or equivalent) will be used to collect ambient instrument data and status codes from the ambient air monitors. Typically, continuous station data will be maintained in the data loggers, and data will be viewed locally using a laptop and the relevant DAS software applications. The logger will typically store approximately 21 days of five minute averages and 3 months of one hour averages. If possible, the DAS will acquire data and control the ambient analyzers via serial communication. Remote data transmission will be accomplished by the periodic transmission of collected station air quality data via phone line.

5.4 Meteorological Tower

Horizontal wind speed, wind direction, ambient temperature, relative humidity, barometric pressure, and rainfall will be collected. The meteorological sensors will be mounted on an external telescoping 10 m aluminum tower. Meteorological sensor measurement data will be logged using the DAS mentioned above. The proposed meteorological equipment will be:

- Wind Speed/Wind Direction: Met One Instruments Inc. Model 034B (or equivalent)
- Temperature: Campbell Scientific Model 107 (or equivalent)
- Relative Humidity: Campbell Scientific Model HMP60 (or equivalent)
- Atmospheric Pressure: Campbell Scientific Model CS106 (or equivalent)
- Rainfall: Texas Electronic TE525M (or equivalent)

5.5 Equipment Enclosure and Sampling Manifold

A custom instrumentation shelter will be used to store the monitoring equipment. The shelter will have a steel frame structure covered in a weatherproof exterior. A rooftop guardrail and accompanying ladder will be installed to provide access to the hi-volume samplers. Wall mounted HVAC units will be installed to provide adequate heating and cooling to the shelter during different weather conditions, which will ensure correct temperature readings during the sampling.

A shelter temperature of 20-25°C will be maintained to within +/- 1°C by an automatic heat/cool thermostat with adjustable hysteresis. The shelter temperature will be measured and collected along with the pollutant and meteorological data, and alarmed with limits. Out-of-limit shelter temperature conditions will be immediately flagged and communicated to maintenance technicians via phone line/cellular call out.

Ambient air will be drawn into the station using an insulated 6” Teflon lined stainless steel sampling cane and, 4 port manifold (or equivalent). The manifold flow rate will be approximately 60 cubic feet per meter (cfm) to ensure an adequate ambient air exchange rate. The temperature control on the manifold will be automatically adjusted to ensure that the manifold temperature is at least 10°C above the ambient dew point to prevent the formation of condensation or water droplets.

6 LABORATORY ANALYTICAL PROCEDURES

All samples will be obtained and analysed following US EPA reference or equivalent methods, as per the MOE Operations Manual (MOE, 2008). A summary of the contaminants to be assessed by laboratory analytical procedures during this monitoring program and their laboratory reference methods is provided below.

Table 6-1 Summary of Laboratory Reference Methods

Contaminant	Laboratory Reference Method
Total Suspended Particulate (TSP) and Metals	US EPA Manual Reference Method: 40 CFR Part 50, Appendix B Compendium Method IO-3 with Atomic Emission Spectroscopy/Inductively Coupled Plasma (AES/ICP)
Polycyclic Aromatic Hydrocarbons (PAHs)	Gas Chromatography/Mass Spectrometry (GC/MS) following US EPA Method TO-13A
Dioxins and Furans	Gas Chromatography/Mass Spectrometry (GC/MS) following US EPA Method TO-9A

A summary of the method detection limits to be used in the analysis versus their applicable air quality criteria is presented in Tables 6-2 to 6-4. As required by the MOE, the MDLs for all contaminants are at least a factor of ten less than their applicable criteria (with the exception of the dioxin and furan MDL for which a single value for the MDL cannot be presented, as explained below).

Table 6-2 Method Detection Limits for Metals

Contaminant	MOE 24-Hour Criteria ($\mu g/m^3$)	MDL ($\mu g/m^3$) [1]	Ratio of MDL to Criteria
Aluminum	4.8	1.18E-02	408
Antimony	25	5.88E-03	4250
Arsenic	0.3	3.53E-03	85
Barium	10	5.88E-04	17000
Beryllium	0.01	5.88E-04	17
Boron	120	3.53E-03	34000
Cadmium	0.025	1.18E-03	21
Total Chromium (and compounds)	0.5	1.18E-03	425
Cobalt	0.1	1.18E-03	85
Lead	0.5	1.76E-03	283

Table 6-2 Method Detection Limits for Metals

Contaminant	MOE 24-Hour Criteria ($\mu g/m^3$)	MDL ($\mu g/m^3$) [1]	Ratio of MDL to Criteria
Nickel	0.2	1.76E-03	113
Phosphorus	0.35	1.47E-02	24
Silver	1	5.88E-04	1700
Selenium	10	5.88E-03	1700
Tin	10	5.88E-03	1700
Vanadium	2	1.18E-03	1700
Zinc	120	2.94E-03	40800
Bismuth	no criteria	3.53E-03	NA
Copper	50	1.18E-03	42500
Iron	4	2.94E-03	1360
Magnesium (JSL List)	0.2	5.88E-03	34
Molybdenum	120	1.76E-03	68000
Strontium	120	5.88E-04	204000
Thallium (JSL List)	0.24	5.88E-03	40.8
Titanium	120	5.88E-04	204000
Uranium	0.3	1.76E-02	17
Zirconium (JSL List)	20	5.88E-04	34000

Note: 1 - Based on a hi-vol sample volume of 1700 m^3 in a 24-hour period (typical value from EA ambient monitoring program).

Table 6-3 Method Detection Limits for PAHs

Contaminant	MOE 24-Hour Criteria ($\mu g/m^3$)	MDL ($\mu g/m^3$) [1]	Ratio of MDL to Criteria
Acenaphthylene	3.5	9.42E-05	37170
Acenaphthene	no criteria	9.42E-05	NA
Anthracene	0.2	9.42E-05	2124
Benzo(a)anthracene	no criteria	9.42E-05	NA
Benzo(b)fluoranthene	no criteria	9.42E-05	NA
Benzo(k)fluoranthene	no criteria	9.42E-05	NA
Benzo(a)fluorene	no criteria	1.88E-04	NA
Benzo(b)fluorene	no criteria	1.88E-04	NA
Benzo(ghi)perylene	1.2	9.42E-05	12744

Table 6-3 Method Detection Limits for PAHs

Contaminant	MOE 24-Hour Criteria ($\mu g/m^3$)	MDL ($\mu g/m^3$) [1]	Ratio of MDL to Criteria
Benzo(a)pyrene [2]	5.0E-05	5.6E-08	885
Benzo(e)pyrene	no criteria	1.88E-04	NA
Biphenyl	no criteria	1.88E-04	NA
Chrysene	no criteria	9.42E-05	NA
Dibenzo(a,h)anthracene	no criteria	9.42E-05	NA
Fluoranthene	140	9.42E-05	1486800
Indeno(1,2,3-cd)pyrene	no criteria	9.42E-05	NA
1-methylnaphthalene	12	1.88E-04	63720
2-methylnaphthalene	10	1.88E-04	53100
Naphthalene	22.5	1.36E-04	165938
Perylene	no criteria	1.88E-04	NA
Phenanthrene	no criteria	9.42E-05	NA
Pyrene	0.2	9.42E-05	2124
Tetralin	1200	1.88E-04	6372000
O-terphenyl	no criteria	1.88E-04	NA

Note: 1 - Based on a hi-vol sample volume of 531 m^3 in a 24-hour period (typical value from EA ambient monitoring program).
2 – Using High Resolution Mass Spectrometry (HRMS)

Table 6-4 Method Detection Limits for Dioxins and Furans

Contaminant	MOE 24-Hour Criteria ($\mu g/m^3$)	MDL ($\mu g/m^3$) [1]	Ratio of MDL to Criteria
Dioxins and Furans (TEQ)	1.00E-07	6.3E-09 to 2.4E-08	16 to 4

Note: 1 - Based on a hi-vol sample volume of 531 m^3 in a 24-hour period and maximum and minimum TEQ DL values from the EA ambient monitoring program.

For dioxins and furans, a TEQ MDL range is presented in Table 6-4. The TEQ MDL will vary depending on the estimated detection limit of each dioxin and furan cogener included in the TEQ calculation and therefore cannot be accurately represented by a single value. To gauge the relative range of the expected dioxin and furan TEQ MDLs, the maximum and minimum sample specific DLs measured during the EA ambient monitoring program were examined. The ratio of laboratory TEQ DLs to the MOE dioxin and furan AAQC varied from 16 to 4. The factor of 16 meets the MOE criteria for the MDL to be 10 times lower than the AAQC. At the other end of the range, the ratio of 4 would not meet the MOE requirement, but would meet the US EPA requirement for dioxin and furan ambient monitoring presented in 40 CFR Part 136, Appendix B (DL to be less than 1/3 of the regulatory compliance level).

7 QUALITY ASSURANCE PROCEDURES

7.1 Operator Requirements

The proposed monitoring program will be operated by a third-party consultant hired by the Regions. The consultant will be responsible for all data analysis and for preparing both quarterly and annual reports summarizing the monitoring to date.

The consultant will be required to provide the Regions with a quality plan for operating and maintaining the monitoring program, which will include the following general provisions:

- All field activities will be recorded in standardized field notes. Hi-vol data sheets will include initial and final flow measurements for each sample;
- Chain of custody forms will be completed and submitted along with exposed samples to the CALA laboratory used for analysis;
- All original containers will be used when submitting filters for analysis to avoid cross-contamination of samples, which will be recorded in the chain of custody forms; and,
- Maintaining training records for all personnel involved in the project.

7.2 Instrumentation Calibration

Samplers will be bench-tested and calibrated prior to their installation in the field. If required, the samplers will be re-calibrated once installed before their first use. On-going calibration of the samplers will follow the recommended calibration schedule listed in the MOE Operations Manual (MOE, 2008), but will be done on a quarterly basis at a minimum.

MOE will conduct periodic audits of the equipment including prior to commencement of the monitoring program.

7.3 Accuracy Checks of Analysis Techniques

Travel and field blank samples will be submitted to the CALA accredited laboratory to ensure the accuracy of the analytical techniques used. Blank samples will account for ten percent (10%) of total submitted samples.

7.4 Sample Collection and Transportation

Samples will be properly handled to ensure that there is no contamination. For filters this entails the use of surgical gloves and tweezers to avoid contamination. All samples will be carefully removed from the monitoring device by a trained operator, and placed in sealed, non-reactive containers. All samples will be placed in protective cases for protection from breakage, contamination or loss during transportation.

Quality records for sample collection will be maintained. The quality record will include at least the following parameters:

- Station ID;
- Station name/location;
- Filter/canister ID;
- Sample start date/time;
- Sample end date/time or elapsed time;
- Date/time sample collected;
- Technician name;
- Meteorological conditions during sampling; and,
- Comments on visual inspection of filters/canisters prior to and after sampling.

7.5 Data Review and Validation

Data collected from the continuous monitors will be screened for any suspicious data including outliers, instrumentation drift and missing data following MOE protocols given in the document Operations Manual (MOE, 2008). In general, the Operations Manual states that at a minimum, the required rate of recovery of valid data for both continuous and non-continuous monitors is 75% (both seasonally and annually). In addition, for NO_X and SO_2 sampling, zero drifts beyond 5 parts per billion (ppb) require an off-set adjustment.

A final data screening of all measurement data will be performed at the end of the monitoring program to examine overall trends and to identify and correct any suspect data following MOE protocols (MOE, 2008).

8 REPORTING REQUIREMENTS

Both quarterly and annual reports will be generated that include the results of the ambient monitoring program. The quarterly reports will follow a standardized format to be agreed upon by the Regions, and will include the following statistical information as required by the MOE (MOE, 2008):

For Continuous Monitors:

- Period Arithmetic Mean;
- Monthly Arithmetic Mean;
- Maximum for any averaging period used for comparison to statutory or regulatory limits;
- Maximum 24-hour; and,
- Percentage of valid hours.

For Non-Continuous Monitors:

- No. of valid samples;
- Percentage of valid data;
- Period arithmetic mean;
- Period geometric mean (TSP only);
- Maximum 24-hour value; and,
- Maximum monthly value.

In addition, should a validated exceedance of O.Reg.419/05 criteria occur, it will be reported. For quarterly report submissions, continuous and non-continuous data will be submitted electronically (Excel format) along with the report. Edit logs for all continuous and non-continuous monitors will be provided in the quarterly reports.

Annual reports will follow a similar format to the quarterly reports, and will include both a summary and analysis of the ambient monitoring program of the previous year. In addition to the required sections as detailed for the quarterly report, the annual report will include the following:

- A map showing the location of emitting sources, property boundaries, and monitoring stations, including scaling and north arrow;
- A summary of overall operations, e.g., summary of parameters monitored and equipment/model numbers, frequency of site visits and calibrations, confirmation of data backups and/or archiving, list of problems that resulted in significant losses of data along with remedial actions;

- A summary of audits and audit outcomes;
- Summary statistics, including:
  - Annual Arithmetic Mean;
  - Annual Geometric Mean (TSP only);
  - Maximum 1-hour (continuous data only);
  - Maximum 24-hour;
  - Number of valid hours or sampling periods;
  - Percent of valid data;
- A summary of any exceedences of O.Reg.419/05 or other applicable criteria for each applicable averaging period and the number of times exceedances occurred; and,
- A comparison to historical data collected at the monitoring station.

Further requirements for both the quarterly and annual reports can be found in the MOE Operations Manual (MOE, 2008).

The quarterly and annual reports and data collected from the monitoring program will be made available to the Ontario Ministry of Environment per the requirements of the MOE Operations Manual (MOE, 2008). The Regions will make this information available to other parties per the requirements of the Minister's Notice of Approval for the EA.

9 DATA REVIEW AND TRIGGERS FOR PROGRAM ALTERATION

9.1 Data Review and Corrective Actions

Bi-weekly screening of the analytical data will be conducted to ensure that short-term 1 hour and 24 hour objectives are met. These are acute exposure timeframes that should be monitored to ensure that health and the environment are protected in between the timeframe of preparing quarterly and annual reports. This process will be conducted for the first year of monitoring during DYEC operation and the need for continued review will be re-visited based on the results of the first year. The results of the bi-weekly review will be summarized in a letter report to the Regions only (the MOE will be notified of exceedances, as described below).

Two sets of standards will be used for comparison to the air quality data during the screening process. The first set of standards will be the limits reported in O.Reg.419/05 (Schedules 3 and 6). These are compliance based standards used through the province of Ontario. However, not all chemicals have O.Reg.419/05 criteria, or in some instances updated health-based standards were used in the human health risk assessment (HHRA) conducted in support of the Environmental Assessment. These health-based values, which are reported in Table 7-2 (Summary of Inhalation TRVs and Inhalation Benchmarks Selected for CACs) and Table 7-3 (Inhalation TRVs and Inhalation Benchmarks for Selected COPCs) of the HHRA (Stantec, 2009b) will be used as the second set of standards.

If at any time at the monitoring locations the 1 hour and 24 hour criteria are exceeded for one or more contaminants, then the Regions, the MOE and the Medical Officer of Health (MOH) for Durham Region will be immediately notified and an investigation into the root cause will be undertaken, as there may be several potential explanations for an exceedance other than the DYEC emissions (e.g. other emissions sources, instrument malfunction, field handling/laboratory analysis errors, etc). The notification of exceedances of applicable air standards for ambient air quality criteria will be reported to the MOE District Manager within 7 days of the exceedance(s) being identified. It is noted that minor exceedances of the health-based standards may not necessarily be cause for concern. These benchmarks have a number of safety factors built in and the toxicological endpoint is usually an irritant effect for the 1 hour values, such that it would be highly unlikely of anyone experiencing an actual health effect. A qualified toxicologist will evaluate the magnitude of the exceedance and the potential for health effects.

If it is determined that the DYEC was the likely cause, for example through review of facility operations and stack emissions data during that period, then the MOE will be formally notified as per the requirements of Section 28 of O. Reg. 419/05. Appropriate corrective actions will be undertaken in consultation with the Region, MOE and MOH and following the requirements of Section 28 of O. Reg. 419/05.

9.2 Monitoring Program Review

9.2.1 Placement and Location of Ambient Monitoring Stations

Selection of the two monitoring stations – upwind and downwind – was based on sound science and engineering practices and professional experience of the air quality engineers. The MOE has also requested that a property line station be installed. If ongoing review of the monitoring data suggests that any of the monitoring stations are not providing relevant information to the program objectives, then in consultation with the MOE, consideration will be given to altering their location(s).

If unexpected results (e.g., measured exceedances of contaminants attributable to DYEC emissions or measured concentrations are significantly higher than those predicted in the EA for the DYEC emissions) then consideration will be given to installation of additional monitoring locations and/or relocation of the existing stations.

Neither of these decisions would be made without detailed review of the data in consultation with the MOE, Regions and the MOH.

9.2.2 Environmental Assessment Model Validation

One of the objectives of the air monitoring program will be to assess the accuracy of the dispersion modeling exercise undertaken during the Environmental Assessment and used to evaluate the potential risk to health and the environment.

Once an appropriate amount of air quality data has been collected at both monitoring locations (a minimum of one-year of measurements (with a 75% data completeness in each quarter) during DYEC operation or to the satisfaction of the Regional Director), it will be used to validate the predictions made in the EA. Model validation procedures will include comparison of maximum measured concentrations at each stations (for each contaminant) to the EA predictions and development of Q-Q plots or measured and modeled concentrations at each location.

If the air quality model predictions used in the EA/HHRA are shown to be either reflective of actual measurements or higher than those measured during facility operation, then no further action would be required. This would mean that the values used in the risk assessment were accurate / conservative and that predictions of potential risk to human and ecological receptors would remain valid.

If air quality modeled predictions underestimated actual ground level concentrations measured during DYEC operation, then the results of the HHERA would need to be revisited using the actual measured data. This would be required for only those chemicals that have higher ground level concentrations that could be attributed to the facility. It is important to note that if higher concentrations are measured at ground level during operation it does not necessarily mean that there would be an unacceptable health or ecological risk. For the majority of chemicals and exposure timeframes (i.e., 1 hour, 24 hour, and annual) the concentration ratios (CR) and incremental lifetime cancer risks (ILCRs) that were used to benchmark potential health risks were often several orders of magnitude below those of concern.

In the event that measured ground level concentrations during DYEC operations are above the health thresholds, then immediate notification of the MOE, Regions and MOH would be required and appropriate corrective actions undertaken in consultation with the Region, MOE and MOH.

9.2.3 Revisions to the Ambient Monitoring Plan

As noted in Section 11.6 of the Provincial Minister's Notice of Approval to Proceed with the Undertaking, the Regional Director may require changes be made (or approve requested changes) to this ambient monitoring and reporting plan. The Region shall revise the plan and implement it in accordance with the required/requested changes.

10 CLOSURE

This Ambient Monitoring Plan (Report) has been prepared by Stantec Consulting Limited (Stantec) for the use of the Regions of Durham and York. The assessment represents the conditions of the proposed DYEC and other identified locations only at the time of the assessment, and is based on the information referenced and contained in this Report. The conclusions presented herein respecting current conditions and potential future conditions at the DYEC and other identified locations represent the best judgment of the assessor based on current environmental standards and information. Stantec attests that to the best of our knowledge, the information presented in this Report is accurate. The use of this Report for other projects or matters without the written permission of Durham Region, York Region and Stantec is solely at the user's own risk.

Respectfully Submitted,

STANTEC CONSULTING LTD.

Original Signed by G. Crooks

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GC/mcs

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Ontario

June 5, 2012

Greg Borchuk
Regional Municipality of Durham

RE: Ambient Air Quality Monitoring Plan Locations

I am writing to confirm acceptance of the proposed upwind (Courtice Water Control Plant), the Durham York Energy Centre property line and the downwind ambient air monitoring locations.

The Regions in consultation with the Ministry of the Environment agreed to monitor ambient air in three locations at an upwind, the Durham York Energy Centre property line and a downwind location. Your proposed Durham York Residual Waste Study dated February 10, 2012, indicated the upwind location to be situated at 180 Courtice Road. An alternative upwind site at the Courtice Water Control Plant was found which optimizes siting criteria requirements. This new location would replace the proposed site as indicated in the Durham York Residual Waste Study. This site is an adequate replacement upwind monitoring location. The proposed downwind location (D-2) is also acceptable as a monitoring location.

It is the Regions' responsibility to ensure data quality and integrity for all three air monitoring sites.

If you have any further questions concerning the acceptance of these locations please contact me at 416-326-3477.

Sincerely,

Daniel Panko

Dan Panko
APEP Supervisor
Central Region
Ministry of the Environment

cc. Dave Fumerton MOE

APPENDIX C

Background Air Quality Monitoring Data

Table C1: Summary of Courtice and Rundle Continuous Monitoring Data (2015-2019)

Indicator Compound	Averaging Period	Courtice [µg/m³]				Rundle [µg/m³]			
		Average	75th Percentile	90th Percentile	Max	Average	75th Percentile	90th Percentile	Max
NO_2	1 hour	12.26	16.40	30.00	132.85	10.41	14.87	23.54	91.20
	24 hour	12.27	16.39	22.28	44.63	10.40	14.23	19.83	48.76
	Annual	14.04	—	—	20.23	12.48	—	—	17.33
SO_2	1 hour	5.16	4.39	11.75	252.05	2.04	2.35	4.03	212.10
	24 hour	5.17	6.60	12.64	53.82	2.04	2.42	4.08	37.56
	Annual	5.26	—	—	8.18	2.34	—	—	3.21
$PM_{2.5}$	24 hour	6.87	8.88	13.22	57.86	7.51	9.46	15.32	55.18
	Annual	8.12	—	—	13.47	8.92	—	—	13.85
PM_{10}	24 hour	12.71	16.44	24.48	107.15	13.91	17.51	28.37	102.19
	Annual	15.05	—	—	24.94	16.52	—	—	25.64

Note: "—" implies the statistic cannot be calculated for the relevant averaging period.

Table C2: Summary of Courtice and Rundle Non-Continuous Monitoring Data for SPM and Metals (2016-2019)

Indicator Compound	Averaging Period	Courtice [µg/m³]				Rundle [µg/m³]			
		Average	75th Percentile	90th Percentile	Max	Average	75th Percentile	90th Percentile	Max
Suspended Particulate Matter	24 hour	25.91	30.94	42.93	146.41	35.57	41.38	65.16	203.61
	Annual	26.00	—	—	26.91	35.60	—	—	52.99
Aluminum	24 hour	0.12	0.14	0.21	1.00	0.22	0.24	0.42	1.42
	Annual	0.13	—	—	0.15	0.19	—	—	0.30
Antimony	24 hour	0.0025	0.0034	0.0035	0.0071	0.0023	0.0033	0.0035	0.0264
	Annual	0.0024	—	—	0.0033	0.0025	—	—	0.0033
Arsenic	24 hour	0.0017	0.0020	0.0021	0.0043	0.0016	0.0020	0.0021	0.0206
	Annual	0.0017	—	—	0.0020	0.0017	—	—	0.0020
Barium	24 hour	0.0080	0.0099	0.0145	0.0339	0.0085	0.0107	0.0150	0.0267
	Annual	0.0080	—	—	0.0092	0.0085	—	—	0.0091
Beryllium	24 hour	0.0003	0.0003	0.0004	0.0016	0.0002	0.0003	0.0003	0.0018
	Annual	0.0002	—	—	0.0003	0.0002	—	—	0.0003
Boron	24 hour	0.0054	0.0123	0.0127	0.0139	0.0068	0.0123	0.0127	0.0133
	Annual	0.0058	—	—	0.0127	0.0060	—	—	0.0126
Cadmium	24 hour	0.0007	0.0007	0.0007	0.0019	0.0007	0.0007	0.0007	0.0047
	Annual	0.0007	—	—	0.0007	0.0007	—	—	0.0007
Chromium	24 hour	0.0029	0.0038	0.0054	0.0225	0.0033	0.0041	0.0057	0.0175

Indicator Compound	Averaging Period	Courtice [µg/m³]				Rundle [µg/m³]			
		Average	75th Percentile	90th Percentile	Max	Average	75th Percentile	90th Percentile	Max
	Annual	0.0030	—	—	0.0046	0.0031	—	—	0.0041
Cobalt	24 hour	0.0007	0.0007	0.0007	0.0014	0.0007	0.0007	0.0007	0.0028
	Annual	0.0007	—	—	0.0007	0.0007	—	—	0.0007
Copper	24 hour	0.0305	0.0405	0.0589	0.1269	0.0332	0.0520	0.0801	0.2291
	Annual	0.0305	—	—	0.0450	0.0373	—	—	0.0527
Lead	24 hour	0.0024	0.0029	0.0041	0.0143	0.0048	0.0028	0.0045	0.3960
	Annual	0.0023	—	—	0.0027	0.0042	—	—	0.0102
Molybdenum	24 hour	0.0011	0.0011	0.0020	0.0077	0.0014	0.0021	0.0036	0.0313
	Annual	0.0011	—	—	0.0013	0.0016	—	—	0.0025
Nickel	24 hour	0.0011	0.0010	0.0011	0.0054	0.0013	0.0010	0.0021	0.0194
	Annual	0.0011	—	—	0.0012	0.0013	—	—	0.0017
Phosphorus	24 hour	0.2092	0.2300	0.4800	2.0247	0.3096	0.2300	0.5700	2.1538
	Annual	0.2388	—	—	0.6970	0.2615	—	—	0.7276
Selenium	24 hour	0.0033	0.0034	0.0035	0.0071	0.0032	0.0033	0.0035	0.0044
	Annual	0.0033	—	—	0.0033	0.0032	—	—	0.0033
Silver	24 hour	0.0012	0.0017	0.0017	0.0036	0.0011	0.0017	0.0017	0.0106
	Annual	0.0012	—	—	0.0017	0.0012	—	—	0.0017
Thallium	24 hour	0.0023	0.0034	0.0035	0.0071	0.0018	0.0033	0.0035	0.0044

Indicator Compound	Averaging Period	Courtice [µg/m³]				Rundle [µg/m³]			
		Average	75th Percentile	90th Percentile	Max	Average	75th Percentile	90th Percentile	Max
	Annual	0.0022	—	—	0.0033	0.0021	—	—	0.0033
Tin	24 hour	0.0025	0.0034	0.0035	0.0071	0.0026	0.0033	0.0035	0.0412
	Annual	0.0024	—	—	0.0033	0.0027	—	—	0.0039
Vanadium	24 hour	0.0018	0.0017	0.0018	0.0202	0.0021	0.0017	0.0018	0.0384
	Annual	0.0018	—	—	0.0022	0.0021	—	—	0.0029
Zinc	24 hour	0.0335	0.0391	0.0560	0.2460	0.0271	0.0346	0.0485	0.2460
	Annual	0.0335	—	—	0.0345	0.0278	—	—	0.0312

Note: “—” implies that the statistic cannot be calculated for the relevant averaging period.

Table C3: Summary of Courtice, Rundle and Newmarket Monitoring Data for all other Available Indicator Compounds

Indicator Compound	Averaging Period	Courtice [µg/m³]				Rundle [µg/m³]				Newmarket [µg/m³]			
		Average	75th Percentile	90th Percentile	Max	Average	75th Percentile	90th Percentile	Max	Average	75th Percentile	90th Percentile	Max
1,2,4 – Trichlorobenzene	24 hour	—	—	—	—	—	—	—	—	0.0048	0.0058	0.0082	0.0365
	Annual	—	—	—	—	—	—	—	—	0.0048	—	—	0.0056
1,2-Dichlorobenzene	24 hour	—	—	—	—	—	—	—	—	0.0022	0.0026	0.0037	0.0080
	Annual	—	—	—	—	—	—	—	—	0.0022	—	—	0.0027
1-Methylnaphthalene	24 hour	0.0047	0.0052	0.0089	0.0240	0.0105	0.0094	0.0191	0.2382	—	—	—	—
	Annual	0.0047	—	—	0.0064	0.0102	—	—	0.0201	—	—	—	—
2-Methylnaphthalene	24 hour	0.0081	0.0083	0.0150	0.0504	0.0203	0.0173	0.0371	0.5025	—	—	—	—
	Annual	0.0080	—	—	0.0115	0.0197	—	—	0.0404	—	—	—	—
Acenaphthene	24 hour	0.0035	0.0042	0.0096	0.0296	0.0115	0.0095	0.0243	0.3032	—	—	—	—
	Annual	0.0034	—	—	0.0060	0.0111	—	—	0.0249	—	—	—	—
Acenaphthylene	24 hour	0.0001	0.0001	0.0003	0.0008	0.0002	0.0003	0.0004	0.0033	—	—	—	—
	Annual	0.0001	—	—	0.0002	0.0002	—	—	0.0003	—	—	—	—
Anthracene	24 hour	0.0001	0.0001	0.0004	0.0008	0.0006	0.0005	0.0016	0.0075	—	—	—	—
	Annual	0.0001	—	—	0.0002	0.0005	—	—	0.0009	—	—	—	—
Benzene	24 hour	—	—	—	—	—	—	—	—	0.40	0.48	0.62	2.48
	Annual	—	—	—	—	—	—	—	—	0.40	—	—	0.43
Benzo(a)anthracene	24 hour	0.00007	0.00011	0.00011	0.00012	0.00007	0.00011	0.00011	0.00023	—	—	—	—
	Annual	0.00007	—	—	0.00009	0.00007	—	—	0.00010	—	—	—	—
Benzo(a)fluorene	24 hour	0.00014	0.00021	0.00022	0.00024	0.00015	0.00022	0.00023	0.00040	—	—	—	—
	Annual	0.00013	—	—	0.00018	0.00014	—	—	0.00020	—	—	—	—
Benzo(a)pyrene	24 hour	0.00003	0.00003	0.00006	0.00018	0.00003	0.00004	0.00007	0.00021	—	—	—	—
	Annual	0.00003	—	—	0.00003	0.00003	—	—	0.00004	—	—	—	—
Benzo(b)fluoranthene	24 hour	0.00008	0.00011	0.00011	0.00029	0.00008	0.00011	0.00011	0.00049	—	—	—	—
	Annual	0.00007	—	—	0.00010	0.00008	—	—	0.00011	—	—	—	—
Benzo(b)fluorene	24 hour	0.0135	0.0002	0.0002	1.4310	0.0140	0.0002	0.0002	1.4310	—	—	—	—
	Annual	0.0157	—	—	0.0622	0.0164	—	—	0.0651	—	—	—	—
Benzo(e)pyrene	24 hour	0.00014	0.00021	0.00022	0.00024	0.00014	0.00021	0.00023	0.00029	—	—	—	—
	Annual	0.00013	—	—	0.00018	0.00013	—	—	0.00019	—	—	—	—
Benzo(g,h,i)Perylene	24 hour	0.00007	0.00011	0.00011	0.00012	0.00008	0.00011	0.00011	0.00015	—	—	—	—
	Annual	0.00007	—	—	0.00009	0.00007	—	—	0.00009	—	—	—	—
Benzo(k)fluoranthene	24 hour	0.00007	0.00011	0.00011	0.00012	0.00008	0.00011	0.00011	0.00015	—	—	—	—
	Annual	0.00007	—	—	0.00009	0.00007	—	—	0.00009	—	—	—	—
Biphenyl	24 hour	0.0022	0.0024	0.0041	0.0111	0.0050	0.0040	0.0090	0.1259	—	—	—	—

Indicator Compound	Averaging Period	Courtice [µg/m³]				Rundle [µg/m³]				Newmarket [µg/m³]			
		Average	75th Percentile	90th Percentile	Max	Average	75th Percentile	90th Percentile	Max	Average	75th Percentile	90th Percentile	Max
	Annual	0.0022	—	—	0.0030	0.0048	—	—	0.0101	—	—	—	—
Bromodichloromethane	24 hour	—	—	—	—	—	—	—	—	0.006	0.008	0.010	0.024
	Annual	—	—	—	—	—	—	—	—	0.006	—	—	0.006
Bromoform	24 hour	—	—	—	—	—	—	—	—	0.018	0.020	0.024	0.048
	Annual	—	—	—	—	—	—	—	—	0.018	—	—	0.020
Bromomethane	24 hour	—	—	—	—	—	—	—	—	0.04	0.05	0.06	0.10
	Annual	—	—	—	—	—	—	—	—	0.04	—	—	0.05
Carbon tetrachloride	24 hour	—	—	—	—	—	—	—	—	0.50	0.55	0.59	0.67
	Annual	—	—	—	—	—	—	—	—	0.50	—	—	0.53
Chloroform	24 hour	—	—	—	—	—	—	—	—	0.13	0.14	0.22	0.56
	Annual	—	—	—	—	—	—	—	—	0.13	—	—	0.16
Chrysene	24 hour	0.00008	0.00011	0.00011	0.00030	0.00009	0.00011	0.00012	0.00040	—	—	—	—
	Annual	0.00008	—	—	0.00010	0.00009	—	—	0.00010	—	—	—	—
Dibenzo(a,h)anthracene	24 hour	0.00007	0.00011	0.00011	0.00012	0.00007	0.00011	0.00011	0.00015	—	—	—	—
	Annual	0.00006	—	—	0.00009	0.00006	—	—	0.00009	—	—	—	—
Dichlorodifluoromethane	24 hour	—	—	—	—	—	—	—	—	2.4881	2.6282	2.7568	3.3320
	Annual	—	—	—	—	—	—	—	—	2.4869	—	—	2.6144
Dichloroethene, 1,1 -	24 hour	—	—	—	—	—	—	—	—	0.0001	0.0000	0.0004	0.0019
	Annual	—	—	—	—	—	—	—	—	0.0004	—	—	0.0010
Dichloromethane	24 hour	—	—	—	—	—	—	—	—	0.3494	0.3773	0.4892	1.2398
	Annual	—	—	—	—	—	—	—	—	0.3494	—	—	0.3896
Dioxins, Furans and Dioxin- like PCBs	24 hour	0.0171	0.0177	0.0210	0.1090	0.0174	0.0198	0.0249	0.0952	—	—	—	—
	Annual	0.0161	0.0000	0.0000	0.0244	0.0163	—	—	0.0235	—	—	—	—
Ethylbenzene	24 hour	—	—	—	—	—	—	—	—	0.1707	0.2339	0.3547	0.6988
	Annual	—	—	—	—	—	—	—	—	0.1715	—	—	0.2494
Ethylene Dibromide	24 hour	—	—	—	—	—	—	—	—	0.0013	0.0016	0.0017	0.0017
	Annual	—	—	—	—	—	—	—	—	0.0013	—	—	0.0013
Fluoranthene	24 hour	0.0008	0.0010	0.0020	0.0038	0.0022	0.0027	0.0050	0.0147	—	—	—	—
	Annual	0.0008	—	—	0.0012	0.0021	—	—	0.0027	—	—	—	—
Indeno(1,2,3-cd)Pyrene	24 hour	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	—	—	—	—
	Annual	0.0001	—	—	0.0001	0.0001	—	—	0.0001	—	—	—	—
Naphthalene	24 hour	0.0216	0.0267	0.0412	0.0922	0.0291	0.0355	0.0545	0.2946	0.0371	0.0501	0.0739	0.2200
	Annual	0.0212	—	—	0.0254	0.0283	—	—	0.0395	0.0372	—	—	0.0495
O-terphenyl	24 hour	0.0001	0.0002	0.0002	0.0002	0.0001	0.0002	0.0002	0.0003	—	—	—	—

Indicator Compound	Averaging Period	Courtice [µg/m³]				Rundle [µg/m³]				Newmarket [µg/m³]			
		Average	75th Percentile	90th Percentile	Max	Average	75th Percentile	90th Percentile	Max	Average	75th Percentile	90th Percentile	Max
	Annual	0.0001	—	—	0.0002	0.0001	—	—	0.0002	—	—	—	—
Perylene	24 hour	0.0001	0.0002	0.0002	0.0002	0.0001	0.0002	0.0002	0.0003	—	—	—	—
	Annual	0.0001	—	—	0.0002	0.0001	—	—	0.0002	—	—	—	—
Phenanthrene	24 hour	0.0041	0.0052	0.0099	0.0231	0.0127	0.0125	0.0300	0.2097	—	—	—	—
	Annual	0.0040	—	—	0.0065	0.0122	—	—	0.0219	—	—	—	—
Pyrene	24 hour	0.0004	0.0005	0.0008	0.0015	0.0010	0.0011	0.0022	0.0066	—	—	—	—
	Annual	0.0004	—	—	0.0005	0.0009	—	—	0.0012	—	—	—	—
Tetrachloroethene	24 hour	—	—	—	—	—	—	—	—	0.064	0.081	0.126	0.400
	Annual	—	—	—	—	—	—	—	—	0.064	—	—	0.076
Tetralin	24 hour	0.0018	0.0021	0.0027	0.0078	0.0021	0.0023	0.0029	0.0360	—	—	—	—
	Annual	0.0018	—	—	0.0020	0.0022	—	—	0.0031	—	—	—	—
Toluene	24 hour	—	—	—	—	—	—	—	—	0.98	1.36	2.08	4.36
	Annual	—	—	—	—	—	—	—	—	0.98	—	—	1.34
Trichloroethane, 1,1,1 -	24 hour	—	—	—	—	—	—	—	—	0.02	0.02	0.03	0.04
	Annual	—	—	—	—	—	—	—	—	0.02	—	—	0.03
Trichloroethylene, 1,1,2 -	24 hour	—	—	—	—	—	—	—	—	0.05	0.06	0.15	0.29
	Annual	—	—	—	—	—	—	—	—	0.05	—	—	0.10
Trichlorofluoromethane	24 hour	—	—	—	—	—	—	—	—	1.58	1.66	1.77	7.19
	Annual	—	—	—	—	—	—	—	—	1.58	—	—	1.74
Vinyl chloride	24 hour	—	—	—	—	—	—	—	—	0.002	0.003	0.004	0.008
	Annual	—	—	—	—	—	—	—	—	0.002	—	—	0.003
Xylenes, m-, p- and o-	24 hour	—	—	—	—	—	—	—	—	0.42	0.60	0.87	2.02
	Annual	—	—	—	—	—	—	—	—	0.42	—	—	0.58

Note: "—" implies that the statistic cannot be calculated for the relevant averaging period

APPENDIX D

Emission Calculations

Main Stack - 140,000 TPA

Source Description: Emissions from the main stack under current maximum operating scenario to process 140,000 tpa of waste.
It was conservatively assumed to be operating at maximum capacity 24 hours per day, 7 days per week.

Operating Rate: Both boilers are operating to achieve 140,000 tpa

Methodology: Engineering calculations
Source: Emission concentrations are taken from Facility specific in-stack emission limits, manufacturers specifications and published emission fatcors.

Train Parameters:

Volumetric flow rate per train during 140,000 tpa scenario	21.31	m^3/s at reference conditions of 0% Moisture, 11% Oxygen and 298.15K temperature
Volumetric flow rate per train during 140,000 tpa scenario	26.13	m^3/s at actual conditions

Sample Calculation 1: Particulate Matter Emission Rate

Emission Rate [g/s] = Concentration[mg/Rm3] x volumetric flow rate [Rm³/s] x 1/1000 [mg/g]

$$= \frac{4.84 \text{ mg}}{\text{m}^3} \times \frac{21 \text{ m}^3}{\text{s}} \times \frac{1 \text{ g}}{1{,}000 \text{ mg}}$$

$$= \frac{1.03\text{E-01 g}}{\text{s}}$$

Source Emissions:

Indicator Compound	CAS Number	Concentration per train	Units(1)	Concentration Reference	Emission Rate per Train [g/s]	Total Emission Rate [g/s]
Carbon Monoxide	630-08-0	4.00E+01	mg/Rm3	ECA Limit	8.52E-01	1.70E+00
Sulphur Dioxide	7446-09-05	3.50E+01	mg/Rm3	ECA Limit	7.47E-01	1.49E+00
Total Suspended Particulate	N/A -1	4.84E+00	mg/Rm3	2020 Source Testing Data*	1.03E-01	2.06E-01
Filterable TSP	N/A -2	9.00E+00	mg/Rm3	ECA Limit	1.92E-01	3.84E-01
PM_{10}	N/A -3	4.84E+00	mg/Rm3	2020 Source Testing Data	1.03E-01	2.06E-01
$PM_{2.5}$	N/A -4	4.58E+00	mg/Rm3	2020 Source Testing Data	9.76E-02	1.95E-01
Lead	7439-92-1	5.00E-02	mg/Rm3	ECA Limit	1.07E-03	2.13E-03
Cadmium	7440-43-9	7.00E-03	mg/Rm3	ECA Limit	1.49E-04	2.98E-04
Mercury	7439-97-6	1.50E-02	mg/Rm3	ECA Limit	3.20E-04	6.39E-04
Hydrogen Fluoride	7664-39-3	1.00E-01	mg/Rm3	2020 Source Testing Data	2.13E-03	4.26E-03
Dioxins, Furans and Dioxin- like PCBs	N/A -6	6.00E-08	mg/Rm3	ECA Limit	0.0013 µg TEQ/s	0.0026 µg TEQ/s
Hydrogen Chloride	7647-01-0	9.00E+00	mg/Rm3	ECA Limit	1.92E-01	3.84E-01
Ammonia	7664-41-7	6.35E-01	mg/Rm3	2020 Source Testing Data	1.35E-02	2.71E-02
Nitrogen Oxides	10102-44-0	1.21E+02	mg/Rm3	ECA Limit	2.58E+00	5.16E+00
Polychlorinated Biphenyls (PCB)	N/A -7	6.50E-07	mg/Rm3	2020 Source Testing Data	1.38E-08	2.77E-08
Aluminum	7429-90-5	3.98E-02	mg/Rm3	MECP Peel HHRA	8.47E-04	1.69E-03
Antimony	7440-36-0	5.15E-05	mg/Rm3	2020 Source Testing Data	1.10E-06	2.20E-06
Arsenic	7440-38-2	4.30E-05	mg/Rm3	2020 Source Testing Data	9.16E-07	1.83E-06
Barium	7440-39-3	1.51E-03	mg/Rm3	2020 Source Testing Data	3.22E-05	6.44E-05
Beryllium	7440-41-7	4.30E-05	mg/Rm3	2020 Source Testing Data	9.16E-07	1.83E-06
Boron	7440-42-8	1.53E-01	mg/Rm3	YD Generic Risk Assessment	3.26E-03	6.52E-03
Chromium (hexavalent)	18540-29-9	3.20E-04	mg/Rm3	Manufacturer Specification	6.82E-06	1.36E-05
Total Chromium (and compounds)	7440-47-3	9.00E-04	mg/Rm3	2020 Source Testing Data	1.92E-05	3.84E-05
Cobalt	7440-48-4	5.15E-05	mg/Rm3	2020 Source Testing Data	1.10E-06	2.20E-06
Copper	7440-50-8	5.15E-03	mg/Rm3	2020 Source Testing Data	1.10E-04	2.20E-04
Molybdenum	7439-98-7	5.14E-03	mg/Rm3	2020 Source Testing Data	1.09E-04	2.19E-04
Nickel	7440-02-0	1.21E-03	mg/Rm3	2020 Source Testing Data	2.57E-05	5.14E-05
Phosphorus	7723-14-0	4.60E-02	mg/Rm3	MECP Peel HHRA	9.81E-04	1.96E-03
Silver	7440-22-4	4.30E-05	mg/Rm3	2020 Source Testing Data	9.16E-07	1.83E-06
Selenium	7782-49-2	7.45E-04	mg/Rm3	2020 Source Testing Data	1.59E-05	3.18E-05
Thallium	7440-28-0	1.02E-04	mg/Rm3	2020 Source Testing Data	2.17E-06	4.35E-06
Tin	7440-31-5	1.76E-02	mg/Rm3	MECP Peel HHRA	3.75E-04	7.50E-04
Vanadium	7440-62-2	2.80E-05	mg/Rm3	2020 Source Testing Data	5.97E-07	1.19E-06
Zinc	7440-66-6	5.45E-03	mg/Rm3	2020 Source Testing Data	1.16E-04	2.32E-04
1,2-Dichlorobenzene	95-50-1	5.14E-05	mg/Rm3	2020 Source Testing Data	1.09E-06	2.19E-06
1,2,4,5-Tetrachlorobenzene	95-94-3	4.24E-06	mg/Rm3	2020 Source Testing Data	9.03E-08	1.81E-07
1,2,4 – Trichlorobenzene	120-82-1	1.96E-05	mg/Rm3	2020 Source Testing Data	4.19E-07	8.37E-07
2,3,4,6-Tetrachlorophenol	58-90-2	9.85E-06	mg/Rm3	2020 Source Testing Data	2.10E-07	4.20E-07
2,4,6-Trichlorophenol	88-06-2	2.00E-05	mg/Rm3	2020 Source Testing Data	4.26E-07	8.52E-07
2,4-Dichlorophenol	120-83-2	1.04E-05	mg/Rm3	2020 Source Testing Data	2.22E-07	4.43E-07
Pentachlorophenol	87-86-5	9.85E-06	mg/Rm3	2020 Source Testing Data	2.10E-07	4.20E-07
Hexachlorobenzene	118-74-1	1.97E-06	mg/Rm3	2020 Source Testing Data	4.20E-08	8.40E-08
Pentachlorobenzene	608-93-5	2.00E-06	mg/Rm3	2020 Source Testing Data	4.26E-08	8.52E-08
Acenaphthylene	208-96-8	1.97E-06	mg/Rm3	2020 Source Testing Data	4.20E-08	8.40E-08
Acenaphthene	83-32-9	4.87E-06	mg/Rm3	2020 Source Testing Data	1.04E-07	2.07E-07
Anthracene	120-12-7	1.98E-06	mg/Rm3	2020 Source Testing Data	4.22E-08	8.44E-08

Made by: SC
Checked by: KSA

Benzo(a)anthracene	56-55-3	4.87E-06	mg/Rm3	2020 Source Testing Data	1.04E-07	2.07E-07
Benzo(b)fluoranthene	205-99-2	4.87E-06	mg/Rm3	2020 Source Testing Data	1.04E-07	2.07E-07
Benzo(k)fluoranthene	207-08-9	4.87E-06	mg/Rm3	2020 Source Testing Data	1.04E-07	2.07E-07
Benzo(a)fluorene	238-84-6	4.87E-06	mg/Rm3	2020 Source Testing Data	1.04E-07	2.07E-07
Benzo(b)fluorene	243-17-4	4.87E-06	mg/Rm3	2020 Source Testing Data	1.04E-07	2.07E-07
Benzo(ghi)perylene	191-24-2	7.10E-06	mg/Rm3	2020 Source Testing Data	1.51E-07	3.02E-07
Benzo(a)pyrene	50-32-8	4.87E-06	mg/Rm3	2020 Source Testing Data	1.04E-07	2.07E-07
Benzo(e)pyrene	192-97-2	4.87E-06	mg/Rm3	2020 Source Testing Data	1.04E-07	2.07E-07
Biphenyl	92-52-4	1.93E-05	mg/Rm3	2020 Source Testing Data	4.12E-07	8.23E-07
Chrysene	218-01-9	2.23E-06	mg/Rm3	2020 Source Testing Data	4.75E-08	9.51E-08
Dibenzo(a,c)anthracene	215-58-7	4.87E-06	mg/Rm3	2020 Source Testing Data	1.04E-07	2.07E-07
Dibenzo(a,h)anthracene	53-70-3	4.87E-06	mg/Rm3	2020 Source Testing Data	1.04E-07	2.07E-07
Fluoranthene	206-44-0	7.11E-06	mg/Rm3	2020 Source Testing Data	1.52E-07	3.03E-07
Fluorene	86-73-7	3.35E-06	mg/Rm3	2020 Source Testing Data	7.13E-08	1.43E-07
Indeno(1,2,3 – cd)pyrene	193-39-5	4.87E-06	mg/Rm3	2020 Source Testing Data	1.04E-07	2.07E-07
1 – methylnaphthalene	90-12-0	4.26E-06	mg/Rm3	2020 Source Testing Data	9.07E-08	1.81E-07
2 – methylnaphthalene	91-57-6	7.73E-06	mg/Rm3	2020 Source Testing Data	1.65E-07	3.29E-07
Naphthalene	91-20-3	4.70E-05	mg/Rm3	2020 Source Testing Data	1.00E-06	2.00E-06
Perylene	198-55-0	1.97E-06	mg/Rm3	2020 Source Testing Data	4.20E-08	8.40E-08
Phenanthrene	85-01-8	2.78E-05	mg/Rm3	2020 Source Testing Data	5.91E-07	1.18E-06
Pyrene	129-00-0	6.34E-06	mg/Rm3	2020 Source Testing Data	1.35E-07	2.70E-07
Tetralin	119-64-2	4.92E-05	mg/Rm3	2020 Source Testing Data	1.05E-06	2.10E-06
O-terphenyl	84-15-1	2.09E-06	mg/Rm3	2020 Source Testing Data	4.45E-08	8.91E-08
Acetaldehyde	75-07-0	4.90E-05	mg/Rm3	2020 Source Testing Data	1.04E-06	2.09E-06
Acrolein	107-02-8	1.98E-05	mg/Rm3	2020 Source Testing Data	4.21E-07	8.42E-07
Benzene	71-43-2	1.16E-03	mg/Rm3	2020 Source Testing Data	2.46E-05	4.92E-05
Bromodichloromethane	75-27-4	3.45E-04	mg/Rm3	2020 Source Testing Data	7.35E-06	1.47E-05
Bromoform	75-25-2	4.11E-04	mg/Rm3	2020 Source Testing Data	8.75E-06	1.75E-05
Bromomethane	74-83-9	3.10E-03	mg/Rm3	2020 Source Testing Data	6.61E-05	1.32E-04
Carbon tetrachloride	56-23-5	3.20E-03	mg/Rm3	2020 Source Testing Data	6.81E-05	1.36E-04
Chloroform	67-66-3	3.01E-03	mg/Rm3	2020 Source Testing Data	6.40E-05	1.28E-04
Dichlorodifluoromethane	75-71-8	7.40E-04	mg/Rm3	2020 Source Testing Data	1.58E-05	3.15E-05
Dichloroethene, 1,1 -	75-35-4	3.45E-04	mg/Rm3	2020 Source Testing Data	7.35E-06	1.47E-05
Dichloromethane	75-09-02	3.24E-02	mg/Rm3	2020 Source Testing Data	6.91E-04	1.38E-03
Ethylbenzene	100-41-4	1.07E-02	mg/Rm3	2020 Source Testing Data	2.29E-04	4.58E-04
Ethylene Dibromide	106-93-4	6.90E-04	mg/Rm3	2020 Source Testing Data	1.47E-05	2.94E-05
Formaldehyde	50-00-0	4.05E-05	mg/Rm3	2020 Source Testing Data	8.63E-07	1.73E-06
Tetrachloroethene	127-18-4	3.70E-04	mg/Rm3	2020 Source Testing Data	7.89E-06	1.58E-05
Toluene	108-88-3	4.25E-02	mg/Rm3	2020 Source Testing Data	9.05E-04	1.81E-03
Trichloroethane, 1,1,1 -	71-55-6	3.45E-04	mg/Rm3	2020 Source Testing Data	7.35E-06	1.47E-05
Trichloroethene	86-42-0	3.45E-04	mg/Rm3	2020 Source Testing Data	7.35E-06	1.47E-05
Trichloroethylene, 1,1,2 -	79-01-06	3.45E-04	mg/Rm3	2020 Source Testing Data	7.35E-06	1.47E-05
Trichlorofluoromethane	75-69-4	2.18E-03	mg/Rm3	2020 Source Testing Data	4.64E-05	9.27E-05
Vinyl chloride	75-01-04	6.90E-04	mg/Rm3	2020 Source Testing Data	1.47E-05	2.94E-05
Xylenes, m-, p- and o-	1330-20-7	1.01E-01	mg/Rm3	2020 Source Testing Data	2.15E-03	4.29E-03

1. Concentrations are at reference conditions of 0% Moisture, 11% Oxygen and 298.15K temperature
2. YD Generic Risk Assessment refers to Algonquin Power EFW plant in Ontario stack testing between 2003 and 2005. (Genivar/Jacques Whitford, 2007)
3. MECP Peel HHRA refers to MOE document "Environmental Risks of Municipal Non-Hazardous Waste Landfilling and Incineration" (MECP, 1999)
4. 2020 Source Testing Data refers to Annual Source Testing Data for DYEC (Ortech, 2021)

Main Stack - 160,000 TPA

Source Description: Emissions from the main stack under the future maximum operating scenario to process 160,000 tpa of waste.
It was conservatively assumed to be operating at maximum capacity 24 hours per day, 7 days per week.

Operating Rate: Both boilers are operating to achieve 160,000 tpa

Methodology: Engineering calculations
Source: Emission concentrations are taken from Facility specific in-stack emission limits, manufacturers specifications and published emission fatcors.

Train Parameters:

Volumetric flow rate per train during 160,000 tpa scenario	=	22.37	m^3/s at reference conditions of 0% Moisture, 11% Oxygen and 298.15K temperature
Volumetric flow rate per train during 160,000 tpa scenario	=	29.71	m^3/s at actual conditions

Sample Calculation 1: Particulate matter emission per train

Emission Rate [g/s] = Concentration[mg/dscm] x volumetric flow rate [dm³/s] x 1/1000 [mg/g]

$$= 4.84\ \frac{mg}{m^3} \times 22.37\ \frac{m^3}{s} \times \frac{1}{1,000}\ \frac{g}{mg}$$

$$= 1.08E-01\ \frac{g}{s}$$

Source Emissions:

Indicator Compound	CAS Number	Concentration per train	Units[1]	Concentration Reference	Emission Rate per Train [g/s]	Total Emission Rate [g/s]
Carbon Monoxide	630-08-0	4.00E+01	mg/Rm3	ECA Limit	8.95E-01	1.79E+00
Sulphur Dioxide	7446-09-05	3.50E+01	mg/Rm3	ECA Limit	7.84E-01	1.57E+00
Total Suspended Particulate	N/A -1	4.84E+00	mg/Rm3	2020 Source Testing Data*	1.08E-01	2.166E-01
Filterable TSP	N/A -2	9.00E+00	mg/Rm3	ECA Limit	2.01E-01	4.03E-01
PM_{10}	N/A -3	4.84E+00	mg/Rm3	2020 Source Testing Data	1.08E-01	2.166E-01
$PM_{2.5}$	N/A -4	4.58E+00	mg/Rm3	2020 Source Testing Data	1.02E-01	2.049E-01
Lead	7439-92-1	5.00E-02	mg/Rm3	ECA Limit	1.12E-03	2.24E-03
Cadmium	7440-43-9	7.00E-03	mg/Rm3	ECA Limit	1.57E-04	3.13E-04
Mercury	7439-97-6	1.50E-02	mg/Rm3	ECA Limit	3.36E-04	6.71E-04
Hydrogen Fluoride	7664-39-3	1.00E-01	mg/Rm3	2020 Source Testing Data	2.24E-03	4.47E-03
Dioxins, Furans and Dioxin- like	N/A -6	6.00E-08	mg/Rm3	ECA Limit	0.0013 µg TEQ/s	0.0027 µg TEQ/s
Hydrogen Chloride	7647-01-0	9.00E+00	mg/Rm3	ECA Limit	2.01E-01	4.03E-01
Ammonia	7664-41-7	6.35E-01	mg/Rm3	2020 Source Testing Data	1.42E-02	2.84E-02
Nitrogen Oxides	10102-44-0	1.21E+02	mg/Rm3	ECA Limit	2.71E+00	5.41E+00
Polychlorinated Biphenyls (PCB)	N/A -7	6.50E-07	mg/Rm3	2020 Source Testing Data	1.45E-08	2.91E-08
Aluminum	7429-90-5	3.98E-02	mg/Rm3	MECP Peel HHRA	8.89E-04	1.78E-03
Antimony	7440-36-0	5.15E-05	mg/Rm3	2020 Source Testing Data	1.15E-06	2.30E-06
Arsenic	7440-38-2	4.30E-05	mg/Rm3	2020 Source Testing Data	9.62E-07	1.92E-06
Barium	7440-39-3	1.51E-03	mg/Rm3	2020 Source Testing Data	3.38E-05	6.76E-05
Beryllium	7440-41-7	4.30E-05	mg/Rm3	2020 Source Testing Data	9.62E-07	1.92E-06
Boron	7440-42-8	1.53E-01	mg/Rm3	YD Generic Risk Assessment	3.42E-03	6.85E-03
Chromium (hexavalent)	18540-29-9	3.20E-04	mg/Rm3	Manufacturer Specification	7.16E-06	1.43E-05
Total Chromium (and compounds)	7440-47-3	9.00E-04	mg/Rm3	2020 Source Testing Data	2.01E-05	4.03E-05
Cobalt	7440-48-4	5.15E-05	mg/Rm3	2020 Source Testing Data	1.15E-06	2.30E-06
Copper	7440-50-8	5.15E-03	mg/Rm3	2020 Source Testing Data	1.15E-04	2.30E-04
Molybdenum	7439-98-7	5.14E-03	mg/Rm3	2020 Source Testing Data	1.15E-04	2.30E-04
Nickel	7440-02-0	1.21E-03	mg/Rm3	2020 Source Testing Data	2.70E-05	5.39E-05
Phosphorus	7723-14-0	4.60E-02	mg/Rm3	MECP Peel HHRA	1.03E-03	2.06E-03
Silver	7440-22-4	4.30E-05	mg/Rm3	2020 Source Testing Data	9.62E-07	1.92E-06
Selenium	7782-49-2	7.45E-04	mg/Rm3	2020 Source Testing Data	1.67E-05	3.33E-05
Thallium	7440-28-0	1.02E-04	mg/Rm3	2020 Source Testing Data	2.28E-06	4.56E-06
Tin	7440-31-5	1.76E-02	mg/Rm3	MECP Peel HHRA	3.94E-04	7.87E-04
Vanadium	7440-62-2	2.80E-05	mg/Rm3	2020 Source Testing Data	6.26E-07	1.25E-06
Zinc	7440-66-6	5.45E-03	mg/Rm3	2020 Source Testing Data	1.22E-04	2.44E-04
1,2-Dichlorobenzene	95-50-1	5.14E-05	mg/Rm3	2020 Source Testing Data	1.15E-06	2.30E-06
1,2,4,5-Tetrachlorobenzene	95-94-3	4.24E-06	mg/Rm3	2020 Source Testing Data	9.48E-08	1.90E-07
1,2,4 – Trichlorobenzene	120-82-1	1.96E-05	mg/Rm3	2020 Source Testing Data	4.39E-07	8.79E-07
2,3,4,6-Tetrachlorophenol	58-90-2	9.85E-06	mg/Rm3	2020 Source Testing Data	2.20E-07	4.41E-07
2,4,6-Trichlorophenol	88-06-2	2.00E-05	mg/Rm3	2020 Source Testing Data	4.47E-07	8.95E-07
2,4-Dichlorophenol	120-83-2	1.04E-05	mg/Rm3	2020 Source Testing Data	2.33E-07	4.65E-07
Pentachlorophenol	87-86-5	9.85E-06	mg/Rm3	2020 Source Testing Data	2.20E-07	4.41E-07
Hexachlorobenzene	118-74-1	1.97E-06	mg/Rm3	2020 Source Testing Data	4.41E-08	8.82E-08
Pentachlorobenzene	608-93-5	2.00E-06	mg/Rm3	2020 Source Testing Data	4.47E-08	8.95E-08
Acenaphthylene	208-96-8	1.97E-06	mg/Rm3	2020 Source Testing Data	4.41E-08	8.82E-08
Acenaphthene	83-32-9	4.87E-06	mg/Rm3	2020 Source Testing Data	1.09E-07	2.18E-07
Anthracene	120-12-7	1.98E-06	mg/Rm3	2020 Source Testing Data	4.43E-08	8.86E-08

Benzo(a)anthracene	56-55-3	4.87E-06	mg/Rm3	2020 Source Testing Data	1.09E-07	2.18E-07
Benzo(b)fluoranthene	205-99-2	4.87E-06	mg/Rm3	2020 Source Testing Data	1.09E-07	2.18E-07
Benzo(k)fluoranthene	207-08-9	4.87E-06	mg/Rm3	2020 Source Testing Data	1.09E-07	2.18E-07
Benzo(a)fluorene	238-84-6	4.87E-06	mg/Rm3	2020 Source Testing Data	1.09E-07	2.18E-07
Benzo(b)fluorene	243-17-4	4.87E-06	mg/Rm3	2020 Source Testing Data	1.09E-07	2.18E-07
Benzo(ghi)perylene	191-24-2	7.10E-06	mg/Rm3	2020 Source Testing Data	1.59E-07	3.17E-07
Benzo(a)pyrene	50-32-8	4.87E-06	mg/Rm3	2020 Source Testing Data	1.09E-07	2.18E-07
Benzo(e)pyrene	192-97-2	4.87E-06	mg/Rm3	2020 Source Testing Data	1.09E-07	2.18E-07
Biphenyl	92-52-4	1.93E-05	mg/Rm3	2020 Source Testing Data	4.32E-07	8.64E-07
Chrysene	218-01-9	2.23E-06	mg/Rm3	2020 Source Testing Data	4.99E-08	9.98E-08
Dibenzo(a,c)anthracene	215-58-7	4.87E-06	mg/Rm3	2020 Source Testing Data	1.09E-07	2.18E-07
Dibenzo(a,h)anthracene	53-70-3	4.87E-06	mg/Rm3	2020 Source Testing Data	1.09E-07	2.18E-07
Fluoranthene	206-44-0	7.11E-06	mg/Rm3	2020 Source Testing Data	1.59E-07	3.18E-07
Fluorene	86-73-7	3.35E-06	mg/Rm3	2020 Source Testing Data	7.48E-08	1.50E-07
Indeno(1,2,3 – cd)pyrene	193-39-5	4.87E-06	mg/Rm3	2020 Source Testing Data	1.09E-07	2.18E-07
1 – methylnaphthalene	90-12-0	4.26E-06	mg/Rm3	2020 Source Testing Data	9.52E-08	1.90E-07
2 – methylnaphthalene	91-57-6	7.73E-06	mg/Rm3	2020 Source Testing Data	1.73E-07	3.46E-07
Naphthalene	91-20-3	4.70E-05	mg/Rm3	2020 Source Testing Data	1.05E-06	2.10E-06
Perylene	198-55-0	1.97E-06	mg/Rm3	2020 Source Testing Data	4.41E-08	8.82E-08
Phenanthrene	85-01-8	2.78E-05	mg/Rm3	2020 Source Testing Data	6.21E-07	1.24E-06
Pyrene	129-00-0	6.34E-06	mg/Rm3	2020 Source Testing Data	1.42E-07	2.83E-07
Tetralin	119-64-2	4.92E-05	mg/Rm3	2020 Source Testing Data	1.10E-06	2.20E-06
O-terphenyl	84-15-1	2.09E-06	mg/Rm3	2020 Source Testing Data	4.68E-08	9.35E-08
Acetaldehyde	75-07-0	4.90E-05	mg/Rm3	2020 Source Testing Data	1.10E-06	2.19E-06
Acrolein	107-02-8	1.98E-05	mg/Rm3	2020 Source Testing Data	4.42E-07	8.84E-07
Benzene	71-43-2	1.16E-03	mg/Rm3	2020 Source Testing Data	2.58E-05	5.17E-05
Bromodichloromethane	75-27-4	3.45E-04	mg/Rm3	2020 Source Testing Data	7.72E-06	1.54E-05
Bromoform	75-25-2	4.11E-04	mg/Rm3	2020 Source Testing Data	9.19E-06	1.84E-05
Bromomethane	74-83-9	3.10E-03	mg/Rm3	2020 Source Testing Data	6.94E-05	1.39E-04
Carbon tetrachloride	56-23-5	3.20E-03	mg/Rm3	2020 Source Testing Data	7.15E-05	1.43E-04
Chloroform	67-66-3	3.01E-03	mg/Rm3	2020 Source Testing Data	6.72E-05	1.34E-04
Dichlorodifluoromethane	75-71-8	7.40E-04	mg/Rm3	2020 Source Testing Data	1.66E-05	3.31E-05
Dichloroethene, 1,1 -	75-35-4	3.45E-04	mg/Rm3	2020 Source Testing Data	7.72E-06	1.54E-05
Dichloromethane	75-09-02	3.24E-02	mg/Rm3	2020 Source Testing Data	7.25E-04	1.45E-03
Ethylbenzene	100-41-4	1.07E-02	mg/Rm3	2020 Source Testing Data	2.40E-04	4.81E-04
Ethylene Dibromide	106-93-4	6.90E-04	mg/Rm3	2020 Source Testing Data	1.54E-05	3.09E-05
Formaldehyde	50-00-0	4.05E-05	mg/Rm3	2020 Source Testing Data	9.06E-07	1.81E-06
Tetrachloroethene	127-18-4	3.70E-04	mg/Rm3	2020 Source Testing Data	8.28E-06	1.66E-05
Toluene	108-88-3	4.25E-02	mg/Rm3	2020 Source Testing Data	9.50E-04	1.90E-03
Trichloroethane, 1,1,1 -	71-55-6	3.45E-04	mg/Rm3	2020 Source Testing Data	7.72E-06	1.54E-05
Trichloroethene	86-42-0	3.45E-04	mg/Rm3	2020 Source Testing Data	7.72E-06	1.54E-05
Trichloroethylene, 1,1,2 -	79-01-06	3.45E-04	mg/Rm3	2020 Source Testing Data	7.72E-06	1.54E-05
Trichlorofluoromethane	75-69-4	2.18E-03	mg/Rm3	2020 Source Testing Data	4.87E-05	9.73E-05
Vinyl chloride	75-01-04	6.90E-04	mg/Rm3	2020 Source Testing Data	1.54E-05	3.09E-05
Xylenes, m-, p- and o-	1330-20-7	1.01E-01	mg/Rm3	2020 Source Testing Data	2.25E-03	4.51E-03

1. Concentrations are at reference conditions of 0% Moisture, 11% Oxygen and 298.15K temperature
2. YD Generic Risk Assessment refers to Algonquin Power EFW plant in Ontario stack testing between 2003 and 2005. (Genivar/Jacques Whitford, 2007)
3. MECP Peel HHRA refers to MOE document "Environmental Risks of Municipal Non-Hazardous Waste Landfilling and Incineration" (MECP, 1999)
4. 2020 Source Testing Data refers to Annual Source Testing Data for DYEC (Ortech, 2021)

Made by: SC
Checked by: KSA

Source 2

Silo Filling

Source Description: There are four (4) silos at the facility. Emissions occur during silo filling and are controlled via a baghouse. Properties of each silo are given in the following table:

Parameter	Pebble Lime	Carbon	Pozzolan	Portland Cement
Usage rate (lb/hr)	469.16	22.03	702.64	316.88
Delivery Payload (tonnes)	30	18.9	36.9	41.3
Fill Frequency (days)	3.7	78.8	4.8	8.1
Deliveries per year	94	4	54	27

Operating Rate: Maximum emissions occur during silo filling which takes approximately 4 hours per silo.

Methodology: Emission Factor
Source: Provided by Covanta

Train Parameters: Baghouse Filter Efficiency 0.0344 g/m3

Filter Flow Rate 0.31 m3/s

Sample Calculation: Particulate Matter from Pebble Lime Silo

1-hour Emission Rate [g/s] = Flow Rate [m3/s] x Filter Efficiency [g/m3]

$$= \frac{0.03 \text{ g}}{\text{m}^3} \times \frac{0.31 \text{ m}^3}{\text{s}}$$

$$= \frac{1.07\text{E-}02 \text{ g}}{\text{s}}$$

24-hour Emission Rate [g/s] 1-hour Emission Rate x daily hours of operation

$$= \frac{1.07\text{E-}02 \text{ g}}{\text{s}} \times \frac{4 \text{ hour}}{24 \text{ hours}}$$

$$= \frac{1.79\text{E-}03 \text{ g}}{\text{s}}$$

Source Emissions:

Silo	Indicator Compound	CAS Number	Hourly Emission Rate [g/s]	Daily Emission Rate [g/s]
Pebble Lime	Total Suspended Particulat	N/A -1	1.07E-02	1.79E-03
	PM_{10}	N/A -3	1.07E-02	1.79E-03
	$PM_{2.5}$	N/A -4	1.07E-02	1.79E-03
Carbon	Total Suspended Particulat	N/A -1	1.07E-02	1.79E-03
	PM_{10}	N/A -3	1.07E-02	1.79E-03
	$PM_{2.5}$	N/A -4	1.07E-02	1.79E-03
Pozzolan	Total Suspended Particulat	N/A -1	1.07E-02	1.79E-03
	PM_{10}	N/A -3	1.07E-02	1.79E-03
	$PM_{2.5}$	N/A -4	1.07E-02	1.79E-03
Portland Cement	Total Suspended Particulat	N/A -1	1.07E-02	1.79E-03
	PM_{10}	N/A -3	1.07E-02	1.79E-03
	$PM_{2.5}$	N/A -4	1.07E-02	1.79E-03

Source 3

Stand-by Generator

Source Description: The Facility has one stand-by generator with a 300 kw power rating

Operating Rate: Maximum emissions occur when the diesel generator is operating at 100% capacity. The generator is typically tested for a 1 hour period, once per week

Methodology: Emission Factor
Source: Diesel firing emission factors are taken from US EPA AP42 chapter 3.4

Equipment Parameters: Maximum Power Rating 300 kW
402 HP

Sample Calculation : Nitrogen Oxides

1-hour Emission Rate [g/s] = Emission Factor [lb/hp-hr] x Maximum Heat Input [hp/hr] x 454[g/lb] / 3600 [hr/s]

$$= \frac{0.02\ \text{lb}}{\text{hp-hr}} \times \frac{402\ \text{HP}}{\text{hr}} \times \frac{454\ \text{g}}{1\ \text{lb}} \times \frac{1\ \text{hr}}{3600\ \text{s}}$$

$$= \frac{1.22\text{E+00}\ \text{g}}{\text{s}}$$

24-hour Emission Rate [g/s] 1-hour Emission Rate x daily hours of operation

$$= \frac{1.22\text{E+00}\ \text{g}}{\text{s}} \times \frac{1\ \text{hour}}{24\ \text{hours}}$$

$$= \frac{5.07\text{E-02}\ \text{g}}{\text{s}}$$

Source Emissions:

Indicator Compound	CAS Number	US EPA EF [lb/hp-hr]	Units	Hourly Emission Rate [g/s]	Daily Emission Rate [g/s]	Annual Emission Rate [g/s]
Nitrogen Oxides	10102-44-0	2.40E-02	lb/hp-hr	1.22E+00	5.07E-02	7.22E-03

Source 4

Residual Ash Building Exhaust Fans

Source Description: The residual ash building is used for storage of residual bottom ash. This material is typically cooled and moist with a nominal 20 to 25% moisture content. The residual ash building has two fans each with a flow rate of 20,000 cfm. Each fan is fitted with a filter to control particulate emissions.

Operating Rate: Maximum emissions occur when both fans are in operation

Methodology: Engineering Calculation
Source: Provided by Covanta

Train Parameters:

Filter Efficiency	0.00022	grains/ft^3
	0.0005	g/m^3
Total Flow Rate	40000	ft^3/min
	18.87	m^3/s

Sample Calculation: Particulate Matter from Exhaust Fan Flow Rate

Emission Rate [g/s] = Flow Rate [m^3/s] x Filter Efficiency [g/m^3]

$$= \frac{0.0005 \ \text{g}}{\text{m}^3} \times \frac{18.87 \ \text{m}^3}{\text{s}}$$

$$= \frac{9.50\text{E-03} \ \text{g}}{\text{s}}$$

Source	Contaminant	CAS Number	Emission Rate [g/s]
Residual Ash Building Exhaust Fans	Total Suspended Particulat	N/A	9.50E-03
	PM_{10}	N/A	9.50E-03
	$PM_{2.5}$	N/A	9.50E-03

APPENDIX E

WRF Validation Report

Set of 5 years (2014-2018) Met Data with 1 km resolution for CALPUFF model for Clarington, Ontario, Canada.

Validation report.

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13th November, 2020

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Miguel A. Manzanares

Conclusions reflected in this report should be understood only as the result of the information used and the procedures carried out on it.

The client agrees that the securing of a determined result is not in charge, but rather the elaboration of a study that contemplates the contents or parameters fixed in the order sheet. Meteosim will not be responsible for the damages or losses that the content of the report may cause to the interests of the client.

The WRF-ARW meteorological model was used to carry out the study. For the meteorological calibration and validation, the meteorological station data from the Executive Weather Agency of the Canadian Government was used.

For the purposes of the provisions of Article 355 of Law 1/2000 of Civil Procedure of the Spanish Government, the undersigned hereby declares, under promise, that he has acted and, where appropriate, will act with the greatest possible objectivity.

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1. Introduction

This report refers to the "Set of 5 years (2014-2018) with 1-kilometre resolution for CALPUFF model for Clarington, Ontario, Canada. Validation report", which aims to validate the results of the meteorological dataset provided by the WRF simulations and guarantee the accuracy of them to be used as a main input for air quality purposes using the CALPUFF model.

The report contains information about the meteorological stations that have been used (section 2), main characteristics of the WRF meteorological model and its configuration for the project (section 3) and the process performed to compute the comparison between the modelled data and the nearest observations, including the final results of the validation and its comparison with the benchmark values provided by the scientific biography (section 4).

2. Observational data: meteorological stations.

The service includes the validation of the simulated meteorological data. Validation process has been performed using as observational data the ones found in the official historical data of the Canadian Government (https://climate.weather.gc.ca/historical_data/search_historic_data_e.html). For that reason, the closest official weather stations to the point with the following coordinates has been selected: Latitude: 43.935° Longitude: -78.608333). During the searching process in this database, it should be noted that the selected stations have to be representative enough of the domain of interest, so that the results obtained in the validation in these points could be extended for the whole domain.

With that, the following stations with available data during part or the whole period of interest (2014-2018) has been found on the database, all of them located less than 25 km from the point of interest (which will be the centre of the meteorological domain in the model simulations):

- Oshawa WPCP (19.6 km from the point of interest).
- PA General Motors Centre (20.5 km from the point of interest).
- Oshawa (22.0 km from the point of interest).

Table 1 and Figure 1 show the location of the meteorological station.

Table 1. Location of the local meteorological stations. *m.a.s.l.: meters above sea level.

Location	Owner	Latitude	Longitude	Height (m.a.s.l*)
Oshawa	Canadian Government	43.520° N	78.500° W	84
Oshawa WPCP	Canadian Government	43.554° N	78.530° W	140
PA General Motors Centre	Canadian Government	43.535° N	78.515 W	125

Figure 1. Map showing the location of the meteorological stations (white triangles) and the centre of the domain in the surroundings of Clarington, Ontario, Canada (red star).

Regarding the locations of the selected meteorological stations and the point of interest, it can be checked that there are similarities between them related to the topographic characteristics (similar altitude and similar location in terms of distance to the Lake Ontario). So that, we can consider that the selected meteorological stations are representative enough of the point of interest and of all the domain to be considered in the meteorological modelling, including the municipality of Clarington and its surroundings. So that, these observational data can be used during the validation process of the meteorological model done in the Section 4 of this report.

3. Modelled data: meteorological model WRF.

In order to analyze the meteorological conditions of an area, meteorological information is required spatially and temporally characterized. This meteorological information can be obtained through weather stations or through meteorological models.

The information obtained from the weather stations, even though it provides a glimpse on the current or past reality, has several disadvantages: station data only offer information from the same point where the measurement is made; and they only offer values of the variables that have measurement sensors such as temperature, wind, humidity, temperature and pressure.

On the other hand, meteorological models despite requiring to be calibrated on the simulated area, offer the possibility to model in the past, the present and the future. They also offer information with a defined resolution in the region of interest. Moreover, they provide data of many other meteorological variables that cannot be measured at the measurement stations.

For all these reasons, in this project weather station information and high-resolution information from meteorological modeling have been combined.

The WRF[1] (*Weather Research and Forecasting)* Model developed and maintained by NCAR (*National Center for Atmospheric Research*) and NOAA (*National Oceanic and Atmospheric Administration*) was used to generate the necessary meteorological data.

WRF has a modular structure (Figure 2) and it has the capacity to be executed in multitasking mode on computers with distributed or shared memory. Some of its many characteristics are:

- Multiple geographic projection options (polar stereographic, Mercator, Lambert, latitude-longitude) and vertical sigma coordinates that follow the terrain.
- The capacity of multiple nesting between the domains. This characteristic is useful for the study of atmospheric phenomena of different spatial scales and the design of high-resolution predictions. The interaction between the domains can be in one direction (one-way nesting) or in two (two-way nesting), and the nested grids can be mobile.
- WRF is a fully compressible and non-hydrostatic model with terrain-following hydrostatic pressure coordinate, which allows the model to be used to represent phenomena of dimensions less than 10 km.
- Implementation of realistic parametrization schemes of physical processes related to atmospheric radiation, microphysics of clouds and precipitation, convection, turbulence and energy flows and amount of movement on the earth's surface.

The input data need to run the model are:

- Physiographic data on the domain of the simulation: terrain height, land uses, vegetation index, sea climate temperature, etc.
- Initial and boundary conditions. The CFSv2 (*Climate Forecast System v2*) reanalysis data from the NCEP (*National Center for Environmental Prediction*) have been used for the initialization

[1] Skamarock, W.C., Klemp, J.B., Dudhia, J., Gill, D.O., Barker, D.M., Wang, W., Powers, J.G., 2005. A description of the advanced research WRF version 2 NCAR Tech Notes-46 +STR.

of the WRF model. CFSv2 performs atmospheric simulations for all the globe with a resolution of 0.5 ° (approximately 55km). CFSv2 corresponds to a coupled model since it contains in an only model an atmospheric and an oceanic model, representing the interaction between the atmosphere, the oceans, the continental surface and the ice cover. CFSv2 assimilates satellite information from the last 30 days, which allows it to provide a complete description of the state of the atmosphere. In this way the initialization of the WRF model has been carried out from CFSv2 reanalysis with a horizontal resolution of 0.5° and the physiographic data of the domain are provided by the model itself.

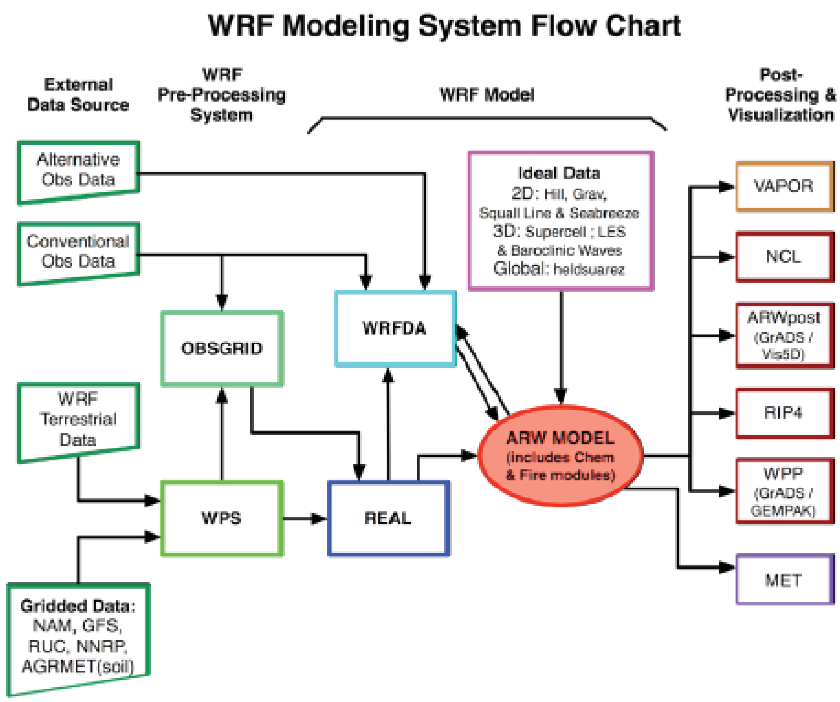


Figure 2. Schematic representation of the operation of WRF-ARW.
http://www.mmm.ucar.edu/wrf/users/docs/user_guide_V3/contents.htm

WRF has been configured to specifically represent the area of study, using two-way nesting architecture for running the simulations, ensuring that the influence between the meteorological processes of different scales and represented in the different modeling domains defined is bijective. For the current study, WRF version 3.9.1.1 has been used, with a horizontal spatial grid resolution up to 333 m.

3.1. Meteorological domains and meteorological simulation characteristics.

For the execution of the WRF-ARW numerical weather forecasting model in its version 3.9.1.1, and for the subsequent calculation of mean wind speeds and maximum wind gusts, simulations were performed on four domains with different horizontal resolutions. These domains configure a modelling architecture that ensures the modelling of meteorological processes at the synoptic, mesoscale and microscale scales. The geographical characteristics of the selected domains are shown in Figure 3 and Table 2.

Table 2. Simulation domains and its characteristics.

CHARACTERISTIC	DOMAIN D01	DOMAIN D02	DOMAIN D03	DOMAIN D04
Description	Eastern half of North America	Eastern half of Great Lakes area and surrounding	West and Central Lake Ontario and surroundings	Clarington and surroundings
Horizontal resolution	27km x 27km	9km x 9km	3km x 3km	1km x1km
Grid size	100 x 100	100 x 100	100 x 100	100 x 100
Domain size	2700km x 2700km	900km x 900km	300km x 300km	100km x 100km

For the analysis of results, the domain defined as D04, with the highest horizontal resolution, centered over Clarington, was considered.

A set of 1826 meteorological simulation has been computed. These simulations have been initialized at 12 UTC of every day between 31st December 2013 and 30th December 2018, and they have been carried out over a period of 36 hours, with a time step[2] of 3 seconds, and considering the first 12 hours of the simulation as spin-up time[3] . With this methodology, the period between 00 UTC on 1st January 2014 and 00:00 UTC on 1st January 2019 is covered, which is equivalent in local time to the period between 10:00 AEDT on December 26th, 2017 and 10:00 AEDT on December 27th, 2017.

The simulations have been initialized taking as initial and boundary conditions the data from the global analysis CFSv2 ("NCEP coupled forecast system model", version 2). CFSv2 (http://rda.ucar.edu/datasets/ds094.2) performs atmospheric simulations for everyone with a resolution of 0.5°. CFSv2 corresponds to a coupled model since it combines an atmospheric and an oceanic model into a single model, representing the interaction between the atmosphere, the oceans, the land and the ice cover. CFSv2 assimilates remote sensing information (satellites, metars, radiosonde, weather stations, etc.) from the past 30 days, allowing you to provide a complete description of the state of the atmosphere.

[2] The model time step corresponds to the time interval between successive resolutions of the primitive equations of dynamic meteorology.

[3] It is the time that the model requires to provide reliable results.

Figure 3. Simulation domains. Domains D01, D02, D03 and D04 (upper right); Domains D02, D03 and D04 (upper left); Domains D03 and D04 (lower left) and Domain D04 (lower right).

For the precise configuration of the WRF model, different vertical levels of constant pressure must be defined. In this way, the model represents the atmosphere divided into levels and their corresponding strata, so that it solves the equations of dynamic meteorology in each cell of the domain represented by cubes with a given horizontal and vertical resolution. The simulation defined a total of 32 vertical levels with an unequal distribution in height, with a higher density in the lower layers of the atmosphere, which has allowed us to describe in the best way the microscale processes that could participate in the meteorological episode.

4. Model validation: comparison between observed and modelled values

Inside the meteorological domain named as D04 (1 kilometre of horizontal resolution), there are three official meteorological stations: Oshawa, Oshawa WPCP and PA General Motors Centre, all of them owned by the Canadian Government. These stations are closer than 30 kilometres from centre of the meteorological domain (Latitude: 43.935° Longitude: -78.608333, which is the point of interest, and they have been proved to be representative of the area of study. For this reason, its observed data could be used in the validation of the meteorological model.

Regarding the considerations that needs to be done for the validation process, it is important to note the following statements.

- Regarding data from the PA General Motors Centre station: data is available only in daily basis, while for the validation process, data need to be in an hourly basis in order to be able to compare the results with the benchmarks provided by the scientific bibliography.
- Regarding data from the Oshawa WPCP station: although its data are presented in an hourly basis, data area only available during the period between October 2014 and October 2015, which means that only 20% of the period is cover by this station.

To maintain consistency of the analysis, data from these two stations would not be considered on the model validation process. So that, the model validation will be performed considering the observational data from Oshawa station, which are in hourly basis and covers more than 99% of the time-period of interest.

Then, a numerical comparison between observed values and data from the model in the location of the weather station has been done. For this comparison, observed and modelled values have been considered for the period between 00:00 UTC 1st January 2014 and 00:00 UTC 1st January 2019.

For this numerical deterministic comparison between data, statistics have been used. As it is defined by the European Environmental Agency (EEA) in its technical report Nº 10/2011 (http://www.eea.europa.eu/publications/fairmode), the statistics selection (which are used are benchmark of the model quality) depends on the model use and its motivation, as well as from the available observed data. To compute the comparative analysis between observations and data obtained from the WRF model, the statistics which have a benchmark value defined in the previous report have been used (Table A.2.3 in the technical report Nº 10/2011). These statistics and its benchmark values are also included in the report of the United States Environmental Protection Agency (U.S. EPA) *Draft Guidance on meteorological model evaluation* (2009), and that were also suggested by Emery et al. (2001) and Tesche et al. (2002). These values have been taken as the recommended by the scientific community to assure the quality of the meteorological simulation.

Then, the selected statistics for the numerical comparison between observed and modelled data, i. e., model validation, are shown below:

$$MB = \frac{1}{N}\sum_{i=1}^{N}(M_i - O_i)$$

Mean Bias: it measures the difference between observed and modelled data. This statistic shows overestimation (MB > 0) or underestimation (MB<0) of the simulation.

$$RMSE = \sqrt{\frac{1}{N}\sum_{i=1}^{N}(M_i - O_i)^2}$$

Root Mean Square Error: it measures the square difference between observed and modelled data, which penalizes the higher deviations.

$$MAGE = \frac{1}{N}\sum_{i=1}^{N}|M_i - O_i|$$

Mean Absolute Gross Error: this statistic measures the error by the absolute differences between observed and modelled data.

$$IOA = 1 - \frac{\sum_{i=1}^{N}(Oi - M_i)^2}{\sum_{i=1}^{N}|M_i - \bar{O}| + |O_i - \bar{O}|^2}$$

Index of Agreement: it measures the correlation between observed and modelled values.

where $O_i$and M_i are the observed and modelled values, respectively, $\bar{O}$ and $\bar{M}$ are the observed and modelled average, respectively, and N is the number of hourly data considered in the evaluation.

Table 3 shows the validation results for the 10m wind speed, 10m wind direction, 2m temperature and 2m relative humidity for the selected meteorological station. These results are completed with the figures of the hourly series of observed and modelled data for the mentioned meteorological variables (Figures 4 and 5) and a set of wind roses based on observed and modelled data for the whole period (Figure 6) and in yearly (Figure 7), seasonally (Figure 8), monthly (Figure 9) and hourly basis (Figure 10).

Table 3. Results of the numerical comparison between observed and modelled data in the Oshawa meteorological station, averaging data in hourly basis during the studied time-periods (between 00:00 UTC 1st January 2014 and 00:00 AEDT 1st January 2019). Benchmark values recommended by the scientific community are shown. *Uncertainty of the model for the mean wind speed it shows in meters per second (m/s) to compute a direct comparison with the benchmark values. At the same time, all the benchmark values shown in the table are based for statistical calculations in a longer time range, for at least 1 year. ** m.a.s.l: meters above sea level.

Variable	**Mean Wind Speed (10m)**			**Mean Wind Direction (10m)**		**Temperature (2m)**			**Relative Humidity (2m)**		
Statistic	**MB**	**RMSE**	**IOA**	**MB**	**MAGE**	**MB**	**MAGE**	**IOA**	**MB**	**MAGE**	**IOA**
Station	< ±0.5 m/s	< 2.0 m/s *	≥ 0.60	< ±10°	< 30°	<±0.5°C	<2.0°C	≥0.80	<±10%	<20%	≥0.60
Oshawa	0.9	2.0	0.83	7	27	0.3	1.8	0.99	-1	9	0.86

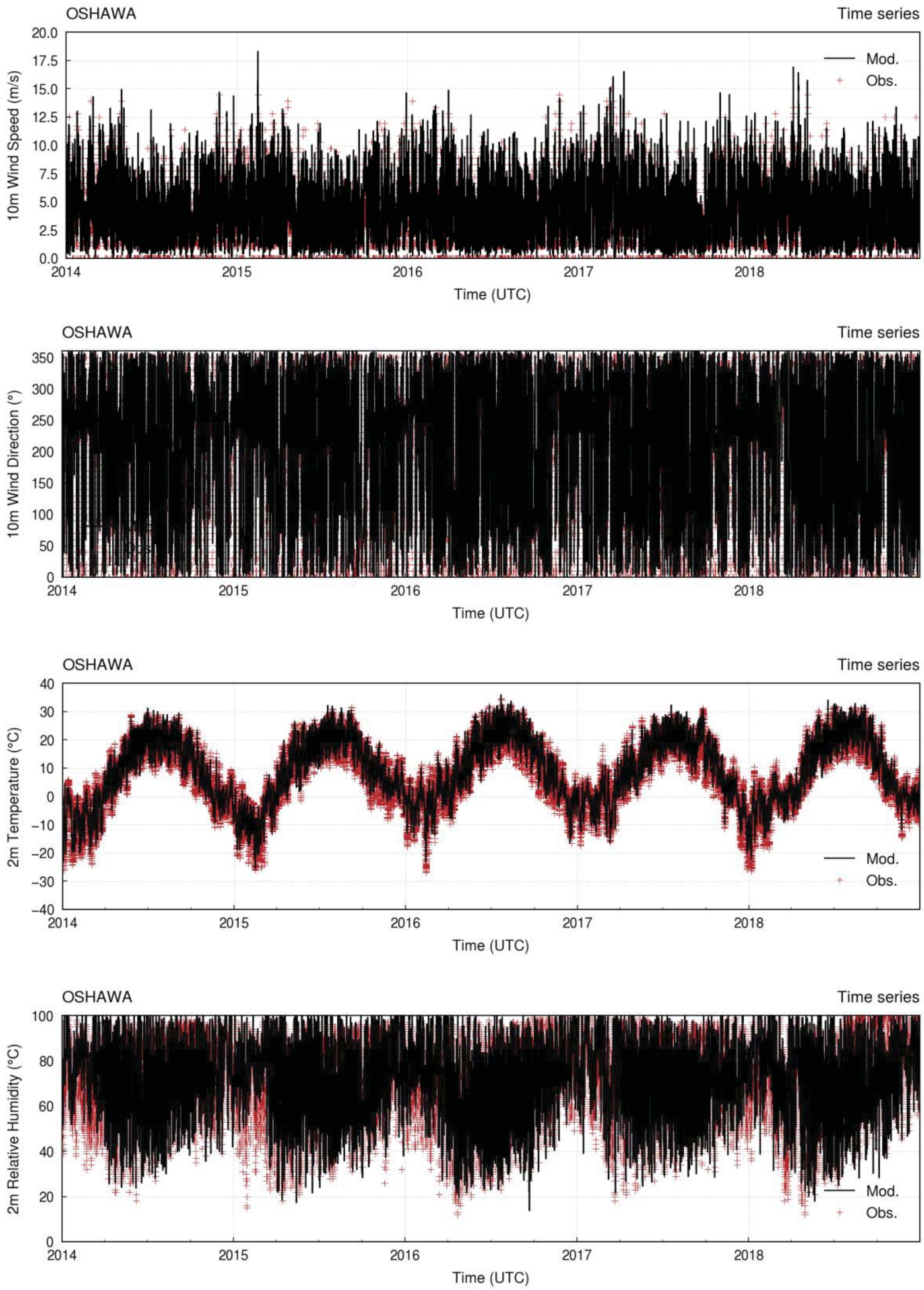


Figure 4. Hourly series of (from upper to lower) mean 10-meter wind speed, 10-meter wind direction, 2 metre temperature and 2 metre relative humidity modelled and observed at the weather station of Oshawa, owned by the Canadian Government, located inside the meteorological domain, between 00:00 UTC on the 1st January 2014 and 00:00 UTC on the 1st January 2019.

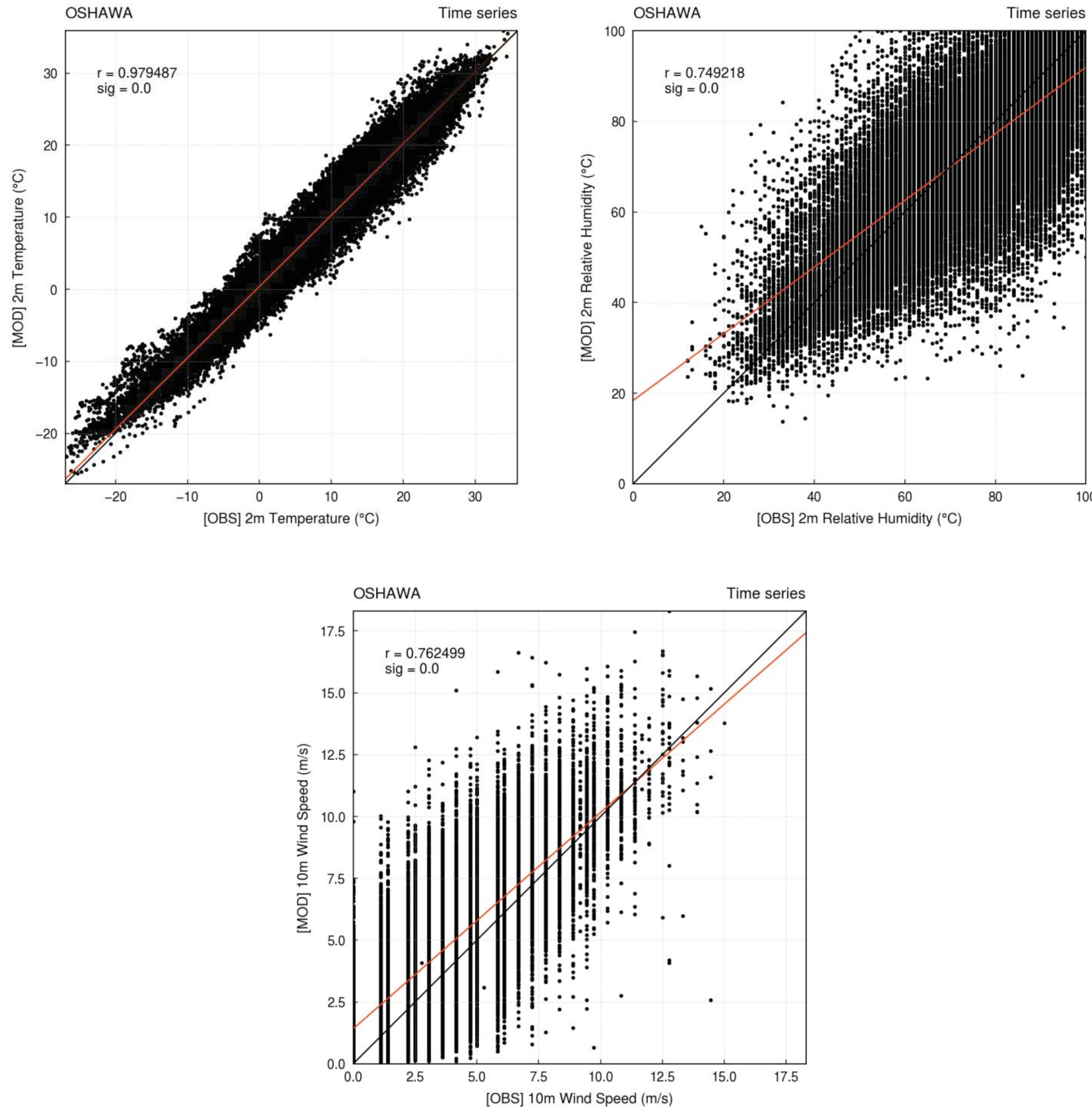


Figure 5. Scatter plot of mean 2-meter temperature (upper left), 2-meter relative humidity (upper right) and 10-meter wind speed (lower) modelled and observed at the weather station of Oshawa, owned by the Canadian Government and located inside the meteorological domain, between 00:00 UTC on the 1st January 2014 and 00:00 UTC on the 1st January 2019.

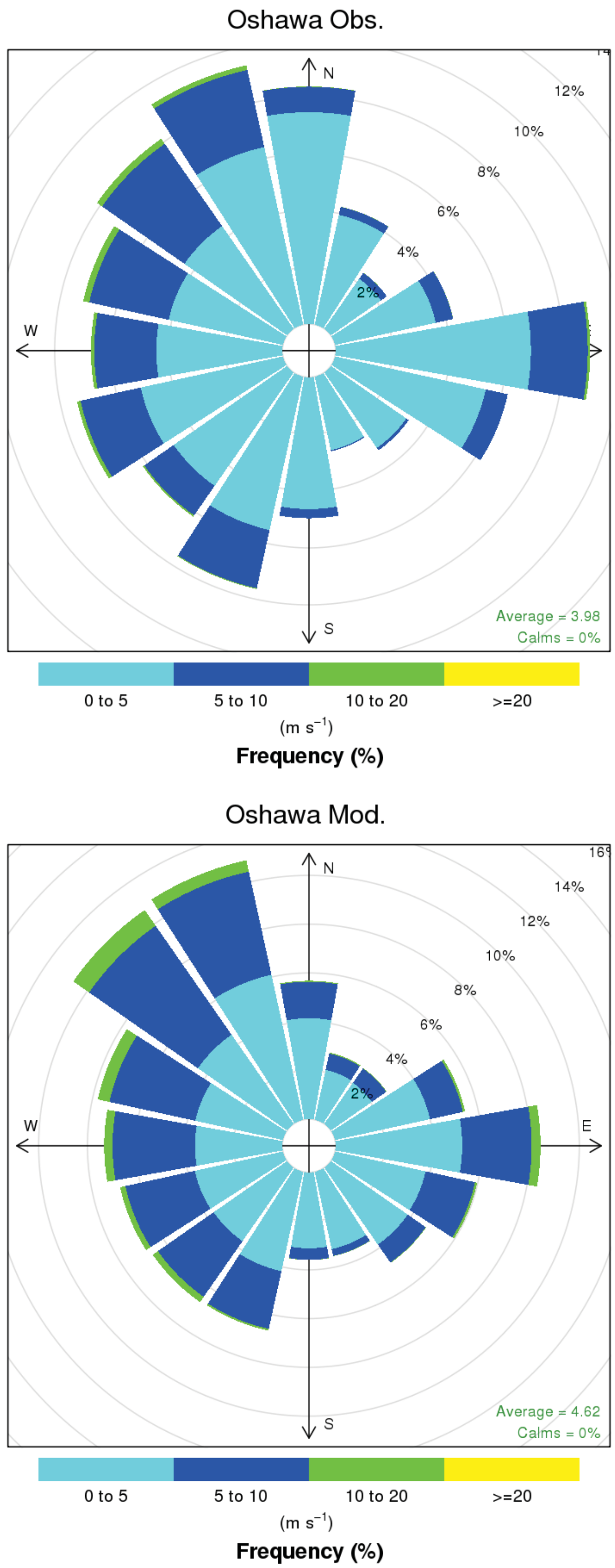
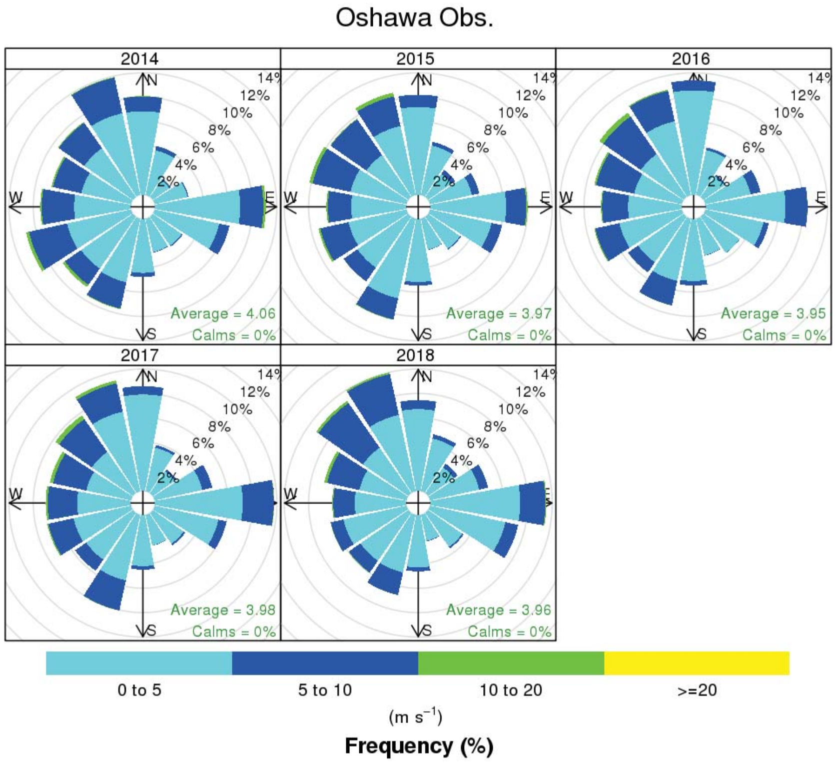


Figure 6. Wind roses based on observed (upper) and modelled (lower) data at the weather station of Oshawa, owned by the Canadian Government and located inside the meteorological domain, between 00:00 UTC on the 1st January 2014 and 00:00 UTC on the 1st January 2019.



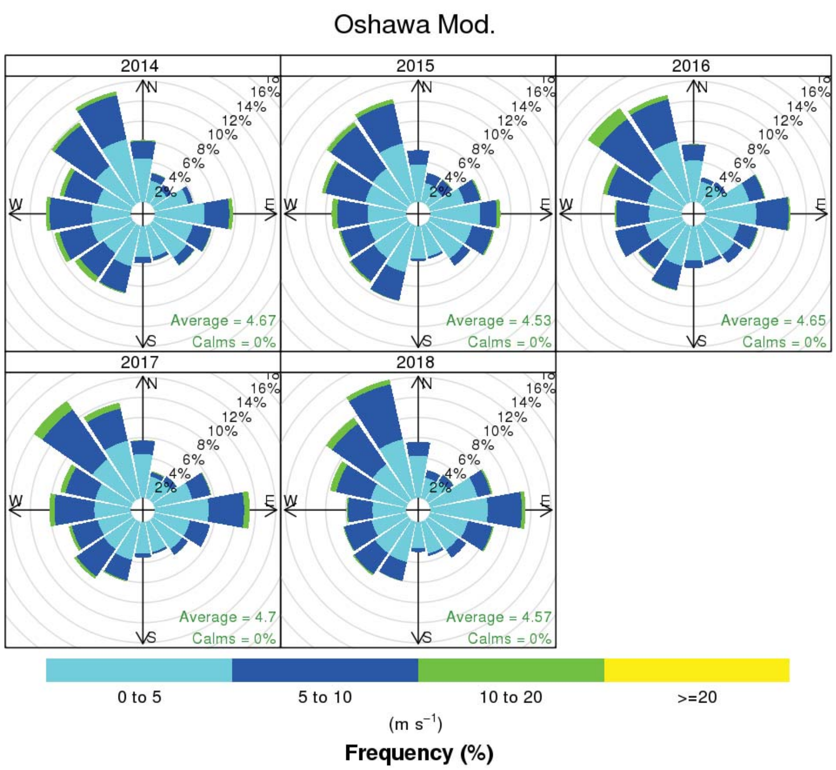


Figure 7. Yearly wind roses based on observed (upper) and modelled (lower) data at the weather station of Oshawa, owned by the Canadian Government and located inside the meteorological domain, between 00:00 UTC on the 1st January 2014 and 00:00 UTC on the 1st January 2019.

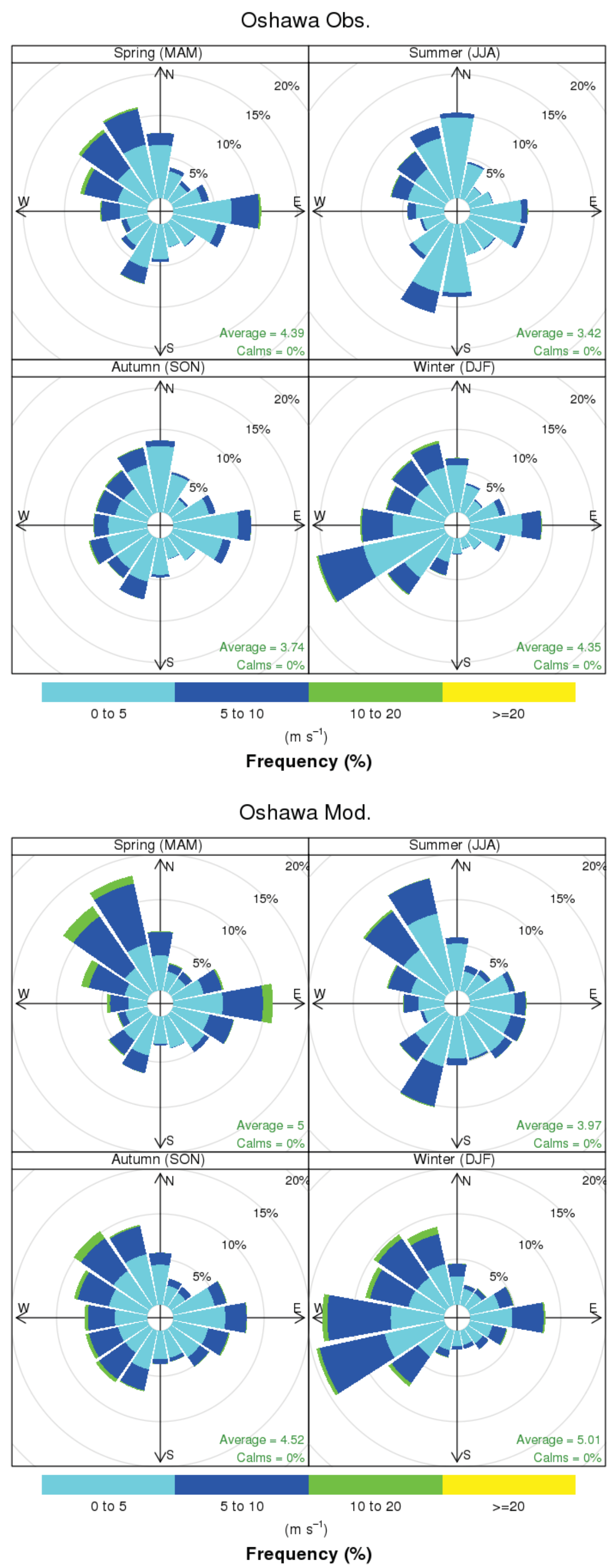


Figure 8. Seasonally wind roses based on observed (upper) and modelled (lower) data at the weather station of Oshawa, owned by the Canadian Government and located inside the meteorological domain, between 00:00 UTC on the 1st January 2014 and 00:00 UTC on the 1st January 2019.

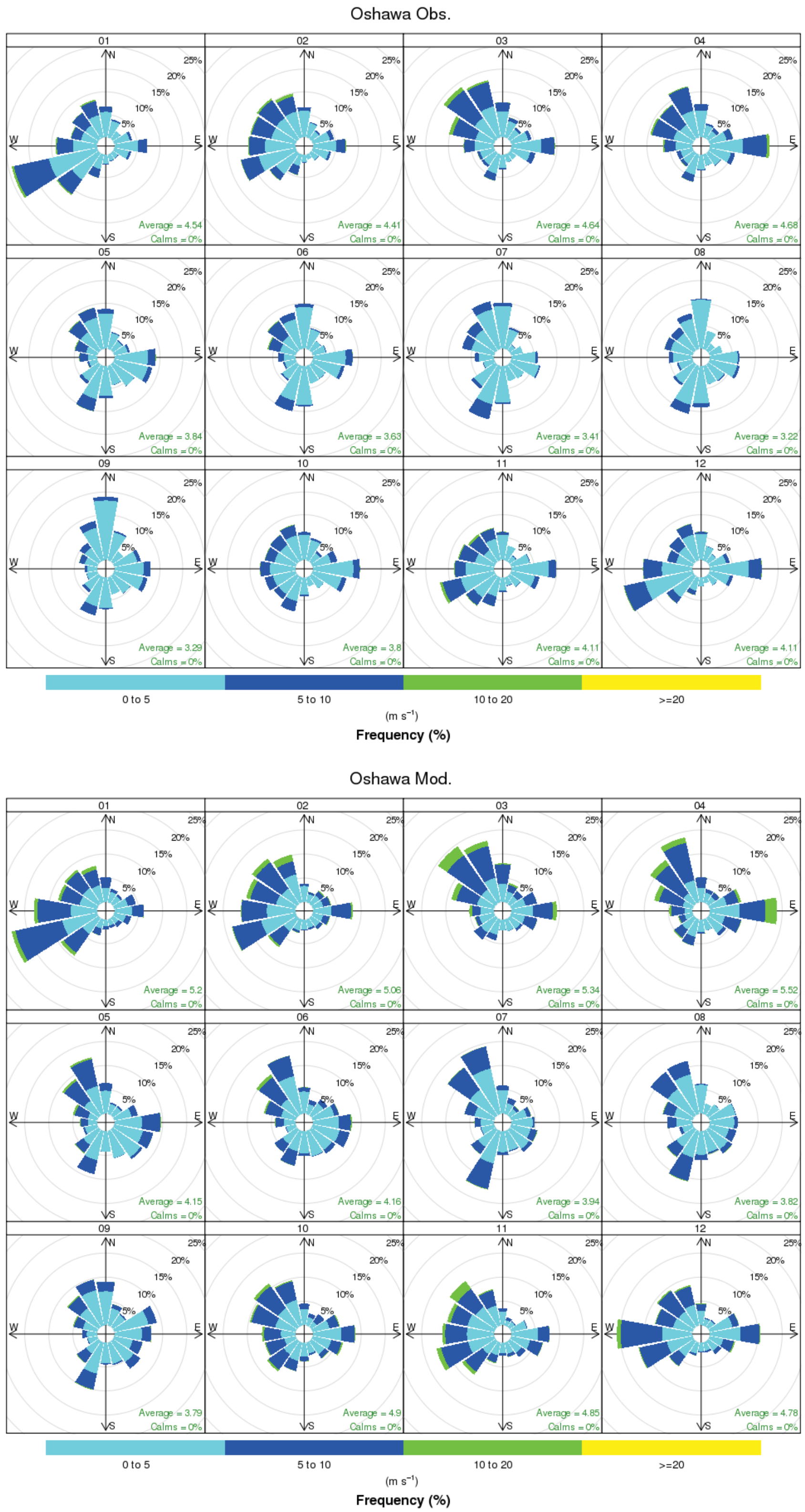


Figure 9. Monthly wind roses based on observed (upper) and modelled (lower) data at the weather station of Oshawa, owned by the Canadian Government and located inside the meteorological domain, between 00:00 UTC on the 1st January 2014 and 00:00 UTC on the 1st January 2019.

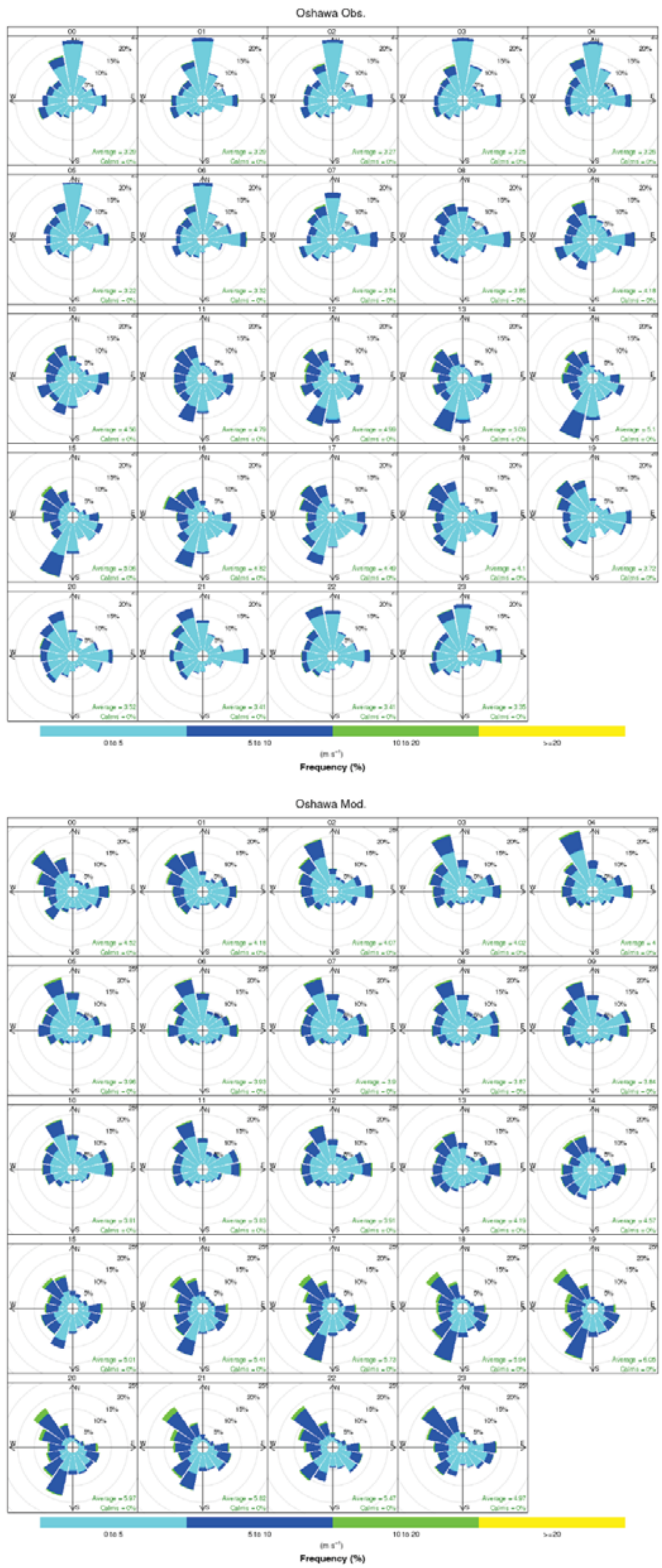


Figure 10. Hourly wind roses based on observed (upper) and modelled (lower) data at the weather station of Oshawa, owned by the Canadian Government and located inside the meteorological domain, between 00:00 UTC on the 1st January 2014 and 00:00 UTC on the 1st January 2019.

From the results shown above:

- Regarding the bias of each of the variable, which is evaluated by the MB, it should be noticed that there are no significant over- or under-estimation in any of the variables, with all the results in the range of values recommended, with only the wind speed MB (0.9 m/s) slightly exceeding the recommended benchmark (0.5 m/s), which is not quite significant considering the complexity of the topography over the area (more detail about that in the following paragraph).
- Regarding the absolute error, which is evaluated by the MAGE (for temperature, relative humidity, and wind direction) and RMSE (for wind speed), all the computed statistics accomplish with the recommended benchmarks. Focusing on the wind fields, which will be key variables for the good performance of the air quality forecast, RMSE for the wind speed has a value of 1.9 m/s, just below the limit of 2.0 m/s that is recommended for model simulations longer than 1 year, and MAGE for wind direction has a value of 27°, also below the maximum recommended error of 30°. It should be noticed that these benchmarks for wind fields are typically used in areas with simple topography conditions that may not have an important influence in the meteorology. This is not the case of the location of the study, as there is an important lake (Lake Ontario) in the vicinities of the analysed weather station that can highly influence the meteorology in the area. So that, in these cases it is expected a higher error of the modelled results due to mesoscale effects such as lake breeze, temperature and relative humidity modifications due to variations on the lake surface temperature, etc… that may not be well reflected for most of the meteorological model. However, it seems that the parametrizations introduced during the calibration process of the WRF model has achieved to correctly consider these mesoscale phenomena, so that, the wind fields validation results show a very good performance of the model.
- Regarding the correlation between observation and modelled data, which is evaluated by the IOA, once again all the statistics for each of the variables accomplish with the expected benchmarks values.

Therefore, numerical comparison between observed and modelled data show a good to very good performance of the WRF model, that supports the reliability of the model simulations run between 1st January 2014 and 31st December 2018 to be used as a main input for an air quality simulation purpose.

Moreover, the results of the statistics provided in this section, that accomplish with all the benchmark proposed by the scientifical biography, could be used as an uncertainty measure associated with the meteorological modelled results, which regarding the results, would be not statistically significante.

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6. Bibliography

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7. Annex

7.1. Meteosim presentation

Meteosim S.L. is a spin-off created in 2003 by members of the Department of Astronomy and Meteorology at the University of Barcelona and the North American company Meso Inc. (Troy, New York). The company is specialized in the development and research of mesoscale weather prediction models, aimed at the wind industry, meteorologically sensitive sectors and air quality.

Since its creation, Meteosim has dedicated its Research and Development resources in the creation of products derived from numerical weather forecasting with important contributions to the business and in consulting studies related to the environment. Our efforts in numerical forecasting have made us world benchmarks in accurate and reliable forecasting for meteorologically sensitive companies.

Most of the meteorological forecasting products and services that Meteosim develops and commercializes have as raw material the information generated by both internationally recognized meteorological models and by their own developed models. In this sense, meteorological models can be used both to forecast the meteorological variables of any region or country in real time, several times a day with a horizon of a few hours to several weeks, as well as to carry out meteorological studies in past time to reproduce the conditions occurred.

Experience and recognition in the development of short-term forecasts for highly localized areas, long-term seasonal forecasts, maritime forecasts, historical studies of past weather conditions, pollutant dispersion models, risk maps, water resources, etc. allow Meteosim to work in different sectors: energy, environment, forensic meteorology, risk management, mining, defense and civil protection, navigation, maritime transport, etc.

In order to reach these scientific levels, the company is made up of a highly qualified team of physics graduates and doctors, masters in meteorology, senior engineers and graduates in environmental sciences, where the spirit of scientific research is combined with customer orientation to put in the market the best technical solutions

Meteosim's main asset is applied scientific knowledge, giving value to the solutions demanded by our clients. Meteosim is proud to have a portfolio of loyal customers that guarantee the quality of service throughout the world, ranging from large multinationals to engineering or public administration.

APPENDIX F

Analysis of Meteorological Data for Courtice and Rundle

The Durham York Energy Centre (DYEC) Project team assessed the suitability of the meteorological data collected as part of the DYEC's ambient air program for use in development of an Air Quality Impact Assessment (AQIA) and updated Emissions Summary and Dispersion Model (ESDM) for the facility, as requested by the MECP following a teleconference call on July 7, 2020.

The ambient air program stations were established in 2012 in accordance with the "Ambient Air Quality Monitoring Plan - Durham York Residual Waste Study", prepared by Stantec Consulting Ltd and dated May 2012, and in consultation with the MECP.

The program includes two monitoring stations:

- one station associated with the pre-existing meteorological tower which was relocated to the Courtice Water Pollution Control Plant from a location located at 180 Courtice Road following the completion of the Environmental Assessment and approval of the Ambient Air Quality Monitoring Program. This station is referred to as the "Courtice Station" and
- one station referred to as the "Rundle Station", located in proximity of the intersection of Rundle Road and Baseline Road.

The locations of the two stations and DYEC are presented on Figure 1, below.

Figure 1: Location of Courtice and Rundle Stations

Section 2.3 of MECP document "Operations Manual for Air Quality Monitoring in Ontario", dated 2018 states that "If there is any intention to use meteorological data for modelling under *O. Reg. 419/05*, the meteorological instrumentation must meet the requirements of *O. Reg. 419/05* and be included in the audit program. Approval for the use of site specific meteorological data for modelling must be obtained from the ministry as per the requirements of *O. Reg. 419/05*." At the time of installation of the stations, using these meteorological station data to support the air quality modelling was not considered as all modelling was carried out using existing site specific data approved by the MECP under Section 13(1) of Ontario Regulation (O.Reg.) 419/05. The MECP provides quarterly review of the meteorological data from both stations as part of the ambient air quality monitoring program and any concerns with the data are addressed as part of that program on an ongoing basis.

STATION CALIBRATION

In response to comments received from MECP by the DYEC Project team on the 2018 Q3/Q4 reports, questions were raised as to the frequency of meteorological equipment calibration. The meteorological station that supports the Courtice ambient air quality monitoring station is operated as part of the Courtice Water Pollution Control Plant (WPCP), and was originally established to support WPCP operations. The Courtice ambient air monitoring station was ultimately located in proximity to the existing 20 m meteorological tower. As the Courtice meteorological station for the WPCP was not installed as part of an MECP program, data from that instrumentation had not been reported to the MECP and no annual calibration has been carried out for the unit. A calibration of the meteorological station was carried out in May 2019 and will be completed annually as part of the DYEC air monitoring program.

At the time of the initial installation of the meteorological station at the Courtice WPCP the unit was configured to report winds as ‘blowing to’ as opposed to the Environment and Climate Change Canada (ECCC) convention, which uses “blowing from”. At the onset of the ambient air quality monitoring program in 2013, the consultant responsible for reporting the data was aware of how the winds were reported and upon receipt of the data they would correct the data by 180 degrees during reporting. Following a change in the consultant responsible for maintaining the meteorological station, the wind direction was not consistently corrected during reporting. Consequentially the station was adjusted on November 14, 2019 so that the station would report per ECCC convention.

The Rundle meteorological station has been operating with the co-located ambient air monitoring station since 2013 and is calibrated annually. A copy of the May 2019 Calibration certificate is included in Attachment 1. Meteorological data for the Rundle Station is reviewed by MECP quarterly as part of the DYEC ambient air monitoring program.

METEOROLOGICAL TOWER HEIGHT

As described above, the Courtice station has a sensor height of 20m above grade as it was established prior to the commencement of the DYEC ambient air monitoring program.

During the review of the quarterly reports for Rundle Station, a discrepancy was identified between the proposed and installed tower height. Prior to Q3 2018 a tower was installed with a height of 7.9 m instead of the proposed 10m. This was remedied during Q3 2018 and reported Section 6.2 of the 2018 Q3 report prepared by RWDI Air Inc. (November 2018). At this time, a repair of the wind vane at Rundle Station was attempted, prior to it ultimately being replaced in Q4 due to the existing wind heads continuing malfunction. The MET One Instruments Model 034B wind head at the Rundle station was replaced with a RM Young wind head on December 20, 2018.

Meteorological Data Analysis

Analysis of meteorological data form the Courtice and Rundle stations was completed on the validated data provided by the DYEC Project team to assess whether the data seems reasonable and suitable for inclusion in the CALMET/CALPUFF modelling. Updated modelling is proposed for the period of 2014-2018 and only these data within this period were considered in the analysis. The data analysis considered only the following parameters, which may be used as inputs to CALMET:

- Temperature;
- Relative Humidity;
- Wind Speed; and
- Wind Direction.

The Courtice and Rundle Stations also report precipitation data but these data will not be included in this analysis since wet deposition is not included in the modelling.

The following modifications have been made to the validated data supplied by the DYEC project team:

1) Wind Direction Correction – As noted above, the wind direction for Courtice was incorrectly reported by 180 degrees for the period between July 1st 2018 (0:00) and November 14th (10:00). This data was therefore corrected.

2) Where wind speeds are reported as "0" m/s, the wind direction was changed to "CALM".

To add additional context to the review of data, meteorological data was also downloaded from the Oshawa weather station located just south of Oshawa Airport and maintained by ECCC. Oshawa weather station is located further inland than either the Courtice or Rundle locations, approximately 11 km NW from Courtice and 12 km, WNW from Rundle. The following modifications were made to the data downloaded directly from the ECCC website:

1) ECCC provide wind direction to the nearest 10 degrees. As wind roses are typically presented for 15 degree increments, a randomization was applied to vary wind direction by +/- 5° as per typical MECP practice.

2) Where wind speeds are reported as "0 m/s", the wind direction was changed to "CALM".

A comparison of the three different stations is provided in Table 1, below.

Table 1: Meteorological Station Comparison

Station Name	ID	Maintained by	Approximate Distance from DYEC	Approximate Distance from Lake Ontario	Tower height
Courtice	N/A	Region of Durham	0.4 km W	0.3 km	20 m
Rundle	N/A	Region of Durham	2 km NE	2 km	7.9 m (prior to Q3 2018) 10 m (post Q3 2018)
Oshawa	71697	ECCC	11 km NW	7 km	10 m

Data Availability

The availability of data at the Courtice and Rundle Stations was calculated for the 2014-2018 period and is summarised in Table 2 and Table 3, respectively.

The Courtice Station (Table 2) has over 95% availability of all parameters for the data period. The Rundle Station (Table 3) has over 95% data availability for the majority of parameters with the exception of wind speed and direction records for 2018. In 2018, problems with the wind head were reported resulting in approximately 15% downtime of the wind sensors.

Table 2: Courtice Station - Data Availability (2014-2018)

Data Year	Temperature	Relative Humidity	Wind Speed	Wind Direction
2014	100%	100%	100%	100%
2015	100%	100%	100%	100%
2016	100%	99%	100%	100%
2017	100%	100%	100%	100%
2018	97%	96%	99%	99%

Table 3: Rundle Station - Data Availability (2014-2018)

Data Year	Temperature	Relative Humidity	Wind Speed	Wind Direction
2014	100%	100%	100%	100%
2015	100%	100%	100%	100%
2016	100%	100%	100%	100%
2017	100%	100%	100%	99%
2018	95%	95%	85%	85%

Review of Temperature Data

Temperature data for the three different stations is compared as follows in Figures 2 and 3:

1) Comparison of average monthly temperature for each calendar year;
2) Comparison of minimum monthly temperature for each calendar year;
3) Comparison of maximum monthly temperature for each calendar year;
4) Comparison of average diurnal profile over the data period, for each month of the year.

The comparisons of average monthly temperature for each calendar year indicate that each of the three stations exhibits a very similar average temperature profile for each month, with the exception of average temperature recorded at Rundle Station in March 2018, which is approximately 2°C lower.

The comparisons of **minimum monthly temperature** for each calendar year analysed indicates that each of the three stations exhibits a very similar profile for minimum temperature each month with slightly warmer minimum temperatures typically recorded at the Courtice Station, which is located closest to Lake Ontario. Two exceptions are noted:

1) The minimum recorded temperature at Oshawa Station in March 2015 is approximately 5°C lower than the minimum recorded temperature at Rundle Station and 7°C lower than the minimum temperature at the Courtice Station. Given that the minimum temperature for at Courtice and Rundle Station are within 2°C of one another, this is likely to have occurred due to local effects at the Oshawa Station, which is located over 10 km away.

2) The minimum temperature recoded at the Rundle Station in March 2018 is significantly lower than the minimum temperatures recorded at Courtice Station or Oshawa Station over this same period. Further investigation shows that on March 28th 2018 at 22:00, the recorded temperature at Rundle Station dropped from 5.4°C to -14.6°C within 1 hour measurements and remained below -12°C until April 1st, 2018 at 00:00, 3 days later, when it rose from -16.3°C to 2.5°C within 1 hour measurements. These extreme temperature changes were not recorded at either the Courtice or Oshawa Stations. As a result, this period of temperature data recorded at Rundle Station is considered to be erroneous and is proposed to be discarded. This would also explain the lower average temperature recorded at Rundle Station in March 2018 and discussed above.

The comparisons of **maximum monthly temperature** for each calendar year analysed indicates that each of the three stations exhibits a very similar profile for maximum temperature each month with the highest maximum temperatures typically recorded at Oshawa Station, which is the most inland. One exception was noted. In March 2015, the maximum recorded temperature was approximately 9°C higher than the maximum temperature recorded at Courtice Station and 11°C higher than the maximum recorded temperature at Oshawa Station. On further inspection of the data, the temperature recorded on March 16, 2015 the temperature recorded at 7:00 was 18.5 °C compared to a temperature of -0.1°C the preceding hour and 6.3°C the following hour. Temperatures of -0.8°C and 4.8°C were recorded at the same hour, as a result, this hour of temperature at the Rundle Station is considered to be erroneous and it is proposed to be discarded.

The comparison of the **diurnal temperature** profile for each month illustrate similar profiles across all three stations. Typically, Courtice is shown to have the warmest average temperatures in winter months and the lowest average temperatures in summer months. This is attributed to being located approximately 300 m from Lake Ontario and subject to lake effects.

Overall, the temperature data for the Courtice and Rundle Stations exhibits very similar patterns to the data for the temperature recorded at Oshawa Station over the same period. The data appears to be reasonable.

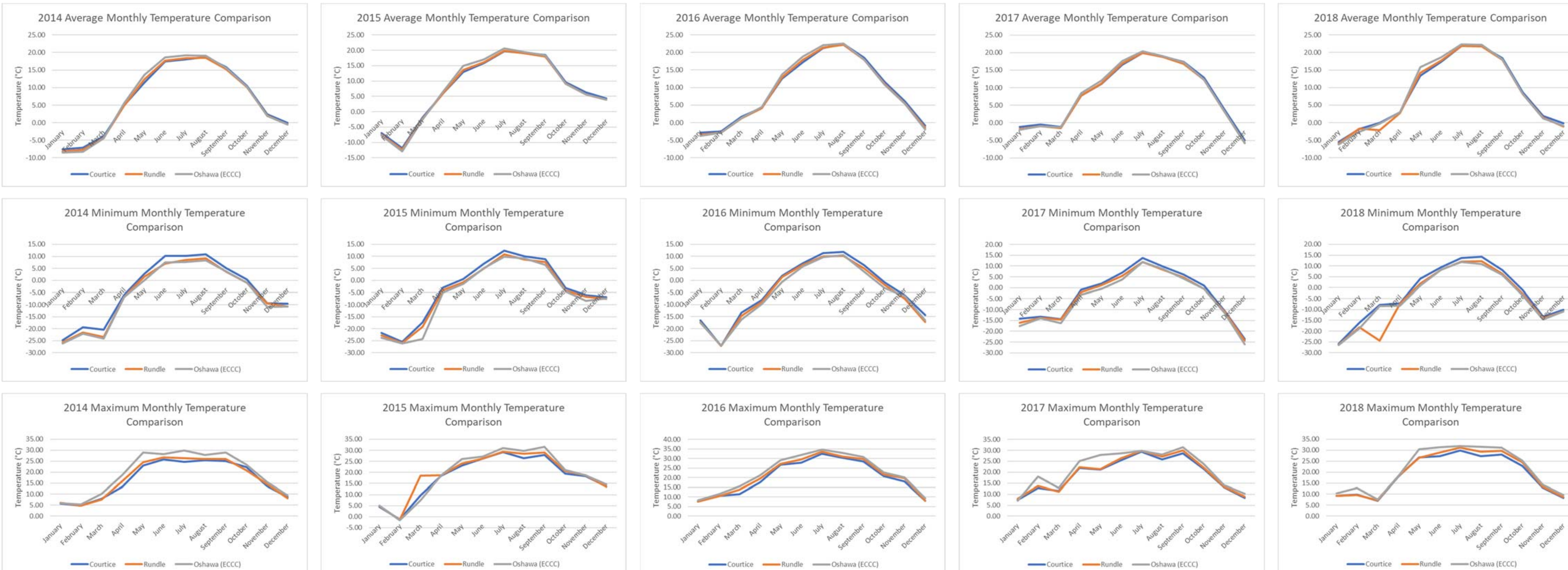


Figure 2: Annual Temperature Profiles (Average, Minimum and Maximum) for 2014-2018 Data Period

Figure 3: Comparison of Diurnal Temperature Profiles for 2014-2018 Data Period

Review of Relative Humidity Data

Average monthly relative humidity for each calendar year is illustrated in Figure 4 The recorded data shows very similar patterns for each of the three stations. The difference between recorded relative humidity is typically smallest in summer months and greatest in the winter months with Courtice typically recording the lowest relative humidity data. Overall, the relative humidity data for the Courtice and Rundle Stations shows reasonable correlation with the data recorded at the Oshawa Station over the same period and no data is identified as erroneous and/or unsuitable for use.

Figure 4: Comparison of Average Relative Humidity for 2014-2018 Data Period

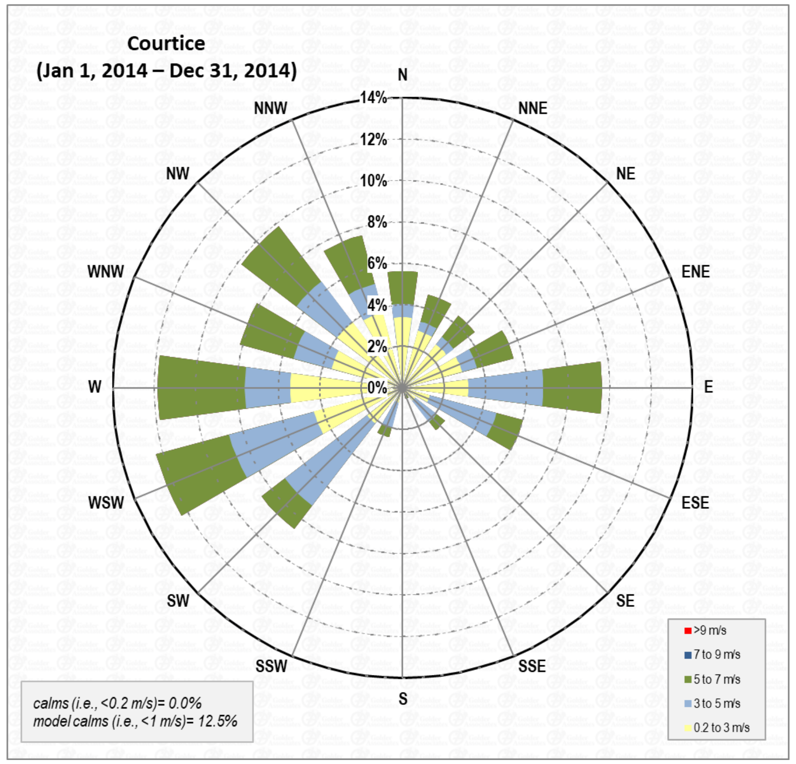
Review of Wind Data

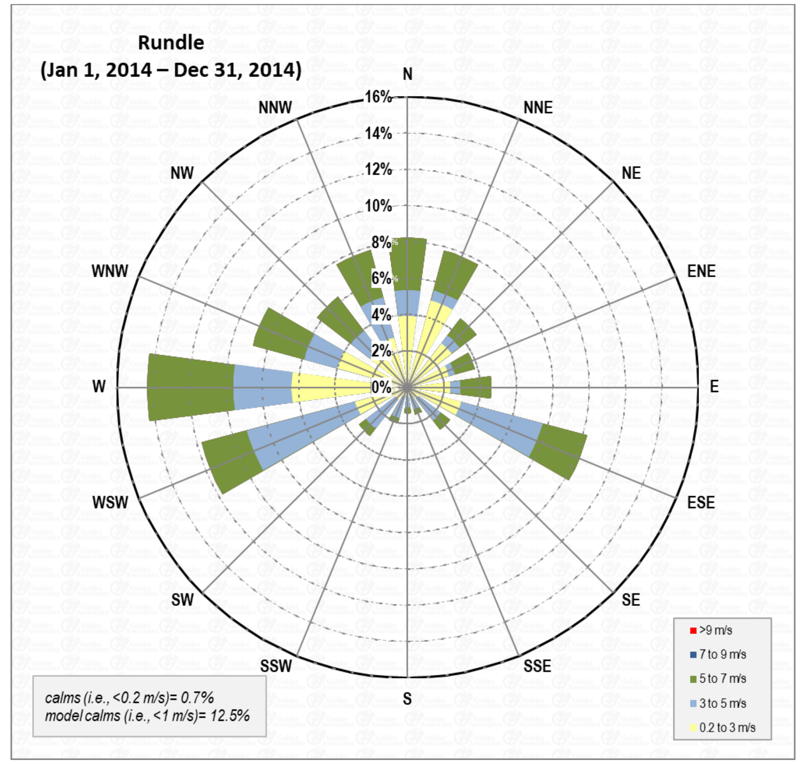
Wind Roses are presented for each station in Figure 5. There are differences in the height of each wind tower and in the distances of each station from Lake Ontario which should be considered when reviewing the windrose data.

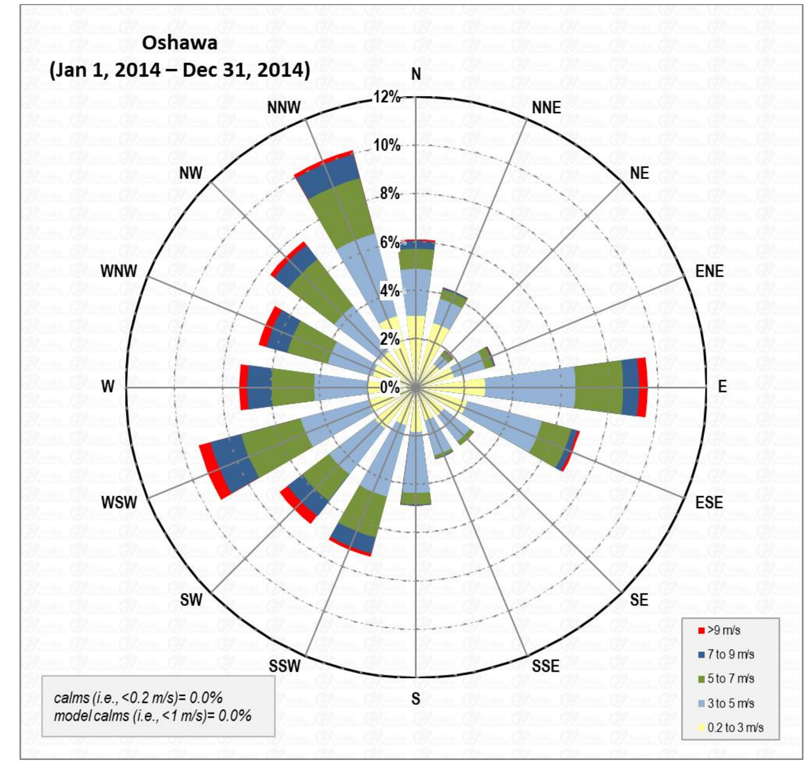
For each year of data, the Courtice Station illustrates a bi-modal distribution with the most frequent winds from the west and east. This station has a 20 m high wind tower but it is located closest to lake Ontario (approximately 300m).

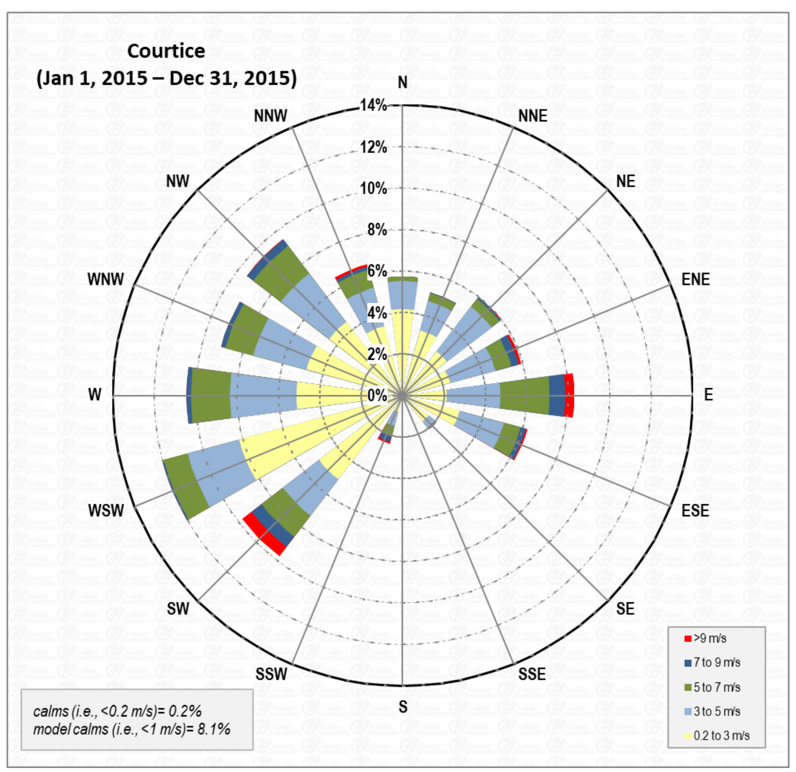
The Rundle Station exhibits a strong WSW predominant wind direction for 2015 – 2017. In 2018, the wind tower was increased in height from 7.8 m to 10 m. The predominant wind direction is reported as more westerly in the years following this change, although it is noted that there was approximately 15% downtime in 2018.

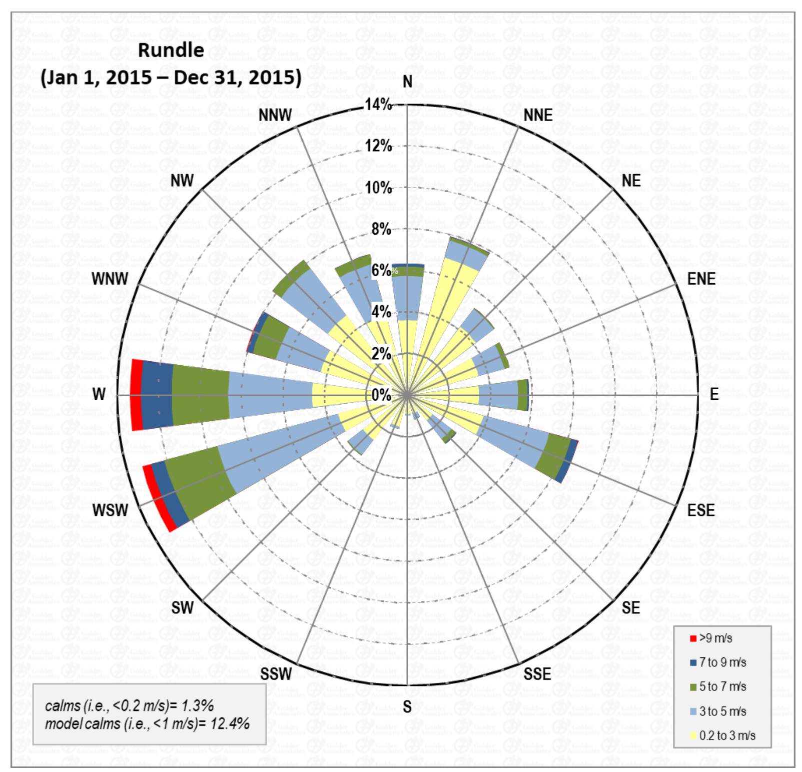
The Oshawa Station shows much more variability in wind direction with predominant winds from the NW. This station is located the furthest from Lake Ontario. The Oshawa station reports less calm wind speeds (i.e. less than 0.2 m/s), however it is identified that the wind speed sensor at this station that may not be as sensitive as the sensors at Courtice and Rundle Stations as the lowest non-zero recorded wind speed is 4 km/hr. Comparatively wind speeds of 0.1 km/hr were recorded at both Courtice and Rundle Stations.

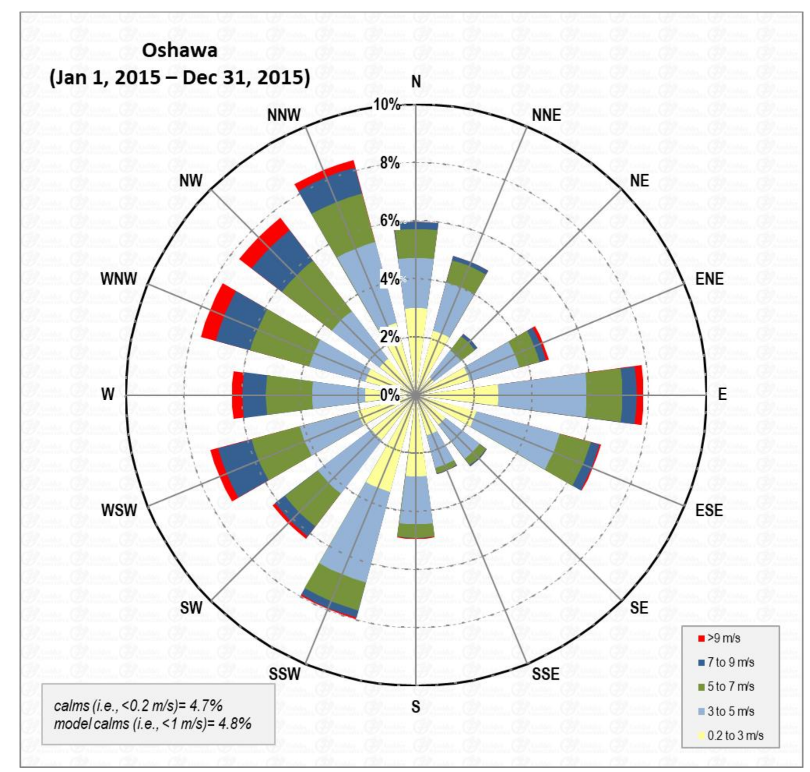

Courtice
(Jan 1, 2014 – Dec 31, 2014)
calms (i.e., <0.2 m/s)= 0.0%
model calms (i.e., <1 m/s)= 12.5%
>9 m/s
7 to 9 m/s
5 to 7 m/s
3 to 5 m/s
0.2 to 3 m/s

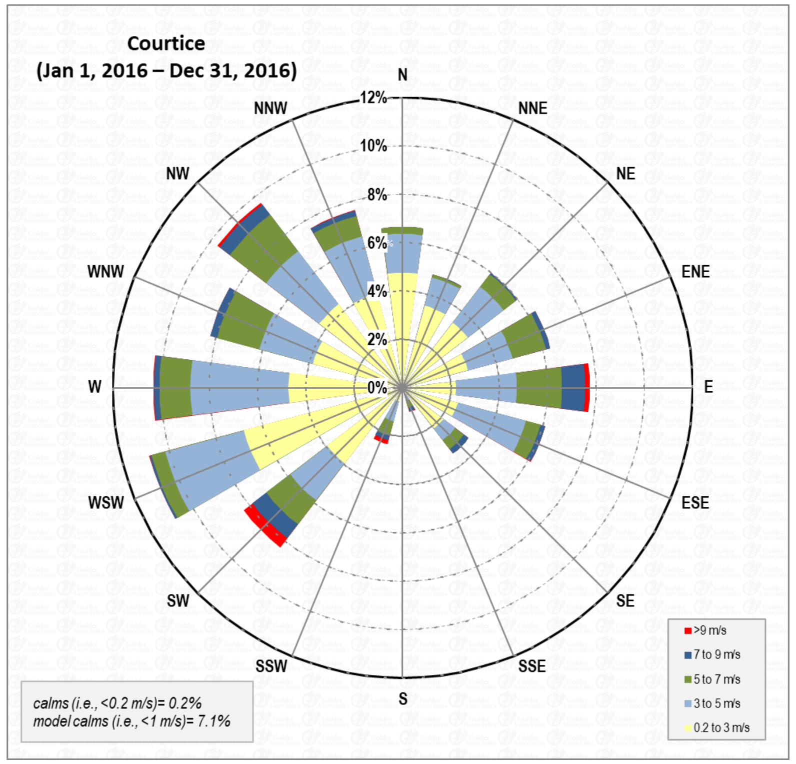

Rundle
(Jan 1, 2014 – Dec 31, 2014)
calms (i.e., <0.2 m/s)= 0.7%
model calms (i.e., <1 m/s)= 12.5%
>9 m/s
7 to 9 m/s
5 to 7 m/s
3 to 5 m/s
0.2 to 3 m/s

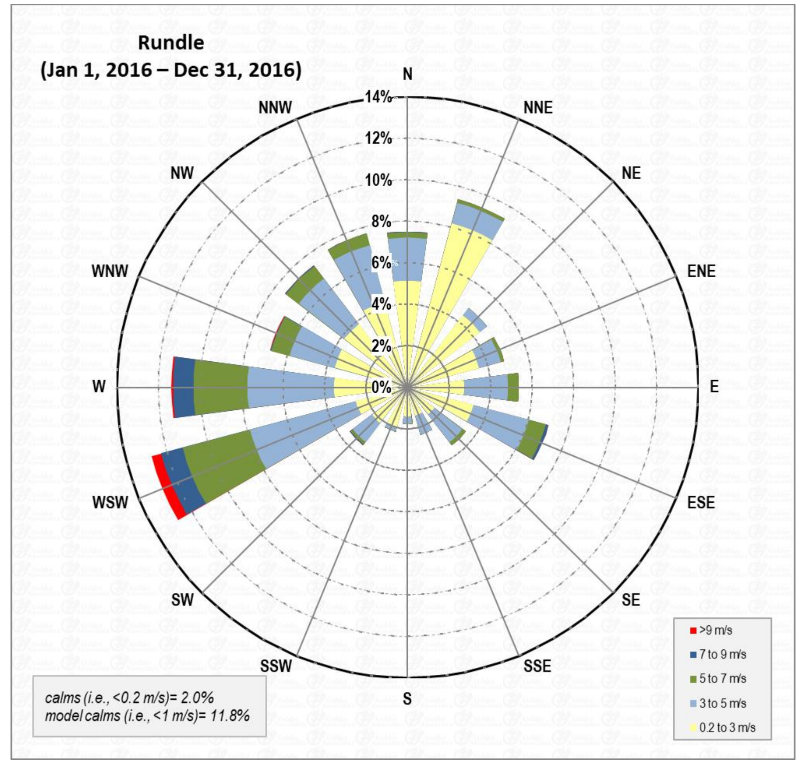

Oshawa
(Jan 1, 2014 – Dec 31, 2014)
calms (i.e., <0.2 m/s)= 0.0%
model calms (i.e., <1 m/s)= 0.0%
>9 m/s
7 to 9 m/s
5 to 7 m/s
3 to 5 m/s
0.2 to 3 m/s

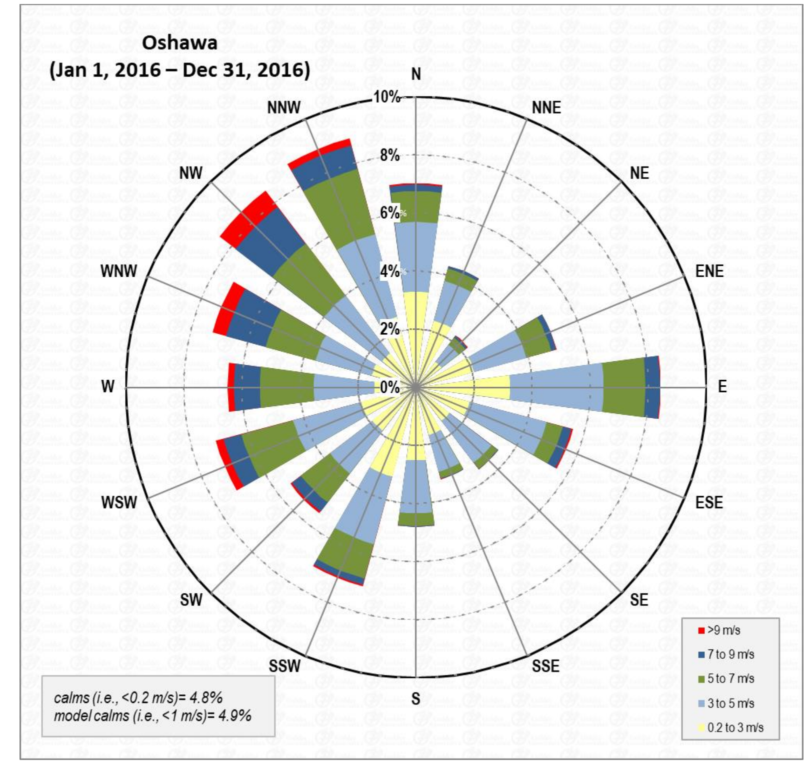

Courtice
(Jan 1, 2015 – Dec 31, 2015)
calms (i.e., <0.2 m/s)= 0.2%
model calms (i.e., <1 m/s)= 8.1%
>9 m/s
7 to 9 m/s
5 to 7 m/s
3 to 5 m/s
0.2 to 3 m/s

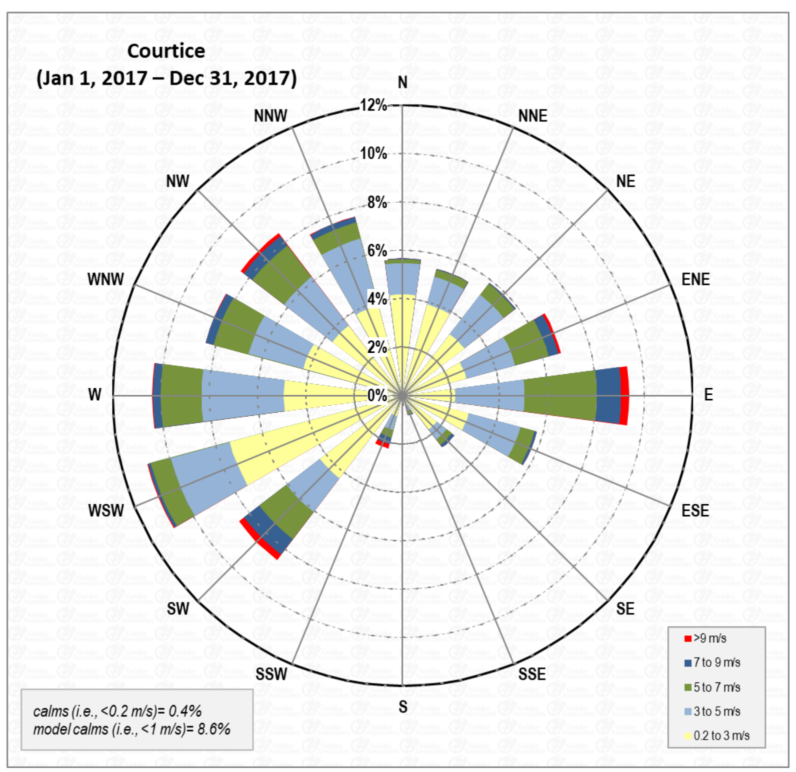

Rundle
(Jan 1, 2015 – Dec 31, 2015)
calms (i.e., <0.2 m/s)= 1.3%
model calms (i.e., <1 m/s)= 12.4%
>9 m/s
7 to 9 m/s
5 to 7 m/s
3 to 5 m/s
0.2 to 3 m/s

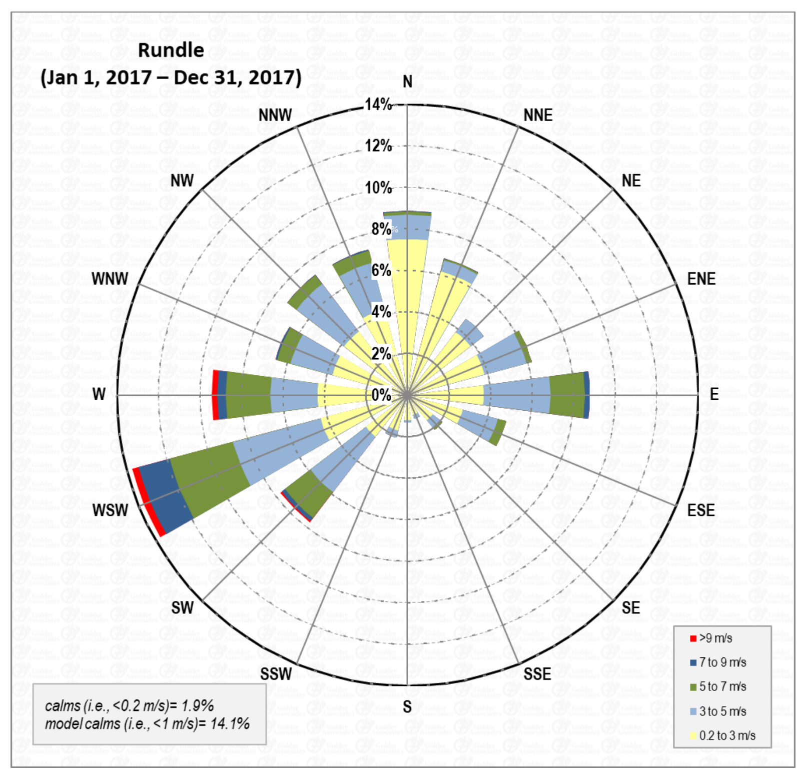

Oshawa
(Jan 1, 2015 – Dec 31, 2015)
calms (i.e., <0.2 m/s)= 4.7%
model calms (i.e., <1 m/s)= 4.8%
>9 m/s
7 to 9 m/s
5 to 7 m/s
3 to 5 m/s
0.2 to 3 m/s

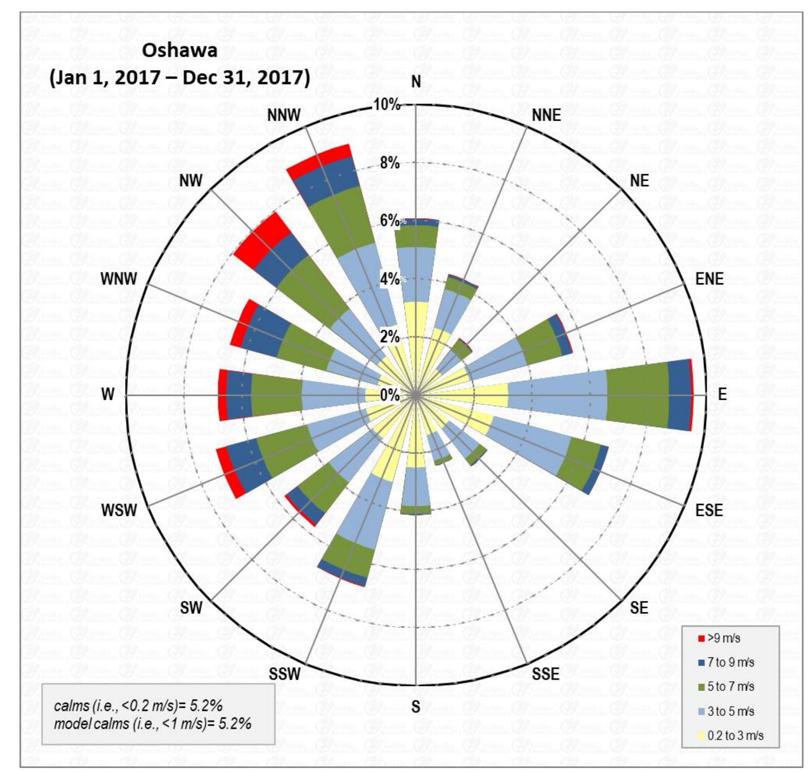

Courtice
(Jan 1, 2016 – Dec 31, 2016)
calms (i.e., <0.2 m/s)= 0.2%
model calms (i.e., <1 m/s)= 7.1%
>9 m/s
7 to 9 m/s
5 to 7 m/s
3 to 5 m/s
0.2 to 3 m/s


Rundle
(Jan 1, 2016 – Dec 31, 2016)
calms (i.e., <0.2 m/s)= 2.0%
model calms (i.e., <1 m/s)= 11.8%
>9 m/s
7 to 9 m/s
5 to 7 m/s
3 to 5 m/s
0.2 to 3 m/s


Oshawa
(Jan 1, 2016 – Dec 31, 2016)
calms (i.e., <0.2 m/s)= 4.8%
model calms (i.e., <1 m/s)= 4.9%
>9 m/s
7 to 9 m/s
5 to 7 m/s
3 to 5 m/s
0.2 to 3 m/s


Courtice
(Jan 1, 2017 – Dec 31, 2017)
calms (i.e., <0.2 m/s)= 0.4%
model calms (i.e., <1 m/s)= 8.6%
>9 m/s
7 to 9 m/s
5 to 7 m/s
3 to 5 m/s
0.2 to 3 m/s


Rundle
(Jan 1, 2017 – Dec 31, 2017)
calms (i.e., <0.2 m/s)= 1.9%
model calms (i.e., <1 m/s)= 14.1%
>9 m/s
7 to 9 m/s
5 to 7 m/s
3 to 5 m/s
0.2 to 3 m/s


Oshawa
(Jan 1, 2017 – Dec 31, 2017)
calms (i.e., <0.2 m/s)= 5.2%
model calms (i.e., <1 m/s)= 5.2%
>9 m/s
7 to 9 m/s
5 to 7 m/s
3 to 5 m/s
0.2 to 3 m/s

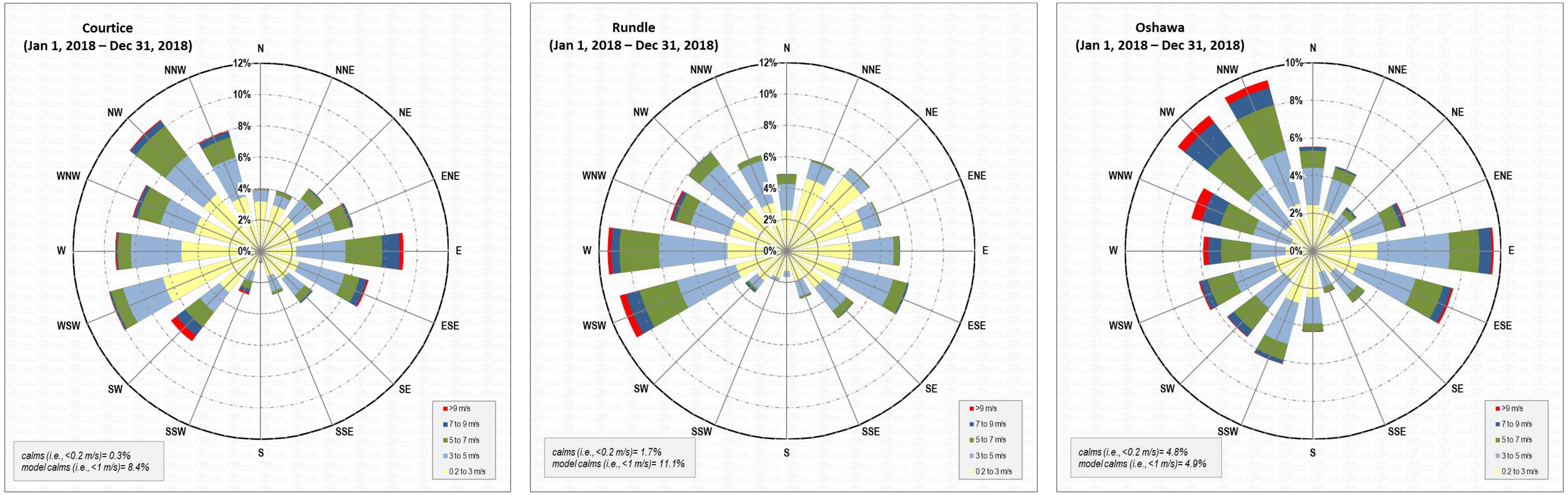


Figure 5: Annual Windroses for the 2014-2018 Data Period by Station

Summary of Data Analysis

Overall, the data from Courtice and Rundle shows reasonable correlation with the Oshawa station for the temperature and relative humidity data.

For wind data , there is more variability between the stations due to the difference in both tower heights and station locations. Overall the data shows consistent annual trends at each station on a yearly basis and the data appears to be reasonable.

Conclusions

The Courtice and Rundle Stations have been calibrated throughout the 2014-2018 period and data validation is completed by the consulting firm responsible for their maintenance. Golder completed a review of the data and found most of the data to be to be suitable for inclusion in the CALMET modelling, taking into account change in wind sensor height and disqualified data (during equipment downtime/maintenance).

APPENDIX G

Sample CALMET and CALPUFF Input files

```
CALMET.INP      2.2             Hour Start and End Times with Seconds
Template CALMET simulation for winter months
19117255 DYEC 2021 AQIA

---------------- Run title (3 lines) ------------------------------------------

                    CALMET MODEL CONTROL FILE
                    --------------------------

-------------------------------------------------------------------------------

INPUT GROUP: 0 -- Input and Output File Names


Subgroup (a)
------------
Default Name  Type          File Name
------------  ----          ---------
GEO.DAT       input    ! GEODAT=GEO_UD_WINTER_DYEC.DAT       !
SURF.DAT      input    ! SRFDAT=SURF.DAT      !
CLOUD.DAT     input    * CLDDAT=            *
PRECIP.DAT    input    * CLDDAT=            *
WT.DAT        input    * WTDAT=             *

CALMET.LST    output   ! METLST=CALMET_W1.LST     !
CALMET.DAT    output   ! METDAT=CALMET_W1.DAT    !
PACOUT.DAT    output   * PACDAT=            *

All file names will be converted to lower case if LCFILES = T
Otherwise, if LCFILES = F, file names will be converted to UPPER CASE
         T = lower case      ! LCFILES = F !
         F = UPPER CASE

NUMBER OF UPPER AIR & OVERWATER STATIONS:

    Number of upper air stations (NUSTA)  No default     ! NUSTA =  0  !
    Number of overwater met stations
                                 (NOWSTA) No default     ! NOWSTA =  1  !

NUMBER OF PROGNOSTIC and IGF-CALMET FILEs:

    Number of MM4/MM5/3D.DAT files
                                 (NM3D) No default       ! NM3D =  1  !

    Number of IGF-CALMET.DAT files
                                 (NIGF)   No default     ! NIGF =  0  !

                       !END!
--------------------------------------------------------------------------------
Subgroup (b)
---------------------------------
Upper air files (one per station)
---------------------------------
Default Name  Type       File Name
------------  ----       ---------

--------------------------------------------------------------------------------
Subgroup (c)
-----------------------------------------
Overwater station files (one per station)
-----------------------------------------
Default Name  Type       File Name
------------  ----       ---------
SEA1.DAT       input     1  ! SEADAT=BUOY.DAT!    !END!
--------------------------------------------------------------------------------
Subgroup (d)
```

```
-------------------------------------------------
MM4/MM5/3D.DAT files (consecutive or overlapping)
-------------------------------------------------
Default Name  Type       File Name
------------  ----       ---------
MM51.DAT       input      1  ! M3DDAT=201401.DAT!    !END!



--------------------------------------------------------------------------------
Subgroup (e)
-------------------------------------------------
IGF-CALMET.DAT files (consecutive or overlapping)
-------------------------------------------------
Default Name  Type       File Name
------------  ----       ---------
IGFn.DAT       input     1  * IGFDAT=CALMET0.DAT *    *END*
--------------------------------------------------------------------------------
Subgroup (f)
----------------
Other file names
----------------

Default Name  Type       File Name
------------  ----       ---------
DIAG.DAT      input      * DIADAT=                  *
PROG.DAT      input      * PRGDAT=                  *

TEST.PRT      output     * TSTPRT=                  *
TEST.OUT      output     * TSTOUT=                  *
TEST.KIN      output     * TSTKIN=                  *
TEST.FRD      output     * TSTFRD=                  *
TEST.SLP      output     * TSTSLP=                  *
DCST.GRD      output     * DCSTGD=                  *

--------------------------------------------------------------------------------
NOTES: (1) File/path names can be up to 70 characters in length
       (2) Subgroups (a) and (f) must have ONE 'END' (surrounded by
           delimiters) at the end of the group
       (3) Subgroups (b) through (e) are included ONLY if the corresponding
           number of files (NUSTA, NOWSTA, NM3D, NIGF) is not 0, and each must have
           an 'END' (surround by delimiters) at the end of EACH LINE

                         !END!


-------------------------------------------------------------------------------


INPUT GROUP: 1 -- General run control parameters
--------------

     Starting date:    Year   (IBYR)  --    No default   ! IBYR  =  2014  !
                       Month  (IBMO)  --    No default   ! IBMO  =  1  !
                       Day    (IBDY)  --    No default   ! IBDY  =  1  !
     Starting time:    Hour   (IBHR)  --    No default   ! IBHR  =  0  !
                       Second (IBSEC) --    No default   ! IBSEC =  0  !

     Ending date:      Year   (IEYR)  --    No default   ! IEYR  =  2014  !
                       Month  (IEMO)  --    No default   ! IEMO  =  1  !
                       Day    (IEDY)  --    No default   ! IEDY  =  31  !
     Ending time:      Hour   (IEHR)  --    No default   ! IEHR  =  23  !
                       Second (IESEC) --    No default   ! IESEC =  3600  !

      UTC time zone         (ABTZ) -- No default       ! ABTZ= UTC-0500 !
         (character*8)
         PST = UTC-0800, MST = UTC-0700 , GMT = UTC-0000
```

```
        CST = UTC-0600, EST = UTC-0500

    Length of modeling time-step (seconds)
    Must divide evenly into 3600 (1 hour)
    (NSECDT)                        Default:3600     ! NSECDT =  3600  !
                                    Units: seconds

    Run type            (IRTYPE) -- Default: 1       ! IRTYPE=  1  !

       0 = Computes wind fields only
       1 = Computes wind fields and micrometeorological variables
           (u*, w*, L, zi, etc.)
       (IRTYPE must be 1 to run CALPUFF or CALGRID)

    Compute special data fields required
    by CALGRID (i.e., 3-D fields of W wind
    components and temperature)
    in additional to regular           Default: T    ! LCALGRD = T !
    fields ? (LCALGRD)
    (LCALGRD must be T to run CALGRID)

     Flag to stop run after
     SETUP phase (ITEST)             Default: 2       ! ITEST=  2   !
     (Used to allow checking
     of the model inputs, files, etc.)
     ITEST = 1 - STOPS program after SETUP phase
     ITEST = 2 - Continues with execution of
                 COMPUTATIONAL phase after SETUP


    Test options specified to see if
    they conform to regulatory
    values? (MREG)                   No Default       ! MREG =  0   !

       0 = NO checks are made
       1 = Technical options must conform to USEPA guidance
                 IMIXH    -1     Maul-Carson convective mixing height
                                 over land; OCD mixing height overwater
                 ICOARE   0      OCD deltaT method for overwater fluxes
                 THRESHL  0.0    Threshold buoyancy flux over land needed
                                 to sustain convective mixing height growth
                 ISURFT   > 0    in OBS mode (pick one representative station)
                          -2     in NOOBS mode (itprog=2) (average all
                                 surface prognostic temperatures to get
                                 a single representative sf. temp)
                 IUPT     > 0    in OBS mode (pick one representative station)
                          -2     in NOOBS mode (ITPROG>0) (average all surface
                                 prognostic temperatures to get a single
                                 representative sf. temp)
                 IZICRLX  0      Do NOT use convective mixing height relaxation
                                 to equilibrium value

!END!

--------------------------------------------------------------------------------

INPUT GROUP: 2 -- Map Projection and Grid control parameters
--------------

    Projection for all (X,Y):
    -------------------------

    Map projection
    (PMAP)                      Default: UTM    ! PMAP = UTM  !

        UTM :  Universal Transverse Mercator
```

```
         TTM :  Tangential Transverse Mercator
         LCC :  Lambert Conformal Conic
          PS :  Polar Stereographic
          EM :  Equatorial Mercator
        LAZA :  Lambert Azimuthal Equal Area

     False Easting and Northing (km) at the projection origin
     (Used only if PMAP= TTM, LCC, or LAZA)
     (FEAST)                   Default=0.0     ! FEAST  = 0.000  !
     (FNORTH)                  Default=0.0     ! FNORTH = 0.000  !

     UTM zone (1 to 60)
     (Used only if PMAP=UTM)
     (IUTMZN)                  No Default      ! IUTMZN =  17   !

     Hemisphere for UTM projection?
     (Used only if PMAP=UTM)
     (UTMHEM)                  Default: N      ! UTMHEM = N  !
         N   :  Northern hemisphere projection
         S   :  Southern hemisphere projection

     Latitude and Longitude (decimal degrees) of projection origin
     (Used only if PMAP= TTM, LCC, PS, EM, or LAZA)
     (RLAT0)                   No Default      ! RLAT0 = 40N  !
     (RLON0)                   No Default      ! RLON0 = 90E  !

         TTM :  RLON0 identifies central (true N/S) meridian of projection
                RLAT0 selected for convenience
         LCC :  RLON0 identifies central (true N/S) meridian of projection
                RLAT0 selected for convenience
         PS  :  RLON0 identifies central (grid N/S) meridian of projection
                RLAT0 selected for convenience
         EM  :  RLON0 identifies central meridian of projection
                RLAT0 is REPLACED by 0.0N (Equator)
         LAZA:  RLON0 identifies longitude of tangent-point of mapping plane
                RLAT0 identifies latitude of tangent-point of mapping plane

     Matching parallel(s) of latitude (decimal degrees) for projection
     (Used only if PMAP= LCC or PS)
     (XLAT1)                   No Default      ! XLAT1 = 30N  !
     (XLAT2)                   No Default      ! XLAT2 = 60N  !

         LCC :  Projection cone slices through Earth's surface at XLAT1 and XLAT2
         PS  :  Projection plane slices through Earth at XLAT1
                (XLAT2 is not used)

     ----------
     Note:  Latitudes and longitudes should be positive, and include a
            letter N,S,E, or W indicating north or south latitude, and
            east or west longitude.  For example,
            35.9  N Latitude  =  35.9N
            118.7 E Longitude = 118.7E


     Datum-region
     ------------

     The Datum-Region for the coordinates is identified by a character
     string.  Many mapping products currently available use the model of the
     Earth known as the World Geodetic System 1984 (WGS-84).  Other local
     models may be in use, and their selection in CALMET will make its output
     consistent with local mapping products.  The list of Datum-Regions with
     official transformation parameters is provided by the National Imagery and
     Mapping Agency (NIMA).

     NIMA Datum - Regions(Examples)
```

```
     ------------------------------------------------------------------------------
     WGS-84    WGS-84 Reference Ellipsoid and Geoid, Global coverage (WGS84)
     NAS-C     NORTH AMERICAN 1927 Clarke 1866 Spheroid, MEAN FOR CONUS (NAD27)
     NAR-C     NORTH AMERICAN 1983 GRS 80 Spheroid, MEAN FOR CONUS (NAD83)
     NWS-84    NWS 6370KM Radius, Sphere
     ESR-S     ESRI REFERENCE 6371KM Radius, Sphere

     Datum-region for output coordinates
     (DATUM)                  Default: WGS-84    ! DATUM =  WGS-84 !


     Horizontal grid definition:
     ---------------------------

     Rectangular grid defined for projection PMAP,
     with X the Easting and Y the Northing coordinate

            No. X grid cells (NX)      No default     ! NX =   160  !
            No. Y grid cells (NY)      No default     ! NY =   160  !

     Grid spacing (DGRIDKM)            No default     ! DGRIDKM = 0.25 !
                                       Units: km

     Reference grid coordinate of
     SOUTHWEST corner of grid cell (1,1)

        X coordinate (XORIGKM)         No default     ! XORIGKM = 662.536 !
        Y coordinate (YORIGKM)         No default     ! YORIGKM = 4845.000 !
                                       Units: km


   Vertical grid definition:
     -------------------------

        No. of vertical layers (NZ)    No default     ! NZ =  8  !

        Cell face height in arbitrary
        vertical grid (ZFACE(NZ+1))    No defaults
                                       Units: m
        ! ZFACE = 0.,20.,50.,100.,200.,500.,1000.,2000.,3300. !

!END!


--------------------------------------------------------------------------------

INPUT GROUP: 3 -- Output Options
--------------


    DISK OUTPUT OPTION

       Save met. fields in an unformatted
       output file ?              (LSAVE)  Default: T     ! LSAVE = T !
       (F = Do not save, T = Save)

       Type of unformatted output file:
       (IFORMO)                            Default: 1    ! IFORMO =  1  !

            1 = CALPUFF/CALGRID type file (CALMET.DAT)
            2 = MESOPUFF-II type file     (PACOUT.DAT)


    LINE PRINTER OUTPUT OPTIONS:

       Print met. fields ?  (LPRINT)       Default: F     ! LPRINT = F !
```

```
       (F = Do not print, T = Print)
       (NOTE: parameters below control which
              met. variables are printed)

       Print interval
       (IPRINF) in hours                   Default: 1     ! IPRINF =  1  !
       (Meteorological fields are printed
        every  1  hours)


       Specify which layers of U, V wind component
       to print (IUVOUT(NZ)) -- NOTE: NZ values must be entered
       (0=Do not print, 1=Print)
       (used only if LPRINT=T)        Defaults: NZ*0
       ! IUVOUT =  0 ,  0 ,  0 ,  0 ,  0 ,  0 ,  0 ,  0 ,  0 ,  0  !
       -----------------------


       Specify which levels of the W wind component to print
       (NOTE: W defined at TOP cell face --  10  values)
       (IWOUT(NZ)) -- NOTE: NZ values must be entered
       (0=Do not print, 1=Print)
       (used only if LPRINT=T & LCALGRD=T)
       -----------------------------------
                                            Defaults: NZ*0
        ! IWOUT =  0 ,  0 ,  0 ,  0 ,  0 ,  0 ,  0 ,  0 ,  0 ,  0  !


       Specify which levels of the 3-D temperature field to print
       (ITOUT(NZ)) -- NOTE: NZ values must be entered
       (0=Do not print, 1=Print)
       (used only if LPRINT=T & LCALGRD=T)
       -----------------------------------
                                            Defaults: NZ*0
        ! ITOUT =  0 ,  0 ,  0 ,  0 ,  0 ,  0 ,  0 ,  0 ,  0 ,  0  !

       Specify which meteorological fields
       to print
       (used only if LPRINT=T)             Defaults: 0 (all variables)
       -----------------------


         Variable            Print ?
                          (0 = do not print,
                           1 = print)
         --------         ------------------

      !  STABILITY  =           0           ! - PGT stability class
      !  USTAR      =           0           ! - Friction velocity
      !  MONIN      =           0           ! - Monin-Obukhov length
      !  MIXHT      =           0           ! - Mixing height
      !  WSTAR      =           0           ! - Convective velocity scale
      !  PRECIP     =           0           ! - Precipitation rate
      !  SENSHEAT   =           0           ! - Sensible heat flux
      !  CONVZI     =           0           ! - Convective mixing ht.


       Testing and debug print options for micrometeorological module

          Print input meteorological data and
          internal variables (LDB)         Default: F       ! LDB = F !
          (F = Do not print, T = print)
          (NOTE: this option produces large amounts of output)

          First time step for which debug data
          are printed (NN1)                Default: 1       ! NN1 =  1  !
```

```
          Last time step for which debug data
          are printed (NN2)                Default: 1       ! NN2 =  1  !

          Print distance to land
          internal variables (LDBCST)      Default: F       ! LDBCST = F !
          (F = Do not print, T = print)
          (Output in .GRD file DCST.GRD, defined in input group 0)

       Testing and debug print options for wind field module
       (all of the following print options control output to
        wind field module's output files: TEST.PRT, TEST.OUT,
        TEST.KIN, TEST.FRD, and TEST.SLP)

          Control variable for writing the test/debug
          wind fields to disk files (IOUTD)
          (0=Do not write, 1=write)        Default: 0       ! IOUTD =  0  !

          Number of levels, starting at the surface,
          to print (NZPRN2)                Default: 1       ! NZPRN2 =  0  !

          Print the INTERPOLATED wind components ?
          (IPR0) (0=no, 1=yes)             Default: 0       !  IPR0 =  0  !

          Print the TERRAIN ADJUSTED surface wind
          components ?
          (IPR1) (0=no, 1=yes)             Default: 0       !  IPR1 =  0  !

          Print the SMOOTHED wind components and
          the INITIAL DIVERGENCE fields ?
          (IPR2) (0=no, 1=yes)             Default: 0       !  IPR2 =  0  !

          Print the FINAL wind speed and direction
          fields ?
          (IPR3) (0=no, 1=yes)             Default: 0       !  IPR3 =  0  !

          Print the FINAL DIVERGENCE fields ?
          (IPR4) (0=no, 1=yes)             Default: 0       !  IPR4 =  0  !

          Print the winds after KINEMATIC effects
          are added ?
          (IPR5) (0=no, 1=yes)             Default: 0       !  IPR5 =  0  !

          Print the winds after the FROUDE NUMBER
          adjustment is made ?
          (IPR6) (0=no, 1=yes)             Default: 0       !  IPR6 =  0  !

          Print the winds after SLOPE FLOWS
          are added ?
          (IPR7) (0=no, 1=yes)             Default: 0       !  IPR7 =  0  !

          Print the FINAL wind field components ?
          (IPR8) (0=no, 1=yes)             Default: 0       !  IPR8 =  0  !

!END!


-------------------------------------------------------------------------------

INPUT GROUP: 4 -- Meteorological data options
--------------

    NO OBSERVATION MODE             (NOOBS)  Default: 0     ! NOOBS =  1   !
          0 = Use surface, overwater, and upper air stations
          1 = Use surface and overwater stations (no upper air observations)
              Use MM4/MM5/3D for upper air data
```

```
          2 = No surface, overwater, or upper air observations
              Use MM4/MM5/3D for surface, overwater, and upper air data

    NUMBER OF SURFACE & PRECIP. METEOROLOGICAL STATIONS

       Number of surface stations   (NSSTA)  No default     ! NSSTA =  8  !

       Number of precipitation stations
       (NPSTA=-1: flag for use of MM5/3D precip data)
                                    (NPSTA)  No default     ! NPSTA =  -1  !

    CLOUD DATA OPTIONS
       Output option - output a CLOUD.DAT file (yes or no)
       0=no, 1=yes
                                   (ICLDOUT) Default:999      ! ICLDOUT = 0  !

       Method to compute cloud fields:
                                   (MCLOUD)  Default: 999     ! MCLOUD =  1  !
       MCLOUD = 1 - Clouds data generated from surface observations
       MCLOUD = 2 - Gridded CLOUD.DAT read from CLOUD.DAT file (no output
                    is possible since already exist)
       MCLOUD = 3 - Gridded cloud cover from Prognostic Rel. Humidity
                    at 850mb (Teixera)
       MCLOUD = 4 - Gridded cloud cover from Prognostic Rel. Humidity
                    at all levels (MM5toGrads algorithm)

    FILE FORMATS

       Surface meteorological data file format
                                   (IFORMS)  Default: 2     ! IFORMS =  2  !
       (1 = unformatted (e.g., SMERGE output))
       (2 = formatted   (free-formatted user input))

       Precipitation data file format
                                   (IFORMP)  Default: 2     ! IFORMP =  2  !
       (1 = unformatted (e.g., PMERGE output))
       (2 = formatted   (free-formatted user input))

       Cloud data file format
                                   (IFORMC)  Default: 2     ! IFORMC =  2  !
       (1 = unformatted - CALMET unformatted output)
       (2 = formatted   - free-formatted CALMET output or user input)

!END!


-------------------------------------------------------------------------------

INPUT GROUP: 5 -- Wind Field Options and Parameters
--------------


    WIND FIELD MODEL OPTIONS
       Model selection variable (IWFCOD)     Default: 1      ! IWFCOD =  1  !
          0 = Objective analysis only
          1 = Diagnostic wind module

       Compute Froude number adjustment
       effects ? (IFRADJ)                    Default: 1      ! IFRADJ =  1  !
       (0 = NO, 1 = YES)

       Compute kinematic effects ? (IKINE)   Default: 0      ! IKINE  =  0  !
       (0 = NO, 1 = YES)

       Use O'Brien procedure for adjustment
       of the vertical velocity ? (IOBR)     Default: 0      ! IOBR =  0  !
```

```
      (0 = NO, 1 = YES)

      Compute slope flow effects ? (ISLOPE) Default: 1      ! ISLOPE  =  1  !
      (0 = NO, 1 = YES)

      Extrapolate surface wind observations
      to upper layers ? (IEXTRP)            Default: -4     ! IEXTRP = -4  !
      (1 = no extrapolation is done,
       2 = power law extrapolation used,
       3 = user input multiplicative factors
           for layers 2 - NZ used (see FEXTRP array)
       4 = similarity theory used
       -1, -2, -3, -4 = same as above except layer 1 data
           at upper air stations are ignored

      Extrapolate surface winds even
      if calm? (ICALM)                      Default: 0      ! ICALM  =  0  !
      (0 = NO, 1 = YES)

      Layer-dependent biases modifying the weights of
      surface and upper air stations (BIAS(NZ))
        -1<=BIAS<=1
      Negative BIAS reduces the weight of upper air stations
        (e.g. BIAS=-0.1 reduces the weight of upper air stations
      by 10%; BIAS= -1, reduces their weight by 100 %)
      Positive BIAS reduces the weight of surface stations
        (e.g. BIAS= 0.2 reduces the weight of surface stations
      by 20%; BIAS=1 reduces their weight by 100%)
      Zero BIAS leaves weights unchanged (1/R**2 interpolation)
      Default: NZ*0
                              ! BIAS =  0 ,  0 ,  0 ,  0 ,  0 ,  0 ,  0 ,  0 ,  0 ,  0  !

      Minimum distance from nearest upper air station
      to surface station for which extrapolation
      of surface winds at surface station will be allowed
      (RMIN2: Set to -1 for IEXTRP = 4 or other situations
       where all surface stations should be extrapolated)
                                            Default: 4.     ! RMIN2 = -1.0 !

      Use gridded prognostic wind field model
      output fields as input to the diagnostic
      wind field model (IPROG)              Default: 0      ! IPROG =  14  !
      (0 = No, [IWFCOD = 0 or 1]
       1 = Yes, use CSUMM prog. winds as Step 1 field, [IWFCOD = 0]
       2 = Yes, use CSUMM prog. winds as initial guess field [IWFCOD = 1]
       3 = Yes, use winds from MM4.DAT file as Step 1 field [IWFCOD = 0]
       4 = Yes, use winds from MM4.DAT file as initial guess field [IWFCOD = 1]
       5 = Yes, use winds from MM4.DAT file as observations [IWFCOD = 1]
       13 = Yes, use winds from MM5/3D.DAT file as Step 1 field [IWFCOD = 0]
       14 = Yes, use winds from MM5/3D.DAT file as initial guess field [IWFCOD = 1]
       15 = Yes, use winds from MM5/3D.DAT file as observations [IWFCOD = 1]

      Timestep (seconds) of the prognostic
      model input data   (ISTEPPGS)       Default: 3600    ! ISTEPPGS =  3600   !

      Use coarse CALMET fields as initial guess fields (IGFMET)
      (overwrites IGF based on prognostic wind fields if any)
                                            Default: 0      ! IGFMET =  0  !

   RADIUS OF INFLUENCE PARAMETERS

      Use varying radius of influence       Default: F      ! LVARY =  F!
      (if no stations are found within RMAX1,RMAX2,
       or RMAX3, then the closest station will be used)

      Maximum radius of influence over land
```

```
       in the surface layer (RMAX1)          No default      ! RMAX1 = 30. !
                                             Units: km
       Maximum radius of influence over land
       aloft (RMAX2)                         No default      ! RMAX2 = 30. !
                                             Units: km
       Maximum radius of influence over water
       (RMAX3)                               No default      ! RMAX3 = 128. !
                                             Units: km


    OTHER WIND FIELD INPUT PARAMETERS

       Minimum radius of influence used in
       the wind field interpolation (RMIN)   Default: 0.1    ! RMIN = 0.1 !
                                             Units: km
       Radius of influence of terrain
       features (TERRAD)                     No default      ! TERRAD = 2. !

                                             Units: km
       Relative weighting of the first
       guess field and observations in the
       SURFACE layer (R1)                    No default      ! R1 = 2. !
       (R1 is the distance from an           Units: km
       observational station at which the
       observation and first guess field are
       equally weighted)

       Relative weighting of the first
       guess field and observations in the
       layers ALOFT (R2)                     No default      ! R2 = 2. !
       (R2 is applied in the upper layers    Units: km
       in the same manner as R1 is used in
       the surface layer).

       Relative weighting parameter of the
       prognostic wind field data (RPROG)    No default      ! RPROG = 0. !
       (Used only if IPROG = 1)              Units: km
       ------------------------

       Maximum acceptable divergence in the
       divergence minimization procedure
       (DIVLIM)                              Default: 5.E-6  ! DIVLIM= 5.0E-06 !

       Maximum number of iterations in the
       divergence min. procedure (NITER)     Default: 50     ! NITER =  50  !

       Number of passes in the smoothing
       procedure (NSMTH(NZ))
       NOTE: NZ values must be entered
            Default: 2,(mxnz-1)*4 ! NSMTH =
 2 ,  4 ,  4 ,  4 ,  4 ,  4 ,  4 ,  4 ,  4 ,  4  !

       Maximum number of stations used in
       each layer for the interpolation of
       data to a grid point (NINTR2(NZ))
       NOTE: NZ values must be entered       Default: 99.    ! NINTR2 = 99 !

       Critical Froude number (CRITFN)       Default: 1.0    ! CRITFN = 1. !

       Empirical factor controlling the
       influence of kinematic effects
       (ALPHA)                               Default: 0.1    ! ALPHA = 0.1 !

       Multiplicative scaling factor for
       extrapolation of surface observations
       to upper layers (FEXTR2(NZ))          Default: NZ*0.0
```

```
    ! FEXTR2 = 0., 0., 0., 0., 0., 0., 0., 0., 0., 0. !
    (Used only if IEXTRP = 3 or -3)


 BARRIER INFORMATION

    Number of barriers to interpolation
    of the wind fields (NBAR)            Default: 0      ! NBAR =  0  !

    Level (1 to NZ) up to which barriers
    apply (KBAR)                         Default: NZ     ! KBAR =  8  !

    THE FOLLOWING 4 VARIABLES ARE INCLUDED
    ONLY IF NBAR > 0
    NOTE: NBAR values must be entered     No defaults
          for each variable              Units: km

       X coordinate of BEGINNING
       of each barrier (XBBAR(NBAR))     ! XBBAR = 0. !
       Y coordinate of BEGINNING
       of each barrier (YBBAR(NBAR))     ! YBBAR = 0. !

       X coordinate of ENDING
       of each barrier (XEBAR(NBAR))     ! XEBAR = 0. !
       Y coordinate of ENDING
       of each barrier (YEBAR(NBAR))     ! YEBAR = 0. !


 DIAGNOSTIC MODULE DATA INPUT OPTIONS

    Surface temperature (IDIOPT1)        Default: 0      ! IDIOPT1 =  0  !
       0 = Compute internally from
           hourly surface observations or prognostic fields
       1 = Read preprocessed values from
           a data file (DIAG.DAT)

       Surface met. station to use for
       the surface temperature (ISURFT)    Default: -1    ! ISURFT =  -1  !
       (Must be a value from 1 to NSSTA
       or -1 to use 2-D spatially varying
          surface temperatures).
       or -2 to use a domain-average prognostic
       lapse rate (only with ITPROG=2)
       (Used only if IDIOPT1 = 0)
       --------------------------

       Temperature lapse rate used in the    Default: 0     ! IDIOPT2 =  0  !
       computation of terrain-induced
       circulations (IDIOPT2)
       0 = Compute internally from (at least) twice-daily
           upper air observations or prognostic fields
       1 = Read hourly preprocessed values
           from a data file (DIAG.DAT)

       Upper air station to use for
       the domain-scale lapse rate (IUPT) Default: -1   ! IUPT   =  -1  !
       (Must be a value from 1 to NUSTA
       or -1 to use 2-D spatially varying lapse rate)
       or -2 to use a domain-average prognostic
       lapse rate (only with ITPROG>0)
       (Used only if IDIOPT2 = 0)
       --------------------------

       Depth through which the domain-scale
       lapse rate is computed (ZUPT)      Default: 200.  ! ZUPT = 200. !
       (Used only if IDIOPT2 = 0)         Units: meters
```

```
          --------------------------

       Initial Guess Field Winds
       (IDIOPT3)                             Default: 0     ! IDIOPT3 =  0  !
          0 = Compute internally from
              observations or prognostic wind fields
          1 = Read hourly preprocessed domain-average wind values
              from a data file (DIAG.DAT)

          Upper air station to use for
          the initial guess winds (IUPWND)    Default: -1    ! IUPWND = -1  !
          (Must be a value from -1 to NUSTA, with
          -1 indicating 3-D initial guess fields,
          and IUPWND>1 domain-scaled (i.e. constant) IGF
          (Used only if IDIOPT3 = 0 and noobs=0)
          ---------------------------------------

          Bottom and top of layer through
          which the domain-scale winds
          are computed
          (ZUPWND(1), ZUPWND(2))        Defaults: 1., 1000. ! ZUPWND= 1., 1000. !
          (Used only if IDIOPT3 = 0, NOOBS>0 and IUPWND>0)    Units: meters
          --------------------------

       Observed surface wind components
       for wind field module (IDIOPT4)  Default: 0     ! IDIOPT4 =  0  !
          0 = Read WS, WD from a surface
              data file (SURF.DAT)
          1 = Read hourly preprocessed U, V from
              a data file (DIAG.DAT)

       Observed upper air wind components
       for wind field module (IDIOPT5)  Default: 0     ! IDIOPT5 =  0  !
          0 = Read WS, WD from an upper
              air data file (UP1.DAT, UP2.DAT, etc.)
          1 = Read hourly preprocessed U, V from
              a data file (DIAG.DAT)

       LAKE BREEZE INFORMATION

          Use Lake Breeze Module  (LLBREZE)
                                          Default: F      ! LLBREZE = F !

           Number of lake breeze regions (NBOX)           ! NBOX =  0  !

        X Grid line 1 defining the region of interest
                                                       ! XG1 = 0. !
        X Grid line 2 defining the region of interest
                                                       ! XG2 = 0. !
        Y Grid line 1 defining the region of interest
                                                       ! YG1 = 0. !
        Y Grid line 2 defining the region of interest
                                                       ! YG2 = 0. !

         X Point defining the coastline (Straight line)
                   (XBCST)  (KM)   Default: none    ! XBCST = 0. !

         Y Point defining the coastline (Straight line)
                   (YBCST)  (KM)   Default: none    ! YBCST = 0. !

         X Point defining the coastline (Straight line)
                   (XECST)  (KM)   Default: none    ! XECST = 0. !

         Y Point defining the coastline (Straight line)
                   (YECST)  (KM)   Default: none    ! YECST = 0. !
```

```
       Number of stations in the region     Default: none ! NLB =  0 !
       (Surface stations + upper air stations)

       Station ID's  in the region   (METBXID(NLB))
       (Surface stations first, then upper air stations)
         ! METBXID =  0 !

!END!


-------------------------------------------------------------------------------

INPUT GROUP: 6 -- Mixing Height, Temperature and Precipitation Parameters
--------------

    EMPIRICAL MIXING HEIGHT CONSTANTS

       Neutral, mechanical equation
       (CONSTB)                             Default: 1.41   ! CONSTB = 1.41 !
       Convective mixing ht. equation
       (CONSTE)                             Default: 0.15   ! CONSTE = 0.15 !
       Stable mixing ht. equation
       (CONSTN)                             Default: 2400.  ! CONSTN = 2400.!
       Overwater mixing ht. equation
       (CONSTW)                             Default: 0.16   ! CONSTW = 0.16 !
       Absolute value of Coriolis
       parameter (FCORIOL)                  Default: 1.E-4  ! FCORIOL = 1.0E-04!
                                            Units: (1/s)

    SPATIAL AVERAGING OF MIXING HEIGHTS

       Conduct spatial averaging
       (IAVEZI)  (0=no, 1=yes)              Default: 1      ! IAVEZI =  1  !

       Max. search radius in averaging
       process (MNMDAV)                     Default: 1      ! MNMDAV =  10  !
                                            Units: Grid
                                                   cells
       Half-angle of upwind looking cone
       for averaging (HAFANG)               Default: 30.    ! HAFANG = 30. !
                                            Units: deg.
       Layer of winds used in upwind
       averaging (ILEVZI)                   Default: 1      ! ILEVZI =  1  !
       (must be between 1 and NZ)


    CONVECTIVE MIXING HEIGHT OPTIONS:
       Method to compute the convective
       mixing height(IMIHXH)                Default: 1      ! IMIXH =  1  !
           1: Maul-Carson for land and water cells
          -1: Maul-Carson for land cells only -
              OCD mixing height overwater
           2: Batchvarova and Gryning for land and water cells
          -2: Batchvarova and Gryning for land cells only
              OCD mixing height overwater

       Threshold buoyancy flux required to
       sustain convective mixing height growth
       overland (THRESHL)                   Default: 0.0   ! THRESHL = 0.0 !
       (expressed as a heat flux            units: W/m3
        per meter of boundary layer)


       Threshold buoyancy flux required to
       sustain convective mixing height growth
```

```
      overwater (THRESHW)                   Default: 0.05   ! THRESHW = 0.05 !
      (expressed as a heat flux             units: W/m3
       per meter of boundary layer)


      Flag to allow relaxation of convective mixing height
      to equilibrium value when  0<QH<THRESHL (overland)
                             or  0<QH<THRESHW (overwater)
      (IZICRLX)                             Default: 1      ! IZICRLX =  1  !
         0 : do NOT use convective mixing height relaxation
             to equilibrium value (treatment identical to CALMET v5.8)
         1 : use convective mixing height relaxation
             to equilibrium value

      Relaxation time of convective mixing height to
      equilibrium value when  0<QH<THRESHL (overland)
                          or  0<QH<THRESHW (overwater)
      (Used only if IZICRLX = 1 and  TZICRLX must be >= 1.)
      (TZICRLX)                             Default: 800.   ! TZICRLX =  800.  !
                                            Units: seconds

      Option for overwater lapse rates used
      in convective mixing height growth
      (ITWPROG)                             Default: 0      ! ITWPROG =  0  !
      0 : use SEA.DAT lapse rates and deltaT (or assume neutral
          conditions if missing)
      1 : use prognostic lapse rates (only if IPROG>2)
          and SEA.DAT deltaT (or neutral if missing)
      2 : use prognostic lapse rates and prognostic delta T
          (only if iprog>12 and 3D.DAT version# 2.0 or higher)

      Land Use category ocean in 3D.DAT datasets
      (ILUOC3D)                             Default: 16     ! ILUOC3D =  16  !
      Note: if 3D.DAT from MM5 version 3.0, iluoc3d = 16
            if MM4.DAT,           typically iluoc3d = 7


   OTHER MIXING HEIGHT VARIABLES

      Minimum potential temperature lapse
      rate in the stable layer above the
      current convective mixing ht.         Default: 0.001  ! DPTMIN = 0.001 !
      (DPTMIN)                              Units: deg. K/m
      Depth of layer above current conv.
      mixing height through which lapse     Default: 200.   ! DZZI = 200. !
      rate is computed (DZZI)               Units: meters

      Minimum overland mixing height        Default:  50.   ! ZIMIN = 50. !
      (ZIMIN)                               Units: meters
      Maximum overland mixing height        Default: 3000.  ! ZIMAX = 2500. !
      (ZIMAX)                               Units: meters
      Minimum overwater mixing height       Default:   50.  ! ZIMINW = 50. !
      (ZIMINW) -- (Not used if observed     Units: meters
      overwater mixing hts. are used)
      Maximum overwater mixing height       Default: 3000.  ! ZIMAXW = 2500. !
      (ZIMAXW) -- (Not used if observed     Units: meters
      overwater mixing hts. are used)


   OVERWATER SURFACE FLUXES METHOD and PARAMETERS
         (ICOARE)                           Default: 10      ! ICOARE =  10   !
          0: original deltaT method (OCD)
         10: COARE with no wave parameterization (jwave=0, Charnock)
         11: COARE with wave option jwave=1 (Oost et al.)
             and default wave properties
        -11: COARE with wave option jwave=1 (Oost et al.)
```

```
            and observed wave properties (must be in SEA.DAT files)
        12: COARE with wave option 2 (Taylor and Yelland)
             and default wave properties
       -12: COARE with wave option 2 (Taylor and Yelland)
            and observed wave properties (must be in SEA.DAT files)


        Note:  When ICOARE=0, similarity wind profile stability PSI functions
               based on Van Ulden and Holtslag (1985) are substituted for
               later formulations used with the COARE module, and temperatures
               used for surface layer parameters are obtained from either the
               nearest surface station temperature or prognostic model 2D
               temperatures (if ITPROG=2).



        Coastal/Shallow water length scale (DSHELF)
        (for modified z0 in shallow water)
        ( COARE fluxes only)
                                        Default : 0.        ! DSHELF = 0. !
                                        units: km

         COARE warm layer computation (IWARM)               ! IWARM =  0   !
         1: on - 0: off (must be off if SST measured with
         IR radiometer)                 Default: 0

         COARE cool skin layer computation (ICOOL)          ! ICOOL =  0   !
         1: on - 0: off (must be off if SST measured with
         IR radiometer)                 Default: 0

  RELATIVE HUMIDITY PARAMETERS

     3D relative humidity from observations or
     from prognostic data? (IRHPROG)       Default:0        ! IRHPROG =  0   !

        0 = Use RH from SURF.DAT file
            (only if NOOBS = 0,1)
        1 = Use prognostic RH
            (only if NOOBS = 0,1,2)

  TEMPERATURE PARAMETERS

     3D temperature from observations or
     from prognostic data? (ITPROG)        Default:0        ! ITPROG =  1   !

        0 = Use Surface and upper air stations
            (only if NOOBS = 0)
        1 = Use Surface stations (no upper air observations)
            Use MM5/3D for upper air data
            (only if NOOBS = 0,1)
        2 = No surface or upper air observations
            Use MM5/3D for surface and upper air data
            (only if NOOBS = 0,1,2)

     Interpolation type
     (1 = 1/R ; 2 = 1/R**2)                Default:1         ! IRAD =  1  !

     Radius of influence for temperature
     interpolation (TRADKM)                Default: 500.     ! TRADKM = 20. !
                                           Units: km

     Maximum Number of stations to include
     in temperature interpolation (NUMTS)  Default: 5        ! NUMTS = 5  !

     Conduct spatial averaging of temp-
     eratures (IAVET)  (0=no, 1=yes)       Default: 1        ! IAVET =  1  !
```

```
       (will use mixing ht MNMDAV,HAFANG
        so make sure they are correct)

       Default temperature gradient          Default: -.0098   ! TGDEFB = -0.0098 !
       below the mixing height over          Units: K/m
       water (TGDEFB)

       Default temperature gradient          Default: -.0045   ! TGDEFA = -0.0045 !
       above the mixing height over          Units: K/m
       water (TGDEFA)

       Beginning (JWAT1) and ending (JWAT2)
       land use categories for temperature                    ! JWAT1 =  999  !
       interpolation over water -- Make                       ! JWAT2 =  999  !
       bigger than largest land use to disable

   PRECIP INTERPOLATION PARAMETERS

       Method of interpolation (NFLAGP)      Default: 2       ! NFLAGP =  2  !
        (1=1/R,2=1/R**2,3=EXP/R**2)
       Radius of Influence  (SIGMAP)         Default: 100.0   ! SIGMAP = 50. !
        (0.0 => use half dist. btwn          Units: km
         nearest stns w & w/out
         precip when NFLAGP = 3)
       Minimum Precip. Rate Cutoff (CUTP)    Default: 0.01    ! CUTP = 0.01 !
        (values < CUTP = 0.0 mm/hr)          Units: mm/hr
!END!


--------------------------------------------------------------------------------

INPUT GROUP: 7 -- Surface meteorological station parameters
--------------

     SURFACE STATION VARIABLES
     (One record per station --  8  records in all)


             1     2
         Name   ID            X coord.   Y coord.   Time   Anem.
                               (km)       (km)      zone   Ht.(m)
       ----------------------------------------------------------
! SS1  ='COUR'   111111      680.050     4860.016    5    20  !
! SS2  ='RUND'   222222      681.958     4861.864    5    7.9 !
! SS3  ='OSHA'   071697      668.892     4865.761    5    10  !
! SS4  ='COBO'   071431      728.587     4870.940    5    10  !
! SS5  ='BUTT'   071639      631.101     4857.709    5    10  !
! SS6  ='BBTA'   071265      629.393     4831.751    5    10  !
! SS7  ='YYZA'   071624      610.389     4836.873    5    10  !
! SS8  ='TREN'   071621      777.397     4890.676    5    10  !



-------------------
      1
        Four character string for station name
        (MUST START IN COLUMN 9)

      2
        Six digit integer for station ID

!END!


--------------------------------------------------------------------------------
```

```
INPUT GROUP: 8 -- Upper air meteorological station parameters
--------------

     UPPER AIR STATION VARIABLES
     (One record per station --  3  records in all)

             1     2
         Name    ID      X coord.   Y coord.  Time zone
                           (km)       (km)
        -----------------------------------------------

-------------------
      1
        Four character string for station name
        (MUST START IN COLUMN 9)

      2
        Five digit integer for station ID

!END!


-------------------------------------------------------------------------------

INPUT GROUP: 9 -- Precipitation station parameters
--------------

     PRECIPITATION STATION VARIABLES
     (One record per station --  16  records in all)
     (NOT INCLUDED IF NPSTA = 0)

            1          2
         Name   Station    X coord.  Y coord.
                  Code       (km)      (km)
         ------------------------------------



-------------------
      1
        Four character string for station name
        (MUST START IN COLUMN 9)

      2
        Six digit station code composed of state
        code (first 2 digits) and station ID (last
        4 digits)

!END!
```

```
CALPUFF.INP     7.0            Groups 0f,0g added; new emission scaling
19117255 DYEC 2021 AQIA
CALPUFF Input File for DYEC 2021 Environmental Screening Assessment
(140 ktpa scenario - Unit Emission Rate )

---------------- Run title (3 lines) ------------------------------------------
   MODEL:  Version TNG
SOFTWARE:  CALApps v2.0197 (Beta) - September 22, 2014
-------------------------------------------------------------------------------

                    CALPUFF MODEL CONTROL FILE
                    --------------------------

-------------------------------------------------------------------------------

INPUT GROUP: 0 -- Input and Output File Names
--------------

Default Name  Type          File Name
------------  ----          ---------
CALMET.DAT    input    * METDAT =             *
    or
ISCMET.DAT    input    * ISCDAT =             *
    or
PLMMET.DAT    input    * PLMDAT =             *
    or
PROFILE.DAT   input    * PRFDAT =             *
SURFACE.DAT   input    * SFCDAT =             *
RESTARTB.DAT  input    * RSTARTB=             *
--------------------------------------------------------------------------------
CALPUFF.LST   output   ! PUFLST =CALPUFF.LST  !
CONC.DAT      output   ! CONDAT =CALPUFF.CON  !
DFLX.DAT      output   * DFDAT  =             *
WFLX.DAT      output   * WFDAT  =             *

VISB.DAT      output   * VISDAT =             *
TK2D.DAT      output   * T2DDAT =             *
RHO2D.DAT     output   * RHODAT =             *
RESTARTE.DAT  output   * RSTARTE=             *
--------------------------------------------------------------------------------
Other Files
-----------
OZONE.DAT     input    * OZDAT  =    *
VD.DAT        input    * VDDAT  =             *
CHEM.DAT      input    * CHEMDAT=             *
AUX           input    ! AUXEXT =    aux!
(Extension added to METDAT filename(s) for files
 with auxiliary 2D and 3D data)
H2O2.DAT      input    * H2O2DAT=             *
NH3Z.DAT      input    * NH3ZDAT=             *
HILL.DAT      input    * HILDAT=             *
HILLRCT.DAT   input    * RCTDAT=             *
COASTLN.DAT   input    ! CSTDAT=../../COAST-V2.DAT   !
FLUXBDY.DAT   input    * BDYDAT=             *
BCON.DAT      input    * BCNDAT=             *
DEBUG.DAT     output   * DEBUG =             *
MASSFLX.DAT   output   * FLXDAT=             *
MASSBAL.DAT   output   * BALDAT=             *
FOG.DAT       output   * FOGDAT=             *
RISE.DAT      output   * RISDAT=             *
PFTRAK.DAT    output   * TRKDAT=             *
--------------------------------------------------------------------------------
All file names will be converted to lower case if LCFILES = T
Otherwise, if LCFILES = F, file names will be converted to UPPER CASE
         T = lower case      ! LCFILES = F !
         F = UPPER CASE
```

```
NOTE: (1) file/path names can be up to 132 characters in length


Provision for multiple CALMET Domains and files
-----------------------------------------------------

     Number of CALMET.DAT Domains (NMETDOM)
                                Default: 1       ! NMETDOM =   1   !

     Number of CALMET.DAT files (NMETDAT)
     (Total for ALL Domains)
                                Default: 1       ! NMETDAT =   12   !

Variable point/area/volume/flare emissions input files
-------------------------------------------------------

     Number of POINT source files (PTEMARB.DAT)
     with time-varying data (NPTDAT)
                                Default: 0       ! NPTDAT =  0   !

     Number of BUOYANT AREA source files (BAEMARB.DAT)
     with time-varying data (NARDAT)
                                Default: 0       ! NARDAT =  0   !

     Number of VOLUME source files (VOLEMARB.DAT)
     with time-varying data (NVOLDAT)
                                Default: 0       ! NVOLDAT =  0  !

     Number of FLARE source files (FLEMARB.DAT)
     with time-varying data (NFLDAT)
                                Default: 0       ! NFLDAT   =  0 !

     Number of ROAD source files (RDEMARB.DAT)
     with time-varying data (NRDDAT)
                                Default: 0       ! NRDDAT   =  0 !

     Number of BUOYANT LINE source files (LNEMARB.DAT)
     with time-varying data (NLNDAT)
                                Default: 0       ! NLNDAT   =  0 !
     Note:  Only 1 BUOYANT LINE source file is allowed
     -----

!END!


-------------
Subgroup (0a)
-------------

  Provide a name for each CALMET domain if NMETDOM > 1
  Enter NMETDOM lines.
                                    a,b
Default Name             Domain Name
------------             ------------
 none                  * DOMAIN1=     *   *END*
 none                  * DOMAIN2=     *   *END*
 none                  * DOMAIN3=     *   *END*


  The following CALMET.DAT filenames are processed in sequence
  if NMETDAT > 1

  Enter NMETDAT lines, 1 line for each file name.

                                     a,c,d
Default Name  Type          File Name
```

```
------------  ----        ---------
 none         input    ! METDAT=../CALMET_W1.DAT!   !END!
 none         input    ! METDAT=../CALMET_W2.DAT!   !END!
 none         input    ! METDAT=../CALMET_SP3.DAT!  !END!
 none         input    ! METDAT=../CALMET_SP4.DAT!   !END!
 none         input    ! METDAT=../CALMET_SP5.DAT!   !END!
 none         input    ! METDAT=../CALMET_SU6.DAT!  !END!
 none         input    ! METDAT=../CALMET_SU7.DAT!   !END!
 none         input    ! METDAT=../CALMET_SU8.DAT!   !END!
 none         input    ! METDAT=../CALMET_F9.DAT!   !END!
 none         input    ! METDAT=../CALMET_F10.DAT!   !END!
 none         input    ! METDAT=../CALMET_F11.DAT!   !END!
 none         input    ! METDAT=../CALMET_W12.DAT!  !END!

-------------
    a
     The name for each CALMET domain and each CALMET.DAT file is treated
     as a separate input subgroup and therefore must end with an input
     group terminator.
    b
     Use DOMAIN1= to assign the name for the outermost CALMET domain.
     Use DOMAIN2= to assign the name for the next inner CALMET domain.
     Use DOMAIN3= to assign the name for the next inner CALMET domain, etc.
      --------------------------------------------------------------------
      |   When inner domains with equal resolution (grid-cell size)      |
      |   overlap, the data from the FIRST such domain in the list will  |
      |   be used if all other criteria for choosing the controlling     |
      |   grid domain are inconclusive.                                  |
      --------------------------------------------------------------------
    c
     Use METDAT1= to assign the file names for the outermost CALMET domain.
     Use METDAT2= to assign the file names for the next inner CALMET domain.
     Use METDAT3= to assign the file names for the next inner CALMET domain, etc.
    d
     The filenames for each domain must be provided in sequential order


-------------
Subgroup (0b) - PTEMARB.DAT files
-------------

  POINT Source File Names
  The following PTEMARB.DAT filenames are processed if NPTDAT>0
  A total of NPTDAT lines is expected with one file name assigned per line
  Each line is treated as an input group and must terminate with END
  (surrounded by delimiters)
  (Each file contains emissions parameters for the entire period modeled
   for 1 or more sources)

Default Name  Type          File Name
------------  ----          ---------
 none         input       * PTDAT=     *   *END*


-------------
Subgroup (0c) - BAEMARB.DAT files
-------------

  BUOYANT AREA Source File Names
  The following BAEMARB.DAT filenames are processed if NARDAT>0
  A total of NARDAT lines is expected with one file name assigned per line
  Each line is treated as an input group and must terminate with END
  (surrounded by delimiters)
  (Each file contains emissions parameters for the entire period modeled
   for 1 or more sources)
```

```
Default Name  Type          File Name
------------  ----          ---------
 none         input       * ARDAT=     *   *END*


-------------
Subgroup (0d) - VOLEMARB.DAT files
-------------

  VOLUME Source File Names
  The following VOLEMARB.DAT filenames are processed if NVOLDAT>0
  A total of NVOLDAT lines is expected with one file name assigned per line
  Each line is treated as an input group and must terminate with END
  (surrounded by delimiters)
  (Each file contains emissions parameters for the entire period modeled
   for 1 or more sources)

Default Name  Type          File Name
------------  ----          ---------
 none         input       * VOLDAT=     *   *END*


-------------
Subgroup (0e) - FLEMARB.DAT files
-------------

  FLARE Source File Names
  The following FLEMARB.DAT filenames are processed if NFLDAT>0
  A total of NFLDAT lines is expected with one file name assigned per line
  Each line is treated as an input group and must terminate with END
  (surrounded by delimiters)
  (Each file contains emissions parameters for the entire period modeled
   for 1 or more sources)

Default Name  Type          File Name
------------  ----          ---------
 none         input       * FLDAT=     *   *END*


-------------
Subgroup (0f) - RDEMARB.DAT files
-------------

  ROAD Source File Names
  The following RDEMARB.DAT filenames are processed if NRDDAT>0
  A total of NRDDAT lines is expected with one file name assigned per line
  Each line is treated as an input group and must terminate with END
  (surrounded by delimiters)
  (Each file contains emissions parameters for the entire period modeled
   for 1 or more sources)

Default Name  Type          File Name
------------  ----          ---------
 none         input       * RDDAT=     *   *END*


-------------
Subgroup (0g) - LNEMARB.DAT file
-------------

  BUOYANT LINE Source File Name  (not more than 1)
  The following LNEMARB.DAT filename is processed if NLNDAT>0
  The assignment is treated as an input group and must terminate with END
  (surrounded by delimiters)

Default Name  Type          File Name
```

```
------------  ----          ---------
LNEMARB.DAT   input       * LNDAT=     *   *END*


--------------------------------------------------------------------------------

INPUT GROUP: 1 -- General run control parameters
--------------

    Option to run all periods found
    in the met. file     (METRUN)   Default: 0       ! METRUN =   0  !

         METRUN = 0 - Run period explicitly defined below
         METRUN = 1 - Run all periods in met. file

     Starting date:    Year   (IBYR)  --    No default   ! IBYR  =  2014  !
                       Month  (IBMO)  --    No default   ! IBMO  =  1  !
                       Day    (IBDY)  --    No default   ! IBDY  =  1  !
     Starting time:    Hour   (IBHR)  --    No default   ! IBHR  =  0  !
                       Minute (IBMIN) --    No default   ! IBMIN =  0  !
                       Second (IBSEC) --    No default   ! IBSEC =  0  !

     Ending date:      Year   (IEYR)  --    No default   ! IEYR  =  2014  !
                       Month  (IEMO)  --    No default   ! IEMO  =  12  !
                       Day    (IEDY)  --    No default   ! IEDY  =  31  !
     Ending time:      Hour   (IEHR)  --    No default   ! IEHR  =  24  !
                       Minute (IEMIN) --    No default   ! IEMIN =  0  !
                       Second (IESEC) --    No default   ! IESEC =  0  !

     (These are only used if METRUN = 0)

     Base time zone:          (ABTZ)  --    No default   ! ABTZ= UTC-0500 !
      (character*8)
     The modeling domain may span multiple time zones.  ABTZ defines the
     base time zone used for the entire simulation.  This must match the
     base time zone of the meteorological data.
     Examples:
         Greenwich Mean Time (GMT) = UTC+0000
         EST                       = UTC-0500
         CST                       = UTC-0600
         MST                       = UTC-0700
         PST                       = UTC-0800
         Los Angeles, USA          = UTC-0800
         New York, USA             = UTC-0500
         Santiago, Chile           = UTC-0400
         UK                        = UTC+0000
         Western Europe            = UTC+0100
         Rome, Italy               = UTC+0100
         Cape Town, S.Africa       = UTC+0200
         Sydney, Australia         = UTC+1000

     Length of modeling time-step (seconds)
     Equal to update period in the primary
     meteorological data files, or an
     integer fraction of it (1/2, 1/3 ...)
     Must be no larger than 1 hour
     (NSECDT)                         Default:3600     ! NSECDT =  3600  !
                                      Units: seconds

     Number of chemical species (NSPEC)
                                      Default: 5       ! NSPEC =  1   !

     Number of chemical species
     to be emitted  (NSE)             Default: 3       ! NSE =  1   !

     Flag to stop run after
```

```
     SETUP phase (ITEST)             Default: 2       ! ITEST =  2   !
     (Used to allow checking
     of the model inputs, files, etc.)
           ITEST = 1 - STOPS program after SETUP phase
           ITEST = 2 - Continues with execution of program
                       after SETUP

     Restart Configuration:

        Control flag (MRESTART)      Default: 0       ! MRESTART =  0   !

           0 = Do not read or write a restart file
           1 = Read a restart file at the beginning of
               the run
           2 = Write a restart file during run
           3 = Read a restart file at beginning of run
               and write a restart file during run

        Number of periods in Restart
        output cycle (NRESPD)        Default: 0       ! NRESPD =  0   !

           0 = File written only at last period
          >0 = File updated every NRESPD periods

     Meteorological Data Format (METFM)
                                     Default: 1       ! METFM =  1   !

           METFM = 1 - CALMET binary file (CALMET.MET)
           METFM = 2 - ISC ASCII file (ISCMET.MET)
           METFM = 3 - AUSPLUME ASCII file (PLMMET.MET)
           METFM = 4 - CTDM plus tower file (PROFILE.DAT) and
                       surface parameters file (SURFACE.DAT)
           METFM = 5 - AERMET tower file (PROFILE.DAT) and
                       surface parameters file (SURFACE.DAT)

     Meteorological Profile Data Format (MPRFFM)
            (used only for METFM = 1, 2, 3)
                                     Default: 1       ! MPRFFM =  1   !

           MPRFFM = 1 - CTDM plus tower file (PROFILE.DAT)
           MPRFFM = 2 - AERMET tower file (PROFILE.DAT)


     Sigma-y is adjusted by the factor (AVET/PGTIME)**0.2 to either
     decrease it if the averaging time selected is less than the base
     averaging time, or increase it if the averaging time is greater.
     The base averaging time is denoted as PGTIME due to historical
     reasons as this adjustment was originally applied to the PG sigma
     option.  It is now applied to all dispersion options.
     The factor is applied to the ambient turbulence sigma-v (m/s) and
     does not alter buoyancy enhancement or far-field Heffter growth.

     Averaging Time (minutes) (AVET)
                                     Default: 60.0    ! AVET = 60. !
     Base Averaging Time (minutes) (PGTIME)
                                     Default: 60.0    ! PGTIME = 60. !


     Output units for binary concentration and flux files
     written in Dataset v2.2 or later formats
     (IOUTU)                         Default: 1       ! IOUTU = 1 !
         1 = mass      -  g/m3 (conc) or g/m2/s (dep)
         2 = odour     -  odour_units (conc)
         3 = radiation -  Bq/m3 (conc) or Bq/m2/s (dep)
```

```
!END!


-------------------------------------------------------------------------------

INPUT GROUP: 2 -- Technical options
--------------


     Vertical distribution used in the
     near field (MGAUSS)                   Default: 1     ! MGAUSS =  1   !
        0 = uniform
        1 = Gaussian

     Terrain adjustment method
     (MCTADJ)                              Default: 3     ! MCTADJ =  3   !
        0 = no adjustment
        1 = ISC-type of terrain adjustment
        2 = simple, CALPUFF-type of terrain
            adjustment
        3 = partial plume path adjustment

     Subgrid-scale complex terrain
     flag (MCTSG)                          Default: 0     ! MCTSG =  0   !
        0 = not modeled
        1 = modeled

     Near-field puffs modeled as
     elongated slugs? (MSLUG)              Default: 0     ! MSLUG =  0   !
        0 = no
        1 = yes (slug model used)

     Transitional plume rise modeled?
     (MTRANS)                              Default: 1     ! MTRANS =  1   !
        0 = no  (i.e., final rise only)
        1 = yes (i.e., transitional rise computed)

     Stack tip downwash? (MTIP)            Default: 1     ! MTIP =  1  !
        0 = no  (i.e., no stack tip downwash)
        1 = yes (i.e., use stack tip downwash)

     Method used to compute plume rise for
     point sources not subject to building
     downwash? (MRISE)                     Default: 1     ! MRISE =   1  !
        1 = Briggs plume rise
        2 = Numerical plume rise

     Apply stack-tip downwash to FLARE sources?
     (MTIP_FL)                             Default: 0     ! MTIP_FL  =  0 !
        0 = no  (no stack-tip downwash)
        1 = yes (apply stack-tip downwash)

     Plume rise module for FLARE sources
     (MRISE_FL)                            Default: 2     ! MRISE_FL =  2 !
        1 = Briggs module
        2 = Numerical rise module

     Method used to simulate building
     downwash? (MBDW)                      Default: 1     ! MBDW =   2  !
        1 = ISC method
        2 = PRIME method

     Vertical wind shear modeled above
     stack top (modified Briggs plume rise)?
     (MSHEAR)                              Default: 0     ! MSHEAR =  0   !
        0 = no  (i.e., vertical wind shear not modeled)
```

```
   1 = yes (i.e., vertical wind shear modeled)

Puff splitting allowed? (MSPLIT)      Default: 0     ! MSPLIT =  0  !
   0 = no (i.e., puffs not split)
   1 = yes (i.e., puffs are split)

Chemical mechanism flag (MCHEM)       Default: 1     ! MCHEM =  0   !
   0 = chemical transformation not
       modeled
   1 = transformation rates computed
       internally (MESOPUFF II scheme)
   2 = user-specified transformation
       rates used
   3 = transformation rates computed
       internally (RIVAD/ARM3 scheme)
   4 = secondary organic aerosol formation
       computed (MESOPUFF II scheme for OH)
   5 = user-specified half-life with or
       without transfer to child species
   6 = transformation rates computed
       internally (Updated RIVAD scheme with
       ISORROPIA equilibrium)
   7 = transformation rates computed
       internally (Updated RIVAD scheme with
       ISORROPIA equilibrium and CalTech SOA)

Aqueous phase transformation flag (MAQCHEM)
(Used only if MCHEM = 6, or 7)        Default: 0     ! MAQCHEM =  0   !
   0 = aqueous phase transformation
       not modeled
   1 = transformation rates and wet
       scavenging coefficients adjusted
       for in-cloud aqueous phase reactions
       (adapted from RADM cloud model
        implementation in CMAQ/SCICHEM)

Liquid Water Content flag (MLWC)
(Used only if MAQCHEM = 1)            Default: 1     ! MLWC =  1   !
   0 = water content estimated from cloud cover
       and presence of precipitation
   1 = gridded cloud water data read from CALMET
       water content output files (filenames are
       the CALMET.DAT names PLUS the extension
       AUXEXT provided in Input Group 0)

Wet removal modeled ? (MWET)          Default: 1     ! MWET =  0   !
   0 = no
   1 = yes

Dry deposition modeled ? (MDRY)       Default: 1     ! MDRY =  0   !
   0 = no
   1 = yes
   (dry deposition method specified
    for each species in Input Group 3)


Gravitational settling (plume tilt)
modeled ? (MTILT)                     Default: 0     ! MTILT =  0   !
   0 = no
   1 = yes
   (puff center falls at the gravitational
    settling velocity for 1 particle species)

Restrictions:
    - MDRY  = 1
    - NSPEC = 1  (must be particle species as well)
```

```
         - sg    = 0  GEOMETRIC STANDARD DEVIATION in Group 8 is
                      set to zero for a single particle diameter

     Method used to compute dispersion
     coefficients (MDISP)                Default: 3     ! MDISP =  2   !

        1 = dispersion coefficients computed from measured values
            of turbulence, sigma v, sigma w
        2 = dispersion coefficients from internally calculated
            sigma v, sigma w using micrometeorological variables
            (u*, w*, L, etc.)
        3 = PG dispersion coefficients for RURAL areas (computed using
            the ISCST multi-segment approximation) and MP coefficients in
            urban areas
        4 = same as 3 except PG coefficients computed using
            the MESOPUFF II eqns.
        5 = CTDM sigmas used for stable and neutral conditions.
            For unstable conditions, sigmas are computed as in
            MDISP = 3, described above.  MDISP = 5 assumes that
            measured values are read

     Sigma-v/sigma-theta, sigma-w measurements used? (MTURBVW)
     (Used only if MDISP = 1 or 5)       Default: 3     ! MTURBVW =  3  !
        1 = use sigma-v or sigma-theta measurements
            from PROFILE.DAT to compute sigma-y
            (valid for METFM = 1, 2, 3, 4, 5)
        2 = use sigma-w measurements
            from PROFILE.DAT to compute sigma-z
            (valid for METFM = 1, 2, 3, 4, 5)
        3 = use both sigma-(v/theta) and sigma-w
            from PROFILE.DAT to compute sigma-y and sigma-z
            (valid for METFM = 1, 2, 3, 4, 5)
        4 = use sigma-theta measurements
            from PLMMET.DAT to compute sigma-y
            (valid only if METFM = 3)

     Back-up method used to compute dispersion
     when measured turbulence data are
     missing (MDISP2)                    Default: 3     ! MDISP2 =  3  !
     (used only if MDISP = 1 or 5)
        2 = dispersion coefficients from internally calculated
            sigma v, sigma w using micrometeorological variables
            (u*, w*, L, etc.)
        3 = PG dispersion coefficients for RURAL areas (computed using
            the ISCST multi-segment approximation) and MP coefficients in
            urban areas
        4 = same as 3 except PG coefficients computed using
            the MESOPUFF II eqns.

     [DIAGNOSTIC FEATURE]
     Method used for Lagrangian timescale for Sigma-y
     (used only if MDISP=1,2 or MDISP2=1,2)
     (MTAULY)                            Default: 0     ! MTAULY =  0  !
        0 = Draxler default 617.284 (s)
        1 = Computed as Lag. Length / (.75 q) -- after SCIPUFF
       10 < Direct user input (s)             -- e.g., 306.9


     [DIAGNOSTIC FEATURE]
     Method used for Advective-Decay timescale for Turbulence
     (used only if MDISP=2 or MDISP2=2)
     (MTAUADV)                           Default: 0     ! MTAUADV =  0  !
        0 = No turbulence advection
        1 = Computed (OPTION NOT IMPLEMENTED)
       10 < Direct user input (s)   -- e.g., 800
```

```
Method used to compute turbulence sigma-v &
sigma-w using micrometeorological variables
(Used only if MDISP = 2 or MDISP2 = 2)
(MCTURB)                              Default: 1     ! MCTURB =  1  !
   1 = Standard CALPUFF subroutines
   2 = AERMOD subroutines

PG sigma-y,z adj. for roughness?      Default: 0     ! MROUGH =  0  !
(MROUGH)
   0 = no
   1 = yes

Partial plume penetration of          Default: 1     ! MPARTL =  1  !
elevated inversion modeled for
point sources?
(MPARTL)
   0 = no
   1 = yes

Partial plume penetration of          Default: 1     ! MPARTLBA =  1  !
elevated inversion modeled for
buoyant area sources?
(MPARTLBA)
   0 = no
   1 = yes

Strength of temperature inversion     Default: 0     ! MTINV =  0  !
provided in PROFILE.DAT extended records?
(MTINV)
   0 = no (computed from measured/default gradients)
   1 = yes

PDF used for dispersion under convective conditions?
                                      Default: 0     ! MPDF =  1  !
(MPDF)
   0 = no
   1 = yes

Sub-Grid TIBL module used for shore line?
                                      Default: 0     ! MSGTIBL = 1  !
(MSGTIBL)
   0 = no
   1 = yes

Boundary conditions (concentration) modeled?
                                      Default: 0     ! MBCON = 0  !
(MBCON)
   0 = no
   1 = yes, using formatted BCON.DAT file
   2 = yes, using unformatted CONC.DAT file

Note:  MBCON > 0 requires that the last species modeled
       be 'BCON'.  Mass is placed in species BCON when
       generating boundary condition puffs so that clean
       air entering the modeling domain can be simulated
       in the same way as polluted air.  Specify zero
       emission of species BCON for all regular sources.

Individual source contributions saved?
                                      Default: 0     ! MSOURCE = 0  !
(MSOURCE)
   0 = no
   1 = yes
```

```
     Analyses of fogging and icing impacts due to emissions from
     arrays of mechanically-forced cooling towers can be performed
     using CALPUFF in conjunction with a cooling tower emissions
     processor (CTEMISS) and its associated postprocessors.  Hourly
     emissions of water vapor and temperature from each cooling tower
     cell are computed for the current cell configuration and ambient
     conditions by CTEMISS. CALPUFF models the dispersion of these
     emissions and provides cloud information in a specialized format
     for further analysis. Output to FOG.DAT is provided in either
     'plume mode' or 'receptor mode' format.

     Configure for FOG Model output?
                                        Default: 0     ! MFOG =  0   !
     (MFOG)
        0 = no
        1 = yes  - report results in PLUME Mode format
        2 = yes  - report results in RECEPTOR Mode format


     Test options specified to see if
     they conform to regulatory
     values? (MREG)                     Default: 1     ! MREG =  0   !

        0 = NO checks are made
        1 = Technical options must conform to USEPA
            Long Range Transport (LRT) guidance
                       METFM    1 or 2
                       AVET     60. (min)
                       PGTIME   60. (min)
                       MGAUSS   1
                       MCTADJ   3
                       MTRANS   1
                       MTIP     1
                       MRISE    1
                       MCHEM    1 or 3 (if modeling SOx, NOx)
                       MWET     1
                       MDRY     1
                       MDISP    2 or 3
                       MPDF     0 if MDISP=3
                                1 if MDISP=2
                       MROUGH   0
                       MPARTL   1
                       MPARTLBA 0
                       SYTDEP   550. (m)
                       MHFTSZ   0
                       SVMIN    0.5 (m/s)


!END!


--------------------------------------------------------------------------------

INPUT GROUP: 3a, 3b -- Species list
-------------------

------------
Subgroup (3a)
------------

  The following species are modeled:

! CSPEC =          UNIT !         !END!


                                                          Dry                OUTPUT GROUP
```

```
    SPECIES          MODELED          EMITTED       DEPOSITED               NUMBER
     NAME         (0=NO, 1=YES)    (0=NO, 1=YES)    (0=NO,                 (0=NONE,
   (Limit: 12                                        1=COMPUTED-GAS        1=1st CGRUP,
    Characters                                       2=COMPUTED-PARTICLE   2=2nd CGRUP,
    in length)                                       3=USER-SPECIFIED)     3= etc.)

!          UNIT  =         1,               1,           0,                  0   !


!END!

  Note:  The last species in (3a) must be 'BCON' when using the
         boundary condition option (MBCON > 0).  Species BCON should
         typically be modeled as inert (no chem transformation or
         removal).


-------------
Subgroup (3b)
-------------
  The following names are used for Species-Groups in which results
  for certain species are combined (added) prior to output.  The
  CGRUP name will be used as the species name in output files.
  Use this feature to model specific particle-size distributions
  by treating each size-range as a separate species.
  Order must be consistent with 3(a) above.



--------------------------------------------------------------------------------


INPUT GROUP: 4 -- Map Projection and Grid control parameters
--------------

     Projection for all (X,Y):
     -------------------------

     Map projection
     (PMAP)                     Default: UTM    ! PMAP = UTM  !

         UTM :  Universal Transverse Mercator
         TTM :  Tangential Transverse Mercator
         LCC :  Lambert Conformal Conic
          PS :  Polar Stereographic
          EM :  Equatorial Mercator
        LAZA :  Lambert Azimuthal Equal Area

     False Easting and Northing (km) at the projection origin
     (Used only if PMAP= TTM, LCC, or LAZA)
     (FEAST)                    Default=0.0     ! FEAST  = 0.000  !
     (FNORTH)                   Default=0.0     ! FNORTH = 0.000  !

     UTM zone (1 to 60)
     (Used only if PMAP=UTM)
     (IUTMZN)                   No Default      ! IUTMZN =  17   !

     Hemisphere for UTM projection?
     (Used only if PMAP=UTM)
     (UTMHEM)                   Default: N      ! UTMHEM = N  !
         N   :  Northern hemisphere projection
         S   :  Southern hemisphere projection

     Latitude and Longitude (decimal degrees) of projection origin
     (Used only if PMAP= TTM, LCC, PS, EM, or LAZA)
     (RLAT0)                    No Default      ! RLAT0 = 0N  !
```

```
     (RLON0)                    No Default      ! RLON0 = 0E  !

         TTM :  RLON0 identifies central (true N/S) meridian of projection
                RLAT0 selected for convenience
         LCC :  RLON0 identifies central (true N/S) meridian of projection
                RLAT0 selected for convenience
         PS  :  RLON0 identifies central (grid N/S) meridian of projection
                RLAT0 selected for convenience
         EM  :  RLON0 identifies central meridian of projection
                RLAT0 is REPLACED by 0.0N (Equator)
         LAZA:  RLON0 identifies longitude of tangent-point of mapping plane
                RLAT0 identifies latitude of tangent-point of mapping plane

     Matching parallel(s) of latitude (decimal degrees) for projection
     (Used only if PMAP= LCC or PS)
     (XLAT1)                    No Default      ! XLAT1 = 0N  !
     (XLAT2)                    No Default      ! XLAT2 = 0N  !

         LCC :  Projection cone slices through Earth's surface at XLAT1 and XLAT2
         PS  :  Projection plane slices through Earth at XLAT1
                (XLAT2 is not used)

     ----------
     Note:  Latitudes and longitudes should be positive, and include a
            letter N,S,E, or W indicating north or south latitude, and
            east or west longitude.  For example,
            35.9  N Latitude  =  35.9N
            118.7 E Longitude = 118.7E


     Datum-region
     ------------

     The Datum-Region for the coordinates is identified by a character
     string.  Many mapping products currently available use the model of the
     Earth known as the World Geodetic System 1984 (WGS-84).  Other local
     models may be in use, and their selection in CALMET will make its output
     consistent with local mapping products.  The list of Datum-Regions with
     official transformation parameters is provided by the National Imagery and
     Mapping Agency (NIMA).

     NIMA Datum - Regions(Examples)
     ------------------------------------------------------------------------------
     WGS-84    WGS-84 Reference Ellipsoid and Geoid, Global coverage (WGS84)
     NAS-C     NORTH AMERICAN 1927 Clarke 1866 Spheroid, MEAN FOR CONUS (NAD27)
     NAR-C     NORTH AMERICAN 1983 GRS 80 Spheroid, MEAN FOR CONUS (NAD83)
     NWS-84    NWS 6370KM Radius, Sphere
     ESR-S     ESRI REFERENCE 6371KM Radius, Sphere

     Datum-region for output coordinates
     (DATUM)                    Default: WGS-84    ! DATUM = WGS-84  !


METEOROLOGICAL Grid (outermost if nested CALMET grids are used):

     Rectangular grid defined for projection PMAP,
     with X the Easting and Y the Northing coordinate

            No. X grid cells (NX)      No default     ! NX =  160   !
            No. Y grid cells (NY)      No default     ! NY =  160   !
        No. vertical layers (NZ)       No default     ! NZ =  8     !

           Grid spacing (DGRIDKM)      No default     ! DGRIDKM = 0.25 !
                                       Units: km

                Cell face heights
```

```
                  (ZFACE(nz+1))      No defaults
                                     Units: m
   ! ZFACE = .0, 20.0, 50.0, 100.0, 200.0, 500.0, 1000.0, 2000.0, 3300.0 !

            Reference Coordinates
           of SOUTHWEST corner of
                 grid cell(1, 1):

            X coordinate (XORIGKM)     No default     ! XORIGKM = 662.536 !
            Y coordinate (YORIGKM)     No default     ! YORIGKM = 4845.0 !
                                      Units: km


COMPUTATIONAL Grid:

     The computational grid is identical to or a subset of the MET. grid.
     The lower left (LL) corner of the computational grid is at grid point
     (IBCOMP, JBCOMP) of the MET. grid.  The upper right (UR) corner of the
     computational grid is at grid point (IECOMP, JECOMP) of the MET. grid.
     The grid spacing of the computational grid is the same as the MET. grid.

        X index of LL corner (IBCOMP)      No default     ! IBCOMP =  1   !
                  (1 <= IBCOMP <= NX)

        Y index of LL corner (JBCOMP)      No default     ! JBCOMP =  1   !
                  (1 <= JBCOMP <= NY)


        X index of UR corner (IECOMP)      No default     ! IECOMP =  160  !
                  (1 <= IECOMP <= NX)

        Y index of UR corner (JECOMP)      No default     ! JECOMP =  160   !
                  (1 <= JECOMP <= NY)



SAMPLING Grid (GRIDDED RECEPTORS):

     The lower left (LL) corner of the sampling grid is at grid point
     (IBSAMP, JBSAMP) of the MET. grid.  The upper right (UR) corner of the
     sampling grid is at grid point (IESAMP, JESAMP) of the MET. grid.
     The sampling grid must be identical to or a subset of the computational
     grid.  It may be a nested grid inside the computational grid.
     The grid spacing of the sampling grid is DGRIDKM/MESHDN.

        Logical flag indicating if gridded
        receptors are used (LSAMP)         Default: T     ! LSAMP = F !
        (T=yes, F=no)

        X index of LL corner (IBSAMP)      No default     ! IBSAMP =  0   !
         (IBCOMP <= IBSAMP <= IECOMP)

        Y index of LL corner (JBSAMP)      No default     ! JBSAMP =  0   !
         (JBCOMP <= JBSAMP <= JECOMP)


        X index of UR corner (IESAMP)      No default     ! IESAMP =  0   !
         (IBCOMP <= IESAMP <= IECOMP)

        Y index of UR corner (JESAMP)      No default     ! JESAMP =  0   !
         (JBCOMP <= JESAMP <= JECOMP)


       Nesting factor of the sampling
        grid (MESHDN)                      Default: 1     ! MESHDN =  1  !
        (MESHDN is an integer >= 1)
```

```
!END!

-------------------------------------------------------------------------------


INPUT GROUP: 5 -- Output Options
--------------
                                    *                            *
     FILE                       DEFAULT VALUE             VALUE THIS RUN
     ----                       -------------             --------------

   Concentrations (ICON)              1                   !  ICON =  1   !
   Dry Fluxes (IDRY)                  1                   !  IDRY =  0   !
   Wet Fluxes (IWET)                  1                   !  IWET =  0   !
   2D Temperature (IT2D)              0                   !  IT2D =  0   !
   2D Density (IRHO)                  0                   !  IRHO =  0   !
   Relative Humidity (IVIS)           1                   !  IVIS =  0   !
    (relative humidity file is
     required for visibility
     analysis)
   Use data compression option in output file?
   (LCOMPRS)                           Default: T         ! LCOMPRS = T !

   *
    0 = Do not create file, 1 = create file


    QA PLOT FILE OUTPUT OPTION:

       Create a standard series of output files (e.g.
       locations of sources, receptors, grids ...)
       suitable for plotting?
       (IQAPLOT)                       Default: 1         ! IQAPLOT =  1   !
         0 = no
         1 = yes

    DIAGNOSTIC PUFF-TRACKING OUTPUT OPTION:

       Puff locations and properties reported to
       PFTRAK.DAT file for postprocessing?
       (IPFTRAK)                       Default: 0         ! IPFTRAK =  0   !
         0 = no
         1 = yes, update puff output at end of each timestep
         2 = yes, update puff output at end of each sampling step

    DIAGNOSTIC MASS FLUX OUTPUT OPTIONS:

       Mass flux across specified boundaries
       for selected species reported?
       (IMFLX)                         Default: 0         ! IMFLX =  0  !
         0 = no
         1 = yes (FLUXBDY.DAT and MASSFLX.DAT filenames
                are specified in Input Group 0)

       Mass balance for each species
       reported?
       (IMBAL)                         Default: 0         ! IMBAL =  0 !
         0 = no
         1 = yes (MASSBAL.DAT filename is
             specified in Input Group 0)


    NUMERICAL RISE OUTPUT OPTION:
```

```
       Create a file with plume properties for each rise
       increment, for each model timestep?
       This applies to sources modeled with numerical rise
       and is limited to ONE source in the run.
       (INRISE)                        Default: 0         ! INRISE =  0   !
         0 = no
         1 = yes (RISE.DAT filename is
                  specified in Input Group 0)


    LINE PRINTER OUTPUT OPTIONS:

       Print concentrations (ICPRT)    Default: 0         ! ICPRT =  1   !
       Print dry fluxes (IDPRT)        Default: 0         ! IDPRT =  0   !
       Print wet fluxes (IWPRT)        Default: 0         ! IWPRT =  0   !
       (0 = Do not print, 1 = Print)

       Concentration print interval
       (ICFRQ) in timesteps            Default: 1         ! ICFRQ =  1   !
       Dry flux print interval
       (IDFRQ) in timesteps            Default: 1         ! IDFRQ =  1   !
       Wet flux print interval
       (IWFRQ) in timesteps            Default: 1         ! IWFRQ =  1   !

       Units for Line Printer Output
       (IPRTU)                         Default: 1         ! IPRTU =  3   !
                       for            for
                  Concentration    Deposition
           1 =       g/m**3         g/m**2/s
           2 =      mg/m**3        mg/m**2/s
           3 =      ug/m**3        ug/m**2/s
           4 =      ng/m**3        ng/m**2/s
           5 =     Odour Units
           6 =      TBq/m**3       TBq/m**2/s    TBq=terabecquerel
           7 =      GBq/m**3       GBq/m**2/s    GBq=gigabecquerel
           8 =       Bq/m**3        Bq/m**2/s    Bq=becquerel (disintegrations/s)

       Messages tracking progress of run
       written to the screen ?
       (IMESG)                         Default: 2         ! IMESG =  2   !
         0 = no
         1 = yes (advection step, puff ID)
         2 = yes (YYYYJJJHH, # old puffs, # emitted puffs)


     SPECIES (or GROUP for combined species) LIST FOR OUTPUT OPTIONS

                ---- CONCENTRATIONS ----   ------ DRY FLUXES ------   ------ WET FLUXES ---
                    ---   -- MASS FLUX --
   SPECIES
   /GROUP        PRINTED?  SAVED ON DISK?   PRINTED?  SAVED ON DISK?   PRINTED?  SAVED ON
       DISK?   SAVED ON DISK?
   -------      ------------------------   ------------------------   ---------------0-----
       ---   ---------------
!          UNIT =     1,           1,           0,           0,           0,           0,
    0   !


  Note:  Species BCON (for MBCON > 0) does not need to be saved on disk.


     OPTIONS FOR PRINTING "DEBUG" QUANTITIES (much output)

       Logical for debug output
       (LDEBUG)                                 Default: F     ! LDEBUG = F !
```

```
       First puff to track
       (IPFDEB)                                 Default: 1     ! IPFDEB =  1  !

       Number of puffs to track
       (NPFDEB)                                 Default: 1     ! NPFDEB =  1  !

       Met. period to start output
       (NN1)                                    Default: 1     ! NN1 =  1   !

       Met. period to end output
       (NN2)                                    Default: 10    ! NN2 =  10  !

!END!


-------------------------------------------------------------------------------


INPUT GROUP: 6a, 6b, & 6c -- Subgrid scale complex terrain inputs
-------------------------

---------------
Subgroup (6a)
---------------
       Number of terrain features (NHILL)       Default: 0     ! NHILL =  0   !

       Number of special complex terrain
       receptors  (NCTREC)                      Default: 0     ! NCTREC =  0   !

       Terrain and CTSG Receptor data for
       CTSG hills input in CTDM format ?
       (MHILL)                                  No Default     ! MHILL =  2   !
       1 = Hill and Receptor data created
           by CTDM processors & read from
           HILL.DAT and HILLRCT.DAT files
       2 = Hill data created by OPTHILL &
           input below in Subgroup (6b);
           Receptor data in Subgroup (6c)

       Factor to convert horizontal dimensions  Default: 1.0   ! XHILL2M = 1.0 !
       to meters (MHILL=1)

       Factor to convert vertical dimensions    Default: 1.0   ! ZHILL2M = 1.0 !
       to meters (MHILL=1)

       X-origin of CTDM system relative to      No Default     ! XCTDMKM = 0 !
       CALPUFF coordinate system, in Kilometers (MHILL=1)

       Y-origin of CTDM system relative to      No Default     ! YCTDMKM = 0 !
       CALPUFF coordinate system, in Kilometers (MHILL=1)

! END !

---------------
Subgroup (6b)
---------------

                          1 **
     HILL information


HILL           XC        YC       THETAH  ZGRID  RELIEF    EXPO 1    EXPO 2   SCALE 1
    SCALE 2    AMAX1     AMAX2
 NO.          (km)      (km)      (deg.)   (m)      (m)       (m)       (m)       (m)        (
     m)       (m)       (m)
----          ----      ----      ------  -----  ------    ------    ------   -------    ---
```

```
    ----    -----     -----

---------------
Subgroup (6c)
---------------

    COMPLEX TERRAIN RECEPTOR INFORMATION

                     XRCT         YRCT        ZRCT          XHH
                     (km)         (km)         (m)
                    ------        -----      ------         ----


-------------------
1
     Description of Complex Terrain Variables:
          XC, YC  = Coordinates of center of hill
          THETAH  = Orientation of major axis of hill (clockwise from
                    North)
          ZGRID   = Height of the  0  of the grid above mean sea
                    level
          RELIEF  = Height of the crest of the hill above the grid elevation
          EXPO 1  = Hill-shape exponent for the major axis
          EXPO 2  = Hill-shape exponent for the major axis
          SCALE 1 = Horizontal length scale along the major axis
          SCALE 2 = Horizontal length scale along the minor axis
          AMAX    = Maximum allowed axis length for the major axis
          BMAX    = Maximum allowed axis length for the major axis

          XRCT, YRCT = Coordinates of the complex terrain receptors
          ZRCT    = Height of the ground (MSL) at the complex terrain
                    Receptor
          XHH     = Hill number associated with each complex terrain receptor
                    (NOTE: MUST BE ENTERED AS A REAL NUMBER)

   **
     NOTE: DATA for each hill and CTSG receptor are treated as a separate
           input subgroup and therefore must end with an input group terminator.

--------------------------------------------------------------------------------


INPUT GROUP: 7 -- Chemical parameters for dry deposition of gases
--------------

      SPECIES     DIFFUSIVITY      ALPHA STAR      REACTIVITY    MESOPHYLL RESISTANCE
          HENRY'S LAW COEFFICIENT
       NAME        (cm**2/s)                                           (s/cm)
           (dimensionless)
      -------     -----------      ----------      ----------    --------------------     --
          ---------------------


!END!


--------------------------------------------------------------------------------


INPUT GROUP: 8 -- Size parameters for dry deposition of particles
--------------

     For SINGLE SPECIES, the mean and standard deviation are used to
     compute a deposition velocity for NINT (see group 9) size-ranges,
     and these are then averaged to obtain a mean deposition velocity.
```

```
     For GROUPED SPECIES, the size distribution should be explicitly
     specified (by the 'species' in the group), and the standard deviation
     for each should be entered as 0.  The model will then use the
     deposition velocity for the stated mean diameter.

      SPECIES      GEOMETRIC MASS MEAN        GEOMETRIC STANDARD
       NAME              DIAMETER                  DEVIATION
                         (microns)                 (microns)
      -------      -------------------        ------------------


!END!


-------------------------------------------------------------------------------


INPUT GROUP: 9 -- Miscellaneous dry deposition parameters
--------------

     Reference cuticle resistance (s/cm)
     (RCUTR)                           Default: 30    !  RCUTR = 30.0 !
     Reference ground resistance  (s/cm)
     (RGR)                             Default: 10    !    RGR = 10.0 !
     Reference pollutant reactivity
     (REACTR)                          Default: 8     ! REACTR = 8.0 !

     Number of particle-size intervals used to
     evaluate effective particle deposition velocity
     (NINT)                            Default: 9     !   NINT =  9  !

     Vegetation state in unirrigated areas
     (IVEG)                            Default: 1     !   IVEG =  1   !
        IVEG=1 for active and unstressed vegetation
        IVEG=2 for active and stressed vegetation
        IVEG=3 for inactive vegetation

!END!


-------------------------------------------------------------------------------


INPUT GROUP: 10 -- Wet Deposition Parameters
---------------

                      Scavenging Coefficient -- Units: (sec)**(-1)

       Pollutant      Liquid Precip.       Frozen Precip.
       ---------      --------------       --------------

!END!


-------------------------------------------------------------------------------


INPUT GROUP: 11a, 11b -- Chemistry Parameters
---------------------

---------------
Subgroup (11a)
---------------

     Several parameters are needed for one or more of the chemical transformation
     mechanisms.  Those used for each mechanism are:
```

```
                                                          S
                                  M                 B  R  O
                                  A  B  R  R  R     C  H  4  B        N
                            B     V  C  N  N  N  M  K  -  -  C  O     D
                            C  M  G  K  I  I  I  H  H  I  I  K  F  V  E
                         M  K  N  N  N  T  T  T  2  2  S  S  P  R  C  C
                         O  O  H  H  H  E  E  E  O  O  R  R  M  A  N  A
Mechanism (MCHEM)        Z  3  3  3  3  1  2  3  2  2  P  P  F  C  X  Y
--------------------   --------------------------------------------------
0 None                   .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
1 MESOPUFF II            X  X  .  .  X  X  X  X  .  .  .  .  .  .  .  .
2 User Rates             .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  .
3 RIVAD                  X  X  .  .  X  .  .  .  .  .  .  .  .  .  .  .
4 SOA                    X  X  .  .  .  .  .  .  .  .  .  .  X  X  X  .
5 Radioactive Decay      .  .  .  .  .  .  .  .  .  .  .  .  .  .  .  X
6 RIVAD/ISORRPIA         X  X  X  X  X  X  .  .  X  X  X  X  .  .  .  .
7 RIVAD/ISORRPIA/SOA     X  X  X  X  X  X  .  .  X  X  X  X  X  X  .  .


Ozone data input option (MOZ)     Default: 1            ! MOZ =  0   !
(Used only if MCHEM = 1,3,4,6, or 7)
   0 = use a monthly background ozone value
   1 = read hourly ozone concentrations from
       the OZONE.DAT data file

Monthly ozone concentrations in ppb (BCKO3)
(Used only if MCHEM = 1,3,4,6, or 7 and either
   MOZ = 0, or
   MOZ = 1 and all hourly O3 data missing)
                                  Default: 12*80.
     !  BCKO3 = 17.30, 14.80, 32.70, 33.50, 32.90, 37.70, 36.50, 33.10, 30.10, 21.20,
         19.10, 16.20 !

Ammonia data option (MNH3)        Default: 0            ! MNH3 =  0   !
(Used only if MCHEM = 6 or 7)
   0 = use monthly background ammonia values (BCKNH3) - no vertical variation
   1 = read monthly background ammonia values for each layer from
       the NH3Z.DAT data file

Ammonia vertical averaging option (MAVGNH3)
(Used only if MCHEM = 6 or 7, and MNH3 = 1)
   0 = use NH3 at puff center height (no averaging is done)
   1 = average NH3 values over vertical extent of puff
                                  Default: 1            ! MAVGNH3 =  0   !

Monthly ammonia concentrations in ppb (BCKNH3)
(Used only if MCHEM = 1 or 3, or
           if MCHEM = 6 or 7, and MNH3 = 0)
                                  Default: 12*10.
!  BCKNH3 = 10.00, 10.00, 10.00, 10.00, 10.00, 10.00, 10.00, 10.00, 10.00, 10.00, 10.00
    , 10.00 !

Nighttime SO2 loss rate in %/hour (RNITE1)
(Used only if MCHEM = 1, 6 or 7)
This rate is used only at night for MCHEM=1
and is added to the computed rate both day
and night for MCHEM=6,7 (heterogeneous reactions)
                                  Default: 0.2          ! RNITE1 = .2 !

Nighttime NOx loss rate in %/hour (RNITE2)
(Used only if MCHEM = 1)
                                  Default: 2.0          ! RNITE2 = 2.0 !

Nighttime HNO3 formation rate in %/hour (RNITE3)
(Used only if MCHEM = 1)
                                  Default: 2.0          ! RNITE3 = 2.0 !
```

```
     H2O2 data input option (MH2O2)    Default: 1            ! MH2O2 =  1   !
     (Used only if MCHEM = 6 or 7, and MAQCHEM = 1)
        0 = use a monthly background H2O2 value
        1 = read hourly H2O2 concentrations from
            the H2O2.DAT data file

     Monthly H2O2 concentrations in ppb (BCKH2O2)
     (Used only if MQACHEM = 1 and either
        MH2O2 = 0 or
        MH2O2 = 1 and all hourly H2O2 data missing)
                                       Default: 12*1.
     !  BCKH2O2 = 1.00, 1.00, 1.00, 1.00, 1.00, 1.00, 1.00, 1.00, 1.00, 1.00, 1.00, 1.00 !


 --- Data for ISORROPIA Option
     (used only if MCHEM = 6 or 7)

     Minimum relative humidity used in ISORROPIA computations (RH_ISRP)
                                       Default: 50.          ! RH_ISRP = 50.0 !
                                       Units: %

     Minimum SO4 used in ISORROPIA computations (SO4_ISRP)
                                       Default: 0.4          ! SO4_ISRP = .4 !
                                       Units: ug/m3


 --- Data for SECONDARY ORGANIC AEROSOL (SOA) Options
     (used only if MCHEM = 4 or 7)

     The MCHEM = 4 SOA module uses monthly values of:
          Fine particulate concentration in ug/m^3 (BCKPMF)
          Organic fraction of fine particulate     (OFRAC)
          VOC / NOX ratio (after reaction)         (VCNX)

     The MCHEM = 7 SOA module uses monthly values of:
          Fine particulate concentration in ug/m^3 (BCKPMF)
          Organic fraction of fine particulate     (OFRAC)

     These characterize the air mass when computing
     the formation of SOA from VOC emissions.
     Typical values for several distinct air mass types are:

        Month    1    2    3    4    5    6    7    8    9   10   11   12
                Jan  Feb  Mar  Apr  May  Jun  Jul  Aug  Sep  Oct  Nov  Dec

     Clean Continental
        BCKPMF   1.   1.   1.   1.   1.   1.   1.   1.   1.   1.   1.   1.
        OFRAC  .15  .15  .20  .20  .20  .20  .20  .20  .20  .20  .20  .15
        VCNX    50.  50.  50.  50.  50.  50.  50.  50.  50.  50.  50.  50.

     Clean Marine (surface)
        BCKPMF  .5   .5   .5   .5   .5   .5   .5   .5   .5   .5   .5   .5
        OFRAC  .25  .25  .30  .30  .30  .30  .30  .30  .30  .30  .30  .25
        VCNX    50.  50.  50.  50.  50.  50.  50.  50.  50.  50.  50.  50.

     Urban - low biogenic (controls present)
        BCKPMF  30.  30.  30.  30.  30.  30.  30.  30.  30.  30.  30.  30.
        OFRAC  .20  .20  .25  .25  .25  .25  .25  .25  .20  .20  .20  .20
        VCNX     4.   4.   4.   4.   4.   4.   4.   4.   4.   4.   4.   4.

     Urban - high biogenic (controls present)
        BCKPMF  60.  60.  60.  60.  60.  60.  60.  60.  60.  60.  60.  60.
        OFRAC  .25  .25  .30  .30  .30  .55  .55  .55  .35  .35  .35  .25
        VCNX    15.  15.  15.  15.  15.  15.  15.  15.  15.  15.  15.  15.
```

```
     Regional Plume
        BCKPMF  20.  20.  20.  20.  20.  20.  20.  20.  20.  20.  20.  20.
        OFRAC  .20  .20  .25  .35  .25  .40  .40  .40  .30  .30  .30  .20
        VCNX    15.  15.  15.  15.  15.  15.  15.  15.  15.  15.  15.  15.

     Urban - no controls present
        BCKPMF 100. 100. 100. 100. 100. 100. 100. 100. 100. 100. 100. 100.
        OFRAC  .30  .30  .35  .35  .35  .55  .55  .55  .35  .35  .35  .30
        VCNX     2.   2.   2.   2.   2.   2.   2.   2.   2.   2.   2.   2.

     Default: Clean Continental
     !  BCKPMF = 1.00, 1.00, 1.00, 1.00, 1.00, 1.00, 1.00, 1.00, 1.00, 1.00, 1.00, 1.00 !
     !  OFRAC  = 0.15, 0.15, 0.20, 0.20, 0.20, 0.20, 0.20, 0.20, 0.20, 0.20, 0.20, 0.15 !
     !  VCNX   = 50.00, 50.00, 50.00, 50.00, 50.00, 50.00, 50.00, 50.00, 50.00, 50.00, 50.00
           , 50.00 !

 --- End Data for SECONDARY ORGANIC AEROSOL (SOA) Options


     Number of half-life decay specification blocks provided in Subgroup 11b
     (Used only if MCHEM = 5)
     (NDECAY)                                  Default: 0      ! NDECAY =  0   !

!END!


--------------
Subgroup (11b)
--------------

     Each species modeled may be assigned a decay half-life (sec), and the associated
     mass lost may be assigned to one or more other modeled species using a mass yield
     factor. This information is used only for MCHEM=5.

     Provide NDECAY blocks assigning the half-life for a parent species and mass yield
     factors for each child species (if any) produced by the decay.
     Set HALF_LIFE=0.0 for NO decay (infinite half-life).

                               a             b
        SPECIES      Half-Life   Mass Yield
         NAME          (sec)       Factor
        -------      ---------   ----------

     *   SPEC1   =    3600.,        -1.0   *    (Parent)
     *   SPEC2   =     -1.0,         0.0   *    (Child)
   *END*

--------
    a
     Specify a half life that is greater than or equal to zero for 1 parent species
     in each block, and set the yield factor for this species to -1
    b
     Specify a yield factor that is greater than or equal to zero for 1 or more child
     species in each block, and set the half-life for each of these species to -1

     NOTE: Assignments in each block are treated as a separate input
           subgroup and therefore must end with an input group terminator.
           If NDECAY=0, no assignments and input group terminators should appear.

--------------------------------------------------------------------------------


INPUT GROUP: 12 -- Misc. Dispersion and Computational Parameters
---------------

     Horizontal size of puff (m) beyond which
```

```
     time-dependent dispersion equations (Heffter)
     are used to determine sigma-y and
     sigma-z (SYTDEP)                           Default: 550.   ! SYTDEP = 5.5E02 !

     Switch for using Heffter equation for sigma z
     as above (0 = Not use Heffter; 1 = use Heffter
     (MHFTSZ)                                   Default: 0      ! MHFTSZ =  0   !

     Stability class used to determine plume
     growth rates for puffs above the boundary
     layer (JSUP)                               Default: 5      ! JSUP =  5   !

     Vertical dispersion constant for stable
     conditions (k1 in Eqn. 2.7-3)  (CONK1)     Default: 0.01   ! CONK1 = .01 !

     Vertical dispersion constant for neutral/
     unstable conditions (k2 in Eqn. 2.7-4)
     (CONK2)                                    Default: 0.1    ! CONK2 = .1 !

     Factor for determining Transition-point from
     Schulman-Scire to Huber-Snyder Building Downwash
     scheme (SS used for Hs < Hb + TBD * HL)
     (TBD)                                      Default: 0.5    ! TBD = .5 !
        TBD < 0   ==> always use Huber-Snyder
        TBD = 1.5 ==> always use Schulman-Scire
        TBD = 0.5 ==> ISC Transition-point

     Range of land use categories for which
     urban dispersion is assumed
     (IURB1, IURB2)                             Default: 10     ! IURB1 =  10  !
                                                         19     ! IURB2 =  19  !

     Site characterization parameters for single-point Met data files ---------
     (needed for METFM = 2,3,4,5)

        Land use category for modeling domain
        (ILANDUIN)                              Default: 20     ! ILANDUIN =  20  !

        Roughness length (m) for modeling domain
        (Z0IN)                                  Default: 0.25   ! Z0IN = .25 !

        Leaf area index for modeling domain
        (XLAIIN)                                Default: 3.0    ! XLAIIN = 3.0 !

        Elevation above sea level (m)
        (ELEVIN)                                Default: 0.0    ! ELEVIN = .0 !

        Latitude (degrees) for met location
        (XLATIN)                                Default: -999.  ! XLATIN = -999.0 !

        Longitude (degrees) for met location
        (XLONIN)                                Default: -999.  ! XLONIN = -999.0 !

     Specialized information for interpreting single-point Met data files -----

        Anemometer height (m) (Used only if METFM = 2,3)
        (ANEMHT)                                Default: 10.    ! ANEMHT = 10.0 !

        Form of lateral turbulance data in PROFILE.DAT file
        (Used only if METFM = 4,5 or MTURBVW = 1 or 3)
        (ISIGMAV)                               Default: 1      ! ISIGMAV =  1  !
            0 = read sigma-theta
            1 = read sigma-v

        Choice of mixing heights (Used only if METFM = 4)
        (IMIXCTDM)                              Default: 0      ! IMIXCTDM =  0  !
```

```
       0 = read PREDICTED mixing heights
       1 = read OBSERVED mixing heights

  Maximum length of a slug (met. grid units)
  (XMXLEN)                                    Default: 1.0    ! XMXLEN = 1.0 !

  Maximum travel distance of a puff/slug (in
  grid units) during one sampling step
  (XSAMLEN)                                   Default: 1.0    ! XSAMLEN = 1.0 !

  Maximum Number of slugs/puffs release from
  one source during one time step
  (MXNEW)                                     Default: 99     ! MXNEW =  99   !

  Maximum Number of sampling steps for
  one puff/slug during one time step
  (MXSAM)                                     Default: 99     ! MXSAM =  99   !

  Number of iterations used when computing
  the transport wind for a sampling step
  that includes gradual rise (for CALMET
  and PROFILE winds)
  (NCOUNT)                                    Default: 2      ! NCOUNT =  2   !

  Minimum sigma y for a new puff/slug (m)
  (SYMIN)                                     Default: 1.0    ! SYMIN = 1.0  !

  Minimum sigma z for a new puff/slug (m)
  (SZMIN)                                     Default: 1.0    ! SZMIN = 1.0  !

  Maximum sigma z (m) allowed to avoid
  numerical problem in calculating virtual
  time or distance.  Cap should be large
  enough to have no influence on normal events.
  Enter a negative cap to disable.
  (SZCAP_M)                                   Default: 5.0e06 ! SZCAP_M = 5.0E06 !


  Default minimum turbulence velocities sigma-v and sigma-w
  for each stability class over land and over water (m/s)
  (SVMIN(12) and SWMIN(12))

                 ----------  LAND  ----------       ---------  WATER  ----------
     Stab Class :  A    B    C    D    E    F         A    B    C    D    E    F
                 ---  ---  ---  ---  ---  ---       ---  ---  ---  ---  ---  ---
  Default SVMIN : .50, .50, .50, .50, .50, .50,      .37, .37, .37, .37, .37, .37
  Default SWMIN : .20, .12, .08, .06, .03, .016,     .20, .12, .08, .06, .03, .016

        ! SVMIN = 0.500, 0.500, 0.500, 0.500, 0.500, 0.500, 0.370, 0.370, 0.370, 0.370,
            0.370, 0.370!
        ! SWMIN = 0.200, 0.120, 0.080, 0.060, 0.030, 0.016, 0.200, 0.120, 0.080, 0.060,
            0.030, 0.016!

  Divergence criterion for dw/dz across puff
  used to initiate adjustment for horizontal
  convergence (1/s)
  Partial adjustment starts at CDIV(1), and
  full adjustment is reached at CDIV(2)
  (CDIV(2))                                   Default: 0.0,0.0  ! CDIV = .0, .0 !

  Search radius (number of cells) for nearest
  land and water cells used in the subgrid
  TIBL module
  (NLUTIBL)                                   Default: 4      ! NLUTIBL = 4  !

  Minimum wind speed (m/s) allowed for
```

```
     non-calm conditions. Also used as minimum
     speed returned when using power-law
     extrapolation toward surface
     (WSCALM)                                  Default: 0.5    ! WSCALM = .5 !

     Maximum mixing height (m)
     (XMAXZI)                                  Default: 3000.  ! XMAXZI = 3000.0 !

     Minimum mixing height (m)
     (XMINZI)                                  Default: 50.    ! XMINZI = 50.0 !


     Temperatures (K) used for defining upper bound of
     categories for emissions scale-factors
     11 upper bounds (K) are entered; the 12th class has no upper limit
     (TKCAT(11))
                 Default   : 265., 270., 275., 280., 285., 290., 295., 300., 305., 310.,
                     315.  (315.+)
                              <     <     <     <     <     <     <     <     <     <     <
         Temperature Class :  1     2     3     4     5     6     7     8     9     10    11
             (12)
                             ----  ----  ----  ----  ----  ----  ----  ----  ----  ----  ---
                                 -
                  ! TKCAT  = 265., 270., 275., 280., 285., 290., 295., 300., 305., 310.,
                      315. !

     Wind Speeds (m/s) used for defining upper bound of
     categories for emissions scale-factors
     5 upper bounds (m/s) are entered; the 6th class has no upper limit
     (WSCAT(5))                      Default   :
                                     ISC RURAL : 1.54, 3.09, 5.14, 8.23, 10.8 (10.8+)

                          Wind Speed Class :  1     2     3     4     5
                                             ---   ---   ---   ---   ---
                                       ! WSCAT = 1.54, 3.09, 5.14, 8.23, 10.80 !

     Default wind speed profile power-law
     exponents for stabilities 1-6
     (PLX0(6))                       Default   : ISC RURAL values
                                     ISC RURAL : .07, .07, .10, .15, .35, .55
                                     ISC URBAN : .15, .15, .20, .25, .30, .30

                           Stability Class :  A     B     C     D     E     F
                                             ---   ---   ---   ---   ---   ---
                                        ! PLX0 = 0.07, 0.07, 0.10, 0.15, 0.35, 0.55 !

     Default potential temperature gradient
     for stable classes E, F (degK/m)
     (PTG0(2))                       Default: 0.020, 0.035
                                        ! PTG0 = 0.020,   0.035 !

     Default plume path coefficients for
     each stability class (used when option
     for partial plume height terrain adjustment
     is selected -- MCTADJ=3)
     (PPC(6))                  Stability Class :  A     B     C     D     E     F
                                  Default  PPC : .50,  .50,  .50,  .50,  .35,  .35
                                                ---   ---   ---   ---   ---   ---
                                        !  PPC = 0.50, 0.50, 0.50, 0.50, 0.35, 0.35 !

     Slug-to-puff transition criterion factor
     equal to sigma-y/length of slug
     (SL2PF)                              Default: 10.        ! SL2PF = 10.0 !

     Receptor-specific puff/slug properties (e.g., sigmas and height above
     ground at the time when the trajectory is nearest the receptor) may be
```

```
     extrapolated forward or backward in time along the current step using
     the current dispersion, for receptors that lie upwind of the puff/slug
     position at the start of a step, or downwind at the end of a step.
     Specify the upwind/downwind extrapolation zone in sigma-y units.
     Using FCLIP=1.0 clips the the upwind zone at one sigma-y at the start
     of the step and the downwind zone at one sigma-y at the end of the step.
     This is consistent with the sampling done in CALPUFF versions through
     v6.42 prior to the introduction of the FCLIP option.
     The default is No Extrapolation, FCLIP=0.0.
     (FCLIP)                               Default: 0.0         ! FCLIP = 0.0 !

     Puff-splitting control variables ------------------------

       VERTICAL SPLIT
       --------------

       Number of puffs that result every time a puff
       is split - nsplit=2 means that 1 puff splits
       into 2
       (NSPLIT)                            Default:   3         ! NSPLIT =  3  !

       Time(s) of a day when split puffs are eligible to
       be split once again; this is typically set once
       per day, around sunset before nocturnal shear develops.
       24 values: 0 is midnight (00:00) and 23 is 11 PM (23:00)
       0=do not re-split    1=eligible for re-split
       (IRESPLIT(24))                      Default:  Hour 17 = 1
       !  IRESPLIT = 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,1,0,0,0,0,0,0 !

       Split is allowed only if last hour's mixing
       height (m) exceeds a minimum value
       (ZISPLIT)                           Default: 100.        ! ZISPLIT = 100.0 !

       Split is allowed only if ratio of last hour's
       mixing ht to the maximum mixing ht experienced
       by the puff is less than a maximum value (this
       postpones a split until a nocturnal layer develops)
       (ROLDMAX)                           Default: 0.25        ! ROLDMAX = 0.25 !


       HORIZONTAL SPLIT
       ----------------

       Number of puffs that result every time a puff
       is split - nsplith=5 means that 1 puff splits
       into 5
       (NSPLITH)                           Default:   5         ! NSPLITH =  5  !

       Minimum sigma-y (Grid Cells Units) of puff
       before it may be split
       (SYSPLITH)                          Default:  1.0        ! SYSPLITH = 1.0 !

       Minimum puff elongation rate (SYSPLITH/hr) due to
       wind shear, before it may be split
       (SHSPLITH)                          Default:  2.         ! SHSPLITH = 2.0 !

       Minimum concentration (g/m^3) of each
       species in puff before it may be split
       Enter array of NSPEC values; if a single value is
       entered, it will be used for ALL species
       (CNSPLITH)                          Default:  1.0E-07    ! CNSPLITH = 1.0E-07 !

     Integration control variables ------------------------

       Fractional convergence criterion for numerical SLUG
       sampling integration
```

```
       (EPSSLUG)                          Default:   1.0e-04  ! EPSSLUG = 1.0E-04 !

       Fractional convergence criterion for numerical AREA
       source integration
       (EPSAREA)                          Default:   1.0e-06  ! EPSAREA = 1.0E-06 !

       Trajectory step-length (m) used for numerical rise
       integration
       (DSRISE)                           Default:   1.0      ! DSRISE = 1.0 !

       Boundary Condition (BC) Puff control variables ------------------------

       Minimum height (m) to which BC puffs are mixed as they are emitted
       (MBCON=2 ONLY).  Actual height is reset to the current mixing height
       at the release point if greater than this minimum.
       (HTMINBC)                          Default:   500.     ! HTMINBC = 500.0 !

       Search radius (km) about a receptor for sampling nearest BC puff.
       BC puffs are typically emitted with a spacing of one grid cell
       length, so the search radius should be greater than DGRIDKM.
       (RSAMPBC)                          Default:   10.      ! RSAMPBC = 10.0 !

       Near-Surface depletion adjustment to concentration profile used when
       sampling BC puffs?
       (MDEPBC)                           Default:   1        ! MDEPBC =  1  !
          0 = Concentration is NOT adjusted for depletion
          1 = Adjust Concentration for depletion

!END!


-------------------------------------------------------------------------------


INPUT GROUPS: 13a, 13b, 13c, 13d -- Point source parameters
--------------------------------

---------------
Subgroup (13a)
---------------

     Number of point sources with
     parameters provided below      (NPT1)  No default  !  NPT1 =  1  !

     Units used for point source
     emissions below                (IPTU)  Default: 1  !  IPTU =   1  !
           1 =       g/s
           2 =      kg/hr
           3 =      lb/hr
           4 =     tons/yr
           5 =     Odour Unit * m**3/s  (vol. flux of odour compound)
           6 =     Odour Unit * m**3/min
           7 =     metric tons/yr
           8 =     Bq/s  (Bq = becquerel = disintegrations/s)
           9 =     GBq/yr


     Number of source-species
     combinations with variable
     emissions scaling factors
     provided below in (13d)        (NSPT1) Default: 0  !  NSPT1 =  0  !

     Number of point sources with
     variable emission parameters
     provided in external file      (NPT2)  No default  !  NPT2 =  0  !
```

```
     (If NPT2 > 0, these point
     source emissions are read from
     the file: PTEMARB.DAT)

!END!

---------------
Subgroup (13b)
---------------
                                           a
          POINT SOURCE: CONSTANT DATA
          -----------------------------
                                                                                   b          c
  Source       X          Y       Stack    Base     Stack    Exit  Exit    Bldg.  Emission
   No.     Coordinate Coordinate Height Elevation Diameter  Vel.  Temp.   Dwash   Rates
              (km)       (km)       (m)      (m)       (m)  (m/s) (deg. K)
  ------   ---------- ---------- ------   ------   -------- ----- -------- ----- --------
   1 ! SRCNAM = STCK1 !
   1 ! X = 680.53812,   4860.34615, 87.6, 100.94,    1.7,     23.02, 405.37,  1.0, 1.0E00 !
   1 ! ZPLTFM  =       .0 !
   1 ! FMFAC  =      1.0 !   !END!

--------

    a
     Data for each source are treated as a separate input subgroup
     and therefore must end with an input group terminator.

     SRCNAM  is a 12-character name for a source
             (No default)
     X       is an array holding the source data listed by the column headings
             (No default)
     SIGYZI  is an array holding the initial sigma-y and sigma-z (m)
             (Default: 0.,0.)
     FMFAC   is a vertical momentum flux factor (0. or 1.0) used to represent
             the effect of rain-caps or other physical configurations that
             reduce momentum rise associated with the actual exit velocity.
             (Default: 1.0  -- full momentum used)
     ZPLTFM  is the platform height (m) for sources influenced by an isolated
             structure that has a significant open area between the surface
             and the bulk of the structure, such as an offshore oil platform.
             The Base Elevation is that of the surface (ground or ocean),
             and the Stack Height is the release height above the Base (not
             above the platform).  Building heights entered in Subgroup 13c
             must be those of the buildings on the platform, measured from
             the platform deck.  ZPLTFM is used only with MBDW=1 (ISC
             downwash method) for sources with building downwash.
             (Default: 0.0)

    b
     0. = No building downwash modeled
     1. = Downwash modeled for buildings resting on the surface
     2. = Downwash modeled for buildings raised above the surface (ZPLTFM > 0.)
     NOTE: must be entered as a REAL number (i.e., with decimal point)

    c
     An emission rate must be entered for every pollutant modeled.
     Enter emission rate of zero for secondary pollutants that are
     modeled, but not emitted.  Units are specified by IPTU
     (e.g. 1 for g/s).

---------------
Subgroup (13c)
---------------

           BUILDING DIMENSION DATA FOR SOURCES SUBJECT TO DOWNWASH
```

```
           --------------------------------------------------------
Source                                                                a
 No.       Effective building height, width, length and X/Y offset (in meters)
           every 10 degrees.  LENGTH, XBADJ, and YBADJ are only needed for
           MBDW=2 (PRIME downwash option)
------     ---------------------------------------------------------------------
1    ! SRCNAM  =   STCK1 !
1    ! HEIGHT  =  34.9,    34.9,      31,      31,   18.44,   18.44,
                  18.44,   18.44,   18.44,   18.44,      31,      31,
                  34.9,    34.9,    34.9,    34.9,    34.9,    34.9,
                  34.9,    34.9,      31,      31,   18.44,   18.44,
                  18.44,   18.44,   18.44,   18.44,      31,      31,
                  34.9,    34.9,    34.9,    34.9,    34.9,    34.9!
 1    ! WIDTH  =  54.17,    56.2,   32.98,   31.24,      48,   45.54,
                  41.69,   43.32,   46.55,   48.37,   31.92,   33.24,
                  42.89,   37.52,   37.12,   35.59,   36.37,   37.47,
                  54.17,    56.2,   32.98,   31.24,      48,   45.54,
                  41.69,   43.32,   46.55,   48.37,   31.92,   33.24,
                  42.89,   40.24,   39.78,   40.74,   45.29,    50.5!
1    ! LENGTH =   45.77,   45.65,   33.24,   33.55,   41.07,   35.88,
                  29.59,   32.65,   38.51,    43.2,   33.71,   32.98,
                  55.12,   26.42,   21.38,   15.68,   17.93,   23.38,
                  45.77,   45.65,   33.24,   33.55,   41.07,   35.88,
                  29.59,   32.65,   38.51,    43.2,   33.71,   32.98,
                  55.12,   52.05,   47.39,    41.3,   41.88,    44.5!
1    ! XBADJ  =   35.11,   28.81,    8.55,    3.38,  -10.13,  -11.87,
                  -13.25,   -19.1,  -26.52,  -33.14,  -38.73,  -43.15,
                  -85.14, -101.34, -102.58,  -100.7,   -99.9,  -98.01,
                  -80.88,  -74.46,  -41.79,  -36.93,  -30.94,     -24,
                  -16.34,  -13.56,  -11.99,  -10.06,    5.02,   10.17,
                  30.02,   36.31,    41.5,   45.42,   44.35,   40.34!
1    ! YBADJ  =   33.66,   43.02,   26.66,   30.64,   24.01,    25.5,
                  26.21,   26.03,   25.11,   23.43,   29.42,   25.17,
                  35.24,   29.33,   13.59,   -2.56,  -18.64,  -34.16,
                 -33.66,  -43.02,  -26.66,  -30.64,  -24.01,   -25.5,
                 -26.21,  -26.03,  -25.11,  -23.43,  -29.42,  -25.17,
                 -35.24,  -25.67,  -13.61,    0.18,   12.18,   23.27!
! END !


--------

    a
     Building height, width, length, and X/Y offset from the source are treated
     as a separate input subgroup for each source and therefore must end with
     an input group terminator.  The X/Y offset is the position, relative to the
     stack, of the center of the upwind face of the projected building, with the
     x-axis pointing along the flow direction.

---------------
Subgroup (13d)
---------------
                                                            a
          POINT SOURCE: EMISSION-RATE SCALING FACTORS
          -------------------------------------------

      Use this subgroup to identify temporal variations in the emission
      rates given in 13b.  Factors assigned multiply the rates in 13b.
      Skip sources here that have constant emissions.  For more elaborate
      variation in source parameters, use PTEMARB.DAT and NPT2 > 0.

      Sets of emission-rate scale factors are defined in Input Group 19, and
      are referenced by the FACTORNAME.  Provide NSPT1 lines that identify the
      emission-rate scale factor table for each source-species combination that
      uses the scaling option.  Note that a scale-factor table can be used with
      more than one source-species combination so a FACTORNAME can be repeated.
```

```
  Source-               Source      Species      Scale-factor table
  Species               Name   b    Name   c     Name        d
   No.                 (SRCNAM)     (CSPEC)      (FACTORNAME)
  ------               ------------ ------------ ---------------------



--------
    a
     Assignment for each source-specie is treated as a separate input subgroup
     and therefore must end with an input group terminator.
    b
     Source name must match one of the SRCNAM names defined in Input Group 13b
    c
     Species name must match one of the CSPEC names of emitted species defined in Input
         Group 3
    d
     Scale-factor name must match one of the FACTORNAME names defined in Input Group 19


--------------------------------------------------------------------------------


INPUT GROUPS: 14a, 14b, 14c, 14d -- Area source parameters
--------------------------------

---------------
Subgroup (14a)
---------------

     Number of polygon area sources with
     parameters specified below (NAR1)       No default  !  NAR1 =  0   !

     Units used for area source
     emissions below            (IARU)       Default: 1  !  IARU =   1  !
           1 =        g/m**2/s
           2 =       kg/m**2/hr
           3 =       lb/m**2/hr
           4 =     tons/m**2/yr
           5 =     Odour Unit * m/s  (vol. flux/m**2 of odour compound)
           6 =     Odour Unit * m/min
           7 =     metric tons/m**2/yr
           8 =     Bq/m**2/s  (Bq = becquerel = disintegrations/s)
           9 =     GBq/m**2/yr

     Number of source-species
     combinations with variable
     emissions scaling factors
     provided below in (14d)        (NSAR1) Default: 0  !  NSAR1 =  0  !

     Number of buoyant polygon area sources
     with variable location and emission
     parameters (NAR2)                      No default  !  NAR2 =  0   !
     (If NAR2 > 0, ALL parameter data for
     these sources are read from the file: BAEMARB.DAT)

!END!

---------------
Subgroup (14b)
---------------
                                          a
          AREA SOURCE: CONSTANT DATA
          ----------------------------
```

```
                                                           b
Source           Effect.    Base      Initial    Emission
 No.             Height   Elevation   Sigma z     Rates
                   (m)       (m)        (m)
-------          ------    ------     --------   ---------


--------
    a
     Data for each source are treated as a separate input subgroup
     and therefore must end with an input group terminator.
    b
     An emission rate must be entered for every pollutant modeled.
     Enter emission rate of zero for secondary pollutants that are
     modeled, but not emitted.  Units are specified by IARU
     (e.g. 1 for g/m**2/s).

---------------
Subgroup (14c)
---------------

           COORDINATES (km) FOR EACH VERTEX(4) OF EACH POLYGON
           --------------------------------------------------------
Source                                                                a
 No.       Ordered list of X followed by list of Y, grouped by source
------     ------------------------------------------------------------


--------
    a
     Data for each source are treated as a separate input subgroup
     and therefore must end with an input group terminator.


---------------
Subgroup (14d)
---------------
                                                      a
          AREA SOURCE: EMISSION-RATE SCALING FACTORS
          -------------------------------------------

      Use this subgroup to identify temporal variations in the emission
      rates given in 14b.  Factors assigned multiply the rates in 14b.
      Skip sources here that have constant emissions.  For more elaborate
      variation in source parameters, use BAEMARB.DAT and NAR2 > 0.

      Sets of emission-rate scale factors are defined in Input Group 19, and
      are referenced by the FACTORNAME.  Provide NSAR1 lines that identify the
      emission-rate scale factor table for each source-species combination that
      uses the scaling option.  Note that a scale-factor table can be used with
      more than one source-species combination so a FACTORNAME can be repeated.


  Source-              Source      Species      Scale-factor table
  Species              Name   b    Name   c     Name         d
   No.                (SRCNAM)     (CSPEC)      (FACTORNAME)
  ------              ------------ ------------ ---------------------

    1  * SCALEFACTOR  =   1,          SO2,       AREAS              *  *END*

--------
    a
     Assignment for each source-specie is treated as a separate input subgroup
     and therefore must end with an input group terminator.
    b
     Source name must match one of the SRCNAM names defined in Input Group 14b
```

```
    c
     Species name must match one of the CSPEC names of emitted species defined in Input
         Group 3
    d
     Scale-factor name must match one of the FACTORNAME names defined in Input Group 19


--------------------------------------------------------------------------------

INPUT GROUPS: 15a, 15b, 15c -- Line source parameters
---------------------------

---------------
Subgroup (15a)
---------------

     Number of buoyant line sources
     with variable location and emission
     parameters (NLN2)                              No default  !  NLN2 =  0   !

      (If NLN2 > 0, ALL parameter data for
       these sources are read from the file: LNEMARB.DAT)

     Number of buoyant line sources (NLINES)        No default   ! NLINES =  0  !

     Units used for line source
     emissions below                (ILNU)          Default: 1  !  ILNU =   1  !
           1 =        g/s
           2 =       kg/hr
           3 =       lb/hr
           4 =     tons/yr
           5 =     Odour Unit * m**3/s  (vol. flux of odour compound)
           6 =     Odour Unit * m**3/min
           7 =     metric tons/yr
           8 =     Bq/s  (Bq = becquerel = disintegrations/s)
           9 =     GBq/yr

     Number of source-species
     combinations with variable
     emissions scaling factors
     provided below in (15c)        (NSLN1)         Default: 0  !  NSLN1 =  0  !

     Maximum number of segments used to model
     each line (MXNSEG)                             Default: 7   ! MXNSEG =  7  !

     The following variables are required only if NLINES > 0.  They are
     used in the buoyant line source plume rise calculations.

        Number of distances at which                Default: 6   ! NLRISE =  6  !
        transitional rise is computed

        Average building length (XL)                No default   ! XL = .0 !
                                                    (in meters)

        Average building height (HBL)               No default   ! HBL = .0 !
                                                    (in meters)

        Average building width (WBL)                No default   ! WBL = .0 !
                                                    (in meters)

        Average line source width (WML)             No default   ! WML = .0 !
                                                    (in meters)

        Average separation between buildings (DXL)  No default   ! DXL = .0 !
                                                    (in meters)
```

```
        Average buoyancy parameter (FPRIMEL)        No default   ! FPRIMEL = .0 !
                                                    (in m**4/s**3)

!END!

---------------
Subgroup (15b)
---------------

          BUOYANT LINE SOURCE: CONSTANT DATA
          ----------------------------------
                                                                                                a
Source     Beg. X      Beg. Y      End. X    End. Y     Release    Base        Emission
 No.     Coordinate  Coordinate  Coordinate Coordinate  Height    Elevation      Rates
            (km)        (km)        (km)       (km)       (m)       (m)
------   ----------  ----------  ---------  ----------  -------   ---------    ---------

--------

    a
     Data for each source are treated as a separate input subgroup
     and therefore must end with an input group terminator.

    b
     An emission rate must be entered for every pollutant modeled.
     Enter emission rate of zero for secondary pollutants that are
     modeled, but not emitted.  Units are specified by ILNTU
     (e.g. 1 for g/s).

---------------
Subgroup (15c)
---------------
                                                                  a
          BUOYANT LINE SOURCE: EMISSION-RATE SCALING FACTORS
          --------------------------------------------------

      Use this subgroup to identify temporal variations in the emission
      rates given in 15b.  Factors assigned multiply the rates in 15b.
      Skip sources here that have constant emissions.  For more elaborate
      variation in source parameters, use LNEMARB.DAT and NLN2 > 0.

      Sets of emission-rate scale factors are defined in Input Group 19, and
      are referenced by the FACTORNAME.  Provide NSLN1 lines that identify the
      emission-rate scale factor table for each source-species combination that
      uses the scaling option.  Note that a scale-factor table can be used with
      more than one source-species combination so a FACTORNAME can be repeated.


  Source-                Source      Species      Scale-factor table
  Species                Name   b    Name   c     Name        d
   No.                  (SRCNAM)     (CSPEC)      (FACTORNAME)
  ------                ------------ ------------ ---------------------


--------
    a
     Assignment for each source-specie is treated as a separate input subgroup
     and therefore must end with an input group terminator.
    b
     Source name must match one of the SRCNAM names defined in Input Group 15b
    c
     Species name must match one of the CSPEC names of emitted species defined in Input
         Group 3
    d
     Scale-factor name must match one of the FACTORNAME names defined in Input Group 19
```

```
-------------------------------------------------------------------------------


INPUT GROUPS: 16a, 16b, 16c -- Volume source parameters
---------------------------

---------------
Subgroup (16a)
---------------

     Number of volume sources with
     parameters provided in 16b,c (NVL1)     No default  !  NVL1 =  0   !

     Units used for volume source
     emissions below in 16b       (IVLU)     Default: 1  !  IVLU =   1  !
           1 =        g/s
           2 =       kg/hr
           3 =       lb/hr
           4 =     tons/yr
           5 =     Odour Unit * m**3/s  (vol. flux of odour compound)
           6 =     Odour Unit * m**3/min
           7 =     metric tons/yr
           8 =     Bq/s  (Bq = becquerel = disintegrations/s)
           9 =     GBq/yr

     Number of source-species
     combinations with variable
     emissions scaling factors
     provided below in (16c)      (NSVL1)    Default: 0  !  NSVL1 =  0  !

     Number of volume sources with
     variable location and emission
     parameters                   (NVL2)     No default  !  NVL2 =   0   !

      (If NVL2 > 0, ALL parameter data for
       these sources are read from the VOLEMARB.DAT file(s) )

!END!

---------------
Subgroup (16b)
---------------
                                          a
           VOLUME SOURCE: CONSTANT DATA
           ------------------------------
                                                                                         b
Source         X           Y        Effect.    Base     Initial    Initial    Emission
 No.       Coordinate  Coordinate   Height   Elevation  Sigma y    Sigma z     Rates
              (km)        (km)        (m)       (m)       (m)        (m)
------     ----------  ----------   ------    ------    --------   --------   --------

--------
    a
     Data for each source are treated as a separate input subgroup
     and therefore must end with an input group terminator.

    b
     An emission rate must be entered for every pollutant modeled.
     Enter emission rate of zero for secondary pollutants that are
     modeled, but not emitted.  Units are specified by IVLU
     (e.g. 1 for g/s).

---------------
Subgroup (16c)
---------------
```

```
                                                      a
          VOLUME SOURCE: EMISSION-RATE SCALING FACTORS
          --------------------------------------------

      Use this subgroup to identify temporal variations in the emission
      rates given in 16b.  Factors assigned multiply the rates in 16b.
      Skip sources here that have constant emissions.  For more elaborate
      variation in source parameters, use VOLEMARB.DAT and NVL2 > 0.

      Sets of emission-rate scale factors are defined in Input Group 19, and
      are referenced by the FACTORNAME.  Provide NSVL1 lines that identify the
      emission-rate scale factor table for each source-species combination that
      uses the scaling option.  Note that a scale-factor table can be used with
      more than one source-species combination so a FACTORNAME can be repeated.


  Source-               Source      Species      Scale-factor table
  Species               Name   b    Name   c     Name        d
   No.                 (SRCNAM)     (CSPEC)      (FACTORNAME)
  ------               ------------ ------------ ---------------------




--------
    a
     Assignment for each source-specie is treated as a separate input subgroup
     and therefore must end with an input group terminator.
    b
     Source name must match one of the SRCNAM names defined in Input Group 16b
    c
     Species name must match one of the CSPEC names of emitted species defined in Input
         Group 3
    d
     Scale-factor name must match one of the FACTORNAME names defined in Input Group 19


--------------------------------------------------------------------------------

INPUT GROUP: 17  -- FLARE source control parameters (variable emissions file)
---------------

     Number of flare sources defined in FLEMARB.DAT file(s)
     (NFL2)                            Default: 0     !  NFL2    =  0 !

     (At least 1 FLEMARB.DAT file is needed if NFL2 > 0)

!END!


--------------------------------------------------------------------------------


INPUT GROUPS: 18a, 18b, 18c -- Road Emissions parameters
---------------------------

---------------
Subgroup (18a)
---------------

     Emissions from roads are generated from individual line segments defined
     by a sequence of coordinates provided for each road-link.  Each link
     is entered as a discrete source and is defined as a section of the road
     for which emissions are uniform.

     A long, winding isolated road might be characterized by a single link made
     up of many coordinate triples (x,y,z) that describe its pathway.  These
```

```
     points should be sufficient to resolve curves, but need not have uniform
     spacing.  For example, a straight flat segment can be defined by 2 points,
     regardless of the distance covered.  Long line segments are automatically
     divided further within the model into segments that are limited by the
     grid-cell boundaries (no segment may extend across multiple cells).
     One emission rate (g/m/s) for each species is used for the entire road.

     Near a congested intersection, many short links may be required to resolve
     the spatial and temporal distribution of emissions.  Each is entered and
     modeled as a discrete source.

     Number of road-links with emission parameters
     provided in Subgroup 18b (NRD1)      No default      !  NRD1 =  0   !

     Number of road-links with arbitrarily time-varying
     emission parameters (NRD2)           No default      !  NRD2 =  0   !
     (If NRD2 > 0, ALL variable road data
     are read from the file: RDEMARB.DAT)


     Emissions from one or more of the roads presented in Subgroup 18b
     may vary over time-based cycles or by meteorology.  This variability
     is modeled by applying an emission-rate scale factor specified for
     particular road links and species in Subgroup 18c.

     Number of road links and species combinations
     with variable emission-rate scale-factors
     (NSFRDS)                             Default: 0      !  NSFRDS =  0   !

!END!

---------------
Subgroup (18b)
---------------
                                                                      a
      DATA FOR ROADS WITH CONSTANT OR SCALED EMISSION PARAMETERS
      -----------------------------------------------------------
                                                                     b
Road                   Effect.   Initial    Initial    Emission
 No.                   Height    Sigma z    Sigma y     Rates
                       (mAGL)      (m)        (m)      (g/s/m)
-------                ------    ------     --------   ---------


--------
    a
     Data for each of the NRD1 roads are treated as a separate input subgroup
     and therefore must end with an input group terminator.
    b
     NSPEC Emission rates must be entered (one for every pollutant modeled).
     Enter emission rate of zero for secondary pollutants.
    c
     Road-source names are entered without spaces, and may be 16 characters long.


---------------
Subgroup (18c)
---------------
                                   a
      EMISSION-RATE SCALING FACTORS
      ------------------------------

      Use this subgroup to identify temporal variations in the emission
      rates given in 18b.  Factors assigned multiply the rates in 18b.
      Skip sources here that have constant emissions.  For more elaborate
      variation in source parameters, use RDEMARB.DAT and NRD2 > 0.
```

```
      Sets of emission-rate scale factors are defined in Input Group 19, and
      are referenced by the FACTORNAME.  Provide NSFRDS lines that identify the
      emission-rate scale factor table for each source-species combination that
      uses the scaling option.  Note that a scale-factor table can be used with
      more than one source-species combination so a FACTORNAME can be repeated.


  Source-              Source      Species      Scale-factor table
  Species              Name   b    Name   c     Name         d
   No.                (SRCNAM)     (CSPEC)      (FACTORNAME)
  ------              ------------ ------------ ---------------------



--------
    a
     Assignment for each source-specie is treated as a separate input subgroup
     and therefore must end with an input group terminator.
    b
     Source name must match one of the SRCNAM names defined in Input Group 18b
    c
     Species name must match one of the CSPEC names of emitted species defined in Input
         Group 3
    d
     Scale-factor name must match one of the FACTORNAME names defined in Input Group 19

---------------
Subgroup (18d)
---------------
                                              a
           COORDINATES FOR EACH NAMED ROAD
           -------------------------------

                    X           Y         Ground
Coordinate      Coordinate  Coordinate   Elevation
 No.               (km)        (km)         (m)
----------      ----------  ----------   ---------


--------
    a
     Each line of coordinates is treated as a separate input subgroup
     and therefore must end with an input group terminator.


-------------------------------------------------------------------------------


INPUT GROUPS: 19a, 19b -- Emission rate scale-factor tables
----------------------

     Use this group to enter variation factors applied to emission rates for any
     source-specie combinations that use this feature.  The tables of emission-rate
     scale factors are referenced by the name assigned to FACTORNAME.  These names
     do not need to include specific source or species names used in the simulation,
     particularly if one factor table is used for many types of sources and species,
     but should be descriptive.  But if a factor table applies to just one source,
     the reference name for it should generally contain that source-name.
     FACTORNAME must NOT include spaces.

     The FACTORTYPE for each table must be one of the following:

         CONSTANT1          1   scaling factor
         MONTH12            12  scaling factors: months 1-12
         DAY7               7   scaling factors: days 1-7
```

```
                            [SUNDAY,MONDAY, ... FRIDAY,SATURDAY]
         HOUR24             24  scaling factors: hours 1-24
         HOUR24_DAY7        168 scaling factors: hours 1-24,
                              repeated  7 times: SUNDAY, MONDAY, ... SATURDAY
         HOUR24_MONTH12     288 scaling factors: hours 1-24,
                              repeated 12 times: months 1-12
         WSP6               6   scaling factors: wind speed classes 1-6
                            [speed classes (WSCAT) defined in Group 12]
         WSP6_PGCLASS6      36  scaling factors: wind speed classes 1-6
                              repeated  6 times: PG classes A,B,C,D,E,F
                            [speed classes (WSCAT) defined in Group 12]
         TEMPERATURE12      12  scaling factors: temperature classes 1-12
                            [temperature classes (TKCAT) defined in Group 12]

     The number of tables defined may exceed the number of tables referenced in the
     input groups for each source type above (for convenience), but tables for all
     FACTORNAME names referenced must be present here.

---------------
Subgroup (19a)
---------------

     Number of Emission Scale-Factor
     tables                        (NSFTAB) Default: 0  !  NSFTAB =  0  !

     !END!


---------------
Subgroup (19b)
---------------
                                                            a,b,c
     Enter factors for NSFTAB Emission Scale-Factor tables




--------
    a
     Assignments for each table are treated as a separate input subgroup
     and therefore must end with an input group terminator.
    b
     FACTORNAME must be no longer than 40 characters
    c
     Spaces are NOT allowed in any FACTORNAME or FACTORTYPE assignment,
     and the names are NOT case-sensitive



--------------------------------------------------------------------------------

INPUT GROUPS: 20a, 20b, 20c -- Non-gridded (discrete) receptor information
---------------------------

---------------
Subgroup (20a)
---------------

     Number of non-gridded receptors (NREC)  No default  !  NREC =  4353   !


     Group names can be used to assign receptor locations in
     Subgroup 20c and thereby provide an identification that
     can be referenced when postprocessing receptors.  The
     default assignment name X is used when NRGRP = 0.
```

```
     Number of receptor group names (NRGRP)  Default: 0  !  NRGRP =  0   !

!END!

---------------
Subgroup (20b)
---------------

     Provide a name for each receptor group if NRGRP>0.
     Enter NRGRP lines.
                     a,b
            Group Name
            ----------




-------------
    a
     Each group name provided is treated as a separate input subgroup
     and therefore must end with an input group terminator.
    b
     Receptor group names must not include blanks.


---------------
Subgroup (20c)
---------------
                                               a
           NON-GRIDDED (DISCRETE) RECEPTOR DATA
           ------------------------------------

              c          X            Y          Ground        Height   b
Receptor Group        Coordinate   Coordinate    Elevation   Above Ground
  No.    Name            (km)         (km)          (m)           (m)
-------- -----        ----------   ----------    ---------   ------------
 1!X=680.15,  4859.96,  85.63,  0.000!!END!
2!X=680.17,  4859.96,  86.26,  0.000!!END!
3!X=680.19,  4859.96,  87.1,  0.000!!END!
4!X=680.21,  4859.96,  88.29,  0.000!!END!
5!X=680.23,  4859.96,  89.47,  0.000!!END!
6!X=680.25,  4859.96,  90.63,  0.000!!END!
7!X=680.27,  4859.96,  91.16,  0.000!!END!
8!X=680.29,  4859.96,  91.68,  0.000!!END!
9!X=680.31,  4859.96,  92.2,  0.000!!END!
10!X=680.33,  4859.96,  92.39,  0.000!!END!
11!X=680.35,  4859.96,  92.44,  0.000!!END!
12!X=680.37,  4859.96,  92.5,  0.000!!END!
13!X=680.39,  4859.96,  92.55,  0.000!!END!
14!X=680.41,  4859.96,  92.61,  0.000!!END!
15!X=680.43,  4859.96,  92.68,  0.000!!END!
16!X=680.45,  4859.96,  92.75,  0.000!!END!
17!X=680.47,  4859.96,  92.82,  0.000!!END!
18!X=680.49,  4859.96,  92.89,  0.000!!END!
19!X=680.51,  4859.96,  92.97,  0.000!!END!
20!X=680.53,  4859.96,  92.95,  0.000!!END!
21!X=680.55,  4859.96,  92.86,  0.000!!END!
22!X=680.57,  4859.96,  92.77,  0.000!!END!
23!X=680.59,  4859.96,  92.85,  0.000!!END!
24!X=680.61,  4859.96,  93.35,  0.000!!END!
25!X=680.63,  4859.96,  93.85,  0.000!!END!
26!X=680.65,  4859.96,  94.34,  0.000!!END!
27!X=680.67,  4859.96,  94.83,  0.000!!END!
28!X=680.69,  4859.96,  95.32,  0.000!!END!
29!X=680.71,  4859.96,  95.8,  0.000!!END!
30!X=680.73,  4859.96,  96,  0.000!!END!
31!X=680.75,  4859.96,  95.99,  0.000!!END!
```

```
32!X=680.77,  4859.96,  95.99,  0.000!!END!
33!X=680.79,  4859.96,  96.29,  0.000!!END!
34!X=680.81,  4859.96,  97.57,  0.000!!END!
35!X=680.83,  4859.96,  98.84,  0.000!!END!
36!X=680.85,  4859.96,  100.11,  0.000!!END!
37!X=680.87,  4859.96,  100.38,  0.000!!END!
38!X=680.89,  4859.96,  100.53,  0.000!!END!
39!X=680.91,  4859.96,  100.7,  0.000!!END!
40!X=680.93,  4859.96,  101.2,  0.000!!END!
41!X=680.95,  4859.96,  101.98,  0.000!!END!
42!X=680.15,  4859.98,  86.16,  0.000!!END!
43!X=680.17,  4859.98,  86.77,  0.000!!END!
44!X=680.19,  4859.98,  87.59,  0.000!!END!
45!X=680.21,  4859.98,  88.73,  0.000!!END!
46!X=680.23,  4859.98,  89.88,  0.000!!END!
47!X=680.25,  4859.98,  91.01,  0.000!!END!
48!X=680.27,  4859.98,  91.62,  0.000!!END!
49!X=680.29,  4859.98,  92.22,  0.000!!END!
50!X=680.31,  4859.98,  92.82,  0.000!!END!
51!X=680.33,  4859.98,  93,  0.000!!END!
52!X=680.35,  4859.98,  92.98,  0.000!!END!
53!X=680.37,  4859.98,  92.97,  0.000!!END!
54!X=680.39,  4859.98,  92.96,  0.000!!END!
55!X=680.41,  4859.98,  92.96,  0.000!!END!
56!X=680.43,  4859.98,  92.96,  0.000!!END!
57!X=680.45,  4859.98,  92.96,  0.000!!END!
58!X=680.47,  4859.98,  92.97,  0.000!!END!
59!X=680.49,  4859.98,  92.98,  0.000!!END!
60!X=680.51,  4859.98,  92.99,  0.000!!END!
61!X=680.53,  4859.98,  92.99,  0.000!!END!
62!X=680.55,  4859.98,  92.97,  0.000!!END!
63!X=680.57,  4859.98,  92.94,  0.000!!END!
64!X=680.59,  4859.98,  93.1,  0.000!!END!
65!X=680.61,  4859.98,  93.66,  0.000!!END!
66!X=680.63,  4859.98,  94.23,  0.000!!END!
67!X=680.65,  4859.98,  94.79,  0.000!!END!
68!X=680.67,  4859.98,  95.34,  0.000!!END!
69!X=680.69,  4859.98,  95.89,  0.000!!END!
70!X=680.71,  4859.98,  96.44,  0.000!!END!
71!X=680.73,  4859.98,  96.53,  0.000!!END!
72!X=680.75,  4859.98,  96.33,  0.000!!END!
73!X=680.77,  4859.98,  96.14,  0.000!!END!
74!X=680.79,  4859.98,  96.36,  0.000!!END!
75!X=680.81,  4859.98,  97.77,  0.000!!END!
76!X=680.83,  4859.98,  99.17,  0.000!!END!
77!X=680.85,  4859.98,  100.56,  0.000!!END!
78!X=680.87,  4859.98,  100.58,  0.000!!END!
79!X=680.89,  4859.98,  100.48,  0.000!!END!
80!X=680.91,  4859.98,  100.38,  0.000!!END!
81!X=680.93,  4859.98,  100.82,  0.000!!END!
82!X=680.95,  4859.98,  101.67,  0.000!!END!
83!X=680.15,  4860,  86.62,  0.000!!END!
84!X=680.17,  4860,  87.36,  0.000!!END!
85!X=680.19,  4860,  88.16,  0.000!!END!
86!X=680.21,  4860,  89.04,  0.000!!END!
87!X=680.23,  4860,  89.93,  0.000!!END!
88!X=680.25,  4860,  90.81,  0.000!!END!
89!X=680.27,  4860,  91.42,  0.000!!END!
90!X=680.29,  4860,  92.02,  0.000!!END!
91!X=680.31,  4860,  92.62,  0.000!!END!
92!X=680.33,  4860,  92.97,  0.000!!END!
93!X=680.35,  4860,  93.22,  0.000!!END!
94!X=680.37,  4860,  93.46,  0.000!!END!
95!X=680.39,  4860,  93.59,  0.000!!END!
96!X=680.41,  4860,  93.57,  0.000!!END!
97!X=680.43,  4860,  93.56,  0.000!!END!
```

```
98!X=680.45,  4860,  93.54,  0.000!!END!
99!X=680.47,  4860,  93.41,  0.000!!END!
100!X=680.49,  4860,  93.3,  0.000!!END!
101!X=680.51,  4860,  93.19,  0.000!!END!
102!X=680.53,  4860,  93.19,  0.000!!END!
103!X=680.55,  4860,  93.23,  0.000!!END!
104!X=680.57,  4860,  93.26,  0.000!!END!
105!X=680.59,  4860,  93.46,  0.000!!END!
106!X=680.61,  4860,  94.01,  0.000!!END!
107!X=680.63,  4860,  94.56,  0.000!!END!
108!X=680.65,  4860,  95.11,  0.000!!END!
109!X=680.67,  4860,  95.67,  0.000!!END!
110!X=680.69,  4860,  96.23,  0.000!!END!
111!X=680.71,  4860,  96.79,  0.000!!END!
112!X=680.73,  4860,  96.87,  0.000!!END!
113!X=680.75,  4860,  96.65,  0.000!!END!
114!X=680.77,  4860,  96.42,  0.000!!END!
115!X=680.79,  4860,  96.63,  0.000!!END!
116!X=680.81,  4860,  97.99,  0.000!!END!
117!X=680.83,  4860,  99.38,  0.000!!END!
118!X=680.85,  4860,  100.78,  0.000!!END!
119!X=680.87,  4860,  100.64,  0.000!!END!
120!X=680.89,  4860,  100.38,  0.000!!END!
121!X=680.91,  4860,  100.11,  0.000!!END!
122!X=680.93,  4860,  100.49,  0.000!!END!
123!X=680.95,  4860,  101.35,  0.000!!END!
124!X=680.15,  4860.02,  87.09,  0.000!!END!
125!X=680.17,  4860.02,  87.96,  0.000!!END!
126!X=680.19,  4860.02,  88.71,  0.000!!END!
127!X=680.21,  4860.02,  89.33,  0.000!!END!
128!X=680.23,  4860.02,  89.97,  0.000!!END!
129!X=680.25,  4860.02,  90.61,  0.000!!END!
130!X=680.27,  4860.02,  91.22,  0.000!!END!
131!X=680.29,  4860.02,  91.82,  0.000!!END!
132!X=680.31,  4860.02,  92.42,  0.000!!END!
133!X=680.33,  4860.02,  92.96,  0.000!!END!
134!X=680.35,  4860.02,  93.47,  0.000!!END!
135!X=680.37,  4860.02,  93.96,  0.000!!END!
136!X=680.39,  4860.02,  94.24,  0.000!!END!
137!X=680.41,  4860.02,  94.22,  0.000!!END!
138!X=680.43,  4860.02,  94.2,  0.000!!END!
139!X=680.45,  4860.02,  94.17,  0.000!!END!
140!X=680.47,  4860.02,  93.92,  0.000!!END!
141!X=680.49,  4860.02,  93.68,  0.000!!END!
142!X=680.51,  4860.02,  93.44,  0.000!!END!
143!X=680.53,  4860.02,  93.45,  0.000!!END!
144!X=680.55,  4860.02,  93.55,  0.000!!END!
145!X=680.57,  4860.02,  93.65,  0.000!!END!
146!X=680.59,  4860.02,  93.89,  0.000!!END!
147!X=680.61,  4860.02,  94.37,  0.000!!END!
148!X=680.63,  4860.02,  94.85,  0.000!!END!
149!X=680.65,  4860.02,  95.34,  0.000!!END!
150!X=680.67,  4860.02,  95.83,  0.000!!END!
151!X=680.69,  4860.02,  96.33,  0.000!!END!
152!X=680.71,  4860.02,  96.83,  0.000!!END!
153!X=680.73,  4860.02,  96.99,  0.000!!END!
154!X=680.75,  4860.02,  96.96,  0.000!!END!
155!X=680.77,  4860.02,  96.92,  0.000!!END!
156!X=680.79,  4860.02,  97.21,  0.000!!END!
157!X=680.81,  4860.02,  98.26,  0.000!!END!
158!X=680.83,  4860.02,  99.32,  0.000!!END!
159!X=680.85,  4860.02,  100.4,  0.000!!END!
160!X=680.87,  4860.02,  100.33,  0.000!!END!
161!X=680.89,  4860.02,  100.19,  0.000!!END!
162!X=680.91,  4860.02,  100.06,  0.000!!END!
163!X=680.93,  4860.02,  100.36,  0.000!!END!
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164!X=680.95,  4860.02,  100.96,  0.000!!END!
165!X=680.15,  4860.04,  87.57,  0.000!!END!
166!X=680.17,  4860.04,  88.57,  0.000!!END!
167!X=680.19,  4860.04,  89.25,  0.000!!END!
168!X=680.21,  4860.04,  89.61,  0.000!!END!
169!X=680.23,  4860.04,  89.99,  0.000!!END!
170!X=680.25,  4860.04,  90.41,  0.000!!END!
171!X=680.27,  4860.04,  91.02,  0.000!!END!
172!X=680.29,  4860.04,  91.62,  0.000!!END!
173!X=680.31,  4860.04,  92.22,  0.000!!END!
174!X=680.33,  4860.04,  92.96,  0.000!!END!
175!X=680.35,  4860.04,  93.73,  0.000!!END!
176!X=680.37,  4860.04,  94.48,  0.000!!END!
177!X=680.39,  4860.04,  94.89,  0.000!!END!
178!X=680.41,  4860.04,  94.87,  0.000!!END!
179!X=680.43,  4860.04,  94.85,  0.000!!END!
180!X=680.45,  4860.04,  94.8,  0.000!!END!
181!X=680.47,  4860.04,  94.42,  0.000!!END!
182!X=680.49,  4860.04,  94.05,  0.000!!END!
183!X=680.51,  4860.04,  93.69,  0.000!!END!
184!X=680.53,  4860.04,  93.72,  0.000!!END!
185!X=680.55,  4860.04,  93.88,  0.000!!END!
186!X=680.57,  4860.04,  94.05,  0.000!!END!
187!X=680.59,  4860.04,  94.31,  0.000!!END!
188!X=680.61,  4860.04,  94.72,  0.000!!END!
189!X=680.63,  4860.04,  95.14,  0.000!!END!
190!X=680.65,  4860.04,  95.57,  0.000!!END!
191!X=680.67,  4860.04,  96,  0.000!!END!
192!X=680.69,  4860.04,  96.43,  0.000!!END!
193!X=680.71,  4860.04,  96.86,  0.000!!END!
194!X=680.73,  4860.04,  97.12,  0.000!!END!
195!X=680.75,  4860.04,  97.29,  0.000!!END!
196!X=680.77,  4860.04,  97.44,  0.000!!END!
197!X=680.79,  4860.04,  97.78,  0.000!!END!
198!X=680.81,  4860.04,  98.5,  0.000!!END!
199!X=680.83,  4860.04,  99.24,  0.000!!END!
200!X=680.85,  4860.04,  100,  0.000!!END!
201!X=680.87,  4860.04,  100.02,  0.000!!END!
202!X=680.89,  4860.04,  100.01,  0.000!!END!
203!X=680.91,  4860.04,  100.01,  0.000!!END!
204!X=680.93,  4860.04,  100.21,  0.000!!END!
205!X=680.95,  4860.04,  100.56,  0.000!!END!
206!X=680.15,  4860.06,  88.05,  0.000!!END!
207!X=680.17,  4860.06,  89.18,  0.000!!END!
208!X=680.19,  4860.06,  89.77,  0.000!!END!
209!X=680.21,  4860.06,  89.88,  0.000!!END!
210!X=680.23,  4860.06,  90,  0.000!!END!
211!X=680.25,  4860.06,  90.21,  0.000!!END!
212!X=680.27,  4860.06,  90.82,  0.000!!END!
213!X=680.29,  4860.06,  91.42,  0.000!!END!
214!X=680.31,  4860.06,  92.02,  0.000!!END!
215!X=680.33,  4860.06,  92.98,  0.000!!END!
216!X=680.35,  4860.06,  94,  0.000!!END!
217!X=680.37,  4860.06,  95.01,  0.000!!END!
218!X=680.39,  4860.06,  95.54,  0.000!!END!
219!X=680.41,  4860.06,  95.52,  0.000!!END!
220!X=680.43,  4860.06,  95.5,  0.000!!END!
221!X=680.45,  4860.06,  95.42,  0.000!!END!
222!X=680.47,  4860.06,  94.92,  0.000!!END!
223!X=680.49,  4860.06,  94.42,  0.000!!END!
224!X=680.51,  4860.06,  93.92,  0.000!!END!
225!X=680.53,  4860.06,  93.99,  0.000!!END!
226!X=680.55,  4860.06,  94.22,  0.000!!END!
227!X=680.57,  4860.06,  94.45,  0.000!!END!
228!X=680.59,  4860.06,  94.72,  0.000!!END!
229!X=680.61,  4860.06,  95.08,  0.000!!END!
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230!X=680.63,  4860.06,  95.43,  0.000!!END!
231!X=680.65,  4860.06,  95.79,  0.000!!END!
232!X=680.67,  4860.06,  96.16,  0.000!!END!
233!X=680.69,  4860.06,  96.52,  0.000!!END!
234!X=680.71,  4860.06,  96.89,  0.000!!END!
235!X=680.73,  4860.06,  97.26,  0.000!!END!
236!X=680.75,  4860.06,  97.62,  0.000!!END!
237!X=680.77,  4860.06,  97.97,  0.000!!END!
238!X=680.79,  4860.06,  98.33,  0.000!!END!
239!X=680.81,  4860.06,  98.73,  0.000!!END!
240!X=680.83,  4860.06,  99.15,  0.000!!END!
241!X=680.85,  4860.06,  99.58,  0.000!!END!
242!X=680.87,  4860.06,  99.72,  0.000!!END!
243!X=680.89,  4860.06,  99.84,  0.000!!END!
244!X=680.91,  4860.06,  99.96,  0.000!!END!
245!X=680.93,  4860.06,  100.05,  0.000!!END!
246!X=680.95,  4860.06,  100.14,  0.000!!END!
247!X=680.15,  4860.08,  88.73,  0.000!!END!
248!X=680.17,  4860.08,  89.94,  0.000!!END!
249!X=680.19,  4860.08,  90.48,  0.000!!END!
250!X=680.21,  4860.08,  90.45,  0.000!!END!
251!X=680.23,  4860.08,  90.43,  0.000!!END!
252!X=680.25,  4860.08,  90.52,  0.000!!END!
253!X=680.27,  4860.08,  91.06,  0.000!!END!
254!X=680.29,  4860.08,  91.61,  0.000!!END!
255!X=680.31,  4860.08,  92.16,  0.000!!END!
256!X=680.33,  4860.08,  93.18,  0.000!!END!
257!X=680.35,  4860.08,  94.3,  0.000!!END!
258!X=680.37,  4860.08,  95.43,  0.000!!END!
259!X=680.39,  4860.08,  96,  0.000!!END!
260!X=680.41,  4860.08,  96,  0.000!!END!
261!X=680.43,  4860.08,  96,  0.000!!END!
262!X=680.45,  4860.08,  95.92,  0.000!!END!
263!X=680.47,  4860.08,  95.34,  0.000!!END!
264!X=680.49,  4860.08,  94.76,  0.000!!END!
265!X=680.51,  4860.08,  94.17,  0.000!!END!
266!X=680.53,  4860.08,  94.27,  0.000!!END!
267!X=680.55,  4860.08,  94.56,  0.000!!END!
268!X=680.57,  4860.08,  94.84,  0.000!!END!
269!X=680.59,  4860.08,  95.13,  0.000!!END!
270!X=680.61,  4860.08,  95.43,  0.000!!END!
271!X=680.63,  4860.08,  95.72,  0.000!!END!
272!X=680.65,  4860.08,  96.01,  0.000!!END!
273!X=680.67,  4860.08,  96.31,  0.000!!END!
274!X=680.69,  4860.08,  96.61,  0.000!!END!
275!X=680.71,  4860.08,  96.92,  0.000!!END!
276!X=680.73,  4860.08,  97.42,  0.000!!END!
277!X=680.75,  4860.08,  97.97,  0.000!!END!
278!X=680.77,  4860.08,  98.51,  0.000!!END!
279!X=680.79,  4860.08,  98.86,  0.000!!END!
280!X=680.81,  4860.08,  98.94,  0.000!!END!
281!X=680.83,  4860.08,  99.04,  0.000!!END!
282!X=680.85,  4860.08,  99.16,  0.000!!END!
283!X=680.87,  4860.08,  99.42,  0.000!!END!
284!X=680.89,  4860.08,  99.68,  0.000!!END!
285!X=680.91,  4860.08,  99.92,  0.000!!END!
286!X=680.93,  4860.08,  99.87,  0.000!!END!
287!X=680.95,  4860.08,  99.7,  0.000!!END!
288!X=680.15,  4860.1,  89.54,  0.000!!END!
289!X=680.17,  4860.1,  90.81,  0.000!!END!
290!X=680.19,  4860.1,  91.34,  0.000!!END!
291!X=680.21,  4860.1,  91.32,  0.000!!END!
292!X=680.23,  4860.1,  91.3,  0.000!!END!
293!X=680.25,  4860.1,  91.38,  0.000!!END!
294!X=680.27,  4860.1,  91.86,  0.000!!END!
295!X=680.29,  4860.1,  92.35,  0.000!!END!
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296!X=680.31,  4860.1,  92.84,  0.000!!END!
297!X=680.33,  4860.1,  93.69,  0.000!!END!
298!X=680.35,  4860.1,  94.62,  0.000!!END!
299!X=680.37,  4860.1,  95.55,  0.000!!END!
300!X=680.39,  4860.1,  96,  0.000!!END!
301!X=680.41,  4860.1,  96,  0.000!!END!
302!X=680.43,  4860.1,  96,  0.000!!END!
303!X=680.45,  4860.1,  95.92,  0.000!!END!
304!X=680.47,  4860.1,  95.48,  0.000!!END!
305!X=680.49,  4860.1,  95.02,  0.000!!END!
306!X=680.51,  4860.1,  94.56,  0.000!!END!
307!X=680.53,  4860.1,  94.66,  0.000!!END!
308!X=680.55,  4860.1,  94.88,  0.000!!END!
309!X=680.57,  4860.1,  95.1,  0.000!!END!
310!X=680.59,  4860.1,  95.39,  0.000!!END!
311!X=680.61,  4860.1,  95.74,  0.000!!END!
312!X=680.63,  4860.1,  96.1,  0.000!!END!
313!X=680.65,  4860.1,  96.42,  0.000!!END!
314!X=680.67,  4860.1,  96.53,  0.000!!END!
315!X=680.69,  4860.1,  96.65,  0.000!!END!
316!X=680.71,  4860.1,  96.79,  0.000!!END!
317!X=680.73,  4860.1,  97.32,  0.000!!END!
318!X=680.75,  4860.1,  97.98,  0.000!!END!
319!X=680.77,  4860.1,  98.62,  0.000!!END!
320!X=680.79,  4860.1,  99.02,  0.000!!END!
321!X=680.81,  4860.1,  99.07,  0.000!!END!
322!X=680.83,  4860.1,  99.11,  0.000!!END!
323!X=680.85,  4860.1,  99.16,  0.000!!END!
324!X=680.87,  4860.1,  99.37,  0.000!!END!
325!X=680.89,  4860.1,  99.59,  0.000!!END!
326!X=680.91,  4860.1,  99.81,  0.000!!END!
327!X=680.93,  4860.1,  99.69,  0.000!!END!
328!X=680.95,  4860.1,  99.43,  0.000!!END!
329!X=680.15,  4860.12,  90.34,  0.000!!END!
330!X=680.17,  4860.12,  91.68,  0.000!!END!
331!X=680.19,  4860.12,  92.21,  0.000!!END!
332!X=680.21,  4860.12,  92.18,  0.000!!END!
333!X=680.23,  4860.12,  92.16,  0.000!!END!
334!X=680.25,  4860.12,  92.24,  0.000!!END!
335!X=680.27,  4860.12,  92.66,  0.000!!END!
336!X=680.29,  4860.12,  93.08,  0.000!!END!
337!X=680.31,  4860.12,  93.5,  0.000!!END!
338!X=680.33,  4860.12,  94.19,  0.000!!END!
339!X=680.35,  4860.12,  94.92,  0.000!!END!
340!X=680.37,  4860.12,  95.66,  0.000!!END!
341!X=680.39,  4860.12,  96,  0.000!!END!
342!X=680.41,  4860.12,  96,  0.000!!END!
343!X=680.43,  4860.12,  96,  0.000!!END!
344!X=680.45,  4860.12,  95.94,  0.000!!END!
345!X=680.47,  4860.12,  95.62,  0.000!!END!
346!X=680.49,  4860.12,  95.3,  0.000!!END!
347!X=680.51,  4860.12,  94.96,  0.000!!END!
348!X=680.53,  4860.12,  95.04,  0.000!!END!
349!X=680.55,  4860.12,  95.2,  0.000!!END!
350!X=680.57,  4860.12,  95.36,  0.000!!END!
351!X=680.59,  4860.12,  95.65,  0.000!!END!
352!X=680.61,  4860.12,  96.07,  0.000!!END!
353!X=680.63,  4860.12,  96.48,  0.000!!END!
354!X=680.65,  4860.12,  96.82,  0.000!!END!
355!X=680.67,  4860.12,  96.74,  0.000!!END!
356!X=680.69,  4860.12,  96.67,  0.000!!END!
357!X=680.71,  4860.12,  96.61,  0.000!!END!
358!X=680.73,  4860.12,  97.18,  0.000!!END!
359!X=680.75,  4860.12,  97.89,  0.000!!END!
360!X=680.77,  4860.12,  98.61,  0.000!!END!
361!X=680.79,  4860.12,  99.05,  0.000!!END!
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362!X=680.81,  4860.12,  99.16,  0.000!!END!
363!X=680.83,  4860.12,  99.27,  0.000!!END!
364!X=680.85,  4860.12,  99.37,  0.000!!END!
365!X=680.87,  4860.12,  99.45,  0.000!!END!
366!X=680.89,  4860.12,  99.54,  0.000!!END!
367!X=680.91,  4860.12,  99.64,  0.000!!END!
368!X=680.93,  4860.12,  99.52,  0.000!!END!
369!X=680.95,  4860.12,  99.32,  0.000!!END!
370!X=680.15,  4860.14,  91.16,  0.000!!END!
371!X=680.17,  4860.14,  92.56,  0.000!!END!
372!X=680.19,  4860.14,  93.07,  0.000!!END!
373!X=680.21,  4860.14,  93.05,  0.000!!END!
374!X=680.23,  4860.14,  93.02,  0.000!!END!
375!X=680.25,  4860.14,  93.1,  0.000!!END!
376!X=680.27,  4860.14,  93.45,  0.000!!END!
377!X=680.29,  4860.14,  93.81,  0.000!!END!
378!X=680.31,  4860.14,  94.17,  0.000!!END!
379!X=680.33,  4860.14,  94.68,  0.000!!END!
380!X=680.35,  4860.14,  95.22,  0.000!!END!
381!X=680.37,  4860.14,  95.76,  0.000!!END!
382!X=680.39,  4860.14,  96,  0.000!!END!
383!X=680.41,  4860.14,  96,  0.000!!END!
384!X=680.43,  4860.14,  96,  0.000!!END!
385!X=680.45,  4860.14,  95.96,  0.000!!END!
386!X=680.47,  4860.14,  95.77,  0.000!!END!
387!X=680.49,  4860.14,  95.57,  0.000!!END!
388!X=680.51,  4860.14,  95.37,  0.000!!END!
389!X=680.53,  4860.14,  95.42,  0.000!!END!
390!X=680.55,  4860.14,  95.51,  0.000!!END!
391!X=680.57,  4860.14,  95.61,  0.000!!END!
392!X=680.59,  4860.14,  95.91,  0.000!!END!
393!X=680.61,  4860.14,  96.39,  0.000!!END!
394!X=680.67,  4860.14,  96.94,  0.000!!END!
395!X=680.69,  4860.14,  96.68,  0.000!!END!
396!X=680.71,  4860.14,  96.43,  0.000!!END!
397!X=680.73,  4860.14,  97.03,  0.000!!END!
398!X=680.75,  4860.14,  97.81,  0.000!!END!
399!X=680.77,  4860.14,  98.59,  0.000!!END!
400!X=680.79,  4860.14,  99.08,  0.000!!END!
401!X=680.81,  4860.14,  99.26,  0.000!!END!
402!X=680.83,  4860.14,  99.43,  0.000!!END!
403!X=680.85,  4860.14,  99.57,  0.000!!END!
404!X=680.87,  4860.14,  99.52,  0.000!!END!
405!X=680.89,  4860.14,  99.48,  0.000!!END!
406!X=680.91,  4860.14,  99.45,  0.000!!END!
407!X=680.93,  4860.14,  99.35,  0.000!!END!
408!X=680.95,  4860.14,  99.21,  0.000!!END!
409!X=680.15,  4860.16,  91.97,  0.000!!END!
410!X=680.17,  4860.16,  93.44,  0.000!!END!
411!X=680.19,  4860.16,  93.93,  0.000!!END!
412!X=680.21,  4860.16,  93.91,  0.000!!END!
413!X=680.23,  4860.16,  93.89,  0.000!!END!
414!X=680.25,  4860.16,  93.96,  0.000!!END!
415!X=680.27,  4860.16,  94.24,  0.000!!END!
416!X=680.29,  4860.16,  94.54,  0.000!!END!
417!X=680.31,  4860.16,  94.83,  0.000!!END!
418!X=680.33,  4860.16,  95.16,  0.000!!END!
419!X=680.35,  4860.16,  95.5,  0.000!!END!
420!X=680.37,  4860.16,  95.86,  0.000!!END!
421!X=680.39,  4860.16,  96,  0.000!!END!
422!X=680.41,  4860.16,  96,  0.000!!END!
423!X=680.43,  4860.16,  96,  0.000!!END!
424!X=680.45,  4860.16,  95.99,  0.000!!END!
425!X=680.47,  4860.16,  95.93,  0.000!!END!
426!X=680.49,  4860.16,  95.86,  0.000!!END!
427!X=680.51,  4860.16,  95.79,  0.000!!END!
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428!X=680.53,  4860.16,  95.8,  0.000!!END!
429!X=680.55,  4860.16,  95.82,  0.000!!END!
430!X=680.67,  4860.16,  97.14,  0.000!!END!
431!X=680.69,  4860.16,  96.68,  0.000!!END!
432!X=680.71,  4860.16,  96.24,  0.000!!END!
433!X=680.73,  4860.16,  96.89,  0.000!!END!
434!X=680.75,  4860.16,  97.74,  0.000!!END!
435!X=680.77,  4860.16,  98.58,  0.000!!END!
436!X=680.79,  4860.16,  99.12,  0.000!!END!
437!X=680.81,  4860.16,  99.36,  0.000!!END!
438!X=680.83,  4860.16,  99.59,  0.000!!END!
439!X=680.85,  4860.16,  99.76,  0.000!!END!
440!X=680.87,  4860.16,  99.59,  0.000!!END!
441!X=680.89,  4860.16,  99.42,  0.000!!END!
442!X=680.91,  4860.16,  99.26,  0.000!!END!
443!X=680.93,  4860.16,  99.18,  0.000!!END!
444!X=680.95,  4860.16,  99.11,  0.000!!END!
445!X=680.15,  4860.18,  92.2,  0.000!!END!
446!X=680.17,  4860.18,  93.56,  0.000!!END!
447!X=680.19,  4860.18,  94.08,  0.000!!END!
448!X=680.21,  4860.18,  94.19,  0.000!!END!
449!X=680.23,  4860.18,  94.3,  0.000!!END!
450!X=680.25,  4860.18,  94.44,  0.000!!END!
451!X=680.27,  4860.18,  94.68,  0.000!!END!
452!X=680.29,  4860.18,  94.92,  0.000!!END!
453!X=680.31,  4860.18,  95.16,  0.000!!END!
454!X=680.33,  4860.18,  95.36,  0.000!!END!
455!X=680.35,  4860.18,  95.56,  0.000!!END!
456!X=680.37,  4860.18,  95.78,  0.000!!END!
457!X=680.39,  4860.18,  95.91,  0.000!!END!
458!X=680.41,  4860.18,  96,  0.000!!END!
459!X=680.43,  4860.18,  96.07,  0.000!!END!
460!X=680.45,  4860.18,  96.15,  0.000!!END!
461!X=680.47,  4860.18,  96.25,  0.000!!END!
462!X=680.49,  4860.18,  96.34,  0.000!!END!
463!X=680.67,  4860.18,  97.46,  0.000!!END!
464!X=680.69,  4860.18,  96.86,  0.000!!END!
465!X=680.71,  4860.18,  96.26,  0.000!!END!
466!X=680.73,  4860.18,  96.94,  0.000!!END!
467!X=680.75,  4860.18,  97.8,  0.000!!END!
468!X=680.77,  4860.18,  98.67,  0.000!!END!
469!X=680.79,  4860.18,  99.21,  0.000!!END!
470!X=680.81,  4860.18,  99.48,  0.000!!END!
471!X=680.83,  4860.18,  99.75,  0.000!!END!
472!X=680.85,  4860.18,  99.94,  0.000!!END!
473!X=680.87,  4860.18,  99.65,  0.000!!END!
474!X=680.89,  4860.18,  99.35,  0.000!!END!
475!X=680.91,  4860.18,  99.06,  0.000!!END!
476!X=680.93,  4860.18,  99.01,  0.000!!END!
477!X=680.95,  4860.18,  99.01,  0.000!!END!
478!X=680.15,  4860.2,  92.4,  0.000!!END!
479!X=680.17,  4860.2,  93.64,  0.000!!END!
480!X=680.19,  4860.2,  94.18,  0.000!!END!
481!X=680.21,  4860.2,  94.42,  0.000!!END!
482!X=680.23,  4860.2,  94.65,  0.000!!END!
483!X=680.25,  4860.2,  94.86,  0.000!!END!
484!X=680.27,  4860.2,  95.03,  0.000!!END!
485!X=680.29,  4860.2,  95.2,  0.000!!END!
486!X=680.31,  4860.2,  95.38,  0.000!!END!
487!X=680.33,  4860.2,  95.45,  0.000!!END!
488!X=680.35,  4860.2,  95.53,  0.000!!END!
489!X=680.37,  4860.2,  95.61,  0.000!!END!
490!X=680.39,  4860.2,  95.78,  0.000!!END!
491!X=680.41,  4860.2,  96,  0.000!!END!
492!X=680.43,  4860.2,  96.2,  0.000!!END!
493!X=680.69,  4860.2,  97.64,  0.000!!END!
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494!X=680.71,  4860.2,  97.1,  0.000!!END!
495!X=680.73,  4860.2,  97.77,  0.000!!END!
496!X=680.75,  4860.2,  98.57,  0.000!!END!
497!X=680.77,  4860.2,  99.37,  0.000!!END!
498!X=680.79,  4860.2,  99.72,  0.000!!END!
499!X=680.81,  4860.2,  99.73,  0.000!!END!
500!X=680.83,  4860.2,  99.75,  0.000!!END!
501!X=680.85,  4860.2,  99.73,  0.000!!END!
502!X=680.87,  4860.2,  99.5,  0.000!!END!
503!X=680.89,  4860.2,  99.27,  0.000!!END!
504!X=680.91,  4860.2,  99.03,  0.000!!END!
505!X=680.93,  4860.2,  99.1,  0.000!!END!
506!X=680.95,  4860.2,  99.21,  0.000!!END!
507!X=680.15,  4860.22,  92.6,  0.000!!END!
508!X=680.17,  4860.22,  93.71,  0.000!!END!
509!X=680.19,  4860.22,  94.28,  0.000!!END!
510!X=680.21,  4860.22,  94.65,  0.000!!END!
511!X=680.23,  4860.22,  95.01,  0.000!!END!
512!X=680.25,  4860.22,  95.27,  0.000!!END!
513!X=680.27,  4860.22,  95.38,  0.000!!END!
514!X=680.29,  4860.22,  95.49,  0.000!!END!
515!X=680.31,  4860.22,  95.59,  0.000!!END!
516!X=680.33,  4860.22,  95.53,  0.000!!END!
517!X=680.35,  4860.22,  95.48,  0.000!!END!
518!X=680.37,  4860.22,  95.44,  0.000!!END!
519!X=680.39,  4860.22,  95.66,  0.000!!END!
520!X=680.41,  4860.22,  96,  0.000!!END!
521!X=680.69,  4860.22,  98.42,  0.000!!END!
522!X=680.71,  4860.22,  97.94,  0.000!!END!
523!X=680.73,  4860.22,  98.59,  0.000!!END!
524!X=680.75,  4860.22,  99.33,  0.000!!END!
525!X=680.77,  4860.22,  100.07,  0.000!!END!
526!X=680.79,  4860.22,  100.22,  0.000!!END!
527!X=680.81,  4860.22,  99.97,  0.000!!END!
528!X=680.83,  4860.22,  99.73,  0.000!!END!
529!X=680.85,  4860.22,  99.52,  0.000!!END!
530!X=680.87,  4860.22,  99.36,  0.000!!END!
531!X=680.89,  4860.22,  99.19,  0.000!!END!
532!X=680.91,  4860.22,  99.02,  0.000!!END!
533!X=680.93,  4860.22,  99.22,  0.000!!END!
534!X=680.95,  4860.22,  99.46,  0.000!!END!
535!X=680.15,  4860.24,  92.79,  0.000!!END!
536!X=680.17,  4860.24,  93.77,  0.000!!END!
537!X=680.19,  4860.24,  94.39,  0.000!!END!
538!X=680.21,  4860.24,  94.88,  0.000!!END!
539!X=680.23,  4860.24,  95.38,  0.000!!END!
540!X=680.25,  4860.24,  95.68,  0.000!!END!
541!X=680.27,  4860.24,  95.72,  0.000!!END!
542!X=680.29,  4860.24,  95.77,  0.000!!END!
543!X=680.31,  4860.24,  95.8,  0.000!!END!
544!X=680.33,  4860.24,  95.61,  0.000!!END!
545!X=680.35,  4860.24,  95.43,  0.000!!END!
546!X=680.37,  4860.24,  95.26,  0.000!!END!
547!X=680.39,  4860.24,  95.55,  0.000!!END!
548!X=680.41,  4860.24,  96.02,  0.000!!END!
549!X=680.69,  4860.24,  99.2,  0.000!!END!
550!X=680.71,  4860.24,  98.79,  0.000!!END!
551!X=680.73,  4860.24,  99.42,  0.000!!END!
552!X=680.75,  4860.24,  100.09,  0.000!!END!
553!X=680.77,  4860.24,  100.76,  0.000!!END!
554!X=680.79,  4860.24,  100.71,  0.000!!END!
555!X=680.81,  4860.24,  100.2,  0.000!!END!
556!X=680.83,  4860.24,  99.7,  0.000!!END!
557!X=680.85,  4860.24,  99.32,  0.000!!END!
558!X=680.87,  4860.24,  99.22,  0.000!!END!
559!X=680.89,  4860.24,  99.12,  0.000!!END!
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560!X=680.91,  4860.24,  99.01,  0.000!!END!
561!X=680.93,  4860.24,  99.34,  0.000!!END!
562!X=680.95,  4860.24,  99.71,  0.000!!END!
563!X=680.15,  4860.26,  92.94,  0.000!!END!
564!X=680.17,  4860.26,  93.82,  0.000!!END!
565!X=680.19,  4860.26,  94.5,  0.000!!END!
566!X=680.21,  4860.26,  95.13,  0.000!!END!
567!X=680.23,  4860.26,  95.75,  0.000!!END!
568!X=680.25,  4860.26,  96.09,  0.000!!END!
569!X=680.27,  4860.26,  96.08,  0.000!!END!
570!X=680.29,  4860.26,  96.07,  0.000!!END!
571!X=680.31,  4860.26,  96.03,  0.000!!END!
572!X=680.33,  4860.26,  95.72,  0.000!!END!
573!X=680.35,  4860.26,  95.41,  0.000!!END!
574!X=680.37,  4860.26,  95.1,  0.000!!END!
575!X=680.39,  4860.26,  95.45,  0.000!!END!
576!X=680.69,  4860.26,  99.99,  0.000!!END!
577!X=680.71,  4860.26,  99.65,  0.000!!END!
578!X=680.73,  4860.26,  100.24,  0.000!!END!
579!X=680.75,  4860.26,  100.84,  0.000!!END!
580!X=680.77,  4860.26,  101.45,  0.000!!END!
581!X=680.79,  4860.26,  101.18,  0.000!!END!
582!X=680.81,  4860.26,  100.41,  0.000!!END!
583!X=680.83,  4860.26,  99.66,  0.000!!END!
584!X=680.85,  4860.26,  99.12,  0.000!!END!
585!X=680.87,  4860.26,  99.08,  0.000!!END!
586!X=680.89,  4860.26,  99.05,  0.000!!END!
587!X=680.91,  4860.26,  99,  0.000!!END!
588!X=680.93,  4860.26,  99.47,  0.000!!END!
589!X=680.95,  4860.26,  99.97,  0.000!!END!
590!X=680.15,  4860.28,  93.04,  0.000!!END!
591!X=680.17,  4860.28,  93.85,  0.000!!END!
592!X=680.19,  4860.28,  94.62,  0.000!!END!
593!X=680.21,  4860.28,  95.38,  0.000!!END!
594!X=680.23,  4860.28,  96.13,  0.000!!END!
595!X=680.25,  4860.28,  96.52,  0.000!!END!
596!X=680.27,  4860.28,  96.51,  0.000!!END!
597!X=680.29,  4860.28,  96.5,  0.000!!END!
598!X=680.31,  4860.28,  96.45,  0.000!!END!
599!X=680.33,  4860.28,  96.14,  0.000!!END!
600!X=680.35,  4860.28,  95.83,  0.000!!END!
601!X=680.37,  4860.28,  95.52,  0.000!!END!
602!X=680.39,  4860.28,  95.9,  0.000!!END!
603!X=680.71,  4860.28,  100.01,  0.000!!END!
604!X=680.73,  4860.28,  100.53,  0.000!!END!
605!X=680.75,  4860.28,  101.06,  0.000!!END!
606!X=680.77,  4860.28,  101.6,  0.000!!END!
607!X=680.79,  4860.28,  101.24,  0.000!!END!
608!X=680.81,  4860.28,  100.41,  0.000!!END!
609!X=680.83,  4860.28,  99.58,  0.000!!END!
610!X=680.85,  4860.28,  99.02,  0.000!!END!
611!X=680.87,  4860.28,  99.06,  0.000!!END!
612!X=680.89,  4860.28,  99.1,  0.000!!END!
613!X=680.91,  4860.28,  99.13,  0.000!!END!
614!X=680.93,  4860.28,  99.66,  0.000!!END!
615!X=680.95,  4860.28,  100.22,  0.000!!END!
616!X=680.15,  4860.3,  93.14,  0.000!!END!
617!X=680.17,  4860.3,  93.88,  0.000!!END!
618!X=680.19,  4860.3,  94.75,  0.000!!END!
619!X=680.21,  4860.3,  95.64,  0.000!!END!
620!X=680.23,  4860.3,  96.52,  0.000!!END!
621!X=680.25,  4860.3,  96.95,  0.000!!END!
622!X=680.27,  4860.3,  96.94,  0.000!!END!
623!X=680.29,  4860.3,  96.93,  0.000!!END!
624!X=680.31,  4860.3,  96.88,  0.000!!END!
625!X=680.33,  4860.3,  96.57,  0.000!!END!
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!X=680.35,  4860.3,  96.26,  0.000!!END!
!X=680.37,  4860.3,  95.95,  0.000!!END!
!X=680.39,  4860.3,  96.35,  0.000!!END!
!X=680.73,  4860.3,  100.41,  0.000!!END!
!X=680.75,  4860.3,  100.82,  0.000!!END!
!X=680.77,  4860.3,  101.23,  0.000!!END!
!X=680.79,  4860.3,  100.88,  0.000!!END!
!X=680.81,  4860.3,  100.18,  0.000!!END!
!X=680.83,  4860.3,  99.47,  0.000!!END!
!X=680.85,  4860.3,  99.06,  0.000!!END!
!X=680.87,  4860.3,  99.24,  0.000!!END!
!X=680.89,  4860.3,  99.4,  0.000!!END!
!X=680.91,  4860.3,  99.57,  0.000!!END!
!X=680.93,  4860.3,  99.98,  0.000!!END!
!X=680.95,  4860.3,  100.41,  0.000!!END!
!X=680.15,  4860.32,  93.23,  0.000!!END!
!X=680.17,  4860.32,  93.91,  0.000!!END!
!X=680.19,  4860.32,  94.89,  0.000!!END!
!X=680.21,  4860.32,  95.9,  0.000!!END!
!X=680.23,  4860.32,  96.91,  0.000!!END!
!X=680.25,  4860.32,  97.39,  0.000!!END!
!X=680.27,  4860.32,  97.37,  0.000!!END!
!X=680.29,  4860.32,  97.36,  0.000!!END!
!X=680.31,  4860.32,  97.3,  0.000!!END!
!X=680.33,  4860.32,  96.99,  0.000!!END!
!X=680.35,  4860.32,  96.68,  0.000!!END!
!X=680.37,  4860.32,  96.37,  0.000!!END!
!X=680.73,  4860.32,  100.29,  0.000!!END!
!X=680.75,  4860.32,  100.56,  0.000!!END!
!X=680.77,  4860.32,  100.84,  0.000!!END!
!X=680.79,  4860.32,  100.52,  0.000!!END!
!X=680.81,  4860.32,  99.95,  0.000!!END!
!X=680.83,  4860.32,  99.37,  0.000!!END!
!X=680.85,  4860.32,  99.11,  0.000!!END!
!X=680.87,  4860.32,  99.42,  0.000!!END!
!X=680.89,  4860.32,  99.71,  0.000!!END!
!X=680.91,  4860.32,  100,  0.000!!END!
!X=680.93,  4860.32,  100.29,  0.000!!END!
!X=680.95,  4860.32,  100.59,  0.000!!END!
!X=680.15,  4860.34,  93.32,  0.000!!END!
!X=680.17,  4860.34,  93.94,  0.000!!END!
!X=680.19,  4860.34,  95.03,  0.000!!END!
!X=680.21,  4860.34,  96.18,  0.000!!END!
!X=680.23,  4860.34,  97.31,  0.000!!END!
!X=680.25,  4860.34,  97.82,  0.000!!END!
!X=680.27,  4860.34,  97.81,  0.000!!END!
!X=680.29,  4860.34,  97.79,  0.000!!END!
!X=680.31,  4860.34,  97.72,  0.000!!END!
!X=680.33,  4860.34,  97.41,  0.000!!END!
!X=680.35,  4860.34,  97.1,  0.000!!END!
!X=680.37,  4860.34,  96.79,  0.000!!END!
!X=680.71,  4860.34,  100.01,  0.000!!END!
!X=680.73,  4860.34,  100.15,  0.000!!END!
!X=680.75,  4860.34,  100.3,  0.000!!END!
!X=680.77,  4860.34,  100.45,  0.000!!END!
!X=680.79,  4860.34,  100.17,  0.000!!END!
!X=680.81,  4860.34,  99.72,  0.000!!END!
!X=680.83,  4860.34,  99.27,  0.000!!END!
!X=680.85,  4860.34,  99.17,  0.000!!END!
!X=680.87,  4860.34,  99.61,  0.000!!END!
!X=680.89,  4860.34,  100.03,  0.000!!END!
!X=680.91,  4860.34,  100.44,  0.000!!END!
!X=680.93,  4860.34,  100.6,  0.000!!END!
!X=680.95,  4860.34,  100.77,  0.000!!END!
!X=680.15,  4860.36,  93.72,  0.000!!END!
!X=680.17,  4860.36,  94.39,  0.000!!END!
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692!X=680.19,  4860.36,  95.49,  0.000!!END!
693!X=680.21,  4860.36,  96.63,  0.000!!END!
694!X=680.23,  4860.36,  97.77,  0.000!!END!
695!X=680.25,  4860.36,  98.23,  0.000!!END!
696!X=680.27,  4860.36,  98.18,  0.000!!END!
697!X=680.29,  4860.36,  98.14,  0.000!!END!
698!X=680.31,  4860.36,  98.05,  0.000!!END!
699!X=680.33,  4860.36,  97.77,  0.000!!END!
700!X=680.35,  4860.36,  97.5,  0.000!!END!
701!X=680.37,  4860.36,  97.21,  0.000!!END!
702!X=680.71,  4860.36,  100,  0.000!!END!
703!X=680.73,  4860.36,  100.01,  0.000!!END!
704!X=680.75,  4860.36,  100.03,  0.000!!END!
705!X=680.77,  4860.36,  100.05,  0.000!!END!
706!X=680.79,  4860.36,  99.82,  0.000!!END!
707!X=680.81,  4860.36,  99.51,  0.000!!END!
708!X=680.83,  4860.36,  99.19,  0.000!!END!
709!X=680.85,  4860.36,  99.24,  0.000!!END!
710!X=680.87,  4860.36,  99.8,  0.000!!END!
711!X=680.89,  4860.36,  100.36,  0.000!!END!
712!X=680.91,  4860.36,  100.87,  0.000!!END!
713!X=680.93,  4860.36,  100.9,  0.000!!END!
714!X=680.95,  4860.36,  100.94,  0.000!!END!
715!X=680.15,  4860.38,  94.25,  0.000!!END!
716!X=680.17,  4860.38,  95.05,  0.000!!END!
717!X=680.19,  4860.38,  96.11,  0.000!!END!
718!X=680.21,  4860.38,  97.18,  0.000!!END!
719!X=680.23,  4860.38,  98.26,  0.000!!END!
720!X=680.25,  4860.38,  98.62,  0.000!!END!
721!X=680.27,  4860.38,  98.51,  0.000!!END!
722!X=680.29,  4860.38,  98.4,  0.000!!END!
723!X=680.31,  4860.38,  98.27,  0.000!!END!
724!X=680.33,  4860.38,  98.06,  0.000!!END!
725!X=680.35,  4860.38,  97.85,  0.000!!END!
726!X=680.71,  4860.38,  100.21,  0.000!!END!
727!X=680.73,  4860.38,  100.2,  0.000!!END!
728!X=680.75,  4860.38,  100.19,  0.000!!END!
729!X=680.77,  4860.38,  100.19,  0.000!!END!
730!X=680.79,  4860.38,  99.9,  0.000!!END!
731!X=680.81,  4860.38,  99.54,  0.000!!END!
732!X=680.83,  4860.38,  99.19,  0.000!!END!
733!X=680.85,  4860.38,  99.27,  0.000!!END!
734!X=680.87,  4860.38,  99.87,  0.000!!END!
735!X=680.89,  4860.38,  100.46,  0.000!!END!
736!X=680.91,  4860.38,  101,  0.000!!END!
737!X=680.93,  4860.38,  100.95,  0.000!!END!
738!X=680.95,  4860.38,  100.92,  0.000!!END!
739!X=680.15,  4860.4,  94.79,  0.000!!END!
740!X=680.17,  4860.4,  95.72,  0.000!!END!
741!X=680.19,  4860.4,  96.72,  0.000!!END!
742!X=680.21,  4860.4,  97.73,  0.000!!END!
743!X=680.23,  4860.4,  98.74,  0.000!!END!
744!X=680.25,  4860.4,  99.01,  0.000!!END!
745!X=680.27,  4860.4,  98.83,  0.000!!END!
746!X=680.29,  4860.4,  98.66,  0.000!!END!
747!X=680.31,  4860.4,  98.5,  0.000!!END!
748!X=680.33,  4860.4,  98.36,  0.000!!END!
749!X=680.35,  4860.4,  98.21,  0.000!!END!
750!X=680.69,  4860.4,  100.46,  0.000!!END!
751!X=680.71,  4860.4,  100.42,  0.000!!END!
752!X=680.73,  4860.4,  100.42,  0.000!!END!
753!X=680.75,  4860.4,  100.41,  0.000!!END!
754!X=680.77,  4860.4,  100.4,  0.000!!END!
755!X=680.79,  4860.4,  100.05,  0.000!!END!
756!X=680.81,  4860.4,  99.63,  0.000!!END!
757!X=680.83,  4860.4,  99.22,  0.000!!END!
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758!X=680.85,  4860.4,  99.28,  0.000!!END!
759!X=680.87,  4860.4,  99.88,  0.000!!END!
760!X=680.89,  4860.4,  100.48,  0.000!!END!
761!X=680.91,  4860.4,  100.99,  0.000!!END!
762!X=680.93,  4860.4,  100.88,  0.000!!END!
763!X=680.95,  4860.4,  100.78,  0.000!!END!
764!X=680.15,  4860.42,  95.34,  0.000!!END!
765!X=680.17,  4860.42,  96.39,  0.000!!END!
766!X=680.19,  4860.42,  97.34,  0.000!!END!
767!X=680.21,  4860.42,  98.28,  0.000!!END!
768!X=680.23,  4860.42,  99.23,  0.000!!END!
769!X=680.25,  4860.42,  99.39,  0.000!!END!
770!X=680.27,  4860.42,  99.15,  0.000!!END!
771!X=680.29,  4860.42,  98.92,  0.000!!END!
772!X=680.31,  4860.42,  98.73,  0.000!!END!
773!X=680.33,  4860.42,  98.65,  0.000!!END!
774!X=680.35,  4860.42,  98.57,  0.000!!END!
775!X=680.69,  4860.42,  100.58,  0.000!!END!
776!X=680.71,  4860.42,  100.64,  0.000!!END!
777!X=680.73,  4860.42,  100.63,  0.000!!END!
778!X=680.75,  4860.42,  100.63,  0.000!!END!
779!X=680.77,  4860.42,  100.62,  0.000!!END!
780!X=680.79,  4860.42,  100.2,  0.000!!END!
781!X=680.81,  4860.42,  99.72,  0.000!!END!
782!X=680.83,  4860.42,  99.24,  0.000!!END!
783!X=680.85,  4860.42,  99.3,  0.000!!END!
784!X=680.87,  4860.42,  99.9,  0.000!!END!
785!X=680.89,  4860.42,  100.5,  0.000!!END!
786!X=680.91,  4860.42,  100.97,  0.000!!END!
787!X=680.93,  4860.42,  100.8,  0.000!!END!
788!X=680.95,  4860.42,  100.64,  0.000!!END!
789!X=680.15,  4860.44,  95.88,  0.000!!END!
790!X=680.17,  4860.44,  97.04,  0.000!!END!
791!X=680.19,  4860.44,  97.93,  0.000!!END!
792!X=680.21,  4860.44,  98.82,  0.000!!END!
793!X=680.23,  4860.44,  99.7,  0.000!!END!
794!X=680.25,  4860.44,  99.78,  0.000!!END!
795!X=680.27,  4860.44,  99.47,  0.000!!END!
796!X=680.29,  4860.44,  99.17,  0.000!!END!
797!X=680.31,  4860.44,  98.97,  0.000!!END!
798!X=680.33,  4860.44,  98.95,  0.000!!END!
799!X=680.35,  4860.44,  98.93,  0.000!!END!
800!X=680.69,  4860.44,  100.69,  0.000!!END!
801!X=680.71,  4860.44,  100.85,  0.000!!END!
802!X=680.73,  4860.44,  100.85,  0.000!!END!
803!X=680.75,  4860.44,  100.84,  0.000!!END!
804!X=680.77,  4860.44,  100.84,  0.000!!END!
805!X=680.79,  4860.44,  100.35,  0.000!!END!
806!X=680.81,  4860.44,  99.8,  0.000!!END!
807!X=680.83,  4860.44,  99.25,  0.000!!END!
808!X=680.85,  4860.44,  99.32,  0.000!!END!
809!X=680.87,  4860.44,  99.91,  0.000!!END!
810!X=680.89,  4860.44,  100.51,  0.000!!END!
811!X=680.91,  4860.44,  100.96,  0.000!!END!
812!X=680.93,  4860.44,  100.72,  0.000!!END!
813!X=680.95,  4860.44,  100.49,  0.000!!END!
814!X=680.15,  4860.46,  96.31,  0.000!!END!
815!X=680.17,  4860.46,  97.27,  0.000!!END!
816!X=680.19,  4860.46,  98.03,  0.000!!END!
817!X=680.21,  4860.46,  98.8,  0.000!!END!
818!X=680.23,  4860.46,  99.57,  0.000!!END!
819!X=680.25,  4860.46,  99.67,  0.000!!END!
820!X=680.27,  4860.46,  99.49,  0.000!!END!
821!X=680.29,  4860.46,  99.31,  0.000!!END!
822!X=680.31,  4860.46,  99.11,  0.000!!END!
823!X=680.33,  4860.46,  98.89,  0.000!!END!
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824!X=680.67,  4860.46,  100.61,  0.000!!END!
825!X=680.69,  4860.46,  100.83,  0.000!!END!
826!X=680.71,  4860.46,  101.01,  0.000!!END!
827!X=680.73,  4860.46,  101.05,  0.000!!END!
828!X=680.75,  4860.46,  101.08,  0.000!!END!
829!X=680.77,  4860.46,  101.1,  0.000!!END!
830!X=680.79,  4860.46,  100.57,  0.000!!END!
831!X=680.81,  4860.46,  99.99,  0.000!!END!
832!X=680.83,  4860.46,  99.39,  0.000!!END!
833!X=680.85,  4860.46,  99.44,  0.000!!END!
834!X=680.87,  4860.46,  100,  0.000!!END!
835!X=680.89,  4860.46,  100.57,  0.000!!END!
836!X=680.91,  4860.46,  100.96,  0.000!!END!
837!X=680.93,  4860.46,  100.65,  0.000!!END!
838!X=680.95,  4860.46,  100.34,  0.000!!END!
839!X=680.15,  4860.48,  96.73,  0.000!!END!
840!X=680.17,  4860.48,  97.5,  0.000!!END!
841!X=680.19,  4860.48,  98.13,  0.000!!END!
842!X=680.21,  4860.48,  98.76,  0.000!!END!
843!X=680.23,  4860.48,  99.41,  0.000!!END!
844!X=680.25,  4860.48,  99.54,  0.000!!END!
845!X=680.27,  4860.48,  99.5,  0.000!!END!
846!X=680.29,  4860.48,  99.44,  0.000!!END!
847!X=680.31,  4860.48,  99.22,  0.000!!END!
848!X=680.33,  4860.48,  98.74,  0.000!!END!
849!X=680.67,  4860.48,  100.94,  0.000!!END!
850!X=680.69,  4860.48,  100.97,  0.000!!END!
851!X=680.71,  4860.48,  101.05,  0.000!!END!
852!X=680.73,  4860.48,  101.21,  0.000!!END!
853!X=680.75,  4860.48,  101.37,  0.000!!END!
854!X=680.77,  4860.48,  101.53,  0.000!!END!
855!X=680.79,  4860.48,  101.11,  0.000!!END!
856!X=680.81,  4860.48,  100.65,  0.000!!END!
857!X=680.83,  4860.48,  100.19,  0.000!!END!
858!X=680.85,  4860.48,  100.24,  0.000!!END!
859!X=680.87,  4860.48,  100.67,  0.000!!END!
860!X=680.89,  4860.48,  101.12,  0.000!!END!
861!X=680.91,  4860.48,  101.37,  0.000!!END!
862!X=680.93,  4860.48,  100.99,  0.000!!END!
863!X=680.95,  4860.48,  100.62,  0.000!!END!
864!X=680.15,  4860.5,  97.14,  0.000!!END!
865!X=680.17,  4860.5,  97.72,  0.000!!END!
866!X=680.19,  4860.5,  98.22,  0.000!!END!
867!X=680.21,  4860.5,  98.72,  0.000!!END!
868!X=680.23,  4860.5,  99.24,  0.000!!END!
869!X=680.25,  4860.5,  99.43,  0.000!!END!
870!X=680.27,  4860.5,  99.51,  0.000!!END!
871!X=680.29,  4860.5,  99.58,  0.000!!END!
872!X=680.31,  4860.5,  99.31,  0.000!!END!
873!X=680.33,  4860.5,  98.58,  0.000!!END!
874!X=680.35,  4860.5,  97.86,  0.000!!END!
875!X=680.67,  4860.5,  101.27,  0.000!!END!
876!X=680.69,  4860.5,  101.11,  0.000!!END!
877!X=680.71,  4860.5,  101.09,  0.000!!END!
878!X=680.73,  4860.5,  101.39,  0.000!!END!
879!X=680.75,  4860.5,  101.68,  0.000!!END!
880!X=680.77,  4860.5,  101.96,  0.000!!END!
881!X=680.79,  4860.5,  101.66,  0.000!!END!
882!X=680.81,  4860.5,  101.32,  0.000!!END!
883!X=680.83,  4860.5,  100.99,  0.000!!END!
884!X=680.85,  4860.5,  101.04,  0.000!!END!
885!X=680.87,  4860.5,  101.34,  0.000!!END!
886!X=680.89,  4860.5,  101.65,  0.000!!END!
887!X=680.91,  4860.5,  101.77,  0.000!!END!
888!X=680.93,  4860.5,  101.33,  0.000!!END!
889!X=680.95,  4860.5,  100.89,  0.000!!END!
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890!X=680.15,  4860.52,  97.53,  0.000!!END!
891!X=680.17,  4860.52,  97.93,  0.000!!END!
892!X=680.19,  4860.52,  98.3,  0.000!!END!
893!X=680.21,  4860.52,  98.68,  0.000!!END!
894!X=680.23,  4860.52,  99.06,  0.000!!END!
895!X=680.25,  4860.52,  99.31,  0.000!!END!
896!X=680.27,  4860.52,  99.52,  0.000!!END!
897!X=680.29,  4860.52,  99.73,  0.000!!END!
898!X=680.31,  4860.52,  99.39,  0.000!!END!
899!X=680.33,  4860.52,  98.4,  0.000!!END!
900!X=680.35,  4860.52,  97.42,  0.000!!END!
901!X=680.37,  4860.52,  96.61,  0.000!!END!
902!X=680.39,  4860.52,  97.28,  0.000!!END!
903!X=680.41,  4860.52,  97.95,  0.000!!END!
904!X=680.65,  4860.52,  101.96,  0.000!!END!
905!X=680.67,  4860.52,  101.59,  0.000!!END!
906!X=680.69,  4860.52,  101.23,  0.000!!END!
907!X=680.71,  4860.52,  101.15,  0.000!!END!
908!X=680.73,  4860.52,  101.57,  0.000!!END!
909!X=680.75,  4860.52,  101.99,  0.000!!END!
910!X=680.77,  4860.52,  102.4,  0.000!!END!
911!X=680.79,  4860.52,  102.21,  0.000!!END!
912!X=680.81,  4860.52,  102,  0.000!!END!
913!X=680.83,  4860.52,  101.8,  0.000!!END!
914!X=680.85,  4860.52,  101.83,  0.000!!END!
915!X=680.87,  4860.52,  102,  0.000!!END!
916!X=680.89,  4860.52,  102.19,  0.000!!END!
917!X=680.91,  4860.52,  102.17,  0.000!!END!
918!X=680.93,  4860.52,  101.67,  0.000!!END!
919!X=680.95,  4860.52,  101.17,  0.000!!END!
920!X=680.15,  4860.54,  97.97,  0.000!!END!
921!X=680.17,  4860.54,  98.23,  0.000!!END!
922!X=680.19,  4860.54,  98.52,  0.000!!END!
923!X=680.21,  4860.54,  98.81,  0.000!!END!
924!X=680.23,  4860.54,  99.09,  0.000!!END!
925!X=680.25,  4860.54,  99.38,  0.000!!END!
926!X=680.27,  4860.54,  99.67,  0.000!!END!
927!X=680.29,  4860.54,  99.95,  0.000!!END!
928!X=680.31,  4860.54,  99.57,  0.000!!END!
929!X=680.33,  4860.54,  98.41,  0.000!!END!
930!X=680.35,  4860.54,  97.24,  0.000!!END!
931!X=680.37,  4860.54,  96.27,  0.000!!END!
932!X=680.39,  4860.54,  96.8,  0.000!!END!
933!X=680.41,  4860.54,  97.35,  0.000!!END!
934!X=680.43,  4860.54,  97.91,  0.000!!END!
935!X=680.45,  4860.54,  98.26,  0.000!!END!
936!X=680.47,  4860.54,  98.54,  0.000!!END!
937!X=680.65,  4860.54,  102.46,  0.000!!END!
938!X=680.67,  4860.54,  101.89,  0.000!!END!
939!X=680.69,  4860.54,  101.34,  0.000!!END!
940!X=680.71,  4860.54,  101.21,  0.000!!END!
941!X=680.73,  4860.54,  101.76,  0.000!!END!
942!X=680.75,  4860.54,  102.3,  0.000!!END!
943!X=680.77,  4860.54,  102.83,  0.000!!END!
944!X=680.79,  4860.54,  102.76,  0.000!!END!
945!X=680.81,  4860.54,  102.69,  0.000!!END!
946!X=680.83,  4860.54,  102.61,  0.000!!END!
947!X=680.85,  4860.54,  102.61,  0.000!!END!
948!X=680.87,  4860.54,  102.66,  0.000!!END!
949!X=680.89,  4860.54,  102.71,  0.000!!END!
950!X=680.91,  4860.54,  102.57,  0.000!!END!
951!X=680.93,  4860.54,  102,  0.000!!END!
952!X=680.95,  4860.54,  101.44,  0.000!!END!
953!X=680.15,  4860.56,  98.46,  0.000!!END!
954!X=680.17,  4860.56,  98.67,  0.000!!END!
955!X=680.19,  4860.56,  98.96,  0.000!!END!
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956!X=680.21,  4860.56,  99.25,  0.000!!END!
957!X=680.23,  4860.56,  99.53,  0.000!!END!
958!X=680.25,  4860.56,  99.82,  0.000!!END!
959!X=680.27,  4860.56,  100.11,  0.000!!END!
960!X=680.29,  4860.56,  100.39,  0.000!!END!
961!X=680.31,  4860.56,  100.1,  0.000!!END!
962!X=680.33,  4860.56,  99.2,  0.000!!END!
963!X=680.35,  4860.56,  98.29,  0.000!!END!
964!X=680.37,  4860.56,  97.55,  0.000!!END!
965!X=680.39,  4860.56,  97.89,  0.000!!END!
966!X=680.41,  4860.56,  98.25,  0.000!!END!
967!X=680.43,  4860.56,  98.61,  0.000!!END!
968!X=680.45,  4860.56,  98.91,  0.000!!END!
969!X=680.47,  4860.56,  99.2,  0.000!!END!
970!X=680.49,  4860.56,  99.48,  0.000!!END!
971!X=680.51,  4860.56,  99.78,  0.000!!END!
972!X=680.53,  4860.56,  100.12,  0.000!!END!
973!X=680.65,  4860.56,  102.81,  0.000!!END!
974!X=680.67,  4860.56,  102.11,  0.000!!END!
975!X=680.69,  4860.56,  101.42,  0.000!!END!
976!X=680.71,  4860.56,  101.2,  0.000!!END!
977!X=680.73,  4860.56,  101.71,  0.000!!END!
978!X=680.75,  4860.56,  102.23,  0.000!!END!
979!X=680.77,  4860.56,  102.74,  0.000!!END!
980!X=680.79,  4860.56,  102.75,  0.000!!END!
981!X=680.81,  4860.56,  102.76,  0.000!!END!
982!X=680.83,  4860.56,  102.77,  0.000!!END!
983!X=680.85,  4860.56,  102.76,  0.000!!END!
984!X=680.87,  4860.56,  102.74,  0.000!!END!
985!X=680.89,  4860.56,  102.73,  0.000!!END!
986!X=680.91,  4860.56,  102.51,  0.000!!END!
987!X=680.93,  4860.56,  101.91,  0.000!!END!
988!X=680.95,  4860.56,  101.31,  0.000!!END!
989!X=680.15,  4860.58,  98.95,  0.000!!END!
990!X=680.17,  4860.58,  99.11,  0.000!!END!
991!X=680.19,  4860.58,  99.4,  0.000!!END!
992!X=680.21,  4860.58,  99.69,  0.000!!END!
993!X=680.23,  4860.58,  99.97,  0.000!!END!
994!X=680.25,  4860.58,  100.26,  0.000!!END!
995!X=680.27,  4860.58,  100.55,  0.000!!END!
996!X=680.29,  4860.58,  100.83,  0.000!!END!
997!X=680.31,  4860.58,  100.64,  0.000!!END!
998!X=680.33,  4860.58,  100,  0.000!!END!
999!X=680.35,  4860.58,  99.35,  0.000!!END!
1000!X=680.37,  4860.58,  98.82,  0.000!!END!
1001!X=680.39,  4860.58,  98.97,  0.000!!END!
1002!X=680.41,  4860.58,  99.13,  0.000!!END!
1003!X=680.43,  4860.58,  99.31,  0.000!!END!
1004!X=680.45,  4860.58,  99.57,  0.000!!END!
1005!X=680.47,  4860.58,  99.85,  0.000!!END!
1006!X=680.49,  4860.58,  100.13,  0.000!!END!
1007!X=680.51,  4860.58,  100.47,  0.000!!END!
1008!X=680.53,  4860.58,  100.88,  0.000!!END!
1009!X=680.55,  4860.58,  101.28,  0.000!!END!
1010!X=680.57,  4860.58,  101.71,  0.000!!END!
1011!X=680.59,  4860.58,  102.34,  0.000!!END!
1012!X=680.63,  4860.58,  103.63,  0.000!!END!
1013!X=680.65,  4860.58,  103.13,  0.000!!END!
1014!X=680.67,  4860.58,  102.3,  0.000!!END!
1015!X=680.69,  4860.58,  101.47,  0.000!!END!
1016!X=680.71,  4860.58,  101.16,  0.000!!END!
1017!X=680.73,  4860.58,  101.54,  0.000!!END!
1018!X=680.75,  4860.58,  101.94,  0.000!!END!
1019!X=680.77,  4860.58,  102.31,  0.000!!END!
1020!X=680.79,  4860.58,  102.32,  0.000!!END!
1021!X=680.81,  4860.58,  102.33,  0.000!!END!
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!X=680.83,  4860.58,  102.34,  0.000!!END!
!X=680.85,  4860.58,  102.28,  0.000!!END!
!X=680.87,  4860.58,  102.2,  0.000!!END!
!X=680.89,  4860.58,  102.12,  0.000!!END!
!X=680.91,  4860.58,  101.82,  0.000!!END!
!X=680.93,  4860.58,  101.16,  0.000!!END!
!X=680.95,  4860.58,  100.49,  0.000!!END!
!X=680.15,  4860.6,  99.43,  0.000!!END!
!X=680.17,  4860.6,  99.55,  0.000!!END!
!X=680.19,  4860.6,  99.84,  0.000!!END!
!X=680.21,  4860.6,  100.13,  0.000!!END!
!X=680.23,  4860.6,  100.41,  0.000!!END!
!X=680.25,  4860.6,  100.7,  0.000!!END!
!X=680.27,  4860.6,  100.99,  0.000!!END!
!X=680.29,  4860.6,  101.27,  0.000!!END!
!X=680.31,  4860.6,  101.2,  0.000!!END!
!X=680.33,  4860.6,  100.82,  0.000!!END!
!X=680.35,  4860.6,  100.42,  0.000!!END!
!X=680.37,  4860.6,  100.08,  0.000!!END!
!X=680.39,  4860.6,  100.04,  0.000!!END!
!X=680.41,  4860.6,  100.01,  0.000!!END!
!X=680.43,  4860.6,  99.99,  0.000!!END!
!X=680.45,  4860.6,  100.23,  0.000!!END!
!X=680.47,  4860.6,  100.51,  0.000!!END!
!X=680.49,  4860.6,  100.79,  0.000!!END!
!X=680.51,  4860.6,  101.16,  0.000!!END!
!X=680.53,  4860.6,  101.63,  0.000!!END!
!X=680.55,  4860.6,  102.1,  0.000!!END!
!X=680.57,  4860.6,  102.57,  0.000!!END!
!X=680.59,  4860.6,  103.07,  0.000!!END!
!X=680.61,  4860.6,  103.58,  0.000!!END!
!X=680.63,  4860.6,  104.1,  0.000!!END!
!X=680.65,  4860.6,  103.43,  0.000!!END!
!X=680.67,  4860.6,  102.47,  0.000!!END!
!X=680.69,  4860.6,  101.52,  0.000!!END!
!X=680.71,  4860.6,  101.11,  0.000!!END!
!X=680.73,  4860.6,  101.37,  0.000!!END!
!X=680.75,  4860.6,  101.63,  0.000!!END!
!X=680.77,  4860.6,  101.87,  0.000!!END!
!X=680.79,  4860.6,  101.89,  0.000!!END!
!X=680.81,  4860.6,  101.9,  0.000!!END!
!X=680.83,  4860.6,  101.91,  0.000!!END!
!X=680.85,  4860.6,  101.8,  0.000!!END!
!X=680.87,  4860.6,  101.65,  0.000!!END!
!X=680.89,  4860.6,  101.51,  0.000!!END!
!X=680.91,  4860.6,  101.13,  0.000!!END!
!X=680.93,  4860.6,  100.4,  0.000!!END!
!X=680.95,  4860.6,  99.67,  0.000!!END!
!X=680.15,  4860.62,  99.91,  0.000!!END!
!X=680.17,  4860.62,  99.99,  0.000!!END!
!X=680.19,  4860.62,  100.28,  0.000!!END!
!X=680.21,  4860.62,  100.57,  0.000!!END!
!X=680.23,  4860.62,  100.85,  0.000!!END!
!X=680.25,  4860.62,  101.14,  0.000!!END!
!X=680.27,  4860.62,  101.43,  0.000!!END!
!X=680.29,  4860.62,  101.71,  0.000!!END!
!X=680.31,  4860.62,  101.77,  0.000!!END!
!X=680.33,  4860.62,  101.64,  0.000!!END!
!X=680.35,  4860.62,  101.51,  0.000!!END!
!X=680.37,  4860.62,  101.33,  0.000!!END!
!X=680.39,  4860.62,  101.1,  0.000!!END!
!X=680.41,  4860.62,  100.87,  0.000!!END!
!X=680.43,  4860.62,  100.66,  0.000!!END!
!X=680.45,  4860.62,  100.88,  0.000!!END!
!X=680.47,  4860.62,  101.16,  0.000!!END!
!X=680.49,  4860.62,  101.44,  0.000!!END!
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1088!X=680.51,  4860.62,  101.86,  0.000!!END!
1089!X=680.53,  4860.62,  102.39,  0.000!!END!
1090!X=680.55,  4860.62,  102.92,  0.000!!END!
1091!X=680.57,  4860.62,  103.42,  0.000!!END!
1092!X=680.59,  4860.62,  103.8,  0.000!!END!
1093!X=680.61,  4860.62,  104.18,  0.000!!END!
1094!X=680.63,  4860.62,  104.57,  0.000!!END!
1095!X=680.65,  4860.62,  103.73,  0.000!!END!
1096!X=680.67,  4860.62,  102.64,  0.000!!END!
1097!X=680.69,  4860.62,  101.56,  0.000!!END!
1098!X=680.71,  4860.62,  101.06,  0.000!!END!
1099!X=680.73,  4860.62,  101.18,  0.000!!END!
1100!X=680.75,  4860.62,  101.32,  0.000!!END!
1101!X=680.77,  4860.62,  101.44,  0.000!!END!
1102!X=680.79,  4860.62,  101.45,  0.000!!END!
1103!X=680.81,  4860.62,  101.46,  0.000!!END!
1104!X=680.83,  4860.62,  101.48,  0.000!!END!
1105!X=680.85,  4860.62,  101.31,  0.000!!END!
1106!X=680.87,  4860.62,  101.1,  0.000!!END!
1107!X=680.89,  4860.62,  100.9,  0.000!!END!
1108!X=680.91,  4860.62,  100.44,  0.000!!END!
1109!X=680.93,  4860.62,  99.64,  0.000!!END!
1110!X=680.95,  4860.62,  98.85,  0.000!!END!
1111!X=680.15,  4860.64,  100.28,  0.000!!END!
1112!X=680.17,  4860.64,  100.42,  0.000!!END!
1113!X=680.19,  4860.64,  100.66,  0.000!!END!
1114!X=680.21,  4860.64,  100.9,  0.000!!END!
1115!X=680.23,  4860.64,  101.14,  0.000!!END!
1116!X=680.25,  4860.64,  101.35,  0.000!!END!
1117!X=680.27,  4860.64,  101.56,  0.000!!END!
1118!X=680.29,  4860.64,  101.78,  0.000!!END!
1119!X=680.31,  4860.64,  101.87,  0.000!!END!
1120!X=680.33,  4860.64,  101.88,  0.000!!END!
1121!X=680.35,  4860.64,  101.88,  0.000!!END!
1122!X=680.37,  4860.64,  101.83,  0.000!!END!
1123!X=680.39,  4860.64,  101.6,  0.000!!END!
1124!X=680.41,  4860.64,  101.36,  0.000!!END!
1125!X=680.43,  4860.64,  101.12,  0.000!!END!
1126!X=680.45,  4860.64,  101.36,  0.000!!END!
1127!X=680.47,  4860.64,  101.65,  0.000!!END!
1128!X=680.49,  4860.64,  101.94,  0.000!!END!
1129!X=680.51,  4860.64,  102.38,  0.000!!END!
1130!X=680.53,  4860.64,  102.93,  0.000!!END!
1131!X=680.55,  4860.64,  103.49,  0.000!!END!
1132!X=680.57,  4860.64,  104.01,  0.000!!END!
1133!X=680.59,  4860.64,  104.33,  0.000!!END!
1134!X=680.61,  4860.64,  104.64,  0.000!!END!
1135!X=680.63,  4860.64,  104.95,  0.000!!END!
1136!X=680.65,  4860.64,  104,  0.000!!END!
1137!X=680.67,  4860.64,  102.81,  0.000!!END!
1138!X=680.69,  4860.64,  101.62,  0.000!!END!
1139!X=680.71,  4860.64,  101.02,  0.000!!END!
1140!X=680.73,  4860.64,  101.01,  0.000!!END!
1141!X=680.75,  4860.64,  101,  0.000!!END!
1142!X=680.77,  4860.64,  101.01,  0.000!!END!
1143!X=680.79,  4860.64,  101.02,  0.000!!END!
1144!X=680.81,  4860.64,  101.03,  0.000!!END!
1145!X=680.83,  4860.64,  101.04,  0.000!!END!
1146!X=680.85,  4860.64,  100.82,  0.000!!END!
1147!X=680.87,  4860.64,  100.55,  0.000!!END!
1148!X=680.89,  4860.64,  100.28,  0.000!!END!
1149!X=680.91,  4860.64,  99.74,  0.000!!END!
1150!X=680.93,  4860.64,  98.88,  0.000!!END!
1151!X=680.95,  4860.64,  98.02,  0.000!!END!
1152!X=680.15,  4860.66,  100.63,  0.000!!END!
1153!X=680.17,  4860.66,  100.84,  0.000!!END!
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!X=680.19,  4860.66,  101.01,  0.000!!END!
!X=680.21,  4860.66,  101.19,  0.000!!END!
!X=680.23,  4860.66,  101.37,  0.000!!END!
!X=680.25,  4860.66,  101.44,  0.000!!END!
!X=680.27,  4860.66,  101.53,  0.000!!END!
!X=680.29,  4860.66,  101.62,  0.000!!END!
!X=680.31,  4860.66,  101.65,  0.000!!END!
!X=680.33,  4860.66,  101.66,  0.000!!END!
!X=680.35,  4860.66,  101.67,  0.000!!END!
!X=680.37,  4860.66,  101.64,  0.000!!END!
!X=680.39,  4860.66,  101.54,  0.000!!END!
!X=680.41,  4860.66,  101.43,  0.000!!END!
!X=680.43,  4860.66,  101.32,  0.000!!END!
!X=680.45,  4860.66,  101.58,  0.000!!END!
!X=680.47,  4860.66,  101.88,  0.000!!END!
!X=680.49,  4860.66,  102.17,  0.000!!END!
!X=680.51,  4860.66,  102.54,  0.000!!END!
!X=680.53,  4860.66,  102.96,  0.000!!END!
!X=680.55,  4860.66,  103.39,  0.000!!END!
!X=680.57,  4860.66,  103.82,  0.000!!END!
!X=680.59,  4860.66,  104.2,  0.000!!END!
!X=680.61,  4860.66,  104.58,  0.000!!END!
!X=680.63,  4860.66,  104.96,  0.000!!END!
!X=680.65,  4860.66,  104.08,  0.000!!END!
!X=680.67,  4860.66,  103.02,  0.000!!END!
!X=680.69,  4860.66,  101.96,  0.000!!END!
!X=680.71,  4860.66,  101.38,  0.000!!END!
!X=680.73,  4860.66,  101.24,  0.000!!END!
!X=680.75,  4860.66,  101.11,  0.000!!END!
!X=680.77,  4860.66,  101.02,  0.000!!END!
!X=680.79,  4860.66,  101.14,  0.000!!END!
!X=680.81,  4860.66,  101.26,  0.000!!END!
!X=680.83,  4860.66,  101.37,  0.000!!END!
!X=680.85,  4860.66,  101.17,  0.000!!END!
!X=680.87,  4860.66,  100.92,  0.000!!END!
!X=680.89,  4860.66,  100.66,  0.000!!END!
!X=680.91,  4860.66,  100.13,  0.000!!END!
!X=680.93,  4860.66,  99.31,  0.000!!END!
!X=680.95,  4860.66,  98.49,  0.000!!END!
!X=680.15,  4860.68,  100.99,  0.000!!END!
!X=680.17,  4860.68,  101.25,  0.000!!END!
!X=680.19,  4860.68,  101.36,  0.000!!END!
!X=680.21,  4860.68,  101.47,  0.000!!END!
!X=680.23,  4860.68,  101.59,  0.000!!END!
!X=680.25,  4860.68,  101.53,  0.000!!END!
!X=680.27,  4860.68,  101.49,  0.000!!END!
!X=680.29,  4860.68,  101.45,  0.000!!END!
!X=680.31,  4860.68,  101.44,  0.000!!END!
!X=680.33,  4860.68,  101.44,  0.000!!END!
!X=680.35,  4860.68,  101.45,  0.000!!END!
!X=680.37,  4860.68,  101.46,  0.000!!END!
!X=680.39,  4860.68,  101.49,  0.000!!END!
!X=680.41,  4860.68,  101.51,  0.000!!END!
!X=680.43,  4860.68,  101.53,  0.000!!END!
!X=680.45,  4860.68,  101.81,  0.000!!END!
!X=680.47,  4860.68,  102.1,  0.000!!END!
!X=680.49,  4860.68,  102.39,  0.000!!END!
!X=680.51,  4860.68,  102.68,  0.000!!END!
!X=680.53,  4860.68,  102.98,  0.000!!END!
!X=680.55,  4860.68,  103.28,  0.000!!END!
!X=680.57,  4860.68,  103.63,  0.000!!END!
!X=680.59,  4860.68,  104.08,  0.000!!END!
!X=680.61,  4860.68,  104.52,  0.000!!END!
!X=680.63,  4860.68,  104.96,  0.000!!END!
!X=680.65,  4860.68,  104.17,  0.000!!END!
!X=680.67,  4860.68,  103.24,  0.000!!END!
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1220!X=680.69,  4860.68,  102.31,  0.000!!END!
1221!X=680.71,  4860.68,  101.74,  0.000!!END!
1222!X=680.73,  4860.68,  101.47,  0.000!!END!
1223!X=680.75,  4860.68,  101.2,  0.000!!END!
1224!X=680.77,  4860.68,  101.05,  0.000!!END!
1225!X=680.79,  4860.68,  101.3,  0.000!!END!
1226!X=680.81,  4860.68,  101.55,  0.000!!END!
1227!X=680.83,  4860.68,  101.78,  0.000!!END!
1228!X=680.85,  4860.68,  101.65,  0.000!!END!
1229!X=680.87,  4860.68,  101.46,  0.000!!END!
1230!X=680.89,  4860.68,  101.26,  0.000!!END!
1231!X=680.91,  4860.68,  100.82,  0.000!!END!
1232!X=680.93,  4860.68,  100.13,  0.000!!END!
1233!X=680.95,  4860.68,  99.44,  0.000!!END!
1234!X=680.15,  4860.7,  101.35,  0.000!!END!
1235!X=680.17,  4860.7,  101.66,  0.000!!END!
1236!X=680.19,  4860.7,  101.7,  0.000!!END!
1237!X=680.21,  4860.7,  101.75,  0.000!!END!
1238!X=680.23,  4860.7,  101.79,  0.000!!END!
1239!X=680.25,  4860.7,  101.61,  0.000!!END!
1240!X=680.27,  4860.7,  101.44,  0.000!!END!
1241!X=680.29,  4860.7,  101.27,  0.000!!END!
1242!X=680.31,  4860.7,  101.22,  0.000!!END!
1243!X=680.33,  4860.7,  101.23,  0.000!!END!
1244!X=680.35,  4860.7,  101.23,  0.000!!END!
1245!X=680.37,  4860.7,  101.29,  0.000!!END!
1246!X=680.39,  4860.7,  101.45,  0.000!!END!
1247!X=680.41,  4860.7,  101.6,  0.000!!END!
1248!X=680.43,  4860.7,  101.74,  0.000!!END!
1249!X=680.45,  4860.7,  102.03,  0.000!!END!
1250!X=680.47,  4860.7,  102.32,  0.000!!END!
1251!X=680.49,  4860.7,  102.62,  0.000!!END!
1252!X=680.51,  4860.7,  102.83,  0.000!!END!
1253!X=680.53,  4860.7,  102.99,  0.000!!END!
1254!X=680.55,  4860.7,  103.17,  0.000!!END!
1255!X=680.57,  4860.7,  103.44,  0.000!!END!
1256!X=680.59,  4860.7,  103.96,  0.000!!END!
1257!X=680.61,  4860.7,  104.46,  0.000!!END!
1258!X=680.63,  4860.7,  104.97,  0.000!!END!
1259!X=680.65,  4860.7,  104.26,  0.000!!END!
1260!X=680.67,  4860.7,  103.47,  0.000!!END!
1261!X=680.69,  4860.7,  102.66,  0.000!!END!
1262!X=680.71,  4860.7,  102.09,  0.000!!END!
1263!X=680.73,  4860.7,  101.69,  0.000!!END!
1264!X=680.75,  4860.7,  101.3,  0.000!!END!
1265!X=680.77,  4860.7,  101.09,  0.000!!END!
1266!X=680.79,  4860.7,  101.47,  0.000!!END!
1267!X=680.81,  4860.7,  101.84,  0.000!!END!
1268!X=680.83,  4860.7,  102.21,  0.000!!END!
1269!X=680.85,  4860.7,  102.14,  0.000!!END!
1270!X=680.87,  4860.7,  102.01,  0.000!!END!
1271!X=680.89,  4860.7,  101.88,  0.000!!END!
1272!X=680.91,  4860.7,  101.52,  0.000!!END!
1273!X=680.93,  4860.7,  100.96,  0.000!!END!
1274!X=680.95,  4860.7,  100.39,  0.000!!END!
1275!X=680.15,  4860.72,  101.62,  0.000!!END!
1276!X=680.17,  4860.72,  101.96,  0.000!!END!
1277!X=680.19,  4860.72,  101.97,  0.000!!END!
1278!X=680.21,  4860.72,  101.98,  0.000!!END!
1279!X=680.23,  4860.72,  101.96,  0.000!!END!
1280!X=680.25,  4860.72,  101.68,  0.000!!END!
1281!X=680.27,  4860.72,  101.39,  0.000!!END!
1282!X=680.29,  4860.72,  101.09,  0.000!!END!
1283!X=680.31,  4860.72,  101.01,  0.000!!END!
1284!X=680.33,  4860.72,  101.01,  0.000!!END!
1285!X=680.35,  4860.72,  101.02,  0.000!!END!
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1286!X=680.37,  4860.72,  101.13,  0.000!!END!
1287!X=680.39,  4860.72,  101.41,  0.000!!END!
1288!X=680.41,  4860.72,  101.69,  0.000!!END!
1289!X=680.43,  4860.72,  101.96,  0.000!!END!
1290!X=680.45,  4860.72,  102.26,  0.000!!END!
1291!X=680.47,  4860.72,  102.55,  0.000!!END!
1292!X=680.49,  4860.72,  102.84,  0.000!!END!
1293!X=680.51,  4860.72,  102.96,  0.000!!END!
1294!X=680.53,  4860.72,  103,  0.000!!END!
1295!X=680.55,  4860.72,  103.05,  0.000!!END!
1296!X=680.57,  4860.72,  103.26,  0.000!!END!
1297!X=680.59,  4860.72,  103.84,  0.000!!END!
1298!X=680.61,  4860.72,  104.41,  0.000!!END!
1299!X=680.63,  4860.72,  104.98,  0.000!!END!
1300!X=680.65,  4860.72,  104.36,  0.000!!END!
1301!X=680.67,  4860.72,  103.7,  0.000!!END!
1302!X=680.69,  4860.72,  103.02,  0.000!!END!
1303!X=680.71,  4860.72,  102.43,  0.000!!END!
1304!X=680.73,  4860.72,  101.9,  0.000!!END!
1305!X=680.75,  4860.72,  101.38,  0.000!!END!
1306!X=680.77,  4860.72,  101.13,  0.000!!END!
1307!X=680.79,  4860.72,  101.64,  0.000!!END!
1308!X=680.81,  4860.72,  102.14,  0.000!!END!
1309!X=680.83,  4860.72,  102.64,  0.000!!END!
1310!X=680.85,  4860.72,  102.63,  0.000!!END!
1311!X=680.87,  4860.72,  102.56,  0.000!!END!
1312!X=680.89,  4860.72,  102.49,  0.000!!END!
1313!X=680.91,  4860.72,  102.22,  0.000!!END!
1314!X=680.93,  4860.72,  101.79,  0.000!!END!
1315!X=680.95,  4860.72,  101.36,  0.000!!END!
1316!X=680.15,  4860.74,  101.45,  0.000!!END!
1317!X=680.17,  4860.74,  101.75,  0.000!!END!
1318!X=680.19,  4860.74,  101.75,  0.000!!END!
1319!X=680.21,  4860.74,  101.76,  0.000!!END!
1320!X=680.23,  4860.74,  101.75,  0.000!!END!
1321!X=680.25,  4860.74,  101.6,  0.000!!END!
1322!X=680.27,  4860.74,  101.43,  0.000!!END!
1323!X=680.29,  4860.74,  101.26,  0.000!!END!
1324!X=680.31,  4860.74,  101.21,  0.000!!END!
1325!X=680.33,  4860.74,  101.2,  0.000!!END!
1326!X=680.35,  4860.74,  101.2,  0.000!!END!
1327!X=680.37,  4860.74,  101.31,  0.000!!END!
1328!X=680.39,  4860.74,  101.6,  0.000!!END!
1329!X=680.41,  4860.74,  101.89,  0.000!!END!
1330!X=680.43,  4860.74,  102.19,  0.000!!END!
1331!X=680.45,  4860.74,  102.48,  0.000!!END!
1332!X=680.47,  4860.74,  102.77,  0.000!!END!
1333!X=680.49,  4860.74,  103.06,  0.000!!END!
1334!X=680.51,  4860.74,  103.18,  0.000!!END!
1335!X=680.53,  4860.74,  103.22,  0.000!!END!
1336!X=680.55,  4860.74,  103.25,  0.000!!END!
1337!X=680.57,  4860.74,  103.46,  0.000!!END!
1338!X=680.59,  4860.74,  104,  0.000!!END!
1339!X=680.61,  4860.74,  104.56,  0.000!!END!
1340!X=680.63,  4860.74,  105.11,  0.000!!END!
1341!X=680.65,  4860.74,  104.49,  0.000!!END!
1342!X=680.67,  4860.74,  103.85,  0.000!!END!
1343!X=680.69,  4860.74,  103.23,  0.000!!END!
1344!X=680.71,  4860.74,  102.65,  0.000!!END!
1345!X=680.73,  4860.74,  102.11,  0.000!!END!
1346!X=680.75,  4860.74,  101.55,  0.000!!END!
1347!X=680.77,  4860.74,  101.3,  0.000!!END!
1348!X=680.79,  4860.74,  101.8,  0.000!!END!
1349!X=680.81,  4860.74,  102.32,  0.000!!END!
1350!X=680.83,  4860.74,  102.85,  0.000!!END!
1351!X=680.85,  4860.74,  102.91,  0.000!!END!
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!X=680.87,  4860.74,  102.94,  0.000!!END!
!X=680.89,  4860.74,  102.96,  0.000!!END!
!X=680.91,  4860.74,  102.81,  0.000!!END!
!X=680.93,  4860.74,  102.54,  0.000!!END!
!X=680.95,  4860.74,  102.26,  0.000!!END!
!X=680.15,  4860.76,  101.28,  0.000!!END!
!X=680.17,  4860.76,  101.53,  0.000!!END!
!X=680.19,  4860.76,  101.54,  0.000!!END!
!X=680.21,  4860.76,  101.54,  0.000!!END!
!X=680.23,  4860.76,  101.55,  0.000!!END!
!X=680.25,  4860.76,  101.52,  0.000!!END!
!X=680.27,  4860.76,  101.48,  0.000!!END!
!X=680.29,  4860.76,  101.44,  0.000!!END!
!X=680.31,  4860.76,  101.43,  0.000!!END!
!X=680.33,  4860.76,  101.42,  0.000!!END!
!X=680.35,  4860.76,  101.41,  0.000!!END!
!X=680.37,  4860.76,  101.53,  0.000!!END!
!X=680.39,  4860.76,  101.83,  0.000!!END!
!X=680.41,  4860.76,  102.12,  0.000!!END!
!X=680.43,  4860.76,  102.41,  0.000!!END!
!X=680.45,  4860.76,  102.7,  0.000!!END!
!X=680.47,  4860.76,  103,  0.000!!END!
!X=680.49,  4860.76,  103.29,  0.000!!END!
!X=680.51,  4860.76,  103.45,  0.000!!END!
!X=680.53,  4860.76,  103.55,  0.000!!END!
!X=680.55,  4860.76,  103.64,  0.000!!END!
!X=680.57,  4860.76,  103.88,  0.000!!END!
!X=680.59,  4860.76,  104.36,  0.000!!END!
!X=680.61,  4860.76,  104.85,  0.000!!END!
!X=680.63,  4860.76,  105.32,  0.000!!END!
!X=680.65,  4860.76,  104.62,  0.000!!END!
!X=680.67,  4860.76,  103.92,  0.000!!END!
!X=680.69,  4860.76,  103.23,  0.000!!END!
!X=680.71,  4860.76,  102.72,  0.000!!END!
!X=680.73,  4860.76,  102.31,  0.000!!END!
!X=680.75,  4860.76,  101.88,  0.000!!END!
!X=680.77,  4860.76,  101.66,  0.000!!END!
!X=680.79,  4860.76,  101.91,  0.000!!END!
!X=680.81,  4860.76,  102.17,  0.000!!END!
!X=680.83,  4860.76,  102.45,  0.000!!END!
!X=680.85,  4860.76,  102.54,  0.000!!END!
!X=680.87,  4860.76,  102.63,  0.000!!END!
!X=680.89,  4860.76,  102.72,  0.000!!END!
!X=680.91,  4860.76,  102.7,  0.000!!END!
!X=680.93,  4860.76,  102.63,  0.000!!END!
!X=680.95,  4860.76,  102.54,  0.000!!END!
!X=679.85,  4859.66,  74.37,  0.000!!END!
!X=679.9,  4859.66,  74.34,  0.000!!END!
!X=679.95,  4859.66,  74.58,  0.000!!END!
!X=680,  4859.66,  75.02,  0.000!!END!
!X=680.05,  4859.66,  75.44,  0.000!!END!
!X=680.1,  4859.66,  75.05,  0.000!!END!
!X=680.15,  4859.66,  74.79,  0.000!!END!
!X=680.2,  4859.66,  74.91,  0.000!!END!
!X=680.25,  4859.66,  75.71,  0.000!!END!
!X=680.3,  4859.66,  77.17,  0.000!!END!
!X=680.35,  4859.66,  78.05,  0.000!!END!
!X=680.4,  4859.66,  78.3,  0.000!!END!
!X=680.45,  4859.66,  78.53,  0.000!!END!
!X=680.5,  4859.66,  79.38,  0.000!!END!
!X=680.55,  4859.66,  80.22,  0.000!!END!
!X=680.6,  4859.66,  80.44,  0.000!!END!
!X=680.65,  4859.66,  77.96,  0.000!!END!
!X=680.7,  4859.66,  76.83,  0.000!!END!
!X=680.75,  4859.66,  76.37,  0.000!!END!
!X=680.8,  4859.66,  76.25,  0.000!!END!
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1418!X=680.85,  4859.66,  76.13,  0.000!!END!
1419!X=680.9,  4859.66,  76.01,  0.000!!END!
1420!X=680.95,  4859.66,  75.78,  0.000!!END!
1421!X=681,  4859.66,  75.24,  0.000!!END!
1422!X=681.05,  4859.66,  73.4,  0.000!!END!
1423!X=681.1,  4859.66,  73,  0.000!!END!
1424!X=681.15,  4859.66,  73,  0.000!!END!
1425!X=681.2,  4859.66,  73,  0.000!!END!
1426!X=681.25,  4859.66,  73,  0.000!!END!
1427!X=679.85,  4859.71,  75.24,  0.000!!END!
1428!X=679.9,  4859.71,  75.07,  0.000!!END!
1429!X=679.95,  4859.71,  75.68,  0.000!!END!
1430!X=680,  4859.71,  76.78,  0.000!!END!
1431!X=680.05,  4859.71,  77.73,  0.000!!END!
1432!X=680.1,  4859.71,  76.99,  0.000!!END!
1433!X=680.15,  4859.71,  76.6,  0.000!!END!
1434!X=680.2,  4859.71,  76.97,  0.000!!END!
1435!X=680.25,  4859.71,  78.55,  0.000!!END!
1436!X=680.3,  4859.71,  81.27,  0.000!!END!
1437!X=680.35,  4859.71,  82.92,  0.000!!END!
1438!X=680.4,  4859.71,  83.53,  0.000!!END!
1439!X=680.45,  4859.71,  84.19,  0.000!!END!
1440!X=680.5,  4859.71,  84.2,  0.000!!END!
1441!X=680.55,  4859.71,  84.11,  0.000!!END!
1442!X=680.6,  4859.71,  83.89,  0.000!!END!
1443!X=680.65,  4859.71,  83.03,  0.000!!END!
1444!X=680.7,  4859.71,  81.54,  0.000!!END!
1445!X=680.75,  4859.71,  80.69,  0.000!!END!
1446!X=680.8,  4859.71,  80.57,  0.000!!END!
1447!X=680.85,  4859.71,  80.45,  0.000!!END!
1448!X=680.9,  4859.71,  80.33,  0.000!!END!
1449!X=680.95,  4859.71,  79.9,  0.000!!END!
1450!X=681,  4859.71,  78.59,  0.000!!END!
1451!X=681.05,  4859.71,  73.94,  0.000!!END!
1452!X=681.1,  4859.71,  73,  0.000!!END!
1453!X=681.15,  4859.71,  73,  0.000!!END!
1454!X=681.2,  4859.71,  73,  0.000!!END!
1455!X=681.25,  4859.71,  73,  0.000!!END!
1456!X=679.85,  4859.76,  75.8,  0.000!!END!
1457!X=679.9,  4859.76,  75.22,  0.000!!END!
1458!X=679.95,  4859.76,  76.45,  0.000!!END!
1459!X=680,  4859.76,  78.64,  0.000!!END!
1460!X=680.05,  4859.76,  80.39,  0.000!!END!
1461!X=680.1,  4859.76,  79.29,  0.000!!END!
1462!X=680.15,  4859.76,  79,  0.000!!END!
1463!X=680.2,  4859.76,  79.92,  0.000!!END!
1464!X=680.25,  4859.76,  82.3,  0.000!!END!
1465!X=680.3,  4859.76,  85.13,  0.000!!END!
1466!X=680.35,  4859.76,  86.49,  0.000!!END!
1467!X=680.4,  4859.76,  86.79,  0.000!!END!
1468!X=680.45,  4859.76,  87.44,  0.000!!END!
1469!X=680.5,  4859.76,  87.44,  0.000!!END!
1470!X=680.55,  4859.76,  87.13,  0.000!!END!
1471!X=680.6,  4859.76,  86.65,  0.000!!END!
1472!X=680.65,  4859.76,  86.23,  0.000!!END!
1473!X=680.7,  4859.76,  86.13,  0.000!!END!
1474!X=680.75,  4859.76,  86.59,  0.000!!END!
1475!X=680.8,  4859.76,  87.45,  0.000!!END!
1476!X=680.85,  4859.76,  87.96,  0.000!!END!
1477!X=680.9,  4859.76,  87.85,  0.000!!END!
1478!X=680.95,  4859.76,  87.25,  0.000!!END!
1479!X=681,  4859.76,  85.97,  0.000!!END!
1480!X=681.05,  4859.76,  82.97,  0.000!!END!
1481!X=681.1,  4859.76,  82.14,  0.000!!END!
1482!X=681.15,  4859.76,  80.7,  0.000!!END!
1483!X=681.2,  4859.76,  78.17,  0.000!!END!
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!X=681.25,  4859.76,  75.59,  0.000!!END!
!X=679.85,  4859.81,  76.33,  0.000!!END!
!X=679.9,  4859.81,  75.98,  0.000!!END!
!X=679.95,  4859.81,  77.45,  0.000!!END!
!X=680,  4859.81,  79.8,  0.000!!END!
!X=680.05,  4859.81,  81.66,  0.000!!END!
!X=680.1,  4859.81,  80.84,  0.000!!END!
!X=680.15,  4859.81,  81.09,  0.000!!END!
!X=680.2,  4859.81,  82.62,  0.000!!END!
!X=680.25,  4859.81,  85.54,  0.000!!END!
!X=680.3,  4859.81,  88.11,  0.000!!END!
!X=680.35,  4859.81,  89.23,  0.000!!END!
!X=680.4,  4859.81,  89.47,  0.000!!END!
!X=680.45,  4859.81,  90.19,  0.000!!END!
!X=680.5,  4859.81,  90.3,  0.000!!END!
!X=680.55,  4859.81,  89.87,  0.000!!END!
!X=680.6,  4859.81,  89.27,  0.000!!END!
!X=680.65,  4859.81,  89.27,  0.000!!END!
!X=680.7,  4859.81,  90.51,  0.000!!END!
!X=680.75,  4859.81,  92.34,  0.000!!END!
!X=680.8,  4859.81,  94.37,  0.000!!END!
!X=680.85,  4859.81,  95.84,  0.000!!END!
!X=680.9,  4859.81,  95.94,  0.000!!END!
!X=680.95,  4859.81,  95.33,  0.000!!END!
!X=681,  4859.81,  94.61,  0.000!!END!
!X=681.05,  4859.81,  94.83,  0.000!!END!
!X=681.1,  4859.81,  94.56,  0.000!!END!
!X=681.15,  4859.81,  91.42,  0.000!!END!
!X=681.2,  4859.81,  85.59,  0.000!!END!
!X=681.25,  4859.81,  79.39,  0.000!!END!
!X=679.85,  4859.86,  76.84,  0.000!!END!
!X=679.9,  4859.86,  77.32,  0.000!!END!
!X=679.95,  4859.86,  78.61,  0.000!!END!
!X=680,  4859.86,  80.13,  0.000!!END!
!X=680.05,  4859.86,  81.19,  0.000!!END!
!X=680.1,  4859.86,  81.46,  0.000!!END!
!X=680.15,  4859.86,  82.71,  0.000!!END!
!X=680.2,  4859.86,  84.86,  0.000!!END!
!X=680.25,  4859.86,  87.78,  0.000!!END!
!X=680.3,  4859.86,  89.18,  0.000!!END!
!X=680.35,  4859.86,  90.02,  0.000!!END!
!X=680.4,  4859.86,  90.57,  0.000!!END!
!X=680.45,  4859.86,  91.29,  0.000!!END!
!X=680.5,  4859.86,  91.76,  0.000!!END!
!X=680.55,  4859.86,  91.47,  0.000!!END!
!X=680.6,  4859.86,  90.99,  0.000!!END!
!X=680.65,  4859.86,  91.4,  0.000!!END!
!X=680.7,  4859.86,  92.34,  0.000!!END!
!X=680.75,  4859.86,  93.78,  0.000!!END!
!X=680.8,  4859.86,  95.58,  0.000!!END!
!X=680.85,  4859.86,  97.46,  0.000!!END!
!X=680.9,  4859.86,  98.68,  0.000!!END!
!X=680.95,  4859.86,  99.36,  0.000!!END!
!X=681,  4859.86,  99.64,  0.000!!END!
!X=681.05,  4859.86,  99.89,  0.000!!END!
!X=681.1,  4859.86,  98.26,  0.000!!END!
!X=681.15,  4859.86,  94.56,  0.000!!END!
!X=681.2,  4859.86,  89.45,  0.000!!END!
!X=681.25,  4859.86,  85.23,  0.000!!END!
!X=679.85,  4859.91,  78.16,  0.000!!END!
!X=679.9,  4859.91,  78.31,  0.000!!END!
!X=679.95,  4859.91,  79.38,  0.000!!END!
!X=680,  4859.91,  80.6,  0.000!!END!
!X=680.05,  4859.91,  81.33,  0.000!!END!
!X=680.1,  4859.91,  82.53,  0.000!!END!
!X=680.15,  4859.91,  84.23,  0.000!!END!
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!X=680.2,  4859.91,  86.53,  0.000!!END!
!X=680.25,  4859.91,  89.49,  0.000!!END!
!X=680.3,  4859.91,  90.42,  0.000!!END!
!X=680.35,  4859.91,  91.08,  0.000!!END!
!X=680.4,  4859.91,  91.62,  0.000!!END!
!X=680.45,  4859.91,  92.19,  0.000!!END!
!X=680.5,  4859.91,  92.77,  0.000!!END!
!X=680.55,  4859.91,  92.62,  0.000!!END!
!X=680.6,  4859.91,  92.41,  0.000!!END!
!X=680.65,  4859.91,  93.25,  0.000!!END!
!X=680.7,  4859.91,  94.07,  0.000!!END!
!X=680.75,  4859.91,  95.1,  0.000!!END!
!X=680.8,  4859.91,  96.63,  0.000!!END!
!X=680.85,  4859.91,  99,  0.000!!END!
!X=680.9,  4859.91,  101.01,  0.000!!END!
!X=680.95,  4859.91,  102.78,  0.000!!END!
!X=681,  4859.91,  103.96,  0.000!!END!
!X=681.05,  4859.91,  104,  0.000!!END!
!X=681.1,  4859.91,  100.62,  0.000!!END!
!X=681.15,  4859.91,  96.48,  0.000!!END!
!X=681.2,  4859.91,  92.75,  0.000!!END!
!X=681.25,  4859.91,  91.75,  0.000!!END!
!X=679.85,  4859.96,  79.74,  0.000!!END!
!X=679.9,  4859.96,  79.08,  0.000!!END!
!X=679.95,  4859.96,  79.96,  0.000!!END!
!X=680,  4859.96,  81.16,  0.000!!END!
!X=680.05,  4859.96,  81.93,  0.000!!END!
!X=680.1,  4859.96,  83.93,  0.000!!END!
!X=681,  4859.96,  103.53,  0.000!!END!
!X=681.05,  4859.96,  103.97,  0.000!!END!
!X=681.1,  4859.96,  100.14,  0.000!!END!
!X=681.15,  4859.96,  97.01,  0.000!!END!
!X=681.2,  4859.96,  94.92,  0.000!!END!
!X=681.25,  4859.96,  94.12,  0.000!!END!
!X=679.85,  4860.01,  80.46,  0.000!!END!
!X=679.9,  4860.01,  80.37,  0.000!!END!
!X=679.95,  4860.01,  80.93,  0.000!!END!
!X=680,  4860.01,  81.72,  0.000!!END!
!X=680.05,  4860.01,  82.54,  0.000!!END!
!X=680.1,  4860.01,  84.76,  0.000!!END!
!X=681,  4860.01,  102.66,  0.000!!END!
!X=681.05,  4860.01,  103.31,  0.000!!END!
!X=681.1,  4860.01,  99.55,  0.000!!END!
!X=681.15,  4860.01,  97.54,  0.000!!END!
!X=681.2,  4860.01,  96.81,  0.000!!END!
!X=681.25,  4860.01,  96.1,  0.000!!END!
!X=679.85,  4860.06,  81.08,  0.000!!END!
!X=679.9,  4860.06,  81.8,  0.000!!END!
!X=679.95,  4860.06,  81.95,  0.000!!END!
!X=680,  4860.06,  82.28,  0.000!!END!
!X=680.05,  4860.06,  83.14,  0.000!!END!
!X=680.1,  4860.06,  85.36,  0.000!!END!
!X=681,  4860.06,  100.26,  0.000!!END!
!X=681.05,  4860.06,  100.1,  0.000!!END!
!X=681.1,  4860.06,  98.58,  0.000!!END!
!X=681.15,  4860.06,  97.52,  0.000!!END!
!X=681.2,  4860.06,  96.91,  0.000!!END!
!X=681.25,  4860.06,  96.6,  0.000!!END!
!X=679.85,  4860.11,  81.1,  0.000!!END!
!X=679.9,  4860.11,  81.85,  0.000!!END!
!X=679.95,  4860.11,  82.3,  0.000!!END!
!X=680,  4860.11,  83.01,  0.000!!END!
!X=680.05,  4860.11,  84.27,  0.000!!END!
!X=680.1,  4860.11,  86.83,  0.000!!END!
!X=681,  4860.11,  98.79,  0.000!!END!
!X=681.05,  4860.11,  98.19,  0.000!!END!
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1616!X=681.1,  4860.11,  97.91,  0.000!!END!
1617!X=681.15,  4860.11,  97.42,  0.000!!END!
1618!X=681.2,  4860.11,  96.96,  0.000!!END!
1619!X=681.25,  4860.11,  96.87,  0.000!!END!
1620!X=679.85,  4860.16,  81.36,  0.000!!END!
1621!X=679.9,  4860.16,  82.01,  0.000!!END!
1622!X=679.95,  4860.16,  82.79,  0.000!!END!
1623!X=680,  4860.16,  83.87,  0.000!!END!
1624!X=680.05,  4860.16,  85.52,  0.000!!END!
1625!X=680.1,  4860.16,  88.43,  0.000!!END!
1626!X=681,  4860.16,  98.93,  0.000!!END!
1627!X=681.05,  4860.16,  98.69,  0.000!!END!
1628!X=681.1,  4860.16,  97.6,  0.000!!END!
1629!X=681.15,  4860.16,  97.14,  0.000!!END!
1630!X=681.2,  4860.16,  96.82,  0.000!!END!
1631!X=681.25,  4860.16,  96.33,  0.000!!END!
1632!X=679.85,  4860.21,  82.92,  0.000!!END!
1633!X=679.9,  4860.21,  83.17,  0.000!!END!
1634!X=679.95,  4860.21,  84.57,  0.000!!END!
1635!X=680,  4860.21,  86.07,  0.000!!END!
1636!X=680.05,  4860.21,  87.62,  0.000!!END!
1637!X=680.1,  4860.21,  89.73,  0.000!!END!
1638!X=681,  4860.21,  99.4,  0.000!!END!
1639!X=681.05,  4860.21,  98.89,  0.000!!END!
1640!X=681.1,  4860.21,  97.2,  0.000!!END!
1641!X=681.15,  4860.21,  97.02,  0.000!!END!
1642!X=681.2,  4860.21,  97.07,  0.000!!END!
1643!X=681.25,  4860.21,  96.64,  0.000!!END!
1644!X=679.85,  4860.26,  84.95,  0.000!!END!
1645!X=679.9,  4860.26,  84.75,  0.000!!END!
1646!X=679.95,  4860.26,  86.45,  0.000!!END!
1647!X=680,  4860.26,  88.11,  0.000!!END!
1648!X=680.05,  4860.26,  89.49,  0.000!!END!
1649!X=680.1,  4860.26,  90.88,  0.000!!END!
1650!X=681,  4860.26,  100.12,  0.000!!END!
1651!X=681.05,  4860.26,  98.8,  0.000!!END!
1652!X=681.1,  4860.26,  96.72,  0.000!!END!
1653!X=681.15,  4860.26,  97.1,  0.000!!END!
1654!X=681.2,  4860.26,  97.93,  0.000!!END!
1655!X=681.25,  4860.26,  98.3,  0.000!!END!
1656!X=679.85,  4860.31,  88.09,  0.000!!END!
1657!X=679.9,  4860.31,  87.49,  0.000!!END!
1658!X=679.95,  4860.31,  88.48,  0.000!!END!
1659!X=680,  4860.31,  89.54,  0.000!!END!
1660!X=680.05,  4860.31,  90.51,  0.000!!END!
1661!X=680.1,  4860.31,  91.51,  0.000!!END!
1662!X=681,  4860.31,  100.56,  0.000!!END!
1663!X=681.05,  4860.31,  99.56,  0.000!!END!
1664!X=681.1,  4860.31,  98.28,  0.000!!END!
1665!X=681.15,  4860.31,  97.97,  0.000!!END!
1666!X=681.2,  4860.31,  98.33,  0.000!!END!
1667!X=681.25,  4860.31,  99.12,  0.000!!END!
1668!X=679.85,  4860.36,  90.14,  0.000!!END!
1669!X=679.9,  4860.36,  89.71,  0.000!!END!
1670!X=679.95,  4860.36,  90.33,  0.000!!END!
1671!X=680,  4860.36,  90.86,  0.000!!END!
1672!X=680.05,  4860.36,  91.37,  0.000!!END!
1673!X=680.1,  4860.36,  92.1,  0.000!!END!
1674!X=681,  4860.36,  100.93,  0.000!!END!
1675!X=681.05,  4860.36,  100.84,  0.000!!END!
1676!X=681.1,  4860.36,  101.18,  0.000!!END!
1677!X=681.15,  4860.36,  99.25,  0.000!!END!
1678!X=681.2,  4860.36,  98.35,  0.000!!END!
1679!X=681.25,  4860.36,  99.26,  0.000!!END!
1680!X=679.85,  4860.41,  90.91,  0.000!!END!
1681!X=679.9,  4860.41,  91.28,  0.000!!END!
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1682!X=679.95,  4860.41,  91.97,  0.000!!END!
1683!X=680,  4860.41,  91.99,  0.000!!END!
1684!X=680.05,  4860.41,  91.93,  0.000!!END!
1685!X=680.1,  4860.41,  92.66,  0.000!!END!
1686!X=681,  4860.41,  100.56,  0.000!!END!
1687!X=681.05,  4860.41,  100.76,  0.000!!END!
1688!X=681.1,  4860.41,  101.83,  0.000!!END!
1689!X=681.15,  4860.41,  100.75,  0.000!!END!
1690!X=681.2,  4860.41,  99.87,  0.000!!END!
1691!X=681.25,  4860.41,  99.75,  0.000!!END!
1692!X=679.85,  4860.46,  91.96,  0.000!!END!
1693!X=679.9,  4860.46,  92.91,  0.000!!END!
1694!X=679.95,  4860.46,  93.83,  0.000!!END!
1695!X=680,  4860.46,  93.63,  0.000!!END!
1696!X=680.05,  4860.46,  93.28,  0.000!!END!
1697!X=680.1,  4860.46,  93.97,  0.000!!END!
1698!X=681,  4860.46,  100.02,  0.000!!END!
1699!X=681.05,  4860.46,  100.33,  0.000!!END!
1700!X=681.1,  4860.46,  101.8,  0.000!!END!
1701!X=681.15,  4860.46,  102.45,  0.000!!END!
1702!X=681.2,  4860.46,  101.93,  0.000!!END!
1703!X=681.25,  4860.46,  100.24,  0.000!!END!
1704!X=679.85,  4860.51,  93.21,  0.000!!END!
1705!X=679.9,  4860.51,  94.56,  0.000!!END!
1706!X=679.95,  4860.51,  95.88,  0.000!!END!
1707!X=680,  4860.51,  95.77,  0.000!!END!
1708!X=680.05,  4860.51,  95.46,  0.000!!END!
1709!X=680.1,  4860.51,  96.15,  0.000!!END!
1710!X=681,  4860.51,  100.52,  0.000!!END!
1711!X=681.05,  4860.51,  100.77,  0.000!!END!
1712!X=681.1,  4860.51,  101.88,  0.000!!END!
1713!X=681.15,  4860.51,  103.3,  0.000!!END!
1714!X=681.2,  4860.51,  103.3,  0.000!!END!
1715!X=681.25,  4860.51,  101.57,  0.000!!END!
1716!X=679.85,  4860.56,  93.63,  0.000!!END!
1717!X=679.9,  4860.56,  94.3,  0.000!!END!
1718!X=679.95,  4860.56,  96.09,  0.000!!END!
1719!X=680,  4860.56,  96.68,  0.000!!END!
1720!X=680.05,  4860.56,  97.04,  0.000!!END!
1721!X=680.1,  4860.56,  97.99,  0.000!!END!
1722!X=681,  4860.56,  100.89,  0.000!!END!
1723!X=681.05,  4860.56,  101.21,  0.000!!END!
1724!X=681.1,  4860.56,  101.88,  0.000!!END!
1725!X=681.15,  4860.56,  104.03,  0.000!!END!
1726!X=681.2,  4860.56,  104.57,  0.000!!END!
1727!X=681.25,  4860.56,  103.08,  0.000!!END!
1728!X=679.85,  4860.61,  93.69,  0.000!!END!
1729!X=679.9,  4860.61,  93.29,  0.000!!END!
1730!X=679.95,  4860.61,  95.49,  0.000!!END!
1731!X=680,  4860.61,  97.02,  0.000!!END!
1732!X=680.05,  4860.61,  98.31,  0.000!!END!
1733!X=680.1,  4860.61,  99.61,  0.000!!END!
1734!X=681,  4860.61,  99.99,  0.000!!END!
1735!X=681.05,  4860.61,  101.43,  0.000!!END!
1736!X=681.1,  4860.61,  100.88,  0.000!!END!
1737!X=681.15,  4860.61,  103.39,  0.000!!END!
1738!X=681.2,  4860.61,  104.5,  0.000!!END!
1739!X=681.25,  4860.61,  103.96,  0.000!!END!
1740!X=679.85,  4860.66,  95.76,  0.000!!END!
1741!X=679.9,  4860.66,  95.51,  0.000!!END!
1742!X=679.95,  4860.66,  97.34,  0.000!!END!
1743!X=680,  4860.66,  97.89,  0.000!!END!
1744!X=680.05,  4860.66,  98.62,  0.000!!END!
1745!X=680.1,  4860.66,  100.04,  0.000!!END!
1746!X=681,  4860.66,  99.94,  0.000!!END!
1747!X=681.05,  4860.66,  101.7,  0.000!!END!
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!X=681.1,  4860.66,  99.93,  0.000!!END!
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!X=681.2,  4860.66,  104.35,  0.000!!END!
!X=681.25,  4860.66,  104.64,  0.000!!END!
!X=679.85,  4860.71,  97.99,  0.000!!END!
!X=679.9,  4860.71,  98.17,  0.000!!END!
!X=679.95,  4860.71,  99.64,  0.000!!END!
!X=680,  4860.71,  98.8,  0.000!!END!
!X=680.05,  4860.71,  98.66,  0.000!!END!
!X=680.1,  4860.71,  100.14,  0.000!!END!
!X=681,  4860.71,  101.91,  0.000!!END!
!X=681.05,  4860.71,  102.32,  0.000!!END!
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!X=681.15,  4860.71,  102.35,  0.000!!END!
!X=681.2,  4860.71,  103.56,  0.000!!END!
!X=681.25,  4860.71,  103.54,  0.000!!END!
!X=679.85,  4860.76,  97.8,  0.000!!END!
!X=679.9,  4860.76,  97.55,  0.000!!END!
!X=679.95,  4860.76,  98.27,  0.000!!END!
!X=680,  4860.76,  97.87,  0.000!!END!
!X=680.05,  4860.76,  98.37,  0.000!!END!
!X=680.1,  4860.76,  100.14,  0.000!!END!
!X=681,  4860.76,  103.15,  0.000!!END!
!X=681.05,  4860.76,  102.59,  0.000!!END!
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!X=681.25,  4860.76,  102.82,  0.000!!END!
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!X=679.95,  4860.81,  97.21,  0.000!!END!
!X=680,  4860.81,  97.2,  0.000!!END!
!X=680.05,  4860.81,  98.26,  0.000!!END!
!X=680.1,  4860.81,  100.19,  0.000!!END!
!X=680.15,  4860.81,  100.87,  0.000!!END!
!X=680.2,  4860.81,  101,  0.000!!END!
!X=680.25,  4860.81,  101.36,  0.000!!END!
!X=680.3,  4860.81,  101.97,  0.000!!END!
!X=680.35,  4860.81,  101.95,  0.000!!END!
!X=680.4,  4860.81,  102.53,  0.000!!END!
!X=680.45,  4860.81,  103.26,  0.000!!END!
!X=680.5,  4860.81,  103.99,  0.000!!END!
!X=680.55,  4860.81,  104.64,  0.000!!END!
!X=680.6,  4860.81,  105.41,  0.000!!END!
!X=680.65,  4860.81,  104.94,  0.000!!END!
!X=680.7,  4860.81,  102.98,  0.000!!END!
!X=680.75,  4860.81,  102.73,  0.000!!END!
!X=680.8,  4860.81,  101.92,  0.000!!END!
!X=680.85,  4860.81,  101.64,  0.000!!END!
!X=680.9,  4860.81,  102.28,  0.000!!END!
!X=680.95,  4860.81,  103.29,  0.000!!END!
!X=681,  4860.81,  103.37,  0.000!!END!
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!X=681.2,  4860.81,  102.67,  0.000!!END!
!X=681.25,  4860.81,  103.11,  0.000!!END!
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!X=679.9,  4860.86,  98.88,  0.000!!END!
!X=679.95,  4860.86,  98.83,  0.000!!END!
!X=680,  4860.86,  99.17,  0.000!!END!
!X=680.05,  4860.86,  100.27,  0.000!!END!
!X=680.1,  4860.86,  101.61,  0.000!!END!
!X=680.15,  4860.86,  101.08,  0.000!!END!
!X=680.2,  4860.86,  101,  0.000!!END!
!X=680.25,  4860.86,  101.37,  0.000!!END!
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!X=680.3,  4860.86,  101.94,  0.000!!END!
!X=680.35,  4860.86,  101.57,  0.000!!END!
!X=680.4,  4860.86,  102.13,  0.000!!END!
!X=680.45,  4860.86,  103.06,  0.000!!END!
!X=680.5,  4860.86,  104.11,  0.000!!END!
!X=680.55,  4860.86,  104.85,  0.000!!END!
!X=680.6,  4860.86,  105.35,  0.000!!END!
!X=680.65,  4860.86,  104.98,  0.000!!END!
!X=680.7,  4860.86,  103.64,  0.000!!END!
!X=680.75,  4860.86,  102.49,  0.000!!END!
!X=680.8,  4860.86,  101.53,  0.000!!END!
!X=680.85,  4860.86,  101.67,  0.000!!END!
!X=680.9,  4860.86,  103.05,  0.000!!END!
!X=680.95,  4860.86,  103.55,  0.000!!END!
!X=681,  4860.86,  102.96,  0.000!!END!
!X=681.05,  4860.86,  101.79,  0.000!!END!
!X=681.1,  4860.86,  100.56,  0.000!!END!
!X=681.15,  4860.86,  101.92,  0.000!!END!
!X=681.2,  4860.86,  102.93,  0.000!!END!
!X=681.25,  4860.86,  103.69,  0.000!!END!
!X=679.85,  4860.91,  100.13,  0.000!!END!
!X=679.9,  4860.91,  99.89,  0.000!!END!
!X=679.95,  4860.91,  100.13,  0.000!!END!
!X=680,  4860.91,  100.89,  0.000!!END!
!X=680.05,  4860.91,  102.01,  0.000!!END!
!X=680.1,  4860.91,  102.83,  0.000!!END!
!X=680.15,  4860.91,  101.45,  0.000!!END!
!X=680.2,  4860.91,  101.18,  0.000!!END!
!X=680.25,  4860.91,  101.54,  0.000!!END!
!X=680.3,  4860.91,  102.01,  0.000!!END!
!X=680.35,  4860.91,  101.24,  0.000!!END!
!X=680.4,  4860.91,  101.68,  0.000!!END!
!X=680.45,  4860.91,  102.76,  0.000!!END!
!X=680.5,  4860.91,  104.13,  0.000!!END!
!X=680.55,  4860.91,  104.87,  0.000!!END!
!X=680.6,  4860.91,  105.02,  0.000!!END!
!X=680.65,  4860.91,  104.99,  0.000!!END!
!X=680.7,  4860.91,  104.45,  0.000!!END!
!X=680.75,  4860.91,  101.69,  0.000!!END!
!X=680.8,  4860.91,  101.08,  0.000!!END!
!X=680.85,  4860.91,  102.28,  0.000!!END!
!X=680.9,  4860.91,  104.47,  0.000!!END!
!X=680.95,  4860.91,  103.37,  0.000!!END!
!X=681,  4860.91,  102.07,  0.000!!END!
!X=681.05,  4860.91,  100.67,  0.000!!END!
!X=681.1,  4860.91,  99.65,  0.000!!END!
!X=681.15,  4860.91,  102.21,  0.000!!END!
!X=681.2,  4860.91,  103.81,  0.000!!END!
!X=681.25,  4860.91,  104.61,  0.000!!END!
!X=679.85,  4860.96,  100.48,  0.000!!END!
!X=679.9,  4860.96,  99.56,  0.000!!END!
!X=679.95,  4860.96,  100.6,  0.000!!END!
!X=680,  4860.96,  101.82,  0.000!!END!
!X=680.05,  4860.96,  102.9,  0.000!!END!
!X=680.1,  4860.96,  103.52,  0.000!!END!
!X=680.15,  4860.96,  102.95,  0.000!!END!
!X=680.2,  4860.96,  102.44,  0.000!!END!
!X=680.25,  4860.96,  102.87,  0.000!!END!
!X=680.3,  4860.96,  103.7,  0.000!!END!
!X=680.35,  4860.96,  103.33,  0.000!!END!
!X=680.4,  4860.96,  103.16,  0.000!!END!
!X=680.45,  4860.96,  103.45,  0.000!!END!
!X=680.5,  4860.96,  104.07,  0.000!!END!
!X=680.55,  4860.96,  104.43,  0.000!!END!
!X=680.6,  4860.96,  104.82,  0.000!!END!
!X=680.65,  4860.96,  105,  0.000!!END!
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1880!X=680.7,  4860.96,  104.66,  0.000!!END!
1881!X=680.75,  4860.96,  102.69,  0.000!!END!
1882!X=680.8,  4860.96,  102.32,  0.000!!END!
1883!X=680.85,  4860.96,  103.44,  0.000!!END!
1884!X=680.9,  4860.96,  105.23,  0.000!!END!
1885!X=680.95,  4860.96,  104.01,  0.000!!END!
1886!X=681,  4860.96,  102.55,  0.000!!END!
1887!X=681.05,  4860.96,  101.42,  0.000!!END!
1888!X=681.1,  4860.96,  101.13,  0.000!!END!
1889!X=681.15,  4860.96,  103.8,  0.000!!END!
1890!X=681.2,  4860.96,  104.91,  0.000!!END!
1891!X=681.25,  4860.96,  105.31,  0.000!!END!
1892!X=679.85,  4861.01,  101.9,  0.000!!END!
1893!X=679.9,  4861.01,  100.49,  0.000!!END!
1894!X=679.95,  4861.01,  101.4,  0.000!!END!
1895!X=680,  4861.01,  102.53,  0.000!!END!
1896!X=680.05,  4861.01,  103.54,  0.000!!END!
1897!X=680.1,  4861.01,  104.15,  0.000!!END!
1898!X=680.15,  4861.01,  104.01,  0.000!!END!
1899!X=680.2,  4861.01,  103.42,  0.000!!END!
1900!X=680.25,  4861.01,  103.95,  0.000!!END!
1901!X=680.3,  4861.01,  105.02,  0.000!!END!
1902!X=680.35,  4861.01,  105.1,  0.000!!END!
1903!X=680.4,  4861.01,  104.49,  0.000!!END!
1904!X=680.45,  4861.01,  104.17,  0.000!!END!
1905!X=680.5,  4861.01,  104.1,  0.000!!END!
1906!X=680.55,  4861.01,  103.96,  0.000!!END!
1907!X=680.6,  4861.01,  104.62,  0.000!!END!
1908!X=680.65,  4861.01,  105,  0.000!!END!
1909!X=680.7,  4861.01,  104.86,  0.000!!END!
1910!X=680.75,  4861.01,  104.09,  0.000!!END!
1911!X=680.8,  4861.01,  103.94,  0.000!!END!
1912!X=680.85,  4861.01,  104.71,  0.000!!END!
1913!X=680.9,  4861.01,  105.81,  0.000!!END!
1914!X=680.95,  4861.01,  105,  0.000!!END!
1915!X=681,  4861.01,  103.59,  0.000!!END!
1916!X=681.05,  4861.01,  103.09,  0.000!!END!
1917!X=681.1,  4861.01,  103.84,  0.000!!END!
1918!X=681.15,  4861.01,  106.1,  0.000!!END!
1919!X=681.2,  4861.01,  106.09,  0.000!!END!
1920!X=681.25,  4861.01,  105.85,  0.000!!END!
1921!X=679.85,  4861.06,  104.54,  0.000!!END!
1922!X=679.9,  4861.06,  102.84,  0.000!!END!
1923!X=679.95,  4861.06,  102.55,  0.000!!END!
1924!X=680,  4861.06,  102.86,  0.000!!END!
1925!X=680.05,  4861.06,  103.82,  0.000!!END!
1926!X=680.1,  4861.06,  104.57,  0.000!!END!
1927!X=680.15,  4861.06,  104.03,  0.000!!END!
1928!X=680.2,  4861.06,  103.79,  0.000!!END!
1929!X=680.25,  4861.06,  104.28,  0.000!!END!
1930!X=680.3,  4861.06,  105.13,  0.000!!END!
1931!X=680.35,  4861.06,  105.62,  0.000!!END!
1932!X=680.4,  4861.06,  105.39,  0.000!!END!
1933!X=680.45,  4861.06,  105.25,  0.000!!END!
1934!X=680.5,  4861.06,  104.88,  0.000!!END!
1935!X=680.55,  4861.06,  103.53,  0.000!!END!
1936!X=680.6,  4861.06,  104.1,  0.000!!END!
1937!X=680.65,  4861.06,  104.92,  0.000!!END!
1938!X=680.7,  4861.06,  105.57,  0.000!!END!
1939!X=680.75,  4861.06,  105.6,  0.000!!END!
1940!X=680.8,  4861.06,  105.91,  0.000!!END!
1941!X=680.85,  4861.06,  106.64,  0.000!!END!
1942!X=680.9,  4861.06,  107.24,  0.000!!END!
1943!X=680.95,  4861.06,  106.1,  0.000!!END!
1944!X=681,  4861.06,  105.52,  0.000!!END!
1945!X=681.05,  4861.06,  105.45,  0.000!!END!
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1946!X=681.1,  4861.06,  105.85,  0.000!!END!
1947!X=681.15,  4861.06,  106.48,  0.000!!END!
1948!X=681.2,  4861.06,  107.24,  0.000!!END!
1949!X=681.25,  4861.06,  107.55,  0.000!!END!
1950!X=679.35,  4859.16,  73,  0.000!!END!
1951!X=679.45,  4859.16,  73,  0.000!!END!
1952!X=679.55,  4859.16,  73,  0.000!!END!
1953!X=679.65,  4859.16,  73,  0.000!!END!
1954!X=679.75,  4859.16,  73,  0.000!!END!
1955!X=679.85,  4859.16,  73,  0.000!!END!
1956!X=679.95,  4859.16,  73,  0.000!!END!
1957!X=680.05,  4859.16,  73,  0.000!!END!
1958!X=680.15,  4859.16,  73,  0.000!!END!
1959!X=680.25,  4859.16,  73,  0.000!!END!
1960!X=680.35,  4859.16,  73,  0.000!!END!
1961!X=680.45,  4859.16,  73,  0.000!!END!
1962!X=680.55,  4859.16,  73,  0.000!!END!
1963!X=680.65,  4859.16,  73,  0.000!!END!
1964!X=680.75,  4859.16,  73,  0.000!!END!
1965!X=680.85,  4859.16,  73,  0.000!!END!
1966!X=680.95,  4859.16,  73,  0.000!!END!
1967!X=681.05,  4859.16,  73,  0.000!!END!
1968!X=681.15,  4859.16,  73,  0.000!!END!
1969!X=681.25,  4859.16,  73,  0.000!!END!
1970!X=681.35,  4859.16,  73,  0.000!!END!
1971!X=681.45,  4859.16,  73,  0.000!!END!
1972!X=681.55,  4859.16,  73,  0.000!!END!
1973!X=681.65,  4859.16,  73,  0.000!!END!
1974!X=681.75,  4859.16,  73,  0.000!!END!
1975!X=679.35,  4859.26,  73,  0.000!!END!
1976!X=679.45,  4859.26,  73,  0.000!!END!
1977!X=679.55,  4859.26,  73,  0.000!!END!
1978!X=679.65,  4859.26,  73,  0.000!!END!
1979!X=679.75,  4859.26,  73,  0.000!!END!
1980!X=679.85,  4859.26,  73,  0.000!!END!
1981!X=679.95,  4859.26,  73,  0.000!!END!
1982!X=680.05,  4859.26,  73,  0.000!!END!
1983!X=680.15,  4859.26,  73,  0.000!!END!
1984!X=680.25,  4859.26,  73,  0.000!!END!
1985!X=680.35,  4859.26,  73,  0.000!!END!
1986!X=680.45,  4859.26,  73,  0.000!!END!
1987!X=680.55,  4859.26,  73,  0.000!!END!
1988!X=680.65,  4859.26,  73,  0.000!!END!
1989!X=680.75,  4859.26,  73,  0.000!!END!
1990!X=680.85,  4859.26,  73,  0.000!!END!
1991!X=680.95,  4859.26,  73,  0.000!!END!
1992!X=681.05,  4859.26,  73,  0.000!!END!
1993!X=681.15,  4859.26,  73,  0.000!!END!
1994!X=681.25,  4859.26,  73,  0.000!!END!
1995!X=681.35,  4859.26,  73,  0.000!!END!
1996!X=681.45,  4859.26,  73,  0.000!!END!
1997!X=681.55,  4859.26,  73,  0.000!!END!
1998!X=681.65,  4859.26,  73,  0.000!!END!
1999!X=681.75,  4859.26,  73,  0.000!!END!
2000!X=679.35,  4859.36,  73,  0.000!!END!
2001!X=679.45,  4859.36,  73,  0.000!!END!
2002!X=679.55,  4859.36,  73,  0.000!!END!
2003!X=679.65,  4859.36,  73,  0.000!!END!
2004!X=679.75,  4859.36,  73,  0.000!!END!
2005!X=679.85,  4859.36,  73,  0.000!!END!
2006!X=679.95,  4859.36,  73,  0.000!!END!
2007!X=680.05,  4859.36,  73,  0.000!!END!
2008!X=680.15,  4859.36,  73,  0.000!!END!
2009!X=680.25,  4859.36,  73,  0.000!!END!
2010!X=680.35,  4859.36,  73,  0.000!!END!
2011!X=680.45,  4859.36,  73,  0.000!!END!
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2012!X=680.55,  4859.36,  73,  0.000!!END!
2013!X=680.65,  4859.36,  73,  0.000!!END!
2014!X=680.75,  4859.36,  73,  0.000!!END!
2015!X=680.85,  4859.36,  73,  0.000!!END!
2016!X=680.95,  4859.36,  73,  0.000!!END!
2017!X=681.05,  4859.36,  73,  0.000!!END!
2018!X=681.15,  4859.36,  73,  0.000!!END!
2019!X=681.25,  4859.36,  73,  0.000!!END!
2020!X=681.35,  4859.36,  73,  0.000!!END!
2021!X=681.45,  4859.36,  73,  0.000!!END!
2022!X=681.55,  4859.36,  73,  0.000!!END!
2023!X=681.65,  4859.36,  73,  0.000!!END!
2024!X=681.75,  4859.36,  73,  0.000!!END!
2025!X=679.35,  4859.46,  73,  0.000!!END!
2026!X=679.45,  4859.46,  73,  0.000!!END!
2027!X=679.55,  4859.46,  73,  0.000!!END!
2028!X=679.65,  4859.46,  73,  0.000!!END!
2029!X=679.75,  4859.46,  73,  0.000!!END!
2030!X=679.85,  4859.46,  73,  0.000!!END!
2031!X=679.95,  4859.46,  73,  0.000!!END!
2032!X=680.05,  4859.46,  73,  0.000!!END!
2033!X=680.15,  4859.46,  73,  0.000!!END!
2034!X=680.25,  4859.46,  73,  0.000!!END!
2035!X=680.35,  4859.46,  73,  0.000!!END!
2036!X=680.45,  4859.46,  73,  0.000!!END!
2037!X=680.55,  4859.46,  73,  0.000!!END!
2038!X=680.65,  4859.46,  73,  0.000!!END!
2039!X=680.75,  4859.46,  73,  0.000!!END!
2040!X=680.85,  4859.46,  73,  0.000!!END!
2041!X=680.95,  4859.46,  73,  0.000!!END!
2042!X=681.05,  4859.46,  73,  0.000!!END!
2043!X=681.15,  4859.46,  73,  0.000!!END!
2044!X=681.25,  4859.46,  73,  0.000!!END!
2045!X=681.35,  4859.46,  73,  0.000!!END!
2046!X=681.45,  4859.46,  73,  0.000!!END!
2047!X=681.55,  4859.46,  73,  0.000!!END!
2048!X=681.65,  4859.46,  73,  0.000!!END!
2049!X=681.75,  4859.46,  73,  0.000!!END!
2050!X=679.35,  4859.56,  73,  0.000!!END!
2051!X=679.45,  4859.56,  73,  0.000!!END!
2052!X=679.55,  4859.56,  73,  0.000!!END!
2053!X=679.65,  4859.56,  73,  0.000!!END!
2054!X=679.75,  4859.56,  73,  0.000!!END!
2055!X=679.85,  4859.56,  73,  0.000!!END!
2056!X=679.95,  4859.56,  73,  0.000!!END!
2057!X=680.05,  4859.56,  73,  0.000!!END!
2058!X=680.15,  4859.56,  73,  0.000!!END!
2059!X=680.25,  4859.56,  73,  0.000!!END!
2060!X=680.35,  4859.56,  73,  0.000!!END!
2061!X=680.45,  4859.56,  73,  0.000!!END!
2062!X=680.55,  4859.56,  74.46,  0.000!!END!
2063!X=680.65,  4859.56,  73.34,  0.000!!END!
2064!X=680.75,  4859.56,  73,  0.000!!END!
2065!X=680.85,  4859.56,  73,  0.000!!END!
2066!X=680.95,  4859.56,  73,  0.000!!END!
2067!X=681.05,  4859.56,  73,  0.000!!END!
2068!X=681.15,  4859.56,  73,  0.000!!END!
2069!X=681.25,  4859.56,  73,  0.000!!END!
2070!X=681.35,  4859.56,  73,  0.000!!END!
2071!X=681.45,  4859.56,  73,  0.000!!END!
2072!X=681.55,  4859.56,  73,  0.000!!END!
2073!X=681.65,  4859.56,  73,  0.000!!END!
2074!X=681.75,  4859.56,  73,  0.000!!END!
2075!X=679.35,  4859.66,  76.32,  0.000!!END!
2076!X=679.45,  4859.66,  74.68,  0.000!!END!
2077!X=679.55,  4859.66,  74.11,  0.000!!END!
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!X=679.65,  4859.66,  75.18,  0.000!!END!
!X=679.75,  4859.66,  74.43,  0.000!!END!
!X=681.35,  4859.66,  73,  0.000!!END!
!X=681.45,  4859.66,  73,  0.000!!END!
!X=681.55,  4859.66,  73,  0.000!!END!
!X=681.65,  4859.66,  73,  0.000!!END!
!X=681.75,  4859.66,  73,  0.000!!END!
!X=679.35,  4859.76,  82.46,  0.000!!END!
!X=679.45,  4859.76,  82.05,  0.000!!END!
!X=679.55,  4859.76,  81.77,  0.000!!END!
!X=679.65,  4859.76,  79.33,  0.000!!END!
!X=679.75,  4859.76,  77.43,  0.000!!END!
!X=681.35,  4859.76,  73,  0.000!!END!
!X=681.45,  4859.76,  73,  0.000!!END!
!X=681.55,  4859.76,  73,  0.000!!END!
!X=681.65,  4859.76,  73,  0.000!!END!
!X=681.75,  4859.76,  73,  0.000!!END!
!X=679.35,  4859.86,  86.05,  0.000!!END!
!X=679.45,  4859.86,  87.75,  0.000!!END!
!X=679.55,  4859.86,  84.33,  0.000!!END!
!X=679.65,  4859.86,  81.79,  0.000!!END!
!X=679.75,  4859.86,  79.73,  0.000!!END!
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!X=681.45,  4859.86,  78.28,  0.000!!END!
!X=681.55,  4859.86,  77.13,  0.000!!END!
!X=681.65,  4859.86,  76.51,  0.000!!END!
!X=681.75,  4859.86,  75.75,  0.000!!END!
!X=679.35,  4859.96,  89.4,  0.000!!END!
!X=679.45,  4859.96,  87.7,  0.000!!END!
!X=679.55,  4859.96,  84.27,  0.000!!END!
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!X=679.75,  4859.96,  79.04,  0.000!!END!
!X=681.35,  4859.96,  91.96,  0.000!!END!
!X=681.45,  4859.96,  90.26,  0.000!!END!
!X=681.55,  4859.96,  88.39,  0.000!!END!
!X=681.65,  4859.96,  87.25,  0.000!!END!
!X=681.75,  4859.96,  86.39,  0.000!!END!
!X=679.35,  4860.06,  88.47,  0.000!!END!
!X=679.45,  4860.06,  83.64,  0.000!!END!
!X=679.55,  4860.06,  80.67,  0.000!!END!
!X=679.65,  4860.06,  79.06,  0.000!!END!
!X=679.75,  4860.06,  79.62,  0.000!!END!
!X=681.35,  4860.06,  96.1,  0.000!!END!
!X=681.45,  4860.06,  95.09,  0.000!!END!
!X=681.55,  4860.06,  93.28,  0.000!!END!
!X=681.65,  4860.06,  92.06,  0.000!!END!
!X=681.75,  4860.06,  94.07,  0.000!!END!
!X=679.35,  4860.16,  86.31,  0.000!!END!
!X=679.45,  4860.16,  82.72,  0.000!!END!
!X=679.55,  4860.16,  79.58,  0.000!!END!
!X=679.65,  4860.16,  80.28,  0.000!!END!
!X=679.75,  4860.16,  80.71,  0.000!!END!
!X=681.35,  4860.16,  96.83,  0.000!!END!
!X=681.45,  4860.16,  97.84,  0.000!!END!
!X=681.55,  4860.16,  94.97,  0.000!!END!
!X=681.65,  4860.16,  93.12,  0.000!!END!
!X=681.75,  4860.16,  94.91,  0.000!!END!
!X=679.35,  4860.26,  86.47,  0.000!!END!
!X=679.45,  4860.26,  82.89,  0.000!!END!
!X=679.55,  4860.26,  80.84,  0.000!!END!
!X=679.65,  4860.26,  82.26,  0.000!!END!
!X=679.75,  4860.26,  82.1,  0.000!!END!
!X=681.35,  4860.26,  100.38,  0.000!!END!
!X=681.45,  4860.26,  97.54,  0.000!!END!
!X=681.55,  4860.26,  95.67,  0.000!!END!
!X=681.65,  4860.26,  95.27,  0.000!!END!
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!X=681.75,  4860.26,  95.72,  0.000!!END!
!X=679.35,  4860.36,  85.38,  0.000!!END!
!X=679.45,  4860.36,  83.44,  0.000!!END!
!X=679.55,  4860.36,  82.83,  0.000!!END!
!X=679.65,  4860.36,  84.42,  0.000!!END!
!X=679.75,  4860.36,  86.5,  0.000!!END!
!X=681.35,  4860.36,  100.54,  0.000!!END!
!X=681.45,  4860.36,  94.71,  0.000!!END!
!X=681.55,  4860.36,  96,  0.000!!END!
!X=681.65,  4860.36,  96.81,  0.000!!END!
!X=681.75,  4860.36,  97.85,  0.000!!END!
!X=679.35,  4860.46,  88.75,  0.000!!END!
!X=679.45,  4860.46,  86.96,  0.000!!END!
!X=679.55,  4860.46,  85.37,  0.000!!END!
!X=679.65,  4860.46,  86.97,  0.000!!END!
!X=679.75,  4860.46,  90.03,  0.000!!END!
!X=681.35,  4860.46,  97.04,  0.000!!END!
!X=681.45,  4860.46,  97.42,  0.000!!END!
!X=681.55,  4860.46,  97.18,  0.000!!END!
!X=681.65,  4860.46,  98.63,  0.000!!END!
!X=681.75,  4860.46,  98.86,  0.000!!END!
!X=679.35,  4860.56,  93.99,  0.000!!END!
!X=679.45,  4860.56,  90.85,  0.000!!END!
!X=679.55,  4860.56,  85.95,  0.000!!END!
!X=679.65,  4860.56,  87.79,  0.000!!END!
!X=679.75,  4860.56,  92.54,  0.000!!END!
!X=681.35,  4860.56,  98.91,  0.000!!END!
!X=681.45,  4860.56,  97.85,  0.000!!END!
!X=681.55,  4860.56,  97.62,  0.000!!END!
!X=681.65,  4860.56,  100.26,  0.000!!END!
!X=681.75,  4860.56,  104.53,  0.000!!END!
!X=679.35,  4860.66,  96.76,  0.000!!END!
!X=679.45,  4860.66,  93.9,  0.000!!END!
!X=679.55,  4860.66,  90.31,  0.000!!END!
!X=679.65,  4860.66,  90.97,  0.000!!END!
!X=679.75,  4860.66,  94.33,  0.000!!END!
!X=681.35,  4860.66,  101.28,  0.000!!END!
!X=681.45,  4860.66,  98.27,  0.000!!END!
!X=681.55,  4860.66,  98.98,  0.000!!END!
!X=681.65,  4860.66,  100.56,  0.000!!END!
!X=681.75,  4860.66,  110.12,  0.000!!END!
!X=679.35,  4860.76,  97.11,  0.000!!END!
!X=679.45,  4860.76,  94.54,  0.000!!END!
!X=679.55,  4860.76,  93.42,  0.000!!END!
!X=679.65,  4860.76,  94.91,  0.000!!END!
!X=679.75,  4860.76,  96.85,  0.000!!END!
!X=681.35,  4860.76,  104.31,  0.000!!END!
!X=681.45,  4860.76,  105.05,  0.000!!END!
!X=681.55,  4860.76,  105.63,  0.000!!END!
!X=681.65,  4860.76,  105.07,  0.000!!END!
!X=681.75,  4860.76,  110.77,  0.000!!END!
!X=679.35,  4860.86,  97.95,  0.000!!END!
!X=679.45,  4860.86,  96.18,  0.000!!END!
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!X=679.65,  4860.86,  97.52,  0.000!!END!
!X=679.75,  4860.86,  98.27,  0.000!!END!
!X=681.35,  4860.86,  105.47,  0.000!!END!
!X=681.45,  4860.86,  108.46,  0.000!!END!
!X=681.55,  4860.86,  108.39,  0.000!!END!
!X=681.65,  4860.86,  107.91,  0.000!!END!
!X=681.75,  4860.86,  110.88,  0.000!!END!
!X=679.35,  4860.96,  99.74,  0.000!!END!
!X=679.45,  4860.96,  97.81,  0.000!!END!
!X=679.55,  4860.96,  95.05,  0.000!!END!
!X=679.65,  4860.96,  97.09,  0.000!!END!
!X=679.75,  4860.96,  101.6,  0.000!!END!
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2210!X=681.35,  4860.96,  109.08,  0.000!!END!
2211!X=681.45,  4860.96,  111.67,  0.000!!END!
2212!X=681.55,  4860.96,  113.22,  0.000!!END!
2213!X=681.65,  4860.96,  115.88,  0.000!!END!
2214!X=681.75,  4860.96,  118.54,  0.000!!END!
2215!X=679.35,  4861.06,  100,  0.000!!END!
2216!X=679.45,  4861.06,  99.36,  0.000!!END!
2217!X=679.55,  4861.06,  96.76,  0.000!!END!
2218!X=679.65,  4861.06,  97.86,  0.000!!END!
2219!X=679.75,  4861.06,  105.45,  0.000!!END!
2220!X=681.35,  4861.06,  111.11,  0.000!!END!
2221!X=681.45,  4861.06,  114.82,  0.000!!END!
2222!X=681.55,  4861.06,  120.94,  0.000!!END!
2223!X=681.65,  4861.06,  125.15,  0.000!!END!
2224!X=681.75,  4861.06,  122.68,  0.000!!END!
2225!X=679.35,  4861.16,  99.05,  0.000!!END!
2226!X=679.45,  4861.16,  99.55,  0.000!!END!
2227!X=679.55,  4861.16,  99.85,  0.000!!END!
2228!X=679.65,  4861.16,  100.98,  0.000!!END!
2229!X=679.75,  4861.16,  104.19,  0.000!!END!
2230!X=679.85,  4861.16,  104.63,  0.000!!END!
2231!X=679.95,  4861.16,  103.02,  0.000!!END!
2232!X=680.05,  4861.16,  104.42,  0.000!!END!
2233!X=680.15,  4861.16,  104.79,  0.000!!END!
2234!X=680.25,  4861.16,  104.12,  0.000!!END!
2235!X=680.35,  4861.16,  105.98,  0.000!!END!
2236!X=680.45,  4861.16,  104.96,  0.000!!END!
2237!X=680.55,  4861.16,  103.7,  0.000!!END!
2238!X=680.65,  4861.16,  105.58,  0.000!!END!
2239!X=680.75,  4861.16,  106.98,  0.000!!END!
2240!X=680.85,  4861.16,  108.98,  0.000!!END!
2241!X=680.95,  4861.16,  108.75,  0.000!!END!
2242!X=681.05,  4861.16,  109.81,  0.000!!END!
2243!X=681.15,  4861.16,  109.52,  0.000!!END!
2244!X=681.25,  4861.16,  111.21,  0.000!!END!
2245!X=681.35,  4861.16,  111.39,  0.000!!END!
2246!X=681.45,  4861.16,  115.91,  0.000!!END!
2247!X=681.55,  4861.16,  118.75,  0.000!!END!
2248!X=681.65,  4861.16,  118.25,  0.000!!END!
2249!X=681.75,  4861.16,  119.17,  0.000!!END!
2250!X=679.35,  4861.26,  101.3,  0.000!!END!
2251!X=679.45,  4861.26,  101.24,  0.000!!END!
2252!X=679.55,  4861.26,  102.32,  0.000!!END!
2253!X=679.65,  4861.26,  104.18,  0.000!!END!
2254!X=679.75,  4861.26,  105.69,  0.000!!END!
2255!X=679.85,  4861.26,  100.48,  0.000!!END!
2256!X=679.95,  4861.26,  102.24,  0.000!!END!
2257!X=680.05,  4861.26,  105.45,  0.000!!END!
2258!X=680.15,  4861.26,  104.99,  0.000!!END!
2259!X=680.25,  4861.26,  105.29,  0.000!!END!
2260!X=680.35,  4861.26,  105.99,  0.000!!END!
2261!X=680.45,  4861.26,  105.26,  0.000!!END!
2262!X=680.55,  4861.26,  104.77,  0.000!!END!
2263!X=680.65,  4861.26,  106.74,  0.000!!END!
2264!X=680.75,  4861.26,  108.39,  0.000!!END!
2265!X=680.85,  4861.26,  111.47,  0.000!!END!
2266!X=680.95,  4861.26,  112.55,  0.000!!END!
2267!X=681.05,  4861.26,  113.01,  0.000!!END!
2268!X=681.15,  4861.26,  111.89,  0.000!!END!
2269!X=681.25,  4861.26,  111.7,  0.000!!END!
2270!X=681.35,  4861.26,  110.99,  0.000!!END!
2271!X=681.45,  4861.26,  116.05,  0.000!!END!
2272!X=681.55,  4861.26,  118.11,  0.000!!END!
2273!X=681.65,  4861.26,  115.18,  0.000!!END!
2274!X=681.75,  4861.26,  116.28,  0.000!!END!
2275!X=679.35,  4861.36,  104.65,  0.000!!END!
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2276!X=679.45,  4861.36,  104.81,  0.000!!END!
2277!X=679.55,  4861.36,  107.11,  0.000!!END!
2278!X=679.65,  4861.36,  105.2,  0.000!!END!
2279!X=679.75,  4861.36,  103.52,  0.000!!END!
2280!X=679.85,  4861.36,  100.46,  0.000!!END!
2281!X=679.95,  4861.36,  106.11,  0.000!!END!
2282!X=680.05,  4861.36,  107.55,  0.000!!END!
2283!X=680.15,  4861.36,  106.82,  0.000!!END!
2284!X=680.25,  4861.36,  106.5,  0.000!!END!
2285!X=680.35,  4861.36,  105.17,  0.000!!END!
2286!X=680.45,  4861.36,  105.92,  0.000!!END!
2287!X=680.55,  4861.36,  105.05,  0.000!!END!
2288!X=680.65,  4861.36,  107.98,  0.000!!END!
2289!X=680.75,  4861.36,  111.37,  0.000!!END!
2290!X=680.85,  4861.36,  114.09,  0.000!!END!
2291!X=680.95,  4861.36,  116.15,  0.000!!END!
2292!X=681.05,  4861.36,  115.7,  0.000!!END!
2293!X=681.15,  4861.36,  112.32,  0.000!!END!
2294!X=681.25,  4861.36,  112.88,  0.000!!END!
2295!X=681.35,  4861.36,  110.61,  0.000!!END!
2296!X=681.45,  4861.36,  114.39,  0.000!!END!
2297!X=681.55,  4861.36,  115.4,  0.000!!END!
2298!X=681.65,  4861.36,  115.97,  0.000!!END!
2299!X=681.75,  4861.36,  116.52,  0.000!!END!
2300!X=679.35,  4861.46,  109.45,  0.000!!END!
2301!X=679.45,  4861.46,  108.27,  0.000!!END!
2302!X=679.55,  4861.46,  107.8,  0.000!!END!
2303!X=679.65,  4861.46,  105.62,  0.000!!END!
2304!X=679.75,  4861.46,  101.9,  0.000!!END!
2305!X=679.85,  4861.46,  102.44,  0.000!!END!
2306!X=679.95,  4861.46,  107.48,  0.000!!END!
2307!X=680.05,  4861.46,  105.9,  0.000!!END!
2308!X=680.15,  4861.46,  106.92,  0.000!!END!
2309!X=680.25,  4861.46,  107.62,  0.000!!END!
2310!X=680.35,  4861.46,  107.92,  0.000!!END!
2311!X=680.45,  4861.46,  106.75,  0.000!!END!
2312!X=680.55,  4861.46,  105.27,  0.000!!END!
2313!X=680.65,  4861.46,  109.08,  0.000!!END!
2314!X=680.75,  4861.46,  112.29,  0.000!!END!
2315!X=680.85,  4861.46,  115.78,  0.000!!END!
2316!X=680.95,  4861.46,  116.26,  0.000!!END!
2317!X=681.05,  4861.46,  116.01,  0.000!!END!
2318!X=681.15,  4861.46,  114.6,  0.000!!END!
2319!X=681.25,  4861.46,  116.83,  0.000!!END!
2320!X=681.35,  4861.46,  115.04,  0.000!!END!
2321!X=681.45,  4861.46,  114.67,  0.000!!END!
2322!X=681.55,  4861.46,  114.63,  0.000!!END!
2323!X=681.65,  4861.46,  115.42,  0.000!!END!
2324!X=681.75,  4861.46,  114.89,  0.000!!END!
2325!X=679.35,  4861.56,  113.53,  0.000!!END!
2326!X=679.45,  4861.56,  110.59,  0.000!!END!
2327!X=679.55,  4861.56,  107.42,  0.000!!END!
2328!X=679.65,  4861.56,  105.55,  0.000!!END!
2329!X=679.75,  4861.56,  103.68,  0.000!!END!
2330!X=679.85,  4861.56,  104.2,  0.000!!END!
2331!X=679.95,  4861.56,  105,  0.000!!END!
2332!X=680.05,  4861.56,  104.61,  0.000!!END!
2333!X=680.15,  4861.56,  104.93,  0.000!!END!
2334!X=680.25,  4861.56,  109.3,  0.000!!END!
2335!X=680.35,  4861.56,  110.96,  0.000!!END!
2336!X=680.45,  4861.56,  108.85,  0.000!!END!
2337!X=680.55,  4861.56,  107.26,  0.000!!END!
2338!X=680.65,  4861.56,  110.83,  0.000!!END!
2339!X=680.75,  4861.56,  112.74,  0.000!!END!
2340!X=680.85,  4861.56,  114.26,  0.000!!END!
2341!X=680.95,  4861.56,  117.86,  0.000!!END!
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!X=681.05,  4861.56,  118.5,  0.000!!END!
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!X=681.25,  4861.56,  119.57,  0.000!!END!
!X=681.35,  4861.56,  120.75,  0.000!!END!
!X=681.45,  4861.56,  119.68,  0.000!!END!
!X=681.55,  4861.56,  115.65,  0.000!!END!
!X=681.65,  4861.56,  115.37,  0.000!!END!
!X=681.75,  4861.56,  114.69,  0.000!!END!
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!X=678.55,  4858.16,  73,  0.000!!END!
!X=678.75,  4858.16,  73,  0.000!!END!
!X=678.95,  4858.16,  73,  0.000!!END!
!X=679.15,  4858.16,  73,  0.000!!END!
!X=679.35,  4858.16,  73,  0.000!!END!
!X=679.55,  4858.16,  73,  0.000!!END!
!X=679.75,  4858.16,  73,  0.000!!END!
!X=679.95,  4858.16,  73,  0.000!!END!
!X=680.15,  4858.16,  73,  0.000!!END!
!X=680.35,  4858.16,  73,  0.000!!END!
!X=680.55,  4858.16,  73,  0.000!!END!
!X=680.75,  4858.16,  73,  0.000!!END!
!X=680.95,  4858.16,  73,  0.000!!END!
!X=681.15,  4858.16,  73,  0.000!!END!
!X=681.35,  4858.16,  73,  0.000!!END!
!X=681.55,  4858.16,  73,  0.000!!END!
!X=681.75,  4858.16,  73,  0.000!!END!
!X=681.95,  4858.16,  73,  0.000!!END!
!X=682.15,  4858.16,  73,  0.000!!END!
!X=682.35,  4858.16,  73,  0.000!!END!
!X=682.55,  4858.16,  73,  0.000!!END!
!X=682.75,  4858.16,  73,  0.000!!END!
!X=678.35,  4858.36,  73,  0.000!!END!
!X=678.55,  4858.36,  73,  0.000!!END!
!X=678.75,  4858.36,  73,  0.000!!END!
!X=678.95,  4858.36,  73,  0.000!!END!
!X=679.15,  4858.36,  73,  0.000!!END!
!X=679.35,  4858.36,  73,  0.000!!END!
!X=679.55,  4858.36,  73,  0.000!!END!
!X=679.75,  4858.36,  73,  0.000!!END!
!X=679.95,  4858.36,  73,  0.000!!END!
!X=680.15,  4858.36,  73,  0.000!!END!
!X=680.35,  4858.36,  73,  0.000!!END!
!X=680.55,  4858.36,  73,  0.000!!END!
!X=680.75,  4858.36,  73,  0.000!!END!
!X=680.95,  4858.36,  73,  0.000!!END!
!X=681.15,  4858.36,  73,  0.000!!END!
!X=681.35,  4858.36,  73,  0.000!!END!
!X=681.55,  4858.36,  73,  0.000!!END!
!X=681.75,  4858.36,  73,  0.000!!END!
!X=681.95,  4858.36,  73,  0.000!!END!
!X=682.15,  4858.36,  73,  0.000!!END!
!X=682.35,  4858.36,  73,  0.000!!END!
!X=682.55,  4858.36,  73,  0.000!!END!
!X=682.75,  4858.36,  73,  0.000!!END!
!X=678.35,  4858.56,  73,  0.000!!END!
!X=678.55,  4858.56,  73,  0.000!!END!
!X=678.75,  4858.56,  73,  0.000!!END!
!X=678.95,  4858.56,  73,  0.000!!END!
!X=679.15,  4858.56,  73,  0.000!!END!
!X=679.35,  4858.56,  73,  0.000!!END!
!X=679.55,  4858.56,  73,  0.000!!END!
!X=679.75,  4858.56,  73,  0.000!!END!
!X=679.95,  4858.56,  73,  0.000!!END!
!X=680.15,  4858.56,  73,  0.000!!END!
!X=680.35,  4858.56,  73,  0.000!!END!
!X=680.55,  4858.56,  73,  0.000!!END!
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!X=680.75,  4858.56,  73,  0.000!!END!
!X=680.95,  4858.56,  73,  0.000!!END!
!X=681.15,  4858.56,  73,  0.000!!END!
!X=681.35,  4858.56,  73,  0.000!!END!
!X=681.55,  4858.56,  73,  0.000!!END!
!X=681.75,  4858.56,  73,  0.000!!END!
!X=681.95,  4858.56,  73,  0.000!!END!
!X=682.15,  4858.56,  73,  0.000!!END!
!X=682.35,  4858.56,  73,  0.000!!END!
!X=682.55,  4858.56,  73,  0.000!!END!
!X=682.75,  4858.56,  73,  0.000!!END!
!X=678.35,  4858.76,  73,  0.000!!END!
!X=678.55,  4858.76,  73,  0.000!!END!
!X=678.75,  4858.76,  73,  0.000!!END!
!X=678.95,  4858.76,  73,  0.000!!END!
!X=679.15,  4858.76,  73,  0.000!!END!
!X=679.35,  4858.76,  73,  0.000!!END!
!X=679.55,  4858.76,  73,  0.000!!END!
!X=679.75,  4858.76,  73,  0.000!!END!
!X=679.95,  4858.76,  73,  0.000!!END!
!X=680.15,  4858.76,  73,  0.000!!END!
!X=680.35,  4858.76,  73,  0.000!!END!
!X=680.55,  4858.76,  73,  0.000!!END!
!X=680.75,  4858.76,  73,  0.000!!END!
!X=680.95,  4858.76,  73,  0.000!!END!
!X=681.15,  4858.76,  73,  0.000!!END!
!X=681.35,  4858.76,  73,  0.000!!END!
!X=681.55,  4858.76,  73,  0.000!!END!
!X=681.75,  4858.76,  73,  0.000!!END!
!X=681.95,  4858.76,  73,  0.000!!END!
!X=682.15,  4858.76,  73,  0.000!!END!
!X=682.35,  4858.76,  73,  0.000!!END!
!X=682.55,  4858.76,  73,  0.000!!END!
!X=682.75,  4858.76,  73,  0.000!!END!
!X=678.35,  4858.96,  73,  0.000!!END!
!X=678.55,  4858.96,  73,  0.000!!END!
!X=678.75,  4858.96,  73,  0.000!!END!
!X=678.95,  4858.96,  73,  0.000!!END!
!X=679.15,  4858.96,  73,  0.000!!END!
!X=679.35,  4858.96,  73,  0.000!!END!
!X=679.55,  4858.96,  73,  0.000!!END!
!X=679.75,  4858.96,  73,  0.000!!END!
!X=679.95,  4858.96,  73,  0.000!!END!
!X=680.15,  4858.96,  73,  0.000!!END!
!X=680.35,  4858.96,  73,  0.000!!END!
!X=680.55,  4858.96,  73,  0.000!!END!
!X=680.75,  4858.96,  73,  0.000!!END!
!X=680.95,  4858.96,  73,  0.000!!END!
!X=681.15,  4858.96,  73,  0.000!!END!
!X=681.35,  4858.96,  73,  0.000!!END!
!X=681.55,  4858.96,  73,  0.000!!END!
!X=681.75,  4858.96,  73,  0.000!!END!
!X=681.95,  4858.96,  73,  0.000!!END!
!X=682.15,  4858.96,  73,  0.000!!END!
!X=682.35,  4858.96,  73,  0.000!!END!
!X=682.55,  4858.96,  73,  0.000!!END!
!X=682.75,  4858.96,  73,  0.000!!END!
!X=678.35,  4859.16,  73,  0.000!!END!
!X=678.55,  4859.16,  73,  0.000!!END!
!X=678.75,  4859.16,  73,  0.000!!END!
!X=678.95,  4859.16,  73,  0.000!!END!
!X=679.15,  4859.16,  73,  0.000!!END!
!X=681.95,  4859.16,  73,  0.000!!END!
!X=682.15,  4859.16,  73,  0.000!!END!
!X=682.35,  4859.16,  73,  0.000!!END!
!X=682.55,  4859.16,  73,  0.000!!END!
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2474!X=682.75,  4859.16,  73,  0.000!!END!
2475!X=678.35,  4859.36,  73,  0.000!!END!
2476!X=678.55,  4859.36,  73,  0.000!!END!
2477!X=678.75,  4859.36,  73,  0.000!!END!
2478!X=678.95,  4859.36,  73,  0.000!!END!
2479!X=679.15,  4859.36,  73,  0.000!!END!
2480!X=681.95,  4859.36,  73,  0.000!!END!
2481!X=682.15,  4859.36,  73,  0.000!!END!
2482!X=682.35,  4859.36,  73,  0.000!!END!
2483!X=682.55,  4859.36,  73,  0.000!!END!
2484!X=682.75,  4859.36,  73,  0.000!!END!
2485!X=678.35,  4859.56,  73,  0.000!!END!
2486!X=678.55,  4859.56,  73,  0.000!!END!
2487!X=678.75,  4859.56,  73,  0.000!!END!
2488!X=678.95,  4859.56,  73,  0.000!!END!
2489!X=679.15,  4859.56,  73,  0.000!!END!
2490!X=681.95,  4859.56,  73,  0.000!!END!
2491!X=682.15,  4859.56,  73,  0.000!!END!
2492!X=682.35,  4859.56,  73,  0.000!!END!
2493!X=682.55,  4859.56,  73,  0.000!!END!
2494!X=682.75,  4859.56,  75.25,  0.000!!END!
2495!X=678.35,  4859.76,  75.24,  0.000!!END!
2496!X=678.55,  4859.76,  79.96,  0.000!!END!
2497!X=678.75,  4859.76,  88.47,  0.000!!END!
2498!X=678.95,  4859.76,  88.93,  0.000!!END!
2499!X=679.15,  4859.76,  84.72,  0.000!!END!
2500!X=681.95,  4859.76,  73,  0.000!!END!
2501!X=682.15,  4859.76,  73,  0.000!!END!
2502!X=682.35,  4859.76,  77.74,  0.000!!END!
2503!X=682.55,  4859.76,  78.61,  0.000!!END!
2504!X=682.75,  4859.76,  82.56,  0.000!!END!
2505!X=678.35,  4859.96,  83.25,  0.000!!END!
2506!X=678.55,  4859.96,  87.03,  0.000!!END!
2507!X=678.75,  4859.96,  96.42,  0.000!!END!
2508!X=678.95,  4859.96,  92.49,  0.000!!END!
2509!X=679.15,  4859.96,  87.7,  0.000!!END!
2510!X=681.95,  4859.96,  84.53,  0.000!!END!
2511!X=682.15,  4859.96,  86.54,  0.000!!END!
2512!X=682.35,  4859.96,  84.38,  0.000!!END!
2513!X=682.55,  4859.96,  79.25,  0.000!!END!
2514!X=682.75,  4859.96,  91.34,  0.000!!END!
2515!X=678.35,  4860.16,  88.76,  0.000!!END!
2516!X=678.55,  4860.16,  95.49,  0.000!!END!
2517!X=678.75,  4860.16,  99.96,  0.000!!END!
2518!X=678.95,  4860.16,  91.1,  0.000!!END!
2519!X=679.15,  4860.16,  89.56,  0.000!!END!
2520!X=681.95,  4860.16,  99.03,  0.000!!END!
2521!X=682.15,  4860.16,  97.93,  0.000!!END!
2522!X=682.35,  4860.16,  98.3,  0.000!!END!
2523!X=682.55,  4860.16,  92.73,  0.000!!END!
2524!X=682.75,  4860.16,  85.16,  0.000!!END!
2525!X=678.35,  4860.36,  98.46,  0.000!!END!
2526!X=678.55,  4860.36,  99.95,  0.000!!END!
2527!X=678.75,  4860.36,  94.74,  0.000!!END!
2528!X=678.95,  4860.36,  88.61,  0.000!!END!
2529!X=679.15,  4860.36,  88.5,  0.000!!END!
2530!X=681.95,  4860.36,  100.1,  0.000!!END!
2531!X=682.15,  4860.36,  99.62,  0.000!!END!
2532!X=682.35,  4860.36,  102.25,  0.000!!END!
2533!X=682.55,  4860.36,  104.29,  0.000!!END!
2534!X=682.75,  4860.36,  107.88,  0.000!!END!
2535!X=678.35,  4860.56,  92.83,  0.000!!END!
2536!X=678.55,  4860.56,  93.57,  0.000!!END!
2537!X=678.75,  4860.56,  91.28,  0.000!!END!
2538!X=678.95,  4860.56,  90.53,  0.000!!END!
2539!X=679.15,  4860.56,  91.06,  0.000!!END!
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!X=681.95,  4860.56,  123.19,  0.000!!END!
!X=682.15,  4860.56,  107.95,  0.000!!END!
!X=682.35,  4860.56,  106.58,  0.000!!END!
!X=682.55,  4860.56,  107.19,  0.000!!END!
!X=682.75,  4860.56,  111.25,  0.000!!END!
!X=678.35,  4860.76,  98.99,  0.000!!END!
!X=678.55,  4860.76,  97.82,  0.000!!END!
!X=678.75,  4860.76,  95.6,  0.000!!END!
!X=678.95,  4860.76,  94.07,  0.000!!END!
!X=679.15,  4860.76,  96.23,  0.000!!END!
!X=681.95,  4860.76,  127.55,  0.000!!END!
!X=682.15,  4860.76,  113.42,  0.000!!END!
!X=682.35,  4860.76,  109.82,  0.000!!END!
!X=682.55,  4860.76,  114.22,  0.000!!END!
!X=682.75,  4860.76,  121.29,  0.000!!END!
!X=678.35,  4860.96,  102.41,  0.000!!END!
!X=678.55,  4860.96,  97.43,  0.000!!END!
!X=678.75,  4860.96,  99,  0.000!!END!
!X=678.95,  4860.96,  99.91,  0.000!!END!
!X=679.15,  4860.96,  102.69,  0.000!!END!
!X=681.95,  4860.96,  130.36,  0.000!!END!
!X=682.15,  4860.96,  120.44,  0.000!!END!
!X=682.35,  4860.96,  121.93,  0.000!!END!
!X=682.55,  4860.96,  121.43,  0.000!!END!
!X=682.75,  4860.96,  125.96,  0.000!!END!
!X=678.35,  4861.16,  108.08,  0.000!!END!
!X=678.55,  4861.16,  106.06,  0.000!!END!
!X=678.75,  4861.16,  102.76,  0.000!!END!
!X=678.95,  4861.16,  101.72,  0.000!!END!
!X=679.15,  4861.16,  102.01,  0.000!!END!
!X=681.95,  4861.16,  126.29,  0.000!!END!
!X=682.15,  4861.16,  124.2,  0.000!!END!
!X=682.35,  4861.16,  127.17,  0.000!!END!
!X=682.55,  4861.16,  126.75,  0.000!!END!
!X=682.75,  4861.16,  133.26,  0.000!!END!
!X=678.35,  4861.36,  117.15,  0.000!!END!
!X=678.55,  4861.36,  115.97,  0.000!!END!
!X=678.75,  4861.36,  112.65,  0.000!!END!
!X=678.95,  4861.36,  110.03,  0.000!!END!
!X=679.15,  4861.36,  107.25,  0.000!!END!
!X=681.95,  4861.36,  117.77,  0.000!!END!
!X=682.15,  4861.36,  122.58,  0.000!!END!
!X=682.35,  4861.36,  123.82,  0.000!!END!
!X=682.55,  4861.36,  126.73,  0.000!!END!
!X=682.75,  4861.36,  127.61,  0.000!!END!
!X=678.35,  4861.56,  117.49,  0.000!!END!
!X=678.55,  4861.56,  120.28,  0.000!!END!
!X=678.75,  4861.56,  117.56,  0.000!!END!
!X=678.95,  4861.56,  117.05,  0.000!!END!
!X=679.15,  4861.56,  111.99,  0.000!!END!
!X=681.95,  4861.56,  116.42,  0.000!!END!
!X=682.15,  4861.56,  116.86,  0.000!!END!
!X=682.35,  4861.56,  116.49,  0.000!!END!
!X=682.55,  4861.56,  130.35,  0.000!!END!
!X=682.75,  4861.56,  116.06,  0.000!!END!
!X=678.35,  4861.76,  118.88,  0.000!!END!
!X=678.55,  4861.76,  123.13,  0.000!!END!
!X=678.75,  4861.76,  124.46,  0.000!!END!
!X=678.95,  4861.76,  118.51,  0.000!!END!
!X=679.15,  4861.76,  115.92,  0.000!!END!
!X=679.35,  4861.76,  117,  0.000!!END!
!X=679.55,  4861.76,  109.5,  0.000!!END!
!X=679.75,  4861.76,  107.43,  0.000!!END!
!X=679.95,  4861.76,  105.6,  0.000!!END!
!X=680.15,  4861.76,  111.28,  0.000!!END!
!X=680.35,  4861.76,  112.44,  0.000!!END!
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2606!X=680.55,  4861.76,  119.18,  0.000!!END!
2607!X=680.75,  4861.76,  116.37,  0.000!!END!
2608!X=680.95,  4861.76,  117.84,  0.000!!END!
2609!X=681.15,  4861.76,  130.51,  0.000!!END!
2610!X=681.35,  4861.76,  126.03,  0.000!!END!
2611!X=681.55,  4861.76,  115.73,  0.000!!END!
2612!X=681.75,  4861.76,  114.9,  0.000!!END!
2613!X=681.95,  4861.76,  113.58,  0.000!!END!
2614!X=682.15,  4861.76,  114.32,  0.000!!END!
2615!X=682.35,  4861.76,  119.75,  0.000!!END!
2616!X=682.55,  4861.76,  122.64,  0.000!!END!
2617!X=682.75,  4861.76,  112.5,  0.000!!END!
2618!X=678.35,  4861.96,  125.33,  0.000!!END!
2619!X=678.55,  4861.96,  124.63,  0.000!!END!
2620!X=678.75,  4861.96,  126.83,  0.000!!END!
2621!X=678.95,  4861.96,  119.96,  0.000!!END!
2622!X=679.15,  4861.96,  117,  0.000!!END!
2623!X=679.35,  4861.96,  114.04,  0.000!!END!
2624!X=679.55,  4861.96,  111.68,  0.000!!END!
2625!X=679.75,  4861.96,  114.3,  0.000!!END!
2626!X=679.95,  4861.96,  116.87,  0.000!!END!
2627!X=680.15,  4861.96,  119.66,  0.000!!END!
2628!X=680.35,  4861.96,  118.41,  0.000!!END!
2629!X=680.55,  4861.96,  118.82,  0.000!!END!
2630!X=680.75,  4861.96,  122.11,  0.000!!END!
2631!X=680.95,  4861.96,  125.71,  0.000!!END!
2632!X=681.15,  4861.96,  128.32,  0.000!!END!
2633!X=681.35,  4861.96,  116.23,  0.000!!END!
2634!X=681.55,  4861.96,  116.3,  0.000!!END!
2635!X=681.75,  4861.96,  113.75,  0.000!!END!
2636!X=681.95,  4861.96,  112.18,  0.000!!END!
2637!X=682.15,  4861.96,  115.01,  0.000!!END!
2638!X=682.35,  4861.96,  119.81,  0.000!!END!
2639!X=682.55,  4861.96,  112.8,  0.000!!END!
2640!X=682.75,  4861.96,  114.34,  0.000!!END!
2641!X=678.35,  4862.16,  126.71,  0.000!!END!
2642!X=678.55,  4862.16,  130.07,  0.000!!END!
2643!X=678.75,  4862.16,  138.47,  0.000!!END!
2644!X=678.95,  4862.16,  117.89,  0.000!!END!
2645!X=679.15,  4862.16,  115.64,  0.000!!END!
2646!X=679.35,  4862.16,  112.69,  0.000!!END!
2647!X=679.55,  4862.16,  109.97,  0.000!!END!
2648!X=679.75,  4862.16,  118.49,  0.000!!END!
2649!X=679.95,  4862.16,  125.46,  0.000!!END!
2650!X=680.15,  4862.16,  133.06,  0.000!!END!
2651!X=680.35,  4862.16,  125.2,  0.000!!END!
2652!X=680.55,  4862.16,  121.03,  0.000!!END!
2653!X=680.75,  4862.16,  124.88,  0.000!!END!
2654!X=680.95,  4862.16,  129.35,  0.000!!END!
2655!X=681.15,  4862.16,  128.32,  0.000!!END!
2656!X=681.35,  4862.16,  124.14,  0.000!!END!
2657!X=681.55,  4862.16,  118.2,  0.000!!END!
2658!X=681.75,  4862.16,  117.72,  0.000!!END!
2659!X=681.95,  4862.16,  114.05,  0.000!!END!
2660!X=682.15,  4862.16,  113.47,  0.000!!END!
2661!X=682.35,  4862.16,  111.9,  0.000!!END!
2662!X=682.55,  4862.16,  112.3,  0.000!!END!
2663!X=682.75,  4862.16,  109.86,  0.000!!END!
2664!X=678.35,  4862.36,  125.65,  0.000!!END!
2665!X=678.55,  4862.36,  131.7,  0.000!!END!
2666!X=678.75,  4862.36,  126.69,  0.000!!END!
2667!X=678.95,  4862.36,  119.56,  0.000!!END!
2668!X=679.15,  4862.36,  118.31,  0.000!!END!
2669!X=679.35,  4862.36,  115.43,  0.000!!END!
2670!X=679.55,  4862.36,  114.84,  0.000!!END!
2671!X=679.75,  4862.36,  116.01,  0.000!!END!
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!X=679.95,  4862.36,  122.82,  0.000!!END!
!X=680.15,  4862.36,  128.49,  0.000!!END!
!X=680.35,  4862.36,  125.11,  0.000!!END!
!X=680.55,  4862.36,  125.31,  0.000!!END!
!X=680.75,  4862.36,  123.72,  0.000!!END!
!X=680.95,  4862.36,  126.56,  0.000!!END!
!X=681.15,  4862.36,  130.9,  0.000!!END!
!X=681.35,  4862.36,  126.54,  0.000!!END!
!X=681.55,  4862.36,  119.87,  0.000!!END!
!X=681.75,  4862.36,  120.54,  0.000!!END!
!X=681.95,  4862.36,  120.49,  0.000!!END!
!X=682.15,  4862.36,  113.93,  0.000!!END!
!X=682.35,  4862.36,  112.89,  0.000!!END!
!X=682.55,  4862.36,  112.53,  0.000!!END!
!X=682.75,  4862.36,  109.12,  0.000!!END!
!X=678.35,  4862.56,  129.65,  0.000!!END!
!X=678.55,  4862.56,  129.63,  0.000!!END!
!X=678.75,  4862.56,  126.1,  0.000!!END!
!X=678.95,  4862.56,  121.4,  0.000!!END!
!X=679.15,  4862.56,  117.38,  0.000!!END!
!X=679.35,  4862.56,  118.19,  0.000!!END!
!X=679.55,  4862.56,  116.31,  0.000!!END!
!X=679.75,  4862.56,  116.84,  0.000!!END!
!X=679.95,  4862.56,  124.8,  0.000!!END!
!X=680.15,  4862.56,  128.77,  0.000!!END!
!X=680.35,  4862.56,  128.66,  0.000!!END!
!X=680.55,  4862.56,  125.52,  0.000!!END!
!X=680.75,  4862.56,  122.95,  0.000!!END!
!X=680.95,  4862.56,  126.39,  0.000!!END!
!X=681.15,  4862.56,  131.22,  0.000!!END!
!X=681.35,  4862.56,  128.28,  0.000!!END!
!X=681.55,  4862.56,  124.51,  0.000!!END!
!X=681.75,  4862.56,  121.34,  0.000!!END!
!X=681.95,  4862.56,  116.57,  0.000!!END!
!X=682.15,  4862.56,  116.08,  0.000!!END!
!X=682.35,  4862.56,  113.53,  0.000!!END!
!X=682.55,  4862.56,  108.71,  0.000!!END!
!X=682.75,  4862.56,  115.47,  0.000!!END!
!X=675.3,  4855.11,  73,  0.000!!END!
!X=675.8,  4855.11,  73,  0.000!!END!
!X=676.3,  4855.11,  73,  0.000!!END!
!X=676.8,  4855.11,  73,  0.000!!END!
!X=677.3,  4855.11,  73,  0.000!!END!
!X=677.8,  4855.11,  73,  0.000!!END!
!X=678.3,  4855.11,  73,  0.000!!END!
!X=678.8,  4855.11,  73,  0.000!!END!
!X=679.3,  4855.11,  73,  0.000!!END!
!X=679.8,  4855.11,  73,  0.000!!END!
!X=680.3,  4855.11,  73,  0.000!!END!
!X=680.8,  4855.11,  73,  0.000!!END!
!X=681.3,  4855.11,  73,  0.000!!END!
!X=681.8,  4855.11,  73,  0.000!!END!
!X=682.3,  4855.11,  73,  0.000!!END!
!X=682.8,  4855.11,  73,  0.000!!END!
!X=683.3,  4855.11,  73,  0.000!!END!
!X=683.8,  4855.11,  73,  0.000!!END!
!X=684.3,  4855.11,  73,  0.000!!END!
!X=684.8,  4855.11,  73,  0.000!!END!
!X=685.3,  4855.11,  73,  0.000!!END!
!X=685.8,  4855.11,  73,  0.000!!END!
!X=675.3,  4855.61,  73,  0.000!!END!
!X=675.8,  4855.61,  73,  0.000!!END!
!X=676.3,  4855.61,  73,  0.000!!END!
!X=676.8,  4855.61,  73,  0.000!!END!
!X=677.3,  4855.61,  73,  0.000!!END!
!X=677.8,  4855.61,  73,  0.000!!END!
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!X=678.3,  4855.61,  73,  0.000!!END!
!X=678.8,  4855.61,  73,  0.000!!END!
!X=679.3,  4855.61,  73,  0.000!!END!
!X=679.8,  4855.61,  73,  0.000!!END!
!X=680.3,  4855.61,  73,  0.000!!END!
!X=680.8,  4855.61,  73,  0.000!!END!
!X=681.3,  4855.61,  73,  0.000!!END!
!X=681.8,  4855.61,  73,  0.000!!END!
!X=682.3,  4855.61,  73,  0.000!!END!
!X=682.8,  4855.61,  73,  0.000!!END!
!X=683.3,  4855.61,  73,  0.000!!END!
!X=683.8,  4855.61,  73,  0.000!!END!
!X=684.3,  4855.61,  73,  0.000!!END!
!X=684.8,  4855.61,  73,  0.000!!END!
!X=685.3,  4855.61,  73,  0.000!!END!
!X=685.8,  4855.61,  73,  0.000!!END!
!X=675.3,  4856.11,  73,  0.000!!END!
!X=675.8,  4856.11,  73,  0.000!!END!
!X=676.3,  4856.11,  73,  0.000!!END!
!X=676.8,  4856.11,  73,  0.000!!END!
!X=677.3,  4856.11,  73,  0.000!!END!
!X=677.8,  4856.11,  73,  0.000!!END!
!X=678.3,  4856.11,  73,  0.000!!END!
!X=678.8,  4856.11,  73,  0.000!!END!
!X=679.3,  4856.11,  73,  0.000!!END!
!X=679.8,  4856.11,  73,  0.000!!END!
!X=680.3,  4856.11,  73,  0.000!!END!
!X=680.8,  4856.11,  73,  0.000!!END!
!X=681.3,  4856.11,  73,  0.000!!END!
!X=681.8,  4856.11,  73,  0.000!!END!
!X=682.3,  4856.11,  73,  0.000!!END!
!X=682.8,  4856.11,  73,  0.000!!END!
!X=683.3,  4856.11,  73,  0.000!!END!
!X=683.8,  4856.11,  73,  0.000!!END!
!X=684.3,  4856.11,  73,  0.000!!END!
!X=684.8,  4856.11,  73,  0.000!!END!
!X=685.3,  4856.11,  73,  0.000!!END!
!X=685.8,  4856.11,  73,  0.000!!END!
!X=675.3,  4856.61,  73,  0.000!!END!
!X=675.8,  4856.61,  73,  0.000!!END!
!X=676.3,  4856.61,  73,  0.000!!END!
!X=676.8,  4856.61,  73,  0.000!!END!
!X=677.3,  4856.61,  73,  0.000!!END!
!X=677.8,  4856.61,  73,  0.000!!END!
!X=678.3,  4856.61,  73,  0.000!!END!
!X=678.8,  4856.61,  73,  0.000!!END!
!X=679.3,  4856.61,  73,  0.000!!END!
!X=679.8,  4856.61,  73,  0.000!!END!
!X=680.3,  4856.61,  73,  0.000!!END!
!X=680.8,  4856.61,  73,  0.000!!END!
!X=681.3,  4856.61,  73,  0.000!!END!
!X=681.8,  4856.61,  73,  0.000!!END!
!X=682.3,  4856.61,  73,  0.000!!END!
!X=682.8,  4856.61,  73,  0.000!!END!
!X=683.3,  4856.61,  73,  0.000!!END!
!X=683.8,  4856.61,  73,  0.000!!END!
!X=684.3,  4856.61,  73,  0.000!!END!
!X=684.8,  4856.61,  73,  0.000!!END!
!X=685.3,  4856.61,  73,  0.000!!END!
!X=685.8,  4856.61,  73,  0.000!!END!
!X=675.3,  4857.11,  73,  0.000!!END!
!X=675.8,  4857.11,  73,  0.000!!END!
!X=676.3,  4857.11,  73,  0.000!!END!
!X=676.8,  4857.11,  73,  0.000!!END!
!X=677.3,  4857.11,  73,  0.000!!END!
!X=677.8,  4857.11,  73,  0.000!!END!
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!X=678.3,  4857.11,  73,  0.000!!END!
!X=678.8,  4857.11,  73,  0.000!!END!
!X=679.3,  4857.11,  73,  0.000!!END!
!X=679.8,  4857.11,  73,  0.000!!END!
!X=680.3,  4857.11,  73,  0.000!!END!
!X=680.8,  4857.11,  73,  0.000!!END!
!X=681.3,  4857.11,  73,  0.000!!END!
!X=681.8,  4857.11,  73,  0.000!!END!
!X=682.3,  4857.11,  73,  0.000!!END!
!X=682.8,  4857.11,  73,  0.000!!END!
!X=683.3,  4857.11,  73,  0.000!!END!
!X=683.8,  4857.11,  73,  0.000!!END!
!X=684.3,  4857.11,  73,  0.000!!END!
!X=684.8,  4857.11,  73,  0.000!!END!
!X=685.3,  4857.11,  73,  0.000!!END!
!X=685.8,  4857.11,  73,  0.000!!END!
!X=675.3,  4857.61,  73,  0.000!!END!
!X=675.8,  4857.61,  73,  0.000!!END!
!X=676.3,  4857.61,  73,  0.000!!END!
!X=676.8,  4857.61,  73,  0.000!!END!
!X=677.3,  4857.61,  73,  0.000!!END!
!X=677.8,  4857.61,  73,  0.000!!END!
!X=678.3,  4857.61,  73,  0.000!!END!
!X=678.8,  4857.61,  73,  0.000!!END!
!X=679.3,  4857.61,  73,  0.000!!END!
!X=679.8,  4857.61,  73,  0.000!!END!
!X=680.3,  4857.61,  73,  0.000!!END!
!X=680.8,  4857.61,  73,  0.000!!END!
!X=681.3,  4857.61,  73,  0.000!!END!
!X=681.8,  4857.61,  73,  0.000!!END!
!X=682.3,  4857.61,  73,  0.000!!END!
!X=682.8,  4857.61,  73,  0.000!!END!
!X=683.3,  4857.61,  73,  0.000!!END!
!X=683.8,  4857.61,  73,  0.000!!END!
!X=684.3,  4857.61,  73,  0.000!!END!
!X=684.8,  4857.61,  73,  0.000!!END!
!X=685.3,  4857.61,  73,  0.000!!END!
!X=685.8,  4857.61,  73,  0.000!!END!
!X=675.3,  4858.11,  73,  0.000!!END!
!X=675.8,  4858.11,  73,  0.000!!END!
!X=676.3,  4858.11,  73,  0.000!!END!
!X=676.8,  4858.11,  73,  0.000!!END!
!X=677.3,  4858.11,  73,  0.000!!END!
!X=677.8,  4858.11,  73,  0.000!!END!
!X=678.3,  4858.11,  73,  0.000!!END!
!X=678.8,  4858.11,  73,  0.000!!END!
!X=679.3,  4858.11,  73,  0.000!!END!
!X=679.8,  4858.11,  73,  0.000!!END!
!X=680.3,  4858.11,  73,  0.000!!END!
!X=680.8,  4858.11,  73,  0.000!!END!
!X=681.3,  4858.11,  73,  0.000!!END!
!X=681.8,  4858.11,  73,  0.000!!END!
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!X=682.8,  4858.11,  73,  0.000!!END!
!X=683.3,  4858.11,  73,  0.000!!END!
!X=683.8,  4858.11,  73,  0.000!!END!
!X=684.3,  4858.11,  73,  0.000!!END!
!X=684.8,  4858.11,  73,  0.000!!END!
!X=685.3,  4858.11,  73,  0.000!!END!
!X=685.8,  4858.11,  73,  0.000!!END!
!X=675.3,  4858.61,  73,  0.000!!END!
!X=675.8,  4858.61,  73,  0.000!!END!
!X=676.3,  4858.61,  73,  0.000!!END!
!X=676.8,  4858.61,  73,  0.000!!END!
!X=677.3,  4858.61,  73,  0.000!!END!
!X=677.8,  4858.61,  73,  0.000!!END!
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!X=678.3,  4858.61,  73,  0.000!!END!
!X=682.8,  4858.61,  73,  0.000!!END!
!X=683.3,  4858.61,  73,  0.000!!END!
!X=683.8,  4858.61,  73,  0.000!!END!
!X=684.3,  4858.61,  73,  0.000!!END!
!X=684.8,  4858.61,  73,  0.000!!END!
!X=685.3,  4858.61,  73,  0.000!!END!
!X=685.8,  4858.61,  73,  0.000!!END!
!X=675.3,  4859.11,  73,  0.000!!END!
!X=675.8,  4859.11,  73,  0.000!!END!
!X=676.3,  4859.11,  73,  0.000!!END!
!X=676.8,  4859.11,  73,  0.000!!END!
!X=677.3,  4859.11,  73,  0.000!!END!
!X=677.8,  4859.11,  73,  0.000!!END!
!X=678.3,  4859.11,  73,  0.000!!END!
!X=682.8,  4859.11,  73,  0.000!!END!
!X=683.3,  4859.11,  73,  0.000!!END!
!X=683.8,  4859.11,  73,  0.000!!END!
!X=684.3,  4859.11,  73,  0.000!!END!
!X=684.8,  4859.11,  73,  0.000!!END!
!X=685.3,  4859.11,  73,  0.000!!END!
!X=685.8,  4859.11,  73,  0.000!!END!
!X=675.3,  4859.61,  77.38,  0.000!!END!
!X=675.8,  4859.61,  73,  0.000!!END!
!X=676.3,  4859.61,  73.48,  0.000!!END!
!X=676.8,  4859.61,  74.05,  0.000!!END!
!X=677.3,  4859.61,  73,  0.000!!END!
!X=677.8,  4859.61,  73,  0.000!!END!
!X=678.3,  4859.61,  73,  0.000!!END!
!X=682.8,  4859.61,  77.61,  0.000!!END!
!X=683.3,  4859.61,  78.36,  0.000!!END!
!X=683.8,  4859.61,  73,  0.000!!END!
!X=684.3,  4859.61,  73,  0.000!!END!
!X=684.8,  4859.61,  73,  0.000!!END!
!X=685.3,  4859.61,  73,  0.000!!END!
!X=685.8,  4859.61,  73,  0.000!!END!
!X=675.3,  4860.11,  76.06,  0.000!!END!
!X=675.8,  4860.11,  73,  0.000!!END!
!X=676.3,  4860.11,  74.69,  0.000!!END!
!X=676.8,  4860.11,  73.92,  0.000!!END!
!X=677.3,  4860.11,  85.67,  0.000!!END!
!X=677.8,  4860.11,  93.69,  0.000!!END!
!X=678.3,  4860.11,  88.05,  0.000!!END!
!X=682.8,  4860.11,  78.66,  0.000!!END!
!X=683.3,  4860.11,  85.8,  0.000!!END!
!X=683.8,  4860.11,  87.88,  0.000!!END!
!X=684.3,  4860.11,  97.92,  0.000!!END!
!X=684.8,  4860.11,  73,  0.000!!END!
!X=685.3,  4860.11,  73,  0.000!!END!
!X=685.8,  4860.11,  73,  0.000!!END!
!X=675.3,  4860.61,  77.07,  0.000!!END!
!X=675.8,  4860.61,  74.71,  0.000!!END!
!X=676.3,  4860.61,  89.27,  0.000!!END!
!X=676.8,  4860.61,  99.36,  0.000!!END!
!X=677.3,  4860.61,  104.02,  0.000!!END!
!X=677.8,  4860.61,  97.08,  0.000!!END!
!X=678.3,  4860.61,  93.68,  0.000!!END!
!X=682.8,  4860.61,  111.62,  0.000!!END!
!X=683.3,  4860.61,  112.14,  0.000!!END!
!X=683.8,  4860.61,  99.69,  0.000!!END!
!X=684.3,  4860.61,  91.28,  0.000!!END!
!X=684.8,  4860.61,  77.95,  0.000!!END!
!X=685.3,  4860.61,  73.65,  0.000!!END!
!X=685.8,  4860.61,  82.19,  0.000!!END!
!X=675.3,  4861.11,  79.42,  0.000!!END!
!X=675.8,  4861.11,  82.66,  0.000!!END!
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2936!X=676.3,  4861.11,  99.58,  0.000!!END!
2937!X=676.8,  4861.11,  107.29,  0.000!!END!
2938!X=677.3,  4861.11,  95.8,  0.000!!END!
2939!X=677.8,  4861.11,  93.69,  0.000!!END!
2940!X=678.3,  4861.11,  107.21,  0.000!!END!
2941!X=682.8,  4861.11,  129.87,  0.000!!END!
2942!X=683.3,  4861.11,  116.72,  0.000!!END!
2943!X=683.8,  4861.11,  106.95,  0.000!!END!
2944!X=684.3,  4861.11,  93.98,  0.000!!END!
2945!X=684.8,  4861.11,  100.56,  0.000!!END!
2946!X=685.3,  4861.11,  92.95,  0.000!!END!
2947!X=685.8,  4861.11,  91.7,  0.000!!END!
2948!X=675.3,  4861.61,  80.02,  0.000!!END!
2949!X=675.8,  4861.61,  91.18,  0.000!!END!
2950!X=676.3,  4861.61,  106.97,  0.000!!END!
2951!X=676.8,  4861.61,  107.58,  0.000!!END!
2952!X=677.3,  4861.61,  113.61,  0.000!!END!
2953!X=677.8,  4861.61,  110.16,  0.000!!END!
2954!X=678.3,  4861.61,  118.11,  0.000!!END!
2955!X=682.8,  4861.61,  112.07,  0.000!!END!
2956!X=683.3,  4861.61,  103.45,  0.000!!END!
2957!X=683.8,  4861.61,  95.57,  0.000!!END!
2958!X=684.3,  4861.61,  87.41,  0.000!!END!
2959!X=684.8,  4861.61,  81.54,  0.000!!END!
2960!X=685.3,  4861.61,  17.07,  0.000!!END!
2961!X=685.8,  4861.61,  82.85,  0.000!!END!
2962!X=675.3,  4862.11,  88.41,  0.000!!END!
2963!X=675.8,  4862.11,  117.27,  0.000!!END!
2964!X=676.3,  4862.11,  125.65,  0.000!!END!
2965!X=676.8,  4862.11,  121.24,  0.000!!END!
2966!X=677.3,  4862.11,  119.4,  0.000!!END!
2967!X=677.8,  4862.11,  116.05,  0.000!!END!
2968!X=678.3,  4862.11,  126.49,  0.000!!END!
2969!X=682.8,  4862.11,  110.45,  0.000!!END!
2970!X=683.3,  4862.11,  108.55,  0.000!!END!
2971!X=683.8,  4862.11,  109.66,  0.000!!END!
2972!X=684.3,  4862.11,  91.22,  0.000!!END!
2973!X=684.8,  4862.11,  85.07,  0.000!!END!
2974!X=685.3,  4862.11,  73.14,  0.000!!END!
2975!X=685.8,  4862.11,  81.37,  0.000!!END!
2976!X=675.3,  4862.61,  94.57,  0.000!!END!
2977!X=675.8,  4862.61,  117.44,  0.000!!END!
2978!X=676.3,  4862.61,  125.44,  0.000!!END!
2979!X=676.8,  4862.61,  128.58,  0.000!!END!
2980!X=677.3,  4862.61,  114.93,  0.000!!END!
2981!X=677.8,  4862.61,  128,  0.000!!END!
2982!X=678.3,  4862.61,  130.9,  0.000!!END!
2983!X=678.8,  4862.61,  125.42,  0.000!!END!
2984!X=679.3,  4862.61,  119.36,  0.000!!END!
2985!X=679.8,  4862.61,  117.63,  0.000!!END!
2986!X=680.3,  4862.61,  129.3,  0.000!!END!
2987!X=680.8,  4862.61,  125.18,  0.000!!END!
2988!X=681.3,  4862.61,  128.91,  0.000!!END!
2989!X=681.8,  4862.61,  119.59,  0.000!!END!
2990!X=682.3,  4862.61,  113.42,  0.000!!END!
2991!X=682.8,  4862.61,  117.66,  0.000!!END!
2992!X=683.3,  4862.61,  112.07,  0.000!!END!
2993!X=683.8,  4862.61,  107.02,  0.000!!END!
2994!X=684.3,  4862.61,  112.23,  0.000!!END!
2995!X=684.8,  4862.61,  86,  0.000!!END!
2996!X=685.3,  4862.61,  84.79,  0.000!!END!
2997!X=685.8,  4862.61,  85.43,  0.000!!END!
2998!X=675.3,  4863.11,  131.09,  0.000!!END!
2999!X=675.8,  4863.11,  132.6,  0.000!!END!
3000!X=676.3,  4863.11,  118.52,  0.000!!END!
3001!X=676.8,  4863.11,  128.45,  0.000!!END!
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3002!X=677.3,  4863.11,  131.85,  0.000!!END!
3003!X=677.8,  4863.11,  133.71,  0.000!!END!
3004!X=678.3,  4863.11,  133.81,  0.000!!END!
3005!X=678.8,  4863.11,  132.47,  0.000!!END!
3006!X=679.3,  4863.11,  122.81,  0.000!!END!
3007!X=679.8,  4863.11,  125.95,  0.000!!END!
3008!X=680.3,  4863.11,  132.54,  0.000!!END!
3009!X=680.8,  4863.11,  123.67,  0.000!!END!
3010!X=681.3,  4863.11,  127.02,  0.000!!END!
3011!X=681.8,  4863.11,  120.93,  0.000!!END!
3012!X=682.3,  4863.11,  119.04,  0.000!!END!
3013!X=682.8,  4863.11,  127.5,  0.000!!END!
3014!X=683.3,  4863.11,  116.62,  0.000!!END!
3015!X=683.8,  4863.11,  118.44,  0.000!!END!
3016!X=684.3,  4863.11,  104.7,  0.000!!END!
3017!X=684.8,  4863.11,  88.37,  0.000!!END!
3018!X=685.3,  4863.11,  94.51,  0.000!!END!
3019!X=685.8,  4863.11,  81.69,  0.000!!END!
3020!X=675.3,  4863.61,  132.56,  0.000!!END!
3021!X=675.8,  4863.61,  130.49,  0.000!!END!
3022!X=676.3,  4863.61,  119.83,  0.000!!END!
3023!X=676.8,  4863.61,  126.55,  0.000!!END!
3024!X=677.3,  4863.61,  132.25,  0.000!!END!
3025!X=677.8,  4863.61,  132.99,  0.000!!END!
3026!X=678.3,  4863.61,  138.31,  0.000!!END!
3027!X=678.8,  4863.61,  134.69,  0.000!!END!
3028!X=679.3,  4863.61,  131.84,  0.000!!END!
3029!X=679.8,  4863.61,  131.33,  0.000!!END!
3030!X=680.3,  4863.61,  127.24,  0.000!!END!
3031!X=680.8,  4863.61,  124.73,  0.000!!END!
3032!X=681.3,  4863.61,  122.84,  0.000!!END!
3033!X=681.8,  4863.61,  126.13,  0.000!!END!
3034!X=682.3,  4863.61,  123.21,  0.000!!END!
3035!X=682.8,  4863.61,  126.94,  0.000!!END!
3036!X=683.3,  4863.61,  121.01,  0.000!!END!
3037!X=683.8,  4863.61,  119.66,  0.000!!END!
3038!X=684.3,  4863.61,  108.97,  0.000!!END!
3039!X=684.8,  4863.61,  116.49,  0.000!!END!
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3041!X=685.8,  4863.61,  80.93,  0.000!!END!
3042!X=675.3,  4864.11,  124.36,  0.000!!END!
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3044!X=676.3,  4864.11,  135.49,  0.000!!END!
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3047!X=677.8,  4864.11,  137.35,  0.000!!END!
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3049!X=678.8,  4864.11,  134.03,  0.000!!END!
3050!X=679.3,  4864.11,  134.5,  0.000!!END!
3051!X=679.8,  4864.11,  136.74,  0.000!!END!
3052!X=680.3,  4864.11,  133.99,  0.000!!END!
3053!X=680.8,  4864.11,  136.04,  0.000!!END!
3054!X=681.3,  4864.11,  133.9,  0.000!!END!
3055!X=681.8,  4864.11,  132.81,  0.000!!END!
3056!X=682.3,  4864.11,  130.39,  0.000!!END!
3057!X=682.8,  4864.11,  122.86,  0.000!!END!
3058!X=683.3,  4864.11,  125.22,  0.000!!END!
3059!X=683.8,  4864.11,  119.66,  0.000!!END!
3060!X=684.3,  4864.11,  116.2,  0.000!!END!
3061!X=684.8,  4864.11,  114.5,  0.000!!END!
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3064!X=675.3,  4864.61,  138.21,  0.000!!END!
3065!X=675.8,  4864.61,  136.95,  0.000!!END!
3066!X=676.3,  4864.61,  137.78,  0.000!!END!
3067!X=676.8,  4864.61,  133.64,  0.000!!END!
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3071!X=678.8,  4864.61,  135.51,  0.000!!END!
3072!X=679.3,  4864.61,  136.63,  0.000!!END!
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3078!X=682.3,  4864.61,  131.87,  0.000!!END!
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3081!X=683.8,  4864.61,  122.87,  0.000!!END!
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3083!X=684.8,  4864.61,  114.58,  0.000!!END!
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3123!X=682.8,  4865.61,  144.67,  0.000!!END!
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3126!X=684.3,  4865.61,  123.02,  0.000!!END!
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3132!X=664.55,  4850.36,  73,  0.000!!END!
3133!X=665.55,  4850.36,  73,  0.000!!END!
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!X=691.55,  4855.36,  73,  0.000!!END!
!X=692.55,  4855.36,  73,  0.000!!END!
!X=693.55,  4855.36,  73,  0.000!!END!
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!X=697.55,  4855.36,  73,  0.000!!END!
!X=698.55,  4855.36,  73,  0.000!!END!
!X=699.55,  4855.36,  73,  0.000!!END!
!X=700.55,  4855.36,  73,  0.000!!END!
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!X=663.55,  4856.36,  73,  0.000!!END!
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!X=666.55,  4856.36,  73,  0.000!!END!
!X=667.55,  4856.36,  73,  0.000!!END!
!X=668.55,  4856.36,  73,  0.000!!END!
!X=669.55,  4856.36,  73,  0.000!!END!
!X=670.55,  4856.36,  73,  0.000!!END!
!X=671.55,  4856.36,  73,  0.000!!END!
!X=672.55,  4856.36,  73,  0.000!!END!
!X=673.55,  4856.36,  73,  0.000!!END!
!X=674.55,  4856.36,  73,  0.000!!END!
!X=686.55,  4856.36,  73,  0.000!!END!
!X=687.55,  4856.36,  73,  0.000!!END!
!X=688.55,  4856.36,  73,  0.000!!END!
!X=689.55,  4856.36,  73,  0.000!!END!
!X=690.55,  4856.36,  73,  0.000!!END!
!X=691.55,  4856.36,  73,  0.000!!END!
!X=692.55,  4856.36,  73,  0.000!!END!
!X=693.55,  4856.36,  73,  0.000!!END!
!X=694.55,  4856.36,  73,  0.000!!END!
!X=695.55,  4856.36,  73,  0.000!!END!
!X=696.55,  4856.36,  73,  0.000!!END!
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!X=699.55,  4856.36,  73,  0.000!!END!
!X=700.55,  4856.36,  73,  0.000!!END!
!X=662.55,  4857.36,  84.31,  0.000!!END!
!X=663.55,  4857.36,  79.12,  0.000!!END!
!X=664.55,  4857.36,  83.17,  0.000!!END!
!X=665.55,  4857.36,  82.37,  0.000!!END!
!X=666.55,  4857.36,  73,  0.000!!END!
!X=667.55,  4857.36,  82.05,  0.000!!END!
!X=668.55,  4857.36,  83.35,  0.000!!END!
!X=669.55,  4857.36,  73,  0.000!!END!
!X=670.55,  4857.36,  73,  0.000!!END!
!X=671.55,  4857.36,  73,  0.000!!END!
!X=672.55,  4857.36,  73,  0.000!!END!
!X=673.55,  4857.36,  73,  0.000!!END!
!X=674.55,  4857.36,  73,  0.000!!END!
!X=686.55,  4857.36,  73,  0.000!!END!
!X=687.55,  4857.36,  73,  0.000!!END!
!X=688.55,  4857.36,  73,  0.000!!END!
!X=689.55,  4857.36,  73,  0.000!!END!
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!X=690.55,  4857.36,  73,  0.000!!END!
!X=691.55,  4857.36,  73,  0.000!!END!
!X=692.55,  4857.36,  73,  0.000!!END!
!X=693.55,  4857.36,  73,  0.000!!END!
!X=694.55,  4857.36,  73,  0.000!!END!
!X=695.55,  4857.36,  73,  0.000!!END!
!X=696.55,  4857.36,  73,  0.000!!END!
!X=697.55,  4857.36,  73,  0.000!!END!
!X=698.55,  4857.36,  73,  0.000!!END!
!X=699.55,  4857.36,  73,  0.000!!END!
!X=700.55,  4857.36,  73,  0.000!!END!
!X=662.55,  4858.36,  81.66,  0.000!!END!
!X=663.55,  4858.36,  80.57,  0.000!!END!
!X=664.55,  4858.36,  80.3,  0.000!!END!
!X=665.55,  4858.36,  77.7,  0.000!!END!
!X=666.55,  4858.36,  79.49,  0.000!!END!
!X=667.55,  4858.36,  84.88,  0.000!!END!
!X=668.55,  4858.36,  91.61,  0.000!!END!
!X=669.55,  4858.36,  79.02,  0.000!!END!
!X=670.55,  4858.36,  88.59,  0.000!!END!
!X=671.55,  4858.36,  87.61,  0.000!!END!
!X=672.55,  4858.36,  96,  0.000!!END!
!X=673.55,  4858.36,  74.8,  0.000!!END!
!X=674.55,  4858.36,  73,  0.000!!END!
!X=686.55,  4858.36,  73,  0.000!!END!
!X=687.55,  4858.36,  73,  0.000!!END!
!X=688.55,  4858.36,  73,  0.000!!END!
!X=689.55,  4858.36,  73,  0.000!!END!
!X=690.55,  4858.36,  73,  0.000!!END!
!X=691.55,  4858.36,  73,  0.000!!END!
!X=692.55,  4858.36,  73,  0.000!!END!
!X=693.55,  4858.36,  73,  0.000!!END!
!X=694.55,  4858.36,  73,  0.000!!END!
!X=695.55,  4858.36,  73,  0.000!!END!
!X=696.55,  4858.36,  73,  0.000!!END!
!X=697.55,  4858.36,  73,  0.000!!END!
!X=698.55,  4858.36,  73,  0.000!!END!
!X=699.55,  4858.36,  73,  0.000!!END!
!X=700.55,  4858.36,  73,  0.000!!END!
!X=662.55,  4859.36,  86.7,  0.000!!END!
!X=663.55,  4859.36,  79.08,  0.000!!END!
!X=664.55,  4859.36,  84.07,  0.000!!END!
!X=665.55,  4859.36,  91.27,  0.000!!END!
!X=666.55,  4859.36,  84.13,  0.000!!END!
!X=667.55,  4859.36,  96.24,  0.000!!END!
!X=668.55,  4859.36,  97.47,  0.000!!END!
!X=669.55,  4859.36,  92.26,  0.000!!END!
!X=670.55,  4859.36,  106.2,  0.000!!END!
!X=671.55,  4859.36,  106.57,  0.000!!END!
!X=672.55,  4859.36,  100.46,  0.000!!END!
!X=673.55,  4859.36,  86.02,  0.000!!END!
!X=674.55,  4859.36,  74.07,  0.000!!END!
!X=686.55,  4859.36,  73,  0.000!!END!
!X=687.55,  4859.36,  73,  0.000!!END!
!X=688.55,  4859.36,  73,  0.000!!END!
!X=689.55,  4859.36,  73,  0.000!!END!
!X=690.55,  4859.36,  73,  0.000!!END!
!X=691.55,  4859.36,  73,  0.000!!END!
!X=692.55,  4859.36,  73,  0.000!!END!
!X=693.55,  4859.36,  73,  0.000!!END!
!X=694.55,  4859.36,  73,  0.000!!END!
!X=695.55,  4859.36,  73,  0.000!!END!
!X=696.55,  4859.36,  73,  0.000!!END!
!X=697.55,  4859.36,  73,  0.000!!END!
!X=698.55,  4859.36,  73,  0.000!!END!
!X=699.55,  4859.36,  73,  0.000!!END!
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3466!X=663.55,  4860.36,  85.15,  0.000!!END!
3467!X=664.55,  4860.36,  95.28,  0.000!!END!
3468!X=665.55,  4860.36,  94.98,  0.000!!END!
3469!X=666.55,  4860.36,  89.07,  0.000!!END!
3470!X=667.55,  4860.36,  85.72,  0.000!!END!
3471!X=668.55,  4860.36,  99.95,  0.000!!END!
3472!X=669.55,  4860.36,  96.59,  0.000!!END!
3473!X=670.55,  4860.36,  105.75,  0.000!!END!
3474!X=671.55,  4860.36,  105.16,  0.000!!END!
3475!X=672.55,  4860.36,  95.58,  0.000!!END!
3476!X=673.55,  4860.36,  104.31,  0.000!!END!
3477!X=674.55,  4860.36,  84.82,  0.000!!END!
3478!X=686.55,  4860.36,  73,  0.000!!END!
3479!X=687.55,  4860.36,  73,  0.000!!END!
3480!X=688.55,  4860.36,  73,  0.000!!END!
3481!X=689.55,  4860.36,  73,  0.000!!END!
3482!X=690.55,  4860.36,  73,  0.000!!END!
3483!X=691.55,  4860.36,  73,  0.000!!END!
3484!X=692.55,  4860.36,  73,  0.000!!END!
3485!X=693.55,  4860.36,  73,  0.000!!END!
3486!X=694.55,  4860.36,  73,  0.000!!END!
3487!X=695.55,  4860.36,  73,  0.000!!END!
3488!X=696.55,  4860.36,  73,  0.000!!END!
3489!X=697.55,  4860.36,  73,  0.000!!END!
3490!X=698.55,  4860.36,  73,  0.000!!END!
3491!X=699.55,  4860.36,  73,  0.000!!END!
3492!X=700.55,  4860.36,  73,  0.000!!END!
3493!X=662.55,  4861.36,  102.26,  0.000!!END!
3494!X=663.55,  4861.36,  97.06,  0.000!!END!
3495!X=664.55,  4861.36,  96.49,  0.000!!END!
3496!X=665.55,  4861.36,  91.84,  0.000!!END!
3497!X=666.55,  4861.36,  96.5,  0.000!!END!
3498!X=667.55,  4861.36,  113.47,  0.000!!END!
3499!X=668.55,  4861.36,  125.62,  0.000!!END!
3500!X=669.55,  4861.36,  106.72,  0.000!!END!
3501!X=670.55,  4861.36,  102.38,  0.000!!END!
3502!X=671.55,  4861.36,  100.71,  0.000!!END!
3503!X=672.55,  4861.36,  98.49,  0.000!!END!
3504!X=673.55,  4861.36,  98.91,  0.000!!END!
3505!X=674.55,  4861.36,  81.86,  0.000!!END!
3506!X=686.55,  4861.36,  73,  0.000!!END!
3507!X=687.55,  4861.36,  73,  0.000!!END!
3508!X=688.55,  4861.36,  73,  0.000!!END!
3509!X=689.55,  4861.36,  73,  0.000!!END!
3510!X=690.55,  4861.36,  73,  0.000!!END!
3511!X=691.55,  4861.36,  73,  0.000!!END!
3512!X=692.55,  4861.36,  73,  0.000!!END!
3513!X=693.55,  4861.36,  73,  0.000!!END!
3514!X=694.55,  4861.36,  73,  0.000!!END!
3515!X=695.55,  4861.36,  73,  0.000!!END!
3516!X=696.55,  4861.36,  73,  0.000!!END!
3517!X=697.55,  4861.36,  73,  0.000!!END!
3518!X=698.55,  4861.36,  73,  0.000!!END!
3519!X=699.55,  4861.36,  73,  0.000!!END!
3520!X=700.55,  4861.36,  73,  0.000!!END!
3521!X=662.55,  4862.36,  103.51,  0.000!!END!
3522!X=663.55,  4862.36,  95.48,  0.000!!END!
3523!X=664.55,  4862.36,  101.33,  0.000!!END!
3524!X=665.55,  4862.36,  107.4,  0.000!!END!
3525!X=666.55,  4862.36,  103.68,  0.000!!END!
3526!X=667.55,  4862.36,  131.44,  0.000!!END!
3527!X=668.55,  4862.36,  106.09,  0.000!!END!
3528!X=669.55,  4862.36,  109.87,  0.000!!END!
3529!X=670.55,  4862.36,  116.32,  0.000!!END!
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3530!X=671.55,  4862.36,  108.15,  0.000!!END!
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3532!X=673.55,  4862.36,  94.28,  0.000!!END!
3533!X=674.55,  4862.36,  88.01,  0.000!!END!
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3536!X=688.55,  4862.36,  73,  0.000!!END!
3537!X=689.55,  4862.36,  73,  0.000!!END!
3538!X=690.55,  4862.36,  73,  0.000!!END!
3539!X=691.55,  4862.36,  73,  0.000!!END!
3540!X=692.55,  4862.36,  73,  0.000!!END!
3541!X=693.55,  4862.36,  73,  0.000!!END!
3542!X=694.55,  4862.36,  73,  0.000!!END!
3543!X=695.55,  4862.36,  73,  0.000!!END!
3544!X=696.55,  4862.36,  73,  0.000!!END!
3545!X=697.55,  4862.36,  73,  0.000!!END!
3546!X=698.55,  4862.36,  73,  0.000!!END!
3547!X=699.55,  4862.36,  73,  0.000!!END!
3548!X=700.55,  4862.36,  73,  0.000!!END!
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3550!X=663.55,  4863.36,  108.99,  0.000!!END!
3551!X=664.55,  4863.36,  131.79,  0.000!!END!
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3555!X=668.55,  4863.36,  133.55,  0.000!!END!
3556!X=669.55,  4863.36,  131.17,  0.000!!END!
3557!X=670.55,  4863.36,  110.16,  0.000!!END!
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3559!X=672.55,  4863.36,  110.61,  0.000!!END!
3560!X=673.55,  4863.36,  98.19,  0.000!!END!
3561!X=674.55,  4863.36,  98.03,  0.000!!END!
3562!X=686.55,  4863.36,  84,  0.000!!END!
3563!X=687.55,  4863.36,  86.16,  0.000!!END!
3564!X=688.55,  4863.36,  87.35,  0.000!!END!
3565!X=689.55,  4863.36,  96.06,  0.000!!END!
3566!X=690.55,  4863.36,  87.88,  0.000!!END!
3567!X=691.55,  4863.36,  73.56,  0.000!!END!
3568!X=692.55,  4863.36,  82.22,  0.000!!END!
3569!X=693.55,  4863.36,  83.49,  0.000!!END!
3570!X=694.55,  4863.36,  77.24,  0.000!!END!
3571!X=695.55,  4863.36,  102.06,  0.000!!END!
3572!X=696.55,  4863.36,  100.48,  0.000!!END!
3573!X=697.55,  4863.36,  96.07,  0.000!!END!
3574!X=698.55,  4863.36,  73,  0.000!!END!
3575!X=699.55,  4863.36,  73,  0.000!!END!
3576!X=700.55,  4863.36,  73,  0.000!!END!
3577!X=662.55,  4864.36,  117.61,  0.000!!END!
3578!X=663.55,  4864.36,  122.3,  0.000!!END!
3579!X=664.55,  4864.36,  133.09,  0.000!!END!
3580!X=665.55,  4864.36,  119.97,  0.000!!END!
3581!X=666.55,  4864.36,  117.96,  0.000!!END!
3582!X=667.55,  4864.36,  126.14,  0.000!!END!
3583!X=668.55,  4864.36,  121.46,  0.000!!END!
3584!X=669.55,  4864.36,  135.65,  0.000!!END!
3585!X=670.55,  4864.36,  126.96,  0.000!!END!
3586!X=671.55,  4864.36,  119.05,  0.000!!END!
3587!X=672.55,  4864.36,  109.57,  0.000!!END!
3588!X=673.55,  4864.36,  108.8,  0.000!!END!
3589!X=674.55,  4864.36,  127.97,  0.000!!END!
3590!X=686.55,  4864.36,  95.2,  0.000!!END!
3591!X=687.55,  4864.36,  88.47,  0.000!!END!
3592!X=688.55,  4864.36,  96,  0.000!!END!
3593!X=689.55,  4864.36,  119.33,  0.000!!END!
3594!X=690.55,  4864.36,  103.28,  0.000!!END!
3595!X=691.55,  4864.36,  94.05,  0.000!!END!
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3598!X=694.55,  4864.36,  99.88,  0.000!!END!
3599!X=695.55,  4864.36,  103.91,  0.000!!END!
3600!X=696.55,  4864.36,  121.31,  0.000!!END!
3601!X=697.55,  4864.36,  132.88,  0.000!!END!
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3603!X=699.55,  4864.36,  131.33,  0.000!!END!
3604!X=700.55,  4864.36,  120.97,  0.000!!END!
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3606!X=663.55,  4865.36,  134.62,  0.000!!END!
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3609!X=666.55,  4865.36,  137.71,  0.000!!END!
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3611!X=668.55,  4865.36,  135.36,  0.000!!END!
3612!X=669.55,  4865.36,  135.1,  0.000!!END!
3613!X=670.55,  4865.36,  136.81,  0.000!!END!
3614!X=671.55,  4865.36,  120.05,  0.000!!END!
3615!X=672.55,  4865.36,  117.38,  0.000!!END!
3616!X=673.55,  4865.36,  122.26,  0.000!!END!
3617!X=674.55,  4865.36,  138.99,  0.000!!END!
3618!X=686.55,  4865.36,  89.06,  0.000!!END!
3619!X=687.55,  4865.36,  94.06,  0.000!!END!
3620!X=688.55,  4865.36,  96.74,  0.000!!END!
3621!X=689.55,  4865.36,  113.22,  0.000!!END!
3622!X=690.55,  4865.36,  112.02,  0.000!!END!
3623!X=691.55,  4865.36,  94.14,  0.000!!END!
3624!X=692.55,  4865.36,  96.48,  0.000!!END!
3625!X=693.55,  4865.36,  102.28,  0.000!!END!
3626!X=694.55,  4865.36,  91.54,  0.000!!END!
3627!X=695.55,  4865.36,  120.59,  0.000!!END!
3628!X=696.55,  4865.36,  144.23,  0.000!!END!
3629!X=697.55,  4865.36,  134.66,  0.000!!END!
3630!X=698.55,  4865.36,  138.49,  0.000!!END!
3631!X=699.55,  4865.36,  140.02,  0.000!!END!
3632!X=700.55,  4865.36,  137.87,  0.000!!END!
3633!X=662.55,  4866.36,  146.91,  0.000!!END!
3634!X=663.55,  4866.36,  142.4,  0.000!!END!
3635!X=664.55,  4866.36,  146.81,  0.000!!END!
3636!X=665.55,  4866.36,  147.09,  0.000!!END!
3637!X=666.55,  4866.36,  151.76,  0.000!!END!
3638!X=667.55,  4866.36,  143.3,  0.000!!END!
3639!X=668.55,  4866.36,  143.22,  0.000!!END!
3640!X=669.55,  4866.36,  141.09,  0.000!!END!
3641!X=670.55,  4866.36,  142.35,  0.000!!END!
3642!X=671.55,  4866.36,  144.47,  0.000!!END!
3643!X=672.55,  4866.36,  143.15,  0.000!!END!
3644!X=673.55,  4866.36,  150.06,  0.000!!END!
3645!X=674.55,  4866.36,  151.65,  0.000!!END!
3646!X=675.55,  4866.36,  152.42,  0.000!!END!
3647!X=676.55,  4866.36,  146.63,  0.000!!END!
3648!X=677.55,  4866.36,  149.89,  0.000!!END!
3649!X=678.55,  4866.36,  151.54,  0.000!!END!
3650!X=679.55,  4866.36,  152.96,  0.000!!END!
3651!X=680.55,  4866.36,  153.36,  0.000!!END!
3652!X=681.55,  4866.36,  157.64,  0.000!!END!
3653!X=682.55,  4866.36,  155.99,  0.000!!END!
3654!X=683.55,  4866.36,  143,  0.000!!END!
3655!X=684.55,  4866.36,  130.2,  0.000!!END!
3656!X=685.55,  4866.36,  126.28,  0.000!!END!
3657!X=686.55,  4866.36,  0,  0.000!!END!
3658!X=687.55,  4866.36,  104.26,  0.000!!END!
3659!X=688.55,  4866.36,  100.71,  0.000!!END!
3660!X=689.55,  4866.36,  117.74,  0.000!!END!
3661!X=690.55,  4866.36,  108.54,  0.000!!END!
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3662!X=691.55,  4866.36,  102.74,  0.000!!END!
3663!X=692.55,  4866.36,  101.34,  0.000!!END!
3664!X=693.55,  4866.36,  113.33,  0.000!!END!
3665!X=694.55,  4866.36,  124.95,  0.000!!END!
3666!X=695.55,  4866.36,  131.81,  0.000!!END!
3667!X=696.55,  4866.36,  138.29,  0.000!!END!
3668!X=697.55,  4866.36,  152.01,  0.000!!END!
3669!X=698.55,  4866.36,  146.7,  0.000!!END!
3670!X=699.55,  4866.36,  148.76,  0.000!!END!
3671!X=700.55,  4866.36,  162.68,  0.000!!END!
3672!X=662.55,  4867.36,  157.04,  0.000!!END!
3673!X=663.55,  4867.36,  158.53,  0.000!!END!
3674!X=664.55,  4867.36,  149.54,  0.000!!END!
3675!X=665.55,  4867.36,  151.1,  0.000!!END!
3676!X=666.55,  4867.36,  152.75,  0.000!!END!
3677!X=667.55,  4867.36,  155.44,  0.000!!END!
3678!X=668.55,  4867.36,  143.52,  0.000!!END!
3679!X=669.55,  4867.36,  148,  0.000!!END!
3680!X=670.55,  4867.36,  148.41,  0.000!!END!
3681!X=671.55,  4867.36,  162.08,  0.000!!END!
3682!X=672.55,  4867.36,  180.91,  0.000!!END!
3683!X=673.55,  4867.36,  176.99,  0.000!!END!
3684!X=674.55,  4867.36,  167.03,  0.000!!END!
3685!X=675.55,  4867.36,  158.99,  0.000!!END!
3686!X=676.55,  4867.36,  174.89,  0.000!!END!
3687!X=677.55,  4867.36,  152.69,  0.000!!END!
3688!X=678.55,  4867.36,  160.62,  0.000!!END!
3689!X=679.55,  4867.36,  160.6,  0.000!!END!
3690!X=680.55,  4867.36,  155.5,  0.000!!END!
3691!X=681.55,  4867.36,  153.03,  0.000!!END!
3692!X=682.55,  4867.36,  165.74,  0.000!!END!
3693!X=683.55,  4867.36,  150.48,  0.000!!END!
3694!X=684.55,  4867.36,  143.58,  0.000!!END!
3695!X=685.55,  4867.36,  128.88,  0.000!!END!
3696!X=686.55,  4867.36,  101.86,  0.000!!END!
3697!X=687.55,  4867.36,  112.12,  0.000!!END!
3698!X=688.55,  4867.36,  107.41,  0.000!!END!
3699!X=689.55,  4867.36,  107.95,  0.000!!END!
3700!X=690.55,  4867.36,  118.8,  0.000!!END!
3701!X=691.55,  4867.36,  113.74,  0.000!!END!
3702!X=692.55,  4867.36,  112.91,  0.000!!END!
3703!X=693.55,  4867.36,  136.96,  0.000!!END!
3704!X=694.55,  4867.36,  139.33,  0.000!!END!
3705!X=695.55,  4867.36,  118.11,  0.000!!END!
3706!X=696.55,  4867.36,  137.93,  0.000!!END!
3707!X=697.55,  4867.36,  155.97,  0.000!!END!
3708!X=698.55,  4867.36,  159.07,  0.000!!END!
3709!X=699.55,  4867.36,  160.58,  0.000!!END!
3710!X=700.55,  4867.36,  149.61,  0.000!!END!
3711!X=662.55,  4868.36,  166.98,  0.000!!END!
3712!X=663.55,  4868.36,  163.61,  0.000!!END!
3713!X=664.55,  4868.36,  157.73,  0.000!!END!
3714!X=665.55,  4868.36,  169.21,  0.000!!END!
3715!X=666.55,  4868.36,  161.25,  0.000!!END!
3716!X=667.55,  4868.36,  153.72,  0.000!!END!
3717!X=668.55,  4868.36,  152.49,  0.000!!END!
3718!X=669.55,  4868.36,  151.33,  0.000!!END!
3719!X=670.55,  4868.36,  153.11,  0.000!!END!
3720!X=671.55,  4868.36,  179.49,  0.000!!END!
3721!X=672.55,  4868.36,  185.27,  0.000!!END!
3722!X=673.55,  4868.36,  188.96,  0.000!!END!
3723!X=674.55,  4868.36,  181.33,  0.000!!END!
3724!X=675.55,  4868.36,  169.3,  0.000!!END!
3725!X=676.55,  4868.36,  194.83,  0.000!!END!
3726!X=677.55,  4868.36,  165.52,  0.000!!END!
3727!X=678.55,  4868.36,  161.1,  0.000!!END!
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3728!X=679.55,  4868.36,  152.37,  0.000!!END!
3729!X=680.55,  4868.36,  165.07,  0.000!!END!
3730!X=681.55,  4868.36,  162.71,  0.000!!END!
3731!X=682.55,  4868.36,  155.39,  0.000!!END!
3732!X=683.55,  4868.36,  155.46,  0.000!!END!
3733!X=684.55,  4868.36,  155.35,  0.000!!END!
3734!X=685.55,  4868.36,  132.84,  0.000!!END!
3735!X=686.55,  4868.36,  107.88,  0.000!!END!
3736!X=687.55,  4868.36,  125.88,  0.000!!END!
3737!X=688.55,  4868.36,  119.26,  0.000!!END!
3738!X=689.55,  4868.36,  114.75,  0.000!!END!
3739!X=690.55,  4868.36,  119.44,  0.000!!END!
3740!X=691.55,  4868.36,  116.19,  0.000!!END!
3741!X=692.55,  4868.36,  136.51,  0.000!!END!
3742!X=693.55,  4868.36,  132.12,  0.000!!END!
3743!X=694.55,  4868.36,  146.81,  0.000!!END!
3744!X=695.55,  4868.36,  147.79,  0.000!!END!
3745!X=696.55,  4868.36,  131.73,  0.000!!END!
3746!X=697.55,  4868.36,  153.87,  0.000!!END!
3747!X=698.55,  4868.36,  162.82,  0.000!!END!
3748!X=699.55,  4868.36,  167.35,  0.000!!END!
3749!X=700.55,  4868.36,  170.52,  0.000!!END!
3750!X=662.55,  4869.36,  174.22,  0.000!!END!
3751!X=663.55,  4869.36,  164.78,  0.000!!END!
3752!X=664.55,  4869.36,  169.56,  0.000!!END!
3753!X=665.55,  4869.36,  172.89,  0.000!!END!
3754!X=666.55,  4869.36,  159.05,  0.000!!END!
3755!X=667.55,  4869.36,  166.95,  0.000!!END!
3756!X=668.55,  4869.36,  174.21,  0.000!!END!
3757!X=669.55,  4869.36,  156.68,  0.000!!END!
3758!X=670.55,  4869.36,  163.86,  0.000!!END!
3759!X=671.55,  4869.36,  195.27,  0.000!!END!
3760!X=672.55,  4869.36,  192.75,  0.000!!END!
3761!X=673.55,  4869.36,  200.53,  0.000!!END!
3762!X=674.55,  4869.36,  188.52,  0.000!!END!
3763!X=675.55,  4869.36,  193.06,  0.000!!END!
3764!X=676.55,  4869.36,  198.45,  0.000!!END!
3765!X=677.55,  4869.36,  182.18,  0.000!!END!
3766!X=678.55,  4869.36,  166.3,  0.000!!END!
3767!X=679.55,  4869.36,  164.45,  0.000!!END!
3768!X=680.55,  4869.36,  155.69,  0.000!!END!
3769!X=681.55,  4869.36,  158.86,  0.000!!END!
3770!X=682.55,  4869.36,  160.39,  0.000!!END!
3771!X=683.55,  4869.36,  174.38,  0.000!!END!
3772!X=684.55,  4869.36,  160.01,  0.000!!END!
3773!X=685.55,  4869.36,  142.94,  0.000!!END!
3774!X=686.55,  4869.36,  120.19,  0.000!!END!
3775!X=687.55,  4869.36,  130.7,  0.000!!END!
3776!X=688.55,  4869.36,  127.36,  0.000!!END!
3777!X=689.55,  4869.36,  129.56,  0.000!!END!
3778!X=690.55,  4869.36,  120.9,  0.000!!END!
3779!X=691.55,  4869.36,  131.29,  0.000!!END!
3780!X=692.55,  4869.36,  136.31,  0.000!!END!
3781!X=693.55,  4869.36,  144.52,  0.000!!END!
3782!X=694.55,  4869.36,  154.28,  0.000!!END!
3783!X=695.55,  4869.36,  149.71,  0.000!!END!
3784!X=696.55,  4869.36,  140.28,  0.000!!END!
3785!X=697.55,  4869.36,  159.92,  0.000!!END!
3786!X=698.55,  4869.36,  171.67,  0.000!!END!
3787!X=699.55,  4869.36,  163.62,  0.000!!END!
3788!X=700.55,  4869.36,  157.91,  0.000!!END!
3789!X=662.55,  4870.36,  178.03,  0.000!!END!
3790!X=663.55,  4870.36,  174.95,  0.000!!END!
3791!X=664.55,  4870.36,  180.27,  0.000!!END!
3792!X=665.55,  4870.36,  177.8,  0.000!!END!
3793!X=666.55,  4870.36,  178.52,  0.000!!END!
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3794!X=667.55,  4870.36,  181.07,  0.000!!END!
3795!X=668.55,  4870.36,  189.33,  0.000!!END!
3796!X=669.55,  4870.36,  168.43,  0.000!!END!
3797!X=670.55,  4870.36,  194.21,  0.000!!END!
3798!X=671.55,  4870.36,  203.16,  0.000!!END!
3799!X=672.55,  4870.36,  212.4,  0.000!!END!
3800!X=673.55,  4870.36,  208.7,  0.000!!END!
3801!X=674.55,  4870.36,  210.69,  0.000!!END!
3802!X=675.55,  4870.36,  205.97,  0.000!!END!
3803!X=676.55,  4870.36,  211.87,  0.000!!END!
3804!X=677.55,  4870.36,  188.75,  0.000!!END!
3805!X=678.55,  4870.36,  178.13,  0.000!!END!
3806!X=679.55,  4870.36,  173.91,  0.000!!END!
3807!X=680.55,  4870.36,  167,  0.000!!END!
3808!X=681.55,  4870.36,  160.66,  0.000!!END!
3809!X=682.55,  4870.36,  168.94,  0.000!!END!
3810!X=683.55,  4870.36,  172.21,  0.000!!END!
3811!X=684.55,  4870.36,  175.79,  0.000!!END!
3812!X=685.55,  4870.36,  155.2,  0.000!!END!
3813!X=686.55,  4870.36,  137.33,  0.000!!END!
3814!X=687.55,  4870.36,  151.27,  0.000!!END!
3815!X=688.55,  4870.36,  157.14,  0.000!!END!
3816!X=689.55,  4870.36,  145.31,  0.000!!END!
3817!X=690.55,  4870.36,  130.06,  0.000!!END!
3818!X=691.55,  4870.36,  140.86,  0.000!!END!
3819!X=692.55,  4870.36,  147.59,  0.000!!END!
3820!X=693.55,  4870.36,  155,  0.000!!END!
3821!X=694.55,  4870.36,  164.71,  0.000!!END!
3822!X=695.55,  4870.36,  165.93,  0.000!!END!
3823!X=696.55,  4870.36,  154.86,  0.000!!END!
3824!X=697.55,  4870.36,  149.82,  0.000!!END!
3825!X=698.55,  4870.36,  161.84,  0.000!!END!
3826!X=699.55,  4870.36,  161.42,  0.000!!END!
3827!X=700.55,  4870.36,  176.32,  0.000!!END!
3828!X=662.55,  4871.36,  183.67,  0.000!!END!
3829!X=663.55,  4871.36,  203.09,  0.000!!END!
3830!X=664.55,  4871.36,  193.11,  0.000!!END!
3831!X=665.55,  4871.36,  194.9,  0.000!!END!
3832!X=666.55,  4871.36,  190.96,  0.000!!END!
3833!X=667.55,  4871.36,  191.98,  0.000!!END!
3834!X=668.55,  4871.36,  191.36,  0.000!!END!
3835!X=669.55,  4871.36,  180.48,  0.000!!END!
3836!X=670.55,  4871.36,  198.66,  0.000!!END!
3837!X=671.55,  4871.36,  231.29,  0.000!!END!
3838!X=672.55,  4871.36,  225.67,  0.000!!END!
3839!X=673.55,  4871.36,  224.62,  0.000!!END!
3840!X=674.55,  4871.36,  213.82,  0.000!!END!
3841!X=675.55,  4871.36,  209.38,  0.000!!END!
3842!X=676.55,  4871.36,  198.55,  0.000!!END!
3843!X=677.55,  4871.36,  198.41,  0.000!!END!
3844!X=678.55,  4871.36,  192.52,  0.000!!END!
3845!X=679.55,  4871.36,  186.38,  0.000!!END!
3846!X=680.55,  4871.36,  170.41,  0.000!!END!
3847!X=681.55,  4871.36,  162.5,  0.000!!END!
3848!X=682.55,  4871.36,  179.86,  0.000!!END!
3849!X=683.55,  4871.36,  167.15,  0.000!!END!
3850!X=684.55,  4871.36,  176.44,  0.000!!END!
3851!X=685.55,  4871.36,  162.96,  0.000!!END!
3852!X=686.55,  4871.36,  154.21,  0.000!!END!
3853!X=687.55,  4871.36,  161.36,  0.000!!END!
3854!X=688.55,  4871.36,  158.41,  0.000!!END!
3855!X=689.55,  4871.36,  154.59,  0.000!!END!
3856!X=690.55,  4871.36,  152.89,  0.000!!END!
3857!X=691.55,  4871.36,  148.52,  0.000!!END!
3858!X=692.55,  4871.36,  156.21,  0.000!!END!
3859!X=693.55,  4871.36,  177.09,  0.000!!END!
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!X=694.55,  4871.36,  228.04,  0.000!!END!
!X=695.55,  4871.36,  206.26,  0.000!!END!
!X=696.55,  4871.36,  164.09,  0.000!!END!
!X=697.55,  4871.36,  178.13,  0.000!!END!
!X=698.55,  4871.36,  157,  0.000!!END!
!X=699.55,  4871.36,  155.32,  0.000!!END!
!X=700.55,  4871.36,  172.41,  0.000!!END!
!X=662.55,  4872.36,  205.56,  0.000!!END!
!X=663.55,  4872.36,  213.33,  0.000!!END!
!X=664.55,  4872.36,  205.68,  0.000!!END!
!X=665.55,  4872.36,  209.24,  0.000!!END!
!X=666.55,  4872.36,  201.75,  0.000!!END!
!X=667.55,  4872.36,  197.46,  0.000!!END!
!X=668.55,  4872.36,  202.03,  0.000!!END!
!X=669.55,  4872.36,  202.98,  0.000!!END!
!X=670.55,  4872.36,  218.74,  0.000!!END!
!X=671.55,  4872.36,  253.94,  0.000!!END!
!X=672.55,  4872.36,  252.19,  0.000!!END!
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!X=674.55,  4872.36,  237.24,  0.000!!END!
!X=675.55,  4872.36,  234.1,  0.000!!END!
!X=676.55,  4872.36,  225.34,  0.000!!END!
!X=677.55,  4872.36,  207.46,  0.000!!END!
!X=678.55,  4872.36,  218.2,  0.000!!END!
!X=679.55,  4872.36,  183.36,  0.000!!END!
!X=680.55,  4872.36,  177.31,  0.000!!END!
!X=681.55,  4872.36,  178.08,  0.000!!END!
!X=682.55,  4872.36,  180.13,  0.000!!END!
!X=683.55,  4872.36,  188.04,  0.000!!END!
!X=684.55,  4872.36,  172.74,  0.000!!END!
!X=685.55,  4872.36,  162.71,  0.000!!END!
!X=686.55,  4872.36,  149.59,  0.000!!END!
!X=687.55,  4872.36,  173.77,  0.000!!END!
!X=688.55,  4872.36,  168.72,  0.000!!END!
!X=689.55,  4872.36,  174.92,  0.000!!END!
!X=690.55,  4872.36,  175.36,  0.000!!END!
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!X=692.55,  4872.36,  191.54,  0.000!!END!
!X=693.55,  4872.36,  200.84,  0.000!!END!
!X=694.55,  4872.36,  215.98,  0.000!!END!
!X=695.55,  4872.36,  222.28,  0.000!!END!
!X=696.55,  4872.36,  195.07,  0.000!!END!
!X=697.55,  4872.36,  168.34,  0.000!!END!
!X=698.55,  4872.36,  160.35,  0.000!!END!
!X=699.55,  4872.36,  164.63,  0.000!!END!
!X=700.55,  4872.36,  168.47,  0.000!!END!
!X=662.55,  4873.36,  228.14,  0.000!!END!
!X=663.55,  4873.36,  225.59,  0.000!!END!
!X=664.55,  4873.36,  215.46,  0.000!!END!
!X=665.55,  4873.36,  219.78,  0.000!!END!
!X=666.55,  4873.36,  217.28,  0.000!!END!
!X=667.55,  4873.36,  220.99,  0.000!!END!
!X=668.55,  4873.36,  217.38,  0.000!!END!
!X=669.55,  4873.36,  223.32,  0.000!!END!
!X=670.55,  4873.36,  223.77,  0.000!!END!
!X=671.55,  4873.36,  253.86,  0.000!!END!
!X=672.55,  4873.36,  256.48,  0.000!!END!
!X=673.55,  4873.36,  259.08,  0.000!!END!
!X=674.55,  4873.36,  259.59,  0.000!!END!
!X=675.55,  4873.36,  247.67,  0.000!!END!
!X=676.55,  4873.36,  254.47,  0.000!!END!
!X=677.55,  4873.36,  227.58,  0.000!!END!
!X=678.55,  4873.36,  214.15,  0.000!!END!
!X=679.55,  4873.36,  190,  0.000!!END!
!X=680.55,  4873.36,  183.36,  0.000!!END!
!X=681.55,  4873.36,  187.69,  0.000!!END!
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!X=682.55,  4873.36,  182.64,  0.000!!END!
!X=683.55,  4873.36,  184.69,  0.000!!END!
!X=684.55,  4873.36,  186.63,  0.000!!END!
!X=685.55,  4873.36,  189.05,  0.000!!END!
!X=686.55,  4873.36,  161.66,  0.000!!END!
!X=687.55,  4873.36,  186,  0.000!!END!
!X=688.55,  4873.36,  171.09,  0.000!!END!
!X=689.55,  4873.36,  184.46,  0.000!!END!
!X=690.55,  4873.36,  186.22,  0.000!!END!
!X=691.55,  4873.36,  189.91,  0.000!!END!
!X=692.55,  4873.36,  201.85,  0.000!!END!
!X=693.55,  4873.36,  227.99,  0.000!!END!
!X=694.55,  4873.36,  243.59,  0.000!!END!
!X=695.55,  4873.36,  219.25,  0.000!!END!
!X=696.55,  4873.36,  250.03,  0.000!!END!
!X=697.55,  4873.36,  173.22,  0.000!!END!
!X=698.55,  4873.36,  161.43,  0.000!!END!
!X=699.55,  4873.36,  159.02,  0.000!!END!
!X=700.55,  4873.36,  164.02,  0.000!!END!
!X=662.55,  4874.36,  243.45,  0.000!!END!
!X=663.55,  4874.36,  236.95,  0.000!!END!
!X=664.55,  4874.36,  234.42,  0.000!!END!
!X=665.55,  4874.36,  224.3,  0.000!!END!
!X=666.55,  4874.36,  229.05,  0.000!!END!
!X=667.55,  4874.36,  232.34,  0.000!!END!
!X=668.55,  4874.36,  231.05,  0.000!!END!
!X=669.55,  4874.36,  233.33,  0.000!!END!
!X=670.55,  4874.36,  246.94,  0.000!!END!
!X=671.55,  4874.36,  270.37,  0.000!!END!
!X=672.55,  4874.36,  264,  0.000!!END!
!X=673.55,  4874.36,  270.52,  0.000!!END!
!X=674.55,  4874.36,  269.5,  0.000!!END!
!X=675.55,  4874.36,  272.32,  0.000!!END!
!X=676.55,  4874.36,  265.89,  0.000!!END!
!X=677.55,  4874.36,  254.17,  0.000!!END!
!X=678.55,  4874.36,  205.38,  0.000!!END!
!X=679.55,  4874.36,  200.42,  0.000!!END!
!X=680.55,  4874.36,  195.53,  0.000!!END!
!X=681.55,  4874.36,  194.34,  0.000!!END!
!X=682.55,  4874.36,  197.63,  0.000!!END!
!X=683.55,  4874.36,  202.61,  0.000!!END!
!X=684.55,  4874.36,  200.65,  0.000!!END!
!X=685.55,  4874.36,  194.37,  0.000!!END!
!X=686.55,  4874.36,  171.76,  0.000!!END!
!X=687.55,  4874.36,  193.19,  0.000!!END!
!X=688.55,  4874.36,  180.26,  0.000!!END!
!X=689.55,  4874.36,  199.01,  0.000!!END!
!X=690.55,  4874.36,  197.25,  0.000!!END!
!X=691.55,  4874.36,  212.26,  0.000!!END!
!X=692.55,  4874.36,  226.47,  0.000!!END!
!X=693.55,  4874.36,  261.33,  0.000!!END!
!X=694.55,  4874.36,  249.32,  0.000!!END!
!X=695.55,  4874.36,  264.24,  0.000!!END!
!X=696.55,  4874.36,  246.9,  0.000!!END!
!X=697.55,  4874.36,  232.65,  0.000!!END!
!X=698.55,  4874.36,  175.54,  0.000!!END!
!X=699.55,  4874.36,  184.96,  0.000!!END!
!X=700.55,  4874.36,  177.19,  0.000!!END!
!X=662.55,  4875.36,  264.53,  0.000!!END!
!X=663.55,  4875.36,  252.74,  0.000!!END!
!X=664.55,  4875.36,  255.66,  0.000!!END!
!X=665.55,  4875.36,  239.56,  0.000!!END!
!X=666.55,  4875.36,  243.09,  0.000!!END!
!X=667.55,  4875.36,  245.12,  0.000!!END!
!X=668.55,  4875.36,  246.01,  0.000!!END!
!X=669.55,  4875.36,  235.71,  0.000!!END!
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3992!X=670.55,  4875.36,  259.03,  0.000!!END!
3993!X=671.55,  4875.36,  275.64,  0.000!!END!
3994!X=672.55,  4875.36,  283.83,  0.000!!END!
3995!X=673.55,  4875.36,  274,  0.000!!END!
3996!X=674.55,  4875.36,  273,  0.000!!END!
3997!X=675.55,  4875.36,  280.69,  0.000!!END!
3998!X=676.55,  4875.36,  267.55,  0.000!!END!
3999!X=677.55,  4875.36,  218.29,  0.000!!END!
4000!X=678.55,  4875.36,  218.04,  0.000!!END!
4001!X=679.55,  4875.36,  229.35,  0.000!!END!
4002!X=680.55,  4875.36,  206.62,  0.000!!END!
4003!X=681.55,  4875.36,  203.95,  0.000!!END!
4004!X=682.55,  4875.36,  206.25,  0.000!!END!
4005!X=683.55,  4875.36,  212.63,  0.000!!END!
4006!X=684.55,  4875.36,  208.14,  0.000!!END!
4007!X=685.55,  4875.36,  190.18,  0.000!!END!
4008!X=686.55,  4875.36,  200.07,  0.000!!END!
4009!X=687.55,  4875.36,  223.16,  0.000!!END!
4010!X=688.55,  4875.36,  191.13,  0.000!!END!
4011!X=689.55,  4875.36,  219.23,  0.000!!END!
4012!X=690.55,  4875.36,  210.25,  0.000!!END!
4013!X=691.55,  4875.36,  230.18,  0.000!!END!
4014!X=692.55,  4875.36,  241.32,  0.000!!END!
4015!X=693.55,  4875.36,  269.81,  0.000!!END!
4016!X=694.55,  4875.36,  292.52,  0.000!!END!
4017!X=695.55,  4875.36,  288.26,  0.000!!END!
4018!X=696.55,  4875.36,  283.16,  0.000!!END!
4019!X=697.55,  4875.36,  270.6,  0.000!!END!
4020!X=698.55,  4875.36,  195.16,  0.000!!END!
4021!X=699.55,  4875.36,  194.18,  0.000!!END!
4022!X=700.55,  4875.36,  183.94,  0.000!!END!
4023!X=662.55,  4876.36,  283.64,  0.000!!END!
4024!X=663.55,  4876.36,  276.11,  0.000!!END!
4025!X=664.55,  4876.36,  267.08,  0.000!!END!
4026!X=665.55,  4876.36,  267.55,  0.000!!END!
4027!X=666.55,  4876.36,  264.66,  0.000!!END!
4028!X=667.55,  4876.36,  260.75,  0.000!!END!
4029!X=668.55,  4876.36,  265.69,  0.000!!END!
4030!X=669.55,  4876.36,  274.67,  0.000!!END!
4031!X=670.55,  4876.36,  286.12,  0.000!!END!
4032!X=671.55,  4876.36,  290.69,  0.000!!END!
4033!X=672.55,  4876.36,  273.09,  0.000!!END!
4034!X=673.55,  4876.36,  272.23,  0.000!!END!
4035!X=674.55,  4876.36,  253.12,  0.000!!END!
4036!X=675.55,  4876.36,  236.24,  0.000!!END!
4037!X=676.55,  4876.36,  226.22,  0.000!!END!
4038!X=677.55,  4876.36,  233.75,  0.000!!END!
4039!X=678.55,  4876.36,  266.12,  0.000!!END!
4040!X=679.55,  4876.36,  251.61,  0.000!!END!
4041!X=680.55,  4876.36,  222.18,  0.000!!END!
4042!X=681.55,  4876.36,  219.79,  0.000!!END!
4043!X=682.55,  4876.36,  228.77,  0.000!!END!
4044!X=683.55,  4876.36,  217.66,  0.000!!END!
4045!X=684.55,  4876.36,  217.47,  0.000!!END!
4046!X=685.55,  4876.36,  231.25,  0.000!!END!
4047!X=686.55,  4876.36,  250.41,  0.000!!END!
4048!X=687.55,  4876.36,  238.2,  0.000!!END!
4049!X=688.55,  4876.36,  210.68,  0.000!!END!
4050!X=689.55,  4876.36,  233.84,  0.000!!END!
4051!X=690.55,  4876.36,  236.78,  0.000!!END!
4052!X=691.55,  4876.36,  259.55,  0.000!!END!
4053!X=692.55,  4876.36,  264.83,  0.000!!END!
4054!X=693.55,  4876.36,  273.35,  0.000!!END!
4055!X=694.55,  4876.36,  295.23,  0.000!!END!
4056!X=695.55,  4876.36,  295.9,  0.000!!END!
4057!X=696.55,  4876.36,  255.82,  0.000!!END!
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4058!X=697.55,  4876.36,  236.38,  0.000!!END!
4059!X=698.55,  4876.36,  209.16,  0.000!!END!
4060!X=699.55,  4876.36,  188.5,  0.000!!END!
4061!X=700.55,  4876.36,  178.36,  0.000!!END!
4062!X=662.55,  4877.36,  319.7,  0.000!!END!
4063!X=663.55,  4877.36,  307.82,  0.000!!END!
4064!X=664.55,  4877.36,  306.81,  0.000!!END!
4065!X=665.55,  4877.36,  287.71,  0.000!!END!
4066!X=666.55,  4877.36,  282.65,  0.000!!END!
4067!X=667.55,  4877.36,  275.55,  0.000!!END!
4068!X=668.55,  4877.36,  290.01,  0.000!!END!
4069!X=669.55,  4877.36,  303.58,  0.000!!END!
4070!X=670.55,  4877.36,  304.03,  0.000!!END!
4071!X=671.55,  4877.36,  304.05,  0.000!!END!
4072!X=672.55,  4877.36,  287.65,  0.000!!END!
4073!X=673.55,  4877.36,  280.7,  0.000!!END!
4074!X=674.55,  4877.36,  293.2,  0.000!!END!
4075!X=675.55,  4877.36,  291.54,  0.000!!END!
4076!X=676.55,  4877.36,  288.67,  0.000!!END!
4077!X=677.55,  4877.36,  285.27,  0.000!!END!
4078!X=678.55,  4877.36,  274.71,  0.000!!END!
4079!X=679.55,  4877.36,  262.87,  0.000!!END!
4080!X=680.55,  4877.36,  245.52,  0.000!!END!
4081!X=681.55,  4877.36,  228.93,  0.000!!END!
4082!X=682.55,  4877.36,  242.58,  0.000!!END!
4083!X=683.55,  4877.36,  236.1,  0.000!!END!
4084!X=684.55,  4877.36,  283.15,  0.000!!END!
4085!X=685.55,  4877.36,  260.92,  0.000!!END!
4086!X=686.55,  4877.36,  260.63,  0.000!!END!
4087!X=687.55,  4877.36,  266.55,  0.000!!END!
4088!X=688.55,  4877.36,  236.8,  0.000!!END!
4089!X=689.55,  4877.36,  240.22,  0.000!!END!
4090!X=690.55,  4877.36,  264.64,  0.000!!END!
4091!X=691.55,  4877.36,  270.82,  0.000!!END!
4092!X=692.55,  4877.36,  256.48,  0.000!!END!
4093!X=693.55,  4877.36,  245.15,  0.000!!END!
4094!X=694.55,  4877.36,  264.24,  0.000!!END!
4095!X=695.55,  4877.36,  233.58,  0.000!!END!
4096!X=696.55,  4877.36,  226.77,  0.000!!END!
4097!X=697.55,  4877.36,  224.63,  0.000!!END!
4098!X=698.55,  4877.36,  189.65,  0.000!!END!
4099!X=699.55,  4877.36,  180.21,  0.000!!END!
4100!X=700.55,  4877.36,  176.62,  0.000!!END!
4101!X=662.55,  4878.36,  314.83,  0.000!!END!
4102!X=663.55,  4878.36,  305.73,  0.000!!END!
4103!X=664.55,  4878.36,  304.89,  0.000!!END!
4104!X=665.55,  4878.36,  294.34,  0.000!!END!
4105!X=666.55,  4878.36,  312.29,  0.000!!END!
4106!X=667.55,  4878.36,  318.08,  0.000!!END!
4107!X=668.55,  4878.36,  315.99,  0.000!!END!
4108!X=669.55,  4878.36,  312.01,  0.000!!END!
4109!X=670.55,  4878.36,  322.77,  0.000!!END!
4110!X=671.55,  4878.36,  324.85,  0.000!!END!
4111!X=672.55,  4878.36,  315.18,  0.000!!END!
4112!X=673.55,  4878.36,  309.74,  0.000!!END!
4113!X=674.55,  4878.36,  307.47,  0.000!!END!
4114!X=675.55,  4878.36,  318.22,  0.000!!END!
4115!X=676.55,  4878.36,  317.12,  0.000!!END!
4116!X=677.55,  4878.36,  304.97,  0.000!!END!
4117!X=678.55,  4878.36,  289.85,  0.000!!END!
4118!X=679.55,  4878.36,  260.22,  0.000!!END!
4119!X=680.55,  4878.36,  260.13,  0.000!!END!
4120!X=681.55,  4878.36,  255.23,  0.000!!END!
4121!X=682.55,  4878.36,  272.33,  0.000!!END!
4122!X=683.55,  4878.36,  276.11,  0.000!!END!
4123!X=684.55,  4878.36,  302.21,  0.000!!END!
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4124!X=685.55,  4878.36,  287.38,  0.000!!END!
4125!X=686.55,  4878.36,  290.16,  0.000!!END!
4126!X=687.55,  4878.36,  272.27,  0.000!!END!
4127!X=688.55,  4878.36,  263.02,  0.000!!END!
4128!X=689.55,  4878.36,  274.86,  0.000!!END!
4129!X=690.55,  4878.36,  272.75,  0.000!!END!
4130!X=691.55,  4878.36,  285.88,  0.000!!END!
4131!X=692.55,  4878.36,  259.83,  0.000!!END!
4132!X=693.55,  4878.36,  278.55,  0.000!!END!
4133!X=694.55,  4878.36,  240.79,  0.000!!END!
4134!X=695.55,  4878.36,  231.47,  0.000!!END!
4135!X=696.55,  4878.36,  218.2,  0.000!!END!
4136!X=697.55,  4878.36,  195.08,  0.000!!END!
4137!X=698.55,  4878.36,  194.21,  0.000!!END!
4138!X=699.55,  4878.36,  205.36,  0.000!!END!
4139!X=700.55,  4878.36,  183.36,  0.000!!END!
4140!X=662.55,  4879.36,  302.74,  0.000!!END!
4141!X=663.55,  4879.36,  296.86,  0.000!!END!
4142!X=664.55,  4879.36,  294.73,  0.000!!END!
4143!X=665.55,  4879.36,  270.38,  0.000!!END!
4144!X=666.55,  4879.36,  286.32,  0.000!!END!
4145!X=667.55,  4879.36,  289.56,  0.000!!END!
4146!X=668.55,  4879.36,  300.41,  0.000!!END!
4147!X=669.55,  4879.36,  314.5,  0.000!!END!
4148!X=670.55,  4879.36,  315.29,  0.000!!END!
4149!X=671.55,  4879.36,  336.32,  0.000!!END!
4150!X=672.55,  4879.36,  338.2,  0.000!!END!
4151!X=673.55,  4879.36,  319.17,  0.000!!END!
4152!X=674.55,  4879.36,  314.11,  0.000!!END!
4153!X=675.55,  4879.36,  323.47,  0.000!!END!
4154!X=676.55,  4879.36,  323.25,  0.000!!END!
4155!X=677.55,  4879.36,  327.42,  0.000!!END!
4156!X=678.55,  4879.36,  299.56,  0.000!!END!
4157!X=679.55,  4879.36,  285.48,  0.000!!END!
4158!X=680.55,  4879.36,  296.23,  0.000!!END!
4159!X=681.55,  4879.36,  296.31,  0.000!!END!
4160!X=682.55,  4879.36,  296.88,  0.000!!END!
4161!X=683.55,  4879.36,  315.88,  0.000!!END!
4162!X=684.55,  4879.36,  336.13,  0.000!!END!
4163!X=685.55,  4879.36,  315.73,  0.000!!END!
4164!X=686.55,  4879.36,  298.11,  0.000!!END!
4165!X=687.55,  4879.36,  290.32,  0.000!!END!
4166!X=688.55,  4879.36,  292.81,  0.000!!END!
4167!X=689.55,  4879.36,  292.92,  0.000!!END!
4168!X=690.55,  4879.36,  304.91,  0.000!!END!
4169!X=691.55,  4879.36,  296.56,  0.000!!END!
4170!X=692.55,  4879.36,  296.95,  0.000!!END!
4171!X=693.55,  4879.36,  267.07,  0.000!!END!
4172!X=694.55,  4879.36,  264.59,  0.000!!END!
4173!X=695.55,  4879.36,  281.53,  0.000!!END!
4174!X=696.55,  4879.36,  235.87,  0.000!!END!
4175!X=697.55,  4879.36,  214.7,  0.000!!END!
4176!X=698.55,  4879.36,  200.67,  0.000!!END!
4177!X=699.55,  4879.36,  202,  0.000!!END!
4178!X=700.55,  4879.36,  191.45,  0.000!!END!
4179!X=662.55,  4880.36,  288.33,  0.000!!END!
4180!X=663.55,  4880.36,  290.82,  0.000!!END!
4181!X=664.55,  4880.36,  278.48,  0.000!!END!
4182!X=665.55,  4880.36,  261.8,  0.000!!END!
4183!X=666.55,  4880.36,  264.21,  0.000!!END!
4184!X=667.55,  4880.36,  268.9,  0.000!!END!
4185!X=668.55,  4880.36,  274.32,  0.000!!END!
4186!X=669.55,  4880.36,  284,  0.000!!END!
4187!X=670.55,  4880.36,  304.44,  0.000!!END!
4188!X=671.55,  4880.36,  326.52,  0.000!!END!
4189!X=672.55,  4880.36,  331.34,  0.000!!END!
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4190!X=673.55,  4880.36,  339.94,  0.000!!END!
4191!X=674.55,  4880.36,  322.97,  0.000!!END!
4192!X=675.55,  4880.36,  343.8,  0.000!!END!
4193!X=676.55,  4880.36,  316.48,  0.000!!END!
4194!X=677.55,  4880.36,  332.22,  0.000!!END!
4195!X=678.55,  4880.36,  329.87,  0.000!!END!
4196!X=679.55,  4880.36,  307.09,  0.000!!END!
4197!X=680.55,  4880.36,  336.11,  0.000!!END!
4198!X=681.55,  4880.36,  334.41,  0.000!!END!
4199!X=682.55,  4880.36,  355.02,  0.000!!END!
4200!X=683.55,  4880.36,  347.54,  0.000!!END!
4201!X=684.55,  4880.36,  341.47,  0.000!!END!
4202!X=685.55,  4880.36,  337.24,  0.000!!END!
4203!X=686.55,  4880.36,  321.17,  0.000!!END!
4204!X=687.55,  4880.36,  344.92,  0.000!!END!
4205!X=688.55,  4880.36,  348.84,  0.000!!END!
4206!X=689.55,  4880.36,  320.41,  0.000!!END!
4207!X=690.55,  4880.36,  312.15,  0.000!!END!
4208!X=691.55,  4880.36,  328.08,  0.000!!END!
4209!X=692.55,  4880.36,  327.63,  0.000!!END!
4210!X=693.55,  4880.36,  308.16,  0.000!!END!
4211!X=694.55,  4880.36,  288.65,  0.000!!END!
4212!X=695.55,  4880.36,  268.98,  0.000!!END!
4213!X=696.55,  4880.36,  252.63,  0.000!!END!
4214!X=697.55,  4880.36,  244.23,  0.000!!END!
4215!X=698.55,  4880.36,  217.06,  0.000!!END!
4216!X=699.55,  4880.36,  210.62,  0.000!!END!
4217!X=700.55,  4880.36,  221.73,  0.000!!END!
4218!X=680.422,  4860.198,  96.1,  0.000!!END!
4219!X=680.432,  4860.195,  96.2,  0.000!!END!
4220!X=680.441,  4860.192,  96.3,  0.000!!END!
4221!X=680.451,  4860.189,  96.4,  0.000!!END!
4222!X=680.46,  4860.186,  96.4,  0.000!!END!
4223!X=680.47,  4860.182,  96.4,  0.000!!END!
4224!X=680.479,  4860.179,  96.4,  0.000!!END!
4225!X=680.489,  4860.176,  96.4,  0.000!!END!
4226!X=680.498,  4860.173,  96.3,  0.000!!END!
4227!X=680.508,  4860.17,  96.2,  0.000!!END!
4228!X=680.517,  4860.167,  96.1,  0.000!!END!
4229!X=680.527,  4860.164,  96,  0.000!!END!
4230!X=680.536,  4860.161,  95.9,  0.000!!END!
4231!X=680.546,  4860.157,  95.9,  0.000!!END!
4232!X=680.555,  4860.154,  95.8,  0.000!!END!
4233!X=680.565,  4860.151,  95.8,  0.000!!END!
4234!X=680.574,  4860.148,  95.8,  0.000!!END!
4235!X=680.584,  4860.145,  95.9,  0.000!!END!
4236!X=680.593,  4860.142,  96.1,  0.000!!END!
4237!X=680.603,  4860.139,  96.3,  0.000!!END!
4238!X=680.612,  4860.136,  96.5,  0.000!!END!
4239!X=680.622,  4860.133,  96.7,  0.000!!END!
4240!X=680.632,  4860.131,  96.8,  0.000!!END!
4241!X=680.642,  4860.128,  97,  0.000!!END!
4242!X=680.651,  4860.126,  97,  0.000!!END!
4243!X=680.657,  4860.129,  97,  0.000!!END!
4244!X=680.659,  4860.139,  97.1,  0.000!!END!
4245!X=680.657,  4860.145,  97.3,  0.000!!END!
4246!X=680.658,  4860.155,  97.4,  0.000!!END!
4247!X=680.66,  4860.165,  97.5,  0.000!!END!
4248!X=680.662,  4860.175,  97.7,  0.000!!END!
4249!X=680.669,  4860.177,  97.6,  0.000!!END!
4250!X=680.671,  4860.187,  97.9,  0.000!!END!
4251!X=680.672,  4860.197,  98.2,  0.000!!END!
4252!X=680.673,  4860.207,  98.5,  0.000!!END!
4253!X=680.675,  4860.216,  98.8,  0.000!!END!
4254!X=680.676,  4860.226,  99.2,  0.000!!END!
4255!X=680.678,  4860.236,  99.5,  0.000!!END!
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!X=680.679,  4860.246,  99.8,  0.000!!END!
!X=680.68,  4860.256,  100.2,  0.000!!END!
!X=680.685,  4860.264,  100.4,  0.000!!END!
!X=680.692,  4860.271,  100.3,  0.000!!END!
!X=680.699,  4860.279,  100.2,  0.000!!END!
!X=680.706,  4860.286,  100.1,  0.000!!END!
!X=680.713,  4860.293,  100.1,  0.000!!END!
!X=680.715,  4860.301,  100.1,  0.000!!END!
!X=680.712,  4860.311,  100.1,  0.000!!END!
!X=680.709,  4860.32,  100,  0.000!!END!
!X=680.706,  4860.33,  100,  0.000!!END!
!X=680.703,  4860.339,  100.1,  0.000!!END!
!X=680.7,  4860.349,  100.1,  0.000!!END!
!X=680.697,  4860.358,  100.2,  0.000!!END!
!X=680.694,  4860.368,  100.3,  0.000!!END!
!X=680.691,  4860.378,  100.4,  0.000!!END!
!X=680.688,  4860.387,  100.4,  0.000!!END!
!X=680.685,  4860.397,  100.5,  0.000!!END!
!X=680.682,  4860.406,  100.5,  0.000!!END!
!X=680.679,  4860.416,  100.5,  0.000!!END!
!X=680.676,  4860.425,  100.5,  0.000!!END!
!X=680.673,  4860.435,  100.5,  0.000!!END!
!X=680.67,  4860.444,  100.5,  0.000!!END!
!X=680.667,  4860.454,  100.5,  0.000!!END!
!X=680.664,  4860.463,  100.7,  0.000!!END!
!X=680.661,  4860.473,  100.9,  0.000!!END!
!X=680.657,  4860.482,  101.1,  0.000!!END!
!X=680.654,  4860.492,  101.3,  0.000!!END!
!X=680.651,  4860.501,  101.6,  0.000!!END!
!X=680.648,  4860.511,  101.9,  0.000!!END!
!X=680.645,  4860.52,  102.2,  0.000!!END!
!X=680.642,  4860.53,  102.5,  0.000!!END!
!X=680.639,  4860.539,  102.9,  0.000!!END!
!X=680.636,  4860.549,  103.2,  0.000!!END!
!X=680.633,  4860.558,  103.3,  0.000!!END!
!X=680.63,  4860.568,  103.5,  0.000!!END!
!X=680.627,  4860.577,  103.6,  0.000!!END!
!X=680.621,  4860.58,  103.5,  0.000!!END!
!X=680.611,  4860.577,  103.1,  0.000!!END!
!X=680.602,  4860.573,  102.7,  0.000!!END!
!X=680.592,  4860.57,  102.2,  0.000!!END!
!X=680.583,  4860.566,  101.8,  0.000!!END!
!X=680.573,  4860.564,  101.3,  0.000!!END!
!X=680.564,  4860.561,  100.9,  0.000!!END!
!X=680.554,  4860.558,  100.7,  0.000!!END!
!X=680.545,  4860.555,  100.4,  0.000!!END!
!X=680.535,  4860.552,  100.1,  0.000!!END!
!X=680.526,  4860.549,  99.8,  0.000!!END!
!X=680.516,  4860.546,  99.6,  0.000!!END!
!X=680.507,  4860.543,  99.3,  0.000!!END!
!X=680.497,  4860.54,  99.1,  0.000!!END!
!X=680.487,  4860.537,  98.8,  0.000!!END!
!X=680.478,  4860.534,  98.7,  0.000!!END!
!X=680.468,  4860.531,  98.6,  0.000!!END!
!X=680.459,  4860.528,  98.6,  0.000!!END!
!X=680.449,  4860.525,  98.6,  0.000!!END!
!X=680.44,  4860.522,  98.6,  0.000!!END!
!X=680.43,  4860.519,  98.5,  0.000!!END!
!X=680.421,  4860.516,  98.3,  0.000!!END!
!X=680.411,  4860.513,  98.1,  0.000!!END!
!X=680.402,  4860.51,  97.9,  0.000!!END!
!X=680.392,  4860.507,  97.6,  0.000!!END!
!X=680.382,  4860.504,  97.4,  0.000!!END!
!X=680.373,  4860.501,  97.2,  0.000!!END!
!X=680.363,  4860.498,  97.3,  0.000!!END!
!X=680.354,  4860.495,  97.7,  0.000!!END!
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4322!X=680.344,  4860.492,  98.1,  0.000!!END!
4323!X=680.335,  4860.489,  98.5,  0.000!!END!
4324!X=680.337,  4860.48,  98.5,  0.000!!END!
4325!X=680.34,  4860.47,  98.6,  0.000!!END!
4326!X=680.343,  4860.461,  98.7,  0.000!!END!
4327!X=680.346,  4860.451,  98.8,  0.000!!END!
4328!X=680.349,  4860.441,  99,  0.000!!END!
4329!X=680.352,  4860.432,  98.9,  0.000!!END!
4330!X=680.355,  4860.422,  98.7,  0.000!!END!
4331!X=680.357,  4860.413,  98.5,  0.000!!END!
4332!X=680.36,  4860.403,  98.3,  0.000!!END!
4333!X=680.363,  4860.394,  98.1,  0.000!!END!
4334!X=680.366,  4860.384,  97.9,  0.000!!END!
4335!X=680.369,  4860.374,  97.6,  0.000!!END!
4336!X=680.372,  4860.365,  97.4,  0.000!!END!
4337!X=680.375,  4860.355,  97.3,  0.000!!END!
4338!X=680.378,  4860.346,  97.1,  0.000!!END!
4339!X=680.381,  4860.336,  97,  0.000!!END!
4340!X=680.384,  4860.327,  96.9,  0.000!!END!
4341!X=680.386,  4860.317,  96.7,  0.000!!END!
4342!X=680.389,  4860.307,  96.6,  0.000!!END!
4343!X=680.392,  4860.298,  96.5,  0.000!!END!
4344!X=680.395,  4860.288,  96.3,  0.000!!END!
4345!X=680.398,  4860.279,  96.2,  0.000!!END!
4346!X=680.401,  4860.269,  96.1,  0.000!!END!
4347!X=680.404,  4860.26,  96,  0.000!!END!
4348!X=680.407,  4860.25,  95.9,  0.000!!END!
4349!X=680.41,  4860.24,  96,  0.000!!END!
4350!X=680.413,  4860.231,  96.1,  0.000!!END!
4351!X=680.415,  4860.221,  96.1,  0.000!!END!
4352!X=680.418,  4860.212,  96.1,  0.000!!END!
4353!X=680.421,  4860.202,  96.1,  0.000!!END!
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a
Data for each receptor are treated as a separate input subgroup and therefore must end with an input group terminator.

b
Receptor height above ground is optional. If no value is entered, the receptor is placed on the ground.

c
Receptors can be assigned using group names provided in 20b. If no group names are used (NRGRP=0) then the default assignment name X must be used.

APPENDIX H

Comparison of Modelled Scenarios

Comparison of Modelled Scenarios

Indicator Compound	CAS No.	Averaging Period	Background Concentration [µg/m³]	140,000 TPA (Scenario 1A)			160,000 TPA (Scenario 2A)			Percentage Change of Maximum Concentration [%]	Percentage Change of Maximum Concentration (Including Background) [%]
				Total Facility Emission Rate [g/s]	Maximum POI Concentration [µg/m³]	Maximum Concentration (Including Background) [µg/m³]	Total Facility Emission Rate [g/s]	Maximum POI Concentration [µg/m³]	Maximum Concentration (Including Background) [µg/m³]		
1 – Methylnaphthalene	90-12-0	24-hour	0.009	1.81E-07	0.0000002	0.009	1.90E-07	0.0000002	0.009	0%	0%
1,2,4 – Trichlorobenzene	120-82-1	24-hour	0.008	8.37E-07	0.000001	0.008	8.79E-07	0.000001	0.008	0%	0%
1,2,4,5-Tetrachlorobenzene	95-94-3	24-hour	—	1.81E-07	0.0000002	0.0000002	1.90E-07	0.0000002	0.0000002	0%	—
1,2-Dichlorobenzene	95-50-1	1-hour	0.009	2.19E-06	0.00003	0.01	2.30E-06	0.00002	0.01	-11%	0%
2 – Methylnaphthalene	91-57-6	24-hour	0.015	3.29E-07	0.0000004	0.015	3.46E-07	0.0000004	0.015	0%	0%
2,3,4,6-Tetrachlorophenol	58-90-2	24-hour	—	4.20E-07	0.0000005	0.0000005	4.41E-07	0.0000005	0.0000005	0%	—
2,4,6-Trichlorophenol	88-06-2	24-hour	—	8.52E-07	0.000001	0.000001	8.95E-07	0.000001	0.000001	0%	—
2,4-Dichlorophenol	120-83-2	24-hour	—	4.43E-07	0.000001	0.000001	4.65E-07	0.000001	0.000001	0%	—
Acenaphthene	83-32-9	24-hour	0.010	2.07E-07	0.0000002	0.01	2.18E-07	0.0000002	0.01	0%	0%
Acenaphthylene	208-96-8	24-hour	0.0003	8.40E-08	0.0000001	0.0003	8.82E-08	0.0000001	0.0003	0%	0%
Acetaldehyde	75-07-0	24-hour	—	2.09E-06	0.000002	0.000002	2.19E-06	0.000002	0.000002	0%	—
Acetaldehyde	75-07-0	1/2-hour	—	2.09E-06	0.00003	0.00003	2.19E-06	0.00003	0.00003	-11%	—
Acrolein	107-02-8	1-hour	—	8.42E-07	0.0000097	0.0000097	8.84E-07	0.0000086	0.0000086	-11%	—
Acrolein	107-02-8	24-hour	—	8.42E-07	0.0000010	0.000001	8.84E-07	0.0000010	0.000001	0%	—
Aluminum	7429-90-5	24-hour	0.21	1.69E-03	0.002	0.22	1.78E-03	0.002	0.22	0%	0%
Ammonia	7664-41-7	24-hour	—	2.71E-02	0.03	0.03	2.84E-02	0.03	0.03	0%	—
Anthracene	120-12-7	24-hour	0.0004	8.44E-08	0.0000001	0.0004	8.86E-08	0.0000001	0.0004	0%	0%
Antimony	7440-36-0	24-hour	0.003	2.20E-06	0.000003	0.003	2.30E-06	0.000003	0.003	0%	0%
Arsenic	7440-38-2	24-hour	0.002	1.83E-06	0.000002	0.002	1.92E-06	0.000002	0.002	0%	0%
Barium	7440-39-3	24-hour	0.014	6.44E-05	0.0001	0.015	6.76E-05	0.0001	0.015	0%	0%
Benzene	71-43-2	Annual	0.40	4.92E-05	0.000003	0.40	5.17E-05	0.000003	0.40	-9%	0%
Benzene	71-43-2	24-hour	0.62	4.92E-05	0.00006	0.62	5.17E-05	0.00006	0.62	0%	0%
Benzo(a)anthracene	56-55-3	24-hour	0.0001	2.07E-07	0.00000024	0.0001	2.18E-07	0.00000024	0.0001	0%	0%
Benzo(a)fluorene	238-84-6	24-hour	0.0002	2.07E-07	0.0000002	0.0002	2.18E-07	0.0000002	0.0002	0%	0%
Benzo(a)pyrene [as a surrogate of total Polycyclic Aromatic Hydrocarbons (PAHs)]	50-32-8	Annual	0.000026	2.07E-07	0.00000001	0.000026	2.18E-07	0.00000001	0.000026	-9%	0%
Benzo(a)pyrene [as a surrogate of total Polycyclic Aromatic Hydrocarbons (PAHs)]	50-32-8	24-hour	0.000058	2.07E-07	0.0000002	0.000058	2.18E-07	0.0000002	0.000058	0%	0%
Benzo(b)fluoranthene	205-99-2	24-hour	0.0001	2.07E-07	0.0000002	0.0001	2.18E-07	0.0000002	0.0001	0%	0%
Benzo(b)fluorene	243-17-4	24-hour	0.0002	2.07E-07	0.0000002	0.0002	2.18E-07	0.0000002	0.0002	0%	0%
Benzo(e)pyrene	192-97-2	24-hour	0.0002	2.07E-07	0.0000002	0.0002	2.18E-07	0.0000002	0.0002	0%	0%
Benzo(ghi)perylene	191-24-2	24-hour	0.0001	3.02E-07	0.0000004	0.0001	3.17E-07	0.0000004	0.0001	0%	0%

Indicator Compound	CAS No.	Averaging Period	Background Concentration [µg/m³]	140,000 TPA (Scenario 1A)			160,000 TPA (Scenario 2A)			Percentage Change of Maximum Concentration [%]	Percentage Change of Maximum Concentration (Including Background) [%]
				Total Facility Emission Rate [g/s]	Maximum POI Concentration [µg/m³]	Maximum Concentration (Including Background) [µg/m³]	Total Facility Emission Rate [g/s]	Maximum POI Concentration [µg/m³]	Maximum Concentration (Including Background) [µg/m³]		
Benzo(k)fluoranthene	207-08-9	24-hour	0.0001	2.07E-07	0.0000002	0.0001	2.18E-07	0.0000002	0.0001	0%	0%
Beryllium	7440-41-7	24-hour	0.0004	1.83E-06	0.000002	0.0004	1.92E-06	0.000002	0.0004	0%	0%
Biphenyl	92-52-4	1-hour	—	8.23E-07	0.00001	0.000	8.64E-07	0.00001	0.000	-11%	—
Boron	7440-42-8	24-hour	0.013	6.52E-03	0.008	0.02	6.85E-03	0.008	0.02	0%	0%
Bromodichloromethane	75-27-4	24-hour	0.010	1.47E-05	0.00002	0.01	1.54E-05	0.00002	0.01	0%	0%
Bromoform	75-25-2	24-hour	0.024	1.75E-05	0.00002	0.02	1.84E-05	0.00002	0.02	0%	0%
Bromomethane	74-83-9	24-hour	0.057	1.32E-04	0.0002	0.06	1.39E-04	0.0002	0.06	0%	0%
Cadmium	7440-43-9	24-hour	0.001	2.98E-04	0.0004	0.001	3.13E-04	0.0004	0.001	0%	0%
Cadmium	7440-43-9	Annual	0.001	2.98E-04	0.00002	0.001	3.13E-04	0.00002	0.001	-9%	0%
Carbon Monoxide	630-08-0	1/2-hour	—	1.70E+00	23.57	23.57	1.79E+00	20.99	20.99	-11%	—
Carbon Monoxide	630-08-0	1-Hour	—	1.70E+00	19.64	19.64	1.79E+00	17.49	17.49	-11%	—
Carbon Monoxide	630-08-0	8-hour	—	1.70E+00	5.17	5.17	1.79E+00	4.71	4.71	-9%	—
Carbon tetrachloride	56-23-5	24-hour	0.59	1.36E-04	0.00016	0.59	1.43E-04	0.00016	0.59	0%	0%
Chloroform	67-66-3	24-hour	0.22	1.28E-04	0.00015	0.22	1.34E-04	0.00015	0.22	0%	0%
Chloroform	67-66-3	Annual	0.13	1.28E-04	0.000008	0.13	1.34E-04	0.000007	0.13	-9%	0%
Chromium (hexavalent)	7440-47-3	Annual	—	3.84E-05	0.000002	0.000002	4.03E-05	0.000002	0.000002	-9%	—
Chromium (hexavalent)	7440-47-3	24-hour	—	3.84E-05	0.00005	0.00005	4.03E-05	0.00005	0.00005	0%	—
Chrysene	218-01-9	24-hour	0.0001	9.51E-08	0.0000001	0.0001	9.98E-08	0.0000001	0.0001	0%	0%
Cobalt	7440-48-4	24-hour	0.001	2.20E-06	0.0000	0.0007	2.30E-06	0.0000	0.0007	0%	0%
Copper	7440-50-8	24-hour	0.031	2.20E-04	0.0003	0.0308	2.30E-04	0.0003	0.0308	0%	0%
Dibenzo(a,c)anthracene	215-58-7	24-hour	—	2.07E-07	0.0000002	0.0000002	2.18E-07	0.0000002	0.0000002	0%	—
Dibenzo(a,h)anthracene	53-70-3	24-hour	0.0001	2.07E-07	0.0000002	0.0001	2.18E-07	0.0000002	0.0001	0%	0%
Dichlorodifluoromethane	75-71-8	24-hour	2.757	3.15E-05	0.00004	2.76	3.31E-05	0.00004	2.76	0%	0%
Dichloroethene, 1,1 -	75-34-3	24-hour	0.000	1.47E-05	0.00002	0.0004	1.54E-05	0.00002	0.0004	0%	0%
Dichloromethane	75-09-02	24-hour	0.489	1.38E-03	0.00163	0.49	1.45E-03	0.00162	0.49	0%	0%
Dichloromethane	75-09-02	Annual	0.349	1.38E-03	0.00008	0.35	1.45E-03	0.00008	0.35	-9%	0%
Dioxins, Furans and Dioxin- like PCBs	N/A -6	24-hour	0.021	0.0026 µg TEQ/s	0.003 pg TEQ/m³	0.024 pg TEQ/m³	0.0027 µg TEQ/s	0.003 pg TEQ/m³	0.024 pg TEQ/m³	0%	0%
Ethylbenzene	100-41-4	24-hour	0.355	4.58E-04	0.0005	0.36	4.81E-04	0.0005	0.36	0%	0%
Ethylbenzene	100-41-4	10-minute	1.426	4.58E-04	0.0087	1.44	4.81E-04	0.0078	1.43	-11%	0%
Ethylene Dibromide	106-93-4	24-hour	0.002	2.94E-05	0.00003	0.002	3.09E-05	0.00003	0.002	0%	0%
Fluoranthene	206-44-0	24-hour	0.002	3.03E-07	0.0000004	0.002	3.18E-07	0.0000004	0.002	0%	0%

Indicator Compound	CAS No.	Averaging Period	Background Concentration [µg/m³]	140,000 TPA (Scenario 1A)			160,000 TPA (Scenario 2A)			Percentage Change of Maximum Concentration [%]	Percentage Change of Maximum Concentration (Including Background) [%]
				Total Facility Emission Rate [g/s]	Maximum POI Concentration [µg/m³]	Maximum Concentration (Including Background) [µg/m³]	Total Facility Emission Rate [g/s]	Maximum POI Concentration [µg/m³]	Maximum Concentration (Including Background) [µg/m³]		
Fluorine	86-73-7	24-hour	—	1.43E-07	0.0000002	0.0000002	1.50E-07	0.0000002	0.0000002	0%	—
Formaldehyde	50-00-0	24-hour	—	1.73E-06	0.000002	0.000002	1.81E-06	0.000002	0.000002	0%	—
Hexachlorobenzene	118-74-1	24-hour	—	8.40E-08	0.0000001	0.0000001	8.82E-08	0.0000001	0.0000001	0%	—
Hydrogen Chloride	7647-01-0	24-hour	—	3.84E-01	0.45	0.45	4.03E-01	0.45	0.45	0%	—
Hydrogen Fluoride	7664-39-3	24-hour	—	4.26E-03	0.01	0.01	4.47E-03	0.01	0.01	0%	—
Hydrogen Fluoride	7664-39-3	30-day	—	4.26E-03	0.0008	0.0008	4.47E-03	0.0007	0.0007	-17%	—
Indeno(1,2,3 – cd)pyrene	193-39-5	24-hour	0.0001	2.07E-07	0.0000002	0.0001	2.18E-07	0.0000002	0.0001	0%	0%
Lead	7439-92-1	24-hour	0.004	2.13E-03	0.003	0.007	2.24E-03	0.003	0.007	0%	0%
Lead	7439-92-1	30-day	—	2.13E-03	0.0004	0.0004	2.24E-03	0.0003	0.0003	-17%	—
Mercury	7439-97-6	24-hour	—	6.39E-04	0.0008	0.0008	6.71E-04	0.0008	0.0008	0%	—
Molybdenum	7439-98-7	24-hour	0.001	2.19E-04	0.0003	0.0014	2.30E-04	0.0003	0.0014	0%	0%
Naphthalene	91-20-3	24-hour	0.04	2.00E-06	0.000002	0.04	2.10E-06	0.000002	0.04	0%	0%
Naphthalene	91-20-3	10-minute	0.17	2.00E-06	0.00004	0.17	2.10E-06	0.00003	0.17	-11%	0%
Nickel	7440-02-0	Annual	0.001	5.14E-05	0.000003	0.001	5.39E-05	0.000003	0.001	-9%	0%
Nickel	7440-02-0	24-hour	0.001	5.14E-05	0.0001	0.00	5.39E-05	0.0001	0.00	0%	0%
Nitrogen Dioxides	10102-44-0	1-hour	30.00	5.16E+00	41.26	71.26	5.41E+00	40.63	70.63	-2%	-1%
Nitrogen Dioxides	10102-44-0	24-hour	22.28	5.16E+00	6.09	28.37	5.41E+00	6.06	28.35	0%	0%
Nitrogen Dioxides	10102-44-0	Annual	14.04	5.16E+00	0.31	14.36	5.41E+00	0.28	14.33	-9%	0%
O-terphenyl	84-15-1	24-hour	0.0002	8.91E-08	0.0000001	0.0002	9.35E-08	0.0000001	0.0002	0%	0%
Pentachlorobenzene	608-93-5	24-hour	—	8.52E-08	0.0000001	0.0000001	8.95E-08	0.0000001	0.0000001	0%	—
Pentachlorophenol	87-86-5	24-hour	—	4.20E-07	0.0000005	0.0000005	4.41E-07	0.0000005	0.0000005	0%	—
Perylene	198-55-0	24-hour	0.0002	8.40E-08	0.0000001	0.0002	8.82E-08	0.0000001	0.0002	0%	0%
Phenanthrene	85-01-8	24-hour	0.010	1.18E-06	0.000001	0.01	1.24E-06	0.000001	0.01	0%	0%
Phosphorus	7723-14-0	24-hour	0.48	1.96E-03	0.0023	0.48	2.06E-03	0.0023	0.48	0%	0%
PM_{10}	N/A -3	24-hour	24.48	2.06E-01	1.17	25.65	2.17E-01	1.13	25.62	-3%	0%
$PM_{2.5}$	N/A -4	24-hour	13.22	1.95E-01	1.10	14.32	2.05E-01	1.06	14.28	-3%	0%
$PM_{2.5}$	N/A -4	Annual	8.12	1.95E-01	0.06	8.18	2.05E-01	0.05	8.18	-7%	0%
Polychlorinated Biphenyls (PCB)	N/A -7	24-hour	—	2.77E-08	0.00000003	0.00000003	2.91E-08	0.00000003	0.00000003	0%	—
Pyrene	129-00-0	24-hour	0.001	2.70E-07	0.000000	0.0008	2.83E-07	0.000000	0.0008	0%	0%
Selenium	7782-49-2	24-hour	0.003	3.18E-05	0.00004	0.0035	3.33E-05	0.00004	0.0035	0%	0%
Silver	7440-22-4	24-hour	0.002	1.83E-06	0.000002	0.001745	1.92E-06	0.000002	0.001745	0%	0%
Sulphur Dioxide	7446-09-05	10-minute	19.41	1.49E+00	28.39	47.80	1.57E+00	25.28	44.70	-11%	-6%

Indicator Compound	CAS No.	Averaging Period	Background Concentration [µg/m³]	140,000 TPA (Scenario 1A)			160,000 TPA (Scenario 2A)			Percentage Change of Maximum Concentration [%]	Percentage Change of Maximum Concentration (Including Background) [%]
				Total Facility Emission Rate [g/s]	Maximum POI Concentration [µg/m³]	Maximum Concentration (Including Background) [µg/m³]	Total Facility Emission Rate [g/s]	Maximum POI Concentration [µg/m³]	Maximum Concentration (Including Background) [µg/m³]		
Sulphur Dioxide	7446-09-05	1-hour	11.75	1.49E+00	17.20	28.96	1.57E+00	15.32	27.08	-11%	-6%
Sulphur Dioxide	7446-09-05	24-hour	12.64	1.49E+00	1.76	14.40	1.57E+00	1.76	14.39	0%	0%
Sulphur Dioxide	7446-09-05	Annual	5.26	1.49E+00	0.09	5.35	1.57E+00	0.08	5.34	-9%	0%
Tetrachloroethene	127-18-4	24-hour	0.13	1.58E-05	0.00002	0.13	1.66E-05	0.00002	0.13	0%	0%
Tetralin	119-64-2	24-hour	0.003	2.10E-06	0.000002	0.003	2.20E-06	0.000002	0.003	0%	0%
Thallium	7440-28-0	24-hour	0.003	4.35E-06	0.000005	0.003	4.56E-06	0.000005	0.003	0%	0%
Tin	7440-31-5	24-hour	0.003	7.50E-04	0.001	0.004	7.87E-04	0.001	0.004	0%	0%
Toluene	108-88-3	24-hour	2.080	1.81E-03	0.002	2.08	1.90E-03	0.002	2.08	0%	0%
Total Chromium (and compounds)	7440-47-3	24-hour	0.005	3.84E-05	0.00005	0.0055	4.03E-05	0.00005	0.0055	0%	0%
Total Chromium (and compounds)	7440-47-3	24-hour	0.005	3.84E-05	0.00005	0.0055	4.03E-05	0.00005	0.0055	0%	0%
Total Suspended Particulate	N/A -1	24-hour	42.93	2.06E-01	1.17	44.10	2.17E-01	1.13	44.07	-3%	0%
Total Suspended Particulate	N/A -1	Annual	26.00	2.06E-01	0.06	26.06	2.17E-01	0.06	26.05	-7%	0%
Trichloroethane, 1,1,1 -	71-55-6	24-hour	0.029	1.47E-05	0.00002	0.03	1.54E-05	0.00002	0.03	0%	0%
Trichloroethene	86-42-0	24-hour	—	1.47E-05	0.00002	0.00	1.54E-05	0.00002	0.00	0%	—
Trichloroethylene, 1,1,2 -	79-01-06	24-hour	0.15	1.47E-05	0.00002	0.15	1.54E-05	0.00002	0.15	0%	0%
Trichloroethylene, 1,1,2 -	79-01-06	Annual	0.05	1.47E-05	0.000001	0.05	1.54E-05	0.000001	0.05	-9%	0%
Trichlorofluoromethane	75-69-4	24-hour	1.77	9.27E-05	0.0001	1.77	9.73E-05	0.0001	1.77	0%	0%
Vanadium	7440-62-2	24-hour	0.002	1.19E-06	0.000001	0.0018	1.25E-06	0.000001	0.0018	0%	0%
Vinyl chloride	75-01-04	24-hour	0.004	2.94E-05	0.00003	0.004	3.09E-05	0.00003	0.004	0%	0%
Vinyl chloride	75-01-04	Annual	0.002	2.94E-05	0.000002	0.002	3.09E-05	0.000002	0.002	-9%	0%
Xylenes, m-, p- and o-	1330-20-7	24-hour	0.87	4.29E-03	0.01	0.87	4.51E-03	0.01	0.87	0%	0%
Xylenes, m-, p- and o-	1330-20-7	10-minute	3.49	4.29E-03	0.08	3.57	4.51E-03	0.07	3.56	-11%	0%
Zinc	7440-66-6	24-hour	0.06	2.32E-04	0.0003	0.06	2.44E-04	0.0003	0.06	0%	0%

Notes: "—" implies background monitoring data was not available for this Indicator Compound

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