Appendix D.11 Screening Level Human Health Risk Assessment Report

Environmental Review Report

East Windsor Generation Facility Expansion

Capital Power Corporation

SLR Project No.: 241.030524.00024

July 2024

SCIENCE INTEGRITY KNOWLEDGE

EAST WINDSOR GENERATING FACILITY EXPANSION

SCREENING LEVEL HUMAN HEALTH RISK ASSESSMENT (SLHHRA) REPORT

FINAL REPORT

June 3, 2024

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EAST WINDSOR GENERATING FACILITY EXPANSION
SCREENING LEVEL HUMAN HEALTH RISK ASSESSMENT (SLHHRA) REPORT

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LIST OF ABBREVIATIONS

ATSDR	Agency for Toxic Substances and Disease Registry
Cal EPA	California Environmental Protection Agency
CCME	Canadian Council of Ministers of the Environment
COC	Chemical of Concern
CR	Concentration Ratio
CSM	Conceptual Site Model
ERR	Environmental Review Report
ESP	Environmental Screening Process
EWCC	East Windsor Cogeneration Centre
HHRA	Human Health Risk Assessment
HQ	Hazard Quotient
IESO	Independent Electricity System Operator
ILCR	Incremental Lifetime Cancer Risk
IUR	Inhalation unit risk
LCR	Lifetime Cancer Risk
MECP	Ontario Ministry of the Environment, Conservation and Parks
MPOI	Maximum Point of Impingement
NOAEL	No Observable Adverse Effect Level
NOx	Oxides of nitrogen
PDI	Permissible daily intakes
PM	Particulate Matter
$PM_{2.5}$	Fine particulate matter (less than 5 microns in diameter)
RfC	Reference Concentration
RfD	Reference Dose
SLHHRA	Screening Level Human Health Risk Assessment
TCEQ	Texas Commission on Environmental Quality
TDI	Tolerable Daily Intake
TEQ	Toxicity Equivalence Factors
TRV	Toxicological Reference Value
US EPA	United States Environmental Protection Agency
WHO	World Health Organization

EAST WINDSOR GENERATING FACILITY EXPANSION
SCREENING LEVEL HUMAN HEALTH RISK ASSESSMENT (SLHHRA) REPORT

EXECUTIVE SUMMARY

Capital Power Corporation (Capital Power), through its affiliate East Windsor (Expansion) L.P., is proposing the East Windsor Generation Facility Expansion (the Project) in the City of Windsor, Ontario. The Project is in response to the Independent Electricity System Operator's (IESO's) call for additional natural gas generation capacity and would provide up to approximately 107 Megawatts (MW) gross of additional generation capacity to the Windsor-Essex area and provincial electricity grid. The proposed Project is being designed to provide dependable capacity at peak times when Ontario's other generation sources are not capable of meeting demand.

The objective of this Screening Level Human Health Risk Assessment (SLHHRA) is to address concerns related to potential human health impacts of the proposed Project on the surrounding community. Thus, the primary objective of the SLHHRA was to determine the potential short- and long-term human health risks to individuals in the surrounding community who may be impacted by emissions from the proposed expansion. The SLHHRA involved an evaluation of the potential health impacts related to inhalation of emissions, both project-specific and in the broader cumulative context of the overall airshed (*i.e.*, existing regional background conditions ***plus*** project-specific contributions), at key residential locations in the surrounding community. The SLHHRA was specifically focused on two COCs: oxides of nitrogen (NOx) and fine particulate matter ($PM_{2.5}$). Ground-level air concentrations were predicted using theoretical air dispersion modelling conducted by the SLR Air Quality Assessment team which was then used as a basis to evaluate potential health risks arising at discrete residential locations within the surrounding community. As such, the SLHHRA should be read in conjunction with the Air Quality report (SLR, 2024) and not considered a standalone document.

The results of the assessment indicate that while regional background concentrations of both NOx and $PM_{2.5}$ are elevated above their respective health-based benchmarks in the Windsor area, the emissions from the Project would not result in a significantly elevated health risk to the surrounding community. Furthermore, it is important to note that the proposed facility is anticipated to operate infrequently as a peaking facility and must operate for less than 1500 hours annually. Dispatch forecasting suggests that the unit may run less than 150 hours annually, with an average run time of 2 to 4 hours. It is unlikely that both the existing East Windsor Cogeneration Centre (EWCC) and the Project will operate concurrently. Finally, the air dispersion modelling conducted in the Air Quality Assessment evaluates emissions of the existing EWCC and the proposed Project against five years of 1-hour meteorological conditions to produce the range of potential cumulative air concentrations at the various receptor locations. Given how infrequently the proposed Project is expected to operate, it is highly unlikely that emissions will coincide with those rare meteorological conditions that lead to worst-case 1-hour concentrations.

As such, the current SLHHRA, which conservatively assumes continuous exposures to the emitted COCs and operating concurrent to the EWCC, is likely significantly overestimating potential cumulative risk.

EAST WINDSOR GENERATING FACILITY EXPANSION
SCREENING LEVEL HUMAN HEALTH RISK ASSESSMENT (SLHHRA) REPORT

1.0 INTRODUCTION

1.1 Project Overview

Capital Power Corporation (Capital Power), through its affiliate East Windsor (Expansion) L.P., is proposing the East Windsor Generation Facility Expansion (the Project) in the City of Windsor, Ontario. The Project is responsive to the Independent Electricity System Operator's (IESO's) call for additional natural gas generation capacity and would provide up to approximately 107 Megawatts (MW) gross of additional generation capacity to the Windsor-Essex area and provincial electricity grid. The proposed Project is being designed to provide dependable capacity at peak times when Ontario's other generation sources are not capable of meeting demand.

The Project consists of the construction and operation of a new simple cycle natural gas generation facility located adjacent to the existing East Windsor Cogeneration Centre (EWCC)[1]. The Project will make use of some existing infrastructure, including tying into the existing EWCC high-voltage interconnection line to avoid the need for a new connection to the provincial electricity grid. Ancillary project components include an equipment building, storage building, stormwater management system and site servicing. Additional areas for temporary staging and laydown will be required during the construction phase.

The Project will be located within the existing EWCC fenceline, primarily on lands owned by Capital Power. These lands represent a series of parcels, municipally known as 228 to 276 Cadillac Street (hereby referred to as the Project Site). These parcels, along with others on the west side of Cadillac Street, were formerly residential properties that were acquired, and residences removed, as part of the original development of the EWCC. The Project Site is approximately 0.61 hectares (1.49 acres) in size and is currently used for site access, parking, mowed and landscaped areas, and storage (Figure 1-1).

1.2 Objective

The objective of the screening level Human Health Risk Assessment (SLHHRA) is to evaluate potential emissions of oxides of nitrogen (NOx) and fine particulate matter ($PM_{2.5}$) as part of an ERR to meet the requirements of the ESP for Electricity Projects. While other criteria air contaminants such as carbon monoxide and sulphur dioxide were evaluated in the Air Quality Assessment (SLR 2024), cumulative concentrations were negligible and as such were not carried forward to the SLHHRA. Similarly, the emissions of other potential contaminants of concern, such as VOCs, PAHs, and metals, were considered very low and below a level indicative of potential human health concern. As such, the current assessment focused on NOx and $PM_{2.5}$ as the key chemicals of concern.

[1] The EWCC is located on the land leased from Ford Motor Company of Canada Ltd. In addition to generating electricity, the facility used to provide steam to the neighbouring Ford Motor company for their Ford Windsor engine plant. Since the closure of the engine plant in 2018, Ford has terminated the Steam Supply Agreement with EWCC, and EWCC now operates in simple cycle mode as a peaking plant.

To address potential concerns with respect to potential human health impacts related to the proposed expansion, a SLHHRA approach was used to assess potential health risks related to facility emissions of $PM_{2.5}$ and NOx. The intent of the SLHHRA is to evaluate potential health risks related to emissions from the proposed expansion individually, as well as cumulatively in addition to existing regional background concentrations and contributions from the existing EWCC. As such, the SLHHRA should be read in conjunction with the Air Quality report (SLR, 2024) and not considered a standalone document.

The SLHHRA was conducted according to widely accepted risk assessment methodologies and guidance documents published and endorsed by regulatory agencies including the Ontario Ministry of the Environment, Conservation and Parks (MOE 2005; 2011), Health Canada (2010; 2021), and the United States Environmental Protection Agency (US EPA, 2005).

2.0 PROJECT AND SITE CONTEXT

2.1 Site Context

The Project Site (see Figure 1-1) is located adjacent to the EWCC, on a series of parcels municipally known as 228 to 276 Cadillac Street. The Project will be located within the existing EWCC fenceline, primarily on lands owned by Capital Power. The EWCC is located on the Ford Powerhouse property, on land leased from the Ford Motor Company of Canada Ltd. The current EWCC facility fenceline encompasses the Project Site lands, which are currently used for site access, parking, storage, and landscaped areas.

Both the Project and EWCC are located on lands designated as a “Business Park” which provides for business and industrial uses and zoned as “Commercial District” which allows public utilities and accessory uses as per the City of Windsor Zoning By-law 8600. Immediately surrounding the property, within 500 m, residential, commercial, and institutional uses make up the primary land use and have been in existence for over two decades.

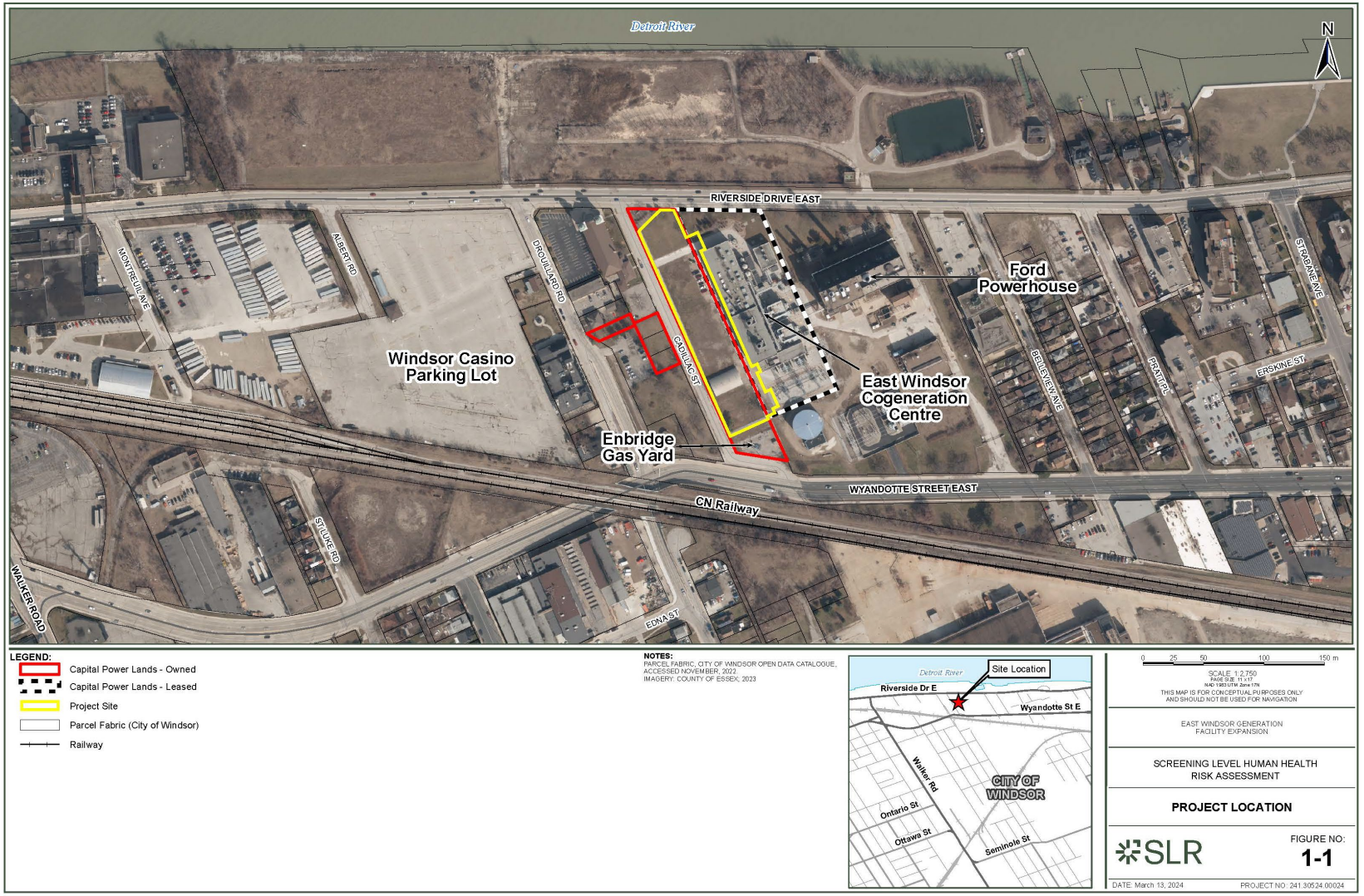


Figure 1-1 Project Location

2.2 EWCC Context

The existing EWCC commenced commercial operations in 2009. As a result of the conversion of the EWCC from a cogeneration to a simple cycle operation, the EWCC noise was assessed in May 2021 as part of the amendment of the ECA (Air and Noise). The amended ECA Air was issued by the MECP on April 2022, and the EWCC currently operates in accordance with the ECA A-500-4130410774.

The EWCC operates its existing generators in simple cycle mode to produce electricity using two Gas Turbine Generators (GTGs). Electricity is generated and directed to the provincial grid when dispatched by the IESO.

2.3 Project Context

The Project is a simple cycle natural gas fired peaking power plant which would provide the provincial electricity grid and IESO with reliable and responsive peaking power supply. The Project will be located within the EWCC fenceline and will share some existing infrastructure and services but will be owned and operated by a separate Capital Power entity. The Project is IESO-contracted, metered, and dispatched independently of the EWCC.

Key project components include one General Electric (GE) 7E.03 simple cycle gas turbine generator, and all associated infrastructure including an inlet air filter, exhaust stack, fuel gas compressor, natural gas handling system, instrumentation and control systems, and a Generator Step-Up (GSU) transformer. Natural gas will be supplied to the Project from a high-pressure fuel gas pipeline originating from the existing Enbridge operated EWCC gas yard. Ancillary project components include an equipment building, storage building, stormwater management system (SWM) and site servicing.

The gas turbine will include a dedicated exhaust stack for emissions produced. This exhaust stack will be approximately 3.4 m by 6.1 m and 22.5 m above grade. The Project will utilize emission control technology, including dry, low NOx burners on the gas turbine generator. The modular system has a relatively small footprint, allows for timely installation and commissioning, and has an approximate 10-20-minute start-up time.

Similar to the EWCC, the Project is expected to run infrequently; as a peaking facility it must operate for less than 1,500 hours, annually. Dispatch forecasting suggests that the unit may run less than 150 hours annually, with an average run time of approximately 2 to 4 hours. While the expansion is co-located adjacent to the EWCC, the two facilities will operate and be dispatched by the IESO, independently. Both facilities are classified and operate as peaking plants and would be available for dispatch by the IESO to fulfil system demands.

Although there is the possibility that both facilities would be dispatched concurrently by the IESO, this scenario is anticipated to be unlikely. Regardless, the assessment has considered this unlikely scenario and conservatively includes the combined effect of both the existing and proposed facilities operating simultaneously. The combined facility with the expansion included will have a total nameplate capacity of 172.6 MW and a maximum output of 195 MW.

3.0 REVIEW OF STUDY METHODOLOGY AND ANALYSIS

3.1 Risk Assessment Framework

In general, a human health risk assessment, or HHRA, is a scientific study that evaluates the potential for the occurrence of adverse health effects from exposures of people (receptors) to chemicals of concern (COCs) present in surrounding environmental media (*e.g.*, air, soil, sediment, surface water, groundwater, food, *etc.*), under existing or predicted exposure conditions. HHRA procedures are based on the fundamental dose-response principle of toxicology. The response of an individual to a chemical exposure typically increases in proportion to the chemical concentration in critical target tissues where adverse effects may occur. The concentrations of chemicals in the target tissues (the dose) are determined by the degree of exposure, which is proportional to the chemical concentrations in the environment where the receptor resides, works, or visits.

All chemicals (anthropogenic and natural) have the potential to cause effects in people and the ecosystem; however, it is the ability of a receptor to be exposed to an elevated chemical concentration and the inherent toxicity of the chemical that determines the level of effect and potential for unacceptable risk to the exposed receptor. As illustrated in the diagram to the right, if all three components are present (*i.e.,* where the three circles intersect), the possibility of adverse risk exists.

The prediction of an individual's exposure to specific chemicals in the environment and the potential risks resulting from such exposures can be determined through the completion of a quantitative HHRA.

A SLHHRA is a qualitative or quantitative evaluation of risk typically based on a "worst-case" exposure scenario rather than verifiable site-specific conditions. It can also choose to focus the evaluation of risk on specific elements or chemicals, or specific exposure pathways (*e.g.*, only inhalation exposures), that stakeholders view as providing the greatest potential for health risk. As an initial scoping of potential risk, the SLHHRA approach relies on available data to provide conservative estimates of exposure and risk based on a worst-case scenario, so that exposures and risks are not underestimated. The intent is to determine whether there is the potential for adverse health impacts under these worst-case exposure scenarios for the relevant COC(s) emitted from the facility under evaluation, identify any data gaps limiting the assessment's ability to appropriately estimate exposures and risk, and eliminate any COC(s) and pathways of exposure which are not a concern moving forward from any further analyses.

Should the SLHHRA indicate the potential for risk to be elevated beyond acceptable levels, the process provides an excellent foundation on which additional data gathering and analysis can be conducted in support of a more detailed quantitative human health risk assessment (HHRA), should it be required by the relevant risk managers and stakeholders.

It should be noted that there is no specific regulatory guidance for the completion of a SLHHRA for an emission source such as the proposed facility; however, the Ontario Ministry of the Environment, Conservation and Parks (MECP) does provide some guidance for screening level risk assessments (for contaminated sites) as part of O. Reg. 153/04. As such, the current

SLHHRA was conducted according to widely accepted risk assessment methodologies and guidance published and endorsed by regulatory agencies including the MECP (as noted above), Health Canada, the Canadian Council of the Ministers of the Environment (CCME), and the United States Environmental Protection Agency (US EPA).

Overall, the current SLHHRA follows the standard HHRA framework (Figure 2-1) that is composed of the following steps:

i) problem formulation;
ii) exposure assessment;
iii) hazard assessment; and,
iv) risk characterization.

Typically, where potential adverse impacts are predicted through risk characterization, an additional step providing risk management and recommendations for mitigation measures to address these concerns can be added, if necessary.

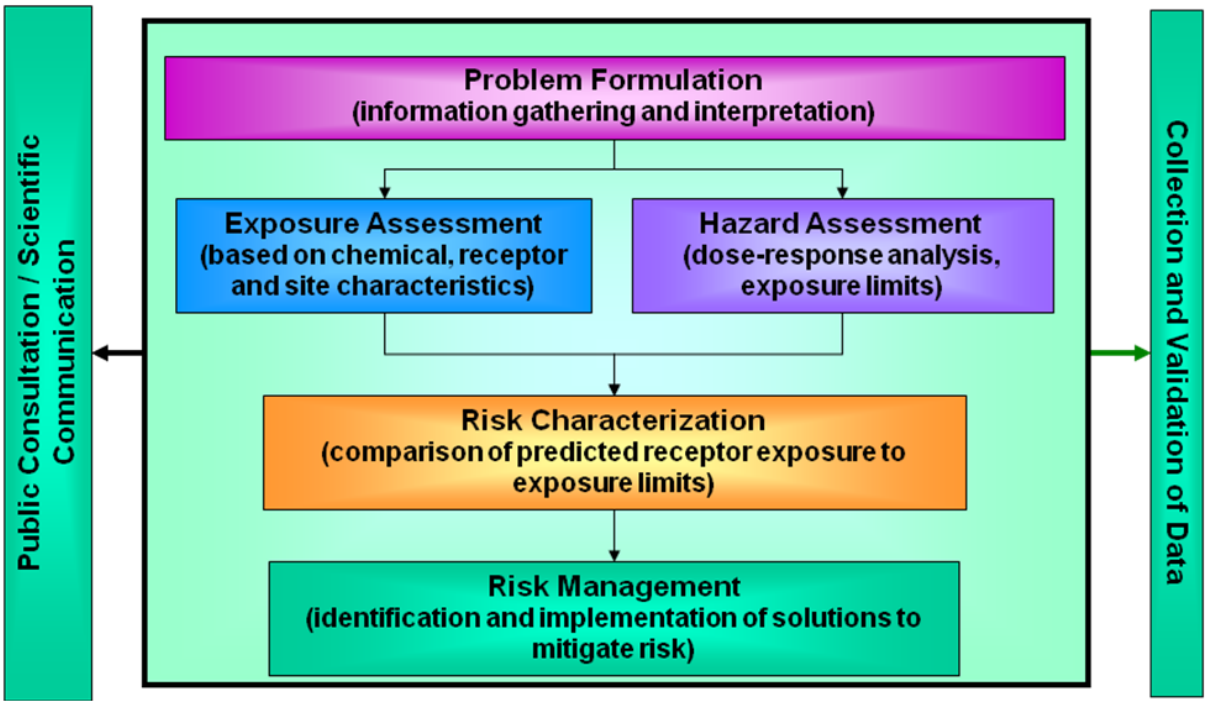


Figure 3-1 Overview of Standard HHRA Framework

3.1.1 Problem Formulation

The first step in the SLHHRA process, as was the case in the assessment of the Project, is an information gathering and interpretation stage that plans and focuses the study on critical areas of concern. Problem formulation defines the nature and scope of the work to be conducted, permits practical boundaries to be placed on the overall scope of work and ensures that the assessment is directed at the key areas and issues of concern. This step is critical to the success of the SLHHRA as sound planning during the problem formulation step reduces the need for significant modifications once the SLHHRA has begun. The data gathered and evaluated in this step provides information into the physical layout and characteristics of the

assessment area, possible exposure pathways, potential human receptors, COCs, and any other specific areas or issues of concern to be addressed.

The key tasks that comprise the problem formulation step of this SLHHRA include the following:

- **Site characterization**, which consists of a review of available project-specific data to identify factors affecting the availability of chemicals to potential receptors;
- **Chemical characterization**, which involves the identification of the chemicals requiring further study, including a screening step which excludes those chemicals for which there are negligible risk;
- **Receptor characterization** to identify "receptors of concern", which include those individuals with the greatest probability of exposure to chemicals from the proposed facility and those that have the greatest sensitivity to these chemicals; and,
- **Identification of exposure scenarios and pathways** considers chemical-specific parameters, such as solubility and volatility, characteristics of the study area, such as physical geography, as well as the physiology and behaviour of the receptors.

The outcome of these tasks forms the basis of the approach taken in the SLHHRA.

3.1.2 Exposure Assessment

In a SLHHRA, the exposure assessment evaluates data related to all chemicals, receptors and exposure pathways and routes identified during the problem formulation phase. The assessment of potential occurrences of adverse effects from chemicals is based on the dose-response concept that is fundamental to the responses of biological systems to chemicals (Filov *et al*., 1979; Amdur *et al*., 1991). Since it is not usually practical to measure concentrations of chemicals at the actual site where the adverse response occurs within tissues and cells, these concentrations are estimated based on either the dose of the chemical that actually enters a receptor or, more commonly, by the concentrations in various environmental media that act as pathways for exposure. The degree of exposure of individuals to chemicals from the environment therefore depends on the interactions of a number of parameters, including:

- The concentrations of chemicals in various environmental media as determined by the magnitude of point sources as well as background or ambient concentrations;
- The characteristics of the COCs which affect environmental fate and persistence (*e.g.*, physical-chemical properties);
- The impact of site-specific characteristics in the local area, such as geology, geography and hydrogeology, on chemical behaviour;
- The physiological and behavioural characteristics of the receptors (*e.g.,* respiration rate, soils/dusts intake, time spent at various activities and in different environmental areas); and,
- The various physical, chemical and biological factors that determine the bioavailability of chemicals from various exposure pathways.

The primary objective of the exposure assessment was to predict, using a series of conservative assumptions, the rate of exposure of individuals living in the surrounding community (residential receptors) to the COCs through various exposure scenarios and pathways identified in the problem formulation step.

Given the nature of the Project under assessment, and that the primary source of COCs to the environment is *via* emissions to the atmosphere from the proposed facility expansion, the primary route of exposure for people is inhalation.

For the inhalation exposure assessment, specific rates of exposure were not calculated. Rather, human exposures have been conservatively assumed to be equal to ambient air concentrations (measured or modelled) of these substances (in $\mu g/m^3$). The inhalation assessment will evaluate health risks from short- and long-term exposures (*via* direct air inhalation only) for any chemicals selected for further study at each of the sensitive receptor locations in the surrounding community.

3.1.3 Hazard Assessment

The hazard assessment involves identifying and understanding potential health outcomes that can result from exposure to each of the COCs and the conditions under which the outcomes might be observed. The hazard, or toxicity, assessment methodology is based on the fundamental dose response principle. That is, the response of biological systems to chemical exposures increases in proportion to the concentration of a chemical in critical target tissues where adverse health outcomes may occur.

3.1.3.1 Dose-Response Approaches

Two basic and quite different chemical categories are commonly recognized by regulatory agencies, depending on the compound's mode of toxic action, and applied when estimating toxicological criteria for humans (FDA, 1982; US EPA, 1989). These are the *threshold approach* (or the no-observed-adverse-effect levels [NOAELs]/benchmark dose with extrapolation/uncertainty factor approach) typically used to evaluate non-carcinogens, and the *non-threshold approach* (or the mathematical model-unit risk estimation approach), typically used for carcinogenic compounds. While there are other possible dose response relationships that could be used to describe the toxicological outcome related to exposure to a given chemical (*e.g.*, a J-shaped or an inverted U-shaped dose response such as would occur under hormesis conditions), the standard threshold and non-threshold approaches are the standard dose response relationships evaluated in HHRAs of this type.

Threshold Response Chemicals: For most effects, it is thought that there is a dose-response threshold below which no adverse effects would be expected to occur. Thresholds are generally assumed for non-carcinogenic effects because, for these types of effects, it is generally believed that homeostatic, compensating, and adaptive mechanisms must be overcome before toxicity is manifested biologically or physiologically. A NOAEL can be identified for threshold chemicals, which is the dose or amount of the chemical that results in no observable response in the most sensitive test species and test endpoint. The application of uncertainty or safety factors to the NOAEL provides an added level of protection, allowing for derivation of a *toxicity reference value* (TRV) or exposure limit that is expected to be safe to sensitive individuals following exposure for a prescribed period of time. Exposure limits derived for threshold-response chemicals are called reference concentrations (RfC), reference doses (RfD), acceptable daily intakes (ADI), tolerable daily intakes (TDI) or permissible daily intakes (PDI) and are generally derived by regulatory agencies such as Health Canada and the US EPA. These values indicate doses of chemicals that individuals can be exposed to on a daily basis over an entire lifetime without appreciable risk of the occurrence of adverse health effects.

Non-threshold Response Chemicals: This means that any exposure greater than zero is assumed to have a non-zero probability of causing some type of response or damage. This relationship is typically used for chemicals that can cause cancer by damaging genetic material. Under a "non-threshold" assumption, any exposure has some potential to cause damage, so it is necessary to define an "acceptable" level of risk associated with these types of exposures.

The acceptable level of risk is an issue of policy rather than a scientific decision (CCME, 2006), and is set by regulatory agencies as opposed to risk assessors. Regulatory agencies have typically employed acceptable incremental lifetime cancer risk (ILCR) levels (*i.e.*, over and above baseline) between 1-in-100,000 and 1-in-1,000,000. An ILCR represents the incremental risk of an individual within a given population developing cancer over his or her lifetime due to exposures from a specific carcinogenic compound.

- Health Canada has specified an ILCR of 1-in-100,000, which is considered "essentially negligible" (Health Canada, 2021b).
- The Ontario MECP considers an ILCR of 1-in-1,000,000 per exposure pathway to be acceptable for human health risk assessments in the Province of Ontario (MOE, 2011).

ILCRs generally consider risks related to a particular project (the Project alone, excluding any contribution from other background or pre-existing sources) in that the cancer risks are expressed on an incremental or additional basis as compared to cancer risks related to all sources. The current SLHHRA is being conducted as part of an ESP in the Province of Ontario. As such, the ILCRs are reported relative to the Ontario acceptable ILCR of 1-in-1,000,000 (*i.e.*, one-in-one-million or 1×10^{-6}). This acceptable ILCR of 1-in-1,000,000 increases a person's lifetime cancer risk from 0.400000 (based on the existing 40% lifetime probability of developing cancer in Canada) to 0.400001.

Similar to an ILCR, the lifetime cancer risk (LCR) is an additional measure used to assess cancer. Unlike ILCRs, LCRs include the consideration of cancer risks from all sources including the particular facility under consideration. As such, LCRs are expressed on a total or all sources basis. MECP has indicated that it may be appropriate to consider cancer risks in this manner, which has been done in the current assessment. The MECP does not recommend an acceptable LCR for exposure to carcinogens associated with background or existing baseline conditions and, therefore, the LCR values (for "baseline" and "cumulative sources") are typically provided for reference only (MOE, 2011).

3.1.3.2 Exposure Limit Terminology

The terminology used to define threshold and non-threshold exposure limits differs according to the source/media and type of exposure, and often varies between regulatory jurisdictions. The following terms are used to describe exposure limits in the current assessment.

Reference concentration (RfC): The US EPA (2023) defines a reference concentration as *"…an estimate (with uncertainty spanning perhaps an order of magnitude) of a continuous inhalation exposure to the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a lifetime.*" It can be derived from a NOAEL, a low-observed-adverse-effect level (LOAEL), or benchmark concentration, with uncertainty factors generally applied to reflect limitations of the data used. A reference concentration refers to the acceptable level of an airborne chemical for which the primary route of exposure is inhalation, and applies to either acute (*i.e.*, less than 24 hours) or chronic (*i.e.*,

more than three months) exposure periods. The reference concentration is expressed as a concentration of the chemical in air (*i.e.,* micrograms per cubic metre, µg/m^3) and applies only to chemicals acting through a threshold mode of toxicological action.

For chemicals such as irritants and some combustion gases, short term or acute non-systemic toxicity is frequently observed at the points of entry into the body (*i.e.*, the respiratory tract, eyes, and skin, for airborne contaminants). In these cases, because the toxicity is enacted simply by direct contact between the receptor and the contaminated medium, the concentration in the air to which the receptor is exposed is the important measure of exposure, rather than the internal dose associated with multiple exposure pathways. For chemicals with these characteristics, short term RfCs are used to characterize health risk, and are intended to be protective of the general population.

Inhalation unit risk (IUR): The US EPA (2023) defines a unit risk value as "*…the upper-bound excess lifetime cancer risk estimated to result from continuous exposure to an agent at a concentration of 1 µg/L in water, or 1 µg/m^3 in air…"* The risks are referred to as "upper bound" because they are not likely to be underestimated and, in fact, may range from as low as zero to the upper bound value. A unit risk value of 3.0 x 10^{-5} per µg/m^3 would mean that under an upper worst-case estimate, three excess cancer cases would be expected to develop per one hundred thousand (100,000) people, if all 100,000 people were exposed every day for a lifetime to 1 µg of the chemical per m^3 of air.

Note that neither of the COCs considered in this assessment are considered to act via a carcinogenic mechanism. As such, IURs and the assessment of carcinogen related risks are not relevant to this SLHHRA and are not considered further.

3.1.3.3 Exposure Duration

The toxicity of a chemical has been observed to vary between acute (short term) and chronic (long term) exposure. Thus, it is important to differentiate TRVs based on duration of exposure.

The two TRV durations used in the current assessment can be described as follows:

- ***Acute:*** the amount or dose of a chemical that can be tolerated without evidence of adverse health effects on a short-term basis. These benchmarks are routinely applied to conditions in which exposures extend from minutes through several hours or several days only (ATSDR, 2006). For the current assessment, risks were evaluated based upon 1-hour and 24-hour exposure periods, where a relevant acute TRV, based on an acute toxicity endpoint, for that time period is available.
- ***Chronic:*** the amount of a chemical that is expected to be without effect, even when exposure occurs continuously or regularly over extended periods, possibly lasting for periods of at least a year, and possibly extending over an entire lifetime (ATSDR, 2006).

3.1.3.4 Benchmark Selection

For the SLHHRA, toxicological benchmarks were reviewed from a variety of regulatory agencies to select the most appropriate benchmark to represent the current science and relevance to the type of emissions from the proposed expansion. Many regulatory agencies recommend more than one benchmark depending on the overall chemical's toxicity and exposure duration – in

other words, they may have TRVs representing threshold or non-threshold modes-of-action, and acute or chronic TRVs representing short- or long-term exposures to the contaminant.
As it would be inappropriate to establish a generic hierarchy of source agencies by which to select TRVs given the breadth of chemicals evaluated in a typical SLHHRA, when TRVs for one of the chemicals were available from multiple regulatory agencies, all the TRVs were reviewed, and the professional judgment of experienced toxicologists was used to select the most appropriate TRV.

The most critical considerations in selecting TRVs were the source (it must have been derived by a reputable agency), the data used to derive the benchmark (*e.g.*, does it reflect the most sensitive endpoint, protect for the most sensitive individual, *etc.*), the date the TRV was derived (it must be as up to date as possible), and its relevance in terms of duration and route of exposure. Both the MECP (MOE, 2005; 2011) and Health Canada (2021) provide lists of acceptable jurisdictions that maybe be used to determine toxicity reference values. The TRVs employed in the assessment have been obtained from regulatory agencies such as:

- MECP;
- Health Canada;
- Canadian Council of Ministers of the Environment (CCME);
- World Health Organization (WHO);
- United States Environmental Protection Agency – Integrated Risk Information System (US EPA IRIS);
- Texas Commission on Environmental Quality (TCEQ);
- California Environmental Protection Agency (Cal EPA); and,
- Agency for Toxic Substances and Disease Registry (ATSDR).

3.1.4 Risk Characterization

The final step of a risk assessment is risk characterization. This involves the estimation, description, and evaluation of risk associated with exposure to COCs by comparing the estimated exposure to the appropriate reference benchmark or TRV for a specific chemical or group of compounds. Risk characterization involves the comparison of estimated exposures (identified in the exposure assessment) with reference benchmarks or TRVs (identified during the hazard/toxicity assessment) to identify the potential for elevated human health risks. This comparison is typically expressed as a Concentration Ratio (CR) or Hazard Quotient (HQ) for non-carcinogenic chemicals and is calculated by dividing the predicted exposure by the reference benchmark/TRV. In the case of direct acting non-threshold carcinogenic chemicals, potential risks are expressed as incremental lifetime cancer risks (ILCRs) and represent the incremental risk of an individual within a given population developing cancer over his or her lifetime due to exposures from a specific carcinogenic chemical of concern. For this SLHHRA, as neither of the included COCs are considered to act via a carcinogenic mechanism, ILCRs will not be calculated as part of this assessment.

Separate assessments were completed for short term (acute) and long term (chronic) durations because the health outcomes produced by some COCs depend on the duration of exposure. It is important to distinguish between the health outcomes that might result from short-term exposures *versus* effects that may occur following long-term exposures.

In recognition of the influence of these exposure variables, risk estimates of inhalation of exposures were segregated into:

- Short-term inhalation (1-hour or 24-hour durations); and,
- Long-term inhalation (annual average durations).

3.1.4.1 Concentration Ratios (CRs) for Non-Carcinogens

Concentration Ratios (CR)

Concentration Ratios or CR values were used to evaluate the acute and chronic health risk from exposure to chemicals *via* inhalation. CR values have been calculated by dividing the predicted air concentration (for 1-hour, 24-hour, or annual average exposure durations) by the appropriate toxicity reference value (*i.e.*, RfC), according to the following example equation:

$$CR_{duration} = \frac{[Air]_{duration}}{RfC_{duration}}$$

Where:

$CR_{duration}$	=	the duration-specific *CR* (unitless), calculated for acute and chronic durations, as appropriate
$[Air]_{duration}$	=	the predicted air concentration (µg/m^3) for the specific time duration
$RfC_{duration}$	=	the RfC (µg/m^3) for the specific time duration

For a chemical expected to be present in a single environmental media, such as the case with many gases which occur only or predominately in ambient air, a benchmark representing the entire exposure limit (*i.e.*, a CR value of 1.0) is considered appropriate. Therefore, a CR value of 1.0 (*i.e.*, 100% of the exposure limit) was used as acceptable CR value in the inhalation assessment. Acute and chronic CR values less than the selected benchmark (*i.e.*, CR ≤1.0), indicate that predicted concentrations of the chemical in air were less than the applicable inhalation exposure limit (*e.g.*, RfC) and that adverse health effects would not be expected to occur.

When predicted risks are greater than the inhalation benchmark level (*i.e.*, CR > 1.0), this indicates the potential for adverse health outcomes may exist. This outcome is referred to as an "exceedance" (*i.e.*, the predicted ground-level air concentration is greater than, or exceeds, the corresponding inhalation exposure limit for that averaging period). Re-evaluation of such CR estimates is important since both the exposure estimates and the toxicological criteria are based on a series of conservative assumptions, particularly when considering the maximum "worst-case" exposure scenarios.

In general, interpretation of the CR values proceeded as follows:

CR ≤1:

Signifies that the estimated exposure is less than or equal to the selected benchmark (*i.e.*, the assumed safe level of exposure). This situation is generally indicative of a negligible likelihood of adverse health effects due to inhalation. Typically, a significant degree of conservatism is incorporated during the derivation of a TRV and, therefore, if predicted exposures (under a worst case or highly conservative set of conditions) are less than a properly derived TRV, it can reasonably be concluded that adverse health effects are not expected. An exception to this may be in the evaluation of certain criteria air contaminants where no threshold for effects has been identified.

CR >1:

Signifies that the exposure estimate exceeds the selected benchmark. This suggests that the potential for an elevated level of risk of adverse health effects may be present for a particular chemical and triggers an additional evaluation. The significance of a CR above 1 must be balanced against the degree of conservatism incorporated in the risk assessment (*e.g.,* an accounting of the number of assumptions used within the risk assessment that tend to overestimate, rather than underestimate, exposure, and potential health risks).

4.0 PROBLEM FORMULATION

The current assessment followed standard risk assessment methods and was conducted consistent with the risk assessment procedures endorsed by regulatory agencies including Health Canada and the US EPA, as well as guidance provided by the MECP.

4.1 Proposed Expansion

The Project is a simple cycle natural gas fired peaking power plant which would provide the provincial grid and IESO with reliable and responsive peaking power supply. The Project will be located within the EWCC fence line and will share some existing infrastructure and services but will be owned and operated by a separate Capital Power entity. The Project is IESO-contracted, metered, and dispatched independently of the EWCC.

Key project components include one General Electric (GE) 7E.03 simple cycle gas turbine generator, and all associated infrastructure including an inlet air filter, exhaust stack, fuel gas compressor, natural gas handling system, instrumentation and control systems, and a Generator Step-Up (GSU) transformer. Natural gas will be supplied to the Project from a high-pressure fuel gas pipeline originating from the existing EWCC Enbridge operated gas yard. Ancillary project components include an equipment building, storage building, stormwater management system (SWM) and site servicing.

The gas turbine will include a dedicated exhaust stack and is the primary source of emissions associated with the Project. This exhaust stack will be approximately 3.4 m by 6.1 m and 22.5 m above grade. The Project will utilize emission control technology, specifically low NOx burners on the gas turbine generator. The modular system has a relatively small footprint, allows for timely installation and commissioning, and has an approximate 10-20-minute start-up time. Figure 3-1 illustrates site layout.

Similar to the EWCC, the Project is expected to run infrequently as a peaking facility, and it must operate for less than 1,500 hours annually. Dispatch forecasting suggests that the unit may run less than 150 hours annually, with an average run time of approximately 2 to 4 hours. While the expansion is co-located adjacent to the EWCC, the two facilities are expected to operate independently. Both are peaker plants, and both would be available for dispatch by the IESO to fulfil system demands. It is unlikely that both the EWCC and the expansion will operate concurrently.

The Project will also be capable of Peak Firing during periods of time when higher system demand (as requested by the IESO) is required. The need for Peak Firing may be realized during extreme conditions when additional output is needed. Peak Firing leads to increased equipment maintenance given the increased firing temperatures and wear on system components. Given the stress Peak Firing places on the equipment, it is only intended to be used when required and for limited period of time to meet system needs.

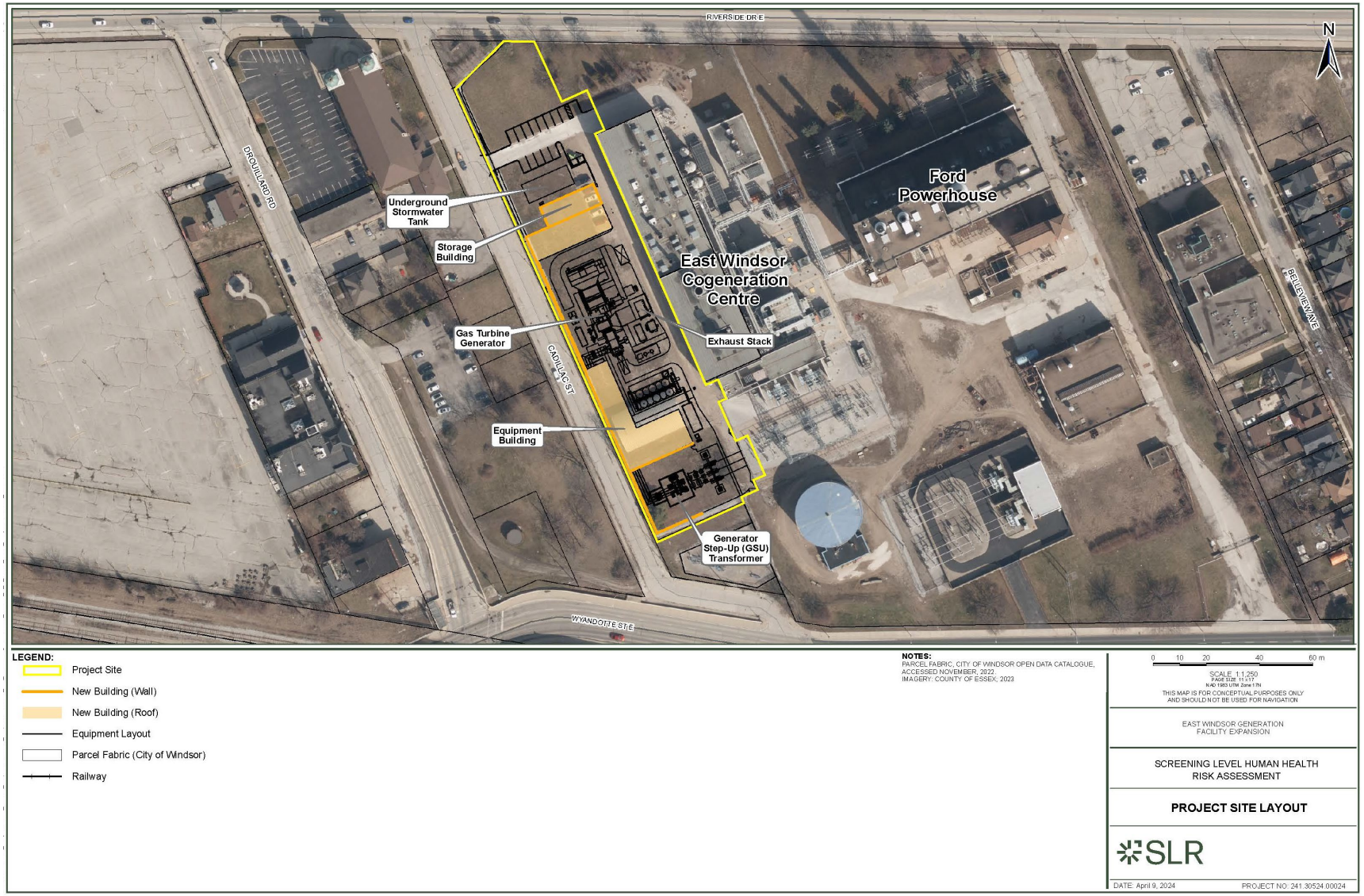


Figure 4-1 Project Site Layout (SLR, 2024)

4.1.1 Proposed Locations for Sensitive Receptors

Relying on predicted ground-level air concentrations at the maximum point of impingement (MPOI) from an emission source to evaluate human health risks, particularly long-term risks, is considered a very conservative (*i.e.*, highly protective) approach. By definition, predicted ground-level air concentrations at all other locations are lower than those predicted at the MPOI. As such, the standard risk assessment approach is to also evaluate exposures and potential health risks at several specific sensitive receptor locations beyond the MPOI in the community surrounding the Project-specific emission sources.

To complete the air dispersion modelling, the air quality assessment assumed a spatial boundary composed of a 16 x 16 km receptor grid. Within this grid, fifteen (15) sensitive receptor locations were selected to evaluate potential impacts from the proposed project within the surrounding community from all wind directions. Table 4-1 provides a list of the sensitive receptor locations, while Figure 4-2 provides a map of their locations with respect to the proposed Project and the existing EWCC facility.

Table 4-1 List of Sensitive Receptor Locations

Receptor ID	Description of Sensitive Receptor
R1	Residential House
R2	Residential House
R3	Residential House
R4	Rivershore Tower Apartments – Skyline Living
R5	Shoreview at Riverside
R6	Water's Edge Event Centre
R7	Arcadian Apartments
R8	Residential House
R9	Lifetimes on Riverside
R10	Club Lofts Condominium
R11	Drouillard Place Terrace
R12	Palazzo Apartments
R13	Summit House
R14	Alexander Park – Hazelview Properties
R15	Lions Manor Apartment

Note: Rows shaded in blue represent sensitive receptor locations with the worst-case predicted air concentrations in proximity to the proposed Project and existing EWCC facility.

Dispersion modelling was used to select sensitive receptors R1 through R4 to represent worst case predicted concentrations and sensitive features surrounding the Project site (SLR, 2024), and were the focus of this SLHHRA (see blue rows in Table 4-1). These locations were three nearby residential homes (R1 through R3) and the Rivershore Tower Apartments (R4). Note that the worst-case receptor location modelled for the apartments identified for R4 were at an elevated height and not ground level like other receptors.

Figure 4-2 Location of Sensitive Receptor Locations surrounding Proposed Facility (SLR, 2024)

4.2 Identification of Chemical of Concern

As discussed previously, the specific focus of the SLHHRA was to address potential concerns with respect to emissions of $PM_{2.5}$ and NOx released from the Project. In particular, the SLHHRA will focus on assessing the Project Alone impacts, as well as cumulative exposures to the surrounding community from the existing regional background concentrations, emissions from the existing EWCC, and the Project for these two COCs.

While other criteria air contaminants such as carbon monoxide and sulphur dioxide were evaluated in the Air Quality Assessment (SLR, 2024), cumulative concentrations were negligible and as such were not carried forward to the SLHHRA. Similarly, the emissions of other potential contaminants of concern, such as VOCs, PAHs, and metals, were considered very low and below a level indicative of potential human health concern. As such, the current assessment focused on NOx and $PM_{2.5}$ as the key chemicals of concern.

The size of the airborne particles to which people are exposed is one of the most important aspects in determining the potential for health risk resulting from PM exposure. Size is directly related to where particles will be deposited in specific parts of the respiratory tract. Particles larger than about 10 microns (*μm*) in aerodynamic diameter (>PM_{10}) are deposited almost exclusively in the nose, throat, and upper respiratory tract, and tend to be coughed out over a very short period of time. This size range is considered outside the inhalable range for people, since these particles are too large to be deposited in the lung. Health effects associated with particles greater than PM_{10} are considered less critical compared to fractions less than 10 microns in size since they are less likely to be absorbed into the body *via* inhalation. Fine and ultrafine particles (<2.5 μm), on the other hand, are small enough to reach the alveoli (air spaces) deep in the lungs. In general, it may be assumed that the smaller the particle, the greater the potential to reach respiratory structures such as alveoli where blood-gas exchange occurs. Inhaled fine and ultrafine particles can also carry adsorbed chemical pollutants to the deeper lung structures. Smaller particles tend to be present in greater numbers, and they possess a greater total surface area than larger particles of the same mass.

The potential impacts of human exposure to the respirable fraction of PM (*i.e.*, $PM_{2.5}$ and PM_{10}) were emphasized in the current SLRHHRA, rather than the broader size fraction represented by total suspended particulate (*i.e.*, TSP, comprising particles ranging up to 44 μm in size). The inhalable fraction (*i.e.*, PM_{10}) is also widely used to evaluate potential health issues, since this size of particle primarily affects tissues in the upper airways but can also travel deep into the lung. When both sets of data are available (PM_{10} and $PM_{2.5}$), the $PM_{2.5}$ data tends to carry more weight in determining the potential for health risks because of the large body of scientific literature characterizing both the epidemiological and toxicological properties of the finer size fraction. As such, this assessment focuses on the health implications of $PM_{2.5}$ emissions from the Project.

4.3 Identification and Selection of Human Receptors

A human receptor is a hypothetical person who resides and/or works in the area being investigated and is, or could potentially be, exposed to the chemicals identified as being of potential concern. For the current assessment, one specific group of sensitive receptors was evaluated – the residential receptor. Due to the residency time at a given receptor location (*i.e.*, conservatively assumed to be present 24-hours per day and 365 days per year), the residential receptor group is considered to have the highest potential exposure and resultant health risk from chemicals emitted from the Project. Due to this conservatism, this receptor group will also account for those sensitive individuals who may be present at other land uses throughout the Study Area (*e.g.*, hospitals, daycares, schools, retirement homes, *etc.*).

The residential receptor was assumed to be born in the Windsor Area with the facility operating, and conservatively assumed to live at that location close to the facility (*i.e.*, R1, R2, R3, or R4 per Figure 4-2) for their entire lifetime (*i.e.*, 80 years). The individual was assumed to be exposed *via* inhalation of ambient air to emissions from the proposed facility (and other nearby significant sources).

For the assessment of inhalation risks, as a straight comparison between predicted short term (*i.e.*,1-hour and 24-hour exposure durations) and long term (*i.e.*, annual average exposures) air concentrations and the corresponding regulatory benchmark is made, the resulting CR value is receptor-independent (*i.e.*, the same value is calculated for all receptor age groups).

4.4 Identification of Exposure Scenarios and Pathways

4.4.1 Exposure Scenarios

For the current assessment, only one exposure scenario was evaluated: residential exposure to cumulative air concentrations arising from the Project in combination with the existing EWCC and regional background contributions for the two COCs identified for evaluation in this SLHHRA.

To evaluate this scenario, chemical-specific concentrations were modelled for each of the four most sensitive receptor locations (R1, R2, R3, and R4) based upon the emission profile for both the existing EWCC (part of background conditions) and the proposed Project (*i.e.*, Project Alone concentrations).

4.4.2 Exposure Pathways

The primary exposure pathway evaluated in the HHRA was the inhalation of the COCs by individuals living in the surrounding community.

Figure 4-3 illustrates the Conceptual Site Model (CSM) used in the assessment and provides an overview of the sources of COCs and the exposure pathways associated with these sources that are considered in the SLHHRA.

For the sake of conservatism, individuals at each of the assessed receptor locations were assumed to spend 24 hours per day, 7 days per week, for 52 weeks per year at this location. This is obviously an overestimation of potential exposures as individuals are not expected to live their entire life in their home and never leave.

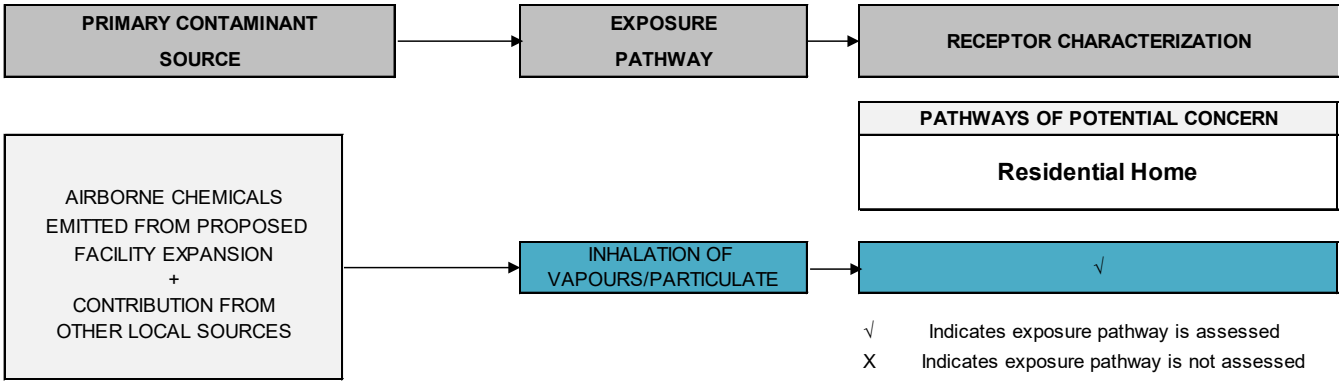


Figure 4-3 Conceptual Site Model (CSM) for Assessment

5.0 EXPOSURE ASSESSMENT

The magnitude of exposure of human receptors to chemicals in the environment typically depends on the interactions of a number of parameters, including:

- The concentrations of chemicals in various environmental media (as determined by the quantities of chemicals entering the environment from various sources, their persistence, fate and behaviour in these media, and the normal ambient, or background concentrations that exist independent of a specific source);
- The physical-chemical characteristics of the chemicals of concern, which affect their environmental fate, transport, behaviour and persistence, and determine the degree or extent by which chemicals can be absorbed into the body;
- The influence of site-specific environmental characteristics, such as geology, soil type, topography, hydrology, hydrogeology, local meteorology and climatology, *etc.*, on a chemical's fate, transport and behaviour within environmental media;
- The physiological and behavioural characteristics of the receptors (*e.g.,* respiration rate, soils/dusts intake rate, food ingestion rates, time spent at various activities and in different areas); and,
- The various exposure pathways for the transfer of the chemicals from the different environmental media to humans (*e.g.,* inhalation of indoor and outdoor air, soil particles and dusts; ingestion of food items, water, soils/dusts; skin penetration of various chemicals from dermal contact with soil/dust, water, sediments).

5.1 Estimation of Local Background Conditions

SLR (2024) completed a review of MECP and National Air Pollution Surveillance (NAPS) ambient monitoring stations in the Windsor area, and identified the following monitoring station near the Project which could be considered representative of background air quality concentrations:

- Windsor Downtown (ID: 12008), Address: 467 University Ave. W. Years: 2018-2022, COCs: $PM_{2.5}$, NOx, CO, SO_2

The Windsor Downtown station is 3.68 km slightly southwest of the Project site.

Data from this station was used by SLR's Air Quality Assessment team to calculate the chemical-specific regional background air concentrations, including 1-hour, 24-hour, and annual average, for use in the SLHHRA. These values are included in Tables 5-1 and 5-2 for NOx and $PM_{2.5}$, respectively. For the 24-hour background concentration, the 90th percentile of all the background concentrations of each parameter collected from all the data sources was used. The average of all the background concentrations from the specified period was used to calculate the annual average background concentration for each relevant COC. Refer to the Air Quality Assessment report (SLR, 2024) for specific details on the background data collection and interpretation process.

5.2 Estimation of Ambient Ground-Level Air Concentrations

Ground-level air concentrations for each of the COCs at the worst-case residential sensitive receptor locations were estimated by the SLR Air Quality Assessment team for use in the SLHHRA. Refer to the Air Quality Assessment report (SLR, 2024) for detailed information on the emissions inventory, assumptions, and air dispersion modelling used to predict ground-level air concentrations for both the Project Alone (*i.e.*, proposed facility-emitted) and existing EWCC

(used to predict existing background concentrations in conjunction with regional background concentrations from the Windsor Downtown station) at the four identified sensitive receptor locations.

Table 5-1 provides the average and worst-case (*i.e.*, maximum) 1-hour, 24-hour, and annual average air concentrations of NOx for regional background, existing EWCC, Project Alone, and cumulative under modelled Scenario A (*i.e.*, 100% load normal operations). Table 5-2 provides the average and worst-case/maximum 24-hour and annual average air concentrations of $PM_{2.5}$ for regional background, existing EWCC, Project Alone, and cumulative again under modelled Scenario A (*i.e.*, 100% load normal operations). In both cases, the cumulative concentration represents the predicted average or worst-case/maximum concentrations for the existing EWCC added to those concentrations predicted for that same time period for the proposed project (*i.e.*, to ensure similar meteorological conditions are evaluated), and added to the regional background concentration from the Windsor Downtown MECP station.

Pollutants like NOx have 1-hour regulatory standards because their effects can be acute and rapid, while regulatory agencies typically do not establish 1-hour benchmarks for $PM_{2.5}$ due to the variability in sources and meteorological conditions. As such, 1-hour health effects were only evaluated for NOx in the current SLHHRA.

Table 5-1 Predicted Average and Maximum 1-hour, 24-hour, and Annual Average Background, Facility-specific, and Cumulative NOx Concentrations at Worst-case Receptor Locations

Sensitive Receptor	Statistic	Predicted Air Concentration (µg/m³)											
		1-hour				24-hour				Annual Average			
		Regional Background [a]	Existing EWCC	Project Alone	Cumulative	Regional Background [a]	Existing EWCC	Project Alone	Cumulative	Regional Background [a]	Existing EWCC	Project Alone	Cumulative
R1	Average	46	0.16	0.020	46.2	42	0.16	0.020	42.2	18	0.16	0.020	18.2
	Maximum		13.6	1.5	61.0		2.4	0.29	44.6		0.20	0.023	18.2
R2	Average		0.17	0.018	46.2		0.17	0.018	42.2		0.17	0.018	18.2
	Maximum		81.3	7.1	134.4		9.3	0.30	51.3		0.21	0.019	18.2
R3	Average		0.073	0.010	46.1		0.073	0.010	42.1		0.073	0.010	18.1
	Maximum		61.6	7.3	114.9		3.2	0.31	45.2		0.09	0.012	18.1
R4	Average		0.66	0.049	46.7		0.66	0.049	42.7		0.66	0.049	18.7
	Maximum		67.9	14.5	124.7		20.6	1.5	63.2		0.78	0.056	18.8

[a] Regional background concentrations represent the 90th percentile ambient concentrations for the Windsor Downtown MECP monitoring station.

Table 5-2 Predicted Average and Maximum 24-hour and Annual Average Background, Facility-specific, and Cumulative $PM_{2.5}$ Concentrations at Worst-case Receptor Locations

Receptor	Statistic	Predicted Air Concentration (µg/m³)							
		24-hour				Annual Average			
		Regional Background [a]	Existing EWCC	Project Alone	Cumulative	Regional Background [a]	Existing EWCC	Project Alone	Cumulative
R1	Average	13	0.016	0.0025	13.0	9	0.016	0.0025	9.0
	Maximum		0.24	0.037	13.3		0.020	0.0029	9.0
R2	Average		0.017	0.0022	13.0		0.017	0.0023	9.0
	Maximum		0.93	0.038	13.9		0.021	0.0024	9.0
R3	Average		0.0073	0.0013	13.0		0.0073	0.0013	9.0
	Maximum		0.32	0.039	13.3		0.0085	0.0016	9.0
R4	Average		0.066	0.0065	13.1		0.066	0.0065	9.1
	Maximum		2.1	0.21	15.1		0.078	0.0073	9.1

[a] Regional background concentrations represent the 90th percentile ambient concentrations for the Windsor Downtown MECP monitoring station.

6.0 HAZARD ASSESSMENT

All chemicals have the potential to cause toxicological effects; however, it is the chemical concentration, the route of exposure, the duration of exposure, and the inherent toxicity of the chemical that determines the level of effect and hence the potential for adverse health effects. The sensitivity of a person (genetic or otherwise) to a particular chemical also contributes to the effect. Toxicity Reference Values (TRVs) which incorporate all these factors are used to characterize health risks in the assessment and the values selected are presented in this Section.

As noted previously, the toxicity of a chemical has been observed to vary between acute (short term) and chronic (long term) exposure. Thus, it is important to differentiate TRVs based on duration of exposure as follows:

- ***Acute:*** the amount or dose of a chemical that can be tolerated without evidence of adverse health effects on a short-term basis. These benchmarks are routinely applied to conditions in which exposures extend from minutes through several hours or several days only (ATSDR, 2006). For the current assessment, risks were evaluated based on the 1-hour and 24-hour exposure period where a relevant acute TRV, based on an acute toxicity endpoint, for that time period is available.
- ***Chronic:*** the amount of a chemical that is expected to be without effect, even when exposure occurs continuously or regularly over extended periods, possibly lasting for periods of at least a year, and possibly extending over an entire lifetime (ATSDR, 2006).

When TRVs for one of the chemicals were available from multiple regulatory agencies, all the TRVs were reviewed, and the professional judgment of experienced toxicologists was used to select the most appropriate TRV.

The most critical considerations in selecting TRVs were the source (it must have been derived by a reputable agency), the data used to derive the benchmark, the date the TRV was derived (it must be as up to date as possible), and its relevance in terms of duration and route of exposure.

A summary of the TRVs used for inhalation assessment is provided in Table 6-1. Again, it is noted that as neither of the included COCs are considered to act via a carcinogenic mechanism, carcinogenic TRVs are not relevant to this assessment, and only non-carcinogenic TRVs are provided.

Table 6-1 Summary of Inhalation TRVs and Benchmarks Selected for Use in the HHRA

Chemical of Concern	Non-Carcinogenic Inhalation TRVs (µg/m^3)			
	Duration	***Value***	***Critical Effect***	***Source***
Nitrogen Oxides (NOx)	1-hour	50	Decreased lung function and increased airway responsiveness in asthmatics	Health Canada (2015)
	24-hour	25	All-cause non-accidental mortality and asthma hospital admissions and emergency room visits	WHO (2021)
	Annual Average	10	Based on all non-accidental mortality and cause-specific, respiratory mortality	WHO (2021)
$PM_{2.5}$	24-hour	15	All-cause non-accidental mortality and cause specific mortality (cardiovascular, non-malignant respiratory, cerebrovascular)	WHO (2021)
	Annual Average	5	All non-accidental mortality and cause-specific mortality (circulatory, non-malignant respiratory mortality, lung cancer)	WHO (2021)

7.0 RISK CHARACTERIZATION

The final step of the SLHHRA is risk characterization which involves the estimation, description, and evaluation of risk associated with exposure to chemicals by comparing the estimated exposure to the TRV for a specific chemical or group of compounds to identify potential human health risks. This comparison is typically expressed as a CR for non-carcinogenic chemicals and is calculated by dividing the predicted exposure by the TRV.

The following sections provide the worst-case short- and long-term human health risk estimates for both Project Alone and Cumulative conditions at the four sensitive receptor locations.

As presented in Section 3.1.4.1, CR values were used to evaluate short- and long-term health risks resulting from exposures to COC *via* inhalation. CR values were calculated by dividing the predicted ground-level air concentration (Section 5.1) by the appropriate health-based reference benchmark (Section 6.0).

In general, a CR value less than or equal to one (CR value ≤1) represents a situation where the predicted ground-level air concentration is less than a corresponding health-based reference benchmark. Considering the various assumptions applied to understand exposure concentrations are geared to over predicting rather than under predicting ground-level air concentrations, and given the typical uncertainty factors applied during the development of a health-based TRV mean these values are conservative in nature, a CR value less than or equal to one (CR value ≤ 1) is a strong indicator of negligible health risks resulting from exposure to a particular COC.

A CR value greater than one (CR value > 1) is indicative of a scenario whereby the predicted ground level air concentration is greater than the corresponding health-based reference benchmark, suggesting that the potential for an adverse health effect may be present. The significance of the exceedance must be balanced against the degree of conservatism incorporated in the derivation of the TRVs, as well as the predicted ground-level concentrations.

7.1 Inhalation Assessment

Table 7-1 presents worst-case inhalation risk estimates (expressed as CR values) for short-term (*i.e.*, 1- and 24-hour) and chronic (annual average) exposures to oxides of nitrogen at each of the top four sensitive receptor locations, while Table 7-3 presents worst-case inhalation risk estimates (expressed as CR values) for short-term (*i.e.*, 24-hour) and chronic (annual average) exposures to $PM_{2.5}$ at each of the top four sensitive receptor locations.

7.1.1 Oxides of Nitrogen

Results of the assessment show that existing 90th percentile regional background concentrations of NOx already either approach (in the case of 1-hour) or exceed (in the case of the 24-hour and annual average) levels that could pose a potential health risk to sensitive individuals living in this area of Windsor. Worst-case short-term (*i.e.*, 1- or 24-hour time periods) contributions of the existing EWCC facility, as well as the proposed Expansion, then add the existing elevated background concentrations; however, when one considers the average contribution of these two facilities, short-term contributions to the cumulative NOx concentrations at the worst-case receptor locations are minimal compared to regional background.

As can be seen in Table 7-2, on average, the contribution from the proposed Project to cumulative acute exposures and risks (i.e., 1-hour and 24-hour) for NOx ranged from 0.022% to 0.12%. When considering the worst-case maximum exposures, the contribution from the proposed Project to cumulative acute exposures and risks for NOx ranged from 0.15% to 13.7%.

This is further illustrated when you refer to the sorted hourly frequency graphs for sensitive receptor locations R2 and R4 provided by Figure 7-1 which demonstrates that over a five-year period, exceedances of the health-based benchmark are infrequent and entirely driven by regional background concentrations (*i.e.*, cumulative 1-hour concentrations exceeded the health-based benchmark 1% and 4% of the time at location R2 and R4, respectively).

When evaluating chronic exposure, while regional background concentrations already exceed the health-based benchmark in the Windsor area, the existing EWCC facility and the proposed Project provide a minimal contribution to the overall cumulative concentrations predicted for the surrounding sensitive receptor locations (*i.e.*, the worst-case project contribution is 0.3% of the regional background concentration). It is also important to note that worst-case ambient concentration contributions from the Project are based on rare meteorological conditions. Given this is a planned peaker facility which is only intended to run at most 150 hours annually, it is highly unlikely that the plant would be running during these rare meteorological conditions that result in worst-case ambient concentrations.

As can be seen in Table 7-2, on average, the contribution from the proposed Project to cumulative chronic exposures and risks (i.e., annual) for NOx ranged from 0.057% to 0.26%. When considering the worst-case maximum exposures, the contribution from the proposed Project to cumulative chronic exposures and risks for NOx ranged from 0.068% to 0.30%.

Table 7-1 Predicted Concentration Ratio Estimates of Background, Facility-specific and Cumulative Short-term and Long-term Exposures to NOx at Worst-case Receptor Locations

Sensitive Receptor	Statistic	Predicted Concentration Ratio (CR) [a]											
		1-hour				24-hour				Annual Average			
		Regional Background	Existing EWCC	Project Alone	Cumulative	Regional Background	Existing EWCC	Project Alone	Cumulative	Regional Background	Existing EWCC	Project Alone	Cumulative
R1	Average	0.92	0.0033	0.00040	0.92	1.7	0.0066	0.00080	1.7	1.8	0.016	0.0020	1.8
	Maximum		0.27	0.030	1.2		0.10	0.012	1.8		0.020	0.0023	1.8
R2	Average		0.0033	0.00035	0.92		0.0067	0.00071	1.7		0.017	0.0018	1.8
	Maximum		1.6	0.14	2.7		0.37	0.012	2.1		0.021	0.0019	1.8
R3	Average		0.0015	0.00021	0.92		0.0029	0.00041	1.7		0.0073	0.0010	1.8
	Maximum		1.2	0.15	2.3		0.13	0.0123	1.8		0.0085	0.0012	1.8
R4	Average		0.013	0.0010	0.93		0.027	0.0020	1.7		0.066	0.0049	1.9
	Maximum		1.4	0.29	2.5		0.83	0.061	2.5		0.078	0.0056	1.9

Note: Shaded cells indicate concentrations that exceed the relevant health-based benchmark.

[a] As discussed in Section 3.1.4.1, Concentration Ratio values are calculated by taking the air concentration (as shown in Table 5-1) and dividing it by the applicable health-based guideline (as shown in Table 6-1) to provide a quantification of potential risks associated with those estimated exposures. The 1-hour CR value is based on the Health Canada (2015) acute benchmark of 50 µg/m^3, the 24-hour CR value is based on the WHO (2021) acute benchmark of 25 µg/m^3, and the annual average CR value is based on the WHO (2021) chronic benchmark of 10 µg/m^3.

Table 7-2 Predicted Incremental Increase in Risk Estimates for Project Alone compared to Cumulative Risks for NOx at Worst-case Receptor Locations

Sensitive Receptor	Statistic	1-hour	24-hour	Annual Average
R1	Average	0.043%	0.047%	0.11%
	Maximum	2.2%	0.52%	0.13%
R2	Average	0.038%	0.042%	0.10%
	Maximum	5.6%	0.058%	0.093%
R3	Average	0.022%	0.025%	0.057%
	Maximum	6.8%	0.088%	0.068%
R4	Average	0.10%	0.11%	0.26%
	Maximum	9.5%	0.89%	0.30%

Note: Incremental increase percentage is calculated based on (Cumulative – Existing Background) / Existing Background, where Existing Background = Regional Background + Existing EWCC.

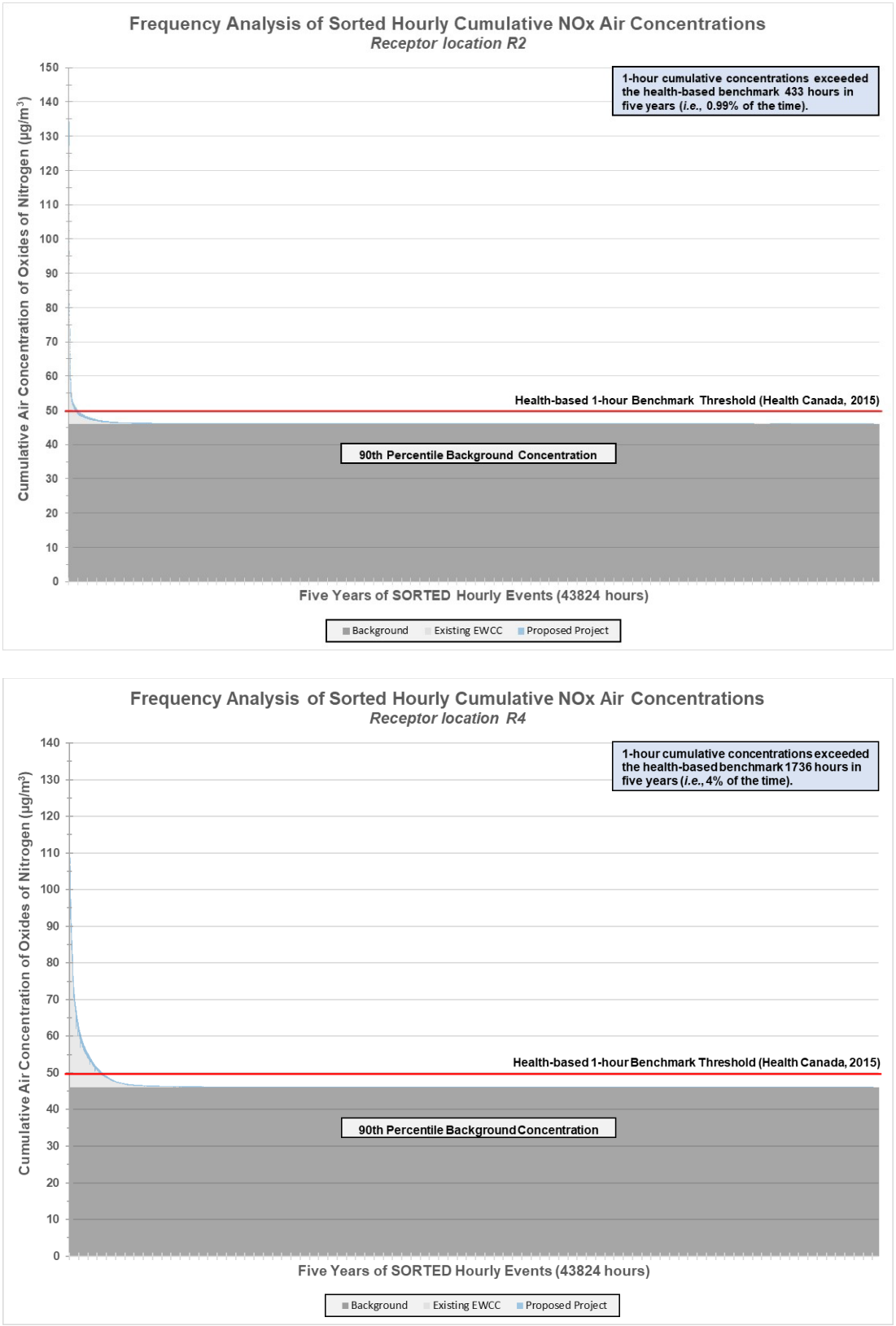


Figure 7-1 Sorted Hourly Frequency Plots for Cumulative NOx Air Concentrations at Receptor Locations R2 and R4

7.1.2 Fine Particulate Matter ($PM_{2.5}$)

Results of the assessment show that existing 90th percentile regional background concentrations of $PM_{2.5}$ already either approach (in the case of 24-hour) or exceed (in the case of the annual average) levels that could pose a potential health risk to sensitive individuals living in this area of Windsor. In the case of short-term (24-hour) exposures, the cumulative concentrations predicted at the surrounding sensitive receptor locations do not exceed the corresponding health-based benchmark, even under worst-case conditions.

Table 7-3 Predicted Concentration Ratio Estimates of Background, Facility-specific and Cumulative Short-term and Long-term Exposures to $PM_{2.5}$ at Worst-case Receptor Locations

		Predicted Concentration Ratio (CR) [a]							
		24-hour				Annual Average			
Receptor	Statistic	Regional Background	Existing EWCC	Project Alone	Cumulative	Regional Background	Existing EWCC	Project Alone	Cumulative
R1	Average	0.87	0.0011	0.00017	0.87	1.8	0.0033	0.00051	1.8
	Maximum		0.016	0.0024	0.88		0.0039	0.00058	1.8
R2	Average		0.0011	0.00015	0.87		0.0033	0.00045	1.8
	Maximum		0.062	0.0026	0.93		0.0042	0.00047	1.8
R3	Average		0.00049	0.000088	0.87		0.0015	0.00026	1.8
	Maximum		0.021	0.0026	0.89		0.0017	0.00031	1.8
R4	Average		0.0044	0.00043	0.87		0.013	0.0013	1.8
	Maximum		0.14	0.014	1.0		0.016	0.0015	1.8

Note: Shaded cells indicate concentrations that exceed the relevant health-based benchmark.

[a] As discussed in Section 3.1.4.1, Concentration Ratio values are calculated by taking the air concentration (as shown in Table 5-1) and dividing it by the applicable health-based guideline (as shown in Table 6-1) to provide a quantification of potential risks associated with those estimated exposures. The 24-hour CR value is based on the WHO (2021) acute benchmark of 15 µg/m^3, and the annual average CR value is based on the WHO (2021) chronic benchmark of 5 µg/m^3.

As can be seen in Table 7-4, on average, the contribution from the proposed Project to cumulative acute exposures and risks (i.e., 24-hour) for $PM_{2.5}$ ranged from 0.010% to 0.050%. When considering the worst-case maximum exposures, the contribution from the proposed Project to cumulative acute exposures and risks for $PM_{2.5}$ ranged from 0.03% to 0.54%.

This is further illustrated when you refer to the sorted hourly frequency graphs for worst-case sensitive receptor location R4 provided by Figure 7-2 which demonstrates that over a five-year period, exceedances of the health-based benchmark are highly infrequent and entirely driven by regional background concentrations. In this case, cumulative 24-hour concentrations marginally exceeded the health-based benchmark once (*i.e.*, 15.1 versus 15 µg/m^3) over a five-year period (or 0.05% of the time).

When evaluating chronic exposure, while regional background concentrations already exceed the health-based benchmark in the Windsor area, the existing EWCC facility and the proposed Project provide a negligible contribution to the overall cumulative concentrations predicted for the surrounding sensitive receptor locations (*i.e.*, the worst-case project contribution is 0.08% of the regional background concentration).

As can be seen in Table 7-4, on average, the contribution from the proposed Project to cumulative chronic exposures and risks (i.e., annual) for $PM_{2.5}$ ranged from 0.015% to 0.072%. When considering the worst-case maximum exposures, the contribution from the proposed Project to cumulative chronic exposures and risks for $PM_{2.5}$ ranged from 0.017% to 0.075%.

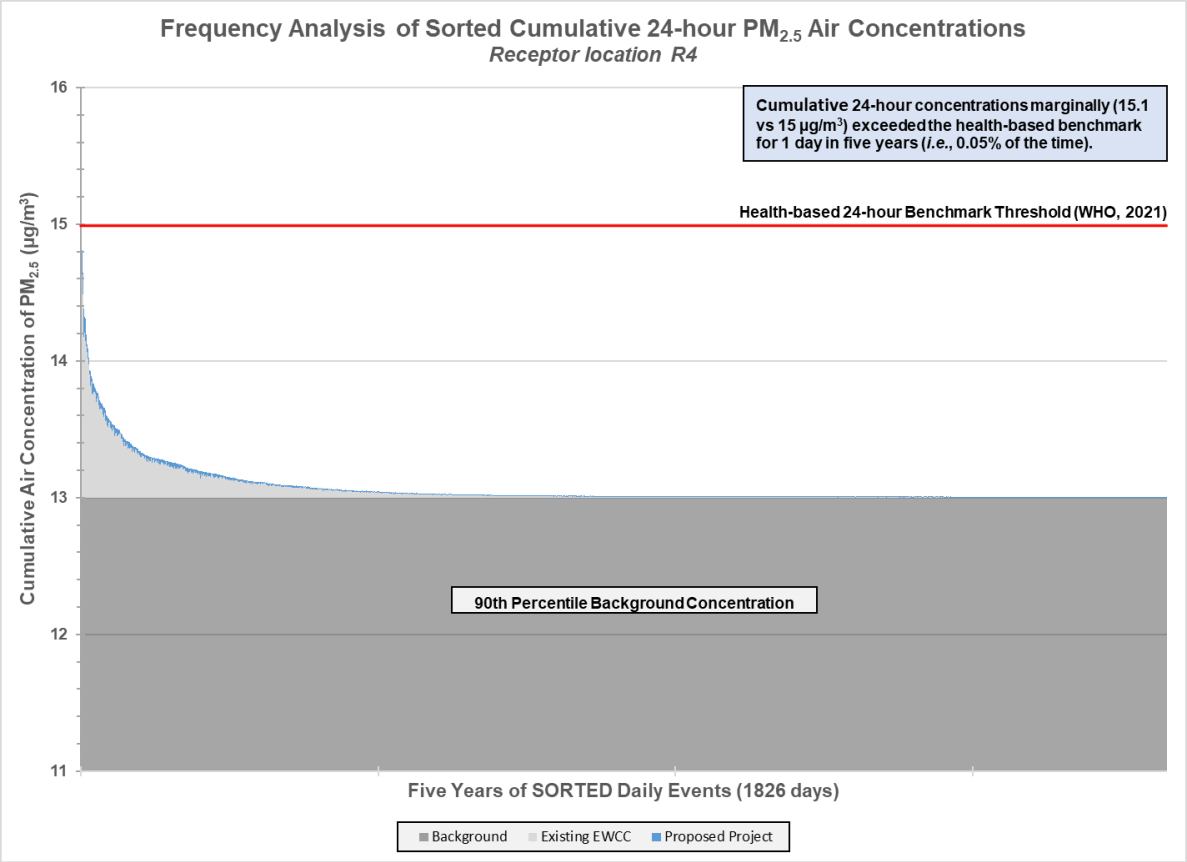


Figure 7-2 Sorted Daily Frequency Plot for Cumulative $PM_{2.5}$ Air Concentrations at Receptor Location R4

Table 7-4 Predicted Incremental Increase in Risk Estimates for Project Alone compared to Cumulative Risks for $PM_{2.5}$ at Worst-case Receptor Locations

Sensitive Receptor	Statistic	24-hour	Annual Average
R1	Average	0.020%	0.028%
	Maximum	0.22%	0.032%
R2	Average	0.017%	0.025%
	Maximum	0.03%	0.023%
R3	Average	0.010%	0.015%
	Maximum	0.038%	0.017%
R4	Average	0.050%	0.072%
	Maximum	0.54%	0.075%

Note: Incremental increase percentage is calculated based on (Cumulative – Existing Background) / Existing Background, where Existing Background = Regional Background + Existing EWCC.

8.0 UNCERTAINTY ANALYSIS

In any risk assessment, the intention is to obtain the most accurate evaluation of risk based upon the available data and state of knowledge, without underestimating the potential health risks. With any such predictive assessment, there are always a number of technical boundaries that limit the ability of the assessment to quantify risk with absolute certainty. The following section provides an overview of the key technical uncertainties inherent within the current assessment.

A quantitative HHRA involves assigning numerical values to input parameters in an appropriate exposure or risk model to obtain a quantitative estimate of risk. Numerical values are required for parameters describing chemical concentrations in environmental media, chemical fate and transport, human exposure and toxic response. These values may be measured, assumed, prescribed, or based on published literature. Variability and uncertainty in the input parameters or risk model result in variability and uncertainty in the estimate of risk. The US EPA (2005) suggests that the risk characterization process maintain transparency, clarity, consistency, and reasonableness. The goal of risk characterization is to clearly communicate the key findings of the assessment and to provide a clear and balanced assessment of the strengths and limitations of the process.

When assumptions are made during the risk assessment process, either because of data gaps or knowledge gaps, each can result in some degree of uncertainty in the overall conclusions. In order to understand the uncertainties within the assessment and to ensure that the implications of these uncertainties are understood and addressed, it is important to document and characterize them. To ensure that the risk assessment does not underestimate the potential for the occurrence of adverse effects, it is necessary to make assumptions that are conservative (protective). In other words, assumptions should be made that tend to overestimate exposure, toxicity, and risk, rather than underestimate these parameters.

A summary of the assumptions that were incorporated into the SLHHRA can be found in Table 8-1, arranged according to the steps of the risk assessment paradigm. Given the tendency for the assumptions described below to typically overestimate both exposure and toxicity by design, it is likely that the risk characterization errs on the side of caution and over predicts risk. Examination of the table shows that conservatism was introduced at virtually every step of the assessment, and extended to the problem formulation, exposure assessment, and toxicity assessment of the risk assessment. The degree of impact indicates whether the Study Team believes the assumption will under- or over-predict potential risks, or whether it would have a neutral impact on the results.

Table 8-1 Major Assumptions Used in the HHRA

Risk Assessment Paradigm	*Assumption*	*Discussion of Impact on Risk Characterization*	*Degree of Impact*
Problem Formulation	Selection of chemicals of concern is adequate to characterize potential facility emissions	The SLHHRA was directed to evaluate oxides of nitrogen and fine particulate matter as the two worst-case COCs given elevated background conditions in the Windsor area. Other typical COCs were also evaluated in the Air Quality report and showed their emissions were significantly below regulatory benchmarks.	Neutral
	Air quality assessment scenarios reflect realistic operating conditions of the proposed expanded facility	Careful consideration was given to the assessment scenarios evaluated in the SLHHRA, with reasonable worst-case operating conditions assumed for both the air quality assessment and ultimately the SLHHRA.	Over Predict
	Potential exposures were evaluated throughout the Study Area.	Care was taken to select locations in the surrounding area that would likely demonstrate the highest potential impacts from the proposed facility expansion.	Neutral
	Residential receptor locations were primarily evaluated in the SLHHRA.	Focus was given to areas where community residents were expected to have high occupancy (such as residential dwellings), as well as locations where sensitive individuals may be present on a frequent basis (*e.g.*, schools, retirement homes, cultural and recreational areas, etc.). It is highly unlikely that an individual will spend all their time on a daily basis at any given receptor location.	Over Predict
	Residential receptors assumed to live their entire lifespan at the same location.	The residential receptor was assumed to be born in the Study Area and conservatively assumed to live at that location for their entire lifetime (*i.e.*, 80 years).	Over Predict
Exposure Assessment	Maximum 24-hour air concentrations predicted at each of the receptor locations were used to evaluate short-term inhalation risks for a subset of COCs.	This assumption is highly improbable and represents a worst-case scenario. The frequency with which the maximum would occur at any one receptor location varies with respect to the COC and the receptor location. Individual exposure to 24-hour maximum ground-level air concentrations requires that a receptor (person) be present at the same time and duration of the maximum predicted air concentration at that particular receptor location each day that the modelled predicted concentration occurs.	Over Predict
	Ambient concentrations are assumed to represent the inhalation level by community members at that location.	Since people may live in one location and work in another, this assumption may cause exposure misclassification; however, it is expected that by evaluating constant exposures at the worst-case locations, we are not underestimating exposures and risks.	Mixed
	Ground-level air concentrations of COCs related to emissions were estimated based on mathematical air dispersion models.	The SLHHRA relied on the results of air dispersion modelling to evaluate the health risks from direct inhalation exposure as well as to predict inhalation health risks. The MECP has discussed matters of confidence and uncertainty in the predictions of dispersion models with regard to ground level concentrations. This remains the best mechanism to forecast future distributions of emissions in built environments. The air dispersion models used to provide data for the current assessment are approved by the MECP and the US EPA for use on these types of emission studies. Refer to the Air Quality study (SLR, 2024) for further discussion of the uncertainty inherent in the use of these models.	Mixed

Table 8-1 Major Assumptions Used in the HHRA			
Risk Assessment Paradigm	***Assumption***	***Discussion of Impact on Risk Characterization***	***Degree of Impact***
	Contributions from the facility may be double counted between regional background and Existing EWCC contributions.	Measurements of existing regional background concentrations may include some contribution of the existing operating EWCC facility, as its emissions may be within the zone of influence for the regional air monitoring depending on wind direction. However, given the distance between the existing EWCC facility and the regional monitoring station (*i.e.*, 3.68 km east-northeast of the Project site), it is unlikely that it would have significant impacts on the measured regional background concentrations compared to other regional and transboundary sources of NOx and $PM_{2.5}$.	Over Predict
	Receptors are assumed to be exposed to the modelled concentrations continuously.	The proposed facility is anticipated to operate 2 to 4 hours at a time or approximately 1.7% of the year as a peaker generation facility. As such, the assessment is likely significantly overestimating potential risk.	Over Predict
Toxicity Assessment	Toxicity reference values (TRVs) have been developed by regulatory agencies with sufficient conservatism to assure protection of the most sensitive and/or susceptible individuals within the general population (*e.g.*, infants and young children, the elderly, individuals with compromised health). Uncertainty and data gaps are addressed in the derivation of the TRVs using uncertainty factors.	A considerable amount of conservatism is incorporated in the TRVs developed by regulatory agencies. TRVs are deliberately set by regulatory agencies with the protection of the most sensitive individuals in mind. Typically, the TRVs used in the current assessment were derived from the most sensitive health-related endpoints, and then adjusted to account for differences in sensitivity to chemicals among individuals. The use of uncertainty factors (of 10- to-1,000 fold) are directed, in part, toward the protection of sensitive individuals.	Over Predict
	Humans were assumed to be the most sensitive species with respect to toxic effects of COC.	For obvious reasons, toxicity assays are not generally conducted on humans, so toxicological data from the most sensitive laboratory species were used in the estimation of toxicological criteria for humans, as appropriate. In some cases, however, human-specific data was available and was used in the Toxicity Assessment. Uncertainty and data gaps are addressed in the derivation of the TRVs through the use of uncertainty factors. This is a conservative approach.	Over Predict

9.0 OVERALL FINDINGS AND CONCLUSIONS

The purpose of this assessment is to address concerns related to potential human health impacts of the proposed facility expansion on the surrounding community. Thus, the primary objective of the SLHHRA was to determine the potential short- and long-term human health risks to individuals in the surrounding community who may be impacted by emissions from the proposed expansion. The SLHHRA involved an evaluation of the potential health impacts related to inhalation of emissions, both project-specific and in the broader cumulative context of the overall airshed (*i.e.*, existing regional background conditions ***plus*** project-specific contributions), at key residential locations in the surrounding community. The SLHHRA was specifically focused on two COCs: oxides of nitrogen (NOx) and fine particulate matter ($PM_{2.5}$).

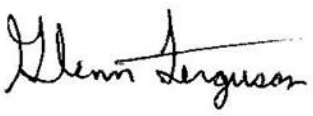
The results of the assessment indicate that while regional background concentrations of both NOx and $PM_{2.5}$ are elevated above their respective health-based benchmarks in the Windsor area, the emissions from the Project would not result in a significantly elevated health risk to the surrounding community. Furthermore, it is important to note that the proposed facility is anticipated to operate infrequently as a peaking facility and must operate for less than 1500 hours annually. Dispatch forecasting suggests that the unit may run less than 150 hours annually, with an average run time of 2 to 4 hours. It is unlikely that both the existing EWCC and the Project will operate concurrently. Finally, the air dispersion modelling conducted in the Air Quality Assessment evaluates emissions of the existing EWCC and the proposed Project against five years of 1-hour meteorological conditions to produce the range of potential cumulative air concentrations at the various receptor locations. Given how infrequently the proposed Project is expected to operate, it is highly unlikely that emissions will coincide with those rare meteorological conditions that lead to worst-case 1-hour concentrations.

As such, the current SLHHRA, which conservatively assumes continuous exposures to the emitted COCs and operating concurrent to the EWCC, is likely significantly overestimating potential cumulative risk.

10.0 DOCUMENT SIGN-OFF

The risk assessment has been performed in accordance with accepted practice and usual standards of thoroughness and competence for the profession of toxicology and environmental risk assessment. The information, opinions and recommendations provided within the aforementioned report have been developed using reasonable and responsible practices, and the report was completed to the best of our knowledge and ability.

Intrinsik Corp.



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