From:	Travis Ritchie
To:	Sarah.Preiksaitis@yukon.ca
Subject:	Faro Generating Station Air Emission Permit
Date:	January 10, 2022 3:02:00 PM
Attachments:	image001.png image002.png image003.png image004.png image005.png

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Hello Sarah,

Happy New Year!

I wanted to follow up with you regarding the proposed amendment to our air emissions permit for the Faro Generating Station pursuant to YESAA Project Assessment 2021.0115.

I will prepare an application to amend the permit and send it your way this week, but I first wanted check in regarding the decision document. Yukon Energy noted that the YESAB Designated Office's recommendation contains a requirement for continuous air quality monitoring. This condition was included in the evaluation report despite the evidence presented by YEC in its project proposal and during the assessment regarding the very low likelihood/probability of any YAAQS exceedances in the community arising from its operations and the even lower likelihood of significant adverse effects to human health to arise from our operations. I know this is a matter of course for Decision Bodies, but before YG issues its decision document for this project we would only ask that this condition of the Designated Office's recommendation be examined very closely considering the evidence provided during the assessment. If there are any questions regarding the Project that YG would like to explore as part of its deliberations on the Decision Document and/or issuing an amended air emissions permit please feel free to contact me at anytime.

Thank you for your time and consideration.

Regards,

Travis

yukon energy

Travis Ritchie P.Biol.
Manager - Environment, Assessment, & Licensing
Telephone: 867-393-5350 | Mobile: 867-333-0300

APPROVED SustainableElectricityCompany™

From:	Travis Ritchie
To:	Sarah.Preiksaitis@yukon.ca
Subject:	Application for Air Emissions Permit - Faro Generating Station
Date:	January 17, 2022 3:36:00 PM
Attachments:	env-application-air-emissions-permit-general FARO GENERATING STATION 2022.01.17final.pdf Faro Diesel_YESAA_Supporting_Document_FINAL__2021.08.12red.pdf image001.png image002.png image003.png image004.png image005.png

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Hello Sarah,

Please see the attached application for an Air Emissions Permit for the Faro Generating Station pursuant to YESAA Project Assessment 2021.0115 and YG's pending decision document.

If you have any questions regarding the application or the facility please let me know.

Thank you.

Regards,

Travis

Travis Ritchie P.Biol.
Manager - Environment, Assessment, & Licensing
Telephone: 867-393-5350 | Mobile: 867-333-0300

Yukon

AIR EMISSION REGULATIONS

APPLICATION FOR AN AIR EMISSIONS PERMIT GENERAL

- Applicants should ensure that they:
  - are familiar with the *Air Emissions Regulation* (under the Yukon *Environment Act*).
  - complete all applicable sections, legibly printing or typing all information.
  - complete the signature block at the end of the form.
  - submit all required attachments, including all applicable activity-specific form(s).
- A pre-permit inspection may be conducted prior to the issuance of any permit.
- An assessment of the activity you are undertaking may be required under the Yukon *Environmental and Socio-Economic Assessment Act* (YESAA) prior to the issuance of this permit.
- Additional information may be required upon receipt of this application.
- Payment of a tehnical review fee may be required prior to the issuance of this permit.

Read carefully and fill out all sections.

Part 1 - Contact and site information

1. Name and address of applicant

Contact name	Position title	Phone
Travis Ritchie	Mgr. Environment	867.393.5350
Business name or government agency/branch/department		Fax
Yukon Energy Corporation		
Mailing address		Postal code
Box 5920 Whitehorse, YT		Y1A 6S7
Email	Name (person or business) to appear on permit	
travis.ritchie@northwestel.net	Yukon Energy Corporation	

2. Who is directly responsible for the activity requiring an Air Emissions Permit? (For multiple site locations, list on a separate sheet) ☐ Same as (1) above, **or:**

Contact name	Position title	Phone
Guy Morgan	VP Operations	867.393.5366
Business name or government agency/branch/department		Fax
Yukon Energy Corporation		
Mailing address		Postal code
Box 5920 Whitehorse, Y.T.		Y1A 6S7
Email		
guy.morgan@yec.yk.ca		

3. Where will the source of the air emissions be located? (For multiple site locations, list on a separate sheet) ☐ Same as (1) above, **or:**

Mailing address	Postal code
Box 220, Faro, Y.T.	Y0B 1K0
Civic address	Postal code
413 Campbell Street, Faro, Y.T.	Y0B 1K0

Legal address (lot #, block, plan #, quad/group)

Lot 114, Plan 49716 LTO DCT No. 93Y377

Geographic Coordinates (centre of site/point source of air emissions in lat/long, UTM (specify zone) or Yukon Albers)

UTM Zone: 8 • Northing: 6901266.50 • Easting: 585174.54

4. Who owns the land on which the source of air emissions will be located? (For multiple site locations, list on a separate sheet) ☑ Same as (1) above, **or:**

Name(s)*

5. Is the land leased? If so, by whom?

No.

6. If the land is within municipal boundaries, describe the zoning of that land.* (For multiple site locations, list on a separate sheet).

Within the Town of Faro. Zoned as Community Use.

*Applicants not owning the land on which the source is to be located must include with this application a letter from the landowner authorizing the intended activity on their property.

Part 2 - Activities requiring an air emissions permit

Check off the activity(ies) that apply to your operation and complete the applicable activity-specific activity form(s).

- ☐ Manufacturing asphalt
- ☐ Production/exploration of oil and/or natural gas resulting in release of combustion products from flaring or burning
- ☐ Quarrying, crushing and screening of stone, clay, shale, coal or minerals in an active excavation area covering an area greater than 4 hectares
- ☐ Processing or handling of coal at a rate of greater than 5 million BTU per hour
- ☐ Operation of equipment capable of generating, burning or using, according to the manufacturer's specifications, heat energy equivalent to or greater than 5,000,000 BTU/hr
- ☐ Burning of waste by:
  - ☐ Incinerating*:
    - ☐ Operation of incinerators capable of burning, according to the manufacturer's specifications, more than 5kg of solid waste per day
    - ☐ Incinerating special waste, as defined in the Special Waste Regulations
    - ☐ Incinerating contaminated soil containing any contaminant in excess of the generic numerical soil standard or the matrix numerical soil standard in Schedules 1 and 2 of the Contaminated Sites Regulation, but which is not special waste
  - ☐ Open burning** of more than 5 kg/day of solid waste
  - ☐ Demolition of a structure by burning
- ☑ Operation of electricity generating facilities with a maximum nameplate capacity equal to or more than 1.0 Megavolt ampere (at unity power factor equivalent to 1.0 megawatt).
- ☐ Use of fuel with sulphur content in excess of 1.1% for:
  - ☐ Heating
  - ☐ Generating steam or electricity
  - ☐ Combustion in industrial process
- ☐ Storage or handling of solid, liquid or gaseous materials or substances in a manner that causes or may cause an adverse effect.
- ☐ This application has been required by the Minister for any of the following reasons:
  - ☐ Opacity of emissions exceeds 40%
  - ☐ Release of a contaminant to the air that may cause or is likely to cause irreparable damage to the natural environment
  - ☐ In the opinion of a health officer, the release of a contaminant to the air that may cause actual or imminent harm to public health or safety

* **Incinerating** means combustion in an incinerator, which is equipment used for the burning of waste or contaminated soil where the air intake and combustion temperatures may be controlled.

** **Open burning** refers to the combustion of material without control of the combustion air or without a stack or chimney to vent the emitted products of combustion to the atmosphere.

Part 3 - Other permits/approvals

7. Have you applied for another permit(s) under *Yukon's Environment Act* regulations:
   - ☐ Solid Waste Regulations
     - ☐ Operation of a solid waste disposal site
     - ☐ Operation of a commercial dump
     - ☐ Other: _____
   - ☑ Special Waste Regulations
     - ☐ Disposal of special waste
     - ☑ Other: Special Waste Permit exists for facility.
   - ☑ Other regulation: Fuel Storage Tank Permit exists for facility.

Is your project subject to review under the *Yukon Environmental and Socio-economic Assessment Act* (YESAA)?

☑ Yes: YESAA project number 2021.0115 ☐ No

Part 4 - Emissions and source information

9. Describe the type and quantity of the contaminants that may be released into the air. If available, provide results of any stack tests or dispersion modelling that has been conducted for the potential emissions.

Please see attached YESAA Project Proposal Supporting Document, Section 6.1.2 (pdf pages 35-38) and its Appendix B (pdf pages 53-120).

10. Provide (as an attachment) a set of plans/drawings of the facility clearly showing the layout of the following as they apply:
    - The location of relevant process equipment,
    - The point or points of discharge to the atmosphere,
    - Building dimensions,
    - Stack heights,
    - Directional arrow showing North and the prevailing wind direction(s), and
    - The scale or approximate scale of the drawing.
11. Provide (as an attachment) a map or aerial photograph, on a scale of 1:50,000 detailing the location of the facility, homes, buildings, roads and other adjacent facilities within a five kilometre radius of the source(s).
12. Identify which of the following measures (if any) will be taken to reduce the amount of air emissions released from the facility and/or the concentrations of contaminants in the air emissions.
    - ☐ Burning cleaner fuels (i.e. natural gas instead of oil)
    - ☐ Adding scrubber systems
    - ☐ Sorting feedstock (for incinerators and/or burning vessels)
    - ☐ Increasing air flow
    - ☐ Controlling the combustion temperature
    - ☑ Other: Avoiding the use of diesel generation and maximizing use of low carbon energy resources whenever possible.

    Provide manufacturer's specifications (as an attachment) for any emissions control equipment to be used, if available.
13. Provide a description of any measures to be taken to mitigate the effects of the release of air contaminants on the surrounding environment such as only burning solid waste when the wind direction will move smoke away from populated areas. (Use an extra sheet if necessary.)

Please see attached YESAA Project Proposal Supporting Document, Section 6.1.3 (pdf pages 39-41).

14. Provide a description of any equipment or devices the applicant intends to use to monitor the release of contaminants into the air at the point(s) of release. Include information on contaminants monitored, monitoring frequency, action levels and responses, and any other relevant information.

Total CAC emissions are calculated and reported annually to YG Environment - Standards and Approvals, as per requirements of air emissions permit.

15. Attach the manufacturer's specifications for any equipment which has the potential to produce emissions.

16. List staff certified to observe opacity (if any):

Name of staff	Training institute	Date last trained

I, Travis Ritchie (PRINT NAME CLEARLY), am the authorized representative of Yukon Energy Corporation (BUSINESS PERSON RESPONSIBLE FOR SOURCE OR ACTIVITY), and I certify that the information provided on this application form is correct and complete to the best of my knowledge.

All attachments and site-specific information comprise part of this application.

Signature of applicant	Date	No. of attachments
Travis Ritchie	2022.01.17	1

The original completed and signed application should be mailed or delivered to your local government office or:

Environmental Programs Branch (V-8)
Department of Environment, Government of Yukon (located at 10 Burns Road, Whitehorse)
Box 2703, Whitehorse, Yukon Y1A 2C6

For additional information:
Phone: (867) 667-5683 or 1-800-661-0408 ext. 5683
Fax: (867) 393-6205
Web: yukon.ca/en/waste-and-recycling
Email: envprot@gov.yk.ca

This information is being collected under the authority of section 11 of the *Air Emissions Regulation*, section 9 of the *Solid Waste Regulations* and/or section 9 of the *Special Waste Regulations*. For further information, contact the Environmental Programs Branch at (867) 667-5683 or toll free at 1-800-661-0408 extension 5683.

Faro Generating Station

Capacity Expansion Project

YESAA Project Proposal Supporting Document

AUGUST 2021

yukon energy

Table of Contents

List of Acronyms and Abbreviations

ATCO	ATCO Electric Yukon (Formerly Yukon Electrical Company Ltd.)
AQDMG	Air Quality Dispersion Modelling Guideline
CAC	Common Air Contaminants of Concern
CO	Carbon monoxide
GWh	Gigawatt hour
km	Kilometers
m	Metre
MD	Mayo-Dawson Power Generation and Transmission System
MW	Megawatt
NAPS	National Air Pollution Surveillance
NO_2	Nitrogen dioxide
NPRI	National Pollutant Release Inventory
$PM_{2.5}$	Fine particulate matter
PM_{10}	Course particulate matter
PSL	Permissible Sound Levels
SO_2	Sulphur dioxide
UTM	Universal Transverse Mercator
VC	Valued Component
VOCs	Volatile organic compounds
WAF	Whitehorse-Aishihik-Faro Power Generation and Transmission System
WRGS	Whitehorse Rapids Generating Station
YECL	Yukon Electrical Company Ltd. (Now Atco Electric Yukon Ltd.)
YESAA	Yukon Environmental & Socio-economic Assessment Act
YESAB	Yukon Environmental & Socio-economic Assessment Board
YIS	Yukon Integrated System
YT	Yukon Territory
YUB	Yukon Utilities Board

1 Introduction

1.1 Project Overview & Document Structure

The Yukon Energy Corporation (Yukon Energy) is applying under Parts 6 and 9 of the *Environment Act* and Part V of the *Air Emissions Regulations* for an amendment of Air Emissions Permit No. 60-010 authorizing Yukon Energy to modify the thermal generating component (the Project) of its Faro Diesel Facility (the Site).

Yukon Energy seeks an amendment of the Permit to allow for the addition of up to 4.9 MW of additional operational capacity (to a maximum total of 15.5 MW) for the diesel electricity generators. The Site is currently permitted to operate at a capacity of 10.6 MW. The additional generation capacity will act as insurance against the very unlikely event that Yukon Energy experiences an extended winter power outage with loss of generation or transmission from the Aishihik Generating Station[1], if hydroelectricity can not meet energy demands and for maintenance purposes. An extended power outage has a very low probability, but the likely consequences require Yukon Energy to be prepared to immediately restore supply to customers on the grid to avoid rolling blackouts. Having access to portable diesel generators ensures that Yukon Energy can continue to provide reliable service during the winter in an emergency.

The need for this contingency measure came as a result of analysis of information prepared as part of Yukon Energy's 2016 Resource Plan (2017). The 2016 plan identified that there is a capacity gap of approximately 8 MW between maximum probable (winter) load and the installed capacity of the system under an N-1 event. Yukon Energy's updated 10-Year Renewable Electricity Plan, updated in December 2020, identifies an even greater gap (>20 MW) between existing resources and forecasted peak energy demand (Yukon Energy 2020). This Project is expected to be required until more permanent solutions to address the current N-1 capacity gap are implemented. Yukon Government's document *Our Clean Future: A Yukon strategy for climate change, energy and a green economy* (Government of Yukon 2020) identifies a renewable energy target of 97% by 2030. Yukon Energy's 10-Year Renewable Plan outlines key projects and partnerships that will help to address the energy and peak capacity shortfalls over the 10-year planning horizon. Several projects have been identified in the Future-Focused Portfolio (such as Whitehorse Hydro uprates, the battery energy storage system, the Southern and Mayo Lakes Enhanced Storage Projects), but these projects will take time to plan, design, permit, and construct, and Yukon Energy requires a temporary solution be put in place until new capacity can be added to the system. These back-up units would typically be at the bottom of stacking order and would only be operated in

[1] **Emergency (or "N-1") Whitehorse-Aishihik-Faro (WAF) and Mayo-Dawson (MD) system capacity planning criteria:** Each grid system (WAF and MD) will be planned to be able to carry the forecast peak winter loads (excluding major industrial loads) under the largest single contingency (known as "N-1"). The N-1 criterion determines system capacity assuming the loss of the system's single largest generating or transmission-related generation source. In the case of WAF, this is presently the Aishihik transmission line, without which the WAF grid loses ability to access approximately 37 MW of generation.

the case of an emergency, planned and unplanned outages for maintenance, when hydroelectricity cannot meet demands, and for short durations for monthly exercise to confirm operational readiness.

The permit amendment request to expand the thermal generating capacity in Faro is subject to a Designated Office level environmental and socio-economic effects assessment by the Watson Lake Designated Office of the Yukon Environmental and Socio-economic Assessment Board (YESAB) under the *Yukon Environmental and Socio-economic Assessment Act* (*YESAA*).

Pursuant to that assessment, Yukon Energy requests a recommendation from the Designated Office to allow the permit amendment to proceed, on the basis that the Project (i.e., the modifications to Yukon Energy's diesel generating facilities described in this proposal and operated in accordance with the terms and conditions of an air emissions Permit and the applicable provisions of the *Environment Act* and *Air Emissions Regulations*) **will not have significant adverse environmental or socio-economic effects** within the meaning of section 56(1)(a) of *YESAA*.

This document provides supporting information for the permit amendment process and the associated environmental and socio-economic assessment, and includes detailed information referenced in the *YESAA* Designated Office Evaluation Form 1, which has also been completed and is filed on the YESAB Online Registry.

Section 1 of this document contains general proposal information including:

- The intent and structure of this document and related information;
- The proponent, Yukon Energy Corporation;
- Project Location;
- The Project purpose and need; and
- An identification of the required assessment and regulatory approvals.

Section 2 contains information regarding the assessment approach and assessment scope, including:

- The identification of valued components for focussed effects assessment; and,
- The context and criteria Yukon Energy has used for determining the significance of any identified potential effects to the valued components.

Section 3 contains information describing the Faro Diesel Facility, as well as operation ranges and requirements, and regulatory context, and

- Facility overview;
- Operational requirements and ranges;
- Generation profiles;

- Operational resource usage and waste generation; and,
- Brief comments on the applicable regulatory context under the *Public Utilities Act* and applicable legal and regulatory constraints on the operation of the facilities under the existing permit and applicable environmental legislation.

Section 4 includes a description of the Project scope.

Section 5 provides details on the environmental and socio-economic setting including:

- Reference to previous studies and the emissions inventories; and,
- Baseline air quality and noise levels for Faro.

Section 6 presents the effects assessment and includes:

- Characterization of potential Project-related effects.
- A description of the modelled thermal generation profiles;
- An identification of sensitive air and noise emission receptor sites in the vicinity of the Faro Generating Station;
- Mitigations that will be used to reduce potential adverse effects; and,
- Assessment conclusions respecting the significance of the potential effects.

Five appendices are included as follows:

- Appendix A Air Emissions Permit No. 60-010
- Appendix B Air Dispersion Modelling Assessment for the Faro Generating Station (WSP, 2020a);
- Appendix C Noise Impact Assessment, Faro Generating Station (WSP, 2020b).
- Appendix D Sound Level Measurements, Faro Generating Station (Hemmera, 2021)
- Appendix E Dena Cho Environmental Ltd. YESAA Project Proposal Technical Review Report

1.2 Proponent Information

Yukon Energy is the Project proponent.

Established in 1987, Yukon Energy is a public electric utility that operates as a business, at arm's length from the Yukon Government, and is wholly owned by the Yukon Development Corporation (a Crown corporation).

Yukon Energy's headquarters are located near the Whitehorse Rapids Generating Station (WRGS) in Whitehorse, with community offices in Mayo, Faro, and Dawson City. It employs approximately 100 highly skilled and motivated Yukoners who are committed to offering the highest quality service possible. Yukon Energy works hard to meet the challenge of providing reliable electricity and related energy services to Yukoners in the most affordable, yet environmentally and socially responsible way.

Yukon Energy is the main generator and transmitter of electrical energy in the Yukon, and works with its parent company, Yukon Development Corporation, to provide Yukoners with a sufficient supply of safe, reliable electricity and related energy services. Yukon Energy owns and operates the 138 kV Yukon Integrated System (YIS), formerly known as the Whitehorse-Aishihik-Faro (WAF), and 69 kV Mayo-Dawson (MD) transmission grids, which have been connected as a single grid since 2011, as well as over 90% of the electric generation resources on these grids; it is also the public utility with primary responsibility for planning and development of new generation and transmission facilities in Yukon.

There are almost 15,000 electricity consumers in the territory. Yukon Energy directly serves about 1,800 of these customers, most of who live in and around Dawson City, Mayo and Faro. Indirectly, we provide power to approximately 15,000 other Yukon customers in Whitehorse, Carcross, Carmacks, Haines Junction, Ross River, Teslin, and Pelly Crossing, through the sale of energy to the ATCO Electric Yukon (ATCO). ATCO buys wholesale power from Yukon Energy and sells it to retail customers in the territory via its own distribution network.

Yukon Energy currently has the capacity to generate approximately 132 megawatts (MW) of power:

- At present, 92 MW of that capacity are provided by Yukon Energy's hydro generation facilities in Whitehorse, Mayo and Aishihik Lake (40 MW at Whitehorse, 37 MW at Aishihik, and 15 MW at Mayo);
- Approximately 40 MW of capacity are provided by Yukon Energy's thermal (fossil fuel-fired) generators, including seven generators in Whitehorse (five diesel and two natural gas), three diesels in Mayo, five diesels in Dawson City, two diesels in Faro, and several relatively small portable generators. Rental diesel units are also temporarily/seasonally located in Whitehorse (9 units) and Faro (7 units).

In contrast to the diesel generation facilities operated by ATCO in communities such as Watson Lake and Old Crow, which are isolated from the transmission grid and must therefore operate continuously (24 hours per day, 365 days per year), Yukon Energy only uses its fossil fuel-fired generators:

- As back up during renewable energy system outages (planned and unplanned);
- To supplement energy demand during colder periods of the year; and
- To exercise the units for very short durations on a monthly basis to ensure operational readiness.

This is because most of the needs of customers on the system are satisfied by Yukon Energy's three hydro generating stations. For the vast majority of the time, the thermal generators do not operate. However, Yukon Energy's thermal generation facilities are essential to its ability to provide a reliable supply of electricity to customers whenever demand exceeds hydro supply (e.g., as a result of planned maintenance, emergency repair, or peaking demand during cold temperatures).[2]

Yukon Energy is regulated principally under the Yukon *Business Corporations Act*, *Public Utilities Act*, *Waters Act*, and the federal *Fisheries Act*. In particular, under the *Public Utilities Act*, Yukon Energy has an obligation to supply electricity service to its customers, and its rates and operations are subject to regulation by the Yukon Utilities Board. Yukon Energy's thermal generation facilities are also subject to regulation under the Yukon *Environment Act* and *Air Emissions Regulations*, as well as *YESAA*.

1.3 Project Location

The Project is located in the community of Faro, Yukon near the town entrance. This area is within the unceded traditional territory of the Ross River Dena Council. The proposed capacity expansion activities are located within the existing generating station boundaries. No new land or site clearing is required.

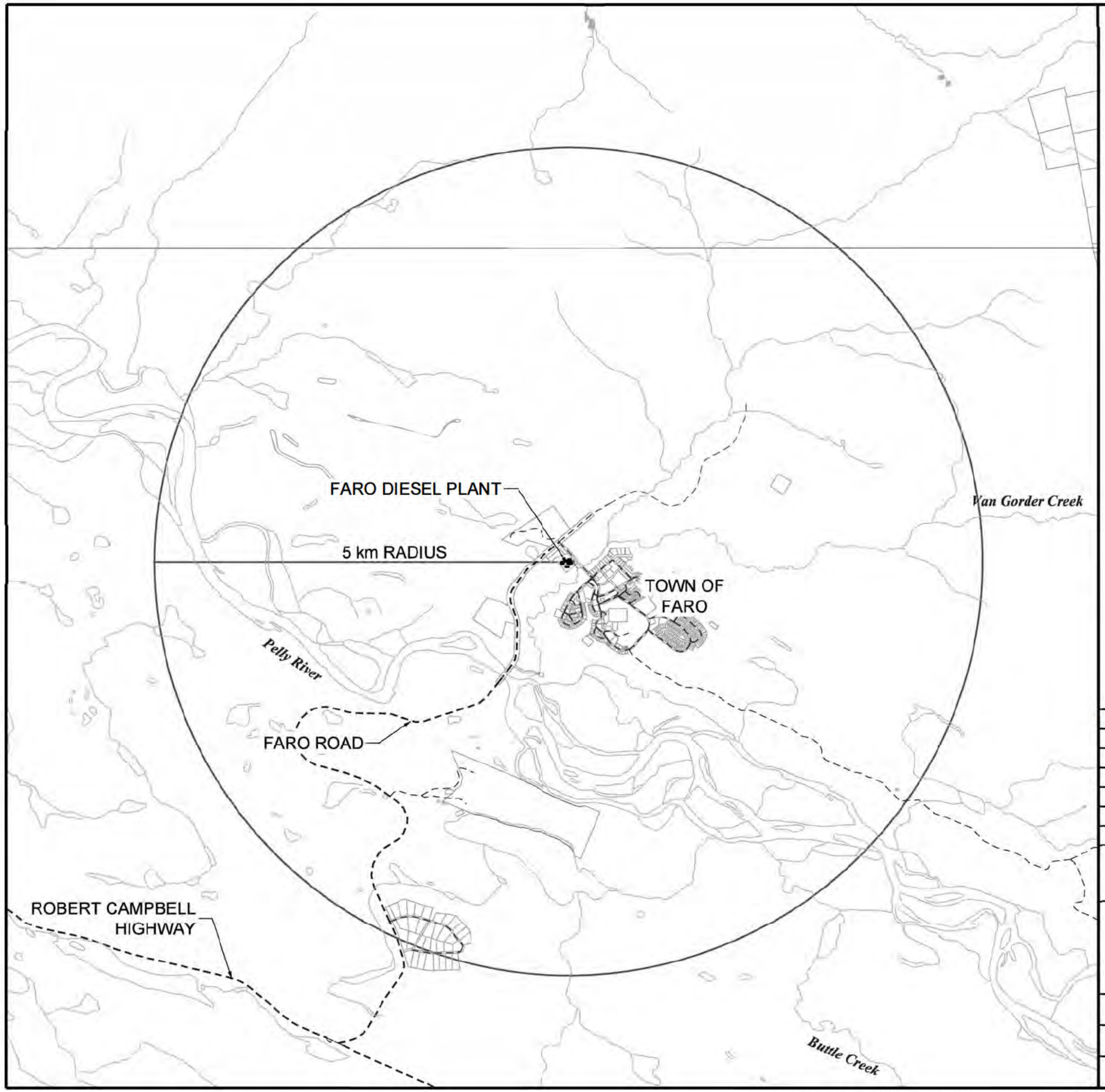
The legal description of the property is:

- Lot 114, Plan 49716 LTO DCT No. 93Y377
- NTS Map Sheet # 105 K/03

Approximate UTM coordinates are:

- UTM Zone: 8
- Northing: 6901266.50
- Easting: 585174.54

[2] For example, Yukon Energy's reliance on the thermal generation facilities was essential when a major power outage occurred on the WAF grid in January 2006 due to a failure on the connection to the Aishihik hydro generating facility. If Yukon Energy had not had the ability to operate its diesel units in those circumstances, customers would have been left without power in the middle of the winter.



LEGEND

DIGITAL DATA SOURCES AND DISCLAIMERS:

National Topographic Data Base (NTDB) compiled by Natural Resources Canada at 1:50,000. Reproduced under license from Her Majesty the Queen in Right of Canada, with permission of Natural Resources Canada.

Yukon Community Cadastral Information and First Nations Settlement Lands compiled by Legal Surveys, Natural Resources Canada.

UTM Zone 8 NAD83

Scale 1:50,000

0.5 0 2 Kilometers

Rev. No.	Date	Description	Appro'd
1	SEPT 4, 2008	INITIAL REVIEW	TR
2	SEPT 19, 2008	FINAL	TR

YUKON ENERGY CORPORATION

FARO GENERATING STATION CAPACITY EXPANSION
PROJECT YESAA PROJECT PROPOSAL
SUPPORTING DOCUMENTATION

FIGURE 1:
OVERVIEW OF YEC FARO DIESEL PLANT AREA

Drawn: C.McGILLIVRAY	Date: August 2021
Scale: 1:50000	Map Sheet No. 105K03
Revision Number: 3	Dwg Name: FIGURE 1

1.4 Project Purpose

Yukon Energy's diesel (thermal) electric generating plants are installed and operated to ensure the ongoing operation of the integrated power system and so all customers on these systems can receive reliable power consistent with Yukon Energy's corporate and regulatory obligations.

Given the current generation mix (hydro and thermal) and system design, Yukon Energy's ability to operate the installed thermal plants, particularly during conditions where demand for electricity cannot be adequately met by hydro (e.g., planned maintenance, emergency repair, demand during cold winter temperatures), is essential to avoid scenarios where there would be a requirement to impose blackout conditions to various customers. This is particularly relevant during times where the lack of such ability would at best be very inconvenient, and at worst dangerous to infrastructure and human health and safety, such as would be the case during cold winter temperatures.

The current need for thermal generation is related to several factors including:

1. The need to meet demand for electricity during those times when hydro-electric facilities are offline as a result of an emergency condition;
2. The need to meet demand for electricity during those times when hydro-electric facilities are taken offline for routine maintenance;
3. The need to meet demand for electricity during those times when there is a grid separation (i.e., transmission outage) and electricity from hydro-electric facilities is not available;
4. The need to exercise a particular diesel unit as a part of routine maintenance; and
5. The need to meet demand for electricity during those times when hydro-electric facilities are otherwise unable to meet current demand for energy.

This Project includes an amendment to the existing Air Emissions Permit (Permit No. 60-010) to operate any combination of existing generators and six of the seven additional temporary rental diesel units up to a total operational site capacity of 15.5 MW, as required. Slightly more capacity than 15.MW will be installed at site for backup and redundancy purposes. Operations will not exceed the 15.5 MW permitted site capacity ceiling.

1.5 Required Authorizations and Regulatory Approvals

Yukon Energy requires an amendment of its existing Air Emissions Permit No. 60-010 to have the ability to operate additional thermal generation resources and ensure the continuity of a reliable supply of power to Yukoners as described earlier in this proposal. A Permit can be issued by the Minister responsible for the Department of the Environment pursuant to Section 12 of the *Air Emissions*

Regulations under the *Environment Act*. It is expected that the existing permit would be amended to allow the requested modification to the Faro Generating Station.

To amend the Permit in this manner, the Yukon Government must issue a decision document based on the environmental and socio-economic assessment of the amendment application under *YESAA*. An environmental and socio-economic assessment is required under Schedule 1, Part 4, Item 2(b) of the *Assessable Activities, Exceptions and Executive Committee Projects Regulations* under *YESAA,* because the Permit is for the "operation … of … a fossil fuel-fired electrical generating station".

While the amendment request is to authorize changes to the Faro Generating Station to have up to 15.5 MW of standby/back-up diesel generating capacity, the activity is a expansion (<5MW) to an existing facility and does not involve the construction, decommissioning, or abandonment of a fossil-fuel fired electrical generating station, as such the proposed activity is not immediately assessable at the Executive Committee level.

As noted in Section 1.1 Project Overview, Yukon Energy is requesting a recommendation by the Designated Office to allow the Permit amendment to proceed, on the basis that the Project (i.e., the continuing operation of the Yukon Energy's Faro Diesel Facility with the addition of 4.9 MW of additional diesel generating capacity (total of 15.5 MW of generating capacity) in accordance with the terms and conditions of the amended Permit and the applicable provisions of the *Environment Act* and *Air Emissions Regulations*) will not have a significant adverse environmental or socio-economic effect within the meaning of section 56(1)(a) of *YESAA*.

2 Assessment Approach and Scope

2.1 Identification of Valued Components

For the purpose of identifying and assessing potential environmental and socio-economic effects, value may be attributed to a component of the environment and/or the socio-economic system for economic, social, environmental, aesthetic or ethical reasons.

Valued environmental and socio-economic components (VCs) are parts of the local environment and socio-economic fabric that are valued because of their ecological and/or socio-economic importance. VCs can represent a species or species group, a type of ecosystem, or an important component of a social and/or economic system and are used in the assessment of potential Project-related effects arising from Project activities

Based on its understanding of the environmental and socio-economic setting of its generating facilities, and upon an examination of known and typical interests related to air emissions, Yukon Energy has identified three VCs for this Project:

- Human health and safety (air emissions)
- Aural aesthetics (noise emissions)
- Environmental quality (effects of accidents and malfunctions associated with fuel/oil storage and use)

Human Health and Safety relates to the potential for decreased ambient air quality and ensures Project activities will not have a significant adverse effect on the health and safety of those living, working and playing in and around Faro.

Aural Aesthetics (Noise) relates to increase noise levels associated with the Project. An assessment on Aural Aesthetics ensures that noise levels resulting from Project activities are within acceptable levels.

Other components of the environment, such as water, soils, and general maintenance of environmental quality, are more appropriately related to such things as the potential for petroleum hydrocarbon releases, and have not been examined beyond the scoping stage of this assessment, as such matters are adequately addressed by operational and non-discretionary regulatory controls currently in place such as Yukon Energy's Special Waste Permit, Storage Tank Permit, etc., and not by the Air Emissions Permit amendment that Yukon Energy is applying for at this time.

2.2 Analysis & Significance of Potential Effects

The Designated Office must evaluate the potential effects, if any, on VCs resulting from the amendment of Yukon Energy's Air Emissions Permit for the purposes previously described and must make a recommendation to the Decision Body based on that evaluation, in accordance with section 56(1) of *YESAA*.

In particular, under section 56(1)(a), if the Designated Office is satisfied that Yukon Energy's operation of the modified thermal generator complement, in compliance with the terms and conditions of its Air Emissions Permit and all other relevant legislative and regulatory requirements (e.g., under the *Environment Act* and *Air Emissions Regulations),* will not have "significant adverse environmental or socio-economic effects in or outside the Yukon", the Office must recommend that the renewal of the Permit be allowed to proceed.[3]

This assessment uses the approach applied to both ATCO's and Yukon Energy's Air Emissions Permit renewal projects previously submitted to YESAB's Designated Offices for evaluation since 2005.

[3] Alternatively, the Designated Office also has authority to recommend that the Permit be amended subject to specified terms and conditions, if it determines that the operation of the modified thermal generator complement "will have significant adverse environmental or socio-economic effects…that can be mitigated by those terms and conditions" within the meaning of section 56(1)(b).

In its September 8, 2009 Designated Office Evaluation Report on Project Number 2009-0107 (YECL[4] Air Emissions Permit Renewal – Watson Lake, YT), the Watson Lake Designated Office determined it was appropriate to exercise its authority under section 56(1)(a) with reference to both "the application of existing legislation as well as the mitigation measures proposed by the proponent" (at page 1).

This was in the context of an application by ATCO to renew the air emissions permit for the diesel generator station it operates on a full-time basis, year-round as the sole source of electrical supply for the communities of Watson Lake, Upper Liard, and Lower Post, BC (in contrast to Yukon Energy's diesel generating facilities, which are operated only as back-up during hydro system and transmission system outages, and, occasionally, to supplement energy demand during colder periods of the year).

Accordingly, in Project Number 2009-0107, where the Watson Lake Designated Office found that the application of existing legislation as well as mitigation measures proposed by the proponent would be "adequate to eliminate, reduce or control the significant adverse effects of the project" resulting from the continuous, year round operation of ATCO's diesel generator station in Watson Lake, the Designated Office concluded that the project "will not have significant adverse environmental or socio-economic effects in or outside Yukon", and recommended under section 56(1)(a) that the project be allowed to proceed.

The same approach to section 56(1)(a) was adopted with respect to ATCO's other air emission permit renewal applications, by:

- The Dawson City Designated Office in its September 9, 2009 Evaluation Report on Project Number 2009-0104 (YECL Air Emissions Permit Renewal – Old Crow) (in the context of another YECL diesel generating station operated on a full-time basis year-round, as the sole source of electrical supply for the community of Old Crow);
- The Teslin Designated Office in its September 4, 2009 Evaluation Report on Project Number 2009-0105 (Teslin Electrical Generating Station Air Emissions Permit Renewal);
- The Watson Lake Designated Office in its September 4, 2009 Evaluation Report on Project Number 2009-0106 (YECL Air Emissions Permit Renewal – Ross River, YT);
- The Haines Junction Designated Office in its September 8, 2009 Evaluation Report on Project Number 2009-0108 (Air Emissions Permit Renewal – Haines Junction, YT); and
- The Mayo Designated Office in its September 4, 2009 Evaluation Report on Project Number 2009-0109 (Air Emissions Permit Renewal – Carmacks).

[4] Yukon Electrical Company Ltd. was renamed Atco Electric Yukon after the 2009 assessment.

To ensure consistency in the interpretation and application of section 56(1) of *YESAA*, the same approach must be applied by the Designated Office in assessing and issuing a recommendation with respect to Yukon Energy's proposed renewal of its Air Emissions Permit: i.e., the potential effects (if any) of the project must be assessed on the basis of Yukon Energy continuing to operate its facilities (on an emergency back-up/secondary supply basis only) in compliance with the terms and conditions of the Permit and all other legislative and regulatory requirements, in addition to the principal mitigation measures proposed by Yukon Energy, which include the following:

- Generators being operated and maintained regularly as per manufacturer's specifications to provide a reliable and efficient source of electricity;
- Visual opacity limits and monitoring; and
- Use of ultra-low sulphur fuel only.

In assessing whether any effect resulting from such continuing operation of Yukon Energy's facilities may be considered "significant" within the meaning of section 56(1) of *YESAA*, the Designated Office should further apply the framework of analysis adopted by the YESAB Executive Committee in Part 4.3 of its November 2, 2007 Screening Report & Recommendation on Project Assessment 2006-0286 (Yukon Energy Corporation Carmacks-Stewart/Minto Spur Transmission Project; page 15):

The determination of whether or not a particular effect is significant is undertaken in the context of the effect, and the circumstances encountered. In developing mitigative measures to address effects, the character of the effect (duration, frequency, magnitude, extent, reversibility), the socio-economic context (i.e., as linked to social expectations), and the likelihood of the effect occurring are key criteria that facilitate the determination of which effects are significant and thus should be mitigated. Societal expectations are often a reflection of the adversity of an effect as compared to the level of effort required to address the effect.

Two broad categories of effects exist along the spectrum of significance: insignificant, and significant …

Category A [Insignificant] consists of those potential effects for which mitigation is not necessary. This category would include beneficial effects as well as adverse effects that are within established norms (e.g., natural variation of baseline conditions, codes and standards), and levels of acceptable change/socio-economic context.

Category B [Significant] consists of all those effects that do not fall under category A. In this category, there exists a broad spectrum of adverse effects that are considered significant, which may range from minor adverse effects outside of local environmental norms/societal expectations to major consequential effects and have a moderate to high likelihood of occurring. Mitigative measures have been recommended for all adverse effects in this category, as required by YESAA.

The significance of a Project's potential effects on a particular VESEC (such as human health and safety) should also be assessed under section 56(1) of *YESAA* with reference to any relevant effect attributes, which could include the direction of change (i.e., positive, neutral, negative, or both positive and negative), the magnitude of a potential effect, its geographic extent, duration, frequency, reversibility, and likelihood of occurrence, and the applicable socio-economic context.

Having regard to the foregoing:

- The determination of the "significance" of the potential effects of the continuing operation of Yukon Energy's diesel facilities on human health and safety requires the identification and assessment of both the potential beneficial and adverse effects;
- In that exercise, potential adverse effects should be assessed with reference to those effect attributes that are relevant to the character of the effect and acceptability of the effect;
- Attributes relevant to the character of an effect may include the reasonably contemplated frequency, duration, magnitude, extent, and reversibility of the effect over the term of the amended Permit; and
- The level of acceptability of an effect should also be assessed with reference to the environmental standards now established under the Yukon Ambient Air Quality Standards and the likelihood of the standards being exceeded, which have been developed in consideration of those common effect attributes and reasonable societal expectations as the basis for the development of any such applicable codes and standards.

2.3 Engagement & Consultation

Between April 2020 and June 2021, Yukon Energy shared information with the Town of Faro and Faro residents about the addition of diesel-powered electricity generation at the existing Faro diesel power plant and encouraged residents to provide their feedback. Objectives of the engagement activities were to:

- Inform the public about the addition of seven temporary diesel rental units at the Faro diesel plant, why the rentals were needed, why the Faro site was selected, and how the rentals would be used;
- Inform the public about the results of the noise monitoring and air quality modelling work completed for the project;
- Inform the public that Yukon Energy would be applying for an amended air emissions permit at the Faro Generating Station, and how the public could be involved in the YESAA process; and
- Gather input about public interests and/or concerns.

Tables 1-3, below, summarize the engagement activities undertaken for this project.

Table 1 Summary of Engagement with the Town of Faro Administration

Date	Engagement Approach	Feedback Received
April 14, 2020	Email to Town of Faro advising of the Corporation's plans to add rental diesels in Faro in 2020. The email included a request for a follow-up discussion.	None.
July 27, 2020	Yukon Energy met with the Town of Faro Council to discuss its 10-Year Renewable Electricity Plan. As part of this meeting, Yukon Energy shared information about the rental diesel project with Council.	Council provided feedback that residents would most likely be concerned about noise from the rentals and air quality.
October 2, 2020	Yukon Energy management hosted a site visit with members of Faro Council at the Faro diesel plant.	Council members present relayed that they had heard that some residents had concerns about noise and air emissions from the rentals and consultation about their installation.
March 2021	Yukon Energy requested a meeting with Town of Faro Council to discuss the Corporation's proposal for an amended air emissions permit at the Faro diesel plant.	Town of Faro CAO advised Yukon Energy that there wasn't consensus from Council to meet.

* Additional activities during this time included emails to Town of Faro staff and Council about the project, public mailers and meetings, and noise monitoring and air modelling results.

Table 2 Summary of Engagement with the Public

Date	Engagement Approach	Feedback Received
September 2020	An information sheet about the addition of seven temporary diesel units being installed at the Faro plant were mailed to all residents in Faro. Information was also posted on Yukon Energy's website.	Fewer than six individuals contacted Yukon Energy to express concerns about noise from the rentals, air emission and consultation about the addition of the units.
December 2, 2020	Yukon Energy hosted a public information meeting about the addition of diesel generation at the Faro plant. The session was hosted online due to COVID-19 concerns. The meeting was advertised with community posters, radio and print ads, and social media. A copy of the presentation was posted on Yukon Energy's website after the event.	Six members of the public attended. Key themes of questions and comments raised by public members were: noise levels from rentals, air quality, consultation with local residents, consultation with Ross River Dena Council, and Faro Air Permits (allowances, changes and subsequent consultation.
March 11, 2021	Yukon Energy hosted an in-person drop-in event at the Faro Recreation Centre to share information about diesel in Faro, share information about the noise monitoring and air quality modelling conducted and its upcoming proposal for an amended air emissions permit. The event was advertised with community posters and Facebook.	No member of the public attended.
June 2021	An information sheet reporting back on the use of the rental diesels in winter 20/21, and with information about Yukon Energy's upcoming proposal for an amended air emissions permit in Faro was mailed to all residents in Faro. Information was also posted on Yukon Energy's website.	No feedback received.

Copies of the above noted information pieces and presentation can be found on Yukon Energy's website. https://yukonenergy.ca/energy-in-yukon/projects-facilities/diesel-facilities/portable-diesel-rental/

Table 3 Summary of Engagement with the Ross River Dena Council and Development Corporation

Date	Engagement Approach	Feedback Received
April 2020 to April 2021	More than a dozen emails and phone calls to Dena Nezzidi Limited Partnership (DNLP) 34 (designate for the Ross River Dena Council) to share information about the Faro rental diesel project and to request a meeting with Ross River Dena Council to discuss the project.	The Dena Nezzidi Limited Partnership representative attended Yukon Energy's December 2, 2020 public information meeting. The representative expressed concerns that Ross River Dena was not consulted before the installation of rental diesel units in Faro.
May 6, 2021	Discussion with Ross River Dena Council and Dena Nezzidi Limited Partnership leaders.	DNLP noted that this discussion could not be interpreted as consultation with Council or viewed as Council's support of the project. Other concerns were raised about the additional use of diesel. RRDC and DNLP expressed desires to review the YESAA proposal before submission, and discuss investment and procurement opportunities as part of the project.
July 2021	DNLP review of Yukon Energy Draft YESAA proposal	
Throughout 2021	Discussions about procurement opportunities for RRDC related to the project (fuel supply, investment in future projects)	

At the request of the Ross River Dena Council, Yukon Energy engaged the services of Dena Cho Environmental Ltd. to conduct a technical review of this YESAA Project Proposal Supporting Document. Each of the recommendations contained in the report from Dena Cho Environmental Ltd. were accepted

have been incorporated into this document or otherwise into the ongoing planning and communication activities for the Project. The referenced letter report is contained in Appendix E.

3 Facility Description

This section has been included to provide context for the assessment and to provide the reader with an understanding of the existing Faro Diesel Facility.

3.1 Facility Overview

The Project is located within the fenced area of the existing Faro Diesel Facility. This property is registered to Yukon Energy Corporation.

The existing facility includes:

- A fenced yard;
- Generator Building (ID: FD1)
- Generator Building (ID: FD7)
- Stations for seven portable rental diesel generators installed in 2020;
- Fuel storage (permanent storage tanks for FD1 and FD7, temporary storage for rental generators);
- Substation;
- Office; and
- Control Building.

Figure 2 provides an overview of the Site with the rental diesel units installed.

Modification of the existing Site included the addition of seven portable rental diesel generators in 2020. A summary of all the diesel units located at the Faro Facility are summarized in Table 3. These generators are temporarily installed at Site but only operated in combination with the existing, permanent units on site up to an operational capacity of 10.6 MW. This is the site operating ceiling until the existing Air Emissions Permit has been amended to allow for the additional operational capacity of up to 15.5 MW.

Figure 2: Faro Generating Station Site Overview

Table 4: Yukon Energy Thermal Generation Inventory at the Faro Generating Station

Unit No.	Manufacturer	Name Plate Capacity (MW)	Derated Capacity (MW)
FD1	Mirrlees	5.15	2.4
FD7	Caterpillar (CAT) 3612	3.3	2.8
YM20	Caterpillar (CAT) 3612C	1.8	n/a
YM21	Caterpillar (CAT) 3612C	1.8	n/a
YM22	Caterpillar (CAT) 3612C	1.8	n/a
YM23	Caterpillar (CAT) 3612C	1.8	n/a
YM24	Caterpillar (CAT) 3612C	1.8	n/a
YM25	Caterpillar (CAT) 3612C	1.8	n/a

3.2 Operational Ranges & Requirements

Yukon Energy's thermal electric generating plants are installed and operated to ensure the overall Yukon integrated electrical system, and so all customers on these systems can receive reliable power consistent with Yukon Energy's corporate and regulatory obligations. Hydro generation stations on the Yukon grid are typically supplemented as necessary by thermal for peaking or maintenance purposes.

The current need for thermal generation is related to several factors including:

- The need to meet demand for electricity during those times when hydro-electric facilities are taken offline for routine maintenance;
- The need to meet demand for electricity during those times when hydro-electric facilities are offline as a result of an emergency condition;
- The need to meet demand for electricity during those times when hydro-electric facilities are otherwise unable to meet current demand for energy;
- The need to 'exercise' a particular thermal unit as a part of routine maintenance;

Table 2 summarizes the annual thermal generation required over the last three years (2017–2019).

Table 5: Summary of Annual Diesel Generation 2018–2020 for the Faro Diesel Facility

Unit	2020		2019		2019	
	Run Time (unit hours)	Energy Produced (kW)	Run Time (unit hours)	Energy Produced (kW)	Run Time (unit hours)	Energy Produced (kW)
FD1	29	38,604	29.0	57,874	10.5	25,017
FD7	497	896,280	496.5	743,820	173.4	276,780
YM20	21	34,469	-	-	-	-
YM21	44	71,702	-	-	-	-
YM22	6	9,105	-	-	-	-
YM23	136	221,122	-	-	-	-
YM24	6	9,755	-	-	-	-
YM25	44	71,540	-	-	-	-
YM26	117	190,230	-	-	-	-

Demand for electricity is growing in Yukon. There is an existing gap today between the available dependable capacity on the grid and the amount of electricity Yukoners require during a winter peak

under emergency conditions. To continue providing most of the territory's energy from renewable sources and to accommodate the increased demand for electricity, Yukon Energy is investing in new dependable renewable electricity sources that add firm winter capacity to the grid. This will allow YEC to continue meeting Yukoners' growing demands for renewable electricity – even on the coldest and darkest of days – while also supporting Yukon government's emission reduction targets. However, until those additional and dependable renewable energy resources can be brought into service, Yukon Energy is forecasting increased need to support its hydro assets with thermal electricity to meet the needs of Yukoners today.

Having regard to this increased demand, Table 3 presents the forecasted diesel generation for Yukon Energy's thermal facility in Faro, which was analyzed for the purpose of completing the effects assessment contained in this Project Proposal. As can be seen from the table, forecast average generation is lower than the actual average generation over the last 10 years, this is due to more thermal load being met by the natural gas generators at the Whitehorse Rapids Generating Station in recent years. This is also a reminder of the fact that the principal purpose of this project is not to meet routine system loads with thermal generation in Faro, but rather to be prepared with sufficient firm dispatchable energy in an emergency situation on the system as discussed in Section 3.3, below.

- **Scenario 1:** Actual average generation levels over the last 10 years.
- **Scenario 2:** Forecast "average case" levels of thermal generation required at the Faro Diesel Facility through to 2023. This scenario reflects Yukon Energy's projections of the most likely levels of thermal generation over the 2021–2023 period, given current hydrological conditions and electricity demand predictions.
- **Scenario 3:** Hypothetical "worst case" scenario. This scenario reflects Yukon Energy's projections of the maximum demand that might theoretically need to be met from thermal generation, in the event of an emergency like an N-1 event. This scenario represents an extreme case, which is very unlikely to occur over the term required to close the current generation capacity gap.

Table 6: Summary of Forecasted Diesel Generation 2021–2023 for the Faro Diesel Facility

Permit Year	2021			2022			2023		
Scenario	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**
Diesel Generation (MWh/yr)	515	261	3100	515	313.2	3100	515	208.8	3100

3.3 Regulatory Context

3.3.1 Regulation under the *Public Utilities Act*

Yukon Energy's thermal generating stations are operated as a critical component of the Corporation's facilities required to satisfy its obligation to supply electricity service to its customers under the *Public Utilities Act*. As such, the stations are regulated by the Yukon Utilities Board (YUB) both in terms of the requirement for installed capacity, and the ability of Yukon Energy to recover any costs spent on these facilities through electrical rates.

To satisfy Yukon Energy's obligations, the generating stations must be designed and installed to ensure that the power systems are able to supply utility-grade reliable power to customers. This requires the thermal stations to meet the capacity planning criteria[5] reviewed by the YUB in its review of Yukon Energy's 20-year Resource Plan 2011–2030 (Yukon Energy 2011), and the consequent recommendations from the YUB to the Minister of Justice dated January 15, 2007.

Yukon Energy must be able to meet utility standard planning criteria in terms of the quantity of installed thermal generation on the system, and at the right locations on the system, as well as the ability to operate the diesel generators as required to the full capability of their rated output. If Yukon Energy is not able to meet these requirements, it could experience one or more of the following conditions:

- In **very cold weather conditions**, Yukon Energy would be unable to meet the peak loads of the integrated transmission grid. This would give rise to interruptions of service on substantial components of the power grid, likely during peak load hours (e.g., daytime hours). Further, once such outages occur it becomes very difficult to resume service due to a condition known as 'cold load pick-up' where the generation available must be well in excess of the normal average load on a feeder in order to be able to restore service (due, for example, to the fact that after even a brief outage in such weather, basically every furnace fan or heat tape installed on the system will automatically be drawing load when the system is restored).

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[5] The criteria adopted by Yukon Energy and set out in the 20-year Resource Plan 2011–2030 are as follows:

[1] WAF and MD System-wide capacity planning criteria: Each system (WAF and MD) will be planned not to exceed a Loss of Load Expectation (or LOLE) of two hours per year.

[2] Emergency (or "N-1") WAF and MD system capacity planning criteria: Each grid system (WAF and MD) will be planned to be able to carry the forecast peak winter loads (excluding major industrial loads) under the largest single contingency (known as "N-1"). The N-1 criterion determines system capacity assuming the loss of the system's single largest generating or transmission-related generation source. In the case of WAF, this is presently the Aishihik transmission line, without which the WAF grid loses ability to access approximately 37 MW of generation.

[3] WAF and MD "community" criteria: For communities on the WAF or MD grids, any location with a load large enough to justify a diesel unit of about 1 MW or more will be considered as a preferred location for new diesel units if that community does not already have back-up from another source (e.g., having an existing diesel unit). The new diesel units would provide grid support, and in times of line failures would provide local generation for the communities where they are located.

- In **unplanned system outages**, particularly in winter conditions, Yukon Energy would similarly be unable to supply load. Outages due to unplanned system outages could be for an extended duration. Extended outages have occurred historically and include:
    - A major failure of the power cables at the Aishihik hydro plant on January 29, 2006, where up to six WAF diesels operated for two days to maintain power to the system. For a further eight days the WAF system operated in a constrained mode without diesels operating, but needed to be ready to operate at any time. The system was not fully restored to normal status until February 21, more than three weeks after the incident.
    - A fire at the Whitehorse Rapids hydro plant occurred in October 1997, and diesel generation was used to supply substantial components of the load.
    - A number of times in recent years and in various locations, when forest fires are in close proximity to grid locations and transmission lines are, at times, required to be de-energized.
- During periodic **drought conditions**, even at the current load levels, the diesel units could be required for energy-related reasons to maintain service to load and ensure the hydro plants can maintain their water levels within licenced ranges. For example, diesel generation for this purpose was required in the late winter of 1999 due to the severe drought conditions experienced at Aishihik in 1998 and similar conditions in Mayo in 2018 and 2019. While this can lead to sustained diesel generation, the output is typically at a low level. For example, during the early part of 1999, the average output of all combined diesel generation on WAF was 3 MW, or less than 10% of the installed diesel capability on WAF.

In **planned system outages**, such as transmission line maintenance, communities such as Faro and Dawson, which are located away from the integrated system's hydro plants require diesel generation to maintain continuity of service. If Yukon Energy's ability to use and operate the required thermal generators were to be constrained (before new permanent capacity can be brought into service) in any way that could prevent the Corporation from being able to rely on the facilities to provide a dependable supply of back-up power to customers in accordance with utility standard planning criteria, such constraints could result in one or more of the foregoing situations arising, in which Yukon Energy would be unable to supply customers with power in accordance with its obligations under the *Public Utilities Act*. This would present an obvious and acute risk of harm to human health and safety and public and private infrastructure, particularly during cold winter temperatures.

3.3.2 Legal & Regulatory Constraints under Environment Act and Air Emissions Regulation

Aside from the regulation of Yukon Energy's thermal generating stations by the YUB under the *Public Utilities Act*, Yukon Energy's use and reliance on its thermal facilities is constrained by the terms and

conditions of its existing Air Emissions Permit, as well as the requirements of relevant legislation that applies to the Project, including the *Environment Act* and the *Air Emissions Regulations.*

As noted in Part 2.3 above, for the purpose of assessing what, if any, potential effects the amendment of the Permit could have on human health and safety, the Designated Office should assume that Yukon Energy will continue to operate its thermal generation facilities in compliance with all relevant legislative and regulatory requirements, and that the decisions bodies and regulators will continue to enforce such requirements, in order to help ensure that no significant adverse effects occur as a result of the operation of the facilities.

Assuming Yukon Energy's Air Emissions Permit is amended to allow for the use of additional diesel generators in compliance with the terms and conditions like those contained in the existing Permit No. 60-010 (Appendix A), Yukon Energy's operation of the facilities will continue to be subject to the following requirements under the Permit:

- All associated personnel (employees, contractors or volunteers) a) have access to a copy of this permit; b) are knowledgeable of the terms and conditions of the Permit; and c) receive appropriate training for the purposes of carrying out the requirements of the Permit (paragraph 2.3);
- Yukon Energy is required to provide written notice to an environmental protection analyst before any significant change of circumstances at the site, including, without limitation, a) discontinuation of any regulated activity at the site; b) change of ownership of the site or any of the sources; and c) change to the mailing address of phone number of the permittee (paragraph 2.4);
- Yukon Energy is required to obtain approval from an environmental protection analyst prior to a) adding, modifying, removing or replacing any equipment or components relating to the release, abatement, control or treatment of air emissions; and b) before any change in location of the source(s) (paragraph 2.5);
- If an inspection reveals that the site or source(s) is in any way not in compliance with the Permit, Yukon Energy is required to repair the damage or take other actions required to bring the site or source(s) into compliance (paragraph 2.7);
- Yukon Energy shall, in accordance with the manufacturer's recommendations and best management practices, inspect, maintain and operate the sources, any stand-alone air pollution control equipment, and testing and monitoring equipment as necessary to provide optimum control of air contaminant emissions during all operating periods (paragraph 3.2);

- Except for maintenance or test purposes, Yukon Energy shall run the sources at each site in order of highest possible efficiency under the circumstances (paragraph 3.3);
- Yukon Energy shall ensure that the fuel used by the source(s) conforms to the most recent Canadian federal Sulphur in Diesel Fuel Regulations for off-road applications (paragraph 3.3);
- Yukon Energy shall ensure that the visible emissions from any source shall not exceed an opacity of 20% as measured by an environmental protection officer (paragraph 4.1);
- In the event that the opacity of emissions from any source exceeds an opacity of 20% as measured by the environmental protection officer, Yukon Energy shall take measures to reduce the opacity of the emissions below that criterion as directed by an environmental protection officer (paragraph 4.2);
- Yukon Energy shall ensure that particulates collected using emission control equipment are contained so that there is no release of contaminants to the atmosphere or into an open body of water (paragraph 4.3);
- If ambient air quality monitoring data within the area of influence of Yukon Energy's facility indicates that one or more of Yukon's Ambient Air Quality Standards is being exceeded, and the environmental protection officer is satisfied that Yukon Energy's facility is the cause or a significant contributor to the prevailing ambient air quality condition, Yukon Energy shall undertake such mitigation measures as may be specified by the environmental protection officer to improve the ambient air quality condition (paragraph 4.4);
- If any diesel generator exceeds 3% of its annual potential to emit in a calendar year, and, in that same calendar year, if the total operating time of all the generators at that site exceeds 3% of their total annual potential to emit, Yukon Energy will create a emissions management plan to be submitted to the analyst for approval (paragraph 5.1);
- Yukon Energy will carry out any commitments in the approved emissions management plan on a schedule that is approved by the analyst (paragraph 5.2);
- Yukon Energy will submit a report to an environmental protection analyst which includes (from paragraph 6.1):
    - Total annual operating hours for all sources at all sites;
    - The estimated total annual emissions of SO2, PM2.5, CO, NO2, and N2O from each source at each of the sites, including the calculation used to determine those results;
    - Total annual emissions of volatile organic compounds (VOCs) as required in part 5.3 of this permit; and,

  - A summary of the fugitive CH4 monitoring program including methodology, data, and total fugitive emissions as required in part 5.4 of this permit; by March 31st of each year of this permit for the previous calendar year.

- Yukon Energy is required to contact either an environmental protection officer or the Yukon Spill Report Centre as soon as possible under the circumstances in the event of an unauthorized release or emission, such as fugitive emissions or emissions resulting from burning fuel other than that allowed under the Permit (paragraph 7.1);
- Yukon Energy is required to maintain records for at least three years in a format acceptable to an environmental protection officer, and to make them available on request for inspection by an environmental protection officer, including every plan developed under the Permit, summaries of all inspections carried out under the Permit, notes concerning any spills, leaks or unauthorized emissions, any deficiencies identified in an inspection and how and when they were remedied, and notes concerning any instance where the most efficient source was not used, and the reason for use of the less efficient source (paragraphs 8.1 and 8.2).

Yukon Energy's operation of the modified facility will also continue to be subject to all applicable requirements and prohibitions under the *Environment Act* and *Air Emissions Regulations*, including:

- The general prohibition under section 6 of the *Regulations* against Yukon Energy releasing or allowing the release of any contaminant to such extent or degree as may: (a) cause or be likely to cause irreparable damage to the natural environment; or (b) in the opinion of a health officer, cause actual or imminent harm to public health or safety;
- Yukon Energy's obligation under section 12(3) of the *Regulations* to provide written notice to the Minister, as soon as is reasonably feasible, of <u>any</u> significant change of circumstances involving the permitted activity;
- The authority of an environmental protection officer under section 12(4) of the *Regulations* to conduct periodic inspections of Yukon Energy's facilities to ensure compliance with the terms and conditions of the Permit;
- The authority of an environmental protection officer to issue a "hold order" under section 153 of the *Act*, or an "environmental protection order" under section 159 of the *Act*, in any of the circumstances described in those sections;
- The authority of the Minister to issue an "environmental protection order" under section 160 of the *Act*; and
- The overriding authority of the Minister to suspend or cancel the Permit under section 91 of the *Act*, if Yukon Energy contravenes a term or condition or the Permit or a provision of the *Act* or *Regulations*, or if, in the Minister's opinion, Yukon Energy's operation of its diesel facilities "has

caused or is likely to cause irreparable or costly damage to the natural environment", or if, on the advice of a health officer, it is the Minister's opinion that Yukon Energy's operation or its diesel facilities "has caused or is likely to cause a threat to public health or safety".

It should be emphasized that if, during the term of the amended Permit, a situation arises in which the continuing operation of Yukon Energy's could ever cause actual or imminent harm to public health or safety because of any change in circumstances or operating conditions that is not contemplated at this time, the *Environment Act* and *Regulations* will give overriding authority to an environmental protection officer and/or the Minister, in the circumstances specified, to require Yukon Energy to cease operating one or more of the diesel units, or take other action that may be deemed necessary to prevent, remedy or otherwise mitigate that harm.

Other relevant legislative requirements include:

- Section 27 of the *Occupational Health Regulations*, which stipulates workers' exposure limits for airborne contaminants, usually based on an 8-hour permissible exposure limit;
- Sections 46 to 50 of the *Canadian Environmental Protection Act, 1999*, which speaks to the reporting requirements of the National Pollutant Release Inventory (NPRI);
- Yukon Special Waste Regulations;
- Yukon Contaminated Site Regulations;
- Yukon Storage Tank Regulations.

4 Project Scope

The scope of this Project is to amend the existing Air Emissions Permit (No. 60-010) to increase the operational capacity from 10.6 MW to 15.5 MW. Seven additional rental diesel generators have been added to the Site. These diesel generators will be used, as required, within the terms and conditions of the existing Air Emissions Permit. Until the permit is amended to include the additional operational capacity, the maximum operational capacity of 10.6 MW will be followed using any combination of the units installed at the station.

The temporal scope of this Project is for the foreseeable future, but given that the maximum permit term under the Environment Act is 10 years, that is the established temporal scope of this proposal.

5 Environmental and Socio-economic Setting

5.1 Environment Setting

The Town of Faro is situated on the unceded Traditional Territory of Ross River Dena Council, and is geographically located in the Pelly River Valley in the Anvil Mountains, which is 356 km northeast of Whitehorse on the Tintina Trench fault line on the edge of the Yukon Plateau-North Ecoregion. It is located at an elevation of approximately 690 m above sea level. The soil surrounding the facility is composed of sand and gravel layers with some silt.

5.1.1 Vegetation

The Project is located within the Yukon Plateau-North Ecoregion of the Boreal Cordillera ecozone. The vegetation ranges from boreal to alpine, with northern boreal forest reaching elevations up to 1,500 m. The dominant forest type of the boreal zone is characterized by open canopy black spruce with a moist or drier lichen understory. White spruce forests, occasionally with aspen or lodgepole pine, occur in warmer and better-drained sites. Various willows, sedges, and aquatic plants are present in or around wetland areas.

The Site is located within the existing Faro Diesel Facility and has been previously cleared.

5.1.2 Wildlife

The Yukon Plateau-North Ecoregion provides habitat for a variety of wildlife and bird species typical of the boreal forest. The ecoregion supports populations of grizzly and black bears, caribou, moose, wolverine, marten, wolf, Stone and Fannin sheep, lynx, red fox, beavers, and other small mammals. There is a large abundance of grizzlies in the Faro area. The Tintina Trench serves as an important migratory corridor for large numbers of sandhill cranes that breed in Alaska. The region's wetlands are also used as breeding grounds for raptors, songbirds, forest birds, and waterfowl.

5.1.3 Fish and Aquatic Ecosystems

The Site is located within the Pelly River watershed. The Project is located approximately 2 km away from the Pelly River. Van Gorda Creek is the closest waterbody and is located approximately 0.15 km to the southeast.

Some of the fish species inhabiting the Pelly River are Chinook, Coho, and Chum salmon, lake trout, Arctic grayling, northern pike, burbot, and whitefish.

5.1.4 Air Quality

The British Columbia Air Quality Dispersion Modelling Guideline (AQDMG; BC MOE 2015) considers baseline air quality be the concentrations from emissions of both natural and anthropogenic sources, excluding the source being modelled.

For this assessment WSP (2020a) assessed baseline air quality for the Site (see Appendix B). Typically, this is done within the modelled airshed, however, in Yukon, ambient air quality monitoring data is only available for one station located in downtown Whitehorse. Environment Canada operates an air quality monitoring station located at 1091 - 1st Avenue, as part of the National Air Pollution Surveillance (NAPS) network. There is no monitoring station in Faro.

To determine the baseline air contaminant concentrations for the Project's airshed (i.e., Faro), WSP (2020a) scaled the baseline concentrations from the Whitehorse Air Quality Station based on the emissions inventories previously developed for YEC's air assessment (SENES 2011).

The most recent 3-year data record includes monitoring for NO_x, NO_2 and $PM_{2.5}$ for the period 2016–2018. Baseline data for SO_2 and CO were not available and were therefore not applied in WSP's assessment. The data used and analyzed for the air quality assessment is presented in WSP's report in Appendix B.

The data from the station indicate that for the three-year period (2016–2018), the maximum levels of NO_2, $PM_{2.5}$ and PM_{10} in Faro are well below the ambient air quality standards used by Yukon Environment.

5.1.4.1. Emissions Inventory

In 2008, SENES completed an emissions inventory for Yukon Energy for the purposes of its Air Emissions Permit renewal application. Individual inventories were developed for each community in which Yukon Energy maintains diesel generators (SENES 2008).

The Town of Faro contains a small fraction of the population within the Yukon and its inventory uses scaled activity from the Whitehorse inventory in situations where local data were not available. The following are points of interest from the SENES' 2008 inventory for Faro:

- Within the inventory bounds there is very little agricultural activity both for land use activity and agricultural equipment usage.
- There were no significant point sources identified for Faro other than the Yukon Energy power plant.

- The highway traffic accounts for vehicles travelling along a 15 km stretch of the Campbell Highway.
- A population of 388 was estimated for the inventory year.
- A total of 786 flights were recorded at the local airport.
- A total of 367 cords of wood were estimated to have been burned during the year.
- Yukon Energy diesel operations contributed approximately 0.4%, 16%, and 2% of the total community emissions of $PM_{2.5}$, NO_x, and CO_2, respectively.

5.1.5 Noise

WSP (2020b) completed a noise impact assessment for the Faro Diesel Facility. This study assessed existing noise sources to use as baseline levels of noise, to which Project effects would be measured against.

Currently, the Yukon does not have any specific regulatory noise guidance or criteria. For this assessment the British Columbia Oil and Gas Commission's (BC OGC) *British Columbia Noise Control Best Practices Guideline* (2009) and Health Canada's Guidance for Evaluation Human Health Impacts in Environmental Assessments: Noise (2017) were used.

The BC OCG Guidelines defines Permissible Sound Levels (PSL) at receptor locations using methods outlined in their document. In accordance with the BC OCG Guidelines, facilities constructed and operated before October 1998 are considered "deferred facilities" and, without outstanding noise complaints, are considered to meet the communities noise tolerance levels. The Faro Facility was constructed and operated prior to 1998 and therefor sound from the existing facility is considered to be the PSL for this Project.

Noise sources within the Facility boundaries include:

- FD1 Generator (Mirrlees KV16 Model)
- FD7 Generator (Caterpillar (CAT) 3612.

Both FD1 and FD7 are contained within generator buildings and noise sources from these buildings include air intake louvres and dampers, exhaust fans, noise breakout through façade and combustion air. For the generator buildings, there are also remote radiators located outside the building. The noise sources, along with sound power level are summarized in WSP (2020b).

Other than the generator buildings, the other buildings on site are considered sources of with negligible effects.

Hemmera (2021; Appendix D) completed actual noise monitoring measurements at the Faro Generating Station and in the Town of Faro between March 10th and 11th, 2021 to collect baseline noise data and to support the modelled assessment of potential noise impacts from the Project.

This monitoring measured sound levels for two operational scenarios in addition to colleting ambient sound levels:

1) Operation of the two existing generators (FD1 and FD7), and
2) Operation of the six rental generating units (YM20 to YM26).

For each of these scenarios, short-term noise monitoring was conducted at the southwestern corner of the generating station and at a near by residence located at 130 Dawson Drive. Baseline noise levels were established by sound measurements made at 130 Dawson Drive by conducting 24 hours of noise monitoring when no diesel generators were operating at the facility. Results of this assessment are provided in Appendix D and summarized in Table 5.

Table 7: Noise Monitoring Results (Hemmera 2021)

Location	Baseline (Ambient)	Operational Scenario 1	Operational Scenario 2
Facility fence line	-	60.6	72.2
130 Dawson Drive	39.4	42.8	41.7

5.2 Socio-economic Setting

5.2.1 Nearby Communities

The Faro Generating Station is located within the unceded territory of the Ross River Dena Council. The Town of Faro is located just off the Robert Campbell Highway, 356 km northeast of Whitehorse and 423 km from Watson Lake. In 2016, the population of Faro was 348 (Statistics Canada, 2017). Essential services in Faro include a municipal landfill; an RCMP detachment; the Faro Nursing Station; a hotel; schools; an airport; volunteer fire, ambulance and search-and-rescue services; and other businesses, including a bank.

5.2.2 First Nations

The project is located within the unceded traditional territory of the Ross River Dena Council.

5.2.3 Administrative Boundaries and Other Land Use Activities

Administrative boundaries that overlap with the project include group trapline concession #405 and outfitting concession #9. Hikers and other recreational users may occasionally frequent the wooded areas surrounding the Project. Land uses near the community include mining, recreation, hunting, trapping, and other traditional land uses.

6 Environmental and Socio-economic Effects Assessment

Given the setting and nature of the Project, three VC's were identified for this Project as having the potential for significant adverse effects: Human Health and Safety, Aural Aesthetics, and Environmental Quality. Beneficial effects from Yukon Energy's Faro Diesel Facility are also discussed here.

As mentioned in Section 2.1, potential effects to Environmental Quality are related to such things as the petroleum hydrocarbon (fuel/oil) releases. These potential effects are possible with the Project and are considered significant if they were to occur, but they are adequately addressed by standard mitigation measures (applicable codes and standards) that are part of non-discretionary legislation and regulations such as the Spills Regulations, Storage Tank Regulations, and Special Waste Regulations (pursuant to the Yukon Environment Act). In addition, operational controls currently in place under Yukon Energy's Special Waste Permit, Storage Tank Permit, Air Emissions Permit, including the amendment that Yukon Energy is applying for at this time are considered sufficient to mitigate such potential effects. As such, they are not considered further in this assessment.

6.1 Human Health and Safety

6.1.1 Potential Effects

This Project includes increasing the operational capacity of diesel generators from the current operational capacity of 10.5 MW to 15.5 MW. The diesel generators in Faro are used to supplement Yukon Energy's hydro-electricity supply and as otherwise described earlier in this document.

Potential effects of the increase operational capacity on air quality include:

- Periodic effects to local air quality; and,
- Adverse effects to human health resulting from exposure to airborne contaminants.

The potential for significant adverse effects to Human Health and Safety as a result of Project-related activities (i.e., increasing the operation capacity from 10.6 to 15.5 MW) have been assessed by Yukon

Energy. The assessment has concluded that no significant adverse effects to Human Health and Safety will arise from the increased operating capacity for diesel generation operations in Faro.

In addition to potential adverse Project-related effects, Yukon Energy's thermal generation facilities, including the Faro Generating Station, have an obvious beneficial effect on Human Health and Safety, given Yukon Energy's reliance on those facilities for back-up power generation capacity. The diesel facilities are essential to Yukon Energy's ability to provide a reliable supply of electricity to customers on those occasions when Yukon Energy is unable to satisfy total customer demand through hydro generation alone, i.e., in emergency situations, as well as during periods of planned maintenance, or when demand otherwise outstrips hydro supply as a result of peaking demand during cold winter temperatures.

If Yukon Energy were not able to use and rely on its thermal generation facilities to provide a reliable supply of back-up power to customers in these circumstances, this would put both infrastructure and human health and safety at very serious risk, particularly during the cold winter months. Notwithstanding the potential effects of not being able to meet customer demand in such circumstances it is essential that electricity generating activities do not put other human, community, and/or environmental values at risk of serious irreversible harm.

6.1.2 Effects Characterization

Diesel-fired generators produce contaminants in the combustion gases. Adverse effects can result from short-term exposure, including irritation of the tissues of the eyes, and upper and lower respiratory systems. The toxicity is dependent on the chemical concentration in the air rather than the total internal dose received by multiple exposure pathways. For criteria air contaminants (CACs) in combustion gases such as carbon monoxide (CO), particulate matter ($PM_{2.5}$), nitrogen dioxide (NO_2) and sulphur dioxide (SO_2), exposure limits are represented by air quality standards/guidelines/objectives and are used to assess potential effects on human health. In Yukon, the Ambient Air Quality Standards are used to determine allowable exposure limits and to regulate emission rates.

It should also be noted that the effects of diesel generation emissions on human health result from the cumulative interaction of emissions from Yukon Energy and all other sources of contaminants in the airshed, including community sources such as local vehicular traffic, home heating (using either fuel oil or wood stoves), and other (non-Yukon Energy) industrial activity. Those other sources, which are not within the Corporation's control, collectively produce the majority of contaminants in the community (SENES 2008). Any potential effects on human health would be as a result of overall ambient air quality.

The nearest resident to the Faro Diesel Facility is approximately 380 m to the southeast. The nearest business is located approximately 360 m to the east-southeast. The nearest childcare facility is 785 m to

the southeast, school is 825 m to the southeast and health care facility is 860 m to the southeast (WSP 2020a).

The updated Air Quality Dispersion Modeling Assessment for the Faro Diesel Facility, completed by WSP (2020a; Appendix B), includes a thorough and comprehensive dispersion modelling analysis to assess the potential effects within the Faro airshed of five CACs produced from the diesel generators including:

- Carbon monoxide (CO),
- Sulphur dioxide (SO_2),
- Nitrogen dioxide (NO_2),
- Fine particulate matter ($PM_{2.5}$); and
- Course particulate mater (PM_{10}).

The potential effects of Yukon Energy emissions of those contaminants was modelled, analyzed, and assessed based on two generation/emission scenarios for the Faro Diesel Facility:

1. Existing Permitted Generation/Emission Capacity Scenario (10.6 MW); and
2. Theoretical Future Expansion Generation/Emission Capacity Scenario (16 MW).

WSP's (2020a) model evaluated compliance of the five CACs with the Yukon Ambient Air Quality Standards (YAAQS) and shows the changes in potential air quality impacts between the existing and future scenarios.

Both the existing and future expansion scenarios were evaluated assuming maximum emissions from the facility resulting from 1) maximum operating conditions; and 2) using the nameplate capacities. The modelling also assumed that the generators are emitting simultaneously and continuously year-round, which never be the case. In this way, the impact assessment is conservative. As discussed in Section 3.5.1, this additional capacity is required to meet the utility standard planning criteria and is only planned for use during extreme weather conditions (i.e., very cold temperatures), during system outages, during draught conditions and during maintenance.

Results from WSP's (2020a) model are summarized as follows:

"Despite these conservative assumptions, the ambient air quality dispersion modelling results showed that, with the exception of short-term (1-hour) NO_2 results, the maximum cumulative predicted concentrations for all air contaminants ($PM_{2.5}$ PM_{10}, SO_2, and CO) were well below their respective ambient air quality criteria. The maximum points of impingement (worst-case receptors) were all found either near the Facility or outside the Town of Faro, in both scenarios. Overall, the cumulative predicted

air contaminant concentrations from the Future Scenario were higher than those of the Existing Scenario given the increased power generation of the facility expansion.

While the dispersion modelling results predicted short-term NO_2 exceedances for both scenarios, the primary objective of the air quality assessment was to evaluate the potential risks on the human population residing near the facility (in the Town of Faro). The modelling results for the Existing Scenario at the maximally impacted receptor within the Faro Town showed that the cumulative predicted concentrations for all pollutants evaluated were in compliance with the YAAQS.

While the dispersion modelling predicted short-term (1-hour) NO_2 exceedances in the Future Scenario, the predicted air quality impacts for all the other air pollutants – including both fine and coarse particulate matter ($PM_{2.5}$ and PM_{10}), SO_2, and CO – were well below the YAAQS. With regard to the NO_2 predicted short-term (1-hour) NO_2 exceedances, it is important to note that the YAAQS for NO_2 were reduced drastically in late 2019 from 401 µg/m^3 previously to 113 µg/m^3 presently. The maximum cumulative predicted 1-hour NO_2 concentrations from both existing and future permit scenarios would be well below the previous NO_2 criteria. When compared to the newly revised NO_2 YAAQS, the maximum cumulative predicted 1-hour NO_2 concentration was 129% of the Yukon Ambient Air Quality Standards for NO_2 at the maximally impacted Faro Town receptor in the Future Scenario. Moreover, the predicted 1-hour NO_2 exceedances were found spatially limited to a confined area surrounding the Facility areas on the outskirts of Faro, with a low frequency of occurrence of 0.21% of the time (56 hours out of 26,304 modelled hours) at the maximally impacted Faro Town receptor.

These short-term (1-hour) NO_2 exceedances were found entirely under calm stable meteorological conditions, which typically hinder atmospheric dispersion; primarily during nighttime and in the colder months of the year; and, exclusively under west-northwest winds. Outdoor human activity would be limited during cold nighttime hours and this lowers the probability of human to be exposed to the short term NO_2 impacts. Combined with the low frequency of model predictions exceeding the NO2 YAAQS (56 hours out of 26,304 modelled hours), there is an even lower probability of exposure to levels above the YAAQS.

Finally, it is important to note that the modelling results represent the worst-case potential air quality impacts based upon the facility's maximum operating conditions. As such, the model predicted air contaminant concentrations are conservative. Furthermore, the conditions giving rise to predicted short-term NO_2 exceedances would be very unlikely to happen because the emission sources at the facility are highly unlikely to operate continuously year-round at the maximum possible emission rates, nor would it be likely that these maximum emissions coincide exactly with the particular meteorological conditions that give rise to the event as they occur, on average, for less than 20 hours per year modelled. The typical facility emissions are expected to be much lower and would not be anticipated to result in adverse air quality impacts given the low risk of predicted exceedance under even conservative

assumptions. With model predictions indicating an extremely low risk of predicted short-term NO_2 impacts and low potential impacts from the other air pollutants, the overall air quality impacts from the future expanded facility are not anticipated to pose a significant risk to the Town of Faro and air quality would be anticipated to remain in compliance with YAAQS."

6.1.3 Mitigation Measures

Yukon Energy's use and reliance on its diesel facilities during the authorization period will be constrained by the terms and conditions of its Air Emissions Permit, as well as the requirements of relevant legislation that applies to the project, including the Environment Act and the Air Emissions Regulations.

Yukon Energy's operation of the Faro Diesel Plant will continue to be subject to following requirements under the existing Air Emissions Permit:

- All associated personnel (employees, contractors or volunteers) are required to be knowledgeable of the terms and conditions of the Permit, and to receive appropriate training for the purposes of carrying out the requirements of the Permit;
- Yukon Energy is required to provide written notice to an environmental protection analyst before any significant change of circumstances at the site, including, without limitation, discontinuation of any regulated activity at the site, or any change of ownership of the site or any of the sources;
- Yukon Energy is required to obtain approval from an environmental protection analyst before adding, modifying, removing or replacing any equipment or components relating to the release, abatement, control or treatment of air emissions, and before any change in location of the source(s);
- If an inspection reveals that the site or source(s) is in any way not in compliance with the Permit, Yukon Energy is required to repair the damage or take other actions required to bring the site or source(s) into compliance;
- Yukon Energy is required to develop and maintain a fire safety/emergency plan and a current site plan in accordance with the Permit and any requirements established by the Environmental Programs Branch of Environment Yukon; such plans (and any amendments) must be approved by an environmental protection analyst, and Yukon Energy is also required to implement approved plans, and to ensure all associated personnel are familiar with them;
- Yukon Energy is required to maintain and operate the sources, as well as any stand-alone air pollution control equipment and testing and monitoring equipment, in accordance with

manufacturers recommendations and best management practices, as necessary to provide optimum control of air contaminant emission during all operating periods;

- Yukon Energy is also required to run the sources at the site in order of highest possible efficiency in the circumstances, except for maintenance or test purposes;
- Yukon Energy is required to ensure that the fuel used by the source(s) conforms to the most recent Canadian federal Sulphur in Diesel Fuel Regulations for off-road applications (paragraph 4.3);
- Yukon Energy is prohibited from allowing visible emissions from any source to exceed an opacity of 20% as measured by an environmental protection officer, and must comply with further requirements to notify an environmental protection officer of any measured exceedance within 15 days or such time as may be directed by an environmental protection officer, and to take reasonable measures to reduce opacity of emissions within 5 days of any measured exceedance, or in such time as may be directed by an environmental protection officer;
- Yukon Energy must ensure that particulates collected using emission control equipment are contained so that there is no release of contaminants into the atmosphere or any open body of water;
- Yukon Energy is required to conduct visual inspections and maintenance on all source components as per manufacturer's instructions;
- Yukon Energy is required to contact either an environmental protection officer or the Yukon Spill Report Centre as soon as possible under the circumstances in the event of an unauthorized release or emission, such as fugitive emissions or emissions resulting from burning fuel other than that allowed under the Permit;[6]
- Yukon Energy is required to maintain records for at least three years in a format acceptable to an environmental protection officer, and to make them available on request for inspection by an environmental protection officer, including every plan developed under the Permit, summaries of all inspections carried out under the Permit, notes concerning any spills, leaks or unauthorized emissions, any deficiencies identified in an inspection and how and when they were remedies, and notes concerning any instance where the most efficient source was not used, and the reason for use of the less efficient source.

[6] Yukon Energy also commits to notifying the Ross River Dena Council Department of Lands and Resources in the case of a reportable hazardous material release (e.g., fuel/oil spill).

Yukon Energy's operation of the facilities will also continue to be subject to all applicable requirements and prohibitions under the *Environment Act* and Air Emissions Regulations, including:

- The general prohibition under section 6 of the Regulations against Yukon Energy releasing or allowing the release of any contaminant to such extent or degree as may:
    a) cause or be likely to cause irreparable damage to the natural environment; or
    b) b) in the opinion of a health officer, cause actual or imminent harm to public health or safety;
- Yukon Energy's obligation under section 12(3) of the Regulations to provide written notice to the Minister, as soon as is reasonably feasible, of any significant change of circumstances involving the permitted activity;
- The authority of an environmental protection officer under section 12(4) of the Regulations to conduct periodic inspections of Yukon Energy's facilities to ensure compliance with the terms and conditions of the Permit;
- The authority of an environmental protection officer to issue a hold order under section 153 of the *Act*, or an environmental protection order under section 159 of the *Act*, in any of the circumstances described in those sections;
- The authority of the Minister to issue an environmental protection order under section 160 of the *Act*; and
- The overriding authority of the Minister to suspend or cancel the Permit under section 91 of the *Act*, if Yukon Energy contravenes a term or condition or the Permit or a provision of the *Act* or Regulations, or if, in the Ministers opinion, Yukon Energy's operation of its diesel facilities has caused or is likely to cause irreparable or costly damage to the natural environment, or if, on the advice of a health officer, it is the Ministers opinion that Yukon Energy's operation or its diesel facilities has caused or is likely to cause a threat to public health or safety.

It should be emphasized that if, during the term of the Permit, a situation arises in which the continuing operation of generating equipment could ever cause actual or imminent harm to public health or safety because of any change in circumstances or operating conditions that is not contemplated at this time, the *Environment Act* and Regulations will give overriding authority to an environmental protection officer and/or the Minister, in the circumstances specified, to require Yukon Energy to cease operating one or more of the diesel units, or take other action that may be deemed necessary to prevent, remedy or otherwise mitigate that harm.

Other relevant legislative requirements include:

- Section 27 of the Occupational Health Regulations, which stipulates workers exposure limits for airborne contaminants, usually based on an 8-hour permissible exposure limit;
- Sections 46 to 50 of the Canadian *Environmental Protection Act*, 1999, which speaks to the reporting requirements of the National Pollutant Release Inventory (NPRI);
- Yukon Special Waste Regulations;
- Yukon Contaminated Site Regulations; and
- Yukon Storage Tank Regulations.

6.1.4 Significance Determination

In consideration of the effects characterization, the applied mitigation measures, and applicable legislation, no significant adverse effects are expected to result from Project-related activities on the VC of Human Health and Safety.

6.2 Aural Aesthetics (Noise)

6.2.1 Potential Effects

Increasing the operation capacity of the diesel may increase noise levels as extra generators may be operated up to the capacity of 15.5 MW.

6.2.2 Effects Characterization

A noise impact assessment was completed for the Faro Diesel Facility (WSP 2020b; Appendix C). Noise levels of existing sources were compared to the noise levels with an increased operational capacity of up to 16 MW (note: WSP modelled to an increased capacity of 16 MW, however, Yukon Energy will use a maximum operating capacity of up to 15.5 MW, as per this assessment). WSP used the sound level of the existing operation (of 10.6 MW) as the Permissible Sound Level, in accordance with the VC OCG's British Columbia Noise Control Best Practices Guideline (BC OCG 2009). WSP then conducted standardized noise level modelling for existing operations and future expanded operations using the software package CADNA/A (Ver. 2020) and compared results.

The changes in the sound levels with the addition of generators to reach an operating capacity of 16 MW are predicted to be less than 1 dBA at the nearest community receptor, which is not considered to be a significant change and is within the acceptable range. The detailed reporting of the noise impact assessment is contained in Appendix C.

YEC also retained Hemmera to conduct direct sound level measurements at the generating station. The results of this monitoring are included in Appendix D. This monitoring found that:

"The measured noise levels from the Facility for both the existing units and the additional rental units were measurably lower than modelled noise levels in the noise impact assessment previously completed at a desktop level. Measurements confirmed the modelling results that noise levels at nearby receptors do not perceptibly increase with the addition of the six rental units from existing conditions with the two main units (i.e., no perceptible changes with the site expansion to 15.5 MW). This represents a satisfactory confirmation of the previous findings of the noise impact assessment that the proposed site expansion in generating capacity does not result in any significant adverse effects."

6.2.3 Mitigation Measures

No additional mitigations are proposed since the increase in sound level due to the proposed increase in operating capacity is negligible.

6.2.4 Significance Determination

In consideration of the effects characterization, no significant adverse effects are expected to result from Project-related activities on the VC of Aural Aesthetics.

6.3 Effects Assessment Summary & Conclusions

As presented in earlier in this section, the Project has the potential to affect three specific valued components, including i) human health and safety, ii) aural aesthetics (noise), and iii) Environmental quality (land, water, plants and animals).

Potential effects to human health and safety result from the Project's emissions of air contaminants (air pollution) when the generators are running to produce electricity. Yukon Energy examined the potential air emissions from the facility and found that even under the most extreme operational case human health and safety was not likely to be impacted by the Project.

Potential effects to people related to noise from the facility during operations were also examined. With the proposed addition of more generators at the site it is possible that this would increase the noise from the site such that it would cause an unacceptable negative impact to people nearby. The assessment found that the proposed addition of generators would not increase the noise levels to unacceptable levels when compared to applicable guidelines established by Health Canada and other relevant guidelines.

Finally, projects of this nature use fuel, oil, and coolants. When using such hazardous materials there is always the risk of releases to the environment, which can impact the land and water. Such activities are regulated by the Yukon and Federal Governments and require proponents like Yukon Energy to construct and operate facilities like the Faro Generating Station in keeping with strict regulatory codes

and standards. In addition, special authorizations are required to undertake such activities and Yukon Energy maintains the appropriate authorizations to guide and regulate the use of such materials and to report immediately if a release occurs. Yukon Energy has committed to extend such reporting to the Ross River Dena Council government via their Lands & Resources Department.

Having regard to the foregoing review of the potential effects of Yukon Energy increasing the diesel generation capacity at the Faro Diesel Facility, it must be concluded that no significant adverse effects to the identified valued components, within the meaning of section 56(1) of *YESAA,* are reasonably anticipated to result from Yukon Energy's operation of the thermal units under an amended Permit.

Accordingly, Yukon Energy requests that the Designated Office issue a recommendation to the Yukon Government under section 56(1)(a) of *YESAA* to allow the amendment of Yukon Energy's Air Emissions Permit to proceed, on the basis that Yukon Energy's operation of a modified thermal generation complement at the Faro Generating Station, in compliance with the terms of the amended Permit and the requirements of the *Environment Act* and *Air Emissions Regulations*, will not have significant adverse environmental or socio-economic effects in or outside the Yukon.

7 Acknowledgement and Certification

The information submitted in this Project Proposal is required for the purpose of conducting an evaluation under the *Yukon Environmental and Socio-economic Assessment Act*.

I acknowledge that, pursuant to sections 119 and 120 of the *Act*, a copy of this Project Proposal will be placed on a public register and be available to any member of the public to review. I understand that misrepresenting or omitting information required for the evaluation may cause delays in the evaluation or render the recommendations invalid.

I certify that the information provided is true and correct to the best of my knowledge and belief.

Travis Ritchie
Manager – Environment, Assessment & Licensing
August 12, 2021

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Appendix A: Existing Air Emissions Permit (No. 60-010)

Yukon
Environment

Permit No: 60-010

AIR EMISSIONS PERMIT

Issued Pursuant to
the *Environment Act* and the *Air Emissions Regulations*

Permittee: Yukon Energy Corporation

Mailing Address: Box 5920, Whitehorse, Yukon, Y1A 6S7

Site Locations: Generating Plants at:
- Dawson
- Faro
- Mayo
- Whitehorse

Authorized Representative: Travis Ritchie
Phone/Fax: (867) 393-5350 / (867) 393-5322
Email: travis.ritchie@yec.yk.ca

Effective Date: Date of Director's signature

This permit has been amended and replaces permit #60-010 issued on December 15, 2017.

Expiry Date: December 31, 2024

Scope of Authorization: In accordance with your application, you are authorized to operate electricity generating equipment at the above site locations (the "site(s)"), as set out in the terms and conditions of this permit.

Dated this 4th day of October, 2018

T. Powell

Director, Environmental Programs Branch
Environment Yukon

PART 1: DEFINITIONS

1. In this permit,

   "Act" means the *Environment Act*, R.S.Y. 2002, c. 76, as updated from time to time;

   "approved plan" means a plan that is submitted by the permittee and approved by an environmental protection analyst under this permit and includes any terms and conditions specified by the environmental protection analyst in the approval;

   "area of influence" refers to that area as determined in the Permittee's air dispersion modelling submitted to the Branch in 2011 for Whitehorse and in 2012 for Dawson City;

   "associated personnel" means all employees, contractors and volunteers involved in the permitted activities;

   "Branch" means the Environmental Programs Branch, Environment Yukon;

   "emission factor" means the mass emission of a pollutant per unit of energy produced in either grams per kilowatt-hour (g/kWh) or kilograms per megawatt-hour (kg/MWh);

   "emission rate" means the average rate in grams per second (g/s) or kilograms/hour (kg/h) at which a pollutant is emitted from a source, determined either:
   i) as estimated based on emission factors derived from published literature regarding sources of similar type and age (estimated emission rates); or
   ii) as derived from measured data obtained from manual stack testing carried out by the permittee (measured emission rates);

   "environmental protection analyst" means an employee of the Branch so designated by the Minister of Environment under the Act;

   "environmental protection officer" means an employee of the Government of Yukon so designated by the Minister of Environment under the Act;

   "N-1 Event" is a situation where a transmission line, generating unit, or any other element within either the Whitehorse-Aishihik-Faro or Mayo-Dawson system fails, and consequently requires emergency back-up to avoid rolling black-outs in any of the communities;

   "Regulations" means the *Air Emissions Regulations*, O.I.C. 1998/207;

   "source" means a fuel-fired electricity generator which has a maximum nameplate capacity equal to or more than 1.0 megavolt-ampere;

   "total annual emissions" means the emissions derived by multiplying emission factors or measured emission rates for each source by the previous three-year average total energy production for that source.

2. Any term not defined in this permit that is defined in the Act or the Regulations has the same meaning as in the Act or the Regulations.

PART 2: GENERAL

1. No condition of this permit limits the applicability of any other law or bylaw.

2. The permittee shall ensure that all activities authorized by this permit occur on property that the permittee has the right to enter upon and use for that purpose.

3. The permittee shall ensure that all associated personnel:
   a) have access to a copy of this permit;
   b) are knowledgeable of the terms and conditions of this permit; and
   c) receive the appropriate training for the purposes of carrying out the requirements of this permit.

4. The permittee shall provide notice in writing to an environmental protection analyst prior to any significant change of circumstances at the site, including without limitation:
   a) discontinuation of any regulated activity at the site;
   b) change of ownership of the site or any of the sources; and
   c) change to the mailing address or phone number of the permittee.

5. The permittee shall obtain approval from an environmental protection analyst prior to:
   a) any addition, modification, removal or replacement of any equipment or components related to the release, abatement, control or treatment of air emissions; or
   b) any change in location of the source(s).

6. Where conflicts exist between this permit, the permit application or any plans, this permit shall prevail.

7. If an inspection reveals that the site or source(s) is in any way not in compliance with this permit, the permittee shall repair the damage or take other actions as required to bring the site or source(s) into compliance.

8. For clarity, all obligations of the permittee under this permit survive the expiry date to the extent that each is not superseded by one or more conditions in a subsequent permit.

PART 3: OPERATION AND MAINTENANCE

1. The permittee is authorized to operate three liquefied natural gas generators; and five generators running exclusively on diesel fuel at the Whitehorse Station, and diesel generators at Mayo, Dawson and Faro stations. The permittee must obtain a permit amendment prior to adding any additional liquefied natural gas generators at the Whitehorse station.

2. In accordance with the manufacturer’s recommendations and best management practices, the permittee shall inspect, maintain and operate the sources, any stand-alone air pollution control equipment, and testing and monitoring equipment as necessary to provide optimum control of air contaminant emissions during all operating periods.

3. Except for maintenance or test purposes, the permittee shall run the sources at each site in order of highest possible efficiency under the circumstances.

4. The permittee shall ensure that the fuel used by the source(s) conforms to the most recent Canadian federal *Sulphur in Diesel Fuel Regulations* for off-road applications.

PART 4: RELEASE OF CONTAMINANTS

1. The visible emissions from any source shall not exceed an opacity of 20% as measured by an environmental protection officer.

2. In the event that the opacity of emissions from any source exceeds the criterion established in Part 4.1 of this permit, the permittee shall take measures to reduce the opacity of the emissions below that criterion as directed by an environmental protection officer.

3. The permittee shall ensure that particulates collected using emission control equipment are contained so that there is no release of contaminants to the atmosphere or into an open body of water.

4. If ambient air quality monitoring data within the area of influence of the Permittee's facility indicates that one or more of Yukon's Ambient Air Quality Standards is being exceeded, and the environmental protection officer is satisfied that the Permittee's facility is the cause or a significant contributor to the prevailing ambient air quality condition, the Permittee shall undertake such mitigation measures as may be specified by the environmental protection officer to improve the ambient air quality condition.

PART 5: MONITORING EMISSIONS

1. If any diesel generator has exceeded 3% of its annual potential to emit in a calendar year, and, in that same calendar year, if the total operating time of all the generators at that site exceeds 3% of their total annual potential to emit, the permittee shall create a emissions management plan to be submitted to the analyst for approval.

2. The permittee shall carry out any commitments in the approved emissions management plan on a schedule that is approved by the analyst.

3. The permittee shall quantify, through monitoring or calculations based on emissions data and published emissions factors, the levels of volatile organic compounds (VOCs) released in normal operations annually from the liquefied natural gas operations at the Whitehorse station.

4. The permittee shall quantify the fugitive emissions of methane (CH_4) from the point of unloading of the liquefied natural gas into the storage tank to and including any emissions from the generator not emanating from the stack at the Whitehorse station.

PART 6: REPORTING

1. The permittee shall submit to an environmental protection analyst a report which identifies:
   a. the total annual operating hours for all sources at all sites;
   b. the estimated total annual emissions of SO_2, $PM_{2.5}$, CO, NO_2, and N_2O from each source at each of the sites, including the calculation used to determine those results;
   c. total annual emissions of volatile organic compounds (VOCs) as required in part 5.3 of this permit; and,
   d. a summary of the fugitive CH_4 monitoring program including methodology, data, and total fugitive emissions as required in part 5.4 of this permit;

   by March 31st of each year of this permit for the previous calendar year.

PART 7: UNAUTHORIZED EMISSIONS

1. The permittee shall contact either an environmental protection officer or the 24-hour Yukon Spill Report Centre (**867-667–7244**) as soon as possible under the circumstances in the event of an unauthorized release or emission, such as fugitive emissions or emissions resulting from burning fuel other than that allowed for under this permit.

PART 8: RECORDS

1. The permittee shall keep all records required under this permit in a format acceptable to an environmental protection officer for a minimum of three years and make them available for inspection by an environmental protection officer upon request.

2. The permittee shall keep the following records:
   a) a copy of each report and approved plans developed under this permit, and any amendments to and approvals (if applicable) of each report and plan;
   b) summaries of all inspections carried out under this permit (including the name of the person conducting the inspection, the date of each inspection, any observations recorded during the inspection, actions taken as a result of those observations, and the date each action was taken);
   c) notes concerning any spills, leaks or unauthorized emissions occurring at the site, including substance involved, estimated quantity, date of observation of the spill or leak, spill reports made and clean-up procedures implemented;
   d) any and all deficiencies remedied in accordance with Part 2.7, and how and when they were remedied; and
   e) notes concerning any instance where the most efficient source was not used in accordance with Part 3.3 and the reason for use of the less efficient source.

PART 9: EMERGENCY BACK-UP DIESEL GENERATORS AT WHITEHORSE STATION

1. The permittee is authorized to operate up to six emergency back-up generators, to a maximum cumulative total of 12 MW (2MW maximum capacity per unit), exclusively on diesel fuel at the Whitehorse Station only in the event that an N-1 event occurs, and

periodically for short periods to confirm operational readiness, up until March 31st, 2022, unless otherwise approved by the Branch.

2. In accordance with the manufacturer's recommendations and best management practices, the permittee shall inspect, maintain and operate the sources, any stand-alone air pollution control equipment, and testing and monitoring equipment as necessary to provide optimum control of air contaminant emissions during all operating periods.

3. Except for maintenance or test purposes, the permittee shall run the sources at each site in order of highest possible efficiency under the circumstances.

4. The permittee shall ensure that the fuel used by the source(s) conforms to the most recent Canadian federal *Sulphur in Diesel Fuel Regulations* for off-road applications.

Appendix B: Air Dispersion Modelling Assessment for the Faro Generating Station

YUKON ENERGY CORPORATION

AIR DISPERSION MODELLING ASSESSMENT FOR FARO FACILITY

CONFIDENTIAL

December 17, 2020

AIR DISPERSION MODELLING ASSESSMENT FOR FARO FACILITY

YUKON ENERGY CORPORATION

FINAL REPORT

PROJECT NO.: 191-02438-01
CLIENT REF: 20081
DATE: DECEMBER 17, 2020

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EXECUTIVE SUMMARY

WSP Canada Inc. conducted an air quality dispersion modelling and impact assessment for Yukon Energy Corporation's diesel-fuelled electricity generating facility in Faro, Yukon to evaluate the potential air quality impacts of increasing the facility capacity from the existing permitted capacity at 10.6 MW to 16 MW in the future. WSP understands that while the air quality assessment contained within in this report is based on an expanded facility capacity of 16 MW, Yukon Energy Corporation will only be applying for a permit amendment to allow up to 15.5 MW of capacity on site.

A total of five (5) criteria air contaminants were evaluated based on the emission characteristics of the facility genset engine and diesel fuel use - $PM_{2.5}$ PM_{10}, NO_2, SO_2, and CO. Three years (2016-2018) were modelled using the refined CALPUFF dispersion modelling system in accordance with the requirements of a comprehensive air quality dispersion modelling assessment as stipulated in the British Columbia Air Dispersion Modelling Guideline. To evaluate the facility compliance with the Yukon Ambient Air Quality Standards (YAAQS) and show the change in potential air quality impacts between the current and future operating conditions, two (2) modelling scenarios were considered in this air assessment:

1. Existing Permitted Emission Capacity Scenario (10.6 MW); and,
2. Future Expanded Emission Capacity Scenario (16 MW).

Both the existing and future permit scenarios were evaluated assuming maximum emissions from the facility's generators based upon maximum operating conditions and name-plate capacities. The modelling also conservatively assumed that all generators are emitting simultaneously and continuously at the name-plate capacity year-round.

Despite these conservative assumptions, the ambient air quality dispersion modelling results showed that, with the exception of short-term (1-hour) NO_2 results, the maximum cumulative predicted concentrations for all air contaminants ($PM_{2.5}$ PM_{10}, SO_2, and CO) were well below their respective ambient air quality criteria. The maximum points of impingement (worst-case receptors) were all found either near the Facility or outside the Town of Faro, in both scenarios. Overall, the cumulative predicted air contaminant concentrations from the Future Scenario were higher than those of the Existing Scenario given the increased power generation of the facility expansion.

While the dispersion modelling results predicted short-term NO_2 exceedances for both scenarios, the primary objective of the air quality assessment was to evaluate the potential risks on the human population residing near the facility (in the Town of Faro). The modelling results for the Existing Scenario at the maximally impacted receptor within the Faro Town showed that the cumulative predicted concentrations for all pollutants evaluated were in compliance with the YAAQS.

While the dispersion modelling predicted short-term (1-hour) NO_2 exceedances in the Future Scenario, the predicted air quality impacts for all the other air pollutants – including both fine and coarse particulate matter ($PM_{2.5}$ and PM_{10}), SO_2, and CO – were well below the YAAQS. With regards to the NO_2 predicted short-term (1-hour) NO2 exceedances, it is important to note that the YAAQS for NO_2 were reduced drastically in late 2019 from 401 µg/m^3 previously to 113 µg/m^3 presently. The maximum cumulative predicted 1-hour NO_2 concentrations from both existing and future permit scenarios would be well below the previous NO_2 criteria. When compared to the newly revised NO_2 YAAQS, the maximum cumulative predicted 1-hour NO_2 concentration was 129% of the Yukon Ambient Air Quality Standards for NO_2 at the maximally impacted Faro Town receptor in the Future Scenario. Moreover, the predicted 1-hour NO_2 exceedances were found spatially limited to a confined area surrounding the Facility areas on the outskirts of Faro, with a low frequency of occurrence of 0.21% of the time (56 hours out of 26,304 modelled hours) at the maximally impacted Faro Town receptor.

These short-term (1-hour) NO_2 exceedances were found entirely under calm stable meteorological conditions which typically hinder atmospheric dispersion; primarily during nighttime and in the colder months of the year; and, exclusively under west-northwest winds. Outdoor human activity would be limited during cold nighttime hours and this lowers the probability of human to be exposed to the short-term NO_2 impacts. Combined with the low frequency of model predictions exceeding the NO_2 YAAQS (56

hours out of 26,304 modelled hours),there is an even lower probability of exposure to levels above the YAAQS.

Finally, it is important to note that the modelling results represent the worst-case potential air quality impacts based upon the facility's maximum operating conditions. As such, the model predicted air contaminant concentrations are likely conservative. Furthermore, the conditions giving rise to predicted short-term NO_2 exceedances would be very unlikely to happen because the emission sources at the facility are highly unlikely to operate continuously year-round at the maximum possible emission rates, nor would it be likely that these maximum emissions coincide exactly with the particular meteorological conditions that give rise to the event as they occur, on average, for less than 20 hours per year modelled. The typical facility emissions are expected to be much lower and would not be anticipated to result in adverse air quality impacts given the low risk of predicted exceedance under even conservative assumptions. With model predictions indicating an extremely low risk of predicted short-term NO_2 impacts and low potential impacts from the other air pollutants, the overall air quality impacts from the future expanded facility are not anticipated to pose a significant risk to the Town of Faro and air quality would be anticipated to remain in compliance with YAAQS.

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1 INTRODUCTION

WSP Canada Inc. (WSP) was retained by Yukon Energy Corporation (YEC) to perform an air dispersion modelling and impact assessment in support of its permit amendment pursuit with the Yukon Environmental and Socio-economic Assessment Board (YESAB) to increase capacity at the diesel-fuelled electricity generating facility in Faro, Yukon (the "Project" or the "Facility") from the existing permitted capacity of 10.6 MW to 16 MW in the future. WSP understands that while the air quality assessment contained within in this report is based on an expanded facility capacity of 16 MW, Yukon Energy Corporation will only be applying for a permit amendment to allow up to 15.5 MW of capacity on site.

While the existing permit allows the Facility to operate up to a capacity of 10.6 MW, the Facility has been and is currently operating much below the permitted facility capacity of 10.6 MW with only two existing diesel generators on-site – specifically Mirrlees KV16 (Genset ID: FD1) and Caterpillar (CAT) 3612 (Genset ID: FD7). The existing FD1 and FD7 gensets have also been de-rated from their original nameplate capacity of 5.15 MW and 3.3 MW to 2.4 MW and 2.8 MW, respectively. Once expanded, the Facility will continue to operate the existing FD1 and FD7 at the de-rated 2.4 MW and 2.8 MW levels and the proposed facility capacity expansion of 16 MW would see the installation of additional six (6) CAT 3516C 1.8 MW diesel generators (Genset ID: YM20, YM21, YM22, YM23, YM24, and YM25).

Since there is no air dispersion modelling guideline in Yukon, the air dispersion modelling and impact assessment for the Project (the "Air Assessment") followed recommendations of the British Columbia Air Quality Dispersion Modelling Guideline (BC AQDMG, 2015)[1]. The dispersion modelling was completed following the requirements of a Level 3 Comprehensive Assessment as defined by the BC AQDMG and was conducted using the refined dispersion model called CALPUFF.

The following sections describe the assessment methodology and inputs employed in the dispersion modelling, as well as the model prediction results and findings evaluated for two modelling scenarios - representing the existing permitted and future expanded facility capacities.

[1] *British Columbia Ministry of Environment and Climate Change Strategy (2015, November). British Columbia Air Quality Dispersion Modelling Guideline (AQDMG). Retrieved from Government of British Columbia website:* https://www2.gov.bc.ca/assets/gov/environment/air-land-water/air/reports-pub/bc-dispersion-modelling-guideline-2015.pdf

2 AIR QUALITY CRITERIA

Based on the emission characteristics of the Facility's diesel generators, a total of five (5) key criteria air contaminants (CACs) were evaluated in the Air Assessment (Table 2-1). The current Yukon Ambient Air Quality Standards (YAAQS) used as the air quality criteria against which modelling results are assessed. Since there are no YAAQS established for Carbon Monoxide (CO), the ambient air quality objectives from the nearest jurisdiction – British Columbia, are chosen as the air quality criteria for CO in this Air Assessment.

It should be noted that the YAAQS were revised by the Yukon Government Department of Environment recently on October 23, 2019[i], to follow the new and more stringent Canadian Ambient Air Quality Standards (CAAQS) adopted by the Canadian Council of Ministers of the Environment (CCME) to drive air quality improvements across the country. In particular, both CAAQS and YAAQS reduced the 1-hour NO_2 Standard drastically from 401 $\mu g/m^3$ previously to 113 $\mu g/m^3$ presently.

Table 2-1 Air Quality Standards for Air Contaminants Evaluated

Air Contaminant	Jurisdiction	Ambient Air Quality Standard ($\mu g/m^3$)		Statistical Form of Standard
Particulate Matter Fine ($PM_{2.5}$)	Yukon	24-Hour	27	The 3-year average of the annual 98th percentile of the daily 24-hour average concentrations.
	Yukon	Annual	8.8	The 3-year average of the annual average of all 1-hour concentrations.
Particulate Matter Coarse (PM_{10})	Yukon	24-Hour	50	The maximum 24-hour block average concentration.
Nitrogen Dioxide (NO_2)	Yukon	1-Hour	113	The 3-year average of the annual 98th percentile of the daily maximum 1-hour average concentrations.
		Annual	32	The average over a single calendar year of all 1-hour average concentrations.
Sulphur Dioxide (SO_2)	Yukon	1-Hour	183	The 3-year average of the annual 99th percentile of the daily maximum 1-hour average concentrations.
		Annual	13	The average over a single calendar year of all 1-hour average concentrations.
Carbon Monoxide (CO)	British Columbia	1-Hour	14,300	The maximum 1-hour block average concentration.
		8-Hour	5,500	The maximum 8-hour block average concentration.

3 BASELINE AIR QUALITY

Baseline air contaminant concentrations are determined in dispersion modelling assessments in order to provide a complete indication of cumulative impacts to air quality. In this context, the BC AQDMG states that "baseline" is meant to be the concentrations due to emissions from both natural and anthropogenic sources. In other words, it is intended to be the result of the contribution from all sources except the source(s) being modelled. To evaluate compliance against the YAAQS, selected baseline air quality concentrations for the Town of Faro are added to the dispersion model predictions resulting in a predicted cumulative air contaminant concentration.

It is common practice to determine the baseline from historical air quality monitoring data within the modelled airshed. Continuous ambient air quality monitoring data is only available from one station in Yukon located in Downtown Whitehorse (the "Whitehorse AQ Station") and operated by Yukon's Department of Environment as part of Canada's National Air Pollution Surveillance (NAPS) program (NAPS ID: 119004). This station continuously monitors NO_2, NOx and $PM_{2.5}$. To determine the baseline air contaminant concentrations, the most recent available three (3) years of NO_2, NOx and $PM_{2.5}$ monitoring data from the Whitehorse AQ Station were gathered and analyzed in accordance to the BC AQDMG. Due to the lack of SO_2 and CO monitoring in Yukon, the baseline concentrations for SO_2 and CO were not applied in this Air Assessment. The 24-hour PM_{10} baseline concentration were estimated by pro-rating the 24-hour $PM_{2.5}$ baseline concentrations with the ratio of PM_{10} to $PM_{2.5}$ YAAQS values for the 24-hour averaging period (1.85 based on 50 µg/m^3 to 27 µg/m^3).

Directly applying baseline air contaminant concentrations from the Whitehorse AQ Station would not appropriately represent the expected concentrations in the small Town of Faro since there are significantly greater anthropogenic activities and emission sources in Whitehorse. To better estimate baseline concentrations in Faro, the baseline concentrations calculated from the Whitehorse AQ Station were scaled based on the emissions inventories developed for each community in the previous YEC air assessment (SENES, 2011), as shown in Table 3-1. Specifically, the 2007 annual NO_2 emission in Faro was estimated to be 9.66 tonnes, as compared to 540.12 tonnes in Whitehorse, resulting in 1.8% as the Faro to Whitehorse percentage; for $PM_{2.5}$, 1.5% was computed as the percentage of Faro over Whitehorse using 7.3 tonnes of annual $PM_{2.5}$ emissions in Faro and 503.29 tonnes in Whitehorse.

As a way to substantiate the application of the emission estimates from 2007 in scaling baseline air contaminant concentrations for the current Air Assessment, the most recent available population figures from the Yukon Bureau of Statistics[2] were used to compare the community populations between and growth trends in Faro and Whitehorse. Table 3-2 below demonstrates the small population of Faro when compared to Whitehorse and the incremental change from the historical population counts in each community. This supports our assumption that anthropogenic emissions levels in Faro are a fraction of those in Whitehorse and would not have materially change from the 2007 inventory levels.

Table 3-1 Estimated Annual Community Emissions in 2007

Air Contaminant	Annual Emissions (tonnes/year)		Proportion (%) of Faro to Whitehorse Community Annual Emissions
	Whitehorse	Faro	
NOx (as NO_2)	540.12	9.66	1.8%
$PM_{2.5}$	503.29	7.30	1.5%

[2] *Yukon Bureau of Statistics. Yukon Census Historical Population 1901 to 2016. Retrieved from Government of Yukon website: https://yukon.ca/sites/yukon.ca/files/ybs/fin-yukon-census-historical-population-1901-2016.pdf*

Table 3-2 Comparison of Population Counts Between Faro and Whitehorse

Census Year	Population Counts		Proportion (%) of Faro to Whitehorse Population Counts
	Whitehorse	Faro	
2006	20,461	341	1.7%
2011	23,276	344	1.5%
2016	25,085	348	1.4%

Table 3-3 presents the summary of 2016-2018 baseline concentrations calculated from the Whitehorse AQ Station as well those estimated for Faro using the scaling methods described above. The estimated baseline concentrations for Faro were added to the dispersion modelling results to predict the cumulative air contaminant concentrations for the Air Assessment.

Table 3-3 Summary of Baseline Air Quality Concentrations

Air Contaminant	Averaging Time	Ambient Air Quality Standard ($\mu g/m^3$)	Statistical Form for Baseline Concentrations	Baseline Concentrations (2016-2018)			
				Whitehorse		Faro	
				$\mu g/m^3$	% of Criteria	$\mu g/m^3$	% of Criteria
NO_2	1-hour	113	The 3-year average of the annual 98th percentile of the daily maximum 1-hour average concentrations.	37.5	33%	**0.67**	**0.6%**
	Annual	32	The 3-year average of the annual average of all 1-hour concentrations.	6.0	19%	**0.11**	**0.3%**
PM_{10}	24-hour	50	The 3-year average of the annual 98th percentile of the daily 24-hour average concentrations.	31.5	63%	**0.46**	**0.9%**
$PM_{2.5}$	24-hour	27	The 3-year average of the annual 98th percentile of the daily 24-hour average concentrations.	17.0	63%	**0.25**	**0.9%**
	Annual	8.8	The 3-year average of the annual average of all 1-hour concentrations.	3.3	38%	**0.05**	**0.5%**

4 MODELLED EMISSIONS

4.1 MODELLING SCENARIOS

To evaluate the potential air quality impacts from the Facility's proposed expansion, two (2) modelling scenarios were compared in this Air Assessment:

1. Existing Permitted Emission Capacity Scenario (10.6 MW); and,
2. Future Expanded Emission Capacity Scenario (16 MW).

Both emission scenarios assumed that the generators are operating continuously at the maximum rated capacity. To reflect the worst-case air quality impacts from the Facility, the estimated model emission rates established for each emission scenario were applied to all hours during 2016-2018 modelling years. This conservative approach is common in air dispersion modelling assessments. It allows for emission sources to be assessed at maximum pollutant emission rates under all meteorological condition combinations to predict the potential worst-case air contaminant concentrations. However, it should be noted that this conservative assessment of potential air quality impacts did not account for seasonal load variations whereby the generators operate at or near full capacity for only a small portion of the year, during peak consumption periods, but most of the time operate well below their nameplate or total Facility capacity. The typical Facility emissions are expected to be much lower than the maximum possible emission rates modelled in this Air Assessment.

Table 4-1 summarizes the Facility capacity and genset configurations for the "Existing Scenario" and "Future Scenario". While the Facility has historically operated below the existing permit capacity of 10.6 MW using only two existing gensets (FD1 and FD7) that have been de-rated to 2.4 MW and 2.8 MW respectively, three (3) of the new CAT 3516C 1.8 MW diesel generators (Genset ID: YM20, YM21, YM22) were assumed to be added to the Existing Scenario to model emissions levels at the current permitted capacity. The Future Scenario evaluated a Facility capacity of 16 MW using the existing FD1 and FD7 combined with the six (6) new CAT 3516C 1.8 MW diesel generators (Genset ID: YM20, YM21, YM22, YM23, YM24, and YM25).

Table 4-1 Summary of Modelling Scenarios Evaluated for the Project

Modelling Scenario	Genset Configuration	Genset Unit Output and Facility Capacity
Existing Permitted Emission Capacity (Existing)	FD1 + FD7 + YM20 + YM21 + YM22	2.4 MW + 2.8 MW + 3 x 1.8 MW = **10.6 MW**
Future Expanded Emission Capacity (Future)	FD1 + FD7 + YM20 + YM21 + YM22 + YM23 + YM24 + YM25	2.4 MW + 2.8 MW + 6 x 1.8 MW = **16.0 MW**

4.2 SOURCE PARAMETERS AND MODELLED EMISSION RATES

The genset engine exhaust vents were simulated as vertically-oriented point or stack sources in the CALPUFF model. Table 4-2 below summarized the genset types and source characteristics modelled for the Project. The stack parameters were compiled from a combination of data sources, including manufacturer's specification sheets and drawings, as well as the previous YEC air assessment (SENES, 2011). Building downwash effects on these point sources was analyzed according to the genset configurations specified in Table 4-1 for each modelling scenarios using the Building Profile Input Program (BPIP-PRIME) as recommended by the BC AQDMG (2015). The buildings and structures digitized for the Facility are based on the facility layout drawings provided by YEC and genset enclosure drawings from the manufacturers.

To evaluate the potential worst-case air quality impacts resulting from the maximum possible emissions levels from both existing and future permit scenarios, all of the gensets considered in each scenario are conservatively assumed to be releasing simultaneously in a continuously emitting fashion. The new genset (CAT 3516C) emission rates were estimated using the greater of the maximum or name-plate operating capacity from the gensets manufacturer's specifications (such as full-load sustained output and emission performance data), or the applicable stationary combustion source emission factors from published reference documents (such as the United States Environmental Protection Agency's Compilation of Air Emissions Factors referred to as the AP-42). Emission estimates with respect to the existing gensets FD1 and FD7 were provided by YEC using stack sampling data from the previous YEC air assessment (SENES, 2011). The estimated pollutant emission rates and source characteristics modelled for each genset unit in this assessment are detailed in Table 4-2 below.

Table 4-2 Source Parameters Modelled in CALPUFF for both Existing and Future Scenarios

Genset ID:		FD1	FD7	YM20	YM21	YM22	YM23	YM24	YM25
Fuel Type:		Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel
Manufacturer and Model:		Mirrlees KV16	Caterpillar 3612	Caterpillar 3516C	Caterpillar 3516C	Caterpillar 3516C	Caterpillar 3516C	Caterpillar 3516C	Caterpillar 3516C
Unit Power Generation:		2.4 MW	2.8 MW	1.8 MW	1.8 MW	1.8 MW	1.8 MW	1.8 MW	1.8 MW
Included in Existing Scenario?		✓	✓	✓	✓	✓	x	x	x
Included in Future Scenario?		✓	✓	✓	✓	✓	✓	✓	✓
Source Type		Point	Point	Point	Point	Point	Point	Point	Point
Stack Orientation		Vertical	Vertical	Vertical	Vertical	Vertical	Vertical	Vertical	Vertical
Stack Location (NAD 1983 UTM Zone 8N)	(mE)	585,137	585,185	585,135	585,130	585,126	585,121	585,116	585,112
	(mN)	6,901,223	6,901,277	6,901,211	6,901,209	6,901,206	6,901,204	6,901,201	6,901,199
Base Elevation	(mASL)	707	708	707	707	708	708	708	708
Stack Height	(m)	8.3	8.9	4.0	4.0	4.0	4.0	4.0	4.0
Stack Diameter	(m)	0.76	0.43	0.221	0.221	0.221	0.221	0.221	0.221
Stack Exit Volumetric Flow	(ft^3/min)	14,687	10,982	7,130	7,130	7,130	7,130	7,130	7,130
	(m^3/min)	416	311	202	202	202	202	202	202
	(m^3/s)	6.9	5.2	3.4	3.4	3.4	3.4	3.4	3.4
Stack Exit Velocity	(m/s)	15.28	35.69	87.92	87.92	87.92	87.92	87.92	87.92
Stack Exhaust Gas Temperature	(°C)	384.6	430.8	387.0	387.0	387.0	387.0	387.0	387.0
	(°F)	724.3	807.4	728.0	728.0	728.0	728.0	728.0	728.0
	(°K)	657.8	704.0	660.2	660.2	660.2	660.2	660.2	660.2
Pollutant Model Emission Rates:									
$PM_{2.5}$	(g/s)	0.083	0.049	0.022	0.022	0.022	0.022	0.022	0.022
PM_{10}	(g/s)	0.107	0.055	0.022	0.022	0.022	0.022	0.022	0.022
NOx (as NO_2)	(g/s)	6.022	6.531	3.781	3.781	3.781	3.781	3.781	3.781
SO_2	(g/s)	0.010	0.004	0.003	0.003	0.003	0.003	0.003	0.003
CO	(g/s)	1.148	0.191	0.203	0.203	0.203	0.203	0.203	0.203

5 MODELLING METHODOLOGY

Air dispersion modelling was conducted following the methods recommended in the BC AQDMG (2015), which is referenced by *YESAB Proponent's Guide: Model Documentation Report* (2016) as an exemplary guideline for air dispersion modelling. The CALPUFF air dispersion modelling suite was used for assessing potential air quality impacts. CALPUFF is a suite of numerical models (CALMET, CALPUFF, and CALPOST) that are used in series to determine the potential impact of emissions in the vicinity of a source or group of sources.

Detailed three-dimensional meteorological fields were produced by the diagnostic computer model CALMET Version 6.5.0 (Level 150223), based on digital land use data and terrain data, as well as observed surface and upper air data that are available for the Project domain. In accordance with the BC AQDMG (2015), the most recent three years (2016-2018) of meteorological data were modelled in CALMET. The three-dimensional meteorological fields produced by CALMET were used by CALPUFF Version 7.2.1 (Level 150618), a three-dimensional, multi-species, non-steady-state Gaussian puff dispersion model that can simulate the effects of time and space varying meteorological conditions on air contaminant transport. Finally, post-processing utilities were used to post-process and summarize the modelling output from CALPUFF.

5.1 CALMET – METEOROLOGICAL MODELLING

CALMET Version 6.5.0 (Level 150223), associated with the latest CALPUFF System Version 7, was used to generate the meteorological fields for the time period from January 1, 2016 through December 31, 2018. The CALMET model was run in Observation-only mode. Surface weather observations were extracted from the nearest observational weather station situated at the international airport in Faro – "Faro (AUT)" station operated by Environment and Climate Change Canada (ECCC) (WMO ID: 71949). In addition, upper air soundings were retrieved from the only upper air station located in Yukon, namely the Whitehorse international airport station (WMO ID: 71964) – operated by NAV Canada – for meteorology in the vertical layers above the surface in order to resolve the three-dimensional meteorology in the CALMET modelling.

The meteorological data input and CALMET output for the modelling period was assessed following the Quality Assurance and Quality Control (QA/QC) procedures outlined in Section 9 of the AQDMG. A description of the CALMET modelling methodology and data sets follows.

The Universal Transverse Mercator (UTM, NAD 83) coordinate system was used for this model application. The CALMET domain for the Project was a 12 km by 12 km domain as presented in Figure 5-1. The CALMET model was run with a 200 m horizontal grid resolution. The modelling domain and grid resolution were chosen such that the main topographical features expected to influence the three-dimensional diagnostic meteorological fields around the Project are adequately captured.

5.1.1 OBSERVED METEOROLOGICAL DATA

Surface weather stations that record hourly meteorological data within the Project's CALMET domain include one station – "Faro (AUT)" – operated by ECCC (WMO ID: 71949). The available meteorological data collected from January 1, 2016 through December 31, 2018 at this surface station was used as input to the CALMET model executed in Observation-only mode. Upper air data from the Whitehorse international airport station (WMO ID: 71964) was retrieved for the aforementioned modelling period and used as secondary meteorological input to resolve three-dimensional meteorology in the CALMET modelling. The locations of these meteorological stations are displayed as part of Figure 5-1 below.

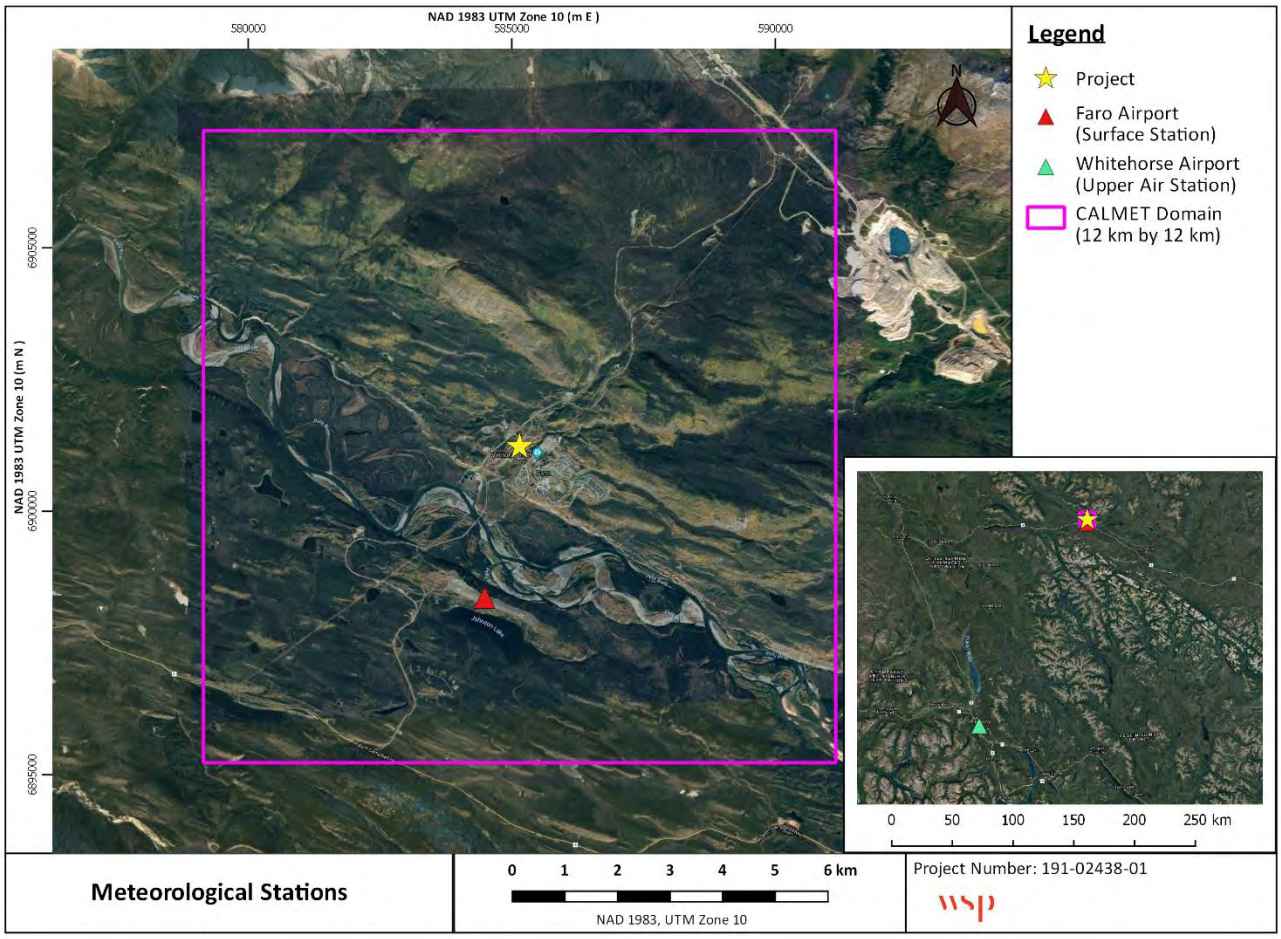

Figure 5-1 Meteorological Stations within CALMET Domain

CALMET requires a measured data value for every hour from at least one meteorological station in order to simulate the three-dimensional fields. Missing data procedures were implemented, when required, according to the AQDMG. The basic meteorological parameters required by the CALMET model were gathered from the surface station and prepared into a CALMET-ready surface data file (SURF.DAT) which includes the following meteorological parameters: wind speed, wind direction, temperature, relative humidity, and station pressure.

Figure 5-2 below illustrates the windrose compiled from the surface wind data observed at the airport in Faro from 2016 to 2018, which shows the prevailing wind patterns.

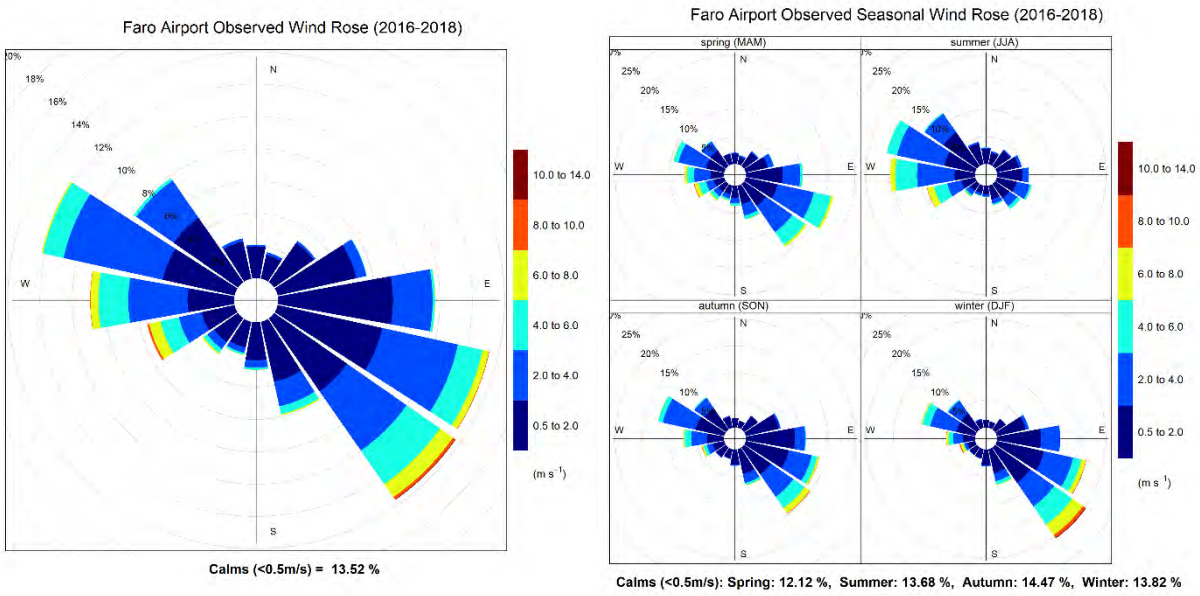

Figure 5-2 Windroses for the Surface Weather Station at Faro International Airport (2016-2018)

5.1.2 GEOPHYSICAL DATA – TERRAIN ELEVATION AND LAND USE

Digital terrain elevation and landuse data covering the CALMET model domain was used to simulate effects of the topography and landscape on the meteorological conditions in the model. In accordance with the AQDMG, the Canadian Digital Elevation Data (CDED) provided by Natural Resources Canada in a 1:50,000 scale was used to generate the terrain elevation inputs for each CALMET grid point, as well as the base elevations of the model emission sources and receptors. Land use characteristics for each grid cell were gathered from 2015 Canada Land Use dataset provided by Natural Resources Canada. Figure 5-3 and Figure 5-4 below show the terrain elevation and land use data used in the CALMET modelling.

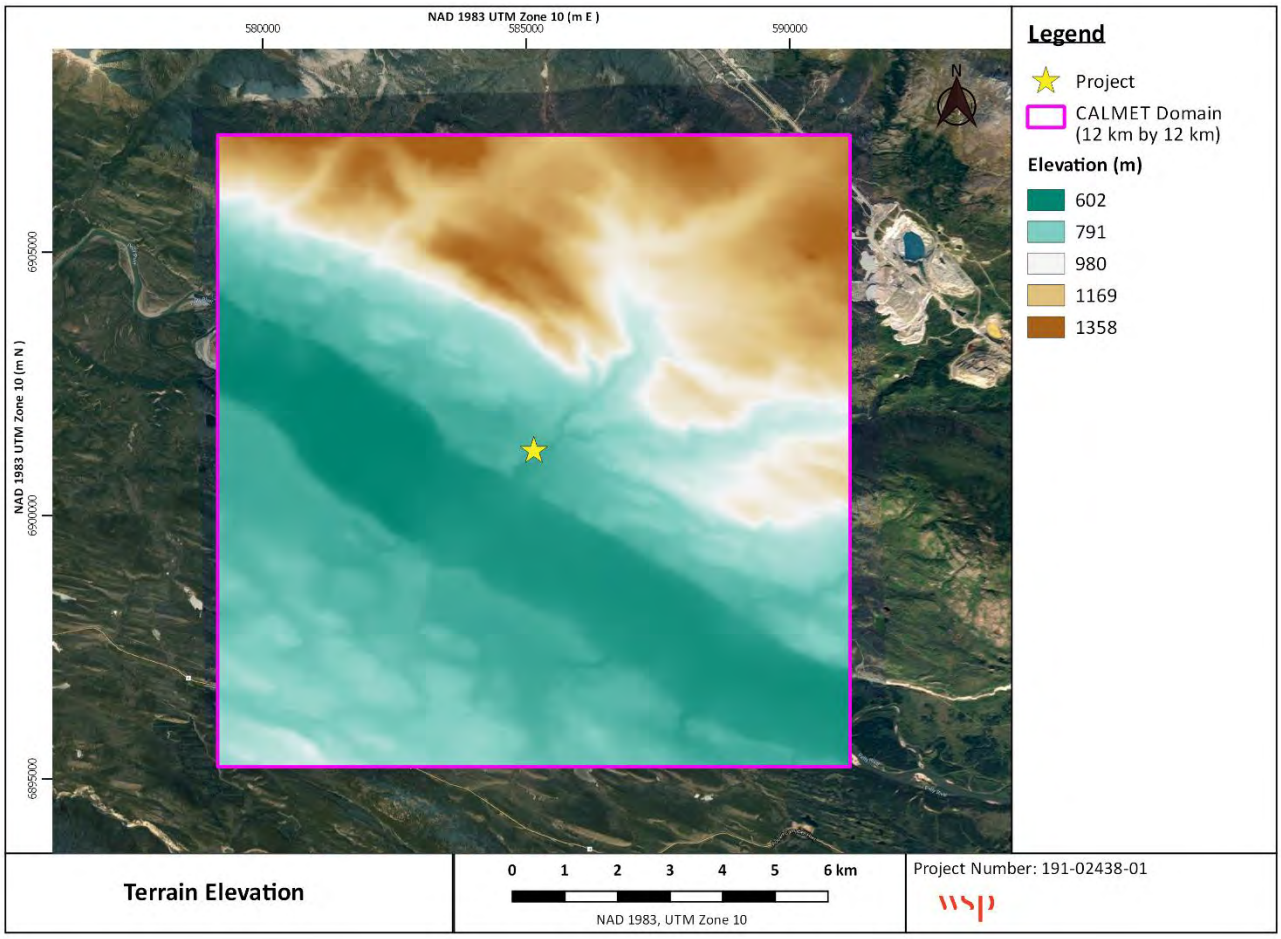

Figure 5-3 Terrain Elevation Data used in CALMET

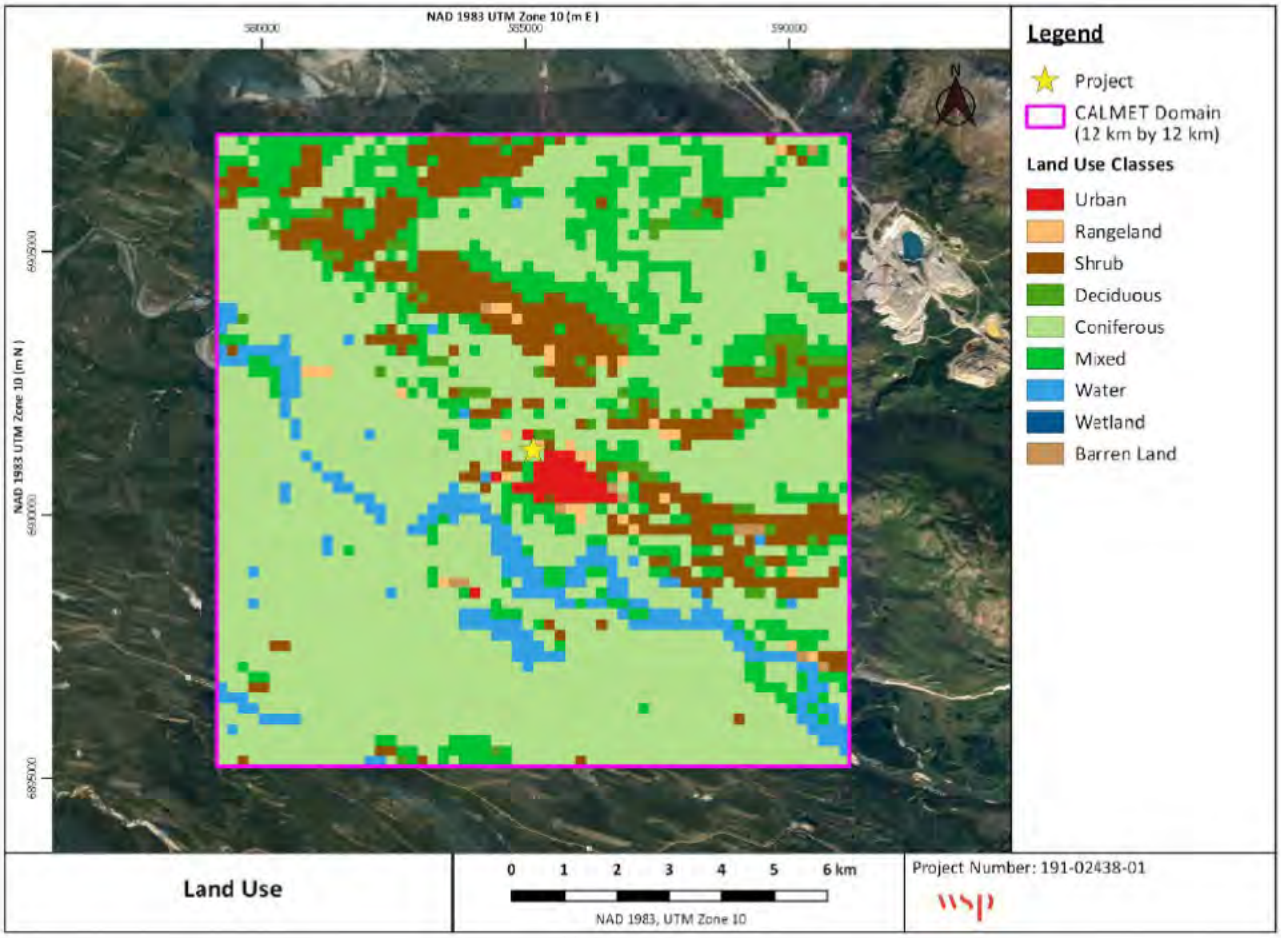

Figure 5-4 Land Use Data used in CALMET

Seasonal parameters were specified for each month based on the seasonal categories outlined in Table 5-1. According to the AQDMG, the seasonal categories are defined as follows:

- Season 1: Midsummer with lush vegetation
- Season 2: Autumn with cropland that has not been harvested
- Season 3: Winter 1, late autumn after frost, no snow on the ground
- Season 4: Winter 2, snow on the ground and subfreezing
- Season 5: Transitional spring with partially green short annuals

Table 5-1 Seasonal Categories for GEO.DAT used in CALMET

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Seasonal Category	4	4	4	4	4	5	1	2	2	3	4	4

5.1.3 CALMET MODEL SWITCHES

The CALMET model has a number of user-specified input switches that determine how the model handles terrain effects, interpolation of observational input data, and so forth. The differences in the modelled and measured meteorological fields were examined as part of QA/QC, and this analysis was utilized to refine and adjust the model options as appropriate. Table 5-2 outlines the options selected in CALMET modelling. The AQDMG default parameters were used wherever applicable.

Table 5-2 Selected CALMET Model Options

CALMET Model Switch	Parameter	Option Selected	BC AQDMG Default
Determines whether observation data are used, or in combination with NWP model output, or NWP data only	NOOBS	0 (Observation Only mode)	No default
Cloud Data Option: 1,2,3,4	MCLOUD	1 (Clouds data generated from surface observations)	No default
Wind field model selection variable	IWFCOD	1 (Yes)	✓
Compute Froude number adjustment effects?	IFRADJ	1 (Yes)	✓
Compute kinematic effects?	IKINE	0 (No)	✓
Use O'Brien procedure for adjustment of the vertical velocity?	IOBR	0 (No)	✓
Compute slope flows?	ISLOPE	1 (Yes)	✓
Extrapolate surface wind observations to upper layers?	IEXTRP	-4 (Extrapolate surface observations using similarity theory)	✓
Extrapolate calm winds aloft?	ICALM	1 (Yes)	No default
Layer-dependent biases	BIAS	-1, -1, -1, -1, -1, -1, -1, -1, -0.5, 0, 0, 0	No default
Minimum distance between upper air station and surface station for which extrapolation of surface winds will be allowed	RMIN2	-1	✓
Gridded prognostic wind field model output fields	IPROG	0 (No, do not use wind fields from MM5/3D.dat file as initial guess field)	✓
Time step (hrs) of the NWP output used as input data	ISTEPPGS	3600	✓
Use coarse CALMET fields as initial guess fields?	IGFMET	0 (Off)	✓
Use varying radius of influence?	LVARY	F (No, stations outside of RMAX1 are excluded)	✓
Maximum radius of influence over land of the surface layer	RMAX1	4.5 km	No default
Maximum radius of influence over land aloft	RMAX2	4.5 km (Set equal to RMAX1)	No default
Maximum radius of influence over water	RMAX3	Not used	No default
Minimum radius of influence used in the wind field interpolation	RMIN	0.1	✓
Radius of influence of terrain features	TERRAD	5 km	No default
Distance from a surface station at which the station observations and 1st guess field are equally weighted	R1	4 km	No default
Distance from an upper air station at which the observations and 1st guess field are equally weighted	R2	4 km (Set equal to R1)	No default
Relative weighting of the prognostic wind field data	RPROG	0	No default
Maximum acceptable divergence in the divergence minimum procedure.	DIVLIM	$5*10^{-6}$	✓

CALMET Model Switch	Parameter	Option Selected	BC AQDMG Default
Maximum number of iterations in the divergence minimum procedure.	NITER	50	✓
Number of passes in the smoothing procedure	NSMTH	2, 4, 4, 4, 4, 4, 4, 4, 4, 0, 0	✓
Maximum number of stations used in each layer for the interpolation of data to a grid point	NINTR2	99	✓
Critical Froude number	CRITFN	1	✓
Empirical factor controlling the influence of kinematic effects	ALPHA	0.1	✓
Multiplicative scaling factor for extrapolation of surface observations to upper layers	FEXTR2	Not used	✓
Number of barriers to interpolation of the wind fields	NBAR	0	✓
Level (1 to NZ) up to which barriers apply.	KBAR	10	✓
X and Y coordinates of barriers	XBBAR, YBBAR, XEBAR, YEBAR	Not used	✓
Diagnostic module surface temperature option	IDIOPT1	0 (Compute internally from hourly surface observations or prognostic fields)	✓
Diag module sfc station to use for the sfc temp (stn ID).	ISURFT	-1 (2-D spatially varying surface temperatures)	✓
Diagnostic module domain-averaged lapse rate option	IDIOPT2	0 (Compute internally from prognostic fields)	✓
Diagnostic module upper air station to use for lapse rate to use	IUPT	-1 (2-D spatially varying potential temperature lapse rate)	✓
Depth through which the domain-scale lapse rate is computed	ZUPT	200	✓
Initial guess field wind components	IDIOPT3	0 (Computed internally from observations or NWP output wind fields)	✓
Upper air station to use for domain-scale winds	IUPWND	-1 (Use 3-D initial guess fields)	✓
Bottom and top of layer through which the initial guess winds are computed	ZUPWND	1,1000	✓
Observed surface wind components for wind field module.	IDIOPT4	0 (Read wind speed and wind direction from SURF.DAT. DIAG.DAT not used.)	✓
Observed upper air wind components	IDIOPT5	0 (Read wind speed and wind direction from upper air data file UP.DAT. DIAG.DAT not used.)	✓
Use Lake Breeze Module?	LLBREZE	F (No, do not use Lake Breeze Module)	✓
# of boxes defining region	NBOX	Not used	✓
X Grid line 1 and line 2 defining the region of interest	XG1, XG2	Not used	✓
Y Grid line 1 and line 2 defining the region of interest	YG1, YG2	Not used	✓
X Point defining the coastline	XBCST	Not used	✓
Y Point defining the coastline	YBCST	Not used	✓

5.2 CALMET QA/QC

Section 9 of the AQDMG with respect to the CALMET/CALPUFF modelling QA/QC process were considered. Key results of the quality tests that were applied to the CALMET modelling are documented and presented in the sections below. The CALMET model outputs at the nearest CALMET grid point to the Project's emission sources were extracted and used to represent the Project and is referred to as the "Facility". In addition, the nearest surface meteorological station ("Faro Airport") was selected for this CALMET QA/QC analysis. Specifically, the observed meteorological data at Faro Airport was used to compare with the CALMET modelled meteorological data extracted at the nearest CALMET grid point to Faro Airport.

5.2.1 TEMPERATURE

Figure 5-5 shows the average monthly surface temperatures at observed and CALMET extracted points. Figure 5-6 shows the average hourly temperatures binned into hour intervals of a day. Both temporal plots show good agreement between the predicted and observed temperature values.

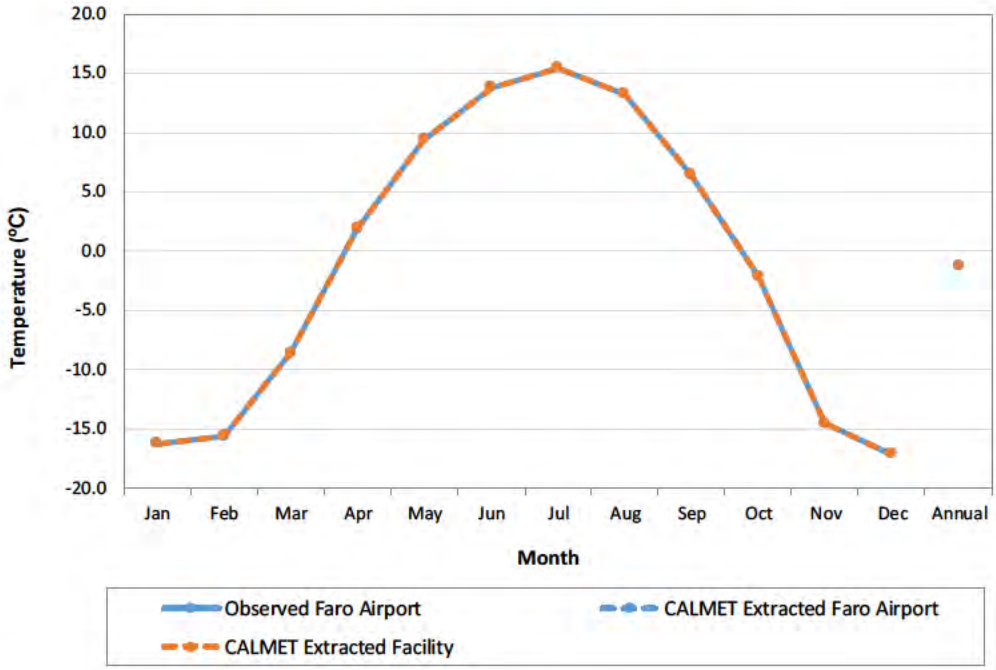

Figure 5-5 Monthly Temperature Variation

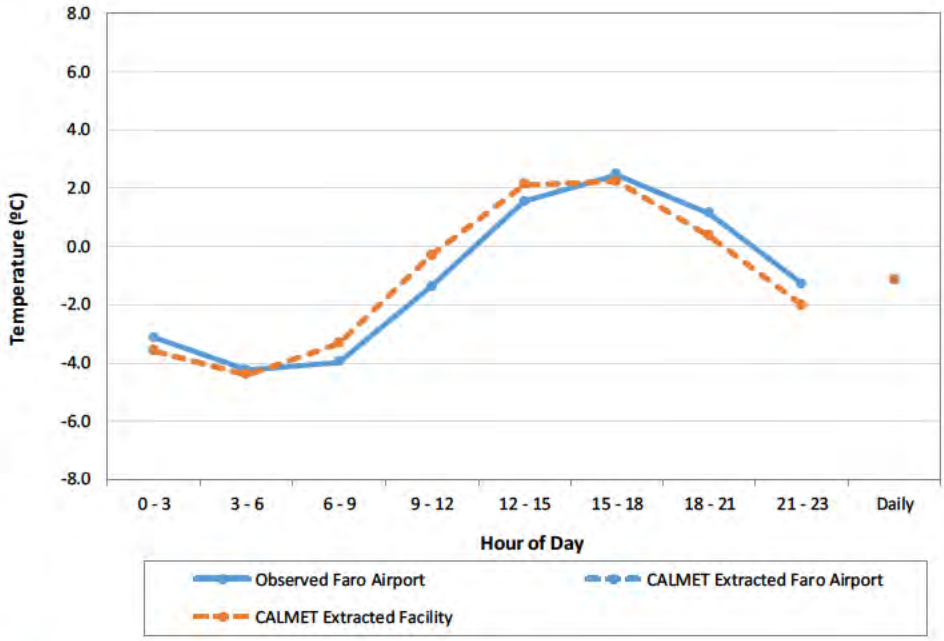

Figure 5-6 Diurnal Temperature Variation

5.2.2 WIND SPEED

The frequency distribution of wind speed at the observed and CALMET extracted points are shown below in Figure 5-7. The modelled wind speeds show good agreement with the observed wind speed data.

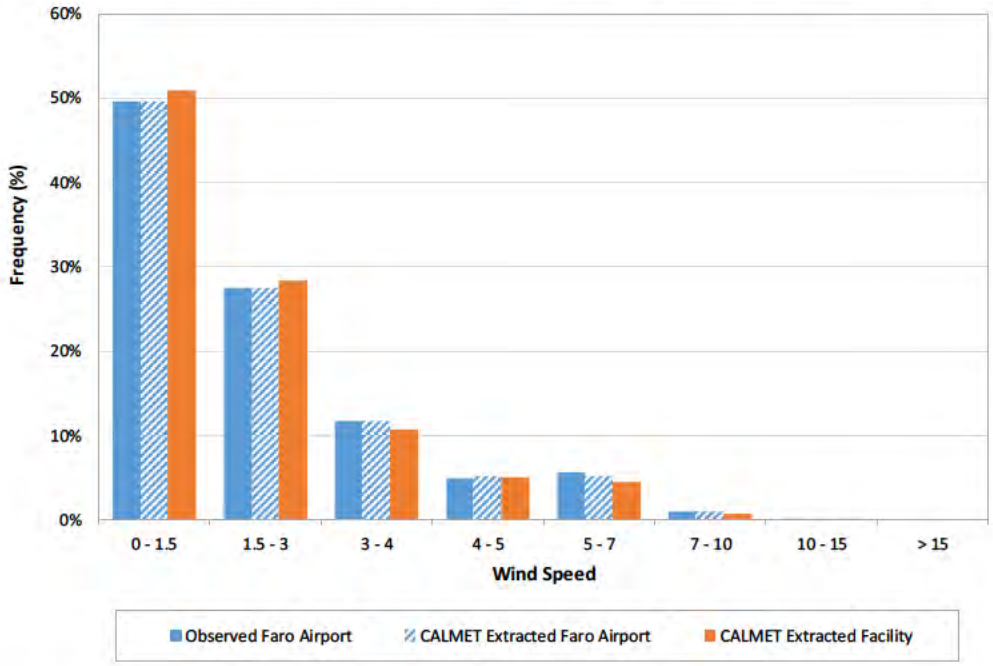

Figure 5-7 Wind Speed Frequency

5.2.3 WIND ROSE

The following figures show full-period and seasonal wind roses for the observed wind data at the selected surface meteorological station (Faro Airport), modelled CALMET wind data extracted at the nearest grid point to Faro Airport, and modelled CALMET wind data extracted at the nearest point to the Facility. The observed and modelled CALMET wind roses show good agreement at Faro Airport station. The wind roses indicate that the predominant winds are from the west-northwest, southeast, and east-southeast directions at Faro Airport station, and east and east-southeast directions at the Facility, which are expected considering the surrounding valley orientation shaped by the Pelly River.

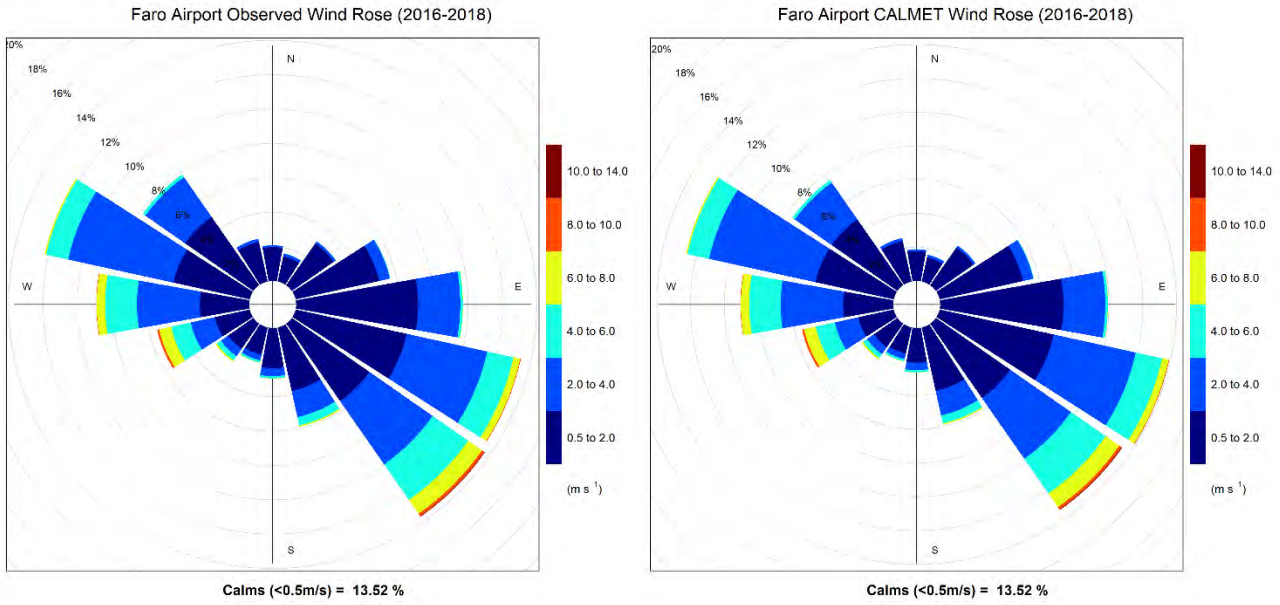

Figure 5-8 Wind Roses at Faro Airport Station

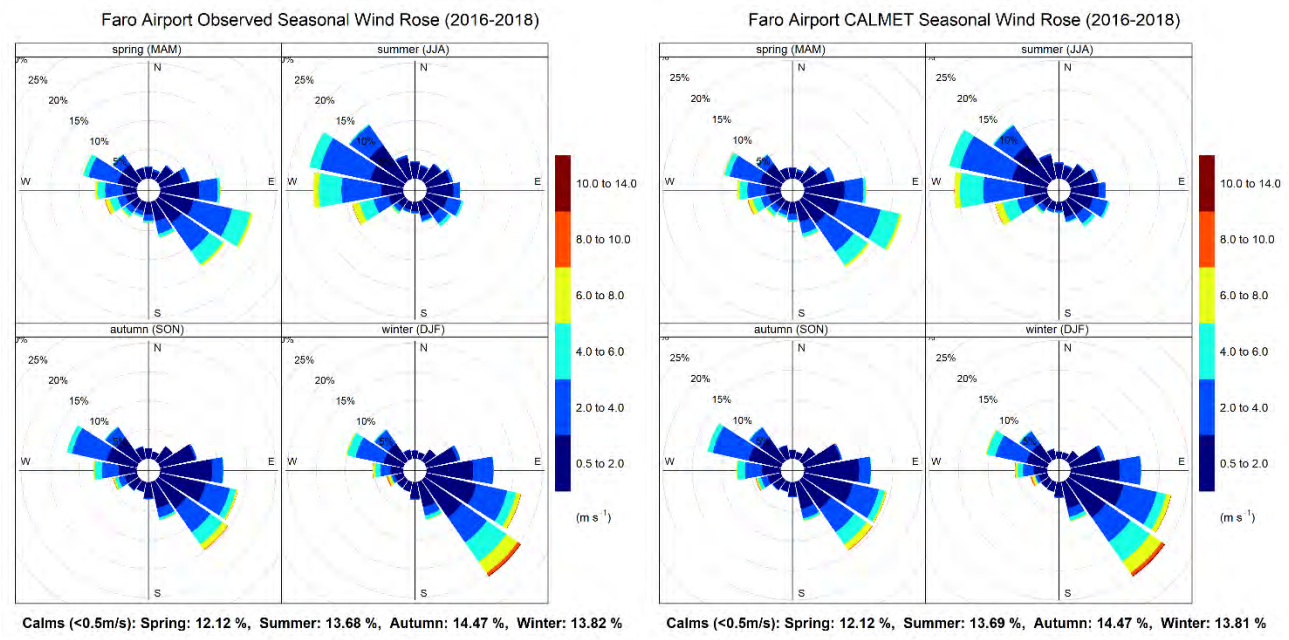

Figure 5-9 Seasonal Wind Roses at Faro Airport Station

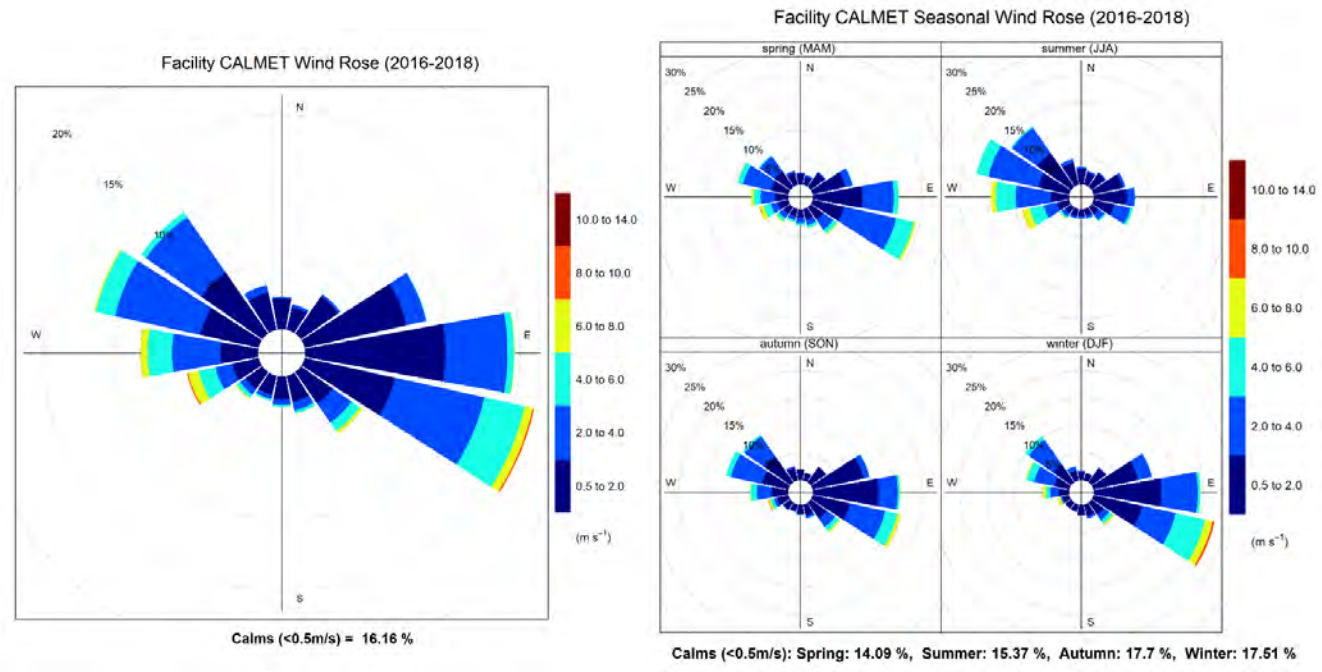

Figure 5-10 Annual and Seasonal Wind Rose at the Facility Location

5.2.4 ATMOSPHERIC STABILITY

Model predicted stability classes are provided in Figure 5-11. The distribution shows higher occurrences of neutral (stability class 4) and stable (stability class 6) conditions near to the Facility and Faro Airport station. There are no observations of atmospheric stability for comparison.

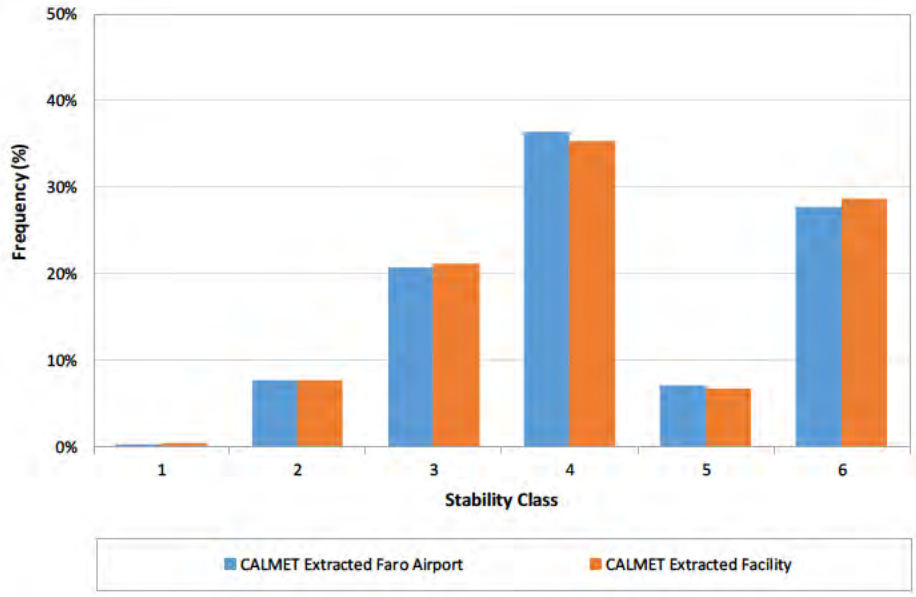

Figure 5-11 Frequency Distribution of Stability Classes

5.2.5 MIXING HEIGHT

Predicted mixing height statistics from CALMET meteorological outputs are below for selected CALMET extracted points. The monthly mixing height variation is shown in Figure 5-12. Figure 5-13 shows the diurnal mixing height variation, illustrating the expected pattern of increasing mixing heights during the daytime and decreasing mixing heights into the nighttime. Figure 5-14 shows the frequency distribution of all the mixing heights predicted by the CALMET model at the selected CALMET extract points. There are no observations of mixing height for comparison.

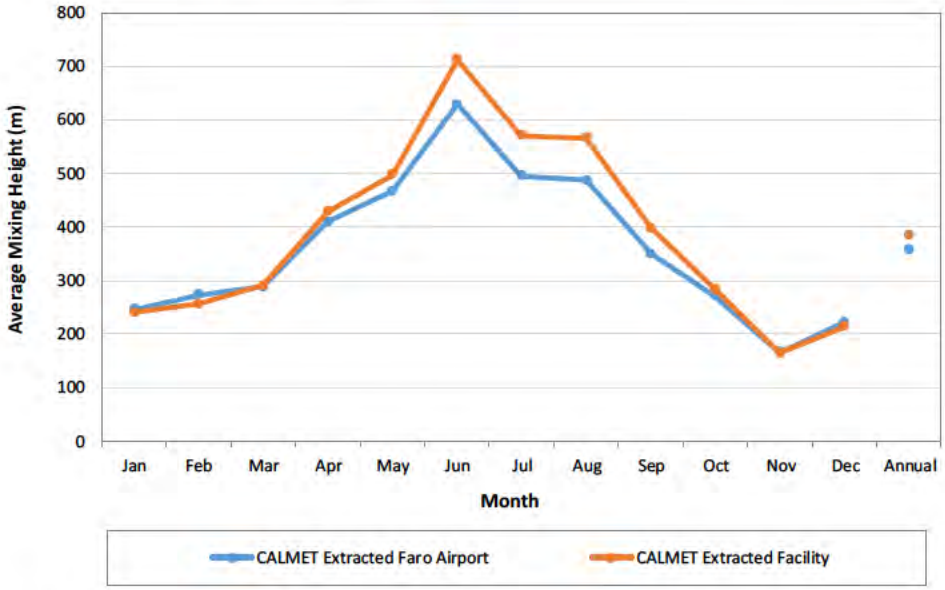

Figure 5-12 Monthly Mixing Height Variation

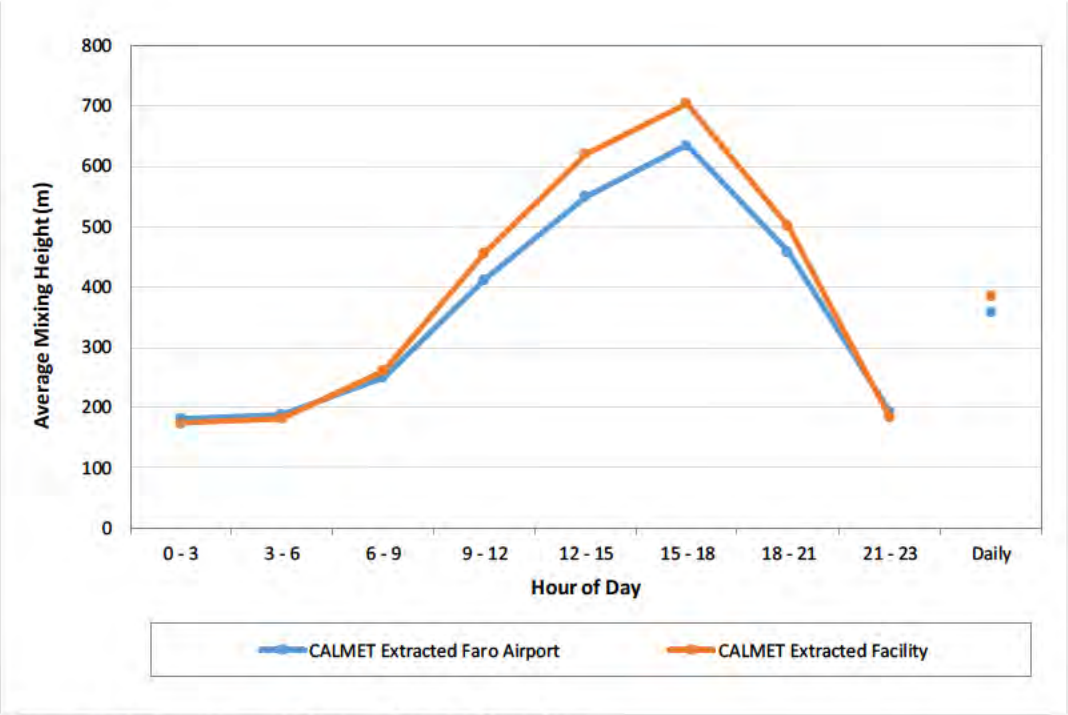

Figure 5-13 Diurnal Mixing Height Variation

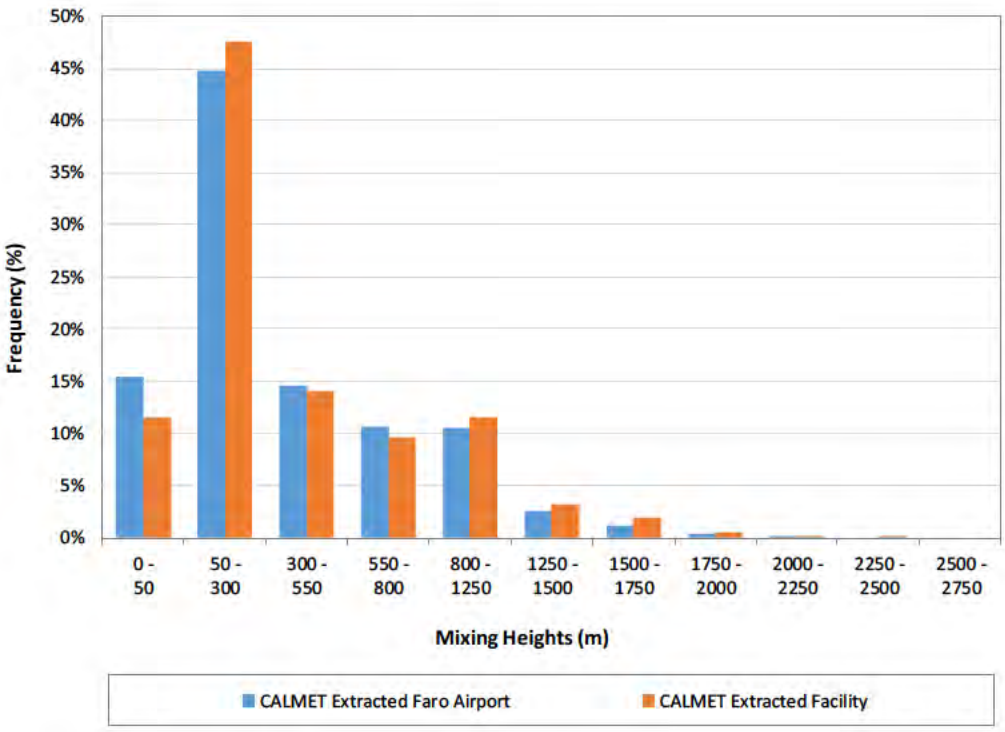

Figure 5-14 Mixing Height Frequency Distribution

5.3 CALPUFF – DISPERSION MODELLING

CALPUFF Version 7.2.1 (Level 150618) was executed for the three-year time period from January 1, 2016 through December 31, 2018. The CALPUFF model uses the meteorological fields generated from CALMET and simulates the dispersion of air emissions from the Project's point sources described in Section 4.

5.3.1 CALPUFF MODEL SWITCHES

Table 5-3 outlines the selected CALPUFF model options. Unless otherwise stated in Table 5-3, the AQDMG default parameters are used wherever applicable.

Table 5-3 Selected CALPUFF Model Options

CALPUFF Model Switch	Parameter	Option Selected	AQDMG Default
Vertical distribution used in the near field	MGAUSS	1 (Gaussian)	✓
Terrain adjustment method	MCTADJ	3 (Partial plume path adjustment)	✓
Subgrid-Scale complex terrain flag	MCTSG	0 (Not used)	✓
Near-field puffs modelled as elongated?	MSLUG	0 (No)	✓
Transitional Plume Rise modelled?	MTRANS	1 (Yes)	✓
Stack-tip downwash?	MTIP	1 (Yes)	✓
Method selected to compute plume rise for point sources not subject to downwash.	MRISE	1 (Briggs plume rise)	✓
Method used to simulate building downwash?	MBDW	2 (PRIME)	✓
Vertical wind shear modelled above stack top?	MSHEAR	0 (No)	✓
Puff splitting allowed?	MSPLIT	0 (No)	✓
Chemical Transformation Scheme?	MCHEM	0 (Not modelled)	✓
Aqueous phase transformation flag (only used in MCHEM =1 or 3)	MAQCHEM	Not used	✓
Wet removal modelled?	MWET	0 (No)	✓
Dry deposition modelled?	MDRY	0 (No)	✓
Gravitational settling (plume tilt)?	MTILT	0 (Not used)	✓
Method used to compute dispersion coefficients	MDISP	2 (Internally calculated)	✓
Sigma measurements used?	MTURBVW	Not used	✓
Back-up method used to compute dispersion when measured turbulence data are missing	MDISP2	Not used	✓
Method used for Lagrangian time scale for σy	MTAULY	0 (Lagrangian time scale)	✓
Advective-Decay timescale for turbulence	MTAUADV	0 (No turbulence advection)	✓
Method used to compute turbulence σv and σw profiles	MCTURB	1 (CALPUFF defaults)	✓
PG sigma y,z adjusted for roughness	MROUGH	0 (Yes)	✓
Partial plume penetration of elevated inversion?	MPARTL	1 (Yes)	✓
Partial plume penetration from buoyant area sources	MPARTLBA	Not used	✓
Strength of temperature inversion provided in PROFILE.DAT extended records?	MTINV	0 (No)	✓
Probability Distribution Function used for dispersion under convective conditions?	MPDF	1 (Yes)	✓
Sub-grid TIBL module used for shore line?	MSGTIBL	Not used	✓
Boundary conditions (concentration) modelled?	MBCON	0 (No)	✓
Configure for FOG Model output?	MFOG	0 (No)	✓
Test options specified to see if they conform to regulatory values?	MREG	0 (No)	✓
Minimum turbulence velocities, sigma v and sigma w for each stability class over land and water	SVMIN, SWMIN	CALPUFF defaults	✓

5.3.2 CALPUFF MODEL DOMAIN AND RECEPTORS

A 12 km by 12 km CALMET model domain and a 10 km by 10 km CALPUFF model domain were defined (Figure 5-15). Receptor grids were then produced for the Project following the instructions established by BC AQDMG (2015). Sensitive receptors - including health care facility, school, child care facility, nearest business and nearest residential location - were also identified and incorporated into the receptor grid. The names and locations of these sensitive receptors are displayed in Figure 5-15.

Model receptors were established according to the receptor spacing and extent requirements as set out in BC AQDMG within the CALPUFF domain. The model receptors created for the Project not only met the minimum requirements outlined in the BC AQDMG, but also included additional dense receptors at 50 m spacing placed over the entire Town of Faro to allow for more model predictions within the community. Receptors representing the sensitive human populations found nearby the Facility were also included in the model receptor grid.

The complete receptor grid used in CALPUFF were generated as follows and also presented in Figure 5-15 below:

- 20 m spacing along the Facility boundary (or Fenceline);
- 50 m spacing within 1.75 km of the Project stack locations, including those encapsulating the entire Faro Town area;
- 250 m spacing within 2 km of the Project stack locations;
- 500 m within 5 km of the Project stack locations;
- Nearest residence (situated approximately 380 m southeast of the Project);
- Nearest business (situated approximately 360 m east-southeast of the Project);
- Nearest child care facility (Bubble's Faro Daycare, situated approximately 785 m southeast of the Project);
- Nearest school (Del Van Gorder School, situated approximately 825 m southeast of the Project), and,
- Nearest health care facility (Faro Health Centre, situated approximately 860 m southeast of the Project).

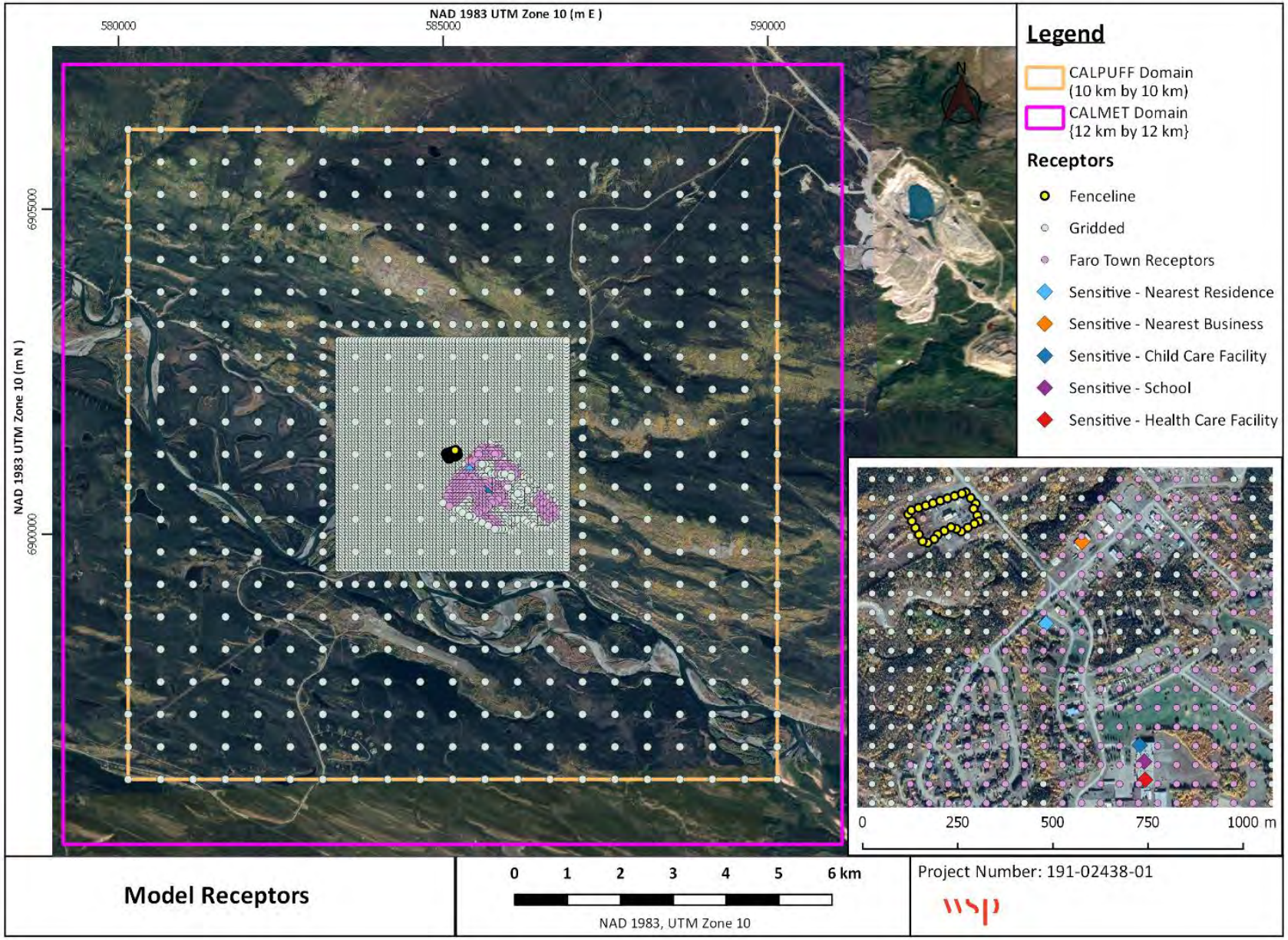

Figure 5-15 Modelled Receptors and Domains

5.3.3 BUILDING DOWNWASH

Buildings or other solid structures may impact air flows in the vicinity of a stack or point source due to the formation of turbulent eddies on the downwind side of the building. On the downwind side of a structure, a recirculating cavity of air forms and it does not mix with other air efficiently. This cavity has the potential to reduce plume rise and impact dispersion. The flow that is affected by the obstruction is known as the "wake".

The CALPUFF model accounts for building downwash with enhanced plume dispersion coefficients due to the turbulent wake and reduced plume rise caused by a combination of the descending streamlines in the lee of the building and the increased entrainment on the wake. Building downwash was considered in this Air Assessment using the US EPA Building Profile Input Program (BPIP-PRIME).

The buildings or structures and their corresponding heights included in the building downwash analysis using BPIP-PRIME are shown in Figure 5-16 and Table 5-4, respectively.

Table 5-4 Building and Structure Heights used in BPIP-PRIME

Building or Structure Name	Building ID	Building Height (m)
Diesel Fuel Tank #1	0	7.4
Diesel Fuel Tank #2	1	4.6
Building #1	2	2.6
FD7 Building	3	9.8
Building #2	6	3.0
FD1 Plant	7	8.9
Office	8	4.9
Control Building	9	4.3
Storage Building	10	5.3
YM20 Enclosure	11	4.0
YM21 Enclosure	12	4.0
YM22 Enclosure	13	4.0
YM23 Enclosure	14	4.0
YM24 Enclosure	15	4.0
YM25 Enclosure	16	4.0

Figure 5-16 Buildings and Structures included in BPIP-PRIME

5.4 NO_X TO NO_2 CONVERSION

As dispersion models only compute and output Nitrogen Oxides (NOx) concentrations, model predicted NOx concentrations need to be converted to NO_2 concentrations using estimation methods in order to compare and demonstrate compliance with the established NO_2 criteria. The regulatory NO_2 conversion methods outlined in BC AQDMG (2015) are conservative and were neither updated nor tested as appropriate for determination of compliance with the new CAAQS. It is generally accepted that with the more stringent NO_2 objectives recently adopted by CCME, that current AQDMG approaches to NOx to NO_2 conversion in dispersion modelling assessments will need to be further refined for most dispersion modelling assessments. Given the overly conservative nature of regulatory NO_2 conversion methods found in any Canadian jurisdictions at the current time, WSP applied the Janssen conversion method for the Project to allow for consistency with past YEC air assessments (SENES, 2011)[3].

[3] *SENES Consultants Limited (2011, October 20). Air Quality Assessment Update in Support of Permit Renewal for Diesel Generator Operations Prepared for Yukon Energy Corporation. Vancouver, British Columbia, Canada.*

The Janssen method is based on an empirically-derived relationship between the source-to-receptor distance and the resulting NO_2-to-NO_x conversion ratios which increases with distance from the source. These NO_2/NO_x conversion ratios are provided in Table 5-5 and applied to the modelled NO_x concentrations in order to estimate the NO_2 concentrations for both modelling scenarios as presented in the air dispersion modelling result tables under Section 6 of this report.

Table 5-5 NO_2/NO_x Conversion Ratios from the Janssen Method

Distance from Source (km)	NO_2/NO_x Conversion Ratios
0 – 1	0.05
1 – 2	0.14
2 – 3	0.19
3 – 4	0.25
4 – 5	0.29
5 – 6	0.33
6 – 7	0.37

6 POST-PROCESSING AND RESULTS

The CALPOST utility from the CALPUFF System Version 7 was used to post-process the CALPUFF dispersion modelling outputs for all air contaminants (NO_2, PM_{10}, $PM_{2.5}$, SO_2, and CO) according to the required statistical forms and averaging periods of the applicable ambient air quality criteria chosen for the Air Assessment (Section 2). The following sections outline the maximum predicted air contaminant concentrations resulting from the two modelling scenarios ("Existing Scenario" and "Future Scenario") defined under Section 4.1. Maximum predicted concentrations are presented in summary tables (Table 6-1 through Table 6-3), summarized by averaging periods (1-hour, 8-hour, 24-hour, and annual) and receptor types. The receptor types are categorized as follows:

- Maximum Point of Impingement (MPOI) – the receptor with the highest predicted ambient concentration across all modelled receptors;
- Faro Town – the receptor with the highest predicted ambient concentration within the Town of Faro;
- Nearest residence (situated approximately 380 m southeast of the Project);
- Nearest business (situated approximately 360 m east-southeast of the Project);
- Nearest child care facility (Bubble's Faro Daycare, situated approximately 785 m southeast of the Project);
- Nearest school (Del Van Gorder School, situated approximately 825 m southeast of the Project), and,
- Nearest health care facility (Faro Health Centre, situated approximately 860 m southeast of the Project).

The maximum predicted air contaminant concentrations from the Existing Scenario and the Future Scenario are outlined in Section 6.1 and Section 6.2, respectively. Tabular summarises of the model predictions at the MPOI for both modelling scenarios are provided in Table 6-1, while Table 6-2 and Table 6-3 present predictions at the sensitive receptors for the Existing and Future Scenarios, respectively. The tables present the total (cumulative) Project concentrations derived by summing the model predicted concentrations with baseline concentrations, where available, and are organized by modelling scenario (as per Table 4-1). Values highlighted in yellow indicate the occurrence of cumulative model predictions exceeding ambient air quality criteria.

In order to illustrate the magnitude compared to the ambient air quality standards considered, percentages of predicted concentrations relative to the applicable standard are also provided in the modelling results summary tables (Table 6-1 through Table 6-3). The spatial distribution and pattern of the dispersion modelling results are depicted by contour plots (isopleths) of maximum predicted concentrations for each air contaminant and averaging period in Figures Figure 6-1 to Figure 6-19. Where appropriate, frequency of exceedances of the applicable ambient air quality criteria are presented. A more in-depth analysis and discussion by each air contaminant are presented in the subsections below.

Table 6-1 Summary of Maximum Cumulative Modelling Results at the MPOI from both Emission Scenarios

AIR CONTAMINANT	AVERAGING PERIOD	AMBIENT AIR QUALITY STANDARD ($\mu g/m^3$)	JURSIDICTION	BASELINE CONCENTRATION		MAXIMUM CUMULATIVE MODEL PREDICTED CONCENTRATION AT THE MPOI			
						Existing Scenario		Future Scenario	
				Value ($\mu g/m^3$)	% of Criteria	Value ($\mu g/m^3$)	% of Criteria	Value ($\mu g/m^3$)	% of Criteria
Nitrogen Dioxide (NO_2)	1-hour	113	Yukon	0.67	0.6%	160.3	142%	243.2	215%
	Annual	32	Yukon	0.11	0.3%	11.0	34%	18.3	57%
Particulate Matter Coarse (PM_{10})	24-hour	50	Yukon	0.46	0.9%	19.7	39%	24.1	48%
Particulate Matter Fine ($PM_{2.5}$)	24-hour	27	Yukon	0.25	0.9%	9.3	34%	12.7	47%
	Annual	8.8	Yukon	0.05	0.5%	1.6	18%	2.2	25%
Sulphur Dioxide (SO_2)	1-hour	183	Yukon	N/A	N/A	3.3	2%	4.3	2%
	Annual	13	Yukon	N/A	N/A	0.2	2%	0.3	3%
Carbon Monoxide (CO)	1-hour	14300	BC	N/A	N/A	480.3	3%	489.0	3%
	8-hour	5500	BC	N/A	N/A	248.8	5%	310.4	6%

Table 6-2 Summary of Maximum Cumulative Modelling Results from the Existing Scenario by Sensitive Receptor Type

AIR CONTAMINANT	AVERAGING PERIOD	AMBIENT AIR QUALITY STANDARD ($\mu g/m^3$)	JURISDICTION	MAXIMUM CUMULATIVE MODEL PREDICTED CONCENTRATION AT THE SENSITVE RECEPTORS											
				Existing Scenario											
				Most Impacted Faro Town Receptor		Nearest Residence		Nearest Business		Nearest Child Care Facility		Nearest School		Nearest Health Care Facility	
				Value ($\mu g/m^3$)	% of Criteria	Value ($\mu g/m^3$)	% of Criteria	Value ($\mu g/m^3$)	% of Criteria	Value ($\mu g/m^3$)	% of Criteria	Value ($\mu g/m^3$)	% of Criteria	Value ($\mu g/m^3$)	% of Criteria
Nitrogen Dioxide (NO_2)	1-hour	113	Yukon	98.1	87%	42.0	37%	43.0	38%	29.8	26%	31.1	28%	30.5	27%
	Annual	32	Yukon	3.9	12%	2.2	7%	2.2	7%	1.3	4%	1.2	4%	1.1	4%
Particulate Matter Coarse (PM_{10})	24-hour	50	Yukon	5.8	12%	4.9	10%	3.1	6%	4.0	8%	3.9	8%	3.5	7%
Particulate Matter Fine ($PM_{2.5}$)	24-hour	27	Yukon	2.5	9%	1.7	6%	1.6	6%	1.2	4%	1.2	4%	1.1	4%
	Annual	8.8	Yukon	0.5	6%	0.4	4%	0.4	4%	0.2	3%	0.2	2%	0.2	2%
Sulphur Dioxide (SO_2)	1-hour	183	Yukon	1.84	1.0%	1.00	0.5%	0.98	0.5%	0.73	0.4%	0.74	0.4%	0.70	0.4%
	Annual	13	Yukon	0.06	0.4%	0.04	0.3%	0.04	0.3%	0.02	0.2%	0.02	0.2%	0.02	0.2%
Carbon Monoxide (CO)	1-hour	14300	BC	192.2	1.3%	115.5	0.8%	104.9	0.7%	84.9	0.6%	86.3	0.6%	90.2	0.6%
	8-hour	5500	BC	68.1	1.2%	62.5	1.1%	35.7	0.6%	53.5	1.0%	53.2	1.0%	48.7	0.9%

Table 6-3 Summary of Maximum Cumulative Modelling Results from the Future Scenario by Sensitive Receptor Type

AIR CONTAMINANT	AVERAGING PERIOD	AMBIENT AIR QUALITY STANDARD ($\mu g/m^3$)	JURISDICTION	MAXIMUM CUMULATIVE MODEL PREDICTED CONCENTRATION AT THE SENSITVE RECEPTORS											
				Future Scenario											
				Most Impacted Faro Town Receptor		Nearest Residence		Nearest Business		Nearest Child Care Facility		Nearest School		Nearest Health Care Facility	
				Value ($\mu g/m^3$)	% of Criteria	Value ($\mu g/m^3$)	% of Criteria	Value ($\mu g/m^3$)	% of Criteria	Value ($\mu g/m^3$)	% of Criteria	Value ($\mu g/m^3$)	% of Criteria	Value ($\mu g/m^3$)	% of Criteria
Nitrogen Dioxide (NO_2)	1-hour	113	Yukon	145.3	129%	61.5	54%	62.3	55%	43.0	38%	43.5	39%	43.6	39%
	Annual	32	Yukon	5.7	18%	3.4	11%	3.0	9%	1.9	6%	1.8	6%	1.7	5%
Particulate Matter Coarse (PM_{10})	24-hour	50	Yukon	6.9	14%	5.6	11%	3.8	8%	4.9	10%	4.8	10%	4.4	9%
Particulate Matter Fine ($PM_{2.5}$)	24-hour	27	Yukon	3.1	11%	2.2	8%	1.9	7%	1.5	6%	1.5	6%	1.4	5%
	Annual	8.8	Yukon	0.6	7%	0.5	6%	0.4	5%	0.3	3%	0.3	3%	0.3	3%
Sulphur Dioxide (SO_2)	1-hour	183	Yukon	2.40	1.3%	1.33	0.7%	1.32	0.7%	1.00	0.5%	1.05	0.6%	1.00	0.5%
	Annual	13	Yukon	0.08	0.6%	0.06	0.5%	0.05	0.4%	0.03	0.3%	0.03	0.3%	0.03	0.2%
Carbon Monoxide (CO)	1-hour	14300	BC	252.2	1.8%	144.8	1.0%	128.3	0.9%	104.5	0.7%	106.7	0.7%	109.3	0.8%
	8-hour	5500	BC	80.7	1.5%	75.8	1.4%	45.6	0.8%	68.9	1.3%	69.4	1.3%	64.3	1.2%

6.1 RESULTS FOR EXISTING SCENARIO

The first modelling scenario considered the ambient air quality impact of the two existing gensets (FD1 and FD7) that have been de-rated to 2.4 MW and 2.8 MW respectively, and three (3) of the new CAT 3516C 1.8 MW diesel generators (Genset ID: YM20, YM21, YM22). The air dispersion modelling results for each air contaminant and averaging period are discussed below, along with the associated contour plots.

6.1.1 GASEOUS POLLUTANTS (SO_2, CO, AND NO_2)

Predicted concentrations of SO_2 and CO for both short-term and long-term averaging periods are very low compared to the ambient air quality criteria. As there was no ambient SO_2 nor CO data available near the Project location, baseline values were not calculated for these 2 air contaminants. As such, baseline air quality was not considered, and the predicted concentrations were found to be well below the ambient air quality criteria. In particular, the maximum predicted concentrations for each receptor category are as follows:

- SO_2
    - MPOI
        - 3.3 µg/m^3, or 2% of the 1-hour SO_2 YAAQS;
        - 0.2 µg/m^3, or 2% of the annual SO_2 YAAQS;
    - Faro Town
        - 1.84 µg/m^3, or 1% of the 1-hour SO_2 YAAQS;
        - 0.06 µg/m^3, or 0.4% of the annual SO_2 YAAQS;
    - Nearest Sensitive Receptors
        - range from 0.70 µg/m^3 to 1.00 µg/m^3 (0.4% to 0.5%) of the 1-hour SO_2 YAAQS; and,
        - range from 0.02 µg/m^3 to 0.04 µg/m^3 (0.2% to 0.3%) of the annual SO_2 YAAQS.
- CO
    - MPOI
        - 480.3 µg/m^3, or 3% of the 1-hour CO ambient air quality criteria;
        - 248.8 µg/m^3, or 5% of the 8-hour CO ambient air quality criteria;
    - Faro Town
        - 192.2 µg/m^3, or 1.3% of the 1-hour CO ambient air quality criteria;
        - 68.1 µg/m^3, or 1.2% of the 8-hour CO ambient air quality criteria;
    - Nearest Sensitive Receptors
        - range from 84.9 µg/m^3 to 115.5 µg/m^3 (0.6% to 0.8%) of the 1-hour CO ambient air quality criteria; and,
        - range from 35.7 µg/m^3 to 62.5 µg/m^3 (0.6% to 1.1%) of the 8-hour CO ambient air quality criteria.

These results indicate that the contribution of the emissions from the Existing Scenario to ambient SO_2 and CO is low. The contour plots (Figure 6-1 through Figure 6-4) show that the predicted concentrations decrease significantly with increased distance from the Facility.

As discussed in Section 5.4, the Janssen Method was used to convert model predictions from NO_x to NO_2 values. The resulting maximum predicted NO_2 concentrations exceed the YAAQS for the short-term averaging period (1-hour) and are well below the YAAQS for the long-term averaging period (annual) at the MPOI. Within the Town of Faro and at the sensitive receptors, the predicted NO_2 concentrations are predicted to be in compliance with the YAAQS. When baseline NO_2 concentration is considered, the cumulative NO_2 predicted concentrations at the various receptor types are as follows:

- MPOI
    - 160.3 µg/m^3, or 142% of the 1-hour NO_2 YAAQS;
    - 11.0 µg/m^3, or 34% of the annual NO_2 YAAQS;
- Faro Town
    - 98.1 µg/m^3, or 87% of the 1-hour NO_2 YAAQS;
    - 3.9 µg/m^3, or 12% of the annual NO_2 YAAQS;
- Nearest Sensitive Receptors
    - range from 29.8 µg/m^3 to 43.0 µg/m^3 (26% to 38%) of the 1-hour NO_2 YAAQS; and,
    - range from 1.1 µg/m^3 to 2.2 µg/m^3 (4% to 7%) of the annual NO_2 YAAQS.

Based on the spatial distribution as shown by the contour plots below (Figure 6-5 and Figure 6-6), exceedances were only predicted for the short-term averaging period (1-hour) and occur away from the receptors that have potential to impact the human population near the Project (i.e. Faro Town receptors). It is important to note that the observed pattern of predicted 1-hour NO_2 concentration distribution with “pockets” of higher concentrations further away from the facility is due to the discrete distance-based conversion methodology of the Janssen Method.

Oftentimes, predicted exceedances are found to occur infrequently, especially given the fact that there would be limited (if any) hours that the Facility is operating at the maximum capacity level. As such, a frequency of exceedance analysis was conducted to determine the number of modelling hours that are predicted to exceed the 1-hour NO_2 YAAQS at the MPOI (situated approximately 1 km east of the Facility center). The resulting percentage of frequency of exceedance, using the 98th percentile 1-hour NO_2 predictions, was determined to be 0.27% (71 hours) at the MPOI. Since the primary concern of air quality assessment is to evaluate the potential risks of the emissions resulting from the Future Scenario on the human population residing near the Project (i.e. at the Faro Town receptors), rather than at the point of maximum impingement, further investigation into determining patterns of the exceedances was not performed for this modelling scenario.

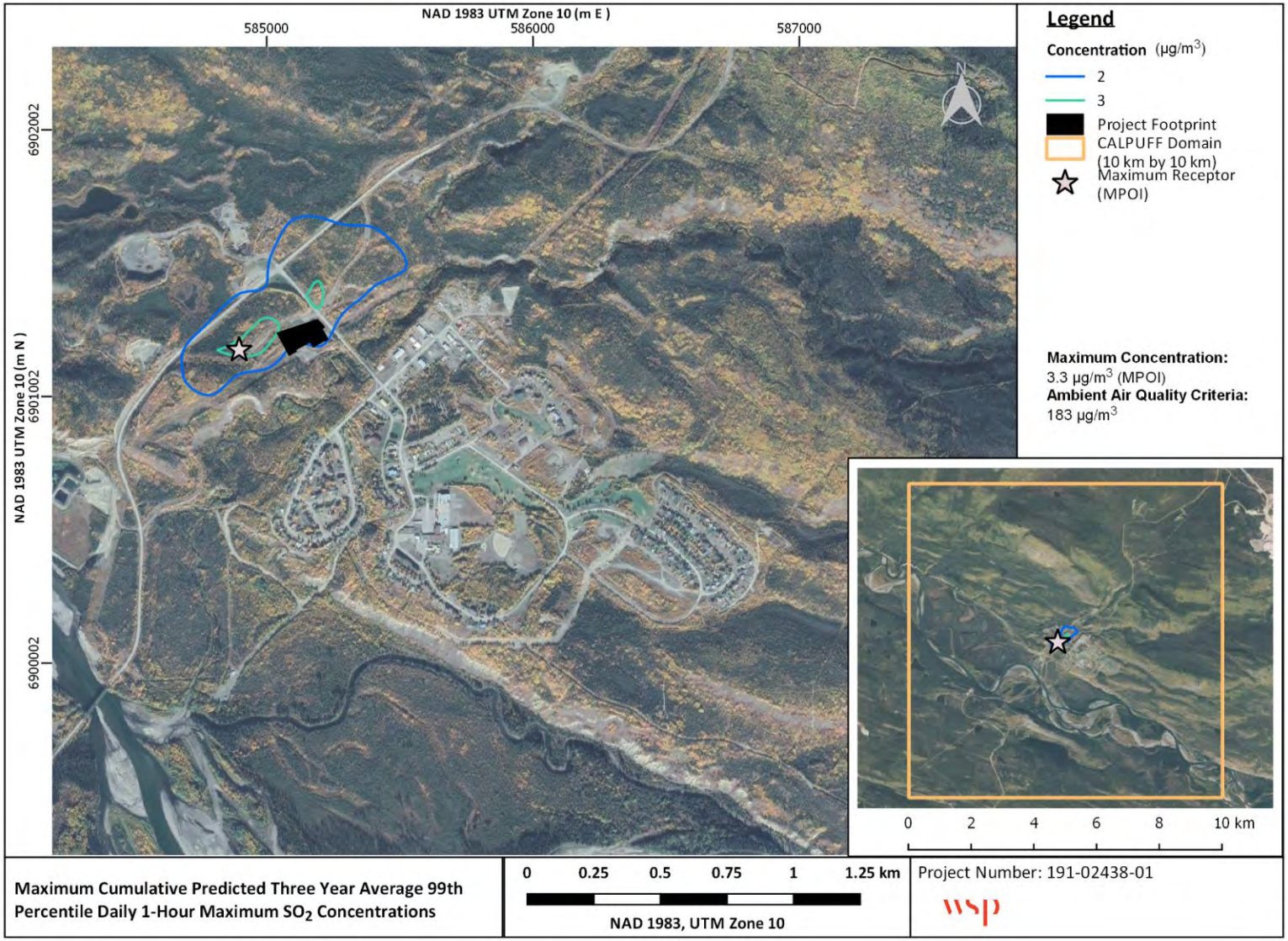

Figure 6-1 Contour Plot of Predicted 1-Hour SO_2 Concentrations for the Existing Scenario

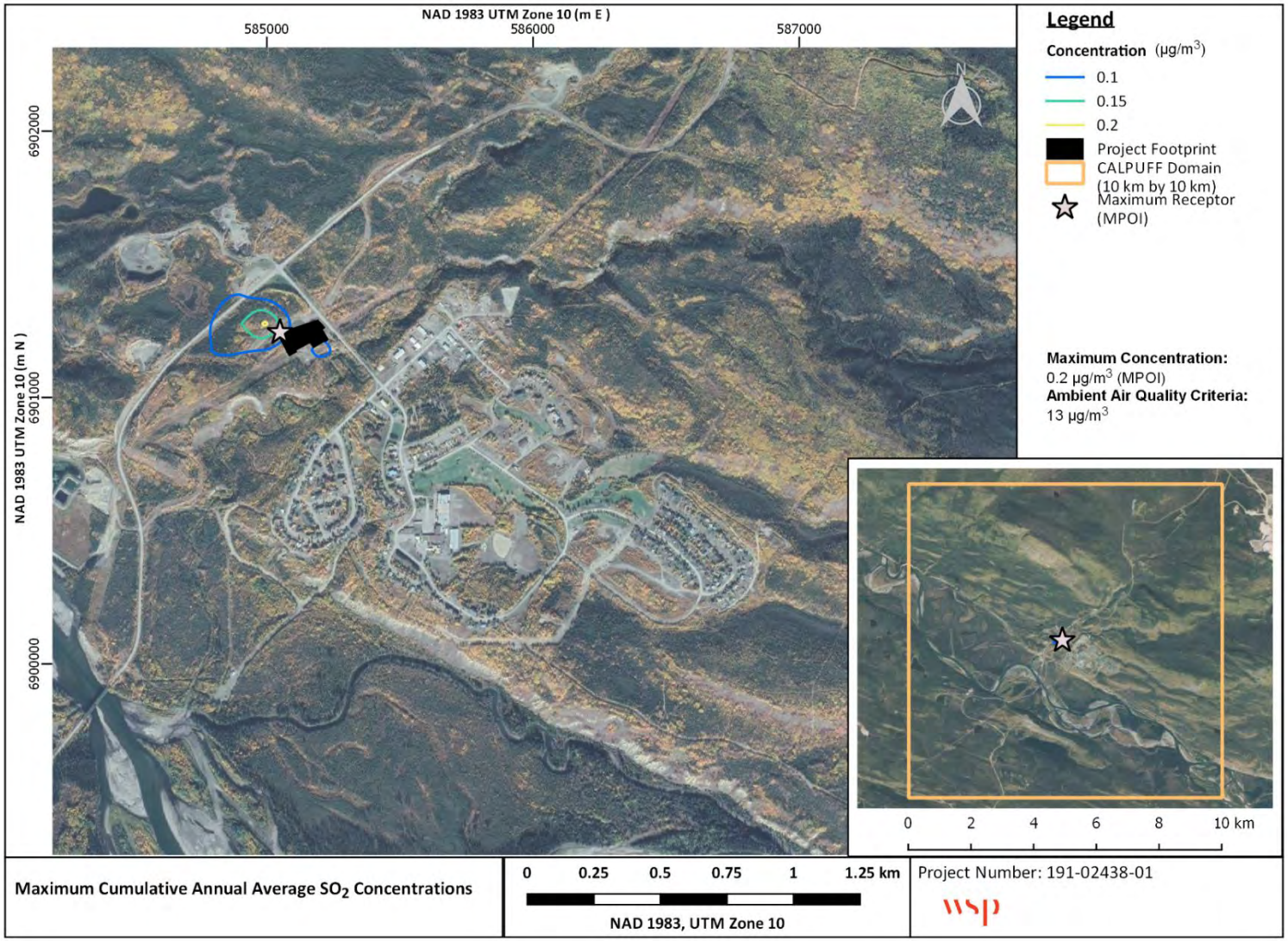

Figure 6-2 Contour Plot of Predicted Annual SO_2 Concentrations for the Existing Scenario

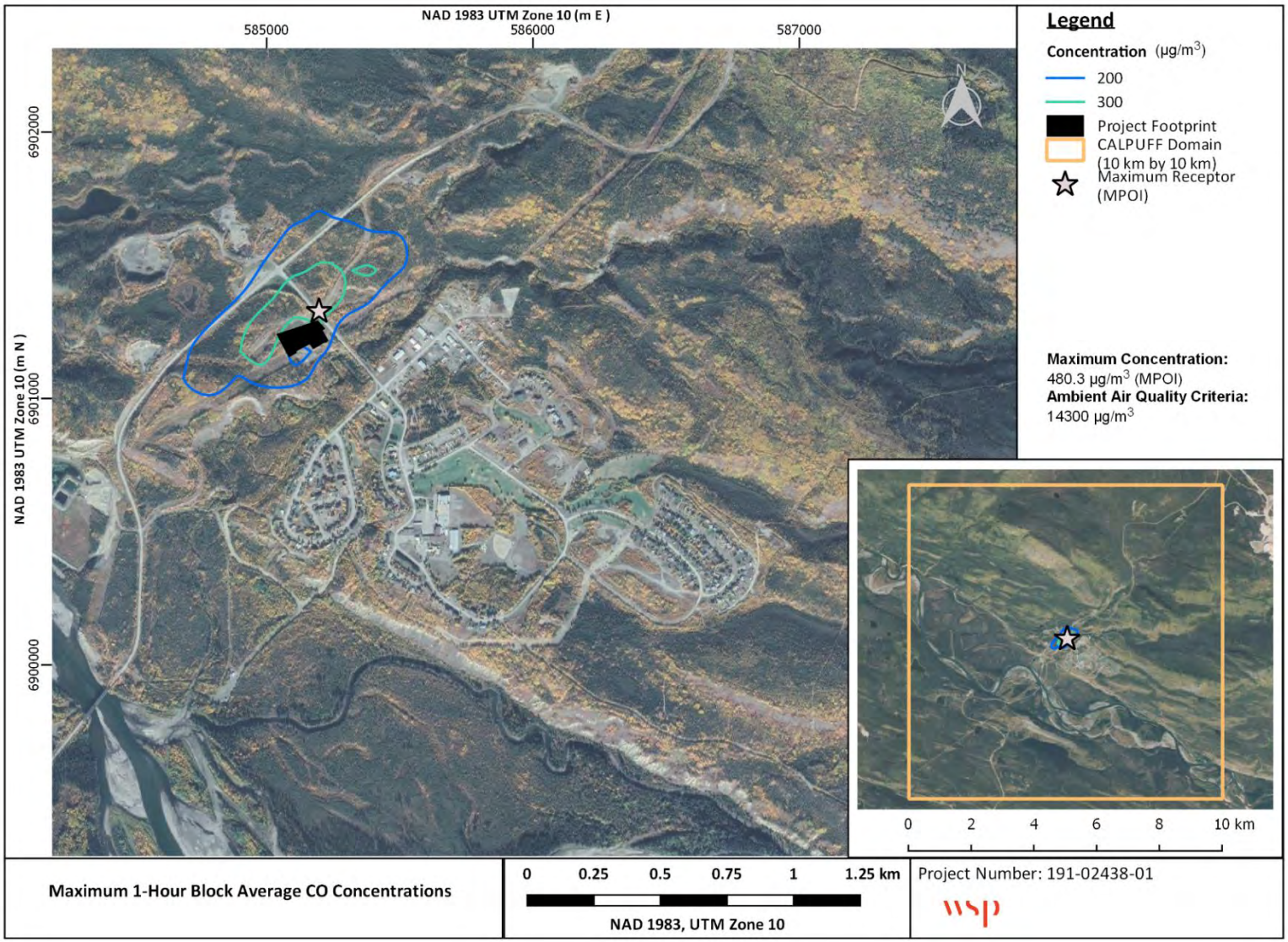

Figure 6-3 Contour Plot of Predicted 1-Hour CO Concentrations for the Existing Scenario

Figure 6-4 Contour Plot of Predicted 8-Hour CO Concentrations for the Existing Scenario

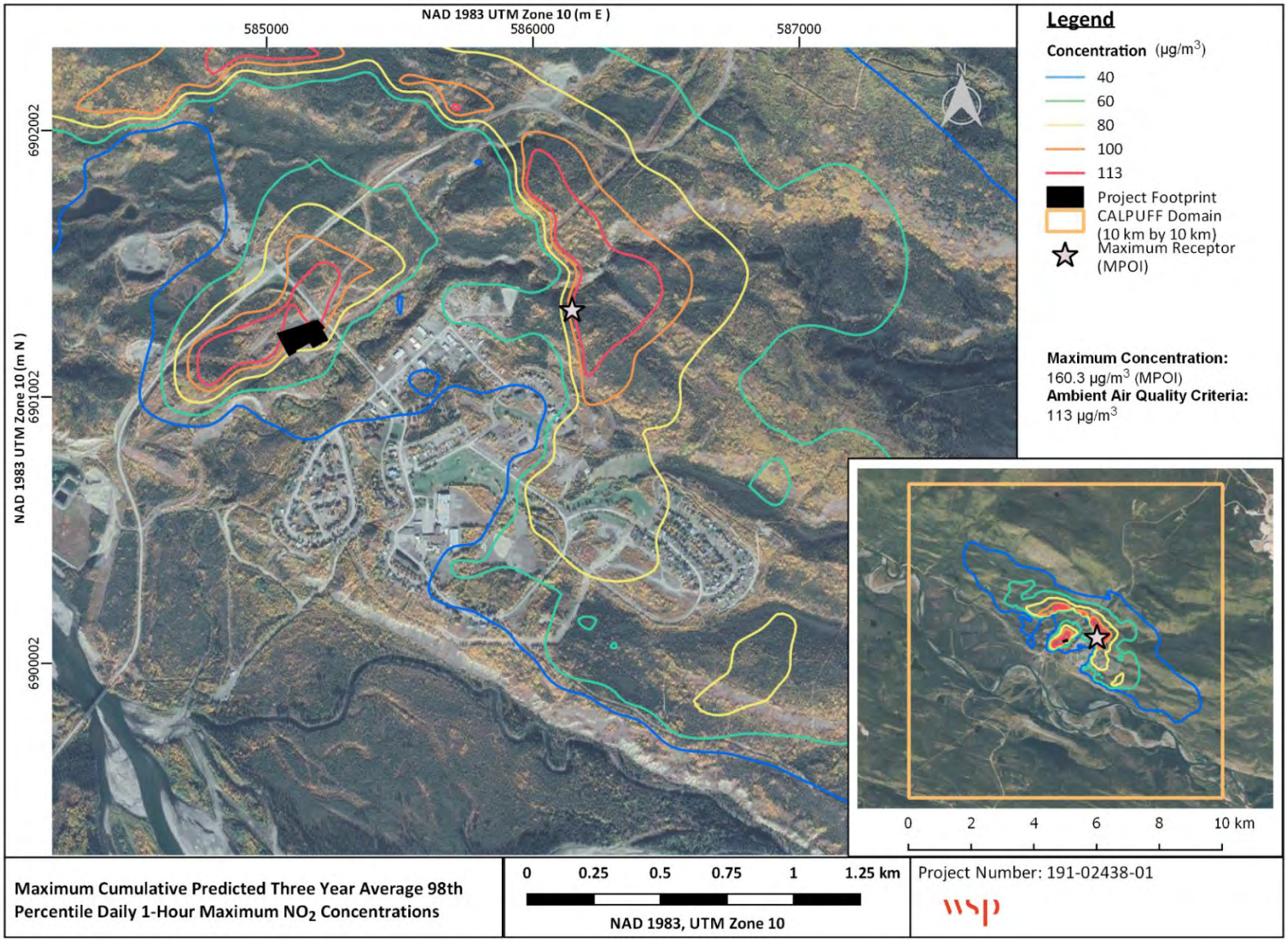

Figure 6-5 Contour Plot of Predicted 1-Hour NO_2 Concentrations for the Existing Scenario

Figure 6-6 Contour Plot of Predicted Annual NO_2 Concentrations for the Existing Scenario

6.1.2 PARTICULATE MATTER ($PM_{2.5}$ AND PM_{10})

With regards to $PM_{2.5}$ and PM_{10}, the predicted concentrations for both short-term and long-term periods showed no exceedances of the associated air quality criteria. When baseline air quality is considered, the cumulative $PM_{2.5}$ and PM_{10} predicted concentrations remain well below the air quality criteria:

- PM_{10}
  - MPOI
    - 19.7 µg/m^3, or 39% of the 24-hour PM_{10} YAAQS;
  - Faro Town
    - 5.8 µg/m^3, or 12% of the 24-hour PM_{10} YAAQS; and,
  - Nearest Sensitive Receptors
    - range from 3.1 µg/m^3 to 4.9 µg/m^3 (6% to 10%) of the 24-hour PM_{10} YAAQS.
- $PM_{2.5}$
  - MPOI
    - 9.3 µg/m^3, or 34% of the 24-hour $PM_{2.5}$ YAAQS;
    - 1.6 µg/m^3, or 18% of the annual $PM_{2.5}$ YAAQS;
  - Faro Town
    - 2.5 µg/m^3, or 9% of the 24-hour $PM_{2.5}$ YAAQS;
    - 0.5 µg/m^3, or 6% of the annual $PM_{2.5}$ YAAQS;
  - Nearest Sensitive Receptors
    - range from 1.1 µg/m^3 to 1.7 µg/m^3 (4% to 6%) of the 24-hour $PM_{2.5}$ YAAQS; and,
    - range from 0.2 µg/m^3 to 0.4 µg/m^3 (2% to 4%) of the annual $PM_{2.5}$ YAAQS.

These results indicate that the contribution of the emissions from the Existing Scenario to ambient concentrations of particulate matter is low relative to YAAQS. In addition, the contour plots (Figure 6-7 through Figure 6-9) show the limited spatial distribution of predicted particulate matter concentrations, where the predicted concentrations decrease significantly with increased distance from the Facility

Figure 6-7 Contour Plot of Predicted 24-Hour PM_{10} Concentrations for the Existing Scenario

Figure 6-8 Contour Plot of Predicted 24-Hour $PM_{2.5}$ Concentrations for the Existing Scenario

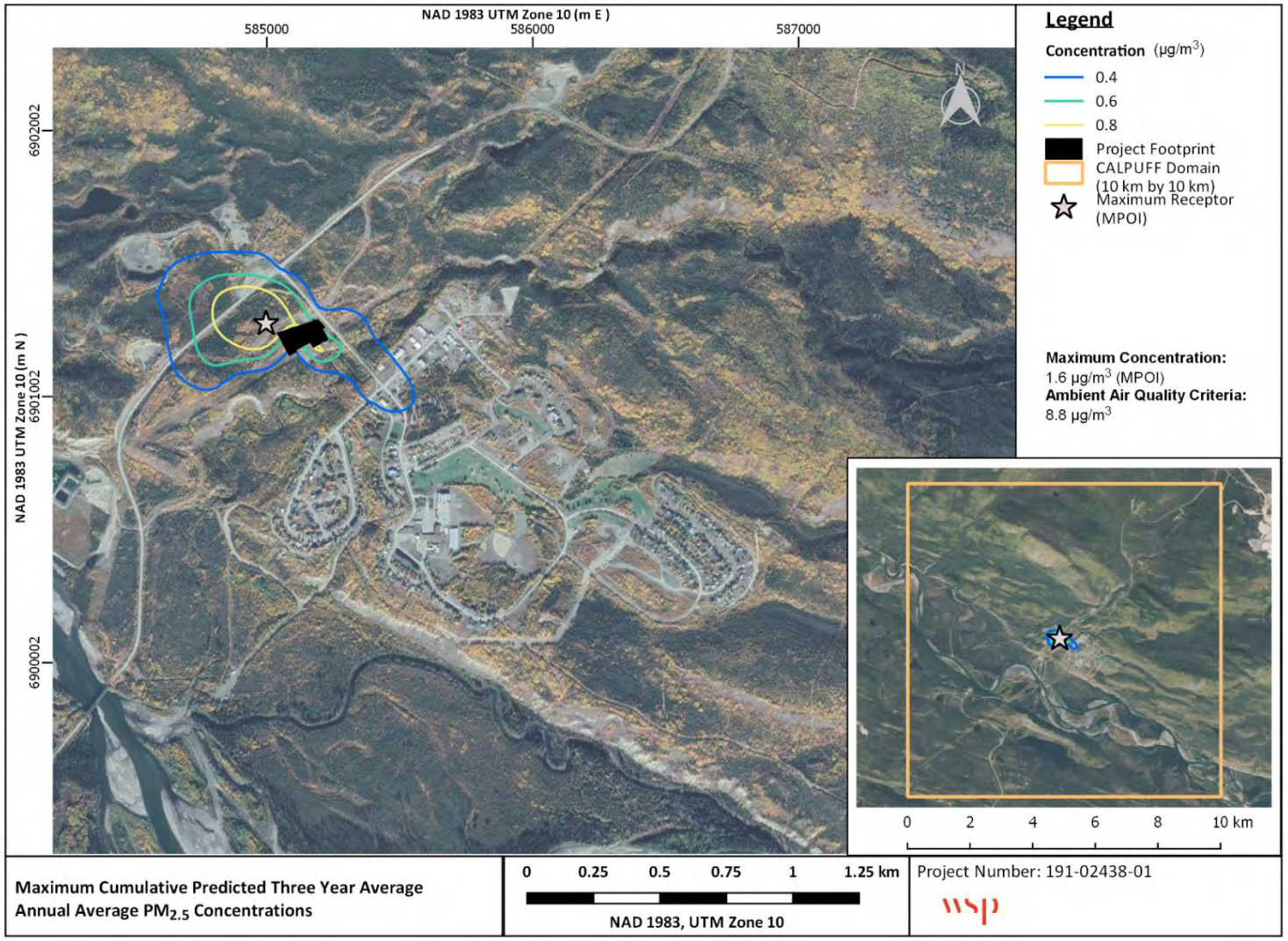

Figure 6-9 Contour Plot of Predicted Annual $PM_{2.5}$ Concentrations for the Existing Scenario

6.2 RESULTS FOR FUTURE SCENARIO

The second modelling scenario considered the ambient air quality impact of the two existing gensets (FD1 and FD7) that had been de-rated to 2.4 MW and 2.8 MW respectively, and six (6) new CAT 3516C 1.8 MW diesel generators (Genset ID: YM20, YM21, YM22, YM23, YM24, and YM25). The air dispersion modelling results for each air contaminant and averaging period are discussed below, along with the associated contour plots.

6.2.1 GASEOUS POLLUTANTS (SO_2, CO, AND NO_2)

Similar to the results of the Existing Scenario, the predicted concentrations of SO_2 and CO for both short-term and long-term averaging periods are very low compared to the ambient air quality criteria. As mentioned in Section 3, baseline values were not available for these two air contaminants, so the predicted values alone are presented below. The predicted concentrations were found to be well below the ambient air quality criteria, where the maximum predicted concentrations for each receptor category are as follows:

- SO_2
  - MPOI
    - 4.3 µg/m^3, or 2% of the 1-hour SO_2 YAAQS;
    - 0.3 µg/m^3, or 3% of the annual SO_2 YAAQS;
  - Faro Town
    - 2.40 µg/m^3, or 1.3% of the 1-hour SO_2 YAAQS;
    - 0.08 µg/m^3, or 0.6% of the annual SO_2 YAAQS;
  - Nearest Sensitive Receptors
    - range from 1.00 µg/m^3 to 1.33 µg/m^3 (0.5% to 0.7%) of the 1-hour SO_2 YAAQS; and,
    - range from 0.03 µg/m^3 to 0.06 µg/m^3 (0.2% to 0.5%) of the annual SO_2 YAAQS.
- CO
  - MPOI
    - 489.0 µg/m^3, or 3% of the 1-hour CO ambient air quality criteria;
    - 310.4 µg/m^3, or 6% of the 8-hour CO ambient air quality criteria;
  - Faro Town
    - 252.2 µg/m^3, or 1.8% of the 1-hour CO ambient air quality criteria;
    - 80.7 µg/m^3, or 1.5% of the 8-hour CO ambient air quality criteria;
  - Nearest Sensitive Receptors
    - range from 104.5 µg/m^3 to 144.8 µg/m^3 (0.7% to 1.0%) of the 1-hour CO ambient air quality criteria; and,
    - range from 45.6 µg/m^3 to 75.8 µg/m^3 (0.8% to 1.4%) of the 8-hour CO ambient air quality criteria.

These results indicate that the contribution of the emissions from the Future Scenario to ambient SO_2 and CO is low. The contour plots (Figure 6-10 through Figure 6-13) show that the predicted concentrations significantly decrease with increased distance from the Facility.

As discussed in Section 5.4, the Janssen Method was used to convert model predictions from NO_x to NO_2 values. The resulting maximum predicted NO_2 concentrations exceed the YAAQS for the short-term averaging period (1-hour) and are well below the YAAQS for the long-term averaging period (annual) at the MPOI. Within the Town of Faro, ambient NO_2 concentrations are predicted to exceed the YAAQS for the short-term averaging period (1-hour) but are well below the YAAQS for the long-term averaging period (annual). The predicted NO_2 concentrations are predicted to be in compliance with the YAAQS at all of the sensitive receptors. When baseline NO_2 concentrations (as defined in Section 3) is considered, the cumulative NO_2 predicted concentrations at the various receptor types are as follows:

- MPOI
    - 243.2 µg/m^3, or 215% of the 1-hour NO_2 YAAQS;
    - 18.3 µg/m^3, or 57% of the annual NO_2 YAAQS;
- Faro Town
    - 145.3 µg/m^3, or 129% of the 1-hour NO_2 YAAQS;
    - 5.7 µg/m^3, or 18% of the annual NO_2 YAAQS;
- Nearest Sensitive Receptors
    - range from 43.0 µg/m^3 to 62.3 µg/m^3 (38% to 55%) of the 1-hour NO_2 YAAQS; and,
    - range from 1.7 µg/m^3 to 3.4 µg/m^3 (5% to 11%) of the annual NO_2 YAAQS.

Based on the spatial distribution as shown by the contour plots below (Figure 6-14 and Figure 6-15), exceedances were predicted for the short-term averaging period (1-hour) only and were found scattered in a confined area surrounding the Facility and also on the outskirts of the Town of Faro. It is important to note that the observed pattern of predicted 1-hour NO_2 concentration distribution with “pockets” of higher concentrations further away from the Facility is due to the discrete distance-based conversion methodology of the Janssen Method.

To characterize the risk associated with the predicted 1-hour NO_2 exceedances, further analysis to evaluate and illustrate the magnitude and extent of these exceedances was performed to determine patterns and provide useful context to the predicted air quality impacts from the Facility’s maximum permitted levels. Since the primary concern of air quality assessment is to evaluate the potential risks on the human population residing near the Project (i.e. at the Faro Town receptors), rather than at the point of maximum impingement, further data analysis of the predicted short-term NO_2 exceedances were analyzed for the maximally impacted receptor within the Faro Town (shown by “Maximum Receptor (Faro Town)” in Figure 6-14)

Specifically, the predicted 1-hour NO_2 exceedances were analyzed for frequency of occurrence, temporal pattern, and meteorological conditions that were attributable to the elevated NO_2 predictions. The frequency of exceedance, using the 98th percentile of 1-hour NO_2 predictions, was determined to be 0.96% (253 hours) at the MPOI and 0.21% (56 hours) at the maximally impacted Faro Town receptor. Moreover, the predicted 1-hour NO_2 exceedances occur entirely under particular wind conditions (light winds predominantly from the west-northwest direction as depicted by Figure 6-16), which primarily follow the prevailing winds at the Facility (as extracted from the CALMET model, shown in Figure 5-10). In fact, based on Table 6-4, all of the predicted exceedances are found from wind directions between 290° and 310°, and low wind speeds (1-3 m/s). Furthermore, according to Table 6-5, the majority of the predicted exceedances (51 out of 56 exceeding hours) occur during the cooler months of the year (January through April and September through December) within the night-time hours (18:00 to 07:00), during which poor dispersion patterns such as temperature inversions and stagnant conditions are more likely to be observed.

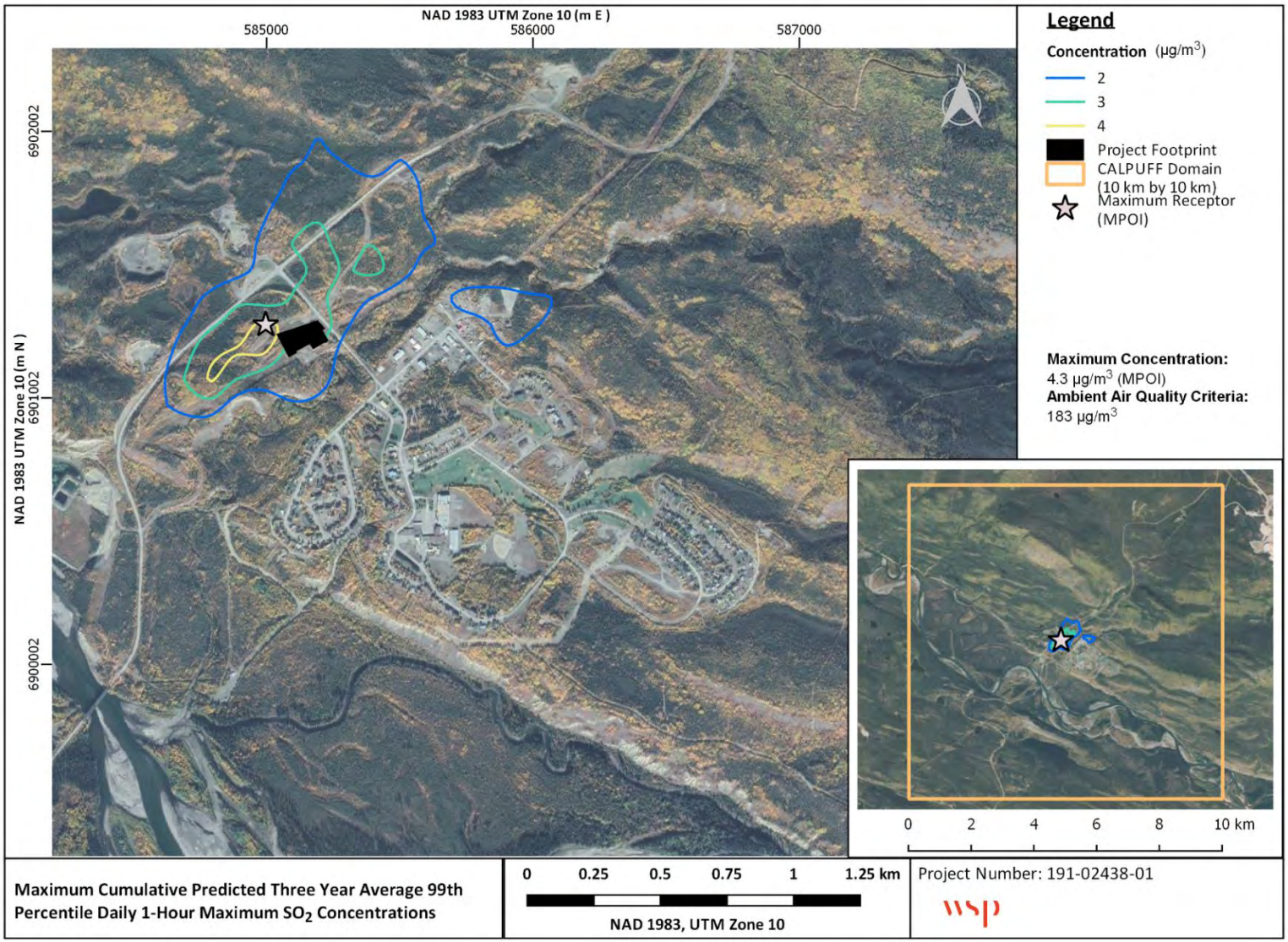

Figure 6-10 Contour Plot of Predicted 1-Hour SO_2 Concentrations for the Future Scenario

Figure 6-11 Contour Plot of Predicted Annual SO_2 Concentrations for the Future Scenario

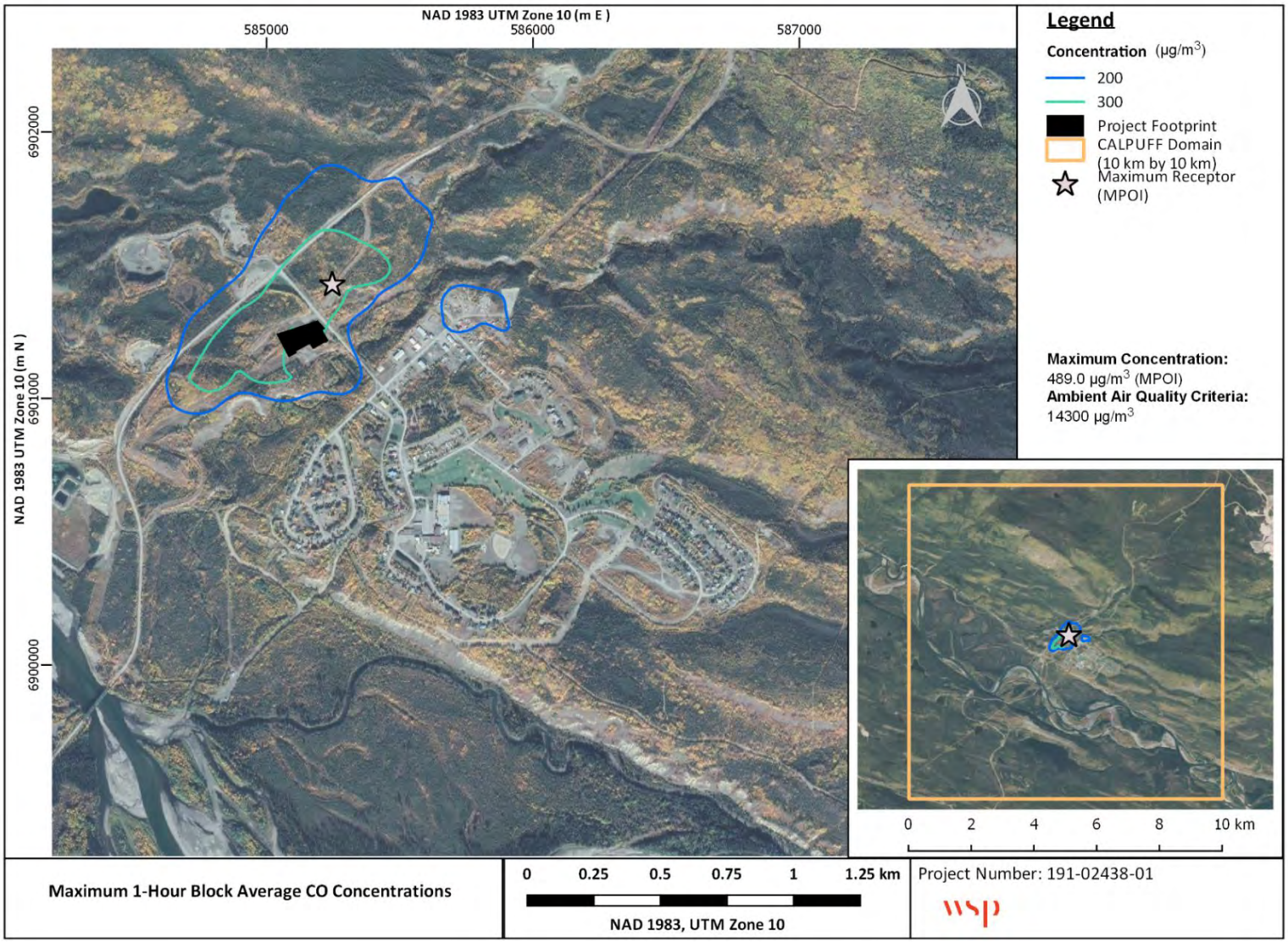

Figure 6-12 Contour Plot of Predicted 1-Hour CO Concentrations for the Future Scenario

Figure 6-13 Contour Plot of Predicted 8-Hour CO Concentrations for the Future Scenario

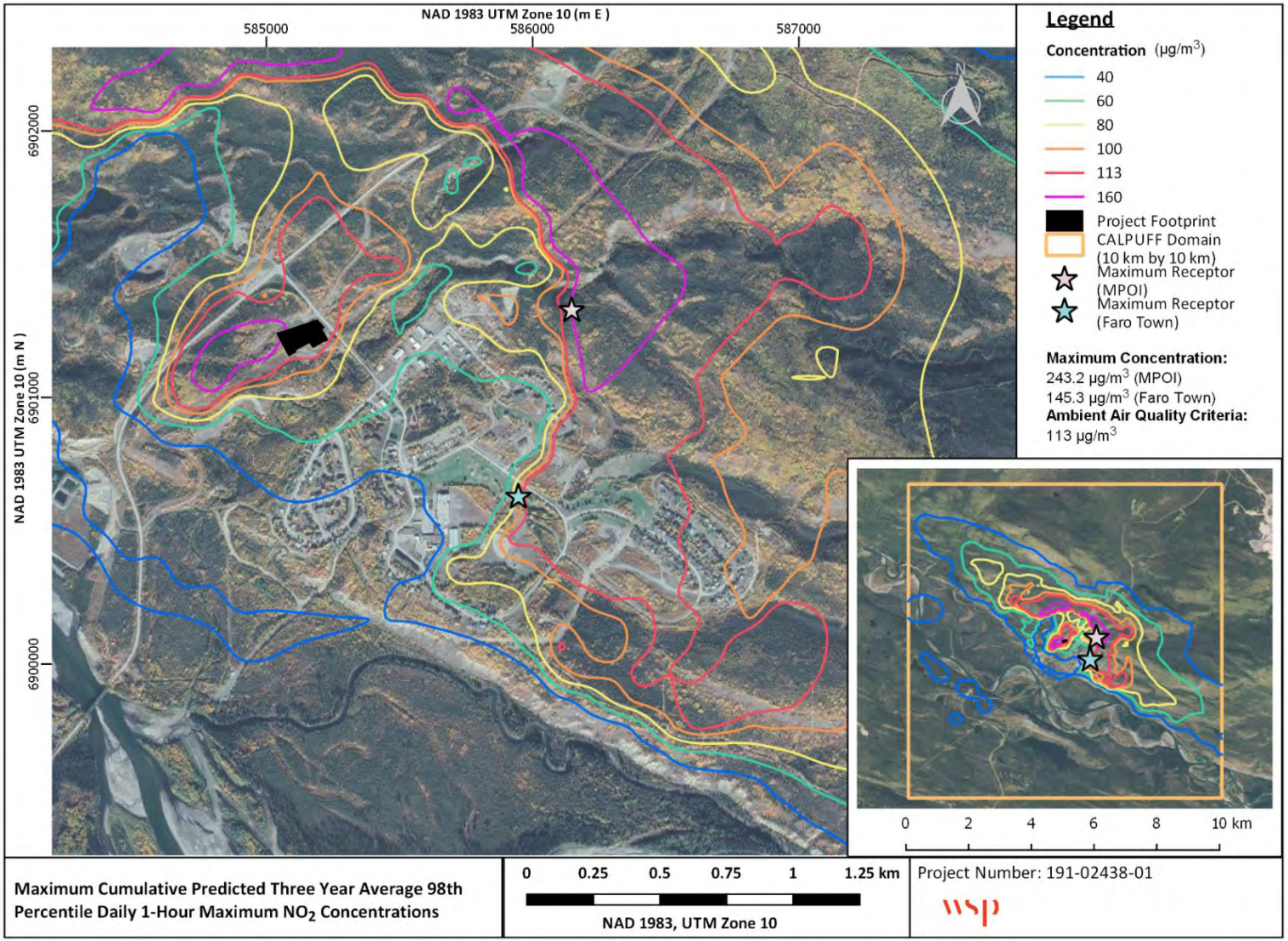

Figure 6-14 Contour Plot of Predicted 1-Hour NO_2 Concentrations for the Future Scenario

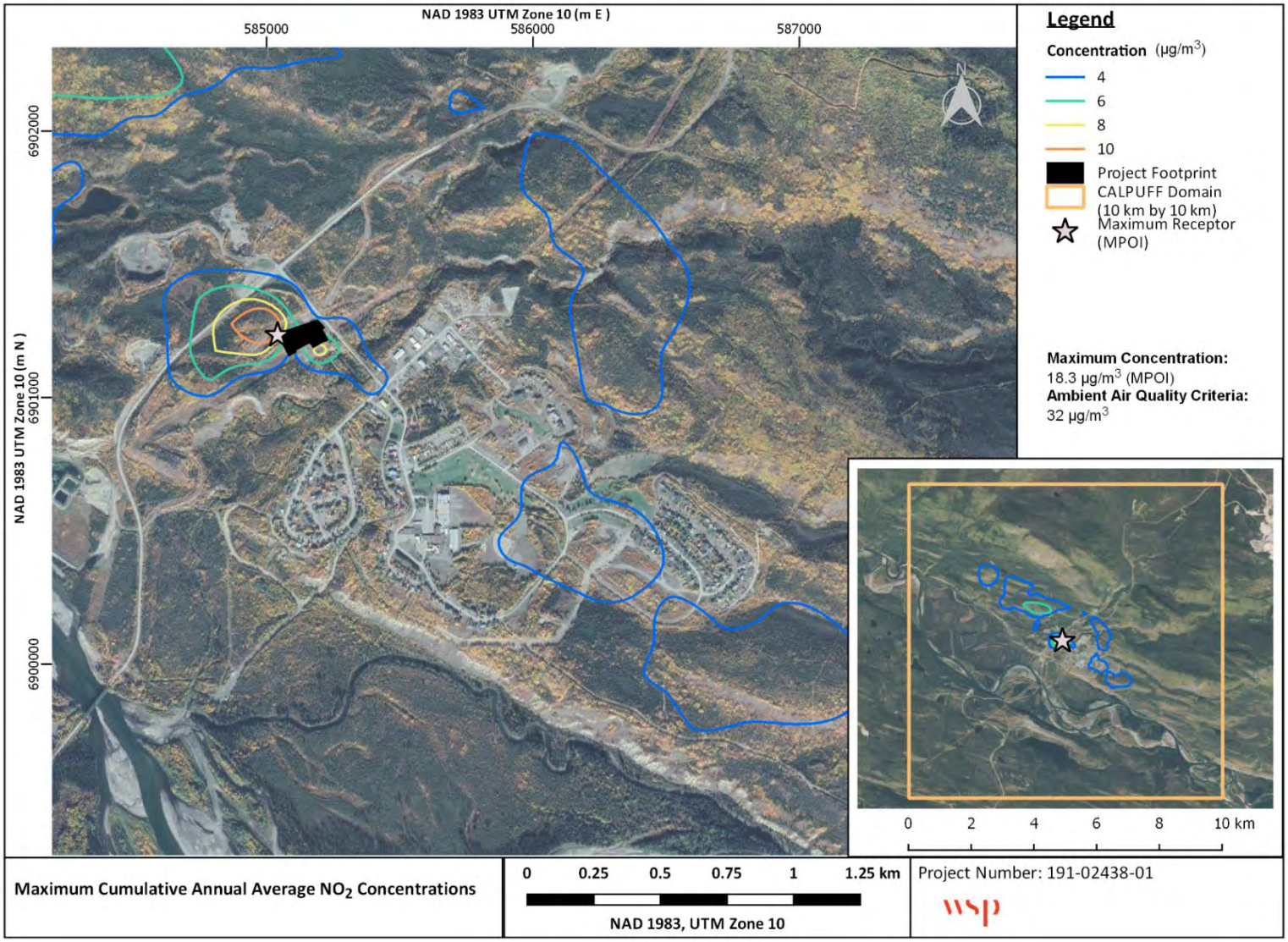

Figure 6-15 Contour Plot of Predicted Annual NO_2 Concentrations for the Future Scenario

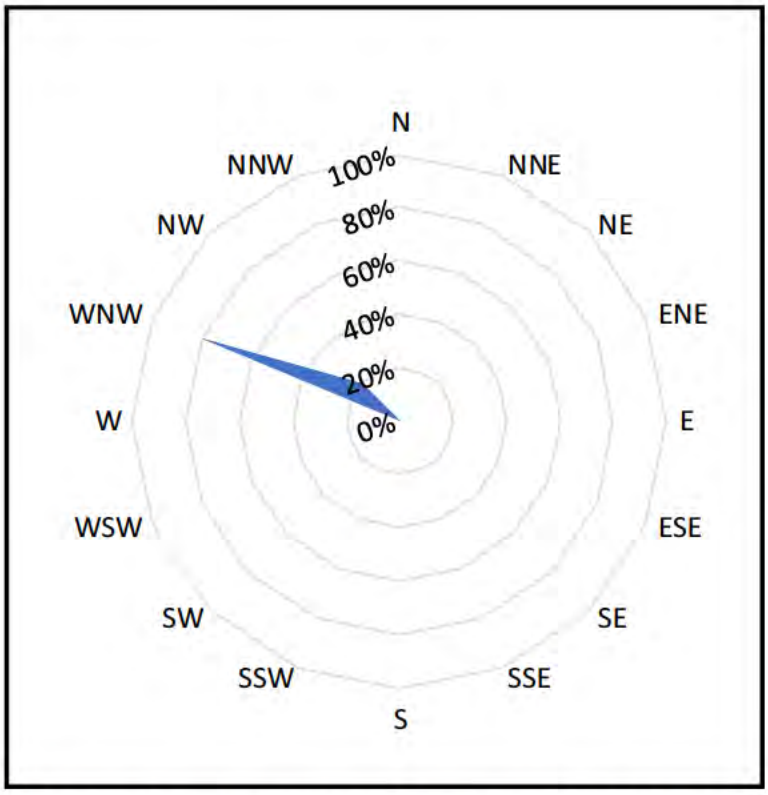

Figure 6-16 Frequency Distribution of Wind Directions Associated with the Predicted 98th Percentile 1-Hour NO_2 YAAQS Exceedances at the Maximally Impacted Faro Town Receptor during Model Years 2016-2018

Table 6-4 Predicted Hours of 98th Percentile 1-Hour NO_2 YAAQS Exceedances at the Maximally Impacted Faro Town Receptor by Wind Speed (m/s) and Wind Direction (°) during Model Years 2016-2018

Number of Exceedance Hours:		Wind Speed										Total Count:
		0-1m/s	1-2m/s	2-3m/s	3-4m/s	4-5m/s	5-6m/s	6-7m/s	7-8m/s	8-9m/s	9-10m/s	
Wind Direction	0-10°	0	0	0	0	0	0	0	0	0	0	0
	10-20°	0	0	0	0	0	0	0	0	0	0	0
	20-30°	0	0	0	0	0	0	0	0	0	0	0
	30-40°	0	0	0	0	0	0	0	0	0	0	0
	40-50°	0	0	0	0	0	0	0	0	0	0	0
	50-60°	0	0	0	0	0	0	0	0	0	0	0
	60-70°	0	0	0	0	0	0	0	0	0	0	0
	70-80°	0	0	0	0	0	0	0	0	0	0	0
	80-90°	0	0	0	0	0	0	0	0	0	0	0
	90-100°	0	0	0	0	0	0	0	0	0	0	0
	100-110°	0	0	0	0	0	0	0	0	0	0	0
	110-120°	0	0	0	0	0	0	0	0	0	0	0
	120-130°	0	0	0	0	0	0	0	0	0	0	0
	130-140°	0	0	0	0	0	0	0	0	0	0	0
	140-150°	0	0	0	0	0	0	0	0	0	0	0
	150-160°	0	0	0	0	0	0	0	0	0	0	0
	160-170°	0	0	0	0	0	0	0	0	0	0	0
	170-180°	0	0	0	0	0	0	0	0	0	0	0
	180-190°	0	0	0	0	0	0	0	0	0	0	0
	190-200°	0	0	0	0	0	0	0	0	0	0	0
	200-210°	0	0	0	0	0	0	0	0	0	0	0
	210-220°	0	0	0	0	0	0	0	0	0	0	0
	220-230°	0	0	0	0	0	0	0	0	0	0	0
	230-240°	0	0	0	0	0	0	0	0	0	0	0
	240-250°	0	0	0	0	0	0	0	0	0	0	0
	250-260°	0	0	0	0	0	0	0	0	0	0	0
	260-270°	0	0	0	0	0	0	0	0	0	0	0
	270-280°	0	0	0	0	0	0	0	0	0	0	0
	280-290°	0	0	0	0	0	0	0	0	0	0	0
	290-300°	0	15	16	0	0	0	0	0	0	0	31
	300-310°	0	18	7	0	0	0	0	0	0	0	25
	310-320°	0	0	0	0	0	0	0	0	0	0	0
	320-330°	0	0	0	0	0	0	0	0	0	0	0
	330-340°	0	0	0	0	0	0	0	0	0	0	0
	340-350°	0	0	0	0	0	0	0	0	0	0	0
	350-360°	0	0	0	0	0	0	0	0	0	0	0
Total Count:		0	33	23	0	0	0	0	0	0	0	56

Note: *Counts of predicted exceedances of the YAAQS are scaled using an orange color gradient according to the count value, such that the higher counts are denoted with darker orange shades while the lower counts are applied with lighter orange shades.*

Table 6-5 Predicted Hours of 98th Percentile 1-Hour NO_2 YAAQS Exceedances at the Maximally Impacted Faro Town Receptor by Hour of the Day and Month of the Year during Model Years 2016-2018

Number of Exceedance Hours:		Hour of the Day																							Total Count:
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	0	
Month of the Year	1	0	1	0	1	1	1	3	0	0	0	0	0	0	0	0	0	0	1	1	2	1	1	0	1	14
	2	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	2	0	1	7
	3	0	1	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	6
	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	9	1	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	5
	10	0	0	0	1	0	0	2	0	0	0	0	0	0	0	0	0	0	2	0	0	1	0	0	0	6
	11	1	0	1	0	0	2	1	0	0	0	0	0	0	0	0	3	1	0	1	0	0	1	0	0	11
	12	1	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	1	1	0	1	0	0	0	6
Total Count:		5	2	2	3	5	4	6	0	0	0	0	0	0	0	1	3	1	4	5	3	5	4	0	3	56

Note: *Counts of predicted exceedances of the YAAQS are scaled using an orange color gradient according to the count value, such that the higher counts are denoted with darker orange shades while the lower counts are applied with lighter orange shades.*

6.2.2 PARTICULATE MATTER ($PM_{2.5}$ AND PM_{10})

With regards to $PM_{2.5}$ and PM_{10}, the predicted concentrations for both short-term and long-term periods showed no exceedances of the associated air quality criteria. When baseline air quality is considered, the cumulative $PM_{2.5}$ and PM_{10} predicted concentrations remain well below the air quality criteria:

- PM_{10}
  - MPOI
    - 24.1 µg/m^3, or 48% of the 24-hour PM_{10} YAAQS;
  - Faro Town
    - 6.9 µg/m^3, or 14% of the 24-hour PM_{10} YAAQS; and
  - Nearest Sensitive Receptors
    - range from 3.8 µg/m^3 to 5.6 µg/m^3 (8% to 11%) of the 24-hour PM_{10} YAAQS.
- $PM_{2.5}$
  - MPOI
    - 12.7 µg/m^3, or 47% of the 24-hour $PM_{2.5}$ YAAQS;
    - 2.2 µg/m^3, or 25% of the annual $PM_{2.5}$ YAAQS;
  - Faro Town
    - 3.1 µg/m^3, or 11% of the 24-hour $PM_{2.5}$ YAAQS;
    - 0.6 µg/m^3, or 7% of the annual $PM_{2.5}$ YAAQS
  - Nearest Sensitive Receptors
    - range from 1.4 µg/m^3 to 2.2 µg/m^3 (5% to 8%) of the 24-hour $PM_{2.5}$ YAAQS; and
    - range from 0.3 µg/m^3 to 0.5 µg/m^3 (3% to 6%) of the annual $PM_{2.5}$ YAAQS.

These results indicate that the contribution of the emissions from the Future Scenario to ambient concentrations of particulate matter is low relative to the YAAQS. In addition, the contour plots (Figure 6-17 through Figure 6-19) show that the predicted concentrations significantly decrease with increased distance from the Facility.

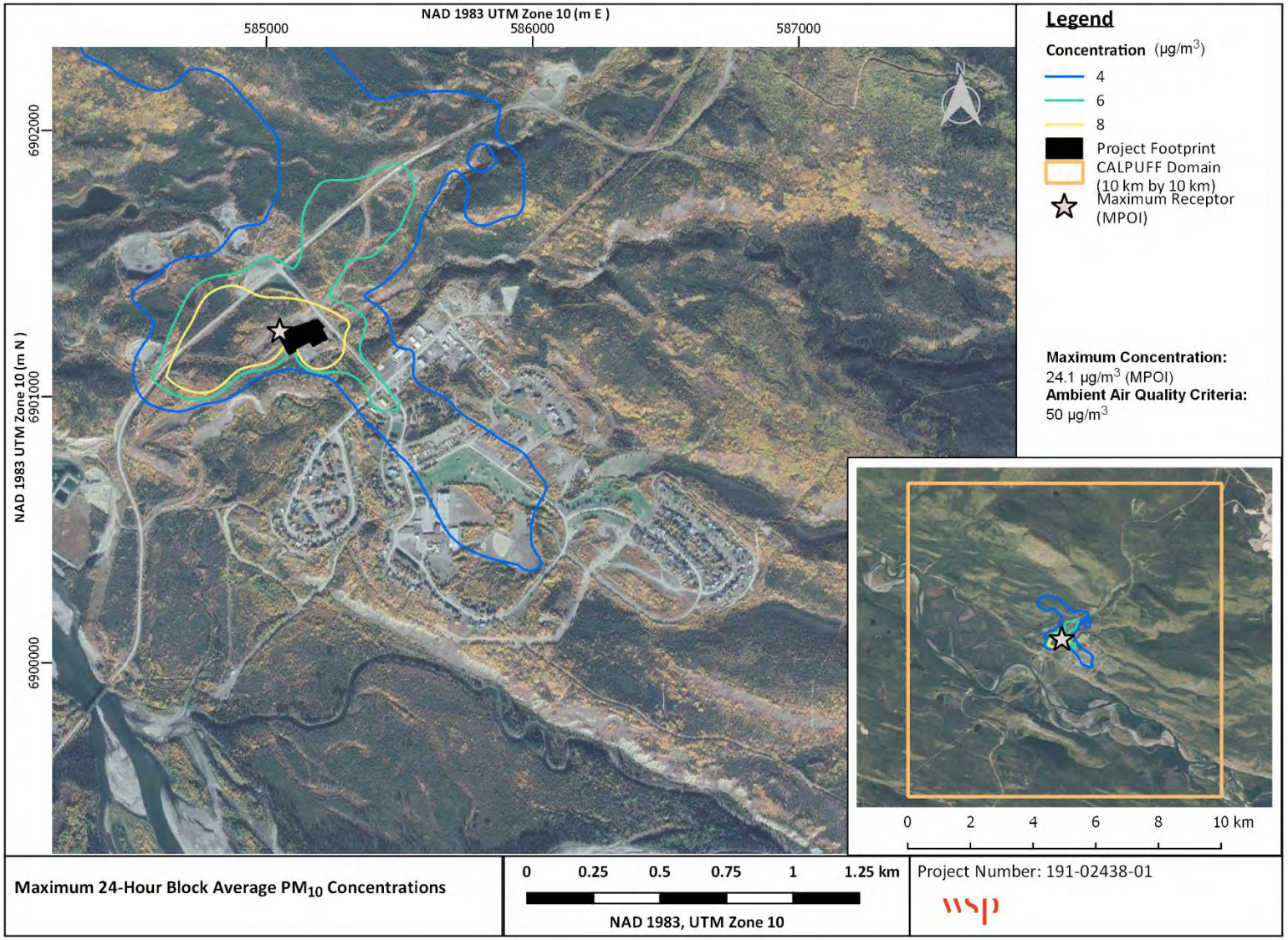

Figure 6-17 Contour Plot of Predicted 24-Hour PM_{10} Concentrations for the Future Scenario

Figure 6-18 Contour Plot of Predicted 24-Hour $PM_{2.5}$ Concentrations for the Future Scenario

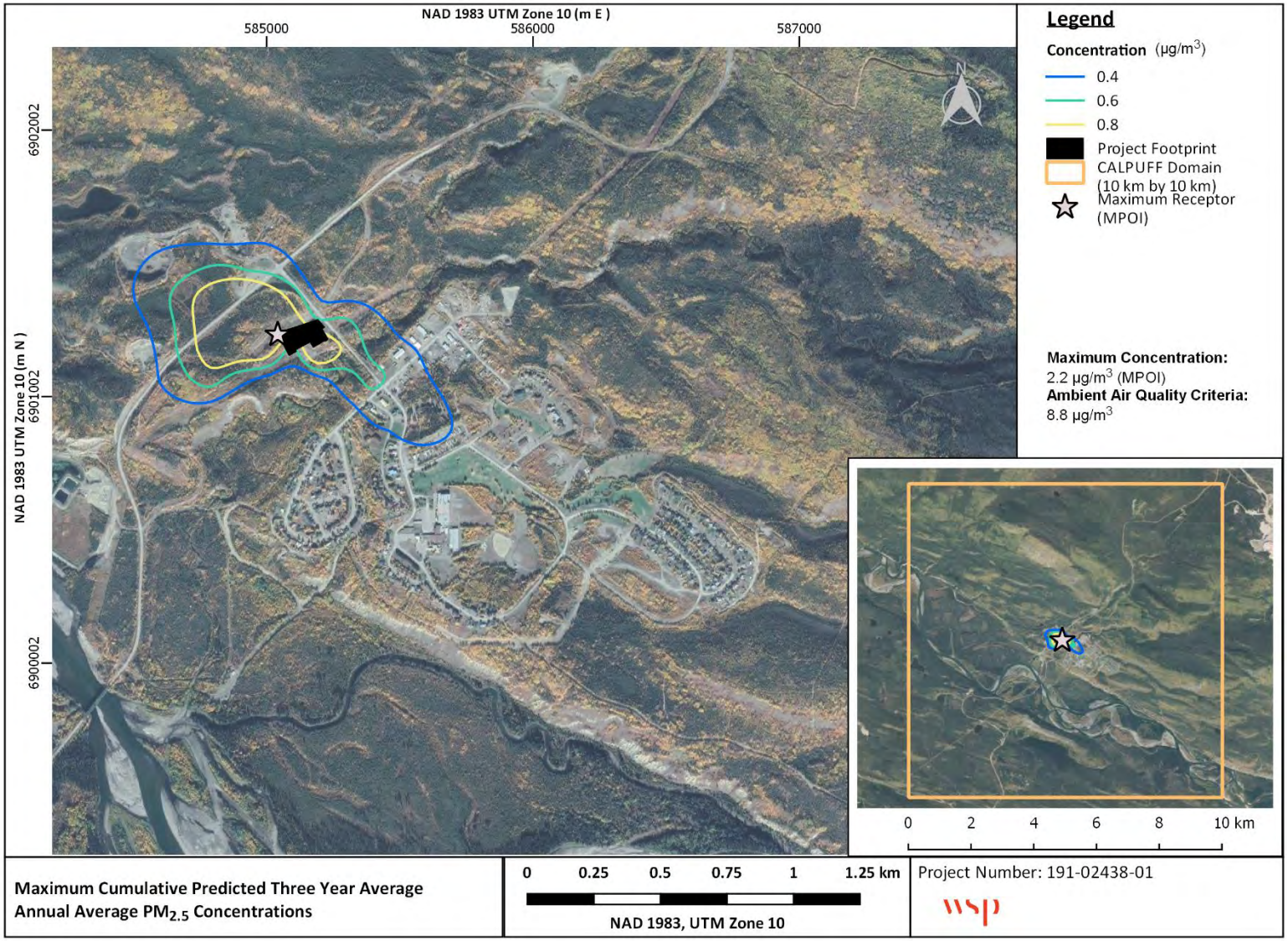

Figure 6-19 Contour Plot of Predicted Annual $PM_{2.5}$ Concentrations for the Future Scenario

7 CONCLUSION

The ambient air quality dispersion modelling results showed that, with the exception of short-term (1-hour) NO_2 results, the maximum total or cumulative predicted concentrations for all air contaminants ($PM_{2.5}$ PM_{10}, SO_2, and CO) were well below their respective ambient air quality standards. The maximum points of impingement (worst-case receptors) were all found either near the Facility or outside the Town of Faro, in both the existing and future permit scenarios. Overall, the cumulative predicted air contaminant concentrations from the Future Scenario were higher than those of the Existing Scenario given the increased power generation of the facility expansion.

While the dispersion modelling results predicted short-term NO_2 exceedances for both scenarios, the primary objective of the air quality assessment was to evaluate the potential risks on the human population residing near the facility in the Town of Faro. The modelling results for the Existing Scenario at the maximally impacted receptor within the Town of Faro showed that the cumulative predicted concentrations for all pollutants evaluated were in compliance with the YAAQS.

For the Future Scenario, the predicted air quality impacts for all the other air pollutants – including both fine and coarse particulate matter ($PM_{2.5}$ and PM_{10}), SO_2, and CO – were well below the YAAQS. With regards to the NO_2 predicted short-term (1-hour) NO_2 exceedances, it is important to note that the YAAQS for NO_2 were reduced drastically in late 2019 from 401 µg/m^3 previously to 113 µg/m^3 presently. The maximum cumulative predicted 1-hour NO_2 concentrations from both existing and future permit scenarios would be well below the previous NO_2 criteria. When compared to the newly revised NO_2 YAAQS, the maximum cumulative predicted 1-hour NO_2 concentration was 129% of the Yukon Ambient Air Quality Standards for NO_2 at the maximally impacted Faro Town receptor in the Future Scenario. Moreover, the predicted 1-hour NO_2 exceedances were spatially limited to a confined area surrounding the Facility and also on the outskirts of Faro, with a low frequency of occurrence of 0.21% of the time (56 hours out of 26,304 modelled hours) at the maximally impacted Faro Town receptor.

These short-term (1-hour) NO_2 exceedances were found entirely under calm stable meteorological conditions which typically hinder atmospheric dispersion; primarily during nighttime and in the colder months of the year; and, exclusively under west-northwest winds. Outdoor human activity would be limited during cold nighttime hours and this lowers the probability of human to be exposed to the short-term NO_2 impacts. Combined with the low frequency of model predictions exceeding the NO_2 YAAQS (56 hours out of 26,304 modelled hours),there is an even lower probability of exposure to levels above the YAAQS.

Finally, it is important to note that the modelling results represent the worst-case potential air quality impacts based upon the facility's maximum operating conditions. As such, the model predicted air contaminant concentrations are likely conservative. Furthermore, the conditions giving rise to predicted short-term NO_2 exceedances would be very unlikely to happen because the emission sources at the facility are highly unlikely to operate continuously year-round at the maximum possible emission rates, nor would it be likely that these maximum emissions coincide exactly with the particular meteorological conditions that give rise to the event as they occur, on average, for less than 20 hours per year modelled. The typical facility emissions are expected to be much lower and would not be anticipated to result in adverse air quality impacts given the low risk of predicted exceedance under even conservative assumptions. With model predictions indicating an extremely low risk of predicted short-term NO_2 impacts and low potential impacts from the other air pollutants, the overall air quality impacts from the future expanded facility are not anticipated to pose a significant risk to the Town of Faro and air quality would be anticipated to remain in compliance with YAAQS.

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Appendix C: Noise Impact Assessment Faro Generating Station

YUKON ENERGY CORPORATION

NOISE IMPACT ASSESSMENT
FARO FACILITY

FEBRUARY 12, 2021

wsp

NOISE IMPACT ASSESSMENT

FARO FACILITY

YUKON ENERGY CORPORATION

FINAL

PROJECT NO.: 191-02438-01
DATE: FEBRUARY 12, 2021

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VERSION HISTORY

VERSION	DATE	TITLE	COMMENTS	PREPARED BY
1.0	February 12, 2021	Noise Impact Assessment – Generator Additions	Upgrade facility from approved 10.6 MW to 15.5 MW.	WSP Canada Inc

EXECUTIVE SUMMARY

WSP Canada Inc., (WSP) was retained by Yukon Energy Corporation (YEC) to prepare a Noise Impact Assessment (NIA) report for its diesel-fuelled electricity generating facility in Faro, Yukon. The Facility is located in south-central Yukon, within the asserted traditional territory of the Kaska Nation and upstream from the territory of the Selkirk First Nation. The Facility is located just northwest of the Town of Faro, Yukon and approximately 15 km south of Faro Mine.

The Facility has an existing Air Emissions Permit which allows the Facility to operate up to a capacity of 10.6 MW. The Facility has been, and is currently operating much below the permitted facility capacity of 10.6 MW with only two existing diesel generators on-site. WSP conducted a NIA to evaluate the potential noise impacts of increasing the Facility's capacity from the existing permitted capacity at 10.6 MW to 15.5 MW in the future. As a conservative approach the assessment of noise impact is based on 16.0 MW capacity. However, it is understood that the YEC will only be applying for a permit amendment with the Yukon Environmental and Socio-economic Assessment Board (YESAB), to allow up to 15.5 MW of capacity at the Faro Facility.

Compliance was established using the manufacturer's sound level data for the existing and proposed generators as noted below:

1. The existing generator, Model: Mirrlees KV16 with rated capacity of 5.15 MW, located within FD1 building shall be operated at or below the capacity of 2.4 MW
2. The existing generator, Model: Caterpillar (CAT) 3612 with rated capacity of 3.3 MW, located within FD7 building shall be operated at or below the capacity of 2.8 MW
3. Seven new generators are proposed (6 will be used for regular operation and 1 standby generator); each generator will be with rated capacity of 1.8 MW. Each of these generators will be with enclosures, silencers or mufflers providing an overall maximum sound level of 78 dBA at 7 metres (23 feet);

The assessment presented in this report are based on the guidelines provided British Columbia Oil and Gas Commission's (BC OGC) "British Columbia Noise Control Best Practices Guideline" (2009) and the principles provided in the Health Canada's (HC) "Guidance for Evaluating Human Health Impacts in Environmental Assessments: Noise" (2017). The assessment indicated that the changes in sound level due to the upgrade is minimal (less than 1 dB). Therefore, it is concluded that the operation of Facility with the proposed expansion complies with the PSL.

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APPENDICES

1 INTRODUCTION

WSP Canada Inc. (WSP) was retained by Yukon Energy Corporation (YEC) to prepare a Noise Impact Assessment (NIA) report for its facility located in Faro, Yukon (the Facility). The Facility currently includes diesel generators with a permitted generating capacity of 10.6 MW. YEC is planning to expand the Facility's generation capacity to 15.5 MW. This report is required in support of a permit amendment pursuit with the Yukon Environmental and Socio-economic Assessment Board (YESAB) to increase capacity at the diesel-fuelled electric generating facility from the permitted capacity of 10.6 MW to 15.5 MW. Although the application of the Faro Facility is for 15.5 MW capacity, as a conservative approach, the NIA considered a capacity of 16 MW. However, it is understood that the YEC will only be applying for a permit amendment to allow up to 15.5 MW of capacity at the Faro Facility.

The purpose of this assessment is to evaluate the overall changes in noise impact due to the proposed changes at the nearby sensitive receptors. The analysis is based on manufacturer's sound level data and conservative estimates of the source sound levels. The findings of the assessment are discussed further within this report.

1.1 STUDY AREA

The study area surrounding the Facility can be classified as a rural area. The existing acoustic environment in the study area is expected to be dominated by natural environmental sounds during the day and night time.

The Facility is located in south-central Yukon, within the asserted traditional territory of the Kaska Nation and upstream from the territory of the Selkirk First Nation. The Facility is located just northwest of the Town of Faro, Yukon and approximately 15 km south of Faro Mine. The 25-sq. km Faro Mine was once the largest open pit lead-zinc mine in the world. The mine has been closed since 1998 and in the process of reclamation. The town is home to approximately 348 residences (Statistics Canada, 2016).

The Facility is in an area classified as 'Industrial/Commercial' surrounded by 'Industrial/Commercial' to the north; 'Parks & Open Space' to the west, and south; and 'Unsurvey Interim Protected First Nation Lands' to the east. The 'residential' lands located to the south and southeast is known as the Town of Faro. A scaled area map showing the Facility and its surrounding area is shown in **Figure 1** and a zoning map is included in **Figure 2**.

1.2 FACILITY DESCRIPTION

The Facility provides reliable energy supply to supplement renewable energy sources. The Facility provides electricity during loss of hydro generation, peak hours of consumption, low water periods, extreme low temperatures and emergencies. The Facility has the potential to operate 24 hours a day.

The Facility is comprised of the following existing buildings; a site plan showing the Facility buildings is provided in **Figure 3**:

- Generator Building (ID: FD1);
- Generator Building (ID: FD7)
- Office Building;
- Control Building;
- Storage Building and
- Diesel Storage Tanks.

The expansion includes operation of 7 rental units at the Facility; the make and mode of these units are Caterpillar (CAT) model 3516C. During the period of this permit the make and model of these units will remain the same.

1.2.1 *OPERATING CAPACITY*

The following generator operations makes up the proposed operating capacity (**Table 1.1**):

Table 1.1 Generator Capacities

GENSET ID	DESCRIPTION	RATED CAPACITY	OPERATING CAPACITY	REMARKS
FD1 (within building)	Mirrlees KV16 Model	5.15 MW	2.4 MW	Existing Operation
FD7 (within building)	Caterpillar (CAT) 3612	3.3 MW	2.8 MW	Existing Operation
YM20 to YM26[1]	Caterpillar (CAT) 3516C	1.8 MW each	6 units to provide 10.3 MW	New Turbines
Total Operating Capacity			15.5 MW	Total future capacity

[1] One of the rental units (i.e. YM26) will be a standby generator and will be used in case of power failure of another generator.

Other than the generator building, other buildings do not have a source with significant noise generation. The noise sources associated with generator building includes, air intake louvres and dampers, exhaust fans, noise breakout through the façade and combustion exhaust. In addition, there are remote radiators for the existing generators located outside the buildings on the north and southwest side at ground level, respectively. The 1.8 MW units (YM20 to YM26) comes with enclosures, silencers and mufflers designed to control noise emissions.

1.3 STUDY OBJECTIVES

The Facility has an existing Air Emissions Permit which allows the Facility to operate up to a capacity of 10.6 MW. The Facility has been, and is currently operating much below the permitted facility capacity of 10.6 MW with only two existing diesel generators on-site. These generators are housed in separate buildings on-site (FD1 and FD7). The study investigates if the future operation with 15.5 MW capacity has the potential to change the existing conditions.

2 NOISE SOURCE SUMMARY

WSP used drawings and site photographs to identify and establish the source of sound for the existing Facility operation and future Facility upgrade. Drawings from the site are included in **Appendix A**. The sources of noise are primarily air intakes and exhausts, radiators and the generators.

2.1 NOISE SOURCES

A total of thirty-four (34) non-negligible noise sources were identified and included in the assessments. These noise sources considered in the assessment are summarized in **Table 2.1;** the sound power of these sources were estimated based on the manufacturer's data. A detailed summary of the sources is provided in **Appendix B.** Manufacturer specification sheets are provided in **Appendix C**.

A site layout plan showing the source locations within the Facility is provided in **Figure 3**.

Table 2.1 Noise Source Summary Table

SOURCE ID	SOURCE DESCRIPTION	SOUND POWER LEVEL (dBA)	SOURCE LOCATION[1]	NOISE CONTROL MEASURES[2]
FD1_GEN_EXH1	FD1 2.4 MW Generator Combustion Exhaust	139	O	S
FD1_GEN_EXH2	FD1 2.4 MW Generator Combustion Exhaust	139	O	S
FD1_GEN_INT1	FD1 2.4 MW Generator Intake	118	O	S
FD1_GEN_INT2	FD1 2.4 MW Generator Intake	118	O	S
FD1_BLD_DIS1	FD1 2.4 MW Building Discharge	111	O	S
FD1_BLD_INT1	FD1 2.4 MW Building Intake	111	O	S
FD1_GEN_RAD1	FD1 2.4 MW Generator Radiator	114	O	U
FD1_GEN_RAD2	FD1 2.4 MW Generator Radiator	114	O	U
FD1_GEN_RAD3	FD1 2.4 MW Generator Radiator	114	O	U
FD1_GEN_RAD4	FD1 2.4 MW Generator Radiator	114	O	U
FD1_BLD_OUT1	FD1 2.4 MW Building Breakout Noise	116	O	U
FD1_BLD_OUT2	FD1 2.4 MW Building Breakout Noise	116	O	U
FD7_GEN_EXH1	FD7 2.8 MW Generator Combustion Exhaust	140	O	U
FD7_BLD_INT1	FD7 2.8 MW Building Intake	121	O	U
FD7_BLD_INT2	FD7 2.8 MW Building Intake	121	O	U
FD7_BLD_INT3	FD7 2.8 MW Building Intake	121	O	U
FD7_BLD_INT4	FD7 2.8 MW Building Intake	121	O	U
FD7_GEN_INT1	FD7 2.8 MW Generator Intake	112	O	U
FD7_GEN_INT2	FD7 2.8 MW Generator Intake	112	O	U
FD7_BLD_DIS1	FD7 2.8 MW Building Discharge Fan	120	O	U
FD7_BLD_DIS2	FD7 2.8 MW Building Discharge Fan	120	O	U
FD7_BLD_DIS3	FD7 2.8 MW Building Discharge Fan	120	O	U

SOURCE ID	SOURCE DESCRIPTION	SOUND POWER LEVEL (dBA)	SOURCE LOCATION[1]	NOISE CONTROL MEASURES[2]
FD7_BLD_DIS4	FD7 2.8 MW Building Discharge Fan	120	O	U
FD7_GEN_RAD1	FD7 2.8 MW Generator Radiator	112	O	U
FD7_GEN_RAD2	FD7 2.8 MW Generator Radiator	112	O	U
FD7_BLD_OUT1	FD7 2.8 MW Building Breakout Noise	115	O	U
FD7_BLD_OUT2	FD7 2.8 MW Building Breakout Noise	115	O	U
YM20_GEN_CAS	YM20 1.8 MW Generator Casing	103	O	E
YM21_GEN_CAS	YM21 1.8 MW Generator Casing	103	O	E
YM22_GEN_CAS	YM22 1.8 MW Generator Casing	103	O	E
YM23_GEN_CAS	YM23 1.8 MW Generator Casing	103	O	E
YM24_GEN_CAS	YM24 1.8 MW Generator Casing	103	O	E
YM25_GEN_CAS	YM25 1.8 MW Generator Casing	103	O	E
YM26_GEN_CAS	YM26 1.8 MW Generator Casing (Backup)	n/a	O	E

Notes:
[1] Source Location: O = outside of a building, I = inside of a building
[2] Noise Control Measures: S = Silencer/Muffler, A = Acoustic Lining, E = Acoustic Enclosure, U = Uncontrolled.

2.2 SOURCES WITH NEGIGIBLE EFFECTS

Some sources are expected to produce sound levels that are not significant compared to other loud sources. These noise sources are considered negligible and are not included in the assessment as these sources are not expected to contribute to the overall noise effect of the Facility at the nearby noise sensitive receptors. The sources with a negligible contribution (or source with insignificant contribution) at the receptors are listed below.

- Small exhaust fans and HVAC units;
- Small compressor or pumps;
- Indoor equipment with small or no motors;
- Breakout noise through façade of building that do not house generators;
- Small transformers (if any); and
- Worker vehicles (moving and idling).

3 NOISE RECEPTOR SUMMARY

Noise receptors are those locations where sound from noise sources at a facility is received and assessed against applicable limits. Sound may be assessed at the plane of a window (PoW) of a noise receptor such as a dwelling. For the purpose of this assessment, the selected PoWs represent the predictable worst-case noise impacts; it represents the closest PoW to the Facility (i.e., the window of the receptor facing the Facility). Receptors are summarized in **Table 3.1** and locations are shown in **Figure 1**.

Table 3.1 Point of Reception Summary

POR ID	DESCRIPTION	RECEPTOR HEIGHT[1] (M)	DISTANCE FROM FACILITY (M)[2]
R1	One Storey Residence on Dawson Drive	1.5	359
R2	Two Storey Residence on Dawson Drive	4.5	406
R3	Three Storey Residence on Dawson Drive	7.5	415
R4	One Storey Army Barracks on Kitza Avenue	1.5	359
R5	One Storey Del Van Gorder School on 100 Bell Avenue	4.5	792
R6	One Storey Faro Health Centre on 447 Campbell Street	1.5	915

Notes:
[1] The height represents the upper story window, which is most exposed to the site.
[2] Distance are provided from the Facility's closest noise source to the receptor.

4 ASSESSMENT CRITERIA

This section reviews the available criteria and establishes acceptable criteria for the Facility upgrade.

In the absence of any specific regulatory noise guidance or criteria in the Yukon, this assessment takes into account best practices and the following guidelines:

- British Columbia Oil and Gas Commission's (BC OGC) "British Columbia Noise Control Best Practices Guideline" (2009); and
- Health Canada's (HC) "Guidance for Evaluating Human Health Impacts in Environmental Assessments: Noise" (2017).

4.1 BRITISH COLUMBIA NOISE CONTROL BEST PRACTICES GUIDELINE

The BC OCG guidelines (BC Guide) are widely accepted in western Canada and commonly used in the Yukon. The guideline provides guidance regarding noise management from noise emission from energy-industry activities. The guideline requires a noise impact assessment for modifications to existing facilities, if there is a reasonable expectation of changes in noise source or sound level, and if there is a receptor located within 1.5 km distance. There is reasonable expectation of source sound levels as well, as there are receptors nearby for the Yukon Energy Facility. Therefore, a noise assessment is required.

The BC Guide is a receptor-based guideline (not property line-based guideline); it defines Permissible Sound Levels (PSLs) at the receptor locations. A PSL at the nearest residence or nearby receptors can be determined based on the methods discussed in the BC Guide. The BC Guide provides methods to estimate daytime (07:00 to 22:00) PSL and nighttime (22:00 to 07:00) PSL.

In accordance with the BC Guide, facilities constructed in and in operation prior to October 1998 are considered "deferred facilities". Such facilities, without outstanding noise complaints are considered to meet the community noise tolerance levels. It is understood that the Faro Facility was constructed prior to 1998 and does not have outstanding noise complaints. Therefore, the sound level from the existing operation is considered to be the PSL for this assessment.

Accordingly, a baseline model with existing operation was completed and the sound levels at the receptors were estimated. The estimated sound level from existing operation at receptors R1 to R6 are shown in **Table 4.1**.

Table 4.1 Permissible Sound Level Limits from BC OCG

POR ID	EXISTING NOISE LEVEL DAYTIME/NIGHTIME PSL (dBA)[1]
R1	58
R2	59
R3	59
R4	59
R5	48
R6	46

Notes:
[1] Refer Section 5 for modelling and results.

4.2 ACCEPTABLE SOUND LEVEL

As discussed previously, the sound levels in this assessment are expressed in terms of energy equivalent sound level over a one-hour period (Leq (1 hour)). Since the generator upgrade is proposed to an existing facility, the assessment considers changes to the acoustical environment before and after the upgrade.

Table 4.2 below, from published literatures, outlines the noise impact rating in relation to the change in sound levels from the baseline condition (or condition prior to the proposed upgrades). When a "significant" or greater impact is predicted (5 dB or greater), noise mitigation measures and their feasibility should be investigated.

Table 4.2 Noise Impact Rating

CHANGES IN SOUND LEVEL	IMPACT RATING
0 to 2.99 dB	Insignificant
3 to 4.99 dB	Noticeable
5 to 9.99 dB	Significant
Over 10 dB	Very Significant

Therefore, a change of up to 3 dB is considered insignificant and was used to assess the impact.

5 IMPACT ASSESSMENT

The objective of this acoustic assessment is to determine the changes in sound level due to proposed changes at Yukon Energy's Faro generator station upgrades during a predictable worst-case operation. A predictable worst-case operation is considered as an hour of operation during which the facility operates at its capacity (i.e. operates at 16 MW capacity).

Since the generator upgrade is being designed, this assessment is completed using an acoustic modelling approach for Faro Facility's current and future operations. This section discusses the assessment methodology, modelling scenarios, the results of the assessment as well as discusses the compliance of the Faro Facility.

5.1 ASSESSMENT METHODS

The predictive analysis of the Faro Facility's noise impact at the POR was completed using commercially available software package CADNA/A (Ver. 2020), a computerized implementation of the algorithms contained in the ISO 9613 "Acoustics – Attenuation of Sound during Propagation Outdoors". CadnaA modelling takes into account the following:

- Source sound power levels;
- Distance attenuation;
- Source-receptor geometry;
- Ground and air (atmospheric) attenuation; and
- Temperature and humidity effects on noise propagation.

The lands between the Facility and receptors are a mixture of sound abortive (e.g. grass) with some reflective (e.g. paved road) and modelled accordingly. Road pavements were modelled with a ground absorption of 0.4 and remaining surfaces were modelled with a ground absorption of one (1). Typical Yukon meteorological values were used to initialize several parameters in the model. These included a temperature of 10 degrees Centigrade and a relative humidity of 80%.

5.2 OPERATING SCENARIOS

The assessment was done assuming a predictable worst-case operation. Since the Facility has the potential to operate at full capacity 24 hours per day to meet power demands, no differences between daytime, evening, or nighttime operations were considered. Two scenarios were evaluated to determine the changes in sound level as previously discussed:

- Existing/Current Operation; and
- Future Expanded Capacity

5.3 MODELLING RESULTS

Table 5.1 shows the predicted sound level results between existing and future scenarios and compares the change in sound levels. Equivalent sound level contours (isopleths of equal sound level) are presented in **Figure 4** and **Figure 5** at heights of 1.5 m above the ground for existing and future scenarios, respectively.

Table 5.1 Summary of Changes in Sound Levels between Existing and Future Scenarios

POR ID	PREDICTED SOUND PRESSURE LEVELS (SPL), dBA			
	EXISTING SPL /PSL [dBA]	FUTURE SPL [dBA]	CHANGE in SPL[1] [dBA]	IMPACT RATING
R1	58	58	< 1	Insignificant
R2	59	60	< 1	Insignificant
R3	59	59	< 1	Insignificant
R4	59	60	< 1	Insignificant
R5	48	48	< 1	Insignificant
R6	46	46	< 1	Insignificant

Notes:
[1] No changes are also considered less than 1 decibel change for simplicity.

As indicated in **Table 5.1**, the changes in the sound levels produced by addition of generators to reach a capacity of 15.5 MW are predicted to be less than 1 dBA. The change in sound level caused by the proposed changes to the Yukon Energy Facility are therefore not considered a significant change. **Figure 6** shows the equivalent sound level contours for the existing and future operation side by side for comparison purposes; these figures show minimal change in sound level contours near the receptor area.

Since the change in sound level due to proposed modification (i.e. capacity increase) is predicted to be less than 1 dB, no additional mitigation other than those included with the proposed 1.8 MW rental units as identified are required.

6 RECOMMENDATIONS AND CLOSURE

6.1 RECOMMENDATIONS

Compliance was established using the manufacturer's sound level data; therefore, when selecting the new generators to reach operational capacity of 15.5 MW the following shall be implemented:

1. The existing generator, Model: Mirrlees KV16 with rated capacity of 5.15 MW, located within FD1 building shall be operated at or below the capacity of 2.4 MW
2. The existing generator, Model: Caterpillar (CAT) 3612 with rated capacity of 3.3 MW, located within FD7 building shall be operated at or below the capacity of 2.8 MW
3. The proposed new generators (YM20 to YM26) shall be 6 regulars plus 1 standby generator each with rated capacity of 1.8 MW and each with enclosures providing an overall maximum sound level of 78 dBA at 7 metres (23 feet);
4. Prior to installation, a shop drawing can be requested from supplier confirming the sound data to be less than 78 dBA at 7 metres (23 feet);
5. If a complaint is received after installation, an acoustic audit shall be performed consisting of onsite measurements.

6.2 CLOSURE

WSP Canada Inc., was retained by Yukon Energy Corporation (YEC) to conduct a Noise Impact Noise Impact Assessment (NIA) report in support of a permit amendment pursuit with the Yukon Environmental and Socio-economic Assessment Board (YESAB) to increase capacity at the diesel-fuelled electric generating facility in Faro, Yukon (the Facility) from the existing permitted capacity of 10.6 MW to 15.5 MW in the future.

Based on WSP's assessment and available information at the time of this report, the assessment indicated that the changes in sound level due to the upgrade is minimal. Therefore, it is concluded that the operation of Facility with the proposed expansion complies with the PSL.

FIGURES

wsp

126 DON HILLOCK DRIVE, UNIT 2
AURORA, ONTARIO CANADA L4G 0G9
TEL.: 905-750-3080 | FAX: 905-727-0463 | WWW.WSP.COM

LEGEND

SITE LOCATION

REPRESENTATIVE RECEPTORS

N
W E
S

POR ID	Description	Receptor Height[1] (m)
R1	One Storey Residence on Dawson Drive	1.5
R2	Two Storey Residence on Dawson Drive	4.5
R3	Three Storey Residence on Dawson Drive	7.5
R4	One Storey Army Barracks on Kitza Avenue	1.5
R5	One Storey Del Van Gorder School on 100 Bell Avenue	4.5
R6	One Storey Faro Health Centre on 447 Campbell Street	1.5

150 75 0 150 Metres

CLIENT:

YUKON ENERGY CORPORATION

PROJECT:

NOISE ASSESSMENT
FARO POWER STATION
FARO, YUKON

PROJECT NO:	DATE:
191-02438-01	NOVEMBER 2020

DESIGNED BY: -

DRAWN BY: TP

CHECKED BY: -

FIGURE NO:	SCALE:
1	1:6,000

TITLE:

AREA MAP SHOWING SITE LOCATION

DISCIPLINE: ENVIRONMENT

ISSUE:	REV.:
-	-

Document Path: D:\aProjects\191-02438-01\MXD\191-02438-01 Figure 1 Area Map.mxd

126 DON HILLOCK DRIVE, UNIT 2
AURORA, ONTARIO CANADA L4G 0G9
TEL.: 905-750-3080 | FAX: 905-727-0463 | WWW.WSP.COM

LEGEND

- SITE LOCATION
- GENERAL COMMERCIAL
- COMMUNITY USE
- ENVIRONMENTAL RESERVE
- FUTURE COUNTRY RESIDENTIAL
- HINTERLAND
- INDUSTRIAL / COMMERCIAL
- MIXED USE
- PARKS & OPEN SPACE
- HIGH DENSITY RESIDENTIAL
- COUNTRY RESIDENTIAL
- MEDIUM DENSITY RESIDENTIAL
- LOW DENSITY RESIDENTIAL
- MOBILE HOME RESIDENTIAL
- URBAN RESERVE

150 75 0 150 METRES

CLIENT:
YUKON ENERGY CORPORATION

PROJECT:
NOISE ASSESSMENT
FARO POWER STATION
FARO, YUKON

PROJECT NO:	DATE:
191-02438-01	NOVEMBER 2020

DESIGNED BY: -

DRAWN BY: TP

CHECKED BY: -

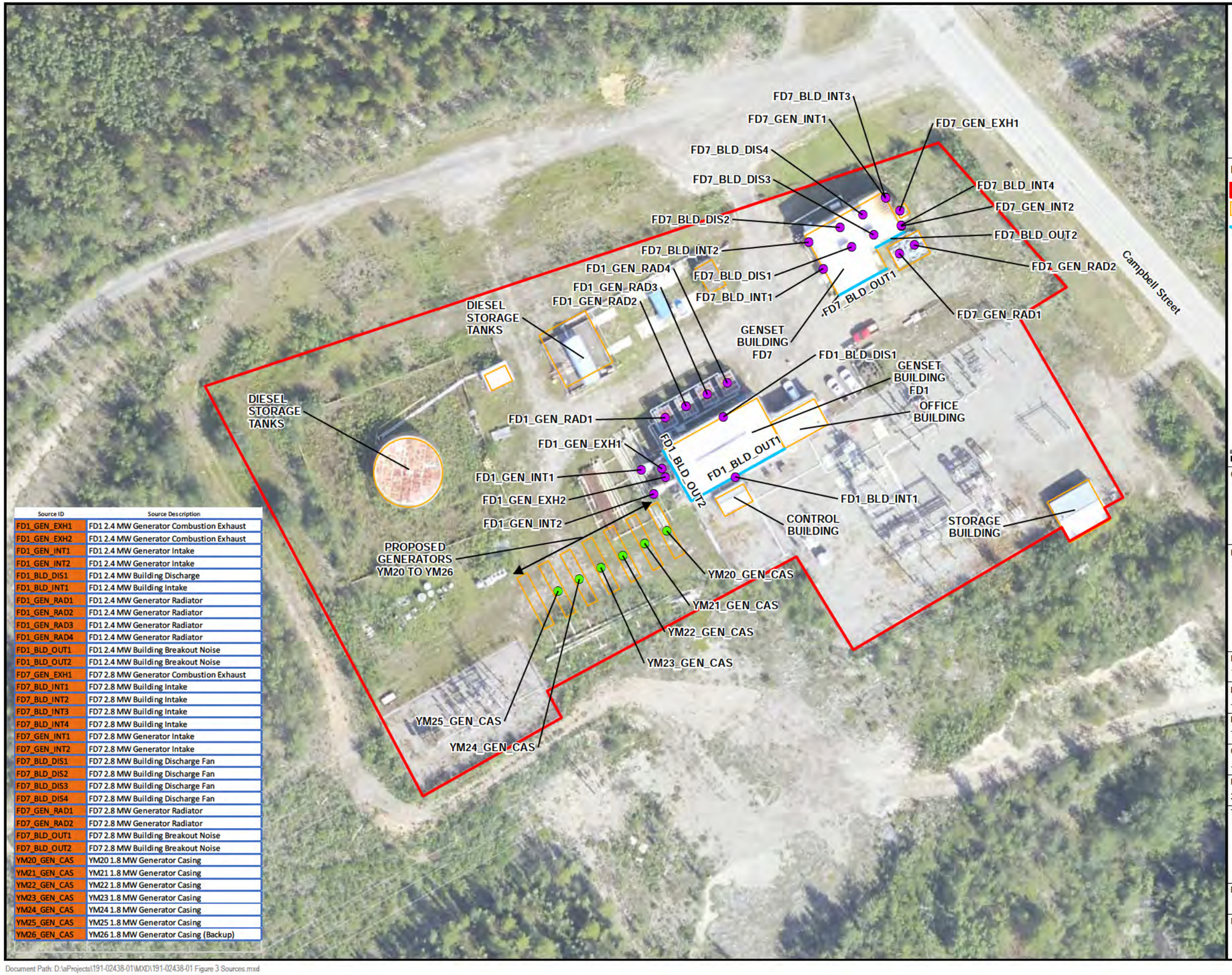
FIGURE NO:	SCALE:
2	1:6,000

TITLE:
ZONING MAP

DISCIPLINE:
ENVIRONMENT

ISSUE:	REV.:
-	-

Document Path: D:\aProjects\191-02438-01\MXD\191-02438-01 Figure 2 Zoning.mxd



Source ID	Source Description
FD1_GEN_EXH1	FD1 2.4 MW Generator Combustion Exhaust
FD1_GEN_EXH2	FD1 2.4 MW Generator Combustion Exhaust
FD1_GEN_INT1	FD1 2.4 MW Generator Intake
FD1_GEN_INT2	FD1 2.4 MW Generator Intake
FD1_BLD_DIS1	FD1 2.4 MW Building Discharge
FD1_BLD_INT1	FD1 2.4 MW Building Intake
FD1_GEN_RAD1	FD1 2.4 MW Generator Radiator
FD1_GEN_RAD2	FD1 2.4 MW Generator Radiator
FD1_GEN_RAD3	FD1 2.4 MW Generator Radiator
FD1_GEN_RAD4	FD1 2.4 MW Generator Radiator
FD1_BLD_OUT1	FD1 2.4 MW Building Breakout Noise
FD1_BLD_OUT2	FD1 2.4 MW Building Breakout Noise
FD7_GEN_EXH1	FD7 2.8 MW Generator Combustion Exhaust
FD7_BLD_INT1	FD7 2.8 MW Building Intake
FD7_BLD_INT2	FD7 2.8 MW Building Intake
FD7_BLD_INT3	FD7 2.8 MW Building Intake
FD7_BLD_INT4	FD7 2.8 MW Building Intake
FD7_GEN_INT1	FD7 2.8 MW Generator Intake
FD7_GEN_INT2	FD7 2.8 MW Generator Intake
FD7_BLD_DIS1	FD7 2.8 MW Building Discharge Fan
FD7_BLD_DIS2	FD7 2.8 MW Building Discharge Fan
FD7_BLD_DIS3	FD7 2.8 MW Building Discharge Fan
FD7_BLD_DIS4	FD7 2.8 MW Building Discharge Fan
FD7_GEN_RAD1	FD7 2.8 MW Generator Radiator
FD7_GEN_RAD2	FD7 2.8 MW Generator Radiator
FD7_BLD_OUT1	FD7 2.8 MW Building Breakout Noise
FD7_BLD_OUT2	FD7 2.8 MW Building Breakout Noise
YM20_GEN_CAS	YM20 1.8 MW Generator Casing
YM21_GEN_CAS	YM21 1.8 MW Generator Casing
YM22_GEN_CAS	YM22 1.8 MW Generator Casing
YM23_GEN_CAS	YM23 1.8 MW Generator Casing
YM24_GEN_CAS	YM24 1.8 MW Generator Casing
YM25_GEN_CAS	YM25 1.8 MW Generator Casing
YM26_GEN_CAS	YM26 1.8 MW Generator Casing (Backup)

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LEGEND

- SITE LOCATION
- BUILDING AND GENERATOR LOCATIONS
- BREAKOUT NOISE SOURCE LOCATION
- EXISTING NOISE SOURCE LOCATION
- FUTURE SOURCES DUE TO ADDITION

N W E S

8 4 0 8 METRES

CLIENT:

YUKON ENERGY CORPORATION

PROJECT:

NOISE ASSESSMENT
FARO POWER STATION
FARO, YUKON

PROJECT NO:	DATE:
191-02438-01	NOVEMBER 2020

DESIGNED BY: -

DRAWN BY: TP

CHECKED BY: -

FIGURE NO:	SCALE:
3	1:800

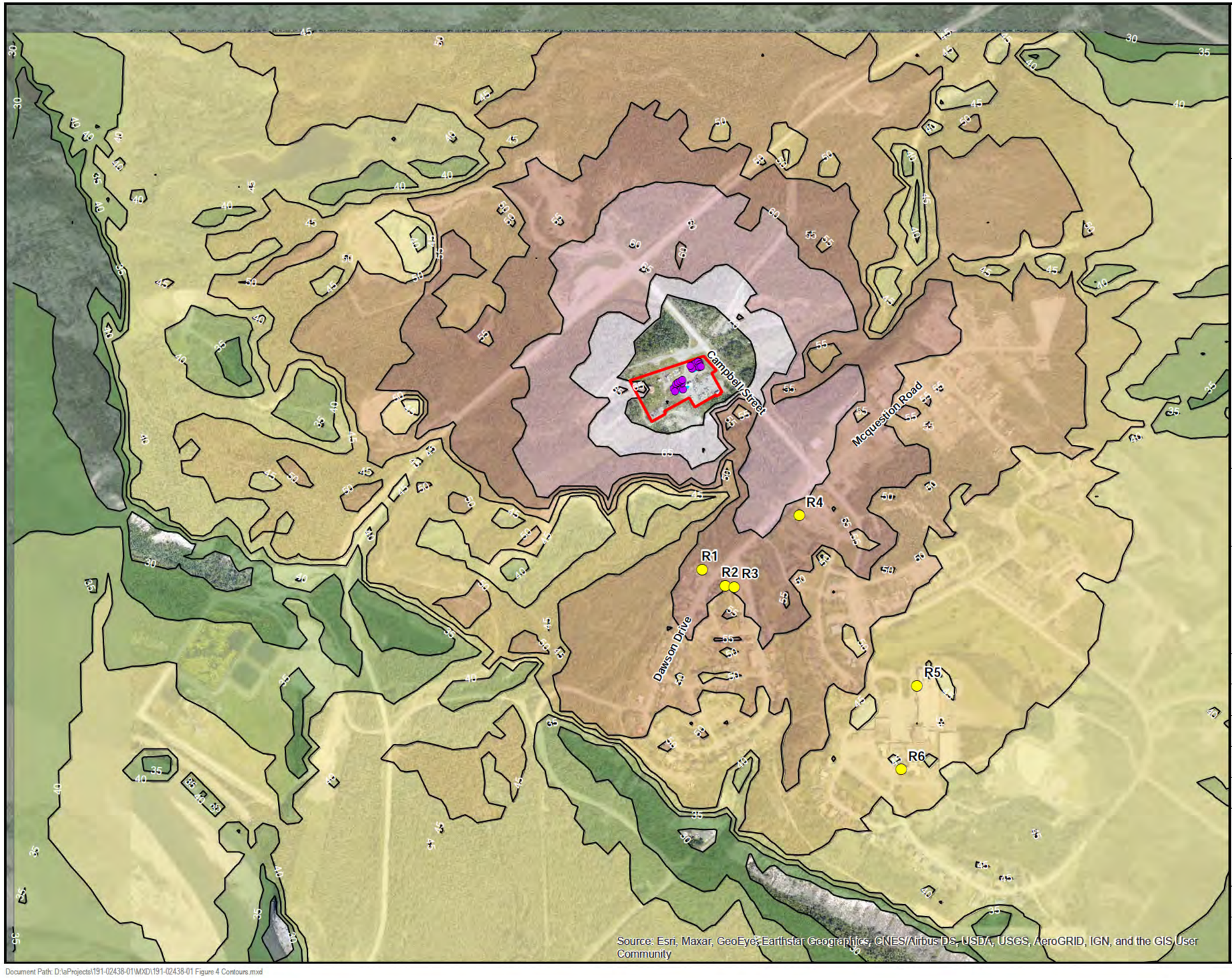
TITLE:

SITE MAP SHOWING EXISTING
FARO FACILITY SOURCES
WITH PROPOSED ADDITIONS

DISCIPLINE: ENVIRONMENT

ISSUE:	REV.:
-	-

Document Path: D:\aProjects\191-02438-01\MXD\191-02438-01 Figure 3 Sources.mxd



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LEGEND

- SITE LOCATION
- REPRESENTATIVE RECEPTORS
- EXISTING NOISE SOURCE LOCATION
- BREAKOUT NOISE SOURCE LOCATION
- 30 dB
- 35 dB
- 40 dB
- 45 dB
- 50 dB
- 55 dB
- 60 dB
- 65 dB

N W E S

150 75 0 150 Metres

CLIENT:
YUKON ENERGY CORPORATION

PROJECT:
NOISE ASSESSMENT
FARO POWER STATION
FARO, YUKON

PROJECT NO:	DATE:
191-02438-01	NOVEMBER 2020

DESIGNED BY: -

DRAWN BY: TP

CHECKED BY: -

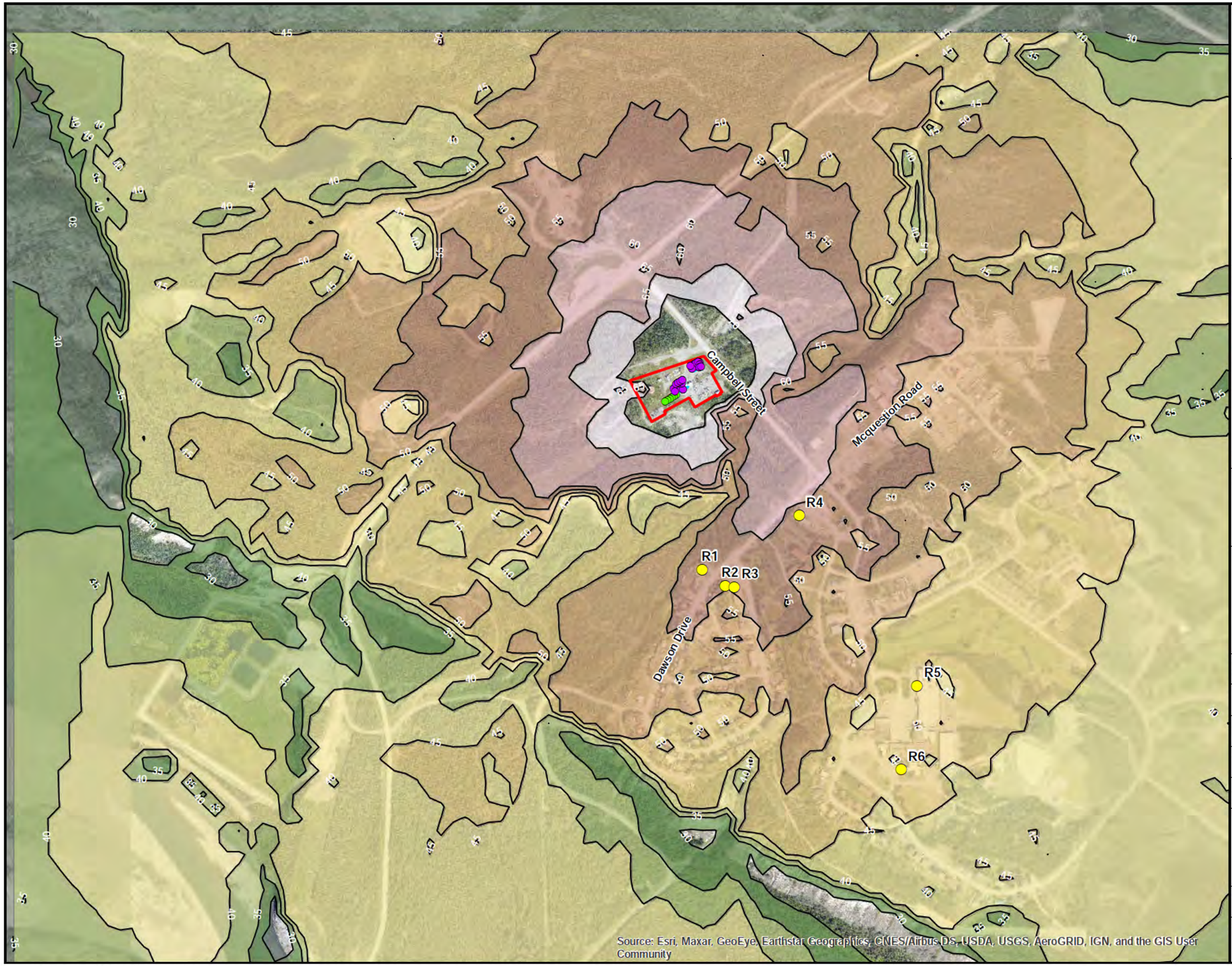
FIGURE NO:	SCALE:
4	1:8,000

TITLE:
EQUVALENT SOUND LEVEL CONTOURS
FOR EXISTING FARO FACILITY

DISCIPLINE:
ENVIRONMENT

ISSUE:	REV.:
-	-

Document Path: D:\aProjects\191-02438-01\MXD\191-02438-01 Figure 4 Contours.mxd



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LEGEND

- SITE LOCATION
- REPRESENTATIVE RECEPTORS
- EXISTING NOISE SOURCE LOCATION
- FUTURE SOURCES DUE TO ADDITION
- BREAKOUT NOISE SOURCE LOCATION
- 30 dB
- 35 dB
- 40 dB
- 45 dB
- 50 dB
- 55 dB
- 60 dB
- 65 dB

N W E S

150 75 0 150 Metres

CLIENT:

YUKON ENERGY CORPORATION

PROJECT:

NOISE ASSESSMENT
FARO POWER STATION
FARO, YUKON

PROJECT NO:	DATE:
191-02438-01	NOVEMBER 2020

DESIGNED BY: -

DRAWN BY: TP

CHECKED BY: -

FIGURE NO:	SCALE:
5	1:8,000

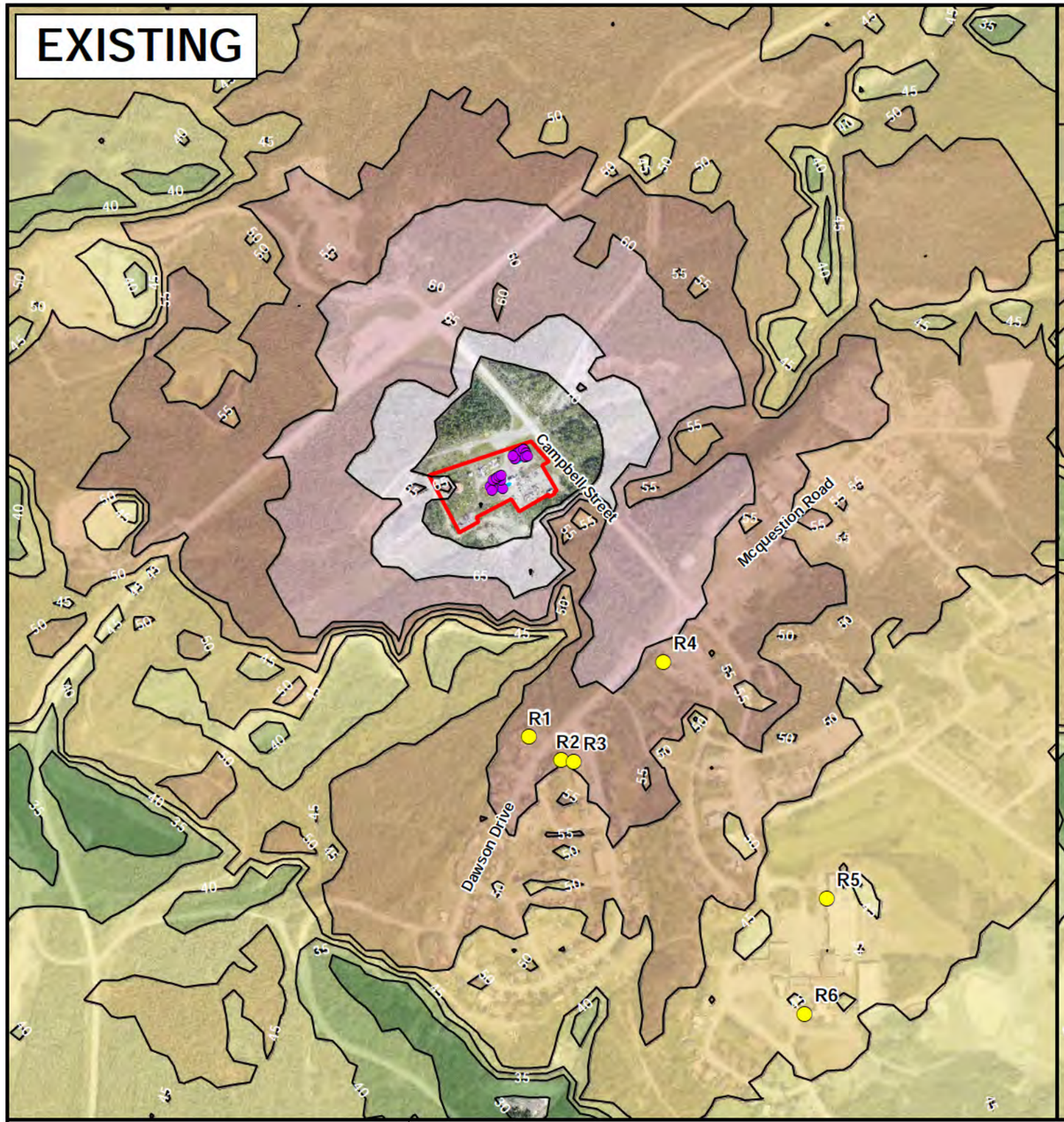
TITLE:

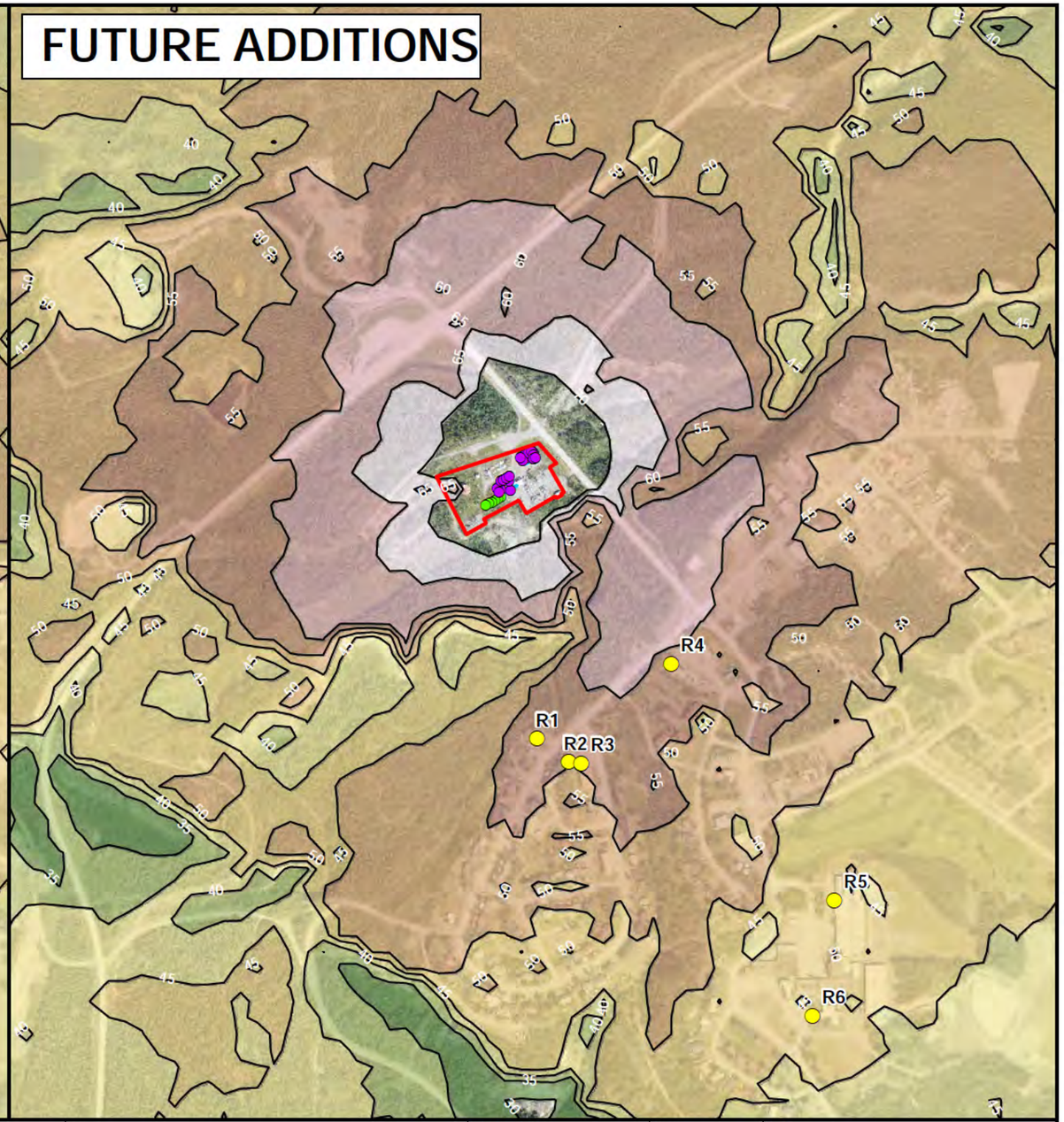
EQUVALENT SOUND LEVEL CONTOURS
FOR EXISTING FARO FACILITY
AND FUTURE ADDITIONS

DISCIPLINE: ENVIRONMENT

ISSUE:	REV.:
-	-

Document Path: D:\aProjects\191-02438-01\MXD\191-02438-01 Figure 5 Contours.mxd





wsp
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AURORA, ONTARIO CANADA L4G 0G9
TEL.: 905-750-3080 | FAX: 905-727-0463 | WWW.WSP.COM

LEGEND

- SITE LOCATION
- REPRESENTATIVE RECEPTORS
- EXISTING NOISE SOURCE LOCATION
- FUTURE SOURCES DUE TO ADDITION
- BREAKOUT NOISE SOURCE LOCATION
- 30 dB
- 35 dB
- 40 dB
- 45 dB
- 50 dB
- 55 dB
- 60 dB
- 65 dB

160 80 0 160 METRES

CLIENT: YUKON ENERGY CORPORATION

PROJECT: NOISE ASSESSMENT
FARO POWER STATION
FARO, YUKON

PROJECT NO:	DATE:
191-02438-01	NOVEMBER 2020

DESIGNED BY: -

DRAWN BY: TP

CHECKED BY: -

SCALE: AS SHOWN

TITLE: EQUVALENT SOUND LEVEL CONTOURS FOR EXISTING FARO FACILITY AND FUTURE ADDITIONS

DISCIPLINE: ENVIRONMENT

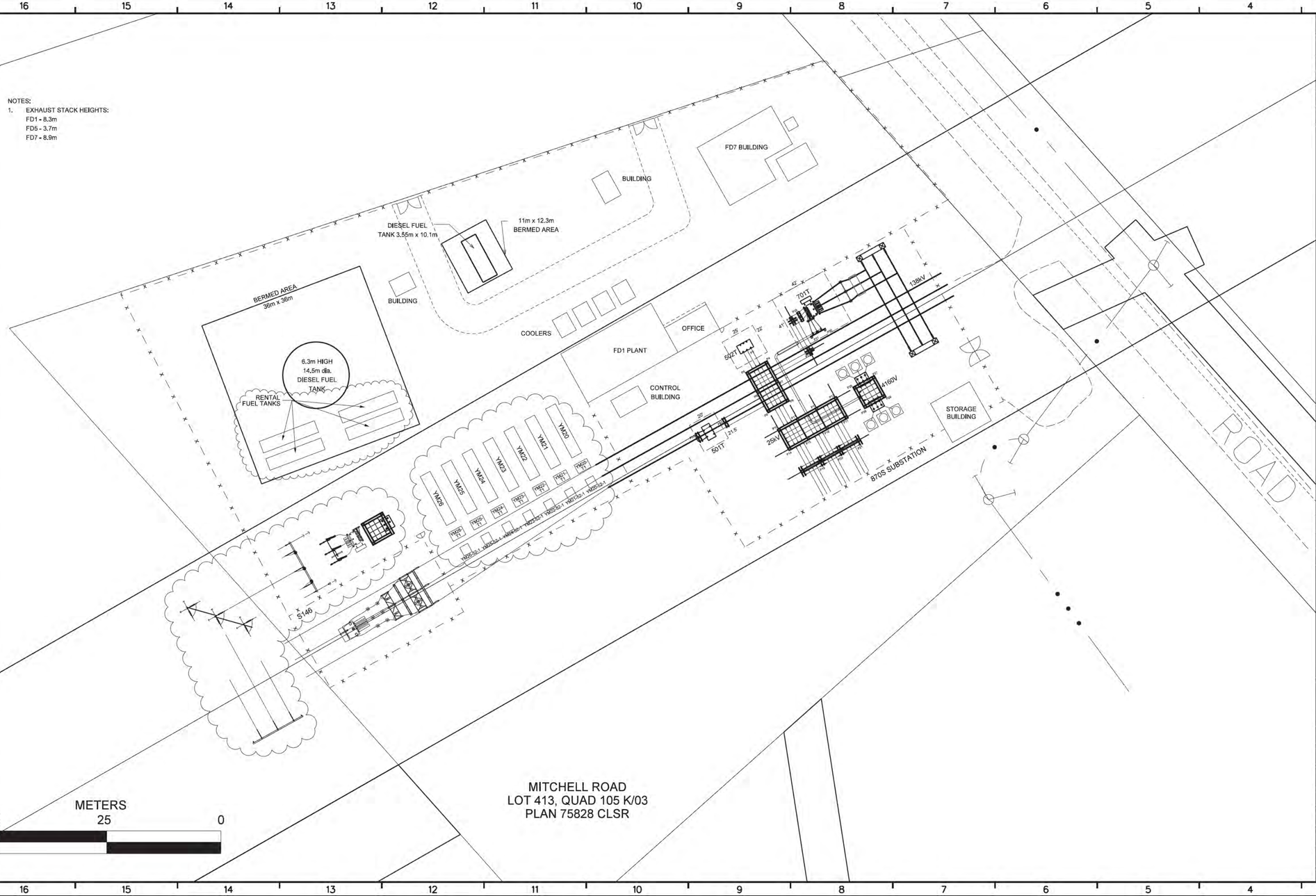
ISSUE:	FIGURE NO:
-	6

Document Path: D:\aProjects\191-02438-01\MXD\191-02438-01 Figure 6 Contours.mxd

APPENDIX

A DRAWINGS

NOTES:
1. EXHAUST STACK HEIGHTS:
   FD1 - 8.3m
   FD5 - 3.7m
   FD7 - 8.9m



REFERENCE DRAWINGS

DWG. NO.	DRAWING TITLE

REV.	DATE	DESCRIPTION	BY	DES.	APP.
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B	APRIL 14 2020	REVISED TX LOCATION	CM	LP	
A	MAR 19 2020	REVIEW	CM	LP	

COMPANY PERMIT

ENGINEERS STAMP

YUKON ENERGY CORPORATION

C20028 - RENTAL DIESELS

CHECKED BY -

DATE -

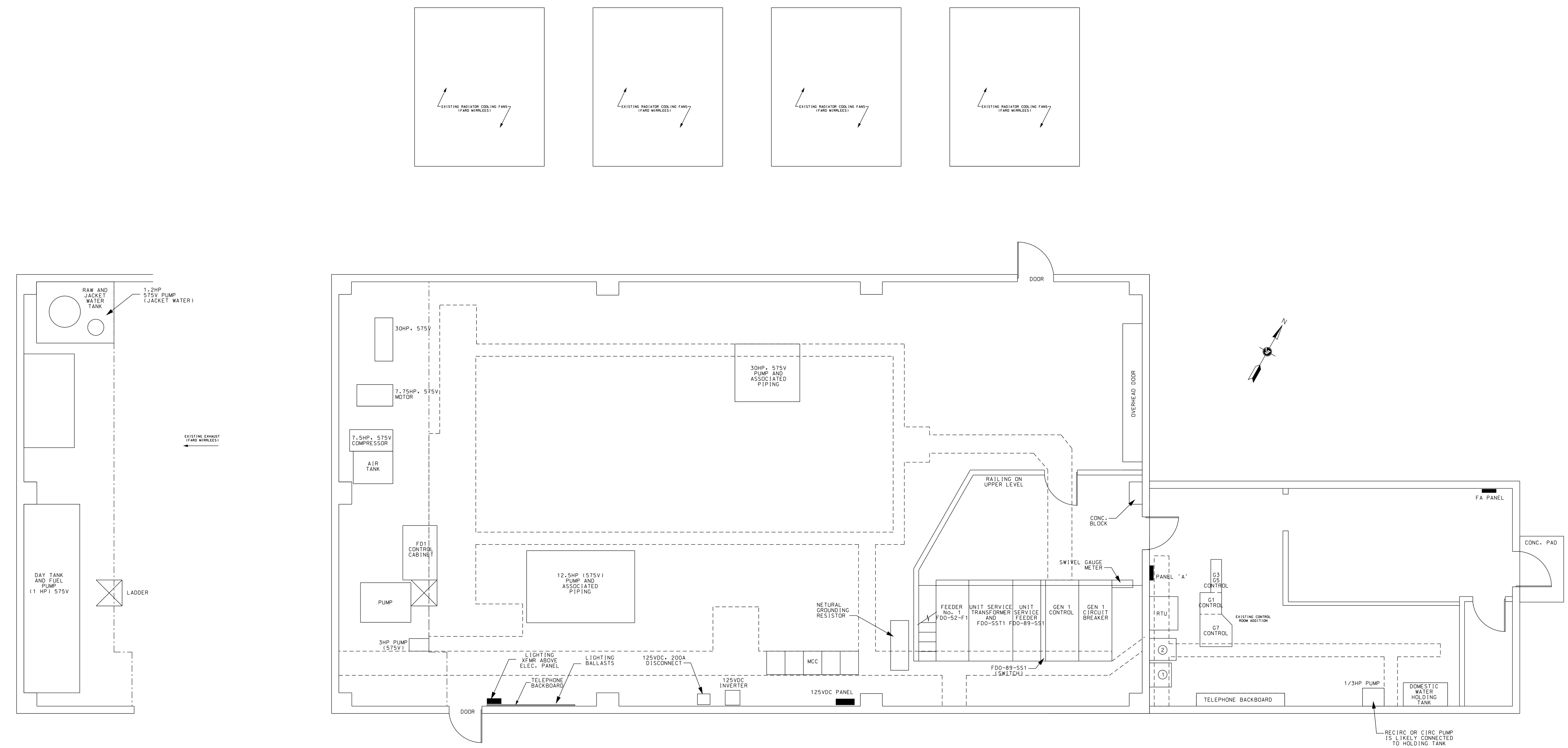
DRAWN BY -

FARO DIESEL & SUBSTATION
SITE PLAN
LOT 413, FARO - YUKON

SCALE A1

farositeplan.dgn

REV. C



MEZZANINE LAYOUT

MAIN FLOOR LAYOUT

FARO FD1 PLANT

COMPILED FROM P131-1003, P131-608

(1) POWERLINE CARRIER FARO-TAKHINI

(2) OLD PLC/MARSHALLING CABINET

FOR REFERNCE ONLY

CADD

YUKON ENERGY CORPORATION

NO.	DATE	REVISIONS	BY	CIVIL	DESIGN	ELEC	MECH	PROT	STND	P.ENG	E.MAN
0	11-JAN-07	AS BUILT FROM EXISTING EQUIPMENT - M0610	TARA		CC/AL						

NO.	DATE	REVISIONS	BY	CIVIL	DESIGN	ELEC	MECH	PROT	STND	P.ENG	E.MAN	REF. DWG. NO.	REF. DWG. TITLE

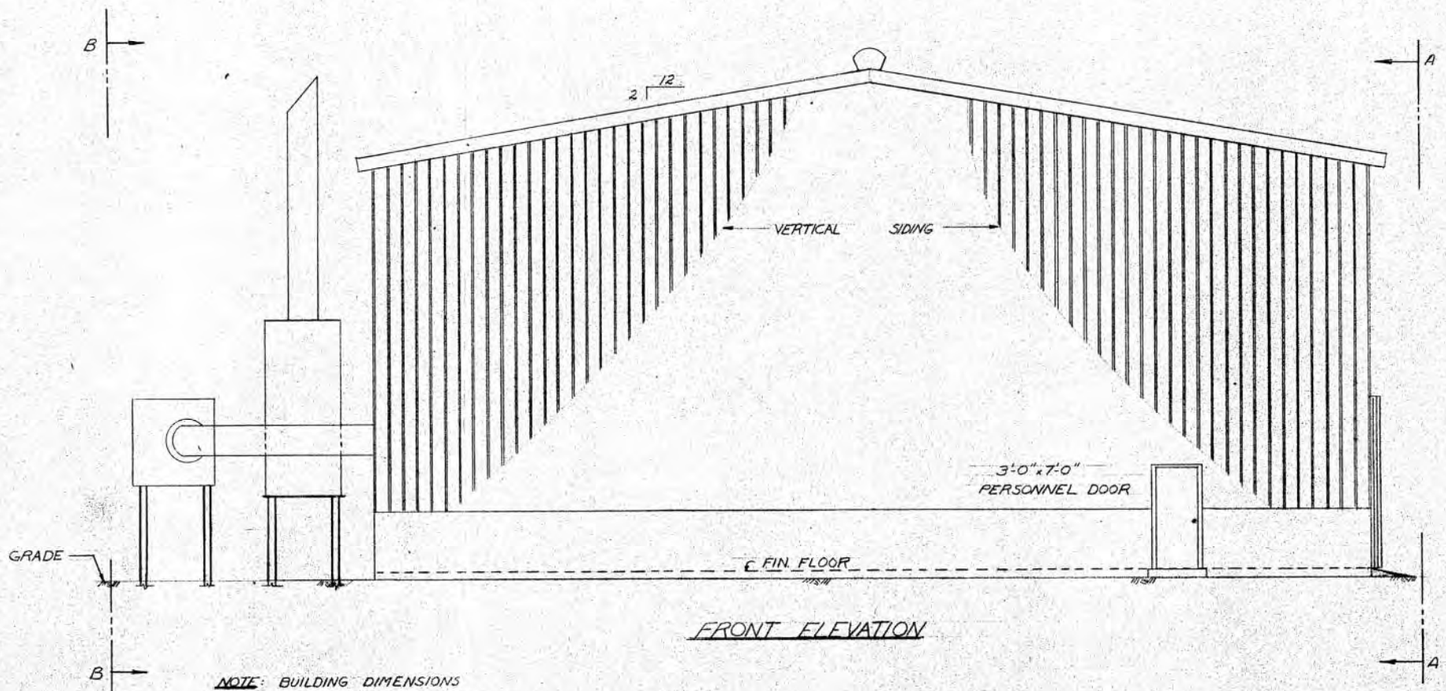
APPROVALS	DATE	APPROVALS	DATE
PROTECTION		MECHANICAL	
STANDARD		CIVIL	
PROJECT ENG.		DESIGN	
ENG. MANAGER		ELECTRICAL	
			11-JAN-07

FARO - FD1 BUILDING EQUIPMENT LAYOUT PLAN VIEW

DRAWN TARA | DESIGN BY CC/AL | SCALE NTS

A1 | DWG. NO. FD1-D-E300-1 | REV. 0

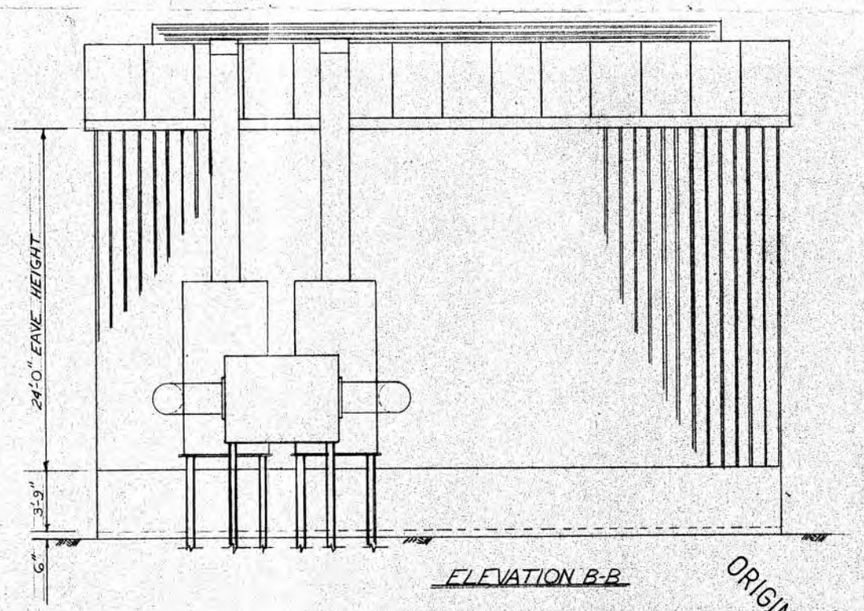
REAR ELEVATION



FRONT ELEVATION

NOTE: BUILDING DIMENSIONS
OUTSIDE TO OUTSIDE
70'-0" (ENDWALL) x 48'-0" (SIDEWALL)
BAY SPACING TO BE 24'-0"

ELEVATION A-A



ELEVATION B-B

ORIGINAL

PRELIMINARY ONLY
NOT FOR CONSTRUCTION

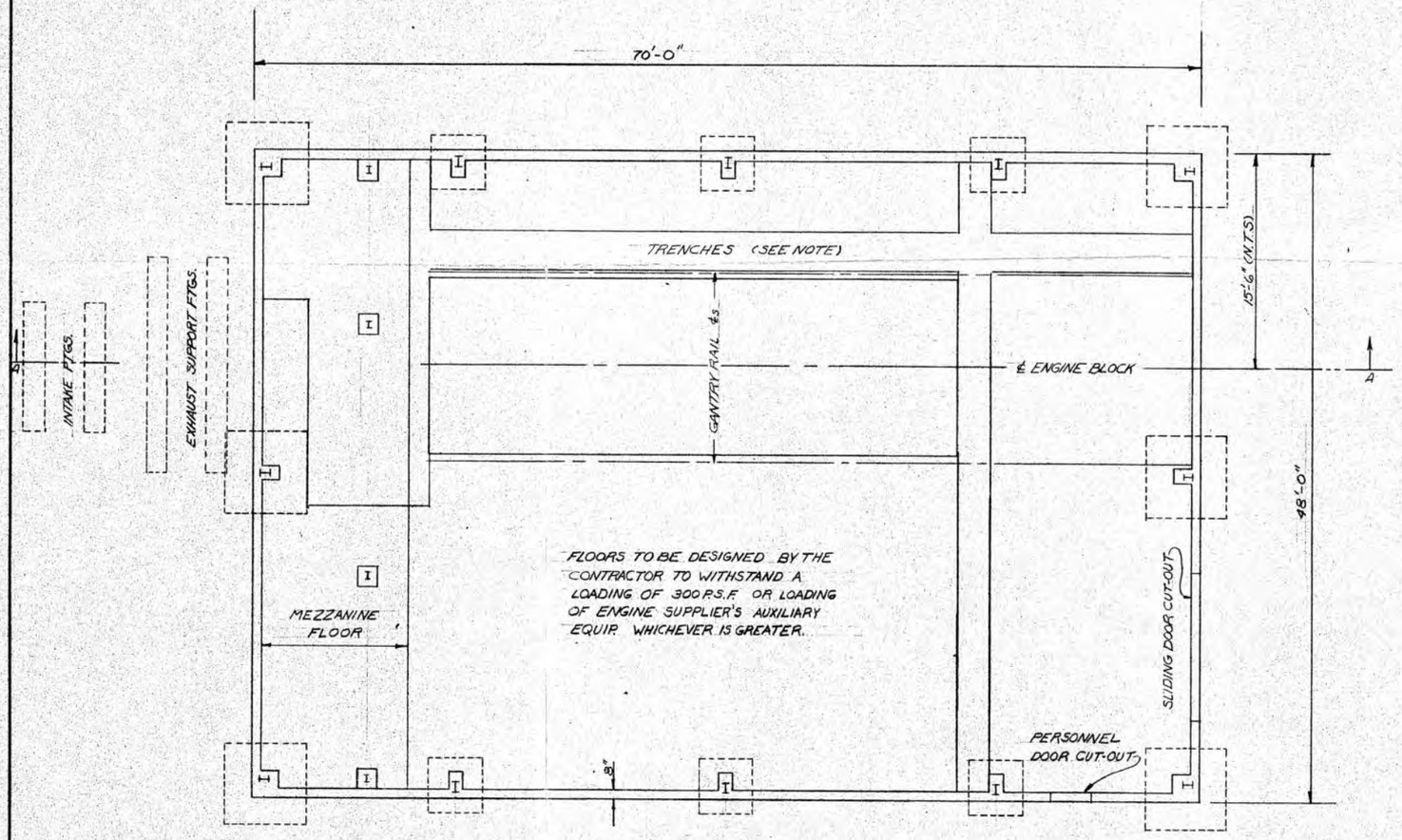
NORTHERN CANADA POWER COMMISSION

FARO, Y.T.

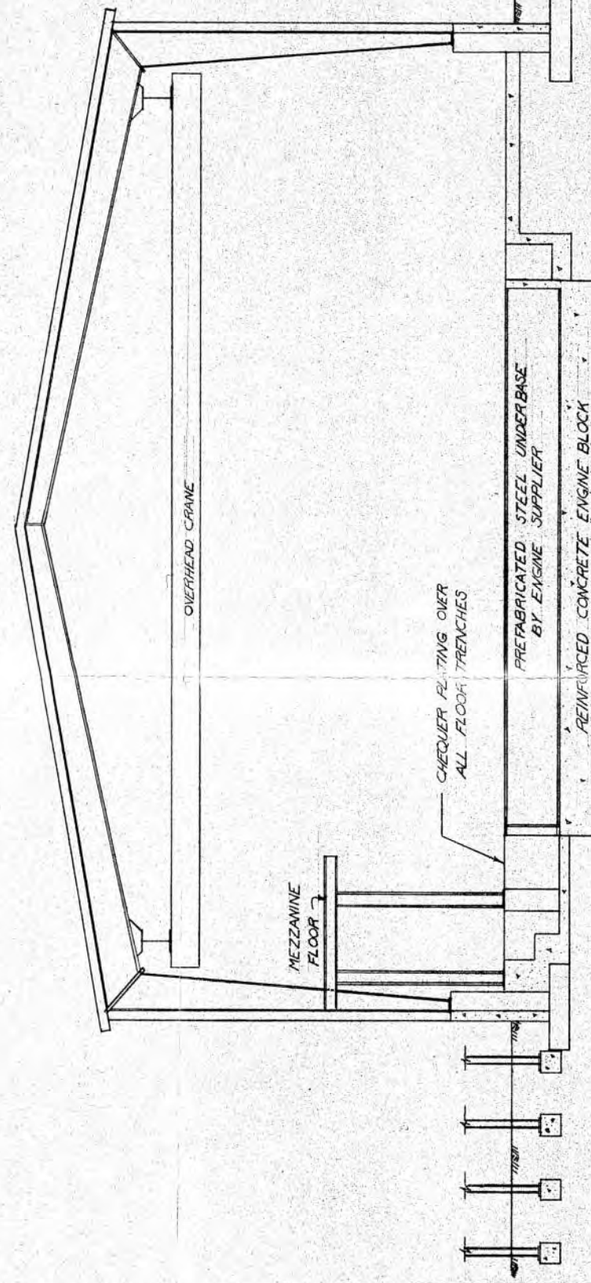
1970 DIESEL STAND-BY PLANT
ELEVATIONS

DCP	ETM&K	FEB 13, 70	WH-1671
D.C.P.		3/32" = 1'-0"	

NOTES: 1) FTGS. & COLUMNS SHOWN ARE APPROX. ONLY. CONTRACTOR TO DESIGN SAME IN CO-ORDINATION WITH BUILDING SUPPLIER. ALLOWABLE SOIL BEARING = 2000 P.S.F.
2) FTGS. FOR INTAKE & EXHAUST SUPPORTS AS WELL AS ALL FLOOR TRENCHING SHALL BE DESIGNED BY THE CONTRACTOR IN CO-ORDINATION WITH THE ENGINE SUPPLIER.



FOUNDATION PLAN



SECTION A-A THROUGH ℄ OF ENGINE BLOCK

ORIGINAL

PRELIMINARY ONLY
NOT FOR CONSTRUCTION

NORTHERN CANADA POWER COMMISSION

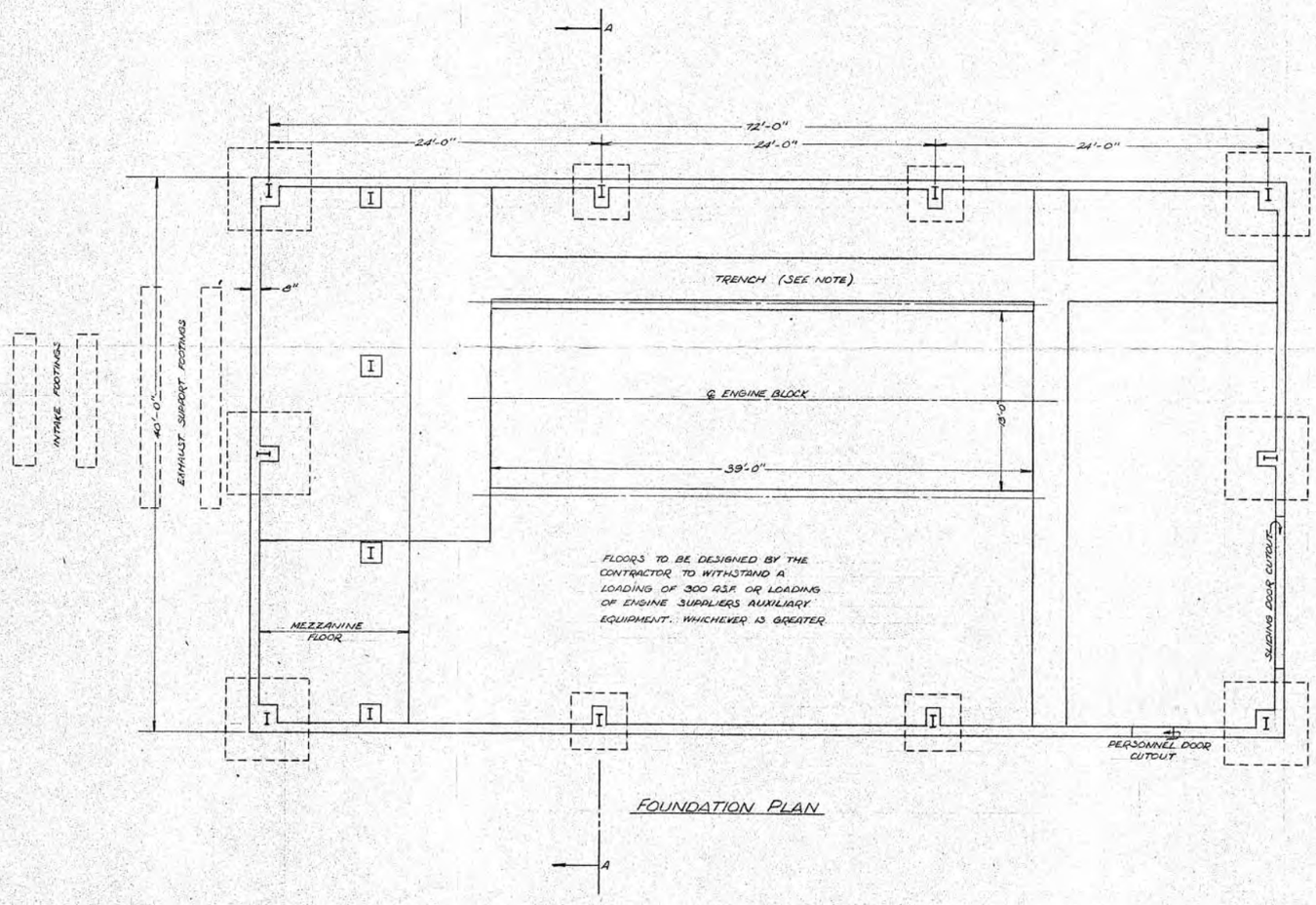
FARO, Y.T.

1970 DIESEL STANDBY PLANT
FOUNDATION PLAN
& SECTION

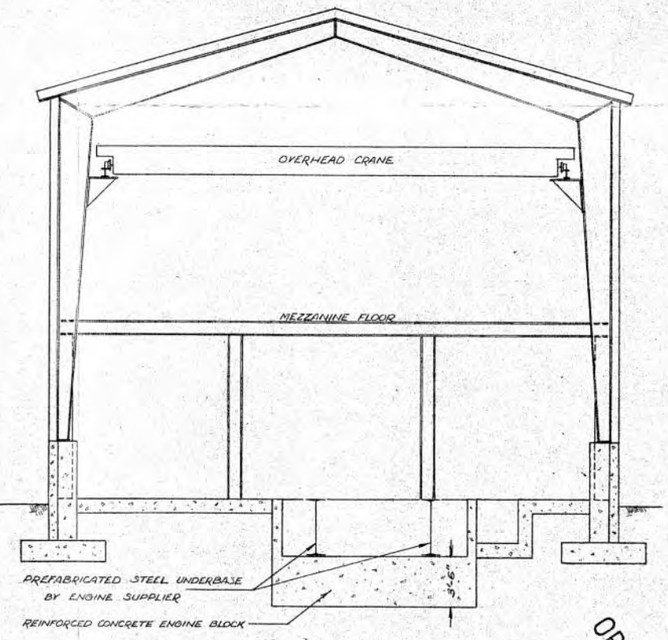
DRAWN	CHECKED	DATE	DRAWING NO.
D.C.P	K.N.C	FEB 15, 1970	WH - 1678
REVISED	APPROVED	SCALE 3/16"=1'-0"	SHEET 1 OF 1

NOTE: (1) FTGS. & COLUMNS SHOWN ARE APPROX. ONLY. CONTRACTOR TO DESIGN SAME IN CO-ORDINATION WITH BUILDING SUPPLIER. ALLOWABLE SOIL BEARING = 2000 P.S.F.

(2) FTGS. FOR INTAKE & EXHAUST SUPPORTS AS WELL AS ALL FLOOR TRENCHING SHALL BE DESIGNED BY THE CONTRACTOR IN CO-ORDINATION WITH THE ENGINE SUPPLIER.



FOUNDATION PLAN



SECTION A-A

ORIGINAL

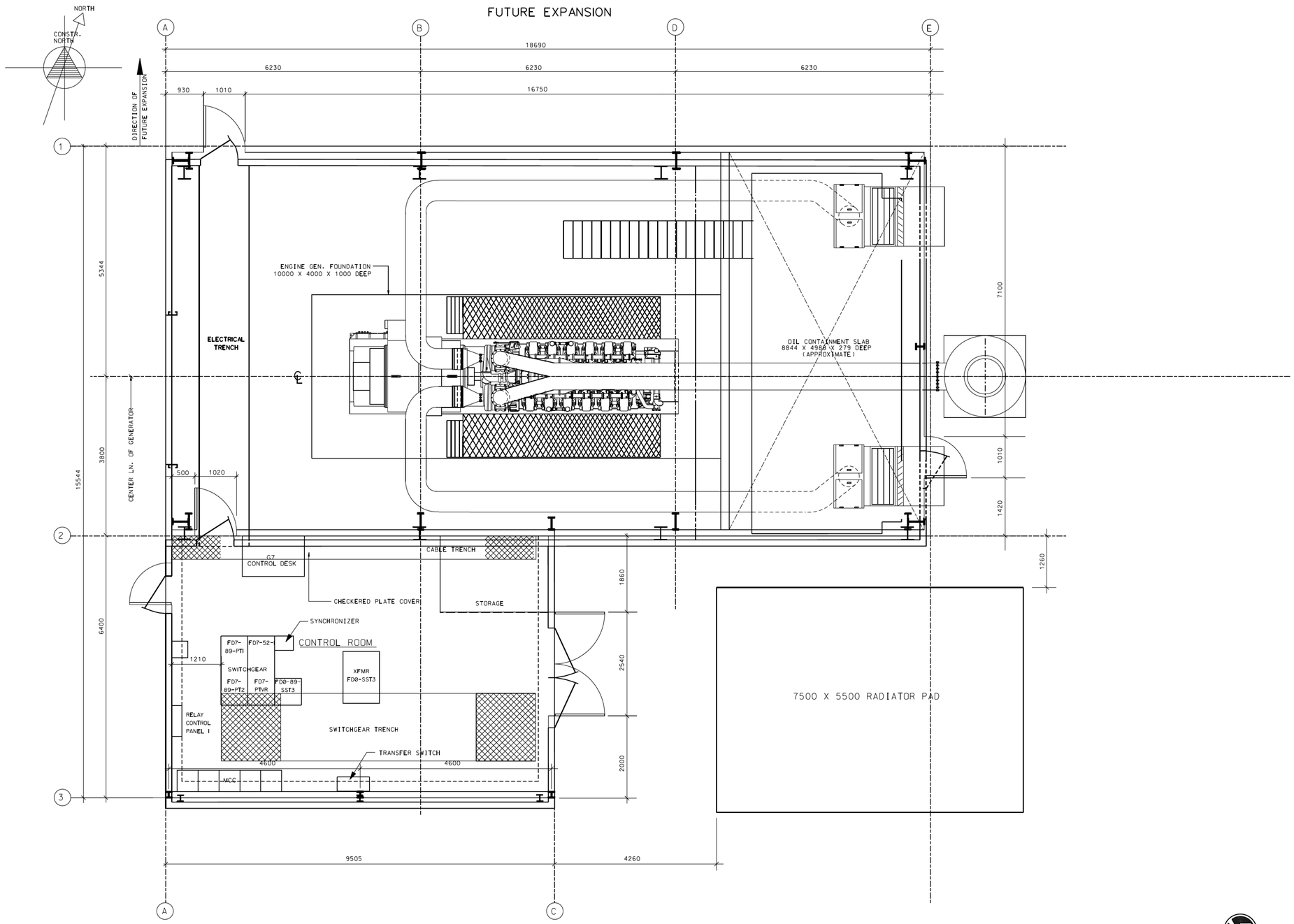
PRELIMINARY ONLY
NOT FOR CONSTRUCTION

NORTHERN CANADA POWER COMMISSION

FARO, Y.T.

1970 DIESEL STAND-BY PLANT
FOUNDATION
PLAN & SECTION (ALTERNATIVE 2)

DRAWN	CHECKED	DATE	DRAWING NO.
DR	E. MACK	28 FEB, '70	114-1702
DESIGNED	APPROVED	SCALE 3/16" = 1'-0"	



CADD

MAIN FLOOR LAYOUT

YUKON ENERGY CORPORATION

NO.	DATE	REVISIONS	BY	CIVIL	DESIGN	ELEC	MECH	PROT	STND	P.ENG	E.MAN
0	15-DEC-06	AS BUILT EXISTING EQUIPMENT - M06010	TARA		CC/AL						
C	29-JUL-92	REVISED	S.C.		PGG						
B	11-JUN-92	REVISED	LGP		WDV						
A	19-MAY-92	PRELIMINARY	S.C.		WDV						

NO.	DATE	REVISIONS	BY	CIVIL	DESIGN	ELEC	MECH	PROT	STND	P.ENG	E.MAN

REF. DWG. NO.	REF. DWG. TITLE
YE03-20200, Rev. C	APL DRAWING - FROM CONSTRUCTION

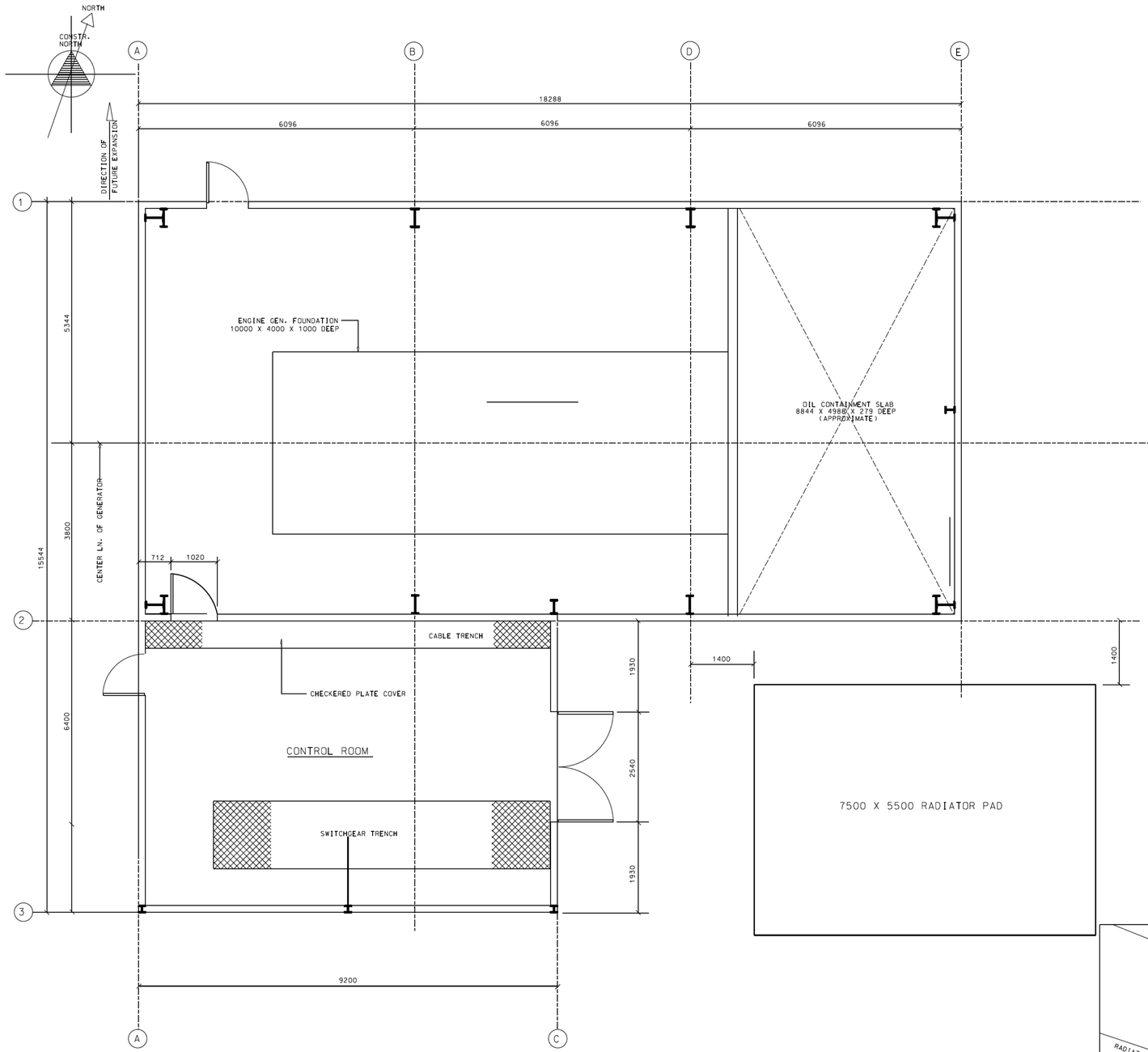
APPROVALS		DATE
PROTECTION		
STANDARD		
PROJECT ENG.		
ENG. MANAGER		

APPROVALS		DATE
MECHANICAL		
CIVIL		
DESIGN		
ELECTRICAL		

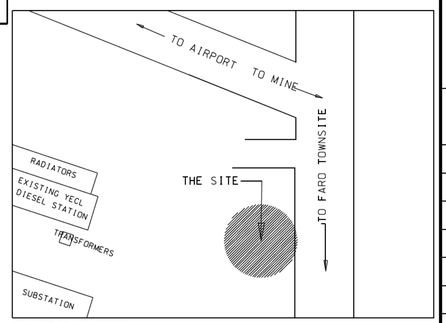
FARO - FD7 BUILDING
EQUIPMENT LAYOUT
PLAN VIEW
SHEET 1 OF 2

DRAWN	DESIGN BY	SCALE
S. CLARK	D. VERVEDA	NTS

AI DWG. NO. YE03-20200 REV. 0



MAIN FLOOR LAYOUT
SCALE 1 : 50 M.



SITE MAP
NOT TO SCALE

REFERENCE DRAWINGS

DWG NO.	DRAWING TITLE
YE03 - 20151	BUILDING PLAN VIEW
YE03 - 20102	PRELIMINARY BUILDING LAYOUT
YE03 - 20608	UNDER SLAB CONDUIT LAYOUT
YE03 - 20700	UNDER SLAB LAYOUT DETAILS

NOTES:

1. FOR PVC PIPES LOCATION SEE ELECTRICAL DWG. NO'S. YE03-50608 & YE03-50700.
2. TOP OF CONCRETE (ASSUMED ELEVATION = 100.00) SHOULD BE AT LEAST 200 MM ABOVE GRADE.

REV.	DATE	DESCRIPTION	BY	DES.	APP.
0	APR 16/93	AS BUILT	LGP	AMV	
6	MAR 08/93	REMOVED ENGINE OUTLINE	LGP	AMV	AMV
5	AUG 17/92	MOVED RADIATOR PAD	S.C.	AMV	AMV
4	AUG 11/92	ADDED MANUAL CHANGES	S.C.	AMV	AMV
3	JULY 20/92	REVISED NOTE 2	CEU	AMV	AMV
2	JULY 09/92	PVC PIPES LOCATION REMOVED. NOTES ADDED. ENGINE GEN. ANCHOR BOLTS REMOVED	CEU	AMV	AMV
1	JUNE 24/92	RADIATOR PAD. SWITCH GEAR PAD CHANGED.	CEU	AMV	AMV

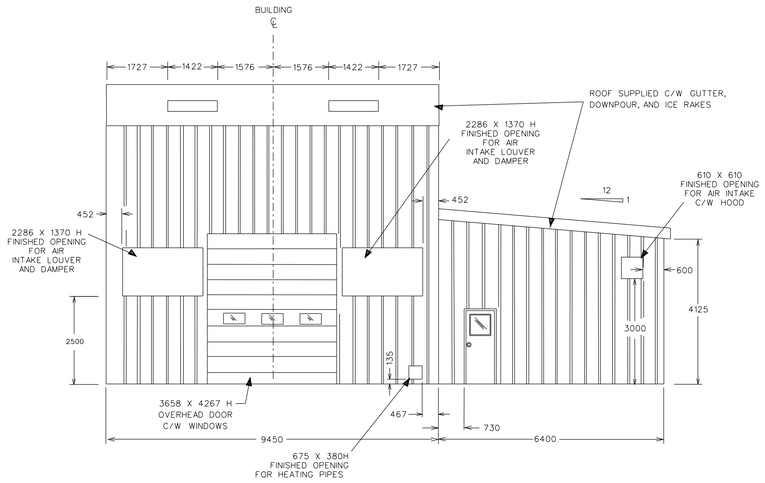
COMPANY PERMIT

ENGINEERS STAMP

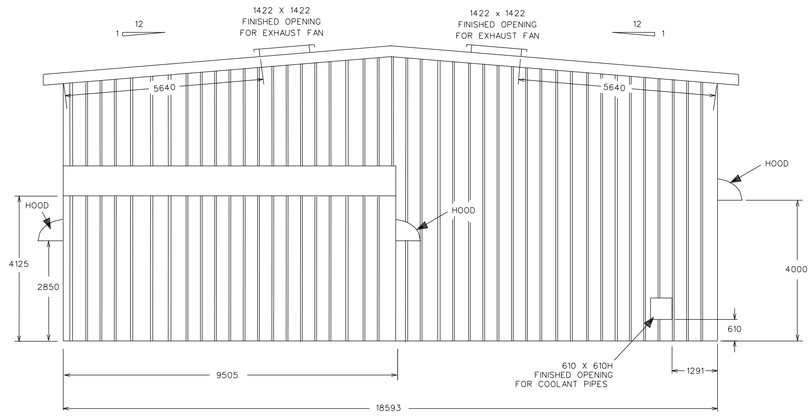
ALBERTA POWER LIMITED

THE YUKON ELECTRICAL CO. LTD.

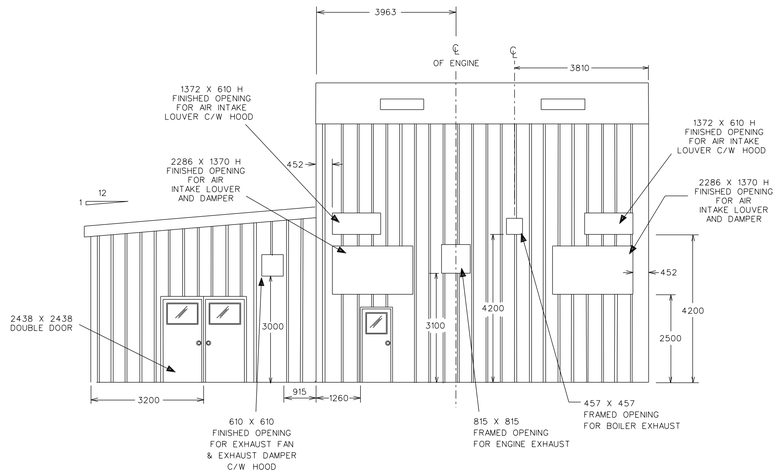
DESIGN A.M.VILLARAZA	1992 FARO ADDITION
ELECTRICAL	
MECHANICAL	
STRUCTURAL A.M.VILLARAZA	MAIN FLOOR LAYOUT SITE MAP
DRAWN C.E.USON	
SCALE AS NOTED	S1 DWG. NO: YE03-20100 RØ
CAD-Y0320100	



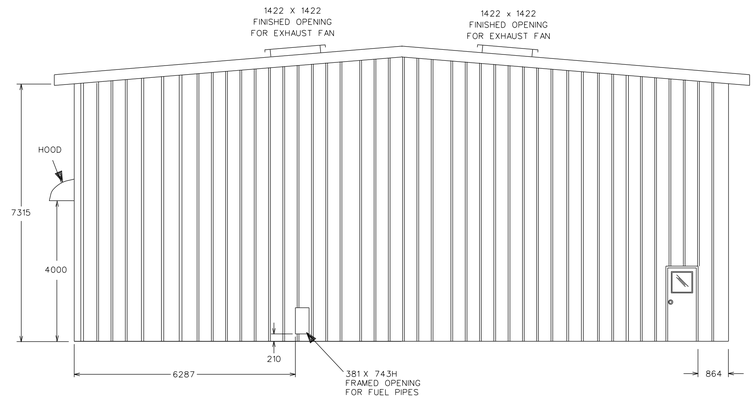
FRONT VIEW



RIGHT SIDE VIEW



REAR VIEW



LEFT SIDE VIEW

REFERENCE DRAWINGS

DWG. NO.	DRAWING TITLE

NOTES:

1. CONTRACTOR SHALL SUPPLY ALL FLASHING AND INSULATION REQUIRED TO COMPLETE ANY PIPE OPENINGS ONCE THE PIPES HAVE BEEN INSTALLED.
2. ALL EXHAUST FANS, LOUVERS, AND DAMPERS SHALL BE PROVIDED BY OTHERS; BUT INSTALLED BY THE BUILDING CONTRACTOR. HOODS SUPPLIED BY CONTRACTOR.

REV.	DATE	DESCRIPTION	BY	DES.	APP.
0	APR 19/93	AS BUILT	LGP	PGG	
C	MAR 08/93	REVISED	LGP	PGG	PGG
B	JULY 15/92	REVISED	S.C.	PGG	PGG
A	JUNE 04/92	PRELIMINARY	S.C.	PGG	PGG

COMPANY PERMIT

ENGINEERS STAMP

YUKON ENERGY CORPORATION

YUKON ELECTRICAL CO. LTD.

P. GOGUEN

CHECKED BY P. GOGUEN

DATE

DRAWN BY S.CLARK

SCALE 1 TO 80 | A1

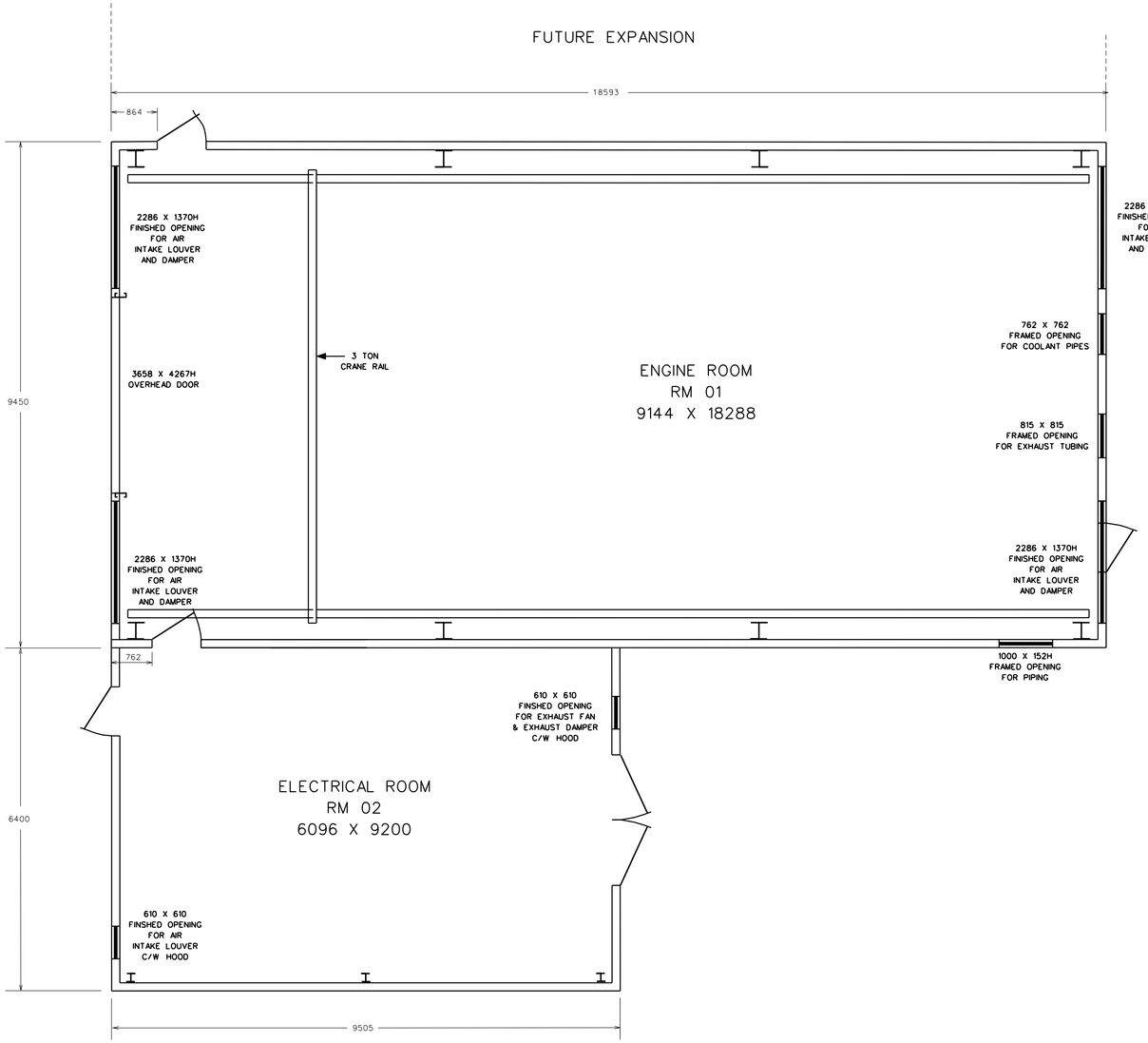
CAD-Y0320150

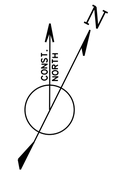
FARO 1992 ADDITION BUILDING EXTERIOR VIEWS

DWG. NO: YE03-20150

REV. 0

ROOM NAME	ROOM NO.	FLOOR FINISH	WALL FINISHES	CEILING FINISH	EXITS			FRAMED OPENING		FRAMED OPENING APPLICATION	
ENGINE ROOM	01	FINISHED CONCRETE	PREPAINTED WHITE SHEET STEEL	PREPAINTED WHITE SHEET STEEL	2 - 915 X 2135 MANDOOR EXITS TO EXTERIOR	1 - 915 X 2135 MANDOOR EXITS TO ROOM 02	1 - 3658 X 4267H OVERHEAD DOOR EXITS TO EXTERIOR	4 - 2286 X 1370H 2 - 1372 X 610H 1 - 457 X 457 1 - 381 X 743H	1 - 815 X 815 1 - 610 x 610 4 - 1232 X 1232 1 - 675 X 380H	4 - AIR INTAKES 2 - AIR INTAKES 1 - BOILER EXHAUST 1 - FUEL PIPING	1 - ENGINE EXHAUST 1 - COOLANT PIPE OPENING 1 - ROOF TOP FAN 1 - HEATING PIPES
ELECTRICAL ROOM	02	FINISHED CONCRETE	PREPAINTED WHITE SHEET STEEL	PREPAINTED WHITE SHEET STEEL	1 - 2438 X 2438 DOUBLE MANDOOR EXITS TO EXTERIOR	1 - 915 X 2135 MANDOOR EXITS TO EXTERIOR	1 - 915 X 2135 MANDOOR EXITS TO ROOM 02	2 - 610 X 610		1 - AIR INTAKE 1 - AIR EXHAUST	





REFERENCE DRAWINGS

DWG. NO.	DRAWING TITLE

LEGEND

FINISHED OPENING

NOTES:

1. SOME FRAMED OPENINGS ARE NOT SHOWN FOR CLARITY PURPOSES.
2. THE CONTRACTOR SHALL SUPPLY ALL FLASHING AND INSULATION REQUIRED TO COMPLETE ANY PIPE OPENINGS ONCE THE PIPES HAVE BEEN INSTALLED.
3. ALL EXHAUST FANS, LOUVERS, AND DAMPERS SHALL BE PROVIDED BY OTHERS; BUT INSTALLED BY THE BUILDING CONTRACTOR.
4. BUILDING STRUCTURAL SHALL BE DESIGNED TO ACCOMMODATE FUTURE EXPANSION.

REV.	DATE	DESCRIPTION	BY	DES.	APP.
Ø	APR 16/93	AS BUILT	LGP	PGG	
C	MAR 09/93	REVISED	LGP	PGG	PGG
B	JULY 15/92	REVISED	S.C.	PGG	PGG
A	JUNE 04/92	PRELIMINARY	S.C.	PGG	PGG

COMPANY PERMIT

ENGINEERS STAMP

APPROVED FOR CONSTRUCTION

DATE — BRANCH HEAD CIVIL

DATE — BRANCH HEAD ELECTRICAL

DATE — BRANCH HEAD MECHANICAL

DATE — BRANCH HEAD CONSTRUCTION

ALBERTA POWER LIMITED

YUKON ELECTRICAL CO. LTD.

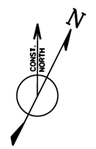
DESIGN P. GOGUEN
ELECTRICAL
MECHANICAL P. GOGUEN
OTHER
DRAWN S.CLARK

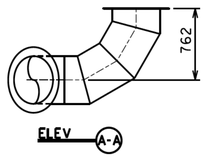
FARO 1992 ADDITION BUILDING PLAN VIEW

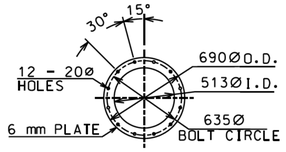
SCALE 1 TO 50 A1
CAD-Y0320151

DWG. NO: YE03-20151

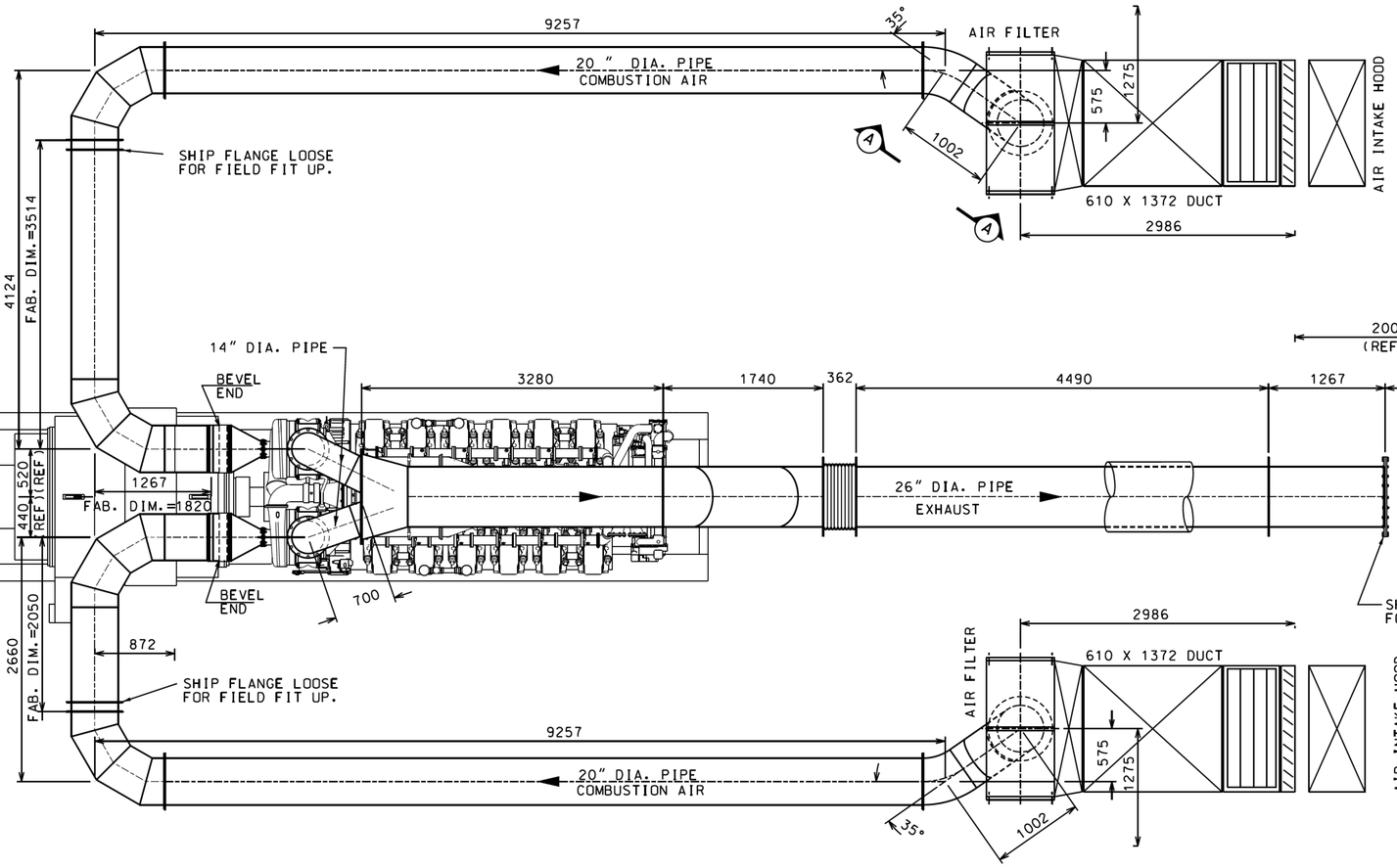
REV. 0







FLANGE DETAIL
SCALE= 1 : 20
QUAN.: 16 REQ'D



REFERENCE DRAWINGS	
DWG. NO.	DRAWING TITLE
YE03 - 20502	ENGINE COMBUSTION AIR AND EXHAUST SYSTEM ELEVATION VIEW

REV.	DATE	DESCRIPTION	BY	DES.	APP.
1	MAY 26/93	AS BUILT REVISED	LGP	PGG	
0	APR 19/93	AS BUILT	LGP	PGG	PGG
D	MAR 10/93	PRELIMINARY	LGP	PGG	PGG
C	SEPT. 15/92	ISSUED FOR CONSTRUCTION	GR	E.H.	E.H.
B	SEPT. 01/92	ISSUED FOR BID	GR	I.C.	I.C.
A	JULY 16/92	PRELIMINARY	LGP	WDV	WDV

COMPANY PERMIT

ENGINEERS STAMP

YUKON ENERGY CORPORATION

THE YUKON ELECTRICAL CO. LTD.

D. VERVEDA

CHECKED BY
D. VERVEDA

DATE

DRAWN BY
S. CLARK

FARO 1992 ADDITION ENGINE COMBUSTION AIR AND EXHAUST SYSTEM PLAN VIEW

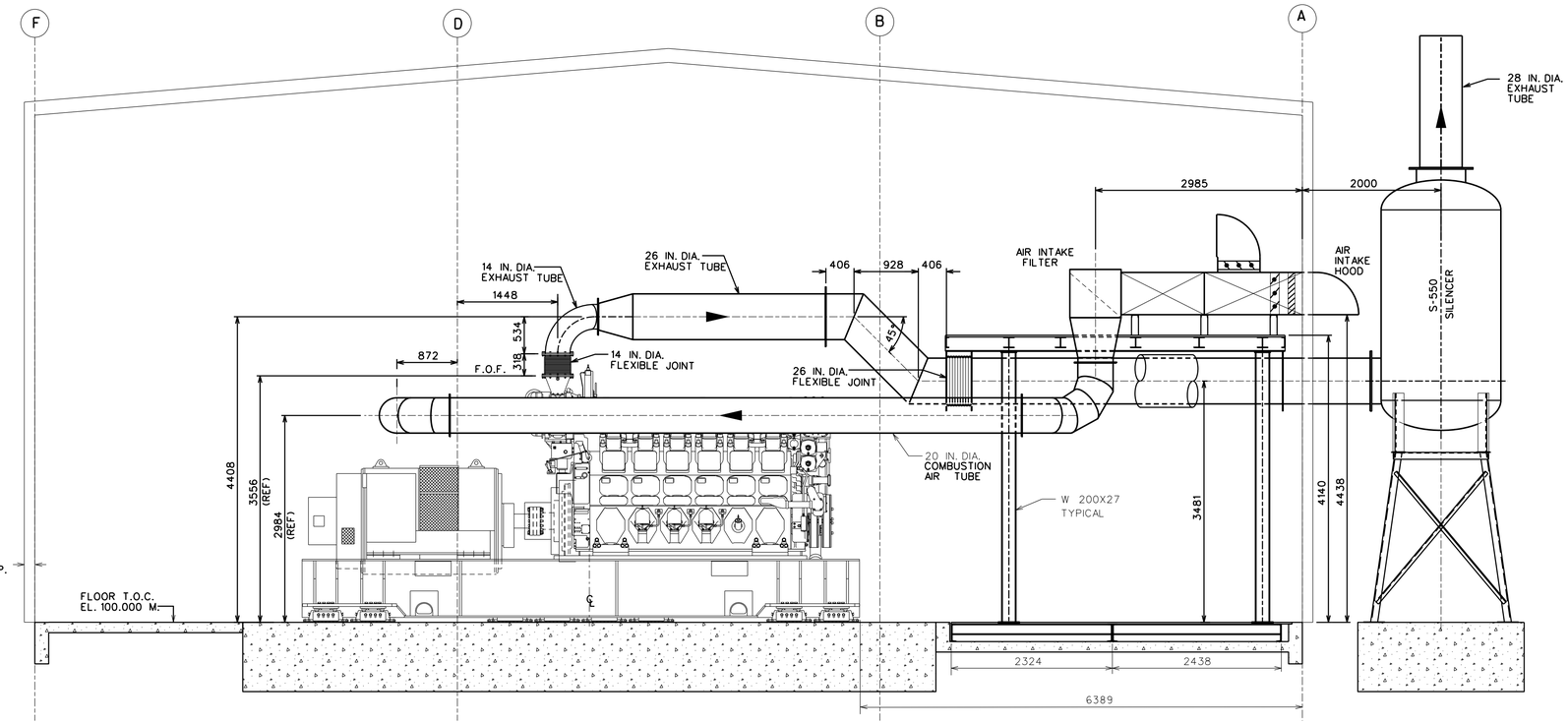
SCALE 1 : 30 A1

CAD-Y0320501

DWG. NO.:YE03-20501

REV. 1

YE03-20501



ELEVATION LOOKING NORTH
@ COLUMN LINE 2

REFERENCE DRAWINGS

DWG. NO.	DRAWING TITLE
YE03 -20501	ENGINE COMBUSTION AIR & EXHAUST SYSTEM PLAN VIEW
YE03 -20556	SILENCER SUPPORT STAND

REV.	DATE	DESCRIPTION	BY	DES.	APP.
1	MAY 26/93	AS BUILT REVISED	LGP	PGG	
0	APR 19/93	AS BUILT	SC	PGG	PGG
B	NOV. 12/92	ISSUED FOR CONSTRUCTION	GR	PGG	PGG
A	JULY 21/92	PRELIMINARY	LGP	WDV	WDV

COMPANY PERMIT

ENGINEERS STAMP

YUKON ENERGY CORPORATION

THE YUKON ELECTRICAL CO. LTD

D.VERVEDA	FARO 1992 ADDITION ENGINE COMBUSTION AIR AND EXHAUST SYSTEM ELEVATION VIEW
CHECKED BY D.VERVEDA	
DATE	
DRAWN BY S.CLARK	
SCALE 1 TO 40 A1	DWG. NO: YE03-20502 REV. 1
CAD-Y0320502	

YE03-20502

APPENDIX

B TABLES

Project Name: Noise Assessment
Site Name: FARO Power Station
WSP Job #: 191-02438-01

Table 1: Noise Source Summary Table

Noise Source ID	Source Description	Sound Power Level [1] (dBA)	Source Location [2] (I or O)	Sound Characteristics [3] (S,Q,I,B,T,C)	Noise Control Measures [4] (S,A,B,L,E,O,U)
Existing Sources					
FD1_GEN_EXH1	FD1 2.4 MW Generator Combustion Exhaust	136	O	S	S
FD1_GEN_EXH2	FD1 2.4 MW Generator Combustion Exhaust	136	O	S	S
FD1_GEN_INT1	FD1 2.4 MW Generator Intake	118	O	S	S
FD1_GEN_INT2	FD1 2.4 MW Generator Intake	118	O	S	S
FD1_BLD_DIS1	FD1 2.4 MW Building Discharge	111	O	S	S
FD1_BLD_INT1	FD1 2.4 MW Building Intake	111	O	S	S
FD1_GEN_RAD1	FD1 2.4 MW Generator Radiator	114	O	S	U
FD1_GEN_RAD2	FD1 2.4 MW Generator Radiator	114	O	S	U
FD1_GEN_RAD3	FD1 2.4 MW Generator Radiator	114	O	S	U
FD1_GEN_RAD4	FD1 2.4 MW Generator Radiator	114	O	S	U
FD1_BLD_OUT1	FD1 2.4 MW Building Breakout Noise	116	O	S	U
FD1_BLD_OUT2	FD1 2.4 MW Building Breakout Noise	116	O	S	U
FD7_GEN_EXH1	FD7 2.8 MW Generator Combustion Exhaust	140	O	S	U
FD7_BLD_INT1	FD7 2.8 MW Building Intake	115	O	S	U
FD7_BLD_INT2	FD7 2.8 MW Building Intake	115	O	S	U
FD7_BLD_INT3	FD7 2.8 MW Building Intake	115	O	S	U
FD7_BLD_INT4	FD7 2.8 MW Building Intake	115	O	S	U
FD7_GEN_INT1	FD1 2.8 MW Generator Intake	109	O	S	U
FD7_GEN_INT2	FD1 2.8 MW Generator Intake	109	O	S	U
FD7_BLD_DIS1	FD1 2.8 MW Building Discharge Fan	114	O	S	U
FD7_BLD_DIS2	FD1 2.8 MW Building Discharge Fan	114	O	S	U
FD7_BLD_DIS3	FD1 2.8 MW Building Discharge Fan	114	O	S	U
FD7_BLD_DIS4	FD1 2.8 MW Building Discharge Fan	114	O	S	U
FD7_GEN_RAD1	FD7 2.8 MW Generator Radiator	112	O	S	U
FD7_GEN_RAD2	FD7 2.8 MW Generator Radiator	112	O	S	U
FD7_BLD_OUT1	FD7 2.8 MW Building Breakout Noise	115	O	S	U
FD7_BLD_OUT2	FD7 2.8 MW Building Breakout Noise	115	O	S	U
Future Sourcs due to Addition					
YM20_GEN_CAS	YM20 1.8 MW Generator Casing	103	O	S	E
YM21_GEN_CAS	YM21 1.8 MW Generator Casing	103	O	S	E
YM22_GEN_CAS	YM22 1.8 MW Generator Casing	103	O	S	E
YM23_GEN_CAS	YM23 1.8 MW Generator Casing	103	O	S	E
YM24_GEN_CAS	YM24 1.8 MW Generator Casing	103	O	S	E
YM25_GEN_CAS	YM25 1.8 MW Generator Casing	103	O	S	E
YM26_GEN_CAS	YM26 1.8 MW Generator Casing (Backup)	n/a	O	S	E

Notes:

[1] Sound Power Level of Source, in dBA

[2] Source Location:

O	located/installed outside the building
I	located/installed inside the building

[3] Sound Characteristics:

S	Steady
Q	Quasi Steady Impulsive
I	Impulsive
B	Buzzing
T	Tonal
C	Cyclic
O	Occasional
W	Time Weighted (factor applied)

[4] Noise Control Measures:

S:	silencer, acoustic louver
A:	acoustic lining, plenum
B:	barrier, berm, screening
L:	lagging
E:	acoustic enclosure
O:	other
U:	uncontrolled

Project Name: Environmental Compliance Approval - Air and Noise
Site Name: FARO Power Station
WSP Job #: 191-02438-01

Table 2: Significant Noise Source Summary

Noise Source ID	Noise Source Description	Source Type	Cadna Sound Library ID	Height Above Grade	Source Coordinates		Octave band sound power spectra (dB)								Overall dB	Overall dBA
				(m)	(x)	(y)	63	125	250	500	1K	2K	4K	8K		
Existing Sources																
FD1_GEN_EXH1	FD1 2.4 MW Generator Combustion Exhaust	Point	FD1_GEN_EXH	8.7	585143	6901251	139	145	141	133	127	120	109	102	147	136
FD1_GEN_EXH2	FD1 2.4 MW Generator Combustion Exhaust	Point	FD1_GEN_EXH	8.7	585143	6901249	139	145	141	133	127	120	109	102	147	136
FD1_GEN_INT1	FD1 2.4 MW Generator Intake	Point	FD1_GEN_INT	5.0	585138	6901251	113	116	116	114	113	112	106	100	122	118
FD1_GEN_INT2	FD1 2.4 MW Generator Intake	Point	FD1_GEN_INT	9.4	585141	6901246	113	116	116	114	113	112	106	100	122	118
FD1_BLD_DIS1	FD1 2.4 MW Building Discharge	Point	FD1_BLD_DIS	9.4	585155	6901262	104	108	108	106	106	105	99	92	114	111
FD1_BLD_INT1	FD1 2.4 MW Building Intake	Point	FD1_BLD_INT	9.4	585158	6901249	106	109	109	107	106	105	99	94	115	111
FD1_GEN_RAD1	FD1 2.4 MW Generator Radiator	Point	FD1_GEN_RAD6	2.0	585143	6901262	96.0	122.0	114.0	109.0	108.0	104.0	100.0	95.0	123	114
FD1_GEN_RAD2	FD1 2.4 MW Generator Radiator	Point	FD1_GEN_RAD6	2.0	585148	6901264	96.0	122.0	114.0	109.0	108.0	104.0	100.0	95.0	123	114
FD1_GEN_RAD3	FD1 2.4 MW Generator Radiator	Point	FD1_GEN_RAD6	2.0	585152	6901267	96.0	122.0	114.0	109.0	108.0	104.0	100.0	95.0	123	114
FD1_GEN_RAD4	FD1 2.4 MW Generator Radiator	Point	FD1_GEN_RAD6	2.0	585156	6901269	96.0	122.0	114.0	109.0	108.0	104.0	100.0	95.0	123	114
FD1_BLD_OUT1	FD1 2.4 MW Building Breakout Noise	V.Area	FD1_BLD_OUT	8.9	Varies	Varies	112.0	115.0	115.0	112.0	111.0	110.0	104.0	99.0	121	116
FD1_BLD_OUT2	FD1 2.4 MW Building Breakout Noise	V.Area	FD1_BLD_OUT	8.9	Varies	Varies	112.0	115.0	115.0	112.0	111.0	110.0	104.0	99.0	121	116
FD7_GEN_EXH1	FD7 2.8 MW Generator Combustion Exhaust	Point	FD7_GEN_EXH	7.5	585193	6901305	143.0	149.0	145.0	137.0	132.0	126.0	116.0	109.0	151	140
FD7_BLD_INT1	FD7 2.8 MW Building Intake	Point	FD7_BLD_INT	3.9	585177	6901293	108.0	112.0	112.0	110.0	110.0	109.0	103.0	96.0	118	115
FD7_BLD_INT2	FD7 2.8 MW Building Intake	Point	FD7_BLD_INT	3.9	585173	6901299	108.0	112.0	112.0	110.0	110.0	109.0	103.0	96.0	118	115
FD7_BLD_INT3	FD7 2.8 MW Building Intake	Point	FD7_BLD_INT	3.9	585190	6901308	108.0	112.0	112.0	110.0	110.0	109.0	103.0	96.0	118	115
FD7_BLD_INT4	FD7 2.8 MW Building Intake	Point	FD7_BLD_INT	3.9	585193	6901302	108.0	112.0	112.0	110.0	110.0	109.0	103.0	96.0	118	115
FD7_GEN_INT1	FD1 2.8 MW Generator Intake	Point	FD7_GEN_INT	4.8	585190	6901308	102.0	106.0	106.0	104.0	104.0	103.0	97.0	91.0	112	109
FD7_GEN_INT2	FD1 2.8 MW Generator Intake	Point	FD7_GEN_INT	4.8	585193	6901302	102.0	106.0	106.0	104.0	104.0	103.0	97.0	91.0	112	109
FD7_BLD_DIS1	FD1 2.8 MW Building Discharge Fan	Point	FD7_BLD_DIS	0.5	585182	6901298	107.0	110.0	110.0	109.0	109.0	108.0	102.0	95.0	117	114
FD7_BLD_DIS2	FD1 2.8 MW Building Discharge Fan	Point	FD7_BLD_DIS	0.5	585180	6901302	107.0	110.0	110.0	109.0	109.0	108.0	102.0	95.0	117	114
FD7_BLD_DIS3	FD1 2.8 MW Building Discharge Fan	Point	FD7_BLD_DIS	0.5	585187	6901300	107.0	110.0	110.0	109.0	109.0	108.0	102.0	95.0	117	114
FD7_BLD_DIS4	FD1 2.8 MW Building Discharge Fan	Point	FD7_BLD_DIS	0.5	585185	6901305	107.0	110.0	110.0	109.0	109.0	108.0	102.0	95.0	117	114
FD7_GEN_RAD1	FD7 2.8 MW Generator Radiator	Point	FD7_GEN_RAD4	2.0	585193	6901296	94.0	120.0	112.0	107.0	106.0	102.0	98.0	93.0	121	112
FD7_GEN_RAD2	FD7 2.8 MW Generator Radiator	Point	FD7_GEN_RAD4	2.0	585196	6901298	94.0	120.0	112.0	107.0	106.0	102.0	98.0	93.0	121	112
FD7_BLD_OUT1	FD7 2.8 MW Building Breakout Noise	V.Area	FD7_BLD_OUT	7.3	Varies	Varies	109.0	112.0	112.0	110.0	110.0	109.0	103.0	97.0	118	115
FD7_BLD_OUT2	FD7 2.8 MW Building Breakout Noise	V.Area	FD7_BLD_OUT	7.3	Varies	Varies	109.0	112.0	112.0	110.0	110.0	109.0	103.0	97.0	118	115
Future Sourcs due to Addition																
YM20_GEN_CAS	YM20 1.8 MW Generator Casing	Point	NEW_CAS	4.0	585144	6901238	106	115	106	97	90	89	87	91	116	103
YM21_GEN_CAS	YM21 1.8 MW Generator Casing	Point	NEW_CAS	4.0	585139	6901235	106	115	106	97	90	89	87	91	116	103
YM22_GEN_CAS	YM22 1.8 MW Generator Casing	Point	NEW_CAS	4.0	585134	6901233	106	115	106	97	90	89	87	91	116	103
YM23_GEN_CAS	YM23 1.8 MW Generator Casing	Point	NEW_CAS	4.0	585130	6901230	106	115	106	97	90	89	87	91	116	103
YM24_GEN_CAS	YM24 1.8 MW Generator Casing	Point	NEW_CAS	4.0	585125	6901228	106	115	106	97	90	89	87	91	116	103
YM25_GEN_CAS	YM25 1.8 MW Generator Casing	Point	NEW_CAS	4.0	585121	6901225	106	115	106	97	90	89	87	91	116	103
YM26_GEN_CAS	YM26 1.8 MW Generator Casing (Backup)	Point	NEW_CAS	4.0	585116	6901223	106	115	106	97	90	89	87	91	116	103

Project Name: Environmental Compliance Approval - Air and Noise
Site Name: FARO Power Station
WSP Job #: 191-02438-01

Table 3: Summary of Changes in Sound Levels between Existing and Future Sources due to Addition

Point of Reception ID	Point of Reception Description	Receptor Coordinates			Sound Impact at POR [1], dBA			
		X	Y	Z	Existing	Future	Change	Impact
R1	One Storey Army Barracks on Kitza Avenue	585198	6900873	1.5	58	58	<1	Insignificant
R2	One Storey Residence on Dawson Drive	585246	6900838	4.5	59	60	<1	Insignificant
R3	Three Storey Residence on Dawson Drive	585266	6900836	7.5	59	59	<1	Insignificant
R4	One Storey Army Barracks on Kitza Avenue	585402	6900986	1.5	59	60	<1	Insignificant
R5	One Storey Del Van Gorder School on 100 Bell Avenue	585650	6900629	1.5	48	48	<1	Insignificant
R6	One Storey Faro Health Centre on 447 Campbell Street	585616	6900454	1.5	46	46	<1	Insignificant

Notes:

[1] Worst-case one hour equivalent sound level from all applicable sources operating in dBA as per scenarios listed in noise report.

APPENDIX

C MANUFACTURER SPECIFICATION

AIR EMISSIONS PERMIT (NO. 60-010)
AMENDMENT APPLICATION
SUPPORTING DOCUMENT

ATTACHMENT B

EPA APPROVED TIER 2
3516C CATERPILLAR ENGINE
GENERATOR SPECIFICATIONS

September 2020

yukon energy

CATERPILLAR®

Image shown may not reflect actual package

STANDBY 2000 kW
PRIME 1825 kW
POWER MODULE
50/60 Hz

Frequency	Voltage	Standby kW (kVA)	Prime kW (kVA)
60	480/277V	2000 (2500)	1825 (2281)
50	400V	1440 (1800)	1310 (1638)

FEATURES

EPA TIER 2 and CARB certified for non-road mobile applications. Factory designed, certified prototype tested with torsional analysis. Production tested and delivered in a package that is ready to be connected to your fuel and power lines. Supported 100% by your Caterpillar® dealer with warranty on parts and labor. Extended warranty available in some areas. The generator set is designed and manufactured in an ISO 9001:2000 compliant facility. Generator set and components meet or exceed the following specifications: AS1359, AS2789, ABGSM TM3, BS4999, DIN6271, DIN6280, EGSA101P, JEM1359, IEC 34/1, ISO3046/1, ISO8528, NEMA MG1-22

CATERPILLAR SR4B GENERATOR

Single bearing, wye-connected, static regulated, brushless permanent magnet excited generator designed to match the performance and output characteristics of the Caterpillar diesel engine driving it.

RELIABLE, FUEL EFFICIENT DIESEL ENGINE

The compact, four-stroke-cycle diesel engine combines durability with minimum weight while providing dependability and economy. The fuel system operates on a variety of fuels.

CATERPILLAR COOLING SYSTEM

Sized compatible to rating with energy efficient fan and core.

CATERPILLAR SWITCHGEAR

Provides single unit and/or multi-unit/utility paralleling components. Standby, load sense/load demand, import, export, and base load modes. Comes standard with Basler Utility Multi-function Relay IPS-100.

EXCLUSIVE CATERPILLAR DIGITAL VOLTAGE REGULATOR (CDVR)

Three-phase sensing and adjustable Volts-per-Hertz regulation give precise control, excellent block loading, and constant voltage in the normal operating range.

ENVIRONMENTALLY FRIENDLY

110% spill containment of onboard engine fluids.

SOUND ATTENUATED CONTAINER

For ease of transportation and protection. Meets 75 dB(A) at 50 ft or below per SAE J1074 measurement procedure at 110% prime load.

FACTORY INSTALLED STANDARD EQUIPMENT

SYSTEM	STANDARD EQUIPMENT
Engine	EPA approved Tier 2 3516C Caterpillar engine Heavy duty air cleaner with service indicator 60-Amp charging alternator Fuel filters – primary and duplex secondary with integral water separator and change-over valve Lubricating oil system with spin-on, full flow oil filters and water cooled oil cooler Oil drain lines routed to engine rail Jacket water heater Fuel cooler and priming pump Electronic ADEM™ A3 controls 24V electric starting motors with battery rack and cables
Generator	SR-4B brushless, permanent magnet excited, three-phase with Caterpillar digital voltage regulator (CDVR), space heater, 6-lead design, Class H insulation operating at Class F temperature for extended life, winding temperature detectors and anti-condensation space heaters (120/240V 1.2 kW)
Containerized Module	40' ISO high cube container, CSC certified 3-axle, 40' ISO container chassis Seven (7) sound attenuated air intake louvers and 4 lockable personnel doors with panic release Side bus bar access door, external access load connection bus bars Shore power connection via distribution block connections for jacket water heater, battery charger, space heaters, and generator condensate heaters Standard lighting 3 AC/4 DC, one (1) single duplex service receptacle, 2 external break-glass emergency stop push buttons 1,250 gal fuel tank, UL listed, double wall, 9 hr runtime @ prime rating Sound attenuated 75 dB(A) @ 50 ft Spill containment 110% of all engine fluids Four (4) oversized maintenance-free batteries, battery rack and 20-Amp battery charger Hospital grade, internally insulated, rectangular exhaust silencer with vertical discharge Vibration isolators, corrosion resistant hardware and hinges External drain access to standard fluids Fire extinguishers (Qty 2) Standard Cat rental decals and painted standard Cat power module white Interior walls and ceilings insulated with 100 mm of acoustic paneling Floor of container insulated with acoustic glass and covered with galvanized steel
Cooling	Standard cooling provides 43° C ambient capability (60 Hz) at prime +10% rating Vertically mounted, separate ATAAC and JW cores with vertical air discharge
Generator Paralleling Control	Custom switchgear control with EMCP 3.3 genset mounted controller and wall mounted paralleling controls Automatic start/stop with cool down timer Protections: 25, 27/59, 40, 32, 81 O/U Utility multi-function relay protections: 25,27/59, 32, 47, 50/51, 62, 67, 81 O/U UMR is IEEE1547-2003 compliant in most applications Reverse compatibility module provided for interface to legacy power modules Touch screen controls with event log Multi-mode operation (island, multi-island and utility parallel), load sharing (multi-unit only) Import & export control (utility parallel only), manual and automatic paralleling capability Touch screen display (status and alarms) Metering display: voltage, current, frequency, power factor, kW, WHM, kVAR, and synchroscope
Quality	Standard genset and package factory tested UL, NEMA, ISO and IEEE standards O&M manuals

SPECIFICATIONS

CAT SR4B GENERATOR

Frame Size 825
Pitch 0.6667
No. of poles 4
Excitation ..... Static regulated brushless PM excited
Constructions ..... Single bearing, close coupled
Insulation ..... Class H
Enclosure ..... Drip proof IP22
Alignment ..... Pilot shaft
Overspeed capability – % of rated ..... 125% of rated
Voltage regulator ..... 3 phase sensing with Volts-per-Hertz
Voltage regulation ..... Less than ± ½% voltage gain
Adjustable to compensate for engine speed droop and line loss
Wave form deviation ..... Less than 5% deviation
Telephone Influence Factor (TIF) ..... Less than 50
Harmonic Distortion (THD) ..... Less than 5%

CAT 3516C DIESEL ENGINE

3516C, 4-Stroke diesel
Bore – mm (in) 170 (6.7)
Stroke – mm (in) 190 (7.5)
Displacement – L (cu in) 69 (4,210)
Compression ratio 15:1
Aspiration ..... ATAAC
Fuel system ..... EUI
Governor type ..... Caterpillar ADEM™ A3 Control System

TECHNICAL DATA

Materials and specifications are subject to change without notice.

Generator Set Technical Data		50 Hz		60 Hz	
	Units	Prime	Standby	Prime	Standby
Performance Specification		DM8754		DM8264	
Power Rating	kW (kVA)	1310 (1637)	1440 (1800)	1825 (2281)	2000 (2500)
Lubricating System					
Oil pan capacity	L (gal)	401.3 (106)		401.3 (106)	
Fuel System					
Fuel Consumption					
100% load	L (gal)	350.1 (92.5)	372.9 (98.5)	483.2 (127.6)	525.7 (138.9)
75% load	L (gal)	281.9 (74.5)	302.8 (80)	380 (100.4)	408.2 (107.8)
50% load	L (gal)	205.5 (54.3)	350.1 (92.4)	270.5 (71.5)	294.2 (77.7)
Fuel tank capacity	L (gal)	4731 (1,250)		4731 (1,250)	
Running time @ 75% rating	Hours	16.7	15.6	12.5	11.5
Cooling System					
Radiator coolant capacity including engine	L (gal)	630 (166)		630 (166)	
Air Requirements					
Combustion air flow	m³/min (cfm)	114.8 (4052)	118.1 (4173)	174.7 (6169)	180.3 (6367)
Maximum air cleaner restriction	kPa (in H_2O)	6.2 (24.9)		6.2 (24.9)	
Generator cooling air	m³/min (cfm)	140 (5,933)		168 (4,995)	
Exhaust System					
Exhaust flow at rated kW	m³/min (cfm)	311.3 (10,993)	320.8 (11,335)	404 (14,260)	428.6 (15,137)
Exhaust stack temperature at rated kW – dry exhaust	°C (°F)	502.1 (935.8)	513.1 (955.6)	387 (728)	405 (762)
Noise Rating (with enclosure)					
@ 7 meters (23 feet)	dB(A)	77	78	78	79
@15 meters (50 feet)	dB(A)	73	74	74	75

Model	Length mm (in)	Width mm (in)	Height mm (in)	Weight	
				With Lube Oil and Coolant kg (lb)	With Fuel, Lube Oil and Coolant kg (lb)
XQ2000 w/o Chassis	12 192 (480)	2438 (96)	2896 (114)	34 019 (75,000)	38 102 (84,000)
XQ2000 w/Chassis	12 192 (480)	2438 (96)	4267 (168)	38 102 (84,000)	42 184 (93,000)

RATING DEFINITIONS

Standby – Applicable for supplying continuous electrical power (at variable load) in the event of a utility power failure. No overload is permitted on these ratings. The generator on the generator set is peak prime rated (as defined in ISO8528-3) at 30° C (86° F).

Prime – Applicable for supplying continuous electrical power (at variable load) in lieu of commercially purchased power. There is no limitation to the annual hours of operation and the generator set can supply 10% overload power for 1 hour in 12 hours.

STANDARD FEATURES

GENERATOR SET EMCP 3.3 LOCAL CONTROL PANEL

- Generator mounted EMCP 3.3 provides power metering, protective relaying and engine and generator control and monitoring.
- Provides MODBUS datalink to paralleling control for monitoring of engine parameters.
- Convenient service access for Caterpillar service tools (not included).
- Integration with the CDVR provides enhanced system monitoring.
- Ability to view and reset diagnostics of all controls networked on J1939 datalink.
- Network modules via the control panel removes the need for a separate service tool for troubleshooting.
- Real-time clock allows for date and time stamping of diagnostics and events.

EMCP 3.3 ENGINE OPERATOR INTERFACE

- Graphical display with positive image, transflective LCD, adjustable white backlight/ contrast.
- Two LED status indicators (1 red, 1 amber).
- Three engine control keys and status indicators (Run/Auto/Stop).
- Lamp test key.
- Alarm acknowledgement key.
- Display navigation keys.
- Two shortcut keys: Engine Operating Parameters and Generator Operating Parameters.
- Fuel level monitoring and control.

CIRCUIT BREAKER

- 3000A fixed type, 3 poles, genset mounted, electrically operated, insulated case circuit breaker.
- Solid state trip unit for overload (time overcurrent) and fault (instantaneous) overcurrent protection.
- Includes DC shunt trip coil activated on any monitored engine or electrical fault, 100 KA-interrupting capacity at 480 VAC.

VOLTAGE REGULATION AND POWER FACTOR CONTROL CIRCUITRY

- Generator mounted automatic voltage regulator, microprocessor based.
- Manual raise/lower voltage adjust capability and VAR/power factor control circuitry for maintaining constant generator power factor while paralleled with the utility.
- Includes RFI suppression, exciter limiter and exciter diode monitoring.
- Voltage and power factor adjustments are performed on the setting screen of the HMI touch screen.

FUEL TANK

- UL Listed 1250 gallon double walled.
- Fuel transfer system

CURRENT TRANSFORMERS

- CT's rated 3000:5 with secondaries wired to shorting terminal strips.

POTENTIAL TRANSFORMERS

- 4:1 ratio with primary and secondary fuse protection.

BUS BARS

- Three phase, plus full rated neutral, bus bars are tin-plated copper with NEMA standard hole pattern for connection of customer load cables and generator cables.
- Bus bars are sized for full load capacity of the generator set at 0.8 power factor.
- Includes ground bus, tin-plated copper, for connection to the generator frame ground and field ground cable.

AC DISTRIBUTION

- Provides 240 VAC for all module accessories.
- Includes controls to de-energize jacket water heaters and generator space heater when the engine is running.

SHORE POWER TWO (2)

- One (1) shore power connection distribution block for jacket water heaters.
- One (1) for generator space, battery charger, and fuel pump.

INTERNAL LIGHTING

- Four (4) internal DC lights with one (1) timer and two switches installed at each side of the container door.
- Three (3) internal AC lights.
- One (1) single duplex service receptacle.

BATTERY CHARGER AND BATTERIES

- 24 VDC/20A battery charger with float/equalize modes and charging ammeter.
- Maintenance free batteries.

EMERGENCY STOP PUSHBUTTON

- Two external ESPs located near each access door.

MODES OF OPERATION

Caterpillar utility paralleling controls are intended for automatic or manual paralleling with a utility power source as a load management system, with provisions for standby operation feeding an isolated load network. Load management operation involves microprocessor-based automatic loading controls with soft loading, base load, Import/Export control and soft unloading. For Standby operation, the generator operates as an isochronous machine isolated from the utility supply. The controls allow for automatic operation, initiated locally or remotely by the customer's SCADA system. Detailed modes of operation are listed below:

SINGLE UNIT ISLAND AND MULTI-UNIT ISLAND OPERATION

1. Utility Standby Mode (Normal)
   a. The utility is providing power for the plant loads.
   b. The Power Module Generator breaker is open.
   c. The pm is in automatic standby mode to respond to a utility failure.
2. Emergency Mode (Emergency)
   a. Utility Failure
      1) The customer protective relaying senses a utility abnormal condition.
      2) A run request is sent to the Power Module Generator plant.
      3) The first Power Module Generator reach rated to voltage and frequency is closed to the bus.
      4) In Multi-Unit Island Mode, the remaining Power Module Generators are paralleled to the bus as they reach rated voltage and frequency. This function is performed via the ModBus Plus data link connected between the Power Modules.
      5) Plant load is transferred to the Power Modules, which share load equally via ModBus Plus data link.
      6) The system is now in Emergency Mode.

GENERATOR DEMAND PRIORITY CONTROL

The System Controls include a Generator Demand Priority Control function to automatically match the on-line Power Module Generator capacity to the loads in order to avoid unnecessary operation of all the Power Module Generators when the plant loads are low.

The following controls are provided for each Power Module Generator:

a. User-settable Generator Priority Selector
b. Status indicator for the Generator Priority selected
c. Status indicator for Power Module Generator on-line or off-line
d. Generator Demand Priority Control Switch (On/Off)
e. User-settable Generator Remove Level (% as a function of single generator capacity)
f. User-settable Generator Remove Time Delay
g. User-settable Generator Add Level (% as a function of single generator capacity)
h. User-settable Generator Add Time Delay

Upon entrance into Emergency Mode, all generators will be started and paralleled to the bus. After the Remove Time Delay, Power Module Generators will be removed from the bus as a function of the generator percentage loading. Generators will be removed from the bus in descending priority order.

Should the generator percentage loading increase to the user-selected Generator Add Level after the user-selected Generator Add Time Delay, the next priority generator will be started, synchronized and paralleled to the bus. Should the Power Module Generator plant ever reach 100% loading, the next priority generator will be started and added to the bus, bypassing the Generator Add Time Delay.

MODES OF OPERATION (continued)

SINGLE UNIT IMPORT, EXPORT OR BASE LOAD OPERATION

During periods of peak demand the system may be placed in operation using the operator interface panel on the front of the switchgear.

1. Entry – Local
   a. The operator places the System Control Switch into Load Management.
   b. The operator selects Import, Export or Base Load Operation.
   c. The Load Management Setpoint is the amount of power Imported, Exported or Base-Loaded. A 4-12-20mA signal is provided by the customer and is linearly proportional to the utility load, with 12mA equaling 0 kW. The 4-12-20mA utility load signal is wired to one and only one Power Module. If the Power Module selected for Load Management is not available, the 4-12-20mA signal will be routed to a different Power Module.
   d. The operator sets the Load Management Setpoint and Power Factor Setpoint.
   e. A Run request signal is received by the Single Unit Power Module.
   f. The Power Module Generator is started and will run for a predetermined warm-up time before it is synchronized and paralleled to the utility.
   g. When the generator is on the bus, it is soft-ramp-loaded until the generator output reaches the Load Management Setpoint.
   h. The generator output is dynamically adjusted to maintain the Load Management Setpoint.
   i. Should the utility fail during Load Management Operation, the Protective Relay will cause the Paralleling Circuit Breaker 52G to open and be locked out until the Lockout Relay is manually reset by an operator on site. The generator is allowed to run for the duration of the cooldown time.
2. Exit – Local
   a. The Run Request signal is removed from the power module.
   b. The generator is soft-ramp-unloaded until the plant load is fully supported by the utility.
   c. The Paralleling Circuit Breaker 52G is opened.
   d. The generator is allowed to run for the duration of the cooldown time.

STANDARD PARALLELING CONTROL

GENERATOR PARALLELING CONTROLS

The switchgear includes:

- Single unit island mode.
- Multiple unit island mode.
  - Includes Load Sense/Load Demand control.
  - Load sharing capability is provided via network communication.
- Single unit utility parallel mode.
  Selectable for Import/Export control.
  If import or export control is selected a 4-12-20mA signal is required (provided by others) scalable to the utility contribution.
- 6 inch black and white HMI touch screen.
- Reverse compatibility module provided for interface to legacy designed Power Module Switchgear. Includes PLC, load share and voltage droop.

Incoming Utility Breaker Status Circuit – Circuit to accept customers contact from remote utility disconnect device. Customer to provide a normally open form 'a' contact to indicate when the local load network is connected to the utility grid.

Utility Transfer Trip Circuit – Circuit accepts input (normally open dry contact) from customer's system protective relay(s) or other controlling device. Operation of contacts causes tripping of the generator circuit breaker via the generator (software) 86 lock-out function and places the engine in cooldown mode. Circuit is disabled when operating in single unit or multiple unit island.

GENERATOR PARALLELING CONTROLS OPERATOR INTERFACE

Graphical mimic one line diagram that shows generator with its respective circuit breaker in a one-line representation of the system. The graphics utilize black and white indicators and bar graphs while actively displaying the following information:

- Utility CB Open/Closed. Input contacts provided by others.
- Utility kW 4-12-20mA signal required and provided by customer that is scalable to the utility contribution.
- Generator CB Open/Closed/Tripped.
- Generator Volts/Amps/kW/Frequency.
- Engine Stopped/Running/Cooldown/Pre-Alarm/Shutdown.
- Engine ECS Position Stop/Auto/Run.
- Utility Output kW.
- System Summary Alarm.

Event logging is also included with up to 500 stored events.

GENERATOR METERING AND PROTECTION

Generator metering that will graphically display 3Ø Voltage, 3Ø Current, Frequency, Power Factor, kW, kVAR and a Synchroscope Display of EMCP 3.3 faults, CDVR or ADEM 3 will be provided via Modbus RTU interface to EMCP 3.3.

Generator/Intertie Protective Relaying including:

- Device 27/59 – Under/Over Voltage.
- Device 81O/U – Under/Over Frequency.
- Device 40 – Loss of Excitation.
- Device 32 – Reverse Power.
- Device 25 – Synchronizing Check.
- Device 15 – Auto Synchronizer.
- Device 65 – Governor Load Sharing, Soft Loading Control.
- Device 90 – VAR/PF and Cross Current Compensation Controller.

PROGRAMMING AND DIAGNOSTICS

Includes field programmable set points for engine control and monitoring variables and self-diagnosis of the EMCP 3.3 system component and wiring failures.

ENGINE CONTROL SWITCH

Keypad selectable, four (4) positions – Off, Auto, Man, Cool:

- Off for engine shutdown and resetting faults.
- Auto for local or remote automatic operation when initiated by switch operation or contact closure.
- Man for local starting and manual paralleling.
- Cool for normal engine shutdown with timed cool-down cycle.

CIRCUIT BREAKER CONTROL SWITCH

Heavy duty, three- (3) position spring return to center with momentary trip and close position and slip contacts for automatic closing. Includes circuit breaker position indicating lamps.

EMERGENCY STOP PUSHBUTTON

- Mushroom head, twist to reset, causes engine shutdown and tripping of the generator circuit breaker. Prevents engine starting when depressed.

STANDARD PARALLELING CONTROL (continued)

ELECTRONIC LOAD SHARING GOVERNOR

- Includes speed adjustment, and auto load share capability when in parallel with legacy power modules.

ALARM MODULE

- Dedicates annunciator screens for warning and shutdown faults. Includes external mounted horn and acknowledge push-button.

AUTOMATIC/MANUAL PARALLELING

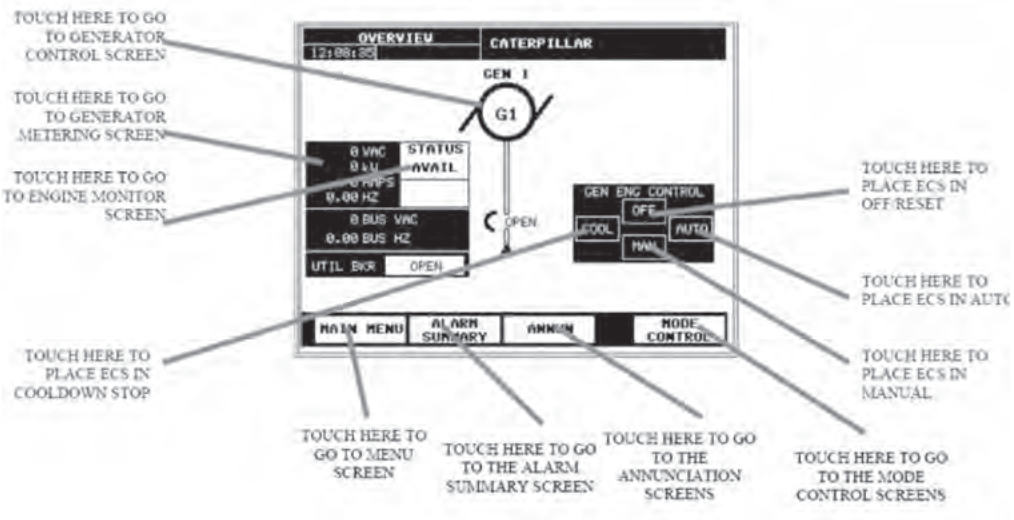
- Automatically synchronizes and parallels the generator with another power source.
- Includes provisions for manual permissive paralleling.

HUMAN MACHINE INTERFACE (HMI) HIGHLIGHTS

- Engine/Generator function is performed thru the 6" HMI touch screen interface.

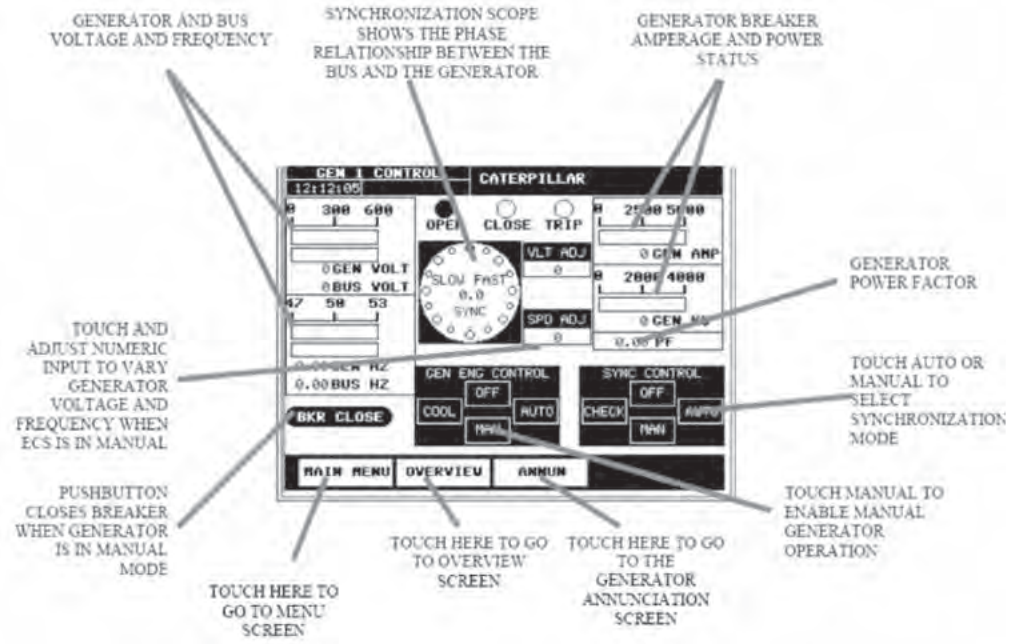
Overview Screen (Typical)

Shows the generator status, generator metering data, bus metering data, ECS position, and generator/utility breaker status.

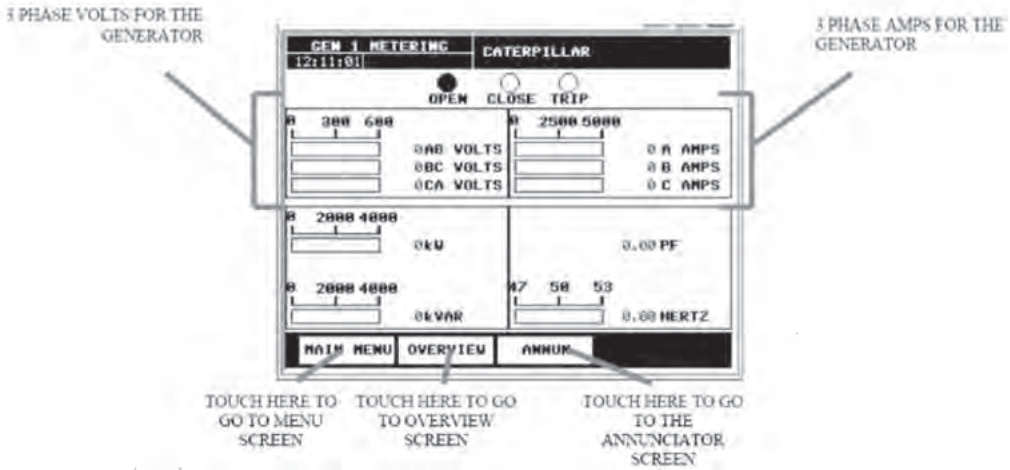


STANDARD PARALLELING CONTROL (continued)

Generator Control Screen (Typical)
It allows the operator to observe the automatic synchronization and transfer of the load to and from the generator. Engine control allows the operator to run the engine in manual, or switch to automatic modes. Voltage and frequency offset adjustment allows the operator to control generator frequency and voltage.



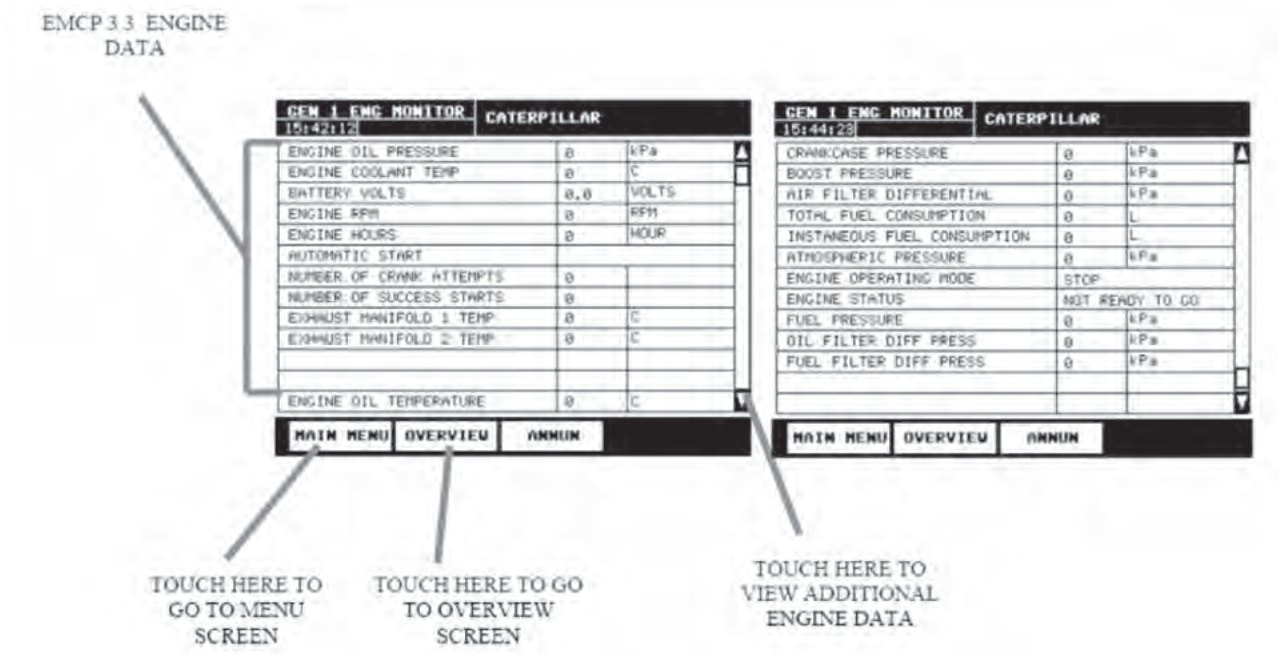
Generator Metering Screen (Typical)
Allows the operator to view three phases of voltage and amperage for the bus and the generator.



STANDARD PARALLELING CONTROL (continued)

Engine Monitoring Screen (Typical)

Engine status is obtained directly from the EMCP 3. Engine starts and total hours can be used by the operator to determine when regular preventive maintenance is required. Other metering includes engine battery and oil filter health.



GEN SET PACKAGE PERFORMANCE DATA [DM8266]

Performance Number: DM8266

Sales Model: 3516CDITA	**Combustion:** DI	**Aspr:** TA
Engine Power: 2500 W/F EKW 2593 W/O F EKW 3,622 HP	**Speed:** 1,800 RPM	**After Cooler:** ATAAC
Manifold Type: DRY	**Governor Type:** ADEM3	**After Cooler Temp(F):** 122
Turbo Quantity: 4	**Engine App:** GP	**Turbo Arrangement:** Parallel
Hertz: 60	**Engine Rating:** PGS	**Strategy:**
Rating Type: STANDBY	**Certification:** EPA TIER-2 2006 -	

General Performance Data

GEN W/F EKW	PERCENT LOAD	ENGINE POWER BHP	ENGINE BMEP PSI	FUEL RATE LB/BHP-HR	FUEL RATE GPH	INTAKE MFLD TEMP DEG F	INTAKE MFLD P IN-HG	INTAKE AIR FLOW CFM	EXH MFLD TEMP DEG F	EXH STACK TEMP DEG F	EXH GAS FLOW CFM
2,500.0	100	3604	333	0.337	173.3	122.0	78.2	6,992.3	1,236.7	921.9	19,048.8
2,250.0	90	3256	301	0.337	156.7	119.3	71.3	6,600.3	1,190.3	889.0	17,516.1
2,000.0	80	2911	269	0.341	141.9	117.0	64.3	6,183.6	1,159.0	871.0	16,167.1
1,875.0	75	2738	253	0.344	134.6	115.9	60.8	5,961.1	1,145.8	864.7	15,506.7
1,750.0	70	2566	237	0.347	127.3	114.6	57.1	5,731.6	1,133.6	859.6	14,846.3
1,500.0	60	2223	205	0.355	112.8	112.8	49.6	5,254.8	1,112.0	853.0	13,522.0
1,250.0	50	1880	174	0.366	98.4	111.0	41.5	4,739.2	1,091.7	848.5	12,144.7
1,000.0	40	1545	143	0.375	82.8	109.4	31.8	4,075.3	1,062.9	848.1	10,439.0
750.0	30	1203	111	0.387	66.5	108.0	22.0	3,404.3	1,012.8	837.9	8,627.4
625.0	25	1029	95	0.396	58.2	107.2	17.4	3,086.5	970.9	818.2	7,702.1
500.0	20	854	79	0.406	49.5	106.3	12.9	2,772.2	905.7	782.2	6,723.9
250.0	10	496	46	0.443	31.4	104.2	4.8	2,193.0	702.9	643.5	4,693.3

Heat Rejection Data

GEN W/F EKW	PERCENT LOAD	REJ TO JW BTU/MN	REJ TO ATMOS BTU/MN	REJ TO EXHAUST BTU/MN	EXH RCOV TO 350F BTU/MN	FROM OIL CLR BTU/MN	FROM AFT CLR BTU/MN	WORK ENERGY BTU/MN	LHV ENERGY BTU/MN	HHV ENERGY BTU/MN
2,500.0	100	47,202	9,156	140,924	75,921	18,596	43,392	152,866	371,872	396,156
2,250.0	90	44,245	8,587	127,047	67,163	16,833	38,046	138,080	336,328	358,280
2,000.0	80	41,458	8,303	115,901	60,566	15,241	33,155	123,408	304,481	324,386
1,875.0	75	40,093	8,189	110,555	57,609	14,445	30,767	116,128	288,899	307,780
1,750.0	70	38,672	8,076	105,266	54,766	13,649	28,321	108,792	273,260	291,117
1,500.0	60	35,885	7,791	94,916	49,420	12,113	23,601	94,233	242,152	257,962
1,250.0	50	32,871	7,564	84,566	44,074	10,578	18,824	79,732	211,101	224,864
1,000.0	40	29,515	7,336	72,566	37,762	8,872	13,478	65,514	177,718	189,320
750.0	30	25,648	6,881	59,258	30,823	7,109	8,474	51,012	142,743	152,070
625.0	25	23,544	6,597	52,150	26,729	6,256	6,426	43,676	124,886	133,019
500.0	20	21,156	6,142	44,245	22,009	5,289	4,550	36,169	106,119	113,057
250.0	10	15,867	5,118	27,525	11,601	3,355	1,763	21,042	67,277	71,656

MECHANICAL Sound Data: 23.0 FEET

GEN W/F EKW	PERCENT LOAD	OVERALL SOUND DB(A)	OBCF 63HZ DB	OBCF 125HZ DB	OBCF 250HZ DB	OBCF 500HZ DB	OBCF 1000HZ DB	OBCF 2000HZ DB	OBCF 4000HZ DB	OBCJ 8000HZ DB
2,500.0	100	103	107	116	107	98	91	90	88	92
2,250.0	90	103	107	116	107	98	91	90	88	92
2,000.0	80	103	107	116	107	98	91	90	88	92
1,875.0	75	103	107	116	107	98	91	90	88	92
1,750.0	70	103	107	116	107	98	91	90	88	92
1,500.0	60	103	107	116	107	98	91	90	88	92
1,250.0	50	103	107	116	107	98	91	90	88	92
1,000.0	40	103	107	116	107	98	91	90	88	92
750.0	30	103	107	116	107	98	91	90	88	92
625.0	25	103	107	116	107	98	91	90	88	92
500.0	20	103	107	116	107	98	91	90	88	92
250.0	10	103	107	116	107	98	91	90	88	92

MECHANICAL Sound Data: 49.2 FEET

GEN W/F EKW	PERCENT LOAD	OVERALL SOUND DB(A)	OBCF 63HZ DB	OBCF 125HZ DB	OBCF 250HZ DB	OBCF 500HZ DB	OBCF 1000HZ DB	OBCF 2000HZ DB	OBCF 4000HZ DB	OBCF 8000HZ DB
2,500.0	100	97	100	110	100	91	85	85	82	86
2,250.0	90	97	100	110	100	91	85	85	82	86
2,000.0	80	97	100	110	100	91	85	85	82	86
1,875.0	75	97	100	110	100	91	85	85	82	86
1,750.0	70	97	100	110	100	91	85	85	82	86
1,500.0	60	97	100	110	100	91	85	85	82	86
1,250.0	50	97	100	110	100	91	85	85	82	86
1,000.0	40	97	100	110	100	91	85	85	82	86
750.0	30	97	100	110	100	91	85	85	82	86
625.0	25	97	100	110	100	91	85	85	82	86
500.0	20	97	100	110	100	91	85	85	82	86
250.0	10	97	100	110	100	91	85	85	82	86

Appendix D: Noise Monitoring at Faro Generating Station

Hemmera Envirochem Inc.
18th Floor, 4730 Kingsway
Burnaby, BC V5H 0C6
T: 604.669.0424
F: 604.669.0430
hemmera.com

May 31, 2021
File No. 105655-01

Yukon Energy Corporation
2 Miles Canyon Road
Whitehorse, YT Y1A 6S7

Attention: Travis Ritchie, Manager – Environment, Assessment & Licensing

Re: Noise Monitoring at Faro Generating Station

Hemmera Envirochem Inc. (Hemmera), a wholly owned subsidiary of Ausenco Engineering Canada Inc. (Ausenco) was retained by Yukon Energy Corporation to conduct noise monitoring at the Faro Generating Station (the Facility). This report summarizes the approach and findings of the noise monitoring.

1.0 BACKGROUND

The Facility operates under Air Emissions Permit 60-010 issued by Yukon Environment and is authorized to operate diesel generators up to a maximum capacity of 10.6 MW. The Facility operates two main generators (FD1 and FD7) with a combined rated capacity of 8.5 MW and a combined normal operating capacity of 5.2 MW. Yukon Energy Corporation is planning to expand generating capacity at the Facility with six rental diesel generating units (YM20 to YM26) with a combined generating capacity of 10.3 MW, to provide a total generating capacity of 15.5 MW.

A noise impact assessment was conducted for the Facility in support of a permit amendment application with Yukon Environment. Yukon Energy Corporation would like noise monitoring at the Facility to compare actual noise levels with modelled levels from the noise impact assessment.

2.0 METHODS

Given the current authorized operating limit of 10.6 MW, noise monitoring of the Facility was conducted on March 10-11, 2021 for two operating scenarios:

1. Operation of the two main generators FD1 and FD7
2. Operation of the six rental generating units YM20 to YM26

For each of the two operating scenarios, short-term noise monitoring (approximately 5 to 10 minutes in duration) was conducted at the southwest corner of the Facility and at a nearby residence located at 130 Dawson Drive. Noise monitoring was conducted using a Larson Davis 831 sound level meter which meets the requirements of IEC 61672-1:2002 for Class 1 performance.

To determine the contribution of baseline noise levels to measured noise levels at 130 Dawson Drive, 24-hour noise monitoring was conducted when no diesel generators were operating at the Facility.

In addition, short-term noise monitoring was conducted at a distance of 7 m from the rental generating units to compare actual noise levels with manufacturer specifications.

3.0 RESULTS

Results of the noise monitoring are summarized in **Table 1**. Actual noise levels, without baseline contribution, for the existing case (FD1 and FD7 only) and the future case (existing case plus six rental diesel generating units) were calculated based on the measured noise levels and compared to modelled noise levels in **Table 2**.

Actual noise levels at both the southwest corner and at 130 Dawson Drive appear to be considerably lower than modelled noise levels from the noise impact assessment. Noise modelling is expected to provide a conservative estimate of worst-case noise levels, assuming all receptors are downwind of the source. Modelling of the two main generators FD1 and FD7 also included noise from multiple sources including the generator intake and exhaust, radiator fan, and building breakout noise. Details on the derivation of sound power levels for each of these sources were not provided in the noise impact assessment but is expected to be conservative. Modelling also may not include attenuation from terrain features and vegetation.

Noise monitoring results suggest that the change in noise levels associated with the six diesel generating units may be greater than that indicated in the noise impact assessment. Measured noise levels at a distance of 7 m from the generating unit was 81.0 to 83.8 dBA, a perceptible difference above the manufacturer specification of 78.0 dBA used in the noise modelling. The change in noise levels at nearby receptors is expected to remain below the 3 dB threshold for a perceptible change.

Table 1 Noise Monitoring Results

Location	Baseline	Scenario 1	Scenario 2
Southwest corner (fenceline)	-	60.6	72.2 [(b)]
130 Dawson Drive	39.4 [(a)]	42.8	41.7

Notes:

All values are in dBA.

[(a)] Reflects daytime (07:00 to 22:00) noise levels, with noticeable spikes from sirens, human activity etc. removed.

[(b)] Usable duration was only 7 seconds due to equipment malfunction and may not be representative of average noise levels.

Table 2 Comparison of Actual and Modelled Noise Levels

Case	Southwest Corner (Fenceline)		130 Dawson Drive	
	Actual	Modelled	Actual	Modelled [a]
Existing (FD1 and FD7)	60.6	Approx. 70	40.1	58
Future (Existing plus YM20 to YM26)	72.5 [b]	Approx. 70	42.2	58
Change	11.9 [b]	<1	2.1	<1

Notes:

All values are in dBA.

[a] Modelled values are provided for R1 located two buildings from 130 Dawson Drive.

[b] Value may not be representative of actual noise levels due to equipment malfunction.

4.0 CONCLUSIONS

Actual measured noise levels from the Facility for both the existing units and the additional rental units were measurably lower than modelled noise levels in the noise impact assessment previously completed at a desktop level. Measurements confirmed the modelling results that noise levels at nearby receptors do not perceptibly increase with the addition of the six rental units from existing conditions with the two main units (i.e., no perceptible changes with the site expansion to 15.5 MW). This represents a satisfactory confirmation of the previous findings of the noise impact assessment that the proposed site expansion in generating capacity does not result in any significant adverse effects.

5.0 CLOSURE

We have appreciated the opportunity of working with you on this project and trust that this report is satisfactory to your requirements. Please feel free to contact the undersigned regarding any questions or further information that you may require.

Report prepared by:
Hemmera Envirochem Inc.

Nancy Chan, B.A.Sc., P.Eng.
Acoustic Specialist
604.669.0424 (143)
nchan@hemmera.com

Mark Milner, M.Eng., P.Eng.
Project Director
604.669.0424 (145)
mmilner@hemmera.com

Appendix E: Dena Cho Environmental Ltd. YESAA Project Proposal Technical Review Report

Dena Cho
Environmental and Remediation Inc.
A Dena Nezziddi Development Corp. Company

Suite 201 – 208 Main St.
Whitehorse, YT
Y1A 2A9

To: Travis Richie, Manager - Environment, Assessment, & Licensing

From: Dena Cho Environmental and Remediation Inc.

Date: August 11, 2021

Re: Faro Generating Station - Capacity Expansion Project – Review of Draft YESAA Project Proposal and Supporting Documents (June 2021)

File: 21-07-30 - YEC YESAB Review - FINAL

1. PROJECT SUMMARY

Yukon Energy Corp. (YEC) has recently contracted Dena Cho Environmental and Remediation Inc. (Dena Cho) to review YEC's draft YESAB application, titled "Faro Generating Station - Capacity Expansion Project" (the Project) proposal, currently in the draft phase of development and yet to be submitted to the Yukon Online Registry.

1.1. LIMITATIONS

This briefing note is intended to provide YEC with a high-level technical overview of the Project. Our review of the Project pertains only to the information and documents Dena Cho was able to obtain from Travis Richie, Manager – Environment, Assessment, & Licensing, as of June 28, 2021 (at 1600 hours). Any information developed by YEC after this period has not been reviewed and therefore not included in the review of this briefing note.

It is also important to note the following disclaimer, in that "**Dena Nezziddi Development Corporation, Dena Nezziddi Limited Partnership and Dena Cho Environmental and Remediation Inc. ("the Companies") are a subsidiary of Ross River Dena Council ("RRDC"), providing services throughout the Yukon Territory and Northern British Columbia. Please be advised that while the Companies are a subsidiary of RRDC, contracting or otherwise procuring services from the Companies should not be interpreted as explicit support for a project by RRDC. Contracts with the Companies should not be proffered as evidence of such support to any third-party. The Companies encourages contractors and developers seeking support for projects to contact RRDC directly.**"

1.2. SCOPE OF REVIEW

Dena Cho's review only pertains to the following documents:

- App_A_Air Emmissions Permit 60-010 Amendment 2.pdf
- App_B_WSP_2020_Air Dispersion Modelling for Faro Facility 20201217.pdf
- App_C_WSP_2021_NoiseImpactAssessment_Faro.pdf
- App_D_Faro Noise Monitoring_Final_v2_210531_.pdf
- Faro Diesel_YESAA_Supporting Document 2021.06.28docx

The following sections are intended to highlight specific technical issues within each document. The format will be presented to highlight the issue, provide rationale for our concern, and provide recommendations. The intent is to offer YEC a position on aspects of the project that may have the potential to impact the land, water and wildlife.

2. GENERAL COMMENT

Dena Cho generally supports the renewal of this air emissions permit as well as supporting the continued development of non-diesel energy development initiatives, such as those developments in support of hydro generation and transmission over the past decade:

- the Mayo-Dawson transmission line upgrade in 2003,
- the refurbishment the second of two Aishihik hydro turbines in 2006,
- the Mayo-Dawson grid connection to the WAF (Southern Grid) in 2011, and
- the Mayo B hydro facility in 2012.

Movement away from the use of fossil fuels, and towards "cleaner" energy is encouraging and supported by Dena Cho. However, we understand the need for stop-gap measures in the meantime to offset current energy demands, prior to the establishment of additional "clean" energy options., such as those noted in YEC's ambitious "5 Year Strategic Plan" and presented in various other media releases from YEC [1][2].

3. ROSS RIVER DENA - PROJECT INVOLVEMENT

As stated in YEC's 10-Year Strategy, "First Nations governments, development corporations and Citizens will have a key role in helping us shape and deliver this plan over the next 10 years. We recognize First Nations as governments and potential energy proponents, partners and investors. In developing this plan, we will work proactively and collaboratively with First Nations governments and development corporations to forge partnerships and create opportunities for investment, contracting, employment and training. First Nations will also be at the forefront of assessments, permitting and approval stages."[3]

Planning for RRDC involvement in YEC's developments will ensure both the inclusion of a local workforce and the involvement in economic opportunities through Dena Nezziddi. For the project being reviewed in this document, one should be reminded of the project's location on Ross River Dena unceded Territory, and that the Ross River Dena have never surrendered lands since time immemorial; therefore, have exclusive right to use and to occupy the land for the purposes of fishing, gathering, hunting and trapping; which is critical to the Dena's survival. This fact will be supported by recommendations further on in this memo.

4. ISSUES AND RECOMMENDATIONS

Dena Cho will now present a specific list of issues and recommendations from a technical perspective, focusing more on project impacts to existing valued ecosystem components and criteria (VECC's).

[1] Yukon Energy Corp, "5 Year Strategic Plan", Yukon Energy Corp webpage, 2019, accessed July 30, 2021, https://yukonenergy.ca/media/site_documents/YEN-5-Year-Strategic-Plan2019-2024.pdf
[2] Yukon Energy Corp, "electricity for 2030", Yukon Energy Corp webpage, January 2020, accessed July 30, 2021, https://yukonenergy.ca/media/site_documents/YEN19347bklt_10yr_summary_draft_web.pdf
[3] Yukon Energy Corp, "Keys to Success", Yukon Energy Corp website, access July 30, 2021, https://yukonenergy.ca/energy-in-yukon/electricity-in-2030/our-draft-10-year-plan/keys-to-success

ISSUE #1

All of the documentation presented on the YOR is highly technical in nature and written both for technically proficient individuals and government stakeholders.

RECOMMENDATION #1

Suggestion to provide a readable summary of the assessment so that more people will understand and can evaluate the assessment.

ISSUE #2

The Ross River Dena has never surrendered lands since time immemorial, therefore, have exclusive right to use, collectively and to occupy the land for the purposes of fishing, gathering, hunting and trapping which is critical to the Dena's survival.

RECOMMENDATION #2

It will be important to reference RRDC's access to their unceded Territory. Suggest revising as follows:

- Section 5.1 – The Town of Faro is situated on the unceded Traditional Territory of RRDC;
- Section 5.2.1 – The Town of Faro is situated on the unceded Traditional Territory of RRDC; and
- Section 5.2.2 – The Project is located on the Unceded Territory of RRDC.

ISSUE #3

In Section 6.1.3, YEC has committed to the following, "Yukon Energy is required to contact either an environmental protection officer or the Yukon Spill Report Centre as soon as possible under the circumstances in the event of an unauthorized release or emission, such as fugitive emissions or emissions resulting from burning fuel other than that allowed under the Permit."

RECOMMENDATION #3

Dena Cho recommends expanding the contact list for any unauthorized release to RRDC or RRDC's Lands Department.

ISSUE #4

Dena Cho would like to see direct involvement of Ross River Dena Council (RRDC) and its development Corporation, Dena Nezziddi Development Corp (Dena Nezziddi).

RECOMMENDATION #4

Dena Cho recommends directly engaging with RRDC and Dena Nezziddi in support of opportunities for meaningful involvement in the energy sector – as historically, this has not been the case – where economic opportunities have

been managed by governments and private companies without RRDC's direct involvement. This approach has created a significant gap in both First Nation involvement and benefit from projects occurring on RRDC's unceded Territory, creating a significant gap in access to energy, upgraded transportation and infrastructure, basic access to reliable food sources, and general access to basic needs. The absence of these support systems has inhibited the ability for RRDC to meaningfully support the needs of their community.

However, with the recent growth of Dena Nezziddi on such projects as Faro Mine, Ketza River Mine and Wolverine Mine, Dena Cho feels that RRDC is now positioned to become significant and equitable partners in opportunities being managed by YEC.

5. CLOSING

As noted above, Dena Cho generally supports the renewal of this air emissions permit as well as supporting the continued development of non-diesel energy development initiatives; however, this support does not extend to support from RRDC. Dena Cho then recommends directly contacting both RRDC and Dena Nezziddi to discuss opportunities for involvement of both the First Nation's government and development corporation.

Yours in trust,

_____

Stuart Van Bibber
General Manager
Dena Cho Environmental and Remediation Inc.
Suite 201 – 208 Main St.
Whitehorse, YT, Y1A 2A9

From: Travis Ritchie
To: Sarah.Preiksaitis@yukon.ca
Subject: RE: Application for Air Emissions Permit - Faro Generating Station
Date: January 19, 2022 9:02:00 AM
Attachments: image001.png
image002.png
image003.png
image004.png
image005.png
image006.png

Hi Sarah,

Thanks for that info.

Regards,

Travis

From: Sarah.Preiksaitis@yukon.ca <Sarah.Preiksaitis@yukon.ca>
Sent: January 19, 2022 8:45 AM
To: Travis Ritchie <Travis.Ritchie@yec.yk.ca>
Subject: RE: Application for Air Emissions Permit - Faro Generating Station

Hi Travis,

Thank you for the application. You may have already been notified, but the decision document has also been issued. I'll be in touch again by the end of this week with more details on the permit.

Thank you,

Yukon
Sarah Preiksaitis (she/her)
Environmental Protection Analyst
Environment | Standards and Approvals
T 867-667-5456 | Yukon.ca

From: Travis Ritchie <Travis.Ritchie@yec.yk.ca>
Sent: January 17, 2022 3:36 PM
To: Sarah.Preiksaitis <Sarah.Preiksaitis@yukon.ca>
Subject: Application for Air Emissions Permit - Faro Generating Station

Hello Sarah,

Please see the attached application for an Air Emissions Permit for the Faro Generating Station pursuant to YESAA Project Assessment 2021.0115 and YG's pending decision document.

If you have any questions regarding the application or the facility please let me know.

Thank you.

Regards,

Travis

yukon energy
Travis Ritchie P.Biol.
Manager - Environment, Assessment, & Licensing
Telephone: 867-393-5350 | Mobile: 867-333-0300

APPROVED SustainableElectricityCompany™

From: Travis Ritchie
To: Sarah.Preiksaitis@yukon.ca
Subject: RE: Air Emissions Permit Application - Technical Review
Date: January 25, 2022 3:00:00 PM
Attachments: image001.png

Hi Sarah,

Thanks for your email. I can confirm we definitely want to proceed with permitting – we have a need to be able to operate the additional capacity as soon as possible so time is of the essence for us.

Regarding the technical review fees, Yukon Energy is a Crown and as such is typically exempt from permitting fees under the jurisdiction of the Yukon Government. I don't recall the Corporation ever having to pay for the technical reviews completed for previous AEP applications, so I would respectfully ask if you could confirm such fees are applicable in this case? If they are we'll get you a cheque immediately so the review can proceed forthwith.

Thanks again.

Regards,

Travis

From: Sarah.Preiksaitis@yukon.ca <Sarah.Preiksaitis@yukon.ca>
Sent: January 25, 2022 2:48 PM
To: Travis Ritchie <Travis.Ritchie@yec.yk.ca>
Subject: Air Emissions Permit Application - Technical Review

Hi Travis,

Thank you for submitting an application for the renewal of the air emissions permit for the Faro Generating Station and the associated air dispersion modeling and impact assessment. In accordance with the Environmental Protection and Assessment Branch policy for technical reviews, a technical review of the air dispersion modeling must be conducted before the amended permit can be issued. This review will be conducted by a qualified third-party reviewer that will determine whether the technical information provided is accurate and comprehensive. The reviewer may also recommend mitigations that may be incorporated into the permit for the proposed activity.

Before the contract can be initiated, the full cost of the technical review must be submitted to the Environmental Protection and Assessment Branch. Funds received by the Branch will be used in their entirety to contract a third-party reviewer to review the technical information. The cost associated with the review of a air dispersion model for an air emissions permit is $6,400.00 and the reviewer will be allowed 28 calendar days to review the technical information. This does not include the length of time required to prepare and issue the permit after the review is completed.

Please make payment no later than March 26 in order to proceed with the next available reviewer.

As a result of the review, the external reviewer may recommend that changes be made to the technical information that you have submitted. If the Branch determines that the recommended changes will significantly affect the content or conclusions of the technical information, you will be required to make the required changes to the technical information and have the changes reviewed by the external reviewer. The cost for this additional review, if required, is $1,280.00 and the reviewer is allowed 14 calendar days to review the changes. If the modified technical information or the full cost of the additional review is not provided to the Branch within 90 calendar days of being informed that changes are required, the permit application will be considered withdrawn and the funds paid for the initial review will not be refunded.

If you wish to proceed with the technical review, please provide payment of $6,400.00 by no later than March 26. Payment can be made by cheque or cash or credit card (by phone). If you choose not to proceed with the technical review, or do not pay the full amount by the due date, the permit application will be considered withdrawn. Requests for refunds of any amount paid must be made in writing and will only be granted if the Branch has not already entered into a contract with the external reviewer. If you have any questions, please do not hesitate to contact me at (867) 667-5456 or sarah.preiksaitis@yukon.ca

Thank you,

Yukon
Sarah Preiksaitis
Environmental Protection Analyst
Environment | Standards and Approvals
T 867-667-5456 | Yukon.ca

From:	Travis Ritchie
To:	Sarah.Preiksaitis@yukon.ca
Subject:	RE: Air Emissions Permit Application - Technical Review
Date:	January 25, 2022 3:45:00 PM
Attachments:	image001.png image002.png image003.png image004.png image005.png image006.png

Hi Sarah,

Thanks for your reply and for sharing that document. I had seen it before and was generally familiar with this aspect of the permitting process, I just thought Crown Corps would be exempt from such fees, but if not that's fine. I'll get our finance group to send a cheque your way. Would you kindly confirm the address and attention info for the purposes of mailing a cheque?

Thanks again.

Regards,

Travis

From: Sarah.Preiksaitis@yukon.ca <Sarah.Preiksaitis@yukon.ca>
Sent: January 25, 2022 3:30 PM
To: Travis Ritchie <Travis.Ritchie@yec.yk.ca>
Subject: RE: Air Emissions Permit Application - Technical Review

Hi Travis,

You are correct that you are not charged a permitting fee. The $6400 fee is for a technical review of the air dispersion model. I understand how it may be confusing given it is associated with your permit application. I've attached a guidance document which provides more context.

Please proceed with payment when you're ready. I'll work to process your permit quickly.

Thank you,

Yukon

Sarah Preiksaitis (she/her)
Environmental Protection Analyst
Environment | Standards and Approvals
T 867-667-5456 | Yukon.ca

From: Travis Ritchie <Travis.Ritchie@yec.yk.ca>
Sent: January 25, 2022 3:00 PM
To: Sarah.Preiksaitis <Sarah.Preiksaitis@yukon.ca>
Subject: RE: Air Emissions Permit Application - Technical Review

***** External email: Do not click on links or attachments except from trusted senders. *****
****

Hi Sarah,

Thanks for your email. I can confirm we definitely want to proceed with permitting – we have a need to be able to operate the additional capacity as soon as possible so time is of the essence for us.

Regarding the technical review fees, Yukon Energy is a Crown and as such is typically exempt from permitting fees under the jurisdiction of the Yukon Government. I don't recall the Corporation ever having to pay for the technical reviews completed for previous AEP applications, so I would respectfully ask if you could confirm such fees are applicable in this case? If they are we'll get you a cheque immediately so the review can proceed forthwith.

Thanks again.

Regards,

Travis

yukon energy

Travis Ritchie P.Biol.
Manager - Environment, Assessment, & Licensing
Telephone: 867-393-5350 | Mobile: 867-333-0300

APPROVED SustainableElectricityCompany™

From: Sarah.Preiksaitis@yukon.ca <Sarah.Preiksaitis@yukon.ca>
Sent: January 25, 2022 2:48 PM
To: Travis Ritchie <Travis.Ritchie@yec.yk.ca>
Subject: Air Emissions Permit Application - Technical Review

Hi Travis,

Thank you for submitting an application for the renewal of the air emissions permit for the Faro Generating Station and the associated air dispersion modeling and impact assessment. In accordance with the Environmental Protection and Assessment Branch policy for technical reviews, a technical review of the air dispersion modeling must be conducted before the amended permit can be issued. This review will be conducted by a qualified third-party reviewer that will determine whether the technical information provided is accurate and comprehensive. The reviewer may also recommend mitigations that may be incorporated into the permit for the proposed activity.

Before the contract can be initiated, the full cost of the technical review must be submitted to the Environmental Protection and Assessment Branch. Funds received by the Branch will be used in their entirety to contract a third-party reviewer to review the technical information. The cost associated with the review of a air dispersion model for an air emissions permit is $6,400.00 and the reviewer will be allowed 28 calendar days to review the technical information. This does not include the length of time required to prepare and issue the permit after the review is completed.

Please make payment no later than March 26 in order to proceed with the next available reviewer.

As a result of the review, the external reviewer may recommend that changes be made to the technical information that you have submitted. If the Branch determines that the recommended changes will significantly affect the content or conclusions of the technical information, you will be required to make the required changes to the technical information and have the changes reviewed by the external reviewer. The cost for this additional review, if required, is $1,280.00 and the reviewer is allowed 14 calendar days to review the changes. If the modified technical information or the full cost of the additional review is not provided to the Branch within 90 calendar days of being informed that changes are required, the permit application will be considered withdrawn and the funds paid for the initial review will not be refunded.

If you wish to proceed with the technical review, please provide payment of $6,400.00 by no later than March 26. Payment can be made by cheque or cash or credit card (by phone). If you choose not to proceed with the technical review, or do not pay the full amount by the due date, the permit application will be considered withdrawn. Requests for refunds of any amount paid must be made in writing and will only be granted if the Branch has not already entered into a contract with the external reviewer. If you have any questions, please do not hesitate to contact me at (867) 667-5456 or sarah.preiksaitis@yukon.ca

Thank you,

Yukon

Sarah Preiksaitis
Environmental Protection Analyst
Environment | Standards and Approvals
T 867-667-5456 | Yukon.ca

From: Travis Ritchie
To: Sarah.Preiksaitis@yukon.ca
Subject: RE: Updated permits and emergency capacity authorization
Date: May 11, 2022 11:54:00 AM
Attachments: image001.png

Thanks Sarah.

From: Sarah.Preiksaitis@yukon.ca <Sarah.Preiksaitis@yukon.ca>
Sent: May 11, 2022 11:18 AM
To: Travis Ritchie <Travis.Ritchie@yec.yk.ca>
Subject: RE: Updated permits and emergency capacity authorization

Hi Travis,

Please see the updated permit for Faro. Under part 5 “monitoring” the number of monitoring locations has been updated. I can also confirm that a permit amendment may be made if you change from rental to permanent diesel generators.

I will have the signed copies of the permits for all the sites for you shortly.

Thank you,

Sarah Preiksaitis
Environmental Protection Analyst
Environment | Standards and Approvals
T 867-667-5456 | Yukon.ca

From: Sarah.Preiksaitis
Sent: May 4, 2022 8:49 AM
To: 'Travis Ritchie' <Travis.Ritchie@yec.yk.ca>
Cc: Jennifer.Dagg <Jennifer.Dagg@yukon.ca>
Subject: RE: Updated permits and emergency capacity authorization

Hi Travis,

If you have any questions please let me know. Otherwise we will send over signed copies of the permits shortly.

Thank you,

Sarah Preiksaitis
Environmental Protection Analyst
Environment | Standards and Approvals
T 867-667-5456 | Yukon.ca

From: Sarah.Preiksaitis
Sent: April 21, 2022 9:38 AM
To: 'Travis Ritchie' <Travis.Ritchie@yec.yk.ca>
Cc: Jennifer.Dagg <Jennifer.Dagg@yukon.ca>
Subject: Updated permits and emergency capacity authorization

Hi Travis,

Attached are the updated permits for all sites. I’ve adjusted to WRGD MW to 16.15MW as you correctly noted. Given the discrepancy regarding the identification of the number of generators I re-added the number of units for all sites. This further clarifies the capacities approved for each site and prevents any confusion. We have received ongoing inquiries from the public in regards to the use and capacities of the diesel generators, at Faro and Whitehorse specifically, and the intention is to avoid any confusion regarding authorized capacities.

I shared with Jenn Dagg your note regarding our authority as a decision body to determine whether a decision document is needed before approval and authorization. You are correct that we have some ability to determine what constitutes a change in scope to a project. However, YESAA, its regulations, and the Air Emissions regulation identify thresholds for assessment and permitting based on MWs. The change you are proposing is beyond the MW thresholds requiring assessment and authorization, so there is no flexibility in this case. Because item 49.1 was revoked from the YESAA Act, the previous decision-making process is not a precedent in this case.

We cannot authorize the extension of the 12MW of emergency capacity and I recommend you to reach out to YESAB immediately to discuss options for assessment.

Thank you,

Sarah Preiksaitis
Environmental Protection Analyst
Environment | Standards and Approvals
T 867-667-5456 | Yukon.ca

From:	Travis Ritchie
To:	"Elizabeth.Barker"
Subject:	RE: [EXT] RE: Faro Station Modifications
Date:	February 20, 2023 9:53:00 AM
Attachments:	image002.png image003.png image004.png image005.png image006.png image007.png

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Hi Liz,

Thanks for that info. Appreciate it.

We'll get the modification proposal to you as soon as we can. Likely next month or in April once our engineering team solidifies the draft plan.

Regards,

Travis

From: Elizabeth.Barker <Elizabeth.Barker@yukon.ca>
Sent: February 20, 2023 9:17 AM
To: Travis Ritchie <Travis.Ritchie@yec.yk.ca>
Subject: RE: [EXT] RE: Faro Station Modifications

Hi Travis,
I appreciate the additional context around YEC's operations. It's good to hear the permit capacity is built into the system controls.

I'd like to let you know that based on the information received to date, the proposed changes to the Faro station are not considered YESAB assessable. We will further evaluate and confirm this decision once we're received formal notification and more details from YEC.

Thanks,
Liz

Elizabeth Barker
Environmental Protection Analyst
Environment | Standards and Approvals
T 867-667-5456 | Yukon.ca

From: Travis Ritchie <Travis.Ritchie@yec.yk.ca>
Sent: Thursday, February 16, 2023 10:00 AM
To: Elizabeth.Barker <Elizabeth.Barker@yukon.ca>
Subject: RE: [EXT] RE: Faro Station Modifications

Hi Liz,

Thanks for your note.

For context, we are still responding to evolving operational needs and community concerns in Faro, so are only in the planning phase of any potential changes. Recent dialogue with the municipal government and residents in the Town of Faro is part of the engagement we are undertaking during this phase. Once we have a draft plan crystallized we had planned to engage your team for review and approval of the potential changes, so we will make sure Part 2, Item 5 of the permit is followed once we reach that point.

Regarding permitted operational capacity I wanted to share that the System Operators are familiar of our permit thresholds and have these rules built directly into their system controls. Any attempt to dispatch more generation at a facility beyond its permitted capacity prompts an alarm that annunciates to the Operator so that we maintain compliance with this permit requirement. As you may know, YEC maintains installed capacity at several of its thermal generating stations that exceeds the operational thresholds allowed by the air emissions permits. This redundancy ensures if any units fail to start when called upon, that we have sufficient back-up resources to meet system demands. In any extraordinary circumstances where we may have an emissions exceedance we would notify your office and that of the Compliance and Inspections Unit forthwith.

Hope this additional context is helpful.

Thanks again.

Regards,

Travis

From: Elizabeth.Barker <Elizabeth.Barker@yukon.ca>
Sent: February 16, 2023 8:37 AM
To: Travis Ritchie <Travis.Ritchie@yec.yk.ca>
Subject: RE: [EXT] RE: Faro Station Modifications

Hi Travis,
Thanks very much for the responses. While I recognize that you have provided information about the proposed modification below, I'll still ask that prior to making any modifications at the Faro station, please send me an official notification and wait until we have approved the modifications before proceeding with them, as per Part 2.5 of the current permit as shown below.

5. The permittee shall obtain approval from an environmental protection analyst prior to:
a) any addition, modification, removal or replacement of any equipment or components related to the release, abatement, control or treatment of air emissions; or
b) any change in location of the source(s).

Additionally, as you are aware, the Faro station was assessed and permitted for a capacity of 15.5MW. Operation above a capacity of 15.5MW will result in non-compliance and could result in further enforcement action.

Thanks again for the quick response and I'll be in touch regarding the complaint management plan.

Cheers,
Liz

From: Travis Ritchie <Travis.Ritchie@yec.yk.ca>
Sent: February 14, 2023 2:47 PM
To: Elizabeth.Barker <Elizabeth.Barker@yukon.ca>
Cc: Lisa Wiklund <lisa.wiklund@yec.yk.ca>
Subject: RE: [EXT] RE: Faro Station Modifications

Hi Liz,

Sorry for the delay. Please see my response embedded below.

Please let me know if you need anything further or would like to discuss.

Regards,

Travis

From: Elizabeth.Barker <Elizabeth.Barker@yukon.ca>
Sent: February 14, 2023 1:54 PM
To: Travis Ritchie <Travis.Ritchie@yec.yk.ca>
Cc: Lisa Wiklund <Lisa.Wiklund@yec.yk.ca>
Subject: RE: [EXT] RE: Faro Station Modifications

Hi Travis,
I need to write a response this week and I was hoping you could answer the following questions?
Are all of the following modifications going to occur at the Faro station: **RESPONSE: Yes**
- Decommissioning FD1 – Mirrlees KV16 Generator
- Adding two new "permanent" generators, FD8 and FD9.
- Moving 3 "temporary" rental generators and infrastructure to a different location in the facility.
- Removing 2 "temporary" rental generators.
- Possible addition of sound barriers around FD7 and/or two of the rentals

If yes…
What is the nameplate capacity and tier of FD8 and FD9?

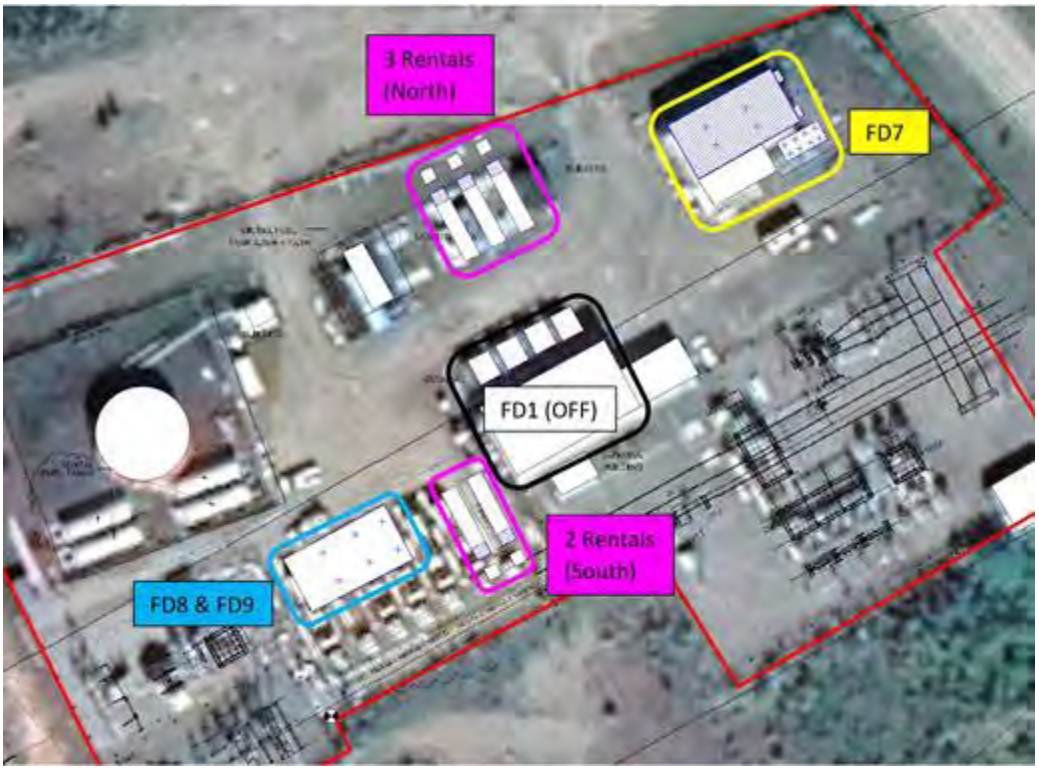
RESPONSE: FD1 is now end of life and we are planning to replace that permitted capacity with 2 x ~2.5 MW EPA Tier 4 and CARB certified diesel generators. This represents an investment by YEC in 'best available technology' and will result in reduced noise and criteria air contaminant (CAC) emissions from the existing Pre-Tier FD1 unit (1960's technology). FD1 represents 5.15 MW of the capacity at the FGS.

Which temporary generators are being removed?

RESPONSE: A portion of the capacity installed at the FGS is made up of rental units (currently 7 x 1.8 MW) that are in place as backup in case any other unit fails to start or is down for planned/unplanned maintenance or repair when the capacity is needed. We anticipate that with the installation of FD8 and FD9, to replace the less reliable FD1, this will allow us to remove two (2) of the seven (7) rental units of this redundant capacity at site in the near term. The temporary rental generators are as described in our previous assessment and permitting documentation (i.e., Caterpillar XQ2000/3516C, EPA Tier 2 and CARB certified units). With the revised configuration we will have approximately 2 MW of back up capacity available at site to complement the operating/production capacity of 15.5 MW allowed under our AEP.

Which rental generators are being moved?

RESPONSE: Due to noise complaints we are planning to relocate 3 of the remaining 5 rental units to a location approximately 45 metres northwest of their current location. This will allow the existing FD1 building to provide some sound attenuation during their operation. We are evaluating the feasibility of additional sound attenuation for the remaining rental units as part of our planning, but don't have an engineering assessment or cost estimate completed yet. See draft site sketch below for planned locations of units.



How far from their current location? A figure would be ideal. **RESPONSE: See above and attached.**

On a side note, I received your response in regards to the Faro Station Complaint Management System and will get back to you as soon as I can so we can finalize that plan.

Thanks and have a great day,
Liz

From: Travis Ritchie <Travis.Ritchie@yec.yk.ca>
Sent: February 9, 2023 9:04 AM
To: Elizabeth.Barker <Elizabeth.Barker@yukon.ca>
Cc: Lisa Wiklund <lisa.wiklund@yec.yk.ca>
Subject: [EXT] RE: Faro Station Modifications

Hi Liz,

Thanks for reaching out.

As part of the presentation in Faro recently we also received several questions from a member of the public and are working on responses. I will try to get our responses over to you shortly for your consideration. If after reviewing, you have any follow up questions or concerns with our responses please feel free to reach out to me. Overall, I hope that what we share makes sense and is

appropriate from your perspective, so I appreciate you connecting with me on this.

Regards,

Travis

Travis Ritchie
Manager - Environment, Assessment, & Licensing
Telephone: 867-393-5350 | Mobile: 867-333-0300

From: Elizabeth.Barker <Elizabeth.Barker@yukon.ca>
Sent: February 9, 2023 8:08 AM
To: Travis Ritchie <Travis.Ritchie@yec.yk.ca>
Subject: Faro Station Modifications

Good Morning Travis,
Our minister received a message with some questions from a member of the public asking about proposed modifications to the Faro plant, as presented on January 24th by Paul Murchison and Ed Peake. The modifications described are as follows:

- Decommissioning FD1 – Mirrlees KV16 Generator
- Adding two new “permanent” generators, FD8 and FD9.
- Moving 3 “temporary” rental generators and infrastructure to a different location in the facility.
- Removing 2 “temporary” rental generators.
- Possible addition of sound barriers around FD7 and/or two of the rentals
- YEC has stated that these modifications will change sound emissions from the

FGS

I'd like to respond as soon as possible so I'm just looking for confirmation that these modifications are being planned and that we will receive notification prior to any work as per Part 2.5 of the Faro permit.

Thanks very much,
Liz

Elizabeth Barker
Environmental Protection Analyst
Environment | Standards & Approvals
T 867-667-5456 | Yukon.ca

From: Travis Ritchie
To: "Elizabeth.Barker"
Subject: RE: [EXT] Request for Approval Under Air Emissions Permit 60-010-01 Faro Rapids Generating Station
Date: January 10, 2024 8:27:05 AM
Attachments: image006.png
image007.png
image008.png
image009.png
image010.png
image011.png

Hi Liz,

Thanks for your email.

We are not asking for more capacity. Recall that we meet our site capacity threshold of 15.5 MW how ever we can with the units we have outlined will be on site. In this case, replacement of the FD1 capacity with the new Tier 4 units will supplant the 2.4 MW of FD1 rated capacity before retirement, plus the balance of the 5.15 MW that is currently being met by the YMs (i.e., FD1 is decommissioned and we will need fewer YMs after the replacement units are installed). As such 5.15 MW of pre-Tier and Tier 2 capacity will now be met mostly with the new Tier 4 units. We are not asking to increase the assessed site capacity of 15.5 MW, just swapping capacity around to meet operational needs.

Hope this helps with your review process.

Regards,

Travis

From: Elizabeth.Barker <Elizabeth.Barker@yukon.ca>
Sent: January 8, 2024 4:37 PM
To: Travis Ritchie <Travis.Ritchie@yec.yk.ca>
Subject: RE: [EXT] Request for Approval Under Air Emissions Permit 60-010-01 Faro Rapids Generating Station

Good Afternoon Travis,
I've reviewed the attached request and have a couple thoughts. In the 2021-0115 Faro YESAA assessment, FD1 was assessed using the de-rated capacity of 2.4MW and the air emissions permit was issued on that basis. As a result, the 5.15MW capacity you have listed for FD1 in the attached request is not representative of the assessed project scope. You are technically asking for a "replacement" that would add an extra 2.5MW of capacity that was not included in the 2021 assessment.

That being said, I recognize the new generators have a US EPA Tier 4 rating, which is higher than any other generator installed onsite. From an air emissions point of view, this replacement is beneficial and addresses concerns that were raised in the YESAA assessment regarding air quality.

I need to dig deeper on this one but I'll be in touch once I have more information.

Elizabeth Barker
Environmental Protection Analyst
Environment | Standards & Approvals
T 867-667-5456 | Yukon.ca

From: Travis Ritchie <Travis.Ritchie@yec.yk.ca>
Sent: December 12, 2023 12:16 PM
To: Elizabeth.Barker <Elizabeth.Barker@yukon.ca>
Cc: admin-faro@faroyukon.ca; lorraine.sterriah@rrdc.ca; Lisa Wiklund <lisa.wiklund@yec.yk.ca>
Subject: [EXT] Request for Approval Under Air Emissions Permit 60-010-01 Faro Rapids Generating Station

Hello Liz,

Please see the attached request for approval. If you have any difficulties with the file please let me know.

Thank you.

Regards,

Travis

Travis Ritchie

Director, Risk & Compliance
Telephone: 867-393-5350 | Mobile: 867-333-0300

#2 Miles Canyon Road
Box 5920, Whitehorse
Yukon Y1A 6S7
yukonenergy.ca

December 12, 2023 File: 2515.03.01

Elizabeth Barker, Environmental Protection Analyst
Yukon Government, Department of Environment, Standards & Approvals Section
Box 2703
Whitehorse, Yukon Y1A 2C6

(via email to: elizabeth.barker@yukon.ca)

Dear Ms. Barker,

RE: AIR EMISSIONS PERMIT NO. 60-010-01 FARO GENERATING STATION – PART 2, CLAUSE 5 – REQUEST FOR APPROVAL OF CAPACITY REPLACEMENT

Pursuant to Part 2, Clause 5 of the above referenced permit Yukon Energy is requesting approval to complete a capacity replacement at the Faro Generating Station. As part of Yukon Energy's Thermal Replacement Project, the Corporation is replacing end of life diesel generators with new diesel capacity. In this case, Faro Diesel No. 1 or FD1 (nameplate capacity 5.15MW) reached end of life after nearly 50 years of service and was retired. Yukon Energy is working to complete a replacement of the generating capacity represented by this unit with two new 2.5 MW generators.

The new generators will meet the EPA's Tier 4 emission standards for non-road diesel engines, replacing the FD1's Pre-Tier emissions. As part of its Thermal Replacement Project, Yukon Energy is making this investment in all *new permanent* diesel generation it installs across the grid, which will result in a decrease in emissions of particulate matter (PM) and oxides of nitrogen (NOx) of approximately 90% from EPA Tier 2 levels. The emissions controls on the units will also reduce noise emissions as compared to the unit being replaced. The new generators will be enclosed in modular containers and, as such, will not require a building to house them. Specifications for the replacement generators and the selective catalytic reduction (SCR) exhaust aftertreatment system are attached to this request for approval.

Yukon Energy expects to complete the installation in Q3 2024, after which it will begin commissioning and load testing units, thereby initiating emissions from the units.

Please contact me by telephone at 867.393.5350 or by email: travis.ritchie@yec.yk.ca if you have any questions, comments, or concerns with this request.

Thank you for your time and consideration in this matter.

Yours Sincerely,

Travis Ritchie
Manager – Environment, Assessment, & Licensing

Attachment: Specifications Caterpillar C175-16 Engine/Generator and ECOCUBE SCR Exhaust Aftertreatment

c. Larry Baran, Chief Administrative Officer – Town of Faro, Yukon Territory (via email)
Lorraine Sterriah, Manager – Heritage, Lands, and Resources – Ross River Dena Council (via email)

PRODUCT SPECIFICATIONS FOR C175-16 (60 HZ)

GENERATOR SET SPECIFICATIONS

Standby Rating	3365(no fan)/3250/3100(no fan)/3000 ekW
Prime Power Rating	3115(no fan)/3000/2825(no fan)/2725 ekW
Emissions/Fuel Strategy	Low Fuel, Tier 2
Voltage	480 to 13800 Volts
Frequency	60 Hz
Speed	1800 RPM
Duty Cycle	Standby, Mission Critical, Prime, Continuous
Maximum Rating	3365 ekW
Minimum Rating	2500 ekW

ENGINE SPECIFICATIONS

Engine Model	C175-16 SCAC, V-16, 4-Stroke Water-Cooled Diesel
Bore	6.89 in
Stroke	8.66 in
Displacement	6456.31 in^3
Compression Ratio	16.7:1
Aspiration	Turbo Aftercooled
Fuel System	Common Rail
Governor Type	ADEM A4

GENERATOR SET DIMENSIONS

Length - Minimum	241.6 in
Length - Maximum	312.9 in
Width - Minimum	83.1 in
Width - Maximum	113.7 in
Height - Minimum	87 in
Height - Maximum	134.3 in
Dry Weight - Genset (minimum)	42750 lb
Dry Weight - Genset (maximum)	50500 lb

C175-16 (60 HZ) STANDARD EQUIPMENT

AIR INLET SYSTEM

4 x Single element canister with service indicator(s).

CONTROL PANEL

2 Programmable relay outputs (Form C)
Low coolant level
Over/under voltage
Coolant temperature
Serial annunciator module data link
Alarm acknowledge
Text alarm/event descriptions
Volts (L-L & L-N)
Reverse power
Over/under frequency
Environmental sealed front face
Programmable protective relaying functions
Speed adjust
Generator phase sequence
Low coolant temperature
Generator mounted - rear facing
Overspeed
Controls

Frequency (Hz)
Engine cycle crank
Engine cool-down timer
Warning/shutdown Indicators:
Lamp test
2 Programmable digital outputs
6 Programmable digital inputs
High coolant temperature
Customer data link (Modbus RTU)
Auto/start/stop control
Emergency stop pushbutton
RPM
Digital Indicators
Communications
Accessory module data link
Oil pressure (psi, kPa or bar)
Low oil pressure
Overcurrent
Emergency stop
24 Volt DC operation
4 Programmable relay outputs (Form A)
Failure to start (overcrank)
True RMS AC metering, 3-phase, +/-2% accuracy
Power factor (per phase & average)
Operating hours
DC volts
Amps (per phase & average)
Cat ECS 100
Reverse reactive power

EXHAUST SYSTEM

Bolted flange, with bellow for each turbo
Exhaust flange outlet

FUEL SYSTEM

Engine mounted filters #REF!
Filters x 3
10 Micron spin on yype
Secondary/tertiary fuel filters
4 Micron spin on type
Primary fuel filter water/fuel water separator

GENERATORS AND ATTACHMENTS

Right side extension box, bottom cable entry
IEC platinum stator RTDs
Reactive droop capability
3 Phase voltage sensing

(MV) Busbar connections, right side extension box, bottom cable entry
Class F temperature rise at 40C ambient
Anti-condensation space heater
NEMA Class H insulation
6 Leads
Class H temperature rise at 40C ambient
Voltage regulator
Exciter diode monitor
Form wound
RFI suppression
(LV) Busbar connections, top/center mounted, top cable entry
3 Phase brushless
60 Hz models: NEMA standard hole pattern
Permanent magnet excitation (PMG)
Min / max exciter limiter
Salient pole

GOVERNING SYSTEM

Redundant shutdown (Overspeed protection through a duplicate speed sensing system)
ADEM A4

LUBE SYSTEM

Oil filter, filler and dipstick
Integral lube Oil cooler
Oil drain lines and valve
Fumes disposal
Lubricating oil
Prelube - required with prime, continuous, and standby
Gear type lube oil pump

MOUNTING SYSTEMS

Rails - Engine/generator
Rubber anti-vibration mounts - shipped loose
Dual 24 volt electric starting motors
Battery disconnect switch
Batteries and battery rack w/cables

POWER TERMINATION

Busbar

SERVICE INSTRUCTIONS

Two PM inspections

GENERAL

Paint - Caterpillar yellow with high gloss black rails & radiator

SAE standard rotation
LH Service
Flywheel and flywheel housing-SAE No. 00

C175-16 (60 HZ) OPTIONAL EQUIPMENT

AIR INLET SYSTEM

Air inlet adapters
Dual element air cleaner
Single element air cleaner
Air inlet protection

CONTROL PANEL

Package mounted radiator
Automatically selected ground
Customer AC-DC connection mounting location - LV/MV
Load share governor
EMCP 4.4
E-Stop
Frame boxes
Annunciator modules
Load share module / auxiliary plate and auxiliary box (LV)
Fuel cooler
Controller mounting location - LV/MV
Modbus monitoring of packages
Customer interface options
EMCP 4.4 optional harness
Controller voltage and current sensing groups
Remote radiators
Generator harness
Interconnect harness
Speed adjust
Controller and MV and HV power connection locations
Raise lower switch

CRANKCASE SYSTEMS

Explosive relief valves
Crankcase ventilation system

EXHAUST SYSTEM

Mufflers
Exhaust support group
Weld flanges
Exhaust collectors/manifold
Front housing - Prime or continuous
Front housing - Standby or mission critical

Aftercooler drain

FUEL SYSTEM

Primary fuel filter

GENERATORS AND ATTACHMENTS

Low voltage - 1800 and 3000 Frames - 60 Hz, 3 phase, 1800 rpm, FW, PM, No of leads=6, Pitch 0.6667
Medium voltage - 1800 and 3000 Frames - 60 Hz, 3 phase, 1800 rpm, FW, PM, No of leads=6, Pitch 0.6667
Conversion GP - Top cable entry
Low voltage - 1800 and 3000 Frames - 50 Hz, 3 phase, 1500 rpm, FW, PM, No of leads=6, Pitch 0.6667
Differential current transformers
Space heater kit
Medium voltage - 1800 and 3000 Frames - 50 Hz, 3 phase, 1500 rpm, FW, PM, No of leads=6, Pitch 0.6667
Thermostat for space heater
Generator air intake

INSTRUMENTATION

Pyrometer and thermocouples

LUBE SYSTEM

Drain group oil pans
Oil filters
Lube oil heater
Electric prelube pumps
Lubricating oil

MOUNTING SYSTEMS

IBC vibration isolators - Shipped loose
Spring type linear vibration isolators
Rubber anti-vibration mounts

POWER CONNECTIONS

Low voltage connection cable
Center post busbarss (LV)
1800 Frame generator side / rear mounted busbars (MV)
Enclosures - Control packaging (LV)
Paralleling circuit breakers
1800 Frame generators Circuit breaker
Neutral ground (LV)
Neutral ground (MV)
Cable entry options (LV)
Cable entry options (MV)
Masterpack breakers
Power connection covers (LV)
Harnesses (Breaker)

Masterpack breaker connections
Side/rear mounted busbars (LV)

SPECIAL TESTS / REPORTS

IBC seismic Certification
Special test charge - Engine only
PGS Test report @ 0.8 power factor
Genset fuel consumption test
Standard genset TVA (Torsional Vibration Analysis) report
PGS Test report @ 1.0 power factor
OSCOSH1 seismic Certification
Custom generator TVA report
Generator test report
Standard engine test charge

STARTING / CHARGING SYSTEM

Heavy duty battery sets with rack
Charging alternators - Dry
Air pressure regulator
Starter location covers
24 Volt power distribution box
24 Volt electric starting motor
35 Amp Battery chargers
24 Volt battery set - Dry
20 Amp Battery chargers
Jacket water heaters
50 Amp Battery chargers
Air starting motor
Jacket water heater wiring groups

GENERAL

Special paint colors
Control GP - air powered bar group
Barring group manual
Service tools - Engine barring group
Engine barring air powered

TABLE 'A'

ecoCUBE ® CONFIGURATION	ENGINE MODEL	EST. WEIGHT (lbs)	EST. PRESSURE DROP (inH2O +/- 10%)	EST. 32.5% UREA CONSUMPTION (L/h +/- 10%)	EXHAUST TEMPERATURE (deg C)
Series 5	CAT C175-16	12500	17.0	39.3	444

TABLE 'B' - FULL LOAD EMISSION PERFORMANCE

ecoCUBE ® CONFIGURATION	INLET NOX (g/HP-h)	OUTLET NOX (g/HP-h)	INLET CO (g/HP-h)	OUTLET CO (g/HP-h)	INLET VOC (g/HP-h)	OUTLET VOC (g/HP-h)	INLET PM (g/HP-h)	OUTLET PM (g/HP-h)
Series 5	6.07	0.50	0.50	< 0.50	0.04	< 0.04	0.04	0.02

The DPF will provide an 85% PM reduction. Please note that if the level of PM that will result post-DPF for a given load point is less than 0.018 g/bhp-hr, the measurement will likely be within the error bars of EPA Method 5/202 (i.e. Method 5/202 will have difficulty accurately measuring this amount of PM as it is so low). As a result, measurements should be taken as per ISO method 8178-4 or 40 CFR 1065.

TABLE 'C' - EXHAUST SOUND ATTENUATION

ecoCUBE ® CONFIGURATION	FREQUENCY (Hz)	62.5	125	250	500	1000	2000	4000	8000
Series 5	MAXIMUM ATTENUATION (dB)		26	29	38	37	41	39	44

TABLE 'D' - BREAKOUT SOUND ATTENUATION

ecoCUBE ® CONFIGURATION	FREQUENCY (Hz)	62.5	125	250	500	1000	2000	4000	8000
Series 5	MAXIMUM ATTENUATION (dB)		26	26	35	35	39	41	40

All stated sound reductions assume 1/1 octave band resolution, from 63 Hz to 8000 Hz.
If engine datasheet does not include complete sound data from the 63 Hz to 8000 Hz frequency range, then the above analysis and guarantee is limited to the frequency range that was provided.
Insertion loss (IL) measured based on ISO 6798-1995 in a survey grade 3 environment.
SPL predictions assume hemispherical sound propagation; it does not account for site-specific conditions.
For outdoor or enclosure mounted ecoCUBE®s, acoustic measurement point is assumed to be at least 7 meters laterally from the enclosure wall (or SCR wall if no enclosure), at a height of 1.5 meters above ground.
For indoor ecoCUBE®s, acoustic measurement point is assumed to be to be at least 7 meters from the edge of the stack opening, perpendicular to the axis of the stack.

NOTE 'A': SYSTEM SPECIFICATIONS

1. REFER TO TABLE 'A' FOR SYSTEM SPECIFIC SPECIFICATIONS & TABLE 'B' FOR EMISSIONS PERFORMANCE.
2. INLET/OUTLET LOCATIONS ARE FIXED. SEE APPROVED SHOP DRAWING FOR FINAL.
3. ecoCUBE® IS INSULATED PER PROJECT PROPOSAL TYPICALLY WITH MINERAL WOOL INSULATION AND METAL CLADDING. MINIMUM AIR FLOW OF 4.0 M/S AROUND ecoCUBE® REQUIRED TO MAINTAIN TOUCH SAFE TEMPERATURE.
4. ecoCUBE® with SILENCING INCLUDED. REFER TO TABLE 'C' AND 'D'.
5. ecoCUBE® UREA CONSUMPTION AND EMISSIONS REDUCTION ARE CALCULATED FROM SPECIFICATIONS ON ENGINE DATASHEET.
6. ecoCUBE® IS FACTORY PRESSURE TESTED TO MEET THE PRESSURE WITHSTAND LEVELS IN CSA B139.1.0:19 S 13.7.
7. ecoCUBE® MEETS THE TEMPERATURE WITHSTAND LEVELS IN CSA B139.1.0:19 S 12.3.
8. SYSTEMS WITH DIESEL PARTICULATE FILTERS (DPFS) MUST BE OPERATED WITH ULSD ONLY. IN ORDER TO PROPERLY REGENERATE DPFS, OPERATING TEMPERATURE MUST BE ABOVE 280ºC FOR 30% OF ENGINE OPERATING TIME AND GREATER THAN 40% ENGINE LOAD.
9. ACCESS CONSIDERATIONS SHOULD BE MADE FOR SERVICING OF THE ecoCUBE® COMPONENTS. IF THE ecoCUBE® REACTOR IS PLACED ON A ROOF OR PLATFORM, EITHER A WALK WAY OR FALL ARREST TIE OFF POINTS SHOULD BE PROVIDED BY OTHERS.
10. UREA QUALITY AND STORAGE IN ACCORDANCE TO ISO22241.
11. OPERATING REACTOR ABOVE 950 DEG F WILL VOID ALL WARRANTIES.
12. INSTALLATION CONTRACTOR TO ENSURE GENERAL PUBLIC SHALL NOT HAVE ACCESS TO REACTORS OR CONTROL PANELS.

NOTE 'B': ecoCUBE® SEISMIC RESTRAINT/MOUNTING (BY OTHERS)

1. MATERIAL: 304 SS
2. USE A HEAVY 6mm WASHER PLATE OVER THE SLOT OR HOLE IN THE SLIDING SUPPORTS AND ADJUST BOLTS TO THE LISTED TORQUE SPECS ON DRAWINGS DM-01.
3. FOR ecoCUBEs INSTALLED IN SEISMICALLY ACTIVE AREAS, ecoCUBE® MOUNTING INFRASTRUCTURE (BY OTHERS) MUST BE SUITABLE.

NOTE 'D' - ADDITIONAL NOTES FOR ENCLOSURE MOUNTED SYSTEMS

1. CLIENTS' INLET DUCT MUST HAVE MINIMUM 7 GA WALL THICKNESS.
2. NO SUDDEN EXPANSION UPSTREAM OF ecoCUBE® INLET. EXPANSION CONE CONE ANGLE NEEDS TO BE LESS OR EQUAL TO 20 DEGREES.
3. FOR SITES REQUIRING ACOUSTIC REDUCTION IN EXCESS OF 35 DBA, ENSURE ALL EXPANSION JOINTS MEET THE REQUIREMENTS AS FOLLOW:
   a) CORRUGATED MULTI-PLY BELLOWS ELEMENT, TYPE T304/T321 SS.
   b) T304/T321 STAINLESS STEEL FLOW LINER.
   c) SHIPPED WITH RETENTION BARS HOLDING JOINT AT NON-COMPRESSED LENGTH.
   d) CONFORM TO EJMA STANDARD OR MIN. 3000 CYCLES FOR ANY ONE MOVEMENT.
   e) MIN. AXIAL COMPRESSION OF 3 IN.
   f) MIN. AXIAL EXPANSION OF 0.5 IN.
   g) MIN LATERAL OFFSET OF 0.5 IN.
   h) MAX. AXIAL SPRING RATE OF 125 LB/IN.
4. ENSURE THIMBLES USED ARE UL/ULC LISTED.
5. ENSURE INLET VELOCITY LESS THAN 7,250 FT/MIN.
6. IF UPSTREAM PIPING IS SMALLER THAN SCR INLET DIAMETER, THE TRANSITION MUST BE 3 X SCR INLET DIAMETER OR MORE.

NOTE 'E' - ENGINE START UP

1. FOR ecoCUBE® SYSTEM EQUIPED WITH DPF AND SCR CATALYST, YELLOW SMOKE MAY APPEAR FOR A BRIEF TIME PERIOD DURING ENGINE START UP. PLEASE SEE SAFETY POWER WHITEPAPER FOR MITIGATION MEASURES TO BE IMPLEMENTED BY INSTALLER: https://safetypower.ca/news/#Yellow

NOTE 'F' - LINEAR OR SPLITTED REACTORS

1. EXHAUST COMPONENTS BETWEEN DPF AND SCR REACTORS NEED TO BE STAINLESS 304/316.

NOTE 'G' - WIND LOADING

1. OUTDOOR REACTOR WITH HEIGHT MORE THAN 72 INCHES MUST HAVE WIND LOADING STUDY DONE BY OTHERS.

NOTE 'C' - INSTALLATION DETAIL FOR CLIENTS AND INSTALLATION CONTRACTORS

1. CLIENTS' INLET DUCT MUST BE SUPPORTED INDEPENDENTLY OF SPI.
2. CLIENT MUST MAKE SURE THERE IS NO ABSORPTIVE SILENCER UPSTREAM OF ecoCUBE®.
3. MAXIMUM AXIAL LOADING ON INLET/S AND OUTLET/S OF REACTOR IS 500 LBS. CONSULT SAFETY POWER IF OTHER LOADS ARE EXERTED ON THE INLET/S AND OUTLET/S.
4. UREA LINES TO BE INSULATED AND HEAT TRACED (SEE PI-02). UREA LINES TO BE 1/4" SS UNLESS GREATER THAN 75 FEET OF HEAD. IF GREATER THAN 75 FEET THEN CONSULT SAFETY POWER.
5. CONTRACTOR TO ENSURE FIXED POINTS OF REACTOR ARE RIGIDLY CONNECTED TO BUILDING STRUCTURE. DO NOT WELD REACTOR TO BUILDING STRUCTURE.
6. CONTRACTOR TO ENSURE ecoCUBE® FLANGES ARE NOT SUBJECTED TO LOAD DURING TRANSPORTATION, STORAGE & INSTALLATION.
7. ENSURE FLOOR MOUNTED ecoCUBE® IS MOUNTED AT LEAST 18" OFF OF FLOOR TO ALLOW FOR INSTALLATION OF FLOATING COLLAR AT INLET.
8. ALL CONDUIT AND WIRING MUST NOT COME IN CONTACT WITH THE REACTOR AND ITS SUPPORTING ELEMENTS.
9. CLIENTS TO SUPPLY DRAINAGE VALVES FOR DRAINAGE BUNGS LOCATED AT THE BOTTOM OF ecoCUBE® AND PIPED TO A LOCATION THAT ALLOWS OPERATOR EASY ACCESS FROM FLOOR LEVEL.
10. ALL OPENINGS ON THE REACTOR MUST BE SECURELY COVERED BEFORE TRANSPORTATION.
11. CLIENT MUST USE ENGINE LUBE OIL APPROVED BY MANUFACTURER FOR USE WITH DOWNSTREAM CATALYSTS.
12. CLIENT ENGINE MUST BE EQUIPPED WITH EXHAUST TEMPERATURE SENSOR AND ALARM.
13. ON ecoCUBE® EQUIPPED WITH OXIDATION CATALYSTS IT IS IMPORTANT THAT THE ENGINE CONTROL UNIT HAVE AN OVERRIDE TO PREVENT OVER FUELLING AN ENGINE WHICH IS UNABLE TO DELIVER ITS REQUESTED LOAD. FAILURE TO HAVE THIS OVERRIDE CAN RESULT IN EXCESS POST COMBUSTION IN THE OXIDATION CATALYSTS. SUCH EXCESS POST COMBUSTION WILL DAMAGE THE OXIDATION CATALYSTS AND VOID ANY ASSOCIATED WARRANTY.
14. PRIOR TO INSTALLATION CONTACT DESIGNATED SAFETY POWER PROJECT MANAGER FOR INSTALLATION OVERVIEW.
15. RECOMMENDED MINIMUM STACK HEIGHT IS 3 DIAMETER OF ecoCUBE® OUTLET.
16. REFER TO DIMENSIONAL DRAWING DM-01 FOR DETAILED VIEWS, ANCHOR POINTS AND SENSOR LOCATIONS.
17. STRUCTURAL CROSS BRACE MUST BE INSTALLED AT FIXED POINTS FOR CEILING MOUNT REACTOR.
18. CONTRACTOR TO ENSURE NO CONDUITS ENTER ANY OF THE SAFETY POWER CONTROL AND JUNCTION BOXES FROM THE TOP.
19. IF EXHAUST TEMPERATURE EXCEEDS THE DESIGN TEMPERATURE AS STATED IN THE SPI PROPOSAL THEN THE CATALYST WARRANTY IS REDUCED. EXCESSIVE ENGINE EXHAUST TEMPERATURE WITHOUT SAFETY POWER'S CONSENT WOULD VOID WARRANTY OF THE SCR CATALYST.
20. MAXIMUM THERMAL EXPANSION OF UP TO 1.5" ON ALL DIRECTIONS AWAY FROM FIXED ANCHOR POINT. DO NOT USE REACTOR FLANGES AS ANCHOR POINTS.
21. REFERENCE KINETIC NOISE DOCUMENT WITH LATERAL SUPPORTS AND SPRING HANGERS FOR CEILING HUNG ecoCUBE® REACTOR.
22. ENSURE UPSTREAM PIPING GASKETS ARE RATED FOR APPROPRIATE TEMPERATURE. DECOMPOSITION OF GASKET MATERIAL MAY POISON CATALYST AND VOID WARRANTY.
23. INSTALLATION CONTRACTOR MUST NOT INSULATE OVER SENSOR AND INSTRUMENT PORTS
24. FOR OUTDOOR APPLICATIONS, CONTRACTOR TO INSULATE ecoCUBE® INLET COLLAR AND UPSTREAM EXHAUST COMPONENTS. ROOF PENETRATION MUST BE ACOUSTICALLY INSULATED TO PREVENT BREAKOUT NOISE.
25. ENSURE THAT ECOCUBE NOT INSTALLED DOWNWIND OF COOLING TOWERS AS PHOSPHATES WILL DE-ACTIVATE SCR CATALYST.
26. THE FOLLOWING CONDITIONS CAN VOID CATALYST WARRANTY: (1) ENGINES THAT USE LUBE OIL WHICH IS NOT RATED FOR USE WITH DOWNSTREAM CATALYSTS (2) ENGINES WITH DATA SHEET EXHAUST TEMPERATURES IN EXCESS OF 480 DEG C CANNOT USE WIPA ECOSYN OILS EVEN THOUGH THEY ARE RATED FOR DOWNSTREAM CATALYST USE
27. SAFETY POWER HAVE NO DIRECT OR CONTINGENT LIABILITY FOR DAMAGE CAUSED BY A THERMAL EXCURSION CREATED BY THE ENGINE'S CONTROL UNIT INJECTING EXCESS FUEL THAT COMBUSTS DOWNSTREAM OF THE ENGINE'S COMBUSTION CHAMBER.
28. UREA TANK MUST NOT BE INSTALLED HIGHER THAN ecoCUBE® REACTOR. CONSULT SAFETY POWER FOR UREA TANK PLACEMENT.
29. DO NOT INSTALL ANY ELECTRONICS BELOW CP100 PANEL.
30. PROPER WEATHER PROTECTION NECESSARY DOWNSTREAM OF ecoCUBE®.
31. ecoCUBE® CANNOT BE INSTALLED IN AN ENCLOSED UN-VENTILATED ENVIRONMENT UNLESS REVIEWED BY SPI.
32. FOR INDOOR INSTALLATIONS, ENSURE THAT ADEQUATE LIGHTING IS AVAILABLE WHERE ecoCUBE® IS INSTALLED.
33. MODBUS POLLING RATE MUST NOT BE MORE THAN ONCE EVERY 10 SECONDS.
34. UPSTREAM PIPING NEEDS TO BE THERMALLY INSULATED.
35. INJECTION LANCE FLEX HOSE MUST NOT SUPPORT WEIGHT OF UREA/AIR LINES OR BUNDLE.
36. IF SYSTEM HAS A BLOWER ENSURE SUCTION SIDE CONNECTED TO OUTSIDE AIR.
37. INSTALLER SHALL PROVIDE CLEARANCE AND ACCESS TO ecoCUBE® WITH NECESSARY MAN LIFTS, SCAFFOLDING AND/OR LADDER.
38. FOR ENCLOSURE APPLICATION, PACKAGER TO STRAP AIR COMPRESSORS WITH VERTICAL RECEIVERS PRIOR TO SHIPMENT TO SITE
39. ENSURE EXHAUST PRESSURE RELIEF VALVE/S ARE INSTALLED VERTICALLY.
40. MOUNTING FEET ON ecoCUBE® REACTOR, UREA TANK, COMPRESSOR W/ RECEIVER TANK ARE DESIGNED FOR STATIONARY APPLICATION. CONTACT SPI FOR PROPER PACKAGING INSTRUCTIONS PRIOR TO SHIPPING.
41. PHOTO VERIFICATION OF COMPLETE INSTALLATION MUST BE SUBMITTED TO SAFETY POWER BEFORE COMMISSIONING CAN BE SCHEDULED.

FOR CUSTOMER APPROVAL

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safety POWER