FREEFIELD LTD.
Ottawa, Ontario

ACOUSTIC ASSESSMENT FOR THE PROPOSED RENFREW GOLF COURSE PIT HORTON TOWNSHIP RENFREW COUNTY ONTARIO

Prepared for

Thomas Cavanagh Construction Limited

Prepared by

Freefield Ltd.

8th April 2024

Postal Address: PO Box 74056, RPO Beechwood, Ottawa, Ontario, K1M 2H9, Canada
T/F: 613 747 0983 | E: info@freefieldacoustics.com | W: www.freefieldacoustics.com

ACOUSTIC ASSESSMENT FOR THE PROSED RENFREW GOLF COURSE PIT HORTON TOWNSHIP, RENFREW COUNTY, ONTARIO

Executive Summary

Thomas Cavanagh Construction Limited (Cavanagh) is applying to the Ministry of Natural Resources and Forestry, MNRF, for a license under the Aggregate Resources Act, ARA, for the Renfrew Golf Course (RGC) Pit, a Class A, Sand Pit (below water), to be located at Part of Lot 23, 24 and 25, Concession 1, Horton Township, Renfrew County, Ontario, as shown in Figures 1 and 2.

The North American Industry Classification System (NAICS) code of the facility is 212323.

The MNRF license application requires the submission of an Acoustic Assessment Report of the proposed operation. Freefield Ltd. has been retained by Cavanagh to complete this acoustic assessment.

The acoustic assessment has been carried out according to the applicable Ministry of Environment, Conservation and Parks (MECP) Noise Assessment Guidelines, including NPC-300, published August 2013. The assessment considers the impact on nearby noise sensitive lands, including existing residences and vacant land zoned for potential noise sensitive use, of noise generated by all on-site equipment operations, including extraction operations by loaders or excavators, aggregate processing operations by a crushing plant, screening plant and wash plant, loading operations by loaders, site preparation and maintenance by an excavator and truck movements used for the shipping of product off-site. The site is not a significant source of vibration hence an assessment of vibrations is not required.

Noise impacts have been predicted and compared to the MECP sound level limits as set out in NPC-300. Where applicable, noise mitigation measures such as barriers and limits to operations have been designed to ensure all operations comply with the applicable sound level limits.

Assessment methodology is provided in Section 1. A detailed description of the facility and its operations is provided in Section 2. Noise sources associated with operations at the pit are summarized in Section 3. Noise sensitive receptors are described in Section 1 and Section 4, with Section 5, 6 and 7 detailing applicable assessment criteria, an assessment of noise impacts and recommended mitigation measures.

Version Control

Title	Comments	Prepared By	Issue Date
Acoustic Assessment for the Proposed Renfrew Golf Course Pit, Horton Township, County of Renfrew, Ontario	Issued to client for review	Freefield Ltd.	21st December 2023
Acoustic Assessment for the Proposed Renfrew Golf Course Pit, Horton Township, County of Renfrew, Ontario	Updated to incorporate new data relating to ground water table and lift elevations	Freefield Ltd.	21st February 2024
Acoustic Assessment for the Proposed Renfrew Golf Course Pit, Horton Township, County of Renfrew, Ontario	Updated to incorporate revised location of Barrier 1 following review by natural environment technical consultant team	Freefield Ltd.	8th April 2024 (This version)

ACOUSTIC ASSESSMENT FOR THE PROSED RENFREW GOLF COURSE PIT HORTON TOWNSHIP, RENFREW COUNTY, ONTARIO

Table of Contents

Tables 20

Figures 29

ACOUSTIC ASSESSMENT FOR THE PROSED RENFREW GOLF COURSE PIT HORTON TOWNSHIP, RENFREW COUNTY, ONTARIO

1.0 Introduction

Thomas Cavanagh Construction Limited (Cavanagh) is applying to the Ministry of Natural Resources and Forestry, MNRF, for a license under the Aggregate Resources Act, ARA, for the Renfrew Golf Course (RGC) Pit, a Class A, Sand Pit (below water), to be located at Part of Lot 23, 24 and 25, Concession 1, Horton Township, Renfrew County, Ontario, as shown in Figures 1 and 2.

The North American Industry Classification System (NAICS) code of the facility is 212323.

This report describes an assessment, carried out by Freefield Ltd., of the potential impact of noise from operations at the facility on nearby noise sensitive receptors in accordance with MECP guidelines for stationary noise sources. [1, 2]

This report has been prepared in accordance with the MECP Document NPC-233, *Information to be Submitted for Approval of Stationary Sources of Sound*, October 1995[3]. Noise from the facility is assessed according to MECP Documents: NPC-300, *Stationary and Transportation Sources – Approval and Planning*, August 2013.[1] This report follows the recommended format contained in, *Sample Application Package, Basic Comprehensive Certificate of Approval (Air and Noise)*, July 2009.[2]

The noise assessment methodology is summarised below.

- Identification of noise sensitive receptors in the vicinity of the facility. Potential noise sensitive receptors include residences, motels, places of worship, schools, hospitals and vacant land zoned for potential noise sensitive use.

- Determination of the MECP sound level limits[1] which apply at each of the noise sensitive receptors.

- Identification of the sources of noise that will arise from the facilities operations. In the current study, the strengths of the various noise sources were obtained from noise measurements of the proposed equipment in operation at the Cavanagh Pine Grove Pit carried out in October 2019 and from a database of noise measurements of similar operations at other aggregate operations in Ontario by Freefield Ltd.

- Based on the strengths of the individual noise sources, noise levels due to the facilities operations are predicted at nearby noise sensitive receptors using a prediction procedure[7] which is favoured by the MECP. The MECP methodology requires that compliance be assessed under predictable "worst case" conditions for normal operations.

- Assessment of compliance of the noise due to the facilities operations with MECP sound level limits. Where appropriate mitigation measures are recommended such that compliance, with MECP sound level limits, is achieved at all receptors.

Note that this assessment considers all significant noise sources in operation on the site. The site is not a significant source of vibration; hence, an assessment of vibrations is not required.

Surrounding Lands, Acoustic Environment and Noise Sensitive Receptors

The facility is located in a predominantly rural area, on the east side of Golf Course Road, approximately 0.5 km north of Highway 60, in Horton Township, Renfrew County, Ontario.

Admaston Township lies immediately west of the site with a road allowance in the form of a possible extension of Golf Course Road, located between the Townships of Horton and Admaston.

The licensed area is approximately 40.5 Hectares and consists of an unexcavated sand deposit. Access to the site is via Golf Course Road which currently terminates at the south end of the site.

The site rises in a northerly direction from Golf Course Road to a knoll approximately 30 m high located in the mid portion of Lot 24.

The land surrounding the facility consists of undulating topography with moderate changes in elevation, plus minus 30 m.

Note that directions in this report are referenced to site north as shown in Figure 1.

The legal description of the land occupied by the facility is as follows:

Part of Lot 23, 24 and 25,
Concession 1,
Horton Township,
Renfrew County, Ontario

A location plan showing the site with respect to the surrounding area is provided in Figure 1. A site layout plan, showing the sites detailed arrangement and elevation contours, is provided in Figure 2. Land use zoning maps for Horton and Admaston Townships are provided in Appendix 1.

The site is zoned Extractive Industrial (EM-h) as shown on the Zoning Map, Appendix 1.

To the north of the site the land is zoned Rural (RU). A number of existing residences and vacant lots zoned for potential noise sensitive use lie in this direction fronting Haley Road and Orin Road. The closest existing residences and vacant lots zoned for potential noise sensitive use in this direction have been selected as noise sensitive receptors in the following assessment.

To the east of the site the land is zoned Open Space (OS). This land is occupied by the Renfrew Golf Course. Further east the land is zoned Rural (RU) and consists of a number of densely wooded inaccessible vacant lots. This land extends for approximately 3.5 km from the sites eastern site boundary with the closest existing residences, in this direction, fronting Garden of Eden Road at an approximate distance of 3.5 km from the site's eastern boundary. Noise impacts from the proposed facility at these residences are expected to be insignificant, hence, no noise sensitive residences in an easterly direction have been included in this assessment.

To the south of the site the land is zoned Open Space (OS). Further south the land is zoned Rural (RU). A number of residences lie in this direction fronting Price Road and Pinnacle Road. The closest existing residences in this direction have been selected as noise sensitive receptors in the following assessment.

To the west of the site the land is zoned Agriculture (A) with small pockets of Rural (RU) zoned land fronting Golf Course Road, Harveys Crescent and Haley Road. A number of residences lie in this direction fronting Golf Course Road, Harveys Crescent and Haley Road. The closest existing residences in this direction have been selected as noise sensitive receptors in the following assessment.

Where receptors have been located on vacant land zoned for potential noise sensitive use i.e. a possible future residence located on land zoned rural, the location selected for assessment is consistent with the existing pattern of development in the area.

The noise sensitive noise sensitive receptors, which have been selected for detailed analysis, are shown in Figure 1. These were selected as being the receptors most likely impacted by noise from the facilities operations. Other noise sensitive receptors are at greater distances and will be less affected by noise from the facility.

Table 1 lists the noise sensitive receptors selected for analysis.

2.0 Facility Description

The proposed RGC Pit will produce various grades of sand and aggregate with an annual production limit of 1,000,000 tonnes per year.

Excavated raw material will be extracted by excavators and loaders which transport the raw material to a mobile screening plant located near the lift face. After screening processed sand and aggregate is stockpiled using conveyors and stackers. A loader or excavator then loads the processed sand and aggregates from stockpiles onto highway trucks which are used to deliver the product off-site.

At certain times a wash plant may be used in place of the mobile screening plant to process raw material. In addition, aggregate trucks may be used to transfer raw material from the extraction face to the wash plant.

The larger stones and rocks which are separated by the screening plant or wash plant will be stockpiled before being loaded onto aggregate trucks and transferred to the mobile crushing plant which is brought to site as needed. After crushing, processed aggregate will be stockpiled using conveyors and stackers. A loader or excavator then loads the processed aggregate from stockpiles onto highway trucks which are used to deliver the product off-site.

Additional material may be brought on site as needed, stored and processed, before being shipped off site.

Extraction will take place in two lifts, corresponding to above water and below water extraction. The lifts may be benched to allow for quality considerations and to comply with Ministry of Labour requirements.

Extraction of the first lift (above water) will commence in the southern region of the site at the existing ground elevation at an approximate elevation of 130 mASL. Extraction will proceed radially towards the north, east and west setback limits. The first lift will extend to the water table and will be sloped or benched as required. The ground water table lies at an approximate elevation of 128 mASL in the south to 150 mASL in the north. Extraction below water will follow above water extraction and will generally proceed from north to south.

Access for shipping processed sand and aggregate is from the site entry off Golf Course Road as shown in Figure 2.

The following equipment will be operated on-site and is included in this assessment as significant sources of noise:

- One mobile screening plant, with associated conveyors and stackers,
- One wash plant, with associated conveyors, stackers and diesel generator,
- One mobile crushing plant, brought to site occasionally, when required,
- Up to five loaders or excavators,

- Aggregate trucks used to ship raw material from the extraction face to the processing plants and large stones and rocks from the screening and wash plant to the crushing plant,
- Highway trucks used to ship the product off site,
- Portable equipment for site preparation and rehabilitation, including excavators, hydraulic shovels, dozers and scrapers.

A description of each operation follows:

Mobile Screening Plant

A mobile screening plant (mobile screener) will be brought to site as needed and located near the extraction face. The mobile screener consists of a hopper (feed bin), screen deck, diesel engine, magnetic separator and conveyors. Overburden, soil, sand and aggregate are fed through the screening plant to produce various grades of product before being stockpiled, using stackers and conveyors, and processed for shipping off site. Oversized aggregates separated in the screening process are stockpiled before being taken to the mobile crushing plant for further processing. Typically, two loaders and two excavators are used to extract material from the lift face to feed the screening plant and fill trucks from the stockpiles for shipment off-site.

The mobile screening plant operates only during daytime hours (07:00 – 19:00).

Wash Plant

A wash plant is used to process extracted sand and separate it into various grades of aggregate. The major components of the wash plant include a hopper (feed bin), dry screen deck, a wet screen deck, a classifier, two double screw material washers, a dewatering derrick and conveyors and stackers. Typically, associated operations include loaders used to supply raw material to the plant and to load trucks from stockpiles for delivery off-site and a diesel generator used to provide power to the plant. The wash plant will be located in location shown on Figure 2.

The wash plant operates only during daytime hours (07:00 – 19:00).

Mobile Crushing Plant

A mobile crushing plant (crusher) is brought to site as needed to crush larger stones and rocks separated via the screening process. The plant consists of a hopper (feed bin), primary and secondary crushing units, a diesel engine, vibrating screens, a magnetic separator and conveyors. Typically, associated operations include one loader and excavator. The mobile crushing plant will be located in location shown on Figure 2.

The mobile crushing plant operates only during daytime hours (07:00 – 19:00).

Loaders and Excavators

Typically, loaders and excavators are required on-site for the following:

- Extracting raw material from the extraction face,

- Loading extracted material onto trucks for delivery to the wash plant and mobile crushing plant,
- Loading sand from stockpiles into the hoppers to feed the mobile screening plant,
- Loading processed sand and aggregate on to trucks for shipping off-site,
- Generally pushing around rock and aggregate to maintain the site in a safe state,
- Removing overburden and site preparation,

Loading and excavating activities may take place on a twenty-four-hour basis (24 hour).

Aggregate Trucks

Aggregate trucks are used to deliver raw material from the extraction face to the processing plants and from the wash plant and screening plant to the crushing plant. Based on the maximum annual tonnage it is assumed a maximum of 12 loads per hour in total are shipped from the extraction face to the wash plant, screening plant and / or mobile crushing plant during periods of maximum capacity during the daytime period of operation. The speed limit for trucks on site is 30 km/h. The use of jake brakes (compression assisted brakes) is forbidden on site. Additional restrictions apply to various regions of the site. Refer to Section 7.0 for further details.

Haul trucks operate only during the daytime (07:00 to 19:00).

Highway Trucks

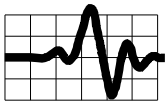
Highway trucks are used for shipping processed sand and aggregate off site. Based on the maximum annual tonnage it is assumed 12 loads per hour in total are shipped from the screening plant, wash plant and / or mobile crushing plant during periods of maximum capacity during the daytime period of operation. During the evening and nighttime period, it is assumed 4 loads per hour are shipped during periods of maximum capacity. The speed limit for trucks on site is 30 km/h. The use of jake brakes (compression assisted brakes) is forbidden on site. Additional restrictions apply to various regions of the site. Refer to Section 7.0 for further details.

On-site truck movements take place on a twenty-four-hour basis (24 hours).

Portable equipment for site preparations and rehabilitation

Portable construction equipment will be used occasionally for site preparation (e.g. land clearing and construction of berms) and rehabilitation. This equipment would typically include excavators, hydraulic shovels, dozers and scrapers. To minimize the impact of noise during site preparation and rehabilitation, the construction equipment used, excavators, bulldozers, etc., will comply with MECP Publication NPC-115,[8] Construction Equipment, August 1978. This publication gives noise standards to be met by construction equipment in Ontario.

Site preparation and rehabilitation activities will take place only during daytime hours (07:00 – 19:00).



Hours of Operation

Daytime Operations (07:00 – 19:00) - During the daytime period, all significant noise sources are assumed to be in operation and include the following:

- One mobile screening plant,
- One wash plant,
- One mobile crushing plant,
- Up to five loaders or excavators,
- On-site truck movements used to deliver material to the processing plants and ship processed product off-site.

Evening and Nighttime Operations (19:00 – 07:00) – During the evening and nighttime period the following significant noise sources may be in operation:

- Up to two loaders or excavators,
- On-site truck movements used to ship processed product off-site.

3.0 Noise Source Summary

The following noise sources have been used to model noise generated by operations at the Renfrew Golf Course Pit. In brackets are the shortened names of the noise sources as used in the acoustic model. The characteristics of these sources, as used in acoustic modelling, are summarized in Table 2.

- One mobile screening plant and one loader (Source: Screener),
- One wash plant and one loader (Source: Washplant),
- One diesel generator used to provide power to the wash plant (Source: Generator),
- One mobile crushing plant and one loader (Source: Crusher),
- Up to three additional loaders or excavators (Source: Loaders*)
- On-site highway truck movements (Source: IHR_1).
- On-site aggregate truck movements (Source: IHR_2).

The noise modelling considers various scenarios relating to different areas of operation as described in Section 6.0. For each scenario, the locations of the noise sources are selected for worst case noise impacts.

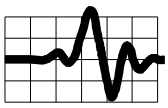
The strengths of the noise sources, i.e. the sound powers shown in Table 2 and used in this analysis, are taken from noise measurements of the mobile screening plant in operation at the Cavanagh Pine Grove Pit in October 2019, the wash plant in operation at Cavanagh Lanark Quarry in August 2020 and from a database of noise measurements by Freefield Ltd. of similar operations made at other aggregate operations in Ontario.

A Brüel & Kjær Type 2270 sound level meter was used for all noise measurements. Field calibrations, using a Brüel & Kjær 4231 field calibrator, and battery checks were carried out before and after each measurement series. In no case did the field calibration vary by more than 0.1 dB over a series of measurements. In addition, the sound level meters, and the field calibrator are laboratory calibrated on an annual basis. Copies of the relevant calibration certificates are included in Appendix 3. The weather conditions during the measurements were suitable for outdoor noise measurements (variable winds of less than 20 km/h, skies generally clear with relatively low humidity). A windshield was used during noise measurements.

Noise from the mobile screening plant, mobile crushing plant and wash plant has been modelled as point sources, located at the centre of the equipment, and includes noise from an associated loader which was in operation, feeding each plant, during measurements.

Noise from the additional loaders and excavators that will be used on-site for extraction, stockpiling and loading operations, are estimated using the moving point source method within a worst-case area of operation. In all scenarios the sound power for excavators was used as this was the higher sound power compared to that for loaders, hence, represents worst case conditions.

Noise from the aggregate trucks and highway trucks, and associated on-site haul routes, are estimated using the moving point source method and modelled as a loop indicating the worst-case on-site truck movements.



Insignificant noise sources:

Conveyors, stackers and noise from employee or service vehicles have been assessed as insignificant noise sources in this analysis.

Refer to Figures 3, 5, 7 and 9 for locations of sources for the worst-case modes of operation analysed.

4.0 Point of Reception Summary

A total of twelve nearby noise sensitive receptors have been selected for detailed noise evaluation.

These existing and potential future residences on vacant land zoned for potential noise sensitive use are those closest to the proposed pit in all directions and represent the worst-case noise impacts in comparison to other nearby or more distant noise sensitive receptors.

The twelve points of reception selected for analysis, POR 1 to POR 12, are shown in Figure 1 and listed in Table 1.

As per MECP Guideline NPC-300, two points of reception (POR) have been selected at each noise sensitive receptor for which worst case sound levels have been calculated.

> POW – Plane of window (POW) points of reception are located on the dwelling or noise sensitive building, typically 2 m above ground for single storey dwellings and 4.5 m above ground for two storey dwellings.
>
> OPR – Outdoor Point of Reception, an area on the property of the residence. For large properties, the OPR point of reception can be up to 30 m from the dwelling at a height of 1.5 m above ground.

Where receptors have been located on vacant land zoned for potential noise sensitive use i.e. a possible future residence located on land zoned rural, the location selected for assessment are consistent with the existing pattern of development in the area.

Noise prediction results are summarized in Table 6.1 and 6.2 by point of reception. Figures 4.1, 4.2, 6.1,6.2, 8.1,8.2, 10.1 and 10.2 show predicted results as noise contours for Scenario 1 through Scenario 4 for daytime and evening and nighttime periods of operation.

Detailed prediction results are contained in Appendix 2, with Tables A2.8.1 to A2.8.8 providing a summary of predicted noise impacts at each point of reception (POR) for the individual sources.

5.0 Assessment Criteria, Performance Limits

Sound level limits, as specified in the MECP guideline NPC-300 [1], depend on the acoustical classification of the area as Class 1, 2, 3 or 4.

> **Class 1 area** 'an area with an acoustical environment typical of a major population centre, where the background sound level is dominated by the activities of people, usually road traffic, often referred to as urban hum.'
>
> **Class 2 area** 'an area with an acoustical environment that has qualities representative of both Class 1 and Class 3 areas: sound levels characteristic of Class 1 during daytime (07:00 to 19:00 or to 23:00 hours); and low evening and night background sound level defined by natural environment and infrequent human activity starting as early as 19:00 hours (19:00 or 23:00 to 07:00 hours).'
>
> **Class 3 area** 'a rural area with an acoustical environment that is dominated by natural sounds having little or no road traffic, such as: a small community; agricultural area; a rural resort area such as a cottage or resort area; or, a wilderness area. '
>
> **Class 4 area** 'an area or specific site that would otherwise be defined as Class 1 or 2 and which: is an area intended for development with new noise sensitive land use(s) that are not yet built; is in proximity to existing, lawfully established stationary source(s); and, has formal confirmation from the land use planning authority with the Class 4 area classification which is determined during the land use planning process. Additionally, areas with existing noise sensitive land use(s) cannot be classified as Class 4 areas.'

Due to the relatively high levels of road traffic on Highway 60 and minimal distance from the highway to the residence, the area in which receptors POR 3 and 6 are located is subject to road traffic noise particularly during the daytime and evening periods. As such, the area in which these receptors are located is classified as Class 2 Area.

Due to the relatively low levels of road traffic along Golf Course Road, Price Road, Pinnacle Road, Haley Road and Orin Road and distance from Highway 60, the area in which receptors POR 1, 2, 4, 5, 7, 8, 9, 10, 11 and 12 are located is at times dominated by natural sounds with little road traffic noise. As such, the area in which these receptors are located is classified as Class 3 Area.

The applicable outdoor sound level limit at a point of reception is the higher of the applicable exclusion limit value, presented in Tables 3 and Table 4, or the background sound level for that point of reception. Background sound level means the sound level that is present in the environment produced by noise sources other than the source under assessment.

A background noise assessment was not carried out, hence, the levels given in the Tables 3 and 4 are taken as the sound level limits at all points of reception for the purpose of this assessment according to their location in a Class 2 and Class 3 Area.

The applicable sound level limits for each point of reception are set out in Table 5.

Sound levels are assessed in terms of the 1-hour equivalent sound level, L_{eq}, effectively the average sound level over each hour. All sound levels are A-weighted, A-weighting being a frequency weighting with represents sensitivity of human hearing to sounds of differing frequencies.

6.0 Impact Assessment

Noise levels have been predicted at the noise sensitive receptors using "predictable worst case" assumptions under normal operations and using ISO 9613-2 sound propagation methodology[6] as implemented in the sound prediction software Cadna-A, Version 2022. The "predictable worst case" is interpreted as meaning the greatest noise impact anticipated under normal operating conditions. The ISO methodology provides a conservative (i.e. high) estimate of the noise level at a receptor taking into account adverse wind and meteorological conditions.

The estimation method includes the following:

- Distance attenuation is based on spherical spreading.
- Atmospheric attenuation.
- Ground attenuations, as appropriate.
- Barrier attenuation, as appropriate.

In order to consider cases of worst noise impacts, four operational scenarios have been modeled. In general, the worst impacts are those which occur when all equipment is operating concurrently. For each scenario daytime and evening and nighttime periods have been analysed.

The following four worst case scenarios are presented in this report and form the basis for the recommended mitigation measures and assessment of compliance to MECP criteria:

Scenario 1: Worst Case, Southern Extraction – Crushing Plant and Screening Plant in operation concurrently with extraction occurring closest to POR 1, 2, 3, 4 & 5 (Day, Evening and Night) – Figure 3, 41 and 4.2.

Scenario 2: Worst Case, Northern Extraction - Crushing Plant and Screening Plant in operation concurrently with extraction occurring closest to POR 6, 7, 8, 9, 10, 11 & 12 – (Day, Evening and Night) – Figure 5, 6.1 and 6.2.

Scenario 3: Worst Case, Southern Extraction – Crushing Plant and Wash Plant in operation concurrently with extraction occurring closest to POR 1, 2, 3, 4 & 5 (Day, Evening and Night) – Figure 7, 8.1 and 8.2.

Scenario 4: Worst Case, Northern Extraction - Crushing Plant and Wash Plant in operation concurrently with extraction occurring closest to POR 6, 7, 8, 9, 10, 11 & 12 – (Day, Evening and Night)– Figure 9, 10.1 and 10.2.

In Table 6.1 and 6.2 estimated noise levels, for daytime and evening and nighttime periods, at the nearest receptors for the worst case, among all scenarios, are compared with the applicable sound level limits. More detailed estimates, for all sources and scenarios, are contained in the Point of Reception Noise Impact Tables in Appendix 2, Tables A2.8.1 to A2.8.8 and Table A2.9.

It can be seen that the sound level limits are met at all noise sensitive points of reception, POR 1 to POR 12, for worst case operating conditions during the proposed daytime period of operation

7 am to 7 pm (07:00 to 19:00) and evening and nighttime period of operation 7 pm to 7 am (19:00 to 07:00).

Details of acoustic modeling are provided in Appendix 2. Figures 4.1, 4.2, 6.1, 6.2, 8.1, 8.2, 10.1 and 10.2 show predicted noise contours for each mode of operation analyzed.

Statement of Compliance

It is concluded that, with the recommended mitigation measures detailed in section 7.0, noise impacts from operations at the Renfrew Gold Course Pit will be in compliance with MECP Environmental Noise Guidelines[1] for the proposed daytime period of operation 7 am to 7 pm (07:00 to 19:00) and evening and nighttime period of operation (19:00 to 07:00).

7.0 Mitigation Measures (Site Plan Recommendations)

Noise mitigation measures for the Renfrew Golf Course Pit operations are detailed below.

The predicted noise impacts in Tables A2.8.1 to A2.8.8 are based on the implementation of the following mitigation measures:

7.1 Noise Barriers and Berms:

7.1.1 Noise barriers and berms are to be provided as per Table 7 and Figure 11, 12, 13 and 14.

7.1.2 Noise barriers and berms are to be solid, having no gaps, and are to have a surface density of no less than 20 kg/m2. Examples of suitable barriers or berms are as follow:

- 7.1.2.1 Lift face or existing terrain;
- 7.1.2.2 Earth, gravel or aggregate berms or stockpiles;
- 7.1.2.3 Concrete or brick walls;
- 7.1.2.4 Commercial noise barriers;
- 7.1.2.5 Shipping containers or buildings,
- 7.1.2.6 A portable barrier such as a truck trailer equipped with movable flaps to block the space between the ground and the bottom of the trailer and increase height if required.

7.1.3 Noise barriers shielding portable equipment may be progressively established to provide shielding from location of operation to the identified noise sensitive point of reception (POR).

7.2 Mobile Screening Plant

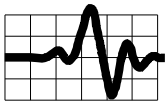
7.2.1 The operation of the mobile screening plant (screener) may take place only during the daytime period (07:00 to 19:00) and shall comply with the following:

- 7.2.1.1 The screener is to be located on the first lift (above water) at an approximate elevation ranging from 130 mASL in the south to 154 mASL in the north.

7.3 Wash Plant

7.3.1 The operation of the wash plant and associated diesel generator may take place only during the daytime period (07:00 to 19:00) and shall comply with the following:

- 7.3.1.1 The wash plant is to be located on the pit floor at a maximum elevation of 140 mASL in locations shown in Figure 2.
- 7.3.1.2 The maximum outdoor sound power of the generator, if used to provide power to the wash plant, must not exceed the levels given in Table 2. To achieve these ratings the generator will likely need to be housed inside an enclosure and fitted with an exhaust silencer that meets the minimum insertion loss requirements listed in Table 8. The silencer is to be located inside the enclosures or as close as possible to the location where the exhaust exits the enclosures with the duct material between the silencer and the generator constructed of 16-gauge weather resistant metal. The silencers shall have a high transmission loss casing.



7.4 Mobile Crushing Plant

7.4.1.1 The operation of the mobile crushing plant (crusher) may take place only during the daytime period (07:00 to 19:00) and shall comply with the following:

7.4.1.2 The crusher is to be located on the pit floor at a maximum elevation of 140 mASL in location shown in Figure 2.

7.5 Loaders and Excavators

7.5.1 The operation of the loaders and excavators may take place during the daytime, evening and nighttime period (24 hours) anywhere in the extraction area.

7.5.1.1 <u>During the daytime period (07:00 to 19:00):</u> A maximum of five (5) loaders or excavators may be in operation concurrently.

7.5.1.2 <u>During the evening and nighttime period (19:00 to 07:00):</u> A maximum of two (2) loaders or excavators may be in operation concurrently.

7.6 Aggregate Trucks

7.6.1 The delivery of material to the processing plants using aggregate trucks may take place during the daytime, evening and nighttime period (24 hours) and shall comply with the following:

7.6.1.1 <u>During the daytime period (07:00 to 19:00):</u>

i. When extracting south of Line AA: A maximum of six (6) loads per hour in total may be delivered to the processing plants.
ii. When extracting north of Line AA: A maximum of twelve (12) loads per hour in total may be delivered to the processing plants.

7.6.1.2 <u>During the evening and nighttime period (19:00 to 07:00):</u>

i. A maximum of four (4) loads per hour in total may be delivered to the processing plants.

7.6.1.3 When operating on-site, highway trucks shall not exceed 30 km/h and shall not use compression braking (Jake Brakes).

7.7 Highway Trucks

7.7.1 The loading and shipping of product using highway trucks may take place during the daytime, evening and nighttime period (24 hours) and shall comply with the following:

7.7.1.1 <u>During the daytime period (07:00 to 19:00):</u>

i. When extracting south of Line AA: A maximum of eight (8) loads per hour in total may be shipped off-site.
ii. When extracting north of Line AA: A maximum of twelve (12) loads per hour in total may be shipped off-site.

7.7.1.2 <u>During the evening and nighttime period (19:00 to 07:00):</u>

i. A maximum of four (4) loads per hour in total may be shipped off-site.

7.7.1.3 When operating on-site, highway trucks shall not exceed 30 km/h and shall not use compression braking (Jake Brakes).

7.8 Portable construction equipment

7.8.1 Portable construction equipment used for site preparation (e.g. land clearing and construction of berms) and rehabilitation shall comply with MECP Publication NPC-115, Construction Equipment, August 1978[8]. (This publication gives noise standards to be met by construction equipment in Ontario.) Site preparation and rehabilitation activities shall take place only during daytime hours (07:00 – 19:00).

7.9 New Process

7.9.1 If a new process is introduced to the site, then this process shall be assessed by a qualified acoustical consultant prior to commissioning. Noise mitigation measures shall be reviewed and altered, if necessary, to ensure that MECP sound level limits are met at all points of reception.

7.0 Conclusions

An acoustic assessment of operations at the Proposed Renfrew Golf Course Pit has been conducted according to MECP noise assessment procedures. Operations include extraction by loaders or excavators, aggregate processing operations by a mobile screening plant, a wash plant and a mobile crushing plant, loading processed sand and aggregate from stockpiles using loaders or excavators, and delivery and shipping of product using highway trucks.

It has been found that noise levels from the operations at nearby receptors are in compliance with MECP sound level limits as set out in publication NPC-300[1], provided that the noise mitigation measures described in Section 7.0 of this report are followed.

Professional Engineers Ontario

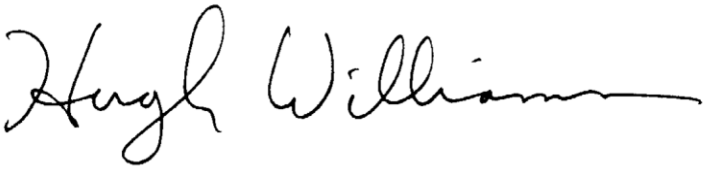
8th April 2024

Limited Engineering Licensee

Name: M. A. WELLS
Number: 100542557
Limitations: Environmental acoustic assessments and recommendations to mitigate noise and vibration; acoustical engineering services for land-use planning, architectural and building acoustics, industrial acoustics, and occupational health and safety audits.

Association of Professional Engineers of Ontario

Michael Wells, B.Architecture (Hons), B.Sc.Arch.
Limited Engineering Licensee, Professional Engineers Ontario, Registered Architect of NSW, Member, Canadian Acoustical Society, Member, Australian Acoustical Society (M.A.A.S.)



Hugh Williamson, Ph.D., P.Eng.
Member, Canadian Acoustical Association

References

1. Ministry of Environment, Conservation and Parks Publication NPC-300, *Environmental Noise Guideline, Stationary and Transportation Sources – Approval and Planning*, August 2013, adopted by the MECP on 22 October 2013.

2. Ministry of Environment, Conservation and Parks, *Sample Application Package, Basic Comprehensive Certificate of Approval (Air and Noise)*, July 2009.

3. Ministry of Environment, Conservation and Parks Publication, NPC-233, *Information to be Submitted for Approval of Stationary Sources of Sound*, October 1995.

4. Ministry of Environment, Conservation and Parks Publication NPC-206, *Sound Levels due to Road Traffic*, October 1995.

5. Ministry of Environment, Conservation and Parks, Ontario Road Noise Analysis Method for Environment and Transportation (ORNAMENT), 1989.

6. Ministry of Environment, Conservation and Parks, STAMSON Software, Version 5.03, 1996. (Software implementation of reference 4).

7. International Standards Organization, *Acoustics - Attenuation of Sound during Propagation Outdoors, Part 2: General Method of Calculation*, ISO 9613-2: 1996(E).

8. Ministry of Environment, Conservation and Parks Publication, NPC-115, *Construction Equipment*, August 1978.

TABLES

Table 1: Point of Reception Summary Table*

Point of Reception	Location*
POR 1	Residence 821 Pinnacle Road (2 storey)
POR 2	Residence 765b Pinnacle Road (Assumed 2 storey)
POR 3	Residence 2122 Highway 60 (1 storey)
POR 4	Residence 1123 Golf Course Road (1.5 storey)
POR 5	Residence 46 Harveys Crescent (2 storey)
POR 6	Residence 10b Haley Road (2 storey)
POR 7	Residence 116 Haley Road (2 storey)
POR 8	Residence 264 Haley Road (2 storey)
POR 9	Residence 809 Orin Road (1 storey) (Also represents 801 and 831 Orin Road)
POR 10	Vacant Lot via Orin Road (Assumed 2 storey)
POR 11	Residence 733 Orin Road (1 storey)
POR 12	Vacant Lot via Orin Road (Assumed 2 storey)

* For assessment purposes, points of reception, (POR), have been taken as upper floor windows (2 m above grade for single storey and 4.5 m above grade to represent two storey residences) and Outdoor Point of Reception (30 m from residence, 1.5 m above grade) in acoustic calculations. POR's located on vacant land have been assessed at 2 stories in height.

Table 2: Noise Source Summary Table

Source ID	Source Description	Sound Power (dBA)	Source Location Ht. above ground* (m)	Sound Character-istics	Noise Control Measures
Screener (and one loader feeding the plant)	Mobile Screening Plant	111.0	3.0	Steady, no significant tonality, non-directional	Refer Section 7.0
Wash Plant (and one loader feeding the plant)	Wash Plant	109.9	4.3	Steady, non-tonal, non-directional	As noted in section 7.0
Generator	Generator	108.5**	4	Steady, non-tonal, non-directional	As noted in section 7.0
Crusher (and one loader feeding the plant)	Mobile Crushing Plant	120.0	3.0	Steady, no significant tonality, non-directional	Refer Section 7.0
Loaders (Additional)	Loaders used for extraction, stockpiling, loading trucks or feeding the screener, wash plant or crusher (CAT982M or similar)	103	2.5	Steady, moving, no significant tonality, non-directional	Refer Section 7.0
Excavators (Additional)	Excavators for extraction or feeding the screener, wash plant or crusher (CAT345DL or similar)	103.2	2.5	Steady, moving, no significant tonality, non-directional	Refer Section 7.0
IHR_1	On-site highway truck movements for shipping product (Truck_Passby)	106.7	2.5	Steady, moving, no significant tonality, non-directional	Refer Section 7.0
IHR_2	On-site aggregate truck movements for delivery of material to the processing plants (Aggregate_Truck_Passby)	105.3	2.5	Steady, moving, no significant tonality, non-directional	Refer Section 7.0

*Height measured from finished grade at location of equipment operation.
**Includes attenuation provided by silencer as noted in Table 8.

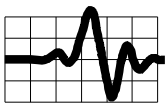


Table 3: MECP Exclusion Limit Values for One-Hour Equivalent Sound Level (Leq, dBA) at Outdoor Points of Reception

Time of Day	Class 1 Area	Class 2 Area	Class 3 Area	Class 4 Area
07:00 – 19:00	50	**50**	**45**	55
19:00 – 23:00	50	**45**	**40**	55

Table 4: MECP Exclusion Limit Values for One-Hour Equivalent Sound Level (Leq, dBA) at Plane of Window of Noise Sensitive Spaces

Time of Day	Class 1 Area	Class 2 Area	Class 3 Area	Class 4 Area
07:00 – 19:00	50	**50**	**45**	60
19:00 – 23:00	50	**50**	**40**	60
23:00 – 07:00	45	**45**	**40**	55

Table 5: Applicable One Hour Sound Level Limits for the Daytime Period (07:00 – 19:00)

Receptor & Point of Reception POW = Plane of Widow OPR = Outdoor Point of Reception	Sound Level Limit 1-hour LAEQ dBA (Daytime Period, 07:00 – 19:00)	Sound Level Limit 1-hour LAEQ dBA (Evening Period, 19:00 – 23:00)	Sound Level Limit 1-hour LAEQ dBA (Nighttime Period, 23:00 – 07:00)
POR_1_POW	45	40	40
POR_1_OPR	45	40	-
POR_2_POW	45	40	40
POR_2_OPR	45	40	-
POR_3_POW	50	50	45
POR_3_OPR	50	45	-
POR_4_POW	45	40	40
POR_4_OPR	45	40	-
POR_5_POW	45	40	40
POR_5_OPR	45	40	-
POR_6_POW	50	50	45
POR_6_OPR	50	45	-
POR_7_POW	45	40	40
POR_7_OPR	45	40	-
POR_8_POW	45	40	40
POR_8_OPR	45	40	-
POR_9_POW	45	40	40
POR_9_OPR	45	40	-
POR_10_POW	45	40	40
POR_10_OPR	45	40	-
POR_11_POW	45	40	40
POR_11_OPR	45	40	-
POR_12_POW	45	40	40
POR_12_OPR	45	40	-

Table 6.1: Acoustic Assessment Summary Table, Worst Case, Daytime Period of Operation, 7 am to 7 pm (07:00 - 19:00)

Point of Reception ID	Location	Scenario 1 Estimated Sound Level Daytime Period (Worst Case) (dBA)	Scenario 2 Estimated Sound Level Daytime Period (Worst Case) (dBA)	Scenario 3 Estimated Sound Level Daytime Period (Worst Case) (dBA)	Scenario 4 Estimated Sound Level Daytime Period (Worst Case) (dBA)	Performance Limit* Daytime Period (dBA)	Compliance with Performance Limit (Yes/No)
POR 1	POW	-**	-**	-**	-**	45	Yes
	OPR	-**	-**	-**	-**	45	Yes
POR 2	POW	-**	-**	-**	-**	45	Yes
	OPR	-**	-**	-**	-**	45	Yes
POR 3	POW	28.8	28.2	28.9	27.9	50	Yes
	OPR	28.7	28.2	28.7	28.0	50	Yes
POR 4	POW	44.9	44.4	44.9	44.7	45	Yes
	OPR	44.6	44.1	44.5	44.5	45	Yes
POR 5	POW	43.9	43.4	43.7	43.5	45	Yes
	OPR	43.0	42.2	43.0	42.8	45	Yes
POR 6	POW	35.2	38.0	35.7	36.5	50	Yes
	OPR	34.6	37.0	35.1	35.7	50	Yes
POR 7	POW	35.7	37.5	35.8	36.3	45	Yes
	OPR	34.9	36.4	35.1	35.6	45	Yes
POR 8	POW	37.1	39.4	37.1	37.6	45	Yes
	OPR	36.3	37.5	36.4	36.8	45	Yes
POR 9	POW	33.8	33.4	33.8	33.8	45	Yes
	OPR	30.8	30.1	30.9	30.9	45	Yes
POR 10	POW	32.0	31.1	32.1	32.0	45	Yes
	OPR	29.9	29.2	30.5	30.5	45	Yes
POR 11	POW	34.5	34.3	34.6	34.6	45	Yes
	OPR	34.3	34.0	34.3	34.3	45	Yes
POR 12	POW	33.9	34.0	33.9	33.9	45	Yes
	OPR	31.0	31.0	30.9	30.9	45	Yes

*Performance limits are based on 1-hour equivalent sound levels, Leq.
**Noise impacts insignificant.

Table 6.2: Acoustic Assessment Summary Table, Worst Case, Evening and Nighttime Period, 7 pm to 7 am (19:00 – 07:00)

Point of Reception ID	Location	Scenario 1 Estimated Sound Level Evening and Nighttime Period (Worst Case) (dBA)	Scenario 2 Estimated Sound Level Evening and Nighttime Period (Worst Case) (dBA)	Scenario 3 Estimated Sound Level Evening and Nighttime Period (Worst Case) (dBA)	Scenario 4 Estimated Sound Level Evening and Nighttime Period (Worst Case) (dBA)	Performance Limit* Evening and Nighttime Period (dBA)	Compliance with Performance Limit (Yes/No)
POR 1	POW	-**	-**	-**	-**	40	Yes
	OPR	-**	-**	-**	-**	40	Yes
POR 2	POW	-**	-**	-**	-**	40	Yes
	OPR	-**	-**	-**	-**	40	Yes
POR 3	POW	21.0	19.1	21.0	18.9	50	Yes
	OPR	20.7	19.1	20.7	18.9	45	Yes
POR 4	POW	39.4	38.5	39.5	38.5	40	Yes
	OPR	39.2	38.3	39.3	38.3	40	Yes
POR 5	POW	33.4	33.2	33.3	32.2	40	Yes
	OPR	32.8	31.8	32.8	31.5	40	Yes
POR 6	POW	21.6	25.0	21.3	24.9	50	Yes
	OPR	20.7	24.1	20.7	23.3	45	Yes
POR 7	POW	18.9	23.2	19.1	23.2	40	Yes
	OPR	18.3	22.4	18.5	22.4	40	Yes
POR 8	POW	20.3	24.7	20.3	24.1	40	Yes
	OPR	19.6	24.1	19.7	23.4	40	Yes
POR 9	POW	16.9	16.5	16.7	16.7	40	Yes
	OPR	15.2	14.2	15.0	14.7	40	Yes
POR 10	POW	18.2	16.9	17.5	17.1	40	Yes
	OPR	15.7	14.5	15.1	14.6	40	Yes
POR 11	POW	17.2	17.2	17.0	17.1	40	Yes
	OPR	17.1	16.8	16.9	16.8	40	Yes
POR 12	POW	15.1	16.2	15.1	15.7	40	Yes
	OPR	13.8	12.8	12.9	12.8	40	Yes

*Performance limits are based on 1-hour equivalent sound levels, Leq.
**Noise impacts insignificant.

Table 7: Recommended Noise Barriers

Barrier	Minimum Height (m)	Minimum Length (m)	Maximum Distance from Source (m)	Location	Required to shield Line of Sight from Identified Source ID	Required to shield Line of Sight to Identified Receptor/s	Description / Administrative Controls
Barrier_1 (Site berm)	3	105	Not applicable	As per: Figure 11	Screener Wash Plant	POR_4	New barrier (site berm): • Required to shield noise impacts at the identified receptor.
Barrier_2 (Site berm)	3	200	Not applicable	As per: Figure 11	Crusher	POR_4	New barrier (site berm): • Required to shield noise impacts at the identified receptor.
Barrier_SP1 (Stockpile)	10 m (6 m)	20 m	25 m	As per: Figure 12	Screener	POR_4	New barrier (stockpile): • Required to shield noise impacts at the identified receptor. • May be reduced to 6 m high when operating north of Line AA.
Barrier_SP2 (Stockpile)	8 m (6 m)	20 m	25 m	As per: Figure 12	Screener	POR_5	New barrier (stockpile): • Required to shield noise impacts at the identified receptor. • May be reduced to 6 m high when operating north of Line AA
Barrier_WP1 (Stockpile)	12 m	50 m	25 m	As per: Figure 13	Wash Plant and associated generator	POR_4 POR_5	New barrier (stockpile): • Required to shield noise impacts at the identified receptors.
Barrier_CP1 (Stockpile)	12 m	30 m	25 m	As per: Figure 14	Crusher	POR_4	New barrier (stockpile): • Required to shield noise impacts at the identified receptor.
Barrier_CP2 (Stockpile)	8 m	20 m	25 m	As per: Figure 14	Crusher	POR_5	New barrier (stockpile): • Required to shield noise impacts at the identified receptor.

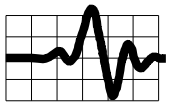


Table 8: Minimum Insertion Loss for Generator Exhaust Silencer

Name	Octave Band Centre Frequency, Hz Minimum Dynamic Insertion Loss (dB)[1]								Rw
	63	125	250	500	1000	2000	4000	8000	
Silencer to be installed at the generator exhaust[2] (Source: Generator)	10	30	38	30	25	20	20	20	24

Notes:

1. Octave Band Centre Frequency, Hz, with minimum dynamic insertion loss in dB or dBA units re 10-12 Watts. Alternative levels at each frequency band permissible providing the overall insertion loss meets the overall insertion loss (Rw) as noted above and resultant noise from the exhaust after installation of the silencer is not tonal in character.
2. Insertion loss based on Silex Silencer Model JB 6. Refer manufacturers data Appendix 4.

FIGURES

Figure 1: Scaled Area Location Plan showing Receptor Locations

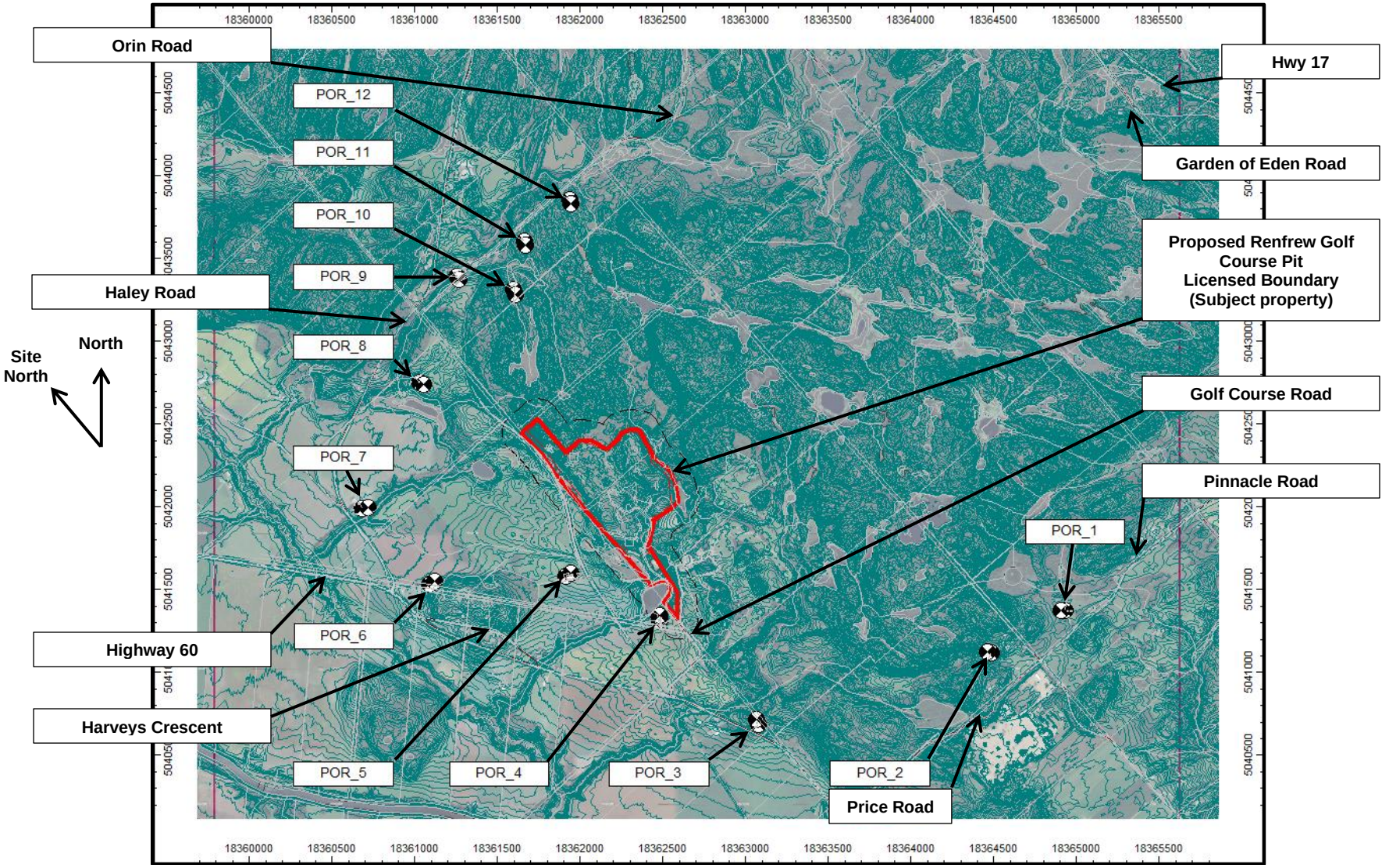


Figure 2: **Detail Site Layout & Surface Elevation Contours** (elevation contours based on Land Information Ontario (LIO), Provincial Digital Elevation Model, at 1-meter intervals)

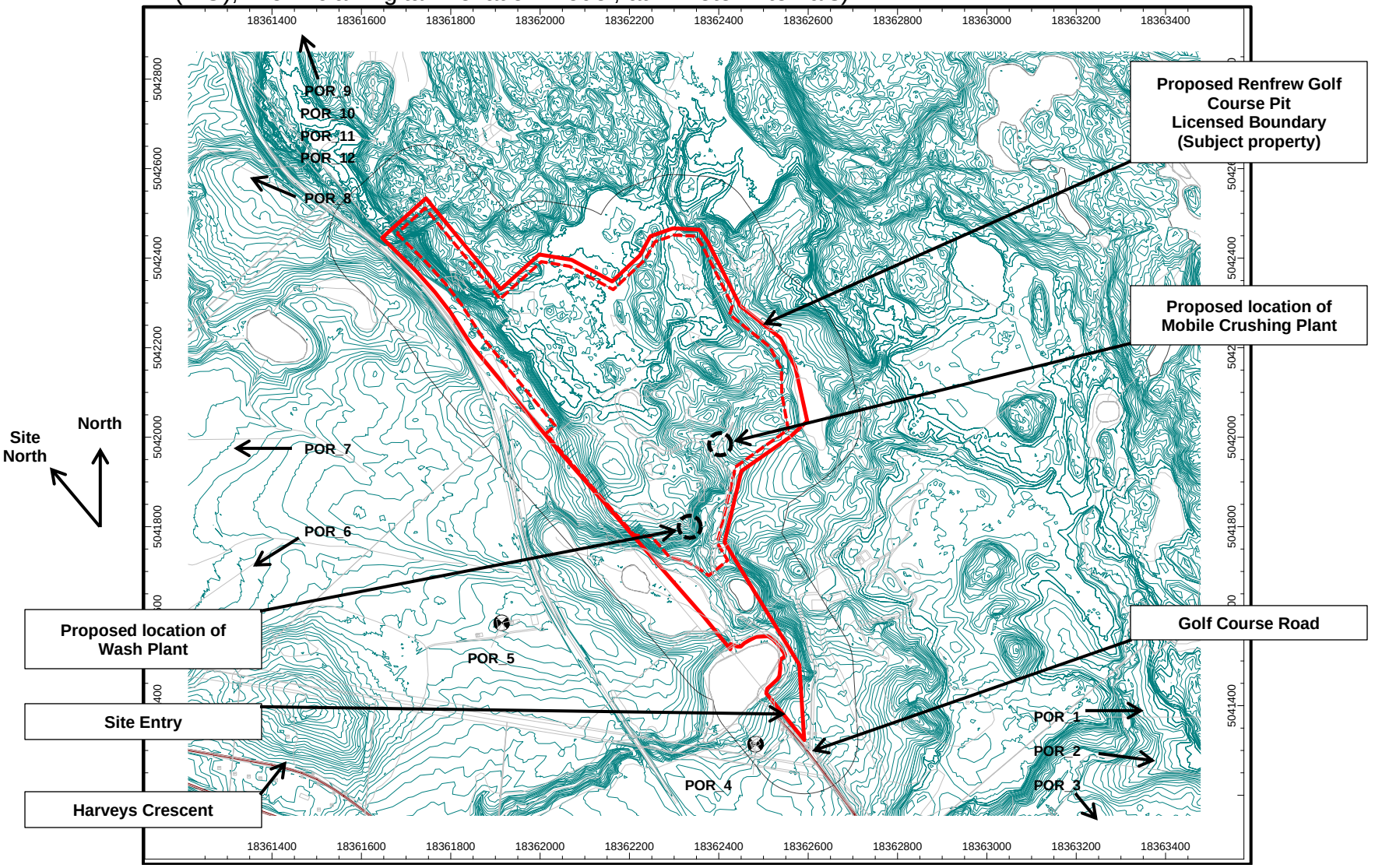


Figure 3: Scenario 1: Worst Case, Southern Extraction – Crushing Plant and Screening Plant in operation concurrently with extraction occurring closest to POR 1, 2, 3, 4 & 5 (Day, Evening and Night)

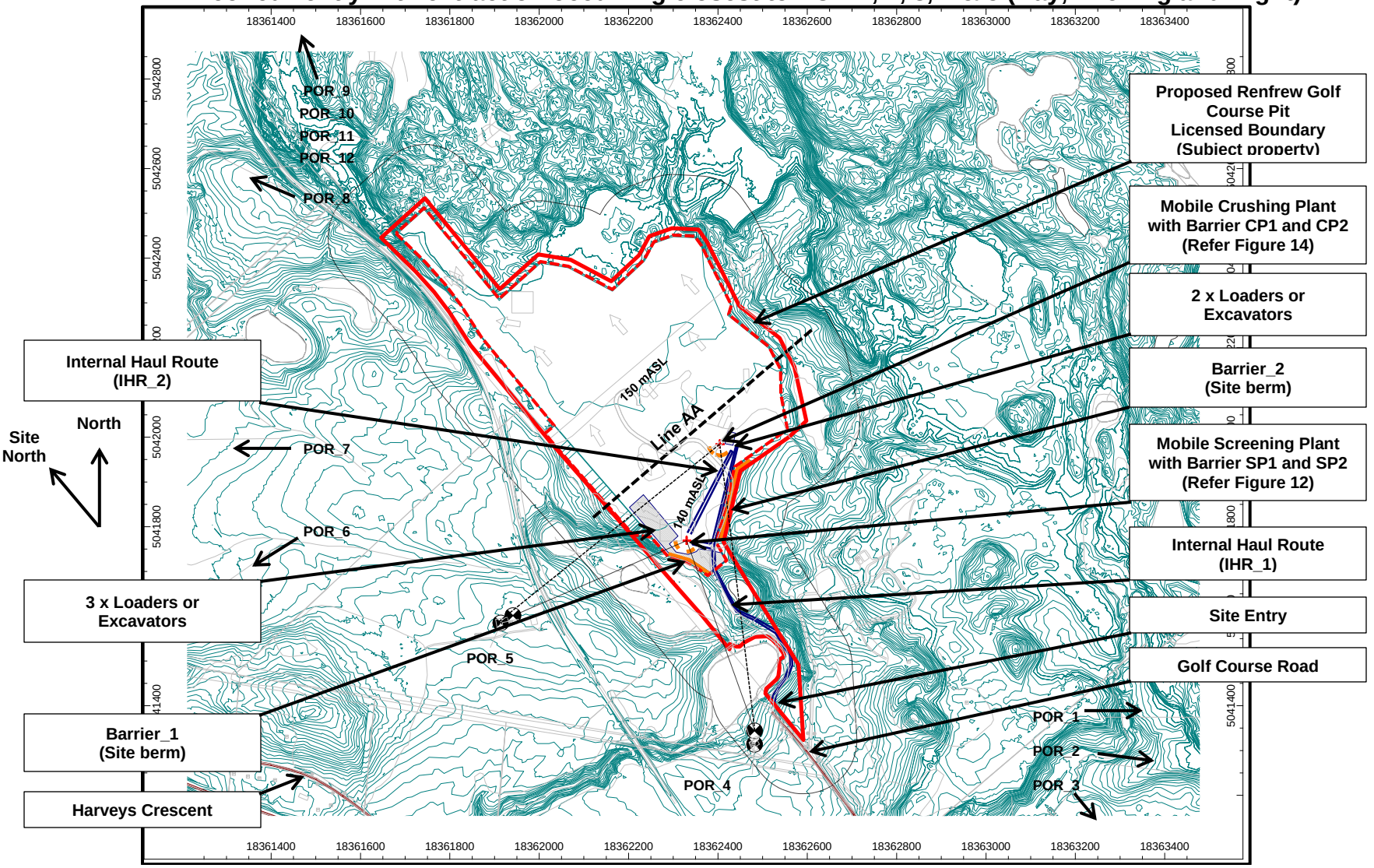


Figure 4.1: Prediction Results, Scenario 1: Worst Case, Daytime Period, Noise Contours, (Noise levels at 4.5 m)

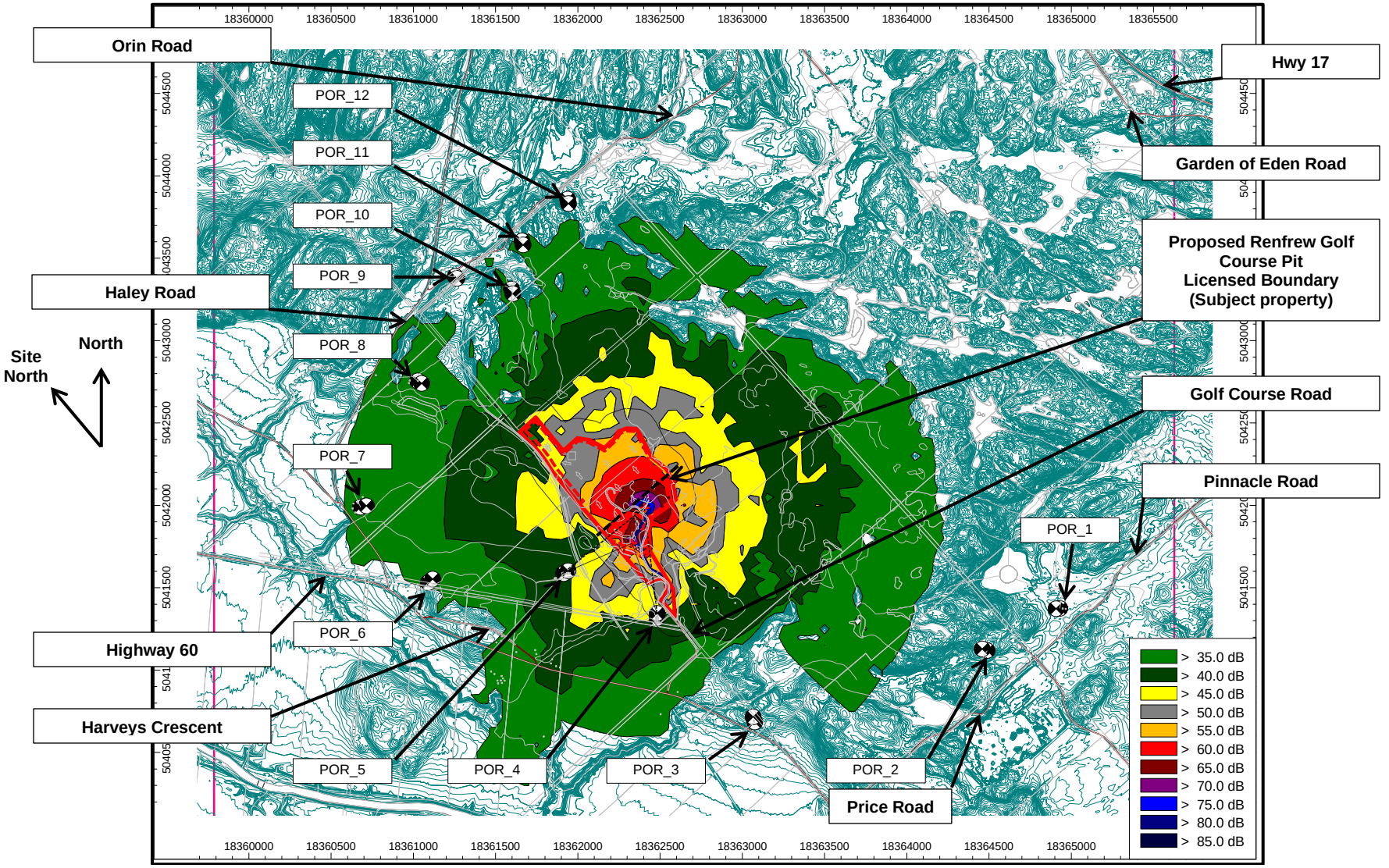


Figure 4.2: Prediction Results, Scenario 1: Worst Case, Evening and Nighttime Period, Noise Contours, (Noise levels at 4.5 m)

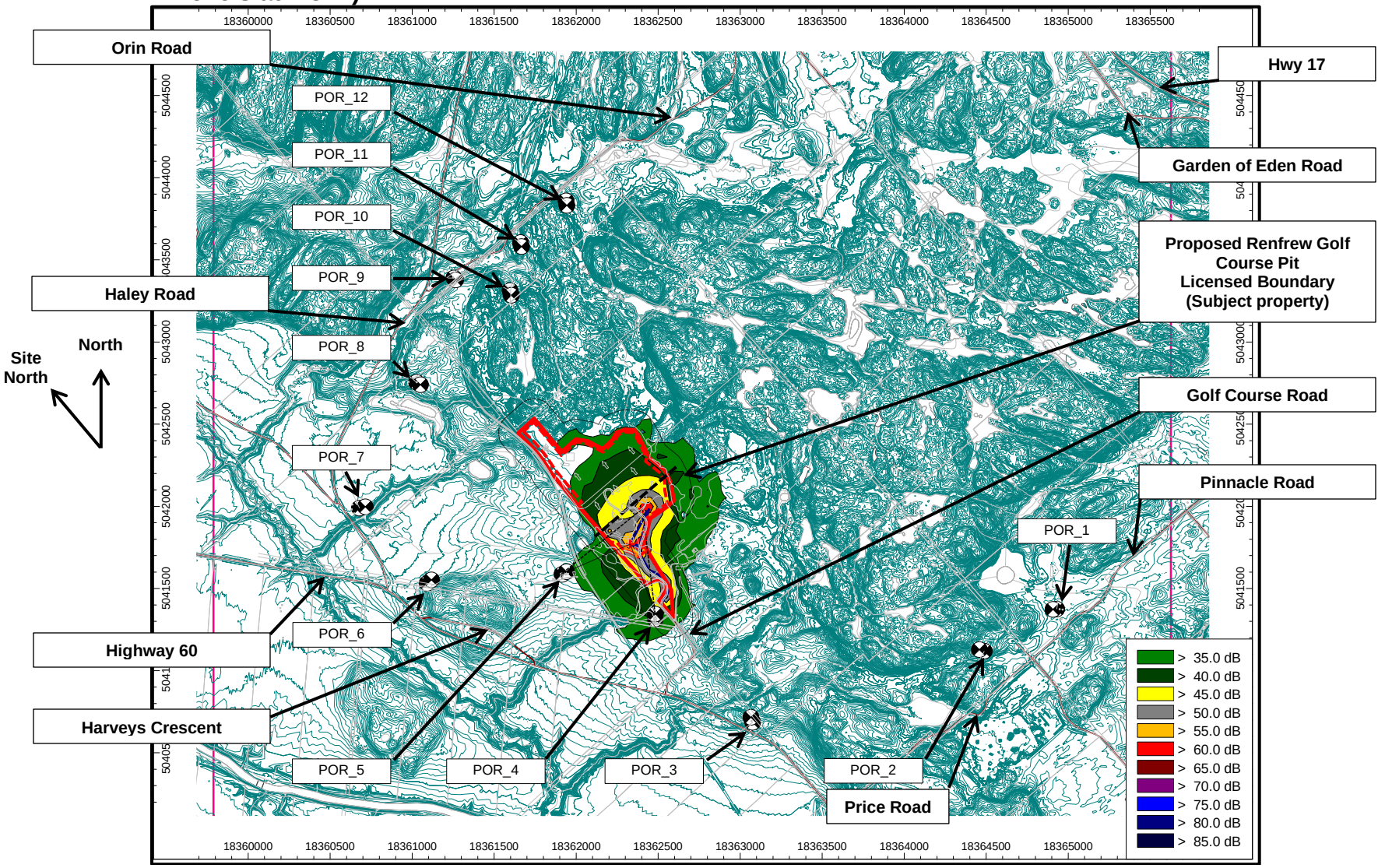


Figure 5: Scenario 2: Worst Case, Northern Extraction - Crushing Plant and Screening Plant in operation concurrently with extraction occurring closest to POR 6, 7, 8, 9, 10, 11 & 12 – (Day, Evening & Night)

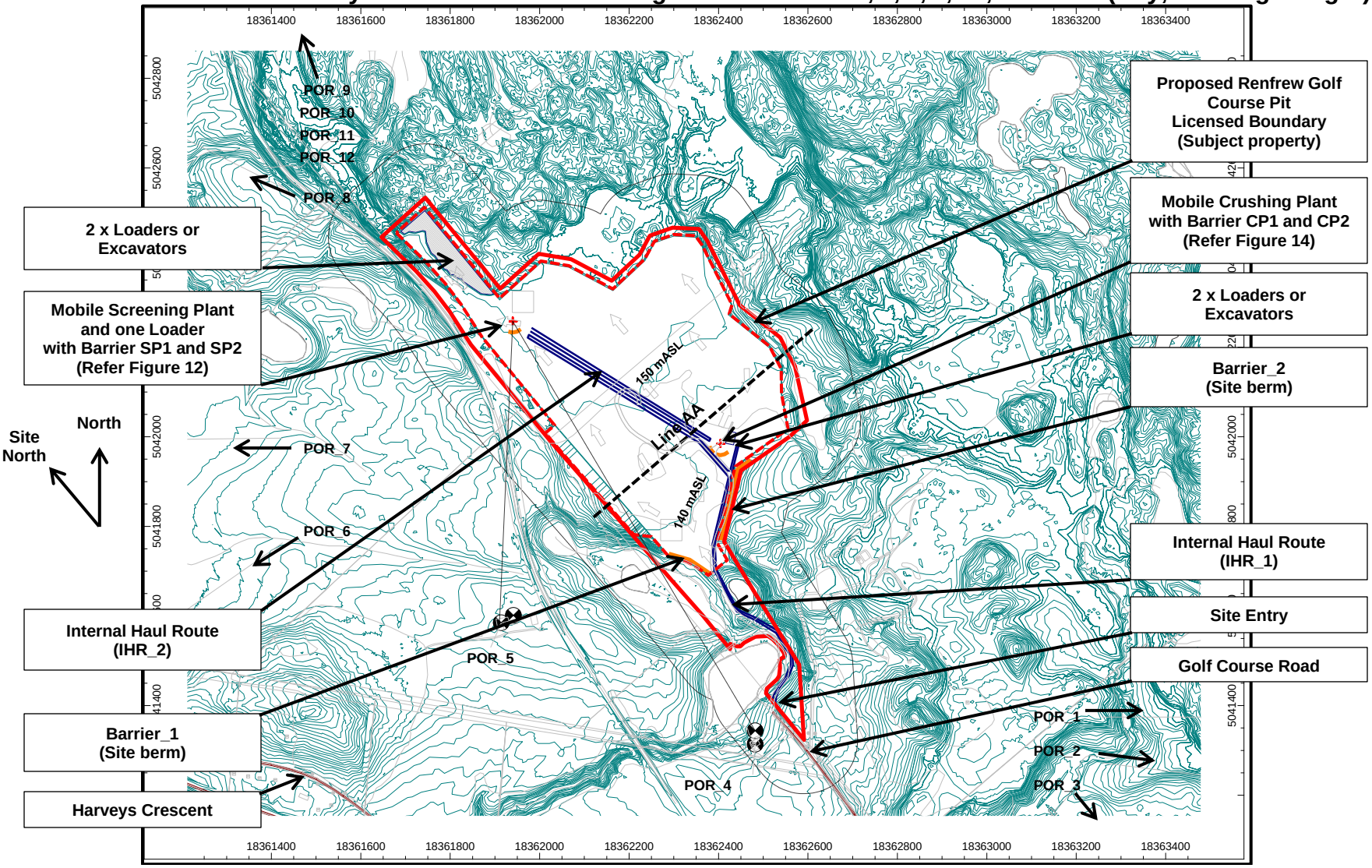


Figure 6.1: Prediction Results, Scenario 2: Worst Case, Daytime Period, Noise Contours, (Noise levels at 4.5 m)

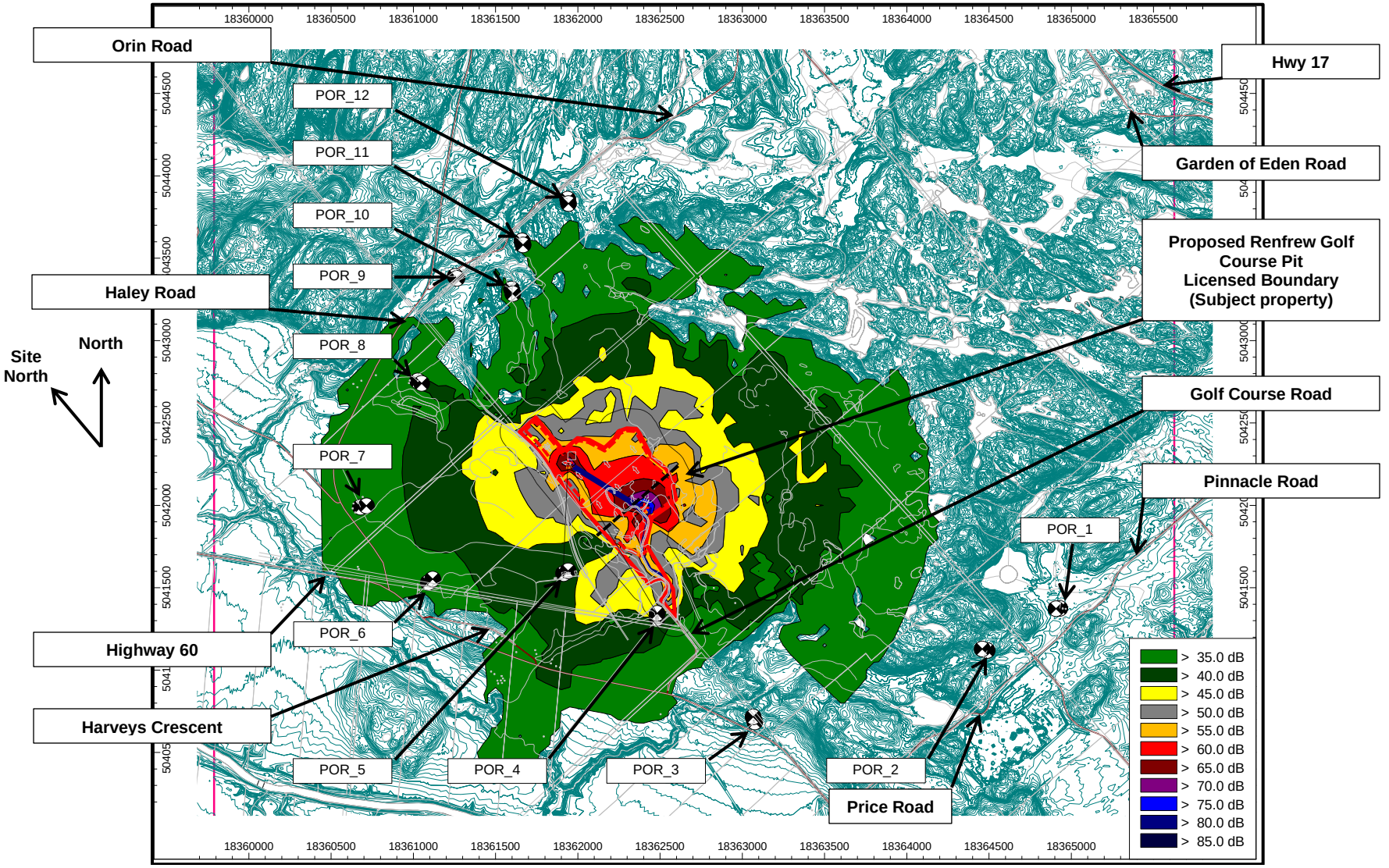


Figure 6.2: Prediction Results, Scenario 2: Worst Case, Evening and Nighttime Period, Noise Contours, (Noise levels at 4.5 m)

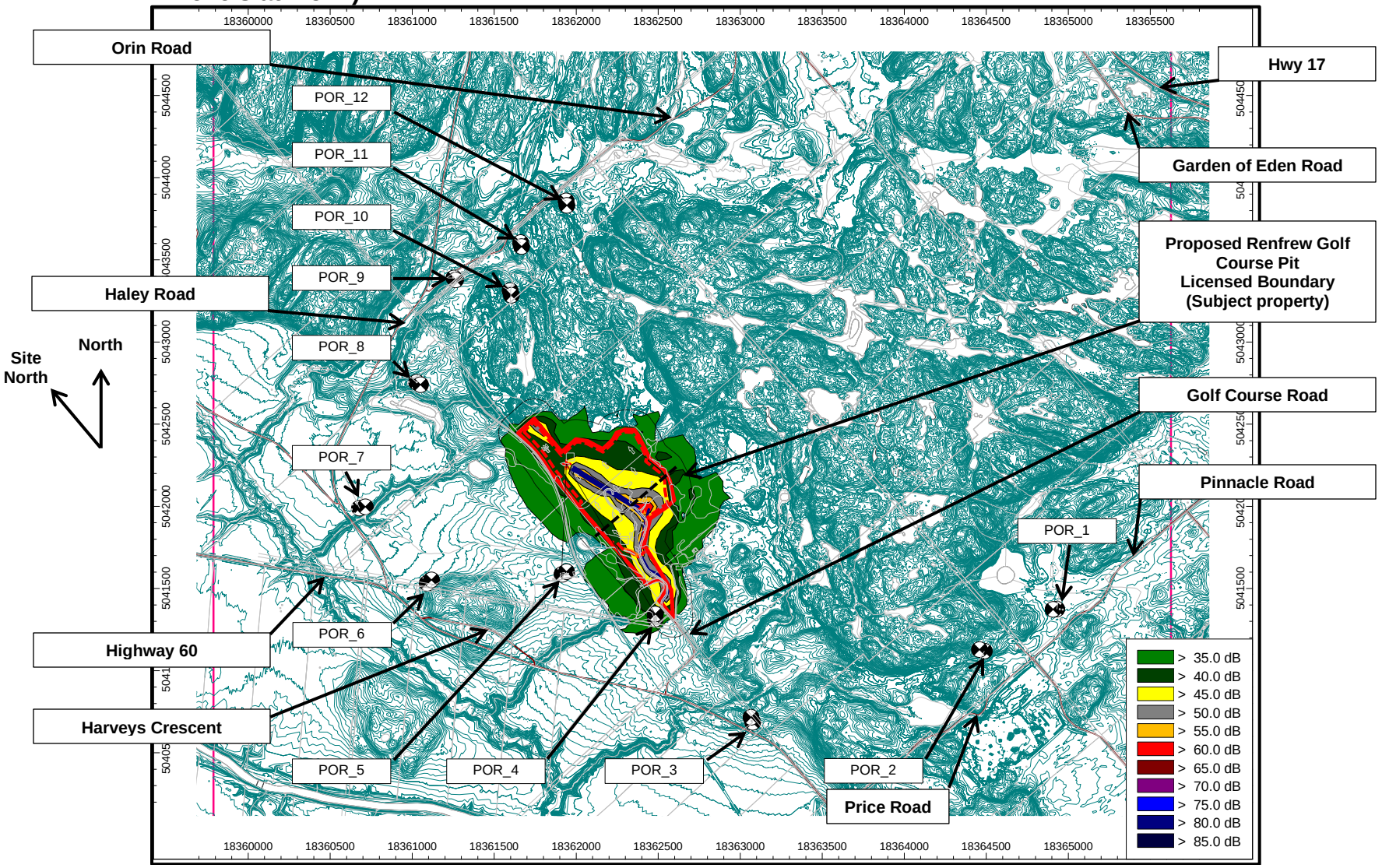


Figure 7: Scenario 3: Worst Case, Southern Extraction – Crushing Plant and Wash Plant in operation concurrently with extraction occurring closest to POR 1, 2, 3, 4 & 5 (Day, Evening and Night)

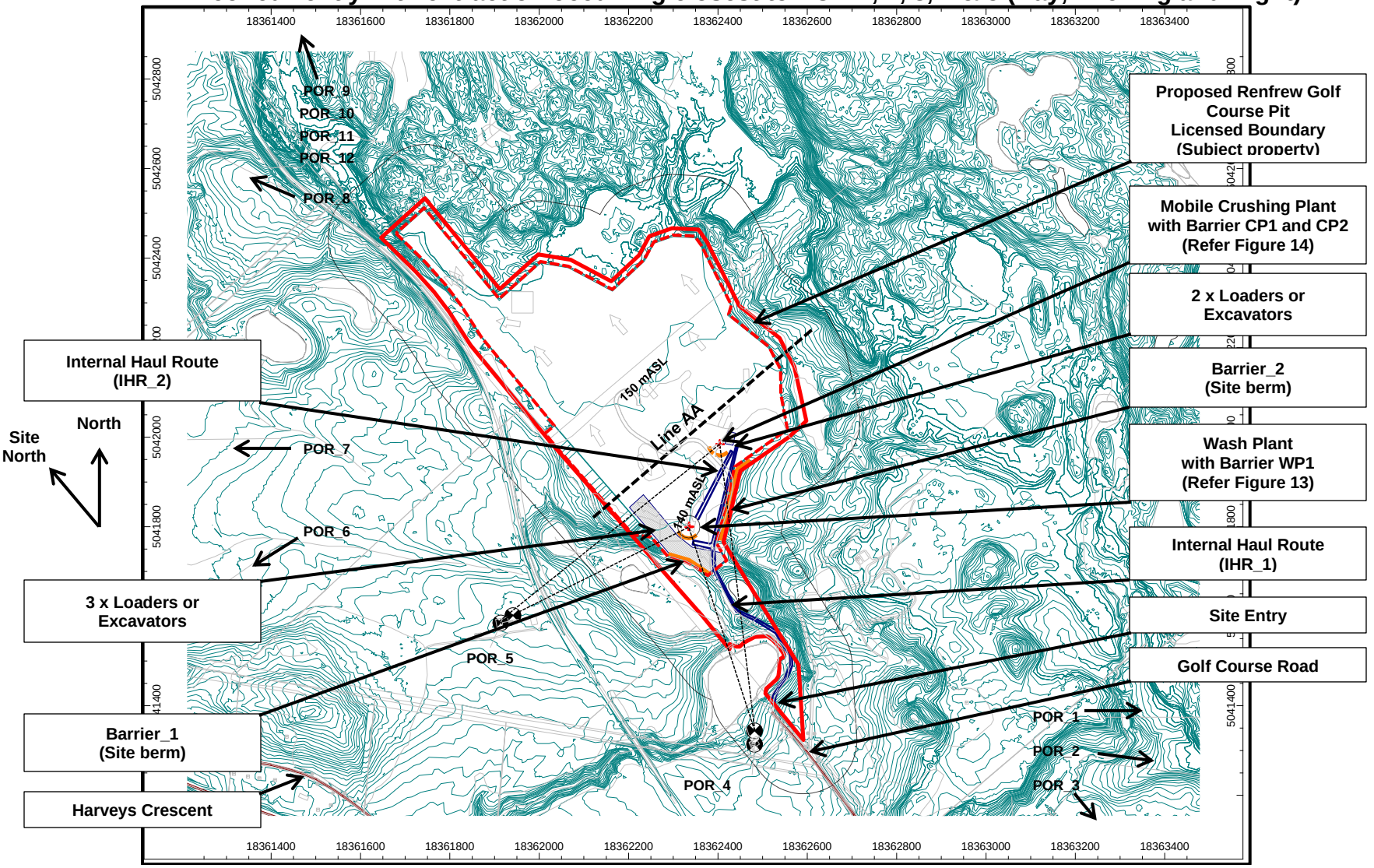


Figure 8.1: Prediction Results, Scenario 3: Worst Case, Daytime Period, Noise Contours, (Noise levels at 4.5 m)

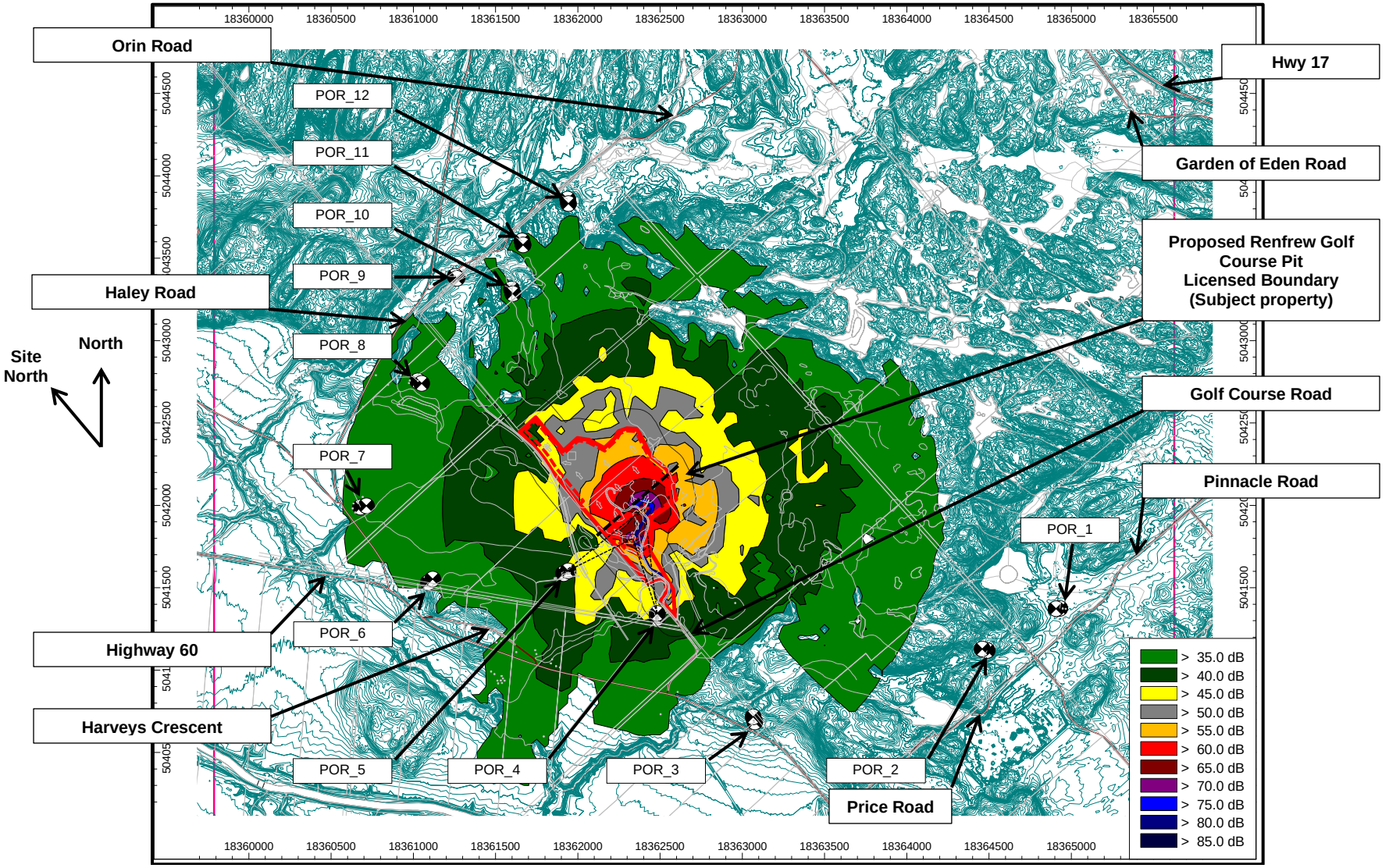


Figure 8.2: Prediction Results, Scenario 3: Worst Case, Evening and Nighttime Period, Noise Contours, (Noise levels at 4.5 m)

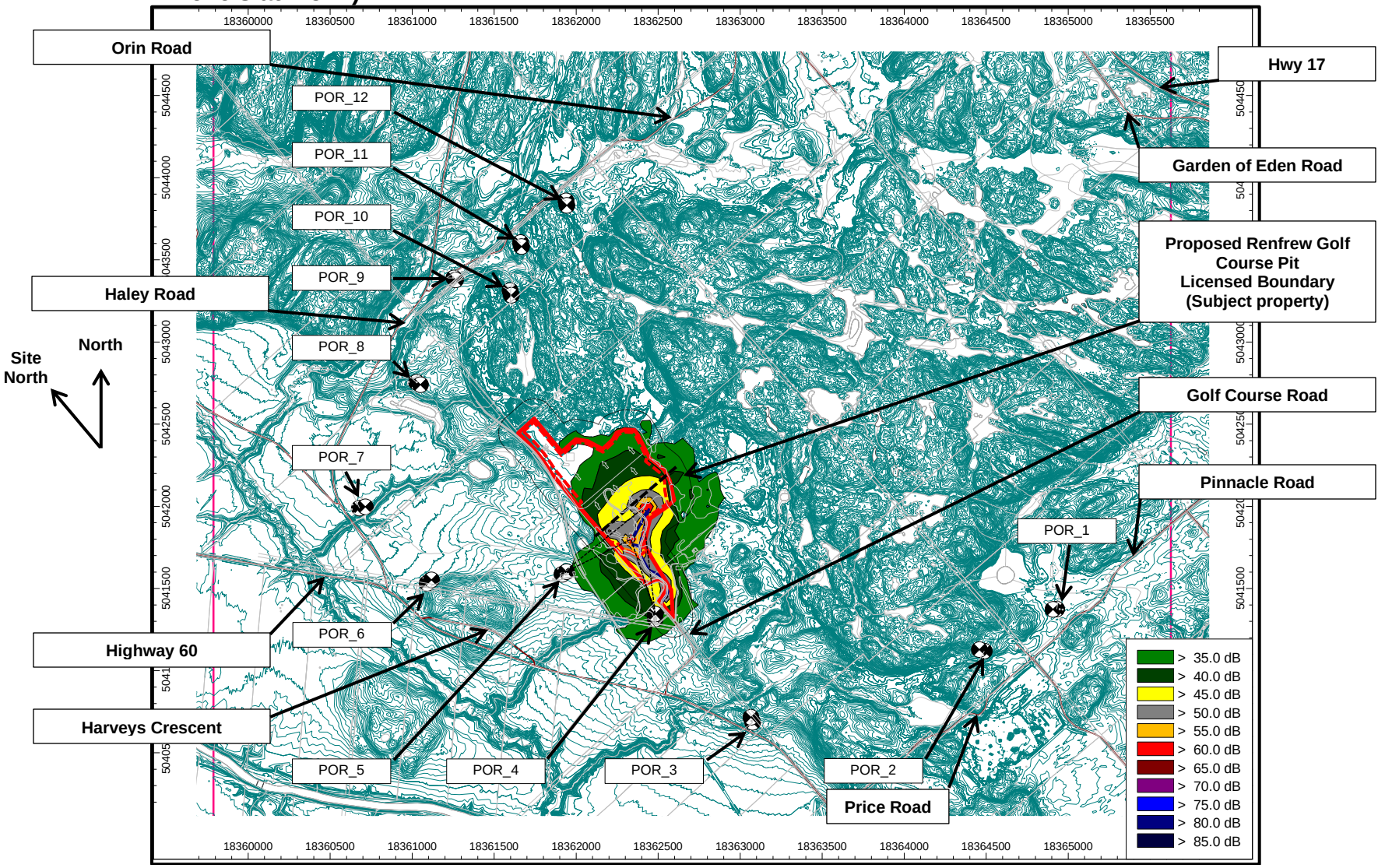


Figure 9: Scenario 4: Worst Case, Northern Extraction - Crushing Plant and Wash Plant in operation concurrently with extraction occurring closest to POR 6, 7, 8, 9, 10, 11 & 12 – (Day, Evening & Night)

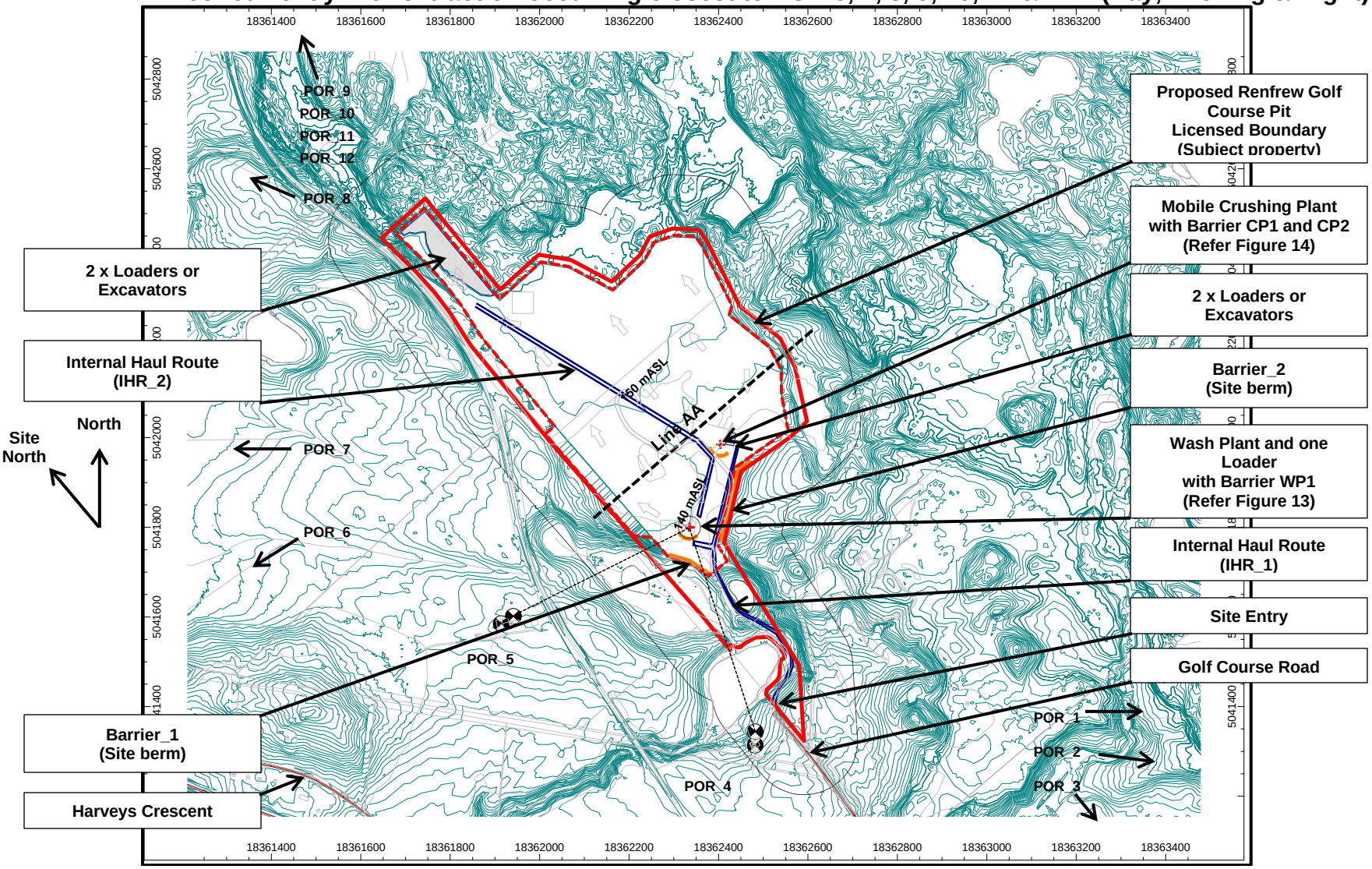


Figure 10.1: Prediction Results, Scenario 4: Worst Case, Daytime Period, Noise Contours, (Noise levels at 4.5 m)

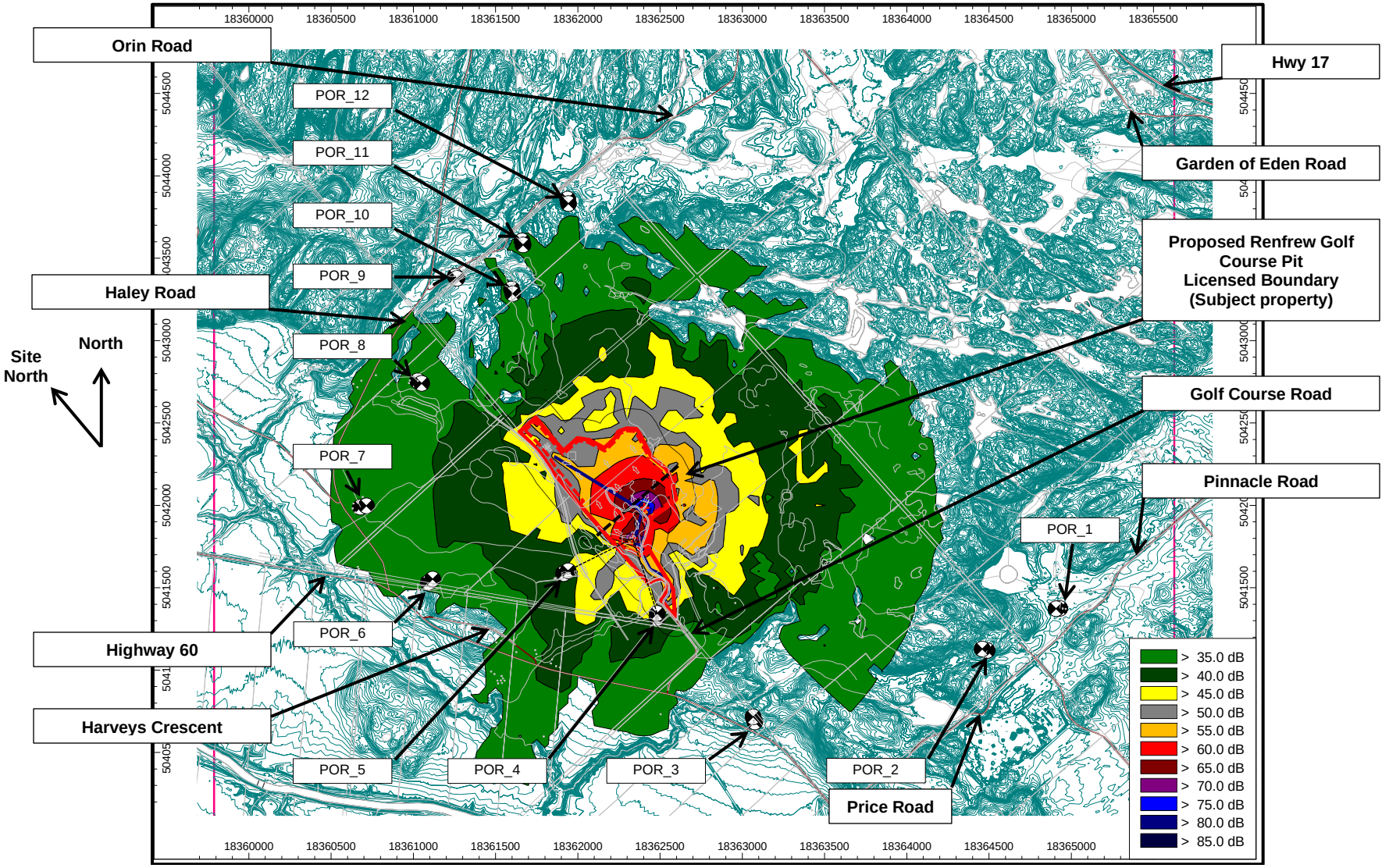


Figure 10.2: Prediction Results, Scenario 4: Worst Case, Evening and Nighttime Period, Noise Contours, (Noise levels at 4.5 m)

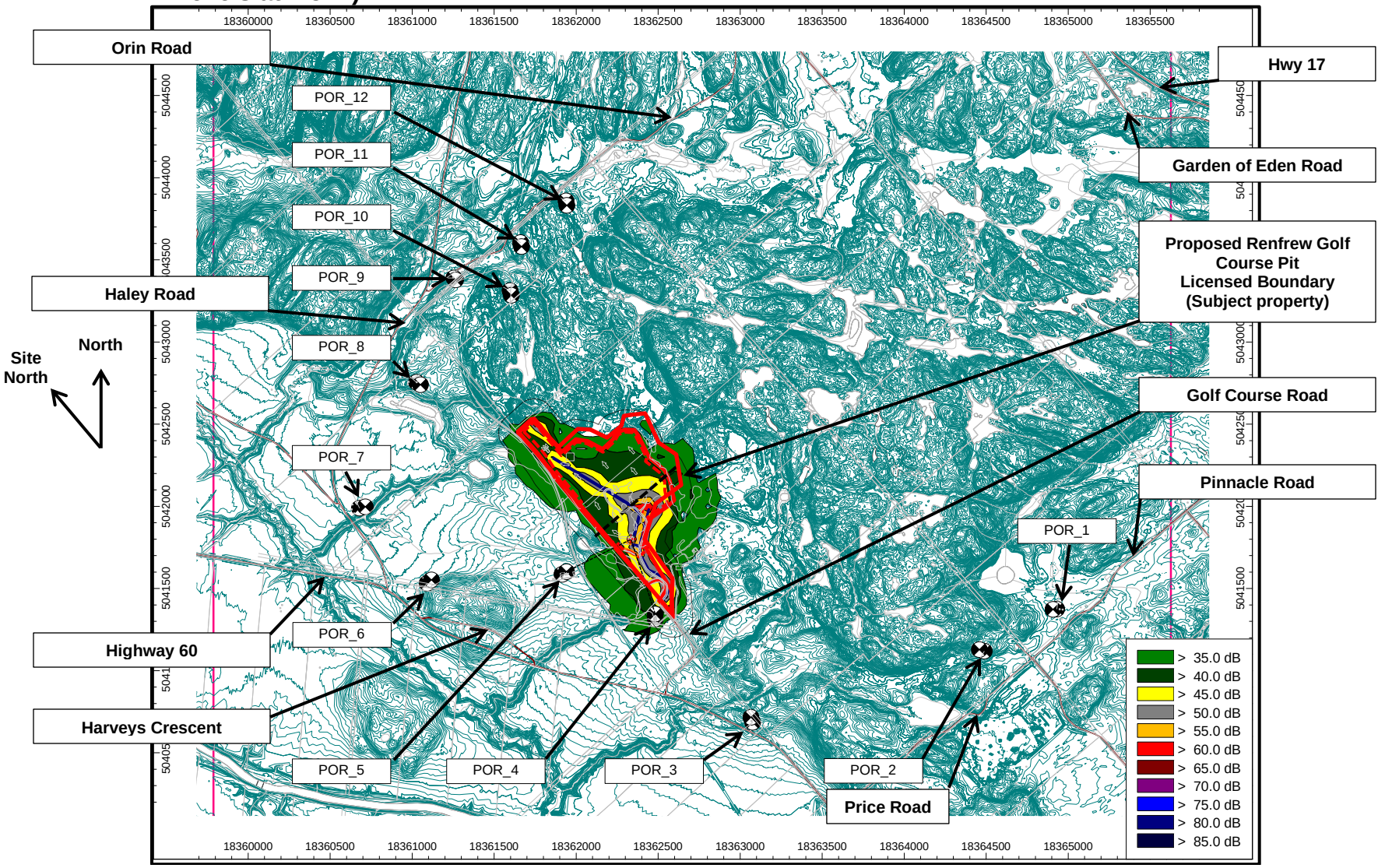


Figure 11: Detail site plan showing Barrier 1 and Barrier 2 (site berms)

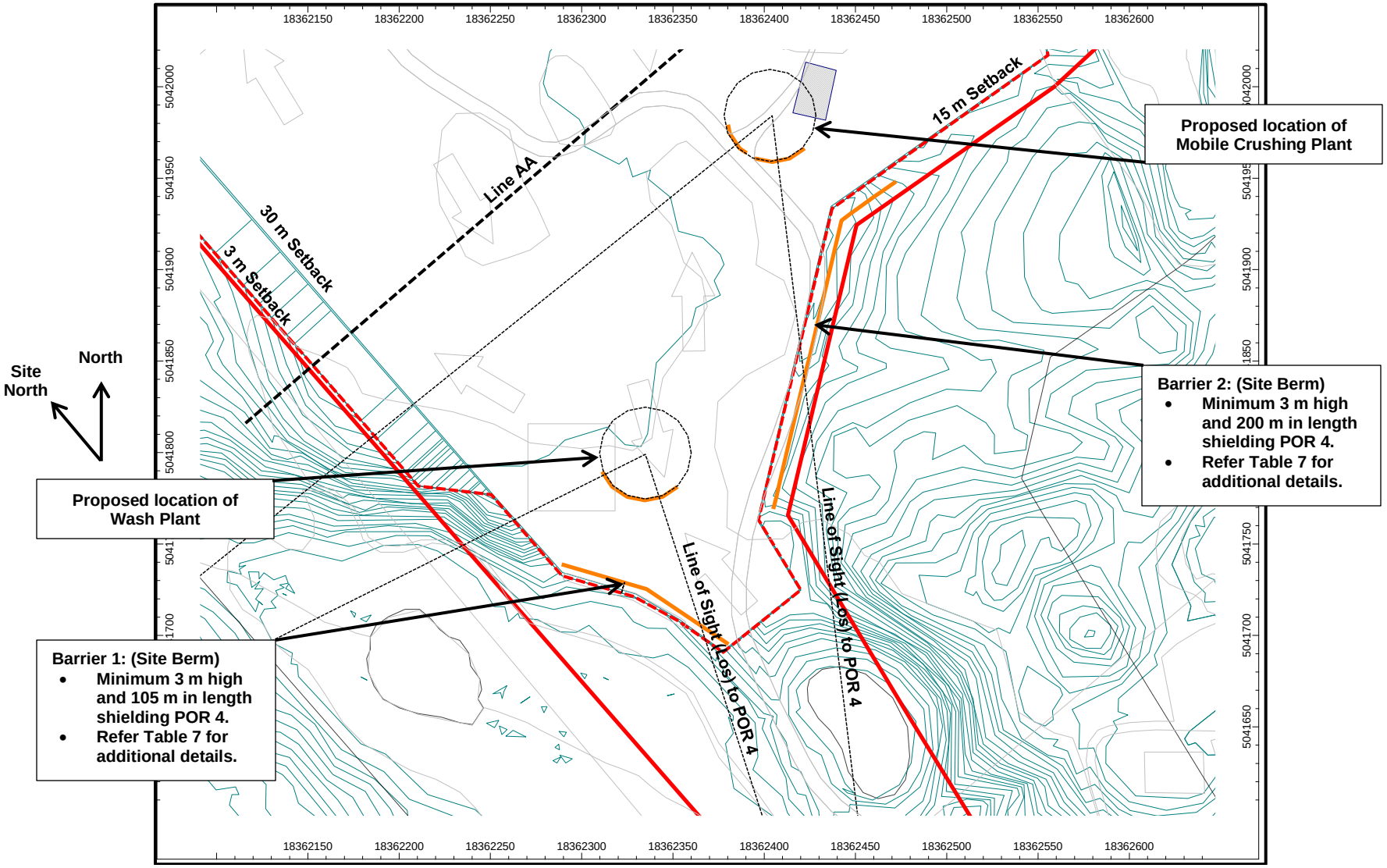


Figure 12: Detail plan at Mobile Screening Plant showing Barrier SP1 and SP2 (Typical)

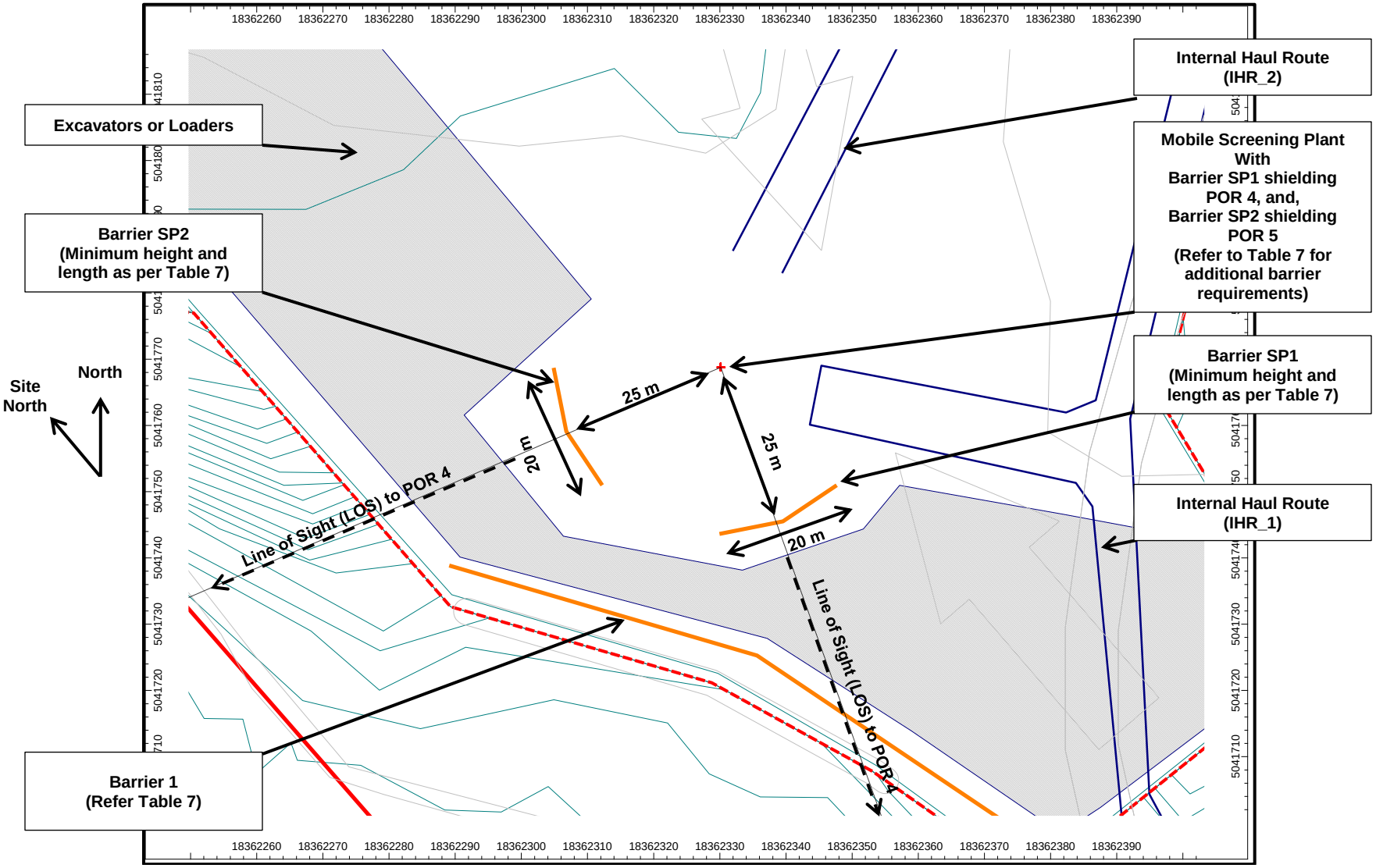


Figure 13: Detail plan at Wash Plant showing Barrier WP1

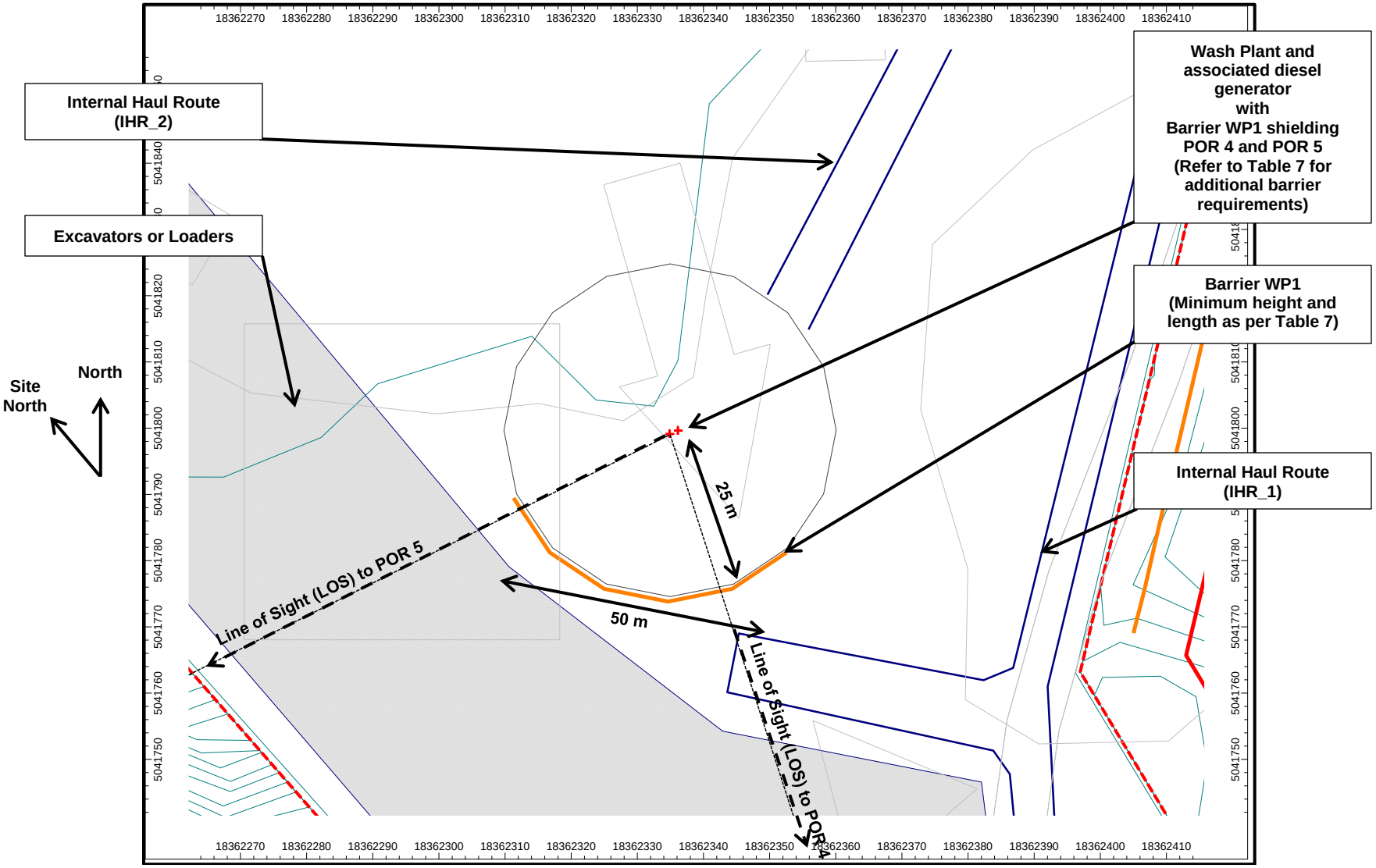
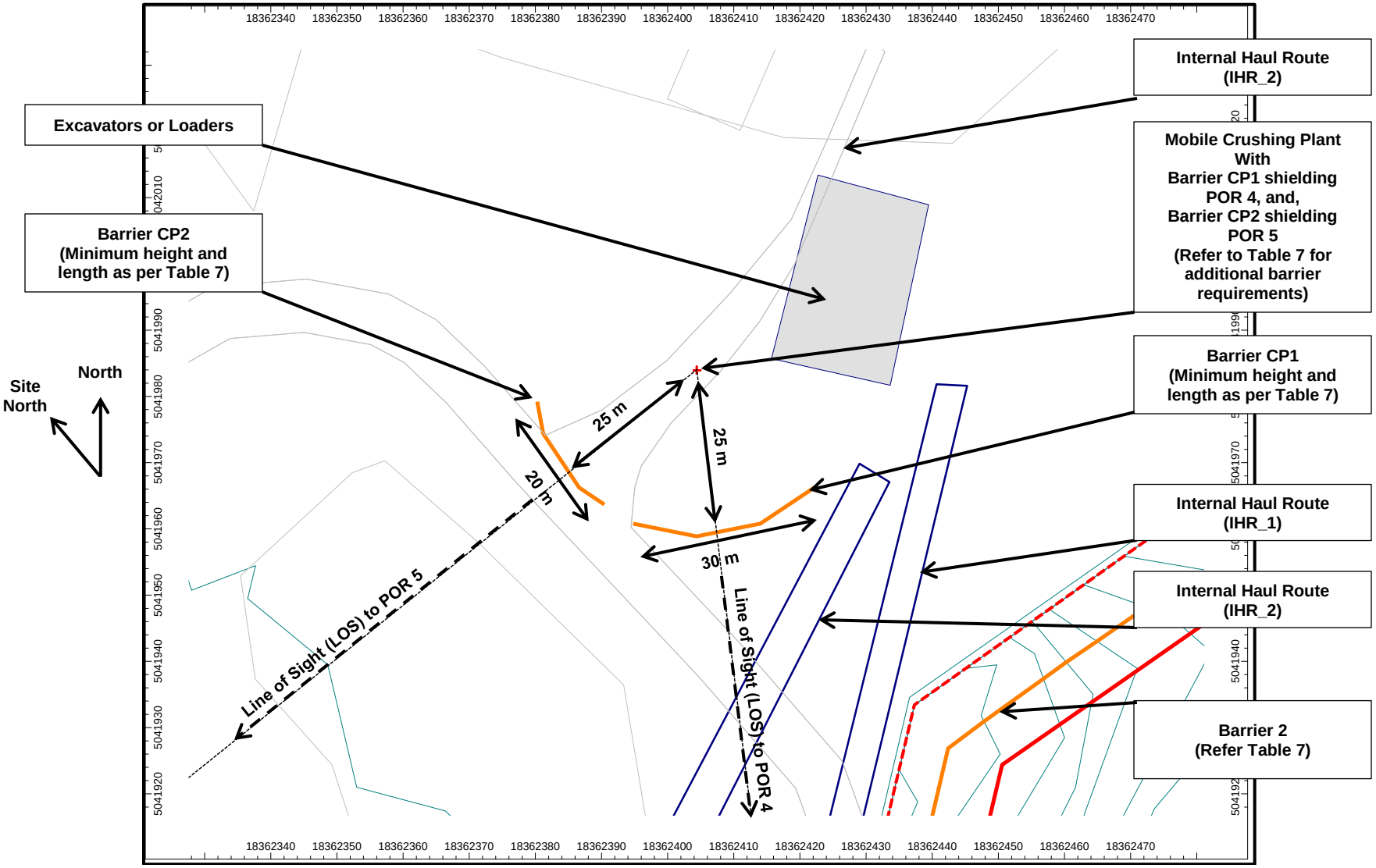


Figure 14: Detail plan at Mobile Crushing Plant showing Barrier CP1 and CP2



Appendix 1

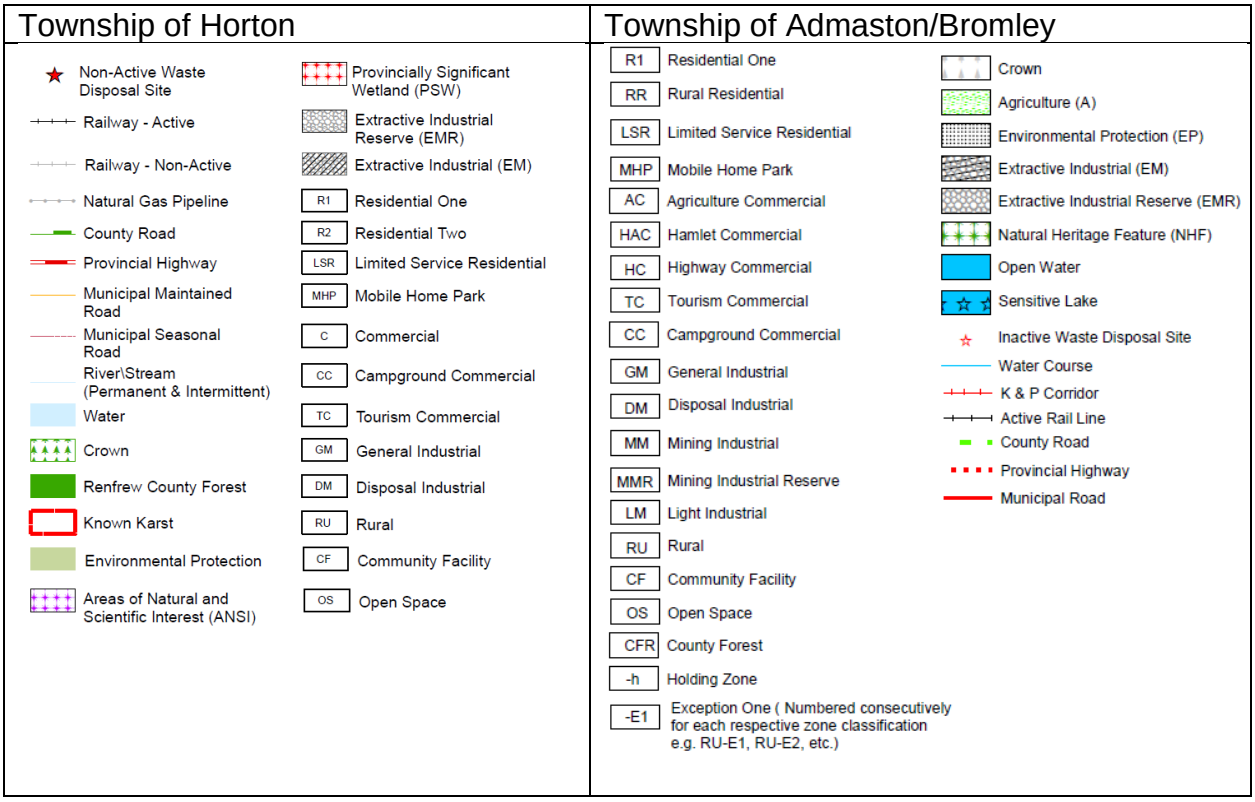
Zoning Plan and Land Use Designations

Contents:

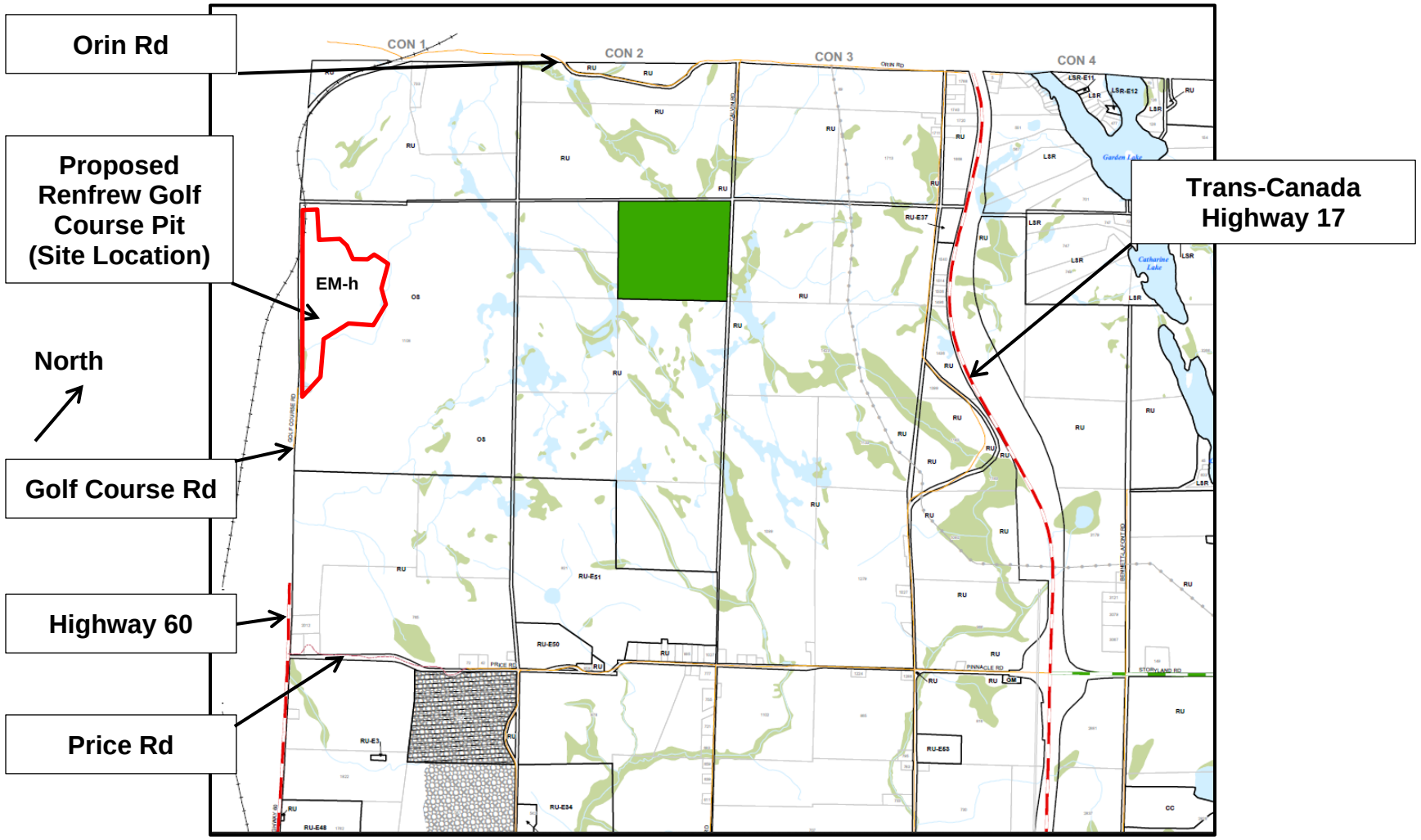
- **Zoning Map**: Township of Horton Zoning By-law 2010-14, Schedule "A" (source: Corporation of the Township of Horton)

- **Zoning Map:** Township of Admaston/Bromley Zoning By-law 2004-13, Schedule "B" (source: Corporation of the Township of Admaston/ Bromley)

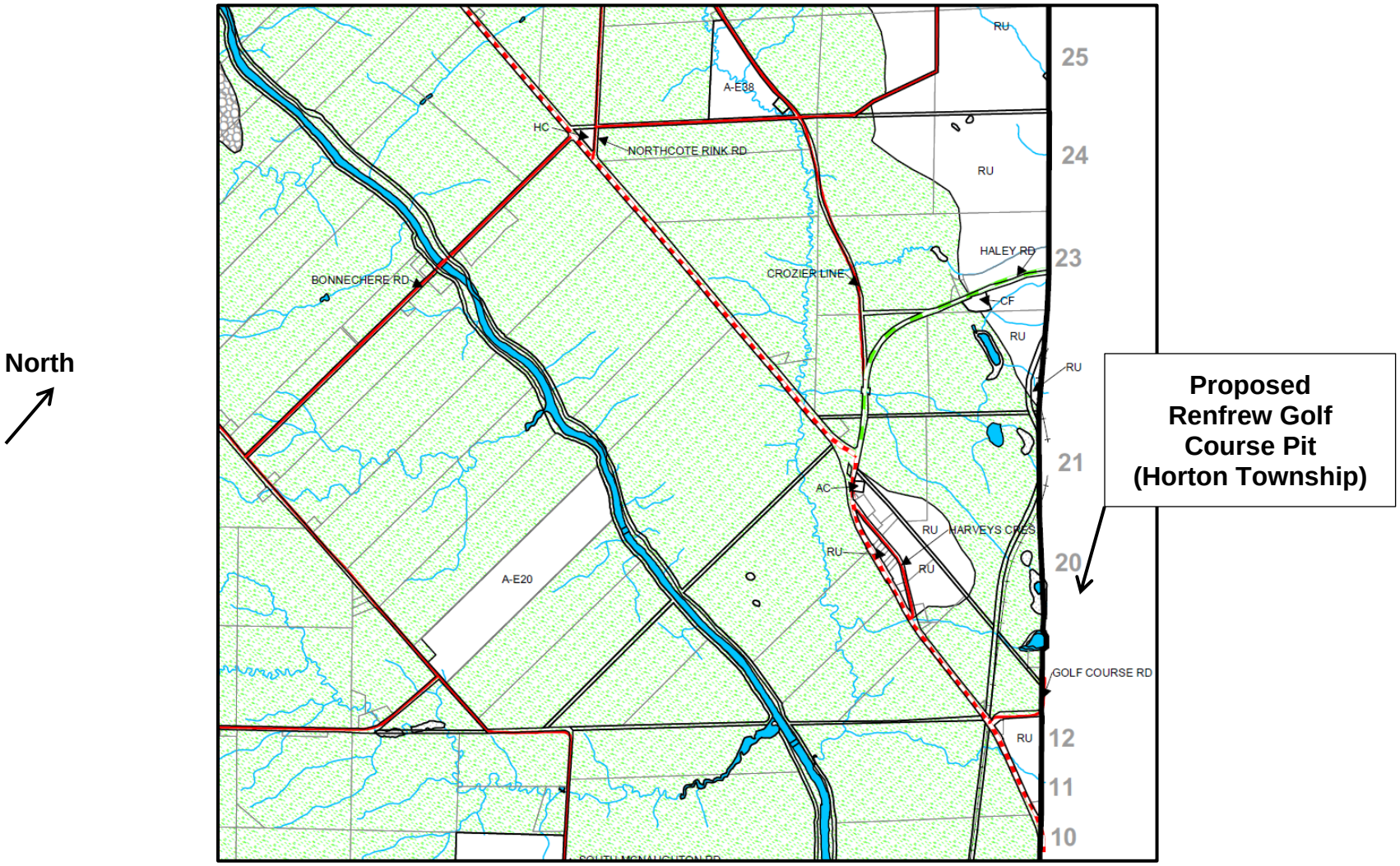
Legend:



Zoning Map: **Township of Horton Zoning By-law 2010-14, Schedule "A" (source: Corporation of the Township of Horton)**



Zoning Map: **Township of Admaston/Bromley Zoning By-law 2004-13, Schedule "B" (source: Corporation of the Township of Admaston/ Bromley)**



Appendix 2

Acoustic Modelling Details

Modeling Notes:

1. Acoustic model developed uses Cadna-A software, Version 2023.
2. Sound propagation is modeled according to ISO 9613-2: 1996(E).
3. The whole of the extraction area is modelled with an absorption coefficient of 0.35 representative of exposed earth. The surrounding area is modeled with an absorption coefficient of 1.0 indicative of a Class 3 Area.
4. MECP favoured conservative modelling assumptions are used, that is, 'no subtraction of negative ground attenuation' and 'no negative path differences'.

Contents:

Table A2.1 Point of Reception Location Table

Name	ID	Height	Coordinates		
			X	Y	Z
		(m)	(m)	(m)	(m)
POR_1_POW	POR_1_POW	4.5	18364930.25	5041374.56	168.5
POR_1_OPR	POR_1_OPR	1.5	18364907.81	5041372.17	168.5
POR_2_POW	POR_2_POW	4.5	18364488.68	5041118.33	184.59
POR_2_OPR	POR_2_OPR	1.5	18364459.27	5041127.43	186.89
POR_3_POW	POR_3_POW	2	18363076.4	5040684.78	142.32
POR_3_OPR	POR_3_OPR	1.5	18363065.83	5040715.58	143.88
POR_4_POW	POR_4_POW	3	18362482.3	5041313.82	136.99
POR_4_OPR	POR_4_OPR	1.5	18362482.3	5041343.82	132.88
POR_5_POW	POR_5_POW	4.5	18361914.34	5041585.04	147.17
POR_5_OPR	POR_5_OPR	1.5	18361941.64	5041601.22	146.5
POR_6_POW	POR_6_POW	4.5	18361091.47	5041531.12	136.6
POR_6_OPR	POR_6_OPR	1.5	18361118.11	5041552.33	136.49
POR_7_POW	POR_7_POW	4.5	18360678.87	5041988.27	131.5
POR_7_OPR	POR_7_OPR	1.5	18360715.29	5041996.83	129.46
POR_8_POW	POR_8_POW	4.5	18361026.17	5042755.19	143.5
POR_8_OPR	POR_8_OPR	1.5	18361051.07	5042739.9	142.36
POR_9_POW	POR_9_POW	2	18361254.67	5043389.98	153.58
POR_9_OPR	POR_9_OPR	1.5	18361265.4	5043377.13	151.32
POR_10_POW	POR_10_POW	4.5	18361596.92	5043312.54	164.81
POR_10_OPR	POR_10_OPR	1.5	18361605.51	5043284.17	166.95
POR_11_POW	POR_11_POW	2	18361661.61	5043605.37	165
POR_11_OPR	POR_11_OPR	1.5	18361667.33	5043580.42	165.63
POR_12_POW	POR_12_POW	4.5	18361938.02	5043858.95	163.6
POR_12_OPR	POR_12_OPR	1.5	18361943.38	5043830.91	164.58

Table A2.2 Point Sources

ID	Result. PWL			Lw / Li	Noise Source Library File	Operating Time			Direct.	Atten-uation	Height	Coordinates		
	Day	Evening	Night	Type	Value	Day	Evening	Night				X	Y	Z
	(dBA)	(dBA)	(dBA)			(min/hr)	(min/hr)	(min/hr)			(m)	(m)	(m)	(m)
Screener_S1*	111	111	111	Lw	Powerscreen_Chiefton_1700	60.0	0.0	0.0	(none)	-	3	18362330.14	5041768.77	138.96
Screener_S2*	111	111	111	Lw	Powerscreen_Chiefton_1700	60.0	0.0	0.0	(none)	-	3	18361940.03	5042257.67	153.7
Crusher_S1_4*	120	120	120	Lw	Crusher_KPI_JCI	60.0	0.0	0.0	(none)	-	3	18362404.38	5041983.95	142.86
Washplant_S3_4*	109.9	109.9	109.9	Lw	Washplant	60.0	0.0	0.0	(none)	-	4	18362334.86	5041799.11	143.68
Generator_S3_4	108.5	108.5	108.5	Lw	Generator_600kW	60.0	0.0	0.0	(none)	Silex_ Silencer_Model_JB_6	4	18362336.13	5041799.61	143.83

*Includes noise from an associated loader or excavator that was in operation at each plant during measurements.

Table A2.3 Line Sources

ID	Result. PWL			Lw / Li	Noise Source Library File	Direct.	Moving Pt. Src			
	Day	Evening	Night	Type	Value		Number			Speed
	(dBA)	(dBA)	(dBA)				Day	Evening	Night	(km/h)
IHR_1_S1_3	102.5	99.5	99.5	PWL-Pt	Truck_Passby	(none)	8	4	4	30
IHR_1_S2	106.6	101.8	101.8	PWL-Pt	Truck_Passby	(none)	12	4	4	30
IHR_1_S4	104.2	99.5	99.5	PWL-Pt	Truck_Passby	(none)	12	4	4	30
IHR_2_S1	94.6	92.8	92.8	PWL-Pt	Aggregate_Truck_Passby	(none)	6	4	4	30
IHR_2_S2	101.1	96.3	96.3	PWL-Pt	Aggregate_Truck_Passby	(none)	12	4	4	30
IHR_2_S3	93.7	92	92	PWL-Pt	Aggregate_Truck_Passby	(none)	6	4	4	30
IHR_2_S4	103.2	98.5	98.5	PWL-Pt	Aggregate_Truck_Passby	(none)	12	4	4	30

Table A2.4 Area Sources*

ID	Result. PWL			Lw / Li	Noise Source Library File	Operating Time			Direct.	Moving Pt. Src		
	Day	Evening	Night	Type	Value	Day	Evening	Night		Number		
	(dBA)	(dBA)	(dBA)			(min/hr)	(min/hr)	(min/hr)		Day	Evening	Night
Loaders_S1	106.2	103.2	103.2	PWL-Pt	Excavator	60	30	30	(none)	2	1	1
Loaders_S1_2_3_4	103.2	103.2	103.2	PWL-Pt	Excavator	60	30	30	(none)	1	1	1
Loaders_S2_4	106.2	103.2	103.2	PWL-Pt	Excavator	60	30	30	(none)	2	1	1
Loaders_S3	106.2	103.2	103.2	PWL-Pt	Excavator	60	30	30	(none)	2	1	1

*Additional loaders or excavators included in acoustic modelling. Note:

Table A2.4 Noise Barriers

ID	Height
	(m)
Barrier_1	3
Barrier_2	3
Barrier_SP1_S1	10
Barrier_SP2_S1	8
Barrier_SP1_SP2_S2	6
Barrier_WP1_S3_4	12
Barrier_CP1_S1_4	12
Barrier_CP2_S1_4	8

Table A2.5 Noise Source Library

ID	Type	Spectra (dB)											Source
		31.5	63	125	250	500	1000	2000	4000	8000	A	lin	
Powerscreen_Chiefton_1700	Lw	106.9	110.7	112.9	110.6	104.8	105.2	104.9	101	92	111	117.7	Measured 21 Oct 2019, Cavanaugh Pine Grove Pit
Washplant	Lw	112.8	116.6	117.9	105.6	103.6	104	103.3	99.9	88.2	109.9	121.4	Measured Lanark Quarry 14 Oct 2020 72 at 73 m
Generator_600kW	Lw	65.3	97.8	112.9	120.6	122.2	123.3	125.3	121.5	109.7	129.7	130	Manufacturers Data - Cummins600DQPAA-Open Exhaust
Crusher_KPI_JCI	Lw	115.5	123.3	122.3	118.8	114.9	116.5	111.7	105.9	96.4	120	127.7	Measured 18 March 2019, KNL Construction Site
Loader	Lw	107.3	109.5	107.1	101.8	99.4	97.6	95.9	90.1	82.9	103	113.6	Meas. Howe-Ross Pit 20-05-13 72dBA at 14m
Excavator	Lw	100	110.2	109	100.8	98.5	98	95.2	92.6	87.7	103.2	113.5	Meas. OTR 23rd August 2017 at 13.0m
Truck_Passby	Lw	111.2	109.1	106.3	101.8	102.2	102.8	100	93.7	83.8	106.7	115	Meas. Alfred TRM 08/10/2021 - 75dBA at 15m Ref 1
Aggregate_Truck_Passby	Lw	106.5	105.9	106.1	104.1	101.5	101.5	96.5	93.2	81.6	105.3	112.7	Meas. Howe-Ross Pit 20-05-13 Lmax75.7dBA at 12m

Table A2.6 Noise Measurement Data

ID	Type	Spectra (dB)											Source*
		31.5	63	125	250	500	1000	2000	4000	8000	A	lin	
Meas_Washplant	Li	74.9	78.7	80	67.7	65.7	66.1	65.4	62	50.3	72	83.5	Measured Lanark Quarry 14 Oct 2020 72 at 73 m
Meas_Powerscreen_Chiefton_1700	Li	66.2	70	72.2	69.9	64.1	64.5	64.2	60.3	51.3	70.3	77	Measured 21 Oct 2019, Cavanaugh Pine Grove Pit
Meas_Crusher_KPI_JCI	Li	67.3	77	71.3	72.5	65.4	70	65.1	57.7	48.1	72.9	80.2	Measured 18 March 2019, KNL Construction Site@50m
Meas_Loader	Li	76.3	78.5	76.1	70.8	68.4	66.6	64.9	59.1	51.9	72	82.6	Meas. Howe-Ross Pit 20-05-13 72dBA at 14m
Meas_Excavator_CAT345DL	Li	69.6	79.8	78.6	70.4	68.1	67.6	64.8	62.2	57.3	72.8	83.1	Meas. OTR 23rd August 2017 at 13.0m
Meas_Truck_Passby	Li	72	69.9	67.1	62.6	63	63.6	60.8	54.5	44.6	67.5	75.8	Meas. Alfred TRM 08/10/2021 - 75dBA at 15m Ref 1
Meas_Aggregate_Truck_Passby	Li	74.9	74.3	74.5	72.5	69.9	69.9	64.9	61.6	50	73.7	81.1	Meas. Howe-Ross Pit 20-05-13 Lmax75.7dBA at 12m

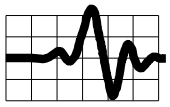


Table A2.7.1 Point of Reception Impacts by Source for Scenario 1* - Day

Source	Daytime Period (07:00 – 19:00)																							
	POR_1_POW	POR_1_OPR	POR_2_POW	POR_2_OPR	POR_3_POW	POR_3_OPR	POR_4_POW	POR_4_OPR	POR_5_POW	POR_5_OPR	POR_6_POW	POR_6_OPR	POR_7_POW	POR_7_OPR	POR_8_POW	POR_8_OPR	POR_9_POW	POR_9_OPR	POR_10_POW	POR_10_OPR	POR_11_POW	POR_11_OPR	POR_12_POW	POR_12_OPR
	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA
Screener_S1	-	-	-	-	20.3	20	36.1	35.5	38.3	37.5	22.6	22.1	25.3	24.2	25.8	24.8	22.7	22.2	24.9	21.8	22.9	22.6	-	-
Crusher_S1_4	-	-	-	-	24.7	24.8	37.8	37.3	40.7	39.5	34.4	33.9	35	34.3	36.4	35.7	33.1	29.7	30.4	28.6	34	33.7	33.8	30.8
IHR_1_S1_3	-	-	-4.2	-2.8	17.9	17.8	41	40.9	32.5	31.9	18.8	18.2	15.7	15.1	15.8	15.3	10.6	8.3	12.7	12.1	10.8	10.6	8.6	5
IHR_2_S1	-	-	-	-	10.2	9.9	25.9	24.3	22.7	22.3	12.5	11.8	9.5	8.7	10.2	9.3	6.7	3.3	8.8	5.1	6.9	6.7	6.5	3.2
Loaders_S1	-	-	-	-	23.1	23.1	38.6	38.2	35.5	35	21.8	20.2	19.2	18.6	21.5	20.9	18.3	18.1	20.6	18.5	18.3	18.3	-	15
Loaders_S1_4	-	-	-	-	18.6	17.5	28.7	28.2	27.2	26.3	20.5	19.8	18.2	17.6	19.6	18.9	16.6	13.9	16.8	12.9	17.3	17.1	17.2	14.2
Total	-	-	-4.2	-2.8	28.8	28.7	44.9	44.6	43.9	43.0	35.2	34.6	35.7	34.9	37.1	36.3	33.8	30.8	32.0	29.9	34.5	34.3	33.9	31.0

* Values at first floor window height (W) at 4.5 m or 2 m and Outdoor Point of Reception (OPR) at 1.5 m are given above as these where the most critical points at each receptor.

Table A2.7.2 Point of Reception Impacts by Source for Scenario 1* - Evening and Night

Source	Evening and Nighttime Period (19:00 - 07:00)																							
	POR_1_POW	POR_1_OPR	POR_2_POW	POR_2_OPR	POR_3_POW	POR_3_OPR	POR_4_POW	POR_4_OPR	POR_5_POW	POR_5_OPR	POR_6_POW	POR_6_OPR	POR_7_POW	POR_7_OPR	POR_8_POW	POR_8_OPR	POR_9_POW	POR_9_OPR	POR_10_POW	POR_10_OPR	POR_11_POW	POR_11_OPR	POR_12_POW	POR_12_OPR
	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA
IHR_1_S1_3	-	-	-7.2	-5.9	14.9	14.8	38	37.9	29.5	28.9	15.8	15.2	12.6	12.1	12.8	12.3	7.6	5.3	9.6	9.1	7.8	7.6	5.6	2
IHR_2_S1	-	-	-	-	8.4	8.1	24.2	22.6	20.9	20.5	10.7	10	7.7	6.9	8.4	7.6	5	1.5	7	3.4	5.2	5	4.7	1.4
Loaders_S1	-	-	-	-	17.1	17.1	32.6	32.2	29.5	29	15.8	14.2	13.2	12.6	15.5	14.8	12.3	12.1	14.5	12.4	12.3	12.3	-	9
Loaders_S1_4	-	-	-	-	15.6	14.5	25.7	25.2	24.2	23.3	17.5	16.8	15.2	14.6	16.6	15.9	13.6	10.9	13.7	9.9	14.3	14.1	14.2	11.2
Total	-	-	-7.2	-5.9	21.0	20.7	39.4	39.2	33.4	32.8	21.6	20.7	18.9	18.3	20.3	19.6	16.9	15.2	18.2	15.7	17.2	17.1	15.1	13.8

* Values at first floor window height (W) at 4.5 m or 2 m and Outdoor Point of Reception (OPR) at 1.5 m are given above as these where the most critical points at each receptor.

Table A2.7.3 Point of Reception Impacts by Source for Scenario 2* - Day

Source	Daytime Period (07:00 – 19:00)																							
	POR_1_POW	POR_1_OPR	POR_2_POW	POR_2_OPR	POR_3_POW	POR_3_OPR	POR_4_POW	POR_4_OPR	POR_5_POW	POR_5_OPR	POR_6_POW	POR_6_OPR	POR_7_POW	POR_7_OPR	POR_8_POW	POR_8_OPR	POR_9_POW	POR_9_OPR	POR_10_POW	POR_10_OPR	POR_11_POW	POR_11_OPR	POR_12_POW	POR_12_OPR
	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA
Screener_S2	-	-	-	-	21.9	21.3	28.7	27.2	35.9	35.1	34	32.4	32.3	30.5	35.3	30.4	15.2	14.8	16.5	14.4	15	14.9	12.5	11.5
Crusher_S1_4	-	-	-	-	24.7	24.8	37.8	37.3	40.7	39.5	34.4	33.9	35	34.3	36.4	35.7	33.1	29.7	30.4	28.6	34	33.7	33.8	30.8
IHR_1_S2	-	-	-2.4	-1.1	20	19.9	42.9	42.7	35.3	34.1	24	23.4	20.8	20.2	22	21.5	15.2	11.7	16.4	14.7	16.4	15.5	14.1	9.6
IHR_2_S2	-	-	-	-	15	15.5	28.5	27.3	31	27.6	17.3	16.6	14.9	14.1	19.6	18.8	6.9	5.9	10.4	7	11.7	11.4	11.3	4.4
Loaders_S1_4	-	-	-	-	18.6	17.5	28.7	28.2	27.2	26.3	20.5	19.8	18.2	17.6	19.6	18.9	16.6	13.9	16.8	12.9	17.3	17.1	17.2	14.2
Loaders_S2_4	-	-	-	-		15.3	25.3	24.4	30.9	30	28	26.9	27	26	28.3	27.6	15.5	15.1	14.6	14.3	13.7	13.4	9.2	8.7
Total	-	-	-2.4	-1.1	28.2	28.2	44.4	44.1	43.4	42.2	38.0	37.0	37.5	36.4	39.4	37.5	33.4	30.1	31.1	29.2	34.3	34.0	34.0	31.0

* Values at first floor window height (W) at 4.5 m or 2 m and Outdoor Point of Reception (OPR) at 1.5 m are given above as these where the most critical points at each receptor.

Table A2.7.4 Point of Reception Impacts by Source for Scenario 2* - Evening and Night

Source	Evening and Nighttime Period (19:00 - 07:00)																							
	POR_1_POW	POR_1_OPR	POR_2_POW	POR_2_OPR	POR_3_POW	POR_3_OPR	POR_4_POW	POR_4_OPR	POR_5_POW	POR_5_OPR	POR_6_POW	POR_6_OPR	POR_7_POW	POR_7_OPR	POR_8_POW	POR_8_OPR	POR_9_POW	POR_9_OPR	POR_10_POW	POR_10_OPR	POR_11_POW	POR_11_OPR	POR_12_POW	POR_12_OPR
	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA
IHR_1_S2	-	-	-7.2	-5.9	15.2	15.1	38.1	37.9	30.5	29.4	19.2	18.7	16	15.4	17.2	16.7	10.5	7	11.6	9.9	11.6	10.7	9.3	4.8
IHR_2_S2	-	-	-	-	10.3	10.8	23.7	22.5	26.2	22.8	12.5	11.9	10.1	9.3	14.8	14	2.1	1.1	5.7	2.2	7	6.6	6.5	-0.4
Loaders_S1_4	-	-	-	-	15.6	14.5	25.7	25.2	24.2	23.3	17.5	16.8	15.2	14.6	16.6	15.9	13.6	10.9	13.7	9.9	14.3	14.1	14.2	11.2
Loaders_S2_4	-	-	-	-	-	9.3	19.3	18.4	24.9	24	22	20.9	21	20	22.3	21.6	9.5	9.1	8.5	8.3	7.7	7.4	3.2	2.7
Total	-	-	-7.2	-5.9	19.1	19.1	38.5	38.3	33.2	31.8	25.0	24.1	23.2	22.4	24.7	24.1	16.5	14.2	16.9	14.5	17.2	16.8	16.2	12.8

* Values at first floor window height (W) at 4.5 m or 2 m and Outdoor Point of Reception (OPR) at 1.5 m are given above as these where the most critical points at each receptor.

Table A2.7.5 Point of Reception Impacts by Source for Scenario 3* - Day

Source	Daytime Period (07:00 – 19:00)																							
	POR_1_POW	POR_1_OPR	POR_2_POW	POR_2_OPR	POR_3_POW	POR_3_OPR	POR_4_POW	POR_4_OPR	POR_5_POW	POR_5_OPR	POR_6_POW	POR_6_OPR	POR_7_POW	POR_7_OPR	POR_8_POW	POR_8_OPR	POR_9_POW	POR_9_OPR	POR_10_POW	POR_10_OPR	POR_11_POW	POR_11_OPR	POR_12_POW	POR_12_OPR
	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA
Crusher_S1_4	-	-	-	-	24.7	24.8	37.8	37.3	40.7	39.5	34.4	33.9	35	34.3	36.4	35.7	33.1	29.7	30.4	28.6	34	33.7	33.8	30.8
Washplant_S3_4	-	-	-	-	20.5	20.4	33.9	33.7	36.8	36.7	27.6	26.7	25.3	24.7	25.7	25.2	23.3	23	25.1	24.6	23.4	23.2	-	-
Generator_S3_4	-	-	-	-	5.9	5.5	25.6	25.3	30.1	30.7	18.9	18.0	15.8	15.7	16.6	16.4	12.9	12.3	15.4	14.7	13.3	13.2	-	-
IHR_1_S1_3	-	-	-4.2	-2.8	17.9	17.8	41	40.9	32.6	32	18.8	18.2	15.6	15.1	15.5	15	9.9	7.2	12.1	11.6	10.5	10.3	8.6	5
IHR_2_S3	-	-	-	-	8.8	8.6	24.4	23.6	21.6	21.3	11.6	10.8	8.5	7.7	9.3	8.5	5.7	2.2	2.9	4.1	6	5.7	5.5	2
Loaders_S1_4	-	-	-	-	18.6	17.5	28.7	28.2	27.2	26.3	20.5	19.8	18.2	17.6	19.6	18.9	16.6	13.9	16.8	12.9	17.3	17.1	17.2	14.2
Loaders_S3	-	-	-	-	23.4	23.2	39.2	38.6	35.5	35.1	21	20.5	19.9	19.4	21.9	21.2	18.1	17.9	19.7	17.5	17.9	17.8	-	11.7
Total	-	-	-4.2	-2.8	28.9	28.7	44.9	44.5	43.7	43.0	35.7	35.1	35.8	35.1	37.1	36.4	33.8	30.9	32.1	30.5	34.6	34.3	33.9	30.9

* Values at first floor window height (W) at 4.5 m or 2 m and Outdoor Point of Reception (OPR) at 1.5 m are given above as these where the most critical points at each receptor.

Table A2.7.6 Point of Reception Impacts by Source for Scenario 3* - Evening and Night

Source	Evening and Nighttime Period (19:00 - 07:00)																							
	POR_1_POW	POR_1_OPR	POR_2_POW	POR_2_OPR	POR_3_POW	POR_3_OPR	POR_4_POW	POR_4_OPR	POR_5_POW	POR_5_OPR	POR_6_POW	POR_6_OPR	POR_7_POW	POR_7_OPR	POR_8_POW	POR_8_OPR	POR_9_POW	POR_9_OPR	POR_10_POW	POR_10_OPR	POR_11_POW	POR_11_OPR	POR_12_POW	POR_12_OPR
	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA
IHR_1_S1_3	-	-	-7.2	-5.9	14.9	14.8	38	37.9	29.6	29	15.8	15.2	12.6	12	12.5	12	6.9	4.2	9.1	8.6	7.5	7.3	5.6	2
IHR_2_S3	-	-	-	-	7.1	6.8	22.6	21.8	19.8	19.5	9.8	9.1	6.8	6	7.6	6.7	4	0.4	1.1	2.3	4.2	4	3.7	0.2
Loaders_S1_4	-	-	-	-	15.6	14.5	25.7	25.2	24.2	23.3	17.5	16.8	15.2	14.6	16.6	15.9	13.6	10.9	13.7	9.9	14.3	14.1	14.2	11.2
Loaders_S3	-	-	-	-	17.3	17.2	33.2	32.6	29.4	29	15	14.5	13.9	13.4	15.9	15.2	12.1	11.9	13.7	11.5	11.8	11.8	-	5.7
Total	-	-	-7.2	-5.9	21.0	20.7	39.5	39.3	33.3	32.8	21.3	20.7	19.1	18.5	20.3	19.7	16.7	15.0	17.5	15.1	17.0	16.9	15.1	12.9

* Values at first floor window height (W) at 4.5 m or 2 m and Outdoor Point of Reception (OPR) at 1.5 m are given above as these where the most critical points at each receptor.

Table A2.7.7 Point of Reception Impacts by Source for Scenario 4* - Day

Source	Daytime Period (07:00 – 19:00)																							
	POR_1_POW	POR_1_OPR	POR_2_POW	POR_2_OPR	POR_3_POW	POR_3_OPR	POR_4_POW	POR_4_OPR	POR_5_POW	POR_5_OPR	POR_6_POW	POR_6_OPR	POR_7_POW	POR_7_OPR	POR_8_POW	POR_8_OPR	POR_9_POW	POR_9_OPR	POR_10_POW	POR_10_OPR	POR_11_POW	POR_11_OPR	POR_12_POW	POR_12_OPR
	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA
Crusher_S1_4	-	-	-	-	24.7	24.8	37.8	37.3	40.7	39.5	34.4	33.9	35	34.3	36.4	35.7	33.1	29.7	30.4	28.6	34	33.7	33.8	30.8
Washplant_S3_4	-	-	-	-	20.5	20.4	33.9	33.7	36.8	36.7	27.6	26.7	25.3	24.7	25.7	25.2	23.3	23	25.1	24.6	23.4	23.2	-	-
Generator_S3_4	-	-	-	-	5.9	5.5	25.6	25.3	30.1	30.7	18.9	18.0	15.8	15.7	16.6	16.4	12.9	12.3	15.4	14.7	13.3	13.2	-	-
IHR_1_S4	-	-	-2.4	-1.1	19.6	19.6	42.8	42.6	34.4	33.8	20.6	20	17.4	16.8	17.3	16.8	11.6	8.9	13.9	13.4	12.2	12.1	10.4	6.7
IHR_2_S4	-	-	-	-	15	14.7	28.4	27.4	27.5	26.6	22.2	15.7	20	19.2	18.5	17.5	14.7	13.1	15.6	12	15.8	15.4	12.1	8.9
Loaders_S1_4	-	-	-	-	18.6	17.5	28.7	28.2	27.2	26.3	20.5	19.8	18.2	17.6	19.6	18.9	16.6	13.9	16.8	12.9	17.3	17.1	17.2	14.2
Loaders_S2_4	-	-	-	-		15.5	25.5	24.6	30.9	30	28	26.9	27	26	28.3	27.6	15.5	15.1	14.6	14.3	13.7	13.4	9.2	8.7
Total	-	-	-2.4	-1.1	27.9	28.0	44.7	44.5	43.5	42.8	36.5	35.7	36.3	35.6	37.6	36.8	33.8	30.9	32.0	30.5	34.6	34.3	33.9	30.9

* Values at first floor window height (W) at 4.5 m or 2 m and Outdoor Point of Reception (OPR) at 1.5 m are given above as these where the most critical points at each receptor.

Table A2.7.8 Point of Reception Impacts by Source for Scenario 4* - Evening and Night

Source	Evening and Nighttime Period (19:00 - 07:00)																							
	POR_1_POW	POR_1_OPR	POR_2_POW	POR_2_OPR	POR_3_POW	POR_3_OPR	POR_4_POW	POR_4_OPR	POR_5_POW	POR_5_OPR	POR_6_POW	POR_6_OPR	POR_7_POW	POR_7_OPR	POR_8_POW	POR_8_OPR	POR_9_POW	POR_9_OPR	POR_10_POW	POR_10_OPR	POR_11_POW	POR_11_OPR	POR_12_POW	POR_12_OPR
	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA	dBA
IHR_1_S4	-	-	-7.2	-5.9	14.9	14.8	38	37.9	29.6	29	15.8	15.2	12.6	12	12.5	12	6.9	4.2	9.1	8.6	7.5	7.3	5.6	2
IHR_2_S4	-	-	-	-	10.2	9.9	23.7	22.6	22.8	21.8	17.4	10.9	15.2	14.5	13.7	12.7	9.9	8.4	10.8	7.3	11	10.7	7.3	4.1
Loaders_S1_4	-	-	-	-	15.6	14.5	25.7	25.2	24.2	23.3	17.5	16.8	15.2	14.6	16.6	15.9	13.6	10.9	13.7	9.9	14.3	14.1	14.2	11.2
Loaders_S2_4	-	-	-	-		9.5	19.5	18.6	24.9	24	22	20.9	21	20	22.3	21.6	9.5	9.1	8.5	8.3	7.7	7.4	3.2	2.7
Total	-	-	-7.2	-5.9	18.9	18.9	38.5	38.3	32.2	31.5	24.9	23.3	23.2	22.4	24.1	23.4	16.7	14.7	17.1	14.6	17.1	16.8	15.7	12.8

* Values at first floor window height (W) at 4.5 m or 2 m and Outdoor Point of Reception (OPR) at 1.5 m are given above as these where the most critical points at each receptor.

Table A2.8 Distance Source to Point of Reception

Source	Coordinates		POR_1_POW	POR_1_OPR	POR_2_POW	POR_2_OPR	POR_3_POW	POR_3_OPR	POR_4_POW	POR_4_OPR	POR_5_POW	POR_5_OPR	POR_6_POW	POR_6_OPR	POR_7_POW	POR_7_OPR	POR_8_POW	POR_8_OPR	POR_9_POW	POR_9_OPR	POR_10_POW	POR_10_OPR	POR_11_POW	POR_11_OPR	POR_12_POW	POR_12_OPR
	X (m)		1836076.4	1836065.8	1836494.0	1836488.2	1836914.3	1836941.6	1836091.5	1836118.1	1836678.9	1836715.3	1836026.2	1836051.1	1836254.7	1836265.4	1836596.9	1836605.5	1836661.6	1836667.3	1836938.0	1836943.4	1836076.4	1836065.8	1836494.0	1836488.2
		Y (m)	5040684.8	5040715.6	5041310.0	5041337.6	5041585.0	5041601.2	5041531.1	5041552.3	5041988.3	5041996.8	5042755.2	5042739.9	5043390.0	5043377.1	5043312.5	5043284.2	5043605.4	5043580.4	5043859.0	5043830.9	5040684.8	5040715.6	5041310.0	5041337.6
			m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m
Screener_S1	1836233 0.14	5041768.77	2630	2608	2254	2224	1316	1285	487	459	455	423	1261	1231	1666	1631	1635	1606	1945	1929	1709	1680	1954	1929	2127	2098
Screener_S2	1836194 0.03	5042257.67	3118	3097	2792	2761	1940	1909	1098	1071	673	656	1117	1083	1290	1252	1041	1011	1324	1307	1109	1080	1376	1351	1601	1573
Crusher_S1_4	1836240 4.38	5041983.95	2598	2577	2257	2226	1463	1430	680	652	632	601	1389	1357	1726	1689	1579	1550	1816	1800	1555	1526	1783	1758	1932	1904
Washplant_S3_4	1836233 4.86	5041799.11	2630	2608	2259	2228	1339	1307	514	486	472	440	1272	1242	1667	1632	1621	1592	1923	1906	1684	1654	1928	1902	2098	2069
Generator_S3_4	1836233 6.13	5041799.61	2629	2607	2258	2227	1338	1307	514	486	473	442	1273	1243	1668	1633	1621	1592	1923	1907	1684	1655	1928	1902	2097	2069

Table A2.9 Sample Calculations – Scenario 1

Receiver
Name: POR_2
ID: POR_2_POW
X: 18364488.68 m
Y: 5041118.33 m
Z: 184.59 m

Line Source, ISO 9613, Name: "IHR_1", ID: "IHR_1_S1_3"																				
Nr.	X	Y	Z	Refl.	DEN	Freq.	Lw	l/a	Optime	K0	Di	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	Lr
	(m)	(m)	(m)			(Hz)	dB(A)	dB	dB	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)
41	18362548.66	5041539.88	130.18	0	D	32	36.1	18.1	0.0	0.0	0.0	77.0	0.1	-5.7	0.0	0.0	9.7	0.0	0.0	-26.9
41	18362548.66	5041539.88	130.18	0	D	63	47.2	18.1	0.0	0.0	0.0	77.0	0.2	-5.7	0.0	0.0	12.0	0.0	0.0	-18.2
41	18362548.66	5041539.88	130.18	0	D	125	54.5	18.1	0.0	0.0	0.0	77.0	0.8	8.5	0.0	0.0	6.0	0.0	0.0	-19.8
41	18362548.66	5041539.88	130.18	0	D	250	57.5	18.1	0.0	0.0	0.0	77.0	2.1	6.3	0.0	0.0	11.0	0.0	0.0	-20.8
41	18362548.66	5041539.88	130.18	0	D	500	63.3	18.1	0.0	0.0	0.0	77.0	3.8	0.8	0.0	0.0	19.4	0.0	0.0	-19.6
41	18362548.66	5041539.88	130.18	0	D	1000	67.1	18.1	0.0	0.0	0.0	77.0	7.3	0.0	0.0	0.0	23.1	0.0	0.0	-22.2
41	18362548.66	5041539.88	130.18	0	D	2000	65.5	18.1	0.0	0.0	0.0	77.0	19.2	-0.0	0.0	0.0	25.0	0.0	0.0	-37.6
41	18362548.66	5041539.88	130.18	0	D	4000	59.0	18.1	0.0	0.0	0.0	77.0	65.1	-0.0	0.0	0.0	25.0	0.0	0.0	-90.0
41	18362548.66	5041539.88	130.18	0	D	8000	47.0	18.1	0.0	0.0	0.0	77.0	232.1	-0.0	0.0	0.0	25.0	0.0	0.0	-269.0
41	18362548.66	5041539.88	130.18	0	N	32	33.0	18.1	0.0	0.0	0.0	77.0	0.1	-5.7	0.0	0.0	9.7	0.0	0.0	-29.9
41	18362548.66	5041539.88	130.18	0	N	63	44.1	18.1	0.0	0.0	0.0	77.0	0.2	-5.7	0.0	0.0	12.0	0.0	0.0	-21.3
41	18362548.66	5041539.88	130.18	0	N	125	51.4	18.1	0.0	0.0	0.0	77.0	0.8	8.5	0.0	0.0	6.0	0.0	0.0	-22.8
41	18362548.66	5041539.88	130.18	0	N	250	54.4	18.1	0.0	0.0	0.0	77.0	2.1	6.3	0.0	0.0	11.0	0.0	0.0	-23.8
41	18362548.66	5041539.88	130.18	0	N	500	60.2	18.1	0.0	0.0	0.0	77.0	3.8	0.8	0.0	0.0	19.4	0.0	0.0	-22.6
41	18362548.66	5041539.88	130.18	0	N	1000	64.0	18.1	0.0	0.0	0.0	77.0	7.3	0.0	0.0	0.0	23.1	0.0	0.0	-25.2
41	18362548.66	5041539.88	130.18	0	N	2000	62.4	18.1	0.0	0.0	0.0	77.0	19.2	-0.0	0.0	0.0	25.0	0.0	0.0	-40.6
41	18362548.66	5041539.88	130.18	0	N	4000	55.9	18.1	0.0	0.0	0.0	77.0	65.1	-0.0	0.0	0.0	25.0	0.0	0.0	-93.0
41	18362548.66	5041539.88	130.18	0	N	8000	43.9	18.1	0.0	0.0	0.0	77.0	232.1	-0.0	0.0	0.0	25.0	0.0	0.0	-272.0
41	18362548.66	5041539.88	130.18	0	E	32	33.0	18.1	0.0	0.0	0.0	77.0	0.1	-5.7	0.0	0.0	9.7	0.0	0.0	-29.9
41	18362548.66	5041539.88	130.18	0	E	63	44.1	18.1	0.0	0.0	0.0	77.0	0.2	-5.7	0.0	0.0	12.0	0.0	0.0	-21.3
41	18362548.66	5041539.88	130.18	0	E	125	51.4	18.1	0.0	0.0	0.0	77.0	0.8	8.5	0.0	0.0	6.0	0.0	0.0	-22.8
41	18362548.66	5041539.88	130.18	0	E	250	54.4	18.1	0.0	0.0	0.0	77.0	2.1	6.3	0.0	0.0	11.0	0.0	0.0	-23.8
41	18362548.66	5041539.88	130.18	0	E	500	60.2	18.1	0.0	0.0	0.0	77.0	3.8	0.8	0.0	0.0	19.4	0.0	0.0	-22.6
41	18362548.66	5041539.88	130.18	0	E	1000	64.0	18.1	0.0	0.0	0.0	77.0	7.3	0.0	0.0	0.0	23.1	0.0	0.0	-25.2
41	18362548.66	5041539.88	130.18	0	E	2000	62.4	18.1	0.0	0.0	0.0	77.0	19.2	-0.0	0.0	0.0	25.0	0.0	0.0	-40.6
41	18362548.66	5041539.88	130.18	0	E	4000	55.9	18.1	0.0	0.0	0.0	77.0	65.1	-0.0	0.0	0.0	25.0	0.0	0.0	-93.0
41	18362548.66	5041539.88	130.18	0	E	8000	43.9	18.1	0.0	0.0	0.0	77.0	232.1	-0.0	0.0	0.0	25.0	0.0	0.0	-272.0
57	18362544.76	5041536.77	130.00	0	D	32	36.1	17.8	0.0	0.0	0.0	77.0	0.1	-5.7	0.0	0.0	9.3	0.0	0.0	-26.8
57	18362544.76	5041536.77	130.00	0	D	63	47.2	17.8	0.0	0.0	0.0	77.0	0.2	-5.7	0.0	0.0	11.5	0.0	0.0	-18.0
57	18362544.76	5041536.77	130.00	0	D	125	54.5	17.8	0.0	0.0	0.0	77.0	0.8	8.5	0.0	0.0	5.5	0.0	0.0	-19.5
57	18362544.76	5041536.77	130.00	0	D	250	57.5	17.8	0.0	0.0	0.0	77.0	2.1	6.3	0.0	0.0	10.4	0.0	0.0	-20.5
57	18362544.76	5041536.77	130.00	0	D	500	63.3	17.8	0.0	0.0	0.0	77.0	3.8	0.8	0.0	0.0	18.8	0.0	0.0	-19.3
57	18362544.76	5041536.77	130.00	0	D	1000	67.1	17.8	0.0	0.0	0.0	77.0	7.3	0.0	0.0	0.0	22.5	0.0	0.0	-21.9
57	18362544.76	5041536.77	130.00	0	D	2000	65.5	17.8	0.0	0.0	0.0	77.0	19.2	-0.0	0.0	0.0	25.0	0.0	0.0	-37.9
57	18362544.76	5041536.77	130.00	0	D	4000	59.0	17.8	0.0	0.0	0.0	77.0	65.2	-0.0	0.0	0.0	25.0	0.0	0.0	-90.4
57	18362544.76	5041536.77	130.00	0	D	8000	47.0	17.8	0.0	0.0	0.0	77.0	232.5	-0.0	0.0	0.0	25.0	0.0	0.0	-269.7
57	18362544.76	5041536.77	130.00	0	N	32	33.0	17.8	0.0	0.0	0.0	77.0	0.1	-5.7	0.0	0.0	9.3	0.0	0.0	-29.8
57	18362544.76	5041536.77	130.00	0	N	63	44.1	17.8	0.0	0.0	0.0	77.0	0.2	-5.7	0.0	0.0	11.5	0.0	0.0	-21.1
57	18362544.76	5041536.77	130.00	0	N	125	51.4	17.8	0.0	0.0	0.0	77.0	0.8	8.5	0.0	0.0	5.5	0.0	0.0	-22.5
57	18362544.76	5041536.77	130.00	0	N	250	54.4	17.8	0.0	0.0	0.0	77.0	2.1	6.3	0.0	0.0	10.4	0.0	0.0	-23.5
57	18362544.76	5041536.77	130.00	0	N	500	60.2	17.8	0.0	0.0	0.0	77.0	3.8	0.8	0.0	0.0	18.8	0.0	0.0	-22.3
57	18362544.76	5041536.77	130.00	0	N	1000	64.0	17.8	0.0	0.0	0.0	77.0	7.3	0.0	0.0	0.0	22.5	0.0	0.0	-24.9
57	18362544.76	5041536.77	130.00	0	N	2000	62.4	17.8	0.0	0.0	0.0	77.0	19.2	-0.0	0.0	0.0	25.0	0.0	0.0	-40.9
57	18362544.76	5041536.77	130.00	0	N	4000	55.9	17.8	0.0	0.0	0.0	77.0	65.2	-0.0	0.0	0.0	25.0	0.0	0.0	-93.4
57	18362544.76	5041536.77	130.00	0	N	8000	43.9	17.8	0.0	0.0	0.0	77.0	232.5	-0.0	0.0	0.0	25.0	0.0	0.0	-272.7
57	18362544.76	5041536.77	130.00	0	E	32	33.0	17.8	0.0	0.0	0.0	77.0	0.1	-5.7	0.0	0.0	9.3	0.0	0.0	-29.8
57	18362544.76	5041536.77	130.00	0	E	63	44.1	17.8	0.0	0.0	0.0	77.0	0.2	-5.7	0.0	0.0	11.5	0.0	0.0	-21.1
57	18362544.76	5041536.77	130.00	0	E	125	51.4	17.8	0.0	0.0	0.0	77.0	0.8	8.5	0.0	0.0	5.5	0.0	0.0	-22.5
57	18362544.76	5041536.77	130.00	0	E	250	54.4	17.8	0.0	0.0	0.0	77.0	2.1	6.3	0.0	0.0	10.4	0.0	0.0	-23.5
57	18362544.76	5041536.77	130.00	0	E	500	60.2	17.8	0.0	0.0	0.0	77.0	3.8	0.8	0.0	0.0	18.8	0.0	0.0	-22.3
57	18362544.76	5041536.77	130.00	0	E	1000	64.0	17.8	0.0	0.0	0.0	77.0	7.3	0.0	0.0	0.0	22.5	0.0	0.0	-24.9
57	18362544.76	5041536.77	130.00	0	E	2000	62.4	17.8	0.0	0.0	0.0	77.0	19.2	-0.0	0.0	0.0	25.0	0.0	0.0	-40.9
57	18362544.76	5041536.77	130.00	0	E	4000	55.9	17.8	0.0	0.0	0.0	77.0	65.2	-0.0	0.0	0.0	25.0	0.0	0.0	-93.4
57	18362544.76	5041536.77	130.00	0	E	8000	43.9	17.8	0.0	0.0	0.0	77.0	232.5	-0.0	0.0	0.0	25.0	0.0	0.0	-272.7
93	18362547.73	5041452.27	131.44	0	D	32	36.1	14.7	0.0	0.0	0.0	76.9	0.1	-5.7	0.0	0.0	8.6	0.0	0.0	-29.1
93	18362547.73	5041452.27	131.44	0	D	63	47.2	14.7	0.0	0.0	0.0	76.9	0.2	-5.7	0.0	0.0	10.6	0.0	0.0	-20.2
93	18362547.73	5041452.27	131.44	0	D	125	54.5	14.7	0.0	0.0	0.0	76.9	0.8	8.5	0.0	0.0	4.4	0.0	0.0	-21.5
93	18362547.73	5041452.27	131.44	0	D	250	57.5	14.7	0.0	0.0	0.0	76.9	2.1	6.3	0.0	0.0	9.3	0.0	0.0	-22.4

Appendix 3

Instrument Calibration Certificates

www.pylonelectronics.com

Pylon Electronics Inc.
147 Colonnade Road
Ottawa, ON K2E 7L9

Page 1 of 1

CERTIFICATE OF CALIBRATION

Description	**SOUND LEVEL CALIBRATOR**	**Work Order**	**N0833134**
Model Number	**4231**	**Serial Number**	**2730374**
Instrument Id	**N/A**	**Cal Procedure**	**33K3-4-2871-1**
Manufacturer	**BRUEL & KJAER**	**Cal Date**	**30 Jan 2020**
Customer Name	**FREEFIELD LTD.**	**Recall Cycle**	**52 Weeks**
		Next Cal Date	**30 Jan 2021**
		Purchase Order	**Credit Card**

Calibration Environment: Temperature **23.0 °C** Relative Humidity **35.2 %RH**

Received Condition: **Within Tolerance**

Completed Condition: **Within Tolerance**

Remarks: **Optimized sound level.**

Standards Used to Establish Traceability

Instrument Type	Model	Asset #	Cal Due Date
4145 BRUEL&KJAER 1" MICROPHONE	4145	240-054	4 Dec 2020
1/2" MICROPHONE	4166	240-709	18 Jun 2020
PISTONPHONE	4220	354-017	1 Apr 2020
FFT SIGNAL ANALYZER SYSTEM	3550	354-759	10 Oct 2020
MICROPHONE PREAMP	2639T	355-164	27 Feb 2020

Pylon certifies that, at the time of calibration, the above listed instrument meets or exceeds all of the specifications defined on the Test Data Sheet (TDS), unless otherwise indicated. The Certificate received and completed conditions and the TDS specifications are based on the procedure(s) and/or specification(s) referenced on the TDS unless otherwise indicated. Any statement of compliance is made without taking measurement uncertainty into account and is based on the instrument's performance against the test limits documented on the test data sheet.

The above listed instrument has been calibrated using standards that are traceable to the International System of Units (SI) through a National Metrological Institute (such as NRC or NIST). Pylon's quality system meets the requirements of ISO/IEC 17025:2005. Unless otherwise specified, Pylon maintains a minimum of a 4:1 ratio between the equipment under test and the measurement system.

Test data As Found and Final (as left) results are the same unless reported otherwise. Certificate remarks identify if adjustments were performed.

pylcert1

Metrologist : ***062*** Quality Assurance: ***301*** Date of Issue: **30 Jan 2020** F083 Rev 15

HALIFAX MONTREAL OTTAWA TORONTO EDMONTON CALGARY

PYLON

Calibration Test Data

Page 1 of 1

Description:	**SOUND LEVEL CALIBRATOR**	Work order:	**N0833134**
Model:	**4231**	Serial:	**2730374**
Customer ID.:	**N/A**	Procedure:	**33K3-4-2871-1**
Manufacturer:	**BRUEL & KJAER**	Proc. Rev.:	**30-Oct-2006**
Customer:	**FREEFIELD LTD.**	Cal Date:	**30-Jan-2020**

TEST REF.	TEST DESCRIPTION	RESULTS MIN	AS FOUND	FINAL	MAX
4.1	**Sound Level Calibration:**				
	Nominal dB_{SPL}	dB_{SPL}	dB_{SPL}	dB_{SPL}	dB_{SPL}
	94.0	93.80	94.15	94.02	94.20
	(+20 dB Button) 114.0	113.80	114.13	114.01	114.20
4.2	**Frequency Calibration:**				
	Nominal (Hz)	Hz	Hz		Hz
	1 k	999.0	1000.0		1001.0
4.3	**Distortion Calibration :**				
	Measured Value	-	0.37 %		1.00 %
	ADDITIONAL TEST:				
	AUTO SHUT OFF	Pass / Fail	Pass		

www.pylonelectronics.com

Pylon Electronics Inc.
147 Colonnade Road
Ottawa, ON K2E 7L9

Page 1 of 1

CERTIFICATE OF CALIBRATION

Description	**SOUND ANALYZER**	**Work Order**	**N0833130**
Model Number	**2270**	**Serial Number**	**3008643**
Instrument Id	**N/A**	**Cal Procedure**	**BE1713-32**
Manufacturer	**BRUEL & KJAER**	**Cal Date**	**30 Jan 2020**
Customer Name	**FREEFIELD LTD.**	**Recall Cycle**	**52 Weeks**
		Next Cal Date	**30 Jan 2021**
		Purchase Order	**Credit Card**

Calibration Environment: Temperature **23.0 °C** Relative Humidity **35.2 %RH**

Received Condition: **Within Tolerance**

Completed Condition: **Within Tolerance**

Remarks: **Unit calibrated with Preamp ZC 0032 S/N 23073 AND MIC 4189 S/N 2985656**

Standards Used to Establish Traceability

Instrument Type	Model	Asset #	Cal Due Date
SOUND LEVEL CALIBRATOR	4231	240-1151	17 Sep 2020
PISTONPHONE	4220	354-017	1 Apr 2020

Pylon certifies that, at the time of calibration, the above listed instrument meets or exceeds all of the specifications defined on the Test Data Sheet (TDS), unless otherwise indicated. The Certificate received and completed conditions and the TDS specifications are based on the procedure(s) and/or specification(s) referenced on the TDS unless otherwise indicated. Any statement of compliance is made without taking measurement uncertainty into account and is based on the instrument's performance against the test limits documented on the test data sheet.

The above listed instrument has been calibrated using standards that are traceable to the International System of Units (SI) through a National Metrological Institute (such as NRC or NIST). Pylon's quality system meets the requirements of ISO/IEC 17025:2005. Unless otherwise specified, Pylon maintains a minimum of a 4:1 ratio between the equipment under test and the measurement system.

Test data As Found and Final (as left) results are the same unless reported otherwise. Certificate remarks identify if adjustments were performed.

pylcert1

Metrologist : *062* Quality Assurance: *301* Date of Issue: **30 Jan 2020** F083 Rev 15

HALIFAX MONTREAL OTTAWA TORONTO EDMONTON CALGARY

Page 1 of 1

PYLON

Calibration Test Data

Description:	**SOUND ANALYZER**	Work order:	**N0833130**
Model:	**2270**	Serial:	**3008643**
Customer ID.:	**N/A**	Procedure:	**BE1713-32**
Manufacturer:	**BRUEL & KJAER**	Proc. Rev.:	**23-Feb-2016**
Customer:	**FREEFIELD LTD.**	Cal Date:	**30-Jan-2020**

TEST REF.	TEST DESCRIPTION	RESULTS MIN	AS FOUND	FINAL	MAX
P. 52	**SOUND LEVEL CALIBRATION**				
	CONNECT TI TO SOUND CALIBRATOR MODEL 4231,				
	SWITCH ON THE CALIBRATOR, PRESS "START" ON TI,				
	NOTE THAT TI INDICATING "DETECTING LEVEL"	Pass / Fail	Pass		
	WHILE TI SEARCHING FOR SIGNAL & SIGNAL IS				
	STABILISING, THE "TRAFFIC LIGHT" INDICATES				
	SHORT GREEN FLASH EVERY SECOND	Pass / Fail	Pass		
	WHEN SIGNAL IS STABLE, THE GREEN LIGHT IS				
	STABLE	Pass / Fail	Pass		
	WHEN CALIBRATION IS COMPLETED SUCCESSFULLY				
	THE TRAFFIC LIGHT INDICATES A SHORT YELLOW				
	FLASH EVERY 5 SECONDS	Pass / Fail	Pass		
	Nominal SPL with 4189 Microphone attached	dB	dB		dB
	93.8 dB	92.8	93.8		94.8
	CALIBRATION COMPLETED	Pass / Fail	Pass		

Appendix 4

Manufacturers Data

Contents:

- Manufacturers Data for Cummins 600kW diesel generator used to provide power to the wash plant
- Manufacturers Data for Silex Silencer Model JB 6.

Manufacturers Data for Cummins 600kW diesel generator.

Sound data

600DQPAA 60 Hz

Sound pressure level @ 7 meters, dB(A)

See notes 1-8 listed below

Configuration		Measurement location number								Average
		1	2	3	4	5	6	7	8	
Standard - unhoused	Infinite exhaust	86.70	91.40	89.80	93.30	91.10	93.10	93.20	92.10	91.70
F200 weather	Mounted muffler	93.50	89.30	83.60	89.10	89.10	89.70	81.10	87.20	89.10
F201 – quiet site II first stage	Mounted muffler	87.30	78.60	77.60	77.40	78.60	77.70	74.10	78.00	80.70
F202 – quiet site II second stage	Mounted muffler	72.60	72.10	75.20	72.70	77.80	75.90	72.50	75.30	74.70

Sound power level, dB(A)

See notes 2-6, 9 and 10 listed below

Configuration		Octave band center frequency (Hz)									Overall sound power level
		31.5	63	125	250	500	1000	2000	4000	8000	
Standard - unhoused	Infinite exhaust	66.00	93.80	105.10	109.10	112.40	112.90	114.40	110.90	111.80	120.20
F200 weather	Mounted muffler	73.10	94.00	104.20	109.50	109.70	111.00	111.50	109.90	109.10	118.30
F201 – quiet site II first stage	Mounted muffler	73.50	93.20	103.10	104.80	102.10	101.70	105.50	101.30	100.40	111.70
F202 – quiet site II second stage	Mounted muffler	66.10	93.30	102.90	97.50	92.50	98.10	98.80	94.00	88.40	106.70

Exhaust sound power level, dB(A)

Open exhaust (no muffler rated load)	RPM	Applied load	Octave band center frequency (Hz)									Overall sound power level
			31.5	63	125	250	500	1000	2000	4000	8000	
	1800	600KW	64.90	97.40	112.50	120.20	121.80	122.90	124.90	121.10	109.30	129.70

Note:

1. Position 1 faces the generator front. The positions proceed around the generator set in a counter-clockwise direction in 45° increments. All positions are at 7 m (23 ft) from the surface of the generator set and 1.2 m (48 in) from floor level.
2. Sound levels are subject to instrumentation, measurement, installation and manufacturing variability.
3. Sound data with remote-cooled generator sets are based on rated loads without cooling fan noise.
4. Sound levels for aluminium enclosure are approximately 2 dB(A)s higher than listen sound levels for steel enclosures.
5. Sound data for generator set with infinite exhaust do not include exhaust noise.
6. Data is based on full rated load with standard radiator-cooling fan package.
7. Sound pressure levels are measured per ANSI S1.13 and ANSI S12.18, as applicable.
8. Reference sound pressure is 20 µPa.
9. Sound power levels per ISO 3744 and ISO 8528-10, as applicable.
10. Reference power = 1 pw (10^{-12} W).
11. Exhaust sound power levels are per ISO 6798, as applicable.

Cummins Inc. Data and specification subject to change without notice MSP-1206 (10/17)

Manufacturers Data for Silex Silencer Model JB 6.

www.silex.com JB

CRITICAL CYLINDRICAL SILENCERS

25 to 32 dBA Noise Reduction

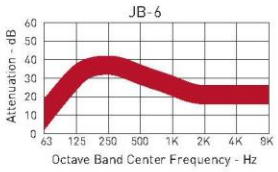
SILENCER SELECTION

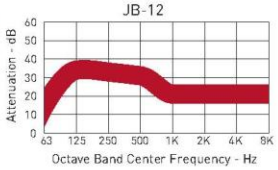
For immediate assistance to select the appropriate silencer that best suits your application's acoustical and backpressure requirements contact Silex Innovations. Or, use our exclusive silencer sizing and selection program, found at www.silex.com.

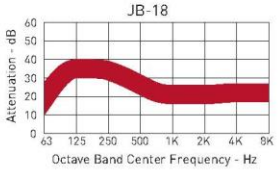
PERFORMANCE & MATERIALS

The critical grade series are reactive silencers with good acoustical performance. All of the silencers are manufactured from light to heavy gauge steel and finished with high temperature black paint. A drain is included as a standard component on the silencer.

TYPICAL ATTENUATION CURVE







DIMENSIONS

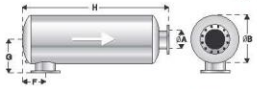
Model	ØA in(mm)	ØB in(mm)	C in(mm)	D in(mm)	F** in(mm)	G in(mm)	H in(mm)	Wgt lb(kg)
JB-1.5	1.5	9(229)	24(610)	30(762)	4(102)	7.5(191)	27(686)	23(10)
JB-2	2	9(229)	24(610)	30(762)	4.5(114)	7.5(191)	27(686)	24(11)
JB-2.5	2.5	10(254)	28(711)	34(864)	5(127)	8(203)	31(787)	34(15)
JB-3	3	12(305)	32(813)	38(660)	5.5(140)	9(229)	35(889)	46(21)
JB-3.5	3.5	14(356)	36(914)	42(1067)	6(152)	10(254)	39(991)	65(29)
JB-4	4	14(356)	40(1016)	48(1219)	6(152)	11(279)	44(1118)	77(35)
JB-5	5	16(406)	49(1245)	57(1448)	7(178)	12(305)	53(1346)	107(49)
JB-6	6	18(457)	55(1397)	63(1600)	8(203)	13(330)	59(1499)	135(61)
JB-8	8	22(559)	66(1676)	74(1880)	9.5(241)	15(381)	70(1778)	208(94)
JB-10	10	26(660)	81(2057)	89(2261)	11.5(292)	17(432)	85(2159)	370(168)
JB-12	12	30(762)	94(2388)	102(2591)	13(330)	19(483)	98(2489)	505(229)
JB-14	14	36(914)	99(2515)	109(2769)	15.5(394)	23(584)	104(2642)	642(291)
JB-16	16	40(1016)	109(2769)	119(3023)	16.5(419)	25(635)	114(2896)	971(440)
JB-18	18	45(1143)	117(2972)	127(3226)	18(457)	27.5(699)	122(3099)	1167(529)
JB-20	20	50(1270)	127(3226)	137(3480)	20.5(521)	30(762)	132(3353)	1669(757)
JB-22	22	54(1372)	139(3531)	149(3785)	22.5(572)	32(813)	144(3658)	1972(894)
JB-24	24	60(1524)	152(3861)	162(4115)	24(610)	35(889)	157(3988)	2384(1081)
JB-26	26	64(1626)	173(4394)	183(4648)	25.5(648)	37(940)	178(4521)	2854(1295)
JB-28	28	68(1727)	190(4826)	200(5080)	26.5(673)	39(991)	195(4953)	3278(1487)
JB-30	30	72(1829)	206(5232)	216(5486)	28(711)	41(1041)	211(5359)	3777(1713)

**For F dimension other than that specified, please contact Silex Innovations.
Available in sizes up to 60" inlet.

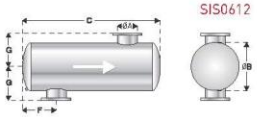
TYPICAL ORIENTATIONS

ST

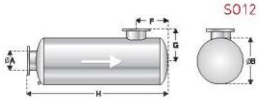
SI



SIS0612



SO12



OPTIONS

- Aluminized steel, 304L or 316L stainless steel
- Dual inlet or custom inlet / outlet configurations
- Thermal insulation blankets to suit all configurations
- Mounting brackets, gussets and lifting lugs

Metric dimensions rounded to nearest mm. Dimensions and weights are nominal and may vary slightly in production models. On silencers 4" and larger the inlet and outlet are flanged, manufactured from minimum ½" thick plate and drilled to ANSI class 150.
The default material used is aluminized steel, however NGP reserves the right to substitute to carbon steel due to material availability, gauge and size limitations.

Corporate Headquarters
1560 Williams Drive
Stoughton, WI 53589
Tel: 608-719-1800

Silex INNOVATIONS

silex.com
Silex: 1-800-387-7818
Sales/Quote Email: Silex.Sales@nelsonqp.com
Order Email: Silex.Orders@nelsonqp.com

35

RESUME: Dr. HUGH WILLIAMSON, P.Eng.

QUALIFICATIONS:

Ph.D. Mechanical Engineering, University of New South Wales, 1972

B.Sc. Mechanical Engineering, (with Distinction), University of Alberta, 1967

Member, Professional Engineers, Ontario

Member, Canadian Acoustical Association

KEY COMPETENCIES:

- Environmental noise and vibration assessments, Environmental Compliance Approval (ECA). Noise assessment for land use planning
- Noise impact assessments for the Aggregates Industry.
- Architectural and building acoustics, acoustics of office spaces, meeting rooms, auditoriums and studios, noise and vibration control of building mechanical services.
- Industrial noise and vibration assessment and control.
- Transportation noise and vibration.
- Noise and vibration aspects of Occupational Health and Safety (OH&S).

PROFESSIONAL EXPERIENCE:

Hugh Williamson is a professional engineer with many years of experience in the measurement, analysis and control of noise and vibration. Freefield Ltd. was incorporated in 2017 and provides consulting services in architectural, building, industrial, transportation and environmental acoustics and vibration. Clients include architects, engineering firms, industrial firms and government departments. Prior to joining Freefield Ltd. Hugh Williamson founded and directed Hugh Williamson Associates Inc. which specialized in consulting services in architectural, building, industrial, transportation and environmental acoustics and vibration. His career included extensive periods in industry as well as university level research and teaching. He is a former Director of the Acoustics and Vibration Unit at the Australian Defence Force Academy. He has published over 50 engineering and scientific papers and has been an invited speaker on noise and vibration at national and international conferences. He has more than 27 years of experience as a consultant.

CLIENT LIST:

Hugh Williamson has provided consulting services to large and small clients including National Research Council, J. L. Richards & Associates, Barry Padolsky Associates, Atkinson Schroeter Design Group, R. W. Tomlinson Limited, Geo. Tackaberry Construction, Miller Paving, City of Ottawa and Government of Canada.

Postal Address: PO Box 74056, RPO Beechwood, Ottawa, Ontario, K1M 2H9, Canada
Phone: 613-747-0983, Email: hugh@freefieldacoustics.com, http://www.freefieldacoustics.com

RESUMÉ: MICHAEL WELLS

QUALIFICATIONS:	Limited Engineering Licensee*, Professional Engineers Ontario *Limitation: Environmental acoustic assessments and recommendations to mitigate noise and vibration; acoustical engineering services for land-use planning, architectural and building acoustics, industrial acoustics, and occupational health and safety audits. Registered Architect of NSW, Registration Number: 8111 B. Architecture (Hons), University of Sydney, 2002 B.Sc. Architecture, University of Sydney, 1999 Member, Canadian Acoustical Association Associate Member, INCE-USA
KEY COMPETENCIES:	• Environmental noise and vibration assessments, Environmental Compliance Approval (ECA). Noise assessment for land use planning. • Architectural and building acoustics, acoustics of office spaces, meeting rooms, auditoriums and studios, noise and vibration control of building mechanical services. • Industrial noise and vibration assessment and control. • Noise assessments for Occupational Health and Safety.

PROFESSIONAL EXPERIENCE:

Michael Wells is a Limited Engineering Licensee, Professional Engineers Ontario, in the field of acoustic engineering as described above. He is also a professional Architect registered in NSW, Australia. Michael. He has more than 10 years of experience in Canada in the measurement, analysis and control of noise and vibration. Michael is a founding Director of Freefield Ltd., incorporated in 2017, which provides consulting services in architectural, building, industrial, transportation and environmental acoustics and vibration. Prior to establishing Freefield Ltd., he worked for the Ontario acoustic consulting firm Hugh Williamson Associates Inc. Previously, Michael worked in Sydney, Australia, specializing in the design of institutional, commercial and residential projects. He is the former Director of Architectural Workshops Australia and Vision Blue Pty Ltd.

CLIENT LIST:

Michael Wells has provided consulting services to large and small clients including: National Research Council, R. W. Tomlinson, G. Tackaberry & Sons Construction, Heidelberg Materials, Miller Paving, J. L. Richards & Associates, Barry Padolsky Associates, Atkinson Schroeter Design Group and Industry Canada.