APPENDIX 22

AIR QUALITY EFFECTS ASSESSMENT

Air Quality Impact Assessment – Development and Operation of Shipyard and Drydock Facility at Marsden Point, Whangārei Harbour

Prepared for

Ministry of Business, Innovation and Employment

August 2026

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Quality Control Sheet

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Limitations:

This report has been prepared by Pattle Delamore Partners Limited (PDP) on the basis of information provided by Ministry of Business, Innovation and Employment and others. PDP has not independently verified the provided information and has relied upon it being accurate and sufficient for use by PDP in preparing the report. PDP accepts no responsibility for errors or omissions in, or the currency or sufficiency of, the provided information.

This report has been prepared for Ministry of Business, Innovation and Employment in respect of its application for all approvals under the Fast-track Approvals Act 2024 for the Northland Shipyard and Drydock Facility. The Panel appointed to consider the application for the Northland Shipyard and Drydock facility may rely on this report for the purpose of making its decision under the Fast-track Approvals Act 2024. PDP accepts no liability if the report is used for a different purpose or if it is used or relied on by any other person. Any such use or reliance will be solely at their own risk.

This report has been prepared in accordance with the Environment Court's Code of Conduct for Expert Witnesses, contained in the Environment Court's Practice Note 2023. The authors of this report agree to comply with the Code of Conduct, and confirm that unless otherwise stated, the issues addressed in this report are within the area of expertise of the authors. No material facts have been omitted that might alter or detracted from the opinions expressed in this report.

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1.0 Introduction

Pattle Delamore Partners Limited (PDP) has been engaged by the Ministry of Business, Innovation and Employment (MBIE) to undertake an air quality assessment (AQA) for the potential effects associated with the construction and operation of a shipyard and dry dock facility to the west of Northport, and associated carpark and access road (the Site).

This assessment is intended to be used to support an application under the Fast Track Approvals Act 2024 (FTAA) for the relevant consents.

MBIE is proposing to develop the site's ship maintenance capacity by reclaiming land and constructing a dry dock or ship lift. The dry dock or ship lift will facilitate ships being removed from the water for maintenance activities to be undertaken.

Based on information provided by MBIE, the project is for the development and operation of a marine maintenance operations facility abutting the western side of the existing Northport facility at Marsden Point, Whangārei Harbour. The project includes a reclamation, vessel haul-out system, and associated wharf structures, dredging, and supporting infrastructure, including carpark and access road.

For our assessment, we have considered the project as comprising of two phases. Phase 1 is construction, including land reclamation, construction of a jetty/hardstand and associated dredging. Phase 2 is the ongoing ship maintenance activities following construction.

This report assesses the potential air quality effects associated with the reclamation and construction of the proposed facility and the subsequent ship maintenance activities at the nearest identified sensitive receptors. This report will be used to support MBIE's FTAA application to construct and operate the facility.

PDP's assessment has been prepared in accordance with the following guidance documents:

- Ministry for the Environment (MfE) Good Practice Guide for Assessing and Managing Dust[1] (GPG Dust);
- Ministry for the Environment (MfE) Good Practice Guide for Assessing and Managing Odour[2] (GPG Odour);

[1] Ministry for the Environment, 2016. *Good Practice Guide for Assessing and Managing Dust.*
[2] Ministry for the Environment, 2016. *Good Practice Guide for Assessing and Managing Odour.*

- MfE Good Practice Guide for Atmospheric Dispersion Modelling[3] (GPG ADM); and,
- MfE Good Practice Guide for Assessing Discharges to Air from Industry[4] (GPG Industry).

2.0 Proposal History

In October 2021, PDP prepared an AQA[5] for Northport Limited for a proposed western expansion which comprised of land reclamation, construction of wharves, and associated dredging. PDP's 2021 report assessed the potential air quality effects associated with the construction of the then proposed western expansion, including the effects of future port operations (including a dry dock) at the nearest identified sensitive receptors. Northport did not proceed with this application. With Northport's permission, PDP's 2021 assessment has informed the assessment of the MBIE proposal presented in this report.

3.0 Receiving Environment

3.1 Site Location

The site of the proposed shipyard and dry dock facility is immediately adjacent to Northport which itself is located on a 58 hectare site at Marsden Point. The site is approximately 18 km southeast of the centre of Whangarei as shown in Figure 1. The main infrastructure proposed to be built at the site is a shipyard and dry dock facility, carpark and access road. The proposed location of this infrastructure is presented in Figure 2 and further discussed in Section 4.0.

[3] Ministry for the Environment, 2004. *Good Practice Guide for Atmospheric Dispersion Modelling.*
[4] Ministry for the Environment, 2016. *Good Practice Guide for Assessing Discharges to Air from Industry.*
[5] Pattle Delamore Partners Limited, 21 October 2021. *Air Quality Assessment – Northport Proposed Expansion Western Reclamation.*

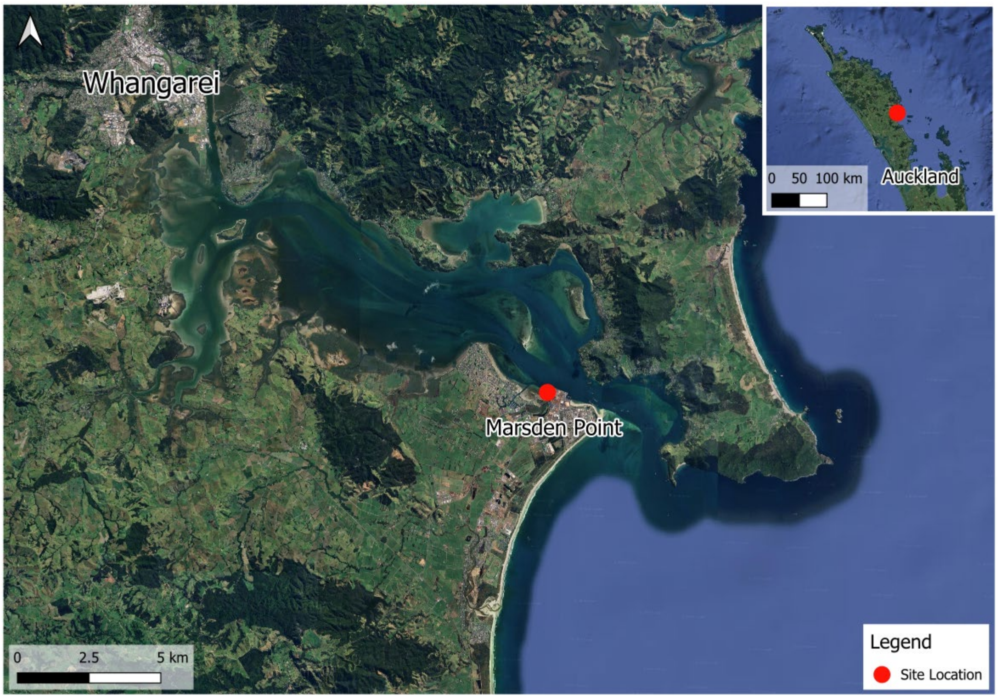

Figure 1: Site Location

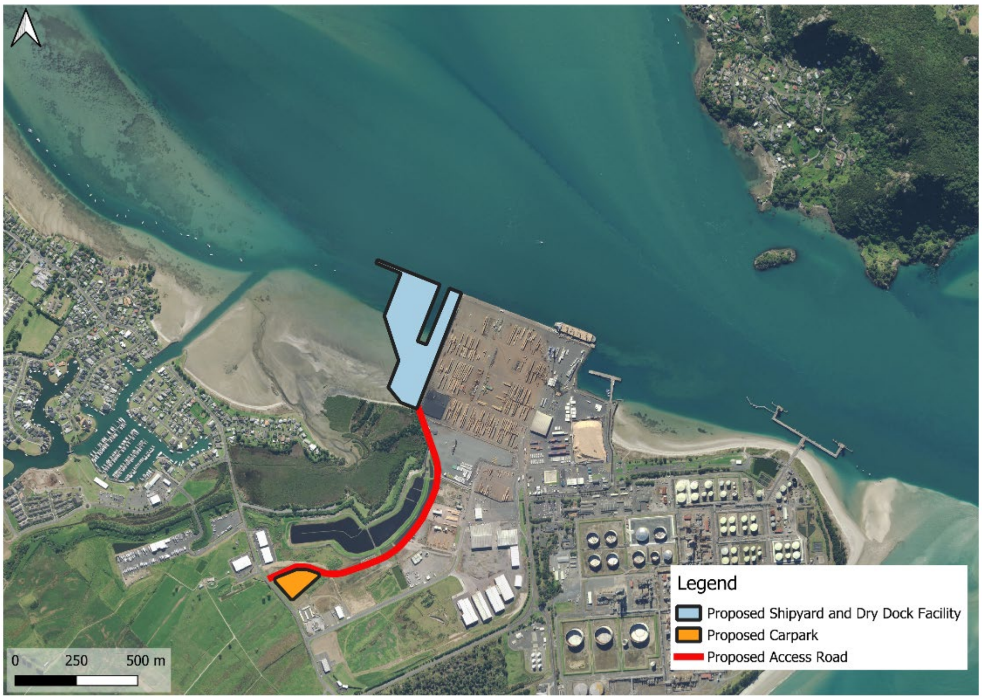

Figure 2: Proposed Site Infrastructure

3.2 Meteorology

The topography of the surrounding area has an influence on wind speed and direction and therefore can have a significant effect on dust generation and the transportation of air pollutants. The site is near the mouth of the Whangarei harbour and the Whangarei Heads. It is also noted that the site will alter the terrain, however as this reclamation will be relatively flat, in PDP's opinion it is unlikely to result in any significant changes to the winds experienced in the area.

Northport has several meteorological monitoring stations near the site on adjacent land. However, these are located very high (approximately 30 m, which likely overestimates wind speeds) on port structures. While directly adjacent to the proposed site, PDP considers that, because of their height, these monitoring stations will experience stronger winds and so do not accurately reflect estimated meteorological conditions that would affect dispersion from the proposed activities. For the purposes of this assessment and as discussed further in Section 10.2.2, meteorological data developed for the air dispersion model has been used in this assessment.

The distribution of hourly average wind speeds and directions predicted at the proposed facility for the years 2019 to 2020 inclusive is shown as a windrose in Figure 3 with the distribution frequency of the winds presented in Table 1. The windrose shows that the predominant winds are from the west southwest.

Winds with a speed of greater than 5 m/s (hereafter referred to as strong winds) have the greatest potential to transport dust significant distances. Based on the data presented in Table 1, the strong winds predominantly occur from the west southwest where they occur 2.6% of the time.

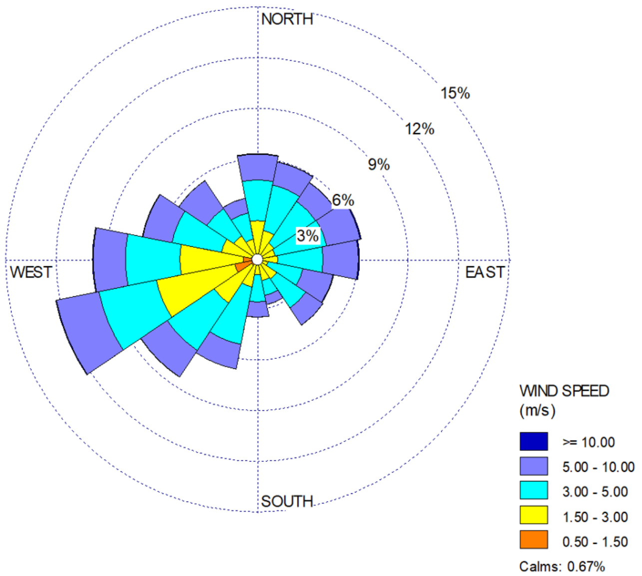

Figure 3: Wind Speed and Wind Direction Distribution Centred on Proposed Facility for 2019 - 2020 (1-hour average)

Table 1: Wind Speed Frequency Distribution at Proposed Facility

Direction	Wind Speed Frequency (%)			Total Direction Frequency
	0.5 to <5 m/s	5 to <10 m/s	≥ 10 m/s	
North	4.8	1.5	0	6.3
North northeast	4.5	1.4	0	5.9
Northeast	4.2	1.3	0	5.5
East northeast	4.2	2	0.1	6.3
East	3.9	2.1	0.1	6.1
East southeast	2.8	1.8	0.1	4.7
Southeast	3.5	1.2	0	4.7
South southeast	2.2	0.6	0	2.8
South	2.6	0.9	0	3.5
South southwest	5.2	1.5	0	6.7
Southwest	6.5	1.9	0	8.4
West southwest	9.6	2.6	0	12.2
West	7.9	1.9	0	9.8
West northwest	5.2	1.8	0	7
Northwest	3.7	2	0	5.7
North northwest	2.8	0.9	0	3.7
Sub-total	73.6	25.4	0.3	99.3
Calms (<0.5 m/s)				0.7

3.3 Sensitive Receptors

A sensitive receptor is generally defined as a location where people or surroundings may be particularly sensitive to the effects of air pollution.

The Regional Plan for Northland (RPN) contains definitions for 'dust-sensitive areas', 'odour-sensitive areas', and 'spray sensitive areas'. The land use types of each of these are set out in Appendix A, however those that are relevant to the project are:

- Residential buildings (including roofing for the collection of drinking water) and associated garden areas;
- Schools;

- Amenity areas where people congregate, including parks and reserves;
- Community buildings and grounds, including places of worship and marae; and
- Natural wetlands and significant areas of indigenous vegetation and habitats of indigenous fauna as defined in the Regional Policy Statement for Northland 2016 on land.

For assessment of amenity effects, reference should be made in the first instance to the relevant district/city and, in some cases, regional plans for specific amenity values for various land-use zones. While these are as discussed previously, it is noted that the RPN does not state the sensitivity of different land uses. PDP has taken guidance from Table 2 of the GPG Dust which lists the typical sensitivities of different receptor land use types. The relevant receptor types are summarised in Table 2.

Table 2: Summary of GPG Dust Sensitivity Types

Receptor Type	Sensitivity
Hospitals, schools, childcare facilities, rest homes, marae	High
Residential	High
Open space recreational	Moderate to high
Rural	Low for rural activities; moderate or high for other activities
Heavy industrial	Low
Public roads	Low

A combination of a field and desktop investigations have been undertaken to identify receptors near to the site deemed sensitive to air discharges. For this assessment, a site visit was also undertaken on 23 April 2026 to confirm the location of some of the nearby receptors as well as to observe the surrounding environment.

PDP has separated receptors between the facility and carpark and access road as the air discharges from this infrastructure are different, and effects should therefore be considered separately.

The facility is bordered by commercial activities to the south, Northport to the east, and Channel Infrastructure to the southeast. The Whangarei Harbour surrounds the site to the west, north and east, which includes Coastal Marine Areas (CMA).

PDP has selected 16 receptors within 1,400 metres of the proposed shipyard and dry dock facility, which are considered representative of the surrounding communities and will be used in the assessment of potential air quality effects. These receptors are presented in Table 3 along with the determined sensitivity of each and shown in Figure 4. It is noted that the Blacksmith Creek Walkway (identified as R7) continues through the vegetation to the beach identified as R8. PDP has also included one receptor in the harbour (R1) to represent that this area can be used by members of the public for fishing and other water-based activities.

Carpark and access road receptors (CP-R1 to C-R8) are presented in Table 4 and shown in Figure 4. These receptors are primarily industrial activities except for the Blacksmith Creek Walkway and are most likely to be affected by dust discharges during the construction of this infrastructure.

For simplicity and readability, not every individual receptor has been identified in this section. The receptors that have been identified are considered to be representative of those not explicitly identified, and consequently the effects at these will be the same as or less than those effects assessed by the nearest identified receptor.

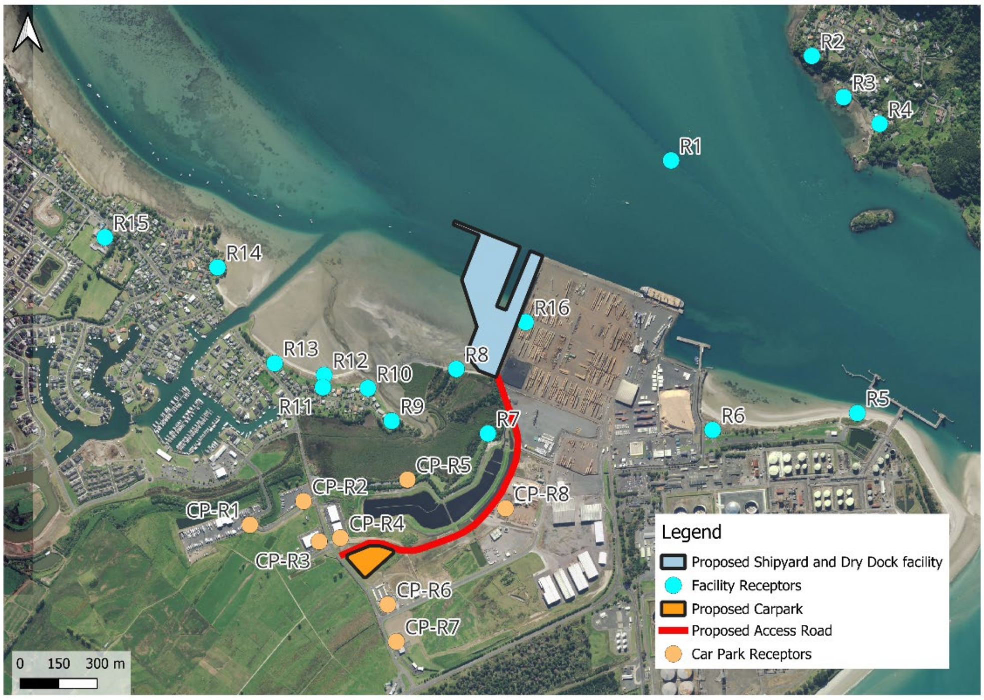

Figure 4: Nearby Receptors

Table 3: Location of Receptors Close to the Proposed Shipyard and Dry Dock Site

Receptor Name	Address/Location	Receptor Type	Receptor Sensitivity	Closest Distance to the Proposed Site (m)	Direction Relative to Site
R1	Whangārei Harbour	Fishing/Recreation	Low	Adjacent	Northeast
R2	136 Reotahi Road	Residential	High	1,300	Northeast
R3	134 Reotahi Road	Residential	High	1,310	Northeast
R4	23 Beach Road	Residential	High	1,400	Northeast
R5	Beach East of Site	Public Space/Recreation	Moderate	1,100	East
R6	Car Park and Beach Access	Public Space/Recreation	Moderate	870	Southeast
R7	Blacksmith Creek Walkway	Public Space/Recreation	Moderate	200	South
R8	Beach West of Site and Wetlands	Public Space/ Recreation/CMA	Moderate	Adjacent	Southwest
R9	38 Albany Road	Residential	High	375	Southwest
R10	26 Albany Road	Residential	High	400	Southwest
R11	8 Albany Road	Residential	High	550	Southwest
R12	Marsden Bay Beach	Public Space/Recreation	Moderate	450	Southwest
R13	138 Marsden Bay Drive	Residential	High	725	Southwest
R14	56 One Tree Point Road	Residential	High	940	Southwest
R15	One Tree Point School	Kura/School	High	1,350	Southwest
R16	Northport	Industrial	Low	Adjacent	East

Table 4: Location of Receptors Close to the Carpark and Access Road

Receptor Name	Address/Location	Receptor Type	Receptor Sensitivity	Closest Distance to the Carpark or Access Road (m)	Direction Relative to Site
CP-R1	1 Hinemoana Lane	Boat Repair Yard	Low	240	Northwest
CP-R2	Marsden Cove Boatyard	Boat Storage	Low	215	Northwest
CP-R3	69 Marsden Bay Drive	Light industrial	Low	50	Northwest
CP-R4	68 Marsden Bay Drive	Light industrial	Low	50	Northwest
CP-R5	Blacksmith Creek Walkway	Public Space/Recreation	Moderate	260	Northeast
CP-R6	Firth Marsden Certified	Heavy industrial	Low	120	South
CP-R7	16 Marsden Bay Drive	Light industrial	Low	285	South
CP-R8	SRG Global	Heavy industrial	Low	Adjacent	East

In summary, the receiving environment is generally of high to medium sensitivity to the potential discharge of contaminants to air from the proposed shipyard and dry dock facility, with some other nearby properties deemed to be of low sensitivity. The carpark and access road receiving environment is generally of low sensitivity, except for the walkway, which is moderate.

3.4 Background Air Quality

The site is located within the Marsden Point Airshed, which is a designated air quality management zone by Northland Regional Council (NRC). The reason this is an airshed was due to sulphur dioxide emissions from the now decommissioned Marsden Point Refinery. As the refinery is no longer operating, sulphur dioxide concentrations are no longer a concern within the airshed. However, the Marsden Point Air Quality Strategy[6] (MPAQS) needs to be complied with for any new air discharges within the airshed.

NRC operates the closest publicly available air quality monitoring site, which is located at Roberts Road in Whangarei, approximately 5 km south of the site. PM_{10} is the only pollutant measured at this location and the most recent validated data (2016 to 2024 inclusive) indicates that concentrations are typically below 30 µg/m^3, with the maximum 24-hour average being 48 µg/m^3. PDP considers this to generally be low for an urban environment, noting there has been no recorded exceedances of the National Environmental Standard for Air Quality (NES-AQ) PM_{10} Ambient Air Quality Standard (AAQS) for this time period.

As no other contaminants are monitored at this location, PDP has undertaken a short air quality monitoring programme to determine the likely background concentrations. An AQMesh monitor measuring concentrations particulate matter[7] and NO_2 was installed on 23 April 2026 alongside an anemometer in the location depicted in Figure 5. Figure 6 identifies the nearby existing sources of airborne contaminants that could influence the monitoring results.

[6] Northland Regional Council, Marsden Point Air Quality Strategy 2007 https://www.nrc.govt.nz/resource-library-summary/plans-and-policies/marsden-point/

[7] Total Suspended Particulate (TSP) (up to 30 µm), PM_{10}, PM_4, $PM_{2.5}$, and PM_1

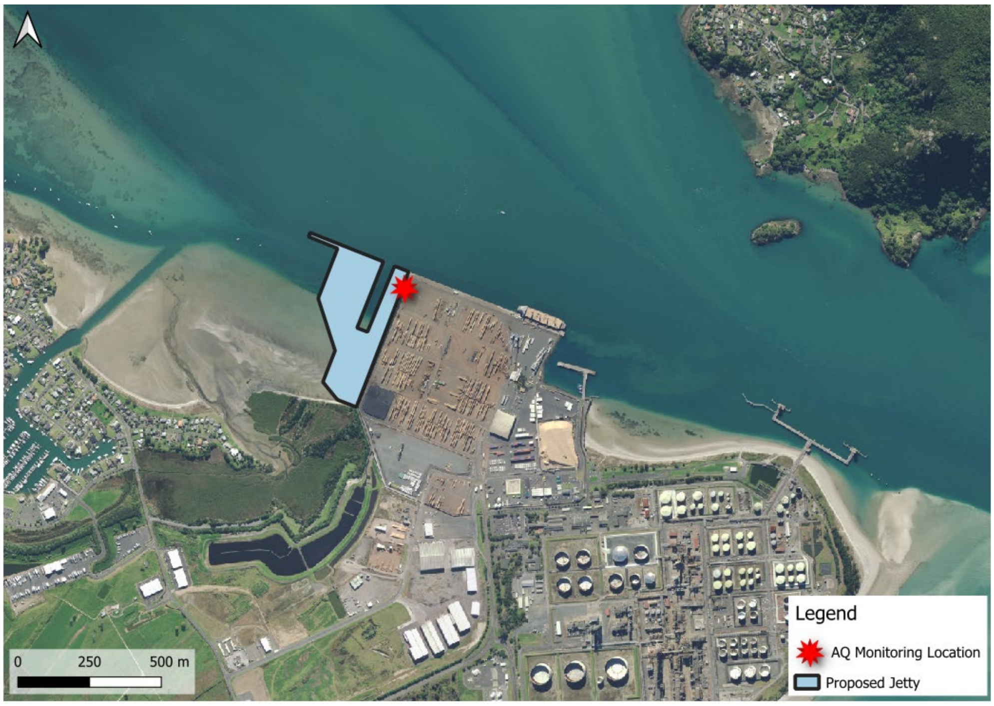

Figure 5: PDP AQ Monitoring Location

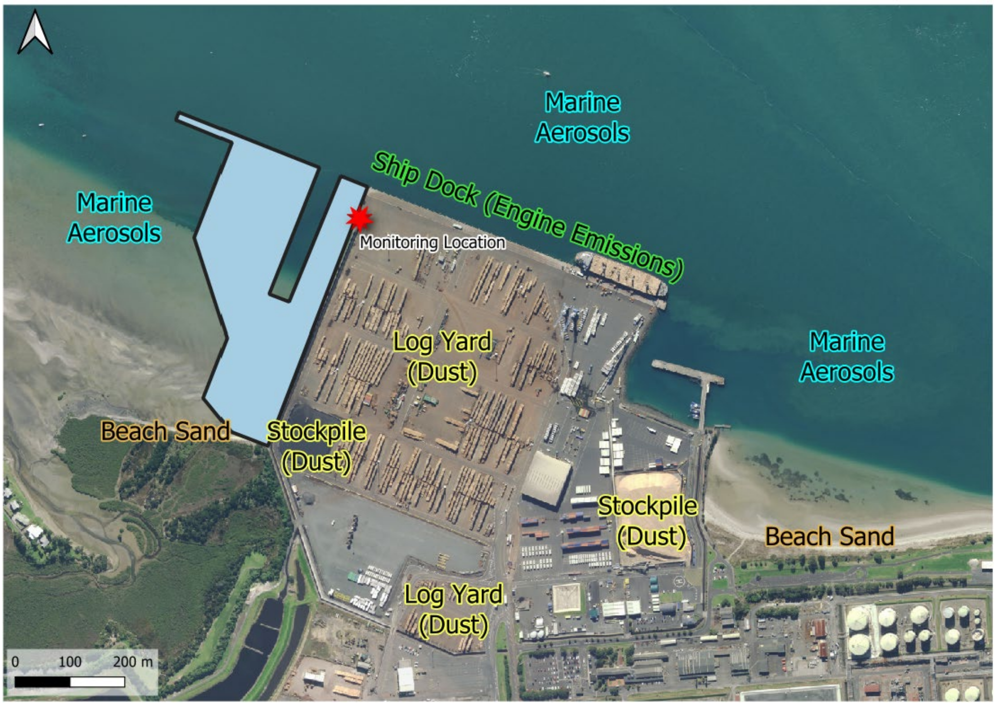

Figure 6: Other Sources of Air Contaminants in the Area

Table 5 presents a summary of the data collected during the on-site air quality monitoring study. It is noted that the PM_{10} concentrations are comparable but lower than those measured in Whangarei, which is not unexpected given the location of the monitoring. Figure 7 then presents a time series for three PM size fractions, and Figure 8 and Figure 9 present polar plots for TSP and nitrogen oxides (NO_x) respectively. These polar plots illustrate the maximum pollutant concentration under each recorded wind condition.

As seen in Figure 8, there is a clear signal for the elevated TSP concentrations recorded when the wind is blowing from the direction of the log yard relative to the monitor (southeast). This highlights the effectiveness of dust monitoring combined with co-located wind monitoring and supports PDP's recommendation for real-time monitoring to be included as part of the project, as discussed in Section 12.8.

Similarly, the polar plot for NOx (Figure 9) shows how the higher NOx concentrations were recorded when the winds were light and blowing from the general northeast and eastern directions. As shown in Figure 6, this corresponds with direction relative to the monitor where ships are docked at Northport.

Table 5: PDP AQ Monitoring Summary (23 April to 20 May 2026)

Contaminant ($\mu g/m^3$)	1-hour Average			24-hour Average		
	Average	99^{th} % ile	Maximum	Average	99^{th} % ile	Maximum
TSP	9.1	98.2	182	8.6	37.6	45.7
PM_{10}	6.8	36.7	59.6	6.5	20.1	22.3
NOx	31.2	140	224	32	97	102

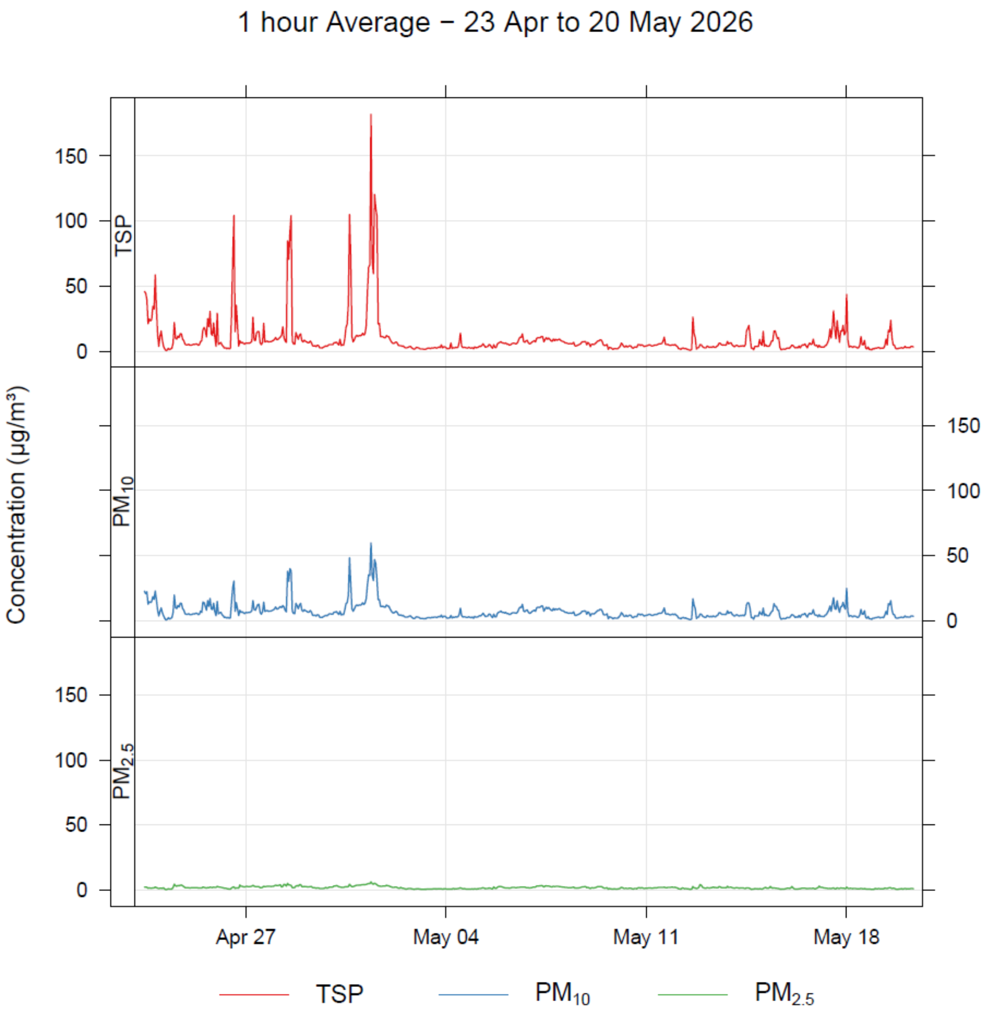

Figure 7: TSP, PM_{10}, and $PM_{2.5}$ (μg /m³) 1-hour Average Time Series

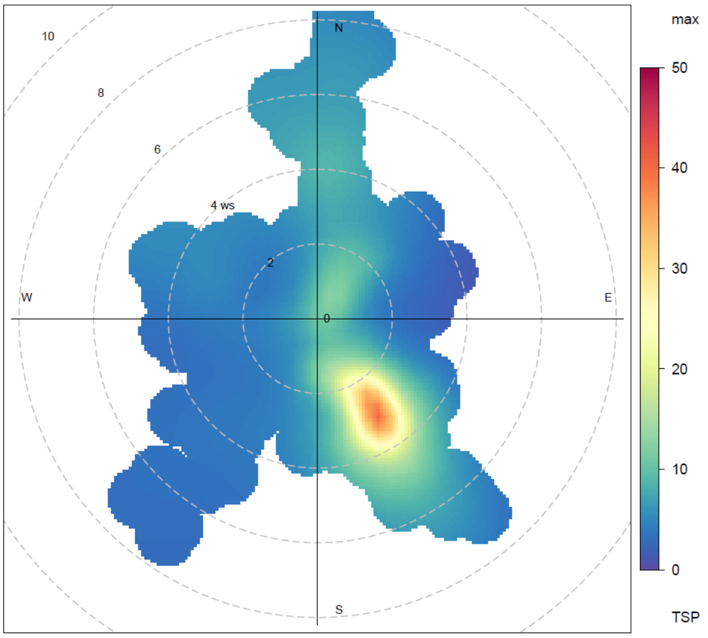

Figure 8: Max TSP (µg/m³) 1-hour Average Polar Plot (23 April to 20 May 2026)

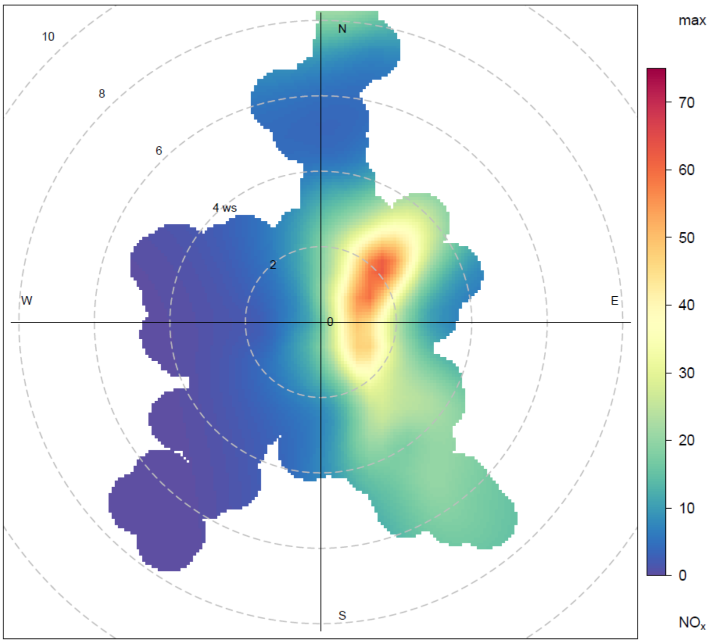

Figure 9: Max NOx (ppb) 1-hour Average Polar Plot (23 April to 20 May 2026)

4.0 Project Description

The Northland shipyard and dry dock facility is to provide vessel maintenance, repairs, and servicing, including cleaning, coating (including primers and paints), and repair of commercial and naval vessels, including potentially Cook Strait ferries and Royal New Zealand Navy (RNZN) logistics vessels, along with other vessels such as international freight vessels and super yachts.

The facility has design capacity to accommodate vessels ~50 metres (m) to 230 m in length with displacement between 500 tonnes (t) and 28,000 t.

The project is listed in Schedule 2 of the Fast-track Approvals Act 2024 as having significant regional or national benefits.

Key components of the project include:

- Reclamation of approximately 9.7 ha.
- A ‘cutout’ to the reclamation where a vessel haul out system is to be located, being a dry dock or ship lift or other lifting mechanism.
- Construction of a piled wharf structure to accommodate vessels either temporarily (before/after haul out), or for extended periods where works not requiring haul out can be undertaken.
- Dredging Stage One: Capital and maintenance dredging associated with construction and ongoing operation of the marine maintenance operations facility, including a berth pocket and a vessel turning basin to provide for safe navigation.
- Dredging Stage Two: Capital dredging to ensure sufficient volume of dredge spoil is available to construct both the NDD and Northport’s Vision for Growth development.
- Fixed plant and buildings to accommodate marine maintenance activities and materials.
- Sufficient working and laydown areas for marine maintenance operations, including the ability to transfer vessels to hardstand.
- Access to and around the marine maintenance operations facility, including a landside area for staff carparking.
- Access road from the carpark to the facility.
- Public access around the edge of the reclamation to a public fishing platform.

5.0 Proposed Activities

5.1 Construction

The construction of the proposed facility will involve the following:

- Site establishment and clearance.
- Formation of reclamation containment structures including:
  - Rock revetment; and,
  - Piles structures.
- Dredging and reclamation.
- Construction of jetty structure.
- Installation of dry dock or ship lift.
- Construction of the carpark and access road.
- Paving, utilities, services, and buildings.

The overall construction period is estimated to be approximately three years from mobilisation to completion of the civil infrastructure work.

5.2 Operation

5.2.1 Vessel Maintenance

The vessel maintenance operations facility will handle vessels from ~50 m to 230 m in length, with displacement between 500 t and 28,000 t. This range is estimated to be broken down to the following:

- 70% vessels up to 140 m in length; and,
- 30% vessels between 140 m and 230 m in length.

The frequency and type of vessels being maintained will vary. It is anticipated that Royal New Zealand Navy (RNZN) logistics vessels and Cook Strait ferries would be regular dockings. Other vessel types are likely to include fleet tankers, roll-on roll-off (Ro-Ro) passenger ferries, cargo ships, commercial tankers, small cruise ships, research vessels, offshore supply boats, superyachts, fishing vessels, and barge/workboats. Foreign going vessels accessing the facility are likely to vary due to vessel schedule and charter changes.

On average, vessels will be docked for up to 21 days, however some larger vessels could be docked for 3 months or more.

Vessels will be maintained in the dry dock or ship lift and/or on the hardstand south of the dry dock or ship lift, with smaller 'white boats' being maintained on the hardstand to the west of the dry dock or ship lift. In some cases, the above water line hull or superstructure of vessels will be worked on while berthed at the jetty structure, however only refit and refurbishment works will be undertaken here from which the discharges to air are negligible.

Figure 10 presents a photograph of an example of the type of dry dock that could be expected at the site.

Figure 10: Photograph of a Floating Dry Dock

Activities undertaken on the hardstand in the dry dock or ship lift will include all necessary maintenance, repairs, and servicing including fabrication, mechanical fitting, blasting of ship surfaces, and coating.

The proposed layout allows for multiple ships to be maintained simultaneously, with the number of ships limited by the available space.

With regard to coating activities, there is the potential for ship spray coating works to occur without encapsulating the dry dock or ship lift. Consequently, PDP's assessment is based on this worst-case scenario using spray coating, with any coatings applied by brush or roller having significantly less potential for air quality effects.

Other vessel maintenance works such as welding, grinding, and metal work have the potential to discharge contaminants to air. Mitigation measures for these activities have been included in Section 12.6.

5.2.2 Auxiliary Plant

To undertake the maintenance activities described, fixed and mobile auxiliary plant will be required. Those pertinent to air discharges include:

- Diesel air compressors;
- Diesel generators;
- Diesel-driven high pressure blasting equipment; and,
- Internal combustion engine (ICE) vehicles.

5.2.3 Hours of Operation

The facility requires the ability to operate 24/7/365, as required, noting that normal working operations will be based on 7:00 am to 6:00 pm, 7 days.

Sunday working will be required for 'time critical' dockings, but for longer repair periods, i.e. vessels docked for greater than 21 days, work will generally occur Monday to Saturday. Additionally, abrasive blasting will be restricted to only occurring from 7:00 am to 6:00 pm, Monday to Saturday.

6.0 Types of Air Contaminants Discharged

This section provides a general overview of the types of particulate and gaseous air contaminants discharged from the proposed construction and operational activities.

6.1 Nuisance Particulate Matter

Dust is categorised by particle size (defined by the aerodynamic diameter of particles) as follows:

- Deposited dust – PM of generally between 30 µm and 100 µm in diameter. This size fraction falls out of suspension in the air relatively rapidly and deposits on exposed surfaces, generally within 100 m of the source.
- Total suspended particulates (TSP) – PM of generally less than 30 µm in diameter. PM of this size fraction remains suspended in the air for a longer time and therefore has the potential to travel further than larger fractions. TSP (particularly the coarse fractions larger than 10 µm) have the potential to affect visibility.
- Fine inhalable or respirable fractions of TSP such as PM_{10} can penetrate the nose or mouth under normal breathing conditions. PM_{10} is currently the size fraction that is monitored and managed under the Resource Management (National Environmental Standards for Air Quality) Regulations 2004 (NESAQ) to reduce health effects of PM in New Zealand (MfE, 2016).

The colour of dust will vary with the source:

- Construction overburden soil – brown;
- Construction base rock – black;
- Surface preparation: Marine debris likely green or brown; and,
- Surface preparation: Paint removal likely white, blue, grey, brown or red.

Dry abrasive blasting is the key activity that generates dust. Garnet will be the only blast media used by the operator. Pre-blasting, garnet blast media contains particles in the size range of 100 µm to 600 µm. The size and weight of these particles mean they tend to fall out of the atmosphere relatively quickly and deposit in close proximity to the blasting activity. Emissions to air that may travel further from the source of the activity will be limited to finer particles (<50 µm particle size) generated by fragmentation of the garnet media or from the ship surface being cleaned.

Data from the USEPA AP42 emission factors indicate that very fine particulate (PM_{10} and $PM_{2.5}$) emission rates from abrasive blasting do not vary significantly with windspeed. Emission of larger particles (PM_{10} to PM_{50}) increases with an increase in wind speed, reflecting the wind energy needed to transport the larger particles.

The main component of dust generated by abrasive blasting will be spent blast media (garnet). The remainder will be surface material from the ship. Steel ships will primarily generate iron dust, with the remainder comprising chromium, manganese, nickel, lead, or paint flecks.

6.2 Coating Overspray

Overspray is the term to describe fine liquid droplets which are discharged to the atmosphere when liquids are sprayed onto a surface. Within the proposed activities, hydro blasting and spray coating will both produce overspray.

Water overspray from surface blasting will be comprised of mist to fine drizzle sized droplets and will contain small paint flakes from the surface being cleaned. These will be deposited in a close vicinity to the blasting.

During spray coating, the coating is forced into the atmosphere under pressure through a restricted opening. The coating is broken up into small particles which are either deposited on the surface or miss the target and become overspray.

The colour of the overspray will reflect the colour of the coating.

Coatings are expensive and cleaning up overspray can also be expensive and time consuming. Therefore, coating techniques have been developed to maximise surface covering and minimise overspray. Overspray droplets tend to drop out of suspension relatively close to the source. Overspray from coating can be controlled by encapsulating the spray coating area or avoided by hand coating.

6.3 Odour

Coating is the key source of odour within the operations undertaken by the operator. The coatings used in spray coating contain solvents which thin the coating so it can be applied using spray equipment. Solvents evaporate from the coating once it has been applied to the surface. Xylene and toluene are some of the more common solvents present in the operator's coatings. The odour associated with these two solvents is typically described as a sweet organic smell similar to that given off from nail polish.

6.4 Hazardous Contaminants

Hazardous pollutants have the potential to cause adverse effects on human health. The activities undertaken have the potential to discharge fine particles, di-isocyanates and volatile organic compounds (VOCs) such as xylene and toluene.

6.4.1 Fine Particles

Fine particle matter is usually defined by particle size. PM_{10} is a mixture of particles that are less than 10 µm in diameter. $PM_{2.5}$ is the fraction of particles with diameters smaller than 2.5 µm. Currently, PM_{10} is regulated under the national environmental standards (NES) and within the Marsden Point Airshed.

The inhalation of PM_{10} and $PM_{2.5}$ may cause the aggravation of existing respiratory and cardiovascular disease particularly in the elderly and children. Those suffering from asthma and other respiratory illnesses or cardiovascular diseases are particularly susceptible.

Particulate matter suspended in the atmosphere can also impact on amenity as a result of reduced visibility and the deposition of larger particles (dust) can also cause nuisance and adverse effects on amenity values.

The most significant source of PM_{10} discharged from activities undertaken by the operator will be the dry abrasive blasting. US EPA AP42 data (Table 6) indicates the following fine particulate fractions emitted during abrasive blasting.

Table 6: Fine particulate fractions from abrasive blasting

Windspeed	Total PM Emission Rate	PM_{10} Fraction	$PM_{2.5}$ Fraction
2.2 m/s	27 $g_{PM}/kg_{media\ used}$	48%	4.8%
4.5 m/s	55 $g_{PM}/kg_{media\ used}$	24%	2.4%
6.7 m/s	91 $g_{PM}/kg_{media\ used}$	14%	1.4%

As such, while PM emissions are closely tied to windspeed (higher windspeeds can entrain a larger particle size), emissions of fine particulate are not heavily influenced by windspeed. Using an estimated maximum hourly media blasting rate of 240 kg/hr, which is typical of other dry dock operations in New Zealand, emissions of PM_{10} would be in the order of 0.87 g/s. Approximately 13% of this PM_{10} would be $PM_{2.5}$ (0.11 g/s).

6.4.2 Di-isocyanates

Some coatings contain di-isocyanates which are the hardener component of two-pack paints. Isocyanates are known to have health impacts at concentrations below their odour detection threshold. A small number of the paints provided by the operator contain isocyanates, and PDP has discussed the potential for effects from these as well as control measures later in this report.

6.4.3 VOCs including Xylene

VOCs are discharged from the coating as it dries. Xylene is one of the most common VOC in the coatings used by the operator. Most of the exposure information for xylene is from studies where workers in industries that use xylene are exposed to levels far higher than the levels normally encountered by the general population.

Short-term exposure to high levels of xylene can cause irritation of the skin, eyes, nose and throat, difficulty breathing, impaired function of the lungs, delayed response to visual stimulus, impaired memory, stomach discomfort and potential liver and kidney effects.

Both short- and long-term exposure can also cause a number of effects on the nervous system such as headaches, lack of muscle co-ordination, dizziness, confusion and loss of balance.

6.4.4 Solid Coating Compounds

Coatings also contain solid components. Titanium dioxide for example is commonly used as the ‘white’ part of white paint. Other solids in the coatings provided by the operator include copper dioxide, zinc oxide, and zineb.

7.0 Sources and Quantities of Air Discharges

7.1 Reclamation and Construction

Sources of nuisance dust during reclamation and construction (of facility, access road, and carpark) will include activities that disturb, expose and/or stockpile soil, aggregates, and construction materials which contain fine material. Primary dust generating sources include:

- Site clearance and bulk earthworks;
- Placement, handling, and trimming of dried reclamation fill, noting wet reclaimed material will have negligible dust discharges;
- Formation of rock revetments;
- Vehicle movements on unsealed or partially sealed surfaces; and,
- Material stockpiles and exposed working faces subject to wind erosion.

Nuisance dust is also referred to as TSP and PDP considers that due to the typical composition of the material handled during this stage of the works (predominantly soils, aggregate, and marine sediment/sand) there will be limited finer material discharged during dry conditions.

Dust emission intensity will vary over time and will be highest during periods of active earthworks, material handling, and vehicle trafficking, particularly during dry conditions. Dust generation from these activities will be episodic and be task or strong wind-dependent rather than continuous.

Construction dust is likely to be a small to medium source of dust that will occur intermittently over the estimated three-year construction period. Options for mitigation of dust generation are addressed in Section 12.0 of this report.

7.2 Ship Surface Preparation

Marine fouling and old paint are removed from the surface of the vessel hull. If the surface profile (roughness) is too smooth to allow coatings to adhere strongly, the surface will be roughened using an abrasive blaster prior to coating.

Surface preparation will primarily occur by:

- Hydro blasting with a water blaster;
- Wet abrasive blasting with wet garnet media.

Dry abrasive blasting will occur in very rare circumstances and will be encapsulated. Prior to surface preparation, the operator will review the ship's paint history. If contamination is likely, the operator will test a representative sample of the paint for lead or mercury containing products. If identified, a process as described in Section 12.4 will be followed, which will be included in the operational management plan to ensure the safe removal of this paint.

7.2.1 Hydro Blasting

Hydro blasting uses a high-pressure stream of water to remove old paint, salt residue, rust, and marine fouling from the ship without damaging the underlying surface. This method is used across internal and external surfaces because it provides the operator flexibility of access to all parts of the vessel. This process also produces less solid waste (garnet) so is preferred.

7.2.2 Abrasive Blasting

Ship surfaces are given a profile by abrasive blasting. Different coatings need different surface profiles to adhere strongly. Abrasive material is blasted against a surface under high pressure to roughen the surface. The profile of a given surface is determined by the pressure at which the media is blasted and the time the surface is exposed to blasting. Although rarely used, garnet is used exclusively as a blasting media instead of sand as it has a negligible free silica content. The remaining blasting works will be either high pressure water blasting (HPWB) or ultra-high pressure water jetting (UHPWJ).

Wet abrasive blasting will predominantly be used and involves mixing water with the blasting media (garnet). The result is the spent media and removed surface coating form a ‘mud’ residue instead of generating dust. Wet abrasive blasting requires the addition of anti-corrosion chemicals to prevent rusting of the wet, cleaned ship surface.

7.2.3 Contaminants Discharged

Nuisance dust associated with ship surface preparation will primarily arise from blasting activities undertaken within the dry dock or ship lift and adjacent hardstand areas. In the rare occasion where dry abrasive blasting is required, it will be undertaken with encapsulation, with only wet abrasive blasting and HPWB/UHPWJ occurring without physical containment.

Given that any dry abrasive blasting will be contained, PDP considers that the dust sources from ship surface preparation include:

- Spent abrasive media;
- Removed paint and coating materials;
- Marine biofouling (such as barnacles and mussels); and,
- Corrosion by-products (e.g. rust scale).

Each of these consists of predominantly coarse, moisture-associated particles. PDP considers that most material will deposit close to the work area. However, as discussed in Section 12.8.2, real-time monitoring is recommended which when combined with correlated wind monitoring, will be able to determine whether there is a potential for off-site dust effects to occur from these activities.

Non-blasting surface preparation activities (e.g. mechanical sanding or grinding) will generate lower-intensity and much more localised dust emissions of shorter duration. However, as no specific details on these activities are available at this stage of the project PDP has not assessed the potential effects from these but has included mitigation measures for these activities in Section 12.6.

Dust discharged from surface preparation has the potential to be a source of dust discharged from the site and will require careful monitoring and mitigation.

7.3 Surface Coating

7.3.1 Coating Application Methods and Rates

Once surfaces have been prepared, the vessel will be coated to protect the metal surfaces while at sea. Each vessel may have different requirements, but generally, surfaces will require a mix of primers, intermediate coats, and topcoats. Two methods are used to coat the surface of ships. The superstructure is coated by roller and brush, and the vessel's hull is coated by either spray coating or brush and roller.

A list of the commonly used coatings is included in Appendix B. The components of the higher volume coatings used have been provided.

The volume of coatings used varies with the size of vessel and scale of task (complete recoat or below waterline surfaces). On a typical 50 m vessel, a complete coating requires approximately 290 litres (L) of coating:

- Metal primer for spot priming – 10 L;
- Topcoat for super structure – 80 L; and,
- Antifoul coatings for below the waterline surfaces 200 L.

A typical coating application rate via spray coating, of approximately 20 litres per hour per spray unit, is assumed.

PDP understands that the operator may (when vessels are in dock for longer periods of time for weather protection or there is a risk of discharge to the surrounding environment) encapsulate the vessels (or sections of vessels) being coated. This will enable capture, treatment, and ventilation to atmosphere of the air within the coating workspace. PDP assumes that the treatment will remove all contaminants and there will be negligible discharges to air from the encapsulated coating.

While it is possible there may be fugitive emissions from encapsulation openings (such as doors), PDP considers these discharges will be of a low intensity and only occur for a very short duration.

Any potential off-site effects from encapsulated coating have not been assessed, as it is anticipated that there will be no offsite effects if coating activities are encapsulated.

7.3.2 Contaminants Discharged

Gaseous contaminants discharged to the air from coating activities are emissions of VOCs associated with solvent evaporation during coating application and curing. VOC emissions from brush and roller application occur gradually over time, resulting in low peak concentrations and reduced potential for off-site effects. However, if a large volume of coatings are applied simultaneously, there may be notable discharges.

Potential odour discharges associated with coating activities may arise from the use of paints, primers, and associated solvents during application and curing. Higher odour discharges are expected when spray coating (without encapsulation) compared to brush and roller application. PDP has therefore assessed the odour potential from unmitigated spray coating. The odour discharge potential is also related to the amount of coating being applied at one time, i.e. three spray guns operating simultaneously may discharge higher intensities of odour than one spray gun.

Coating overspray may occur without encapsulation during the spray-coating process. PDP considers this will be a source of particulate discharged from the site; however, it is understood that there has been a separate assessment undertaken of discharges of contaminants to the CMA from spray drift. To assist with this assessment, PDP has undertaken conservative deposition modelling of potential overspray, the results of which are set out in Section 11.10.

7.4 Other Maintenance Activities

Other maintenance activities at the facility will generate minor air discharges associated with routine industrial operations. Sources include:

- Diesel air compressors and generators;
- Diesel-driven high-pressure blasting equipment; and,
- Internal combustion engine vehicles.

Air discharges from these sources will consist of combustion exhaust gases such as NO_x, carbon monoxide (CO), and particulate matter.

While no specific details are available for size and type of plant (mobile or fixed), PDP has assumed that the combined total of all diesel plant is less than 5 Megawatts (MW) and consequently falls under the permitted activity rules of the RPN[8]. This is a reasonable assumption based on our experience with other ports. The discharges will be similar to vehicles operating on any other industrial site of a similar scale and consequently, any potential discharges from mobile or fixed plant are not assessed further.

8.0 Frequency and Duration of Operations

The averages duration of dry dock berthing for each vessel is anticipated to be approximately three weeks. To prepare and coat the complete exterior surfaces of an average sized vessel (50 m length) takes around 10 days. This work programme is generally comprised of:

- Hydro-blasting 1-2 days;
- Wet abrasive blasting 1 day; and,
- Surface coating 7-8 days.

Hydro blasting, wet abrasive blasting and surface coating are proposed to generally occur:

- Monday to Sunday between 7.00am - 6:00pm (11 hrs per day)

However, there is the capacity to operate 24 hours per day where required subject to appropriate restrictions on noise-generating activities.

9.0 Assessment Criteria

This section of the report identifies the relevant assessment criteria or standards that potential air discharges associated with the proposed facility must meet.

9.1 Regional Rules

The relevant regional rules for air emissions are found in the RPN and discussed in Section 11.0 (Assessment of Environmental Effects (AEE)).

As the site is located within the Marsden Point Airshed, the Marsden Point Air Quality Strategy[9] (MPAQS) has been considered, however, it is noted that this document is out of date. Section D.3.6 of the RPN does however provide that the Marsden Point Air Quality Strategy must be taken into account when considering resource consent applications for discharges to air in the Marsden Point Airshed.

[8] Rule C.7.1.7. PDP notes diesel is not explicitly stated in this rule, however, is defined in the following Rule C.7.1.8 as a footnote reference to oil. PDP has assumed that this same definition applies to the term 'oil' in rule C.7.1.7.

[9] Northland Regional Council, Marsden Point Air Quality Strategy 2007 https://www.nrc.govt.nz/resource-library-summary/plans-and-policies/marsden-point/

9.2 Qualitative Criterion – Nuisance Effects

9.2.1 Dust

The majority of emissions and associated effects from the construction of the reclamation and the various hydro or abrasive blasting activities, as well as from the normal operation of the port, are from nuisance dust which has no quantitative assessment criteria. Therefore, it is assessed against a qualitative criterion, which requires that the activity does not result in:

"any offensive or objectionable dust deposition, or any noxious or dangerous levels of airborne particulate matter, beyond the boundary of the subject property."

9.2.2 Odour

Like nuisance dust, odour also has a similar criterion with any odour generating activities not resulting in "*offensive or objectionable odour beyond the boundary*".

9.3 Quantitative Criteria – Health Effects

To undertake health impact assessments for air contaminants, estimated concentrations are required to be compared against relevant quantitative criteria. This section sets out how PDP has determined the appropriate criteria to use.

The GPG ID recommends an order of priority when reviewing air quality assessment criteria. The documents outlined below set out the minimum requirements that ambient air quality should meet to protect human health and the environment. This order of priority is as follows:

- MfE National Environmental Standards for Air Quality Regulations, 2004 (NES-AQ)[10];
- MfE Ambient Air Quality Guidelines (2002 update) (NZAAQG)[11];
- Regional objectives (unless more stringent than above criteria – note that neither the RPN or the MPAQS have any specific air quality guidelines or standards that are more stringent than the NES-AQ or NZAAQG);
- World Health Organisation (WHO) air quality guideline Global Update 2005 (WHO 2005 AQG) (WHO 2005)[12];
- California Office of Environmental Health Hazard Assessment Reference Exposure Limits (OEHHA REL)[13] ;

[10] https://www.legislation.govt.nz/secondary-legislation/pco-drafted/2004/309/en/latest/#DLM3826290
[11] https://environment.govt.nz/assets/Publications/Files/ambient-guide-may02.pdf
[12] https://www.who.int/publications/i/item/WHO-SDE-PHE-OEH-06.02
[13] www.oehha.ca.gov/air.html

- US Environmental Protection Agency's Inhalation Reference Concentration (US EPA RfC)[14];
- Texas effects screening levels (provided that these have been derived from toxicological data in a transparent manner)[15] (Texas ESL); and,
- Worksafe New Zealand Workplace Exposure Standards (WES TWA) divided by 50 for low and moderately toxic hazardous contaminants or divided by 100 for highly toxic bio-accumulative or carcinogenic hazardous air contaminants[16].

The process of spray coating can result in the emission of a variety of VOC's and inorganic compounds. Therefore, based on the guidance from the MfE, the assessment for coating emissions relies on assessment criteria from the California and Texas documents.

Appendix C contains the air quality guidelines relevant to this assessment along with the source of the value.

Given that coating only occurs for short periods, typically a few hours at a time, PDP considers it is not appropriate to assess these discharges against long term guidelines (e.g. 24-hour or annual guidelines). Therefore, the predicted concentrations have been compared with 1-hour average assessment criteria. There are several compounds (such as Bisphenol-A, Polyamide amine resin) that do not appear to have appropriate assessment criteria based on the recommended guidance by the MfE. Given there are no assessment criteria, PDP considers it unlikely that these compounds would result in adverse health effects.

While the MfE GPG Industry order of priority for guidelines has been considered, where there were multiple guideline values for the same contaminant, PDP has adopted the lowest value for increased conservatism.

[14] www.epa.gov/iris/limits.html
[15] http://tceq.texas.gov/toxicology/esl
[16] https://www.worksafe.govt.nz/topic-and-industry/monitoring/workplace-exposure-standards-and-biological-exposure-indices/

10.0 Assessment Methodologies

The assessment of effects from the proposed project has been undertaken using different methodologies.

For dust effects, a qualitative methodology has been used in accordance with the MfE GPG Dust. The coating operations will also produce odour, the effects of which have been assessed qualitatively in line with MfE GPG Odour.

Conversely, health and spray coating emissions from the ship maintenance activities have been assessed quantitatively using air dispersion modelling in accordance with the MfE GPG ADM.

Each of these assessment methodologies, as well as how the meteorological data was developed, are explained in greater detail in the following subsections.

10.1 Qualitative Dust and Odour Nuisance Assessments

PDP has assessed the potential for nuisance dust effects from the project qualitatively by determining the likely potential for these activities to cause nuisance dust which could affect the surrounding environment.

PDP has assessed the following activities using the methodology discussed in this section:

- Reclamation and construction of the hardstand and dry dock;
- Construction and operation of access road and off-site carpark;
- Ship surface preparation; and,
- Coating overspray.

In determining whether there is the potential for nuisance to occur from these activities, the following considerations have been made:

- The nature of the activity undertaken;
- How long the activities are likely to occur;
- The nature of the material being handled, placed and stored;
- Whether mitigation measures can be implemented to control the potential of effects (e.g. covering or storage of materials, use of water suppression, etc.);
- How close the local community is to the activities;
- The nature of the receptors in these communities and their sensitivity to dust; and,
- The prevailing meteorological conditions.

To assess the expected level of effects from the **reclamation and construction works**, PDP has undertaken a qualitative assessment using the FIDOL (Frequency, Intensity, Duration, Offensiveness and Location) assessment tool. The FIDOL factors are explained in detail below:

- Frequency (F): relates to how often an individual is exposed to dust. Factors determining this include the frequency that the source releases dust (including its source type, characteristics and the rate of emission of the compound or compounds); location of sensitive receptors relative to the work area; prevailing meteorological conditions; and topography.
- Intensity (I): is the concentration of dust at the receptor location.
- Duration (D): is the amount of time that a receptor is exposed to dust. Combined with frequency, this indicates the exposure to dust. The duration of dust emissions, like its frequency, is related to the source type and discharge characteristics, meteorology and location. The longer the dust detection persists in an individual location, the greater the level of complaints that may be expected.
- Offensiveness (O): is a subjective rating of the unpleasantness of the effects of nuisance dust. Offensiveness is related to the sensitivity of the 'receptors' to the dust emission. For example, industrial premises may be more tolerant to dust concentrations than residential properties.
- Location (L): is the type of land use and the nature of human activities in the vicinity of a dust source. The same process in a different location may produce more or less dust depending on local topography and meteorological conditions. It is also important to note that in some locations certain higher dust concentrations may be more acceptable than in others.

To assess the potential effects associated with the **preparation of ship surfaces**, PDP has undertaken a general qualitative assessment which considers the key parameters that affect dust transportation distance, and therefore potential nuisance effects.

To assess the odours associated with the **coating operations**, PDP has undertaken a qualitative assessment using the FIDOL tool. This approach utilises the same FIDOL factors discussed above with odour being interchangeable with dust.

10.2 Quantitative Health Impact Assessment

10.2.1 Air Dispersion Modelling Methodology

To assess the impact of pollutant emissions from spray coating, PDP has undertaken atmospheric dispersion model using CALPUFF (Version 7), which has been used extensively in New Zealand and Australia and is the recommended model in the MfE GPG ADM. CALPUFF is an advanced dispersion model which has been developed to deal with meteorological conditions that may occur in situations of complex terrain, low wind conditions, and coastal environments.

10.2.2 Meteorological Data Analysis

A three-dimensional meteorological dataset was developed by University of Canterbury using the Version 4.1 of the Weather Research and Forecasting Model (WRF[17]). The WRF dataset covered the Far North Region at a 1 km resolution for the years 2019-2020. The WRF dataset was then used to provide inputs to the CALMET meteorological model, which covered a 30 km x 30 km domain with a 0.25 km resolution. No surface observations were incorporated into the CALMET model.

The Southern Oscillation Index (SOI) measures the sea level pressure differences between Tahiti and Darwin. Negative values of this index correspond to El Niño conditions, while positive SOI values correspond with La Niña conditions. During El Niño conditions more southerly winds are experienced whereas more northerlies occur during La Niña conditions.

The Southern Oscillation Index for the modelled years is provided in Figure 11. The modelling years cover both periods, with El Niño conditions occurring in 2019 and La Niña conditions occurring in 2020. PDP therefore considers that the meteorological data used appropriately covers a range of conditions expected at the site.

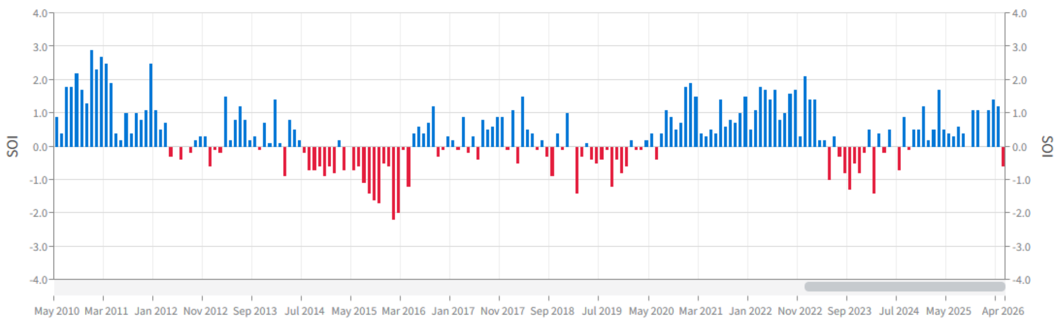

Figure 11: Southern Oscillation Index[18]

[17] http://www.mmm.ucar.edu/weather-research-and-forecasting-model
[18] https://www.ncei.noaa.gov/access/monitoring/enso/soi

10.2.3 Grid Spacing

The CALPUFF model was configured to predict contaminant ground level concentrations (GLC) at a number of discrete receptor locations (identified as sensitive receptors in Section 3.3) and across a 5 km by 5 km grid with a grid spacing of 50 m to a distance of 1,500 m and a grid spacing of 100 m to a distance of 2,500 m. This ensures that all potential sensitive receptors are assessed without the need to identify each location individually. The modelled receptor grid is shown in Figure 12.

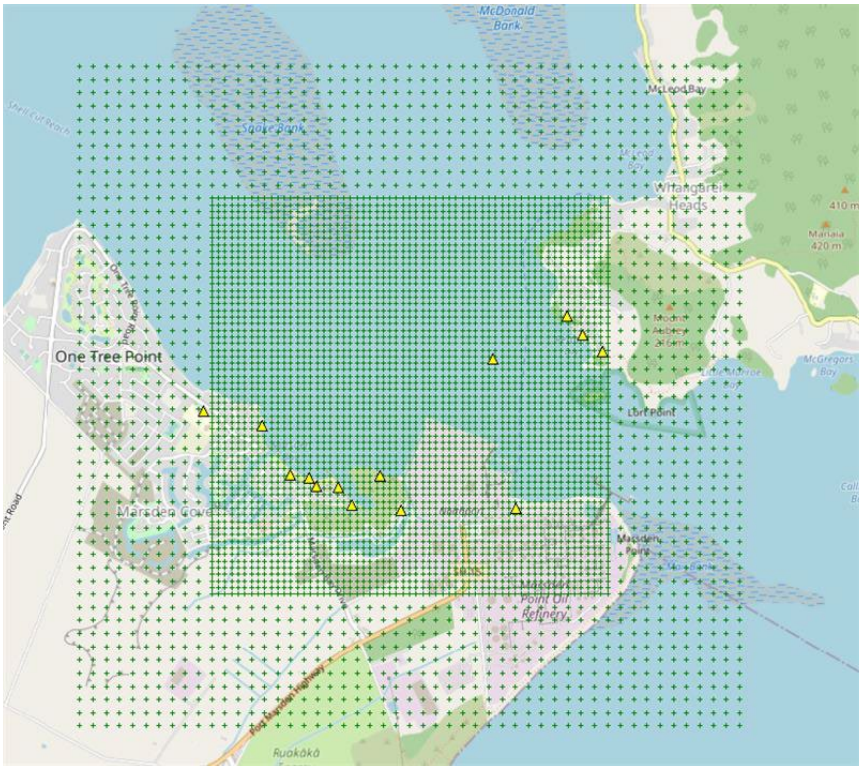

Figure 12: Modelled Receptor Grid and Discrete Receptors (Yellow Triangles)

10.2.4 Terrain and Land Use

The default terrain file (SRMT3) and the land use file (GLCC) were manually updated to better represent the actual site and surrounding environment. Figure 18 and Figure 19 in Appendix D present the modelled terrain and land use respectively.

10.2.5 Emissions Rates

To determine the potential emissions from the coating process, PDP has reviewed the coating specifications, coating application methodology, coating volumes and application rates from the operator at another one of their sites. Details of the coatings assessed are contained in Appendix C. PDP understands that these coatings will also be used at the site, therefore, the information reviewed to determine coating emissions is appropriate for the proposed operation.

PDP has modelled the coating emissions by running two models, each with the same setup except one with a gaseous pollutant, and one with a particle pollutant. The results were then scaled post model run using the particle and gaseous compound emission rates calculated from the coating specification data.

The emission rates have been based on the following conservative assumptions:

- All coatings will be applied by spray gun with no encapsulation.
- That all volatile organics (VOC) will evaporate from the product. This is a worst-case scenario as some of the compounds will bind with the solid components.
- The maximum concentration of the VOCs listed in the Safety Datasheets (SDS) has been used to estimate gaseous compound concentrations.
- Many different coatings contain the same compounds. In this case, the maximum concentration observed for each compound in any coating has been used in the assessment.
- Some paints come as 2 parts (one part being the hardener). The recommended ratio of each paint has been adopted, with emission rates of the compounds in each paint part scaled accordingly. In some cases, the same compounds are present in both parts of the paint. In this case, the scaled emission rates (calculated using the maximum compound percentage) have been summed to get a maximum emission rate for the compound from the paint.
- A spray application rate of 20 L/hour at three locations (therefore combined maximum of 60 L/hour) across the dry dock has been assumed.
- An overspray percentage of 20% has been assumed.
- Spray coating will be undertaken 24 hours, 7 days per week. It is noted that typical operations are between 7:00 am and 6:00 pm (11 hours per day), so the 24/7 approach will conservatively assess typical operations.
- Isocyanates have relatively low volatility and therefore a large proportion of isocyanate component will be retained in the coating. The polymer part of the isocyanates will react within the paint and will not be discharged. For the monomer component of the isocyanates, based on measurements undertaken by the Ontario Ministry of the Environment[19], the amount of isocyanates emitted during spraying was between 2 and 8 percent. PDP has therefore used the more conservative value of 8 percent for calculating isocyanate emission rates.

[19] Ontario Ministry of the Environment: Determination of 1,6-Hexamethylene Diisocyanate (HDI) Emissions from Spray Booth Operations. April 2006

To add to the conservatism, the emission rates used in the model are based on all coating types being applied at once, which is impossible, as coatings have to be applied in an order. Coatings being applied all at once were assessed in the model as there is an extremely high number of combinations in the order in which coatings could be applied, that this would make modelling each potential scenario impractical. However, the outcome of this modelling approach is that this will grossly exaggerate emissions, especially for paints that contain isocyanates as these paints are not as commonly used.

10.2.6 Configuration of vessels and location of coating areas

Two vessels of the maximum length were input longitudinally, the first at ground level (with no attenuation) where the dry dock or ship lift will be, and the other on the hardstand in front of the dry dock or/ship lift (towards the Blacksmith Creek Walkway). Spread across these two vessels are three volume sources, one at the southwestern corner of the southernmost vessel, one in the centre of the vessels and one at the northern most end of the northern vessel (closest to the harbour).

A typical coating application area from the coatings provided by the operator is 6.5 m^2/L. At an application rate of 20 L/hr at each of the three volume sources (totalling 60 L/hr), this corresponds with a maximum of 390 m^2/hour of area coated.

Each volume source has therefore been set with the following parameters:

- Effective height: 12 m above sea level (MSL = 0 m)
  - Hardstand is proposed to be 5 m above sea level; therefore, the centre of the volume source is 7 m above the hardstand.
- Initial Sigma Z: 6.5 m
  - Assumes a 6.5 m spread above and below the centre of the volume source, representing the typical application area.
- Length of side: 10 m.
- Initial Sigma Y: 2.3 m.

10.3 Particulate Deposition Modelling

PDP has undertaken particle deposition modelling using the deposition function of the CALPUFF modelling software. The purpose of this modelling is to quantify the level of particulate deposition on the CMA.

The model has been set up using the same parameters and meteorological data as set out in Section 10.2. This includes the assumption that spray coating will be undertaken 24 hours, 7 days per week to determine the maximum deposition rates. The modelling outputs are set out in Section 11.10.

11.0 Assessment of Environmental Effects

11.1 Effects of Air Contaminants

11.1.1 Particulate Matter

Having considered the size, composition and quantity of the dust discharged from the site preparation, material extraction and mechanical ore processing, the potential adverse effects of particulate matter are:

- Amenity effects – dust being deposited on surfaces;
- Health effects – PM_{10}; and,
- Ecological effects – Deposited particles in marine environment.

Dust nuisance is caused where dust impacts on amenity values. Dust nuisance impacts include soiling of property such as windows, houses, cars, and washing hung out to dry. The degree of amenity effects tends to increase with darker colours of dust. For example, coal dust is considered more offensive than grey aggregate dust.

Dusty conditions can adversely affect people's ability to enjoy an outdoor environment. Airborne dust can cause effects on visibility, which is largely considered a matter of aesthetics. Visibility effects are usually only a concern in the immediate vicinity of the source. Extreme loss of visibility can also be a safety concern for road traffic and aircraft.

Human health effects can occur from exposure to smaller size fractions of particulate matter, PM_{10}. Some elements within PM_{10} particles also pose different levels of toxicity, including metals and organic compounds. Section 11.9 of this report provides an assessment of the potential human health impacts of dust on the nearest sensitive receptors to the site.

Deposited particulates can also have a potential effect on the marine environment and ecosystem. PDP understands that a separate assessment of discharges of contaminants to the CMA from spray drift has been undertaken, however where appropriate, PDP has discussed the potential for these effects to occur in the relevant sections of this report. This includes modelling of particulate deposition rates.

When considering the potential effects of particulate matter on the receiving environment, the key impacts of particulate matter discharged from the operational activities at the site will be on amenity values rather than human health, marine environment, and ecosystems.

11.1.2 Gaseous Pollutants

Gaseous pollutants have the potential to cause adverse human health impacts and the potential to generate odour events. To reflect this duality, many VOCs have an odour threshold below health-based criteria. For example, the California Office of Environmental Health Hazard Assessment (OEHHA) contains reference exposure levels (RELs) for different compounds. It is common odour thresholds for VOCs to be lower than the health impact threshold (you will smell it before it harms you).

Given the nature and timing of the activities which discharge VOCs the most relevant health impacts are short-term (Acute) rather than long-term (chronic) effects. Acute effects occur on a time scale of minutes to hours immediate symptoms can emerge shortly after breathing in VOC vapours or experiencing dermal exposure:

- **Sensory Irritation**: Severe irritation of the eyes (including conjunctival irritation), nose, and throat.
- **Neurological Symptoms**: Headaches, dizziness, loss of coordination, nausea, and vomiting.
- **Respiratory Distress**: Shortness of breath (dyspnoea), coughing, and painful breathing.
- **Cognitive Impairment**: Temporary visual disorders, memory impairment, and extreme fatigue.
- **Dermal Reactions**: Acute allergic skin reactions, rash, and irritations.

There are also potential odour effects associated with the common solvents used in marine coatings.

11.2 Reclamation and Construction of Shipyard and Dry Dock Facility

PDP considers that the most significant potential effect from the reclamation and construction of the shipyard and dry dock facility, is the potential nuisance effect associated with dust deposition. The specific construction activities are discussed further in this section of the report.

There are several factors that are important to consider when determining whether any dust nuisance is caused by the disturbance and placement of fill materials. These include the size and density of the particles, wind speed and direction, height of release, and the distance between the discharge point and the receptors.

These factors are all interconnected, and it is how they combine that determines the potential for an effect to occur.

Typically, the following applies:

- Heavier and larger particles require higher wind speeds to become airborne;

- Large particles will deposit faster than small particles of a similar density;
- More dense particles will deposit more rapidly than less dense particles of a similar size; and
- Particles will travel further before depositing with a strong wind blowing than with a light wind blowing.

Considering this range of variables, there are a number of recognised guidance documents, including those prepared by the Institute of Air Quality management (IAQM)[20, 21], implies that dust nuisance effects are generally only experienced up to 400 m of unmitigated dust sources.

For the reclamation and construction activities, various forms of mitigation to control dust discharges are recommended. Assuming that these are adopted, unmitigated dust discharges will not occur.

PDP considers that the most common type of material that will have the potential to generate dust emissions from the construction of the port facilities is marine sediments used for the reclamation of land.

Dust from marine sediments is typically denser and consequently does not travel as far. Using Stokes' Law, PDP has calculated the distance potentially travelled by a range of dry material from the site. These calculations are based on a particle diameter of 50 to 100 µm, a density of 1.7 g/cm^3 and at wind speeds of 5 and 10 m/s, and the findings are depicted in Figure 13. PDP considers these assumptions to be reasonable based on experience with dust nuisance, and a wind speed of 5 m/s has been used as a suggested trigger to assess for dust effects. The release height used in the calculations (three metres) is also typical of the height that dust is released from for a range of different construction activities, including material handling from trucks and general works with an excavator.

PDP notes that the wind direction is not accounted for in these dust deposition calculations. However, it has an impact on the potential for a receptor to be affected, especially those downwind in a predominant wind direction.

[20] Institute of Air Quality Management, January 2024. *Guidance on the assessment of dust from demolition and construction, v2.2.*

[21] Institute of Air Quality Management, May 2016. *Guidance on the Assessment of Mineral Dust Impacts for Planning, v1.1.*

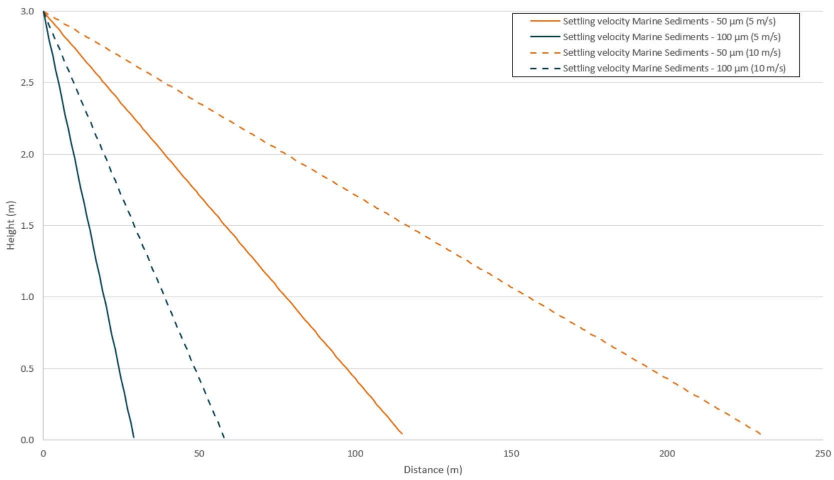

Figure 13: Potential Nuisance Dust Travel with Wind Speed

Based on the above, 400 m has been used in this assessment to conservatively indicate the distance within which some level of dust effects may be experienced if no form of mitigation is used. The majority of the properties located on Albany Road are at least 400 m from the site, and so are unlikely to be affected by dust, however the Blacksmith Creek Walkway (R7), the beach west of the site (which the walkway services), the Northport Site (R16) and the harbour (R1) are within this distance and therefore have the potential to experience dust effects.

As the site operators will use the various forms of mitigation and monitoring described in Section 12.0 to reduce and control the potential for dust emissions, the distance where effects could occur will reduce significantly. Based on the types of activities that will be undertaken and guidance provided in US EPA technical documents[22], with mitigation in place it is likely that effects will only occur within 50 m of sources that are located at ground level.

Figure 14 shows the general area where there would be potential for dust effects to occur if there were no mitigation measures implemented (pink polygon), as well as the general area of potential effects assuming the mitigation measures are operating as intended (yellow polygon).

[22] AP 42, Fifth Edition, Volume I Chapter 13 Miscellaneous Sources, Section 2.4 - Aggregate Handling and Storage Piles

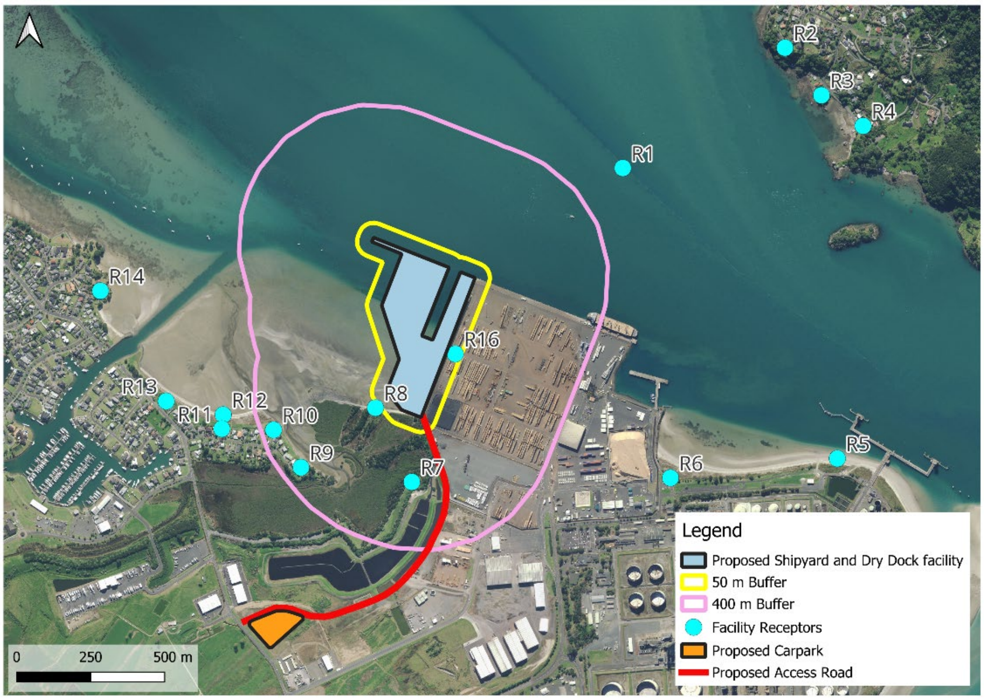

Figure 14: General Mitigated and Unmitigated Dust Transportation Areas for Shipyard and Dry Dock Facility

11.2.1 FIDOL Assessment

PDP has undertaken a FIDOL assessment using the methodology as described in Section 10.1 to assess the potential nuisance dust effects from the construction and reclamation of the proposed Shipyard and Dry Dock facility.

Frequency

As previously discussed, PDP considers that winds with a speed of more than 5 m/s have the potential to cause dust nuisance effects on the nearest sensitive receptors if the mitigation measures discussed in Section 12.0 are not implemented. If the mitigation measures are implemented, nuisance dust emissions should be contained within 50 m of the source.

The frequency with which effects will occur from reclamation and construction will depend to a large extent on the construction methodology, but in any case, will only occur when material is above the waterline.

In dry windy conditions, particularly if disturbed, the marine sediments can be lifted by winds greater than 5 m/s at ground level. Based on the wind speed data presented in Table 1 the frequency of winds above 5 m/s from the north northeast to east-northeast, which have the potential to carry dust from the site to the nearest residential receptors on Albany Road, occur 2.4 % of the time.

Winds from the north to the northeast have the potential to affect Receptors R7 and R8 (the beach to the west of the site, the mangroves, and Blacksmith Creek Walkway), with winds greater than 5 m/s from these directions combined occur between 4.2% of the time.

Winds from the southwest to northwest have the potential to affect Northport (R16), with winds greater than 5 m/s from these directions combined occur between 10.2% of the time.

Based on guidance[23] prepared by the Institute of Air Quality Management, this percentage of winds is classified as 'Infrequent' for Albany Road receptors and R7 and R8 and 'moderately frequent" for Northport which is determined to be a low sensitive receptor based on GPG Dust. This, in combination with the proposed mitigation and monitoring, means that that the frequency of any effects associated with the construction and reclamation of the facility is expected to be low.

Intensity

It is unlikely, even if no mitigation were in place, that the nearest residential receptors will experience an increase in dust intensity. This is primarily due to there being at least 375 m from a potential dust source and these dwellings.

There is potential that if not appropriately mitigated there could be reasonably intense dust effects on receptors R7, R8 and R16 if material is place near the perimeter of the reclamation in dry windy conditions.

Through the use of the mitigation and monitoring measures discussed in Section 12.0, there should be no increase in dust intensity experienced at the residential receptors resulting from the construction activities. However, there still may be increased dust concentrations at some locations at R7, R8 and R16. The potential for an offensive or objectionable effect to occur at these receptors is determined by considering all of the FIDOL factors and PDP's conclusion on this is set out in this section after the discussion of each of the FIDOL factors individually.

Duration

PDP considers that based on the visual and instrumental monitoring discussed in Section 12.8 and the mitigation measures proposed (discussed in Section 12.1), that if a significant dust discharge event were to occur, at worst the duration would be limited to a period of no more than one to two hours at any one time, this being the time taken for site staff to become aware of an issue, identify the source, and implement targeted mitigation.

[23] Institute of Air Quality Management, Guidance on the Assessment of Mineral Dust Impacts for Planning, 2016

Receptor R1 has also been included to represent the potential effects on those using the harbour for recreational activities such as fishing and water sports. These activities are generally short in duration with relatively infrequent human presence when compared to a dwelling.

As with the harbour, given the temporary visiting nature of the beach and Blacksmith Creek Walkway users, it is unlikely that these users will be in this location for any significant duration, and there may be extended periods when no one is present.

For workers on Northport, they are likely to be in this location for a prolonged duration and therefore, if dust is transported in this direction, targeted mitigation will occur in a timely manner.

Offensiveness

Offensiveness relates to the character of the dust and how offensive the character is. For example, dark coal dust is likely to be considered more offensive than light coloured sand.

In this case, PDP expects that any dust discharged from the construction and reclamation works will be predominantly light to moderate in colour, rather than dark or visually striking material, reflecting the mineral composition of marine sediments and reclamation materials. Light-coloured dust is generally less visually intrusive when deposited on surrounding surfaces and is less likely to create strong visual contrast against existing surfaces. PDP therefore considers that any dust discharged will be of a low to moderate offensiveness and typical of dust from general rural activities.

Location

The site is located approximately 375 m from the nearest residential residence (R9 located on Albany Road). This is just within the extent whereby effects from unmitigated dust discharges could be expected. However, as previously discussed, PDP considers that dust deposition will be limited to within 50 m of the source when mitigated.

The Blacksmith Creek Walkway, the beach to the west of the site and Northport to the east are relatively close to some areas of the reclamation, and without appropriate mitigation discussed in Section 12.0 this area could experience nuisance dust effects.

In general, PDP considers the site is appropriately located to control nuisance dust effects.

FIDOL Conclusion

Having assessed the proposed construction and reclamation operations that have the potential to cause dust discharges against the FIDOL factors, PDP considers that there is a low potential for offensive or objectionable effects from dust to be experienced off-site.

This is primarily due to the location of the site in relation to nearby receptors where human occupancy is frequent, the frequency of winds that could transport dust significant distances, and the implementation of the dust mitigation and monitoring measures discussed in Section 12.0.

PDP notes that elevated intensities of dust may be experienced at receptors R1, R7, and R8, however these are all locations which are temporarily used by the public and therefore are not considered to be highly sensitive receptors.

Northport (R16) could also experience elevated intensities of dust, however based on the relatively low sensitivity of this receptor and mitigation measures proposed, it is also considered that there is a low potential for offensive or objectionable effects from dust to be experienced at this location.

11.3 Car Park and Access Road Construction

It is proposed that the car park for these personnel is located off-site and connected by an access road providing for vehicles and pedestrians. In terms of discharges to air, as with other similar construction activities, there is the potential for air-borne dust to be generated during the construction phase when material, mostly soils and aggregates, are mechanically disturbed. As with the construction of the reclamation, there is also the potential for wind-blown dust to be generated when the speeds increase are at least 5 m/s and surfaces are left exposed. Such surfaces include stockpiles excavated surfaces, or areas where dry material has been placed. Once operational, there is likely to be minimal air quality effects from the access road or the carpark as these will be paved.

As previously discussed, there is the potential for unmitigated dust to be transported 400 m from the source under certain meteorological conditions (dry conditions and strong winds), however, with dust mitigation measures in Section 12.0 implemented PDP considers that the potential transportation distances reduce significantly and are generally within 50 m of the source. These two distances are shown for both the carpark and access road in Figure 15.

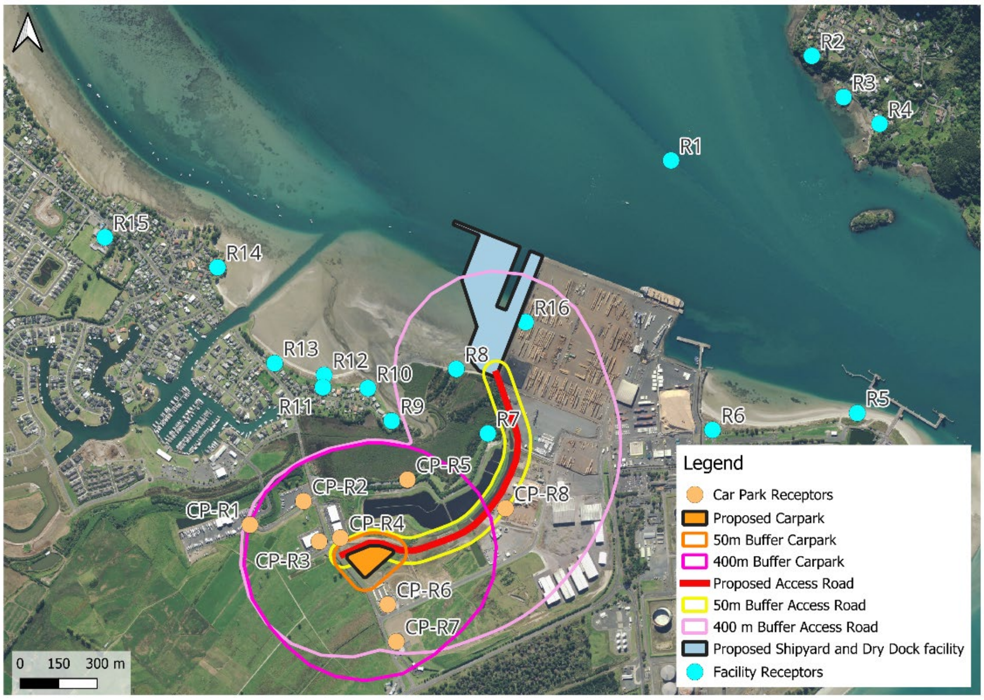

Figure 15: Proposed Car Park Areas and Nearby Receptors

Nearby receptors have been identified as car park receptors (CP-R) in Figure 15, with each summarised in Table 4.

11.3.1 Carpark and Access Road FIDOL Assessment

While the construction of the carpark and access road is likely to result in less dust effects compared to the construction of the dry dock facility, PDP has undertaken a high- level FIDOL assessment using the methodology as described in Section 10.1 to assess the potential nuisance dust effects.

Frequency

As previously discussed, PDP considers that winds with a speed of more than 5 m/s have the potential to cause dust nuisance effects on the nearest sensitive receptors if the mitigation measures discussed in Section 12.0 are not implemented. If the mitigation measures are implemented, nuisance dust emissions should be contained within 50 m of the source.

Based on the wind speed data presented in Table 1 the frequency of winds above 5 m/s from the southeast, which have the potential to carry dust from the carpark construction to receptors CP-R1 to CP-R4, occur 1.2 % of the time.

Winds from the southwest have the potential to affect Receptors CP-R5 and R7, R8, with winds greater than 5 m/s from these directions combined occur between 1.9% of the time.

Winds from the north have the potential to affect CP-R6 and CP-R7, with winds greater than 5 m/s from these directions combined occur between 1.5% of the time.

It is likely that the dust effects from the construction of the access road will be less due to the smaller surface area and the staged nature of construction, however CP-R6 to CP-R7 could be affected by winds from the north to northeast (4.2% greater than 5 m/s) and CP-R8 winds from north to the west (8.1%); CP-R1 to CP-R4 by winds from the southeast to east (5.1%) and CP-R5 and R7, R8 affected by winds from the south to east (6.5%). The frequencies above are likely larger than what will occur in reality as this assumes that the entire access road will be a dust source at the same time, however a staged part of construction will likely occur.

Based on guidance[24] prepared by the Institute of Air Quality Management, this percentage of winds is classified as 'Infrequent' to 'moderately frequent". However, it is also noted that most of the receptors identified are in industrial zones, which have less sensitivity to dust. This, in combination with the proposed mitigation and monitoring, means that that the frequency of any effects associated with the construction of carpark and access road is expected to be low.

Intensity

It is unlikely, even if no mitigation were in place, that the nearest residential receptors will experience an increase in dust intensity. This is primarily due to there being no residential receptors within 400 m from a potential dust source and these dwellings.

There is potential that if not appropriately mitigated there could be reasonably intense dust effects on the closest receptors, if material is place near the perimeter in dry windy conditions.

Duration

PDP considers that based on the visual and instrumental monitoring discussed in Section 12.8 and the mitigation measures proposed (discussed in Section 12.1), that if a significant dust discharge event were to occur, at worst the duration would be limited to a period of no more than one to two hours at any one time, this being the time taken for site staff to become aware of an issue, identify the source, and implement targeted mitigation. It should be noted that the duration for construction of the carpark and access road is likely to be minimal.

[24] Institute of Air Quality Management, Guidance on the Assessment of Mineral Dust Impacts for Planning, 2016

Offensiveness

Offensiveness relates to the character of the dust and how offensive the character is. For example, dark coal dust is likely to be considered more offensive than light coloured sand.

In this case, PDP expects that any dust discharged from the construction of the carpark will be predominantly light to moderate in colour. PDP therefore considers that any dust discharged will be of a low to moderate offensiveness and typical of dust from general rural activities.

Location

The proposed carpark is located more than 400 m from the nearest residential residence. The closest receptors are all industrial activities except for the walkway and beach, where the public will only be present intermittently. In general, PDP considers the site is appropriately located to control nuisance dust effects.

FIDOL Conclusion

Having assessed the proposed construction of carpark and access road that have the potential to cause dust discharges against the FIDOL factors, PDP considers that there is a low potential for offensive or objectionable effects from dust to be experienced off-site.

PDP notes that the car parking and access road surface is asphalt and consequently no dust emissions are expected from the use of the car park once construction is complete.

11.4 Ship Surface Preparation

Based on the proposed operations, once the new facility becomes operational, the reclamation will be used for ship maintenance activities, with the potential for two ships or more to be maintained at the same time. The main particulate emissions from these activities will be predominantly from ship surface preparation. As previously discussed, this includes wet abrasive blasting (including garnet) and high-pressure water blasting. While longer maintenance works may be undertaken in an enclosed environment/encapsulated, shorter blasting works may be undertaken without physical attenuation. Consequently, PDP has qualitatively assessed the potential for effects to occur from these activities as a worst-case scenario.

As discussed earlier any dry abrasive blasting will be undertaken using encapsulation with only HPWB, UHPWJ, and wet abrasive blasting occurring without physical containment.

While some particulates (such as spent abrasive media, removed paint and coating materials, corrosion by-products, and marine biofouling) will be discharged during blasting activities, these are all comparatively large and are expected to deposit in a close vicinity of the surface being blasted from, even during strong winds.

11.5 Surface Coating – Nuisance Particulates

Nuisance particulates can be discharged during spray coating operations. These particulates are the ones that don't 'hit the target' and are emitted into the air.

However, the operators will also continuously measure wind speed and direction, allowing the operators to assess dispersion conditions as they occur. At the same time, trained personnel visually monitor spray application and any potential drift, enabling immediate intervention where necessary. This may include modifying spray pressure and angle, adjusting nozzle configuration, or switching to lower-risk application methods such as brush or roller application.

These real-time inputs are supported by real-time trigger levels and response procedures, ensuring that any emerging overspray risk is addressed promptly. Consequently, PDP considers that coating deposition can be effectively confined to the immediate work area. While coating particulate deposition can be effectively confined to the immediate work area, there is still the potential for particulates to be deposited off-site, including parts of the CMA. PDP has provided worst-case deposition rates in Section 11.10. PDP notes that when surface coating works are encapsulated, no off-site nuisance effects will occur.

11.6 Surface Coating – Contaminants Assessment

PDP has assessed the potential effects from coating emissions against the relevant health-based guidelines using the methodology as set out in Section 10.2. While some spray coating will be encapsulated (such as for expended durations to protect coating works from weather or as required by the tiered mitigation measures), this assessment presents potential pollutant concentrations if no encapsulation were to take place to identify the worst-case scenario.

The predicted 1-hour average ground level ambient concentrations from the coating emissions are presented in Table 7, with concentrations that exceed relevant guidelines highlighted in grey. It is important to note that, as mentioned in Section 10.2.5, this modelling is very conservative as it considers all coatings will be applied at the same time using a spray gun. In reality, it is likely that these concentrations will be much lower than those that are modelled, and if encapsulated, there will be little to no air quality effects. Furthermore, we have identified mitigation measures to reduce the potential of these pollutants to exceed guidelines in Section 12.4.

Table 7: Predicted Coating Concentrations – 3x Spray Coating Sources each at 20 L/hour

Compound	Short-term Health Guideline (µg/m³)	99.9 %ile 1-hourAverage Predicted Concentration (µg/m³)	
		Highest at Residential Receptor	Highest Offsite
2-methoxy-1-methylethyl acetate	2,700	62.2	149
Ethylbenzene	26,000	74	178
Titanium dioxide	50	56.2	134.8
Petroleum naphtha	2,450	672	1,611
Xylenes (o-, m-, p- isomers)	2,200	701	1,693
Hexamethylene diisocyanate (monomer)	0.30	1.1	2.7
Bisphenol-A-(epichlorhydrin); epoxy resin	No limit	164	394
N-butanol	610	343	824
Polyamide amine resin	No limit	16.9	40.5
3,6-diazaoctanethylenediamin	60	0.0	0.1
Toluene	4500	181	434
Epoxy resin	1,000	109	261
Aromatic hydrocarbons, c9	No limit	59.4	143
Ethanediamine	250	3.0	7.1
Meta-Xylene	2,200	23.8	57
Tris-2,4,6-(Dimethylaminomethyl)Phenol	420	29.0	69.7

Table 7: Predicted Coating Concentrations – 3x Spray Coating Sources each at 20 L/hour

Compound	Short-term Health Guideline (µg/m³)	99.9 %ile 1-hourAverage Predicted Concentration (µg/m³)	
		Highest at Residential Receptor	Highest Offsite
Para-xylene	2,200	9.5	22.8
Ortho-xylene	2,200	9.5	22.8
Bisphenol A/ diglycidyl ether resin, liquid	No limit	118	282
Cashew nut liquid/ formaldehyde/ ethylenediamine polymer	No limit	57	137
N-butyl acetate	11,000	192	461
Silica crystalline - quartz	14	68.9	165
Zinc oxide	24	71.3	171
Copper(I) oxide	23	267	640
Zineb	No limit	17.8	42.8
Pyrithione zinc	12	53.4	128
Copper oxide	10	53.4	128
Naphtha	4,000	148	355

11.6.1 Gaseous Compounds

The only gaseous compound that exceeds the relevant health-based guideline is Hexamethylene diisocyanate (HDI) (monomer). This compound has a very low health based guideline and is only found in one of the coatings assessed. Even when modelling the one source furthest from the nearest receptors (northern most source) at 20 L/hour (a third of the maximum rate of 60 L/hour), the guideline value for the HDI is exceeded. If coating with an HDI containing coating only occurred at the northern end of the dry dock at a rate of 10 L/hour, the guideline value would be met at all residential receptors; however, it would still be exceeded off-site.

PDP has therefore recommended control measures to ensure HDI's do not cause adverse health effects off-site. These are discussed in Section 12.3

The compound n-Butanol was also modelled as exceeding the relevant guideline off-site, coating at a maximum 60 L/hr. This offsite location is where R8 is pictured in Figure 4, and is largely driven by coating occurring at the southern end of the hardstand, as well as some contribution from the centre source. When assessing coating occurring at the northern end of the dry dock or ship lift, the guideline value is met. PDP considers it is unlikely that this area will be used for extended periods of time. The guideline is met at all residential receptors regardless of where coating is occurring given the total coating flow rate does not exceed a total of 60 L/hour combined (southern end, central, and northern end).

11.6.2 Solid Compounds

Six of the solid compounds modelled as being exceeding the relevant guideline values when spray coating without encapsulation. These six are:

- Copper oxide (CAS: 1317-38-0);
- Copper(I) oxide (CAS: 1317-39-1);
- Pyrithione zinc (CAS: 13463-41-7);
- Silica crystalline – Quartz (CAS: 14808-60-7);
- Titanium dioxide; and,
- Zinc oxide (CAS: 1314-13-2).

As discussed in Section 12.3, the operator will implement controls by only hand coating and not spraying when using coatings that contain these compounds to ensure these are not discharged off-site at concentrations that could potentially cause adverse health effects. All other spray modelled compounds are well below the relevant health guideline values, as seen in Table 7.

11.7 Surface Coating – Odour Assessment

As with nuisance dust effects from the construction works, PDP has undertaken a FIDOL assessment to assess the potential odour effects from the coating operations.

Frequency

Unlike nuisance dust however, for odour to be experienced off-site, peak odour emissions have to occur during periods of poor dispersion, typically when wind speeds are below 3 m/s (low wind speeds). Table 8 presents a summary of the wind directions when each receptor is downwind, along with the combined wind frequency of these directions when the speeds are less than 3 m/s.

Table 8: Summary of Low Wind Speed Frequencies

Receptor	Receptor Type	Wind Direction(s) when Downwind of Coating	Wind Speed < 3 m/s Frequency (%)
R1	Fishing/Recreation	NE to W	23.6
R2	Residential	SW	3.2
R3	Residential	WSW	6.1
R4	Residential	WSW	6.1
R5	Public Space/Recreation	WNW	6.1
R6	Public Space/Recreation	WNW	6.1
R7	Public Space/Recreation	NW	1.7
R8	Public Space/ Recreation/CMA	NNW	1.3
R9	Residential	NNW	1.3
R10	Residential	NE to ENE	2.3
R11	Residential	NE to ENE	2.3
R12	Public Space/Recreation	NE to ENE	2.3
R13	Residential	NE to ENE	2.3
R14	Residential	E	1.2
R15	Kura/School	E	1.2
R16	Heavy Industry	SW to NW	17.9

Typically, complaints from odour occur at residential receptors when people are exposed to odour over prolonged periods. When considering the residential receptors only, the highest frequency that low wind speeds blow towards a receptor is 6.1%, this being towards R3 and R4. The next highest frequency towards a dwelling is 2.3%. It is noted that these percentages do not necessarily correlate with the percentage of time that odour is experienced.

When considering the general variability coating and subsequent odour emissions and the likelihood of poor dispersion conditions in the direction of the receptors coinciding with odour emissions, PDP expects there to be a low frequency of odour effects experienced off-site at a dwelling.

Odour may be experienced more frequently if people are present on boats in the harbour within close proximity of the proposed facility for extended periods of time, however PDP considers that these activities are temporary and infrequent. PDP also notes that the 23.6% frequency presented in Table 8 account for the entire harbour, and those using the harbour generally keep to a more localised area. There is currently an exclusion zone in the Navigation Safety Bylaw around Northport, and it is also likely that this exclusion zone will be updated to require a safe exclusion zone around the site. Should this occur, this would reduce the potential for odour effects to occur on the harbour even further as a buffer distance to any potentially affected members of the public would be enforced.

Odour may also be experienced more frequently at the Northport site (R16), however, as this is a heavy industry zone, they are considered to be less sensitive to the effects of odour.

Intensity

Odour associated with coating can have a strong intensity and can be considered offensive and objectionable by some people. The intensity is also related to the wind conditions and the resulting level of dilution that occurs between the source and the receptor. In essence, the stronger the wind, the more dilution of odour will occur.

PDP has previously undertaken odour observations during light wind speeds during coating operations at the Lyttleton Port dry dock. During these observations, two spray guns and several hand rollers were operating. Based on this experience, distinct solvent odours were detected 30 m from the operations, and no odour was detected 80 m from the activities.

While the operations at the site will vary from those at Lyttleton, the general level of odour intensity experienced on site has been used as a basis for the intensity assessment. Coating emissions can have strong intensities, with the intensity generally correlated with the quantity of coating being applied simultaneously.

The receptors at highest risk of experiencing elevated intensities of odour are those nearest to the site, these being the non-residential receptors (R1, R7, and R8) and Northport (R16). These receptors are generally periodically used by the public (i.e. not permanently occupied) and with the odour monitoring set out in Section 12.9 implemented, PDP considers that even at these receptors, the odour discharges can be managed by undertaking odour scouting, encapsulating the coated area, or ceasing coating when no other mitigation measures are possible, so that odours of a high intensity are not experienced off-site.

Duration

Unlike the construction works (which is anticipated occur over three years), coating is a critical component of maintaining ships and is expected to occur over the life of the activity. However, as with frequency, the duration that anyone would be exposed to odour depends on the time the wind blows in a specific direction along with the duration that the activities occur.

Typically, the duration that odour could be experienced off-site could be up to a couple of hours, which allows for breaks, coating to dry, and stoppages to change coatings (such as primer to undercoat). Given the nature of coating operations, PDP considers that there is a moderate chance that extended durations of odours will be experienced off-site at the closest receptors (R1, R7, R8 and R16). However, as stated above R1, R7 and R8 are only periodically used by the public, and R16 is a heavy industrial site which has less sensitivity to odour effects, therefore the odour effects are likely to be low.

Offensiveness

The primary source of coating odour is the solvents with the main solvent being xylene, which is described as having a sweet, nail polish remover like odour.

At relatively low concentrations and low exposure frequency, the offensiveness is considered to be low however at higher concentrations and longer durations, coating odour could be considered moderately to highly offensive.

Location

To a large extent the location of the source in proximity to sensitive receptors is the most important of the FIDOL factors. In this instance, even if odours are generated there is little potential for adverse effects if there are few receptors located downwind of the source.

In this case, PDP considers that the location of the dry dock is reasonably well placed in terms of the distance to all the residential receptors being at least 375 m. Based on PDP’s experience, it is unlikely to detect odour from these types of activities more than 100 m from the source.

FIDOL Conclusion

Having assessed the proposed ship surface maintenance activities that have the potential to cause odour discharges against the FIDOL factors, the assessment found that for the most highly sensitive residential receptors, the:

- Frequency of exposure is low for residential receptors.
- Intensity of odour at the nearest residential receptor will be low.
- Duration of exposure could be moderate.
- Offensiveness of odour will be moderate to high directly next to the coated surface, but low off-site.
- Location includes a number of high sensitivity residential receptors; however, they are separated from the dry dock by at least 375 m and are downwind of the site during low wind speeds a low percentage of time. Other receptors including public recreation areas and Northport are located closer to the site.

11.8 Cumulative Effects

PDP has assessed the potential for cumulative effects to occur, based on a range of scenarios set out in the following sub-sections.

11.8.1 Existing Port Operations combined with proposed Construction Activities

As already discussed, the likely distance that nuisance dust from the Site could travel if no mitigation were implemented is 400 m. Therefore, for a receptor to be affected by cumulative dust effects from the existing port operations combined with the construction activities, both these activities must be generating dust within 400 m of a receptor at the same time when winds are blowing towards the receptor.

As indicated by Figure 16 there are no dwellings within 400 m of the existing port activities and therefore the possibility for cumulative effects on these receptors from this scenario is low. As highlighted by the yellow shaded area (the overlap of the pink and green outlines) in Figure 16 there is the possibility of users of the Blacksmith Creek Walkway (R7) and connecting beach (R8) to the west of the port to experience cumulative effects, but this would only be during the relatively infrequent strong winds from the north to the northeast (2.9% of the time).

The buffers of the access road and carpark construction have not been included, however the only overlapping area would be CP-R8, which is a heavy industrial activity and likely to be less sensitive to dust effects.

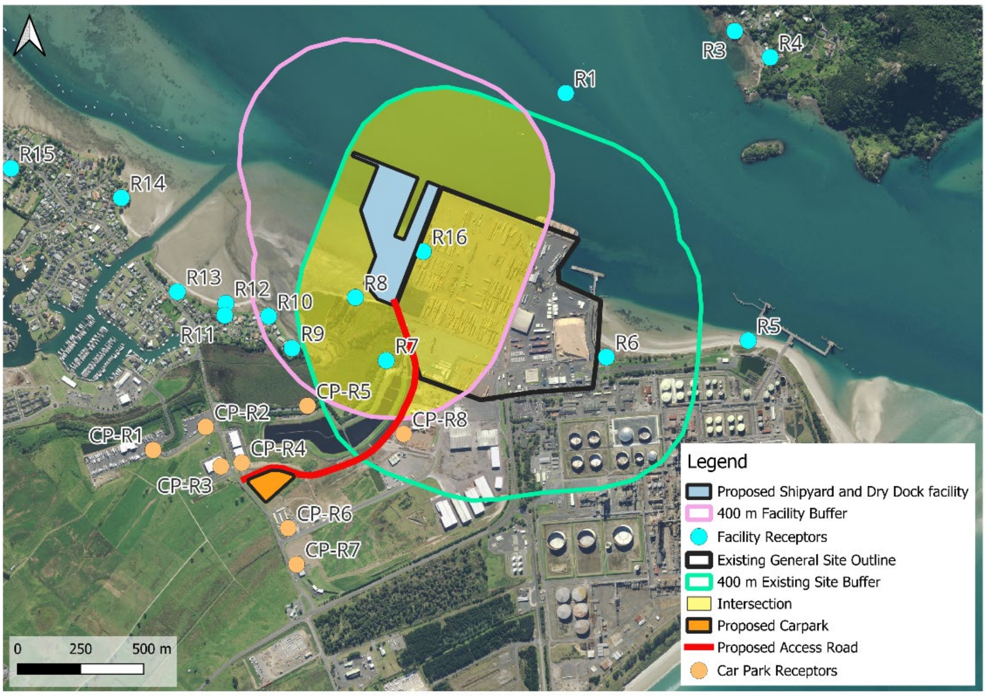

Figure 16: Existing Site and Proposed Site 400 m Buffer Areas

11.8.2 Potential eastern port expansion with proposed Construction Activities

Northport has consent to expand its port immediately to the east of its existing site, which will comprise of 11.7 ha of reclamation within the CMA and 2 ha of earthworks outside the CMA. There is a potential that there could be cumulative effects if the eastern expansion occurs at the same time as the construction of the facility. As already discussed, the likely distance that nuisance dust from the Site could travel if no mitigation were implemented is 400 m. Therefore, for a receptor to be affected by cumulative dust effects from the proposed Eastern port expansion combined with the construction activities, both these activities must be generating dust within 400 m of a receptor at the same time when winds are blowing towards the receptor.

As the proposed eastern port expansion is further east than Northport's current operations the likelihood of cumulative dust effects at any residential receptors is very low.

11.8.3 Current port activities combined with dry dock or ship lift activities

PDP considers that the potential for cumulative air quality effects from the proposed dry dock/ship lift operation and existing port activities is low. This is because dust from activities within the dry dock should be contained within it, and therefore not contribute to any cumulative effects of dust. Additionally, there are no significant sources of VOC’s from the existing port operation that would lead to cumulative effects.

11.9 Health Effects

This section considers the potential for off-site human health effects associated with PM_{10} and $PM_{2.5}$ from the proposed reclamation, construction, and dry dock/ship lift activities.

The NES-AQ and supporting AAQS regulates concentrations of PM_{10}, amongst other air-borne contaminants.

As previously discussed, PDP considers that particulate matter discharged from the reclamation and construction activities will generally be larger particles (dust/TSP), with a low percentage of finer particulate.

Ship surface preparation activities will involve wet-abrasive blasting or high/ultra-high pressure water blasting, with dry abrasive blasting only undertaken when encapsulated. Particulate emissions are expected to be dominated by larger, denser particles that will be damp and therefore deposit close to the source, with minimal PM_{10} or $PM_{2.5}$ particles discharged.

Background air quality data indicate generally low ambient PM_{10} concentrations in the surrounding environment, with no recent exceedances of the NES-AQ standard. PDP’s on-site short-term background monitoring (discussed in Section 3.4) supports this conclusion. With mitigation measures in place, particulate emissions from reclamation and construction are expected to be largely confined to within approximately 50 m of dust sources. Particulates from these works are also expected to be larger particles and contain a small amount of finer particles.

The nearest residential receptors are located at least 375 m from the site, where any increase in PM_{10} or $PM_{2.5}$ concentrations would be highly dispersed, noting the low intensity of each from the source material in the first instance. PDP also notes that the mitigation measures adopted to control nuisance dust also control PM_{10} and $PM_{2.5}$ discharge potential. These mitigation measures will also reduce the amount of PM_{10} and $PM_{2.5}$ discharged towards the adjacent Northport site.

For ship maintenance activities, particulate emissions are either contained or localised and are not expected to increase fine particulate concentrations at off-site receptors.

Overall, PDP considers that it is highly unlikely that a credible pathway for the site to result in sustained or elevated PM_{10} or $PM_{2.5}$ concentrations at off-site sensitive receptors is possible. The risk of adverse human health effects associated with particulate matter is therefore considered negligible.

11.10 CMA Ecological Effects

Dust deposition from reclamation, construction, and dry dock activities can affect coastal marine environments by increasing the load of particulates entering the CMA. Settled dust can elevate turbidity and reduce water clarity, which may influence light penetration and local water quality conditions. Where dust contains residues from materials handling or ship maintenance (e.g. metals, coating particles), these can also cause localised effects. Repeated inputs during construction and maintenance activities can result in a gradual build-up of these materials in areas close to the works.

As mentioned in Section 10.3, PDP has undertaken deposition modelling to predict the potential deposition rates of particulate from surface spray coating overspray on the adjacent CMA. This modelling is based on the worst-case scenario based on solid compounds while spraying. The same emission rates used of the health-based modelling have been adopted for this deposition modelling, which conservatively assumes a 20% overspray.

Figure 17 illustrates the copper(I) oxide deposition rates (presented in µg/m²/hour) contours.

Figure 17: Maximum Copper(I) Oxide Particle Deposition Rates (µg/m²/hr) from Coating Overspray

Table 9 summarises the maximum emission rate (grams per second) and maximum off-site deposition rates for all modelled compounds.

Table 9: Summary Deposition Modelling Maximum Emission and Deposition Rates

Compound	CAS Number	Maximum Emission Rate (g/s)	Maximum Off-site Deposition Rate (µg/m²/hr)
Titanium Dioxide	13463-67-7	0.17	32
Polyamide amine resin	68915-18-4	0.057	9
Epoxy Resin	25036-25-3	0.33	61
TRIS-2,4,6-(DIMETHYLAMINOMETHYL)PHENOL	90-72-2	0.09	16
Bisphenol A/ diglycidyl ether resin, liquid	25085-99-8	0.35	66
Silica crystalline - quartz	14808-60-7	0.21	39
Zinc oxide	1314-13-2	0.21	40
Copper(I) oxide	1317-39-1	0.80	150
Zineb	12122-67-7	0.05	10
Pyrithione zinc	13463-41-7	0.16	30
Copper oxide	1317-38-0	0.16	30

The analysis of the results in Table 9 has been undertaken by others.

As previously discussed, real-time TSP monitoring combined with wind data provides a practical tool to manage these effects. By proactively identifying conditions that can transport dust off-site, the operator can implement targeted controls such as modifying work practices, applying dust suppression measures, and using containment during higher-risk activities like dry material handling during construction and abrasive blasting during operation of the dry dock or ship lift. Additionally, the real-time monitoring will record and alert the operator of elevated concentrations from which they can act to suppress the emission source if found to be caused by on-site activities.

These measures help reduce particulate discharge into the CMA and control the potential for adverse effects to occur.

As blasting will only occur without containment using hydro blasting with a water blaster, or wet abrasive blasting with wet garnet media, it is very unlikely that there will be any air discharges from this activity into the CMA.

12.0 Proposed Mitigation and Monitoring

This section of the report presents the mitigation measures that will be used to control the effects of discharges to air as a result of this project, along with the monitoring methods that will be adopted to assist with proactive mitigation measures.

These mitigation and monitoring measures will be included in an Air Quality Management Plan (AQMP), a draft copy of which is attached to this assessment (Appendix E).

12.1 Reclamation and Construction Activities

The reclamation process and the subsequent construction have the potential to generate dust if left unmitigated. Therefore, it is necessary to consider the mitigation measures that will be used to control emissions and for the assessment of the potential dust effects including the influence of these control measures.

The mitigation measures included in the following sections are in line with PDP's experience with industry good practice and with the MfE GPG Dust. The following measures have been used to form the AQMP for this project.

12.1.1 Movement and Placement of Bulk Materials

There will be large quantities of material disturbed and placed in the reclamation process. A large volume of this material will be wet or contain a high level of moisture. This wet material presents minimal dust risk. However, once this material is above sea level and dries out there is an increased risk of dust generation. For this material the following management measures are recommended to minimise dust emissions:

- Vehicle movements on unsealed areas should:
  - Have vehicle speed limits of 20 km/hr.
  - Be well maintained and covered with coarse material where possible, in particular the vehicle routes.
  - Be sprayed with water if observed as being a significant source of dust.
- Develop guidelines to control the placement of fill material. It is expected that these guidelines would include the following:
  - Keeping the material damp.
  - Keeping drop height to a minimum.
  - Undertaking work in favourable wind conditions.

  - Having a method available to apply water to dampen material when required.

- Sealed surfaces should be regularly swept and more frequent during any spillage, dry conditions, or strong winds.

- Once the reclamation is above sea level the risk of dust emissions can increase as the material dries out and is worked by machinery. During this process the following should be implemented:

  - Keeping the material damp and having a method available to apply water to dampen material as required.

  - Undertaking work in favourable wind conditions.

  - Keeping drop heights to a minimum.

  - Once the material has been placed in the final contour or material is not going to be worked for extended period of time, sealing the material with either a permanent option (concrete or asphalt) or temporary option (grass or coarse aggregate) should be considered.

- Follow the monitoring methodology set out in Sections 12.7, 12.8, and 12.9.

12.1.2 Stockpiled Material

For the most part, the dredged material will be discharged via pipe into the reclamation and see very little subsequent disturbance. In some cases, the dredge material is placed within the confines of the reclamation area, this material will be reworked by earthwork machinery and may be stockpiled for a period of time before being reused as fill. Additional bulk material used for construction and reclamation will also be brought on-site which and may need to be stockpiled until ready for use.

For stockpiled materials with low moisture content and which contain fines, the following management measures will be used to minimise dust emissions:

- Develop guidelines for the removal and stockpiling of material during windy conditions. It is expected that these guidelines would include the following:

  - In the case of fill material, keeping it damp.

  - Limiting the drop height to less than three metres.

  - Only undertake these operations when wind conditions are optimal.

- The size and height of the stockpiles should be below 5 metres;

- Use water to control dust where practicable and appropriate;

- If practicable, apply covers to the material if windy conditions are expected and the piles cannot be kept damp;
- Any material that is placed in temporary stockpiles during the reclamation works where it is not disturbed for more than three months shall be vegetated or covered as soon as practicable; and,
- If dust material is going to be stockpiled for long periods (in excess of three months), install wind breaks around these stockpiles.

12.1.3 Construction Vehicles Engine Emissions

There will be many vehicles operating on the site. The combustion emissions from these vehicles are considered insignificant and unlikely to result in any noticeable changes in air quality. However, operators undertaking the construction and reclamation should develop guidelines to ensure emissions are minimal. It is expected that these guidelines would include the following:

- Vehicles are not left idling while unattended.
- Ensuring vehicles are operating as intended by maintaining vehicles regularly.

12.2 Surface Preparation

The mitigation measures for surface preparation include:

- The majority of surface preparing will be undertaken using HPWB or UHPWJ, which will result in emissions of paint flecks, metal particles, salt and marine deposit which will be encapsulated in water droplets which are heavy and are able to be contained within the facility.
- Wet abrasive blasting will use garnet as the abrasive medium, where the water reduces the dispersion of the garnet particles.
- If dry blasting is undertaken, the area that will be blasted should have scaffolding placed around it and wrapped. This will encapsulate any emissions from this activity.

Table 10 contains controls for managing the effects of surface preparation, noting dry abrasive blasting has been excluded from these controls due to these activities being encapsulated and only used in rare occasions.

Table 10: Surface Preparation Controls

Tier	Action	Description
T1	Lower Risk Methods	Prefer water blasting or wet abrasive blasting over dry abrasive blasting where practicable.
T1	Regular monitoring	Monitor windspeed (visually and on phone) to ensure site limits not exceeded and gauge risk of transport of dust beyond site boundary. Automated notifications will be sent based on readings from the site's met station. Make regular visual checks to see if dust is at risk of leaving the site, adjust controls as necessary.
T1	Site Tidiness	Regular site clean-up to remove dust from surfaces.
T1	Operation	Angle abrasive blasters downwards.
T1	Media	Only garnet media used if needed.
T2	Vacuum Blasting	Use blasters fitted with vacuum heads for flat areas, attached to a sucker truck.
T2	Barriers	If emissions are observed as excessive, use wrapped scaffolding to contain emissions from abrasive blasting of the superstructure.

12.3 Surface Coating

Surface coating within the site has the potential to generate particulate and VOC emissions. Table 11 contains PDP's recommended tiered (T1 to T3) controls for managing the effects of coating.

In addition to Table 11, any coating containing the following compounds will only be hand-coated (i.e. by brush or roller) to eliminate the potential for high concentrations from overspray:

- Copper oxide (CAS: 1317-38-0);
- Copper(I) oxide (CAS: 1317-39-1);
- Pyrithione zinc (CAS: 13463-41-7);
- Silica crystalline – Quartz (CAS: 14808-60-7);
- Titanium dioxide (CAS: 13463-67-7) and,
- Zinc oxide (CAS: 1314-13-2).

Alternatively, coatings containing the six compounds mentioned above can be sprayed provided the vessel is encapsulated and air from the encapsulation is appropriately treated before being discharged.

For any coatings containing Hexamethylene diisocyanate (monomer) (CAS: 822-06-0), encapsulation is required, with an extractor and a two-stage filter, to prevent the discharge of this pollutant to the atmosphere.

As discussed later in Section 11.6, these solid contaminants have all been modelled as exceeding the relevant guideline value if sprayed in a non-contained facility.

Table 11: Spray Coating Controls - Overspray

Tier	Action	Description
T1	Lower Risk Methods	Prefer brush and hand rolling over spray coating where practicable.
T1	Regular monitoring	Monitor windspeed (visually and on phone) to ensure wind conditions are favourable and gauge risk of transport of overspray beyond site boundary. Automated notifications will be sent based on readings from the site met station. Make regular observations of site, look to see if overspray is at risk of leaving site boundary, adjust controls as necessary.
T1	Operation	Narrow items (handrails) which have a high potential for overspray are hand coated. Spray guns are not fired in an upwards direction (above 90°)
T1	Coating Application Rates	Monitor cumulative coating application rate across all entities working on a vessel. Ensure cumulative application rate doesn't exceed consent limits (60 L/hr).
T3	**Physical Screening, Encapsulation or Cessation**	**If T1 measures are not controlling particulate deposition, coating works are to be physically screened, encapsulated or ceased.**

Table 12 contains controls for managing the effects of odour from spray coating.

Table 12: Spray Coating Controls - Odour

Tier	Action	Description
T1	Regular monitoring	Make regular observations of site to see if odour is at risk of leaving site boundary, adjust controls as necessary.
T2	Reduce Rates	If significant odour detected at sensitive receptors, reduce coating application rates until wind direction shifts away from sensitive receptors.
T3	**Cessation**	**Coating to be encapsulated or ceased if persistent odour detected at downwind sensitive receptors.**

12.4 Contaminated Paint Controls

Table 13 contains controls for managing the effects of contaminated paints.

Table 13: Contaminated Paint Controls

Tier	Action	Description
T1	Review paint history	Prior to blasting, review paint history. Identify if tri-butyl tin (TBT), lead or mercury containing products are included in the paint history.
T1	Testing	If no history, or possibility of these contaminants in paint, undertake testing: - Patch testing (screening); and/or - Laboratory analysis.
T2	Blasting	Coatings containing lead, TBT, or mercury shall be vacuum blasted using filtration removing at least 99.9% of mass by particulate matter from the discharge, prior to discharge into air.

12.5 Site Surface Deposition

During surface preparation, debris accumulates on the surfaces under the vessels which under strong winds has the potential to be lifted and transported. Typical debris includes rust flecks, old paint, marine growth, metallic particles and spent blast media. Debris will be removed from the surfaces.

The surfaces will be cleaned in a two-stage process. Large debris particles are swept up and shovelled into skips for transport off-site and disposal into appropriate landfill facilities. The surfaces will then be washed down by site staff with the contaminants disposed of appropriately.

There will be no waste remaining on the surfaces once the clean-up has been completed. Discharges to air are therefore limited to the duration of each coating job.

12.6 Metal Working Activities Welding, Grinding and Cutting Activities

While not assessed in this report due to the specific details not being available at this stage of the project, best practice measures will be adopted for all other activities that could discharge to air. These include; metal work, grinding, and cutting. Mitigation measures that may be adopted for these activities include:

- Local exhaust ventilation (LEV) systems to capture fumes and particulates at source before dispersion;
- Enclosed or semi-enclosed work areas (e.g. welding booths, cutting tables) to control fugitive emissions;
- Apply downdraft extraction tables for plasma cutting and grinding operations;
- Ensure extraction hoods are positioned as close as practicable to emission sources to maximise capture efficiency;
- Treat extracted air using particulate filtration systems (e.g. cartridge filters, baghouse, HEPA as appropriate) prior to discharge;
- Implement good housekeeping practices to prevent accumulation and re-entrainment of settled dust;
- Use wet suppression or vacuum systems (not dry sweeping) for dust removal from grinding/cutting areas;
- Locate a portable real-time PM monitor (discussed in Section 12.8.2) downwind of uncontrolled operations and cease work if this monitoring suggests effects at an off-site receptor is possible.

12.7 Wind Monitoring

PDP recommends that a wind sensor at a height of between 5 and 10 m above ground level is installed and operated near the dry dock or ship lift. This data will provide representative ground level wind conditions and will enable direct correlation with TSP data collected by the monitors discussed in Section 12.8.2 for likely source attribution. Wind speed trigger levels for dust and odour along with the actions for each level are contained in the draft AQMP (Appendix E).

12.8 Dust Monitoring

Due to the scale of the construction works and operations proposed and the proximity of sensitive receptors, the use of real-time instrumental dust monitoring would provide valuable data to determine the effectiveness of mitigation measures, and/or when additional mitigation measures are required to control dust. In addition, it is recommended that visual dust monitoring is undertaken. These two monitoring methodologies are discussed in the following subsections.

12.8.1 Visual Dust Monitoring

There are several straightforward monitoring actions that can be used regularly in addition to the real-time instrumental monitoring to ensure that dust is being controlled appropriately. These monitoring measures (set out in Table 14) are used at most large construction sites and are typically incorporated into site management plans. While some of these activities might not be suitable once the proposed dry dock or ship lift becomes operational, it is recommended that these measures are adopted for the construction phase of the project and modified once operations commence.

Table 14: Visual Dust Monitoring

Monitoring Activity	Frequency
Check weather forecasts for strong winds and rainfall to plan appropriate activities and dust management response.	Daily
Inspect the site, access roads and adjoining roads for the presence of dust deposition.	Twice daily
Observe weather conditions including wind and rain via observations and data inputs from the site weather stations.	Daily and as conditions change
Inspect all exposed surfaces for dampness and to ensure that the exposed un-stabilised area is minimised.	Daily and as conditions change

Table 14: Visual Dust Monitoring

Monitoring Activity	Frequency
Observe vehicle movements to ensure dust generated is kept to a minimum.	Daily and as conditions change
Inspect any stockpiles to ensure that they are not subject to wind erosions. Ensure stockpile height is less than 3 m where possible or appropriate.	Daily and as conditions change
Monitor dust generating activities to ensure dust emissions are effectively controlled.	Daily and as new are activities commenced
Inspect watering systems (water carts and any other spray systems) to ensure equipment is maintained and functioning to effectively dampen exposed areas.	Weekly
Monitor dust generating activities and water application rate.	In winds over 5 m/s
Monitor meteorological conditions to avoid undertaking operation in unfavourable wind conditions.	When wind is blowing towards receptors during high wind speeds.

12.8.2 Real-time Instrumental Monitoring

PDP recommends the installation of three portable, real-time TSP monitors to provide responsive monitoring of dust generated during both construction and operational activities, with monitors deployed near the site boundary generally downwind of active work areas. One of the three monitors will be located upwind to determine the potential for off-site sources to be contributing to downwind recorded concentrations. This monitoring would enable fast identification of elevated dust levels and supports quick implementation of additional dust management measures.

Installation of two downwind units provides redundancy and flexibility, allowing simultaneous coverage of different activity areas or receptors as site operations change.

The trigger level values and actions as set out in Table 15 will be adopted. These apply to both monitors which will each be connected to a telemetry system capable of sending email and/or text alerts to site staff.

Table 15: Instrumental Monitoring Trigger Levels

Tier	1-hour Average TSP Concentration (µg/m³)	Level Type	Action
T1	150	Warning	Check wind direction visually and on phone from on-site sensor. Identify likely source of trigger and apply mitigation to found source if on-site.
T2	200	Action	In addition to T1 action – reduce works that are causing particulate discharges.
T3	**250**	**Cessation**	**Cease all particulate discharging works.**

12.9 Odour Monitoring

Odour monitoring will be based on wind risk conditions (as recorded by the on-site weather station discussed in Section 12.7) and if required, field observations from site staff.

Table 16 details the odour risk conditions and the actions required for each.

Table 16: Odour Wind Alerts

Odour Risk	Alert Type	10-min Average Wind Speed	Actions
Low-Risk	No alert	> 3 m/s	No additional action required. Undertake general site odour monitoring and alert site manager if significant odours are observed near the southern or southwestern boundary of the site.
High-risk	Email alert	Calm to 3 m/s and winds blowing from North to Northeast	Where possible, avoid non-encapsulated coating. If non-encapsulated coating is to occur, one staff member is to undertake odour observations downwind on the boundary. If odours of a strong intensity (4) are observed, confirm this observation with another staff member and cease coating. See Appendix B for Odour Intensity Scale

12.10 Reporting of Monitoring Programme

The following information should be recorded in a daily log or equivalent system (an example of the type of detail that may comprise the daily log is provided in the AQMP):

- Results of the daily site inspections of visible dust emissions;
- Likely source(s) of any observations of dust;
- Weather conditions during the day (i.e., windy, calm, warm, rain etc.);
- Volumes of coating and garnet media used;
- Equipment malfunctions and any remedial action(s) taken;
- Any unusual on-site activities; and,
- Records of any complaints or other community feedback regarding the filling activities.

The log forms should be collated and stored on site and will be made available to NRC staff upon request.

13.0 Conclusion

13.1 Reclamation and Construction Effects

PDP's assessment has concluded that there is limited potential for air discharges from the reclamation and construction of the proposed shipyard and dry dock facility and carpark and access road to cause off-site effects at the nearest residential dwellings due to the distance between these locations and the source of dust being at least 375 m.

At these distances even with no mitigation, it is only during very strong winds that there is any potential for dust effects at these receptors. Provided that the mitigation and monitoring measures presented in Section 12.0 are appropriately implemented, PDP considers that there is low potential for dust nuisance effects from the project.

When considering the reclamation and construction in relation to the consented port activities and proposed eastern expansion of the port, the potential for these two activities to result in cumulative effects is low, as it is very unlikely for the two activities to occur within 400 m of each other with winds blowing towards the nearest dwellings at the same time. In addition, based on the mitigation that Northport undertake, dust effects would only occur within 50 m and therefore there would be no cumulative effects on the nearest receptors.

13.2 Dry Dock/Ship Lift Operations

To assess the worst case potential effects from coating emissions, PDP undertook an atmospheric dispersion modelling assessment using the model CALPUFF, and as discussed in Section 10.2.1.

Some of the compounds were modelled as exceeding the relevant health-based guideline values, therefore, the operator will adopt modified coating techniques and mitigation for coatings containing these compounds including hand coating and encapsulation.

Three real-time TSP monitors and a wind sensor at a height of 5 to 10 m will also be installed to monitor upwind and downwind concentrations of nuisance dust, along with both the dust and odour risk conditions.

With these mitigation measures and monitoring measures in place, PDP considers that there is a low risk of nuisance or adverse health effects experienced off-site. Additionally, PDP considers that at the nearby dwellings, there is a very low risk of adverse effects being experienced.

Overall, with the recommended mitigation measures in place, PDP considers the air quality effects associated with the operation of the proposed facility to be acceptable.

Appendix A: Regional Plan for Northland Sensitive Land Use Types

Table 17: Receptor Types

Land Use	Dust-Sensitive Area (Yes/No)	Odour-Sensitive Area (Yes/No)	Spray-Sensitive Area (Yes/No)
Residential buildings and associated garden areas	Y	Y	Y
Schools, hospital buildings and care facilities and grounds	Y	Y	Y
Amenity areas where people congregate including parks and reserves,	Y	Y	Y
Community buildings and grounds, including places of worship and marae	Y	Y	Y
Natural wetlands and significant areas of indigenous vegetation and habitats of indigenous fauna as defined in the Regional Policy Statement for Northland 2016	Y	N	Y
Roofing for the collection of drinking water	N	N	Y

Appendix B: Paint Details

Product	Ratio	Compound	CAS Number	Max Percent by Weight (%)	VOC Content (g/L)	Percentage of Solids	Specific Gravity of Paint
Interthane White 990 Part A	6	2-methoxy-1-methylethyl acetate	108-65-6	3	420	57	1.242
		ethylbenzene	100-41-4	3			
		Titanium dioxide	13463-67-7	25			
		Petroleum naphtha	64742-95-6	25			
		Xylenes (o-, m-, p- isomers)	1330-20-7	25			
Interthane 990 Part B	1	Hexamethylene diisocyanate polymer	28182-81-2	75	420	57	1.242
		naphtha petroleum, light aromatic solvent	64742-95-6	50			
		Hexamethylene diisocyanate (monomer)	822-06-0	0.3			
INTERGARD 276 GREY PART A	4	Epoxy Resin	25068-38-6	25	420	57	1.242
		n-Butanol	71-36-3	25			
		Xylene	1330-20-7	25			
		Ethyl Benzene	100-41-4	2.5			
INTERGARD 276 GREY PART B	1	Polyamide amine resin	68915-18-4	50	446	47	0.97
		xylene	1330-20-7	50			
		butan-1-ol	71-36-3	25			
		ethylbenzene	100-41-4	10			
		3,6-diazaoctanethylenediamin	112-24-3	2.9			
		toluene	108-88-3	0.3			
Intershield Bronze Part A	2.5	Epoxy Resin	25036-25-3	50	386	60	1.37
		Xylene	1330-20-7	25			
		aromatic hydrocarbons, C9	128601-23-0	5			
		Ethyl benzene	100-41-4	5			
		n-Butanol	71-36-3	5			
		Solvent naphtha (petroleum), light arom.	64742-95-6	3			
Intershield Part B	1	Xylene	1330-20-7	50	386	60	0.96
		n-butanol	71-36-3	15			
		ethylbenzene	100-41-4	3			
		Ethanediamine	107-15-3	1			
Carbomastic 615 Part A	4	bisphenol A/ diglycidyl ether resin, liquid	25068-38-6	20	248	80	0.98
		naphtha petroleum, light aromatic solvent	64742-95-6	10			
		xylene	1330-20-7	10			
		n-butanol	71-36-3	1			
Carbomastic 615 Part B	1	META-XYLENE	108-38-3	25	172	80	0.98
		N-BUTANOL	71-36-3	10			
		TRIS-2,4,6-(DIMETHYLAMINOMETHYL)PHENOL	90-72-2	10			
		PARA-XYLENE	106-42-3	10			
		ETHYL BENZENE	100-41-4	10			
		ORTHO-XYLENE	95-47-6	10			
		ETHYLENEDIAMINE	107-15-3	1			
		TOLUENE	108-88-3	1			
Carboguard 636 XT Part A	4	bisphenol A/ diglycidyl ether resin, liquid	25085-99-8	40	224.39	81	0.98
		xylene	1330-20-7	10			
		naphtha petroleum, light aromatic solvent	64742-95-6	10			
		n-butanol	71-36-3	10			
Carboguard 636 Part B	1	xylene	1330-20-7	20	192.45	N/A	0.98
		cashew nut liquid/ formaldehyde/ ethylenediamine polymer	68413-28-5	80			
Carbothane 134 HG Part A	4	n-butyl acetate	123-86-4	10	366	70	1.329
		toluene	108-88-3	10			
		xylene	1330-20-7	10			
		silica crystalline - quartz	14808-60-7	20			
Carbothane 134 HG Part B	1	Hexamethylene diisocyanate polymer	28182-81-2	100	366	N/A	1.12
		N-BUTYL ACETATE	123-86-4	10			
		AROMATIC HYDROCARBON	64742-95-6	10			
		HEXAMETHYLENE DIISOCYANATE	822-06-0	1			
Sea~Barrier Altra NZ (Single Pack - no part A and B)	1	zinc oxide	1314-13-2	20	381	55	1.75
		xylene	1330-20-7	20			
		copper(I) oxide	1317-39-1	30			
		zineb	12122-67-7	5			
SeaHawk BioCop TF (Antifouling paint - 1 part paint - No Part A and B)	N/A	dicopper oxide	1317-39-1	50	377	80	1.8
		Solvent naphtha (petroleum), light arom.	64742-95-6	25			
		pyrithione zinc	13463-41-7	10			
		copper oxide	1317-38-0	10			
		zinc oxide	1314-13-2	10			
		ethylbenzene	100-41-4	1			
Interprime 450 Bronze (Primer)	2.5	bisphenol-A-(epichlorhydrin); epoxy resin	25068-38-6	60	386	60	1.23
		xylene	1330-20-7	15			
		Naphtha	8030-30-6	10			
		butan-1-ol	71-36-3	4.5			
		ethylbenzene	100-41-4	5			
Interprime 450 Bronze Part B	1	Reaction mass of ethylbenzene and xylene			386	N/A	1.23
		butan-1-ol	71-36-3	20			
		ethylenediamine	107-15-3	0.55			
Pioner White Topcoat (1 part paint)	N/A	hydrocarbons, C9, aromatics	64742-95-6	50	571	34	1.1
		titanium dioxide	13463-67-7	25			
		xylene	1330-20-7	25			
		2-methoxy-1-methylethyl acetate	108-65-6	5			
		ethylbenzene	100-41-4	5			

Appendix C: Short Term Guideline Values

Compound	Short-term Guideline	Source
1-Methoxy-2-propyl acetate	2700	TCEQ ESL
2,2'-[(1-methylethylidene)bis] [4,1-phenyleneoxymethylene]bis-oxirane, homopolymer	Must Meet NAAQS	TCEQ ESL
2,4,6-tris-(dimethylaminomethyl)phenol	420	TCEQ ESL
2-methoxy-1-methylethyl acetate	2700	TCEQ ESL
aromatic hydrocarbons, C9	No limit	
bisphenol A/ bisphenol A diglycidyl ether polymer	1000	TCEQ ESL
bisphenol A/ diglycidyl ether resin, liquid	No limit	
bisphenol-A-(epichlorhydrin); epoxy resin	No limit	
cashew nut liquid/ formaldehyde/ ethylenediamine polymer	No limit	
copper oxide	10	TCEQ ESL
copper(I) oxide	23	TCEQ ESL
dicopper oxide	23	TCEQ ESL
Epoxy Resin	No limit	
Ethanediamine	250	TCEQ ESL
Ethyl Benzene	26000	TCEQ ESL
ethylbenzene	26000	TCEQ ESL
Hexamethylene diisocyanate	0.3	OEHHA
Hexamethylene diisocyanate polymer	4.5	OEHHA
hydrocarbons, C9, aromatics	2450	TCEQ ESL
methyl isobutyl ketone	820	TCEQ ESL
Naphtha	4000	TCEQ ESL
naphtha petroleum, light aromatic solvent	2450	TCEQ ESL
n-Butanol	610	TCEQ ESL
n-butyl acetate	11000	TCEQ ESL
Petroleum naphtha	2450	TCEQ ESL
Polyamide amine resin	No limit	
pyrithione zinc	12	TCEQ ESL
silica crystalline - quartz	14	TCEQ ESL
Solvent naphtha (petroleum), light arom.	2450	TCEQ ESL
Titanium dioxide	50	TCEQ ESL
toluene	4500	TCEQ ESL
triethylenetetramine	60	TCEQ ESL
Xylenes (o-, m-, p- isomers)	2200	TCEQ ESL
zinc oxide	24	TCEQ ESL
zineb	No limit	

Appendix D: Modelled Terrain and Land Use

Figure 18: Modelled Terrain Elevations

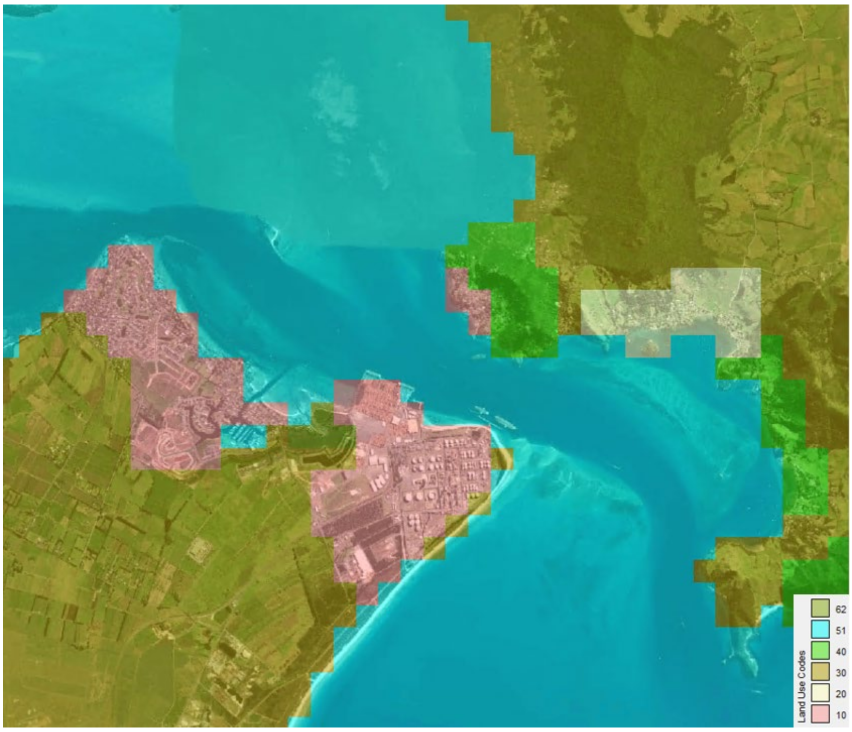

Figure 19: Modelled Land Use Types

Appendix E: Draft AQMP

Air Quality Management Plan – Northland Shipyard and Dry Dock Facility at Marsden Point, Whangārei Harbour

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Prepared for

Ministry of Business, Innovation and Employment

August 2026

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Quality Control Sheet

TITLE	Air Quality Management Plan – Northland Shipyard and Dry Dock Facility at Marsden Point, Whangārei Harbour
CLIENT	Ministry of Business, Innovation and Employment
ISSUE DATE	10 August 2026
JOB REFERENCE	A035660001

Revision History

REV	Date	Status/Purpose	Prepared By	Reviewed by	Approved
1	21/05/2026	DRAFT v1	Cameron Brown	Andrew Curtis	Andrew Curtis
2	04/06/2026	DRAFT v2	Cameron Brown	Shanon Lim	Andrew Curtis
3	14/07/2026	DRAFT v3	Cameron Brown	Andrew Curtis	Andrew Curtis
4	31/07/2026	DRAFT v4	Cameron Brown	Andrew Curtis	Andrew Curtis
5	10/08/2026	DRAFT v5	Cameron Brown	Andrew Curtis	Andrew Curtis

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Limitations:

This report has been prepared by Pattle Delamore Partners Limited (PDP) on the basis of information provided by Ministry of Business, Innovation and Employment and others. PDP has not independently verified the provided information and has relied upon it being accurate and sufficient for use by PDP in preparing the report. PDP accepts no responsibility for errors or omissions in, or the currency or sufficiency of, the provided information.

This report has been prepared by PDP on the specific instructions of Ministry of Business, Innovation and Employment for the limited purposes described in the report. PDP accepts no liability if the report is used for a different purpose or if it is used or relied on by any other person. Any such use or reliance will be solely at their own risk.

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Appendices

1.0 Introduction

This Air Quality Management Plan (AQMP) has been developed in accordance with Condition XX of the Northland Regional Council (NRC) consent XXXXXXX (the consent) by Pattle Delamore Partners Limited (PDP) on behalf of Ministry of Business, Innovation & Employment (MBIE).

1.1 Purpose

The purpose of this AQMP is to ensure that all discharges to air from the operation of the Shipyard and drydock facility at Marsden Point, Whangārei Harbour (the site) are kept to a practicable minimum and remain in compliance with all consent conditions.

To achieve this purpose, the AQMP provides a framework for the operations within the maintenance facility to:

- avoid or mitigate any adverse effects of discharges of dust and overspray generated from surface cleaning, profiling and coating activities;
- avoid or mitigate any adverse effects of discharges of odour generated from coating activities;
- promote proactive solutions to the control of dust and odour discharges from the site; and
- comply with the conditions of consent XXXXXX.

The structure and content of this AQMP incorporates guidance from both the Ministry for the Environment's (MfE's) Good Practice Guide for Managing Dust (GPG Dust) and Good Practice Guide for Managing Odour (GPG Odour).

A copy of this management plan shall be kept on site and will be available for use by site personnel at all times.

1.2 Environmental Performance Indicator

The key environmental performance indicator of this AQMP is that the site activities will not result in dust, overspray, or odour that is objectionable or causes an adverse effect beyond the boundary of the site.

1.3 Site Location and Receiving Environment

Figure 1 shows the general location of the site with receptors deemed to be representative of the receiving environment within 1.4 kilometres (km) plotted. Details of each identified receptor are summarised in Figure 1.

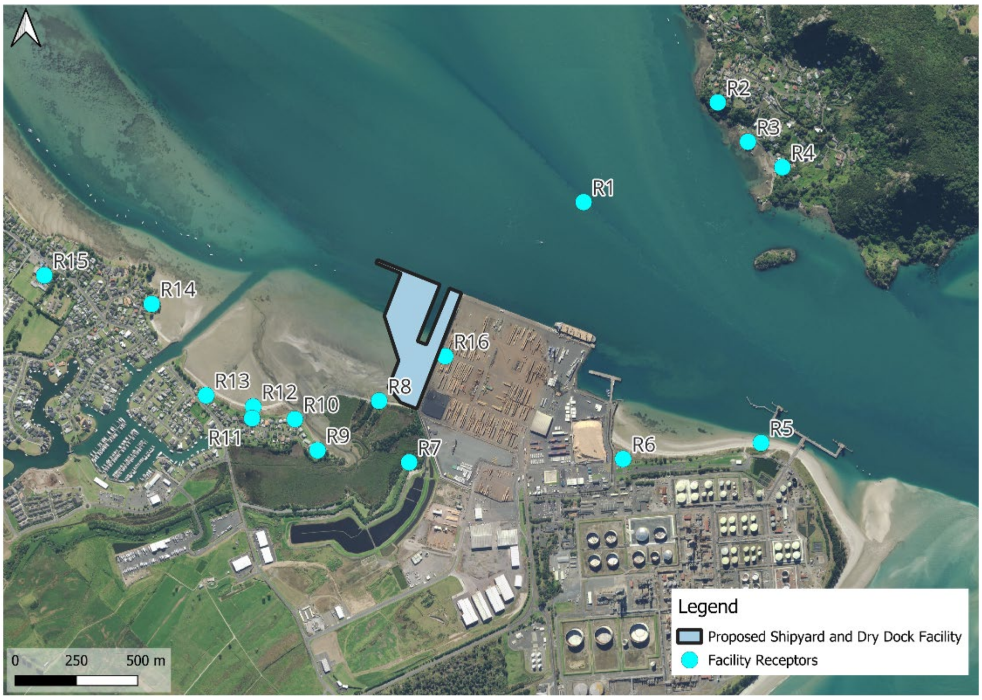

Figure 1: Nearby Receptors

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Table 1: Location of Receptors Close to the Shipyard and Dry Dock Site

Receptor Name	Address/Location	Receptor Type	Receptor Sensitivity	Closest Distance to the Proposed Site (m)	Direction Relative to Site
R1	Whangarei Harbour	Fishing/Recreation	Low	Adjacent	Northeast
R2	136 Reotahi Road	Residential	High	1,300	Northeast
R3	134 Reotahi Road	Residential	High	1,310	Northeast
R4	23 Beach Road	Residential	High	1,400	Northeast
R5	Beach East of Site	Public Space/Recreation	Moderate	1,100	East
R6	Car Park and Beach Access	Public Space/Recreation	Moderate	870	Southeast
R7	Blacksmith Creek Walkway	Public Space/Recreation	Moderate	200	South
R8	Beach West of Site and Wetlands	Public Space/ Recreation/CMA	Moderate	Adjacent	Southwest
R9	38 Albany Road	Residential	High	375	Southwest
R10	26 Albany Road	Residential	High	400	Southwest
R11	8 Albany Road	Residential	High	550	Southwest
R12	Marsden Bay Beach	Public Space/Recreation	Moderate	450	Southwest
R13	138 Marsden Bay Drive	Residential	High	725	Southwest
R14	56 One Tree Point Road	Residential	High	940	Southwest
R15	One Tree Point School	Kura/School	High	1,350	Southwest
R16	Northport	Industrial	Low	Adjacent	East

2.0 Process Overview

The proposed operation consists of two primary activities: preparation of the surface of the vessel and coating the surface.

2.1 Surface Preparation

Marine fouling and old coatings are removed from the surface. If the surface profile (roughness) is too smooth to hold the coating, the surface will be roughened using an abrasive blaster prior to coating.

Surface preparation will occur by:

- Hydro blasting, either high-pressure water blasting (HPWB) or ultra-high-pressure water jetting (UHPWJ);
- Wet abrasive blasting with wet media; or,
- In very rare occasions, dry abrasive blasting with dry media – encapsulated only.

2.2 Coating

Once surfaces have been prepared, the vessel will be coated to protect the metal surfaces while at sea. Each vessel may have different requirements, but generally, surfaces will require a mix of primers, intermediate coats, and topcoats.

Coatings may be applied by hand (brush or roller) or via a spray gun.

3.0 Emission Sources

There are three classes of air contaminants discharged from site activities:

- Dust and coating overspray:

The most significant potential adverse effects of the discharge of these contaminants will be on amenity values which may be affected by deposited dust, deposited coating particles and/or potentially visible dust plumes.

- Odour:

Spray coating is the key source of odour. The coatings used in spray coating contain solvents which thin the coating so it can be applied using spray equipment. Solvents evaporate from the coating once it has been applied to the surface. Xylene and toluene are the most common solvents present in marine coatings. The solvent content of the coating typically ranges between 10% and 50%.

- Hazardous air pollutants:

The activities undertaken have the potential to discharge fine particles, di-isocyanates and volatile organic compounds (VOCs) such as xylene and toluene.

With any dry abrasive blasting being encapsulated, there are limited sources of fine particulate matter.

VOCs are discharged from the coating as it dries. Xylene is the most common VOC in the coatings expected to be used in the facility.

4.0 High Risk Meteorological Conditions

High risk meteorological conditions for **dust and overspray** are higher windspeeds where particles are able to be picked up and transported further from the site.

- Low Dust Risk: Wind speed < 5 m/s or 9.7 knots.
- Medium Dust Risk: Wind speed = 5 to 7.5 m/s or 9.7 to 14.5 knots.
- High Dust Risk: Wind speed > 7.5 m/s or 14.5 knots.

High risk meteorological conditions for **odour effects** are lower windspeeds where dispersion is poorer, and odours are likely to linger instead of being rapidly dispersed. The threshold used for this site is windspeeds below 3 m/s.

- High Odour Risk: Wind speed < 3 m/s or 5.8 knots.
- Low Odour Risk: Wind speed > 3 m/s or 5.8 knots.

5.0 Mitigation Measures

This section sets out the mitigation measures to be adopted to control discharges to air.

5.1 Contaminated Paint Controls

Table 2 contains controls for managing the effects of contaminated paints. Each tier corresponds with an action that will be implemented if further mitigation is required.

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Table 2: Contaminated Paint Controls

Tier	Action	Description
T1	Review paint history	Prior to blasting, review paint history. Identify if **tri-butyl tin (TBT)**, **lead** or **mercury** containing products are included in the paint history.
T1	Testing	If no history, or there is a possibility of these contaminants in paint, undertake testing: - Patch testing (screening); and/or - Laboratory analysis.
T2	Blasting	Coatings containing lead, TBT, or mercury shall be vacuum blasted using filtration removing at least 99.9% of mass by particulate matter from the discharge, prior to discharge into air.

5.2 Abrasive Blasting

The following types of abrasive blasting may occur at the Site:

- HPWB or UHPWJ: The majority of surface preparation is undertaken using HPWB or UHPWJ which will result in emissions of paint flecks, metal particles, salt and marine deposit which will be encapsulated in water droplets which are heavy and are unlikely to travel far beyond the work area if not contained.
- Wet abrasive blasting: Occasionally, wet abrasive blasting (using garnet) will be used.
- Dry blasting: In the rare occasions dry blasting is to be undertaken, the area that will be blasted should have scaffolding placed around it and wrapped. This will encapsulate any emissions from this activity.

Table 3 contains controls for managing the effects of surface preparation, noting dry abrasive blasting has been excluded from these controls due to these activities being encapsulated if the need for use arises.

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Table 3: Surface Preparation Controls		
Tier	**Action**	**Description**
T1	Lower Risk Methods	Prefer water blasting or wet abrasive blasting over dry abrasive blasting where practicable.
T1	Regular monitoring	Monitor windspeed (visually and on phone) to ensure site limits not exceeded and gauge risk of transport of dust beyond site boundary. Automated notifications will be sent based on readings from the site's met station. Make regular visual checks to see if dust is at risk of leaving the site, adjust controls as necessary.
T1	Site Tidiness	Regular site clean-up to remove dust from surfaces.
T1	Operation	Angle abrasive blasters downwards.
T1	Media	Only garnet media used if needed.
T2	Vacuum Blasting	Use blasters fitted with vacuum heads for flat areas, attached to a sucker truck.
T2	Barriers	If emissions are observed as excessive, use wrapped scaffolding to contain emissions from abrasive blasting of the superstructure.

5.3 Surface Coating

Surface coating within the site has the potential to generate particulate and VOC emissions. Table 4 and Table 5 contains tiered controls for managing the effects of coating.

In addition to Table 4, <u>any coating containing the following compounds</u> will <u>only be hand-coated</u> (i.e. by brush or roller) to eliminate the potential for high concentration levels from overspray:

- <u>Copper oxide (CAS: 1317-38-0);</u>
- <u>Copper(I) oxide (CAS: 1317-39-1);</u>
- <u>Pyrithione zinc (CAS: 13463-41-7);</u>
- <u>Silica crystalline – Quartz (CAS: 14808-60-7);</u>
- <u>Titanium dioxide (CAS: 13463-67-7); and,</u>
- <u>Zinc oxide (CAS: 1314-13-2).</u>

Alternatively, coatings containing the six compounds identified above can be sprayed provided the vessel is encapsulated and air from the encapsulation is appropriately treated before being discharged.

For any coatings containing Hexamethylene diisocyanate (monomer) (CAS: 822-06-0), encapsulation is required, with an extractor and a two-stage filter, to prevent the discharge of this pollutant to the atmosphere.

Table 4: Surface Coating Controls

Tier	Action	Description
T1	Lower Risk Methods	Prefer brush and hand rolling over spray coating where practicable.
T1	Regular monitoring	Monitor windspeed (visually and on phone) to ensure wind conditions are favourable and gauge risk of transport of overspray beyond site boundary. Automated notifications will be sent based on readings from the site's met station. Make regular observations of site, look to see if overspray is at risk of leaving site boundary, adjust controls as necessary.
T1	Operation	Narrow items (handrails) which have a high potential for overspray are hand coated. Spray guns are not fired in an upwards direction (above 90°)
T1	Coating Application Rates	Monitor cumulative coating application rate across all entities working on a vessel. Ensure cumulative application rate doesn't exceed consent limits (60 L/hr).
T3	**Physical Screening, Encapsulation or Cessation**	**If T1 measures are not controlling particulate deposition, coating works are to be physically screened, encapsulated or ceased.**

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Table 5 contains controls for managing the effects of odour from spray coating.

Table 5: Spray Coating Controls – Odour

Tier	Action	Description
T1	Regular monitoring	Make regular observations of site to see if odour is at risk of leaving site boundary, adjust controls as necessary.
T2	Reduce Rates	If significant odour detected at sensitive receptors, reduce coating application rates until wind direction shifts away from sensitive receptors.
T3	**Encapsulation or Cessation**	**Coating to be encapsulated or ceased if persistent odour detected at downwind sensitive receptors.**

6.0 Roles and Responsibilities

6.1 MBIE and Operator

MBIE, as the consent holder, has the general responsibility to implement all consent conditions and manage the site in accordance with this AQMP. As MBIE does not operate the site, the day-to-day management of the site is the responsibility of the Operator.

6.2 Site Manager

A nominated **Site Manager** will have the day-to-day responsibility for the implementation of the AQMP and for all Site operations. This responsibility includes ensuring that all contractors operating on Site are familiar with the requirements of this document and are undertaking their activities in accordance with their requirements. The **Site Manager** will have the following responsibilities in respect of the management of air emissions.

They shall ensure:

- That the conditions of all relevant resource consents are complied with at all times;
- That the air discharge control and mitigation measures and procedures outlined in the AQMP are implemented effectively;
- That there are adequate personnel and equipment on site at all times to enable the prescribed air discharge controls;
- That the meteorological and dust monitoring programmes are carried out as required, including recording of daily observations;
- That any complaints received are investigated and resolved as far as practicable;

- That all records are kept and are available to the relevant regulatory authorities; and,
- That all personnel working on the project understand the requirements of the consent conditions and AQMP.

All personnel working on the Project have responsibility for following the requirements of the air discharge consent conditions and the AQMP and reporting to the Site Manager on these issues.

6.3 Contractors

Contractors will from time to time work on the site. They must have an understanding of consent conditions and this AQMP, as well as all other Management Plans relevant to the operation of the Site.

7.0 Staff Training

Successful dust and odour management depends on appropriate actions by site personnel in day-to-day operations of the site. Training for all staff will be undertaken as part of the site induction programme. The environmental induction will include the following information specific to this AQMP:

- Information about the activities that may cause discharges within the site with the potential to impact neighbouring areas;
- Consent requirements;
- Dust and overspray mitigation procedures;
- Description of dust and meteorological monitoring for the site; and
- Complaints management procedures.

Staff training records will be maintained on site. The records will include:

- Who was trained;
- When the person was trained; and
- General description of training content and whether follow up/refresher training is required, and when.

8.0 Monitoring

Visual and instrumental monitoring of dust and overspray will be undertaken during the operation of the site to assess the level of dust and overspray emissions on the site and beyond its boundary.

8.1 Visual Dust Monitoring

The visual dust monitoring will include the activities undertaken at the frequency described in Table 6.

Table 6: Visual Dust Monitoring

Monitoring Activity	Frequency
Check weather forecasts for strong winds and rainfall to plan appropriate activities and dust management response.	Daily
Inspect the site, access roads and adjoining roads for the presence of dust deposition.	Twice daily
Observe weather conditions including wind and rain via observations and data inputs from the site weather stations.	Daily and as conditions change
Inspect all exposed surfaces for dampness and to ensure that the exposed un-stabilised area is minimised.	Daily and as conditions change
Observe vehicle movements to ensure dust generated is kept to a minimum.	Daily and as conditions change
Monitor dust generating activities to ensure dust emissions are effectively controlled.	Daily and as new activities commence
Inspect watering systems (water carts and any other spray systems) to ensure equipment is maintained and functioning to effectively dampen exposed areas.	Weekly

The **Site Manager** or delegate shall undertake a site walkover and visual dust monitoring at least once per day, to assess the overall effectiveness of the AQMP and assess compliance with the requirements of the resource consent conditions.

Site observations will be recorded in a daily log form, an example of which is provided as Appendix A. The daily log forms will be kept for at least 5 years.

Recording relevant inspection results, as well as the conditions of external and internal factors on the log forms, will help to assess if control measures are effective and to define appropriate corrective or preventative actions in case any adverse effects occur.

8.2 Instrumental Dust Monitoring

Three portable real-time TSP monitors are used to provide responsive monitoring of dust generated. The monitors are to be deployed near the site boundary. One is to be located upwind of works, with the other two downwind of active work areas. This monitoring is connected to a data telemetry system capable of sending email alerts when the parameters in Table 9 are exceeded. This is to enable fast identification of elevated dust levels and supports quick implementation of additional dust management measures.

Installation of three units provides redundancy and flexibility, allowing simultaneous coverage of different activity areas or receptors as site operations change while still having one upwind of the activities.

8.3 Instrumental Wind Monitoring

One real-time wind sensor is located on the site at a height of between 5 to 10 m. This wind sensor is connected to a telemetry system which is capable of sending email and/or text alerts and a cloud-based system for remote storage, viewing, and download of data.

8.3.1 Particulates

Table 7 sets out the alerts that will be adopted to inform site staff of the particulate risk conditions.

Table 7: Particulate Risk Wind Alerts

Tier	Alert Type	10-min Average Wind Speed	Actions
Low-Risk	No alert	< 5 m/s	No additional action required. Continue to implement routine particulate controls and checks.
Medium-risk	Email alert	5 to 7.5 m/s	Check particulate mitigation measures are operating effectively. Check downwind TSP concentrations from real-time monitor and implement additional mitigation if required.
High-risk	Email alert	> 7.5 m/s	In addition to medium-risk actions, cease particulate generating activities if winds are blowing towards residential receptors identified in Table 1.

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8.3.2 Odour

Odour monitoring is based on wind risk conditions (as recorded by the on-site weather station discussed in Section 8.3) and if required, field observations from site staff. Table 8 details the odour risk conditions and the actions required for each risk category.

Table 8: Odour Wind Alerts

Odour Risk	Alert Type	10-min Average Wind Speed	Actions
Low-Risk	No alert	> 3 m/s	No additional action required. Undertake general site odour monitoring and alert the Site Manager if significant odours are observed near the southern or southwestern boundary of the site.
High-risk	Email alert	Calm to 3 m/s and winds blowing from North to Northeast	Where possible, avoid non-encapsulated coating. If non-encapsulated coating is to occur, one staff member is to undertake odour observations downwind on the boundary. If odours of a strong intensity (4) are observed, confirm this observation with another staff member and cease coating. See Appendix B for Odour Intensity Scale

8.4 Monitoring Trigger Levels

Three real-time portable TSP monitors are used on site of particulate discharging activities. Each of these are to be connected to a telemetry system which sends out alerts to the **Site Manager** or delegate. The alerts align with those recommended by the MfE GPG Dust are correlated with the tier levels as found in Table 9. Each tier corresponds with an action that will be implemented once the trigger is exceeded.

Table 9: Instrumental Monitoring Trigger Levels

Tier	1-hour Average TSP Concentration (µg/m³)	Level Type	Action
T1	150	Warning	Check wind direction visually and via telemetry system from on-site sensor. Identify likely source of trigger and apply mitigation to found source if on-site.
T2	200	Action	In addition to T1 action – reduce works that are causing particulate discharges.
T3	**250**	**Cessation**	**Cease all particulate discharging works.**

8.5 Reporting of Monitoring Programme

The following information will be recorded in a daily log or equivalent system (an example of the type of detail that may comprise the daily log is provided in Appendix A of this AQMP):

- Results of the daily site inspections of visible dust emissions;
- Likely source(s) of any observations of dust;
- Weather conditions during the day (i.e., windy, calm, warm, rain etc.);
- Volumes of coatings and garnet media used;
- Equipment malfunctions and any remedial action(s) taken;
- Any unusual on-site activities; and
- Records of any complaints or other community feedback.

The log forms will be collated and stored on site and will be made available to NRC staff as required by consent conditions.

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9.0 AQMP Review

This AQMP will be reviewed by a suitably qualified and experienced expert once per year. Any recommended updates to the AQMP will be provided to NRC for recertification.

The review will take into consideration:

- Any significant changes to dust management activities or methods;
- Key changes to roles and responsibilities;
- Changes in industry best practice standards or recommended dust controls;
- Results of inspection and maintenance programmes, logs of incidents, corrective actions, internal or external assessments.
- The outcome of investigations into complaints, discharges of dust or other air pollutants; and
- The outcomes of resource consent compliance audits.

Reasons for making changes to the AQMP will be documented. A copy of the original AQMP document and subsequent versions will be kept for the project records and marked as obsolete. Each new/updated version of the AQMP documentation will be issued with a version number and date.

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10.0 Instrumental Monitoring Maintenance, Servicing, and Calibration

In the event that an issue with any of the instrumental monitors or weather station arises, the **Site Manager** or delegate will contact the **Dust and Weather Monitor Maintenance and Service Provider** to arrange repair/remediation of the monitor(s) to minimise data loss.

Calibrations on all instrumental TSP monitors and the weather station are undertaken by the **Dust and Weather Monitor Maintenance and Service Provider** at the frequency recommended in the manufacturer's instructions.

11.0 Complaints

11.1 Receipt Procedure

It is important to ensure that any complaints are recorded and promptly investigated to identify and resolve the cause of the complaint. Requirements and procedures for complaints are detailed below.

The **Site Manager** is responsible for responding to and following up all complaints regarding dust, overspray or odour, and to ensure that suitable trained personnel are available to respond to complaints at all times.

Actions to be taken as soon as possible, following the receipt of a complaint, by the **Site Manager** include:

- Undertake a site inspection. Note activities taking place and the mitigation methods being used, take photographs for reference as appropriate. If the complaint was related to an event in the recent past, where possible, note any activities taking place at that time;
- Initiate any remedial action necessary, which may include a stop work period;
- Note the time and date of the complaint/s and (unless the complainant refuses to provide them) the identity and contact details of the complainant. Ask the complainant to describe the discharge:
  - Is it constant or intermittent?
  - How long has it been going on for?
  - Is it worse at any time of day?
  - Does it come from an identifiable source?
- Meteorological and dust data from the on-site station shall be downloaded;
- Note if the complaint has been referred to the NRC;
- As soon as possible (within 1 hour, where practicable), visit the area from where the complaint originated to ascertain if dust/odour is still a problem;
- If it becomes apparent that there may be a source of dust/odour other than from the facility, it is important to verify this. Photograph the source and emissions;
- As soon as possible after initial investigations have been completed, contact the complainant to explain any problems found and remedial actions taken. Initiate a damage assessment if required; and
- If necessary, update any relevant procedures to prevent any recurrence of problems and record any remedial action taken.

11.2 Response Procedure

Following the receipt of the complaint, the following actions will be undertaken:

- Complete the appropriate complaint form. Example forms are attached as Appendices C and D;
- Advise the Site Manager and the NRC within 48 hours that a complaint has been received, what the findings of the investigation were, and any remedial action taken;

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- Advise site personnel as soon as is practicable that a complaint has been received, what the findings of the investigation were, and any remedial action taken; and,
- Call or visit the complainant to update them on the actions taken and to check that the issue has been resolved.

12.0 Contact Details

Internal contacts for the site in the event of an emergency are provided in Table 10 and Table 11 below.

Table 10: Internal Environmental Emergency Contact Details

Role	Name	Organisation	Phone	Email
Site Manager	TBC	TBC	TBC	TBC

Table 11: External Contact Details

Role	Name	Organisation	Phone	Email
Consents Compliance Team	TBC	Northland Regional Council	TBC	TBC
Dust and Weather Monitor Service and Maintenance	TBC	TBC	TBC	TBC

13.0 References

Ministry for the Environment. (2016). *Good Practice Guide for Assessing and Managing Odour*. Available at www.mfe.govt.nz.

Ministry for the Environment. (2016). *Good Practice Guide for Assessing and Managing Dust*. Available at www.mfe.govt.nz.

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Appendix A: Daily Log Form

Toolbox Talk	
Item	**Comments**
Scope of work for the day. Identify dust or odour generating tasks.	*Details:*
What is the current and forecast wind speed? Are high risk conditions occurring or forecast for dust and overspray? What mitigation measures are proposed? *3 m/s = 5.8 knots* *5 m/s = 9.7 knots* *7.5 m/s = 14.5 knots* *10 m/s = 19.4 knots.*	*Tick all that apply:* <5 m/s ☐ | am ☐ pm ☐ 5 to 7.5 m/s ☐ | am ☐ pm ☐ >7.5 m/s ☐ | am ☐ pm ☐ >10 m/s ☐ | am ☐ pm ☐ *Mitigation measures:*
What is the current and forecast wind direction (**blowing from**)? Orange highlighted boxes are higher risk.	*Tick all that apply:* S ☐ SW ☐ W ☐ NW ☐ N ☐ NE ☐ E ☐ SE ☐
What is the current condition of the site?	Clean ☐ Needs a Clean ☐
Are there other operators on the same vessel?	Y ☐ N ☐ N/A ☐ *Method of control of application rates:*

Toolbox Talk	
Item	**Comments**
How will coating application rates be controlled for compliance with consent conditions?	
Daily Observations	
Are there any signs of dust or overspray going beyond the site boundary as a result of site activities?	Y ☐ N ☐ N/A ☐ *Details:*
Were additional inspections, restrictions or mitigation measures implemented as a result of site observations?	Y ☐ N ☐ N/A ☐ *Details:*
Note any control equipment malfunctions (and remedial actions taken as appropriate).	*Details:*
Note any unusual on-site activities today.	*Details:*
Note any complaints received or community feedback.	*Details:*
Coatings Used	*Type, volume:*
Garnet Used	*Volume:*

Appendix B: Odour Intensity Scale

Scale of Odour Intensity		
No.	**Intensity Level**	**Description**
0	No odour	No odour.
1	Very weak	Odour is difficult to smell and there is doubt as the whether the odour is actually present. The character cannot be discerned.
2	Weak	An odour is discernible, and the observer is just able to define its character.
3	Distinct	The odour is present, and the character/source of the odour is easily apparent to the assessor.
4	Strong	The odour has a strong intensity but is not at the point which causes discomfort to the assessor.
5	Very strong	The odour is sufficiently strong enough for you to consider leaving the area to avoid exposure, however it is at a level in which the assessor can stay for a period.
6	Extremely strong	The odour is exceptionally strong and may make you feel nauseous or require you to leave the area immediately. Observer experiences clear relief when distanced from the odour.

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Appendix C: Dust Complaints Records

DUST COMPLAINT & ASSESSMENT FORM

PART A: Complaint Details

Date: Time:

Complaint Received By:

Name:

Address:

Contact phone numbers:

Possible source:

Anonymous: Y/N

Is dust occurring now?

Complaint details (include impacts/effects experienced by complainant:

PART B: Complainant Location Assessment

Date: Time:

Assessors Name:

Person spoken to at complaint location:

Reason for investigation: COMPLAINT/PROACTIVE

Complaint details (include impacts/effects experienced by complainant:

INITIAL IMPRESSIONS:

Type of dust

Time of the intial impression:

Any visible dust deposits: Y/N

Plume width (if known):

VISIBLE DUST DEPOSITS

Describe approximate quantites and extent

When was surface last cleaned?

Frequency of cleaning:

Describe the appearance of the deposits:

Colour

Any odour

Shape

Water soluble

Size

Other

Crystalline or powdery

Hard, soft

Weather Data (see over)

Wind direction:
Wind velocity:
Cloud cover:
Temperature:
Rainfall in past 24 hrs:

Photos Taken: Y/N

Samples taken Y/N

Diagram/description of where photos were taken.

Diagram/description of where samples were taken:

Sample collection: Use a small paintbrush (clean) to sweep samples of the dust onto a sheet of paper and then into a clean plastic bag. At least half a teaspoonful will be required for analysis. Lesser amounts may be colected on strips of clear cellotape, which should then be stuck onto sheets of clear plastic to preserve the samples. Label all samples and record date, time, location, etc on a separate sheet of paper if required.

DRAFT

Based on your assessment on this occasion, which of the following applies:

- [ ] I did not find any dust
- [ ] I did find dust and consider it would not be objectionable at any location for any duration or frequency
- [ ] I did find dust and consider it would be objectionable if it became continuous
- [ ] I did find dust and consider it would be objectionable if it occurred on a regular or frequent basis
- [ ] I did detect dust and consider it to be objectionable even in periods of short duration.

FINAL CHECKLIST

- [ ] Upwind assessment completed. Record details below. If not, detail reason: ______
- [ ] Aerial photo/sketch showing location of assessment and upwind assessment attached
- [ ] Are there potential witness statements to obtain YES/NO

REMARKS

PART C: Off-site dust and 360° assessment

Assess the dust upwind of the suspected source and if possible conduct a 360° sweep around the source assessing the odour at different points

OTHER POTENTIAL SOURCES **Time:** ______

Check for road works, ploughing, construction activities, burn-offs, unsealed roads, unsealed sites

Site 1:
Wind direction: Wind strength: Wind stability: GPS Loc:
Visible dust: Desciption of dust
Comment:

Site 2:
Wind direction: Wind strength: Wind stability: GPS Loc:
Visible dust: Desciption of dust:
Comment:

Site 3:
Wind direction: Wind strength: Wind stability: GPS Loc:
Visible dust: Description of dust:
Comment:

Diagram of Suspected source, dust assessment sites and dust plume:

N

COMMENTS

PART D: Source On-site Investigation

If source of dust identified, visit site, identify yourself and show warrant. Explain the findings of your investigation to staff.

Date: Time: Source Identified:

Staff spoken to:: Position:

Staff contact phone number:

Current site operations:

Reason/explanation given for dust

Other Comments

Monitoring results/samples/other records

D R A F T

Site Sketch (If Required)

N

SIGNED BY ASSESSOR ____________________ DATE: ____________

PART E: Dust Reference Sheet

Definitions

Objectionable The term objectionable is the term used in consent conditions and is an ingredient of any subsequent enforcement action. It is a subjective term and is open to interpretation. There is guidance from case law which defines objectionable as: unpleasant or offensive or repugnant; open to objection or undesirable or disapproved of; noxious or dangerous. A test will be applied by the court that the term objectionable will be as it applies to "the minds of a significant cross section of reasonable people in the community". The assessor must bear this test in mind when completing their assessment.

Frequency How often an individual is exposed to dust nuisance events

Intensity As indicated by dust quantity/concentration and the degree of nuisance

Duration The length of the particular dust event

Character How objectionable the dust is, having regard to the nature of the dust

Land Beaufort Wind Scale

B. No.	Description	How to Recognise
0	Calm	Smoke rises straight up
1	Light Air	Smoke drifts
2	Light Breeze	Wind felt on face; leaves rustle
3	Gentle Breeze	Flags flap; twigs move all the time
4	Moderate Breeze	Papers blow; small branches move
5	Fresh Breeze	Small trees sway
6	Strong Breeze	Large branches move, wind whistles
7	Near Gale	Whole trees sway

Measuring Temperature

Use descriptions below or obtain local meterological data, especially temperature from websites such as www.metservice.govt.nz

Cold
Cool
Mild
Warm
Hot

Measuring Cloud Cover

Okta No.	Description
0	Clear Sky
1	Sunny
2	Mostly sunny
3	
4	Half the sky is covered in cloud
5	
6	Mostly cloudy
7	Considerable cloudiness
8	Overcast
F	Fog / Mist

During the day the sun is always shining, so the amount of sunshine reaching the ground depends on the amount and duration of any cloud cover. The amount of cloud cover is usually given in units called oktas. Each okta represents one eighth of the sky covered by cloud.

Appendix D: Odour Complaints Records

DRAFT

ODOUR COMPLAINT & ASSESSMENT FORM

PART A: Complaint Details

Date: Time:

Complaint Received By:

Name:

Address:

Contact phone numbers:

Possible source:

Anonymous: Y/N

Is odour occurring now?

Complaint details (include impacts/effects experienced by complainant:

PART B: Complainant Location Assessment

Date: Time:

Assessors Name:

Person spoken to at complaint location:

Reason for investigation: COMPLAINT/PROACTIVE

Complaint details (include impacts/effects experienced by complainant:

INITIAL IMPRESSIONS:

Time of the intial impression:

Initial odour intensity:

Character:

Initial general hedonic tone:

Plume width (if known):

Odour samples every ten seconds. The time between the ten seconds is disregarded (interval method). Breathe normally rather than sniffing.

		Intensity	Character/notes
1st min	0		
	10		
	20		
	30		
	40		
	50		
2nd min	0		
	10		
	20		
	30		
	40		
	50		
3rd min	0		
	10		
	20		
	30		
	40		
	50		
4th min	0		
	10		
	20		
	30		
	40		
	50		
5th min	0		
	10		
	20		
	30		
	40		
	50		

		Intensity	Character/notes
6th min	0		
	10		
	20		
	30		
	40		
	50		
7th min	0		
	10		
	20		
	30		
	40		
	50		
8th min	0		
	10		
	20		
	30		
	40		
	50		
9th min	0		
	10		
	20		
	30		
	40		
	50		
10th mi	0		
	10		
	20		
	30		
	40		
	50		

Start time:

Weather Data (Part C)

Wind direction:
Wind velocity:
Cloud cover:
Precipitation:
Temperature:

General Hedonic Tone

Record at the end of the survey as an overall impression

Based on your assessment on this occasion, which of the following applies:

- ☐ I did detect odour and consider it would not be objectionable at any location for any duration or frequency
- ☐ I did detect odour and consider it would be objectionable, if it became continuous
- ☐ I did detect odour and consider it would be objectionable if it occurred on a regular or frequent basis
- ☐ I did detect odour and consider it to be objectionable even in periods of short duration.

FINAL CHECKLIST

- ☐ Upwind assessment completed. Record details below. If not, detail reason:
- ☐ Aerial photo/sketch showing location of assessment and upwind assessment attached
- ☐ Are there potential witness statements to obtain YES/NO

REMARKS

PART C: Off-site odour plume and 360° assessment

Assess the odour upwind of the suspected source and if possible conduct a 360° sweep around the source assessing the odour at different points

Site 1:
Wind direction: Wind strength: Wind stability: GPS Loc:
Odour intensity: Odour character:
Comment:

Site 2:
Wind direction: Wind strength: Wind stability: GPS Loc:
Odour intensity: Odour character:
Comment:

Site 3:
Wind direction: Wind strength: Wind stability: GPS Loc:
Odour intensity: Odour character:
Comment:

Site 4:
Wind direction: Wind strength: Wind stability: GPS Loc:
Odour intensity: Odour character:
Comment:

Site 5:
Wind direction: Wind strength: Wind stability: GPS Loc:
Odour intensity: Odour character:
Comment:

Site 6:
Wind direction: Wind strength: Wind stability: GPS Loc:
Odour intensity: Odour character:
Comment:

OTHER POTENTIAL SOURCES: Note any other potential sources and any odour include character, intensity, hedonic tone

Diagram of Suspected source, odour assessment sites and odour plume:

N

PART D: Source On-site Investigation

If source of odour identified, visit site, identify yourself and show warrant. Explain the findings of your investigation to staff.

Date: Time:

Source Identified:

Staff spoken to::

Position:

Staff contact phone number:

Current site operations:

Reason/explanation given for odour

Other Comments

Monitoring results/samples/other records

Site Sketch (If Required)

N

D R A F T

PART E: Odour Reference Sheet

Definitions

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Intensity The strength of the odour (e.g. 3 'distinct')

Character What the odour smells like - describe the smell (e.g. fishy)

Hedonic Tone The degree to which an odour is perceived as pleasant or unpleasant (e.g.-4 'extremely unpleasant')

Scale of Intensity

6	Extremely Strong
5	Very strong
4	Strong
3	Distinct
2	Weak
1	Very weak
0	No odour

General Hedonic Tone

-4	Extremely unpleasant
-3	
-2	
-1	
0	Neutral
1	
2	
3	
4	Extremely pleasant

Measuring Temperature

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Mild
Warm
Hot

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During the day the sun is always shining, so the amount of sunshine reaching the ground depends on the amount and duration of any cloud cover. The amount of cloud cover is usually given in units called oktas. Each okta represents one eighth of the sky covered by cloud.

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5	Fresh Breeze	Small trees sway
6	Strong Breeze	Large branches move, wind whistles
7	Near Gale	Whole trees sway

Odour character descriptors

Code	Descriptor
1	Fragrant
2	Perfumy
3	Sweet
4	Fruity
5	Bakery (fresh bread)
6	Coffee-like
7	Spicy
8	Meaty (cooked)
9	Sea/marine
10	Herbal, green, cut grass
11	Bark-like
12	Woody, resinous
13	Medicinal
14	Burnt, smoky
15	Soapy
16	Garlic, onion
17	Cooked vegetables
18	Chemical
19	Etherish, anaesthetic
20	Sour, acrid, vinegar

Odour character descriptors

Code	Descriptor
21	Like blood, raw meat
22	Rubbish
23	Compost
24	Silage
25	Sickening
26	Musty, earthy, mouldy
27	Sharp, pungent, acid
28	Metallic
29	Tar-like
30	Oily, fatty
31	Like gasoline, solvent
32	Fishy
33	Putrid, foul, decayed
34	Paint-like
35	Rancid
36	Sulphur smelling
37	Dead animal
38	Faecal (like manure)
39	Sewer odour
40	Other – please describe