PROPOSED SOIL WASHING PLANT

890 Taylors Road, Dandenong South

Air Quality and Odour Assessment

Ricardo Energy Environment and Planning

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APPENDICES

1. INTRODUCTION

1.1 Scope and Background

Trinity Consultants Australia (Trinity) was commissioned by Ricardo Energy Environment and Planning to provide an air quality and odour impact assessment of the proposed contaminated soil stockpiling and treatment facility at 890 Taylors Road, Dandenong South.

A private landfill and soil treatment plant currently operated on the subject site. The proposal is to use part of the site to receive contaminated soils (Category C) and to extend the soil treatment plant to include soil washing operations.

The study has been undertaken to assess the potential air quality and odour impacts of the proposed facility on surrounding sensitive receptors to support a planning application to meet the requirements of Victoria Environment Protection Authority (EPA Victoria). The assessment has been completed in accordance with the requirements of EPA Victoria as outlined in the following policies and guidelines:

- Environment Protection Regulations, EPA Victoria, 2021
- 1961: Guideline For Assessing and Minimising Air Pollution, EPA Victoria, 2022
- 1883: Guidance for assessing odour (draft), EPA Victoria, 2022

To aid in the understanding of the terms in this report, a glossary is included in **Appendix A**.

1.2 Tasks Undertaken

The following tasks have been undertaken for the assessment:

- Obtain details of the proposed development from the client, including site layout and operational procedures for running the facility.
- Identify air, dust and odour emission sources for consideration in the assessment.
- Request relevant local meteorological data for the nearest Bureau of Meteorology station.
- Derive emission rates for existing operations and the proposed facility based on operational data.
- Undertake a qualitative assessment of impacts according to EPA Victoria publications 1961 and 1883 based on a range of factors including the derived emission rates, proposed emission controls, separation distances and prevailing meteorology.

2. SITE LOCATION

The subject site is located at 890 Taylors Road, Dandenong South (Lot 1 on PS607356). The soil washing facility and stockpiling is proposed to be located in the south-western portion of the lot. According to the Greater Dandenong Council Planning Scheme, the site is located in an Industrial 1 Zone (IN1Z), which extends to the north, east, south and west of the site.

The site (Lot 1 on PS607356) generally consists of an engineered landfill licensed to receive a broad range of prescribed industrial waste, and a soil processing facility. The following uses surround the proposed development (refer **Figure 2.1**):

- Industrial premises to the north, west, south and east.
- Mostly single storey residential dwellings to the far east.

The nearest sensitive receivers to the proposed operations are located approximately 1500 m to the east residential houses in a General Residential Zone (GRZ1). An isolated residential dwelling (located in an industrial zone) also exists 250 metres west of the site.

Figure 2.1 and **Figure 2.2** presents the site location and surrounding land uses.

Figure 2.1: Site Location and Nearest Sensitive Locations

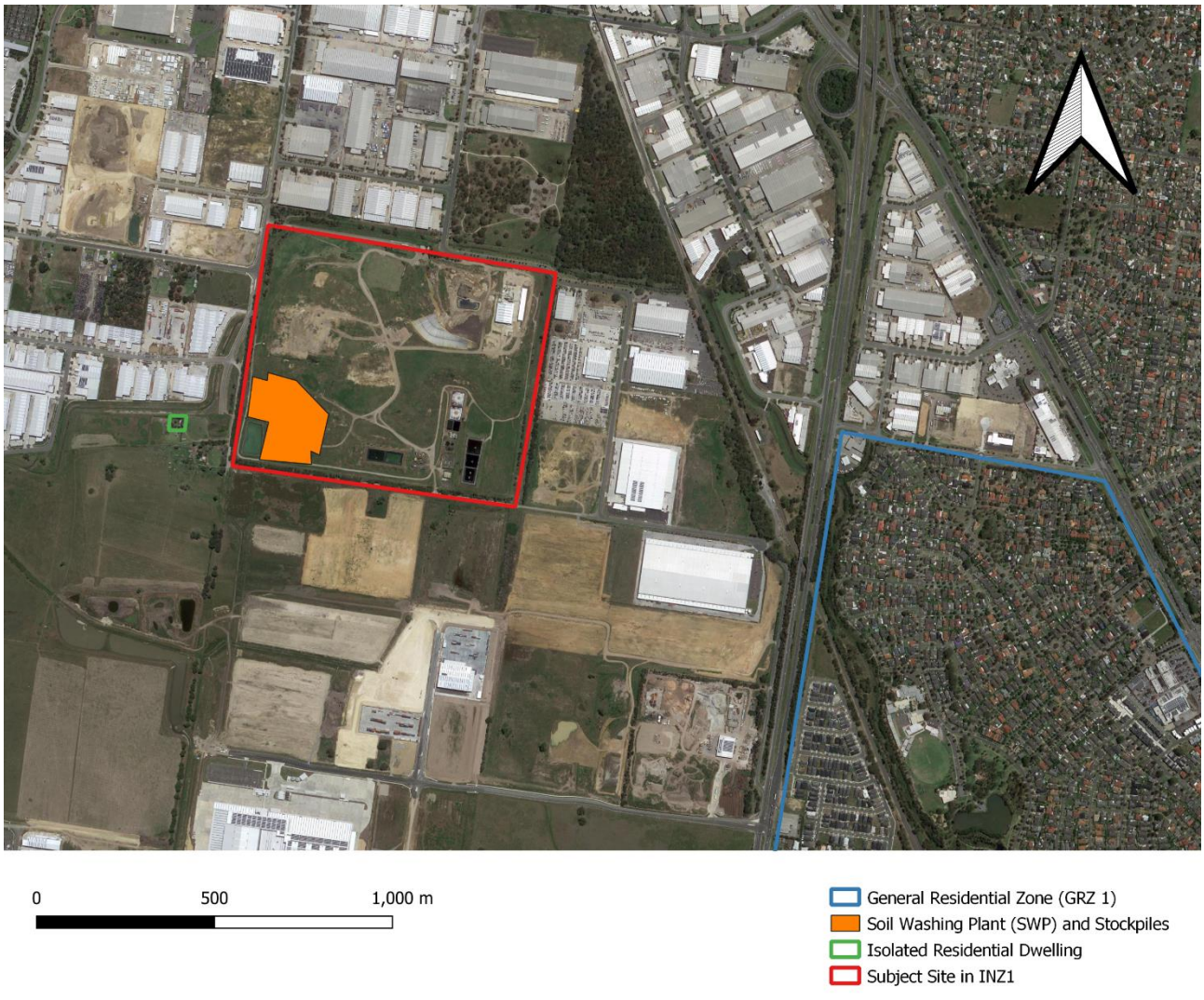
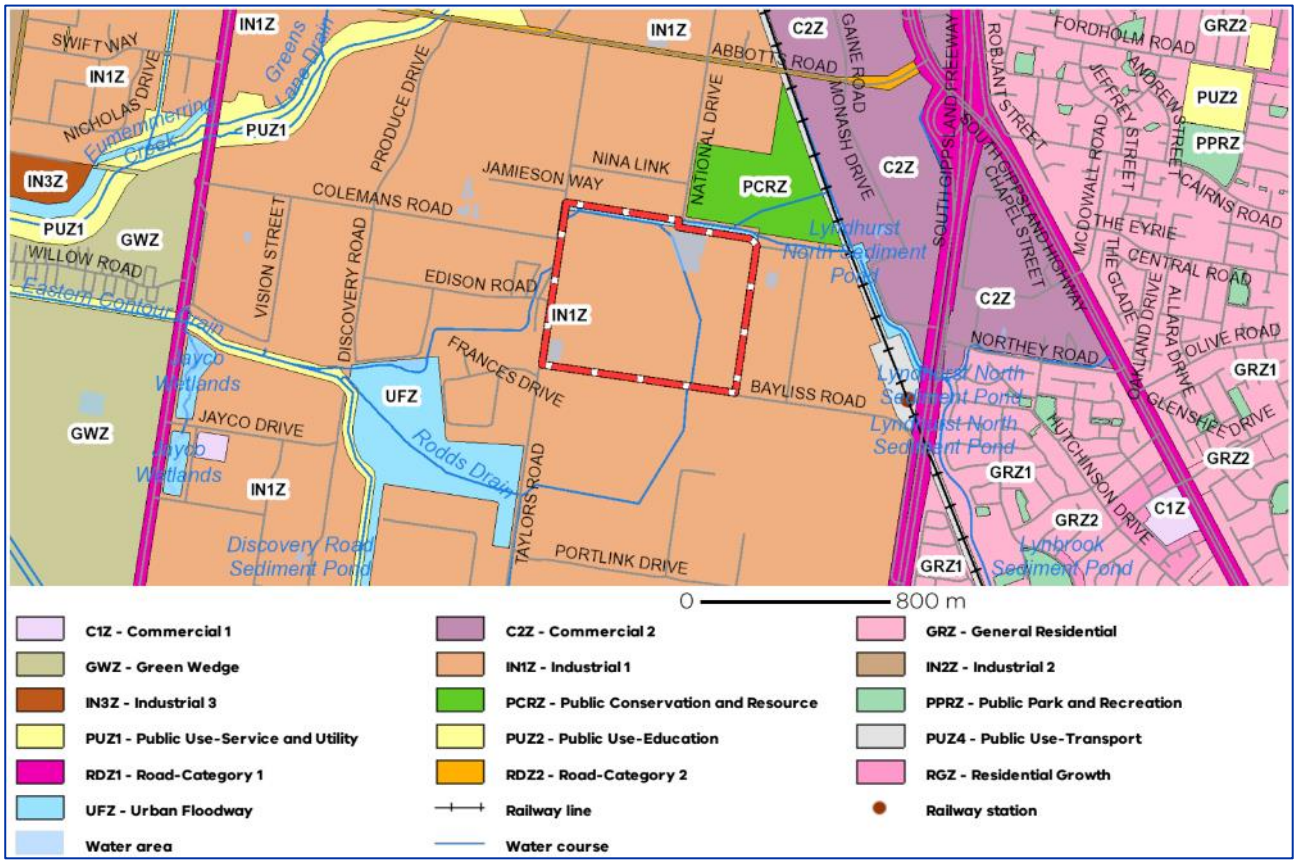


Figure 2.2: Site Location and Zoning



3. PROPOSED DEVELOPMENT

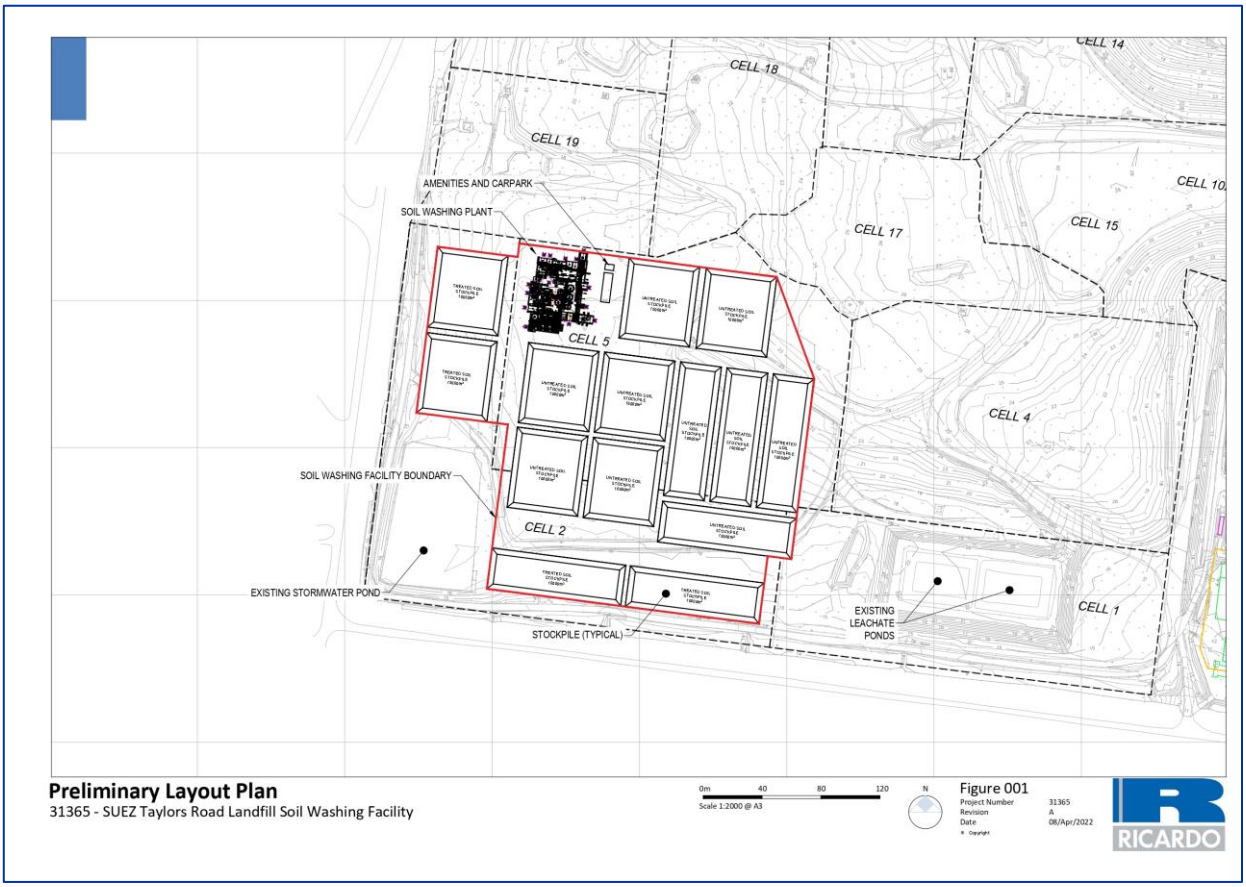
3.1 Project Description

The proposal is for a contaminated soil stockpiling and washing facility. Key features and aspects of the facility are as follows:

- The site can receive and stockpile up to 200,000 tonnes of Category C soils that will be bunded (an average annual throughput of 160,000 tonnes is forecasted). These soils will be progressively processed using a soil washing plant (SWP) with an adjacent wastewater treatment unit.
- Soil washing will include washing, grading and refining waste soils to produce a range of sand, soil and aggregate products.
- Site layout:
  - 12 x untreated soil stockpiles (each up to 10,000 m^3).
  - 2 x treated soil stockpile (each up to 10,000 m^3)
  - Soil washing facility (consisting of distinct process units which are enclosed)

It is noted that a landfill and existing soil treatment plant are also located on the site. These are discussed further in **Section 4.1**.

Figure 3.1: Site Layout



3.2 Process Overview

The site is expected to receive and store up to approximately, 200,000 tonnes/year of Category C soils, which will be progressively processed using the proposed soil washing plant (SWP) with an adjacent wastewater treatment unit.

Category C soils are low contaminant wastes. Based on EPA Victoria publication 1828 Waste disposal categories – characteristics and thresholds, are generally present in small amounts (i.e. a fraction of a percent for heavy metals and VOCs).

The proposed SWP will run 24/7. The soil receival and stockpile management will occur as per the current permit operating times (3 am – 6 pm Monday - Friday, 6 am – 3 pm Saturday, 9 am – 4 pm Sunday).

The following is a general process description for the SWP, as taken from the functional specification of the plant:

- Contaminated soil is fed via front end loader (FEL) into a feeder bin.
- The feeder bin is equipped with a grizzly screen that separates large coarse material from the bulk soil. Grizzly oversize is directed into a bunker and removed with the FEL.
- An over band slinger magnet removes tramp metal objects from the soil stream and drops the metal into a skip.
- The soil stream is then transferred into a wet trommel screen, where high-pressure water is injected to agitate the material and break up the soil into its constituent components and then sieve out the oversize fraction.
- The materials go through the attrition scrubber, cyclonic separator, crossflow teeter bed separator, thickener and granular activated carbon (GAC) for further processing.
- Washed soil is stored in two stockpiles to the west of the SWP.

Based on the operational understanding, the SWP activities consist primarily of mechanical separation of contaminated soils in different categories namely, ferrous scrap metal, oversize (> 50 mm in the bulk soil), gravel (< 50 mm and >5 mm), sand (< 5 mm and >0.15 mm), fines (< 0.15 mm) and organics (> 1 mm and < 1 mm and > 0.15 mm).

Generally speaking, the amount of material being disturbed at any given time is minimal (associated with transferring of waste to and from SWP and stockpiles when requiring washing). The vast majority of material will remain undisturbed and emissions will be controlled through water sprays, polymer spray or hydroseeding.

3.3 Proposed Control Measures

The proposed air emission controls for the site include:

- Polymer spray or hydroseeding on Category C contaminated soil stockpiles
- Soil containing PFAS to be fully covered (as per the PFAS National Environmental Management Plan 2.0)
- Water sprays on treated stockpiles
- Soil washing operations involving wet process (and also consisting of distinct process units which are enclosed)

The above measures represent the most practical options as air emission controls for the site, given the large size of the stockpiles. Also given the large separation distance to the nearest built-up residential zone (1500 metres), additional measured are not warranted.

Water sprays, polymer sprays and hydroseeding will primarily assist in reducing dust emissions. However, the dust controls will also provide assistance in lowering VOC and odour emissions by minimising physical disturbance of the stockpiles, which can more readily lead to release of VOCs.

4. EXISTING ENVIRONMENT

4.1 Overview

The following sections describe the existing environment around the subject site, including existing air emission sources, local topography and wind conditions.

4.2 Existing Air Emission Sources

The subject site is within an existing industrial precinct. Directly west, north and east of the site are established industrial areas. Land to the south-west, south and south-east is still being developed for industrial purposes.

The subject site itself includes a private landfill, which has operated since at least 1990 (under Planning Permit No 890471 and EPA Victoria Operating Licence 70542). With regards to air emissions, the landfill is associated with diffuse sources (i.e. open stockpiles) and fugitive emissions. The landfill is also noted to accept Category B waste.

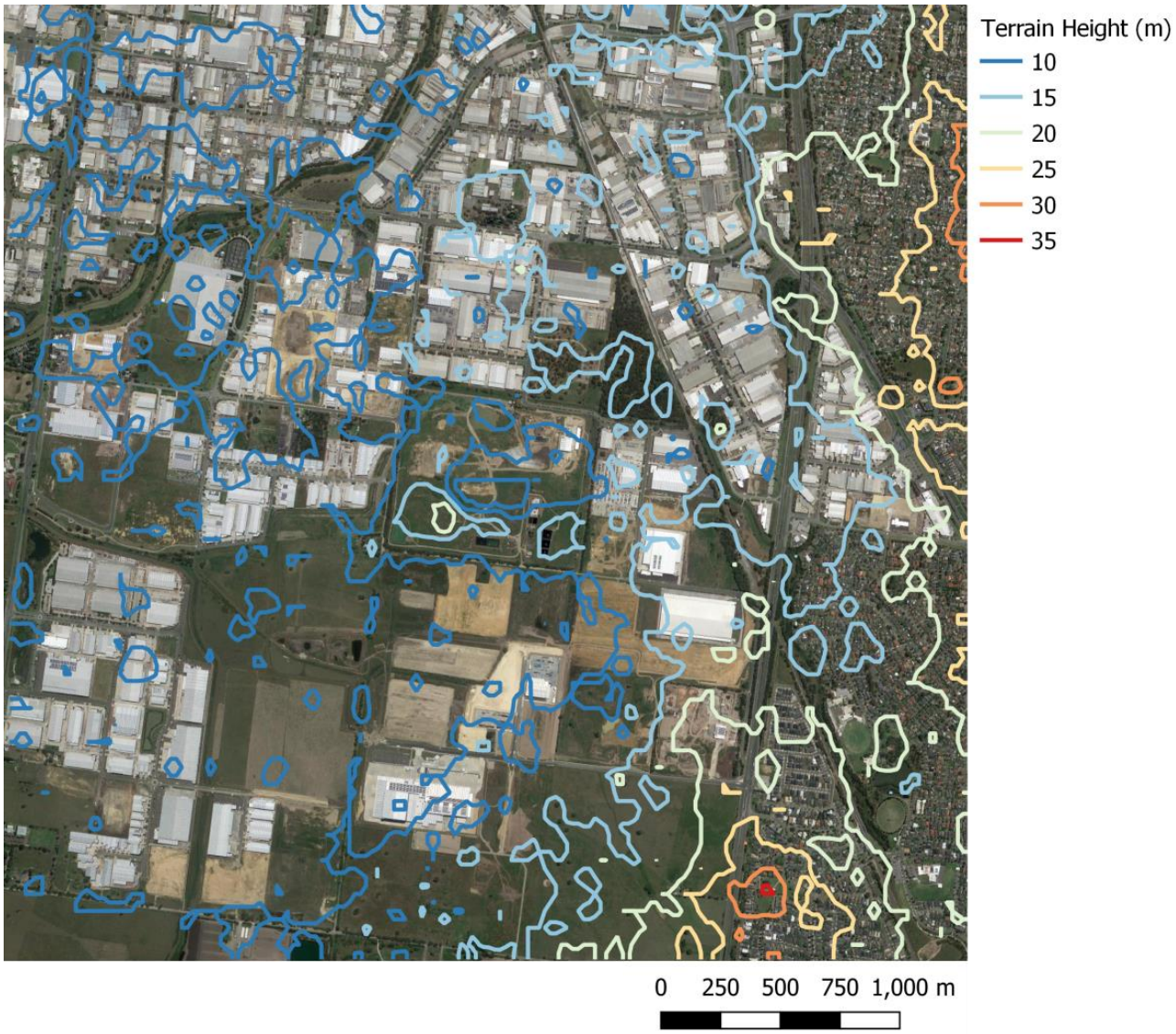
This site also hosts a soil treatment plant known as Earthsure that thermally treats soils to allow reuse, also a potential emission source. This facility thermally treats soils to allow reuse and operates under a separate environmental licence, OL 211831. All treatment and waste handling occurs inside a building. The facility is noted to be approximately 500 metres north-east of the nearest proposed stockpile and 1 km from the nearest residential area to the east.

Another waste recycling facility named Smart Recycling (161 Portlink Dr, Dandenong South VIC 3175) is located approximately 1450 metres south-east of the subject site. The facility processes green waste, builders waste, and pallets and timber waste and currently holds an EPA operating licence (OL000012380). The nearby sensitive receptors are approximately 220 metres east of this site (compared to 1500 metres for the proposed soil washing facility).

4.3 Topography

The subject site is located approximately 10 kilometres (km) east inland from Port Phillip and is characterised by relatively flat topography, at an elevation of 10 to 30 metres (m) above sea levels. **Figure 4.1** presents the ground contours of the site and surrounding area. The nearby sensitive receptors are located in a comparatively flat and low lying at an elevation of 10 to 20 meters.

Figure 4.1: Terrain



4.4 Wind Conditions

Wind roses produced from wind measurements from the nearest Bureau of Meteorology Station at Moorabbin Airport (13.5 km north-west of the site, Station ID 086077) are provided below for the year 2017 and by diurnal conditions. The Moorabbin Airport Station data shows that the winds in the Dandenong area are defined by northerly winds and south-westerly winds. Calms are not considered to be a major feature of the area and tend to occur more often during the night-time (5.7%). The percentage of winds (westerly, west-north-westerly, north-westerly) towards the direction of the eastern residential area (1500 metres away) is 16.8%. The percentage of north-easterly winds towards the direction of isolated residential dwelling (250 metres away) is 10.4%.

Figure 4.2: Annual Wind Rose 2017

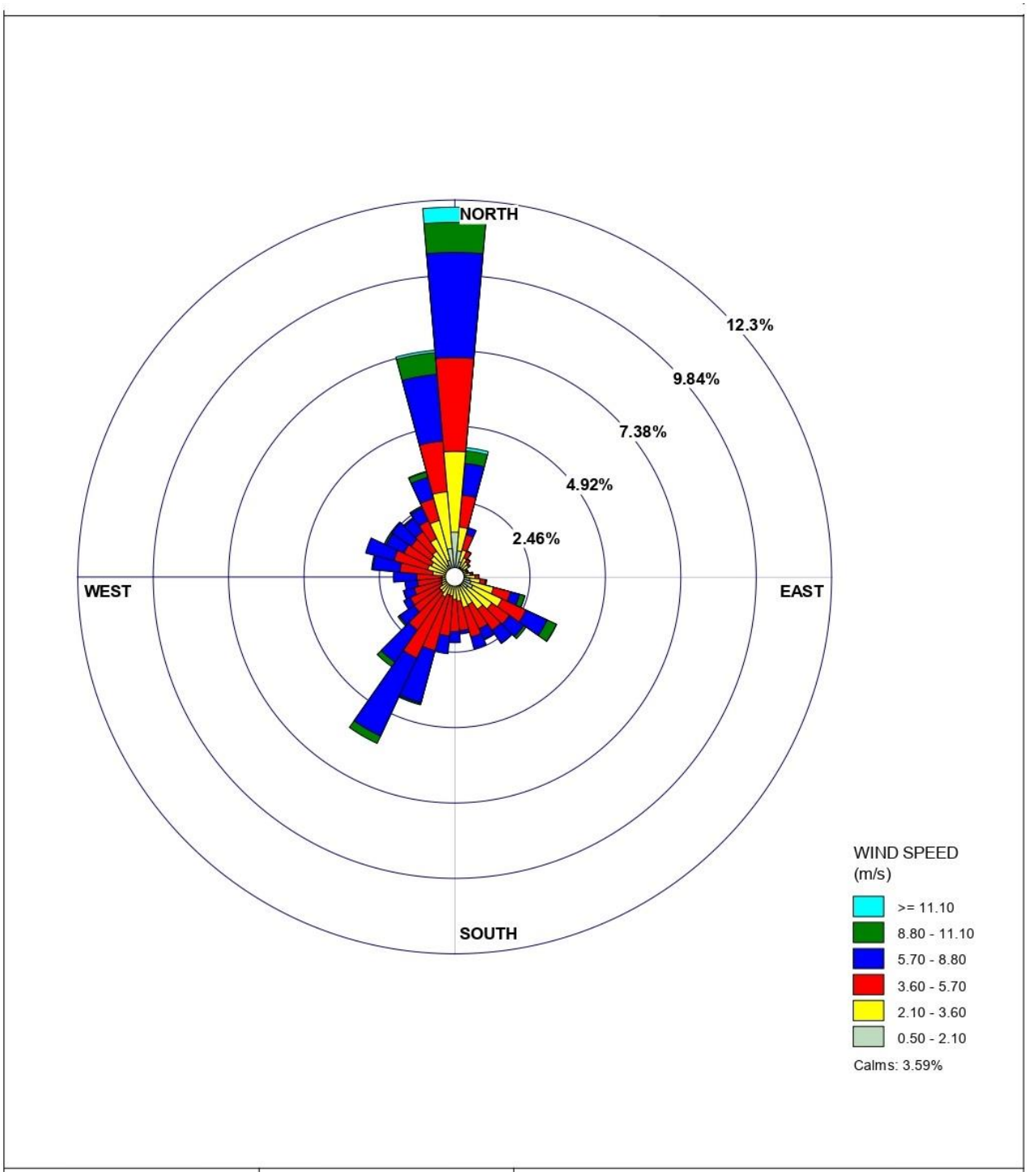
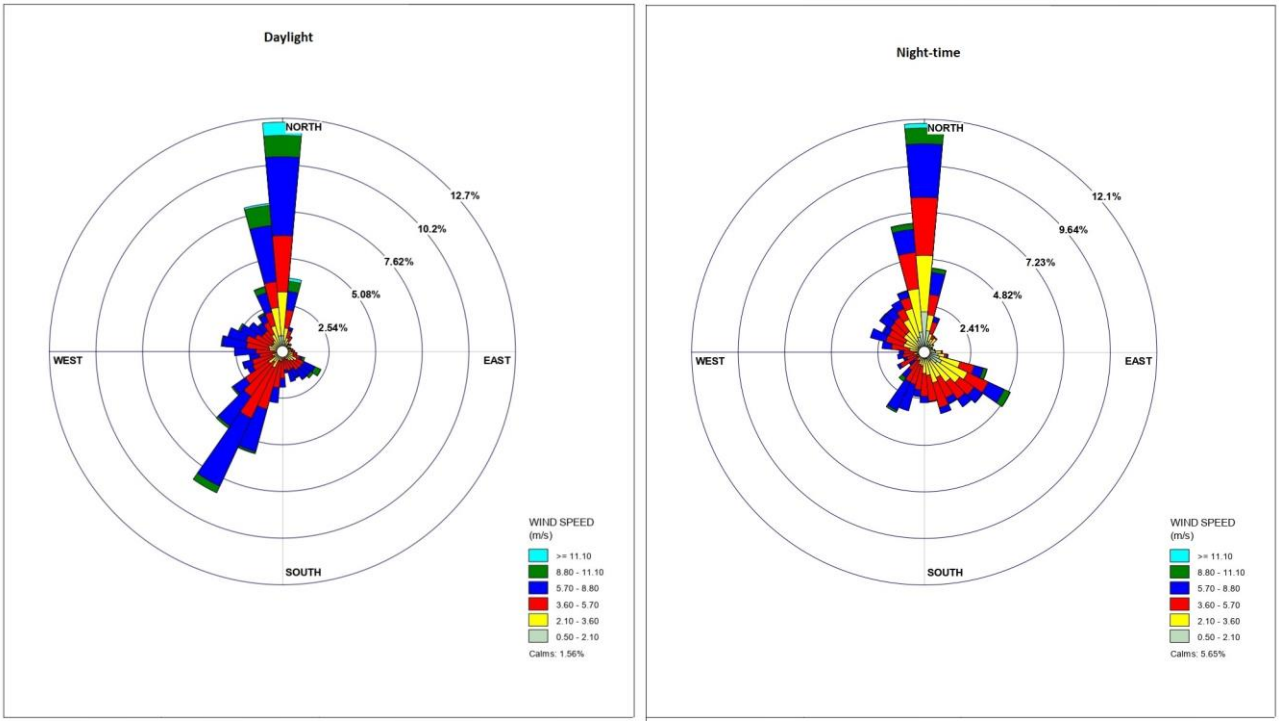


Figure 4.3: Diurnal Wind Roses



5. ASSESSMENT

5.1 Overview

The following sections present the outcomes of a Level 1 air quality assessment according to EPA Victoria publication 1961 Guideline for Assessing and Minimising Air Pollution and a Level 2 odour assessment according to EPA Victoria publication 1883.

The key air emission sources and air quality indicators for the site are considered to be the following:

- Particulate matter associated with soil handling and stockpiling (which includes metals associated with Category C waste)
- Odour emissions associated with untreated soil (associated with compounds such as volatile organic compounds).

Based on the proposed operation of the SWP (as presented in **Section 3.2**), there is no thermal, biological, or chemical processing of the raw feedstock and separated waste components. As such, the relevant air pollutants that are likely to be associated with mechanical separation using an SWP is odour. Initially, there is a potential for dust emissions during the initial coarse screening and metals removal stage. However, during subsequent stages which involve a wet process, dust emissions are expected to be minimal.

The outdoor stockpiles of contaminated soil likely are potential odour and dust emission sources as these will be affected by wind erosion. As discussed previously, air emissions from stockpiles will be minimised through the use of covers (where PFAS containing material is being stored), water sprays on treated stockpiles and polymer spray or hydroseeding on other untreated stockpiles.

It is noted that Category C wastes have relatively low levels of contaminants, including odour producing volatile compounds. This means that the odour potential of the type of soil handled on site is expected to be low relative to higher contaminant wastes (i.e. Category A and B).

The impact of the site operations on air quality and odour emissions has been assessed in the following sections.

5.2 Air Quality

EPA Victoria publication 1961 addresses three guiding principles in "Section 5.2 Level 1 – Qualitative assessment" to provide a broad understanding of when a level 1 assessment is appropriate. Where a Level 1 assessment is appropriate, EPA's recommendation is to submit a brief report which should include:

- a description of the emission sources and receiving environment
- all the proposed emission controls, risk controls, management practices and checks
- a concise rationale justifying the proposed approach against the three principles listed in Section 5.2

Table 5.1 presents the Level 1 guiding principles and their relevant to the proposed project.

Table 5.1: Level 1 Guiding Principles

Guiding Principle	Relevance to Project
Routine activities that have controls that are known to be effective	The site involves a relatively simple process including stockpiling of soil and washing of soil. The site proposes to utilise water sprays on treated stockpiles, covers on PFAS containing materials, and polymer spray or hydroseeding on other untreated stockpiles. These controls are standard types of measures for controlling particulate matter emissions due to wind erosion over stockpiles. Combined with the fact that the vast majority of stockpiles will remain undisturbed, particulate emissions are expected to be minimal.

Guiding Principle	Relevance to Project
	The dust controls will also provide assistance in lowering VOC and odour emissions by minimising physical disturbance of the stockpiles, which may lead to release of VOCs.
Mass emission rates that are so low they can be considered negligible	**Appendix B** presents emission rate calculations for particulates and heavy metals. The emission rate calculations focus on wind erosion over the open stockpiles. Overall, it is concluded that emissions are negligible for the whole site. There is limited information on VOC emissions from stockpiles. The vast majority of the stockpiles will remain undisturbed. As noted previously, Category C wastes have relatively low levels of contaminants, including odour producing volatile compounds.
Fugitive emissions that are difficult to assess accurately	All sources on site are associated with fugitive emissions only (primarily very large area sources), therefore there will be some uncertainty associated with model predictions.

Based on the above review is it considered that a Level 1 assessment is appropriate for the proposed operations.

In addition to the above, the following comments are noted with regards to the level of assessment:

- **The proposed facility can be considered to have lesser impacts than existing site activities in the context of the type of soil waste handled**. The definition presented in (1828: Waste disposal categories – characteristics and thresholds, EPA Victoria, 2020), the contaminated soil can be categorised in Category A, Category B, Category C and Category D. Where Category A and Category B are identified as more severe in terms of environmental impact which include explosive wastes, flammable solid wastes, wastes liable to spontaneous combustion, oxidising wastes, infectious wastes, corrosive wastes, wastes that liberate toxic gases in contact with air or water and wastes capable of yielding another material which possesses any of the characteristics above. On the other hand, Category C and Category D are defined as non-corrosive acids and alkaline wastes and industrial waste where the contaminant concentrations are significantly lower than Category A and Category B. The proposed SWP project will receive Category C waste whereas, the currently operating Earthsure soil treatment plant and landfill accept Category B waste.
- **The site is at a large separation distance to the nearest residential zone.** The guidelines presented in (1518: Recommended separation Guideline distances for industrial residual air emissions, EPA Victoria, 2013), indicate the recommended separation distance for "Permanent contaminated soil treatment facility" is 500 metres. The nearest residential zone is an eastern residential area approximately 1500 metres. The eastern residential area is unlikely to be impacted by the proposed activity (the distance from the source is three times the recommended separation distance). An isolated dwelling in the same industrial area also exists to the west at 250 metres – this is noted to already be impacted by existing industry and the existing waste handling and processing activities on the subject site.

5.3 Odour

With regards to odour impacts, reference has been made to odour criteria outlined in (1883: Guidance for assessing odour (draft), EPA Victoria, 2022). According to the presented guidelines and analysing the distance of the nearest sensitive receptors and proposed SWP activities, a Level 2 odour assessment is considered appropriate for the proposed operations. Therefore, this assessment qualitatively assesses the risk of exposure to odour.

A Level 2 assessment has been undertaken using the source/pathway/receiving environment tool outlined in the draft Publication 1883. The potential risk of the odour sources for the subject site in the receiving environment is based on three attributes:

- Hazard potential of the source (odour source score – OSS)

- Exposure pathway between the source and sensitive locations (odour pathway score – OPS)
- Sensitivity of the receiving environment (odour receiving environment score – ORS).

A level 2 source pathway receiving environment score (SPR) is achieved by adding the ORS, OSS and OPS together. This will result in a number between 2 and 12.

Based on the score, the following should apply:

- 1 to 7 – low score: the risk of odour is low.
- 8 or 9 – medium score: borderline cases – there may be one element that can influence the score and tip it into a low or high score. In these cases, this should be explored further in consultation with EPA.
- 10 to 11 – high score: A level 3 assessment is recommended to fully understand risk.
- 12 – highest score: A level 3 assessment is not likely to demonstrate risk is acceptable, but there may provide further illustration on the nature of the risks and/or inform on odour mitigation measures.

Table 5.2 to **Table 5.5** present the adopted scores and associated justification.

Table 5.2: Odour Source Hazard Potential (OSS)

	Score	Comments/Justification
Activity type	2	Moderate odour potential, based on Appendix A Column 2 of the guide (operations identified as 'permanent contaminated soil treatment facility').
Size of odour hazard	3	Large (Area sources of thousands of m^2). There are 14 stockpiles, ranging from 2,500 m^2 to 2,700 m^2. While the area is large, the stockpiles do not represent a constant source of emissions and will generally be undisturbed.
Type of odour emission	2	Unwelcome – associated with VOCs
Effectiveness of odour control	0	Water sprays, polymer spray, hydroseeding, covers on PFAS.
OSS Final Score	3	

Table 5.3: Odour Exposure Pathway Effectiveness (OPS)

	Receptor	Score	Comments/Justification
Distance	Eastern Residential Area	1	Long distance (1500 m)
	Western House	2	Medium distance (250 m)
Meteorology	Eastern Residential Area	2	Favourable (Even distribution of winds (10–20%) from source to receiving environment). Refer to **Section 4.4**.
	Western House	2	Neutral (Even distribution of winds (10–20%) from source to receiving environment). Refer to **Section 4.4**.
Terrain and built form	Both	2	Neutral – generally flat area. **Refer to 4.3**.
Hours of Operation	Both	3	High frequency – 24/7 operations of SWP.
Final Score	Eastern Residential Area	3	
	Western House	3	

Table 5.4: Receiving Environment Sensitivity (ORS)

	Receptor	Score	Comments/Justification
Existing Use	Eastern Residential Area	3	High sensitivity: Built up area, towns, many dwellings with backyards and outdoor living areas. The eastern residential area is located in a built-up residential zone.
	Western House	1	The western house is an isolated dwelling in a large industrial precinct. It is considered to have low odour sensitivity.
Historical Context	Eastern Residential Area	0	No history of odour complaints based on site operator information.
	Western House	0	No history of odour complaints based on site operator information.
Final Score	Eastern Residential Area	3	
	Western House	1	

Table 5.5: Source Pathway Receiving Environment (SPR) Score

Receptor	Score	Comments
Eastern Residential Area	3+3+3 = 9	A score of 9 represents a borderline case.
Western House	3+3+1 = 7	A score of 7 means the risk of odour is low.

The Level 2 odour assessment for the proposed SWP operations provided an SPR score of 9 (medium score) for the eastern residential area and score of 7 (low) for the western house.

It is noted that the Level 2 assessment approach does not specifically distinguish between the types of waste handled a soil treatment facility. For the proposed operations, only Category C waste will be handled and stockpiled. As noted earlier, Category C waste has minor levels of contaminants, such as VOCs (a fraction of a percentage for individual VOCs), compared to Category A and B. The vast majority of waste will generally remain undisturbed in the stockpiles (until transfer to the soil washing facility). Furthermore, as already indicated, the separation distance to the nearest built-up residential zone is 1500 metres, which is greater than the recommended 500 metre buffer distance in EPA Victoria publication 1518. Consideration of these aspects of the operation provides reasonable grounds for considering the proposed operations as having a low odour risk.

With regards to cumulative impacts, there is a potential for odour emissions from the proposed SWP operations, landfill and Earthsure soil treatment facility to have a similar character. However, the likelihood of cumulative impacts is low as the existing operations are also located at a large distance from the eastern residential area (1 km) and there is also no known history of odour complaints.

6. CONCLUSION AND RECOMMENDATIONS

This assessment qualitatively assesses the risk of exposure to air pollution and odour for the proposed soil washing operations proposed at 890 Taylors Road, South Dandenong. A level 1 air quality assessment has been conducted to assess the potential air pollution risk to sensitive receptors from the proposed operations using the EPA Victoria publication 1961 Guideline for Assessing and Minimising Air Pollution. To assess the potential odour risk to sensitive receptors a level 2 odour assessment has been conducted using the EPA Victoria publication 1883 Guidance for assessing odour (draft).

The following conclusions are made:

- The nearest sensitive receptors include an eastern residential zoned area 1500 metres away, and an isolated dwelling in the same industrial precinct as the proposed operations (250 metres to the west).
- Level 1 air quality assessment – based on the nature of the main air emission sources (mainly undisturbed stockpiles controlled by covers/polymer/water sprays) and low contaminant characteristics of the soil (Category C only), potential air quality impacts are expected to be low. The following is noted:
  - The on-site process is relatively simple and standard emission controls are proposed
  - Calculated emission rates of key pollutants are noted to be very low
  - The site comprises only fugitive sources creating some uncertainty when using dispersion modelling
- Level 2 odour assessment – the Level 2 score for the western isolated dwelling is 7, which is identified as a low odour risk. For the eastern residential area, a Level 2 score of 9 has been identified which is a borderline case. A lower score could be adopted when taking into account the low contaminant nature of the waste (Category C only). Consideration of this aspect of the operation provides reasonable grounds for considering the proposed operations as having a low odour risk.

Based on the findings of Level 1 air quality assessment and Level 2 odour assessment, the site location the proposed control measures (water sprays, polymer spray, hydroseeding, covers on PFAS, wet SWP process) are considered suitable for the proposed operations.

REFERENCES

1518: Recommended separation guideline distances for industrial residual air emissions, EPA Victoria.
1828: Waste disposal categories – characteristics and thresholds, EPA Victoria. (2020).
1883: Guidance for assessing odour (draft), EPA Victoria. (2022).
1961: Guideline for Assessing and Minimising Air Pollution, EPA Victoria. (2022).
Environment Protection Regulations, EPA Victoria. (2021).

APPENDIX A GLOSSARY

Parameter or Term	Description
Conversion of ppm to mg/m^3	Where R is the ideal gas constant; T, the temperature in Kelvin (273.16 + T°C); and P, the pressure in mm Hg, the conversion is as follows: mg/m^{-3} = (P/RT) x Molecular weight x (concentration in ppm) = P x Molecular weight x (concentration in ppm) / 62.4 x (273.2 + T°C)
g/s	Grams per second
mg/m^3	Milligrams per cubic metre
$\mu g/m^3$	Micrograms per cubic metre
Ppb	Parts per billion
Ppm	Parts per million
PM_{10}, $PM_{2.5}$, PM_1	Fine particulate matter with an equivalent aerodynamic diameter of less than 10, 2.5 or 1 micrometres respectively. Fine particulates are predominantly sourced from combustion processes. Vehicle emissions are a key source in urban environments.
99.5^{th} Percentile	The value exceeded 99.5% of the time
CO	Carbon monoxide.
NO_x	Oxides of nitrogen – a suite of gaseous contaminants that are emitted from road vehicles and other sources. Some of the compounds can react in the atmosphere and, in the presence of other contaminants, convert to different compounds (eg, NO to NO_2).
NO_2	Nitrogen dioxide.
VOC	Volatile Organic Compound/s. These compounds can be both toxic and odorous.
Odour Unit	One odour unit (ou) is the number of dilutions required for a sample of odour to reach the odour intensity at which a panel of qualified people can just detect it. Refer to AS 4323.1:2001.

APPENDIX B EMISSION RATE CALCULATIONS

Emissions of total particulate matter (TSP) and heavy metals were calculated using the following emission factor documentation:

- AP 42 (5th Edition), Compilation of Air Pollutant Emission Factors, Vol. 1 Stationary Point and Area Sources, Chapter 13.2.5, Industrial Wind Erosion, November 2006.

Chapter 13.2.5 provides a method for deriving particulate emissions from open stockpiles (due to wind erosion). The method utilises relevant factors including stockpile threshold friction velocities, prevailing wind conditions and the number of disturbances of a stockpile. For the proposed operations, calculations have considered the following:

- Wind speed data from the BOM Moorabbin Airport
- Threshold friction velocity of 1.02 m/s (as per Chapter 13.2.5 for overburden material)
- Assumes disturbance to all stockpiles every hour (this is highly conservative)
- Assumes site stockpiles are at capacity
- Does not account for reduction to particulates due to water sprayers, polymer or hydroseeding (standard water sprays can equate to a 50% reduction).

Table B.1 presents the calculated emission rates. Based on the above listed inputs, the calculations are highly conservative. The results show very low particulate and heavy metal emissions for the site.

Table B.1: Estimated Emission Rates

Pollutant	% Composition	Emission Rate (g/s)
TSP	-	0.270 total 0.232 untreated soil Equivalent to 7.4E-06 g/s/m^2
Antimony	0.0075%	2.0E-05
Arsenic	0.0500%	1.3E-04
Barium	0.6250%	1.7E-03
Beryllium	0.0100%	2.7E-05
Boron	1.5000%	4.0E-03
Cadmium	0.0100%	2.7E-05
Chromium	0.0500%	1.3E-04
Copper	0.5000%	1.3E-03
Lead	0.1500%	4.0E-04
Mercury	0.0075%	2.0E-05
Molybdenum	0.1000%	2.7E-04
Nickel	0.3000%	8.1E-04
Selenium	1.0000%	2.7E-03
Silver	0.0180%	4.9E-05
Tributyltin oxide	0.0003%	6.7E-07
Zinc	3.5000%	9.4E-03

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