Southwest Wastewater Treatment Plant - Air Quality

Technical Assessment to Support a Notice of Requirement

Prepared for Watercare Services Ltd
Prepared by Beca Limited

28 August 2023

Contents

Appendices

Appendix A – Annual Windroses

Revision History

Revision Nº	Prepared By	Description	Date
A	Mathew Noonan	1st Draft for client review	2 June 2023
B	Mathew Noonan	2nd Draft for client review	30 June 2023
C	Mathew Noonan	3rd Draft Update of emission	3 July 2023
D	Mathew Noonan	Final	28 Aug 2023

Document Acceptance

Action	Name	Signed	Date
Prepared by	Mathew Noonan		28 Aug 2023
Reviewed by	Graeme Jenner		28 Aug 2023
Approved by			28 Aug 2023
on behalf of	Beca Limited		

Glossary

Abbreviation	Meaning
AC	Auckland Council
AUP: OP	Auckland Unitary Plan - Operative in Part
ASR	Activated Sludge Reactor
Biofilter	Bark/Soil biofilter filter odour control unit
FIDOL	Frequency Intensity Duration Offensiveness Location
H_2S	Hydrogen sulphide
IPS	Inlet Pump Station
Inlet Works Facility	Includes primary treatment including the screening and de-gritting of the raw wastewater, and storage of the material removed.
MBR	Membrane Reactor
NoR	Notice of Requirement
OCF	Odour Control Facility
OMP	Odour Management Plan
PE	Population equivalent
RAS	Returned Activated Sludge
RSC	Reduced Sulphur compounds
SBR	Sequential Batch Reactor
SOP	Standard Operating Procedures
Sludge Handling Facilities	Includes sludge conveying, storage, thickening, dewatering and loadout facilities
UV	Ultraviolet
WAS	Waste activated sludge
WWTP	Wastewater treatment plant
WWTP Facilities Area	Defined the area of site which compiles with the odour buffer restrictions

Executive Summary

Watercare Services Limited (**Watercare**) identified the need for a sub-regional Wastewater Treatment Plant (**WWTP**) to service the anticipated population growth in the Southwest growth area.

Watercare is proposing to construct a new WWTP (Southwest WWTP) at 372 Glenbrook Beach Road, Auckland to service the communities of Clarks Beach, Waiuku, Glenbrook and Kingseat. The new Southwest WWTP will be developed in 3 stages. When fully developed the WWTP will have the capacity to service a population of approximately 60,000 PE.

The primary discharge to air from the proposed Southwest WWTP will be odour. The odour emitted from WWTP can have the potential to cause adverse air quality amenity effects. A consent for discharges to air of odour and other contaminants from the WWTP will be the subject of a separate application to Auckland Council.

The area surrounding the site is predominantly rural in nature which is considered to have relatively low sensitivity to odour. However, several rural dwellings are located on the surrounding properties which have a higher sensitivity. The closest dwelling is located approximately 320m from the proposed WWTP. Overall, the receiving environment is considered to have relatively low sensitivity to odour. The sensitivity to odour of the receiving environment is not expected change to any extent over the foreseeable future.

The potential adverse effects of odour emissions will be minimised through the implementation of appropriate odour control and management procedures, as well as the provision of a 200m wide odour buffer around the processing units of the WWTP. Potential wastewater odour sources will also be located more than 300m from any existing dwelling. Similar separation distances between treatment processes and sensitive receptors are observed at the Snells-Algies and Pukekohe WWTPs.

Provided standard odour mitigation methods are implemented, such as those included in the indicative design, only comparatively low emission odours are expected from the proposed WWTP during normal operation. The separation distance between the wastewater treatment processes, the site boundary and the surrounding dwellings is such that any odour generated is expected to be sufficiently diluted and dispersed before reaching these locations to not to have an adverse effect on amenity.

This assessment is supported by the good odour performance of the similarly sized Pukekohe WWTP, and a comparison of the separation distances between treatment processes and the surrounding sensitive receptors, against those buffers recommended by the Victorian Environmental Protection Authority (Vic EPA).

Overall, it is concluded that emissions from the Southwest WWTP would not be expected to have any adverse odour amenity effects at any of the assessed receptors.

Dust will be generated during the construction of the WWTP. However, most construction activities will occur several hundred metres from any dwelling. Therefore, provided standard dust control procedure are employed at site, the risk of any adverse dust effects from these activities is considered negligible. Therefore, potential construction dust effects are considered to be less than minor.

1 Introduction

1.1 Overview

Watercare Services Limited (**Watercare**) is a lifeline utility providing water and wastewater services to 1.7 million people in Auckland. Watercare supplies reliable, high-quality drinking water to homes and businesses in the Auckland region and collects, treats, and discharges their wastewater in environmentally responsible ways. Its services are vital for life, keep people safe and help communities to flourish.

As a council-controlled organisation (CCO), wholly owned by Auckland Council, Watercare manages water and wastewater assets worth over $14 billion and plan and build infrastructure to ensure that growth is supported today and into the future. Watercare's vision is to be "trusted by our communities to deliver exceptional performance every day". Watercare's mission is "reliable, safe and efficient water and wastewater services".

Watercare has investigated how best to manage wastewater in the Southwest area in response to the anticipated growth identified in the Auckland Unitary Plan (Operative in Part 2016) (**AUP: OP**). Through this work, Watercare identified the need for a sub-regional Wastewater Treatment Plant (**WWTP**) to service the anticipated population growth in the Southwest growth area. The new WWTP is needed to enable Watercare to discharge treated wastewater into the Waiuku Channel in accordance with stringent treatment standards included within a discharge consent granted by the Environment Court in June 2018.

Following an assessment of alternative sites, Watercare has identified the site at 372 Glenbrook Beach Road (Lot 1 DP 367461) as its preferred location for the WWTP and is seeking to designate the full site. Designation of the site will enable construction of the WWTP which will be delivered in stages. The designation provides for a WWTP at full build out that will provide the capacity to service a long-term population equivalent (**PE**) of 60,000 in the Southwest area. However, it is initially proposed to construct the first stage, a WWTP for 20,000 PE, followed by second stage upgrade for 30,000 PE (in line with the SW Discharge Consent population growth).

The site's size and shape provide at least 200m of separation between the main parts of the plant itself and the adjacent properties. The existing planting around the streams, and wetlands will be retained. The areas not required for the full WWTP are able to be used for farming or will be landscaped which will ensure that the current rural amenity offered by the site is retained.

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Information about the design and operation of the WWTP is set out in the Indicative Design and Operational Report, prepared by Stantec dated August 2023 contained as Appendix B to the Assessment of Environmental Effects supporting the Notice of Requirement (**NoR**).

1.2 The Purpose of this Report

This report is an assessment of the air quality amenity effects (e.g. adverse odour and dust effects) of the proposed Southwest WWTP and supports the AEE that is being submitted with the Notice of Requirement to Auckland Council. It assesses the effects of the designation in relation to the construction of the WWTP and its operation.

The primary discharge to air from the proposed WWTP will be odour when the WWTP is operational. Although some dust may also be generated during construction.

Watercare has commissioned Beca Ltd (**Beca**) to undertake an assessment of the odour and construction dust effects of the proposed discharges to air to support a Notice of Requirement (**NoR**) to designate the site to authorise the construction, operation and maintenance of the Southwest WWTP.

1.3 Scope of Report

This report assesses the potential air quality effects of the proposed discharges to air in support of the NoR application. The assessment has been based on the ultimate 60,000 PE capacity plant.

The primary air quality concern that might affect amenity values is the emission of odour. This has been the focus of this assessment although other discharges such as construction dust are also considered. To minimise the risk of potential odour effects at neighbouring dwellings, Watercare has proposed to designate not just the area required for the actual WWTP processes, but also a separation distance of 200m around the WWTP. A minimum separation distance of 300m from the nearest residential dwellings has also been allowed.

This report includes:

- As description of the site and the proposed odour buffer,
- A brief description of the indicative Stage 3 WWTP and discharges to air.
- An assessment of the receiving environment in terms of the potential environmental influences and sensitivity of the receiving environment,
- An assessment of the potential effects of air discharges on the receiving environment,
- A summary of the conclusion and findings of the investigation.

1.4 Resource Consent

Under the AUP: OP discharges to air from municipal wastewater treatment plants are a **Discretionary Activity**[1]. Therefore, a resource consent to discharge odour and other air contaminants from the proposed Southwest WWTP is also required.

The staged developed of the proposed Southwest WWTP will occur over an extended period. Watercare is therefore seeking (by separate application) an air discharge consent to operate only for the Stage 1 and Stage 2 plants (i.e. up to 30,000PE) for which a detailed design will be developed. The separate resource consent application to Watercare will detail the discharges to air from the proposed WWTP, and the proposed mitigation implemented, monitoring and management procedures.

1.5 Guidance Documents

The following guidelines have been used in this assessment:

- *Good Practice Guide for Assessing the Discharges to Air from Industry* (2016) prepared by the New Zealand Ministry for the Environment (**GPG Industry**), and
- *Good Practice Guide for Assessing and Managing Odour* (2016), prepared by the New Zealand Ministry for the Environment (**GPG Odour**).
- *Good Practice Guide for Assessing and Managing Dust* (2016), prepared by the New Zealand Ministry for the Environment (**GPG Dust**).

1.6 Limitations

Beca has prepared this report for Watercare. Beca has relied upon the information provided by Watercare in completing this document. Unless otherwise stated, Beca has not sought to independently verify the information that was provided. This document is therefore based upon the accuracy and completeness of the information provided and Beca cannot be held responsible for any misrepresentations, incompleteness, or

[1] Table E14.4.1 Activity table (A163)

inaccuracies provided within that information. Should any other information become available, this report will need to be reviewed accordingly.

2 WWTP Site

2.1 Site Description

The proposed Southwest WWTP will be located at 372 Glenbrook Beach Road (Lot 1 DP 367461) (the '**Site**'). The Site was identified through a multi-criteria assessment (**MCA**) process and was subsequently purchased by Watercare. All sites considered in the MCA process were required to be of sufficient size to accommodate the specified odour buffer (refer Section 2.2).

The total area of site is approximately 56 hectares. However, the WWTP facilities will only occupy approximately 6 hectares of this area. Road access to the site will be from Glenbrook Beach Road.

The site is currently used for horticultural purposes, and currently incorporates two man-made ponds (refer Figure 2-1). The pond on the site Northern boundary, is shared with 62A Dunsmuir Road and the smaller pond is located adjacent to Glenbrook Beach Road.

The property is predominantly zoned 'Rural – Mixed Rural' under the AUP: OP. However, the Northeast corner of the site is zoned 'Rural – Rural Coastal' and 'Coastal – General Coastal Marine'. The Taihiki River runs along the site's north-eastern boundary.

2.2 Odour Buffer Area

To minimise the risk of an adverse odour effect being experienced outside the site boundary, a minimum separation distance (odour buffer) between wastewater treatment facilities and the nearest dwellings and site boundary will be maintained.

The following criteria has been used to define the site's odour buffer.

- The (above-ground) wastewater treatment facilities will be located at least 200m from the site boundary, and
- The (above-ground) wastewater treatment facilities will be located at least 300m from any existing residential dwelling.

Based on the odour performance of comparable WWTPs, the odour buffer is considered to be conservative and protective of air quality amenity levels in the area.

The shaded red area in Figure 2-1 shows the area within the site which complies with the odour buffer. It is within this area that wastewater treatment facilities will be located. This area has been referred to as the '**WWTP Facilities Area**' in this report.

Other non-odorous activities (e.g. the offices, storage areas) could potentially be located outside of this area. However, these activities would not have an impact on the air quality outside the site boundary.

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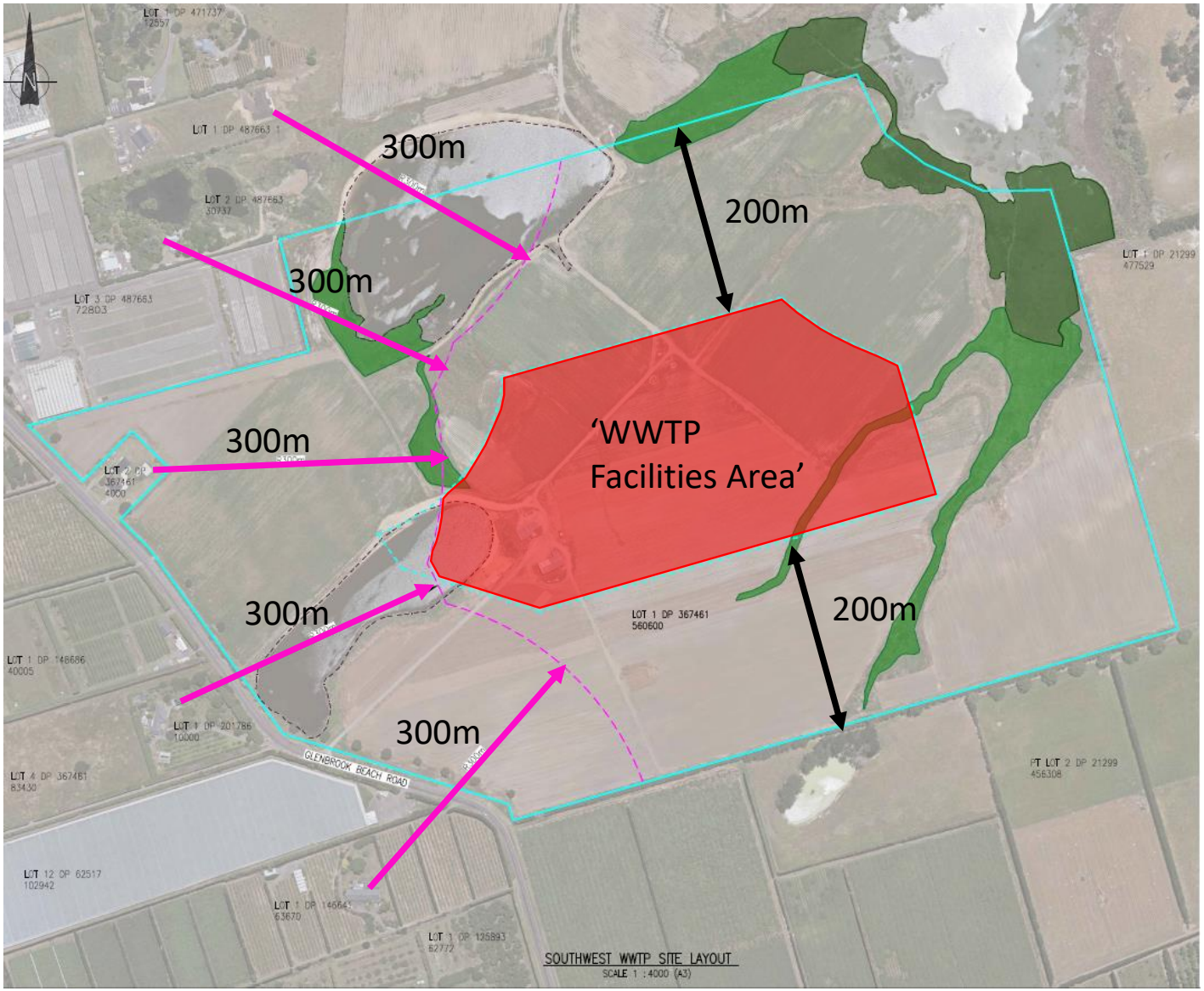

Figure 2-1. Site odour boundary. The shaded red area shows area where the WWTP facilities will be located (i.e. the WWTP Facilities Area)

3 Description of WWTP and Emissions to Air

3.1 Staging of Proposed WWTP

Watercare is proposing to construct a new centralised Southwest WWTP in the Glenbrook Beach area which will service the Clarks Beach, Waiuku, Glenbrook and Kingseat catchments. These catchments are currently serviced by other WWTPs.

The new Southwest WWTP will be developed in three stages in response to the expected increases in the catchments' populations over time. The staging of the plant is shown in Table 3-1. When fully developed, (Stage 3), the plant's treatment capacity will be approximately 60,000 PE. Stages 1 and 2 will be initially developed and resource consents will be sought for these stages.

Table 3-1. Indicative staging of the proposed Southwest WWTP

	Stage 1	Stage 2	Stage 3
Plant Capacity	20,000 PE	30,000 PE	60,000 PE
Description	This is construction of the plant catering for the current population as well as growth up to 20,000PE.	This is an upgrade to the Stage 1 construction to increase capacity from 20,000PE to 30,000PE. Involves some additional physical works within the footprint of the Stage 1 facility. Expected to be required over the next 30 years, but depends on actual population growth rates.	This is a 'duplication' of the Stage 2 plant to double capacity from 30,000PE to 60,000PE, constructed within the same property. This is estimated to be required beyond 2053. Upgrades to the Plant will be completed in line with Auckland Council's growth projections

3.2 Stage 3 Indicative Design

Since the staged development of the WWTP will occur over an extended period, only an indicative design of the Stage 3 WWTP has been developed. A description of the indicative design is included in the supporting documentation to the NoR. This odour assessment has been based on the indicative Stage 3 design.

The layout of the indicative Stage 3 plant is shown in Figure 3-1. All the wastewater treatment processes are located within the WWTP Facilities Area and are therefore compliant with the odour buffer (as described in Section 2.2). Any likely variation in the Stage 3 design would also be compliant with the odour buffer.

The site slopes in an easterly direction towards the Taihiki River. The land profile will be utilised to minimise earthworks and allow for wastewater to gravitate between treatment process. The gravitation of these treatment processes has significant energy cost savings.

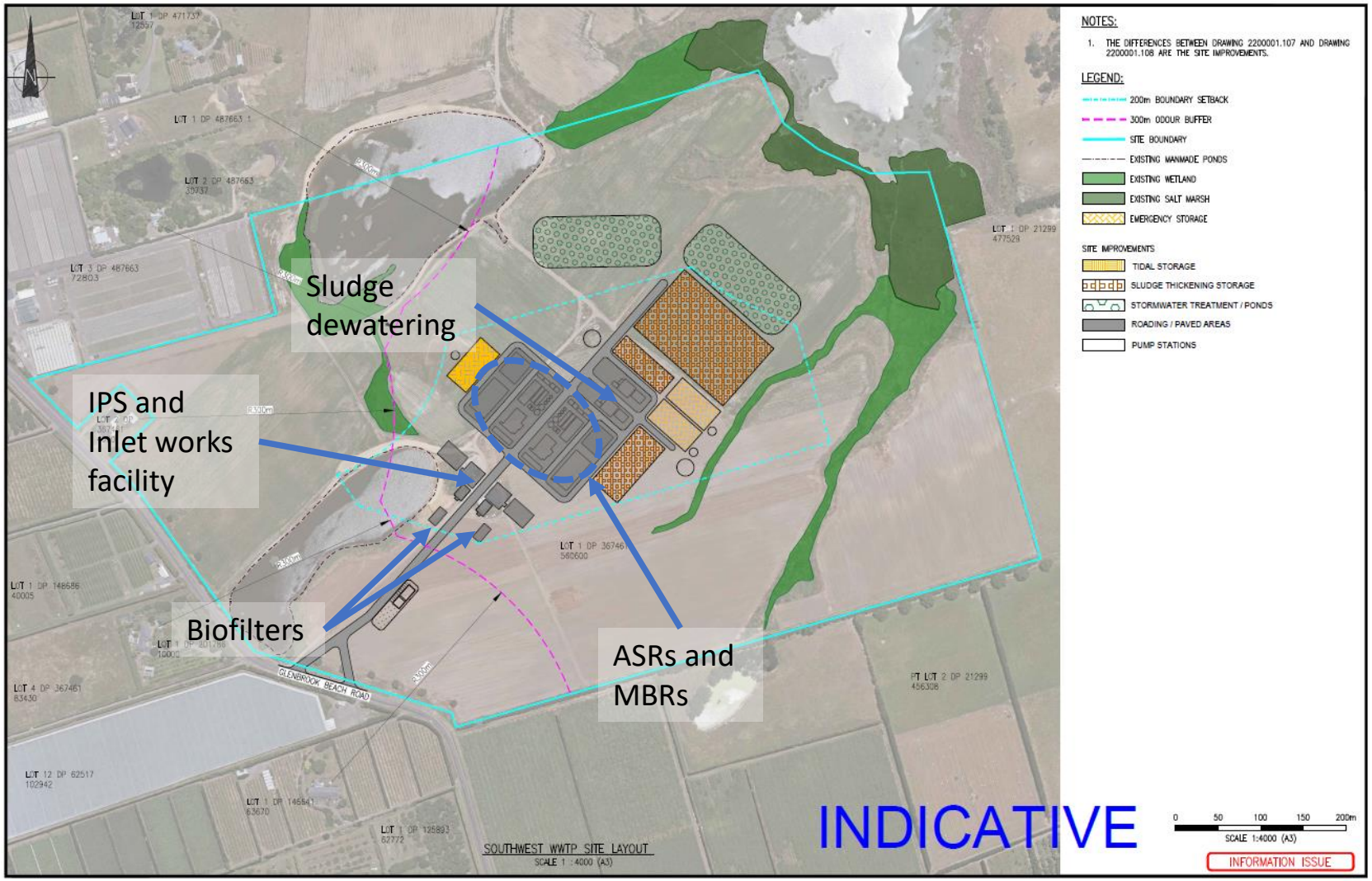

Figure 3-1. Indicative site layout for Stage 3 plant

The site slope will therefore influence the alignment of the treatment processes. The inlet pump stations, and inlet works facility will be located at the more elevated western end of the WWTP Facilities Area and the sludge handling facilities towards the lower eastern end of the WWTP Facilities Area. The inlet pump stations, and inlet works facility are the processes located in closest proximity to the surrounding dwellings. In the contrast, the sludge handling facilities processes are located furthest from the surrounding dwellings.

3.2.1 Process Description

The final design of the WWTP would be expected to incorporate similar treatment processes to those included in the indicative design. These processes can be generally grouped as the following

- Pre-treatment – removal of large solid and grit from the raw wastewater
- Secondary treatment – biological nutrient removal and membrane filtration
- Tertiary treatment - Ultraviolet (UV) disinfection of the treated wastewater
- Sludge Handling Facilities – including the thickening, dewatering and storage of the biomass (sludge) generated from secondary treatment process.

In the indicative design, the raw wastewater enters the WWTP via the inlet pump station (IPS) before being transferred to the inlet works facility. The wastewater is then screened and de-gritted before gravitating to the activated sludge reactors (ASR) for denitrification. The treated water is then pumped to membrane bioreactors (MBR) which separated the suspended biomass (sludge) (produced from the biological processes) from the permeate (the clear treated wastewater).

The permeate is then disinfected by ultra-violet (UV) light before being discharged to the tidal storage pond, where it is held before being pumped to the discharge location in the Waiuku Channel adjacent to the Clarks Beach Golf Course.

Waste activated sludge (WAS) is generated from the biological treatment process which occur in the ASR. In the indicative design, the WAS is to be directed to a series of covered sludge storage ponds. Once thickened, the sludge is then pumped to centrifuges (located in the dewatering building) for dewatering to further reduce their volume. The dewatered sludge is then stored in enclosed storage bins before being transported offsite for further processing.

The WWTP will also incorporate emergency storage tanks to temporarily store emergency overflows, such as during peak wet weather events, or bypassed flows should the treatment processes experience an unexpected breakdown.

3.3 Emissions to Air

The primary discharge to atmosphere from the proposed WWTP will be odour. Emitted odour from WWTP can have an adverse amenity effect.

WWTP odours are generated from the decomposition of organic material (e.g. carbohydrates, fats and proteins) present in the wastewater and WAS. High levels of odour may be generated when wastewater (or sludge) becomes oxygen depleted and anaerobic (septic). During these conditions, highly odorous compounds such as hydrogen sulphide (H_2S) are generated. The emitted odours have a “rotten egg/sewer” type odour and would usually be considered highly unpleasant[2].

[2] Dravnieks A, Masurat T, Lamm R A, Hedonics of Odours and Odour Descriptors: in Journal of the Air Pollution Control Association, July 1984, Vol. 34 No. 7, pp 752-755.

All wastewater treatment processes will generate some odour. The proposed odour mitigation for these sources will be detailed in the separate resource consent application. Industry standard odour mitigation procedures will be implemented at the site.

For illustrative purposes, the indicative Stage 3 design odour emission sources and odour controls are summarised in Table 3-2. Processes which have a high odour potentially are enclosed and vented to an odour control facility (OCF) to minimize emissions to air. The OCFs remove the odorous compounds from the ventilation air before being discharged to the atmosphere.

Only small fugitive odours would be expected from processes that have been enclosed and vented to an OFC. It is highly unlikely any fugitive odour would be detectable outside the site boundary.

Biofilters are expected to be used as OCFs. Biofilters are widely used in New Zealand and internationally to treat wastewater odours. For example, Watercare's Army Bay, Mangere, Pukekohe, Rosedale and Warkworth WWTPs use biofilters to control process odours. Biofilters will also be incorporated in the upgraded Snells-Algies WWTP.

Odour control efficiencies of approximately 95% can be expected for biofilters, although higher control efficiencies can also be achieved[3][4]. Emission testing at Rosedale WWTP have shown biofilter control efficiencies of 98-99%[5]. The air emitted from biofilters commonly has an 'earthy' or 'musty' character. Any residual odour which is emitted to the atmosphere is usually only detectable in the vicinity of biofilter (e.g. within 5 - 30m).

During normal operating conditions, only low levels of odour would be expected to be emitted from other treatment processes sources, Emissions from ASRs are generally only be detected within approximately 30-50m of the tanks. The odour emitted from MBRs are commonly only detectable when standing immediately adjacent to the tanks. Very little odour would be expected to be emitted from the UV disinfection process or the treated wastewater in the tidal storage pond.

The emergency storage tanks will only be a potential source of odour when in use. These events will be infrequent and of short duration.

Overall, the odour emitted from the WWTP during normal operating conditions would be expected to be contained within the site boundary.

3.3.1 Abnormal operating conditions

Higher odour emission rates could occur during abnormal operating conditions (e.g. mechanical failure, extended storage time of sludge or wastewater spill). The frequency, duration and effect of upset conditions will be managed through a combination of plant design (e.g. redundancy of critical systems, odour containment), management procedures and contingency planning (e.g. provision of emergency electrical power supply).

[3] Auckland Regional Council, 2002. *Technical Publication 152: Assessing Discharges of Contaminants into Air (Draft)*

[4] Scottish Executive Environment Group, 2005. *Code of Practice on Assessment and Control of Odour Nuisance from Wastewater Treatment Works*.

[5] Watercare Services Limited. *Rosedale Wastewater Treatment Plant Summer Odour Monitoring – Report 25 May 2022*

Table 3-2. Summary of odour emission from the indicative Stage 3 WWTP

Process	Relative Odour Potential	Odour Controls	Residual Odour Potential
Inlet pump stations	High (inflows are expected to be odorous)	• Enclosed and vented to an OCF (biofilter)	Negligible (possibly minor fugitive emissions)
Inlet works facility	High (inflows are expected to be odorous)	• Enclosed and vented to an OCF (biofilter) • Screening washed to removed organic material and stored in enclosed bins.	Negligible (possibly minor fugitive emissions)
ASR	Low (High if the wastewater becomes anaerobic)	• Wastewater has a low odour potential once the wastewater has been aerated (i.e. prevents anaerobic conditions occurring when high odour emission rates may occur)	Low
MBR	Low	• The treated wastewater will have low odour potential (i.e. aerated). The permeate will have a low organic content	Low
UV Disinfection	Low	• Process is enclosed • The wastewater will have low odour potential (i.e. positive dissolved oxygen concentrations and relatively low organic content)	Negligible
Tidal storage pond	Low	• The treated wastewater will have low odour potential (i.e. positive dissolved oxygen concentrations and relatively low organic content) • Restricted storage times	Low
Emergency storage tanks	High (if the wastewater is anaerobic)	• Used infrequently and of short duration (• Maybe enclosed and vented to an OCF (biofilter)	Negligible (possibly minor fugitive emissions)
Sludge storage ponds	Medium - High	• Covered and vented to an OCF	Negligible (possibly minor fugitive emissions)
Dewatering facility	High	• Enclosed and vented to an OCF (biofilter)	Negligible (possibly minor fugitive emissions)
Dewatered sludge storage tanks	Medium - High	• Enclosed and vented to an OCF (biofilter) • The onsite storage time minimised.	Negligible (possibly minor fugitive emissions)

4 Receiving Environment

4.1 Surrounding Environment

The zoning of the site and the surrounding area under the AUP: OP is shown in Figure 4-1**.** The land which immediately surrounds the site is mainly zoned 'Rural - Mixed Rural' or 'Rural - Rural Coastal' under the AUP: OP.

These properties are predominantly used for agricultural or horticultural purposes. Several large plant nurseries are located north of the site on Glenbrook Beach Road (i.e. 442 and 472 Glenbrook Beach Road). The area also includes several rural life-style blocks. At least one rural dwelling appears to be located on all the properties adjacent to the proposed WWTP site.

The closest residential zoned areas ('Residential Single House Zone') are located more than 410m to northwest of site boundary near the corner of Beach Road and Glenbrook Beach Road. These dwellings would be located more than 750m from the proposed WWTP.

Land further to the northwest of the residential area is zoned Future Urban. This area is located approximately 530m from the site's property boundary, and at least 880m from the proposed WWTP. Currently, this land is undeveloped and is used as agricultural fields. However, a private plan change (Private Plan Change 91) has been notified which seeks to rezone 80 McLain Road from Future Urban zone to Residential – Mixed Housing Suburban zone. The 7.98 ha property subject to the plan change is located at the northern end of Future Urban zone area.

The New Zealand Steel Glenbrook steel mill is located approximately 3km to the south of the site.

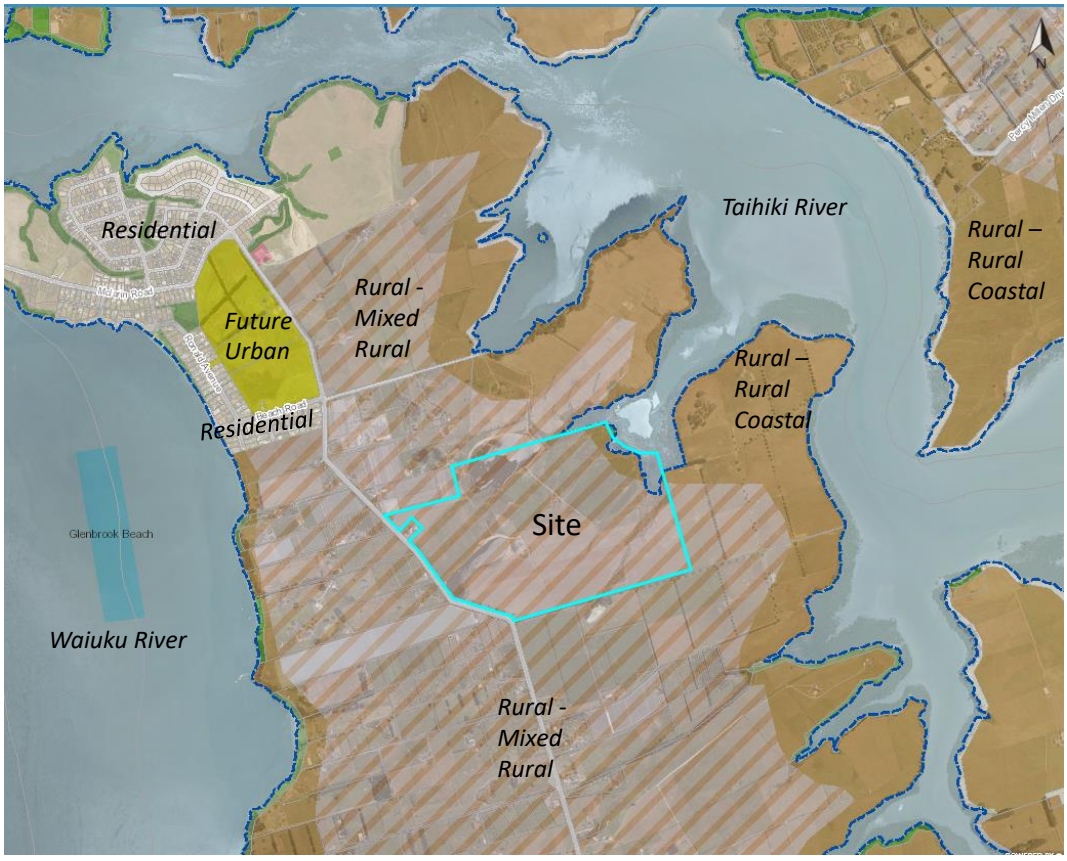

Figure 4-1. Zoning of the site and surrounding area under the AUP: OP

4.2 Sensitivity of the Receiving Environment

The sensitivity of the receiving environment must be considered when assessing potential odour amenity effects. Different locations have different sensitivities to odour[6]. The degree of sensitivity to odour, in any location, is based on characteristics of the land use, including the time of day and the reason people are at a particular location (e.g., for work, home living or recreation).

The MfE GPG Odour[7] provides guidance with regards to the sensitivity of different land-use types to odour nuisance effects. Different land-uses are classified as having a 'high', 'moderate' or 'low' sensitivity to odour.

The GPG Odour sensitivity classifications for different land use zone are comparable to the AUP: OP air quality amenity classifications (Rule E14.4).

4.2.1 Sensitivity to Odour in Rural Environments and Rural Dwellings

People living in rural areas generally have a high tolerance for rural-type odours, which are acceptable to most rural people. However, some types of odours are quite different to normally expected rural odours (due either to the strength (intensity), character and unpleasantness (hedonic tone) of the odour, or to the frequency and duration of the odour) and are much less acceptable.

The AUP: OP recognises that rural production activities, and the operation of local infrastructure can have an impact on odour and dust air quality levels in rural areas. The AUP: OP also notes that these activities will generally not give rise to reverse sensitivity issues[8] [9]. Rural zones are classified as "Medium air quality – dust and odour rural area (Rural)" with regards to activity status of air discharges[10].

The agricultural and horticultural areas in the vicinity of the site will typically have a low occupancy, particularly at night. Therefore, people would rarely be exposed to any odour emitted from the proposed WWTP in these areas. Activities undertaken in these areas would typically be farming related and would generally not be considered to have a high sensitivity to nuisance odours. The surrounding fields are therefore considered to have a low sensitivity to odour.

Rural dwellings are considered to have a higher sensitivity to odour effects, as people may be present at these locations during day or night. The GPG Odour rural residences classified as having a moderate to high sensitivity to odour nuisance effects.

4.2.2 Residential Areas

Residential areas are also considered to have a high sensitivity to nuisance odour. At these locations, people with a high sensitivity to odour could be present during the day and night. Typically, a high level of air quality amenity would be expected in these areas.

[6] Location is one of FIDOL factors (refer Section 5.1)

[7] *Good Practice Guide for Assessing and Managing Odour* (2016), prepared by the New Zealand Ministry for the Environment

[88] Policy E14.2.3 (3), E14.4. Activity table

[9] Policies - H19.2.4 (2)(b), H19.4.3 (2)(d)

[10] E14.4. Activity table

4.2.3 Sensitive Receptors in the Vicinity of the Site

The rural dwellings are the receptors that would be most impacted by any odour emitted from the proposed WWTP. Figure 3-4 shows the location of the dwellings to closest the Stage 3 plant. The footprint of the indicative Stage 3 plant is shown as a grey shaded area in the figure.

The residential zoned areas to the northwest of the site and the Future Urban zoned land are also considered to have a high sensitivity to odour effect. However, these areas are sufficiently distanced from the proposed WWTP such that it is highly unlikely they would be adversely impacted.

The future sensitivity of the receiving environment in terms of the collective policy framework is examined in the Assessment of Environmental Effect (AEE). Overall, it is expected that the sensitivity of the receiving environment is unlikely to increase in the foreseeable future.

Figure 4-2. Location of the nearest rural dwellings. The footprint of the indicative Stage 3 plant is shown as a grey shaded area in the figure.

4.3 Topography

The site and immediate surrounding area are located on relatively flat terrain. There are no topographical features in the surrounding area which are likely to have a significant impact on the dispersion and dilution of the emitted contaminants from the site. The site does however, slope downward in a northeast direction towards the Taihiki River and away from residential dwellings.

The slope of the site is expected influence the layout of the WWTP to allow flows to gravitate from one treatment processes to the next and thereby, avoid energy costs associated with pumping the flow uphill.

4.4 Meteorological Conditions

Weather conditions in an area can have a significant influence on the dispersion of odour emissions in the air. The most influential meteorological parameters on the dispersion of odour emissions are wind speed, wind direction and atmospheric stability.

Worst-case dispersion conditions for odour emitted from any WWTP typically occur during low wind speed (<1.5m/s) and highly stable atmosphere conditions. These conditions are typical of cool, calm winter nights and early morning periods. It is during these conditions, that peak offsite odour concentration would be expected to occur.

Wind flows at the site would be expected to be influenced by coastal land/sea breeze conditions. The slope of the land in the northeast direction would also tend to channel wind flows towards the Taihiki River at night or early morning during low wind speed conditions. These wind flow would also tend to carry any odour emitted from the WWTP away from the surrounding rural dwellings.

The New Zealand Steel Glenbrook Beach Road meteorological monitoring station is the closest meteorological monitoring station to the proposed WWTP. The Glenbrook Beach Road meteorological monitoring station is located approximately 2.8 km to the south southeast of the site. Wind speeds and directions at the station are measured at a height of approximately 6m above ground level (and therefore lower than the recommended meteorological mast height of 10m).

Overall, the wind flows observed at the monitoring station are expected to be representative of those which occur at the site. However, local terrain features will influence wind flows at both the site and monitoring station.

The distribution of 1-hour average wind speeds and wind directions (wind rose) observed at the Glenbrook Beach Road monitoring station for the years 2013 to 2022 is shown in Figure 4-3. The wind rose has been superimposed on an aerial photograph of the WWTP site.

Table 4-1 summarises the hourly wind flows observed at the over the ten-year monitoring period.

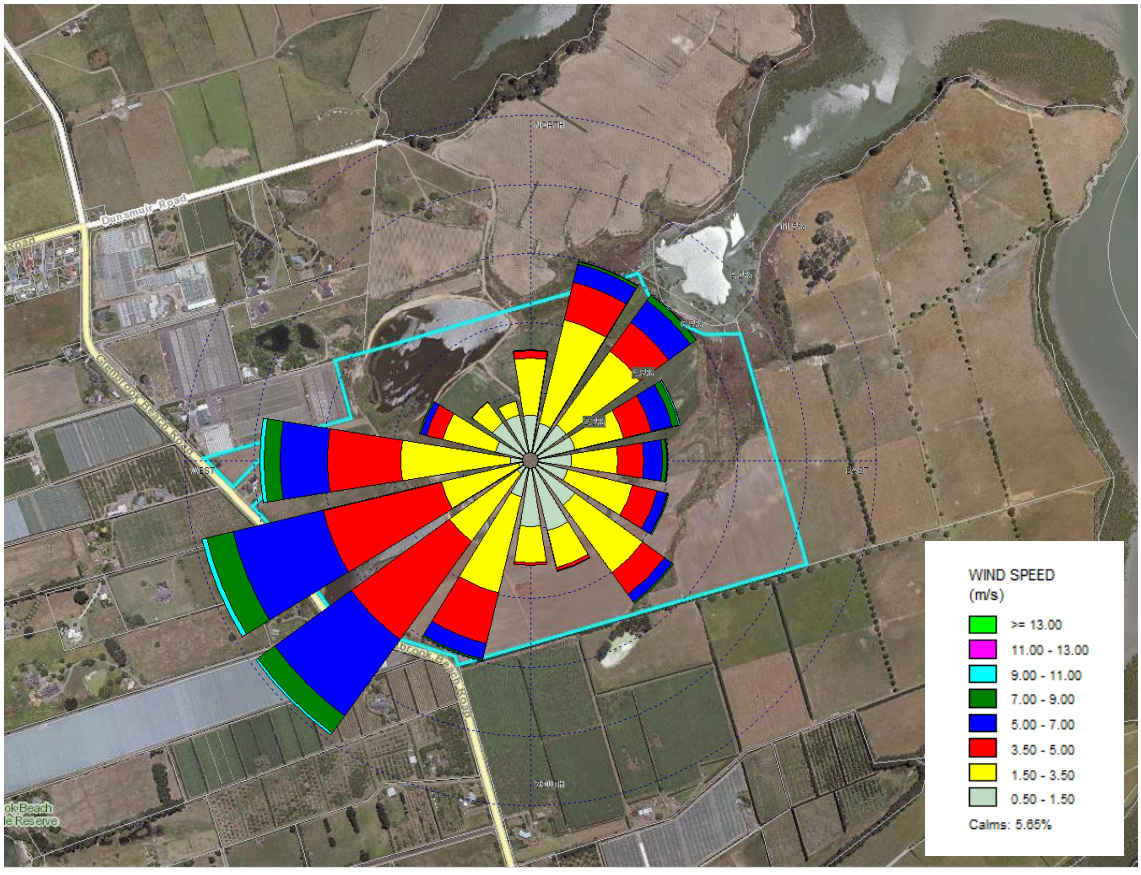

Figure 4-3. Distribution of hourly wind speeds (m/s) and wind directions observed at the Glenbrook Beach Road monitoring station (2013-2022). (Data courtesy of NZ Steel Ltd)

The monitoring shows that the predominant wind direction is from the west to southwest (which occur approximately 37.3% of time). During these wind flows, any odour would tend to be transported away from the nearest dwellings. The secondary predominant wind flows are from the northeast and southerly directions.

Appendix A of this report shows the wind roses for each of the monitored years. The distributions shows that wind flows have varied between years. The average wind speed during the 10-year monitoring period was 2.9 m/s.

The wind distribution shows that a relatively high proportion of low wind speeds occurred at the monitoring station. Wind speeds between 0.5 -1.5 m/s occurred for approximately 22% of the time, and calm conditions for approximately 5.7% of time[11]..

The wind distribution shows that low wind speeds predominantly occurred when winds were from the south to southeast directions. Local topography at the monitoring station and WWTP site can be expected to have an influence on the wind directions during these low wind speed conditions. Therefore, the direction distribution of low wind flows at the proposed WWTP site is, to some extent, likely to vary from those observed at the monitoring station.

Table 4-1. Summary of the distribution of hourly wind speeds (m/s) and wind directions at the Glenbrook Beach Road monitoring station (2013-2022) (reported as % of time). (Data courtesy of NZ Steel Ltd)

Wind direction	0.5 - 1.5 m/s (%)	1.5 - 3.5 m/s (%)	3.5 - 5.0 m/s (%)	5.0 - 7.0 m/s (%)	7.0- 9.0. m/s (%)	>=9.0 m/s (%)	Total (%)
N	1.47	1.80	0.23	0.01	0.00	0.00	3.52
NNE	1.26	3.46	1.25	0.59	0.08	0.02	6.66
NE	1.45	3.07	1.23	0.92	0.21	0.04	6.92
ENE	1.55	1.79	1.02	0.75	0.29	0.06	5.45
E	1.41	1.61	0.94	0.70	0.20	0.06	4.92
ESE	1.29	2.21	0.94	0.38	0.05	0.01	4.88
SE	1.82	2.80	0.95	0.32	0.05	0.01	5.95
SSE	2.38	1.48	0.23	0.05	0.00	0.00	4.14
S	2.24	1.20	0.10	0.00	0.00	0.00	3.54
SSW	1.31	3.14	1.61	0.52	0.04	0.01	6.63
SW	0.58	2.79	3.87	2.99	0.67	0.06	10.96
WSW	0.43	2.57	3.92	2.93	0.87	0.17	10.90
W	0.65	3.53	2.39	1.54	0.52	0.13	8.76
WNW	1.16	1.79	0.57	0.25	0.05	0.01	3.83
NW	1.53	0.82	0.05	0.00	0.00	0.00	2.40
NNW	1.55	0.46	0.01	0.00	0.00	0.00	2.02
Total	**22.08**	**34.52**	**19.30**	**11.97**	**3.03**	**0.57**	**91.48**
Calms							**5.73**
Missing data							**2.79**

[11] The apparently high proportion of low wind speeds can in part be attributed to the 6m mast at which these measurements were taken. The standard height for a meteorological mast is 10m. Wind speeds increase with height above ground as the frictional effect of the surface decrease. Therefore, a lower proportional of low wind speeds would likely have been observed if a standard mast was used.

4.4.1 Seasonal Wind Flows

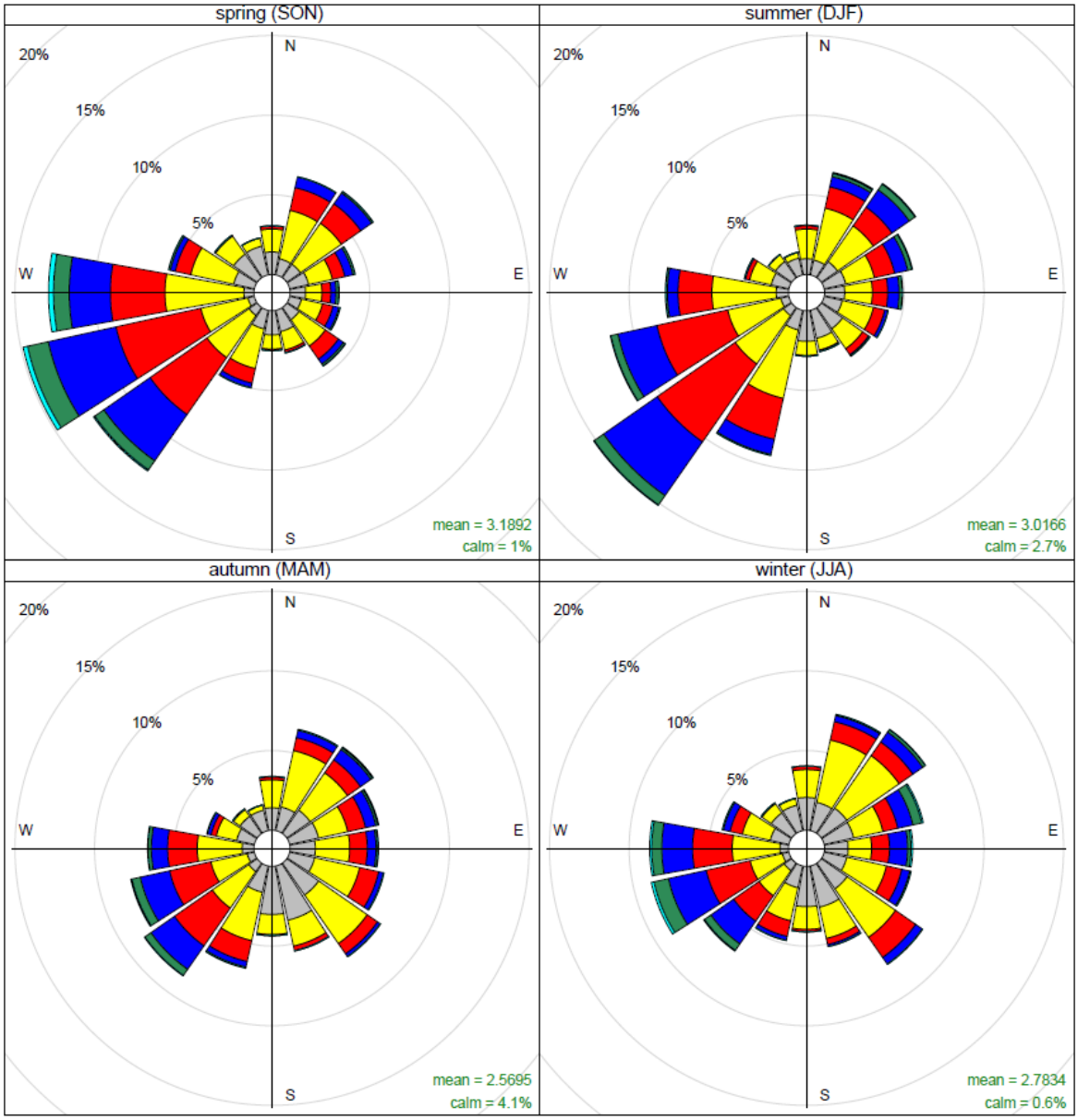

Figure 4-4 shows the seasonal distributions of wind flows observed at the Glenbrook Beach Road monitoring station. The wind roses show the predominant winds are from west-southwest direction during autumn and from the southwest direction in summer. However, during autumn and winter, winds from the northeast to southeast directions occur more frequently.

Wind speeds are also, on average, lower during the autumn and winter. A higher frequency of low wind speeds is also observed during these seasons.

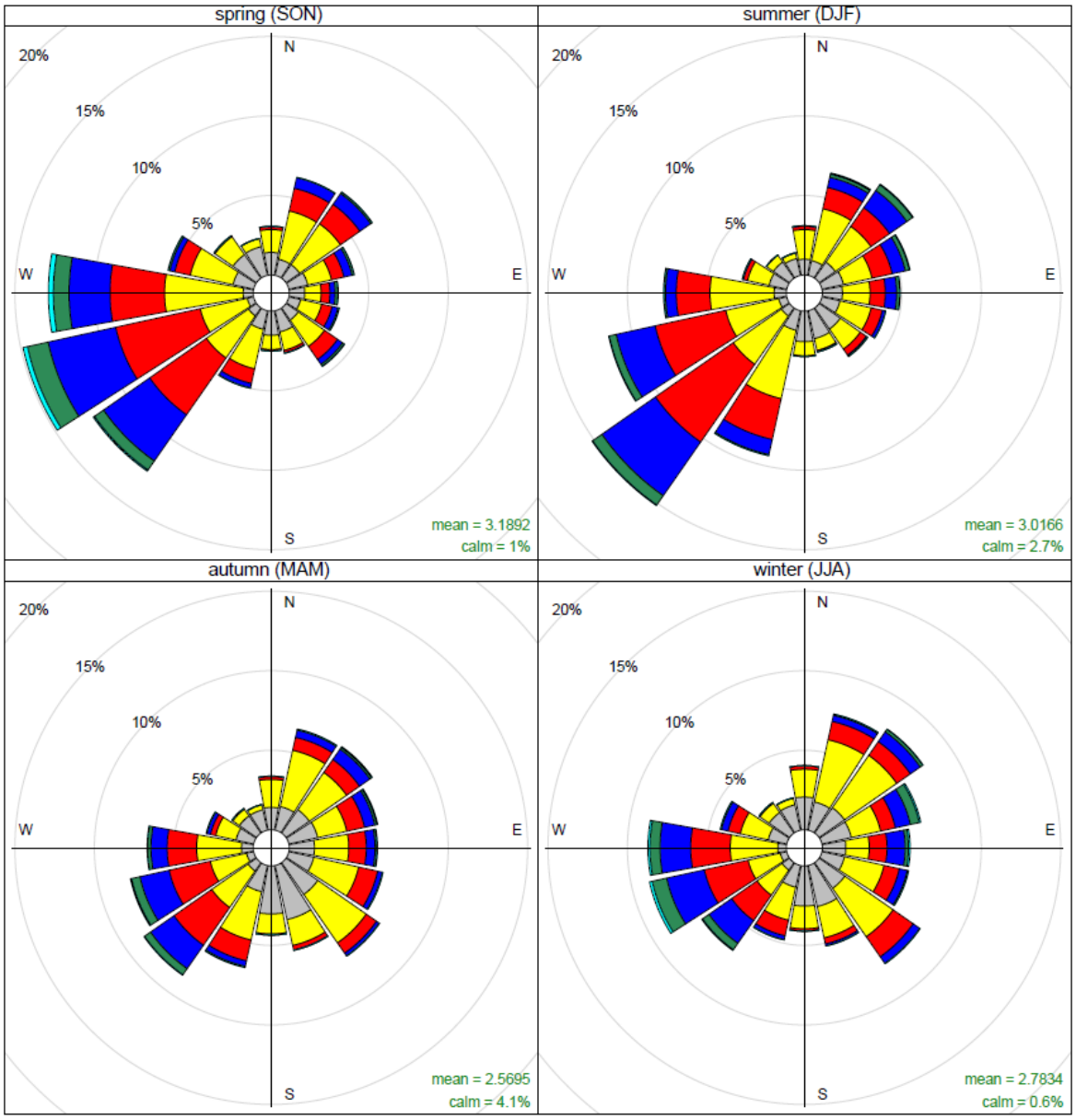

Figure 4-4. Distribution of seasonal hourly wind speeds (m/s) and wind directions observed at the Glenbrook Beach Road monitoring station (2013-2022). (Data courtesy of NZ Steel Ltd)

4.4.2 Diurnal Wind Flows

Figure 4-5 shows the daytime and night-time distributions of wind flows observed at the Glenbrook Beach Road monitoring station. The wind roses show the winds from the west-southwest direction are more predominant during the day.

On average, higher wind speeds occur during the day compared to night-time. Similarly, the frequency of calms and low wind speed conditions are also greater during the night. The monitoring data shows speeds tend to increase during the day between approximately 7am to 4 pm, before decreasing again overnight (refer Figure 4-6).

The wind roses show that the risk of low wind speed and poor dispersion conditions is greater during the night compared to the day.

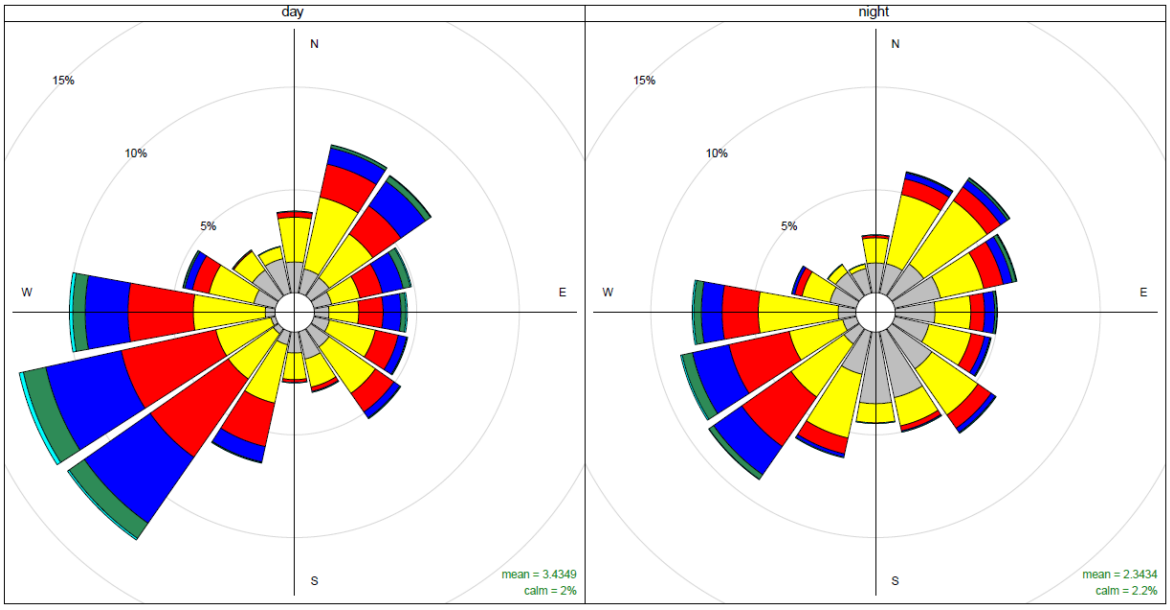

Figure 4-5. Distribution of day and night hourly wind speeds (m/s) and wind directions observed at the Glenbrook Beach Road monitoring station (2013-2022). (Data courtesy of NZ Steel Ltd)

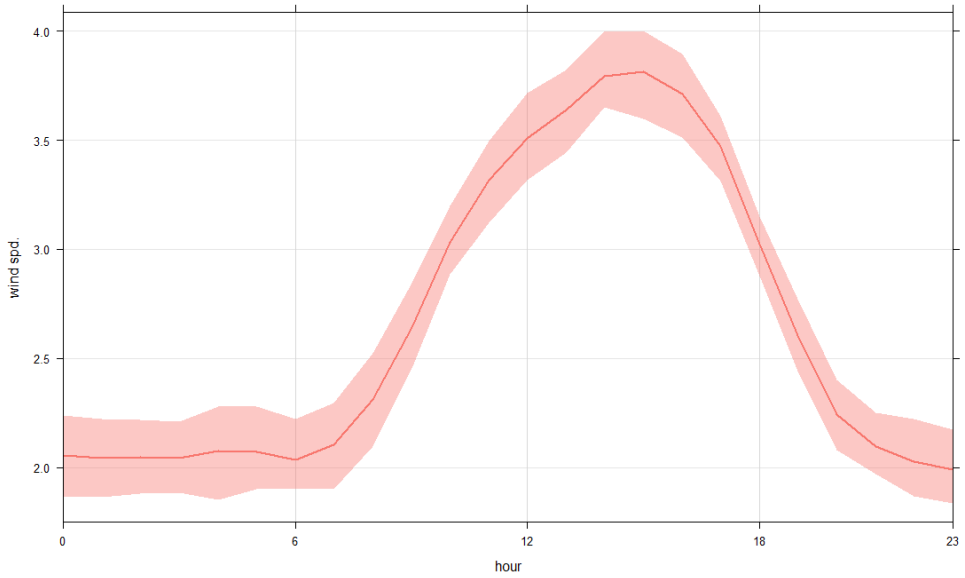

Figure 4-6. Average wind speeds (m/s) observed at the Glenbrook Beach Road monitoring station with regards to time of day (2013-2022). The shading shows the 95% confidence interval. (Data courtesy of NZ Steel Ltd)

4.4.3 Percentage of Time Rural Dwellings are Downwind of WWTP

Table 4-2 summarises the percentage of time the nearest rural dwellings would be downwind of the proposed Stage 3 WWTP and therefore, potentially exposed to odour emitted from the WWTP. Estimates have been based on the wind flows observed at the Glenbrook Beach Road meteorological monitoring station and the indicative Stage 3 layout shown in Figure 3-1.

The table also shows the percentage of the time the rural receptors are downwind of WWTP for all wind speeds conditions and for low wind speed conditions (<1.5m/s) when peak downwind odour concentrations would occur. Low wind speed conditions on average occur 65% of the time during the night.

Table 4-2 shows that nearest rural dwellings are estimated to be downwind of the WWTP between 6.2% to 10.4% of the time, but only 1.9% to 3.4% during poor dispersion conditions (i.e. low winds speeds).

Table 4-2. Percentage of time rural dwellings are expected to be downwind of the Stage 3 WWTP

Receptor	Separation distance to WWTP (m)	Wind Direction when Downwind	Percentage of time downwind (%)	Percentage of time downwind during low wind speeds (%)
R1	320	NNE	9.6%	1.9%
R2	345	ENE	6.6%	1.8%
R3	380	ESE	9.4%	2.5%
R4	385	E	6.2%	1.8%
R5	390	SE	10.4%	3.4%
R6	400	NNE	8.5%	2.0%
R7	440	SSE	7.6%	4.0%
R8	475	SE	9.3%	2.9%
R9	465	N	8.4%	2.4%
R10	494	SE	8.9%	2.5%
R11	680	W	4.6%	1.3%
R12	740	E	3.8%	1.2%
R13	550	ENE	4.7%	1.4%
R14	520	N	6.5%	2.3%
R15	550	N	6.5%	2.3%
R16	540	SSE	7.1%	3.5%

4.5 Background Air Quality

The proposed WWTP is in a rural environment. Common odours associated with agricultural activities would be expected in the surrounding areas. These odours would, at times, be expected to be noticeable at rural dwellings. Commonly, agricultural activities include:

- decomposition of organic material
- fertiliser application
- vegetable odours during the harvesting of produce
- animal odours
- farm effluent ponds.

Dust would also be expected to be generated by these agricultural activities which may, at times, have an impact at surrounding dwellings. The dust emitted from these activities could also be visible at times.

Odour emitted from residential solid fuel burners may also be noticeable during the winter months.

The New Zealand Steel Glenbrook Steel Mill is located approximately 3km to the south of the site. Auckland Council has recently granted an air discharge consent for the continued operation of the mill. The air discharge consent decision noted that no odour would be expected to be observed outside of the site, and any potential nuisance effect from dust fallout from the kilns would most likely occur within 1km of the plant[12].

[12] DIS60376538, NZ Steel Air Discharge Consent Decision. Issued 13 March 2023

Based on the separation distance between the proposed WWTP site and the steel mill, emissions from the steel plant are not expected to have any impact on air quality in areas surrounding the site.

There are no other industrial sources of odours in the immediate vicinity of the site which would impact on local air quality.

5 Assessment of Odour Amenity Effects

5.1 Odour Effect

For an odour discharge to create an adverse effect, it needs to be established that it is offensive or objectionable to an “ordinary person”. It is usually insufficient for an odour discharge simply to be “detected” at or beyond the boundary of a site, for an odour to be considered to have caused an adverse effect.

Guidance provided by the MfE GPG Odour, states that, when assessing whether an odour is likely to have an adverse effect, the FIDOL factors (Frequency, Intensity, Duration, Offensiveness and Location) should be considered. The FIDOL factors, which are universally used in New Zealand and internationally to assess odour effects, are summarised in Table 5-1.

Table 5-1. FIDOL factors

FIDOL Factor	Description
Frequency:	How often an individual is exposed to odour
Intensity:	The perception of the strength of the odour experienced. The intensity of odour experienced increases linearly with the logarithm of the odour concentration
Duration:	The length of any particular odour event
Offensiveness/character:	The character relates to the “hedonic tone” of the odour, which may be pleasant, neutral or unpleasant
Location:	The type of land use and nature of human activities in the vicinity of an odour source, and the expected level of air quality amenity

Different combinations of these factors are significant when assessing adverse effects. Depending on the severity of an odour event, one single occurrence of a high intensity and/or highly unpleasant odour may be significant enough to create an adverse effect. This short-term impact is known as an “acute” odour effect. However, in other situations, an adverse effect may be created when a lower intensity and moderately unpleasant odour is experienced frequently over a long period. This longer-term impact is known as a “chronic” odour effect.

5.2 Published Separation Distances

5.2.1 Overview

The odour which is emitted from an emission source disperses and dilutes with increasing distance downwind. The risk of a receptor being adversely impact by odour similarly also decreases with increasing separation distance.

The GPG Odour recommends relevant separation distances (buffers) should be considered assessing odorous discharges to air. Separation distances are primarily intended to manage the following:

- Unintended or accidental discharges of odour
- Odour effects that cannot be completely internalised even with adoption of the best practicable option (such as odours from landfills)
- Potential land use conflicts and reverse sensitivity effects.

Separation distances are not intended to replace the need for good pollution control but acknowledge that there may be unintended emissions at times, for which allowance should be made. Separation distances are

intended to be used as a risk management tool to minimise the effects of any unexpected or accidental emissions (in contrast to day-to-day emissions).

5.2.2 Published Separation Distances

Published separation distances do not consider the effect that specific treatment and odour control processes have on an odour. They tend to be based on the historic performance of older plants. The separation distances are also applied in all directions and therefore do not consider the influence that meteorological conditions and topography may have on the dispersion of any odours.

Therefore, published separation distances are conservative and are expected to overestimate the impact of site emissions. Published separation distances are often used in New Zealand and Australia as an initial screening method to assess if odour emissions could potentially have an adverse effect.

No New Zealand regulatory agencies have published odour-based separation distances for WWTPs. Water New Zealand[13] has published guidelines for waste stabilisation ponds (e.g. anaerobic, facultative, and maturation ponds) but not for a tank based WWTP such as proposed[14]. It is however, noted that that nearest dwellings are located further than the maximum separation distance of 300m published by Water NZ.

The separation distances published by the Victorian Environment Protection Agency (Vic EPA)[15] are widely used in New Zealand. The Vic EPA separation distances for WWTPs vary with regards to the treatment capacity of the plant (PE capacity) and the general classification of the type of treatment plant (i.e. facultative pond system, aerobic pond system or mechanical/biological plant). All tank based WWTPs, such as the proposed WWTP (and most modern WWTP of any scale), are classified as mechanical/biological plants.

The derived separation distances for the proposed Stage 1 (20,000 PE), Stage 2 (30,000 PE) and Stage 3 (60,000 PE) WWTP are shown in Table 5-2. These Vic EPA derived separation distances are intended to be considered in term of the distance between WWTP processes and sensitive locations, including dwellings where people are likely to be exposed (i.e. not to property boundaries)

Table 5-2. Recommended Victoria EPA separation distances for the different stage of the WWTP

Stage	Population Serviced (n)	Vic EPA Separation Distance (m) *
Stage 1	20,000	271
Stage 2	30,000	310
Stage 3	60,000	390

* mechanical/biological plants (10 x $n^{0.333}$)

Figure 5-1 shows the Vic EPA separation distances when applied to the indicative Stage 3 plant layout (refer Figure 3-1). The figure also shows the location of nearest rural dwellings. A summary of the separation distance between the boundary of the WWTP and the nearest dwelling is shown in Table 3-1.

[13] Water New Zealand, 2017. *Good Practice Guide for waste Stabilisation Ponds: Design and Operation*.

[14] Water New Zealand recommends a separation distance of 150m between stabilisation ponds and rural dwellings and 300m to residential areas

[15] Victoria EPA, *Recommended Separation Distances for Industrial Residual Air Emissions*, March 2013.

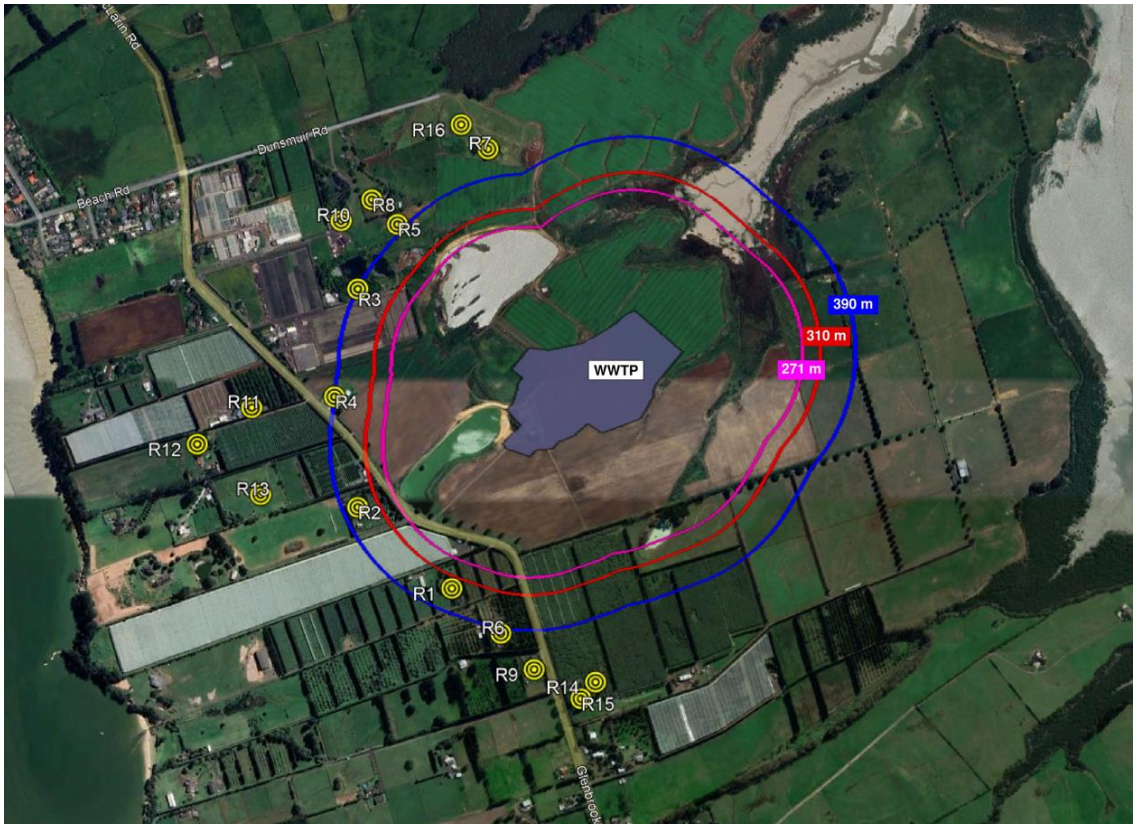

Figure 5-1. Victoria EPA separation distances for the Stage 1, Stage 2 and Stage 3 WWTPs

Table 5-3. Separation distance between rural dwellings and the boundary of indicative Stage 3 plant.

Receptor	Separation distance between nearby dwellings and the Stage 3 Plant (m)
R1	320
R2	345
R3	380
R4	385
R5	390
R6	400
R7	440
R8	475
R9	465
R10	494
R11	680
R12	740
R13	550
R14	520
R15	550
R16	540
Residential and Future Urban zoned land	*>800*

No dwellings are located within the Vic EPA's recommended separation distances for the Stage 1 and Stage 2 plant.

Five dwellings are located within the recommended Stage 3 separation distance (dwelling R1, R2, R3, R4 and R5). However, dwellings R3, R4 and R5 are located approximately 380 to 390m from the WWTP boundary which generally meet the Vic EPA's recommended separation distance.

Dwellings R1 and R2 are respectively located 320m and 345m from the Stage 3 plant boundary, or 82% and 88% of the Vic EPA recommended separation distance. However, only the WWTP inlet works facilities and inlet pump station would be within the recommended separation distance[16]. These processes are expected to be enclosed and vented to biofilters (or an alternative OFC technology). Given the separation distance between processes dwellings and the treatment provided by the biofilter, it is very unlikely any emitted odour would be detectable at these properties.

The separation distance between dwellings R1 and R2 and other treatment processes will be greater than the Vic EPA recommended separation distance. In the indicative design, the ASRs and MBRs are located more than 400 from the nearest dwelling, and sludge treatment facilities more than 470m from the nearest dwelling.

The comparison of separation distances between the WWTP and surrounding dwellings to those recommended by the Vic EPA, indicates that the nearest dwellings are unlikely to experience odour that is offensive or objectionable to the extent that it adversely affects amenity values, even if plant upset conditions were to occur.

The residential area and Future Urban zone to the northeast of the site is located more than 800m from the proposed WWTP and therefore more than twice the separation distance recommended by the Vic EPA. Consequently, no offensive of objectionable odour would be expected in these areas.

5.3 Separation Distances at Comparable WWTPs

5.3.1 Snells-Algies WWTP

The upgraded Snells-Algies WWTP is currently under construction. The proposed WWTP will be a modern activated sludge treatment plant. The proposed Stage 2 Southwest WWTP will have a similar treatment process, odour control and treatment capacity (approximately 30,000 PE) to the upgraded Snells-Algies plant. Therefore, the odour emitted from the upgraded Snells-Algies WWTP is expected to be similar that emitted from the Stage 2 Southwest WWTP

The AUP: OP designations 9347 and 9363[17] which apply to the Snells-Algies WWTP site and adjacent farmland provide for an odour buffer distance of approximately 260m between the upgraded plant and the closest rural dwelling. Other dwellings are located more 350m from the WWTP. Open recreational areas are located within 270m of the proposed WWTP.

The odour buffer proposed for the Southwest WWTP site is consistent to the Snells-Algies WWTP odour buffer.

5.3.2 Pukekohe WWTP

The Pukekohe WWTP was upgraded between 2019 to 2022 to a modern activated sludge treatment plant. The existing sequential batch reactors (SBR) were converted to continuous ASRs. The upgrade increased

[16] This would be also expected the case for alternative WWTP configurations

[17] Watercare the requiring authority

the treatment capacity from approximately 30,000 PE to 60,000 PE, comparable to the proposed Stage 3 Southwest WWTP.

The separation distance between the Pukekohe WWTP and nearest rural dwelling is approximately 270m. The separation distances to the next three dwellings are between 330m to 360m. The separation distances between the Pukekohe WWTP and the nearest rural dwellings are also comparable to those at the proposed Southwest WWTP.

Prior to the upgrade at Pukekohe, only two complaints were received, one in 2013 and one in 2018. Both odour complaints were attributed to the large treatment ponds at the site, and not the tank-based SBRs. Similarly, no odour complaints have been received since the upgraded plant became fully operational, although the commissioning of the upgraded plant has occurred only recently.

Complaint records do not provide conclusive evidence of whether a nuisance odour is present or not. However, they do provide an indication of the relative impact of any emitted odour. The lack of complaints received by Watercare and Auckland Council to date, indicates that any odour emitted from the WWTP is sufficiently dispersed and diluted, over the distance of approximately 270m, to not have an adverse effect on neighbours.

The meteorological conditions which occur at Pukekohe WWTP would also be comparable to those which occur at the proposed Southwest WWTP site. Therefore, the frequency that dwellings are downwind of the WWTP during poor dispersion conditions would also be similar.

Overall, the Pukekohe WWTP complaint records support the effectiveness of the proposed 300m odour buffer distance at the Southwest WWTP to minimise potential adverse odour effects.

5.4 FIDOL Factor Odour Assessment

5.4.1 Location

Section 4.2.3 of this report discusses the sensitivity of the receiving environment. The surrounding area is predominantly used for agricultural and horticultural purposes and has a low sensitivity to odour. The rural dwellings will have a higher sensitivity to odour and would be the most impacted by any adverse odour amenity effects.

However, based on land use and density of housing, the receiving environment is overall, considered to have reasonably low sensitivity to odour (while acknowledging there will be specific locations with a higher sensitivity). The collective policy framework indicates the sensitivity of the receiving environment is unlikely to increase in the foreseeable future.

The Residential and Future Urban zoned located to the northeast of site are located more than 800m from the proposed. These areas have, or in the future may have, a high sensitivity to odour. However, any odour emitted from the WWTP is highly unlikely to be observed in these areas due to the separation distance. The development of the Future Urban zoned area would not have any reverse odour sensitivity effects on the operation of the proposed WWTP.

5.4.2 Frequency, Intensity and Duration

The frequency intensity (i.e., the strength) and duration of odour is influenced by the characteristics of the odour emission source (including odour potential and effectiveness of odour mitigation) and how effectively the emitted odour is dispersed in the environment, before reaching the receptor (including meteorological conditions and the separation distance).

The proposed odour mitigation for the WWTP will be detailed in the air discharge consent application. However, provided standard industry odour mitigation procedures are implemented and maintained, only comparatively low levels of odour are expected to be emitted during normal operating conditions.

The WWTP would be located more than 200m from any of the site's boundaries (in compliance with the odour buffer). During normal operating conditions, emitted odour is expected to be sufficiently dispersed and diluted before reaching the boundary not to have any adverse effect (i.e. the odour concentration (intensity) is not sufficient to be considered either offensive or objection). Similarly, the nearest dwelling is located more than 320m from any proposed treatment process and would also not be expected to experience any odour nuisance effects.

This assessment is supported by the general lack of odour complaints which have been received by Watercare and Auckland Council for the Pukekohe WWTP. The upgraded Pukekohe WWTP has a similar treatment capacity as the proposed Stage 3 plant. The separation distance between the Pukekohe WWTP and the nearest dwelling is also similar to separation distance to the nearest dwellings as the proposed WWTP. Therefore dwelling near Pukekohe WWTP would be expected to be exposed to similar levels of odour to those in the vicinity of the proposed Southwest WWTP.

The meteorological monitoring undertaken at the Glenbrook Beach Road monitoring station shows that prevailing winds at the site will be from the southwest direction. During these winds, any emitted odour will be transported away from the nearest dwellings (in the northeast direction).

The nearest rural dwellings are estimated to be downwind of the WWTP for 6.2% to 10.4% of time, but for only 1.9% to 3.4% of time during low wind speed conditions. The meteorological monitoring data suggests that the nearest dwellings would be infrequently downwind of the WWTP during poor dispersion/dilution conditions, when peak downwind odour concentrations may occur. The slope of the site to the northeast would also assist in directing winds away from nearest dwellings during poor dispersion conditions. The monitoring shows there are no meteorological factors which would potentially increase the risk of odours being observed outside the site boundary.

Higher odour emissions may occur during abnormal operating conditions. However, comparisons of the separation distance between the proposed WWTP and the nearest dwellings against those recommended by Vic EPA, indicate that risk of adverse odours being experienced during such an event is still comparatively low. These events would also be expected to occur infrequently and for a short duration. The risk of abnormal events is minimised through plant design, monitoring and management procedures.

5.4.3 Summary of Odour Effects

Overall, the proposed WWTP is appropriately located in a rural environment where there are relatively few sensitive receptors which may potentially be impacted by site emissions. The proposed odour buffer is considered sufficient to mitigate adverse odour effects when combined with standard industry odour control procedures, both during normal and abnormal operation conditions.

Considering the FIDOL factors, emissions are not expected to result in adverse odour amenity effects at any of the assessed receptors.

6 Assessment of Construction Dust Amenity Effects

6.1 Potential Dust Sources

Dust will be generated during construction of the WWTP. Potential sources of dust during construction would include;

- Excavation works
- Site grading
- Material stockpiles
- Loading and unloading materials
- Vehicle movements on unsealed surfaces
- Dust generated by the wind from dry exposed surfaces.

The emissions of dust during construction will be minimised through the implementation of standard dust control procedures.

6.2 Construction Dust Effects

Dust deposition is the settling of dust onto surfaces. The effects of dust deposition can be subjective and are dependent on the sensitivity of the receiving environment. Some people will not be annoyed by dust, whereas others will be annoyed and may find it objectionable or offensive.

Typically, the most common areas of concern from dust deposition arise at residential properties (or similar sensitive locations such as retail premises or schools) and include the visual soiling of clean surfaces, such as cars, window ledges, and household washing, as well as dust deposits on vegetation. Dust fallout on a road or rural farmland, such as the land which surrounds the site, is unlikely to have nuisance effect even at relatively high deposition rates.

6.3 Sensitivity to Dust

MfE's "*Good Practice Guide for Assessing and Managing Dust*" (GPG Dust) classifies rural areas, such as those which surround the site, as having low sensitivity to dust nuisance effects. However, the rural dwellings would have a higher sensitivity. The GPG Dust classifies rural dwellings as having a moderate to high sensitivity to dust.

Existing agricultural activities at the site and on the surrounding farmland currently generate dust which contribute to the dust deposition rates at the properties neighbouring the WWTP. The sensitivity of the receiving environment to dust effect is therefore considered to be low to moderate.

6.4 Risks from Dust During Construction

The potential risk from dust effects decreases rapidly with increasing separation distance from dust sources. The Institute of Air Quality Management (IAQM), as a general rule, considers the risk of nuisance dust effects from construction activities to be low at distances of 50-100m from construction sources[18]

The main construction activities at the site will occur several hundred metres from any dwelling. Therefore, provided standard dust control procedure are employed during construction, the risk of any adverse dust

[18] Guidance on the assessment of dust from demolition and construction (2014) prepared by Institute of Air Quality Management, London, UK

effects from these activities is considered negligible. Therefore, potential construction dust effects are assessed as being less than minor.

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7 Summary

Watercare is proposing to construct a new advanced WWTP at 372 Glenbrook Beach Road, Auckland to service the communities of Clarks Beach, Waiuku, Glenbrook and Kingseat. The new Southwest WWTP will be developed in 3 stages. When fully developed, the WWTP will have the capacity to service a population of approximately 60,000 PE.

The purpose of this assessment is to support a Notice of Requirement (NoR) for designation of the land area within which the WWTP will be located.

The primary discharge to air from the proposed Southwest WWTP, which may impact the amenity of the area, will be odour. The discharge of odour to air from the WWTP is also the subject of a separate resource consent application to Auckland Council.

The potential adverse effects of these discharges on local amenity will be minimised through the implementation of appropriate odour control and management procedures. A 200m wide odour buffer around the processing units of the WWTP is proposed. Potential wastewater odour sources will also be located more than 300m from any existing dwelling. The proposed odour buffer is considered to provide an appropriate level of separation between WWTP and the nearest dwelling to minimise the risk of adverse odour. Similar separation distances between treatment processes and sensitive receptors are observed at the Snells-Algies and Pukekohe WWTPs.

Overall, the rural receiving environment is considered to have relatively low sensitivity to odour. However, several rural dwellings are located on the surrounding properties which have a higher sensitivity. The closest dwelling is located approximately 320m from the proposed WWTP. The sensitivity to odour of the receiving environment is not expected change to any extent over the foreseeable future.

Provided standard odour mitigation methods are implemented, such as those included in the indicative design, only comparatively low levels of odours are expected from the proposed WWTP during normal operation. The separation distance between the wastewater treatment processes, the site boundary and surrounding dwelling is such that any odour that is generated is expected to be sufficiently dispersed not to have an adverse effect on amenity values.

This assessment is supported by the odour performance of the similarly sized Pukekohe WWTP, and comparison of the separation between treatment processes and the surrounding receptors, against those recommended by the Vic EPA.

Overall, it is concluded that emissions from the proposed Southwest WWTP would not be expected to have any adverse odour amenity effects at any of the assessed receptors.

Similarly, it is concluded that provided industry standard dust mitigation method are implement during construction any potential dust effects will be less than minor.

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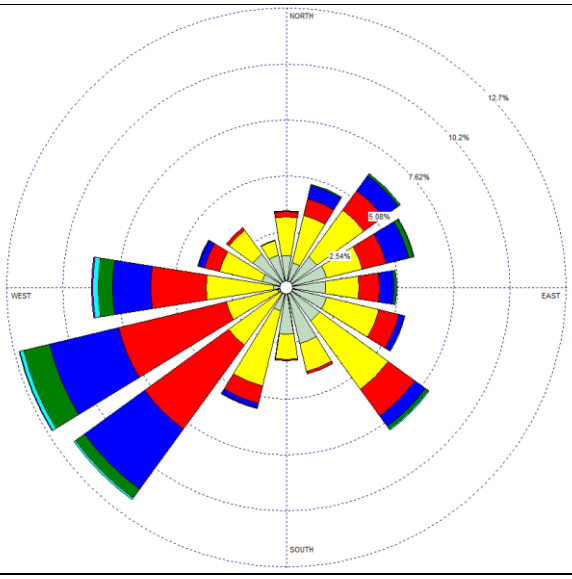
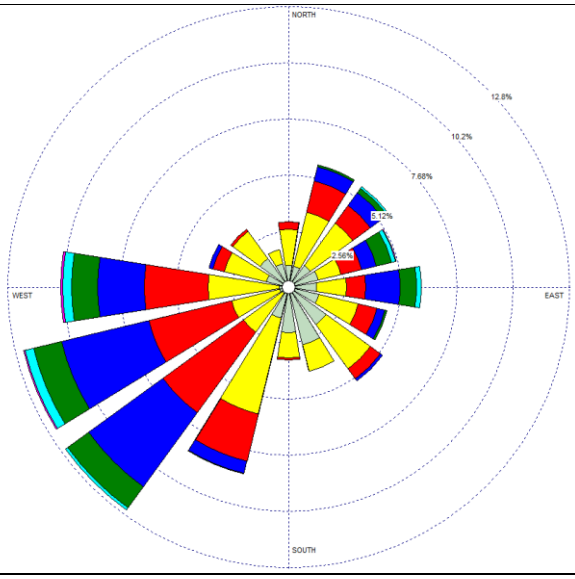
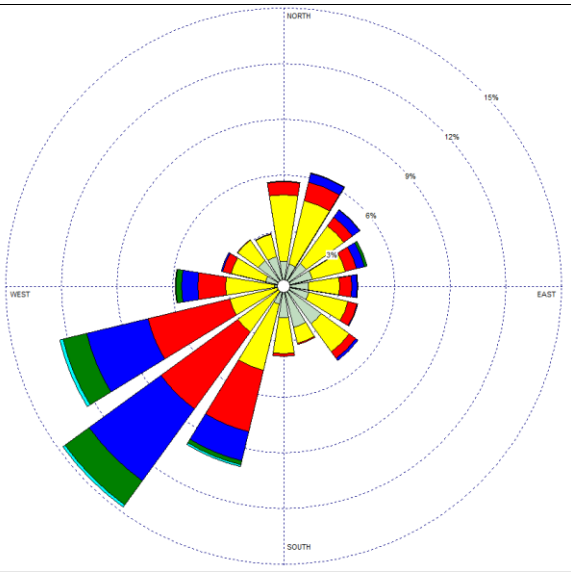
Appendix A – Annual Windroses



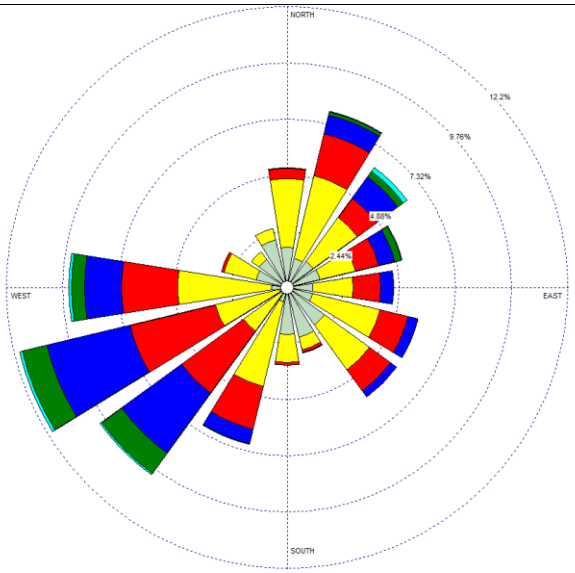
2013



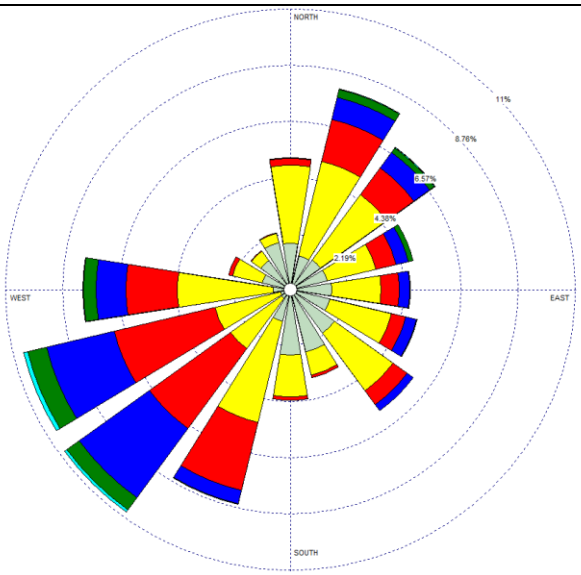
2014



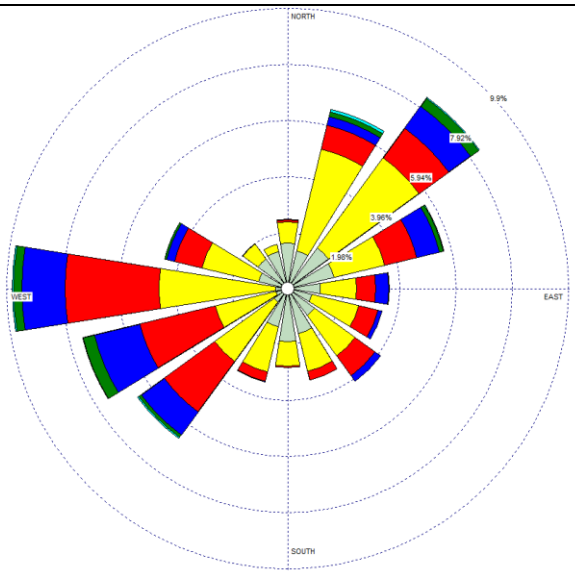
2015



2016



2017 SOI 0.41



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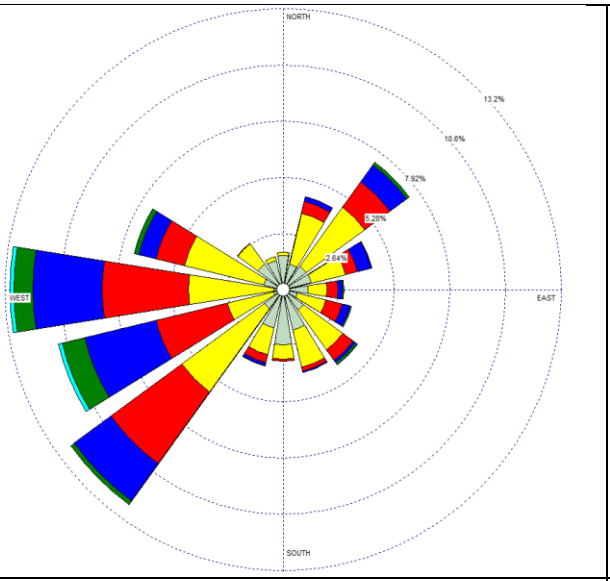
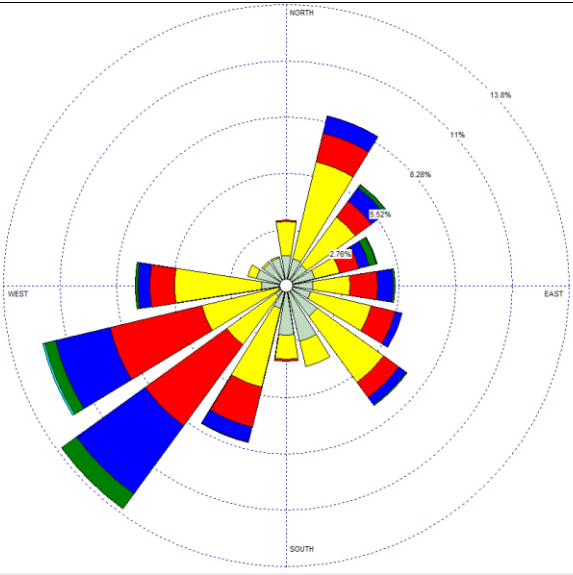
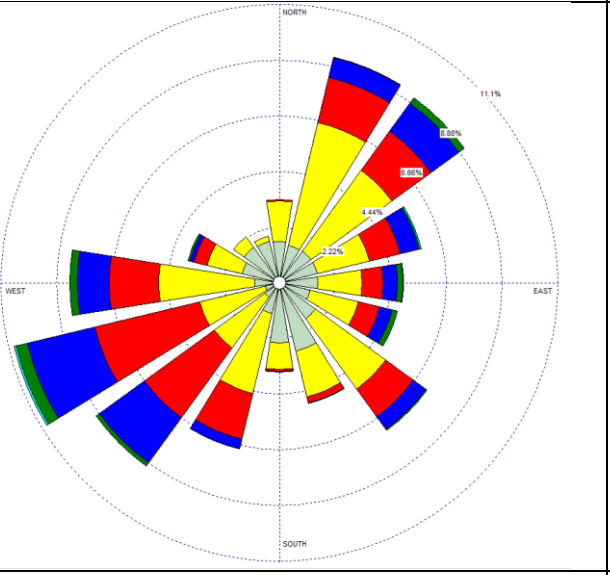


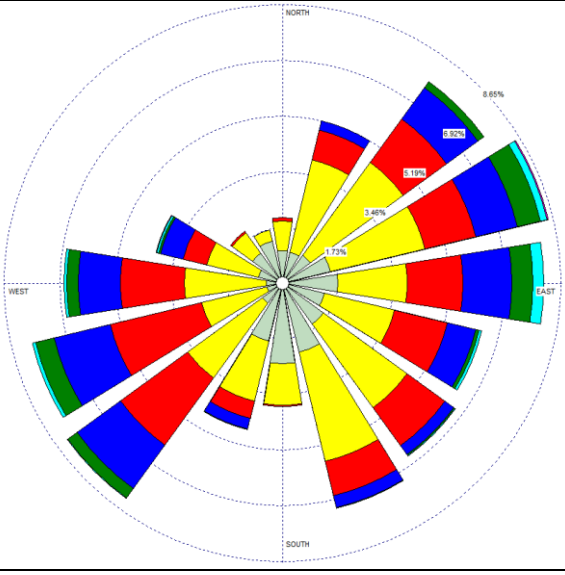
2019



2020



2021



2022