



Beachlands South Limited Partnership

110 Jack Lachlan Drive &
620, 712, 758, and 770 Whitford-Maraetai Road
Beachlands

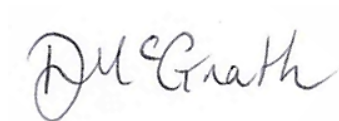
Technical assessment of discharges to air from proposed
wastewater treatment plant



Report 26245
Report date 17/07/2026

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Document History

No	Version	Amendments made	Issue Date
1	DRAFT	Sent to client	14.07.2026
2	FINAL	Revised based on client comments and reissued	17.07.2026

Table of Contents

1.	Introduction	6
2.	Site location and environmental setting	7
3.	Process WWTP location and design	9
4.	Consent requirements	11
5.	Discharges to air	13
6.	Air quality effects on the existing environment	17
7.	Assessment of effects	24
8.	Conclusion and recommendations	31
9.	Recommended consent conditions	32
10.	References.....	35

Table of Tables

Table 5-1: Odour-generating potential and mitigations for the proposed WWTP	14
Table 6-1: Sensitive receptor details	21
Table 7-1: FIDOL assessment factors (MfE, 2016b)	26

Table of Figures

Figure 2-1: Site boundary (dashed purple line) and Auckland Unitary Plan zones	7
Figure 3-1: WWTP process and proposed WWTP building utilising CW technology	10
Figure 6-1: Computer simulated data for Beachlands site (2021 - 2026)	17
Figure 6-2: Beachlands WWTP service areas and discharge location	20
Figure 6-3: Sensitive receptor and WWTP location	23

Terms and Abbreviations

Terms & Abbreviations	Explanation
AEE	Assessment of Environmental Effects
AML	Air Matters Ltd
AUP	Operative Auckland Unitary Plan
BPO	Best Practical Option
BSLP	Beachlands South Limited Partnership
CMA	Coastal Marine Area
CO	Carbon monoxide
CW	Combined Works
EPA	Environmental Protection Agency (Victoria)
EPAN	Ecological Protected Area Network
FIDOL	Frequency, Intensity, Duration, Offensiveness & Location A qualitative approach to evaluate the likelihood of odour giving rise to 'offensive or objectionable odour effects'
FTAA	Fast-track Approvals Act
GHG	Greenhouse Gas
Greenhouse NES	National Environmental Standards for Greenhouse Gases from Industrial Process Heat
Greenhouse NPS	National Policy Statement for Greenhouse Gases from Industrial Process Heat
GPG	Good Practice Guide for Assessing Discharges to Air from Industry / for Assessing and Managing Odour
H ₂ S	Hydrogen sulphide
MfE	Ministry for the Environment (2016)
NESAQ	National Environmental Standards for Air Quality Regulations (2004)
NIWA	National Institute of Water and Atmospheric Research
NO _x	Oxides of nitrogen
PM ₁₀	Particulate matter with a diameter of less than 10 microns
RMA	Resource Management Act 1991
SEA	Significant Ecological Area
SO ₂	Sulfur dioxide
VOC	Volatile organic compounds
WWTP	Wastewater Treatment Plant

1. Introduction

Air Matters Limited (AML) has been engaged by Beachlands South Limited Partnership (BSLP) to undertake a technical assessment of discharges to air (odour) from a proposed Wastewater Treatment Plant (referred to as 'WWTP' and 'Beachlands South WWTP' throughout) associated with the Beachlands South Project, East Auckland. The WWTP is designed to support both immediate infrastructure requirements and long-term growth.

This assessment has been prepared in support of a substantive application submitted by BSLP under the Fast-track Approvals Act 2024 (FTAA). Beachlands South is listed in Schedule 2 of the FTAA as a project of significant regional or national benefits. The project site is legally described as Lot 2 DP 501271 and Lot 100 DP 504488, with recorded addresses of 110 Jack Lachlan Drive, Beachlands, Auckland, and 620, 712, 758 and 770 Whitford-Maraetai Road, Whitford, Auckland, respectively. The proposed WWTP is located approximately 1.5 km south of the Beachlands Airshed (refer Figure 2-1).

The substantive application is supported by a comprehensive set of technical assessments and plans addressing the environmental, servicing and infrastructure matters associated with the proposal. This report should be read alongside the Wastewater Servicing Strategy and Discharge Assessment Report by GWE Engineers and the appended technical reports and drawings lodged in support of the whole application.

1.1 Overview of the proposed development

The Beachlands South development area of 307.2 ha comprises 255 ha of land owned by BSLP, the Formosa Golf Course land (170.5 ha at 110 Jack Lachlan Drive) and 84.7 ha of land at 620 and 712 Whitford-Maraetai Road with the balance of 52 ha of land held by others¹.

The Project will provide for the development of live-zoned land into a comprehensively planned, public transport-focussed community expanding approximately 160 ha. This will comprise approximately 2,000 residential dwellings, a hotel and conference venue, community and commercial activities, an Ecological Protected Area Network (EPAN), walking and cycling networks, and the potential for two schools, along with all associated infrastructure including wastewater servicing. The project will also be transforming Rydges Formosa Golf Resort from 18 holes to nine to 12 holes. The resort currently has a large clubhouse/conference venue, a large recreational building and about 50 visitor accommodation units.

A staged, centralised wastewater servicing strategy is proposed, whereby wastewater will be collected via a communal gravity sewer network and conveyed via pump stations to a centralised treatment plant. Raath and Associates has been engaged to develop a WWTP system which they have based on Combined Works (CW) technology - an integrated biological wastewater treatment system that consolidates all major treatment functions within a single enclosed structure. The wastewater treatment process is outlined in Section 3.

¹ <https://www.beachlandssouth.co.nz/>

2. Site location and environmental setting

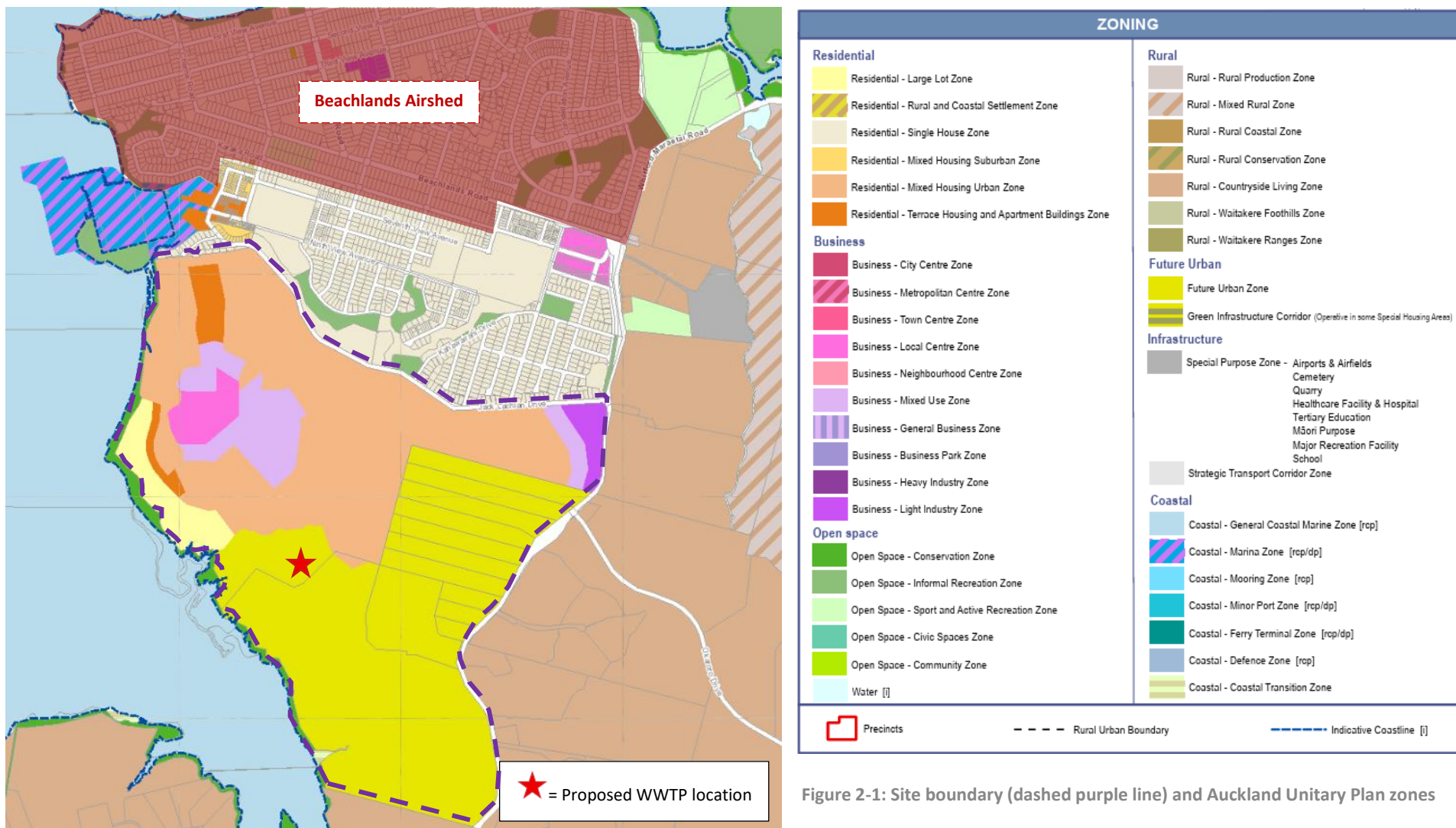


Figure 2-1: Site boundary (dashed purple line) and Auckland Unitary Plan zones

2.1 Site location

The site area comprises 110 Jack Lachlan Drive and 620, 712, 758, and 770 Whitford-Maraetai Road in the Beachlands suburb, located approximately 24 km east of central Auckland.

The property at 110 Jack Lachlan Drive is currently occupied by the Formosa Golf Resort ('golf course'), while the 620 Whitford-Maraetai Road property is predominantly farmland. The site area (dashed purple line in Figure 2-1) is zoned predominantly Urban - Residential Mixed Housing to the north and Future Urban Zone to the south and east where properties 712, 758 and 770 Whitford-Maraetai Road are located. Business - Mixed Use and Local Centre Zones which currently accommodate the Formosa Golf Resort and facilities. A portion of Future Urban zoned land will be used for wastewater management purposes.

Outside of the site area is predominantly residential developments (Single House Zone) with the Pine Harbour Marina to the north and northwest. Rural Country Living zones are located east of Whitford-Maraetai Road and are predominantly detached residential dwellings.

2.2 Environmental setting

2.2.1 Topography

Topography across the site varies but generally slopes gently towards the coastal edge before dropping steeply to the Coastal Marine Area (CMA). North of the site is predominantly flatter residential areas, transitioning into rolling rural hills. The CMA and portions of the site are classified as Significant Ecological Areas (SEAs). The site is dissected by a series of ecological features including streams, wetlands and significant escarpments of native vegetation. The golf course has panoramic views of Waiheke Island and Rangitoto from its clifftop and coastal fairways, along which hundreds of pohutukawa trees and palms have been planted.

The project aims to establish an EPAN comprising approximately 75 hectares of land being replanted, restored, maintained and enhanced including preservation of streams and their margins

2.2.2 Meteorology

Auckland has a subtropical climate. Spring tends to be the windiest season across the region, with strong gusts especially common in exposed coastal locations. In contrast, summer and autumn typically see the highest number of light wind days. During the cooler spring and winter months, south-westerly winds are most prevalent, while northeasterly winds are more frequent in summer².

Local meteorology and its effects on air quality effects are discussed further in Section 6.

² NIWA – The Climate and Weather of Auckland (2013)

3. Process WWTP location and design

A full description of the proposal is provided in the Integrated Wastewater Servicing Strategy and Discharge Assessment Report. The following technical reports and drawings appended to the substantive application should be read in conjunction with this report:

- Raath and Associates (April 24 2026a): Functional Description of the Combined Works Process (RAA25053)
- Raath and Associates (June 4 2026b): Air Quality and Odour Management Memorandum (RAA25053)
- GWE Consulting Engineers (May 2026): Beachlands South Fast-Track Substantive Application – Wastewater Concept Design and AEE

Raath and Associates has designed the WWTP to be capable of servicing approximately 2,000 residential dwellings, a primary and secondary school and associated commercial and community facilities. The treatment plant is to be constructed in two stages:

- Stage 1: Construction of a 450 m³/day treatment module, with treated effluent discharged to the farmland located at 620 Whitford-Maraetai Road, south of the live-zoned land. The stage is supported by sewage network infrastructure comprising three holding and pump stations, each designed with 24-hour storage capacity.
- Stage 2: Expansion to an ultimate capacity of 1,383m³/day through the installation of a second treatment module, with transition to marine discharge via a long sea outfall. The stage is supported by sewage network infrastructure comprising an additional three holding and pump stations (six total) each designed with 24-hour storage capacity.

The proposed treatment plant is based on CW technology - an integrated biological wastewater treatment system that consolidates all major treatment functions within a single enclosed structure.

The treatment process comprises inlet screening (mechanical screen removing rags, plastics, and coarse solids) and grit removal (separating sand and heavier inorganic material, with some removal of fats, oils, and grease), followed by aeration and biological treatment within an enclosed reactor, where organic matter is oxidised and ammoniacal nitrogen is converted to nitrate through nitrification.

The partially treated effluent then passes into an integrated clarification zone, with settled biomass returned internally to the aeration and biological treatment phase. Partially clarified effluent flows through a fixed-film biofilter, enabling further nitrification and denitrification, followed by a dedicated denitrification reactor and a phosphorus removal stage. Excess sludge is directed to a stabilisation zone for further biological breakdown, with residual dewatered solids removed periodically by licensed contractors. Final clarification and UV disinfection complete the process prior to treated effluent discharge. During Stage 1, treated wastewater will be discharged to land via a communal pressure compensating dripper irrigation (PCDI) system onto the farmlands.

According to Raath and Associates report, the system is fully automated and fully enclosed, with only the building structure visible externally, as compared to conventional systems utilising open aeration basins, oxidation ponds or sludge drying beds, resulting in minimal odour generation.

The proposed design will include extraction of air from the enclosed odour generating zones and treatment of this extracted air. The Raath and Associates (2026) report notes that the final decision on the odour treatment type/device will be subject to a final design assessment but will be selected to meet the Best Practical Option (BPO).

Figure 3-1 below provides the WWTP process and provisional layout of the WWTP.

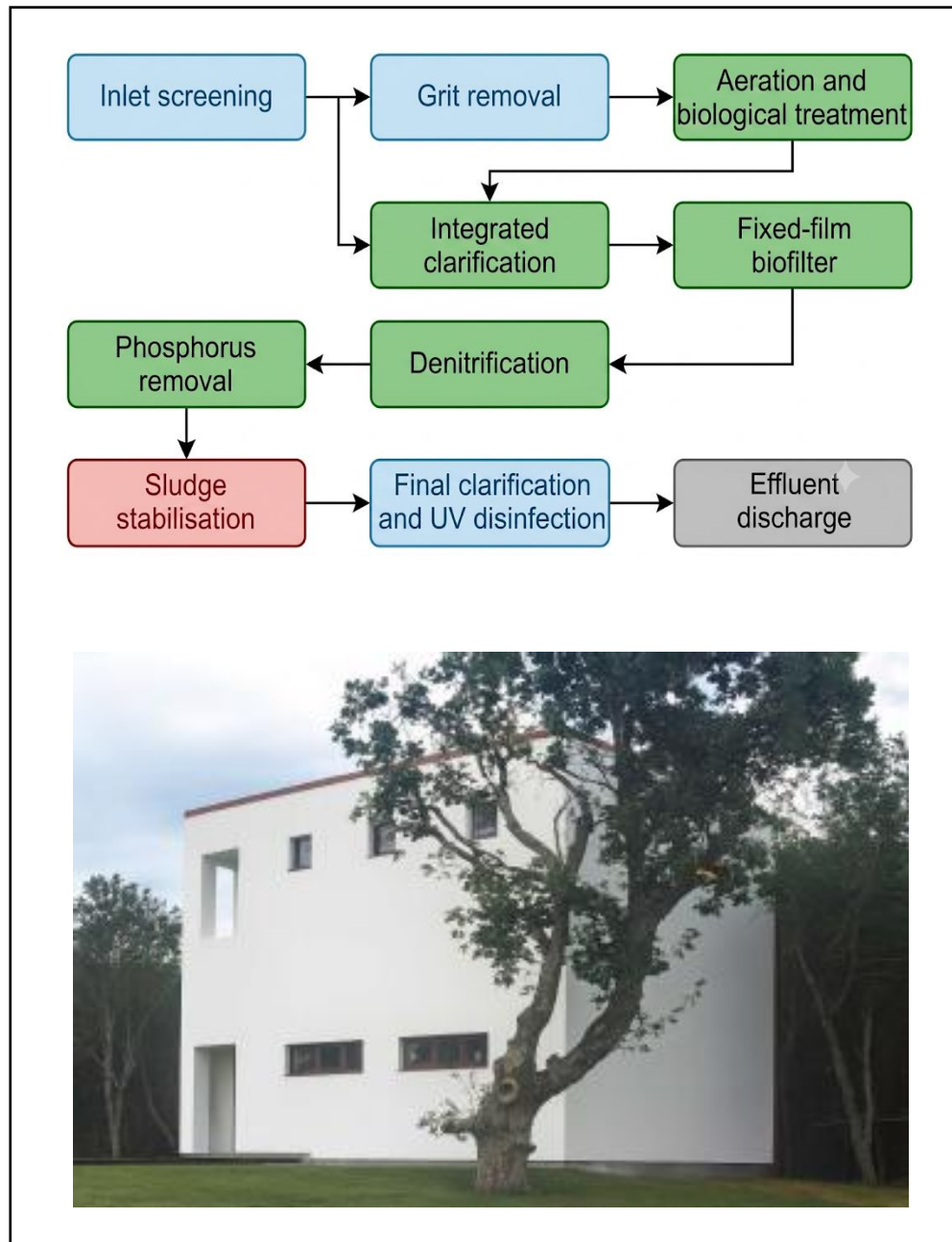


Figure 3-1: WWTP process and proposed WWTP building utilising CW technology

4. Consent requirements

4.1 Auckland Unitary Plan

Table E14.4.1 (Rule A163) of the Operative Auckland Unitary Plan (AUP) states that treatment of municipal wastewater (municipal wastewater treatment plants) is a Discretionary Activity in all air quality areas.

The proposed WWTP is designed to accept and treat municipal wastewater from a new subdivision. As such the emissions to air, including odour, is a **Discretionary** Activity.

Table E14.4.1 (Rule A48) of the AUP states that emergency generators used for the purpose of generating electricity for premises during mains power unavailability (includes operation for the purpose of generator testing and maintenance) is a Permitted Activity.

It is assumed that any installed emergency generators will meet the intent of Rule 48 and as such be a **Permitted** Activity.

No other Rules in the AUP Chapter 14 Air Quality relate to the emissions to air from the operation of the WWTP.

4.2 National Environmental Standards

4.2.1 *National Environmental Standards for Air Quality Regulations 2004*

In 2004, five standards for ambient (outdoor) air quality were introduced in New Zealand under the Resource Management (National Environmental Standards Relating to Certain Air Pollutants, Dioxins and Other Toxics) Regulations 2004 (NESAQ).

The NESAQ includes specific provisions relating to a consent authority's ability to grant resource consents for discharges to air of PM₁₀ (Regulation 17) and other contaminants (Regulations 20 and 21).

Regulation 17 (PM₁₀) is not relevant to the applicant's site as the operation of the WWTP is not likely to generate PM₁₀ emissions. Regulation 20 of the NESAQ applies to the discharge of carbon monoxide (CO), oxides of nitrogen (NO_x), and volatile organic compounds (VOCs). Regulation 20 sets out that an application must be declined if it is likely to cause the concentration of CO, NO_x or VOCs in the Airshed to breach its ambient air quality standard and is likely to be a principal source of that gas in the Airshed. Regulation 21 applies to the discharge of sulphur dioxide (SO₂) and states that an application must be declined if it is likely to cause the concentration of SO₂ in the Airshed to breach its ambient air quality standards.

The operation of any onsite emergency generator will generate carbon monoxide and oxides of nitrogen emissions. However, the ambient air quality standards will not be exceeded as a result of its operation. The discharges to air from the WWTP are expected to contain negligible concentrations of CO, NO_x, SO₂ and VOCs.

Therefore, the NESAQ does not restrict the granting of this consent for discharges to air.

4.2.2 National Environmental Standards for Greenhouse Gas Emissions from Industrial Process Heat Regulations 2023

On 27 July 2023 National Environmental Standards for Greenhouse Gas Emissions from Industrial Process Heat ('Greenhouse NES') and the associated National Policy Statement ('Greenhouse NPS') were introduced for fossil fuel burning equipment that produces industrial process heat. The objective is to reduce emissions of Greenhouse Gases (GHG) in order to mitigate climate change and its current and future adverse effects on the environment and the wellbeing of people and communities. The Greenhouse NES outlines the activity status of a GHG emission dependent on the type of fossil fuel used and annual volume of GHG's emitted.

With regards to the proposed WWTP the only potential GHG emissions from the combustion of fossil fuel will be from any installed fossil fuel-fired, back-up electricity generation device. Backup heat devices are specifically excluded from the regulations (Section 10(1)b) and therefore the Greenhouse NES does not need to be considered as part of this assessment.

5. Discharges to air

5.1 Introduction

The primary discharge to air from the wastewater treatment process will be odour. WWTP odours have the potential to be generated from the decomposition of organic material (e.g. carbohydrates, fats and proteins) present in the wastewater. High levels of odour may be generated when wastewater (or sludge) becomes oxygen depleted and anaerobic (septic) conditions become present. During anaerobic conditions, highly odorous compounds such as hydrogen sulphide (H₂S) are generated.

Odour generated by the processing of wastewater will be made up of a complex range of organic compounds that are able to be detected by human olfaction (sense of smell). Health effects from individual compounds can occur if in elevated concentrations (for example H₂S), however based on AML experience with WWTPs, concentrations of any compounds will be low and not result in any direct potential health effects. Consequently, this assessment is limited to the effects of odour from the proposed WWTP which are described in more detail in Section 7.

Dust may also be generated during the construction of the WWTP resulting in nuisance (soiling) or health-related effects (finer dust). Construction related effects (including dust) across the whole project have been assessed elsewhere in the application and conditions have been proposed to limit the potential effects. As such, dust generation from the construction or on-going operation of the WWTP have not been considered in this assessment.

5.2 Odour generation and mitigation

There are a number of potential odour-generating sources from the WWTP that are summarised below along with a description of the proposed mitigation methods. Information in Table 5-1 has been provided by Raath and Associates and is also based on AML's experience of WWTP odour.

Table 5-1: Odour-generating potential and mitigations for the proposed WWTP

Process ³	Odour Potential	Proposed Controls
Inlet Screening <i>Raw wastewater screened to remove rags, plastics and coarse solids. Screenings managed via off-site disposal</i>	Potential source of odour due to the fresh state of the waste/sewage (H ₂ S, reduced sulphur compounds, ammonia) and accumulation of screenings	● Enclosure to be provided at the inlet, with a provision for extraction of air from enclosed odour-generating zones ● Treatment of extracted air through an odour control system prior to discharge
Grit Removal <i>Sand and heavier inorganic material separated</i>	Potential odour from accumulated grit, sand, and fats, oils and grease	● Enclosed within the same odour-generating zone as inlet screening ● Extraction and treatment of air prior to discharge
Aeration and Biological Treatment <i>Wastewater flows into aeration zone; organic matter is oxidised</i>	Oxygen is supplied at this zone to promote biological activity. Aerobic process is not inherently odorous provided aerobic conditions are maintained; odour potential increases if anaerobic conditions develop	● Enclosed CW reactor ● Oxygen supplied through fine-bubble diffusion, hence provides controlled, efficient oxygen supply to maintain aerobic conditions ● An Air Quality Management Plan (AQMP) will be implemented and will include contingency protocols and recovery measures for abnormal anaerobic operating conditions. A detailed Emergency Response Plan will be developed as part of the operational documentation.
Integrated Clarification <i>Solids are separated from treated effluent; sludge is returned internally to aeration zone</i>	Low odour potential, as the settled biomass is returned internally and treatment occurs within the enclosed CW reactor (aeration zone)	● Contained within the enclosed CW unit

³ GWE Consulting Engineers (2026), Beachlands South Fast-Track Substantive Application, Wastewater Concept Design and AEE

Process ³	Odour Potential	Proposed Controls
Fixed-Film Biofilter Treatment <i>Biofilter containing structured media; biofilms attached to media provide aerobic zones and anoxic microenvironments (happening within the same CW unit)</i>	Low odour potential under normal aerobic/anoxic operation; potential for odour if biofilm conditions become anaerobic	- Enclosed within the CW unit - Structured media supports stable aerobic and anoxic micro-environments - Outlined in the AQMP (to be developed)
Denitrification <i>Anoxic denitrification reactor downstream of biofilter/aeration zone</i>	Anoxic process is not inherently odorous, provided anaerobic (septic) conditions are avoided	- Enclosed within the CW unit - Controlled anoxic conditions
Phosphorus Removal <i>Combination of biological uptake and adsorption within the reactor media</i>	Low odour potential	Contained within the enclosed CW unit
Sludge stabilisation <i>Biological breakdown of sludge under low-oxygen conditions</i>	Potential for odour from biological breakdown under low-oxygen conditions, particularly if anaerobic conditions develop	- Extended sludge age and endogenous respiration reduce sludge volume and odour generation potential - Enclosed unit, and controlled ventilation (extraction of air)
Final polishing and UV Disinfection	Low odour potential	- Contained within the enclosed CW unit - UV disinfection does not generate odorous by-products
Sludge storage and removal, screenings disposal	Potential odours during tank venting and sludge transfer	- Controlled ventilation of sludge storage areas; - Extraction and treatment of air prior to discharge

Process ³	Odour Potential	Proposed Controls
Emergency Storage and backup systems	Potential for odours during abnormal operational events, prolonged power outages, or extended storage periods	● The interim wastewater treatment plant has been sized to accommodate allowance for variability and operational contingency ● The wastewater system incorporates 24-hour storage at pump stations enable the system to manage short-term power outages, equipment failures and peak flow events ● A 100,000-litre emergency storage tank is incorporated within the treatment process, located between the inlet works and the mixing chamber. This provides operational resilience during abnormal events and enhances overall system robustness. It also provides operational contingency in the event of equipment or power interruptions ● It is recommended that the plant incorporates back-up generators systems to ensure critical odour mitigation aspects of the plant, including the ventilation system, can maintain operating during power outages.

Note: The treatment facility is reported to be designed to incorporate appropriate ventilation and odour management measures during detailed design.

Odour treatment may include ozone treatment, activated carbon filtration, or equivalent odour control techniques, to be confirmed at detailed design stage and selected to represent the BPO appropriate to the scale and nature of the facility.

6. Air quality effects on the existing environment

As in all areas of New Zealand the specific prevailing and strong wind direction in any locality is determined largely by local terrain. As noted in Section 2.2, the site topography consists of rolling hills that rise higher toward the east before sloping gently seaward and dropping steeply into the CMA. Air quality effects, particularly odour, can be exacerbated during certain meteorological conditions. In order to assess the potential air quality effects, it is important to understand local meteorology.

For this assessment, AML obtained computer-simulated data from MetService for the site location (latitude - 36.901519, longitude 174.998651). This data covered a five-year period (January 2021 – January 2026). The MetService model combines historical observations and model predications.

Figure 6-1 below displays a wind rose of this data which demonstrates the following characteristics:

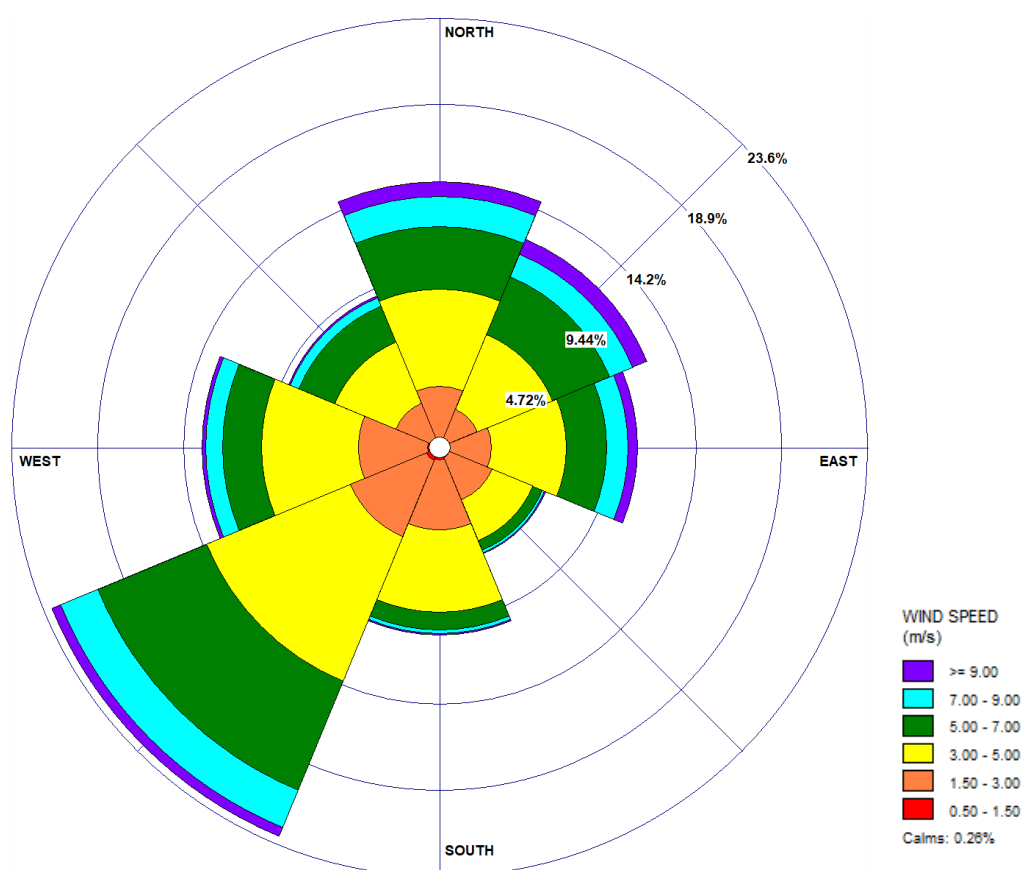


Figure 6-1: Computer simulated data for Beachlands site (2021 - 2026)

- The most predominant winds are from the southwest, blowing 23.1% of the time, followed by the north (14.6%) and west (13.1%).
- The strongest winds (≥ 5 m/s) most commonly occur from the southwest (17.8%) followed by the north (11.3%).
- The most frequent light winds (0.5 – 3 m/s) also occur from the southwest (5.3% of the time) followed by the west and south (both 4.5%).
- Calm winds (<0.5 m/s) were reported 0.3% of the time. Computer simulation models typically underestimate calm conditions, therefore calm winds are likely to be greater than 0.3%. Earth's surface cools rapidly in the evening by radiating heat back into space, creating a stable boundary layer, an atmospheric condition where temperature increases with height. Models appear to underestimate the magnitude of this near surface temperature and wind speed gradient during stable conditions, leading to an underestimation of calm winds by artificially maintaining a continuous, light winds (Steenefeld 2024).
- These predominant wind directions are consistent with previous wind patterns reported for Auckland (NIWA, 2013) therefore this meteorological data is considered appropriate for use in this assessment.
- The stronger wind speeds observations are reflective of the exposed coastal location.

Low wind speeds can result in reduced dispersion and exacerbate the effects of odour. The proposed WWTP will be located within farmlands to the south of the main residential zones. The surrounding rolling hills have the potential to create localised air drainage ('down valley flows') during evening periods on calm nights. Due to the limited scale of the valley (height and fetch) these drainage winds are expected to be very limited and the overarching regional winds, enhanced by the exposed coastal environment of the wider Beachlands area, are likely to be the dominant influence.

6.1 Background air quality

6.1.1 Airsheds

Regional Councils and Unitary Authorities have identified areas where air quality could breach the NESAQ. These areas are called Airsheds.

Airsheds have been identified based on the Regional Council's knowledge of existing air quality data and the location of significant sources and factors that affect the spread of pollution, such as topographical features, meteorological conditions and population density. These Airsheds have been published in the New Zealand Gazette and Councils are required to monitor, manage and report air quality within the airshed in accordance with the NESAQ.

6.1.2 Background air quality in Beachlands

To understand the existing air quality in the area surrounding the Beachlands South project, AML has completed a desktop study using available information and supplemented this with a site visit to review surrounding land use activities.

The site is bordered by rural-residential land to the northeast through southwest. While intermittent agricultural odours from livestock and fertilizer application are typical for this environment, none were present during the site visit on 8 July 2026. Ambient air quality at the site was found to be clear, with no detectable background odours recorded.

6.2 Consented air discharges in the area

Other known consented air discharges within a two km radius of the proposed Beachlands South project boundary include Manukau Quarries (operating at 885 Whitford-Maraetai Road, approximately 515 m northeast of the Jack Lachland Drive/Whitford-Maraetai Road junction) and the Beachlands municipal wastewater treatment plant ('Beachlands WWTP').

The quarry holds a regional resource consent for quarry rehabilitation, earthworks, and the discharge of contaminants to land and water however its operations are not expected to impact the proposed development from an odour perspective.

The Beachlands, Maraetai and Whitford Village Servicing Strategy report by Watercare (2024) discusses water challenges in the area. It notes that the Beachlands WWTP currently services Beachlands and Maraetai and is located approximately 2 km southeast of the Beachlands South project boundary. The Beachlands WWTP is currently designed for a population of 10,000 people. There are currently about 3,400 residential dwellings connected to the wastewater network with the discharge consent limit of 2,800 m³ per day. Treated wastewater is discharged onto land, then through a farm pond, and eventually into the Te Puru Stream, as shown in the figure below.

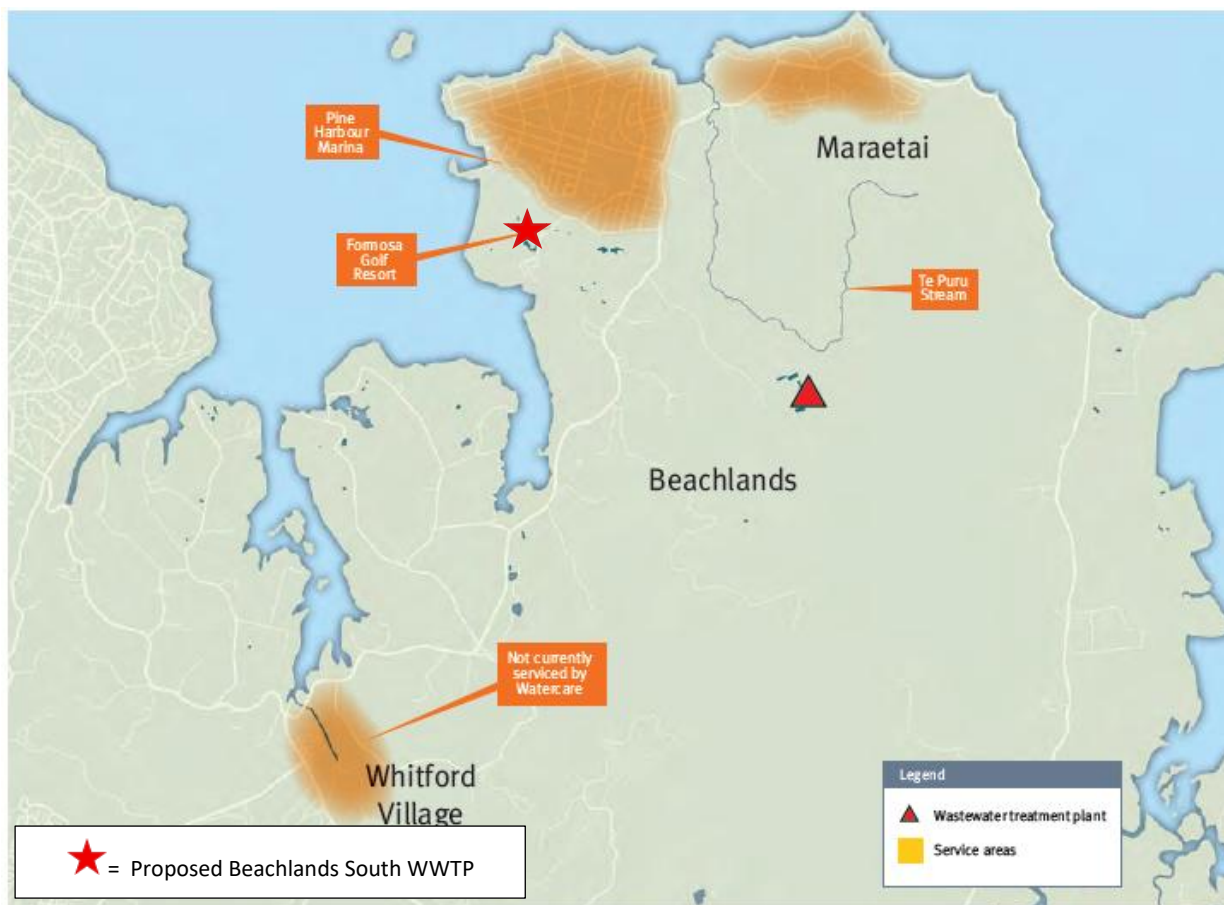


Figure 6-2: Beachlands WWTP service areas and discharge location

The Beachlands WWTP consent was up for renewal on December 31, 2025, with the plant currently operating at close to peak capacity with no room to treat additional wastewater from future growth in the area. A change to the consent conditions has been sought to allow for increased discharges from the treatment plant, after the plant is upgraded to accommodate the treatment of additional flows. Under the upgraded scenario treated effluent will still be discharged into the tributary of the Te Puru Stream via groundwater and an overland flow system. The Beachlands WWTP is currently operating while the renewal consent is being processed.

6.2.1 Cumulative odour effects

Assuming that the Beachlands WWTP and Beachlands South WWTP will continue to be operating simultaneously for the foreseeable future, consideration has been given to the potential cumulative odour effects of both WWTPs operating together. Due to the predominant wind directions and separation distances between the two WWTPs, no individual receptors are expected to be impacted by any odour generated from both WWTPs. Consequently, sensitive receptors listed in Table 6-1 below will be evaluated solely in relation to the potential effects of the proposed Beachlands South WWTP (Section 7).

It is noted however that an increase in odour concentration, i.e. in this case the operation of two WWTPs simultaneously does not necessarily result in an increase in the odour intensity even if the extent of their odours were to overlap. This is due to the fact that the perception of the intensity of odour in relation to the

odour concentration is not linear. If the concentration of an odour, such as H₂S, increases ten-fold, the perceived increase in intensity is expected to be much smaller, i.e. a two-fold increase⁴.

6.3 Sensitive activities (receptors)

When assessing air discharges, the sensitivity of the environment must be taken into account and should be considered as part of any odour assessment. When assessing air discharges, sensitivity is based on characteristics of the land use, including the time of day and the reason people are at the particular location. Other factors that may determine whether an offensive or objectionable effect from an odour emission is likely to occur are the presence of background odours (Section 6.1 above), aspects influencing perception, and the mental and physical state of the affected person.

Ministry for the Environment (MfE) (2016b) guideline recommends the use of district planning maps as these zones are based on controlling adverse effects on amenity, which aligns with odour effects. Typical activities that have a high sensitivity to odours include (MfE, 2016b):

- Residential properties (including rural residential);
- Hospitals, schools, childcare facilities, rest homes and marae;
- Public outdoor locations (e.g. parks, reserves, sports fields, beaches).
- Tourist, cultural, conservation
- Some commercial and retail businesses

Figure 6-3 and Table 6-1 illustrate the identified sensitive receptors surrounding the WWTP. This is based on zoning from the AUP along with specific high-sensitivity activities within low sensitive zones (dwellings in rural zoned areas) within close proximity of the WWTP.

Receptors located within **200 m** of the WWTP are highlighted in red. The importance of this is discussed further in Section 7.2.1.

Table 6-1: Sensitive receptor details

Map ID ^	Addresses	Description / Zone	Approximate distance* and direction from proposed WWTP
Existing Receptors (not part of Beachlands South development)			
Location A	Pine Harbour Marina Carpark	Open Space – Informal recreation area	Northwest, 1505 m
Location B	23, 16 & 228 Tui Brae	Residential – Single House Zone	Northwest, 1440 m
Location C	15, 27 & 47 Angiangi Crescent		North, 1125 m

⁴ BOPRC (2012) A review of odour properties of H₂S - Odour Threshold Investigation.

Map ID ^	Addresses	Description / Zone	Approximate distance* and direction from proposed WWTP
Location D	38 Cadwil Drive		Northeast, 1025 m
Location E	15 Lydiard Place & 42 Kaiawa Street		Northeast, 900 m
Location F	36 Doidge Street & 55 Jack Lachlan Drive		Northeast, 1115 m
Location G	746, 740, 732 & 722 Whitford-Maraetai Road		East, 725 m
Location H	702, 692, 682 & 680 Whitford-Maraetai Road		Southeast, 360 m
Location I	649 & 649A Whitford-Maraetai Road	Rural – Countryside Living	Southeast, 850 m
Location J	66 Seventh View Avenue	Residential – Single House Zone	North, 1565 m
Location K	18 Bell Road & 19 Wakelin Road	Residential – Single House Zone	North, 1965 m
Proposed receptors (within the Beachlands South development)			
Location C1-4 & C6	Beachlands South	Residential – Mixed Housing Urban Zone	Northwest, 650 m
Location C13 & 15			Northwest, 375 m
Location C8-12 & C14			Northwest, 400 m
Location CM3 & CM4			Northwest, 450 m
Location C16-18			Northwest, 180 m
Location CE4			North, 185 m
Location CE5			North through to East, 85 m
Location CE3			North, 430 m
Location CE1 & CE2			North, 590 m
Location CM8 - SCHOOL			North, 645 m

*Distances taken from proposed WWTP boundary to the nearest existing and proposed receptor. The assessment considers receptors **within** the proposed development up to approximately 650m and external receptors up to a cutoff distance of approximately 2 km. Potential effects beyond these locations are discussed further in Section 7.

^ Map ID naming convention in line with Masterplan C (20260416_Masterplan Combined A1) provided by BSLP

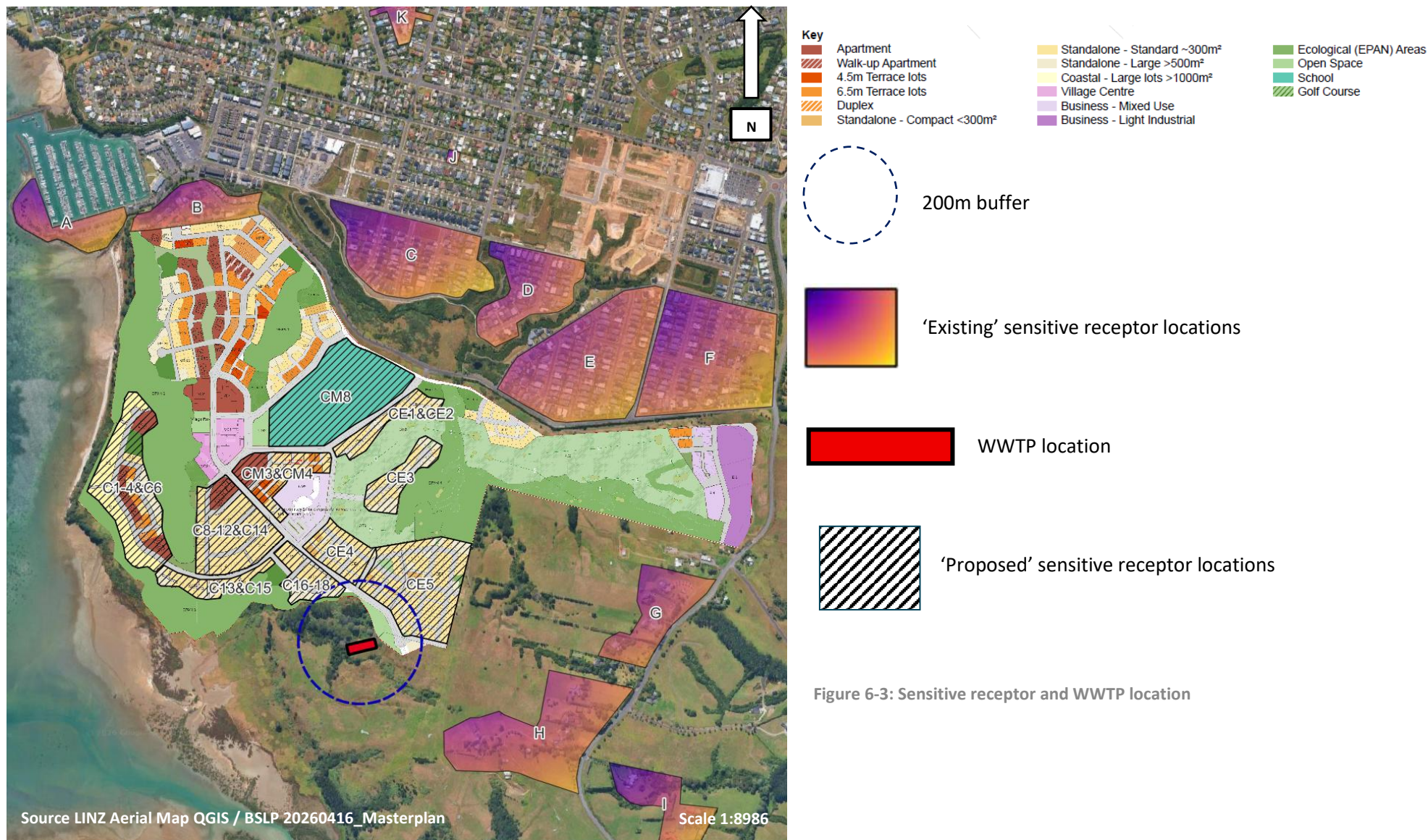


Figure 6-3: Sensitive receptor and WWTP location

7. Assessment of effects

7.1 Potential effects of odour

Odour is perceived by our brains in response to chemicals present in the air we breathe. Humans have a sensitive sense of smell and can detect odour even when chemicals are present in very, very low concentrations. Given that odour is a human perception, it is extremely difficult to measure an odour using a chemical, mechanical or electronic apparatus as is possible for other nuisance effects such as noise and light. At present, assessment by human nose is the most reliable method for determining an odour (MfE, 2016b). In the context of undertaking an assessment, odour can be described in two ways:

- **Acute** - high-intensity and/or highly unpleasant odours occurring infrequently or for short periods (a few minutes to an hour);
- **Chronic** - low-intensity and/or moderately unpleasant odours occurring frequently or continuously over a long period.

People have reported effects of odour that include nausea, headaches, retching, difficulty breathing, frustration, annoyance, depression, stress, tearfulness, reduced appetite, being woken in the night, and embarrassment. All of these can contribute to a reduced quality of life for the individuals who are exposed to the odour. People can develop physiological effects from odour even when their exposure is much lower than that typically required to cause direct health effects. This effect is sometimes termed 'odour worry' and is due to effects brought on by stress or the perception that if there is a smell it must be doing physical harm (MfE, 2016b).

7.2 Screening level assessment

7.2.1 Separation distance

The initial screening assessment is based on the separation distance between sensitive receptors and the proposed WWTP. By having a suitable separation distance, odour emissions can be dispersed and diluted to such an extent that their effects at sensitive locations are minimised to an acceptable level.

Separation distance guidelines are not intended to be used as a pass/fail test, rather as a trigger for more detailed assessment for a particular site. MfE (2016b) notes that relevant separation distances should be considered when assessing odorous discharges to air to address unintended or accidental releases, and/or effects that cannot be internalised even with adoption of the best practicable option. Site specific factors which may influence discharge rates and how they are dispersed, for example terrain, are not taken into account in separation distances.

Environment Protection Authority (EPA) Victoria publishes a 'Separation distance guideline' (EPA Victoria, 2024) which provides advice on recommended separation distances between industrial land uses that emit odour and/or dust, and sensitive land uses. In New Zealand these guidelines have been extensively used and are accepted as appropriate separation distances. Appendix B of the Separation distance guideline' document details recommended separation distances for odour emissions from wastewater treatment plants. It scales

the separation distance based on the wastewater technology and the Equivalent Population it serves. A separation distance of 188 m from the WWTP to sensitive receptors would be applicable in this instance based on a mechanical/biological wastewater plant serving a population of 6,300 residents⁵. To provide a buffer for the proposed WWTP, a screening level separation distance of 200 m has been adopted. The extent of the 200 m buffer is detailed in Figure 6-3 above (blue dashed outline).

Taking into account the location of sensitive receptors as described in Table 6-1, a number of dwellings are within 200 m of the proposed WWTP. These locations are shown in red in Table 6-1 and detailed below:

- **Locations C16-18, CE4 and CE5** (all within the Beachlands South development) have been identified as sensitive receptors located within 200 m of the proposed WWTP site. As the development is of residential nature, these locations are considered sensitive to the effects of odour in accordance with the MfE-Industry GPG (2016a).
- **Location C16-18** represents approximately 35 individual dwellings, predominantly standalone standard sized lots with some large standalone lots. **Location CE4** represents approximately 90 individual lots and **Location CE5** represents approximately 115 lots, both predominantly standalone standard sized lots with some large and compact standalone lots.

Details of the other sensitive receptors listed in Table 6-1 which are outside of the 200 m boundary are as follows:

- **Locations A – K** represent existing dwellings surrounding the WWTP. These dwellings are located between 360 – 1965 m from the site of the WWTP and do **not** form part of the proposed Beachlands South project development.
- **Locations CE 1-3, C 1-4, 6, 8-12 & 13-5 and CM 3, 4 & 8** represent proposed dwellings surrounding the WWTP. These dwellings are located between 375 – 650 m from the site of the WWTP and are included as part of proposed Beachlands South project development.

⁵ Based on 2,100 dwellings (an additional 100 dwellings to the proposal outline to account for schools, hotel and community facilities) with an average occupancy of three persons.

7.2.2 Comparable WWTPs

While there are no directly comparable CW (Combined Works) designs currently operating within New Zealand, AML has drawn on their experience with a range of large municipal and community-scale WWTPs throughout the country including WWTPs that incorporate enclosed odour-generating activities (inlet works, enclosed sludge handling) and with capture and treatment of odorous air through an additional odour control.

7.3 FIDOL Assessment

In New Zealand a recognised qualitative approach to evaluate the likelihood of odour giving rise to 'offensive or objectionable odour effects' is based on an evaluation of the FIDOL factors. The FIDOL factors are described in the MfE GPG-Odour (2016b) and in summary are:

Table 7-1: FIDOL assessment factors (MfE, 2016b)

Factor	Description
Frequency	How often an individual is exposed to the odour
Intensity	The strength of the odour
Duration	The length of exposure
Offensiveness	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

These factors have been applied to the potential odour emissions from the proposed WWTP and discussed in the section below. As noted above, locations within the 200 m buffer are the primary focus of the FIDOL assessment, however other locations outside of this zone are also discussed where relevant.

Factor	Description			
Frequency	Frequency relates to how often odours will be experienced at a receptor. The frequency at which odour could be detected at a receptor will be a combination of the occurrence of the odour emission and certain meteorological conditions, such as wind direction and speed. Worst-case dispersion conditions for odour emitted from any WWTP typically occur during low wind speed (<1.5 meters per second) and highly stable atmospheric conditions. A threshold of 1.5 m/s (~ 5 km/h) is often employed, however given the potential underestimate of calmer periods from the computer simulated meteorology of Beachlands, AML considers an increased threshold (3 m/s) is more appropriate for this assessment to define 'low wind speeds'. Based on the meteorological data presented in Section 6, light winds (≤ 3 m/s) capable of transporting odour towards a receptor, account for approximately 28.6% of all winds (equivalent to approximately 105 days in a year). A wind frequency analysis is provided in the table below along with the identification of the higher risk sensitive receptors located within 200 m of the proposed WWTP.			
	Wind Direction (blowing from)	% of time (all wind speeds)	% of time (low wind speeds ≤ 3 m/s)	Sensitive Receptors in downwind direction <u>within</u> <u>200m</u>
	N	14.6%	3.4%	No
	NE	12.4%	2.3%	No
	E	10.9%	2.9%	No
	SE	6.3%	3.1%	Yes - Location C16-18
	S	10.3%	4.5%	Yes - Location CE4 and CE5
	SW	23.1%	5.3%	Yes – Location CE5
	W	13.1%	4.5%	Yes - Location CE5
	NW	9.0%	2.6%	No
	CALMS	0.3%	-	-
	TOTAL	100%	28.6%	-

Factor	Description
	Any identified sensitive receptor may be impacted by odour generated from the WWTP up to 3.1% of the time (during light south-easterly winds), 4.5% of the time (during light southerly winds), 5.3% of the time (during light south-westerly winds) and 4.5% of the time (during light westerly winds). Cumulatively, the impacts on all sensitive receptors are up to 17.5% based on a low wind speed threshold of ≤ 3 m/s. This is equivalent to 64 days per year. Based on the CW design of the proposed WWTP, odours that would be capable of being offensive at sensitive receptor boundaries are not expected to be emitted under normal operations. Potentially higher odour-emitting events will be limited to infrequent upset and abnormal operations (acute events) which are discussed in more detail in the following sections 'Intensity' and 'Duration'. The expected absence of chronic odour and rare occurrence of acute odour events at the WWTP will limit the frequency of odour at sensitive receptors to rare events. Frequency of any odour events will be further limited by wind conditions towards high-risk sensitive locations as discussed above (which occur for a combined maximum of 17.5% of the time).
Intensity	The intensity of odour at sensitive receptors depends on emission strength (concentration) at the source and the separation distance between the source and receptors. Odour associated with the operation of a WWTP can have a strong intensity. For the proposed WWTP under normal operations it is expected that odour would have no discernible intensity at the identified sensitive receptors based on the small scale of the plant and the extensive mitigation methods deployed. Abnormal acute discharges, if to occur, would be a cause of increased odour intensity, for example if wastewater were to turn anaerobic following WWTP failure. Abnormal discharges that result in unacceptable odours, are not expected to occur based on the mitigations in place as described in Section 5.

Factor	Description
Duration	The duration that a receptor may be exposed to odour depends on the amount of time the wind blows in a specific direction, along with the duration that the odorous activity occurs. Duration of wind is covered above and, in summary, acute or chronic odour from the WWTP activities could affect high risk sensitive receptors for up to 17.5% of of the time during low wind speeds. WWTPs may have extended and more consistent elevated odour during plant failures and emergency situations. During these upset or unanticipated events, the increased odour may last for periods of hours to days. However, the mitigations employed including the 100,000-litre emergency storage tank and expected redundancy system incorporated within the treatment process provide operational contingency in the event of equipment or power interruptions. The duration of rare odour-generating events during upset or abnormal conditions has the potential to last for periods of hours to days. Duration of the effects on nearby sensitive receptors will be further limited by the wind direction.
Offensiveness	As described in Section 5.1, odour associated with the processing of wastewater has an elevated potential to be offensive at sensitive locations.
Location	Location is possibly the most important of the factors, due to the fact that even if odours are generated there is little potential for effect if there are no sensitive receptors located downwind of the source. The sensitive receptors located within proximity of the WWTP that may be affected by odours (if present) are all within the bounds of the proposed Beachlands South subdivision (Locations C16-18, CE4 and CE5), representing a combined 240 dwellings (approximate) within 200 m of the WWTP. The separation distances between the WWTP and sensitive receptors in all other directions are sufficient to minimise potential odour impacts.

Factor	Description
Summary	Taking into account the Offensiveness and Location, AML considers that odours from the WWTP have the potential to result in offensive or objectionable effects at sensitive locations C16-18, CE4 and CE5 representing a combined 240 dwellings (approximate). This conclusion is based on the characteristics of typical WWTP odours and the reduced separation distance to residential dwellings to the northwest through to the east. The frequency, intensity and duration of emitted odour is expected to be very low based on the design of the proposed WWTP and employed mitigation measures. Based on this, the potential odour experienced at any sensitive receptors is considered to be acceptable. The WWTP design will incorporate BPO's for minimising the generation of acute high intensity odour events. A focus on meeting BPO should continue throughout the detailed WWTP design phases and be incorporated into any consent conditions.

8. Conclusion and recommendations

The proposed WWTP is designed to service the Beachlands South Project providing treatment for all facilities on the live-zoned land which includes approximately 2,000 residential dwellings, a hotel and conference venue and two schools. The WWTP is designed to collect wastewater via a communal gravity sewer network, conveyed via pump stations to a centralised treatment plant and treat it to a high standard before discharging it into disposal fields south of the site.

It is proposed that this treatment plant is based on CW technology - an integrated biological wastewater treatment system that consolidates all major treatment functions within a single enclosed structure. Mitigations to minimise odour will include ensuring aerobic/anoxic conditions are maintained, process monitoring of key chemical/biological variables including oxygen levels, redundancy of key equipment on site, robust equipment maintenance and, extraction and treatment of potentially odorous air through the odour treatment system. Based on the employed mitigations the treatment plant is considered to meet the BPO for eliminating and minimising odour. However, as there is not a comparable plant operating in New Zealand, AML has not been able to verify the design performance through odour surveys and has based this assessment on its knowledge of enclosed plants employing a high level of mitigations.

A screening level assessment that considered the appropriate separation distances and the type of surrounding land use was undertaken. This assessment identified three sensitive receptor locations to the northwest through to the east of the WWTP that could be affected by odours if they cannot be effectively controlled at their source. The identified receptors are proposed individual residential dwellings and represent up to a total of 240 lots.

A detailed FIDOL assessment, in accordance with the MfE GPG-Odour was undertaken focusing on the sensitive receptors. In summary, it was identified that during times of odour generation these receptors could experience an elevated exposure to odour due to their position to the prevailing wind direction and small separation distance (<200 m). However based on the modern plant design and odour mitigations employed, the generation of odour from the WWTP, beyond the site boundary, is not expected to occur.

The closest receptors will be located approximately 85 m from the odour generating areas of the WWTP (Location CE5). Detection of odour at these locations may occur even during minor odour release from the operations, as such to ensure the effects remain acceptable, it is imperative that the sites odour control systems are maintained to the highest practical standard.

During abnormal or upset conditions WWTPs can generate elevated chronic odour. Based on the design of plant including the employed redundancies these chronic higher-intensity odours are not expected to occur.

Based on this assessment and the design of the WWTP, the potential effects on amenity values on the surrounding land use are considered to be acceptable and remain less than minor for the duration of the consent. A set of proposed consent conditions have been included to ensure any effects can continue to be controlled to an acceptable level.

It is recommended that the consent conditions incorporate routine odour surveys for an initial period following commissioning to provide confirmation that the employed controls are effective. These surveys should be repeated before and after any future Stage 2 expansion and should be undertaken during periods of low winds or calm conditions, particularly during spring and summer months.

9. Recommended consent conditions

General conditions

1. [Activity to be undertaken in accordance with the plans, including the AEE]
2. Under section 125 of the RMA, this consent lapses five years after the date it is granted unless:
 - a) The consent is given effect to; or
 - b) The council extends the period after which the consent lapses.
3. Air discharge consent number [XX] expires [XX] years after the consent is issued unless it has lapsed, been surrendered or been cancelled at an earlier date pursuant to the RMA.
4. The consent holder must pay the council an initial consent compliance monitoring charge of \$[XX] inclusive of GST, plus any further monitoring charge or charges to recover the actual and reasonable costs incurred to ensure compliance with the conditions attached to this consent.
5. Access to the relevant parts of the property must be maintained and be available at all reasonable times to enable the servants or agents of the council to carry out inspections, surveys, investigations, tests, measurements or take samples whilst adhering to the consent holder's health and safety policy.

Limit Conditions: Air Discharges

6. All processes associated with the wastewater treatment plant (WWTP) must be operated, maintained, supervised, monitored and controlled in accordance with the Air Quality Management Plan certified in accordance with Condition [X] to ensure that all emissions authorised by this consent are maintained at the minimum practicable level.
7. Discharges of contaminants into air from the WWTP must not cause:
 - a) Odours that are noxious, dangerous, offensive or objectionable beyond the boundary of the Site, in the opinion of an enforcement officer.
 - b) Visible emissions (other than water vapour/steam or heat haze) that cause a dangerous, offensive or objectionable effect, in the opinion of an enforcement officer.

Advice Note: Air discharge limits

Condition 7 is to be assessed by suitably trained council enforcement officers in accordance with the procedures outlined in the Good Practice Guides for Odour (Ministry for the Environment, 2016b), including consideration of the FIDOL factors (frequency, intensity, duration, offensiveness and location) for amenity effects (dust, odour and visible emissions).

Process Conditions

8. Within one month of the WWTP commencing treatment, the Consent Holder must provide to the Council a report from an appropriately qualified person, which verifies that the design and installation of the wastewater treatment plant and odour control system (including the odour extraction and treatment system) is in accordance with Conditions 1 and 9.
9. Air discharges from the enclosed Combined Works structure, including inlet screening, grit removal, biological treatment, and sludge stabilisation zones, must be extracted to an emission control system

and discharged from a stack at least 3 m above ground level or the apex height of the nearest building within 20 meters, without obstruction of the vertical discharge of air.

Monitoring and Reporting conditions

10. Within 3 months of exercising this resource consent, The consent holder shall:
 - a) Operate and maintain a weather station on the site to measure and record the air temperature, wind direction and wind velocity on a continuous basis (at no less than 10-minute intervals). The weather data shall be retained for at least the duration of the resource consent.
 - b) Weather data of any period shall be provided to Auckland Council within 5 days of a request.
 - c) The weather station shall be located on the site in a location which, as far as is practicable, is unaffected by surrounding structures or vegetation or other features for the purpose of ensuring the most accurate measurements as practicable on the site.
 - d) The weather station shall be installed and operated in accordance with AS/NZS 3580.14:2014 (Methods for sampling and analysis of ambient air - Meteorological monitoring for ambient air quality monitoring applications).
11. The Council must be notified as soon as practicable in the event of any significant discharge to air, which results or has the potential to result in a breach of air quality conditions or adverse effects on the environment. The following information must be supplied:
 - a) Details of the nature of the discharge including any wind conditions as recorded under condition 10 during the incident timeframe
 - b) An explanation of the cause of the incident
 - c) Details of remediation action taken.

Advice Note: Significant discharges

Significant discharges to be notified to council in accordance with this condition include abnormal discharges arising from unexpected failures of the WWTP (including emission control systems). An email to monitoring@aucklandcouncil.govt.nz should be sent detailing the nature of the issue and what contingency measures are to be implemented to minimise potential air quality effects.

12. All air quality complaints that are received must be recorded and notified to the council on request. The recorded complaint details must include:
 - a) The date, time, location and nature of the complaint.
 - b) The name, phone number and address of the complainant, unless the complainant elects not to supply these details.
 - c) Weather conditions, including wind speed and direction, at time of the complaint.
 - d) Any remedial actions undertaken.

Air Quality Management Plan

13. Prior to the commissioning of the WWTP, an Air Quality Management Plan (AQMP) must be submitted to the Council for certification, to confirm that the activities undertaken in accordance with the AQMP will achieve the objectives of the plan and compliance with the relevant consent conditions. Any subsequent review of the AQMP must also be submitted to the council for certification. The consent

holder must meet the costs of the production, certification, monitoring and review of the AQMP. The purpose of the AQMP is to document the monitoring, management and operational procedures, methodologies and contingency plans required to comply with the conditions of this consent. The AQMP may be a sub-section of a wider Environmental Management Plan, and must incorporate a series of monitoring, management and operational procedures, methodologies and contingency plans, and together shall accurately record all information required to comply with the conditions of this consent. The AQMP must include the following:

- a) Identification of all point sources for discharges of contaminants into air, including a map and schematic diagram showing the location of each source;
- b) Procedures to minimise discharges of contaminants into air (including odour), including details of the inspection, maintenance, monitoring and contingency procedures in place for the wastewater treatment plant.
- c) The operating parameters of odour control equipment and the frequency and scope of the regular checks to be performed on emissions control equipment; including testing of the carbon bed saturation;
- d) Procedures for the monitoring of odour, including details of inspection procedures, recording requirements and contingency measures;
- e) The identification of staff responsibilities;
- f) The procedures for the receipt, recording and handling of air quality complaints received.

14. The AQMP must be reviewed on an annual basis and any subsequent changes to the certified AQMP must be submitted to the council for certification prior to implementation. The council will advise the Consent Holder in writing if any aspects of the AQMP are considered to be inconsistent with achieving the provisions of this consent.

Advice Note: Air Quality Management Plan

The council acknowledges that the Air Quality Management Plan is intended to provide flexibility both for the consent holder and the council for the management of the air discharges. Accordingly, the Air Quality Management Plan may need to be reviewed over time. Any reviews should be in accordance with the stated objectives of the management plan and limited to the scope of this consent.

Certification of the Air Quality Management Plan by the council relates only to those aspects of the management plan that are relevant under the RMA. The certification does not amount to an approval or acceptance of suitability by the council of any elements of the management plan that relate to other legislation, for example, but not limited to, the Building Act 2004 or the Health and Safety at Work Act 2015.

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