

6 December 2023

Att: Sarah Doring
Strategic Planning Manager
Victorian Planning Authority
Level 25, 35 Collins Street
Melbourne Vic 3000

Via email: osepsp@vpa.vic.gov.au and sarah.doring@vpa.vic.gov.au

Dear Sarah,

RE: Submission on Amendment C274card Officer South Employment Precinct Structure Plan

This submission responds to the release of draft documents relating to above mentioned Planning Scheme Amendment and the issues and implications for South East Water's Sewer Pump Station (SPS) site at 170 Officer South Road Officer and subsequent proposed separation distance.

As per *attached* CEE report dated May 2022, supplied to both VPA and the redacted version supplied to the land owner of 190 Officer South Road Officer, South East Water maintain that in order to continue to operate within the General Environment Duty (GED), we require a minimum of 180 meter separation distance to mitigate risks associated with odour and noise.

South East Water have assessed the SPS in line with EPA Odour Guidelines which involved field work, odour surveys and dispersion modelling providing multiple lines of evidence for the recommended 180 meter buffer. EPA also accepts that offsite odour will likely extent to a distance of approximately 200m from the SPS and notes that it may extend further. *Please refer to EPA letter to VPA dated 17 May 2022.*

An environment noise assessment based on noise measurement of the current SPS operation and background noise measurement of the potential residential development has been undertaken to understand the future noise impacts of the SPS on potential residential development. The assessment has found that:

- Current SPS operation meets the EPA noise criteria at the nearest proposed residential development; and
- Predicted future SPS operation meets an expected future EPA noise criteria (with road traffic noise wall) at the nearest residential development.

We note the land owner of 190 Officer South Road Officer has requested the buffer to be reduced to 100 meters and provided a report to support this request however the Tonkin and Taylor report did not evidence any field studies but rather used a generic buffer and guidelines from other States.

We look forward to working with VPA and the land owner of 190 Officer South Road Officer to ensure EPA requirements are satisfied and all parties are operating within the GED.

Integrated Water Management (IWM)

Draft Amendment C274card - Officer South Employment PSP 37_07s7 includes a section on Integrated Water Management (page 10). This section requires that an integrated water management strategy be submitted for subdivisions of 10 lots or more. South East Water supports this requirement for submission of an IWM plan. South East Water seeks that the IWM Plan be required to include initiatives that maximise the use of alternative water to substitute potable water use maximisation and also measures that encourage potable water use efficiency in addition to the existing stormwater drainage provisions.

Plan 9 of the draft PSP document is noted to include guidance regarding IWM solutions within the residential and mixed use portion of the PSP to which South East Water has previously requested the following changes:

- The residential and mixed use portion of the PSP in the north east corner should be shaded to reflect that recycled water will be supplied in this area, with recycled water reticulation mains and internal household plumbing to be provided by developers.
- As the residential and mixed use portion of the PSP will be supplied with recycled water it is not appropriate to also shade this area as requiring on lot rainwater tanks as this will incur additional cost on the community for very minor benefit in addition to the available recycled water.

South East Water is in ongoing discussions with Cardinia Shire Council, Melbourne Water and the VPA regarding the potential for additional IWM solutions to be incorporated within the PSP to support high intensity water users in the commercial and industrial portions of the precinct and to support healthy waterways.

South East Water supports the inclusion of on lot rainwater tanks for all areas of the PSP not already noted to be supplied with recycled water as an interim measure while additional solutions are under development. South East Water also notes and supports the inclusion of the two sewer pump stations and the proposed trunk sewer main and recycled water transfer pipeline.

Should you require anything further from South East Water, please contact me directly on [REDACTED]

Kind regards



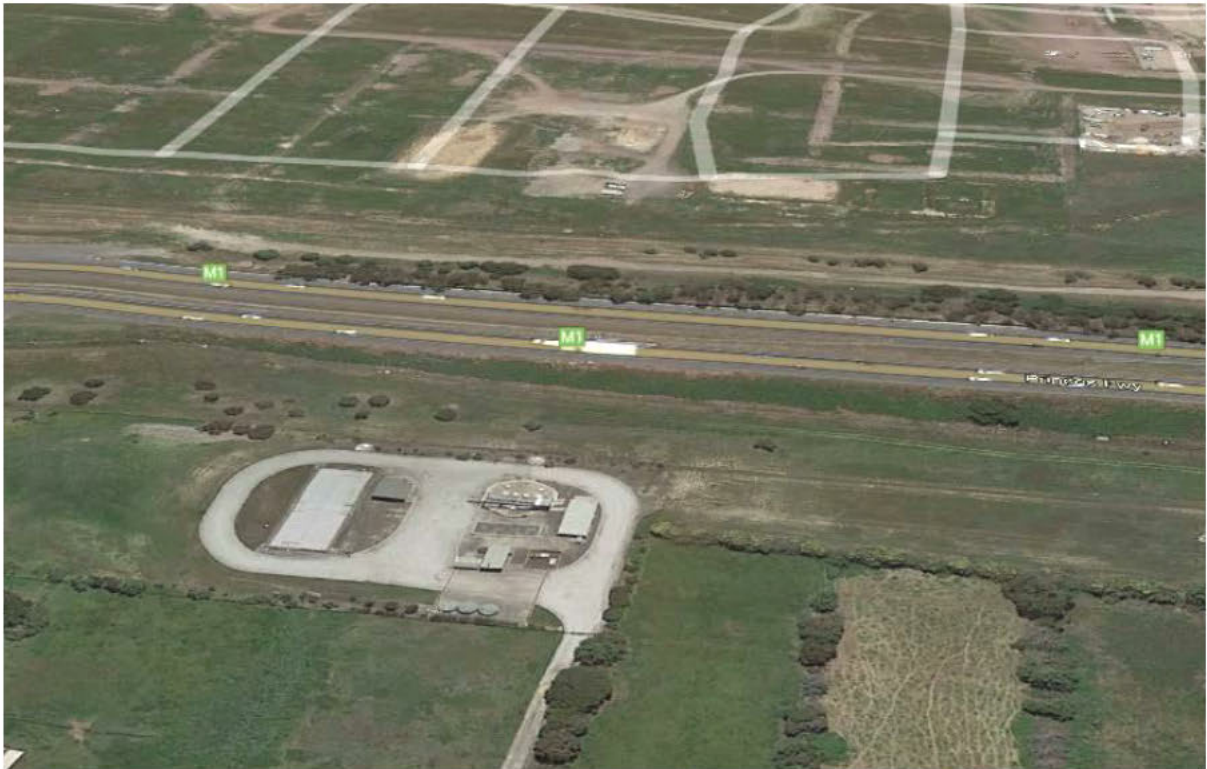
Margaret Hortomaris
Property Manager



If you require an interpreter, contact [REDACTED]

South East Water

Recommended Buffer Zone for Officer South Pumping Station



May 2022



Consulting Environmental Engineers

SOUTH EAST WATER
Recommended Buffer Zone for
Officer South Pumping Station

March 2022

1. OFFICER SOUTH PUMPING STATION	3
2. BUFFER ZONES AND PLANNING	7
3. RISK ASSESSMENT	9
4. H ₂ S AT OFFICER SOUTH PUMPING STATION	11
5. H ₂ S AT GRICES ROAD PUMPING STATION	13
6. HEALTH RISK OF HYDROGEN SULPHIDE (H ₂ S)	14
7. COMPLAINTS ABOUT ODOUR	15
8. ODOUR SURVEYS AT OFFICER SOUTH	16
9. ODOUR SURVEYS AT GRICES ROAD	19
10. EXPERIENCE FROM OTHER SITES	21
11. NOISE ASSESSMENT AT PUMP STATION	22
12. SOUTH EAST WATER DESIGN PROCEDURES	25
13. RECOMMENDED BAO FOR OFFICER SOUTH PUMP STATION	26
14. CONCLUSIONS	30
15. RECOMMENDED BAO SCHEDULE	32
16. REFERENCES	34

Prepared by:

CEE Pty Ltd

Unit 4, 150 Chesterville Road, Cheltenham, VIC 3094

<i>Version</i>	<i>Prepared by</i>	<i>Date</i>	<i>Reviewed by</i>
00	Ian Wallis	28 February 2022	N Goodwin
01	Ian Wallis	18 March 2022	SEW
02	Ian Wallis	30 May 2022	N Goodwin

Issued to:

CMP Consulting Group and South East Water

*This report constitutes the professional opinion and judgement of
Consulting Environmental Engineers*

1. OFFICER SOUTH PUMPING STATION

The Officer South Sewage Pumping Station (SPS) is South East Water's largest sewage pump station and will transfer sewage from a future resident population of 120,000 persons in the suburbs of Officer and Pakenham to the Eastern Treatment Plant at Carrum. The pump station is located at Officer South on the south side of the Princes Freeway adjacent to Officer South Rd.

Sewage from residential and commercial properties in the region collect in the wet well from where they are pumped west to trunk sewers that lead to the Eastern Treatment Plant. The wet well is a 12-sided concrete structure approximately 14 m in diameter that extends 10 m down below ground level and 1 m above ground level. There are 13 large opening lids on the top of the wet well to provide access for maintenance activities, including checking, removing and replacing pumps, checking, adjusting and cleaning sewage level sensors and other control equipment and a monthly clean of the inside walls of the wet well, to remove grease and debris that accumulate over time. The cleaning is carried out with pressure water sprays and involves opening the lids over a period of 2 days. Figure 1-1 shows a plan view of the Officer South Pumping Station

Figure 1-1. Plan View of Officer South Wet Well (15 m in Diameter)

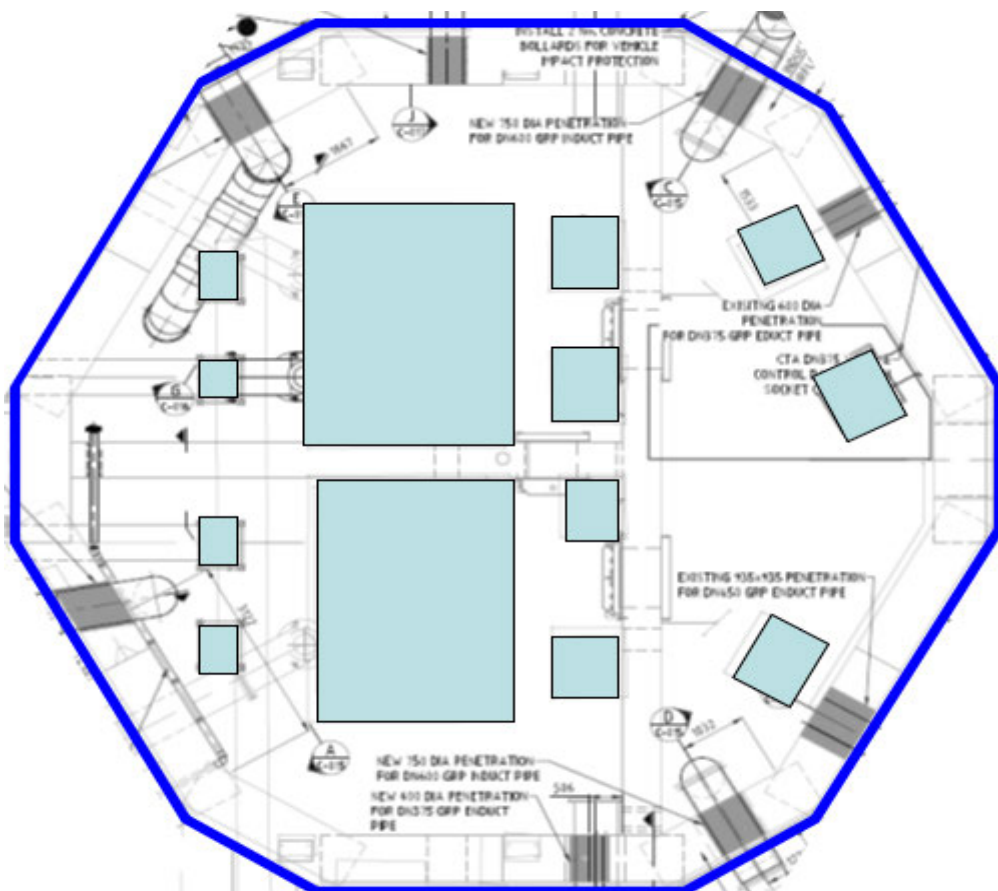


Figure 1-2 shows the pump station in relation to the Princes Freeway and Officer South Road. Currently a new intersection is being developed where the Freeway passes over the top of Officer South Road. A new on-ramp from Officer South Road to the Freeway (heading into the city) is under construction immediately to the north of the pump station site

Figure 1 2. Officer South Pumping Station Location Plan



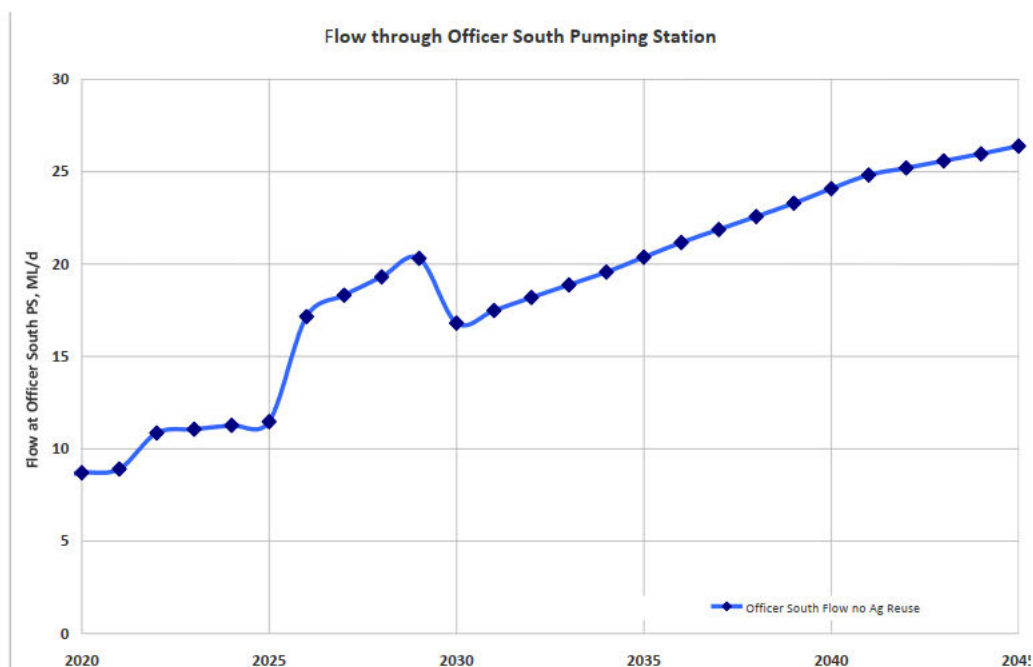
The area to the north of the Princes Freeway is undergoing rapid residential development, as illustrated in Figure 1-3

Figure 1-3. Residential Development North of Officer South Pumping Station



The Officer South Pumping Station is planned to transfer wastewater from Hallam Valley, Officer, Pakenham, Clyde and Officer South to the Eastern Treatment Plant. The daily amount of sewage transferred will increase over time from around 8 million litres per day (8 ML/d) at present to 26 ML/d in 2045

Figure 1-4. Growth in Pumping Station Flows over Time



The catchment served by the pump station is relatively flat land. This means that the sewage must pass through several pump stations before it reaches Officer South, resulting in a long detention time and the development of very anaerobic and odorous conditions in the sewage. Measurements of hydrogen sulphide (described later in this report) show very high concentrations occur at the existing pump stations and even higher concentrations are expected in the future.

Until recently, the Officer South pump station was in an entirely rural zone. Now, all the land north of the Freeway is being developed for housing.

The area south of the Freeway is known as the *Officer South Employment Precinct* and it, together with the existing suburb of Officer, has been identified as a future State Significant Employment Precinct. The Victorian Planning Authority (VPA) is developing a *Precinct Structure Plan* (PSP) for the area.

South East Water was consulted as part of the PSP process and provided advice to the VPA on servicing requirements for sewer, potable and recycled water. This consultation included a request by South East Water to include an odour buffer around major pump stations, including Officer South SPS.

This report sets out the basis for defining the extent of the odour buffer zone around the Officer South pump station.

Officer South Pumping Station is Critical Infrastructure

Officer South SPS forms a critical part of the sewer servicing strategy for the area, both now and into the future. Currently the pump station accepts sewage from the suburb of Officer via gravity flow, the Mary St catchment on the border of Officer and Pakenham, and the suburb of Pakenham via a pump station located at the Pakenham Treatment Plant.

The pumped flows are particularly septic and odorous which has led to significant works over the past year to repair the pump station's damaged internal liner, install increased ventilation of the well and upgrade mechanical and electrical equipment to improve the reliability of the pump station.

Pakenham WRP has insufficient capacity to treat the full inflow and Officer South pump station is required to transfer most of the sewage from the Pakenham area to Eastern Treatment Plant.

Future arrangements include connecting the sewage from the Grices Road pump station to Officer South pump station which will include more sewage with long retention times and high levels of H₂S and respective odour.

In the short to medium term, it is expected that sewage entering the Officer South pump station will be extremely septic and odorous due to exceptionally long retention times as South East Water starts servicing development in the Casey - Clyde growth areas. The limited occupancy of the development area means that, for the first decade, sewage flows are well below the ultimate flows, with a corresponding long retention time in sewers and pump stations, and greater opportunity for septic and odorous conditions to develop.

Allowance has been made in the ventilation upgrades currently being installed for future addition of an air treatment facility to treat these odours. This will be timed to coincide with the connection of a rising main from Ballarto Rd SPS, or development of the surrounding land, whichever comes sooner. Nonetheless, the buffer area will be required for all regular and irregular maintenance periods, when the covers must be lifted and the air capture system will be ineffective.

Noise

In addition to odour, noise is a significant concern for sensitive land uses surrounding large pump stations. This includes noises from pumps, valves and fans and a low level electrical hum when the pumps are running. Due to the critical role of Officer South SPS in servicing the Eastern Growth areas the SPS needs to operate continuously.

South East Water has extensive experience with existing pump stations in residential areas. South East Water commissioned a noise assessment for Officer South pump station and the methodology and results are provided later in this report.

2. BUFFER ZONES AND PLANNING

The *Planning and Environment Act 1987* provides standard provisions for planning schemes called the Victoria Planning Provisions (VPP). The *Planning and Environment Act* and the VPP require that air quality issues must be considered in planning decisions. Section 60 requires the responsible authority, before deciding on a planning permit application, to consider any significant effects on the environment the use or development may have.

More specifically, Clause 13.06-1S (*Air Quality Management*) of the VPP relates to protection of air quality by ensuring, wherever possible, adequate separation between land uses that reduce amenity and sensitive land uses.

Clause 53.10 of the VPP deals with those uses which have adverse amenity potential and specifies the minimum **threshold distance** for various industry types between the proposed use and a sensitive land use zone (for example residential zones). The operation of Clause 53.10 is set out in Planning Practice Note 92 "*Managing Buffers for Land Use Compatibility*", DELWP, March 2021).

EPA Publication 1518 – Separation Distances

EPA Publication 1518 "*Recommended Separation Distances for Industrial Residual Air Emissions*" was published in March 2013. The purpose of the EPA Guideline is to recommend minimum separation distances between odour- or dust-emitting industrial land uses and sensitive land uses. The Guideline informs land use planning decisions and the assessment of planning permit applications. The objective is to prevent new sensitive land uses from impacting on existing industrial land uses and to prevent new industrial land uses from impacting on existing sensitive land uses.

It is understood that higher emissions can occur from time to time due to a range of external circumstances, including maintenance activities. EPA recognizes these types of events and in EPA Publication 1518 it states:

This guideline contains a list of recommended minimum separation distances that aims to minimise the off-site impacts on sensitive land uses arising from unintended, industry-generated odour and dust emissions.

It needs to be recognised that where there are industrial air emissions from premises, even with good pollution control technology and practice, there may still be unintended emissions which must be anticipated and allowed for.

Unlike routine emissions, unintended emissions ... are often intermittent or episodic and may originate at or near ground level. Separation distances seek to avoid the consequence of these unintended emissions. An adequate separation distance should allow (them) to dissipate without adverse impacts on sensitive land uses.

Large sewage pump stations are included in the range of industries listed in Planning Practice Note 92 as having the potential to cause adverse impacts from hazardous air pollutants (such as hydrogen sulphide), noise, dust, odour and overflows

Type of use or activity	Potential adverse impacts					Description of activity
	Hazardous air pollutants	Noise	Dust	Odour	Other risk (e.g. loss of containment)	
Water and wastewater						
Sewage treatment plant, exceeding a design or actual flow rate of 5,000 litres per day	x	x		x	x	<ul style="list-style-type: none">Sewage treatment plant operationVacuum/wastewater/sewage pumping station.

While these impacts can often be controlled through onsite management, unintended off-site impacts due to equipment failure, major maintenance, accidents, abnormal weather events and other causes may still pose risks to amenity, safety and human health. These impacts are particularly concerning where residential areas, hospitals, schools and other sensitive uses may be exposed to the emissions.

Ensuring compatible land uses is fundamental to the objectives of planning in Victoria. This requires a buffer zone between incompatible land uses, which avoids threats to the operation and viability of critical infrastructure, and also minimises the risk of adjacent communities being exposed to odour nuisance.

Odour-sensitive land uses include, but are not limited to:

- Dwellings;
- Residential aged care facility;
- Hospital;
- Child care centre;
- Place of assembly;
- Café, restaurants;
- Schools.

Buffer Area Overlay

Accordingly, South East Water is seeking to establish a Buffer Area Overlay (BAO) over land adjacent to the Officer South pump station.

The extent of the Overlay is determined the methods proposed by EPA Victoria and incorporated into Planning Practice Note 92. They involve a risk assessment, to establish whether a BAO is required, an assessment of multiple lines of evidence, to establish the size of any BAO, and a schedule of land uses that are compatible and incompatible with the Officer South pump station, to contribute to future planning of the precinct.

3. RISK ASSESSMENT

Many small neighbourhood pump stations do not require a buffer zone because the sewage is fresh and contains sufficient dissolved oxygen to limit generation of odours. Sewage in urban Melbourne typically has an initial dissolved oxygen content of around 8 mg/L (depending on ambient temperature, more oxygen in winter and less in summer) and a demand for oxygen of around 3 to 4 mg/L per hour. Some extra oxygen is added at the surface of sewage flowing in gravity sewers, but typically the available oxygen is used up in about 3 hours after discharge.

In hilly terrain, the available oxygen is normally sufficient to allow the sewage to travel about 5 km without causing excessive odours; in flat terrain, the odour problems typically start at the second pump station in the line of sequential pump stations.

For major pump stations like the Officer South pump station, the sewage is depleted of oxygen, has become anaerobic and generated a high concentration of hydrogen sulphide, and has become a liquid that is very odorous and hazardous to human health. The objective is to transfer the sewage to a treatment plant where it can be converted back to clean water for reuse, without adverse impacts along the route.

Table 3-1 shows the risk matrix used to establish whether a BAO is required.

Table 3 1. Risk Matrix from Planning Practice Note 92

Consequence					
Severe	High	High	Very high	Very high	Extreme
Major	Medium	Medium	High	Very high	Very high
Moderate	Medium	Medium	High	High	High
Minor	Low	Low	Medium	Medium	Medium
Very Low	Very low	Low	Low	Low	Medium
Likelihood	Highly unlikely	Unlikely	Possible	Likely	Almost certain

Likelihood criteria	Highly unlikely	Unlikely	Possible	Likely	Almost certain
Descriptive (based on industry history, the nature of the specific business)	Will probably never happen in the industry	Not expected to happen/recur in the industry but it is possible	Expected to happen/recur in the industry occasionally	Expected to happen/recur in the industry regularly	Expected to happen/recur in the industry frequently

Likelihood of Events

The likelihood is assessed as follows:

- **Maintenance events** where the covers are lifted off the pump station are scheduled to occur each month, and are therefore classified as “**Likely**” as the events are expected to occur regularly.
- **Fugitive emissions** due to leaks around the edges of the covers and the unavoidable variations in air volume inside the wet well as the water level changes over a pump cycle lower occur for most of the time, and are therefore classified as “**Almost Certain**”. The volume of fugitive leaks depends on the ventilation arrangements at the pump station

Consequence of Events

The consequence is assessed by consideration of multiple lines of evidence:

- 1 Hydrogen sulphide concentration in wet well;
- 2 Odour surveys around wet well;
3. Odour surveys around upstream wet well;
4. Odour complaints around upstream well;
5. Calculated decay of odour with distance; and
- 6 Experience from other major pump stations

The evidence is set out in the following sections of this assessment report. The outcome is as follows:

- **Maintenance events** where the covers are lifted off the pump station each month are therefore classified as “**Major**” as the resulting odour close to the pump station would disrupt normal activities associated with sensitive land uses and cause great concern about loss of amenity. The odour is very noticeable, penetrates inside the house and disrupts activities (eg, outdoor entertaining) outside the home
- **Fugitive emissions** due to continuous leaks and variations in air volume inside the wet well are classified as “**Moderate**” as the resulting odour close to the pump station would disrupt some activities associated with sensitive land uses and cause some concern about loss of amenity. While the odour that is not unsafe, it can be strong, noticeable and objectionable

Risk Ranking

The combination of likelihood and consequence leads to the following risk ranking.

- **Maintenance events** are therefore classified as “**Likely**” and “**Major**” consequence. According to Table 1, this corresponds to a “**Very High Risk**”, and the need for a BAO.
- **Fugitive emissions** are classified as “**Almost Certain**” and “**Moderate**” consequence. According to Table 3-1, this corresponds to a “**High Risk**”, and the need for a BAO.

In summary, the risk ranking demonstrates that a BAO is justified for the Officer South pump station. The size of the recommended BAO is derived from the extent of the observed and predicted odour impact area.

4. H₂S AT OFFICER SOUTH PUMPING STATION

The concentration of hydrogen sulphide (H₂S) has been measured in the wet well at Officer South pump station in 2013, 2015 and 2017. Figure 4-1 shows the results for the 2013 measurements. The average H₂S was 8 ppm, the 90-percentile level was 16 ppm and the peak concentration was 27 ppm.

Table 4 1. H₂S Gas Measurement at Officer South PS 2013

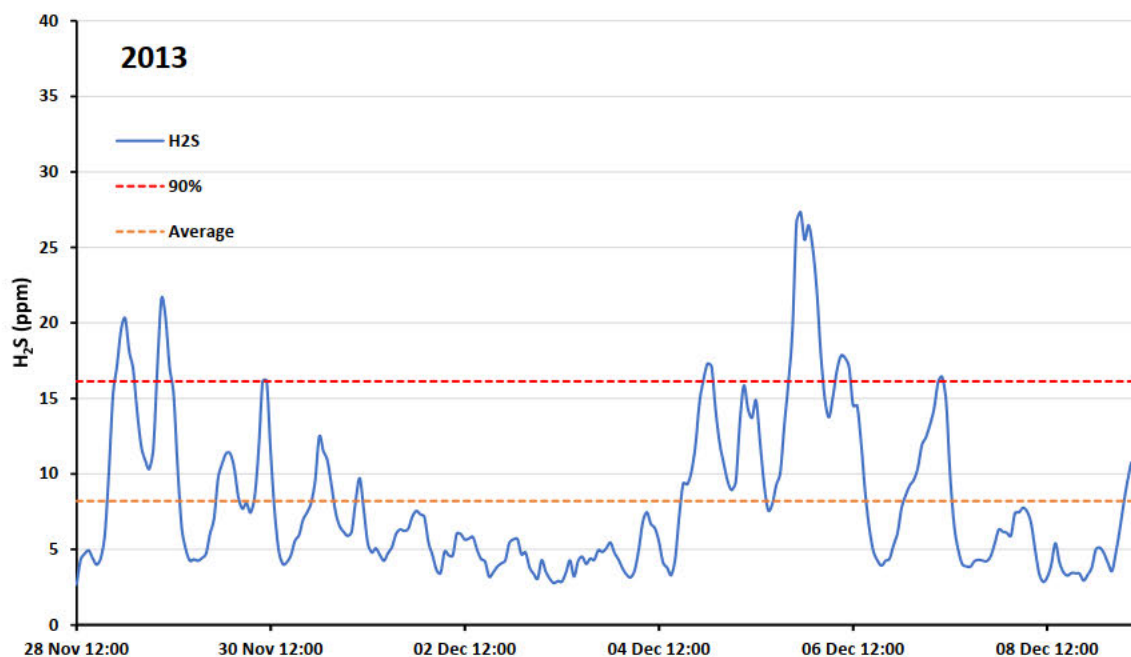


Figure 4-2 shows the results for the 2015 measurements. The average H₂S was 4 ppm, the 90-percentile level was 10 ppm and the peak concentration was 38 ppm.

Table 4 2. H₂S Gas Measurement at Officer South PS 2015

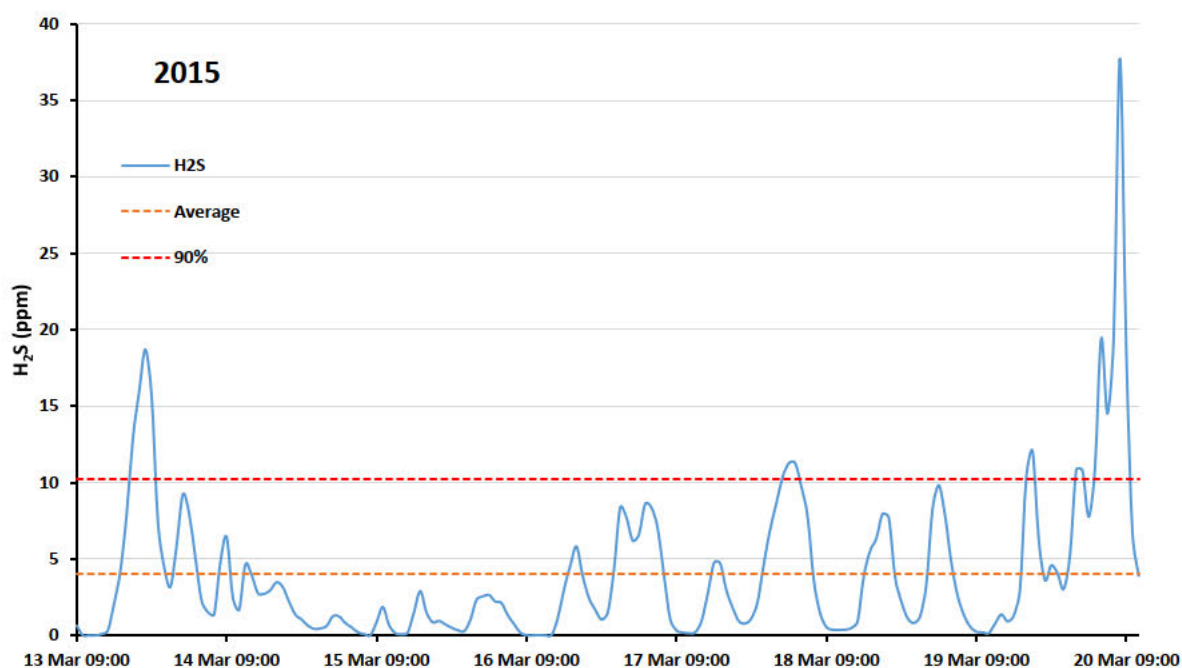
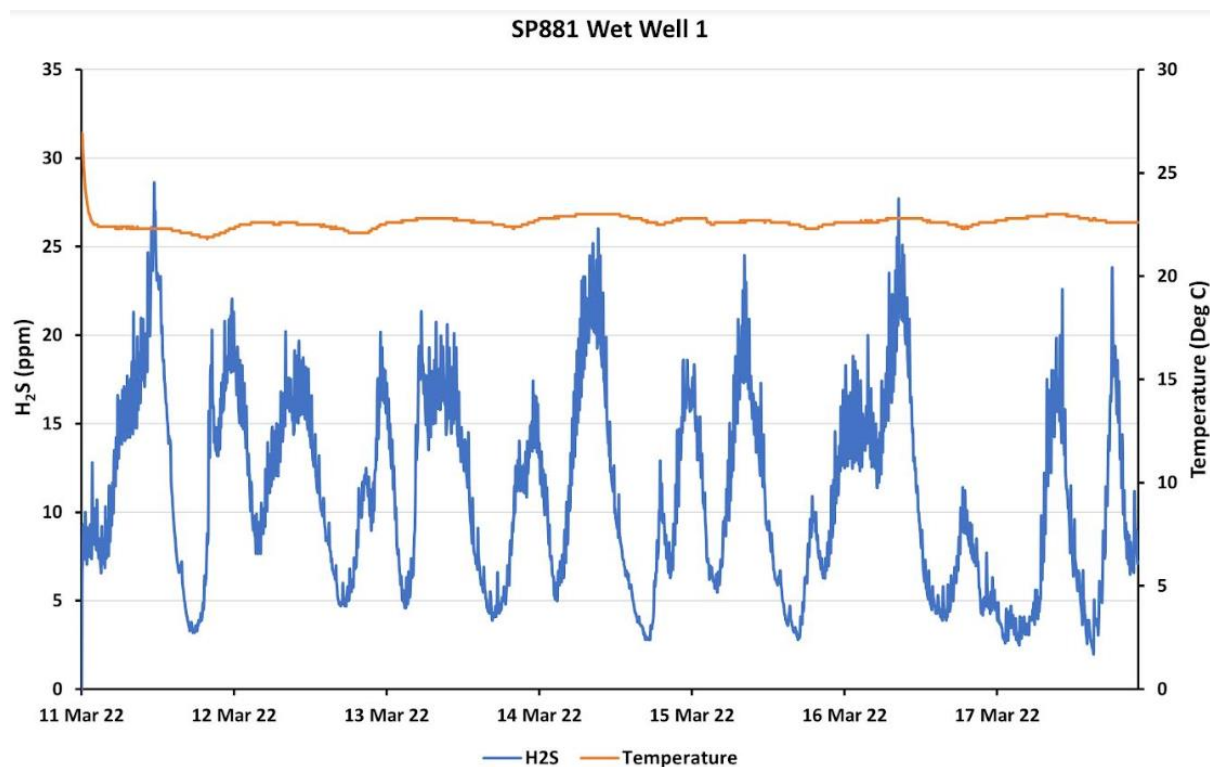


Figure 4-3 shows the results for the 2022 measurements. The average H₂S concentration was 11 ppm and the peak concentration was 30 ppm. The H₂S concentration in 2022 was similar to that in 2015

Table 4-3. H₂S Gas Measurement at Officer South PS - 2022



In the next few years, the flow from Grices Road pump station will be transferred to the Officer South pumping station and this will increase the H₂S levels in the Officer South pump station

A proportion of the flow now handled at Officer South has a residence time in the sewers and pump station of 6 to 8 hours, and therefore has elevated hydrogen sulphide. South East Water has procedures for maintenance personnel to ensure there are no OH&S impacts of H₂S on personnel

Based on the H₂S monitoring data, the H₂S level outside the fenced boundary is predicted to be well under 10 ppm (the lowest health impact level) but occasionally exceed 1 ppm (and thus be in the range of offensive odour). For this reason, a BAO is sought around the Officer South pump station

South East Water intends to take all reasonably practicable steps to contain and treat odour, including installing an odour extraction system to manage foul air for the majority of the time. Even so, the BAO is required for monthly maintenance events when the lids of the pump station are open.

5. H₂S AT GRICES ROAD PUMPING STATION

The Grices Road pump station (in Clyde North next to Berwick Waters Park) is a comparable pump station to Officer South, in a suburban area that has more residential and commercial development than at Officer South. Figure 5-1 shows the 2021 H₂S measurements at Grices Road pump station, when the wet well had a fan-forced ventilation system. The average H₂S was 10 ppm, the 90-percentile level was 16 ppm and the peak concentration was 20 ppm (similar values to Officer South pump station in 2013)

Table 5 1. H₂S Gas Measurement at Grices Road PS 2021

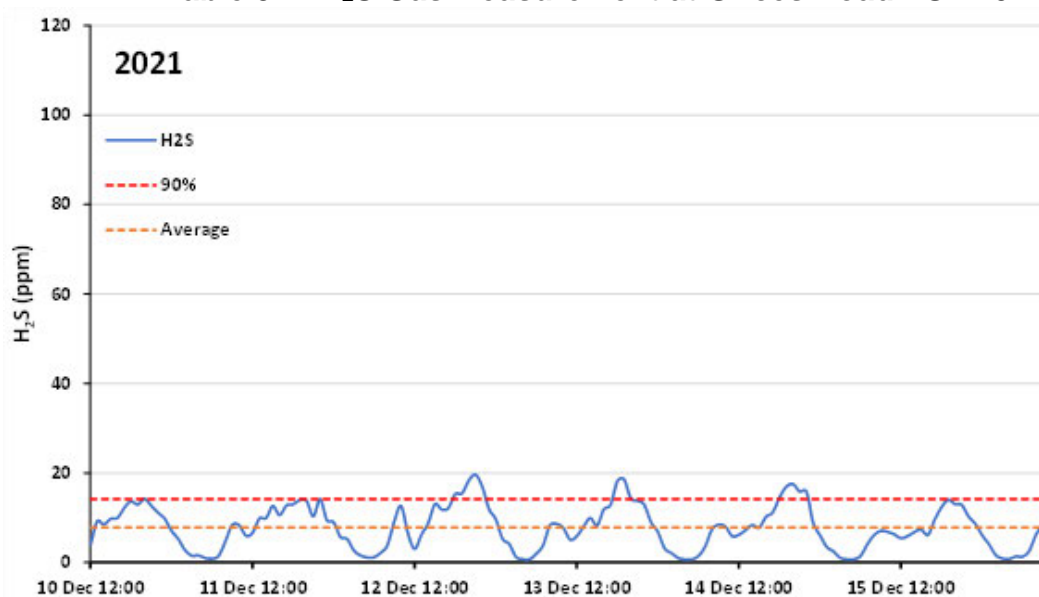
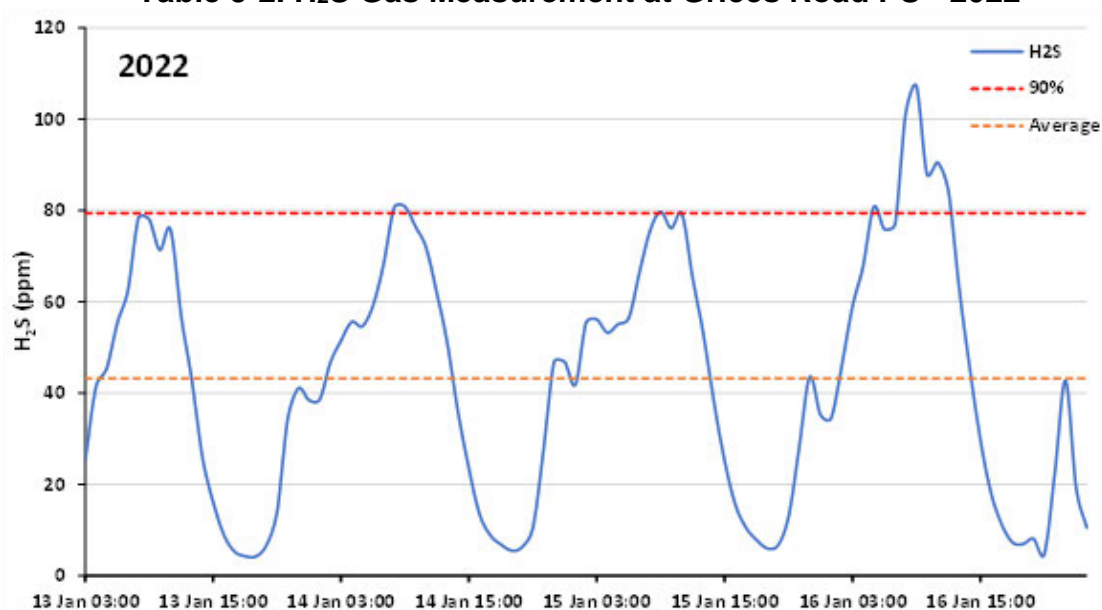


Figure 5-2 shows the results for the 2022 measurements when the fan was not operating (a temporary operating condition). The average H₂S was considerably higher at 44 ppm, the 90-percentile level was 80 ppm and the peak concentration was over 100 ppm. The odour surveys were made during this wet well operating condition

Table 5 2. H₂S Gas Measurement at Grices Road PS 2022

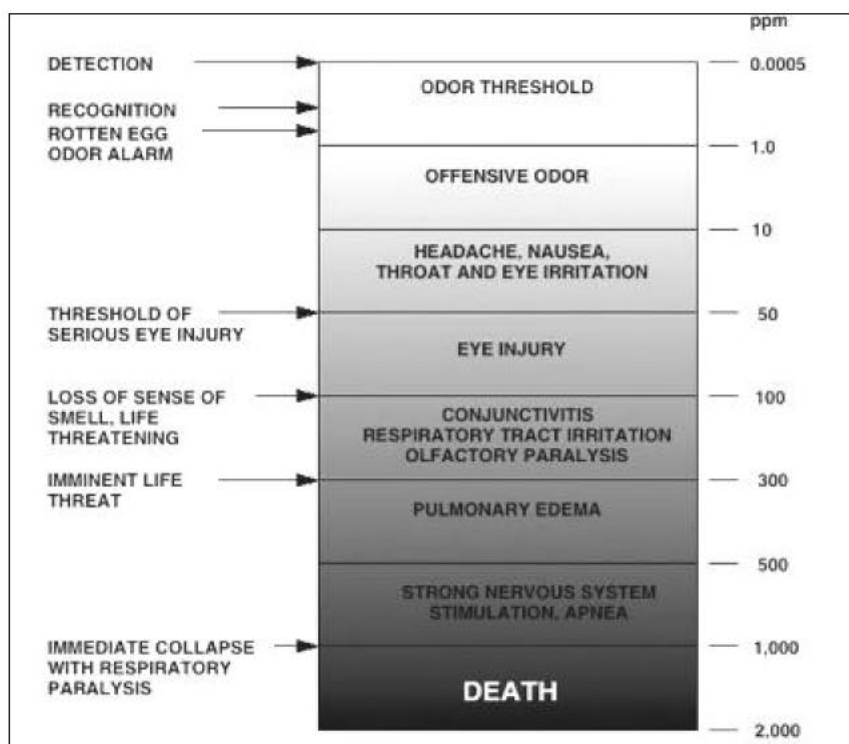


6. HEALTH RISK OF HYDROGEN SULPHIDE (H₂S)

Sewage contains a large number of compounds which, when released from the liquid into the gas above the liquid, can cause an odour nuisance if not captured or treated. Odorous compounds within the sewer network are released into the air-space above the liquid surface in sewers and pump stations. If contained within the network, they constitute an OHS risk to personnel involved in inspection and maintenance of the sewerage network. When released from the network to the general atmosphere, the odorous compounds pose an odour and health risk to nearby sensitive receptors.

Hydrogen sulphide (H₂S) is the main odorous compound released from sewers. H₂S is a colourless and very odorous gas that can be detected by humans at concentrations as low as 0.0005 ppm. At 1 to 50 ppm, H₂S causes nausea and headaches. At higher concentrations, H₂S can be very hazardous to humans, and concentrations above 50 ppm can cause eye injury while H₂S concentrations above 300 ppm can lead to pulmonary edema (swelling) and ultimately death (see Figure 6-1). As described in the next section, H₂S monitoring at Officer Road pump station in 2015 and 2022 has shown that the average H₂S concentration is 11 ppm and the peak concentration is around 30 ppm. Allowing for dilution, the H₂S at the site boundary will always be less than 3 ppm, and therefore not a significant risk to health outside the boundary of the fenced SEW site.

Figure 6-1. H₂S Gas Toxicity Spectrum



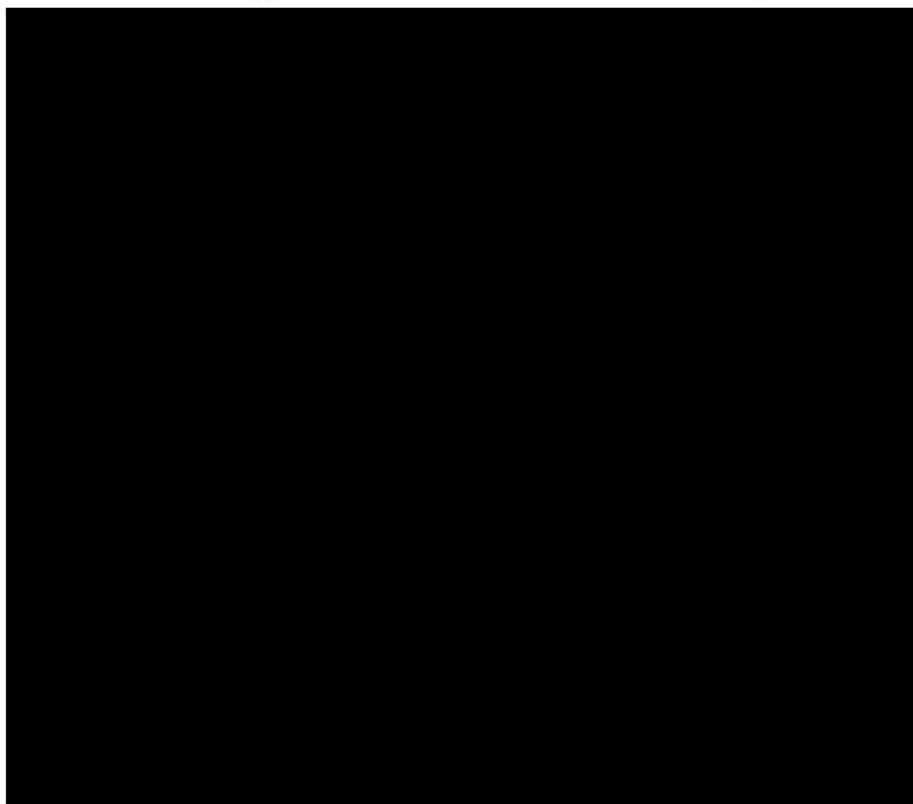
A particular risk of hydrogen sulphide is that, at high concentrations, the nasal system is quickly fatigued, so that a person cannot perceive dangerous concentrations (greater than 50 ppm). The health risk is well-recognized by sewerage agencies who provide air breathing equipment and implement standard procedures to minimise the health risk to maintenance personnel.

7. COMPLAINTS ABOUT ODOUR

Officer South pump station is in a rural area and is adjacent to horse paddocks and stables. The occupier of the stables has complained to South East Water about odour from the pump station, particularly during monthly maintenance events when the covers are removed to clean the wet well and check the pump equipment.

Odour complaints have been received from several sites around the Grices Road pump station, including the sites indicated in Figure 7-1, at distances up to 180 m from the pump station.

Table 7-1. Odour Complaints around Grices Road Pump Station - 2021



The cause of odour complaints is the release of odorous air from the wet well of the pump station. In each pumping cycle, the wet well fills with sewage to a predetermined level, the pumps are switched on and the wet well empties as the sewage is pumped away. Air is pushed out of the wet well each time the sewage level rises. Thus, the minimum amount of air exhausted from a pump station is equivalent to the volume of sewage handled each day. Additional air is dragged into the wet well along sewers and, as an approximation, this can be one to two times the pumping capacity.

The Grices Road pump station has been sealed to the maximum extent possible, and the pump station handles about 5 ML/d of sewage. This means that approximately 10,000 m³ of foul air (two times the pumping volume) must escape from the pump station each day, leading to the odour problem in the neighbourhood. In around 2025, it is planned to divert the sewage from the Grices Road pump station to the Officer South pump station.

8. ODOUR SURVEYS AT OFFICER SOUTH

A crucial step in determining the size of the BAO for the Officer South pump station is to determine the spatial extent of odour by carrying out on-site field odour surveys

As part of this investigation, CEE implemented the procedure in EPA Guidance Document “*Odour Surveillance, 2021*” to conduct odour surveys at both Officer South and Grices Road Pump Stations. The procedure involved starting at various distances downwind of the pump station and tracking the odour plume back to the pump station, periodically crossing the plume until the site boundary was reached. The field assessors had a briefing at the pump station and carried out a reconnaissance survey of the stables and horse paddocks, to become familiar with the character of odour from the pump station and other odour sources in the area.

During the field surveys, any detectable odours with the characteristics of the pump station (hydrogen sulphide) were noted and the following details were recorded:

- Location;
- Odour intensity;
- Odour duration;
- Odour characteristic; and
- Meteorological conditions (wind speed, wind direction, temperature).

Odour Intensity was characterised using the methodology outlined in the EPA Guidance Document as listed in Table 8-1

Table 8 1. Description of Odour Intensity

Odour intensity	Description
Obvious	Odour is easy to smell and always noticeable. Odour is easily recognisable, can be described and may be attributed to a source.
Subtle	Odour can be smelled only when focusing. Odour character can be more to recognise.
No odour	No odour, or no recognised odour

Odour Duration was also recorded in accordance with the EPA guidance, following the descriptions listed in Table 8-2.

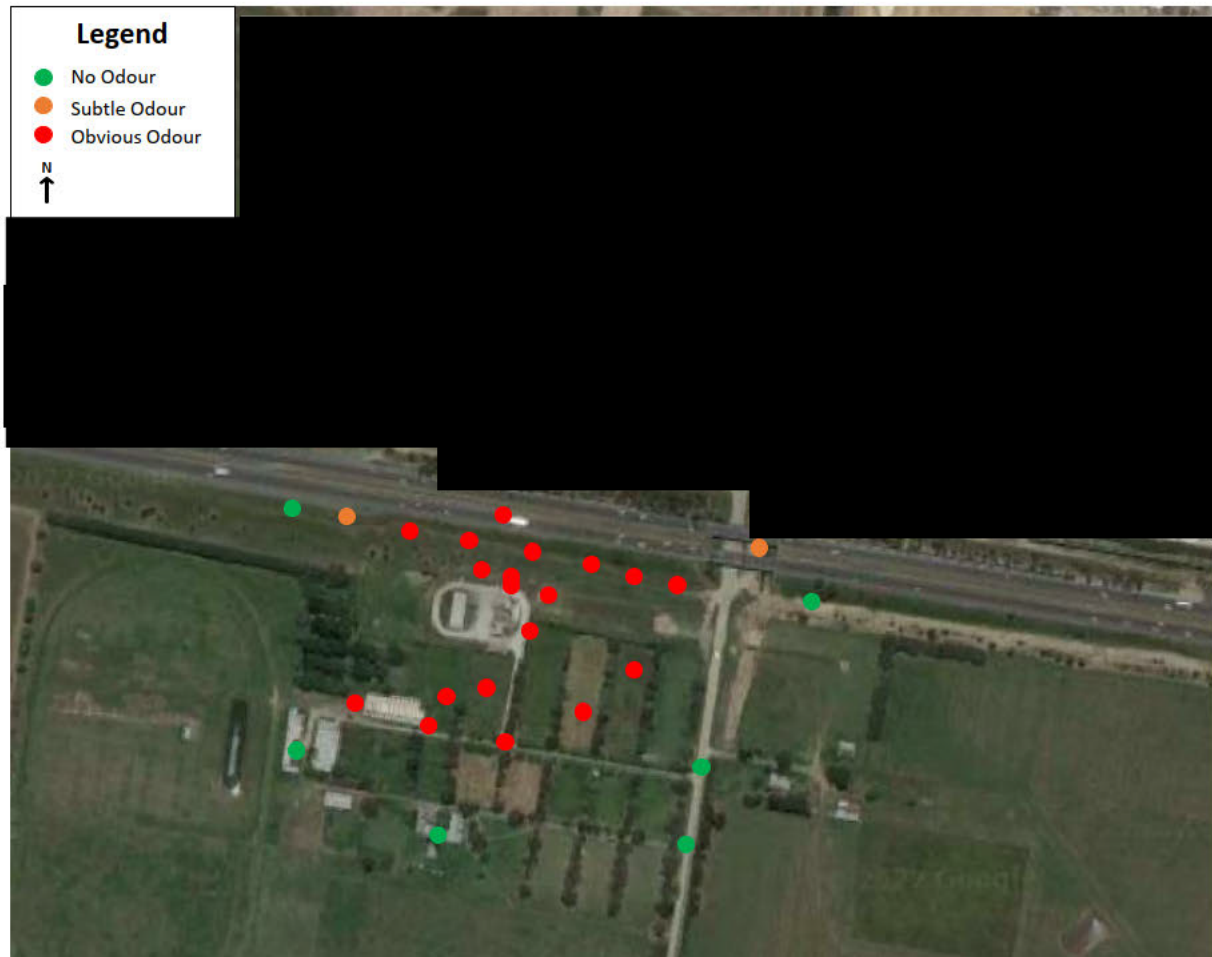
Table 8 2. Description of Odour Duration

Odour duration	Description
Constant	Can smell it constantly
Frequent/Repetitive	On and off with significant/noticeable periods with recognised odour
Transient	On and off (intermittent) with significant / noticeable periods with no odour or no recognised odour

In accordance with EPA guidance, ten odour surveys were undertaken. The observation points in the surveys were determined by the prevailing wind directions at the time of the surveys. To include local experience with odours, the survey personnel were supplemented by a local resident and personnel working over the last six months on the on-ramp construction.

The results of the odour surveys are plotted in Figure 8-1 using coloured circles where:
 Red circle = obvious odour;
 Orange circle = subtle odour; and
 Green circle = no odour

Figure 8-1. Results of Odour Surveys at Officer South Pump Station 2022



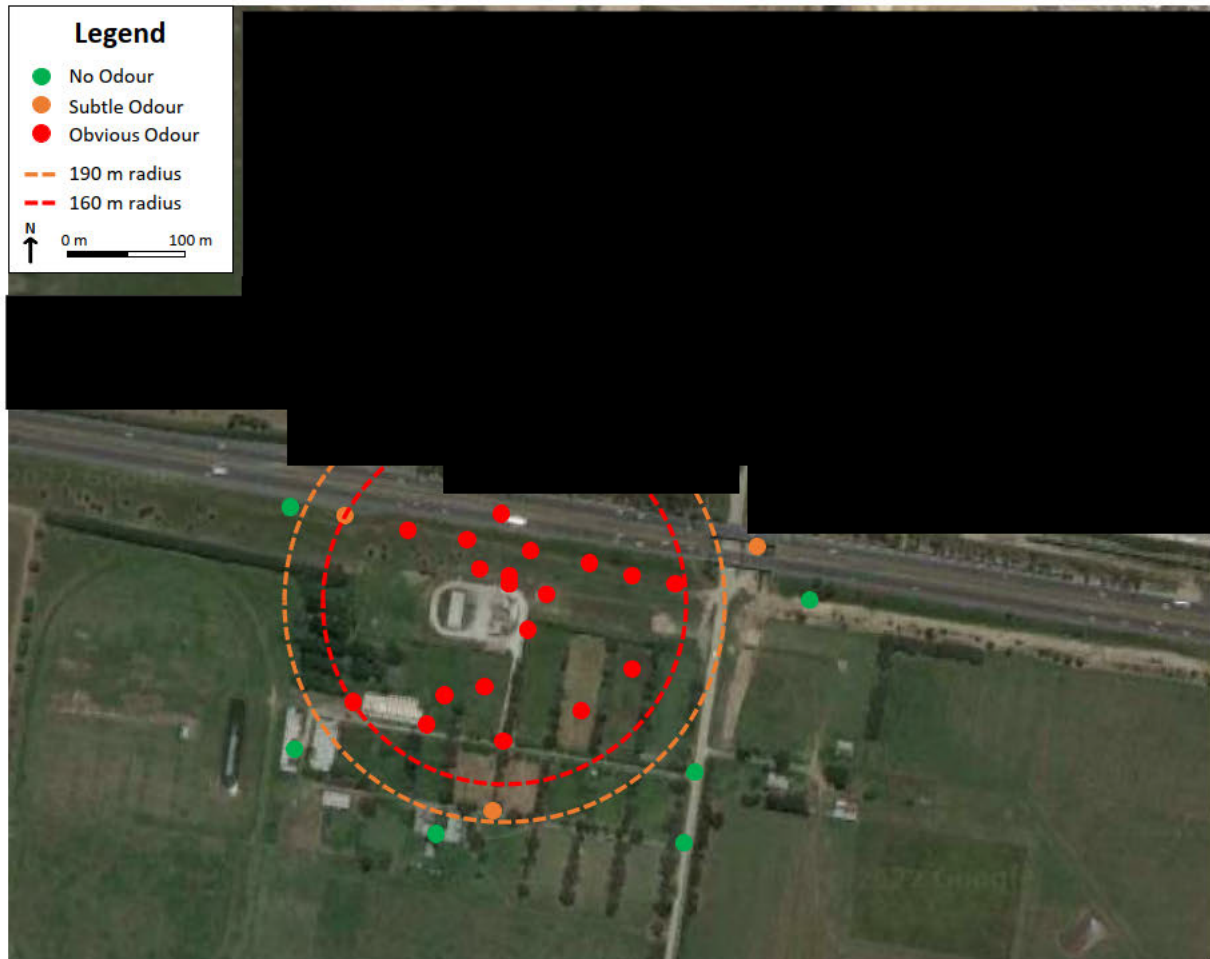
Obvious odour was observed at various distances in all directions from the pump station, depending on the wind direction. Interestingly, obvious odour was not recorded at the three nearby houses, each of which had a “no odour” observation, and the survey observations were confirmed by the house occupants

The Freeway is elevated 7 m above ground level across the north of the pump station and it has a significant effect on the extent of odour. Winds from the south are deflected by the “wall” of the Freeway (and the associated noise wall on the north side) and oscillate to the east and west along the side of the embankment. This explains the observations of obvious odour along the southern edge of the Freeway (with one observation of obvious odour on the Freeway itself).

North-east, north and north-west winds transport obvious odour over an arc across the flat horse paddocks to the south of the pump station. Close to the pump station fence, the downwind odour was recorded as “frequent” as it was present more than half the time at each survey site. At the obvious odour sites further from the pump station, and at all the **subtle** odour sites, the odour observations were recorded as “transient”.

Figure 8-2 shows the distance to odour observations from the Officer South pump station. A circle of 160 m radius encompasses all the observations of **obvious** odour. A larger circle of 190 m diameter encompasses the observations of **subtle** odour, except for the observation on Officer South Road under the Freeway (this is not an odour-sensitive location)

Figure 8-2. Extent of Odour from Officer South Pump Station - 2022



There are no practical ways to prevent odour emissions from the Officer South pump station during maintenance activities. Current practice is to inform nearby residents whenever possible that maintenance works are proposed. This acknowledges that the works have a negative amenity impact on the community.

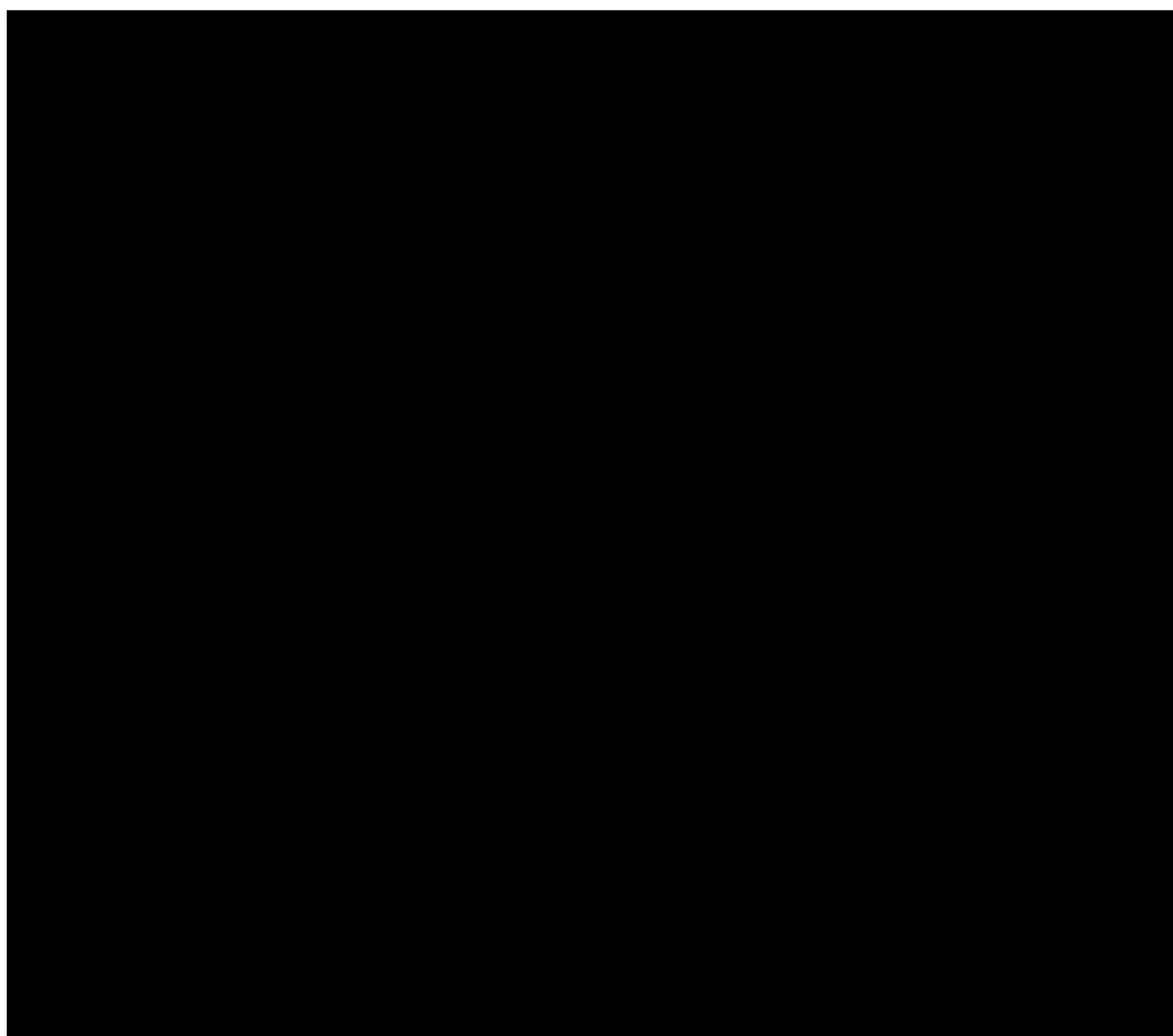
9. ODOUR SURVEYS AT GRICES ROAD

Ten odour surveys also were undertaken around the Grices Road pump station in accordance with EPA guidance. The observation sites for the surveys were determined by the prevailing wind direction at the time of the surveys, and limited by the water bodies in the wetlands and private property.

The results of the odour surveys are plotted in Figure 9-1 using coloured circles where:

- Red circle = obvious odour;
- Orange circle = subtle odour; and
- Green circle = no odour.

Figure 9 1. Results of Odour Surveys at Grices Road 2022



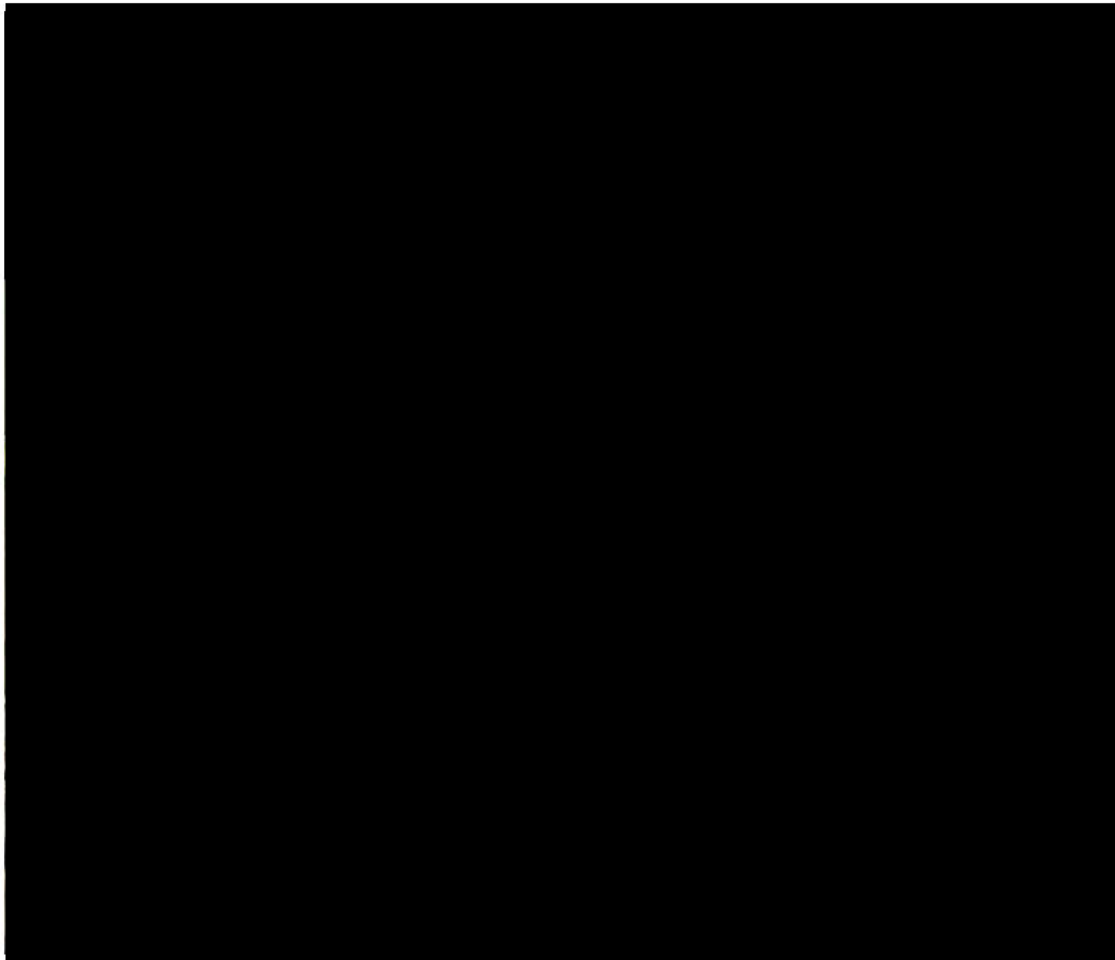
Obvious odour was observed to the north, east and south of the pump station at various distances. The large wetland to the west and south of the pump station limited the observations in those directions.

Obvious odour extended to houses in the vicinity of the pump station which matches the pattern of complaints about odour. Residents in Riverbank Close (the residential street closest to the pump station) said they “often” experienced odour. Obvious odour was readily detected on Grices Road itself.

Close to the pump station, the downwind odour was recorded as “frequent” as it was present more than half the time at each survey site. At the obvious odour sites further from the pump station, and at all the **subtle** odour sites, the observations were recorded as “Intermittent” or “transient”

Figure 9-2 shows the distance to odour observations from the Grices Road pump station wet well. A circle of 180 m radius encompasses all the observations of **obvious** odour. A larger circle of 250 m radius encompasses the observations of **subtle** odour.

Figure 9 2. Extent of Odour from Grices Road Pumping Station 2022



The sewage flow at the Grices Road pump station is approximately half that at Officer South pump station. As a consequence, approximately half the volume of foul air is released each day at Grices Road pump station compared to Officer South.

The extent of obvious odour at Grices Road (180 m) is comparable to that at Officer South (160 m). Subtle odour extends further from Grices Road, most likely due to the higher H_2S concentration in the foul air which funnels along the residential streets, and the 250 m extent of subtle odour at Grices Road is further than the 190 m extent of subtle odour at Officer South.

10. EXPERIENCE FROM OTHER SITES

Every sewage pump station has a different catchment and therefore different odour conditions. Small, local pump stations have fresh sewage with residual dissolved oxygen. Large, regional pump stations, have “aged” sewage with no remaining dissolved oxygen but anaerobic conditions, producing odours.

Sewage at Officer South is predicted to be particularly odorous. It is the largest regional pumping station operated in South East Water’s region.

The Brooklyn pump station operated by Melbourne Water is an even larger pump station handling anaerobic sewage. It has a buffer zone from residential premises of 260 m to the west and 180 m to the south (across the Freeway) and is in an industrial zone.

The Hoppers Crossing pump station, also operated by Melbourne Water, is another large sewage pump station handling anaerobic sewage. It has a buffer of 400 m from residences to the east but has experienced encroachment from commercial development to the north west and a school to the south. Unfortunately, there is a zone of odour impact that extends to odour-sensitive premises, and the Hoppers Crossing pump station received numerous odour complaints from up to 400 m away until last year when they installed a major odour treatment facility. It is considered that Melbourne Water would implement an odour buffer around that pump station if it were possible to do so.

In summary, experience from other major pump stations in Melbourne shows that a buffer zone of around 200 m radius is required to avoid odour complaints.

11. NOISE ASSESSMENT AT PUMP STATION

Arup Australia Pty Ltd (Arup) was engaged to undertake an environmental noise assessment of the Officer South Pump Station. The noise assessment involved:

- Review of existing and proposed SPS operation, proposed development information, planning reports and precinct plans as appropriate.
- Outlining applicable noise standards, policies and guidelines, and nominating project targets
- Undertaking noise measurements of the existing SPS to use for noise modelling and predictions.
- Undertaking background noise measurements to determine applicable environmental noise criteria.
- Modelling and predicting noise levels at the proposed developments and SPS site boundaries, considering potential changes to the SPS operation and road traffic noise on Princes Freeway
- Assessment of noise levels against applicable criteria, and provision of any acoustic advice if required.

In July 2021 the new *Environment Protection Act 2017* superseded the State Environment Protection Policy No. N-1 (SEPP N-1). The new Act introduces and describes the *General Environmental Duty (GED)* which requires all Victorians to understand and minimise their risks of harm to human health and the environment from pollution and waste (including noise)

According to the GED, anyone engaging in an activity that poses a risk of harm to human health and the environment must manage that risk. Noise and vibration are covered under this definition. Risks are required to be eliminated or reduced as far as reasonably practicable, by implementing appropriate controls

The Act and GED refer to specific noise requirements in the EP Regulations 2021. For noise, the Regulations refer to Publication 1826.4 (the *Noise Protocol*) which describes specific noise requirements including noise limits.

The noise limits for the Project have been calculated in accordance with the procedure described in Part 1:A of the *Noise Protocol* using the urban area method. The noise limits depend on: land zoning within 70 m and 200 m of the noise sensitive area; the time of day (different noise limits apply for the day, evening and night periods) at different times of the day; and the background noise level (dBLA₉₀)

According to the *Noise Protocol*, noise from the source under consideration is measured to determine its impact over a continuous 30-minute period. Adjustments to the measured noise level are applied, to account for the effects of duration, tonality, intermittency and impulsiveness. The adjusted 'effective noise level', L_{eff} , is compared against the noise limit to assess compliance with the *Noise Protocol*

To quantify the existing background noise levels at The Project site, Arup undertook attended noise measurements in the vicinity of the SPS. Background noise level measurements were undertaken on 28 February 2022 (Day period), 6 March 2022 (Evening period) and 17/18 March 2022 (Night period)

The noise monitoring results are presented in time periods broken into day, evening and night time intervals. The background noise measurements are presented in Table 11-1. The operational noise limits for The Project detailed in Table 3 have been determined in accordance with the process in the Noise Protocol and background noise measurements. The noise limits are shown in the final column of Table 11.1

Table 11.1. Operational Noise Limits at Residences

Period	Zoning Level, dBLAeq	Measured Background Noise Level, dBLA90	Background Noise Designation	Noise Limit, dBLAeq
Day	50	54	High	60
Evening	44	54	High	57
Night	39	48	High	51

Noise measurements were undertaken on the Officer South SPS site on 28 February 2022 between 1 pm and 2:30 pm to quantify the noise from the SPS. At the time, weather conditions were fine and clear and did not influence the noise measurements. Measurements were taken in octave-bands to analyse the frequency content of the noise. A summary of measurements is presented in Table 11-2.

Table 11.2. Operational Noise Measurements at SPS

Source	Result, dBL _{eq}	Notes
Transformer	56	2 m from eqmt
Submerged pumps	66	2 m from eqmt
Mixer	71	1 m from hatch
Switchroom	75	Reverberant level
Generator	61	At exhaust louvres
AC external unit	65	1 m from eqmt

Noise Predictions

Noise levels were predicted at 200 m east of the SPS and 200 m north of the SPS (in the residential area north of the Freeway). The predictions were based on the octave-band measurements of noise sources at the SPS site and the following assumptions

- Equipment was modelled as separate point sources;
- For current normal operation, all sources including two mixers and two submerged pumps are operating;
- For the future scenario, all sources including four mixers and three submerged pumps are operating; and
- Princes Freeway is on an embankment which provides at least 2 m of shielding between the SPS site and the north residences

The predicted noise levels for the receptors at 200 m east and north are listed in Table 11-3.

Table 11 3. Operational Noise Predictions at Receptors

Location	Criteria	Current conditions, L_{Aeq-30 min}	Future conditions, L_{Aeq-30 min}
200 m east	51 bD(A)	35	36
200 m north	51 dB(A)	28	29

The noise predictions show that the current and future noise levels from the Officer South SPS will comply with the night period noise limit (most stringent limit) by at least 15 dB at the sites 200 m east and 200 m north. This is a significant margin of safety.

The results show that the 200 m buffer zone for odour will be satisfactory to avoid any noise nuisance

It also is apparent that the Freeway embankment reduces the extent of noise further to the north of the site, and therefore the 200 m buffer does not need to extend north of the Freeway

The Freeway embankment also creates a barrier for the movement of odour from the SPS. Thus the 200 m buffer distance for odour and noise is only required south of the Freeway

12. SOUTH EAST WATER DESIGN PROCEDURES

In designing new facilities, such as the Officer South pump station, South East Water complies with all statutory requirements, and carefully considers the implications of the General Environmental Duty.

The Officer South pump station is designed and operated to minimize emissions of odour, noise and noxious gases to the extent practicable

For odour and sewer gas control, South East Water has installed chemical dosing at upstream sites to reduce odour generation, sealed covers on the wet well to minimize fugitive emissions (except during maintenance events) and has a program to install an odour extraction fan and odour scrubber in the future as the load on the pumping station increases over time

For noise control, South East Water has installed submerged pumps, and noise enclosures around valves, switchboards, and future fans.

South East Water has a regular maintenance, inspection and audit program, and continuous monitoring via SCADA, to ensure equipment is properly maintained and any malfunctions are promptly detected and corrected.

13. RECOMMENDED BAO FOR OFFICER SOUTH PUMP STATION

As set out in *Planning Practice Note 92*, an assessment of the potential off-site impacts of the existing Officer South pump station must include:

- The spatial extent of relevant potential impacts, (reflecting current or approved operations), i.e. the required buffer area;
- The potential of the land use for off-site safety, human health or significant amenity impacts, such as hazardous air pollutants, noise and odour;
- Based on potential impacts, what future land uses need to be managed or prohibited in the buffer area. This could include incompatible industrial uses;
- Based on potential impacts, what future buildings and works need to be managed or prohibited in the buffer area; and
- Based on potential impacts, how future subdivision needs to be managed or prohibited in the buffer area

Normally a buffer zone is defined in terms of a distance from an activity boundary. The “activity boundary” defined in EPA Publication 1518, would be the 14 m diameter wet well plus adjacent land within the South East Water site used during maintenance activities. It would be smaller than the fenced South East Water site, as the site includes access tracks, parking and storage, which are not odour-generating sources.

For consistency with the presentation of the odour surveys, and because it does not make a significant difference, the size of the BAO will be described by the radius of a circle centred on the wet well within the activity zone.

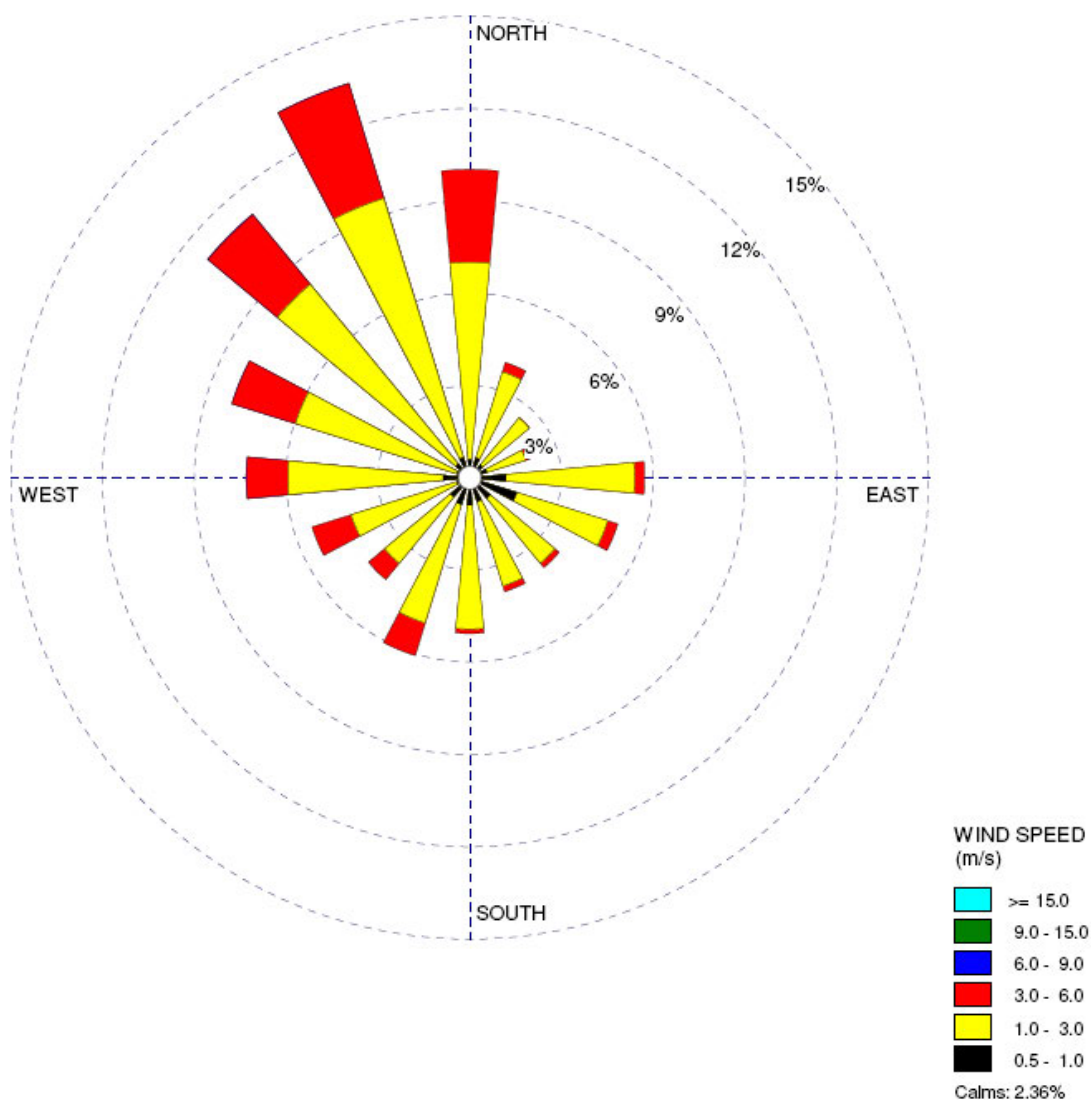
Lines of Evidence for Size of BAO

The multiple lines of evidence that lead to the recommended size of the BAO for the Officer South pump station are set out below

- 1 Odour Complaints at Grices Road pump station extend to **180 m** from the wet well.
2. Complaints have been received about odour in the stables at **160 m** from the Officer South pump station. However, existing houses at **200 m, 220 m and 270 m** from the Officer South pump station **do not** report odour complaints, but they are in a rural area with background odour from horses and cows
3. The odour surveys at Officer South pump station indicated **obvious odour** at **160 m** radius and **subtle odour** at **190 m** radius.
- 4 The odour surveys at Grices Road pump station indicated **obvious odour** at **180 m** radius and **subtle odour** at **250 m** radius
- 5 Other major pump stations in Melbourne have existing buffer distances of **180 m to 260 m**. For a very large pump station, it was found that a 400 m buffer was inadequate without extensive odour scrubbers.
6. The extent of noise impacts will be contained within the odour buffer.

7. In their Submission to the VPA on draft Planning Amendment C407 for the Melbourne Planning Scheme, the EPA recommended the adoption of a BAO that encompassed every observation of obvious and subtle odour from the Arden asphalt plant, thus supporting the proposed BAO that extended a radius of **377 m** from the asphalt plant (*EPA Submission to C407, Oct 2021*)
8. The wind rose for Pakenham (8 km east of Officer South, but in the same generally flat area) is shown in Figure 13-1. The most frequent winds come from the north-east, but winds from the north, west and south-west also are common. The inner black lines show at times there are low speed winds from each segment of the compass, which supports the concept of a circular BAO

Figure 13-1. Annual Wind Rose for Pakenham



9. As noted above, the Freeway is elevated 7 m above ground level across the north of the pump station. Winds from the south are deflected by the embankment of the Freeway (and the associated noise wall on the north side). No obvious odour was observed north of the Freeway, and in our view, it is not necessary to extend the BAO across the Freeway (which itself is not odour-sensitive premises) into the land north of the Freeway. The Freeway embankment is a barrier to noise as well as odour.

The recommended BAO is shown in Figure 13-2. It extends a radius of 180 m from the centre of the wet well of the pump station. The BAO includes all the sites where obvious odour was observed around Officer South pump station, and also all the sites with obvious odour near the Grices Road pump station, after the adjustment for the increased sewage flow and rate of odour release

Figure 13-2. Recommended BAO for Officer South Pumping Station



The recommended BAO for Officer South pump station is consistent with the recommendation made by the EPA for the proposed BAO at Arden (for an odorous industrial site)

The recommended BAO does not include any existing residences or other odour-sensitive premises. It encompasses an area of 0.6 ha of land that is currently rural.

Risk to Potential Sensitive Land uses

The elevated hydrogen sulphide levels that can occur in the vicinity of the pump station are shown in Section 4. Hydrogen sulphide levels in the Officer South pump station are expected to increase when the Grices Road sewage is diverted to Officer South, and more flow is pumped from the Pakenham catchment. These trends will be countered to some extent by increasing local sewage flows from Officer, and progressive improvement in ventilation and odour scrubbing arrangements

Overall, the monitoring data show there is a significant potential for odour sensitive land uses within the BAO to experience significant amenity impacts, including hazardous air pollutants (H₂S), odour and noise

The Officer South pump station will be a local source of noise, as noted earlier. South East Water has incorporated measures into the pump station design to reduce noise and, based on the noise assessment described earlier, noise will be contained within the proposed 200 m odour buffer.

Considering the odour and noise emissions as observed during the odour surveys and noise assessment, the spatial extent of potential noise nuisance will be smaller than the extent of odour nuisance. Significant noise impacts will be confined to an area smaller than the BOA and therefore the BAO will provide the required protection against impacts to noise-sensitive land uses (such as residences).

The risk assessment concluded that:

- Maintenance events correspond to a “Very High Risk”, and the need for a BAO.
- Fugitive emissions correspond to a “High Risk”, and also the need for a BAO.

Future land uses to be managed or prohibited in the buffer area

Odour-sensitive land uses should be prohibited in the BAO. This includes any and all of the following land uses where there is an expectation by the occupants that the amenity will not be adversely affected by odour: residential development, motels, hotels, nursing homes, hospitals, places of assembly, child care centres, cafes and restaurants.

Many uses could be acceptable within the BAO, including stables, horse agistment, cattle grazing, container storage, car parking (for the Officer South station), concrete or pavement recycling, secure storage with incidental public access, some heavy industry.

Future buildings and works to be managed or prohibited in the buffer area

Buildings associated with land uses with an expectation of high amenity should not be permitted, including residences, motels, hotels, places of assembly, schools, nursing homes, hospitals, places of assembly and child care centres. It also would be desirable to exclude cafes and restaurants.

It is not considered practical to introduce design solutions to buildings against the risks of H₂S or odour.

It is important that the wind flow across the pump station from the south is not impeded by a line of high-rise development. Therefore, buildings more than 10 m high should be discouraged within 300 m of the BAO.

Future subdivision to be managed or prohibited in the buffer area

It is preferable that the BAO be retained as a single land holding, but that is not essential as long as the land uses and buildings are restricted as described above.

14. CONCLUSIONS

The conclusions of this assessment are summarised below

1. The Officer South Pump Station is South East Water's largest sewage pump station and will transfer sewage from a future resident population of 120,000 persons in the suburbs of Officer and Pakenham to the Eastern Treatment Plant at Carrum
2. The volume of sewage transferred will increase over time from around 8 ML/d at present to 26 ML/d in 2045.
3. Large sewage pump stations are in the range of industries that are listed in Planning Practice Note 92 as having the potential to cause adverse impacts from hazardous air pollutants (such as hydrogen sulphide), noise, dust, odour and overflows.
4. Sewage at the Officer South pump station contains a range of compounds including hydrogen sulphide at elevated concentrations. These compounds are present at concentrations that cause an odour nuisance and pose an odour and possibly a health risk to nearby sensitive receptors.
5. The risk assessment concluded that:
 - Maintenance events correspond to a "Very High Risk", and the need for a BAO.
 - Fugitive emissions correspond to a "High Risk", and also the need for a BAO
6. In summary, the risk ranking demonstrates that a BAO is justified for the Officer South pump station. The size of the recommended BAO of 180 m radius is derived from the extent of the observed and predicted odour impact area
7. Odour complaints around a comparable pump station at Grices Road have been received from residences at distances up to **180 m** from the pump station.
8. Odour surveys at Officer South pump station indicated **obvious odour** at **160 m** radius and **subtle odour** at **190 m** radius
9. Odour surveys at Grices Road pump station indicated **obvious odour** at **180 m** radius and **subtle odour** at **250 m** radius
10. Other major pump stations in Melbourne have existing buffer distances of **180 m to 260 m**, with even a 400 m buffer proving inadequate for a very large pump station without extensive odour control.
11. Significant noise impacts will be confined to an area smaller than the BOA and therefore the BAO will provide the required protection against impacts to noise sensitive land uses (such as residences).

12. The recommended BAO, shown in Figure 11-2, extends a radius of **180 m** from the centre of the wet well of the pump station. The BAO includes all the sites where obvious odour was observed around the Officer South pump station, and also encompasses all the obvious odour observations near the Grices Road pump station, after the adjustment for the differences in sewage flow, rate of odour release and H₂S concentrations.
- 13 The recommended BAO for Officer South pump station is consistent with the recommendation made by the EPA for the proposed BAO at Arden
14. Overall, the monitoring data show there is a significant potential risk for odour sensitive land uses within the BAO to experience significant amenity impacts, including hazardous air pollutants (H₂S), odour and noise. Thus, a BAO is justified
15. The recommended BAO does not include any existing residences or other odour-sensitive premises. It encompasses an area of 0.6 ha of land that is currently rural
- 16 Commercial or residential development can be permitted beyond the BAO. However, it is important that the wind flow across the pump station from the south is not impeded by a line of high-rise development. It is important that the wind flow across the pump station from the south is not impeded by a line of high-rise development. Therefore, buildings more than 10 m high should be discouraged within 300 m of the BAO

15. RECOMMENDED BAO SCHEDULE

SCHEDULE 1 TO CLAUSE 44.08 BUFFER AREA OVERLAY

Shown on the Precinct Planning Scheme Map as **BAO**

OFFICER SOUTH PUMP STATION

1.0 Statement of risk

South Officer Sewage Pump Station is an operating pump station that handles anaerobic sewage from the region and pumps it to the Eastern Treatment Plant. The pump station is classified as critical infrastructure.

There is potential for unintended off-site odour, noise and hydrogen sulphide that may cause amenity and human health impacts, primarily to the south, west and east of the pump station.

2.0 Objectives

- To restrict encroachment and intensification of land uses that are sensitive to the potential unintended off-site impacts of South Officer pump station on amenity and human health.

3.0 Use of land

The following uses are prohibited on land affected by this overlay:

- Residential premises;
- Other Accommodation (including caretakers cottage and dependent person's unit);
- Child care centre or pre-school;
- School or education centre

A permit is required to use land for a:

- Hospital;
- Place of assembly;
- Car park.

4.0 Buildings and works

The following uses are acceptable, subject to a permit being granted by the responsible authority:

- Building or structure used for parking or storage
- Building or structure used for animals.

5.0 Exemption from notice and review

An application under this overlay is exempt from the notice requirements of section 52(1)(a), (b) and (d) of the Act.

6.0 Decision guidelines

The following decision guidelines apply to an application for a permit under Clause 44 08, in addition to those specified in Clause 44 08 and elsewhere in the scheme which must be considered, as appropriate, by the responsible authority:

- Whether the proposed use may be affected by potential odour and noise impacts from the pump station;
- An amenity assessment which considers the potential for the proposed use to be affected by unintended noise or odour impacts from the pump station;
- The views of South East Water Ltd (or their successors)

16. REFERENCES

DELWP (2021) Managing Buffers for Land Use Compatibility Planning Practice 92

EPA (2013). Recommended Separation Distances for Industrial Residual Air Emissions. EPA Publication 1518.

EPA (2021) Guidance for Odour Surveillance, EPA Publication 1881

Victoria Government (1987). Planning and Environment Act. Authorised Ver No. 153

Victorian Planning Provisions (2021). 13.06-1S Air Quality Management

Victorian Planning Provisions (2021) 44 08 Buffer Area Overlay