Witness Statement

Whittlesea City Council

Planning Scheme Amendment C 241

Planning Panel Hearing: 16 November 2020

Tim Pollock

6 November 2020

1. Name and Address

Mr Tim Pollock, 54 Alto Avenue Croydon 3136.

2. Qualifications and Experience
    - BE (Hons) Monash 1968
    - M. Eng. Sci. Monash 1972
    - Member, Clean Air Society Australia and New Zealand
    - Professional Experience
        - March 2018 to present   Principal, Pollock Environmental Consulting
        - 2002 – February 2018   Principal Environmental Engineer, GHD
        - 1988 – 2002   Principal Environmental Engineer, CSF, CMPS&F, Egis
        - 1985 – 1988   Research Fellow, Monash University
        - 1975 – 1985   Senior Environmental Engineer, Caldwell Connell Engineers
3. Areas of Expertise

I have specialised in dispersion modelling in marine and air environments, the latter for the last 25 years. In the past 20 years I have conducted many buffer distance assessments on industrial developments with potential off-site impact and have written technical papers on the subject.

4. Expertise to Prepare Report

I have reported on odour impact and buffer constraint assessments in many cases for Planning Panel and VCAT proceedings and have conducted such assessments for a range of industries with off-site odour impacts.

5. Instructions which defined the scope of Report

I received instructions from Norton Rose Fulbright, Lawyers acting for Yarra Valley Water (YVW) affected by Amendment C241, to; (i) conduct a review of odour modelling conducted by Jacobs for YVW of the proposed Wollert recycled waste water treatment plant, (ii) consider the appropriate buffer for that plant, and to prepare a witness statement relating to those matters.

6. Facts, Matters and Assumptions Relied Upon
    - Review of plans and reports
    - My experience relevant to waste water treatment plant odour impact and buffer assessments

7. Documents to be taken into account

- PEC report # 0873-1 dated 6 November 2020.
- Jacobs report ISO803QY-DM-RP-001/A dated 11 September 2020
- GHD report 3135311 December 2017
- GHD report 3135311 addendum September 2019

8. Identity of Persons Undertaking Work

Tim Pollock

9. Summary of Opinions

The substantive portion of my statement is given in the PEC report # 0873-1 attached.

10. My opinions are not provisional except where specifically qualified.
11. The analysis presented in this report is within my area of expertise.
12. I declare that I have made all the inquiries that I believe are desirable and appropriate, and no matters of significance which I regard as relevant have to my knowledge been withheld from the Panel.

T. Pollock

6 November 2020

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Amendment C241 Whittlesea Planning Scheme

Appropriate Separation Distance
Proposed Recycled Water Treatment Plant
Yarra Valley Water

November 2020

Contents

Tables and figures

1. Introduction

This report examines the basis for the separation distance prescribed for the proposed Wollert Recycled Water Treatment Plant (RWTP) as given in Plan 15 of the Shenstone Park Precinct Structure Plan[1] issued jointly by VPA and City of Whittlesea.

In particular the work done by GHD[2,3] in two reports and subsequent work by Jacobs[4] for Yarra Valley Water (YVW) are considered and a recommendation is made for the appropriate separation distance to apply.

Note that in this report the terms 'buffer' distance and 'separation' distance are used interchangeably. Reference to Tables and Figures in other reports are shown in italics.

2. Separation Distance for STPs

EPA provide a Guideline[5] for separation distances (SDs) covering a wide range of industries. The SD is chosen to minimise impact (from odour or dust) off site at sensitive land uses. The Guideline in *section 9* also addresses the circumstances when a variation to the recommended or default value can be considered. There are six criteria where site-specific variation to the default SD may apply and these are given in *Table* 4 (repeated below).

Table 4: Criteria for site-specific variation

Criteria	Explanation
Transitioning of the industry	Existing industry has formally indicated that it will transition out of an area and over a specified timeframe.
Plant equipment and operation	The industrial plant and equipment have an exceptionally high standard of emission control technology.
Environmental risk assessment	An environmental risk assessment of IRAEs has been completed that demonstrates a variation is justified.
Size of the plant	The plant is significantly smaller or larger than comparable industries.
Topography or meteorology	There are exceptional topographic or meteorological characteristics which will affect dispersion of IRAEs.
Likelihood of IRAEs	Particular IRAEs are either highly likely or highly unlikely to occur.

[1] Shenstone Park Precinct Structure Plan, September 2019

[2] GHD "Impact Assessment Report for the Shenstone Park Precinct Structure Plan" December 2017 – report for City of Whittlesea

[3] GHD "Shenstone Park Impact Assessment Woody Hill Addendum" September 2019 – report for Victorian Planning Authority

[4] Jacobs "Wollert Recycled Water Treatment Plant VPA Submission – Siting and risk Assessment" report for Yarra Valley Water, 11 September 2020

[5] EPAV 2013 "Recommended separation distances for industrial residual air emissions", Pubn. 1518, March 2013

Size of Plant – fourth criterion

In some cases, the fourth criterion is explicitly accounted for in the Guideline (e.g. broiler farms, piggeries, cattle feedlots) by deferral to the relevant industry Code which gives SDs as a function of the size of operation. The size is typically expressed as the number of animals in the farm.
Separation Distances for STPs[6] are also given as a function of the plant size, where the plant size is expressed as the 'equivalent population' (ep) **n.** Formulae for SD for different types of STPs are given in *Table 6* to *section 11* of the EPA Guideline as shown below.

Table 6: Separation distances for sewage treatment plants (in metres)

Type of installation	Separation Distance (n = equivalent population)
Mechanical/biological wastewater plants	$=10n^{1/3}$
Aerobic pondage systems	$=5n^{1/2}$
Facultative ponds	$=10n^{1/2}$
Disposal areas for secondary treated effluent by spray irrigation	200m
Disposal areas for secondary treated effluent by flood irrigation	50m

Example of how to use this table:
What is the recommended separation distance for an aerobic pondage system serving an equivalent population of 10,000 people?
Distance = $5n^{1/2}$ where n=10,000
Distance = $5(10{,}000)^{1/2}$
Separation distance = 500m

[6] STP - Sewage Treatment Plant

3. Application to proposed Wollert RWTP

The Wollert RWTP will accept and treat wastewater from the main sewer. Typically a RWTP will achieve a ~ 70% recovery to the required standards for non-potable water, with the balance returned to sewer.

3.1 GHD and Jacobs calculations

GHD Calculations

The GHD 2017 report in Section 6.2.4, *Table 13* determined the default SD for the proposed RWTP as 493m or 613 m based on an assumed ep in 2033 of 120,000 or 230,000 (if supply of recycled waste water to a large industrial customer was required). The proposed plant is to be a mechanical/biological treatment plant, so the equation given;

$$\mathrm{SD} = 10\,\mathbf{n}^{1/3}$$

provides the SD for a given ep.
As a SD is to be set for future as well as current conditions, the GHD calculations for the 2033 horizon is the relevant set from which to determine the default SD.
Further, I understand that the supply of recycled waste water to a large industrial customer is no longer an option, so that the 493 m distance calculated in *Table 13* determines the SD. Back-calculation shows that the value for per capita daily sewer flow assumed by GHD was 150l/d/ep.

Jacobs calculations

The Jacobs calculations given in *Table 5-9* rely on more recent plant data from YVW, i.e. subsequent to the withdrawal of the requirement to supply recycled waste water to a large industrial customer.
That table gives an ultimate plant capacity of 28.5 Ml/d and an output of 20 Ml/d.
Note that Jacobs also assume per capita daily sewer flow of 180l/d/ep.
Table 5-9 then gives the 2033 ep as 158,333 based on 28.5 Ml/d and 180l/d/ep, and a corresponding SD of 541 m. Table 1 summarises these calculations/assumptions.

Table 1. Wollert RWTP Separation Distance calculations

Source	Horizon	Plant inflow Ml/d	ep	l/d/ep	SD m	Source Table
GHD	2028	10	70,000	143	412	#2, #13
GHD	2033	18	120,000	150*****	**493**	#2, #13
Jacobs	Ult	28.5	158,333	180	**541**	5-9

3.2 Implications

The discrepancy between the default SD calculated by GHD of 493 m and the 541 m calculated by Jacobs is a combination of the greater plant flow adopted by Jacobs (28.5 Ml/d @ ult vs 18 Ml/d @ 2033 adopted by GHD) countered by the higher per capita flow (180 vs 150 l/d/ep). While the difference is not large (the difference in calculated SD is ~10%), it is useful to test both the choice of ultimate vs horizon 2033 and the difference in per capita flow.

Time Horizon

I consider that it would be more appropriate to adopt the ultimate plant capacity of 28.5 Ml/d (with an inferred time horizon at least a decade further than 2033) in setting the SD.

Per Capita Flow

The appropriate per capita flow is open to more conjecture. Prior to the last drought (millennium drought 1996 - 2009) the accepted value adopted by wastewater engineers was ~ 180 l/d. Water conservation measures during the drought reduced that value to ~ 150l/d. It is a matter of judgement as to what value should be used to characterise waste water usage per capita in future decades.

If the conservative value of 150 l/d is used then the ep at the ultimate flow for Wollert RWTP is 190,000, and the corresponding SD is 575 m. The actual value adopted should be based on the judgement of experienced wastewater engineers.

My instructions are that YVW's view is that 150l/d is the per capita flow that should be used in determining the future radial buffer at the plant ultimate flow.

3.3 Storage of Class B Recycled Water

The Jacobs report recognises the Class B reclaimed water storage basin located separate from the proposed RWTP, some 600m to the north west (see *Figure 4.1, Figure 5.3 and Figure 6.3*). While the odour emission of this area source was included in the modelling of predicted peak odour impact from the RWTP, its' contribution is small at ~10% of the combined peak OERs of all area sources. Neither Jacobs nor GHD claim a separate buffer for this component of the plant.

I concur with this, noting that the reference to SDs in Table 6 of the Guideline relates only to the **disposal** (by spray or flood irrigation) of the treated effluent.

4. Directional Buffer – Effect of Site-Representative Meteorology

In practice the default SDs for a given industry are commonly scribed as a constant radius from the perimeter of all the significant odour (or dust) sources (the so-called activity boundary). The default SD is chosen so that the impact of the pollutant plume downwind of the source(s) during a plant upset/malfunction is reduced to an acceptable level. A fixed radius is appropriate only where site-representative meteorological data is not available.

However, when meteorological data is available, the directions of good and poor dispersion can be determined. In the former the default buffer can be reduced while in the latter the distance can be increased.

Provided the non-radial buffer encloses the same area as does the default fixed radius buffer then the same area of land is sequestered from sensitive land use.

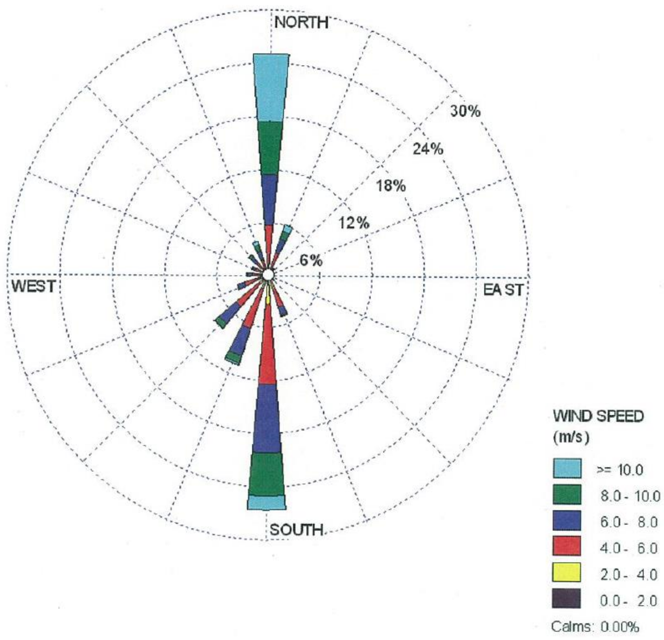
In this manner the degree of protection in the event of an 'industrial residual air emission (IRAE) can be made the same independent of the direction of the sensitive land use from the source.

The EPA Guideline in *section 9* and *Table 4* addresses this issue in the fifth criterion, expressed as *"there are exceptional topographic or meteorological characteristics which will affect the dispersion of IRAEs".*

At this site, the effect of the Kilmore Gap to the north has a major effect in channelling winds to the north/south axis. The figure below (taken from a GHD report [7] for the Crystal Group) shows a windrose from a 12 month dataset at the BoM station located at the Kilmore Gap. The preference for the N/S axis is marked. The effect persists to the south, as seen at Tullamarine airport, seen also in a figure from the GHD report.

[7] GHD 2009 "Buffer,Odour Impact and Environmental Risk Assessments – Wallan Egg Farm" report # 171192, September 2009

Figure 5 Annual wind rose for Wallan (Kilmore Gap)



A directional buffer that takes account of local meteorology has been developed by GHD[8] and that method was used by GHD to conduct a buffer assessment[9] commissioned by Places Victoria of industries attracting buffers that constrain sensitive land uses within the Fishermans Bend Urban Renewal Project (FBURA). This is the method that has been applied here by GHD and Jacobs.

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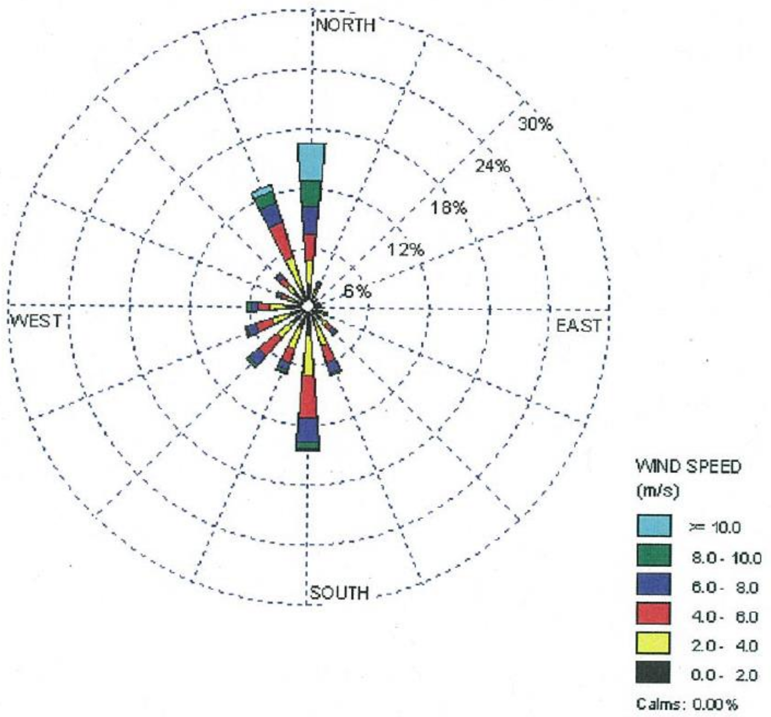
[8] Clarey P, Pollock T "Integrating Separation Distances with Dispersion Modelling", Enviro 04, 28 March – 1 April 2004, Darling Harbour, Sydney.
[9] GHD 2013 "Fishermans Bend Buffer Assessment", report for Places Victoria June 2013

Figure 3 Annual wind rose for Tullamarine



4.1 Application to Wollert RWTP

GHD 2017 Report

The default and directional buffers for the RWTP are shown in *Figures 15* and *16* respectively, with the fixed radius of 613 m and the corresponding variable range shown (derived from *Table 14*, but distances factored by 613/500).

Both *Figures* use an initial estimate of the envelope of the plant unit processes seen as the pink outline. I am instructed that, on the basis of work carried out since the GHD report, the latest version of the plant process envelope has been significantly reduced to approximate dimensions 150 m N/S and ~250m E/W.

The consequence is that the GHD *figures* present an over-estimate of the default and directional SD.

Both fixed radius and directional SD plots are additionally over-estimates as they are based on the assumption that the RWTP would be supplying reclaimed waste water to an industrial customer – on GHD's data the default buffer with which to draw both *Figures* is 493 m, rather than 613m.

Jacobs 2020 Report

I have been provided with *sections 2, 4 ,5* and *Appendix F* of this report, where *section 5* details the odour assessment. A printout of a spreadsheet giving the SOERs and OERs for the modelled unit processes for both average and peak emissions was also provided. Jacobs used their database of SOERs to determine plant OER for the following cases as shown in Table 2.

Table 2. Modelled Cases – Wollert RWTP

Case	Plant OER	Mitigation	OER*****, OU/s	
			Source Type	
			Area (16 of)	Point (5 of)
A	Average	Limited	9,000	1,260
B		Mid-level	4,400	7,600
C		High	3,290	8,150
D	Peak	Limited	18,000	1,260
E		Mid-level	11,200	7,600
F		High	8,440	8,150

***** Rounded to three significant figures

Jacobs provide contour plots of predicted peak 99.9%ile odour levels for Cases B, C E and F. These plots give an indication of the directional variation of odour impact and the plots for Cases B and E are repeated below as Figures 1 and 2.

Both Figures show a similar pattern of impact with a clear lobe of poor dispersion to the SSW and a wider lobe to the NW quadrant. The extension to the west and south west is a minimum reflecting the very low incidence of winds from the east and north east. These model outputs (if expressed as 99.5%ile rather than 99.9%ile) can be used directly to form a directional buffer – as detailed below

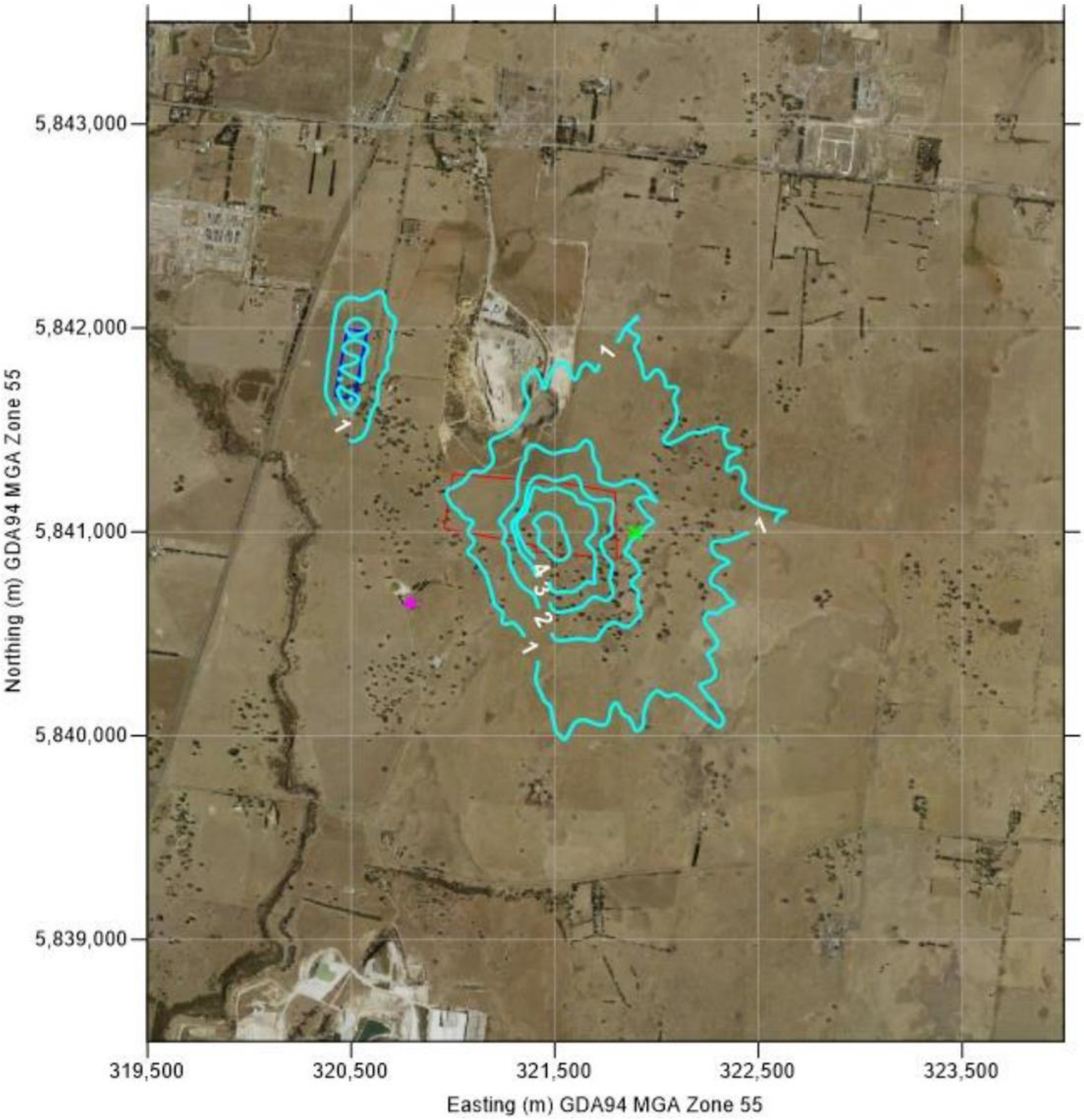


Figure 1. Case B: 99.9 Percentile Odour levels– Proposed Wollert RWTP

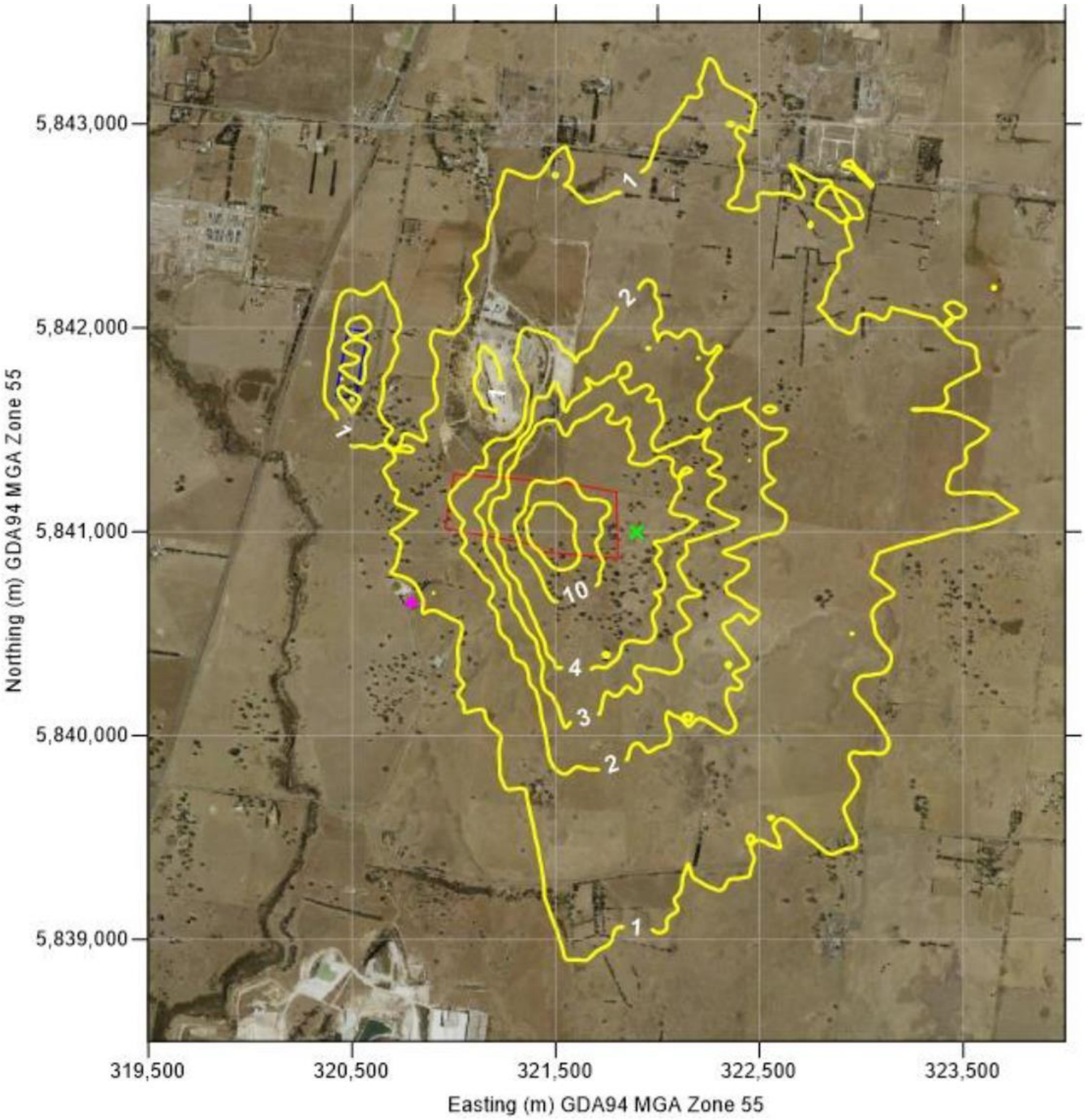


Figure 2. Case E: 99.9 Percentile Odour levels – Proposed Wollert RWTP

4.2 Appropriate Directional Buffer – Wollert RWTP

The Jacobs modelling can be used to determine a directional buffer by re-presenting the peak odour levels for Case E (any of the Cases could be used as the chosen contour is normalised to include the same area as the default radial buffer) at the 99.5 %ile level. The 99.5 %ile is chosen to ensure a differential in extent of the criterion contour with direction from the plant[10].
The steps required to calculate this directional buffer are as follows:

1. Agree an 'activity boundary' to enclose all significant odour sources at the plant. An approximation to the boundary can be taken as a rectangular box enclosing that outline - ~ 250 m east/west x ~150m north/south
2. Agree the default radial buffer at 575 m, assuming a per capita flow of 150l/d/ep.
3. Calculate the area **A** enclosed by the default buffer with the relation

   A = $\pi\ 575^2 + [300 * 110] + 2[575 * 300] + 2[575 * 110] = 1{,}543{,}200\ m^2 \sim \sim 1{,}543{,}000\ m^2 \quad \sim\sim 1{,}540{,}000\ m^2$

4. Run AERMOD for Case E and iterate to choose the 99.5%ile contour level that encloses a planar area of $1.54 * 10^6\ m^2$ (using the planar area option in SURFER)
5. Smooth the chosen contour to eliminate small scale irregularities due to the fine receptor grid.

This procedure was conducted by Jacobs and the resulting directional buffer for 150 l/d/ep is shown in Figure 3 below.

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[10] Clarey P, Pollock T "Integrating Separation Distances with Dispersion Modelling", Enviro 04, 28 March – 1 April 2004, Darling Harbour, Sydney.

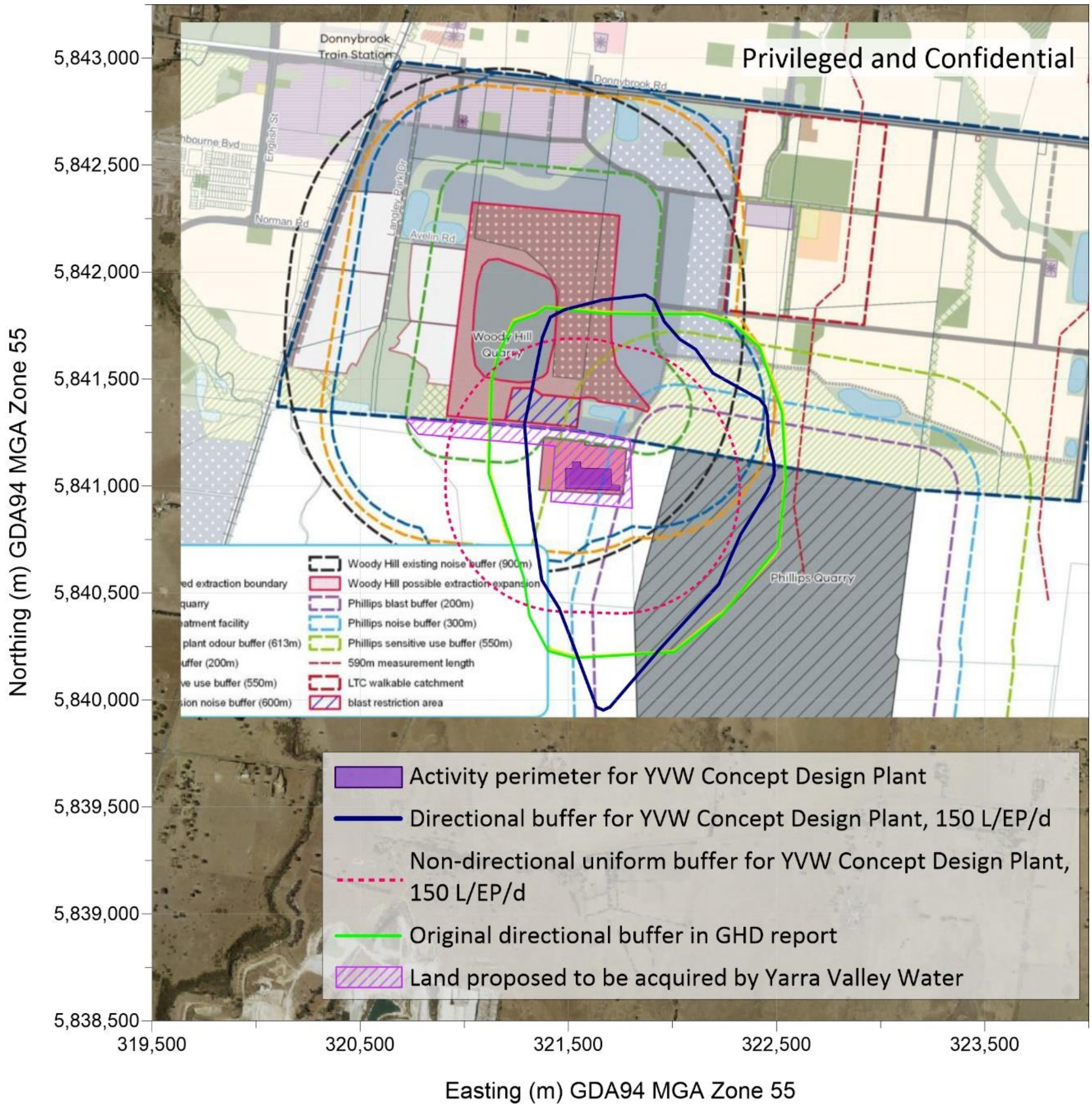

Figure 3. Recommended Directional Separation Distance @ 150 l/ep/d – Wollert RWTP

The default 575 m radial buffer in Figure 3 is shown as the broken pink line, while the corresponding directional buffer is shown as the solid blue line.

Comparing the coverage of each contour it can be seen that the directional buffer is significantly retracted to the west (up to 400 m), and is extended to the south, ENE and NNE by ~ 450, ~250 and ~ 250 m respectively.

The equality of included area for each contour can be visually gauged by seeing that the area lost to the west by the directional buffer referenced to the radial buffer is balanced by the extensions east, south and north of the radial buffer.

5. Summary and Conclusions

Summary

EPA provide a Guideline for separation distances (SDs) covering a wide range of industries. The SD is chosen to minimise impact (from odour or dust) off site at sensitive land uses. In practice the default SDs for a given industry are commonly scribed as a constant radius from the perimeter of all the significant odour (or dust) sources (the so-called activity boundary). A fixed radius is appropriate where site-representative meteorological data is not available.
However, when meteorological data is available, the directions of good and poor dispersion can be determined. In the former the default buffer can be reduced while in the latter the distance can be increased.
Provided the non-radial buffer encloses the same area as does the default fixed radius buffer then the same area of land is sequestered from sensitive land use.
In this manner the degree of protection in the event of an 'industrial residual air emission (IRAE) can be made the same independent of the direction of the sensitive land use from the source.
The area defined by the directional SD will provide guidance to the Responsible Authority on the location of proposed sensitive land uses, ensuring no conflict between the operation of the Wollert RWTP and those sensitive land uses.

Conclusions

- I agree with both GHD and Jacobs that the meteorological data from Tullamarine is representative of wind climate at the Wollert RWTP.
- Site-representative meteorology at the Wollert RWTP shows distinct lobes of good and poor dispersion, meriting variation from the default separation distance via the fifth criterion in *Table 4* of the Guideline.
- I consider the procedure outlined in Section 4.2 is an effective method to form a directional separation distance for the proposed Wollert RWTP.
- The recommended directional separation distance for Wollert RWTP is shown in Figure 3 for a per capita flow of 150 l/d/ep and an ultimate Plant flow of 28.5 ML/d.
- I agree that the directional buffer shown in Figure 3 is appropriate to apply to the proposed Wollert RWTP.