

Arden Structure Plan Advisory Committee Draft Amendment C407 and draft Arden Structure Plan

Expert Odour Report – Arden Asphalt Plant



7 February 2022

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1 Background

1.1 Name and Address

Dr Ian Geoffrey Wallis, 150 Chesterville Road, Cheltenham VIC 3192

1.2 Qualifications of Expert

B.E (Hons), M.Eng.Sc., Ph.D (Monash University)

1.3 Experience

Dr Wallis has 30 years of experience in air quality studies, odour dispersion modelling and odour assessments and his experience includes; preparing the *Plume Calculation Procedure* for the EPA (Schedule C of SEPP for Air Quality Management, 2001) and being responsible for odour assessments and recommendations of appropriate buffer zones for many treatment plants in Victoria, ACT, Western Australia and Queensland. Buffer zones developed in these studies have been incorporated into statutory planning schemes for many of these treatment plants. Dr Wallis has conducted many surveys and investigations to assess odour problems, community responses and feasible solutions.

Dr Wallis has been an EPA-accredited environmental auditor for 17 years, and has completed environmental audits for governments in Victoria, ACT, Western Australia and Queensland.

1.4 Area of Expertise

Dr Wallis has experience and expertise in modelling the extent of odour from wastewater and industrial facilities; assessment of the effects of odour taking account of community expectations and responses and assessment of buffer zone or separation distance for infrastructure and industrial facilities.

1.5 Other Significant Contributors to the Report

This expert witness report relies on the "*Arden Structure Plan – Amenity Risk Assessment*" prepared by GHD for the Victorian Planning Authority and dated 23 August 2021; and the *Aermod Dispersion Modelling* prepared by Mike Lyons & Associates for Citywide Asphalt Group Pty Ltd and dated 16 July 2021.

1.6 Significant Assumptions

The following assumptions were made in preparation of the report:

- Operations and odours observed at the time of the site visit (December 2021) and during the odour surveillance program are representative of routine operations;
- Information provided by Citywide Asphalt Plant regarding plant operations and complaint history is correct; and

- Meteorological data from the BoM weather station located at Essendon Airport is representative of conditions in North Melbourne.

2 Instructions

This report has been prepared in response to a request from Hall & Willcox Lawyers dated 23 November 2021. The scope of the request is as follows.

Our client has instructed us to engage you to undertake the following work:

- (a) review all materials enclosed in your brief;*
- (b) meet in conference by 3 December 2021 with Counsel to discuss your preliminary findings in respect of the odour/emissions matters;*
- (c) if instructed, prepare an expert witness statement addressing odour/emissions matters for the purpose of the Advisory Committee hearing. In addition to any matters that you consider relevant, your witness statement should address whether:*
 - (i) GHD's odour/emissions risk assessment and modelling adopts an appropriate methodology and whether the analysis and recommendations are appropriate;*
 - (ii) the following elements of BAO1 and BAO2 are appropriate to manage adverse amenity risks:*
 - (A) buffer distances;*
 - (B) permit triggers for use, development and subdivision; and*
 - (C) application requirements.*
- (d) if directed by the Advisory Committee, attend an expert conclave in relation to odour/emissions matters;*
- (e) if instructed, attend the Advisory Committee hearing to observe any opposing odour/emissions evidence; and*
- (f) appear at the Advisory Committee hearing to present your evidence in relation to odour/emissions matters.*

Your expert witness report should be prepared in accordance with the Planning Panels Victoria Guide to Expert Evidence.

3 Site Inspection

I made a site inspection at the Citywide asphalt plant on 15 December 2021. A summary of my observations during the site visit with regards to odour is provided below. I also have inspected the operation of the asphalt plant on eight other occasions during the odour surveys carried out by CEE in November/December 2021.

3.1 Background History

The background history of the plant is summarised below from information supplied by Citywide Services.

- In 1952, asphalt production commenced at the site.
- In 2007, the asphalt plant was upgraded with a combination of Benninghoven and Amman asphalt plants.
- In 2016 Citywide and Fulton Hogan commenced a joint venture to operate the asphalt plant.
- There have been no significant changes to the asphalt plant since 2016.

3.2 Asphalt Production

Information on asphalt production presented below is based on information provided by Citywide Services during the site inspection.

The asphalt plant produces an average of 100,000 t/yr of a range of asphalt products for supply to VicRoads, inner city councils and the tramways for application to streets, parking areas, footpaths and repairs to roads excavated for maintenance of buried services. A major proportion of the asphalt produced is used for maintenance in the local government areas of Melbourne, Yarra, Darebin, Moonee Valley and Port Phillip.

Normal operating hours for the asphalt plant are 6 am to 3:30 pm. The plant also provides asphalt for emergency repairs (e.g., to replace a road pavement after a water pipe repair) and a crew is available to produce asphalt at night and on weekends. The site manager estimated that asphalt was required and delivered on approximately 50 per cent of nights and weekends.

The Arden plant produces a range of asphalt products, including conventional hot asphalt (leaving the site at 160 deg C), asphalt with recycled glass, asphalt with crumbed rubber, asphalt with recycled road pavement and GreenPave, containing a range of recycled materials including glass and plastics. GreenPave is a warm asphalt mix (lower temperature) and requires less energy than traditional hot mix asphalt.

Depending on the customer's requirements, the plant makes asphalt mixes from crushed aggregates, sand, reclaimed asphalt pavement, lime, glass, crumbed rubber, recycled plastic and bituminous materials. The site manager advised that the mixes using recycled products generally had a stronger odour than conventional hot mix asphalt.

3.3 Site Storage and Processes

The information below on-site storage and processes is based on my observations during the site inspection

Bitumen is delivered by tanker weekly and stored in four vertical tanks at 165 deg C. The tanks are insulated and heated. Fumes from the tanks are washed through a water bath before being discharged. One delivery of bitumen was observed and there was negligible emission of bitumen odour.

The various sizes and grades of aggregates, sand, glass and rubber are delivered by truck and trailer combinations into large delivery bins around the north and east edges of the site. The materials are then transferred into a series of smaller bins opposite the loading bays by a front-end-loader. The loader transfers specific quantities of the materials from the small bins into a series of chutes that supply a belt conveyor.

The conveyor feeds a large drum, which dries and heats the blended material in a stream of hot air. Once heated, the blended materials are lifted to the top of the mixing tower by a bucket elevator and into hot aggregate storage bins. From these bins, the material is mixed with a weighed quantity of bitumen and lime (as a filler) prior to being weighed and dispatched into the pug mill. Lime is stored in a vertical silo adjacent to the mixer.

For each order, the site computer calculates the quantity of the various raw materials delivered into the pug mill. The pug mill produced a 2 t asphalt mixture every 2 minutes at peak production.

From the pug mill, there are two methods to load trucks. The north train involves trucks moving directly under the pug mill and being filled in a sequence of 2 t releases. The release into the truck takes about 12 to 15 seconds, at intervals of about 60 seconds, until each truck is fully loaded.

The south train has three elevated and insulated silos which can store asphalt for a few hours. The trucks move under the base of the silos and are filled when the computer opens a valve at the base of each silo. The release into the truck takes about 12 seconds.

The processes of combining the asphalt ingredients, mixing, silo storage and discharge by gravity into open-top trucks is controlled by computer, to ensure accurate selection, mixing and release of asphalt mixes.

3.4 Short Workable Period for Asphalt

Asphalt, like concrete, must be placed within a short period or the workability of the mix is lost. Depending on ambient weather conditions, the asphalt must be delivered, spread, compacted and rolled within 2 to 3 hours to achieve a smooth surface. If kept longer, the asphalt becomes lumpy

3.5 Number of Asphalt Delivery Trucks

Information on asphalt delivery trucks was provided by Citywide Services personnel. They said that there are 50 to 120 trucks per day taking asphalt from the plant, depending on customer demand. Typically, there are 200 releases of asphalt into trucks in a day. This corresponds to the production of 2000 t/week of asphalt of various types.

3.6 Sources of Odour Emissions

Based on the site inspections, odour emissions come from the following sources:

1. Loading the trucks. The asphalt drops about 2 m from the loading chute or silo into the tray of the trucks. There is a plume of warm blue smoke which rises from the asphalt as it hits the tray and spreads out. Some of the smoke is captured in an overhead air duct, and conveyed to a gas heater, but the majority escapes into the atmosphere. This results in about 200 short odour releases per day;
2. Fugitive releases of odour from the pug mill (low rate, but continuous);
3. Fugitive releases of odour from spills and chutes, until cleaned up (low rate, but longer duration than truck loading);
4. Cleaning and maintenance of pug mill, silos and chutes (mostly undertaken on long weekends, Easter and in other holiday periods when the plant is not required to produce asphalt); and
5. Failures of equipment (e.g. a recent failure of the bitumen valve was recorded on the site and it resulted in an odour release until disconnected and the site cleaned up).
6. Delivery and unloading/transfer of bitumen.

Citywide Services personnel advised that minor maintenance is carried out weekly. Major maintenance (such as replacement of rollers, wear plates or liners) requires sections of the plant to be pulled apart, cleaned and repaired/replaced and can only be undertaken when the plant is not operating. As noted above, major maintenance is carried out on long weekends, Easter and other holiday periods.

The 18 m high exhaust stack on the site is not considered by me to be a significant odour source. The stack discharges gas combustion products from the materials heating process. Odour emission tests by Eurofins in July 2021 showed a low odour concentration in the exhaust stack (consistent with a normal gas exhaust). Dispersion modelling by Mike Lyons Assoc showed ground level odour concentrations from the stack emissions (with no other emissions from the site) would be less than 0.5 OU (i.e. not noticeable).

In conclusion, based on my inspections at the site and my surveys of odour conditions around the boundary of the site, I consider that the highest intensity odour releases come from truck loading and major equipment maintenance.

3.7 Emission Controls

All operations are monitored and controlled from a control room on the site. The plant can be shut down in the event of equipment failure or operational upset.

The plant is regularly serviced in accordance with a preventative maintenance schedule. Overall, in my opinion, the site is considered to represent good practice in terms of managing odour emissions.

Odour controls evident on the site inspection were:

- Fully enclosed process from the cold feed bins to the final asphalt release;
- Short term storage of asphalt in enclosed silos;
- Fumes from bitumen tanks go through a water bath;
- Gases from air drying are filtered through a baghouse;
- Some odour from the truck filling are captured by an air duct across the truck loading area. This air is directed back into the aggregate dryer; and
- All truck loads are covered with a tarpaulin after loading is completed.

According to GHD, there are currently seven very similar asphalt plants in operation around the country. GHD also noted the emission controls and features on the Arden asphalt plant and they considered the emission controls represent best practice.

3.8 Odour Complaints and Short Community Survey

Three odour complaints have been received by the asphalt plant in the last five years. The site is surrounded by commercial and industrial facilities where the expectations for odour amenity are lower than for residential zones. Almost half the adjoining land is owned and operated by Citywide Services and there is a football ground on the eastern side.

While conducting the odour surveys in December 2021 in the area of the asphalt plant, I had incidental discussions with personnel from four nearby commercial and industrial buildings (in Arden Street, Fogarty Street and at the end of Barwise Street). When asked by me, these people advised that they did regularly notice odour from the asphalt plant, but accepted it as a characteristic of an industrial/commercial area, had not lodged odour complaints and did not expect to do so. This community response indicates that odour does occur in the vicinity of the asphalt plant but it is not at a nuisance level for a commercial/industrial area.

4 GHD Odour Risk Assessment

In 2019, GHD was engaged by the Victorian Planning Authority (VPA) to advise on adverse amenity impacts in the Arden Transport Precinct. GHD identified four industries that are listed in EPA Publication 1518 Recommended Separation Guideline Distances for Industrial Residual Air Emissions as requiring a separation distance. The buffer zones within the separation distances defined in accordance with the EPA guidelines would conflict with the proposed future urban structure of the Precinct, which includes a proposed hospital, proposed school and residential dwellings, and opportunities for other potentially odour-sensitive uses.

The four industries, and their defined separation distances, are:

1. Citywide asphalt plant (500 m separation distance)
2. Holcim concrete batching plant (100 m separation distance)
3. Irwin Stockfeeds grain handling and stockfeed facility (250 m separation distance); and
4. Weston Milling flour mill (250 m separation distance).

In 2021, GHD was engaged by VPA to provide further advice on the management of adverse amenity impacts in the Precinct. GHD made a qualitative risk assessment (Source-Pathway-Receptor method) and carried out odour surveys (Ref: Arden Structure Plan – Amenity Risk Assessment, GHD Report to Victorian Planning Authority, 23 August 2021).

GHD investigated the potential to reduce the separation distances of the four identified industries and the subsequent risk they would pose to amenity within the proposed land uses in the Precinct. The methodology and findings of the 2021 GHD risk assessment and odour surveys are assessed only for the Citywide asphalt plant in this expert report.

4.1 GHD Methodology

The methodology followed by GHD to develop the recommended Buffer Area Overlays (BAO) involved:

1. Inspecting the site equipment and operations;
2. Identifying the sources of, and controls on, odour and dust emissions;
3. Reviewing controls on odour and dust emissions;
4. Reviewing site management and continual improvement plans;
5. Examining odour complaints and EPA notices;
6. Completing a risk assessment based the Source-Pathway-Receptor model based on UK Guidance on the assessment of odour for planning (July 2018), as recommended to GHD by the EPA;
7. Identifying from the risk assessment that the Citywide asphalt plant was “medium” risk and required further assessment and site evidence;
8. Further examining recent odour complaints;
9. Conducting ten odour surveys around the Citywide asphalt plant site in accordance with the EPA guidance publication Odour Surveillance;
10. Revising the risk outcome upward from “medium” risk to “moderate” risk based on the results of the odour surveys;

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11. Checking whether the buffer zones should be adjusted in response to seasonal wind patterns and cumulative effects of other sources;
12. Recommending that the generic EPA separation distance of 500 m for an asphalt plant can be revised downward to a “moderate risk” zone of 152 m radius and a “medium risk” zone of 152 m to 377 m radius.

In the GHD 2021 report, “Medium” risk is defined as a combination of moderate odour sensitivity and medium risk of exposure to odour (see table below, from GHD report).

| Risk of Odour Exposure | Receptor Sensitivity | | | |
|---------------------------|----------------------|----------|----------|----------|
| | Low | Medium | Moderate | High |
| High Risk of Exposure | Medium | Moderate | Moderate | High |
| Moderate Risk of Exposure | Low | Medium | Moderate | Moderate |
| Medium Risk of Exposure | Low | Low | Medium | Moderate |
| Low Risk of Exposure | Low | Low | Low | Medium |

In step 10, GHD increased a portion of the “medium” risk zone to “moderate” risk for the Citywide facility based on the results of the odour surveys which detected obvious odour out to a maximum distance of 152 m. This means that BAO2 represents “medium” risk while BAO1 represents “moderate” risk in GHD terminology.

4.2 Review of GHD Methodology

In my opinion, the procedure followed by GHD to develop the recommended Buffer Area Overlays was satisfactory and represents best current practice.

4.3 Outcome of GHD Methodology

The outcome of the GHD risk assessment is summarised in the plan shown in Figure 1 (from GHD Figure 5-3). The inner orange circle (152 m radius) has moderate risk, the larger yellow circle (377 m radius) has medium risk, and the outer green circle (500 m radius) has low risk. The outer green circle is the EPA default separation distance of 500 m.

Figure 1. Outcome of GHD Risk Assessment



Source: Figure 5-1 of GHD August 2021 Report

The three colours in Figure 1 correspond to the three levels of risk defined by GHD in the table above.

The proposed Buffer Area Overlays, BAO1 and BAO2, correspond to the zones of moderate risk (orange = BAO1) and medium risk (yellow = BAO2).

5 EPA Letter of Support

In October 2021, the EPA provided a submission on the Arden Structure Plan and associated Planning Scheme Amendment 407 (submission 53). The EPA focussed on dust, odour, noise and vibration issues.

In relation to **Dust and Odour**, the EPA submission states:

“Located within the Arden Precinct are a range of existing land uses including industrial activities which have the potential to generate offsite odour and dust impacts in a manner which may compromise the amenity and human health of future sensitive uses”.

“EPA highlighted these risks to the VPA and encouraged the preparation of a site-specific risk assessment to more clearly understand the potential risk, together with development of planning controls designed to mitigate these risks”.

“Of particular concern to EPA is the presence of the existing asphalt manufacturing plant (Citywide) located 208-292 Arden Street, North Melbourne. While it remains in operation, EPA consider it to be incompatible with the development of sensitive uses as proposed by the Structure Plan”.

EPA noted that GHD had undertaken an Amenity Risk Assessment dated August 2021 that forms the technical basis for the two proposed Buffer Area Overlays (BAO1 and BAO2).

The EPA advised “that the methodology used by GHD to assess risk of dust and odour in relation to nominated industry across the Arden Precinct is acceptable. It applies best practice to the assessment of odour in particular, which in itself is consistent with EPA’s recommended approach”.

The EPA was satisfied with the outcomes of the risk assessment insofar as a variation to the recommended separation distances is justified and the findings of the assessment can be used to delineate areas of moderate, medium and low risk which in turn can be used to inform the preparation of a Buffer Area Overlay.

Furthermore, EPA supported the BAO controls as drafted and would resist changes that allow the establishment of sensitive uses within the areas covered by BAO1 and BAO2 under different circumstances than those currently proposed. This includes the extent over which the BAO1 and BAO2 applies, and limits on uses established prior to the ceasing of activities at the asphalt plant.

In summary, it is my understanding that the EPA supports the methodology and outcomes of the GHD risk assessment, and recommends no changes to the BAO.

6 Crucial Basis of BAO

A crucial step in determining the size of the BAO, and therefore is assessing the extent to which the proposed BAO will be successful in avoiding amenity impacts in the future, is the spatial extent of odour as established in the GHD odour surveys.

6.1 GHD Odour Surveys

GHD implemented the procedure in EPA guidance “Odour Surveillance” in conducting the odour surveys. The procedure involved starting downwind of the asphalt plant at a predetermined distance and tracking the odour plume back to the source, periodically crossing the plume until the site boundary was reached.

During the field surveys, any detectable odours with the characteristics of the asphalt plant were noted and the following details were recorded:

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

Odour Intensity was characterised using the methodology outlined in the EPA guidance and listed in Table 1.

Table 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 smelt only when focusing, e.g. by standing still and inhaling slowly into the wind. Odour can be recognised but with some difficulty. |
| 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 2.

Table 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, GHD undertook ten odour surveys. The observation points in the surveys were determined by the prevailing wind directions at the time of the surveys.

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The results of the GHD odour surveys are plotted in Figure 2 using coloured circles where:

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

Figure 2. Results of GHD Odour Surveys



Source: Figure 5-2 of GHD August 2021 Report

The inner white ring on Figure 2 is at 250 m radius from the stack. Odour from the asphalt plant was observed by GHD in the surrounding area on Arden Street, Green Street, Henderson Street, Laurens Street and Fogarty Street.

Obvious odour attributed to the asphalt plant was observed by GHD 12 times in the ten surveys. The odour duration was transient for all instances. Obvious odour was observed along Arden Street at a location north and east of the plant. The most distant site for obvious odour was 152 m east-north-east of the stack at the western edge of the Oval in the North Melbourne Recreation Reserve.

Subtle odour attributed to the asphalt plant was observed by GHD 27 times in the ten surveys. The odour duration was determined to be transient in all instances. Most events with subtle odour were along Arden Street or north-east of the asphalt plant. The most distant site for subtle odour was at 377 m southeast of the stack at a site on Laurens Street (orange dot near the bottom of Figure 5-2). It is noted that the site at 377 m from the stack is well away from other records of obvious or subtle odour and is next to the Arden station construction site.

7 CEE Odour Surveys

As the results of the odour surveys are the crucial step in determining the size of the BAO, I decided to repeat them. The second set of surveys (CEE odour surveys) were conducted in November/December 2021. The time that the GHD surveys were conducted predates the CEE surveys and may have included different wind and weather conditions.

CEE used the same procedure as GHD, following the EPA guidance “Odour Surveillance” in conducting the odour surveys. The CEE surveys were carried out from 8 am to 11 am and 1 pm to 3 pm, to sample both morning and afternoon conditions during the normal working hours of the asphalt plant.

CEE undertook 10 odour surveys on work days in December 2021. In the surveys, the odour intensity was recorded according to the descriptions in Table 1 and the odour duration was recorded according to the descriptions in Table 2. The other details listed were recorded at the time of each survey observation. The results of the CEE odour surveys are summarised by the red, orange and green circles in Figure 3.

Figure 3. Results of CEE Odour Surveys



The pattern of obvious odour and subtle odour from the CEE odour surveys is very similar to the pattern of results from the GHD odour surveys.

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In the CEE surveys, obvious odour from the asphalt plant was observed 12 times, at sites to the south of the plant along Arden Street, to the north of the plant on Green Street and Fogarty Street and to the east of the plant on the recreation reserve.

Subtle odour was recorded 28 times at the same range of locations, at the same and greater distances from the plant, and also south of the plant at the end of Barwise Street. The odour duration was transient for all instances. Subtle odour was observed a maximum distance of 165 m north from the activity boundary (at a site on Henderson Street).

No odour was observed in the CEE surveys on Langford Street, Gracey Street or Macauley Road. Observations of “no odour” are shown as green circles.

Odour observations can only be made where there is access for the observers. The observations were all made on public streets and in the recreation reserve. Surveys could not be made on rooftops, which constitute a lot of the area to the south and west of the plant, or on the construction site for Arden Station. Thus, to a large extent, the concentration of odour observations along Arden Street and to the northeast of the plant reflects the extent of access for observers.

The buildings on the south side of Arden Street create a continuous row of structures about 7 to 8 m high. Subtle odour was observed at ground level to the south of these buildings along the only gap through this row of structures.

My opinion is that obvious and subtle odour would be observed on the roof of the buildings to the south of Arden Street, but it was not feasible to make observations on the roof.

7.1 Effect of Wind

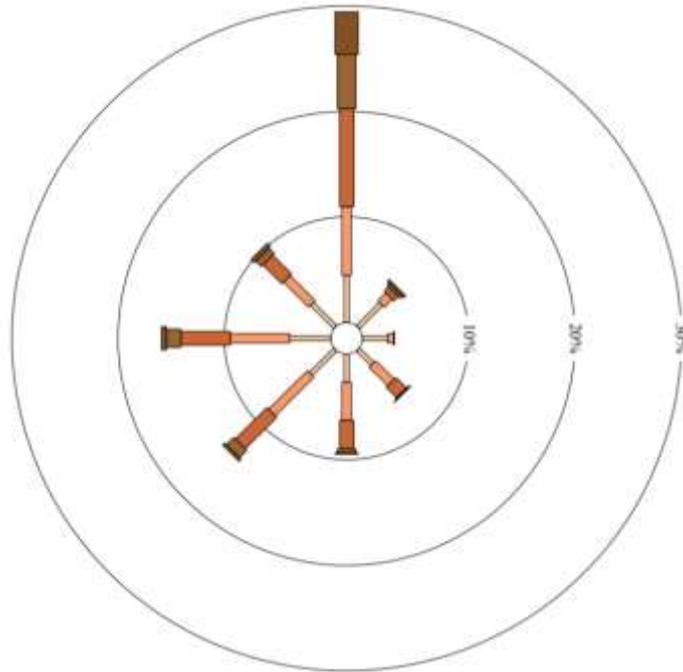
Both the CEE and GHD odour surveys show a concentration of odour impact on Arden Street, and the streets north and immediately east of the site. The distribution of odour does not correspond strongly with the north/south wind pattern apparent in the annual wind rose for Footscray (Figure 5-4 of GHD report) or the similar north/south wind pattern in the 9 am and 3 pm wind roses for Essendon Airport (see Figure 4). The reasons are:

- Odour surveys can only be conducted where there is access for observers, as noted above; and
- The path of odour movement from the asphalt plant is strongly influenced by the location and orientation of buildings and streets. The open parking area for trucks between the asphalt plant and Henderson Street enabled odour to be transported at noticeable intensity from the plant into Henderson Street.

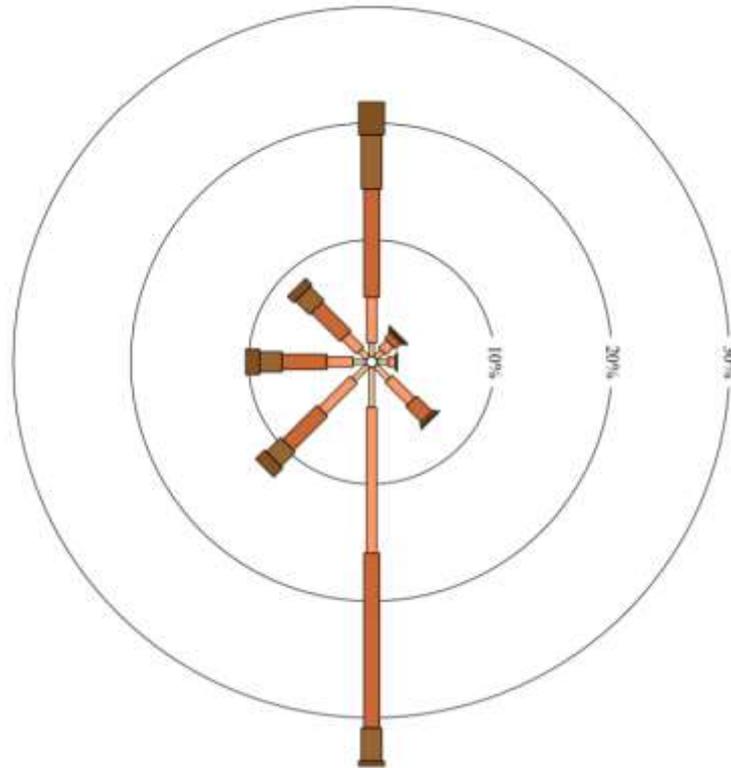
The CEE observers noted that the wind direction was channelled along the streets, so that a wind from the south blowing up Fogarty Street turned and became a wind from the southeast blowing along Henderson Street. Wind directions were particularly variable in Arden Street and Green Street, influenced by the pattern of buildings, so that odour from the plant spreads along Arden Street.

Figure 4. Morning and Afternoon Wind Roses for Essendon Airport

9 am Wind Rise - All Years



3 pm Wind Rise - All Years



7.2 Comparison of GHD and CEE Survey Results

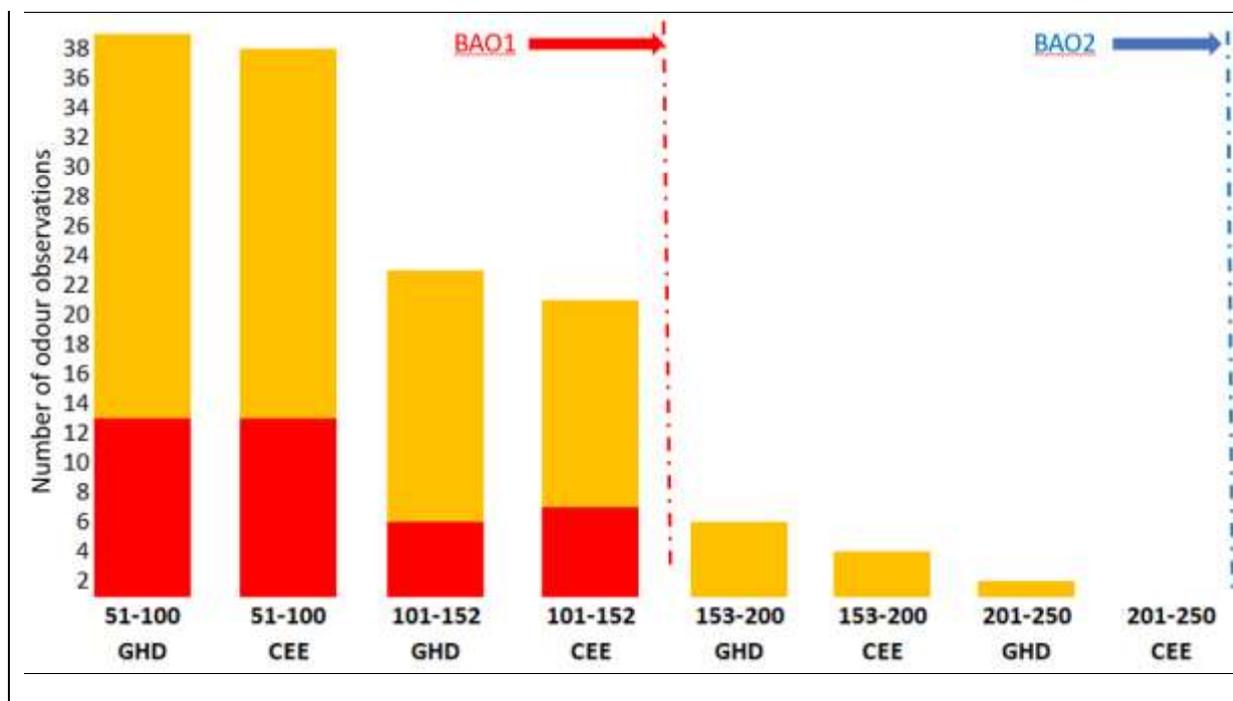
To compare the results of the GHD and CEE odour surveys, the distance of each of the visible red and orange circles in Figures 2 and 3 from the stack was calculated. The distances were then accumulated in groups of 50 m distance – ie, 0 to 50 m, 51 to 100 m, 101 to 152 m, 153 to 200 m and 201 to 250 m. There were few counts from 0 to 50 m as most of this region is within the plant boundary and not accessible for the odour surveys because trucks were regularly entering and leaving the site.

Figure 4 compares the results of the two surveys using column graphs, where the lower red section of each column represents the number of *obvious* odour records and the upper orange section of each column represents the number of *subtle* odour records. It is apparent that the single orange circle at 377 m is an outlier as it plots well away from other observations and this single observation of subtle odour may have come from a different source.

The extent and distribution of *obvious* and *subtle* odour in the CEE odour surveys are very similar (although not identical) to the results from the GHD odour surveys.

To a large extent this reflects the consistent emission rate of odour from day to day, with the wind speed and direction being the largest source of variability. The survey personnel have similar sensitivity - CEE personnel (and I assume, GHD survey personnel also) have been screened for odour surveys by a NATA-registered laboratory in accordance with AS4323.3 – and the surveys were conducted in the same area.

Figure 5. Comparison of Results of CEE and GHD Odour Surveys



7.3 Interpretation of Odour Survey Results

Normally a buffer zone is defined in terms of a distance from an activity boundary. The “activity boundary” for asphalt production and loading, as defined in EPA Publication 1518, is a small rectangle in the centre of the Citywide Services site extending 40 m north/south and 20 m east/west. The stack is on the east side of the activity zone.

However, for consistency with work done to date, 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 stack within the activity zone.

The proposed BAO1 extends for 152 m from the stack on the asphalt site. The odour survey results summarised in Figure 5 provide strong support for the size of the BAO1 and the exclusion of odour-sensitive land uses from within 152 m of the asphalt plant activity boundary.

The proposed BAO2 extends for 153 m to 377 m from the stack on the asphalt site. The odour survey results show only a small number of observations of subtle odour between 153 m and 250 m from the activity boundary (plus the single additional observation at 377 m from the stack).

However, major maintenance occurs on weekends and in holiday periods, and the surveys were conducted on working days. Also, there can, according to Citywide Services personnel, be occasions when the asphalt plant is operating later in the afternoon than 3.30 pm. An allowance needs to be made for these irregular events and that allowance is incorporated into BAO2

As noted above, the EPA has supported BAO1 and BAO2 in their present form.

Even so, in my opinion, there is not a strong justification to extend BAO2 beyond a distance of 250 m from the stack. For that reason, I have shown the extent of BAO2 as 250 m in Figure 5.

Noting the complexity of the wind directions at ground level, as discussed above, the wind roses in Figure 4 indicate that the buffer distance should extend equally to the north, east and south of the stack. The site (and Melbourne in general) experiences few winds from the east. However, the odour survey results show the odour extended well down Arden Street to the west.

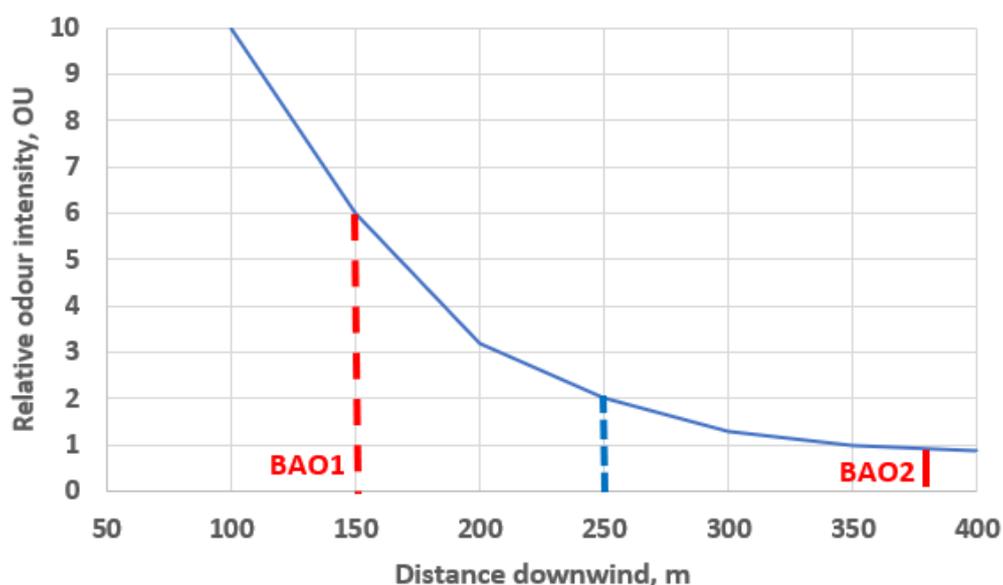
Therefore, it is considered that circular buffer zones are reasonable. If necessary for planning purposes, it also would be reasonable to vary the lines delineating the buffer zones by a small distance to adjust the boundary to match property or planning boundaries.

8 Dispersion of Odour with Distance

The odour concentration decreases with distance from the source due to the combined effects of vertical mixing and lateral mixing. Close to the asphalt plant, the dispersion is strongly affected by buildings and structures but a general pattern of dispersion along a roadway or across the recreation reserve can be calculated using the Aermod dispersion model.

The blue line in Figure 6 illustrates the relative odour level with distance. Note that these are not actual odour levels, as no measurements have been made of the odour emission rates. The purpose of the figure is to show the relative odour levels at the edge of the zones defined by BAO1 and BAO2. If the edge of BAO1 corresponds to 6 OU, the edge of BAO2 corresponds to 1 OU. This is a large margin of safety

Figure 6. Comparison of Results of CEE and GHD Odour Surveys



Based on the site inspection and the results of the odour surveys, emissions from the site are similar from day to day. Larger emissions are likely when the equipment is open for major maintenance but, overall, the peak rate of odour emissions are estimated to be 2 to 3 times the rate on days with average emissions.

In my opinion, the extent of BAO2 is precautionary, and it could be reduced to a distance of 250 m.

9 Consideration of Dust

Dust is addressed in the GHD risk assessment, noting that the plant uses a large quantity of gravel, sand, lime and recycled road pavement, rubber, glass and plastics. These materials are delivered and discharged from large tipper trucks onto a concrete pavement, moved by a front end loader into large storage bins around the north and east sides of the site, and subsequently moved by front end loader from the storage bins to the conveyor loading chute. There is significant potential for generation of dust from these operations.

Dust is managed by watering the stockpiles and regular clearing of the pavement where the front end loader operates. Lime is stored in a silo

For the initial risk assessment, GHD assumed that proposed sensitive uses in the Precinct would be within the generic EPA separation distance of 500 m. At present, the nearest residential receptors are 220 to the east of the stockpiles, across the oval, on the north side of Macauley Road. There are no complaints recorded from these premises about dust.

GHD estimated the risk of odour and dust exposure to be “medium” (see Table 3) and I agree with that assessment.

Table 3. Risk of Odour and Dust Exposure

| Pathway Effectiveness | Source Odour/Dust Potential | | |
|------------------------------|-----------------------------|----------|----------|
| | Small | Medium | Large |
| Highly effective pathway | Medium | Moderate | High |
| Moderately effective pathway | Low | Medium | Moderate |
| Ineffective pathway | Low | Low | Medium |

GHD estimated the risk of odour and dust impact to be “medium” (see Table 4) and I agree with that assessment for residential development and the North Melbourne football club and the baths. However the sensitivity of industrial uses would be lower and hence would have a “low” risk of dust impact. The oval (and the station construction site) would be categorized as having low sensitivity and hence would also have a “low” risk of dust impact.

Table 4. Risk of Odour and Dust Impact

| Risk of Odour /Dust Exposure | Receptor Sensitivity | | | |
|------------------------------|----------------------|----------|----------|----------|
| | Low | Medium | Moderate | High |
| High Risk of Exposure | Medium | Moderate | Moderate | High |
| Moderate Risk of Exposure | Low | Medium | Moderate | Moderate |
| Medium Risk of Exposure | Low | Low | Medium | Moderate |
| Low Risk of Exposure | Low | Low | Low | Medium |

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In general, the Arden Street precinct is at present a relatively dusty area. Citylink, the train, traffic on Arden Street and traffic on Macaulay Road generate background dust. The Arden station construction area is a large (albeit) temporary source of dust.

As noted above, the asphalt plant involves the transport and delivery of large quantities of raw materials, some of which are inherently dusty. Citywide has a management and housekeeping program to control dust and, based on observations during the odour surveys, is reasonably successful.

GHD noted, in regard to recent recorded dust complaints: “With regards to dust there were three (recent) complaints attributed to Weston Milling, two for Melbourne Metro Tunnel and one for Irwin Stockfeeds”. There were none regarding the asphalt plant.

Thereafter, in the GHD report, dust and odour were treated together. Thus, as a management control, GHD recommended a combined “odour/dust risk assessment”.

In my opinion, considering the odour and dust emissions as observed during the site inspection and odour surveys, the spatial extent of potential dust nuisance will be smaller than the extent of odour nuisance. Dust settles out close to the source whereas odour can disperse over greater distances.

Significant dust impacts will be confined to an area smaller than BAO1 and therefore BAO1 will provide the required protection against impacts to dust-sensitive land uses.

10 Consideration of Terms of BAO1

My instructions requested consideration of whether the following elements of BAO1 and BAO2 are appropriate to manage adverse amenity risks:

- a. buffer distances;
- b. permit triggers for use, development and subdivision; and
- c. application requirements.

10.1 Buffer Distance and Land Use

The buffer distance of 152 m for BAO1 is satisfactory, and is essential for the continued operation of the asphalt plant. In my view, no odour sensitive land uses should be permitted inside BAO1. Figure 7 indicates land uses in the BAO1 zone.

To the north, BAO1 extends over the Lost Dogs Home and Citywide Services land, and a small corner of industrial land at the corner of Fogarty Street and Henderson Street. To the east, BAO extends over the recreation reserve and the existing North Melbourne football club building, which will not be affected. To the south, BAO1 extends over existing industrial buildings, including land subject to inundation. To the west, BAO1 extends over Citywide services and existing industrial land.

Figure 7. Proposed Land Uses in BAO1



10.2 Review of Clauses of BAO1

Clause 3.0 Use of land is not satisfactory, in my opinion, as use of the land within BAO1 for accommodation, an education centre, a hospital or a place of assembly would conflict with the Statement of Risk and the Objectives of BAO1.

I recommend that the BAO1 schedule be revised to say that the land within BAO1 may not be used for residential purposes, accommodation, an education centre, a hospital or a place of assembly, or any other use that is considered sensitive to odour and dust.

Odour-sensitive land uses, in my view, are uses where there is an expectation by the occupants that the amenity will not be adversely affected by odour. They include residential development, cafes, restaurants, motels, hotels, nursing homes, hospitals and child care centres.

Clause 5.0 Buildings and works is not satisfactory, in my opinion, as the purpose of BAO1 is to exclude buildings and works that are sensitive to dust and odour.

At present, the nearby buildings near the asphalt plant are mostly 7 to 8 m high, which is satisfactory as it permits wind flow from all directions and does not cause impingement of the exhaust plume of the 18 m high stack on nearby buildings. BAO1 should maintain adequate ventilation and dispersion for the odours from the asphalt plant and I recommend that the maximum roof height of new buildings or extensions of existing buildings within BAO1 should not exceed 9 m.

Clause 6.0 Application requirements. In effect, Clause 6 allows potential developers to commission a sequence of odour surveys until they find one that meets their objective of permitting odour-sensitive development. This is not satisfactory as the purpose of BAO1 is to exclude these sensitive land uses while the asphalt plant is operating under current conditions.

I recommend that the Clause in the Schedule to BAO1 headed “Asphalt plant transition or relocation evidence” should be deleted as it conflicts with the objective of BAO1. In the event that the asphalt plant ceases operation in Arden, it is my expectation that the normal planning processes would terminate BAO1 and BAO2.

In my opinion, this Clause should permit an application to construct a building for an odour-sensitive land use, or dust-sensitive land use (including accommodation, education centre or hospital) within the BAO1 overlay only **after there is a significant change in the operations of the asphalt plant.**

In the event of a change in operations and a related reduction in odour and dust emissions, the extent of BAO1 can be re-visited along the following lines. *An application should describe the reduction in odour emissions as a result of the changed operations and provide a new assessment of potential odour amenity impacts from the changed asphalt plant prepared by a qualified professional. The assessment should define the revised extent of odour determined in accordance with a procedure specified by the EPA and develop design responses to ensure the proposed use within the proposed building will experience the appropriate level of amenity.*

10.3 Buffer Distance and Land Use for BAO2

The recommended buffer distance for BAO2 is 250 m. In my view, no odour sensitive land uses should be permitted inside BAO2.

However, future uses such as a primary or secondary school, could be acceptable within BAO2, depending on the siting of various activities and design measures to control and minimise odour impacts on the occupants.

If necessary for planning purposes, it would be reasonable to exclude the sliver of land north of Gracie Street from BAO2.

Figure 8. Proposed Land Uses in BAO2



10.4 Review of Clauses of BOA2

Clause 3.0 Use of land is not satisfactory, in my opinion, as use of the land within BAO2 for odour-sensitive uses such as accommodation or a hospital would conflict with the Statement of Risk and the Objectives of BAO2.

I recommend that BAO1 be revised to say that the land within BAO2 may not be used for residential purposes, accommodation, a hospital or any other use that is considered sensitive to odour and dust.

Clause 5.0 Buildings and works is not satisfactory, in my opinion, as the purpose of BAO1 is to exclude buildings and works that are sensitive to dust and odour.

Also, BAO2 should maintain adequate ventilation and dispersion for the odours from the asphalt plant or there will be adverse impacts on land close to the plant (for example, the North Melbourne Football Club building and recreation reserve). At present, the nearby buildings within BAO2 are mostly 7 to 8 m high, which is satisfactory as it permits wind flow from all directions and does not cause impingement of the stack exhaust plume on nearby buildings. The stack is 18 m high and the maximum building height in BAO2 should be less than this – I recommend that the maximum roof height of new buildings or extensions of existing buildings in BAO2 should not exceed 15 m.

Clause 6.0 Application requirements is not satisfactory in my opinion, as the purpose of BAO2 is to exclude most of these land uses while the asphalt plant is operating under current conditions.

In effect, Clause 6 allows potential developers to commission a sequence of odour surveys until they find one that meets their objective of permitting development. This is not satisfactory. Suggestions for the revision for Clause 6 are set out in the discussion of BAO1.

11 Conclusions

My conclusions are summarised below.

1. In my opinion, the procedure followed by GHD to develop the recommended Buffer Area Overlays was satisfactory and represents best current practice.
2. The buffer distance of 152 m for BAO1 is satisfactory, and is essential for the continued operation of the asphalt plant. In my view, no odour sensitive land uses should be permitted inside BAO1.
3. The proposed BAO2 extends for 153 m to 377 m from the stack on the asphalt site. The odour survey results show multiple observations of subtle odour between 153 m and 250 m from the activity boundary but only one beyond 250 m which is the single observation at 377 m from the stack. Based on the results of the two odour surveys, I recommend that the extent of BAO2 be limited to 250 m from the stack.
4. Analysis using Aermid on the decline in odour intensity with distance shows that the intended benefits of BAO2 would still be achieved if BAO2 extends to 250 m from the stack.
5. It is considered that circular buffer zones are reasonable for the conditions at this site. If necessary for planning purposes, it also would be reasonable to vary the lines delineating the buffer zones by a small distance to adjust the boundary to match property or planning boundaries.
6. The recommended extent of BAO1 and BOA2 will resolve the amenity risks of both odour and dust.
7. The Clauses in BAO1 and BAO2 have been reviewed to assess their appropriateness to manage adverse amenity risks from the asphalt plant. Recommendations were made to improve the wording of the clauses to focus the planning controls on achieving the objectives of the BAO.
8. A height limitation is recommended for BAO1 of 9 m and BAO2 of 15 m to ensure adequate ventilation and dispersion of odours by winds.

12 References

EPA Publication 440.1 “*A Guide to the Sampling and Analysis of Air Emission and Air Quality*”, EPA Guideline, December 2002.

EPA Publication 1518 “*Recommended Separation Distances for Industrial Residual Air Emissions*”, EPA Guideline, March 2013.

EPA Publication 1881 “*Guidance for Field Odour Surveillance*”, EPA Guideline, May 2021.

GHD “*Arden Adverse Amenity Impact Assessment*” Report to Victorian Planning Authority, 2019

GHD “*Arden Structure Plan – Amenity Risk Assessment*”, Report to Victorian Planning Authority, August 2021

Mike Lyons & Associates “*Aermod Dispersion Modelling*”, Report for Citywide Asphalt Group, July 2021.

Wallis, IG and Oma, R “*Integrated Odour Management at Western Australian Wastewater Treatment Plants*”, Third International Conference on Odour Management, Barcelona, 2009

13 Declaration

I have made all the inquiries that I believe are desirable and appropriate and no matters of significance that I regard as relevant have to my knowledge been withheld from the Panel.

Yours sincerely

Ian Wallis

Ian Wallis