

5.4 RESPONSE TO PETITION RELATING TO ODOUR FROM 7 GRAMS CHICKEN, NOS. 212-214 LAKE STREET, PERTH

Attachments: 1. 212-214 Lake Street - Odour Nuisance from 7 Grams Chicken Cafe - Final Report from OPAM Consulting

RECOMMENDATION:

That Council **NOTES** the response to the petition relating to odour from 7 Grams Chicken.

PURPOSE OF REPORT:

To advise of action taken in response to the petition relating to odour from 7 Grams Chicken, Nos. 212-214 Lake Street, Perth, tabled at the Ordinary Meeting of Council on 22 June 2021.

BACKGROUND:

The history of the matter and proposed course of action was reported to the Ordinary Meeting of Council on 27 July 2021.

DETAILS:

Since the petition was received the City has taken the following action:

Odour investigation

1. An independent environmental odour consultant has been appointed;
2. All petitioners were invited to attend a meeting with the odour consultant held on 15 July 2021, where nine residents attended;
3. All residents who attended the 15 July 2021 meeting have been provided fortnightly updates on the progress of the investigation;
4. The odour consultant has verified the concerns of the residents and provided a report. This report can be viewed at **Attachment 1**. The maps showing the locations of the complainants have been redacted for privacy reasons;
5. Legal advice has confirmed that the City can issue a Notice under the *Health (Miscellaneous provisions) Act 1911* (Health Act Notice); and
6. The City has issued a Health Act Notice requiring the business to stop emitting odours from the exhaust stack.

A Health Act Notice has not previously been used to address odour concerns from food businesses within the City of Vincent. While the odour consultant has suggested a solution that increases the dilution of the exhaust air at the point of discharge, the Health Act Notice allows the business to engage suitable experts or contractors to address the issue as alternative solutions may exist.

The current flume requires and has not received planning approval. The business has been required to address this matter at the same time as complying with the Health Act Notice.

Planning use investigation

Following enquires regarding the approved use of the premises, the City's Officers completed a detailed assessment of approval records for the property.

At the Ordinary Meeting of Council on 7 October 2008, Council granted conditional approval for a Change of Use from Shop to Eating House and Ancillary and Incidental Shop and Associated Alterations (Application for Retrospective Approval).

Since that time, there has been some amendments to the approval including re-consideration of cash-in-lieu and an increase in trading hours. Most recently, a Section 40 certificate was issued under the *Liquor Control Act 1988*, which confirmed compliance with relevant planning laws on 4 November 2020.

The City's Officers have visited the premises several times at different times and days to assess the proportion of dine-in vs take-away customers. This is because the City's Local Planning Scheme No. 2 defines 'fast food outlet' and 'restaurant/café' as follows:

restaurant/café means premises primarily used for the preparation, sale and serving of food and drinks for consumption on the premises by customers for whom seating is provided, including premises that are licensed under the Liquor Control Act 1988.

fast food outlet means premises, including premises with a facility for drive-through service, used for the preparation, sale and serving of food to customers in a form ready to be eaten –

- a) *without further preparation; and*
- b) *primarily off the premises.*

The definition of these uses differ in where the food is 'primarily' eaten; that is, on or off premises. The planning use investigation has assessed whether the business is primarily serving dine-in customers or take away customers.

This investigation has found that the business is primarily serving food that is consumed on premises and operating within its approved planning use, being a restaurant / café, and no further action can be taken by the City in relation to this matter.

CONSULTATION/ADVERTISING:

Nil.

LEGAL/POLICY:

- *Health (Miscellaneous Provisions) Act 1911;*
- *City of Vincent Health Local Law 2004;*
- *Building Act 2011;*
- National Construction Code;
- Local Planning Scheme No. 2; and
- Australian Standard 1668.2-2012 – The use of ventilation and air conditioning in buildings.

RISK MANAGEMENT IMPLICATIONS

Low: It is low risk for Council to consider this report.

STRATEGIC IMPLICATIONS:

This is in keeping with the City's *Strategic Community Plan 2018-2028*:

Innovative and Accountable

Our community is aware of what we are doing and how we are meeting our goals.

SUSTAINABILITY IMPLICATIONS:

This does not contribute to any environmental sustainability outcomes. This action/activity is environmentally neutral.

PUBLIC HEALTH IMPLICATIONS:

Reduced exposure to environmental health risks

FINANCIAL/BUDGET IMPLICATIONS:

The costs of the odour consultant's and legal advice services have been met through the City's existing operational budget.



Food business odour complaints 212 - 214 Lake Street, Perth

Odour impact verification and possible mitigation

Prepared for:
City of Vincent

September 2021

OPAM Consulting

OPAM 21060410

Food business odour complaints
212-214 Lake Street, Perth

Project: Food business odour complaints
212-214 Lake Street, Perth

Scope of Work Odour impact verification and possible mitigation

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REVISION HISTORY

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OPAM 21060410

Food business odour complaints
212-214 Lake Street, Perth

Table of Contents

1	Introduction	3
1.1	Context.....	3
1.2	Scope of work	3
2	Restaurant exhausts and vicinity.....	4
2.1	Restaurant exhausts	4
2.2	Restaurant's vicinity	4
3	Meeting with residents	5
4	Odour patrols	6
4.1	OP #1 – Sunday 11 July 2021 – 13.15 to 14.00.....	8
4.2	OP #2 – Monday 19 July 2021 – 19.30 to 20.40	10
4.3	OP #3 – Wednesday 21 July 2021 – 20.45 to 21.05	11
4.4	OP #4 – Monday 9 August 2021 – 20.10 to 21.00	12
4.5	OP #5 – Thursday 12 August 2021 – 19.10 to 19.50	13
4.6	OP #6 – Monday 16 August 2021 – 18.30 to 18.50	14
5	Downwash and wake effect	15
6	Review of the extraction network and efficiency	18
7	Conclusion about odour impacts and reasons identified	18
8	Review of mitigation options	19

List of Figures

Figure 1:	Former and new fume exhausts from the restaurant.....	4
Figure 2:	Vicinity of the restaurant.....	5
Figure 3:	Odour impacts on Sunday 11 July 2021 – 13.10 to 14.00.....	9
Figure 4:	Odour impacts on Monday 19 July 2021 – 19.30 to 20.40	10
Figure 5:	Odour impacts on Wednesday 21 July 2021 – 20.45 to 21.05	11
Figure 6:	Odour impacts on Monday 9 August 2021 – 20.10 to 21.00	12
Figure 7:	Odour impacts on Thursday 12 August 2021 – 19.10 to 19.50	13
Figure 8:	Odour impacts on Monday 16 August 2021 – 18.30 to 18.50	14
Figure 9:	Downwash effect when wind impacts a building.....	15
Figure 10:	Stack and building downwash effect	15
Figure 11:	Grounding plume under a SE/SW wind.....	16

i

OPAM 21062811

Food business odour complaints
212-214 Lake Street, Perth



Figure 12: Vertical rise of the plume under no to very light wind 17
Figure 13: Sequence #1 – plume pushed down by downwash effect 17
Figure 14: Sequence #2 – plume pushed down by downwash effect 18

List of Tables

Table 1: Odour intensity scale. 7
Table 2: wind and temperature conditions during the 6 OPs 7

List of Appendices

Appendix 1: Complainant’s log about the locations of other complainants 2
Appendix 2: Locations of the complainants 3
Appendix 3: Black stain on the roof around the new stack 4

OPAM 21062811

Food business odour complaints
212-214 Lake Street, Perth

1 Introduction

1.1 Context

Several odour complaints have been lodged against 7 Gram Chicken Café ("restaurant"), a business located at 212-214 Lake Street, Perth that opened in November 2020. The business specialises in deep fried chicken and other fried foods.

The restaurant building is surrounded by town houses, with a large hotel located south of the restaurant.

Following the initial complaints received in November 2020, the business has been requested to review the location and height of the exhaust used to send the kitchen fumes into the atmosphere.

A new extraction network was designed, and a new exhaust stack was installed in May 2021. The tip of the new stack is higher than the previous ones, and the exhaust air is extracted at 10 m/s to the atmosphere.

However, complaints have continued after the installation of the new exhaust. The City of Vincent has been trying to understand the issue to provide some responses to the concerned residents.

1.2 Scope of work

The City of Vincent contracted OPAM Consulting to investigate and collect information that will confirm the odour impacts, explain the reasons of these impacts and possibly advise about options to mitigate emissions.

For this engagement, OPAM Consulting:

- reviewed the location, context, topography and landscape of the area where the restaurant is located;
- performed 6 odour patrols to confirm the presence of odour impacts from the restaurant stack exhaust;
- research information about the wind patterns that may be expected in the given landscape conditions that would impact plume trajectories;
- liaised with the owner and the company that designed and installed the new extraction network and exhaust stack to gather information about the specifications of the air extraction structure;
- investigated possible high-performance filters that capture oil and grease particles to replace the filters currently installed in the hood;
- performed two smoke tests to assess the plume trajectory under different wind conditions and to verify the dragging performance of the air at near distance from the hood.

OPAM 21062811

Food business odour complaints
212-214 Lake Street, Perth

2 Restaurant exhausts and vicinity

2.1 Restaurant exhausts

The restaurant is located at 212-214 Lake Street, Perth.

The restaurant specialises in deep fried chicken and other foods which are immersed into baths of oil. The kitchen is also equipped with a stove where food is prepared in pans. The oil baths and the stove are covered by a large hood equipped with four Honeycomb grease filters (size 495mmx395mm).

Odours are generated from cooking by-products which can be in the form of gas or particles.

Figure 1 presents the previous location of the kitchen exhausts and the new stack.

Initial exhausts of the cooking were located on the southern side of the building and were less than a meter high (left aerial photo on **Figure 1**).

When odour complaints started occurring, it was identified that emissions at a higher level may be necessary to create more dispersion of the plume. The two kitchen exhausts were plugged. The extraction network was re-designed to direct the exhaust fumes towards a new stack located on the northern side of the roof.

The stack height is 3.2m from the roof level, with a cross section at the tip of 450mmx450mm in size. The velocity of the exhaust air at the outlet of the stack is 10 m/s.



Figure 1: Former and new fume exhausts from the restaurant

2.2 Restaurant's vicinity

The restaurant is located within a residential area at the corner of Amy Street and Lake Street. **Figure 2** presents a 3D view of the residential area with the restaurant outlined in yellow.

4

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OPAM 21062811

Food business odour complaints
212-214 Lake Street, Perth

The restaurant is a one-storey building that shares a wall with a town house on the northern side.

Most of the surrounding residential houses are only one-storey buildings of similar height than the restaurant building.

However, the Northbridge hotel is a much larger and taller building located to the south of the restaurant across Amy Street.

There are a few scattered trees across Amy Street.

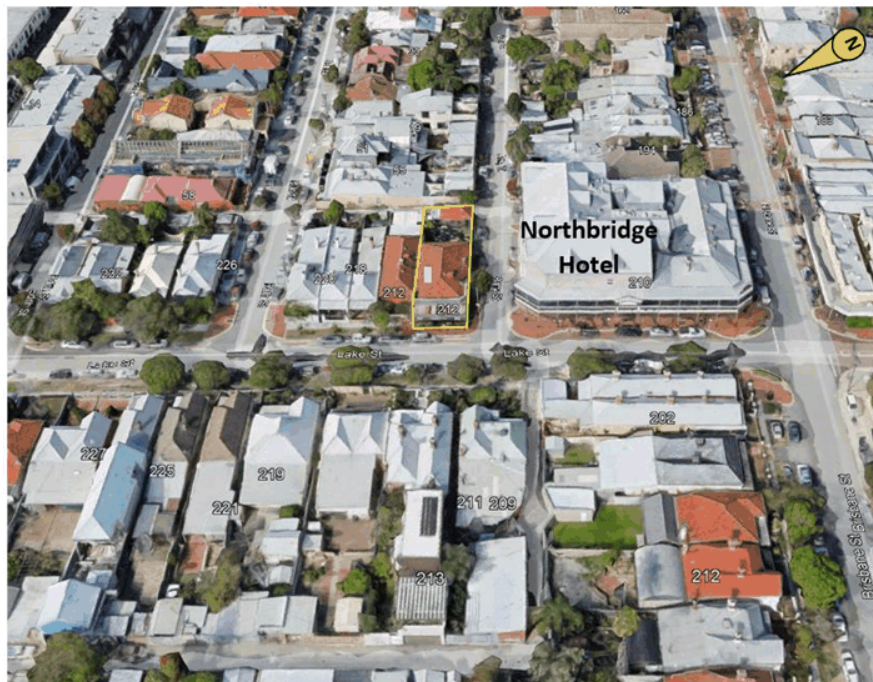


Figure 2: Vicinity of the restaurant

3 Meeting with residents

A meeting with the residents impacted by odours from the restaurant was held at the City of Vincent Administration and Civic Centre on the 15th of July 2021.

The residents provided information about their experiences, the type of odours they have been exposed to and the conditions and periods during which this odour was most frequently experienced.

An attendee provided a map where he identified every house that has lodged an odour complaint related to the restaurant emissions (see **Appendix 1**).

5

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Food business odour complaints
212-214 Lake Street, Perth

Appendix 2 presents a map with red dots that point out where some of the attendees reside. The red line indicates sections of streets where odours were identified while residents were walking.

Appendix 3 presents a document provided by a resident showing a black stain on the roof around the new stack.

The company that installed the new extraction ducting and stack was contacted. The dark stain is from the waterproofing that was put in place to avoid leaks following the installation of the stack. This stain is not related to any leaks of the exhaust fumes from the ducting or the fan. The whole ducting (ceiling cavity and roof) has been tested for leak detection including leaks at the flange joints. The ducting is correctly sealed, and a strong extraction can be felt at the level of the hood indicating an efficient extraction of the cooking fumes.

Some residents felt that odours have become worse with the new stack compared to the previous exhausts, especially when the wind is strong.

The main descriptors residents used to describe the odour were greasy, rancid, burnt and garlic like.

4 Odour patrols

Philippe Najean, director of OPAM Consulting, performed six odour patrols (OPs).

Philippe Najean has his olfactory sensitivity tested according to the ASNZS 4323.3 standard and has 20+ years of experience in the odour field monitoring.

OPs were undertaken following a methodology developed by Philippe when he was working for the Department of Water and Environmental Regulation (DWER). This methodology has since been used for odour impact investigations.

OPs were undertaken under different wind conditions (velocity and direction) and with no rain.

The six OPs were undertaken between 11th of July and 16th of August 2021.

When an odour is recognised, information is noted on its intensity and character (what it smells like).

There are 3 odour intensity levels, as shown in Table 1.

OPAM 21062811

Food business odour complaints
212-214 Lake Street, Perth



Table 1: Odour intensity scale.

Obvious	Odour is easy to recognise and is always noticeable without any effort or focus necessary. Odour can be described and may be attributed to a source.
Subtle	Odour is recognised, can be described, and may be attributed to a source. However, one may need to focus by standing still, inhaling into the wind, and concentrating to recognise it.
0	<ul style="list-style-type: none"> No odour Odour is below the recognition threshold in the field.

The six odour maps presented in **Figures 3 to 8** show the locations where the presence of an odour was monitored. Each map presents the result of one OP.

Table 2 provides the 10-min wind data extracted from the Bureau of Meteorology (BoM) Perth located at Mount Lawley (2.8km NE of the investigated area - https://www.weatherzone.com.au/station.jsp?list=ob<=site&lc=9225&of=of_o&ot=ot_b&ut=1&dt=09%2F08%2F2021).

Table 2: wind and temperature conditions during the 6 OPs

OP#1 – Sunday 11/7/21 – 13.10 to 14.00

Time	Wind dir	Wind spd km/h	Wind gust km/h	Temp °C
14:00	NE	28	39	18
13:50	NE	30	33	18
13:40	NE	31	37	18
13:30	NNE	28	37	18
13:20	NNE	28	31	18
13:10	NNE	30	35	18
13:00	NNE	28	35	18

OP#2 – Monday 19/7/21 – 19.30 to 20.40

Time	Wind dir	Wind spd km/h	Wind gust km/h	Temp °C
20:50	-	0	0	14
20:40	-	0	0	14
20:30	-	0	0	14
20:20	-	0	0	14
20:10	-	0	0	14
20:00	NNE	2	6	14
19:50	-	0	0	14
19:40	-	0	2	14
19:30	NNE	2	7	14

OP#3 – Wedn. 21/7/21 – 20.45 to 21.05

Time	Wind dir	Wind spd km/h	Wind gust km/h	Temp °C
21:10	SSW	7	9	15
21:00	SSW	9	13	15
20:50	SSW	7	9	15
20:40	SSW	7	9	15
20:30	SSW	6	11	14

OP#4 – Monday 9/8/21 – 20.10 to 21.00

Time	Wind dir	Wind spd km/h	Wind gust km/h	Temp °C
21:00	WNW	17	37	14
20:50	W	17	31	14
20:40	WNW	13	19	14
20:30	W	19	39	14
20:20	W	24	31	15
20:10	W	19	22	15
20:00	W	20	43	15
19:50	WNW	17	28	15

OPAM 21062811

Food business odour complaints
212-214 Lake Street, Perth



OP#5 – Thursday 12/8/21 – 19.10 to 19.50 OP#6 – Monday 16/8/21 – 18.30 to 18.50

Time	Wind dir	Wind spd	Wind gust	Tmp
		km/h	km/h	
20:10	-	0	0	11
20:00	-	0	0	11
19:50	-	0	0	11
19:40	-	0	0	11
19:30	-	0	0	11
19:20	-	0	0	11
19:10	-	0	0	12
19:00	-	0	0	12

Time	Wind dir	Wind spd	Wind gust	Tmp
		km/h	km/h	
18:50	ENE	4	6	19
18:40	ENE	6	7	20
18:30	ENE	7	13	20
18:20	ENE	9	13	20

4.1 OP #1 – Sunday 11 July 2021 – 13.15 to 14.00

The wind velocity was around 3-4m/s at ground level (measured with a handheld anemometer) and around 30 km/h (8 m/s) at the BoM weather station (10m from ground level). This difference is to be expected due to the friction and the topography at ground level.

With a NE-NNE wind, upwind measurements were carried out on the corner of Lake Street, Ruth Street and Edith Street. No odour could be recognised here.

Downwind of the exhaust stack of the restaurant, obvious “fried” and “oily” odour was recognised up to 50m from the stack. This same odour was recognised at a subtle level up to 75m from the stack.

It is likely that the plume emitted by the stack was caught in the cavity created by the wind blowing over the town houses to the north of the restaurant. This plume was then brought down (downwash or wake effect) onto Amy Street in this instance. This downwash / wake effect is explained in Section 5 of this report.

This phenomenon creates significant levels of odour at ground level due to the limited dilution of the plume between the emission and ground impacts.

OPAM 21062811

Food business odour complaints
212-214 Lake Street, Perth



Figure 3: Odour impacts on Sunday 11 July 2021 – 13.10 to 14.00

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Food business odour complaints
212-214 Lake Street, Perth



4.2 OP #2 – Monday 19 July 2021 – 19.30 to 20.40

There was barely any wind on site. Wind data for this day and this period in **Table 2** indicates no wind to very light wind with a NNE direction (trend).

With no wind during the assessment, no odour could be recognised in the streets within a 160m radius. The white lines in Figure 2 indicate the path that was patrolled with no odour recognised.

This demonstrates that the plume rises with enough momentum to disperse without any ground level impacts when there is no or very light wind.



Figure 4: Odour impacts on Monday 19 July 2021 – 19.30 to 20.40

OPAM 21062811

Food business odour complaints
212-214 Lake Street, Perth



4.3 OP #3 – Wednesday 21 July 2021 – 20.45 to 21.05

The wind was very light with velocities below 1 m/s at ground level. BoM wind conditions indicated a SSW wind of about 7km/h (about 1.5 m/s).

Under such light wind, an obvious odour was recognised close to the restaurant and subtle odours could be recognised at a distance up to 80m from the restaurant building.



Figure 5: Odour impacts on Wednesday 21 July 2021 – 20.45 to 21.05

OPAM 21062811

Food business odour complaints
212-214 Lake Street, Perth



4.4 OP #4 – Monday 9 August 2021 – 20.10 to 21.00

The wind was from a westerly (W) direction with a velocity between 1.5 and 3 m/s at ground level. The wind data from the BoM also showed a general W direction and velocities between 13 and 24 km/h (i.e. 3 – 7 m/s).

An obvious odour from the restaurant could be recognised at a distance up to 100m from the restaurant’s stack, and a subtle odour at a distance up to 140m.

Under this wind velocity, the wind cavity that developed over the restaurant likely dragged the plume emitted at the stack, and then cascaded down into Ruth Street and Edith Street. Therefore, limited dilution occurred and odour from the restaurant could be recognised at obvious and subtle levels in this area.



Figure 6: Odour impacts on Monday 9 August 2021 – 20.10 to 21.00

OPAM 21062811

Food business odour complaints
212-214 Lake Street, Perth



4.5 OP #5 – Thursday 12 August 2021 – 19.10 to 19.50

There was barely any wind on site. Wind data in **Table 2** indicates no wind for the duration of this OP.

The same path as OP #2 was patrolled with the same results, i.e. no odour was recognised. With no wind during the assessment, no odour could be recognised in the surrounding streets within a 160m radius.



Figure 7: Odour impacts on Thursday 12 August 2021 – 19.10 to 19.50

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Food business odour complaints
212-214 Lake Street, Perth



4.6 OP #6 – Monday 16 August 2021 – 18.30 to 18.50

The wind was very light (maximum 1 m/s) from a NE direction recorded at ground level during this OP. The wind data from the BoM showed a general ENE direction and velocities between 4 and 9 km/h (i.e. 1 – 2.5 m/s).

With little to no wind, there was only one location with subtle odour from the restaurant recognised. The possible downwash effect was likely limited during this OP due to the low wind speed.



Figure 8: Odour impacts on Monday 16 August 2021 – 18.30 to 18.50

OPAM 21062811

Food business odour complaints
212-214 Lake Street, Perth



5 Downwash and wake effect

The dispersion of exhaust from a rooftop stack on a low-rise building in an urban environment has been investigated for years using field and wind tunnel experiments.

Figure 9 presents a drawing that provides a visualisation of the wind streamlines above a building hit by the wind. A cavity is formed at the top of the building before going down at the back of the building (building wake).

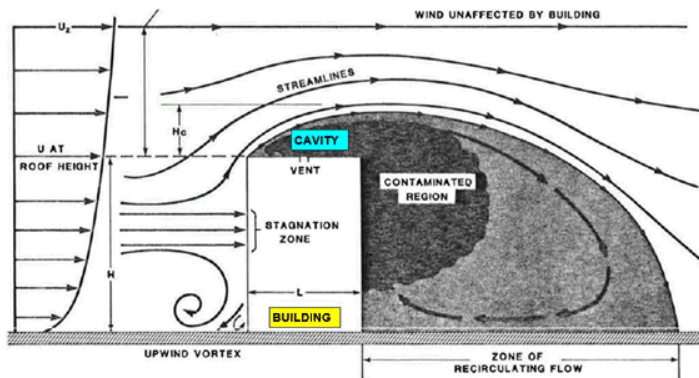
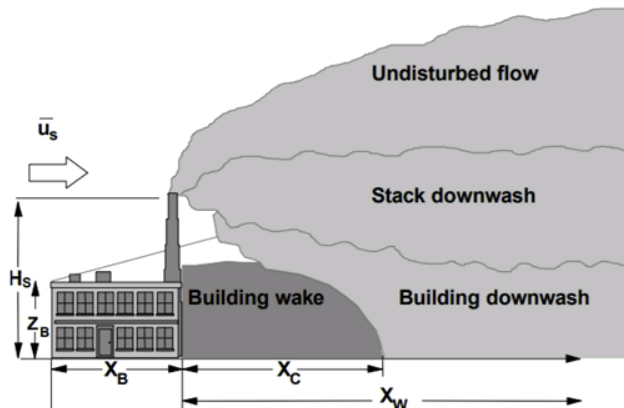


Fig. 1 Centerline Flow Patterns Around Rectangular Building^{1,2}

Scs: 1981 Fundamental Handbook – Chap. 14, Airflow around buildings

Figure 9: Downwash effect when wind impacts a building

When a stack is installed on the roof of a building, stack downwash and building downwash occur downstream when they are hit by wind. An illustration of this phenomenon is provided in **Figure 10**.



Scs: Jaakko Kukkonen, Finnish Meteorological Institute, A dispersion modelling system for urban air pollution, January 1997

Figure 10: Stack and building downwash effect

OPAM 21062811

Food business odour complaints
212-214 Lake Street, Perth

Figure 10 illustrates what happens to emissions from the restaurant under westerly (W), northerly (N), and easterly (E) winds. The cavity is built at the level of the restaurant's roof or other surrounding residents' roofs. Then, the building wake (or zone of recirculating flow) takes place on either Amy Street (N wind), Lake Street (E wind) or Ruth Street (W wind). Once at ground level, any street, lane, and gaps between buildings will provide preferential pathways. This phenomenon is called the canyon effect and will transport the plume further away and possibly at an odour concentration level that can be recognised by residents.

Figure 11 shows a representation of a SE to SW wind affecting the plume emitted by the restaurant. Under these wind conditions, a cavity is formed at the top of the Northbridge hotel with the downwash effect happening at the back of the building (shown in yellow lines). Wind also travels around the side of the building and then rises above the roofs of the restaurant and residences between Amy and Ruth Streets (shown in blue lines). The building wake and zone of recirculation at the back of the building cascades down onto the roofs of the residences on the other side of Amy Street. As such, the plume emitted from the restaurant's stack is not able to rise but is pushed down to the roofs' level and then to the level of the surrounding streets (shown in red lines).



Figure 11: Grounding plume under a SE/SW wind

To be able to visualise the plume pattern at the stack, two smoke tests were organised at the restaurant. A large volume of dense smoke was injected at the level of the hood in the kitchen of the restaurant and pushed into the atmosphere at the stack.

The first test occurred on the 27th of August 2021. There was barely any wind, and it could be observed that the plume rose vertically to the atmosphere. This is what happened during OP #2, OP #5 and partly during OP #6. In this instance, the plume is diluted and either does not ground or if it does, the odour concentration in the plume is likely below the odour recognition threshold.

Figure 12 shows a photo of the plume rise under no or very light wind.

16

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Food business odour complaints
212-214 Lake Street, Perth



Figure 12: Vertical rise of the plume under no to very light wind

A second test occurred on the 2nd of September 2021 under a stronger WSW/SW wind (15 to 28 km/h). Under these wind conditions, the cavity above the Northbridge hotel cascaded down to Amy Street and onto the restaurant’s roof. The plume emitted by the stack was caught in the downwash effect mainly due to the hotel building downwash effect. On Figures 13 and 14, the two sequences of photos show that the plume could not rise but was pushed down to the adjacent roofs. From the roofs and with the downwash effect at the back of the residences, the plume reached ground levels in the streets, lanes, or courtyards of surrounding residences.



Figure 13: Sequence #1 – plume pushed down by downwash effect

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Food business odour complaints
212-214 Lake Street, Perth

Figure 14: Sequence #2 – plume pushed down by downwash effect

6 Review of the extraction network and efficiency

During the smoke test on the 2nd of September, smoke was injected in the kitchen. It was observed that the smoke within 30-40 cm from the edge of the hood was sucked towards the hood at a velocity of several centimetres per second.

The smoke further away was also sucked towards the hood at a lower speed. However, the kitchen was clear of smoke within a period of less than 5 minutes.

This test demonstrated that the extraction efficiency of the hood is high.

There was no other point of smoke emissions at the stack other than at the tip, which confirms no leak within the extraction ducting between the hood and the stack.

The grease filters installed at the restaurant are Honeycomb grease filters 495mmx395mm in size. These filters are recommended for this purpose according to Australian Standards. A search for other types of filters with a potentially higher efficiency has not provided any other reference that would be suitable. The efficiency of capture of the current filters are among the highest existing on the market.

It was also confirmed that the filters are professionally cleaned every week to guarantee an ongoing effective capture of the grease particles and to avoid fire ignition risk.

7 Conclusion about odour impacts and reasons identified

The claims made by the residents about the odour impacts have been verified following six odour patrols performed in the vicinity of the restaurant under different wind conditions.

Suction of the hood and grease capture at the filters are performant. There is no leak in the ducting network installed to extract fumes from the restaurant's kitchen.

However, the air is still loaded with odorous compounds and remaining particles which can impact surrounding residences.

18

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212-214 Lake Street, Perth

Odour impacts are driven by wind direction and velocity and are the result of downwash effects caused by all buildings in the area including the restaurant building.

8 Review of mitigation options

Mitigation solutions should always start at the source of the emissions and move downstream towards the end point of the emissions should no solution be identified upstream.

The extraction effectiveness of the hood has been verified. The grease capture efficiency is among the highest on the market. There is no leak in the ducting network installed for fumes extraction in the kitchen.

The next level of mitigation would be treatment technologies in the ducting network between the hood and the stack. OPAM Consulting tried to identify technologies that would treat the exhaust air prior to it being released into the atmosphere.

Possible options are cold plasma / UV ionisation system or ozone injection technologies.

However, these technologies will unlikely be a solution for the present issue. The reasons for this are:

- They require a significant upfront capital expenditure and a similarly important operational expenditure for electrical power and maintenance (frequent cleaning or spare parts) which may not be sustainable for this business structure;
- They all require some space to be installed which may not be available in the restaurant building;
- They were primarily designed for antimicrobial activity and decontamination, not for odour mitigation. Therefore, none of them will guarantee a high odour abatement efficiency; past information collected by OPAM Consulting has confirmed the limited efficiency of such technology installed within kitchen exhausts;
- Ozone based equipment requires a fine tuning to ensure that no ozone is released into atmosphere.

The following level of mitigation is related to the stack height and location on the roof.

The stack is 3.2m above the roof level and its tip is at 6.5m from ground level, but less than 1m above the apex of the restaurant's roof. This means that the plume will be subject to a downwash effect for any wind direction. To avoid the downwash effect of the plume, it is generally recommended to increase the height of the stack and/or change the location of the stack on the roof.

Increasing the height is not a viable option for the City of Vincent (planning issue).

19

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OPAM 21062811

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212-214 Lake Street, Perth

It should be noted that an increase of the height of the stack by several meters would not solve the issue due to the presence of the large structure of the Northbridge hotel. The plume will still be emitted below the roof level of the hotel and will therefore be subject to the downwash effect of this building.

Due to the presence of the hotel, changing the location of the stack on the roof will not improve the situation either.

In summary, the extraction system is efficient, it is unlikely that a treatment technology will be an effective solution, and the stack cannot be modified.

The last possible solution would be an increased dilution at the stack prior to the fumes being emitted into the atmosphere. The current plume, once diluted by the air under the downwash phenomenon can still be recognised by the residents. A purposely increased dilution prior to emission into the atmosphere would create a plume with lower concentrations of odorous compounds. It is then expected that the dilution due to the downwash effect added to this initial dilution would suffice for the grounding air not to be recognised by the residents.

This solution would require an achievable and viable engineered design to create the dilution prior to any further consideration, as well as trials to assess efficiency.

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APPENDICES

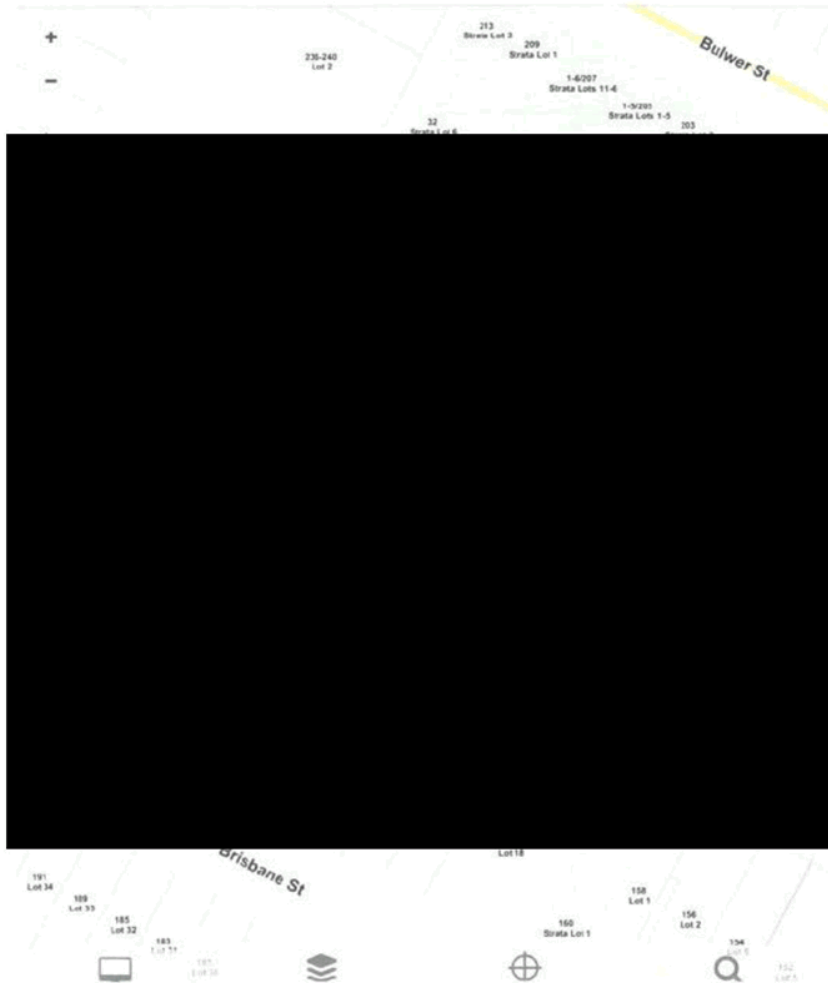
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Appendix 1: Complainant's log about the locations of other complainants
This document was provided by a complainant during the 15/07/21 meeting.

Map from complainants received at 15/7/2021 meeting



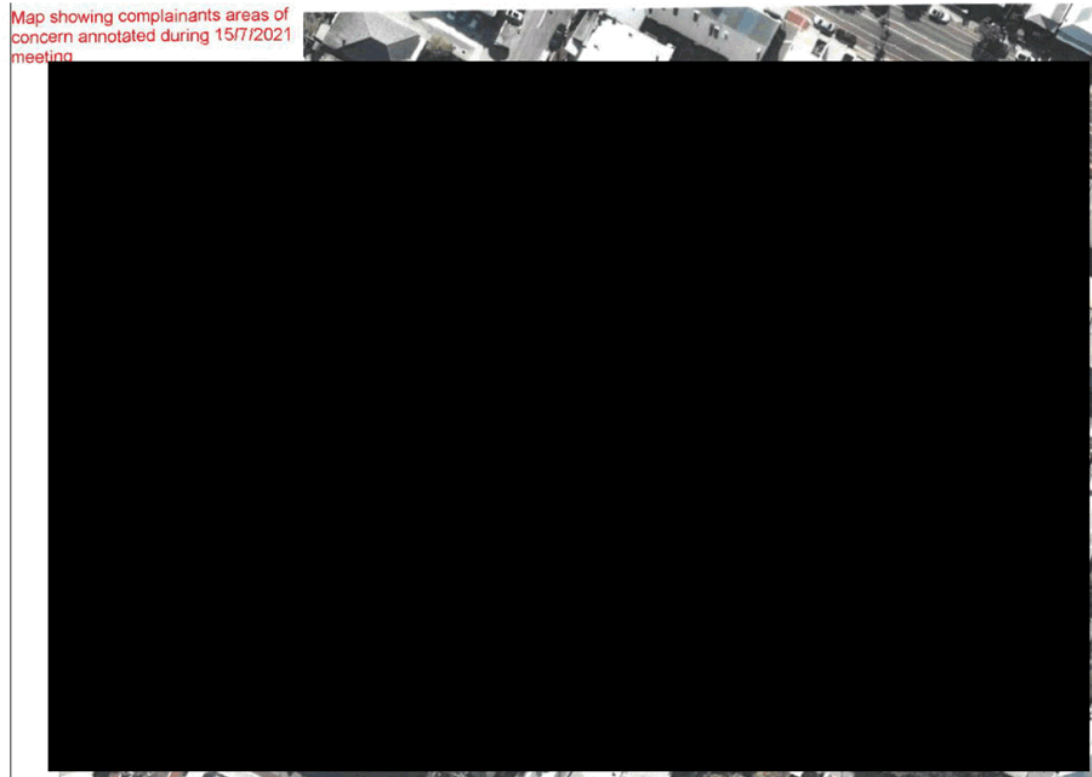
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Appendix 2: Locations of the complainants

This map was annotated by the attendees at the 15/07/21 meeting.



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Appendix 3: Black stain on the roof around the new stack

This photo was provided by a complainant during the 15/07/21 meeting.

