Environment Protection Authority Victoria's Regulation of Kealba Landfill

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Introduction

About this report

In November 2019, Environment Protection Authority Victoria (EPA) was notified of suspected hotspots in the Kealba landfill, which were later confirmed by an environmental consultant.

EPA is the primary regulator for landfills and has been regulating this issue in line with its Compliance and Enforcement Policy. EPA has required the landfill operator to remove four confirmed hotspots under regulatory notice.

EPA expects Barro Group to complete the remediation of hotspots as quickly and safely as possible and to meet the deadlines set in EPA's regulatory notice. At the time of publication of this report, the duty holder has not complied with EPA required timeframes to extinguish a number of the hotspots by 31 May 2021. EPA will consider further regulatory action in line with EPA's Compliance and Enforcement policy.

Hotspot remediation works have resulted in limited smoke in the immediate vicinity and more significant odour in surrounding residential areas as the hotspots are excavated, and the partially combusted materials are exposed. Air quality monitoring by both EPA and the landfill operator has found no issues of concern for long term community health. EPA expects this to continue but still requires the company to continue its air monitoring at the site.

EPA has received a significant number of odour complaints (pollution reports) from residents located in the areas surrounding the landfill. The site has been the subject of community concern, media coverage and interest from the local Council and local Member of Parliament.

On 9 December 2020 Ms Natalie Suleyman MP, Member for St Albans, made a request to the Hon Lily D'Ambrosio MP, Minister for Energy Environment and Climate Change, for EPA to complete a report on the regulation of the site over the last twelve months and measures to prevent the issues occurring in the future.

This report discusses EPA's regulatory role and actions taken to date to regulate the hotspots, which have been undertaken in line with EPA's Compliance and Enforcement Policy. The report also discusses recent enhancements to the Victorian environment protection framework and planning scheme which are expected to reduce the impacts of landfills and landfill hotspots on the community and environment now and into the future.

EPA will also incorporate learnings from the Kealba landfill hotspots issue in future updates to landfill guidance and standards to ensure there is clarity for landfill operators.

EPA's role

EPA was established in 1971 under the auspices of the *Environment Protection Act 1970* (EP Act 1970). EPA is Victoria's environmental regulator and is responsible for protecting human health and the environment from the impacts of pollution and waste. EPA does this via:

- supporting people to understand what they need to do to comply
- working with businesses to address pollution and waste
- holding people to account when they deliberately do things that put our environment and health at risk, or actually cause harm
- reviewing our approach when needed.

EPA aims to ensure clean air, healthy water, safe land and minimal disturbance from noise and odour. EPA also responds to public health concerns about environmental issues. These can include concerns about noise, pollution, odour and air quality.

To protect human health, EPA:

- uses public reporting and environmental monitoring to assess the state of the environment
- uses environmental standards in policies, regulation and guidelines
- assesses and approves activities and premises to make sure they meet environmental standards
- makes sure businesses and community comply with the law.

EPA administers a works approval and licencing system to ensure that waste facilities like landfills operate in line with Victoria's legislative and policy requirements.

A works approval allows a business to conduct works or make changes to a scheduled premises.[1] For example, undertaking works including constructing a new plant or installing new plant equipment, or constructing landfill cells.

An EPA operating licence is required to enable a business to run certain activities at a licensed premises. For example, operating a landfill.

Journey to a modern regulator

In 2016, an independent Ministerial Advisory Committee (MAC) examined the capabilities needed for EPA to function as a modern regulator of pollution and waste. The MAC identified that EPA was not equipped to deal with future pollution and waste challenges and that a significant reform program was required.

The MAC Inquiry made 48 recommendations to Government which were designed to equip the EPA for the future. The recommendations included:

- establishing EPA as an independent statutory authority with a skilled Governing Board
- comprehensive new preventative legislation with stronger powers for EPA
- new environmental public health function and appointment of a Chief Environmental Scientist
- enhanced emergency management/incident response capability
- digital modernisation
- more and stronger compliance and enforcement
- improved monitoring, data/analytics and intelligence.

In 2017, the Victorian Government announced its response to the Independent Inquiry, supporting all recommendations (in full, principle or part). The Victorian Government has provided EPA with record funding of $292.3 million[2] to implement the changes.

[1] Scheduled premises are premises that have the potential for significant environmental impact. Occupiers of these sites are required to obtain an EPA works approval and/or licence, and/or provide a financial assurance. This is regulated under the Environment Protection (Scheduled Premises) Regulations 2017, and will be superseded by the Environment Protection Regulations from 1 July 2021.

[2] Total funding committed in State Budget papers across the financial years 2016-17 to 2024-25.

Steady progress has been made in progressing delivery of these recommendations and many will significantly improve EPA's ability to effectively regulate landfills.

From 1 July 2021, the *Environment Protection Act 2017* (as amended) (EP Act 2017) comes into effect, strengthening EPA's regulatory powers relating to waste in several ways. The new legislation will introduce modern surveillance devices, tougher penalties and a greater focus on industry responsibility and proactively managing risks to human health and the environment. These enhancements are discussed in more detail later in the report.

About Kealba landfill

Kealba landfill (the landfill) is located at Lot 1 McIntyre Road Kealba (street address 2 – 22 Sunshine Avenue Kealba), and is operated by Barro Group Pty Ltd (Barro Group).

The site was originally developed as a stone quarry, with extraction commencing in 1981, and ending in 1999. The landfill has operated from the site since 2 March 2015, accepting solid inert waste and shredded tyres.

EPA's *Industrial Waste Resource Guidelines: Waste categorisation* (EPA publication IWRG 600.2) states that "solid inert waste is hard waste that has a negligible activity or effect on the environment. The waste may be either a municipal or industrial waste." Waste of this type typically arises from commercial, industrial, building and demolition activities. Examples of waste accepted at the landfill include concrete, bricks, dry timber, plasterboard, carpet, plastic, glass, metals, bitumen, and shredded tyres.

Wastes that fall outside of the 'Solid Inert Waste' category (and are therefore not permitted to be disposed of at Kealba landfill) include asbestos containing materials, and solid wastes with contaminant concentrations that would result in them being included in the higher hazard waste type of 'Prescribed Industrial Waste.'

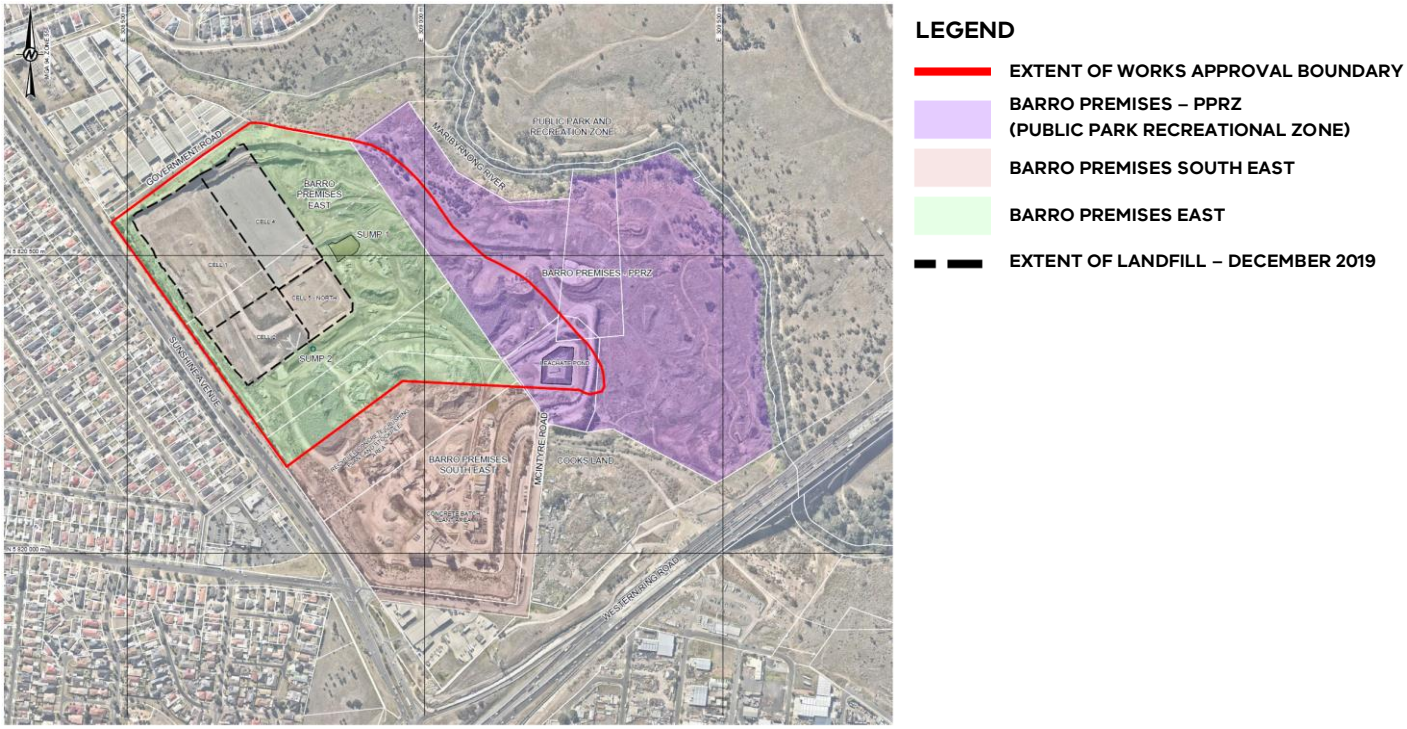

Figure 1: Map of the Kealba landfill.
Source: Adapted from Sunshine Landfill Environmental Risk Assessment and Monitoring Program, Golder Associates.

EPA approvals

Works approval

In August 2001, Barro Group submitted a works approval application to EPA to establish a solid inert landfill at the site. This was assessed by EPA, and referred to Brimbank City Council, Department of Human Services, Western Regional Waste Management Group, Melbourne Water, Department of Primary Industries and Southern Rural Water for advice. The application was also advertised for public submissions for a four-week period commencing 21 November 2001. No public comments were received.

In making its assessment EPA considered a range of factors including the planning scheme, relevant legislation and guidance, impacts to air, land, groundwater and surface waters, noise, dust and odour. The assessment report notes that the closest residence is located 60 metres from the proposed facility, which was compliant with the buffer distance of 50 metres set out in the State Environment Protection Policy (Siting and Management of Landfills Receiving Municipal Wastes) which was in force at the time. On 23 March 2002, EPA approved the works approval (WA46995) under section 19B of the EP Act 1970, with the following conditions:

- The occupier must submit a financial assurance proposal for approval by EPA.
- Construction must be undertaken in accordance with the Construction Quality Assurance (CQA) plan submitted as part of the proposal.
- The landfill liner and leachate drainage system must be designed and constructed in accordance with the standards detailed in the Landfill BPEM.
- An environment improvement plan must be submitted for EPA approval.
- A post construction report must be submitted to EPA for approval.

In November 2003 Barro Group sought an extension for the time within which works must commence under the approval. EPA issued an amended works approval on 2 March 2004, extending the time for two further years.

To satisfy the works approval conditions, Barro Group submitted a range of documentation in relation to the design and planned management of the site, which was reviewed and approved by EPA. This included:

- A CQA plan for construction of the first two landfill cells.
- An environmental audit report confirming that the basal liners for cells 1A and 2A had been constructed in accordance with the approved plans and specifications.
- An environment improvement plan dated April 2009.
- Related maps and plans of the premises.

Licence approval

Under the EP Act 1970, an EPA licence is required to operate a landfill. Following completion of the works described in the works approval, on 12 June 2009 Barro Group lodged an application for an EPA licence. As part of EPA's assessment of the application, it sought assurance from local council as the relevant authority that the site held the appropriate planning permits. Brimbank City Council is the regulator of the site's planning permit and attached conditions.

Brimbank City Council had previously confirmed to EPA that the site held a planning permit that permitted filling of the quarry hole with solid inert waste, as part of EPA's assessment of the site's works approval application. Following EPA's request for confirmation as part of its licence

assessment process, Brimbank City Council subsequently advised EPA it had sought legal advice and was of the view that the site's existing permit did not enable deposit of waste to landfill. This decision was subject to an appeal to VCAT and the Supreme Court by Barro Group. The site's original planning permit was upheld, and EPA considered this as part of its licence assessment.

EPA licence 80195[3] was issued on 6 September 2013, under Scheduled Category A05 (landfills) and permitted Barro Group to accept solid inert waste and shredded tyres for deposit to land, subject to a range of conditions.

The licence has been amended several times since its initial issue:

- On 10 March 2017 it was amended to apply a range of additional standard conditions that were developed as part of the EPA's periodic review of all landfill operating licenses. More detail about this is included later in the report. The amendment also set a maximum depth above which leachate must be extracted (L4.1), and updated condition L8 to enable the landfill to operate a maximum tipping face of 1250 m^2. This was larger than the 30x30 m (900 m^2) recommended maximum in the Landfill BPEM, as the site was considered to be well managed. The recommended tipping face size allows for landfilling business operations to take place while minimising odour and windblown litter impacts on the surrounding area.
- On 25 July 2018 it was amended at Barro Group's request to add new cells 4 and cell 5 North to Schedule 2 of the licence, and reference to the new cells and leachate pond to schedule 1B. The new cells were permitted to accept solid inert waste and tyres shredded <250 mm, consistent with the existing licenced cells.
- On 10 August 2018 it was amended at Barro Group's request to allow for a final cap design for cells 1 and 2 as the current approved contours did not match the surrounding perimeter surface profile. The match of the final cap to surface allows for stormwater to flow into perimeter drainage located around the landfill perimeter. The change did not change the site's maximum airspace, as the raising of the contours on the western and northern boundary of cells 1 and 2 was offset by removing future cell 9 located in the south-east corner of the landfill and lowering the profile of cell 8. The requested amendment did not increase the peak height of the landfill.

Other approvals

Barro Group held an Extractive Industry Licence (No. 144-1) to operate a hard rock and crushed rock quarry at the premises until 1999. Earth Resource Regulator is the regulator of this type of licence.

Brimbank City Council issued a planning permit (P990025) on 9 August 1999 that permits filling of the quarry hole with solid inert waste. The permit requires Barro Group to ensure a detailed landscape rehabilitation plan is prepared to the satisfaction of Parks Victoria and other relevant authorities, and the accordance with the requirements of the site's Extractive Industry Licence. In 2009 Brimbank City Council formed the view that the permit did not allow landfilling activities at the site. Barro Group then sought a review of this decision via the courts and the original permit was upheld.

[3] EPA licences are publicly accessible via https://portal.epa.vic.gov.au/irj/portal

Brimbank City Council has also issued planning permit (P990011) in 1999 to allow the development of the concrete batching plant and materials recycling facility at the site.

Brimbank City Council is the regulator of the site's planning permit and attached conditions.

Landfill design

The Kealba landfill is located within the northern section of the former Sunshine Quarry at McIntrye Road, Kealba. The landfill is surrounded by the residential communities of Kealba and St Albans to its north and west. Industrial and commercial land uses also exist north, south, and west of the landfill, with the Maribyrnong River and Brimbank Park to its northeast.

The entire former quarry site covers an area of approximately 55.8 hectares, with the scheduled premises (the landfill) occupying approximately 20.4 hectares of the site. The total volume of the quarry void available for landfilling is 4.25 million m^3. Allowing for the reshaping of the base, base liner, side liners and final cap, the total airspace available for waste disposal is 3.5 million m^3.

The landfill currently comprises four cells in which waste is deposited (Cell 1, Cell 2, Cell 4, and Cell 5 North). Each landfill cell is located within the former quarry void. All landfill cells are designed with a groundwater collection system, engineered base and side liner systems, and leachate drainage and collection infrastructure. Leachate collected from within the landfill cells can be stored and managed in a leachate pond located in the south-eastern area of the scheduled premises.

Currently the landfill is not accepting waste. All four landfill cells at the premises are still considered 'active' as they have not been filled to the maximum pre-settlement contour levels as approved in their EPA licence. Filling of waste within each cell occurs through the deposition of waste at an active tipping face, and then the compaction and spreading of waste across that tipping face by mechanical plant to form a thin layer of waste. At the end of daily operations, the layer of waste at the active tipping face is covered with a layer of soil (daily cover). Filling of waste typically continues in this method on a daily basis, progressively raising the height of waste within a landfill cell.

Currently no active landfill gas collection, or management system is in place at the landfill. The Environmental Risk Assessment and Monitoring Program prepared for the landfill, and required under its EPA licence, advises that a landfill gas management system will be established in accordance with EPA's Landfill BPEM, and proposes that this will comprise of a passive gas collection system to be constructed underneath the final landfill cap. This would see the installation of the system at the completion of landfilling activities, to manage landfill gas into the future.

Waste acceptance and management

EPA's compliance inspections have observed waste acceptance and management procedures in place to manage the types of waste accepted in accordance with site's licence. This includes controls such as weighbridge checks and CCTV footage at the entrance to the landfill and visual checks at the active tipping face. EPA's inspections before and during the excavation of the hotspots has observed waste types consistent with the licence.

Future of the landfill

In December 2020, Barro Group advised EPA that the landfill had ceased accepting waste and this will continue indefinitely, as they continue to remediate hotspots at the site.

In April 2021 Barro Group advised residents that they intend to continue landfill activities at the site after the remediation of hotspots is completed. They expect that there is approximately 10 years of landfilling that could occur at the site based on the current capacity and available airspace.

Under the Metropolitan Waste and Resource Recovery Implementation Plan, which charts the future of landfills in metropolitan Melbourne, the Kealba landfill is projected to close in 2030.[4]

The most recent estimate of remaining airspace for the current cells at the landfill was presented in the Annual Performance Statement provided to EPA by Barro Group as part of its licence compliance requirement for the 2019/2020 financial year. These estimates, presented in Table 1 below, are based on surveys required to be carried out annually in accordance with the site's EPA Licence.

Table 1: Remaining volumes of current landfill cells as at 30 June 2020. Source: Barro Group Pty Limited 2019/20 Annual Performance Statement.

Cell ID	Capacity (m^3)	Remaining volume (m^3)	% Full	Cell status	Estimated closure date
Cell 2	316,390	109,191	65	Open	30/06/2026
Cell 1	648,910	160,451	75	Open	23/12/2021
Cell 4	540,000	305,528	43	Open	30/06/2024
Cell 5 North	232,000	127,825	44	Open	30/06/2026

In June 2020 Barro Group notified EPA of its intention to design and construct a new landfill cell (Cell 6) on the north-eastern area of the scheduled premises. Any new landfill cell would require approval by EPA and amendment of Barro Group's licence. EPA is not currently considering any application to construct this, or any other new cell at the landfill.

EPA will have regulatory oversight of the landfill until it is satisfied that the site no longer poses a risk to human health or the environment. The site's EPA operating licence requires the operator to implement a rehabilitation plan for the landfill after landfilling ceases. A rehabilitation plan is also required as part of the site's planning permit.

The site's future use is the responsibility of Brimbank City Council. An end use plan was adopted by resolution of Brimbank City Council on 9 April 1996 which involves the filling the northern part of the quarry hole with solid inert waste, and development of a golf course, driving range and soccer field.

[4] The landfill's likely closure date is outlined in the Metropolitan Waste and Resource Recovery Implementation Plan, Metropolitan Waste and Resource Recovery Group, accessible via https://mwrrg.vic.gov.au/assets/resource-files/Web-Metro-Implementation-Plan.pdf

Landfill hotspots

On 26 November 2019, Barro Group notified EPA that it suspected there were hotspots located within the landfill. As a condition of Barro Group's licence, it is required to notify EPA within 24 hours if a hotspot is detected within the landfill.

Background on hotspots

EPA's landfill licencing guideline defines hotspots as "an area of waste below the landfill surface with elevated temperatures accompanied by the evolution of heated gaseous products of thermal degradation, thermal oxidation or combustion, and the emission of visible and invisible radiation."

Hotspots differ from landfill fires, which occur on the surface of waste and combust rapidly, producing intense heat and emitting gases.

Hotspots occurring less than 5 metres from the landfill surface are defined as shallow and are more likely occur in uncapped operational areas or waste flanks (edges) of landfills, or in waste that is less than two years old, or waste that may still be in the aerobic phase of degradation when higher temperatures commonly occur.

Shallow hotspots are more likely to have been caused by air entering exposed edges of the landfill or areas with thin cover due to wind. This is the likely cause of the majority of landfill hotspots in Victoria, including those in the Kealba landfill. Shallow hotspots may also occur from a surface level ignition source such as a hot waste load or a spark from a vehicle, or heating of waste by the sun during the summer months. They can also be exacerbated by air ingress into the landfill space due to active gas extraction, in cases of poor gas containment.

Deep hotspots are defined as those occurring more than 5 metres below the landfill surface in older waste that is in a more advanced state of degradation. They are more likely to be a result of changes and processes within the waste itself, rather than surface level impacts like hot waste loads, sparks or prevailing winds. They can also be caused by air ingress into the landfill resulting from a poorly managed active gas extraction system or a poorly designed leachate re-circulation system. Their depth makes locating, cooling, extinguishing and excavating deep hotspots more challenging.

Hotspots are usually discovered due to smoke observed from the landfill surface, or if a burning odour is present, or if waste rapidly settles in one area, or high carbon monoxide levels within the landfill gas extraction system are detected.

Hotspots occur frequently in landfills in Victoria. Comparative research from New Zealand and the United Kingdom has identified that hotspots are widespread within the landfill industry, and that this incidence does not include undetected hotspots occurring in closed landfills where they are not regularly monitored (Copping et al 2007).

Cause of hotspots

The Kealba landfill hotspots are likely to be a result of oxygen which has ingressed into the landfill due to the design of the landfill cells within the former quarry, combusting with old, decomposed waste. Two pathways are likely to have contributed to this ingress of oxygen: the exposed, external side walls of the landfill; and the leachate drainage layer underneath the waste mass. Hotspot remediation works have recently exposed the leachate drainage layer of Cell 2 in the

landfill. The landfill operator has informed EPA that no leachate was found saturating this drainage layer. The presence of burnt waste immediately above this drainage layer indicates that oxygen may have entered through the leachate drainage network, and fuelled hotspot growth.

As the landfill cells are located within a quarry void, the various side walls of landfill cells are either confined by the quarry walls, or other landfill cells, or exposed to the interior of the quarry. As this type of landfill is progressively filled, the height of the waste mass above the base of the quarry increases, and so too does the height of the landfill's sidewalls. As the height of the exposed sidewalls increases, the gradient of the slope of these walls is also likely to increase. This can present challenges for earthmoving plant to access, and properly compact the sidewall fill material. Inadequate compaction of the exposed sidewalls of the landfill could provide a pathway for oxygen ingress into the landfill.

Health impacts from hotspots

Emissions from landfill hotspots

Combustion occurring in landfill hotspots has the potential to generate particulate matter ($PM_{2.5}$), carbon monoxide (CO) and Volatile Organic Compounds (VOCs) such as benzene.

At very high concentrations, some of the potential pollutants from the hotspots could impact health. For example, $PM_{2.5}$ can cause a variety of health effects, including respiratory irritation and shortness of breath, and can worsen conditions such as asthma and heart disease. Similarly, many VOCs can cause effects such as respiratory irritation, neurological effects including dizziness, however these typically occur at levels orders of magnitude above the maximum thresholds for long-term exposure by national standards. Ongoing exposure to VOCs at lower levels may pose a risk of chronic health effects but only where the levels are consistently higher than maximum thresholds for a significant period of time.

Irritant gases identified in smoke in the immediate vicinity of a large fire may include hydrogen chloride, sulfur dioxide, nitrogen dioxide, acrolein, formaldehyde, ammonia, chlorine and phosgene. Except for sulfur dioxide and VOCs such as acrolein, these have generally not been included in the air quality analysis for Kealba landfill. This is because these substances are only relevant in the immediate vicinity of the fire and the hotspots are too small to generate considerable quantities. This means that they do not produce these gases in concentrations high enough to cause irritation.

Emissions from landfills (unrelated to landfill hotspots)

Landfills can emit landfill gas, which consists of methane (CH_4), carbon dioxide (CO_2) and carbon monoxide. In high concentrations or confined spaces, exposure to these gases can cause asphyxiation or death. In the context of a landfill, these emissions are dispersed into the atmosphere, and only present risks to landfill staff working directly above hotspots.

A recent review (EnRiskS 2020) concluded that available data did not support reports that living near a non-hazardous waste landfill is associated with direct adverse (or acute) health effects. However, it was acknowledged that individual and mixed VOCs released from such landfills may be odorous and may affect amenity and which in turn can adversely impact wellbeing.

Odour from hotspots

Odours are defined as concentrations of substances in the air in gaseous form that stimulate the sense of smell, but are below levels at which they would create a physiological response (i.e. direct physical irritation) in humans. The nose is very sensitive to minute concentrations of compounds, and may react to odours that are pleasant (a fragrance or aroma) or unpleasant (a stink or stench).

Unpleasant or offensive odours are released into the environment mainly from industrial activities including collection and stockpiling of organic waste, landfilling, mixing of chemicals, cooking, heating, waste handling, chemical recycling, and movement of contaminated soils.

Reactions to odours can be very subjective as some people are more sensitive to odours than others. People may also react differently to the same odour depending on their memories and life experience. A smell may be pleasant to one person and unpleasant to someone else. An offensive odour is one that affects the general life, health and wellbeing of an individual as a result of:

- the type of odour released
- the concentration of the odour in air
- the frequency of the odour (how often exposure occurs)
- duration of odour events (how long exposure lasts)
- the age, and susceptibility (state of health) of the people experiencing the odour (i.e. the elderly, young children and or pregnant women).

Health impacts from odour

The likelihood of long-term physiological effects to result from odour exposure is very low. This is because concentrations of likely harmful compounds (e.g. reduced sulphur, amines, ketones, aldehydes etc.) are usually less than a few parts per billion and can be as low as one part per trillion, and well below acceptable limits for human health and safety.

However, odour can cause short-term physiological effects and psychological impacts related to amenity and personal wellbeing. The human nervous system has developed to alert humans to avoid certain unpleasant odours associated with potentially unsafe food or air and trigger similar reactions to the gag reflex, or psychological distress. Some individuals may experience symptoms even at low odour intensities.

When humans expect that an odour is harmful, our bodies may react as if that odour is harmful. In some cases, respiratory problems can occur as people can unconsciously alter their breathing patterns when exposed to unpleasant odour.

Odours are well known to stimulate the entire central nervous system and can affect heartbeat, respiration and other reflexes based on this stimulation (which is different to direct irritant exposure normally associated with air pollution).

It is possible that exposure to some offensive odours may trigger an asthma-type symptom due to the memory/central nervous system feedback loop. People can also become hypersensitive to odour with frequent exposure, where previously they might not have noticed if they will report odours at lower intensity or duration as the subconscious focuses on odour.

New research from the Monell Center for Chemical Senses (Jaen & Dalton, 2016) reveals that simply believing that an odour is potentially harmful can increase airway inflammation in

asthmatics for at least 24 hours following exposure. The findings highlight the role that expectations can play in health-related outcomes. Strong emotions and stress also can act to trigger asthma symptoms (Jaen & Dalton, 2014).

Air quality monitoring at Kealba landfill

EPA undertook air quality monitoring in the landfill area from 2 to 17 December 2019, after being notified of the hotspots. Specialised monitoring equipment was deployed at two residential locations near the landfill that regularly report odour. The monitors measured the air to identify four key substances that could potentially be released into the air from the hotspots; carbon monoxide; sulfur dioxide, $PM_{2.5}$ (fine particles) and volatile organic compounds, a group of carbon-based chemicals that easily evaporate. Monitoring results were reported live to the EPA AirWatch website, and did not identify any levels that would affect human health.

As part of EPA's regular compliance monitoring of this site, during an inspection on 1 July 2020 EPA also used specialised thermal imaging cameras and gas detectors to survey the hotspots for any elevated gas levels and did not detect any levels of concern.

Since December 2019, EPA has required Barro Group to undertake air quality monitoring to assess the risk of harm to sensitive receptors (e.g. residents, schools, businesses) from smoke odour generated from waste hotspots. Under EPA's regulatory notice this must:

- be carried on at locations that are representative of air quality at the northern and western boundaries adjoining the nearest residential receptors
- be carried on at a frequency not exceeding once every 3 days for the duration of waste hotspots being present at the landfill
- be provided to EPA.

To meet EPA's notice requirements, Barro Group engaged independent specialist consultants Golder Associates to develop and undertake an air monitoring plan which was then approved by EPA. Two air monitoring stations are positioned at the northern and western boundaries of the landfill, which are the areas located closest to neighbouring residential properties. This monitoring measures for $PM_{2.5}$, sulfur dioxide, carbon monoxide and VOCs, which is then analysed by a nationally accredited testing laboratory. Barro Group has published reports on air monitoring results to the www.sunshinelandfill.com.au website and provided copies to EPA for review.

EPA has also undertaken regular odour surveys and inspection regime of the premises. This has comprised weekly (at a minimum) odour surveys in the Kealba and St Albans residential areas, as well as fortnightly compliance inspections of the landfill. During an odour survey, an EPA officer will carry out surveillance on roads and residential areas surrounding landfill boundaries to detect odour using their nose. They will make observations relating to wind direction, and gather this information with a view to identifying a source and determining the odour's intensity. The purpose of this regime is to monitor hotspot remediation progress, check compliance with EPA's licence, and statutory notices, and identify opportunities for operational improvements that can be taken at the landfill to reduce odour emissions while remediation occurs.

Pollution reports

Since October 2019, EPA has received more than 800 reports of odour pollution from the local community, made by more than 70 individual community members.

A summary of pollution reports is provided at Appendix 2. EPA has looked at data from EPA's pollution reporting system from June 2019 to date. This shows EPA started to receive pollution reports, noting odour impacts, in November 2019. The highest number of reports were received in November and December 2020, and March 2021.

Figure 2 shows the location of pollution reports EPA received in the peak reporting month of November 2020.

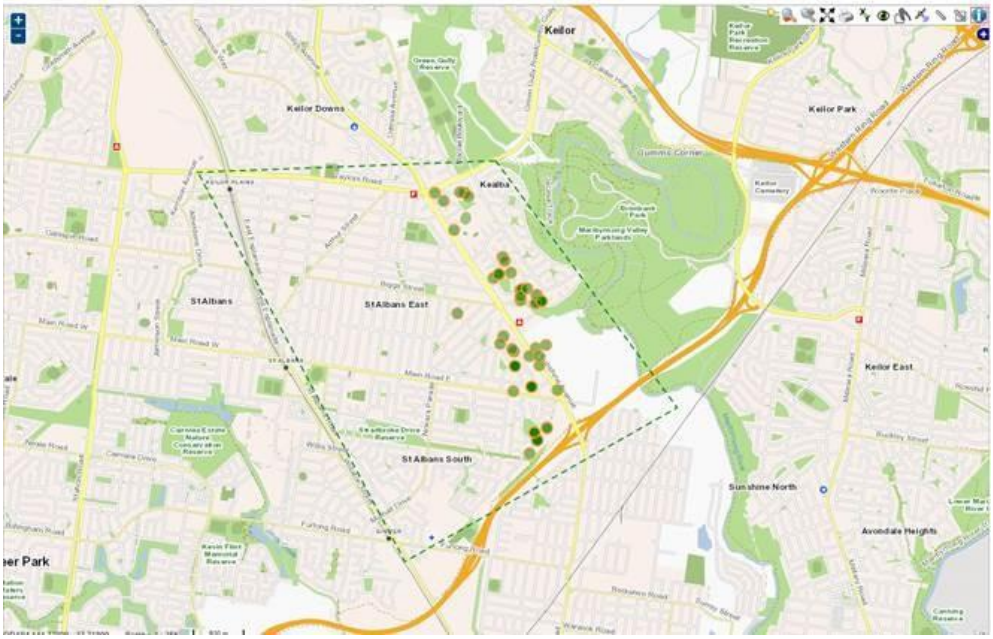

Figure 2: Map of pollution reports made to EPA alleging Kealba landfill as the source, by location, for November 2020.

The odours have been variously described as:

- chemical fertiliser
- manure
- rubbish
- organics
- rotten eggs
- melted chemicals/plastic
- off meat/animal carcass
- putrid
- rancid
- off-socks.

The reports state that some members of the community have experienced health symptoms during odour events, including:

- sore or itching throat
- burning chest
- coughing
- dizziness
- watering/stinging eyes
- nausea
- an increase in asthma symptoms.

Several community members have expressed concerns to the EPA about the impact of odours on their quality of life and mental health, due to difficulty sleeping, an inability to go outside or spend time at home with family and friends.

EPA previously undertook a general review of the descriptions of odour received via community pollution reports between 2012 and 2017 which revealed members of the public who report odour often describe health symptoms such as dry retching, vomiting, difficulty breathing, stinging eyes, and irritated throats. Other common symptoms include wheezing, coughing, nasal congestion, headaches, drowsiness, sore throat and mental depression.

EPA strongly advises that people seek medical advice to discuss their symptoms and confirm if exposure to odour is the likely cause.

Results of odour surveys

EPA's inspection regime and odour surveys have found the intensity and spread of odours from the landfill is dependent on a number of factors. Wind direction, temperature, precipitation, and atmospheric pressure all influence odour emissions from the premises, as does remediation activities at the landfill. The review of air quality, odour surveys and pollution reports indicate that odours are predominantly experienced in residential communities in Kealba and St Albans. EPA officers have observed odour at intensity levels that may result in sensory irritation such as the types described in the symptoms reported in pollution reports.

Typically odour has been found to have a stronger intensity during cool, still mornings, and evenings, and reduced intensity during warmer daytime periods. Excavation of older, hotter waste as remediation has progressed has also had a role in increasing the intensity and spread of odours from time to time. It has been found that the Kealba residential community located north of the landfill, and the St Albans residential community located south-west of the landfill are particularly impacted by odours due to prevailing winds. This is supported by EPA's pollution report data.

Results of air quality monitoring

Several community members have raised concerns that the symptoms being experienced are responses to toxic chemicals in air, and that they may be at risk to long term health impacts as a result of exposure to air emissions from the landfill.

To provide definitive and authoritative advice to the community, Air Quality Scientists in EPA's Applied Sciences Division undertook a comprehensive review of air quality samples taken from the landfill.

EPA assesses air quality against nationally and internationally developed standards for both short (acute) and long-term (chronic) exposures including the National Environment Protection (Ambient Air Quality) Measure[5] and National Environment Protection (Air Toxics) Measure.[6]

Air quality monitoring by both EPA and the landfill operator has found no issues of concern for long term community health. EPA expects this to continue but will continue to require the company to continue its air monitoring at the site. Intermittent exceedances of $PM_{2.5}$ and VOCs

[5] http://www.comlaw.gov.au/Series/F2007B01142

[6] http://www.comlaw.gov.au/Series/F2007B01121

were detected on some occasions; however these were of a short duration and below levels that would indicate a long-term risk to human health. A summary of the results for each pollutant is discussed below.

Carbon monoxide

Concentrations of carbon monoxide were consistently below national standards.

Sulfur dioxide

Concentrations of sulfur dioxide were consistently below national standards.

Small particulate matter (PM2.5)

Figure 3 summarises particulate matter results for air monitoring against the nationally adopted air quality categories for $PM_{2.5}$. The majority of the $PM_{2.5}$ levels measured were less than the National Environment Protection (Ambient Air Quality) Measure 24-hour standard of 25 µg/m3.

$PM_{2.5}$ measurements were found to be above national ambient air quality environment protection standard at the western boundary on thirteen occasions (of 104 sampling events) between 1 July 2020 and 29 January 2021. These concentrations are indicative of conditions at the western site boundary. They likely do not represent impacts to the broader neighbourhood, however, may reflect areas in the immediate vicinity of the boundary within St Albans. As these measurements are 24-hour averages, it may mean that there were short periods of time on days with relevant weather conditions where particulate matter was higher and some sensitive people may have experienced effects.

$PM_{2.5}$ levels along the northern boundary were consistently below the national standards with the exception of one occasion in July 2020 and one occasion in December 2020.

It's noted that sources of particulate matter may include the landfill hotspots, machinery working in the vicinity of the air quality monitor and other emissions in the area, for example vehicles operating in vicinity of monitors.

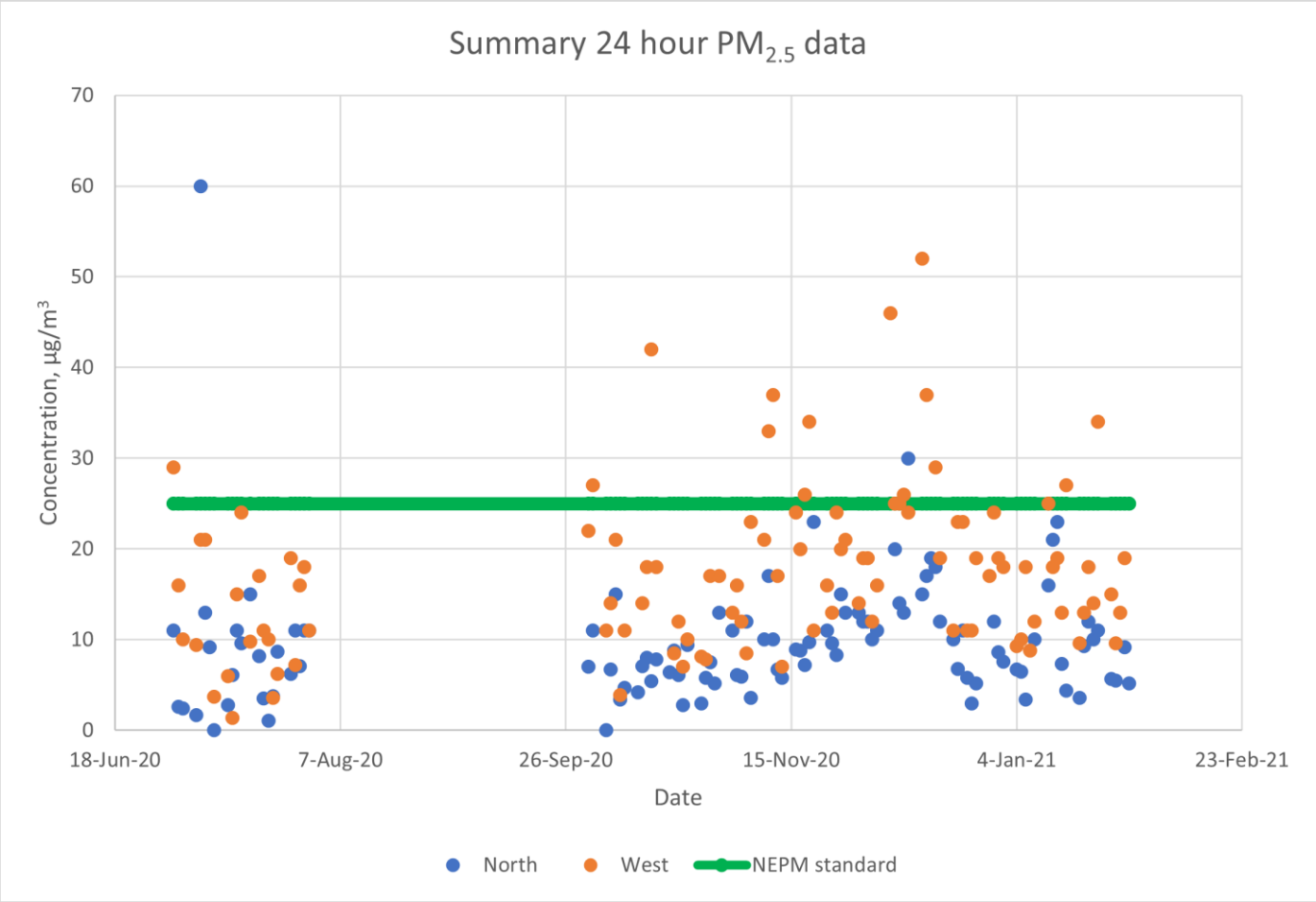

Figure 3: Summary of 24-hour PM2.5 data for July 2020 and October 2020 to January 2021.

Volatile Organic Compounds

A total of 77 VOCs were analysed on 159 occasions each at the northern and western boundary locations between 2019 and 2021. Table 2 summarises the analytes that were detected, air quality guideline exceedances and the maximum concentration detected. The full list of 77 analytes that were measured can be found in EPA's health factsheet.[7]

Concentrations of VOCs in air at the boundary fences were found to be typically at orders of magnitude below (i.e. significantly less than) levels that would result in the acute-type symptoms reported by the community, and were also typically below criteria for long-term air quality. As a result, EPA is of the view that VOCs are unlikely to be the cause of health symptoms reported by the community.

On a small number of occasions there were exceedances of the levels set by established guidelines, for long term long-term exposure. This was found to occur at infrequent and intermittent rates, and as such the risk of chronic health impacts from these are low. When looking at the average concentrations measured over time, these were at rates consistently below the levels for long-term exposure.

[7] https://www.epa.vic.gov.au/for-community/current-projects-issues/kealba/health-information-for-kealba-odour-issues

It is noted that VOCs may arise from landfill hotspots, petroleum hydrocarbons or automotive fumes, or other background sources unrelated to combustion, such as refrigerant gases (e.g. freon).

Table 2: Summary of VOCs detected in air at the Northern and Western boundaries at Kealba landfill.

Chemical	No. detections, North*	No. exceed-ances, North	Max conc, ug/m^3	No. detections, West*	No. exceed-ances West	Max conc, ug/m^3
Benzene	12	**2**	**48**	11	**2**	**24**
2-Butanone	0	0	ND	3	0	10
sec-Butylbenzene	0	0	ND	1	0	8.9
Cumene	0	0	ND	1	0	27
Cyclohexane	0	0	ND	1	0	11
1,2-Dichloroethane	1	0	13	0	0	ND
Ethyl benzene	2	0	4.6	3	0	170
4-Ethyltoluene	1	0	4.2	2	0	200
Freon 11	57	0	3.6	63	0	3.8
Freon 12	138	0	6.3	141	0	7.1
Heptane	1	0	19	2	0	56
Hexane	2	0	63	3	0	140
m, p-Xylene	2	0	8.6	2	0	590
Naphthalene	0	0	ND	1	0	13
Propylbenzene	0	0	ND	1	0	120
Trichloroethene	1	**1**	**14**	1	**1**	**4.4**
Tetrachloroethene	0	0	ND	4	0	60
Toluene	18	0	8.8	25	0	77
1,2,4-Trimethylbenzene	1	0	5.3	2	0	390
1,3,5-Trimethylbenzene	1	0	8.3	1	**1**	**150**
2,2,4-Trimethylpentane	1	0	22	2	0	47
o-xylene	1	0	4.8	2	0	130

*Analysis for 77 analytes was conducted at each monitoring station on 159 occasions, once every three days.
ND = not detected

Benzene

Several community members have expressed concern that one VOC – benzene - has been detected in recent monitoring data, particularly in the context of cancer risk. Benzene is a relatively common VOC in the environment, and typically occurs at very low concentrations, and associated with sources such as fuels, solvents, and combustion.

Only one sample of the 159 samples taken on the western boundary exceeded the short-term air quality guideline of 29 μg/m3 for Benzene, set by the Agency for Toxic Substances and Disease Registry (ATSDR, 2019).[8] Note this is a US standard, but is taken as the established guideline in Victoria. Given the exceedance was only seen on one occasion, and at a distance from residential properties, it is very unlikely to have resulted in health impacts. Acute health effects from

[8] https://www.atsdr.cdc.gov/ToxProfiles/tp3.pdf

benzene, such as mucous membrane irritation and dyspnea are observed at the much higher rate of approximately 2400 μ g/m3. For this reason, the health symptoms reported by community are unlikely to be due to benzene.

On two occasions at both the northern and western boundary, benzene concentrations exceeded the ATSDR guideline for long term exposure (9.6 µg/m3) and current national investigation limits for air toxics (10 µg/m3). The average concentration of benzene measured over the 18-month monitoring period is below these criteria, with most results for benzene below limits of detection for the laboratory. This means any exposure from the hotspots is likely to be very infrequent and unlikely to cause harm.

Support for local community

EPA continues to support community and respond to health concerns by providing public health advice and information to community and their local health networks and General Practitioners. EPA has prepared a fact sheet for local health professionals to assist community members who have concerns about health impacts from the landfill hotspots, which is also available from the EPA website.[9]

EPA's regulation of Kealba landfill

EPA's regulatory approach

EPA regulates the site under the operating licence and regulatory notices issued under the EP Act 1970[10] and the Environment Protection (Scheduled Premises) Regulations 2017.[11] EPA's regulation of the site is also guided by EPA publication 788: *Best practice environmental management – siting, design, operation and rehabilitation of landfills* (Landfill BPEM)[12] which outlines best practice environmental management measures for landfills in Victoria, and *EPA publication 1323.3: Landfill licencing guideline* which provides guidance to landfill operators on how to comply with their licence conditions.

EPA's compliance and enforcement activities are guided EPA's Compliance and Enforcement Policy.[13] Under the policy, EPA takes a risk-based approach to assess risks in terms of the likelihood of the risk occurring and their impact. In assessing risk, EPA will consider the practices and behaviours of duty holders that:

- represent non-compliance with relevant legislation and regulations
- present real or potential harm to human health and the environment
- impact EPA's ability to be an effective regulator, and/or
- require a regulatory response due to public interest and concerns.

[9] The fact sheet can be accessed via: https://www.epa.vic.gov.au/for-community/current-projects-issues/kealba/health-information-for-kealba-odour-issues

[10] https://content.legislation.vic.gov.au/sites/default/files/24795e50-c736-3d9b-bd69-cacfa7e6b38d_70-8056aa213%20authorised.pdf

[11] https://content.legislation.vic.gov.au/sites/default/files/2020-07/17-45sra002%20authorised.pdf

[12] https://www.epa.vic.gov.au/about-epa/publications/788-3

[13] https://www.epa.vic.gov.au/-/media/epa/files/publications/1798-1.pdf

EPA selects from a wide range of regulatory tools to address non-compliance, which includes:

- Providing information, education and advice.
- Inspections – physical attendance at a site by an EPA Authorised Officer to investigate potential pollution and waste offences. EPA officers may provide information to a duty holder and voluntary compliance may be achieved by the duty holder taking immediate action to address any issues avoiding the need for additional regulatory action.
- Inspection reports - following an inspection EPA will issue an inspection report which will detail an Officer's observations and may provide guidance to a duty holder on how to comply with regulatory requirements.
- Section 55 Notice – a notice used to request information from a duty holder to assist EPA in its enquiries.
- Directing, and requiring follow-up action to fix or remedy non-compliance via regulatory notices:
    - Clean up notice – a legal document that requires a duty holder to take action to prevent further contamination and impact on beneficial uses of the environment.
    - Minor works pollution abatement notice – a legal document that requires a duty holder to take action to prevent further occurrence of pollution or potential environmental risk through installation of risk controls and changes to onsite processes and practices in urgent situations.
    - Section 62B Direction - a legal document issued to a duty holder to immediately to stop an activity, address an incident, or undertake an activity to prevent imminent danger.
- Issuing penalties and sanctions for identified non-compliance including:
    - Infringements – financial penalties (fines) issue to a duty holder for breaches of the EP Act.
    - Official warnings – a legal document that confirms a breach of the EP Act, and warns the duty holder of further regulatory action if they do not comply with regulatory requirements.
    - Prosecution – legal action pursues via the courts for offences against the EP Act, which may result in a fine, imprisonment, enforceable undertaking or a court order.

Suspension or revocation of a permission.

EPA may use these tools individually or in combination, to respond in a way that is proportionate to the seriousness of the problem and focused on achieving the desired regulatory outcome. EPA will also consider whether it is appropriate to implement restorative or punitive measures to ensure harm is repaired and the consequences for non-compliance are appropriate.

EPA's enforcement action aims to:

- stop the unlawful activity and remedy any harm caused by the non-compliance (including using restorative justice outcomes)
- ensure future compliance is achieved and sustainable
- raise awareness of the law and consequences of non-compliance
- punish offenders and remove any commercial advantage from the non-compliance.

EPA takes an escalating approach to determine appropriate enforcement response and will consider:

- the nature and seriousness of the non-compliance
- the risk of harm that has arisen from the non-compliance

- the characteristics of the person engaging in the activity
- other relevant criteria and factors such as public interest.

EPA licence requirements

EPA's operating licence held by Barro Group contains 45 conditions which require the operator to manage the landfill to reduce the risks of harm to human health and the environment, including impacts to air, water and land. This includes specific conditions to prevent hotspots, and manage hotspots if they occur. The licence also contains provisions to protect local amenity, and requires the operator ensure that odours offensive to the senses of human beings, and dust, are not discharged beyond the premises boundaries, and that noise and vibrations are controlled. Other conditions require waste cover, leachate management, fire, groundwater and surface water monitoring, requirements for discharge of groundwater to Maribyrnong River and reporting on testing results.

The licence also requires Barro Group to develop a risk assessment and environmental monitoring program, and arrange for regular independent audits of the premises in accordance with section 53V of the EP Act 1970. This requires Barro Group to engage an independent auditor, appointed by EPA under the EP Act 1970, to produce an independent environmental report for the site that provides advice on ways to improve processes, reduce pollution and protect the environment and human health. Barro Group is required to provide a report every two years. Audit reports are publicly available on EPA's website. Barro Group must also provide EPA with an Annual Performance Statement by 30 September each year that testifies how the operator met the licence conditions during the prior financial year. Annual Performance Statements are published on EPA's website.

For licensed sites like Kealba landfill, EPA undertakes an inspection regime that is based on EPA's licensed operator risk assessment (LORA) model. This framework, introduced in 2012, establishes a consistent and transparent approach to prioritise EPA's planned licence compliance inspections based on the risk of each site.

The LORA model represents both 'risk or harm to health and the environment' and 'likelihood of non-compliance'. It assesses licensed sites on six different criteria, including:

- the site's activities
- proximity to receptors
- emissions and wastes
- the site's management systems and plans
- compliance history
- level of community engagement.

A LORA risk rating is calculated using information EPA currently holds and gathers across these six criteria. An operator with a lower risk rating can expect fewer planned licence compliance visits, while those with a higher risk rating can expect more.

In addition to planned licence compliance inspections (informed by LORA), EPA also inspects licensed sites as part of:

- auditing a licensee's annual performance statement
- responding to pollution and emergency reports and incidents
- undertaking local, regional, or sector-based strategic compliance initiatives.

Hotspot prevention and management requirements

The site's operating licence includes the following conditions in relation to hotspot prevention, notification and management:

- *LI_L15 - You must take measures to prevent hotspots in the waste mass at the landfill site.*
- *LI_L16 - You must report hotspots within the waste mass to EPA within 24 hours of detection.*
- *LI_L17 - You must manage hotspots within the waste mass in accordance with the Landfill Licensing Guidelines (EPA Publication 1323.3, released September 2016).*

EPA's Landfill Licensing Guideline contains guidance to assist duty holders to meet their licence conditions. It is important to note that EPA is not prescriptive in its guidance or regulatory requirements as the regulatory framework is designed to allow flexibility to accommodate changing circumstances, risks and other factors which may vary between situations.

An extract from EPA's Landfill Licencing Guideline that relates to hotspots is below.

> *It is your responsibility to ensure that appropriate management procedures are in place and implemented to prevent, identify and cool hotspots within the waste mass. These should include, but not be limited to:*
>
> - *Installation and maintenance of fire fighting equipment and water supply appropriate for the size and activities at the site.*
> - *Fire response training for employees.*
> - *Site emergency procedures.*
> - *Identification of incoming hot loads of waste (at the weighbridge and tipping face).*
> - *Identification of potential hot loads (criteria based on the waste types accepted at the site).*
> - *Refusal of hot loads.*
> - *Isolation (in a suitable quarantine area) and cooling of hot loads prior to burial.*
> - *Good compaction of the waste to remove as much air as possible during burial.*
> - *Containment and disposal of fire fighting run-off water.*
> - *Management of heat generating wastes (e.g. shredder floc, green waste etc.) i.e. no stockpiling of these types of wastes outside of the landfill cell, disposal of these wastes in thin layers in the landfill cell or mixing with non-combustible wastes during disposal.*
> - *Regular inspection and maintenance of the site surface, and penetrations through it, to ensure that cap integrity is maintained to prevent air ingress as far as practicable.*
> - *Regular inspection of the site for signs of hotspots within the waste mass, such as: visible smoke; burning odours; surface cracking, rapid localised subsidence; landfill gas balance indicators (CH4:CO2 ratio, O2 % v/v, CO ppm, H ppm, N2 % v/v); landfill gas or leachate temperatures.*
>
> *It is your responsibility to take appropriate action to manage and cool hotspots within the waste mass. Appropriate management measures should include:*
>
> - *Identify the extent of the affected area and locate the hotspot core.*
> - *Seal the site surface, and penetrations through it, to prevent air ingress as far as practicable.*
> - *Shut down the gas extraction system in the affected area, and consider reducing vacuum in wells adjacent to the affected area.*
> - *Undertake landfill gas surface emissions surveys to confirm site is sealed to air (as far as practicable).*

- *Introduce a diluent to cool the waste in the affected area (e.g. water, leachate, N2, CO2).*
- *Monitor the effectiveness of the actions taken via: - Landfill gas temperature (down-well probe within and adjacent to the affected area) - Landfill gas balance (portable landfill gas analyser and confirmation of readings by laboratory analysis of bag samples from representative gas wells) - Leachate temperature (within and adjacent to the affected area).*
- *Re-introduce extraction of landfill gas only when monitoring indicates typical landfill conditions e.g. O2 < 5%, CO < 100ppm, CH4:CO2 ratio at least 1.3:1, N2 < 20%.*
- *Re-introduce extraction progressively while frequently monitoring landfill gas balance and temperature from wells in the affected area.*

Landfill Operator Audit reports

EPA requires the operator to complete a Landfill Operation Audit report every two years, under a condition in the site's operating licence. The objective of the site audit is to identify and, where possible, quantify the risk of harm or detriment to a segment of the environment caused by the landfill operation. Audit reports are provided to EPA for review and are also published on EPA's website.

Audit reports are prepared in accordance with the following documents:

- Section 53V of the EP Act 1970 which sets out requirements that must be met when an environmental auditor prepares an environmental audit report in relation to the risk of any possible harm or detriment to a segment of the environment caused by any industrial process or activity, waste, substance or noise.
- EPA publication 1323.3: *Landfill licensing*.
- EPA publication 952.5: *Preparation of environmental audit reports on risk to the environment*.
- The site's operating licence and conditions.

The auditor also has regard to:

- relevant State Environment Protection Policies
- the site's verified Environmental Monitoring Program
- landfill monitoring records
- the beneficial uses of the premises and surrounding land.

Barro Group provided EPA with audit reports in 2018 and 2020 to meet its licence requirements. The 2018 Audit report noted that Barro Group was 90 per cent progressed implementing Fire Management Procedures and had installed dedicated fire response infrastructure and water supply at the site for managing fire risk. The operator's hotspot prevention procedure included inspecting waste loads as they came in, conducting a daily visual check of the landfill, and temperature detection, supported by staff training.

The Auditor assessed the fire risk from acceptance of un-authorised waste as 'Medium' based on these controls, but also noted areas that they could improve. The auditor also rated spontaneous combustion of waste as a 'Medium' risk in the audit report again noting areas that Barro Group needed to improve.

EPA's regulation of the site

Kealba Landfill has a current 'Tier 1' LORA risk rating, the highest risk category for EPA licenced premises. The site's LORA risk rating has increased from a 'Tier 4' risk rating in 2018/19, and a 'Tier

3' risk rating in 2019/20. This is consistent with an increase in pollution reports received from the local community, two EPA sanctions for detected licence breaches, and five remedial notices that have been served by EPA.

The 'Tier 1' LORA risk rating means that the site undergoes increased regulatory scrutiny through more frequent licence compliance assessments, and the duty holder must demonstrate a high level of performance over the coming years to reduce its risk rating.

Prior to notification of the hotspots, EPA had conducted three licence compliance inspections, in 2014, prior to waste being accepted, and in 2017, and 2019. EPA also conducted an inspection in 2018 in response to pollution reports for dust emanating from the site. These inspections did not identify any non-compliances. EPA's 2019 licence inspection report noted that the company had reported it undertakes field measurements to detect temperature levels at the landfill.

Since becoming aware of the hotspots at the Kealba landfill in November 2019, EPA has regulated the site in line with its Compliance and Enforcement Policy. EPA's regulatory activities have included:

- Regular inspections at the site and nearby area.
- Conducting odour surveys and other environmental monitoring at the site and nearby residential area.
- Served the operator with five Clean Up Notices which have progressively required the operator to investigate, plan for remediation and undertake remediation works to remove the hotspots.
- Served the operator with one Official Warning for failing to immediately notify EPA of hotspots.
- Served the operator with one Infringement Notice for failing to apply daily cover.
- Formed an internal EPA Problem Assessment Group which has brought together staff from across EPA, with experts in landfill management, environment public health, regulatory strategy and legal expertise, to guide EPA's response to this regulatory issue.
- Commissioned a principal expert review of Barro Group's remediation strategy.

Appendix 1 contains a detailed chronology of EPA's regulatory actions undertaken since EPA was notified of the hotspots in November 2019.

In regulating the site, EPA has also worked with Brimbank City Council, and Fire Rescue Victoria to ensure a combined response to this issue.

Hotspot remediation

Investigation of hotspots

Barro Group engaged Golder Associates, an environmental consultant, to undertake a field investigation to locate hotspots within landfill. Golder developed an investigation methodology which proposed drilling small diameter investigation boreholes into the waste where hotspots were suspected to be, and undertaking temperature and gas measurements at each borehole location to locate hotspots and establish their depth within the waste. Drilling investigation work commenced on 5 December 2019 and concluded on 11 February 2020. Initial drilling locations were chosen based on site surface inspections and additional locations were added as work proceeded.

In total, 102 boreholes were drilled during the investigation, of which 60 were fitted with temperature monitoring pipes. The borehole locations are presented on Figure 3. This testing identified four localised hotspots across Cells 2 and 5. Remediation later confirmed that some were located deep within the waste, in some cases at the very base of the cell.

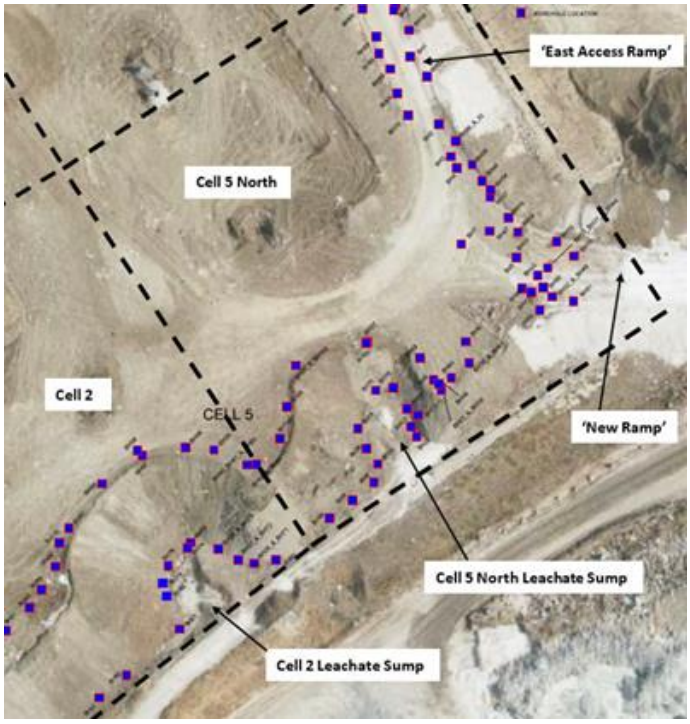

Figure 4: Borehole drill locations (boreholes indicated in purple). Source: Golder report: Landfill hotspot remediation design, 27 March 2020, prepared for Barro Group.

Hotspot remediation

EPA required Barro Group to prepare a Landfill Hotspot Remediation Design report, which was commissioned by Golder Associates. This considered the location of borehole drilling and results and proposed a remediation plan that would involve excavation of the hot waste from hotspot locations, and cooling of extracted waste in a clay covered layover area and once cooled, return the waste to the landfill.

In designing the remediation plan, Golder considered three remediation methods: Gas injection, water injection, and hotspot excavation. Gas and water injection were not recommended as both

were considered to have a low certainty for success, and risk that a partially smothered hotspot may remain dormant, be difficult to detect, and risk of hotspots returning onto the future.

Hotspot excavation was recommended due to its high certainty of long-term success and ability to manage safety for site personnel during implementation. The remediation of hotspots involves the excavation of hot waste, which is temporarily placed in a laydown area where the waste cools down. Once cooled, waste would be placed back into active landfill cells. Figure 4 shows the location of the four hotspots and the layover area, and site access points.

Figure 5: Proposed remediation works for Kealba landfill hotspots. Source: Golder report: Landfill hotspot remediation design, 27 March 2020, prepared for Barro Group.

Hotspot remediation works commenced on 1 July 2020, undertaken by contractors engaged by Barro Group.

Under the operating licence conditions, the landfill operator is required to cover any uncovered waste with a layer of soil at the end of each day's operations to reduce odour from that waste impacting the local community. EPA also applied a requirement via regulatory notice for the operator to cover any cooling waste removed from the landfill overnight with a minimum of 30cms of soil to reduce odour impacts.

To speed up the removal of the hotspots, the Barro Group proposed to not cover waste on the clay bed after daily operations.

EPA permitted a trial of this new technique, under an EPA notice, from 27 August to 30 September 2020. The results of the trial showed that progress to remove hotspots was twice as fast with the new technique. There was an increase in odour impact to the community during September, partially due to the remediation of deeper, older and hotter waste (which is more odorous) during the period.

In October 2020, EPA approved this trial to continue under a regulatory notice. This decision was made following discussions with some of the most affected residents who experience odour and provide pollution reports to EPA. Many of these people told EPA they prefer an earlier completion time, despite the increase odour.

Under the new approach, Barro Group is required to:

- cover any waste cooling on the clay bed over weekends
- continue air quality monitoring
- continue to keep the community informed.

In March 2021 Barro Group surveyed community on a proposed extension of permitted hours during which remediation works can be undertaken at the site. On 28 April 2021, Barro Group formally wrote to EPA to request an alteration of its remediation method to commence remediation at 06:00 hours each weekday, and also carry out remediation on Saturdays. They proposed to add an additional 11 hours of remediation work time each week. EPA reviewed this request and determined to refuse it. In making its decision, EPA considered the potential benefits of increasing the speed of remediation, against the potential for additional odour impacts to the local community. It was determined that the with impending winter conditions, that reduced daylight hours would not provide enough increased speed when compared with the cold, still, climate conditions that are likely to be more prevalent and have the potential to cause poorer odour dispersion that could be exacerbated by the extension of work hours. For works on Saturdays, feedback from the local community was considered, and it was determined that all measures should be taken to minimise odours during weekends.

To date, 49,000 cubic metres of waste has been removed, cooled, and placed back into the landfill. Remediation works were paused over the 2020 Christmas/New Year period, and the Easter 2021 long weekend, to reduce odour impacts for the local community.

Remediation of Hotspot 4 was completed in April 2021, and the operator is continuing to progress remediation of Hotspots 2 and 3 which are required to be completed by 31 May 2021 under EPA's remedial notice. Barro Group has experienced some delays during the remediation works, including when wet weather prevented access of machinery on site, and discovery that some hotspots were larger and deeper seated than originally anticipated.

Fire management during remediation

Barro Group is required to manage the risk of fire at the site, under EPA operating licence and regulatory notice, and hold a Fire Risk Assessment and an Emergency Management Plan. Barro Group is required to notify Fire Rescue Victoria at the start of each week when remediation works will occur. Fire risk is managed on site by Barro Group staff and contractors that apply water to the waste as it is being dug out of the landfill. This is when the fire risk is highest. When the waste

is underground the lack of oxygen means the risk of open flames is much lower. EPA's regulatory notice also requires EPA to be immediately notified if open flames are generated at the site.

Next steps for hotspot remediation

Barro Group is continuing remediation of Hotspots 1, 2, and 3. Remediation work on Hotspots 2 and 3 is well advanced. Hotspot 1 is located under an access point, and Barro Group has required contractors to drive over this location when remediating other hotspots and depositing waste into the layover area. This has prevented works beginning on this hotspot until the others are remediated.

Based on the geography of the site, access requirements, the current rate of removal and the size of the remining hotspots, Barro Group anticipates that the remediation will be completed by September 2021.

EPA's regulatory notice requires Barro Group to complete all remediation works by 31 July 2021. EPA has also required Barro Group to obtain expert advice on how their remediation strategy can be revised to finish the job sooner.

In May 2021, Barro Group sought an extension of time from EPA to complete the remediation works. EPA reviewed the request and is of the view that the current due dates of 31 May 2021 and 31 July 2021 should stand to complete removal of all hotspots. EPA advised Barro Group it would not grant the extension on 20 May 2021. EPA expects the Barro Group to complete the remediation of the Kealba landfill site as quickly and safely as possible and to the deadlines set down in the current notice.

EPA is commissioning an independent analysis, to ensure remaining works and the deadlines for remediation are met or achieved as quickly as possible.

If Barro Group cannot meet it statutory responsibilities as set out in the clean up notice, EPA will look to take action in line with its Compliance and Enforcement Policy which sets out sanctions ranging from fines through to licence suspension and even cancellation.

Community engagement

EPA has required Barro Group to engage regularly and effectively with the local Kealba community under regulatory notice.

Barro Group's community engagement

To meet EPA's requirements Barro Group established a website for the local community to provide regular updates on remediation works and weekly weather forecasting to identify potential odour impact days, accessible via https://sunshinelandfill.com.au/.

EPA required Barro Group to host regular community information sessions. Barro Group hosted sessions in September and December 2020, and February and April 2021, which EPA staff attended. Recordings of each session are available on the landfill's website.

In March 2021 EPA increased the requirements for Barro Group to engage with the community and required more regular updates which they have provided through weekly community forums and odour forecasts on their website. These commenced on 14 April 2021.

Barro Group undertook five letter box drops for residents in the immediate area surrounding the landfill, and these were undertaken in June 2020, August 2020, December 2020, January 2021, and April 2021.

Barro Group carried out a survey of the local community regarding its proposal to extend remediation work hours in March 2021.

EPA community engagement

EPA has also undertaken a range of community engagement activities to keep local residents updated on EPA's regulatory actions and respond to community pollution reports.

When the issue first emerged, EPA hosted a community information stall at the Kealba shops on 13 December 2019 to provide information to the local community.

In May 2020 EPA conducted a letter box drop in the local area to provide additional information to the community about EPA's regulation of the site.

EPA has established a dedicated webpage and publishes regular updates on the Kealba landfill at www.epa.vic.gov.au/kealba.

EPA sends out regular emails to members of the community who have made pollution reports about the landfill, to provide an update on EPA's regulatory activities at the site.

EPA also has phone contact with residents who make frequent pollution reports, to provide updates, and coordinate odour monitoring at their location.

Discussion

Appropriateness of EPA's regulation

EPA's regulation of the site has been conducted in accordance with the Compliance and Enforcement Policy principles, and consideration of all the relevant factors at the time of compliance and enforcement decisions to date. EPA will continue to review the site and will not hesitate to take further regulatory action as appropriate.

Consideration	Relevant factors EPA has considered
The nature and seriousness of the non-compliance	The duty holder had installed dedicated fire response infrastructure, and water supplies for fire suppression. It had a suitable waste load acceptance procedure to prevent non-compliant waste loads and was compacting waste appropriately. Field observations by EPA have found the likely cause of the hotspots is an ingress of oxygen through leachate drainage infrastructure that acted to increase the temperature of older biologically degrading waste deep within the landfill. EPA inspection of waste removed from the landfill during hotspot remediation has found that the landfill operator does not appear to have accepted any non-compliant waste types that could have contributed to hotspot development. Ongoing investigation and remediation of the hotspots has progressed over the course of 18 months, and this is a reflection on the large scale of the hotspots, and the waste volumes overlying them, as well as the complexity of extinguishing burning waste. From 29 April 2020, through a remedial notice, EPA required the duty holder to implement a hotspot remediation strategy that required waste to be excavated from the landfill and cooled outside the landfill cells. These works have been necessary to resolve the hotspots and longer term odour, however in the short-to-medium term, have contributed to increased odours while remediation occurs.
The risk of harm that has arisen from the non-compliance	Waste hotspots within the landfill have resulted in offensive odours impacting upon the local St Albans and Kealba residential communities. This has impacted upon residents wellbeing, and resulted in a loss of amenity within the local community. Some residents have attributed health concerns such as incidences of coughing, eye irritation, asthma, and mental health impacts from the odours they are experiencing.

	The risk of impacts to human health from air emissions released by the waste hotspots has been found to be low. This is based on approximately 18 months of air quality monitoring data that has found Volatile Organic Compound concentrations at the boundaries of the landfill to be consistently well below the relevant air quality criteria for protection of human health. Regardless of this, considering feedback from members of the community on the detriment the hotspots have had on their wellbeing, EPA considers the harm from the non-compliance to be 'High'. This correlates with an escalated level of rigour in regulatory requirements and compliance assessment EPA has placed on the duty holder through the five remedial notices and regular EPA inspections to progress remediation.
The characteristics of the person engaging in the activity	The duty holder has voluntarily ceased accepting waste at the site to reduce impacts on remediation works. The duty holder has complied with a range of regulatory requirements including commissioning a Hotspot Prevention Plan, a Hotspot Reporting Plan, a Site Emergency Procedure, and a Waste Acceptance Procedure, in response to EPA notice requirements. At the time of publication of this report, the duty holder has not complied with EPA required timeframes to extinguish a number of the hotspots by 31 May 2021. EPA received correspondence on behalf of the Barro Group seeking an extension of the 31 May 2021 compliance date. The EPA will consider this request and the information provided to support the extension. Subject to its decision on the extension request, the EPA will continue to consider its response to any non-compliances. For EPA to invoke its power to suspend or revoke a permission, there must be a sustained and significant non-compliance, a significant risk of harm, and the decision must withstand strong internal and external legal scrutiny, as any decision is subject to appeal to VCAT. It is noted that EPA has issued two sanctions to Barro Group for failure to cover waste, and failure to notify EPA of the landfill hotspots within 24 hours, in contravention of the site's operating licence conditions. for identified offences. These were considered appropriate and in line with EPA's Compliance and Enforcement Policy. Prior to the notification of the hotspots, the duty holder had met requirements of its operating licence including

	providing Annual Performance Statements and undertaking environmental audits of the site. Barro Group Pty Ltd has received two prior EPA Infringement Notices in 2017 for activities relating to the stockpiling of tyres at its Brooklyn premises trading as 'Tyre-Lug Services'.
Other relevant criteria and factors such as public interest.	EPA is aware of a high impact from landfill odour to some residents who live close to the landfill, which has had a significant impact on local residents' wellbeing. EPA has required a significant degree of community engagement by the duty holder, under regulatory notice, to address this community concern. In undertaking activities to attempt to comply with EPA's remedial notices, the duty holder has borne significant financial costs, and also suspended its landfilling operations voluntarily. EPA considers that the duty holder has not obtained any financial benefit from the non-compliance occurring or continuing for an extended period of time. Considering the likely cause of the hotspots, EPA does not consider that the duty holder obtained a commercial advantage because it does not appear to have maintained sub-standard hotspot prevention processes and procedures.

EPA considers that its use of compliance and enforcement tools has been appropriate when considering the above factors.

EPA's regulation of the site has been enhanced since the hotspot issue first emerged in November 2019. EPA has revoked and reissued regulatory notice to require specific actions within reasonable timeframes and has increased regulatory requirements that the duty holder must fulfil as the issue has evolved.

EPA increased community engagement requirements in response to community feedback, EPA has increased the requirements for the operator to engage with the local community, providing a range of detailed requirements including the establishment of a website, social media, presence, and requiring weekly community forums.

EPA has provided extensive support to the duty holder to encourage the duty holder to investigate options to complete works faster. EPA has provided detailed regulatory notices to the duty holder that step out how the duty holder can achieve compliance. EPA has applied requirements in stages to enable the duty holder to seek independent advice and support.

Future regulation of the site

EPA will continue to enforce active regulatory notices and will consider use of additional regulatory tools as appropriate, in line with its Compliance and Enforcement Policy.

Barro Group is continuing to run weekly community forums until remediation works are completed.

As a requirement of the site's licence, Barro Group will need to ensure that the next environmental audit is completed by 30 March 2022.

As the site is not currently accepting waste, Barro Group will be required to ensure that they meet the EPA licence requirement that a landfill cell is capped with 0.5 metres of interim clay cover where a cell is going to not receive waste for 3 months or more.

From 1 July 2021, EPA will regulate the landfill under the EP Act 2017. The site's operating licence will automatically transfer over to become an operating licence under the new framework. From 1 July 2021 EPA will commence amending all operating licences to bring them in line with the new framework. In consultation with duty holders, EPA will determine which conditions will be amended, added or revoked. These amendments will also include the addition of new standard conditions where appropriate.

EPA will have an enhanced set of regulatory tools that can be used, in line with EPA's Compliance and Enforcement Policy, to support compliance. These are discussed in more detail in the section below.

Enhancements to the regulation of landfills in Victoria

There have been recent improvements in the state of knowledge around landfills, and their regulation, which means there is now a more robust approvals framework for the development of new landfills in Victoria.

Upcoming changes to the environment protection framework are also expected to enhance EPA's ability to approve and regulate landfills. These changes are expected to better protect local amenity and reduce the impacts from future landfills.

Updates to landfill licence conditions

In 2015, EPA began reviewing all EPA operating licences to ensure they appropriately regulate the level of risk. This involved reviewing the standard licences issued across industry sectors, with a view to ensuring they offer a consistent, transparent and risk-based regulatory oversight of EPA licenced sites, which would be applied by updating licence conditions, discharge limits and other administrative details.

EPA reviewed landfill licences in 2016 and developed a list of standard operating conditions which were applied to all operating licences, including Kealba landfill. Further detail on the updated conditions can be found in EPA publication 1323[14].

Enhancements to Victoria's environment protection framework

From 1 July 2021, EPA will regulate pollution and waste under the EP Act 2017[15], which replaces the EP Act 1970. The EP Act 2017 introduces a new legislative framework for environment protection in

[14] https://www.epa.vic.gov.au/-/media/epa/files/publications/1323-3.pdf

[15] Parliament of Victoria, 2018. *Environment Protection Amendment Act 2018*. Available from http://www.legislation.vic.gov.au/.

Victoria. It includes a new approach to environmental issues, focusing on preventing waste and pollution impacts rather than managing those impacts after they have occurred.

The legislation will enhance the protection of Victoria's environment and human health through a more proportionate, risk-based environment protection framework that includes:

- a preventative approach through a general environmental duty (GED)
- a tiered system of EPA permissions to support risk-based and proportionate regulatory oversight
- significant reforms to contaminated land and waste management
- increased maximum penalties
- requirements for more environmental information to be publicly available
- modernising and strengthening EPA's compliance and enforcement powers.

General environmental duty

The GED is a cornerstone of the new legislation. The GED will focus Victorian business, industry and the community on preventing harm and will require people to undertake reasonably practicable[16] steps to eliminate, or otherwise reduce risks of harm to human health and the environment from pollution and waste. The GED provides a significant shift in the way air quality will be managed in Victoria. It will require duty holders to take proactive steps to assess risks posed by the emissions from their operations and implement actions to minimise those risks.

Updates to permissions framework

From 1 July 2021, EPA will have a broader suite of compliance and enforcement tools to utilise when considering permissions and regulating existing permission holders.

The new permissioning framework will allow EPA to regulate waste activities and facilities in a more proportionate way, depending on the type of waste, the type of activities, and the level of risk that they present to the environment and human health.

The new laws introduce a new three-tiered permissions framework allowing proportionate controls to be applied based on the nature of the risks. The tiers consist of:

- Registrations, which will be automatically granted and are suited to organisations posing moderate to low risks but where standard controls can be applied across a sector.
- Permits, which will have largely standardised assessment processes by EPA and are suited to moderate or high-risk activities with low complexity.
- Licences, to apply customised conditions to manage those complex activities that need the highest level of regulatory control to manage their significant risks to human health and the environment. Development Licences, required before an Operating Licence or Permit is received, allow EPA to influence the design of works or a facility. Operating licences will be required for certain ongoing operational activities include customised conditions to consider the site-specific risks from that activity and may contain maximum emission limits for specified pollutants.

Permission holders will be required to meet their obligations under the GED as well as satisfy any conditions or requirements set out in their permit or licence. When undertaking assessments of

[16] Reasonably practicable includes having regard to the likelihood of the risk of harm eventuating, degree of harm that would result if the risk eventuated, actual and reasonable knowledge on that risk of harm and availability, suitability and cost of ways to eliminate or reduce the risk of harm.

permission applications under the EP Act 2017, EPA must take into account several factors including:

- How the applicant will comply with the GED and other duties under the new Act.
- The degree to which the activity may impact environmental values for each segment of the environment as identified in the Environment Reference Standard.
- Principles of environment protection.
- The state of knowledge of best available technology and techniques for a risk and the degree to which they are being used in an activity.
- The level of stakeholder engagement undertaken by the applicant.
- Whether the person is deemed a fit and proper person to undertake the activity.

EPA permissions can include specific controls and conditions to manage hazards and risks. Conditions and controls may include:

- Volumetric limits - these will set limits on the amount of waste materials allowed to be received at a site (based on maximum monthly inflow tonnage). Maximum safe onsite storage capacities would also be set (based on maximum cubic meters of waste).
- Risk management planning – including the need for an onsite risk assessment and management plan and emergency plans.
- Increased reporting requirements – including regular and ongoing reporting to EPA on inputs and outputs (mass balance reporting); and mandatory reporting requirements to EPA.
- Financial assurances – which may be applied to safeguard against abandonment. Requiring a duty holder to provide a secured dollar amount proportionate to the type and volume of waste being managed.

New tools and powers

The new legislation also provides EPA with a range of enhanced powers and regulatory tools including:

- Enhanced investigation and surveillance powers for EPA Authorised Officers.
- Higher penalties for pollution and waste offences.
- New waste duties that require appropriate management, records and tracking, to ensure better tracking of waste, and preventing unauthorised wastes being disposed to landfill.
- Stronger requirements around persons that can hold a permission, including a 'fit and proper person' test.
- New regulatory notices which can require a site to cease specific activities including:
    - Prohibition notice which can prohibit the person from engaging in an activity.
    - Improvement notice which allows EPA to require a duty holder to take action to remedy a contravention.
    - Non disturbance notice which enables EPA to stop certain activities at a site.
    - Environmental action notice which enables EPA to require a duty holder to undertake certain activities like community engagement or environmental monitoring for community health.

Enhancements to Victoria's planning framework

State planning policy contained within the Victoria Planning Provisions (VPPs) sets out broad principles for land use and development, including consideration of encroachment and land use compatibility. The Planning Policy Framework at Clause 13.07-1S (Land use compatibility), seeks to protect community amenity, human health and safety while facilitating appropriate commercial, industrial or other uses with potential adverse off-site impacts. EPA publication 1518: *Recommended separation distances for industrial residual air emissions* provides guidance for planning authorities on what land uses require separation, the types of land uses that are suitable as interface land uses and informs strategic land use planning decisions and consideration of planning permit applications. This guidance is also included under Clause 13.07-1S for consideration as a policy document.

The Victorian Government has recently introduced planning system improvements that address issues with conflicting land uses and their associated impacts on amenity, human health and safety. This has included amendments to the Victoria Planning Provisions to strengthen policy around consideration and implementation of buffers,[17] as well as the recent gazettal of the new Buffer Area Overlay (BAO)[18] and release of the updated Planning Practice Note[19] to support its implementation.

The BAO is a new planning tool that can be used to identify buffers and manage land use and development around industries with the potential for offsite impacts on human health or safety, or significant offsite impacts on amenity significant amenity, human health or safety impacts, such as landfills. This tool recognises that even when an industry is operating in accordance with all relevant statutory obligations, off-site impacts can still occur. In the case of landfills, the application of the BAO may be beneficial to ensure that land use and development within the buffer is compatible with its potential offsite impacts through operation as well as post closure.

Enhancements to EPA landfill guidance

The Landfill BPEM was last updated in 2015. Landfill owners and operators must have regard to the Landfill BPEM in the planning for works approval or licensing of future landfill sites and design of new landfill cells. The Landfill BPEM also provides guidance for EPA and planning authorities to consider when approving proposed landfills.

The guideline provides existing and future operators of landfills, planning authorities and regulating bodies with:

- information on potential impacts of landfills on the environment and how these are to be mitigated
- a clear statement of environmental performance objectives for each segment of the environment

[17] Via amendment VC175. Further detail is available at https://www.planning.vic.gov.au/schemes-and-amendments/browse-amendments?query=VC175&search_mode=id

[18] Via V10. Further information is available at https://www.planning.vic.gov.au/schemes-and-amendments/browse-amendments?query=V10&search_mode=id

[19] Via V10. Further information is available at https://www.planning.vic.gov.au/schemes-and-amendments/browse-amendments?query=V10&search_mode=id

- information on how to avoid or minimise environmental impacts, including suggested measures to meet the objectives.

The guideline is intended to be used as a default position for landfill siting, design, operation and rehabilitation. Landfill operators must meet the objectives and required outcomes by implementing the relevant best-practice measures, described as suggested measures. Where a landfill operator believes that, for a particular section of the guidelines, alternative means can achieve the objectives and required outcomes, a risk-based assessment will be required to support the proposed alternative measure. Alternatively, if EPA believes that additional requirements are needed to protect the environment, then this will also be supported by a risk-based assessment.

The Landfill BPEM requires that appropriate buffer distance be maintained between a landfill and sensitive land uses (receptors), to protect those receptors from negative impacts (such as landfill gas, offensive odours, noise, litter and dust). The Landfill BPEM prescribes the following buffer distances for a solid inert landfill:

- 100 metres from surface waters
- 200 metres from buildings and structures
- 1500 metres from an aerodrome for piston-engine propeller-driven aircraft
- 3000 metres from an aerodrome for jet aircraft.

Lesser buffer distances may be applied if a risk assessment is undertaken that considers design and operational measures and demonstrates that the environment will be protected and the amenity of the sensitive areas will not be adversely affected. As part of a risk management approach, additional design or operational measures will be required to ameliorate the risks associated with a reduction in buffer distances. Different buffer distances apply for closed landfills.

Buffer areas are not an alternative to providing appropriate management practices but provide for contingencies that may arise with typical management practices.

It is noted that the Landfill BPEM cannot be applied retrospectively in relation to previously issued planning permits or EPA permissions.

Future enhancements to landfill guidance

EPA will incorporate learnings from the Kealba landfill hotspots issue in future updates to landfill guidance and standards to ensure there is clarity for operators on the following:

- methods for preventing and detecting hotspots
- methodology on best practice approaches for hotspot remediation to assist duty holders to respond in a timely way.

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Appendix 1: Chronology of EPA's regulation of Kealba landfill hotspots

Date#	Activity*
26 November 2019	EPA schedules a joint inspection with Brimbank City Council for 3 December 2019 to investigate reports of odour and smoke from local community. This occurs prior to EPA being notified of potential hotspots by Barro Group.
26 November 2019	Barro notifies EPA that there are suspected hotspots in the landfill.
27 November 2019	EPA conducts inspection of the site.
2 December 2019	EPA commences air quality monitoring at two residential properties. Results are presented online using EPA AirWatch. Monitoring ceases on 17 December 2019, transitioning to air quality monitoring carried out by the landfill operator.
3 December 2019	EPA conducts inspection of the site.
9 December 2019	EPA issues Clean Up Notice (EPA ref. 90010782) requiring Barro Group to prepare a Landfill Hotspot Remediation Action Plan, Landfill Hotspot Risk Management Plan, and Landfill Hotspot Remediation Design.
19 December 2019	Barro Group provides Landfill Hotspot Remediation Action Plan to EPA in response to Clause 3.4 of the Clean Up Notice.
14 February 2020	Barro Group submits a request to EPA for an extension of time for compliance of Condition 3.5 and Condition 3.9 of the Clean Up Notice. EPA has an established process to consider extensions to regulatory notices, this requires a duty holder to seek an extension, and provide evidence it has made reasonable efforts to comply with current regulatory requirements, and demonstrate that they have been impacted by factors beyond their control.
20 February 2020	EPA conducts inspection of the site
24 February 2020	EPA meets with Barro Group and Golder Associates to review the results of hotspot identification investigations, and the remediation strategy to abate in order to establish the regulatory process for assessment and approval of this strategy.
28 February 2020	EPA assessed request and accepted the extension request and issues an Amended Clean Up Notice (90010782).
30 March 2020	Barro Group provides EPA with Landfill Hotspot Risk Management Plan, and Landfill Hotspot Remediation Design required under Clause 3.5.1 of amended Clean Up Notice
24 April 2020	EPA issues infringement notice (588873) to Barro Group for a breach of EPA licence conditions, for failing to apply daily cover to Cell 2), in contravention of section 27(2) of the EP Act 1970. The notice requires Barro Group to pay a fine of $8261.00.
29 April 2020	EPA issues Clean Up Notice (90011150) requiring Barro Group to undertake air monitoring and commence hotspot remediation works in line with the Landfill Hotspot Remediation Design report.
1 July 2020	EPA conducts an inspection of the site. During inspection EPA used specialised thermal imaging cameras and gas detectors to survey the hotspots for any elevated gas levels and did not detect any levels of concern.

23 July 2020	EPA revokes Clean Up Notice (90011150) as it is deemed that compliance has been achieved.
27 August 2020	EPA issues Clean Up Notice (90011471) requiring Barro Group to continue hotspot remediation works in line with the Landfill Hotspot Remediation Design report, monitor air quality, allow a trial program to 30 September 2020 to temporarily modify the way excavated waste is handled, and inform the community of remediation works.
29 September 2020	EPA conducts an inspection and undertakes odour surveys in nearby residential areas.
23 November 2020	EPA conducted odour surveys on Meteor Rise, Orbital Drive, and Rowe Street, Kealba.
10 December 2020	EPA conducts and inspection and undertakes odour surveys on Leavesden Avenue, Orbital Drive, Harefield Crescent, Driscolls Road, Rowan Drive, Brazilia Avenue, and Hedgeley Road, Kealba.
23 December 2020	EPA conducts an inspection to confirm closure arrangements (including landfill capping) for the planned closure from 23 December 2020 to 4 January 2021 over the holiday period.
30 December 2020	EPA conducts odour surveys on Harefield Crescent, Orbital Drive, Norman Street and Williams Street, Kealba.
8 January 2021	EPA conducts an inspection of the site.
4 February 2021	EPA conducts an inspection and undertakes odour surveys on Rumbriah Retreat to Barellan Close in St Albans.
18 February 2021	EPA conducts an inspection and undertakes odour surveys on Paringa Drive, Mulwala Gardens, Tanunda Mews and Barellan Close in St Albans.
4 March 2021	EPA conducts an inspection and undertakes odour surveys in the residential areas in Kealba and St Albans.
18 March 2021	EPA conducts an inspection and undertakes odour surveys in the residential areas in Kealba and St Albans.
26 March 2021	EPA issues Clean Up Notice (90012270) to Barro Group to remediate hotspots in in Cell 2 and Cell 5 North (referred to as hotspots 2,3 and 4) by 31 May 2021, and hotspot in Cell 4 (known as hotspot 1) by 31 July 2021. The notice also requires Barro Group to increase its communication to weekly community updates and establish a social media presence for the landfill. The notice continues to apply conditions to require air quality monitoring and controls to manage noise dust and odour.
1 April 2021	EPA conducts an inspection of the site.
16 April 2021	EPA conducts an inspection and undertakes an odour survey on Orbital Drive, Kealba.
28 April 2021	EPA conducts an inspection and undertakes odour surveys at two locations on Orbital Drive, Kealba.

#Does not include activities in May 2021.

* Does not include all instances where EPA conducted weekly odour surveys without a site inspection. EPA commenced weekly odour surveys in the local area in December 2020. Prior to this EPA conducted odour surveys at less frequent intervals.

Appendix 2: Summary of pollution reports submitted to EPA since June 2019

Month	Pollution reports received by EPA that allege Kealba landfill as the source
June 2019	0
July 2019	0
August 2019	0
September 2019	0
October 2019	0
November 2019	36
December 2019	59
January 2020	20
February 2020	12
March 2020	43
April 2020	13
May 2020	17
June 2020	24
July 2020	24
August 2020	17
September 2020	53
October 2020	18
November 2020	174
December 2020	134
January 2021	24
February 2021	52
March 2021	80
April 2021	31
May 2021*	15
Total	**834**

*Data is only provided for part of May 2021.