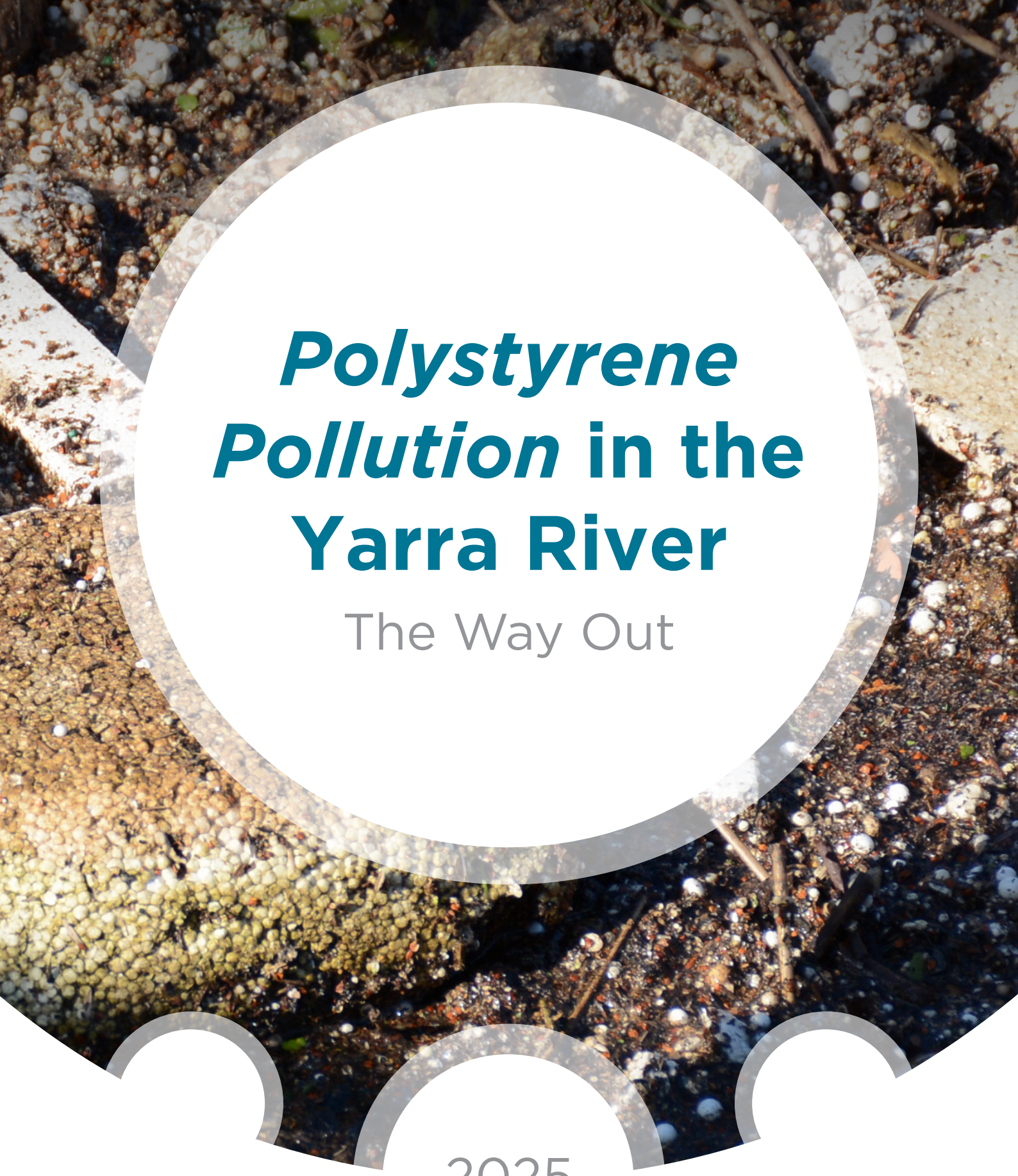

Polystyrene Pollution in the Yarra River

The Way Out

2025

YARRA RIVERKEEPER

VICTORIA State Government | Energy, Environment and Climate Action

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Acknowledgment *of* Country

The Yarra Riverkeeper Association acknowledges that the lands and waterways of the Yarra, Birrarung catchment, are the unceded territories of the Wurundjeri Woi-Wurrung and Bunurong peoples. We pay respect to Traditional Owners, who have and continue to care for Country. We acknowledge that the river now called Yarra has always been known as the Birrarung by its custodians.

Thank you

We acknowledge and thank our funding partner the State Government of Victoria and all the stakeholders that provided their support, time and valuable insights during interviews and roundtables. We value your contributions and look forward to collaborating in further advancing our shared vision for a Yarra, Birrarung that is healthy, protected and loved.

Foreword

This report is a guide for all stakeholders involved in the expanded polystyrene (EPS) life cycle in the construction industry. It provides targeted insights and actionable steps to help EPS manufacturers, people working in the construction industry, local government representatives and members of Expanded Polystyrene Australia (EPSA) to reduce EPS pollution in Melbourne and improve sustainability practices in the construction industry in Victoria.

The Yarra Riverkeeper Association encourages all stakeholders to:

- familiarise themselves with the problem of EPS pollution in Melbourne's waterways
- recognise the need for collective action across the EPS lifecycle, and
- identify what action they can take to reduce pollution and improve sustainability practices in Melbourne.

Executive **Summary**

Expanded Polystyrene pollution in our waterways

Waterways such as rivers act as a major transport pathway for all sizes and types of litter. As a result of the findings of previous polystyrene research (Despotellis et al. 2021; Barmand et al. 2020), EPS pollution has been made a priority project in the Yarra Strategic Plan (Burndap Birrarung burndap umarkoo). This highlights the seriousness of the problem, and the need for further work to ensure responsible use and management of this problematic material.

This project consisted of 3 phases:

- Phase 1 focused on preliminary field research to understand where EPS enters our waterways
- Phase 2 involved more in-depth monitoring to determine which sources contributed the most EPS pollution
- Phase 3 focused on mapping out all stakeholders who handle EPS or can influence the problem, to find gaps and provide the basis for an ongoing working group.

Through the activities in Phase 3 we concluded that:

The following stakeholders can influence practice at each point in the Polystyrene Pathway, from the manufacture of EPS to its use on construction sites and disposal of waste EPS. **(See Figure 1, pg 16)**

While other industries contribute to the presence of polystyrene in waterways, improving practices on construction sites is the right place to concentrate effort to eliminate polystyrene pollution in waterways:

With site hygiene and waste management established as part of building practice, and with a framework of regulatory standards and enforcement across Local Government Areas (LGAs) and the Environmental Protection Authority (EPA), a combination of better education and targeted enforcement will be most effective to improve practices in the construction industry, leveraging the influence of key players on site practices.

While construction contractors and workers have direct influence on what happens on site, they are embedded in business relationships and regulatory systems which should require and promote effective management of EPS.

Our analysis suggests five key strategic drivers are needed to improve practices and heavily reduce EPS pollution:

- Make managing EPS the new way of doing business.
- Make it a clear requirement that builders contain EPS on site.
- Put education and regulation together to shift behaviour.
- Track progress and share what's working.
- Facilitate action by an EPS pollution working group.

Recommended actions

The following recommendations are starting points for action. They should be refined and adapted as they are implemented.

1. Establish a EPS pollution working group to progressively reduce and ultimately eliminate polystyrene pollution from the construction industry. Resource the facilitation of that network as it expands its membership, sets medium term goals, initiates action around the strategies set out here, and monitors and reports on progress.

2. Clarify and standardise agreements between the EPA and LGAs on how the costs to LGAs as the main enforcer of polystyrene pollution in the construction industry can be met.

3. In Collaboration with the building and EPS manufacturing industries, improve storage and collection systems for EPS pods and cladding from construction sites, and require reporting of EPS collection programs from manufacturers.

4. With the building and EPS manufacturing industries, improve storage and collection systems for pod and cladding from construction sites, and require reporting of EPS collection programs.

5. EPA to revise and publicise a guidance note on managing EPS pollution in the construction industry, to provide direction to builders and LGAs on the requirement to contain and dispose of EPS during construction, including best practice procedures for handling EPS and penalties for non-compliance.

A 10-year roadmap for containing and eliminating EPS pollution should be built by the proposed working group. This should explore and expand on changes that the Phase 3 round tables touched on but have not yet investigated in depth.

Strategic drivers and recommendations summary table. **(See Table 1, pg 30)**

The key challenge for reducing EPS pollution in our rivers is that, despite the existence of recycling facilities, storage guidance, and regulation, there still isn't enough incentive for builders to keep their sites clean and dispose of their offcuts properly. Therefore, the focus of future work must be on creating the conditions that promote effective practices, namely through clearer obligations and the enforcement of those obligations.

Project **Vision**

for the Future of EPS in the Australian Construction Industry

We believe the Australian construction industry can be guided by a shared vision of 'driving industry-wide adoption of responsible EPS practices'. By embedding prevention methods upstream and improving downstream recovery, we believe sustainable practices can be implemented into everyday operations. Education and regulation can work together to shift industry expectations, while a network of stakeholders drives meaningful action. Progress can be tracked and success stories shared. A spirit of continuous improvement will ensure EPS is managed responsibly across the industry.

Projects **Summary**

The Polystyrene Pollution in the Yarra River project is made up of 3 phases of work. This report presents the results of Phase 3, which aims to reduce polystyrene pollution of Melbourne's waterways through stakeholder engagement.

Phase 1	Phase 2	Phase 3
2019-2020	2020-2022	2022-2024
Phase 1 focused on preliminary field research to understand where EPS enters our waterways. Field researchers observed where EPS was being used and documented initial evidence of pollution on sites. Further resources were awarded to continue the investigation to gather more evidence	Through further, in-depth, field research, Phase 2 focused on determining which sources contributed the most EPS pollution. Construction and whitegoods were found to be the top two polluting categories by volume. Citizen scientists helped with audits of river pollution to estimate the number of pieces of EPS moving down the Yarra every year. It was estimated that over 380 million pieces of EPS travel down the Yarra every year.	Phase 3 focused first on mapping out stakeholders involved in various capacities with EPS and finding the most useful area of focus for reduction of EPS pollution in our waterways. Work is already underway to limit EPS pollution from consumer food and whitegoods industries, but it was found that action was needed to reduce pollution from construction sites. Interviews and round tables were conducted, and key challenges and understandings were synthesised. Recommendations were critiqued and finalised.
Link to report	**Link to report**	

Project Introduction

Expanded Polystyrene pollution in our waterways

Waterways such as rivers act as a major transport pathway for all sizes and types of litter. High plastic litter loads in rivers, including both macro and microplastics, are due to high levels of mismanaged plastic waste arising from population-rich river catchments.

Expanded Polystyrene pollution has a significant impact on the health of Melbourne's urban rivers, including the Yarra (also known as the Birrarung, henceforth referred to as the 'Yarra, Birrarung') and the Maribyrnong (also known as the Mirrangbamurn, henceforth referred to as the 'Maribyrnong, Mirrangbamurn').

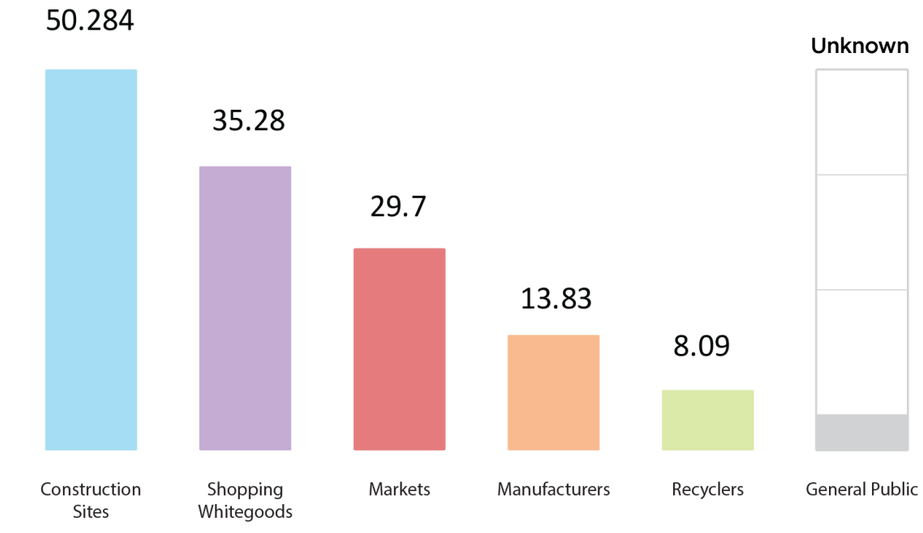
The Yarra Riverkeeper Association's Litter and Flows Report and Phase 1 of the EPS projects demonstrated that polystyrene is the most significant component of macro litter in the Yarra, Birrarung and dominates litter composition in the Maribyrnong, Mirrangbamurn. Based on floating Bandalong Litter Trap quantification in the Yarra, Birrarung in Phase 2, an estimated 380 million pieces enter the river every year. Residential construction, whitegoods, fresh food markets and manufacturing industries contribute significantly to this polystyrene pollution. Data obtained from microplastic trawls in the Yarra, Birrarung have revealed the severity of litter volume – two billion microplastics are estimated to flow into Port Phillip Bay annually.

Expanded polystyrene (EPS) is a cheap, easy-to-use material that has a terrible impact on waterways. It takes over 500 years to decompose (DEECA et al) and, as it breaks down, it leaches harmful chemicals into the waterways. It is ingested by birds, fish and frogs, and causes damage to their internal organs (Samandra et al 2023; Hollerova et al. 2023; Hwang et al. 2020).

The second phase of the project aimed to document the relative contribution of potential sources of polystyrene pollution and identify any further solutions that could be implemented to prevent polystyrene entering the Yarra, Birrarung. A field investigation into 80 construction sites revealed many patterns in everyday site practices and site conditions. This laid the foundation for 25 sources chosen for monitoring, over 5 different industries and over a 6-month monitoring period. The study found construction sites contributed the highest amount of EPS pollution, followed by whitegoods, then fresh food markets, manufacturers and, lastly, recyclers. It was clear that immediate attention needs to be paid to handling and containment practices of EPS across all these industries as pollution is constant and continuing.

These research projects highlighted the seriousness of the problem of EPS pollution in the Yarra, Birrarung, and the need for further work to be done. As a result, EPS pollution was made a priority project in the Yarra Strategic Plan (Burndap Birrarung burndap umarkoo).

The next step was to use the findings of Phases 1 and 2 to engage with stakeholders in initial discussions about control measures and management interventions to reduce polystyrene leakage and pollution. This required multi-stakeholder collaboration between the building industry, government bodies, and community groups to build relationships and co-develop solutions to this emerging issue.



Average volume in liters of EPS pollution per month by industry, Melbourne, 2022

Problem
Mapping

Understanding who's involved and where they are at.

The National Plastics Plan 2022[8] aimed to outline a national approach to increasing plastic recycling, finding alternatives to unnecessary plastics and reducing the impact of plastic on the environment.

This plan originally included all EPS uses in its scope, but with industry lobbying, only consumer EPS remained in the plan for phasing out. The suggested reason for this was that there are no readily available replacements for EPS in industry.

The industry-led phase-outs **do not** apply to:

- EPS used for business-to-business packaging, such as fresh produce boxes
- specialist packaging used in medical applications, for example, organ transport or pharmaceuticals
- EPS used in building and construction
- business-to-consumer packaging where there is a demonstrated and effective reuse model in operation, for example, bulk cold home-delivered meal services.

This means that there is potential for EPS from industry to continue polluting our waterways untracked, with little accountability for those responsible.

Consequently, the aims of Phase 3 of this project were to take existing research and understanding of EPS pollution in the field, and then include the regulatory and human factors influencing the pollution problem. This would help generate a clear picture of where the gaps are for industry pollution to occur and who can help close them.

We began Phase 3 by mapping out the multi-factored failure to contain EPS, as previously documented in the Phase 1 and 2 EPS pollution reports. The purpose of this mapping was to understand who has contributed to the current EPS pollution situation, and how. We call this map the Polystyrene Pathway.

The idea for the polystyrene pollution pathway arose early, taking reference from design-thinking principles and customer journey mapping. Developing the pollution pathway map enabled us to gain a full picture of the actions that had contributed to the current state of EPS pollution in the Yarra, Birrarung – whether adding to it or reducing it.

This served as a base for targeted interviews with stakeholders across the stages of EPS pollution. Interviewees included: EPS manufacturers and peak bodies, builder's associations, whitegoods retailers, state and local government, the EPA, Melbourne Water and the Australian Packaging Covenant Organisation (APCO).

For the results of these interviews, see Appendix for insights tables.

Current responses

In order to inform the most effective interventions, it was critical to understand the current stance of key stakeholders across the polystyrene life cycle. Aside from the key insights resulting from interviews, a few direct responses to EPS pollution are highlighted in the following section.

Expanded Polystyrene Australia

EPSA has recently updated its website to include more (and easier to access) information on EPS recycling options.

With 3 new recycling sites opening up across Australia, EPSA's StyroCycle is 'working closely with industry and government bodies to increase the number of recycling depots and collections for the recycling of expanded polystyrene'.

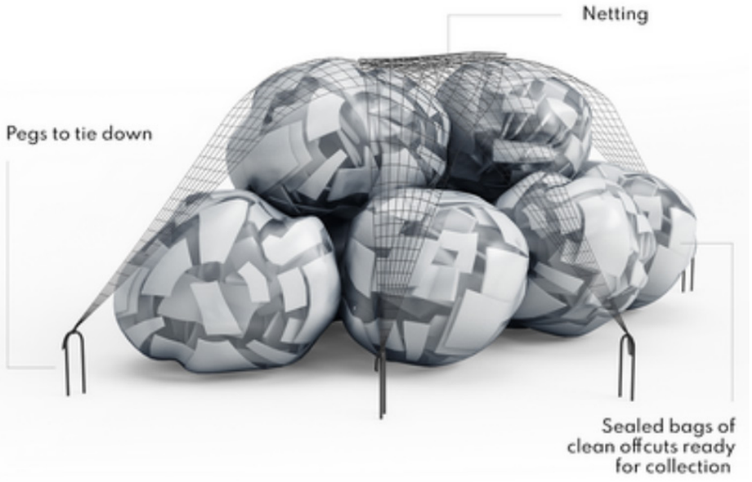
However, StyroCycle recycling requires EPS to be clean, which is a problem for any polystyrene covered in dirt, concrete or cement from use.

It is unclear how much EPS the recycling program has received, despite direct questions being posed to the industry peak body, which should already have reporting requirements.

The **EPSA Pod Code of practice** is a very clear and well thought out guidance on how to retain and control EPS offcuts. Followed correctly by each part of the chain, it will greatly reduce EPS pollution.

It is unclear how well builders know the pod code of practice but, based on the volume of EPS pollution at site inspections in Phase 2, it appears that the knowledge of how to handle EPS is rarely transferred into action.

Until reporting shows otherwise, we conclude that more could be done by EPS manufacturers to pick up correctly bagged waste EPS under the sterocycle program, or incentivise drop off of EPS waste to sterocycle recycling bins, rather than relying on voluntary participation and recycling.



What is expected of builders?
EPSA Pod Code of Practice[8]

Suppliers

Conduct reasonable due diligence about product usage and storage on destination building site to ensure product will be safe and secure.

Be aware of the weather on planned date of delivery, and avoid having drops on days of high wind.

Deliver goods and bags for clean up on site and secure product in place upon delivery by approved tie down method.*

Tie down in smaller packs on windy days to avoid product lift-off.

Take photos after delivery to site to retain as proof that delivery has been made to Airpop Pod code of practice

Builders / Concreters

Manage the use of products on site. Ensure pods are secure using the approved tie down method at all times;

Pack up scrap pods and any off-cuts and place into bags as provided by the supplier. Secure with approved tie down method.

Notify supplier that unused pods and off-cuts are ready to be collected.

Intact pods, along with off-cuts are to be secured by approved method ready for collection to avoid being blown off site.

All recyclable Airpop is to be kept separate from other materials to avoid contamination.

Only clean Airpop waste will be collected from the site. Bags containing products other than Airpop offcuts will not be collected. Contaminated Airpop should be placed into the general waste stream as soon as practicable.**

Builders are responsible for site compliance with Council requirements on site cleanliness. Airpop moulders of waffle pods will assist your compliance program through timely scrap pick-up.

Developers

Consider the installation of perimeter fencing to the development site to safeguard the environment.

Scrap Collection

Take back the clean scrap from building sites in the return bags supplied within 2 days of notification by builder.

Recycle & reuse all clean scrap that is collected in a manner consistent with EPSA commitments towards achieving a plastics circular economy.

Take photos of the scrap bags and issue as a warning to builder if the collected scrap contains contamination

EPA (Victoria)

An EPA compliance manager explained they "have a mandate for pollution monitoring and compliance, focusing mainly on big pollution events with high consequences."

Despite this, the EPA has "been vigilant for some time on the issue of waffle slab styrene on site. We have and will enforce compliance which could lead to heavy penalties for anyone that fails to comply."

The main ways in which the EPA can contribute to the minimisation of EPS pollution are by:

- educating industry about the 'general environmental duty' (GED, as stipulated by the Environment Protection Act, 2017), supporting industry to meet the GED, and
- enforcing it where necessary having their Officers for the Protection of the Local Environment (OPLEs) respond to smaller-scale and lower risk EPS pollution and waste reports, in collaboration with local councils.

In combination, these set the expectations for EPS waste management for industry, and provide the legislative grounds for enforcement.

The purpose of the OPLE Program is to decrease the environmental and amenity impacts of lower risk and lower complexity waste and pollution issues in the state of Victoria. OPLEs work with local councils to help industry, business and community find, prevent and resolve environmental issues. The OPLE pilot commenced in 2017 and transitioned to an embedded program in 2022.

The GED often provides EPA's authorised officers with grounds for issuing remedial notices, if there are poor waste management practices at specific sites. In the last 12 months, officers in EPA's Northern Metropolitan Region took compliance action on at least 2 sites with poor waste management practices specifically relating to EPS, and achieved improved outcomes.

It's an area the region plans to continue investigating in the new financial year. However, to date, no data has been received to show the number of warnings or fines that have been given out.

The intersection of EPA enforcement with local council officers, however, muddies the responsibilities of who responds to residential construction pollution.

LGAs

Local government is the first level of authority and enforcement on the cleanliness of residential construction sites.

Unfortunately, as is the case with many issues that extend across different LGAs, different methods, guiding documentation and structures exist to respond to issues, of which EPS pollution is one.

The variety of guidance and expectations for EPS handling and the lack of resourcing for enforcement at the local government level, weakens our overall response as a city, especially given that the EPA prefers not to respond to one off small-scale incidents. This creates an unresolved gap for keeping builders accountable for their use of EPS.

Of the LGAs who responded to our engagement, and subsequently attended the round table, only one (Wyndham City Council) had specific guidance on EPS for builders. The city of Wyndham made over one million dollars in construction fines, and City of Casey made 566 infringements, yet the pollution continues.

Builders have a high rate of turnover with their contractors, the officers said, and that makes educating them and holding them accountable difficult. Site foremans are spread thinner than ever, with one site foreman managing over 50 builds.

Some councils have also incorporated waffle pod management into their local laws.

Wyndham City's amended local law is one such example, where they have incorporated 2 specific waffle pod requirements:

1. ensure that any polystyrene foam material kept on the building site is secure and does not blow beyond the boundary of the building site;
2. and must ensure that all residual polystyrene foam material is removed from the building site within 48 hours of any slab being poured.

Case Study

City of Casey has taken a different approach. In the council's own words:

'The City of Casey has been actively pursuing circular economy (CE) strategies in the built environment to reduce waste and emissions, as the municipality expects to reach 616,000 residents by 2041. A key initiative is the Circular Economy Living Lab (CELL), an innovation program that fosters collaboration Council and businesses, start-ups, research institutions, and not-for-profit organisations to test and trial solutions to advance towards ambitious environmental goals.

One key project under CELL addressed the impact of expanded polystyrene (EPS) waffle pods, lightweight blocks used in concrete slabs to reduce the amount of concrete required. Though these products are cost-effective, their use in construction sites often leads to severe environmental pollution due to poor waste management. In collaboration with RMIT, City of Casey explored sustainable alternatives to EPS waffle pods. The identified alternatives, made from locally sourced and recycled materials, were found to be both technically and cost competitive compared to traditional EPS.

Despite the promise of these alternatives, the construction and demolition (C&D) sector continues to face challenges in adopting them. Procurement is mostly driven by cost, and strong supplier relationships further hinder the shift towards more sustainable choices. Furthermore, with many stakeholders involved, enforcing sustainable procurement and construction practices has proven difficult for Council.
In Casey and across Australia, the complexity of the supply chain, combined with the sector's focus on cost-saving, has slowed the transition to greener alternatives. To overcome these barriers, Casey has employed a phased approach, using Living Labs like CELL to trial innovations before scaling them up. This incremental strategy has been instrumental in demonstrating the feasibility of sustainable solutions in real-world settings.

Engaging motivated developers committed to sustainability has been key to advancing circular economy goals. Strong partnerships with these developers have allowed the City of Casey to make progress towards its ambitious net-zero emissions and waste reduction targets.

Additionally, Council has been actively involved in Sustainability Victoria's Buy Recycled Service, a state initiative that promotes the use of recycled products in procurement processes. This program offers guidance and support to councils and businesses in making more sustainable purchasing decisions, helping embed CE principles into procurement practices.

While there is still much to be done, the City of Casey's collaborative approach, strong stakeholder engagement, and commitment to sharing lessons with other councils [is] paving the way for systemic change. By championing innovation and advocating sustainable procurement, Casey is positioning itself as a leader in circular economy and sustainability initiatives within Victoria.'

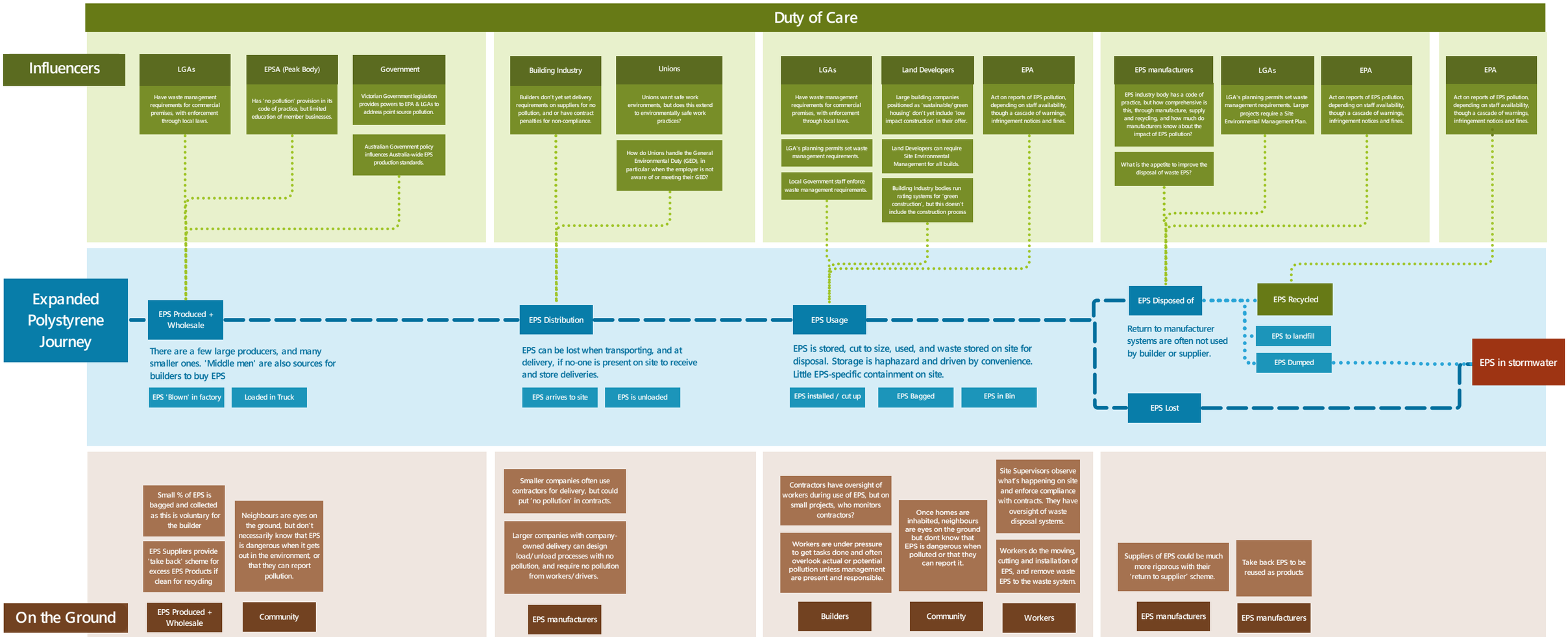
The EPS Pathway

To understand the multiple layers of influence that create the conditions for EPS pollution, a pathway was designed to visualise key factors and show the entire environment in one diagram (see figure 1). This is what we call the Polystyrene Pathway, the physical on ground occurrences with unseen influencers above and below. The bottom layer in brown shows the physical occurrences, or 'how EPS is used on the ground'. The middle layer in blue shows the life cycle of EPS from its manufacture to its escape into waterways.

Following this, the layers of influencing factors were revised and refined by the roundtable participants as an activity to strengthen our understanding.

Figure 1

Expanded Polystyrene Pollution Pathway + Influencers (Construction)



Roundtable **Insights**

Over the course of Phase 3, two roundtable discussions took place to address the gaps of knowledge in the Polystyrene pathway and the influence of key stakeholders. Stakeholders invited to participate included participants from local government, state government and the building industry.[1]

Roundtable one

Goal

Identify how to eliminate the flow of polystyrene pollution from the construction industry into Melbourne's waterways through targeted and concerted action.

Methodology

Round Table 1, conducted in 2023 as part of Phase 3 of this project, analysed on-ground activities and identified who can influence practice at each point in the Polystyrene Pathway, from the manufacture of EPS to its use on construction sites and disposal of waste EPS.

EPS is a low priority for many in the construction industry, and one of many concerns of people in planning and regulatory systems. Making it a higher priority depends on finding people with an interest, understanding their perception of 'business as usual' and the opportunities they see for doing things differently.

[1] Department of Energy, Environment and Climate Action, Melbourne Water, Environment Protection Authority, Master Builders Association, Housing Industry Association, Australian Packaging Covenant Organisation, Cities of Wyndham, Casey, Melbourne and Boroondara, Chain of Ponds Collaboration, Moonee Ponds Creek litter team.

A diagram created to help participants understand and visualise the different layers this problem is affected by.

The following questions were introduced at Round Table 1 in the form of conversation-based inquiry, with the aim of probing participants' perceptions of business as usual in the Polystyrene Pathway:

In your part of the Polystyrene Pathway, how is potential pollution handled now?
What is current practice?
What policies lock that in place?
What's the thinking behind all that?

What could be done differently?
Is this a new idea? Or has it tried before and failed? If so, why?
What thinking would push that along?

What's shifting?
Are social attitudes shifting?
Might new technologies/materials bring new ways to operate?
Is the structure of the industry changing?

Action: can we build an informal network?

> "Polystyrene is mostly well confined at manufacture and dispersed through many locations at the end of the Pathway. Return for effort is likely to be highest by concentrating on construction sites, and practices for EPS use, storage and removal of waste."

Image | Roundtable facilitator Ross leading group discussions around the polystyrene pathway for mapping.

Key findings

Round Table 1 identified and concluded that:

improving practices on construction sites was the right place to concentrate efforts to eliminate polystyrene pollution in waterways:

With site hygiene and waste management established as part of building practice, and with a framework of regulatory standards and enforcement across LGAs and the EPA, a combination of better education and targeted enforcement would do most to improve practices in the construction industry, leveraging the influence of key players on site practices.

Eliminating EPS pollution from waterways is best undertaken not by one authority or industry leader, but by a network of committed people who organise for collective action across many organisations.

In a network, hubs of expertise and influence across industry, government and civil society can share their reading of possibilities for change. For example, those in the EPA have a one view of what's happening in the construction industry, and those in building associations have another.

Staff for whom EPS pollution is one of many responsibilities can have more impact by aligning their actions to create shifts in business as usual. Each can generate buy-in in their sphere of influence and bring more people into the design and implementation of strategy. The network can track implementation of strategies across the Polystyrene Pathway. People can adjust strategies or change course if a particular strategy is not working.

The constraints on change in practice are significant.

- Polystyrene is used in many aspects of construction and is low-cost. There is little economic incentive for builders to change current practice.
- Alternatives to polystyrene, such as cardboard and recycled plastic, are not as cheap as EPS
- Site cleanliness and appropriate storage seems too much effort for workers with multiple jobs and a lack of education.
- There are many residential construction sites, and not many resources to monitor compliance. (However, large-scale residential development is often managed by a single or several developers, opening a possible path of influence.)
- Costs for non-compliance with building permit conditions or EPA regulations can be passed on by builders to the consumer in the cost of builds.
- The EPA has a lengthy process for outright suspension of activity on a building site.
- Making the manufacturer of a material responsible for the whole-of-life-cycle costs, including removal from the waste stream, is an approach being applied in other industries, but application to EPS manufacturers requires government resolve in policy and in enforcement.
- Rating systems for sustainable buildings focus on the end product, not the construction process. (However, the scope of sustainability could be expanded to include the energy and materials used in the building process and the impact on the surrounding environment. 'Green' branding has some standing in the market, but the proportion of consumers willing to pay a premium for sustainable buildings or low impact buildings is still low.)

In light of the constraints, and in light of who has influence on practice and policy at each step in the Polystyrene Pathway, what strategic drivers might make a difference?

Polystyrene is mostly well confined at manufacture and dispersed through many locations at the end of the Pathway. Return for effort is likely to be highest by concentrating on construction sites, and practices for EPS use, storage and removal of waste.

Site hygiene and waste management in the construction industry have well-established arrangements in site management systems, contracts, planning permit conditions and enforcement, and building industry standards, accreditation and education.

Two approaches would make more of these existing arrangements:

- better education about the impact of EPS pollution and ways to avoid it; and,
- Melbourne-wide consistent enforcement.

To test the merits of each approach, and to generate understanding and buy-in amongst those who would have to improve education and enforcement, Roundtable members now need to talk with people who can influence practice.

Roundtable two

Goal

To build on the findings from Round Table 1 and establish how education and targeted enforcement can best be organised to eliminate the flow of polystyrene pollution from the construction industry into Melbourne's waterways.

Methodology

Round Table 2, conducted in 2024 as part of Phase 3 of this project, involved participants from local government, state government and the building industry being tasked to identify where action could be taken to eliminate EPS from Melbourne's creeks and rivers. Participants looked in detail at what capacities could be mobilised and what makes action difficult.

Key findings

Along with the work from Round Table 1, this report draws on perspectives from a wide range of stakeholders. This report gives their assessment of what currently happens around the lines of influence and proposes five strategic drivers for eliminating EPS pollution from the construction industry. These strategies are a beginning point for action. The underpinning assessment and the strategies themselves should be amended and expanded as action proceeds. As new people join this collective effort, all stakeholders should understand what is happening along the Polystyrene Pathway, know what others are doing and consider what they can do.

> "Polystyrene is well-confined at manufacture, and dispersed through many locations at the end of the Pathway. Return for effort is likely to be highest by concentrating on construction sites, and practices for EPS use, storage and removal of waste."

Image | Roundtable facilitator Ross leading group discussions critiquing the suggested recommendations.

Five strategies to eliminate EPS pollution from the construction industry

While contractors and workers have direct influence on what happens on site, they are embedded in business relationships and regulatory systems which should require and promote effective management of EPS. Our analysis suggests five key strategic drivers, where alignment between the efforts of participants will improve practices and eliminate EPS pollution:

1. Make managing EPS the new way of doing business.
2. Highlight the requirement that builders contain EPS on site.
3. Put education and regulation together to shift expectations.
4. Track progress and tell the stories of what's working.
5. Facilitate action by a network of stakeholders.

1. Make managing EPS the new way of doing business

When EPS migrates out of construction sites and enters the drainage system and waterways, damage occurs out of sight – building activity itself is not affected. This must change. Managing EPS must be a new way of doing business, from developers to on-site workers.

While large developers set expectations for building companies, who include site management in contractor agreements, close and consistent EPS management is lacking at each of these levels. Although EPS is beginning to appear in builder education programs, it's not yet part of certifications or rating schemes. Building companies marketing themselves as 'sustainable' refer to energy ratings but overlook environmental impacts of their construction processes.

On site, contractors have oversight of workers during use of EPS. Larger building companies have systems for site hygiene and waste management, but EPS-specific management – such as secure storage, controlled use, and proper disposal – is often neglected. Most smaller projects, with less oversight, face even greater challenges as workers under pressure don't always act on EPS pollution unless contractors and the building company make this a requirement. We however, support the percantage that do.

EPS escapes from sites in three ways:

1. Waffle pods are cut and often dumped off site.
2. Cladding breaks and sheds as it is handled.
3. Waste EPS is poorly stored on site.

On greenfield sites, shared secure storage for EPS waste is sometimes arranged, but smaller sites often use open bins or let waste accumulate against fencing. Although manufacturers have programs to collect EPS waste, the process is inconsistent. Builders are meant to use large bags for storage before pick-up, but research shows this is rare. Instead, most EPS is stored in corrugated fence bins, which allow small pieces to escape. In many cases, EPS was observed scattered across sites, breaking down without proper care.

Providing a dedicated, purpose-built container or a closed solid-walled bin for waste EPS would significantly reduce EPS pollution. Establishing a containment requirement with a clear directive – 'put it in the bin' – would simplify enforcement, promote proper waste management, and minimise environmental impact.

2. Make clear the requirement that builders contain EPS on site

On-site practices will change when:

- workers and on-site management know that eliminating EPS pollution is their responsibility
- their performance is monitored, and
- there are predictable, escalating penalties for not complying with their responsibilities.

We need an authoritative statement of what is expected on construction sites that can be operationalised at local level through collaboration between EPA and LGA staff.

Under the Environment Protection Act 2017, the general environmental duty (GED) requires anyone whose actions harm the environment to take responsibility, and LGAs have power to control litter. An EPA guidance note should be developed that:

- clarifies that EPS pollution must not leave a construction site
- explains how the GED and litter provisions work together, and
- outlines enforcement steps, including fines.

Deciding how to frame guidance is a significant task. Requirements in law might be specified in a code of practice that can be updated more readily than a law itself. Penalties should be increased to maximise the incentive to maintain good practices on-site.

Through planning permits and local laws, LGAs set waste management requirements for construction activity, and their litter officers, local laws officers and other staff initiate education and enforcement. These can be reinforced by suppliers, developers, builders and their industry associations.

An EPA guidance note would:

- provide a rationale and template for requirements that can be made by LGAs (whether permit conditions or local laws), and a framework of penalties
- clarify how the litter provisions of the Environment Protection Act and the GED can work together.

An LGA could adapt and adopt these provisions, needing less time and fewer resources to bring them into a workable form. The building industry would be clear what the GED means for handling EPS, and there would be more consistency across LGAs.

Whether the LGA or the Victorian State Government is the beneficiary of fines will affect LGA willingness to take on the task of managing EPS pollution, and needs to be negotiated so this does not stand in the way of LGA action.

Enforcement is a challenge and EPS pollution visibility can be temporary across many sites. On-site evidence of pollution is crucial, and collaboration between LGA staff and the EPA's OPLEs is critical. Together, they can help develop local strategies combining education and enforcement in a way that fits local circumstances.

3. Put education and regulation together to shift expectations

Education works when requirements are enforced; enforcement works when education provides the reasons behind what is required.

The findings of a collaborative report into *protecting stormwater quality from building and construction site* (The City of Kingston, Melbourne Water, 2003) were that combining enforcement with education shifts construction industry behaviour:

"The audit results of this project and the reviews of similar projects in Victoria and nationally indicate that education alone is ineffective at causing long term behavioural change. Penalties are required as well as education and the penalty levels must be sufficient to act as a deterrent even if the chances of getting caught are small."

The EPA is responsible for educating industries on meeting the GED, and has developed a toolkit for this purpose, making it the primary resource for educational strategies. Requiring building industry bodies to use those materials in builder education, in combination with on-site education by LGA and EPA local staff during monitoring, should create a tipping point for embedding EPS management into site practices, if sustained.

This approach will enable builders to understand the need to manage this aspect of their business, driving new behaviours into site management systems and norms.

Targeting sites will be necessary due to limited resources and budgets until a more robust and competent system can increase surveillance and enforcement. Larger building companies could be encouraged to incorporate EPS management into their waste management systems and contractual requirements. Targeted education of builders in specific geographic areas in which EPS pollution is most prevalent is another possible approach. The goal of which would be to ensure builders in these specific areas understand the importance of compliance.

Fundamental to targeting will be local EPA and LGA staff working together to:

- combine education with enforcement
- decide who will do what
- decide how 'intel' will be shared
- systematically track what is working and what isn't.

Strategies must be developed locally, tailored to the specific circumstances and led by those taking action.

4. Track progress and tell the story of what's working

We need a baseline of the presence of EPS in waterways to track progress, along with success stories to inspire and guide people to take action.

While EPS monitoring in waterways is currently limited, there are now low-cost, reliable methods that should be integrated into the operations of relevant authorities. Data sharing needs to be agreed and a data repository created – allowing access to information about EPS pollution levels and progress over time.

In addition to data, real-world stories of change, from builders to local councils, are crucial. When people hear how others like them have made improvements, they gain both inspiration and practical learnings. For example, some LGAs have decided to act not just on litter, but on EPS from construction, because EPS pollution materially affects the environment their residents value. This decision adds to their workload, but sharing how they made this choice, and how they manage the additional responsibility, can influence the thinking of staff and councillors of other LGAs.

Similarly, when builders adopt rigorous systems to contain EPS, and tell others how they are doing that, their experiences can demonstrate that implementing change is both achievable and less challenging than anticipated.

The stories exist – they just need to be found, crafted into compelling narratives for the right audience, and shared through the channels they engage with.

5. Facilitate action by network of stakeholders

Changing business-as-usual will require collective action. This is not a problem that can be solved by top-down direction from a single authority. The only way to eliminate EPS pollution from construction is to facilitate action by a network of stakeholders.

While EPS pollution of waterways is a serious concern for those who are aware of the problem, currently most stakeholders in the construction industry are uninformed. However, some stakeholders are taking steps towards change. Bringing these stakeholders together as a network to promote systemic improvement could be a real catalyst for change, but this will not happen on its own.

Actions for the network's development include:

- Recruit and continually engage stakeholders.
- Share insights to build an understanding of the multifaceted problem.
- Set long-term goals and a roadmap for eliminating EPS in construction.
- Define medium-term goals with timelines and resources.
- Support immediate action within each stakeholder's influence.
- Facilitate collaboration, addressing issues, and learning from successes and failures.
- Advocate for systemic changes and securing resources, network sponsors and lines of accountability to sustain the network.

This report identifies starting points for reducing EPS pollution from the construction industry that lie within the immediate influence of the construction industry, LGAs, the EPA and EPS manufacturers. A 3-5year roadmap should be built by the network considering changes the Phase 3 round tables have touched on but not yet investigated in depth:

- Substitute EPS with less harmful materials that have a lower propensity to move into drainage systems.
- Implement extended product responsibility schemes for EPS.
- Reduce EPS use in other sectors, such as retail and food industries, in order to influence public opinion and expectations of EPS use more broadly.
- Improve stormwater systems to remove EPS before it enters waterways.

Recommendations

These recommendations are not all-encompassing, but provide starting points for action. They should be refined and adapted as they are implemented.

1. **Develop and publicise an EPA guidance note on managing EPS pollution in the construction industry. This should be a guide, for builders and LGAs, on the requirement to contain and dispose of all EPS during construction. It should describe best practice procedures for handling EPS and detail the penalties for non-compliance.**

2. **Negotiate agreement on how the costs to LGAs of enforcement and education in relation to eliminating polystyrene pollution in the construction industry can be met.**

3. **With the building and EPS manufacturing industries, improve storage and collection systems for EPS pods and cladding from construction sites, and require reporting of EPS collection programs.**

4. **Establish a network of stakeholders to progressively reduce and ultimately eliminate polystyrene pollution from the construction industry. Resource the facilitation of that network as it expands its membership, sets medium term goals, initiates action around the strategies set out here, and monitors and reports progress.**

Our **Vision**

Driving industry-wide adoption of responsible EPS practices

The Recommended Actions summarized within this section are the key priority initiatives identified throughout the project; they are not exhaustive but are the key starting points for action relative to the stakeholders of influence. The below Recommended Actions should be improved as they are implemented. Together, they should respond to the constraints and build on the identified strategic drivers.

Our strategic Drivers

1. Facilitate action by a network of stakeholders
2. Make managing EPS the new way of doing business
3. Make clearer the requirement that builders contain EPS on site
4. Put education and regulation together to shift expectations
5. Track progress and tell the stories of what's working

	Constraints	Recommendations	Suggested Lead Agency	Timeline
UPSTREAM	EPS pollution has persisted due to a disjointed response without structure and clear leadership.	**Establish a network to change policy, address the economic challenge for substitution, and resource the facilitation of that network. Expand membership, include the EPS industry, set medium term goals and initiates action around the strategies set out here, and monitor and report progress.**	DEECA to begin.	Mid 2025 - ongoing
	EPS manufacturers aren't fully accountable for lifecycle costs, including dirty, unrecyclable EPS.	**Expand Manufacturer responsability schemes for EPS and/or development of sector specific schemes. Include dirty and unrecyclabe EPS. Assess the feasibility of whole-of-life cycle costs as a way to incentivise non-polluting use and removal from the waste stream.**	Sustainability Victoria	Mid 2026- ongoing
	EPS is widely used in construction and is cheap, with little economic incentive for builders to change current practice.	**Create grants to scale uptake of EPS alternatives. Support the promotion of alternative material suppliers with supplier directories & solution focused case studies.**	State Government supported by EPSA and building industry	Mid 2025 - 2026
	Rating systems for sustainable buildings exclude pollution in the construction process.	**Ensure builder education, licensing, registration of trades, and 'green' rating schemes cover practices that eliminate EPS pollution.**	Building industry bodies	2026- ongoing
ON THE GROUND	Some LGAs who enforce regulations don't receive the penalty funds from builders, it goes to state revenue. There is limited resources to monitor compliance across many residential sites for periods long enough to establish a norm.	**Negotiate an agreement on covering LGA costs for increased ongoing enforcement and education on polystyrene elimination in construction.** **Waste management plans should address EPS pollution through policies, permits, local laws, education, and enforcement activities.** **Increase staffing to enforce local laws and the GED on construction sites. EPA to see EPS pollution as a higher priority & employ a team.**	Municipal Association of Victoria / State Government	2026 - 2027
	Costs for non-compliance with building permit conditions or EPA regulations can be passed on by builders to the consumer.	**Increase penalties to deter pollution, recover costs and encourage alternatives. Create incentives for best practice EPS management. Publicize a EPA Guidance Note for managing EPS pollution in construction, offering guidance on containing, disposing of, and handling EPS, along with penalties for non-compliance.**	State Gov Supported by EPA/ LGAs	2026 - 2027
	Storing EPS correctly seems too much effort for workers with multiple jobs and a lack of education, and current participating in existing pod recycling programs is low.	**Investigate worker education on GED in construction and improve education on EPS pollution impacts, and showcase best practices for storing and collecting pods and cladding.** **Require public reporting and targets on EPS collection programs.**	MBAV and HIA, supported by EPSA	2026 - ongoing

Our **Conclusion**

This project and series of three reports have provided a comprehensive understanding of EPS pollution and uncovered the key barriers to its reduction. Through stakeholder interviews and round tables, we successfully mapped the problem at multiple levels, gaining insights into what actions have been taken and identifying the key players invested to drive change. The round tables, in particular, highlighted critical gaps in authority and enforcement, which need urgent attention moving forward. Addressing these systemic issues will be essential to creating lasting solutions.

Notably, some LGAs have already implemented measures to reduce EPS pollution, setting a benchmark for others to follow. These examples demonstrate that progress is possible with the right focus, resource and commitment. However, to truly sustain and expand these efforts, the formation of a working group is necessary. This group will be responsible for overseeing the continued reduction of EPS pollution and advancing the Recommended Actions detailed in this report.

This report should mark a closure on documenting the problem of EPS pollution in Melbourne's waterways, and the beginning of decisive action for Victoria and hopefully Australia-wide. The focus must now shift to implementing changes across various levels of influence from site practices and local councils to industry and regulatory bodies – to ensure that EPS pollution is systemically reduced, and we achieve our shared vision of 'Driving industry-wide adoption of responsible EPS practices'.

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Appendix

1 - Stakeholder Interviews

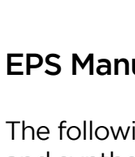
EPS Manufacturers

The following information was gathered and synthesised from interviews with EPS manufacturers and the peak body Expanded Polystyrene Australia (EPSA). EPSA have guidance on handling EPS for builders, and manufacturers recycle clean EPS.

The main aims were to understand what manufacturers believed their roles were in managing EPS pollution, and if they could do more.

What we know

- Vested interest in ensuring continued production and use of EPS
- Peak body has high influence over government
- Responsive to our approach, possibly brand conscious
- Code of Practice on waffle pods, questionable effectiveness.
- Small steps to product life cycle/product stewardship



What we're missing

- Level of influence over members
- Level of investment (true change or window-dressing)
- Rate of retrieval of EPS waste from construction site by members
- How central are they to addressing the problem?
- Effectiveness of projects (e.g. Styrocycle Project?)

Working Relationship

YES; Mostly engaging and responsive. The relationship is delicate due to conflicting interests.

State of Knowledge

- At peak body: High in relation to regulatory environment and political landscape
- Had not been aware about extend of polystyrene ending up in rivers
- Awareness increased after presentation to members' forum

Gaps

- Knowledge to action gap
- Try to get them to share data on retrieval of EPS by members (if they don't have the data; encourage them to start collecting)

User - Construction

The following information was gathered and synthasised from interviews with peak Building bodies in Melbourne. Said bodies represented two-thirds (12,000) of all builders. They were key contacts for this category as all other attempts to speak with builders resulted in no communication. This result speaks for itself, and highlights the state of the industry. The aims were to understand on ground realities and behaviors previously documented, and where improvements could be made.

What we know

- Nine out of ten sites using polystyrene had pollution
- Waste management not a priority (EPS even less so)
- Very diverse industry: size, affiliation with peak bodies
- Multiple parties and stages of develpment on site
- "Dumping" culture exists
- Cost-driven decison making
- In past projects, enforcement was much more effective that education

What we're missing

- Are there some builders already using covered bins?
- What would be the most functional method with the lowest threshold for adoption?
- We are aware that our knowledge is second hand; we have not engaged directly with construction companies/workers

Working Relationship

- YES, continuing relationship with peak bodies;
- NO, no relationship with construction companies

State of Knowledge

- Peak bodies have circulated some materials/held trainings
- Very varied across industry Some awareness of duties and legal (?) obligations
- Knowledge - Action Gap?

Gaps

- We can't accurately gauge the state of knowledge due to lack of direct relationships and size and diversity of sector

User - Whitegoods

The following information was gathered and synthesized from interviews with businesses that used and sold white goods. The engagement was mixed, with some socially responsible companies responding proactively, and others not engaging at all. In general, EPS product packaging is receiving attention and many products have already begun transitioning away from EPS packages. The aims were to understand what drivers supported change, and to get an idea of who is leading this change.

What we know

Poor waste management (disconnect for workers) Significant contribution to polystyrene waste in water: high level of pollution from packaging

Business to consumer packaging will be covered by Plastics Ban

Business to business packaging will not be covered

Retailers have duty to take back polystyrene

What we're missing

How much of waste is from bus2bus rather than bus2consumer?

Level of staff training around waste

Level of concern by companies (in relation to ban)

How feasible/expensive is substitution? What are the barriers?

Working Relationship

MIXED; Some retailers are engaging proactively

State of Knowledge

Some companies very aware of their EPS pollution and have measures in place to either contain or replace EPS packaging.

Gaps

Check on status of "duty to take back packaging in store"

Local Council

The following information was gathered and synthesized from interviews with various local government areas. The main difficulty was reaching many different LGAs and understanding them as a general category for their influence and opportunities towards reducing EPS pollution. Some councils were proactive and proud of their responses so far, and others lagged behind with little to no action taken on EPS specific improvements.

What we know

Set some regulations in regard to site management and waste at time of planning permit approval

No recycling at EPS at municipal waste facilities

Under-resource to enforce waste management

Responsible for storm water inlets and infrastructure

Manage multiples responsibilities

Some leaders with good practice on polystyrene waste management at construction sites

What we're missing

How do we best engage them with our limited capacity?

How effectives are their compliance officers? Are there enough?

What are the obstacles (e.g compare with how they monitor and generate revenue from parking)

Working Relationship

MIXED, it is hard to keep engaged due to their and our capacity

State of Knowledge

High on subject matter

KNOWLEDGE- ACTION gap due to limited resources

Gaps

How can we engage and unify LGAs to create standardized response to EPS pollution.

State Agency - EPA

The following information was gathered and synthesized from interviews with multiple EPA contacts. The EPA were responsive and helpful to understand their very specific placement in the enforcement hierarchy. The aim was to find out how much enforcement our state environmental protection agency really does when it comes to building and more specifically their litter pollution.

What we know

Responsible for enforcement and monitoring but not adequately resourced for polystyrene pollution monitoring (can't respond to "small" events)

Somewhat expanded scope through the new Environment Act (general environmental duty)

Have (limited) program for officers working at council level (Officers for Protection of Local Environment (OPEL))

Disconnect with other agencies and internally

Working Relationship

YES; engaging , but hamstrung by privacy relations

State of Knowledge

Their state of knowledge is medium to high, with even the CEO aware of waffle pod pollution on construction sites.

What we're missing

Role of environment and monitoring of plastics ban

What is their potential role for this program?

Gaps

Get better understanding of potential role they can play

State Government - DEECA

DEECA is the funding partner of this project and many meetings were conducted in the time of this project.

What we know

Charged with policy management of safe and sustainable water resources In charge of several water resource frameworks, including Waterways of the West Action plan

Implementation and funding of projects

Recycling Victoria now incorporated into DEECA Internal and inter-agency disconnect

Restricted relation with industry (privacy legislation) Disconnect with other agencies and internally

Working Relationship

YES; Funded relationship, engaged with stakeholder meetings

State of Knowledge

Awareness of YRKA work and previous research on polystyrene

Seeking to work through YRKA to increase their knowledge

Gaps in institutional knowledge due to high turn-around and gaps in inter-agency coordination

What we're missing

We don't clearly understand their long-term vision for this project: where do they want it to go beyond completion?

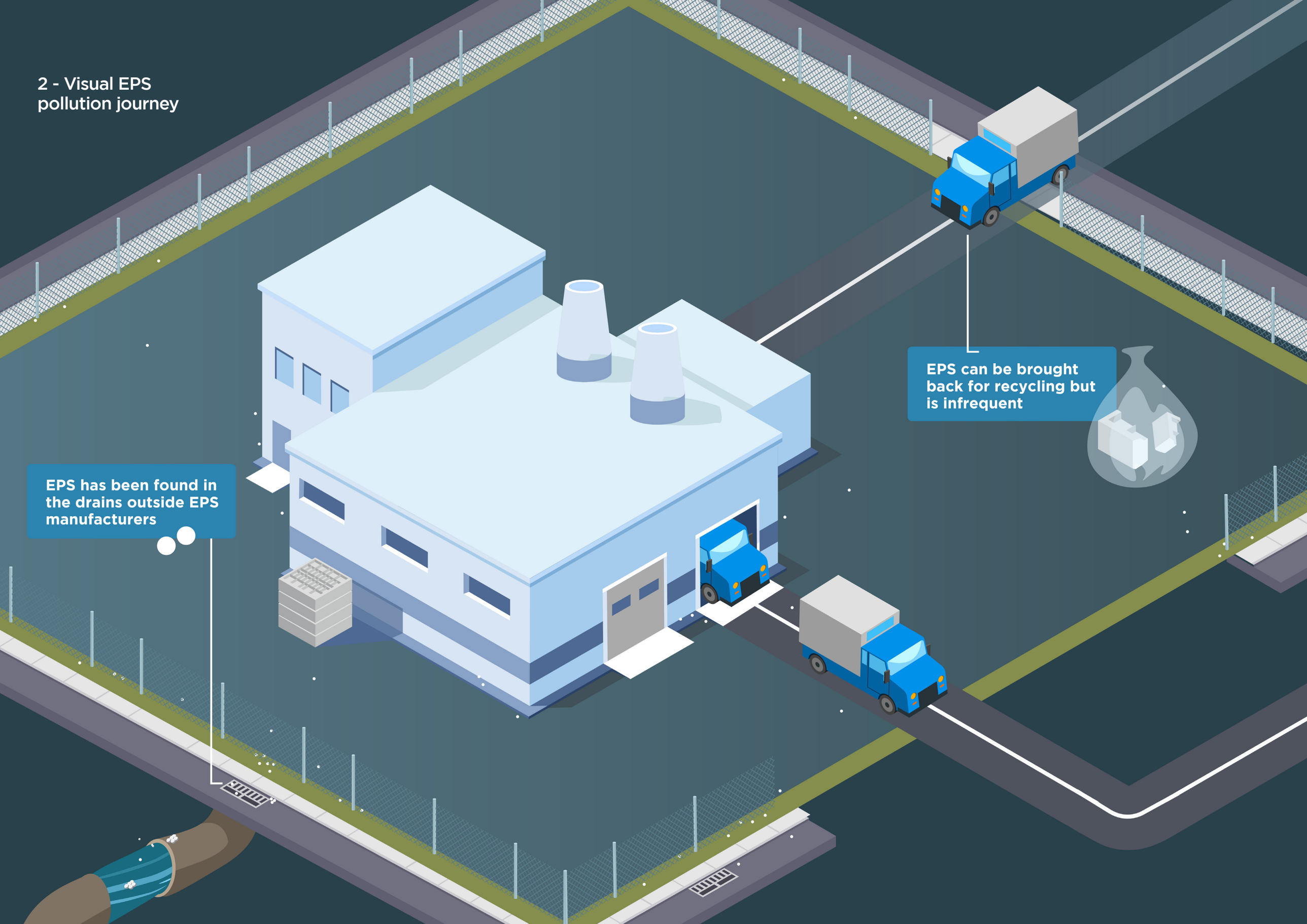
Further understanding of how they work with the federal government

Gaps

Contact Recycling Victoria

Which policy pieces relate to this project

2 - Visual EPS pollution journey



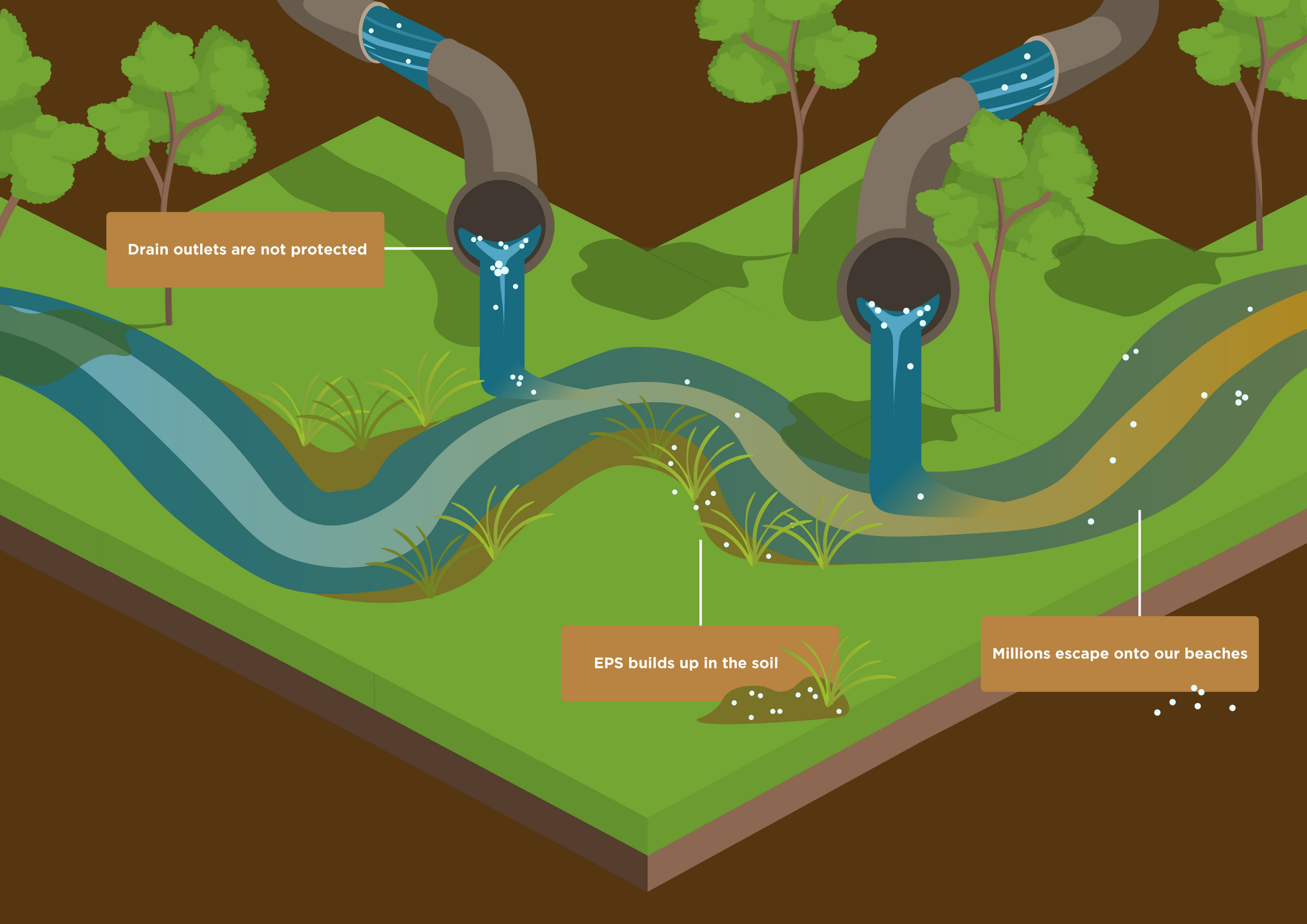
EPS Waffle pods are dumped on empty sites

Off cuts are often left on site

EPS is used as cladding

EPS Left in inadequate bins

EPS Escpes into the drains


Drain outlets are not protected
EPS builds up in the soil
Millions escape onto our beaches