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Date: 21 March 2024

Bendigo Regional Employment Precinct Sustainable Development Opportunities Report

Victorian Planning Authority

HIP V. HYPE

WHO WE ARE

HIP V. HYPE Sustainability provides advice that is commercially grounded, yet ambitious. We pursue exceptional outcomes that are socially, economically and environmentally sustainable and enable action across government, institutions and organisations.

We seek to partner with those who are willing to think strategically to achieve better. We lead, collaborate and support others to deliver impact and build Better Cities and Regions, Better Buildings and Better Businesses.

DISCLAIMER

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VERSION	DATE	ISSUE	PREPARED BY	APPROVED BY
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3	24/11/23	Draft (V3)	Alexandra Faure, Associate	Gavin Ashley, Head of Better Cities & Regions
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HIP V. HYPE

HIP V. HYPE Sustainability Pty Ltd is a Climate Active certified carbon neutral business.

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I. Introduction

HIP V. HYPE Sustainability has been engaged by the Victorian Planning Authority in partnership with Greater Bendigo City Council to investigate sustainable development opportunities for the Bendigo Regional Employment Precinct (BREP), which has been identified for its potential to be developed as an industrial / employment precinct.

This report has been developed as an evolution of the Discussion Paper and provides a roadmap to the successful delivery of sustainable ambitions for the BREP by:

- **Confirming key sustainability targets, strategies, initiatives and partnerships identified as being critical to its development**
- **Detailing key implementation considerations, mechanisms, stages, and delivery roles and partnerships for the VPA and Greater Bendigo City Council to consider and take forward as the project progresses**
- **Providing preliminary spatial implications for the initiatives put forward (if relevant)**

This report concludes the technical investigation undertaken by HIP V. HYPE as part of this project. A co-design workshop will be held as the project progresses and provide an additional opportunity for this work to be presented and further tested with key relevant stakeholders, authorities, and landowners.

ABOUT THE PRECINCT

The development of the Bendigo Regional Employment Precinct (BREP) will be an important part of providing long-term industry needs and employment opportunities for Greater Bendigo's growing population.

The precinct is located south of Marong township, along the Calder Alternative and Wimmera Highways, which provide key strategic links to Melbourne, Mildura and Adelaide. It is approximately 294ha of existing Farming Zone land made up of 13 titles. The City of Greater Bendigo is the largest landowner in the precinct, owning 6 titles that total 155ha or 53% of the precinct.

The ultimate land use response for the precinct is yet to be determined as there are many factors that must be considered. Two of the most notable being the proposed Marong Western Freight Corridor that transverse the site and the Marong Township Structure Plan that will guide future growth of the adjoining town and provides the framework for identification of the precinct.

ABOUT THIS REPORT

The project started by focusing on gaining a shared understanding of what best practice looks like in the context of the BREP site and how it can be best achieved. **(Section I & II)**

To do this, the physical context of the site was reviewed to understand the physical constraints and opportunities of the precinct. **(Section III & Appendix A)**

A thorough review of the current state of sustainable industrial and commercial development was then undertaken, in terms of existing policy, practice and innovation. **(Section III & Appendix B)**

In addition, targeted stakeholder engagement was undertaken to sense-check and build on the preliminary analysis completed, ensure the accuracy of these foundational pieces and gain feedback on some key scoping questions to inform the next phases of the project. **(Section III & Appendix C)**

This allowed us to draw from best practice to develop a strong sustainability vision for the precinct, identify key opportunity areas for best practice industrial development, and analyse sustainability initiatives capable of maximising each of these opportunity areas in the context of the BREP. **(Section IV)**

The final section of the report provides a clear roadmap for the successful implementation of the initiatives. Noting the suite of planning tools that will guide the development of the BREP are yet to be resolved, the implementation plan focuses on planning implementation options and considerations rather than specific planning solutions which need to be considered more broadly than in regard to sustainability. **(Section V)**

II. Background investigation & Stakeholder Engagement

II. Background investigation & Stakeholder Engagement
(i) Physical Context Summary

A physical context review of the site was undertaken to understand existing site constraints. The physical context plan opposite summarises the key physical influences.

This review included a Site and GIS analysis of the regional context of the precinct and its existing conditions, a climate impact assessment, and a technical review of existing technical studies prepared for the site.

Refer to Appendix A for the detailed analysis.

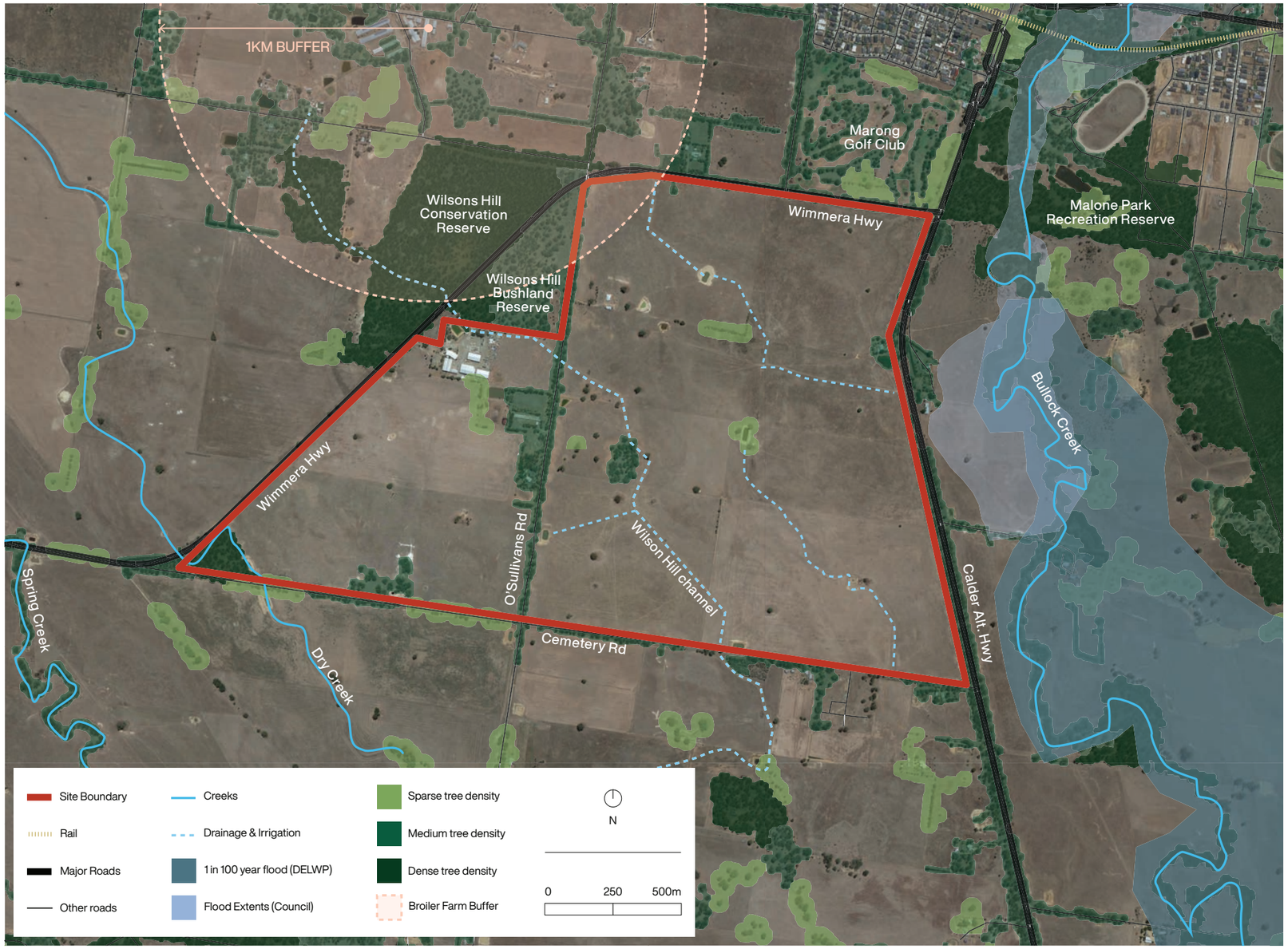

Fig 1. Physical context plan. Spatial analysis by HIP V. HYPE.

II. Background investigation & Stakeholder Engagement
(i) Physical Context Summary

SITE & GIS ANALYSIS

A summary of the site and GIS analysis is as follows:

- **Existing use & land ownership** - The Precinct is approximately 294ha of existing Farming Zone land made up of 13 titles. The City of Greater Bendigo is the largest landowner in the precinct, owning 6 titles that total 155ha or 53% of the precinct. Surrounding use and development is predominantly agricultural, with future residential land directly to the north and east, and Marong township approximately 500m north
- **Urban heat & vegetation** - Consistent with its agricultural use, the site is currently largely cleared of vegetation, with most tree density consisting of roadside vegetation, a number of scattered trees and vegetation patches. The site would currently be exposed to significant levels of heat, due largely to the absence of significant vegetation and canopy cover
- **Flooding & topography** - The site is relatively flat and generally falls from the south-east to the north-west but slightly falls towards the golf course and township along its north-east corner, with stormwater runoff needing to be redirected to avoid creating a flood impact on any residential development. Due to the proximity of key environmental assets, particular attention will also need to be given to the treatment of potentially polluted/contaminated runoff
- **Ecological Vegetation Classes (EVCs)** - Most of the Site was highly modified due to past and current agricultural activities. As part of the redevelopment of the site, there is an opportunity to draw on prevalent EVC species for new plantings and landscape species selection

Refer to Appendix A (i) for more information.

CLIMATE IMPACT ANALYSIS

Understanding how climate hazards translate to the local context is a key step in understanding the exposure, vulnerability and impacts that climate hazards may present for the BREP site and surrounds.

The increased concentration of C02 in our atmosphere will have significant consequences and influence the global climate. Within Australia and more locally Victoria, climate hazards are expected to include: increased temperatures and solar radiation, increased extreme heat days, more extreme storm events, decreased annual rainfall and harsher fire weather and longer fire seasons.

The graphic opposite demonstrates the impact of climate change on key climate hazards. Appendix A (ii) demonstrates the impact under a moderate emissions scenario. Climate impacts are a confluence of hazards, exposure and vulnerability. As the precinct does not yet have a business community, exposure is the critical determinant of climate impacts (along with the hazards themselves).

The 'Five capital framework' was used as a critical lens to further interrogate the multi-layered elements of climate impacts in the context of the BREP. The framework includes the following impact areas or 'capitals'; natural, social, financial, human and physical capital.

The output of this task included a consolidation of key existing and future climate impacts that will need to be taken in consideration in the design response of the BREP. Refer to Appendix A (ii) for more information.

TECHNICAL REVIEW

A review of existing relevant technical documents prepared for the precinct was undertaken. Noting that at the time of writing, the majority of technical studies were still underway or yet to be undertaken, this was limited to:

- Marong Township Structure Plan (2020)
- Industrial land infrastructure assessment (2020)
- BREP draft Biodiversity Assessment, EHP (2022)
- Marong Flood Study (2018)

Each document was summarised, with key opportunities, barriers and implementation considerations for the BREP highlighted. Refer to Appendix A (iii) for more information.

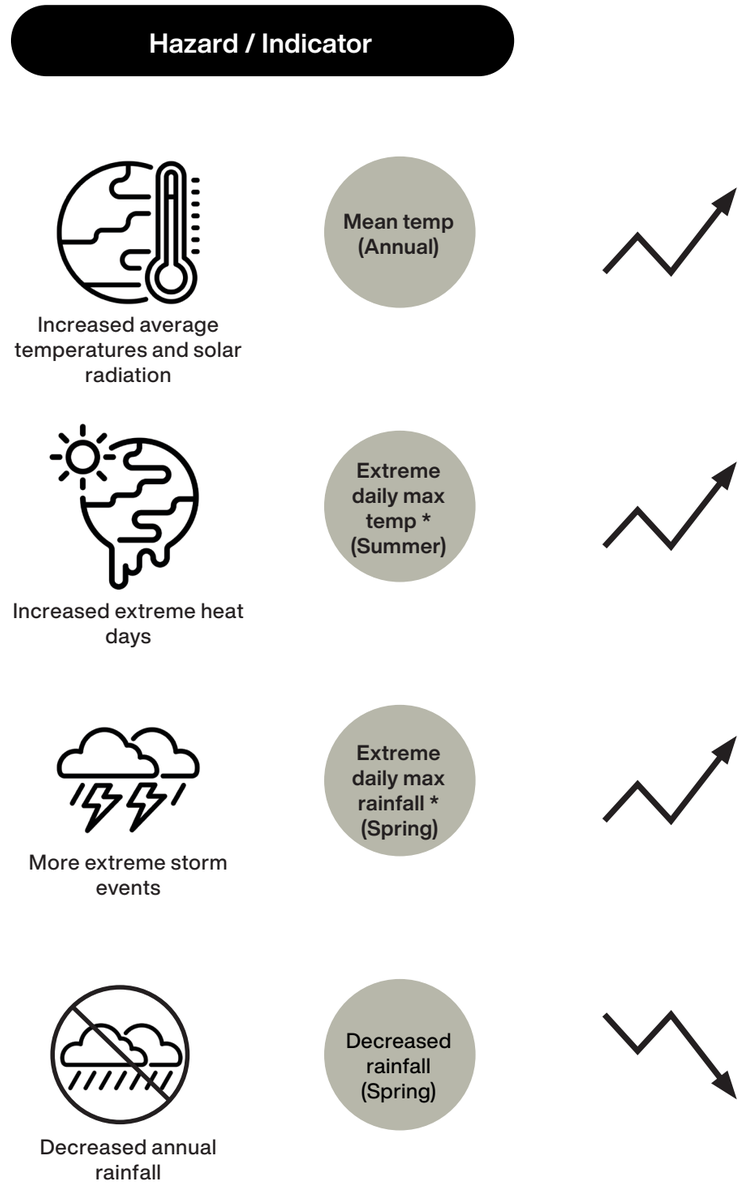

Fig 2. Climate hazard identification. Image by HIP V. HYPE.

II. Background investigation & Stakeholder Engagement
(ii) Policy, Practice and Innovation

This phase of the project focused on understanding both the policy context for BREP, as well as undertaking research on existing and emerging best practice and innovation trends in sustainable employment precincts.

Policy documents selected for review as part of this phase are of varying statutory weight. However, all documents remain relevant to the BREP, noting they either are applicable through a planning process, set overarching targets that create expectations for development to deliver on, or give an indication of where financial support may be available to accelerate specific initiatives. Refer to Appendix B for further information.

Through the best practice and innovation review, we also maintained a focus on identifying examples with direct relevance to the BREP context and the Victoria's planning system.

This included the review of a number of case studies, with insights into key opportunities that could be considered for the BREP. Innovations highlighted were also selected due to their market readiness or certain commercial trajectory with project precedence and relevance to the local Bendigo context.

This work highlighted a variety of strategies that can be incorporated into new industrial/employment development in a greenfield setting to ensure they're set up for success from day one.

Refer to Appendix B for the detailed analysis.

POLICY REVIEW

The following documents were reviewed as part of this stage:

- State-wide
  - + Climate Change Act 2017 (VIC)
  - + Victoria's Climate Change Strategy (2021)
  - + Built Environment Climate Change Adaptation Action Plan 2022-2026
  - + Recycling Victoria: A New Economy (2021)
  - + Gas Substitution Roadmap (2022)
  - + Water for Victoria (2016)
  - + Precinct Structure Planning Guidelines (2021)
- Regional
  - + Dhelkunya Dja - Dja Dja Wurrung Country Plan
  - + Nyauwi Mutjeka Dja Dja Wurrung Renewable Energy Strategy
  - + Coliban Water Urban Water Strategy 2022
  - + North Central Regional Catchment Strategy
  - + Loddon Mallee South Regional Growth Plan
  - + Loddon Mallee Climate Ready Plan
  - + Loddon Mallee Circular Economy Plan
- Municipal / Local
  - + A Stronger Greater Bendigo 2030: Economic Development Strategy 2020 - 2030
  - + Greater Bendigo Industrial Land Development Strategy and Background Report (2020)
  - + City of Greater Bendigo Climate Change and Environment Strategy 2021- 2026
  - + Greater Bendigo Circular Economy and Zero Waste Policy (2021)
  - + Greater Bendigo's Environmentally Sustainable Development and Water Sensitive Urban Design local policies

Refer to Appendix B (i) for further information.

PRACTICE AND INNOVATION SCAN

The practice and innovation scan included two elements:

- The analysis of five case studies to draw insights into key opportunities that could be considered for the BREP, including:
  - + Tonsley Innovation District, South Australia
  - + Logis Eco Industrial Park, Victoria
  - + Portes du Tarn, Toulouse, France
  - + Höchst Industrial Park, Frankfurt, Germany
  - + Kwinana Strategic Industrial Area, Western Australia
- The review of best practice and innovation trends in sustainable industrial and commercial development. Of particular interest to the sustainable development of the BREP, this includes:
  - + Improved worker and landscape amenity
  - + Increasing density
  - + Industry 4.0
  - + Transition and physical climate risk
  - + Operational phase management entities
  - + Industrial ecology or symbiosis and circular economy
  - + Rising input costs

Refer to Appendix B (ii) and (iii) for further information.

II. Background investigation & Stakeholder Engagement
(iii) Stakeholder Engagement

In addition to the background investigation, HV.H undertook targeted stakeholder engagement through November and December.

The focus of these engagements was be to build on and sense-check the analysis completed to date, ensure the accuracy of these foundational pieces and gain feedback on some key scoping questions which will be used to inform the development of the Discussion Paper and Opportunities Report.

Refer to Appendix C for the detailed summary.

ENGAGEMENT APPROACH

Through this process, we also sought to:

- Identify the various stakeholders views on the opportunities and barriers to delivering best-practice sustainable outcomes in employment precincts, generally and with specific reference to the BREP
- Develop a better understanding of the 'value' of sustainable development to the industrial / commercial sectors and key factors influencing investment in sustainable infrastructure and industrial development

As part of the engagement, HV.H met more than 10 different stakeholders including representatives of the City of Greater Bendigo, state agencies, industrial developers, investors, economists, infrastructure specialists, local manufacturers and zero-emission think tanks.

Stakeholders were provided with background information on the project as well as a set of questions to guide the discussions.

Questions included:

- Given location, scale and proportion of local government ownership, what do you consider are the key opportunities for the BREP site from a sustainability perspective? What is unique about this context?
- Given this context, what do you consider are the key barriers to delivering best practice outcomes? And with specifics to BREP?
- What do you consider would help attract investors, developers and tenants (businesses) to BREP?
- What would make investors, developers and tenants 'nervous' about a move or investment in BREP?
- What specific sustainability initiatives have you seen succeed elsewhere that could be considered for BREP?

III. Sustainability Vision

III. Sustainability Vision

In the face of a changing climate, it is essential that the burden of mitigation and adaptation measures are distributed throughout the economy, recognising that we all stand to benefit from a sustainable built environment.

This has now been recognised both globally and at all levels of government in Australia, which provides an extremely sound policy basis for an ambitious sustainability approach for BREP.

The following pages highlight the context for sustainability decision-making and why integrating sustainability considerations early can deliver on the ambition sought for the precinct.

It presents a clear draft vision for how that is achieved in the BREP context.

FOCUS AREAS & DELIVERY MECHANISMS

For BREP, four focus areas have been identified as critical in ensuring an ambitious and meaningful sustainability vision is developed for the precinct:

- FOCUS AREA 1 - NET ZERO CARBON
- FOCUS AREA 2 - CLIMATE RESILIENCE
- FOCUS AREA 3 - CIRCULAR ECONOMY
- FOCUS AREA 4 - LEADERSHIP AND GOVERNANCE

A range of mechanisms will need to be employed for the overall vision to be delivered. The following have been considered as part of this project:

- Capital investment
- Land use planning controls
- Design guidance / placemaking
- Operational investment
- Finance, governance and operational model

A combination of these mechanisms will be required rather than any mechanism type on its own.

We note that not all of these mechanisms can be delivered through the Victorian Planning System or planning tools alone, and would require other means to deliver outcomes.

PRECINCT SUSTAINABILITY VISION

By 2050, BREP has become a national exemplar in sustainable, commercially successful regional industrial development at scale. Through strong leadership and robust governance structures, the original project goals of zero carbon, climate resilience and circular economy focused have remained strong and continued to be delivered through the operational phase.

The construction of buildings and other infrastructure have minimised embodied carbon emissions. The precinct is fully renewable, transport is active or zero emissions and all waste from business is captured and converted to a higher and better use. It is a key gateway to north-western Victoria, and key stop for low emissions long-range transport heading to Mildura, Swan Hill or beyond.

Tenants are connected to each other and their businesses are climate-ready. Tenants, workers and precinct visitors experience a high quality, green and well connected public realm and participate in a broad range of thriving commercial and related activity.

Known as a circular economy centre of excellence, tenants continue to optimise their operational performance, and adapt to the low emission and circular economy markets and supply chains as they evolve. This has translated into strong partnerships with local and regional businesses and a thriving industrial ecology within the precinct and the greater region.

III. Sustainability Vision

FOCUS AREA 1 - ZERO CARBON

The Paris Agreement sets in place commitments to restricting global warming to well below 2 degrees and the Climate Change Act (Vic) 2017 sets in place a zero net emission target of 2045 for Victoria. The City of Greater Bendigo is targeting net zero for the municipality by 2030. To make these targets achievable, new development needs to deliver net zero emissions much earlier, noting that decisions can lock in embodied and operational emissions for the lifetime of assets, and enhance or impede the ability to respond to changing climate impacts over time.

Industrial precincts contribute two types of emissions - embodied carbon emissions and operational emissions. Embodied emissions are all greenhouse gas emissions that are released as part of making a product or service ready for your consumption or use. For an industrial precinct, embodied carbon includes the roads, buildings and other infrastructure. Operational emissions include all the greenhouse had emissions that are a consequence of the precinct's operations including in regard to energy, transport, waste and industrial processes. This also includes what some refer to as 'enabled emissions' which represent emissions resulting from the activities of the precinct's end-users.

Developing a zero carbon precinct in operation involves setting pre-conditions to reduce carbon as much as possible through planning and design and only offsetting the remaining unavoidable emissions as a last resort. This is typically achieved in the design stage through a combination of design decisions and infrastructure investments.

For the BREP, a combination of contextually relevant initiatives will enable the precinct to play its part in meeting global, federal, state and local emission targets as well as future-proof the development against the future cost of transition. Transition risks are business-related risks that arise from the social and economic changes associated with adjusting to a low carbon economy. Businesses and investors are increasingly factoring these risks into their business decision making. They include policy, legal, technology, market, reputational, social and financial risks. BREP has the potential to be at the forefront of the transition. This is further facilitated by the opportunity for the precinct to be considered as a whole rather than focusing on 'building by building' emissions reduction solutions.

For the BREP planning and design initiatives to enable a zero carbon precinct will include a combination of considered material and construction decisions to reduce embodied carbon. The precinct will employ energy efficient design and site layout, on-site renewable deployment and generation, avoidance of fossil fuel, the provision of enabling infrastructure to support waste treatment and low emissions transport.

Beyond the planning and design phase, BREP businesses will also require ongoing operational investment and governance to operate as a net zero carbon community into the future. This is key in ensuring management systems can optimise energy, water, waste / resources use. It also provides an opportunity to create efficiencies and economies of scale for tenants through the aggregation of demand and more efficient supply for common business inputs and outputs and support businesses to thrive in a low-carbon economy.

WHAT DOES SUCCESS LOOK LIKE?

The construction of buildings and other infrastructure have minimised embodied carbon emissions. The precinct is fully renewable, transport is active or zero emissions and all waste from business is captured and converted to a higher and better use. It is a key gateway to north-western Victoria, and key stop for low emissions long-range transport heading to Mildura, Swan Hill or beyond.

Fig 3. Logis Eco Industrial Park, VIC. Photography by Graeme Bentley.

FOCUS AREA 2 - CLIMATE RESILIENCE

Climate change threatens the integrity of the built environment's assets and its ability to provide reliable services. It presents significant risk to local communities, businesses, investors, developers and asset owners, and needs to be at the forefront of the design and delivery of new development. Climate resilience is therefore at the core of key policies guiding this project, such as the Victorian Built Environment Climate Change Adaptation Action Plan 2022-2026, Loddon Mallee Climate Ready Plan and Greater Bendigo's Climate Change and Environment Strategy 2021-2026.

Some climate risks are defined as physical, in that they are inherent to a particular location and the climate hazards impacting that specific location. As climate hazards increase in intensity and frequency, stakeholders are increasingly looking for locations which either have low risk profiles or have taken steps to minimise this physical climate risk, to ensure that business operation is certain, and asset and land value, insurance premiums, market value etc are not adversely affected.

Building a climate resilient precinct includes directly responding to these hazards to reduce exposure to increased temperatures, greater storm intensity and decreasing rainfall over time. It also includes laying the foundations for a business community that has the financial, social and human (knowledge) capital to respond to climate change.

A climate resilient BREP precinct will respond to natural and physical climate impacts through planning and design that:

- Promotes high levels of tree canopy coverage and high-quality public realm and streetscape amenity
- Ensures adequate investment in flood mitigation initiatives
- Invests in enabling infrastructure to support conservation and reuse of water resources
- Supports innovations in the built environment that improve biodiversity outcomes and increase connectivity with surrounding areas
- Ensures adequate capacity in transport and other infrastructure and services such as electricity supply

The adaptive capacity or resilience of the BREP business community will be further built through a strong framework for operational management which facilitates an ongoing operational response to climate change and enables businesses to share resources, knowledge and efficiently respond to a changing climate.

WHAT DOES SUCCESS LOOK LIKE?

The BREP is a climate resilient precinct where tenants are connected and climate-ready. Climate risks are mitigated by a high-quality built environment that is water sensitive, supports thriving ecological systems and increases connectivity with site surrounds. It is a safe and comfortable environment to work and do business.

Fig 4. Logis Eco Industrial Park. Photography by Graeme Bentley.

III. Sustainability Vision

FOCUS AREA 3 - CIRCULAR ECONOMY

Victoria is transitioning to a circular economy, with government, business and community looking for new ways to improve productivity, reduce waste, recycle, reuse more and ultimately reduce harm from waste and pollution.

This is well supported by policy, with the Victorian Government having committed to diverting 80 per cent of waste from landfill by 2030, with an interim target of 72 per cent by 2025, and the City of Greater Bendigo seeking to align its activities to meet or exceed all Victorian and Federal waste and resource targets. Meeting this ambition will require strong action and the fundamental transformation of the regional economy.

In the context of the BREP, this means applying circular economy principles to energy, waste and material management across the precinct life cycle; from precinct-wide design strategies and investments to tenancy operation and ways of working. The ultimate goal is to maximise environmental and economic benefit for the BREP and its tenants, as well as for nearby land, Marong township and the region more broadly.

In relation to precinct planning and design, this will include committing to and implementing ambitious targets for construction waste diversion from landfill and recycled content in infrastructure. Landowners have the opportunity to operate strategically with the clustering of businesses and staging, and combine this with tenancy diversification and curation to achieve a healthy industrial ecology.

From an operational perspective, symbiotic relationships between businesses can enable the outputs of one business or actor becoming the inputs to another. Due to existing surrounding land uses, BREP is well positioned to capitalise on agricultural by-products. At the precinct level, BREP can also capture this opportunity, but it will require a commitment to facilitating transparent information flows and connection between businesses, so that exchanges of heat, energy, water, waste materials and other by-products can be optimised.

The BREP has the potential to become a centre of excellence by further promoting circular economy innovation within the precinct itself through:

- An incubation space for research and development to occur and to pilot and trial ideas before scaling up
- An operational management model that allows exchange of surplus resources in the precinct including energy, water and waste by-products from industrial processes
- A precinct-level waste management approach that aggregates waste / resources at the precinct level to ensure synergies and create economies of scale for non-core streams

Fig 5. Tonsley Innovation District, SA. Photography by Sam Noonan.

WHAT DOES SUCCESS LOOK LIKE?

The BREP is an established centre of excellence and known for circular economy innovation, where by-products of business outputs are routinely converted to a higher and better use within the precinct or close by. Strong networks and information flows between businesses in the precinct and broader area ensure that they are thriving and play a key role in the regional circular economy.

III. Sustainability Vision

FOCUS AREA 4 - LEADERSHIP AND GOVERNANCE

Long term projects such as the BREP cannot be delivered by governments in silo, however clear leadership through the planning phase at the state and local level will assist with investment confidence and is fundamental in attracting investors, developers and tenants and to contribute to the overall success of the precinct.

Strong leadership through the planning phase results in clarity and certainty in that it locks in a clear precinct vision, sustainability targets, critical infrastructure to be provided, employment focus, as well as development process, staging, financing arrangements and delivery.

All these elements are key in creating value for potential partners (private, institutional or other) to join the venture by clearly linking environmental and social benefits to economic prosperity. This requires commercial pragmatism – recognising that the sustainability outcomes will only be realised if the precinct is commercially attractive to the private sector partners required to help deliver on commercial objectives.

A key ingredient in successful planning for development projects in Australia and worldwide has been the role of governments in leveraging their position to deliver additional economic value, social benefits and sustainability outcomes that go above and beyond what the private sector would deliver alone. Governments can lead by example, drive ambition and de-risk critical investments.

The distinctive land ownership of BREP, with Council owning some of the land in the precinct, presents a unique opportunity to support the demonstration of a new benchmark for sustainable, regional industrial development.

This can be facilitated through the provision of alternative planning and design arrangements designed to de-risk specific net zero, climate resilience or circular economy ventures and deliver on more ambitious targets.

A significant number of opportunities and benefits of sustainable industrial development are however linked to the operational phase of the development. Leading examples both internationally and locally have therefore invested in ongoing precinct management and governance structures, information requirements on new businesses and enabled business-to-business exchange through a range of exchange platforms or other forums.

Importantly, an operational entity allows for precincts to continue to evolve, adapt and optimise their performance in a **coordinated manner**. It can administer environmental systems, facilitate energy, water, waste / resource flows and undertake other important monitoring, networking and financing functions. It can also facilitate an ongoing operational response to climate change and play a key role in facilitating tenancy diversification and curation to achieve a healthy industrial ecology (e.g. identifying synergic exchanges that might be strategically advantageous).

Noting that the BREP will be delivered over a long timeframe, strong leadership and governance are considered critical success factors in its development and ongoing operation.

WHAT DOES SUCCESS LOOK LIKE?

The BREP has evolved as a thriving business community true to the original project vision. The vision for the precinct, and its supporting governance structures have continuously provided a sense of confidence in investors, developers, tenants and broader partners. This has resulted in a diverse yet complementary group of businesses with a healthy operating industrial ecology, that continue to optimise their performance and adapt to the low emission and circular economy markets and supply chains.

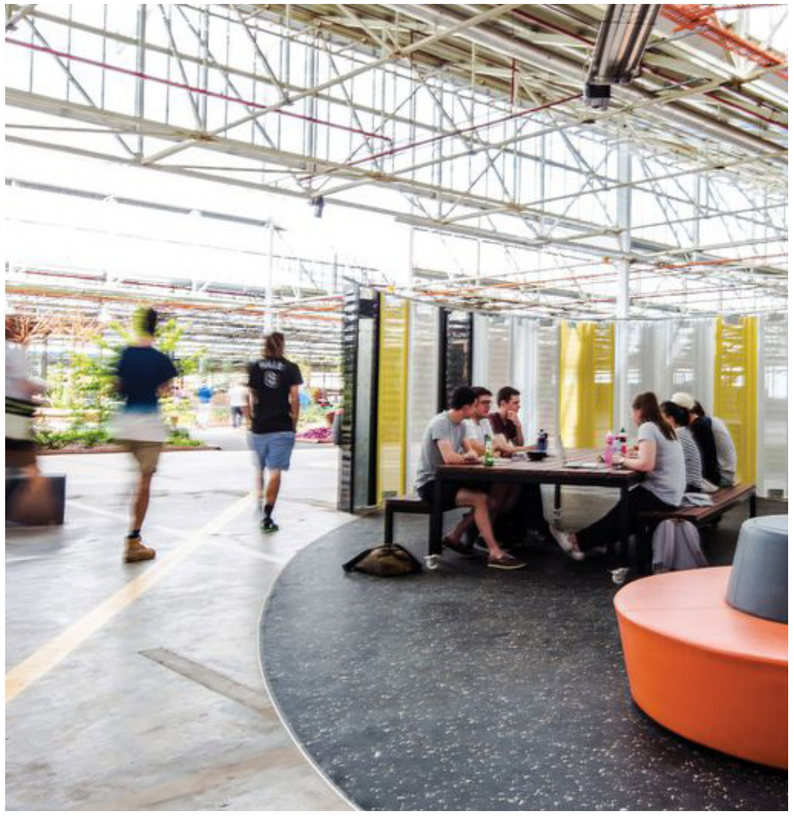

Fig 6. Tonsley Innovation District, SA. Photography by Sam Noonan.

Fig 7. The Honfleur Normandy Outlet in France. Photography by La Compagnie du Paysage.

IV. Opportunities Development

IV. Opportunities Development

To explore how to best deliver on the sustainability vision for the project, the category headings of the Sustainable Subdivisions Framework (SSF) were adopted for the subsequent analysis.

Though its metrics were developed to drive stronger sustainability outcomes in residential subdivisions specifically, the category headings of the SSF provide a robust set of opportunity areas for the effective integration of sustainability in the planning and delivery of development of all types and scales.

Recognising the essential role of governance in the delivery and operation of a commercial and industrial development of this scale, particularly in regard to sustainability, an additional category for governance was also included.

OPPORTUNITY AREAS & SUSTAINABILITY INITIATIVES

The following opportunity areas are core to developing a climate responsive precinct and pursued because of their importance to planning at this scale and in this location. These include:

- Governance
- Site Layout and Liveability
- Streets and Public Realm
- Energy
- Ecology
- Integrated Water Management
- Urban Heat
- Circular Economy (Materials and Waste)

The following pages capture best practice sustainability initiatives capable of maximising each of these opportunity areas in the context of the BREP.

INITIATIVE EVALUATION

The sustainability initiatives identified as capable of maximising the benefits of each of the opportunity areas were further analysed to capture:

- Mechanism type
- Alignment with policy and stakeholder needs
- Responsiveness to physical and technical constraints
- Benefits (social, environmental, economic and financial)
- Land tenure and spatial requirements
- Issues and constraints
- Cost implications
- Prior application / case study example (if relevant)

A number of initiatives considered as part of this work were not further analysed. This is due to the initiatives being covered by separate technical inputs, not sitting within the remit of a Structure Plan or having been identified as of lower priority at this stage.

The initiatives have been included at the end of Chapter IV for completeness and are still able to be developed outside of the VPA's process as part of future project stages by Council, other agencies and stakeholder groups, as appropriate.

IV. A / Opportunity Area Alignment

This work seeks to respond to sustainable ambition and policies from local to global.

The diagram to the right outlines the alignment between the four focus areas for the sustainable development of the BREP, the UN Sustainable Development Goals and the Sustainable Subdivision Framework categories, the latter of which was used as a lens for exploration in this report (as per the project brief).

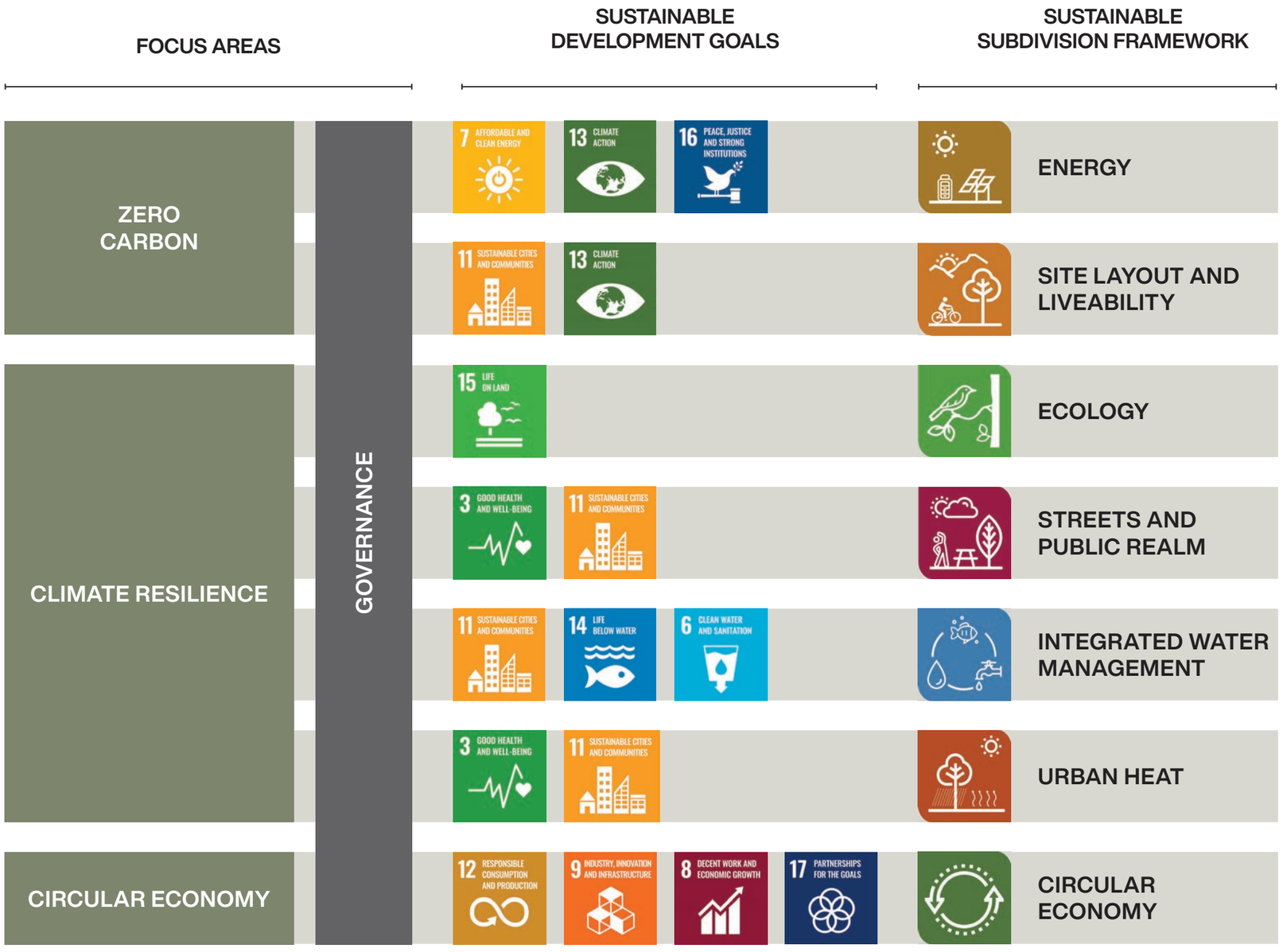

Fig 8. Opportunity Alignment diagram. Image by HIP V. HYPE.

IV. C / Governance

A significant number of opportunities and benefits of sustainable industrial development are linked to the operational phase of the development. Robust governance mechanisms provide the stability for precincts to continue to evolve, adapt and optimise their performance over time.

Leading industrial development examples both internationally and locally have therefore invested in ongoing precinct management and governance structures that provide certainty to tenants, but allow beneficial change and exchange between businesses.

BREP will be delivered over a long timeframe, so strong leadership and governance are considered critical success factors in its development and ongoing operation.

The following pages highlight contextually-relevant governance initiatives that have been identified as most impactful in delivering the sustainability vision for the BREP. This includes:

- Initiative #1 - Zero carbon target
- Initiative #2 - Sustainable design guidelines
- Initiative #3 - Transitional land uses / leases
- Initiative #4 - Precinct operational management entity

Fig 9. Kwinana Industries Council meeting. Photography by Kwinana Industries Council.

IV. C / Governance
Initiative #1 - Zero carbon target

MECHANISM TYPE

Finance, governance and operational model

A zero carbon target will require an 'all electric' standard to apply to the precinct and consistency with Zero Carbon Green Star pathway for operational stationary energy. This will require industrial uses which require process heat to use alternative renewable to mains gas if located in the precinct.

POLICY ALIGNMENT

Achieving net zero emissions and climate resilience in the built environment is a key objective at the State level, with policies such as the Victoria's Climate Change Strategy (2021) and the Built Environment Climate Change Adaptation Action Plan 2022-2026 seeking to support emissions reduction, circular economy, renewable energy technology / battery storage. Recycling Victoria: A New Economy (2021) and the Gas Substitution Roadmap (2022) further emphasise the need for energy, water and/ resource efficiency, with removal of gas from the energy mix and new waste management strategies on multiple scales.

This is also a key focus at the regional level (Loddon Campaspe Economic Growth Strategy, Loddon Mallee Climate Ready Plan and Loddon Mallee Circular Economy Plan) and local level (A Stronger Greater Bendigo 2030: Economic Development Strategy 2020 - 2030 and City of Greater Bendigo Climate Change and Environment Strategy 2021- 2026). Greater Bendigo seeks to shift to a zero carbon economy by 2030 and also seeks to exceed Victorian Government's targets of 80% waste diversion from landfill by 2030.

RESPONSIVENESS TO PHYSICAL & TECHNICAL CONTEXT

To make the State and local net zero targets achievable, new development needs to deliver net zero emissions much earlier that the state target of 2045, noting that decisions can lock in embodied and operational emissions for the lifetime of assets, and enhance or impede the ability to respond to changing climate impacts over time. Setting this target would therefore help deliver on these ambitions, as well as alignment with the targets of potential future tenants.

The scale and location of the BREP as well as the capacity of existing water and waste infrastructure assets to service the precinct make it the perfect candidate for initiatives that support reduction initiatives and 'on-site' closed loops, particularly in regard to energy, water and waste, noting the bulk of benefit will be in stationary energy as a key emissions source.

The site has good connectivity to the electricity network, and its scale further promotes opportunities for onsite renewable energy generation (refer to initiative #10), including temporarily as the precinct develops (refer to initiative #3). Given the cost of upgrading gas infrastructure and Victorian objective of transitioning away from gas, an all-electric approach will be preferable for the BREP to ensure that landowners / tenants can avoid the cost of inevitable transition in the future.

Precinct solar generation on rooftops alone may have sufficient capacity to support the entire precinct energy demand, subject to the energy intensity of the land uses. Pairing precinct solar generation with on-site battery storage would allow for excess energy to be stored during times of low demand and released at other times. It also has the potential to support demand for adjacent land uses such as residential. This would allow the precinct to meet a target net zero on an annual basis, but is highly dependent on energy intensity and daily energy profiles. If the energy intensity is very low the opportunity to be carbon positive will exist for the precinct. Refer to initiative #10.

STAKEHOLDER NEEDS ALIGNMENT

- Aligns with Council & VIC Government's focus on promoting innovation and renewables penetration
- Sets clear vision for future developers / partners that the precinct will be an exemplar in climate response, which will support institutional investment as well as further government and education sector investment in the precinct

BENEFITS

Social

- Health and wellbeing (through greater active travel)

Environmental

- Emissions reduction - operational and embodied
- Air quality

IV. C / Governance
Initiative #1 - Zero carbon target (cont.)

MECHANISM TYPE

Finance, governance and operational model

Economic

- Investment certainty/catalyst
- Productivity (e.g. worker output; through increased visitation, efficiency)

Financial

- Operational costs - resource use (fuel / energy / water
- Operational costs avoided (e.g. landfill levy costs)
- Tenant / investment attraction
- Competitive advantage

LAND TENURE & SPATIAL REQUIREMENTS

This initiative can be rolled-out precinct-wide. The target per se does not require any spatial allocation however, a number of initiatives required to meet the target will have a land tenure and spatial requirement (such as renewable energy generation and storage).

ISSUES AND CONSTRAINTS

- A zero carbon target and associated governance structure can assist in reviewing and reporting on a zero carbon target and identifying optimisation strategies
- Would require buy-in from existing landowners
- Would require elimination of gas and control over electricity supply (either through a s173 agreement or other mechanism) that mandated the purchase of renewable electricity by all tenants
- Would require aggregated waste contracting or clear reporting lines to monitor waste emissions
- May require a mechanism to purchase offsets on behalf of the precinct for unavoidable operational emissions
- Would not cater for embodied carbon emissions
- If pursued, would require further work to establish a clear emissions boundary and governance arrangements

COST IMPLICATIONS

CAPEX implications

- Potentially higher upfront cost for design/ construction
- Cost of purchasing/ installation of applicable technology

OPEX implications

- Annual operational costs associated with meeting zero carbon targets
- Savings from energy efficiency and on-site renewable energy generation
- Potential higher cost of renewable energy in the shorter term
- Potential lower cost of waste collection (avoidance of landfill costs)

PRIOR APPLICATION - NAMBEELUP KAADADJAN PEEL BUSINESS PARK, WA

- The Nambeelup Kaadadjan Peel Business Park is an industrial precinct located 75km south of Perth in WA. The precinct has been designed to suit a wide range of uses (e.g. manufacturing and fabrication, transport and logistics, wholesale storage, warehousing and agri-innovation)
- A key feature of the precinct is its central microgrid, providing a source of onsite power generation to businesses within the park. The microgrid is powered by a 1.2MW ground-mounted on-site solar farm and a 2.5MW battery storage system to moderate, store and discharge power across the Park
- The Peel Business Park micro-grid was installed as a solution to the site's limited access to mains power and the high-costs of extending the mains-grid network into the estate. Due to its successful application within the Park, there are plans to extend the micro-grid beyond the Business Park's landholdings to allow uptake of its energy supply by neighbouring landholdings with minimal capital costs

Fig 10. Peel Business Park's Industrial micro-grid. Photography by DevelopmentWA.

IV. C / Governance
Initiative #2 - Sustainable design guidelines

MECHANISM TYPE

Land use planning control

Design Guidelines seek to ensure improved streetscape outcomes, along with a more limited set of 'on lot' controls. Sustainable Design Guidelines could include design requirements and targets for:

- **Embodied / Operational carbon**
- **Siting and design, including building materials and setbacks**
- **Cooling and greening, including canopy cover, WSUD and on-lot stormwater capture reuse**
- **Operational energy & water, including use of energy and water efficient appliances**
- **Waste management**
- **Climate resilience**

POLICY ALIGNMENT

The Climate Change Act, Victoria's Climate Change Strategy and Built Environment Climate Change Adaptation Action Plan seek to support the rapid transition and adaptation of communities and the built environment through emissions reduction and climate resiliency.

The Loddon Mallee Climate Ready Plan, Loddon Mallee Circular Economy Plan and City of Greater Bendigo Climate Change and Environment Strategy also support this objective, as well as the transition to a regional circular economy.

Clause 15.01-1L-02 (Urban design in industrial areas) seeks to support a high standard of design through improved access, parking, site layout, landscaping and building design in existing industrial areas.

Design guidelines can be designed to support all these objectives through consistency of design and delivery across the precinct.

RESPONSIVENESS TO PHYSICAL & TECHNICAL CONTEXT

The land is under multiple ownership. The development of design guidelines would allow for consistency of development across council & privately-owned land, and ensure the built environment outcomes are of the highest standard.

Precinct-specific design guidelines could build on the existing City of Greater Bendigo's Good Design Guide for Industry and provide a mechanism to lock in design requirements and targets that are specifically focused on environmental performance. These can be drafted to apply to both the private and public realm, and with a level of detail and flexibility that is appropriate for the long-term development of a precinct of this scale.

Beyond facilitating the development of an attractive, unified and functional industrial estate, Design Guidelines can provide standards in regard to energy, water and waste management and efficiency, climate resilience, embodied / operational carbon, and cooling and greening.

STAKEHOLDER NEEDS ALIGNMENT

- Sets clear benchmarks to be achieved by developers in land subdivision and new buildings
- Sets clear vision for developers and other stakeholders
- Improves the value of land for owners, through improved presentation and amenity for workers

BENEFITS

Social

- Urban temperature regulation
- Social capital (including community resilience)
- Safety
- Sense of place
- Accessibility and inclusion

Environmental

- Emissions reduction - operational
- Emissions reduction - embodied
- Potable water reduction
- Resource recovery - diversion from landfill

Economic

- Investment certainty/catalyst
- Productivity (e.g. worker output; through increased visitation, efficiency)

Financial

- Capital cost reduction (e.g. through dematerialisation)
- Tenant / investment attraction
- Competitive advantage

IV. C / Governance
Initiative #2 - Sustainable design guidelines (cont.)

MECHANISM TYPE

Land use planning control

LAND TENURE & SPATIAL REQUIREMENTS

This initiative can be rolled-out precinct-wide and will have spatial implications (e.g. requirements for building and landscape setbacks, cooling and greening initiatives, energy generation and storage, etc).

ISSUES AND CONSTRAINTS

- Design Guidelines would need to be prepared by the VPA in collaboration with Council (as the municipal authority), with landowners having the opportunity to provide feedback through the co-design and public exhibition phases
- Design Guidelines add requirements to the land and would need to balance ambition with the risk that if too prescriptive or cumbersome, it may affect any land sale to the private market
- Design Guidelines might require further consultation with all landowners to determine willingness to enter into an agreement (subject to the statutory weight of the design guidelines)

COST IMPLICATIONS

CAPEX implications

- Cost of creating the Design Guidelines and implementation tool
- Potentially higher capital costs to ensure the assets meet the Design Guidelines requirements (although likely minor when considering whole-of-life costing)

OPEX implications

- Reduced operational costs (i.e. increased energy efficiency, renewable energy generation and storage)
- Potentially increased maintenance costs for green infrastructure

PRIOR APPLICATION - TONSLEY INNOVATION DISTRICT, SA

- The Tonsley Innovation District is a 61 hectare mixed-use precinct located 10km south of Adelaide, South Australia
- Its development has been guided by a comprehensive set of Design Guidelines to be used by those developing public and private buildings, streetscapes and landscape as part of the development
- Encumbrances were established to enforce the Design Guidelines, with development applications reviewed against the guidelines by Renewal SA
- These include maps and guidance in regard to movement, built form and the public domain which covers elements such as wayfinding, WSUD, recreation and activities, public lighting, trees, materials, public art, site services and maintenance
- This has assisted in the development of a pedestrian-friendly precinct, with a network of high quality formal and informal places for people to meet and exchange ideas, such as the award-winning Central Forest

Fig 11. Tonsley Innovation District. Photography by Good Design.

IV. C / Governance
Initiative #3 - Interim land uses / leases

MECHANISM TYPE

Land use planning control

Given the long timeframe for the rollout of the precinct, a dedicated strategy around interim land uses could support either the ongoing agriculture uses or 20 to 25 year interim uses such as nurseries for local native trees, ground mounted solar generation etc.

POLICY ALIGNMENT

The Climate Change Act 2017 (VIC), Victoria's Climate Change Strategy (2021) and Built Environment Climate Change Adaptation Action Plan 2022-2026 seek to support the transition and adaptation of communities and the built environment, through strategies that will ensure that by 2050 Victoria is climate-resilient, prosperous and liveable. This includes an overarching objective around orderly and just adaptation processes, recognising that our community and economy will undertake a significant transition and development needs to be sequenced. Interim land uses support this by creating environmentally responsible, high value uses that can take place as the development is rolled out across the precinct.

The Loddon Campaspe Economic Growth Strategy, Loddon Mallee South Regional Growth Plan, the Greater Bendigo Economic Development Strategy 2020 - 2030 and City of Greater Bendigo Climate Change and Environment Strategy 2021- 2026 all identify key objectives, strategies and action areas for the region and municipality and key issues to overcome, which interim land uses could assist with.

RESPONSIVENESS TO PHYSICAL & TECHNICAL CONTEXT

The BREP will require a staged development over a long timeframe resulting in undeveloped/unused land. In addition to continuing existing land uses, interim land uses could create additional value for landowners in while the precinct develops.

Interim land uses could support existing agricultural uses, assist in meeting other government priorities or support research and innovation in solving/mitigating different urban challenges experienced locally or in the region, including in regard to energy and biodiversity. We note that interim land uses would need to align with underlying planning controls and not conflict with surrounding uses or would otherwise not be possible without a permit. They have the benefit of implementing policy objectives, so as to not limit the availability of land.

For example, extreme heat has been recognised at all levels of government as a key climate risk which needs to be mitigated.

The physical context of the BREP shows that the precinct itself is already affected by high degrees of heat, which will only be exacerbated by its industrial development unless effective greening and cooling strategies are put in place.

Land in the BREP could be temporarily used to grow canopy trees and native biodiversity to a certain level of maturity before their integration within streetscapes of the precinct, for a head start on the amenity and biodiversity value of any provided open space or more broadly in Greater Bendigo.

STAKEHOLDER NEEDS ALIGNMENT

- In addition to continuing existing land uses, temporarily utilising land for interim land uses provides an opportunity for landowners to maximise the financial value of their land, either by leasing it or by establishing temporary additional revenue streams prior to the full development of BREP
- Provides an opportunity to strengthen involvement of Djaara in land management practices on site (e.g. Dja Dja Wurrung operated native nurseries, carbon farming initiatives, renewable energy and storage initiatives, etc.)

BENEFITS

Social

- Depends on transitional land uses adopted

Environmental

- Depends on transitional land uses adopted

Economic

- Local economy
- Productivity (e.g. efficiency)

Financial

- Lease revenue
- Additional benefits, depending on transitional land uses adopted

Initiative #3 - Interim land uses / leases (cont.)

MECHANISM TYPE

Land use planning control

LAND TENURE & SPATIAL REQUIREMENTS

This initiative will require dedicated spatial allocation and will be subject to interests from landowners, dependant on existing use rights, planning controls and the location of sensitive uses, as well as subject to the staging of development.

ISSUES AND CONSTRAINTS

- Possible limitations to transitional land uses (due to existing land use rights, zoning, overlays, and proximity to sensitive uses and key biodiversity assets)
- Transitional land uses will require a clear expiration date to not prejudice the long-term development of the precinct
- Access limitation due to lack of existing road infrastructure
- Access to services is currently limited - further analysis in terms of infrastructure and servicing is required
- Potential for maintenance costs, vandalism, and reduced neighbourhood amenity

COST IMPLICATIONS

CAPEX implications

- Cost of establishing the transitional land use (needs to balance the short life of the investment)
- Potential reduced upfront cost associated with precinct development (i.e. civil works across the precinct could be staged / optimised)

OPEX implications

- Savings through ability for transitional uses to manage land on an ongoing basis
- Savings and cost recovery through ability to lease out land for transitional uses

PRIOR APPLICATION - CHANGI BUSINESS PARK, SINGAPORE

- The Changi Business Park (CBP) is a financial hub located at Changi south, Singapore. It covers an area of approximately 70 hectares and is home to leading technology corporations, as well as IT and financial companies
- CBP is also home to Singapore's largest ground mounted utility-scale solar farm; SolarLand 2 (SL2), a state-of-the-art ground-mount photovoltaic powerplant owned by Terrenus Energy and operating since November 2021. SL2 has a total solar capacity of 19.2 MWp, with all electricity generated going directly to the national grid and contributing towards Singapore's goal of 2 GWp total solar capacity by 2030
- SL2 is installed on 116,000 square metres of interim industrial land at the business park. In the event the land is reclaimed for other uses in future, SL2's mobile design allows it to easily redeployed, requiring significantly less time and cost to dismantle, transport, and install elsewhere
- Agrivoltaics farming (i.e. the practice of growing crops underneath solar panels) is also proposed to be introduced, enabling the space to be utilised to its full potential and contribute to food security in the area, which is also a target of the Singapore Green Plan 2030.

Fig 12. SolarLand2 temporary installation at Changi Business Park. Photography by Longi.

Fig 13. Agrivoltaics farming is also also proposed to be introduced, in conjunction to SL2. Photography by Terrenus Energy.

IV. C / Governance
Initiative #4 - Precinct operational management entity

MECHANISM TYPE

Operational / Governance

This initiative supports a range of other initiatives with an ongoing operational entity in the precinct akin to how a shopping centre or a build to rent model would operate rather than a build to sell model.

Through this ongoing precinct management, environmental management systems as well as energy, water, waste / resource management and other important monitoring and networking and financing functions can be undertaken.

POLICY ALIGNMENT

The Climate Change Act, Victoria's Climate Change Strategy and Built Environment Climate Change Adaptation Action Plan seek to support the rapid and just transition and adaptation of communities and the built environment through emissions reduction and climate resiliency. Setting up a precinct operational management entity is a operational/governance tool that can be designed to support this objective as well as policy objectives through the Recycling Victoria strategy.

The Loddon Mallee Climate Ready Plan, Loddon Mallee Circular Economy Plan and City of Greater Bendigo Climate Change and Environment Strategy also support this objective, as well as the transition to a regional circular economy. A precinct operational management entity can be designed to support these objectives.

RESPONSIVENESS TO PHYSICAL & TECHNICAL CONTEXT

A significant number of opportunities and benefits of sustainable industrial development are linked to the operational phase of the development. An operational entity allows for precincts to continue to evolve, adapt and optimise their performance in a coordinated manner. It can administer environmental systems, facilitate energy, water, waste / resource flows and undertake other important monitoring, networking and financing functions.

It can also facilitate an ongoing operational response to climate change and play a key role in facilitating tenancy diversification and curation to achieve a healthy industrial ecology. As the precinct starts to grow, a governance model where tenants have the opportunity to participate and/or take the lead in undertaking some of these functions, particularly facilitating synergic exchanges might be strategically advantageous, especially in the context of at least some government ownership.

Noting that the precinct is under multiple ownership and will be delivered over a long timeframe, a strong investment in maximising the operational phase is considered a critical success factor to its development and tenant attraction and ongoing operation. The staging of the development will allow the opportunity presented by the precinct level operational view to be further optimised over time.

STAKEHOLDER NEEDS ALIGNMENT

- Supports the efficient operations of business and commercial activities across a large number of businesses
- Provides assistance and consistency in implementing, monitoring and reporting on environmental management systems including for energy, water, waste and other resources
- Supports efficiency and economies of scale in operating environmental management systems including for energy, water, waste / resource management
- Provides assistance in implementing circular economy initiatives such as facilitating the redistribution of excess or surplus resources
- Could enable an additional platform/pathway for business-to-business communication
- Could enable an additional pathway for collaboration and partnership between the Dja Dja Wurrung, government and BREP businesses

BENEFITS

Social

- Social capital (including community resilience)

Environmental

- Depends on precinct operational management entity functions

Economic

- Local economy
- Industry development / Knowledge capital
- Supply chain resilience
- Productivity

Financial

The following are available depending on precinct operational management entity functions:

- Operational costs - resource use (fuel / energy / water)
- Operational costs avoided (e.g. landfill levy costs)

IV. C / Governance
Initiative #4 - Precinct Operational Management Entity (cont.)

MECHANISM TYPE

Operational / Governance

LAND TENURE & SPATIAL REQUIREMENTS

This initiative can be rolled-out precinct-wide. It may require dedicated office space for administration, but this would be minimal and does not need to be included in the Structure Plan.

If administration function located within the precinct, a high visibility location in early stages would be beneficial.

ISSUES AND CONSTRAINTS

- Requirement to establish precinct entity governance to oversee the project early - consultation required to understand preference in terms of structure/model (government, tenant based, vs. third party) and for-profit or non-for-profit
- Willingness for business to see benefit of an additional layer of governance and support. Financial benefit through economies of scale, sharing efficiencies and emissions reduction benefits for business will likely be a driving force to take-up initiative

COST IMPLICATIONS

CAPEX implications

- Cost of creating operational management entity (ie legals, IT and other associated infrastructure)
- Upfront costs associated with communicating requirements and arrangements with participants

OPEX implications

For businesses:

- Ongoing cost (to be paid to management entity) for operational and management services
- Savings for participants who will not be required to manage a portion of their own management functions
- Savings for participants through potential supply chain aggregation

Entity costs:

- Ongoing communication costs
- Ongoing administration, legal, compliance costs
- Cost of service delivery

PRIOR APPLICATION - KWINANA INDUSTRIES COUNCIL

- The Kwinana Strategic Industrial Area (SIA) is located 30km south of the Perth metropolitan area a within the Western Trade Coast
- In 1991, the precinct was incorporated as an Industry Association to deal with precinct-wide issues such as impact on air and water quality. Today, the Kwinana Industrial Council has approximately 15 full members and 20 associated members
- The Kwinana SIA is considered a world leading example of industrial symbiosis, particularly in regard to water, energy and materials flows i.e. product, by-product and utility synergy exchanges. The KIC has played an important role in fostering industrial symbiosis in the precinct

Fig 15. Kwinana Industries Council meeting. Photography by Kwinana Industries Council.

IV. D / Site Layout & Liveability

The site layout of a new precinct presents a significant opportunity to influence the future functionality, connectivity and liveability of the space.

When seeking to improve the functional site layout of a precinct, it is important to consider how future users and tenants will be connected both within and beyond precinct boundaries, while also considering how the design responds to existing site conditions.

In the context of the BREP this will be key in laying the foundations of an accessible urban structure that promotes the use of walking, cycling and public transport in order to minimise car dependency and reduce emissions associated with transport.

The following pages highlight contextually-relevant site & layout initiatives that have been identified as most impactful in delivering the sustainability vision for the BREP. This includes:

- Initiative #5 - Integrated transport planning

Fig 16. A key driver of in-precinct active travel will be to reduce the hostility of the urban environment through a range of mechanisms, including by improving streetscapes and providing places of respite from harsh conditions and 'cool routes'. Photography by Wikimedia.

IV. D / Site Layout & Liveability
Initiative #5 - Integrated Transport Planning

MECHANISM TYPE

Design guidance / placemaking

This initiative proposes for the integrated transport plan of the BREP to prioritise active and public transport over private transport to challenge the car-dependent nature of the employment precinct typology and reduce transport emissions linked to the operation of the precinct.

In the BREP context, this would involve the provision of dedicated transport to and from Marong and Bendigo, supported by a mobility hub close to the principal point of access to allow micro-mobility or cycling access to individual businesses.

POLICY ALIGNMENT

Reducing emissions associated with transport is a key focus of the Climate Change Act 2017 (VIC) and Victoria's Climate Change Strategy (2021). This is also reflective of the Precinct Structure Planning Guidelines (2021) which emphasises the need for walkable communities, access to employment via cycling and walking options, effective use of pedestrian/ cycle routes & public transport connections.

At the local level, Stronger Greater Bendigo 2030: Economic Development Strategy 2020 - 2030 recognises that good transport and connectivity are key enablers for the wider region, unlocking land and supporting major job growth and investment. This is echoed in various local strategies which seek to support sustainable and active transport, including the Greater Bendigo's Climate Change and Environment Strategy 2021- 2026, Connecting Bendigo: Integrated Transport and Land Use Strategy (2015) and Walk, Cycle Greater Bendigo (2019).

RESPONSIVENESS TO PHYSICAL & TECHNICAL CONTEXT

The Site has excellent access to local and regional arterial road networks and its location provides great access to north, west and south parts of the state. However it currently lacks accessibility / direct access to rail and public transport.

Noting the close proximity of the site from the township of Marong (~5-10min bike ride), ensuring the site is accessible via safe and direct pedestrian and cycle routes will be key to prioritise active transport to and from the site. Public transport access from Bendigo and Swan Hill is currently limited (noting the decommissioned status of the Marong train station for passenger rail) and additional services and interchanges would be required to make it an attractive transport option.

Within the precinct itself, a key driver for active travel will be to reduce the hostility of the urban environment through a range of mechanisms, including the improved streetscape outcomes proposed as part of the Design Guidelines initiative (Initiative #2).

There is also an opportunity to build on existing assets to integrate further active transport connections. This could include a redesign of the Wilsons Hill channel or the creation of a connection between the Wilsons Hill Bushland Reserve to the west and Bullock Creek to the east. This provides a platform for additional benefits, including significant biodiversity and urban cooling enhancement.

STAKEHOLDER NEEDS ALIGNMENT

- Is necessary to ensure future employees in precinct are able to move to and from BREP and it is well accessible both locally and regionally
- Provides certainty on accessibility was highlighted by several stakeholders as a critical enabler of further investment.
- Sets clear example for developers re prioritisation of active transport

BENEFITS

Social

- Health and wellbeing
- Amenity and Liveability
- Accessibility and inclusion

Environmental

- Emissions reduction - operational

Economic

- Productivity (travel efficiency)

Financial

- Land/asset value
- Operational costs - resource use (fuel / energy / water)
- Tenant / investment attraction
- Competitive advantage

IV. D / Site Layout & Liveability
Initiative #5 - Integrated Transport Planning (cont.)

MECHANISM TYPE

Design guidance / placemaking

LAND TENURE & SPATIAL REQUIREMENTS

This initiative can be rolled-out in the public realm. It requires dedicated spatial allocation including road allocation for priority bus routes, shared paths, footpaths and internal mobility.

Interchange locations between public transport and any supported micro-mobility would also be critical (i.e. co-location of bus stop and micro-mobility infrastructure).

ISSUES AND CONSTRAINTS

- Strategic importance of freeway system and state freight network connections for businesses in BREP (i.e. movement of goods and services) and unfortunate disconnect with PT infrastructure (both for goods and services and future employees), including due to the decommissioned train station for passenger rail
- The unknown timeline of the bypass project adds limitations to ultimate transport network. Might need to plan for interim routes and corridors to ensure accessibility if the development of the Site occurs prior to the bypass and intersection upgrades. It will also might impact all transport infrastructure investment
- Current car dependency levels in Greater Bendigo will need to be improved on through the provision of adequate public and active transport infrastructure

COST IMPLICATIONS

CAPEX implications

- Upfront capital cost of transport infrastructure design and construction, could be partly or fully recouped through development contributions and / or value capture on higher land sale (i.e. public transport, active transport and micro-mobility infrastructure, including temporary routes from Marong to the development, to support alternative options to car-dependent travel before travel behaviour is locked-in)

OPEX implications

- Cost of asset maintenance (i.e. shared paths and landscaping)
- Reduced worker / resident travel costs

PRIOR APPLICATION - THE YARDS, NSW

- Located in Kemps Creek, New South Wales, the YARDS has set a new Australian benchmark as the first industrial estate to achieve a 6-Star Green Star Communities rating from the Green Building Council of Australia (GBCA)
- One of the five impact categories required to achieve a 6 Star rating is Liveability, which was successfully awarded to the YARDS in-part through the promotion of active and public transport by workers throughout the estate. This includes the incorporation of integrated parks, walking tracks and cycling paths to enable workers and the wider community to access common spaces and amenities throughout the estate without relying on private transport
- By incentivising active transport, the YARDS' design supports the health and wellbeing of workers and visitors accessing amenities within the estate

Fig 17. Providing cycling and pedestrian connections to surrounding regional networks. Photography by Sanchai Mapu.

Fig 18. Visual render of shared paths at the YARDS, Kemp Creek. Photography by Altis Property Partners.

IV. E / Streets and Public Realm

Designing streets and public realm with a focus on people and ecological systems is seen as one of the most influential contributors to sustainable urban development.

Public realm should be designed as inviting, vibrant places that support connection and economy, and drive biodiversity, urban cooling, and integrated water management outcomes.

Investing in the public realm and overall worker amenity is critical in providing a quality business environment and ensuring BREP is regionally attractive. It can deliver multiple outcomes that are attractive to both businesses and their workers (recreation, aesthetics) as well as environmental outcomes such as urban heat mitigation and habitat for biodiversity.

The following pages highlight contextually-relevant street and public realm initiatives that have been identified as most impactful in delivering the sustainability vision for the BREP. This includes:

- Initiative #6 - Landscape uplift and increased amenity
- Initiative #7 - Passive irrigation and WSUD in streets
- Initiative #8 - Alternative road cross sections with sustainable materials

Fig 19. Car parks represent a good opportunity for WSUD and passive irrigation to increase vegetation for ecology and urban cooling benefits - in addition to stormwater filtration. Photography by La Compagnie du Paysage.

IV. E / Streets and Public Realm

Initiative #6 - Landscape uplift and increased amenity

MECHANISM TYPE

Design guidance / placemaking

This initiative requires an increased investment in landscaping and overall worker amenity throughout the precinct. This would include the development of dedicated space for worker wellness and high amenity spaces, access to open space and places for social connection, and outdoor proportions slightly more generous to support increased vegetation (setbacks and frontages to support on-site plantings in addition to street reserves). A canopy cover target of 30% for non-building areas would help drive this design outcome.

POLICY ALIGNMENT

Victoria's Climate Change Strategy (2021) and the Built Environment Climate Change Adaptation Action Plan 2022-2026 recognise the importance of urban greening and cooling measures to ensure climate resilience, including in the design, provision and maintenance of parks, corridors, nature/median strips, private spaces, lakes and waterway environments.

The Greater Bendigo Industrial Land Development Strategy (2020) recognises the importance of going beyond core infrastructure requirements to focus on high amenity environments which foster collaboration and innovation. Greater Bendigo's local policies also echoed these ambitions, including Clause 12.01-1L (Protection of biodiversity) which seeks to enhance biodiversity and biolinks and Clause 15.01-1L-02 (Urban design in industrial areas) which seeks to support a high standard of design through improved access, parking, site layout, landscaping and building design in existing industrial areas.

RESPONSIVENESS TO PHYSICAL & TECHNICAL CONTEXT

Investing in urban greening and overall worker amenity is critical in providing a quality business environment and ensuring BREP is regionally attractive. It can deliver multiple outcomes that are attractive to both businesses and their workers (recreation, aesthetics) as well as environmental outcomes such as urban heat mitigation and habitat for biodiversity.

The provision of dedicated space for worker wellness and social connection is often absent in employment precincts, but has been shown to increase tenant attraction and worker attraction / retention. This can be facilitated by the provision of public open space, passive and active recreation, community facilities and integrated active transport corridors.

There is a strong opportunity to couple this with other 'hub' activators such as food and beverage and recreation, as well as build on existing environmental assets on site (remnant trees and roadside vegetation) and assets adjacent to the precinct such as Wilsons Hill Bushland Reserve to the west and Bullock Creek to the east provide the platform for significant biodiversity and urban cooling enhancement.

STAKEHOLDER NEEDS ALIGNMENT

- Provides clarity and certainty in regard to overall precinct vision, sustainability ambitions and infrastructure to be provided
- Supports the development of a working environment that can be an attractor for new workers and a retainer of existing, which industrial tenants are increasingly understanding makes for good business
- Facilitates the establishment of an employment ecosystem, increases business community resilience and fosters key partnerships

BENEFITS

Social

- Health and wellbeing
- Amenity and liveability
- Urban temperature regulation
- Connection to nature
- Social capital (including community resilience)
- Sense of place

Environmental

- Biodiversity and habitat enhancement
- Climate hazard exposure reduction

Economic

- Local economy
- Employment
- Productivity (e.g. worker wellness)

Financial

- Land/asset value
- Tenant / investment attraction
- Competitive advantage

IV. E / Streets and Public Realm

Initiative #6 - Landscape uplift and increased amenity (cont.)

MECHANISM TYPE

Design guidance / placemaking

LAND TENURE & SPATIAL REQUIREMENTS

This initiative can be rolled-out precinct-wide. It requires dedicated spatial allocation, both in the public and private realm. Open space amenity should be located within walking / riding distance to the majority of industrial lots and co-located with retail and any community infrastructure provided (such as food and beverage, fitness etc).

The concept introduces amenity present in other land uses to an industrial setting. Minimum spatial requirements would include slightly more generous outdoor proportions to support increased vegetation (setbacks and frontages to support on-site planting in addition to street reserve). To maximise the benefits of this initiative, additional space of similar scale to pocket parks in residential communities could also be provided.

ISSUES AND CONSTRAINTS

- Improvements in amenity will increase capital costs, with benefits that cannot be easily measured in the short term (such as staff attraction and retention, health and wellbeing, increased productivity, etc)
- Spatial allocation for public open space reduces developable land
- Timing and staging of open space and amenity (including paths) will be critical in order to capture an increase in land value which can help justify the investment (subject to if the amenity, i.e. open space and landscaping is within public ownership)

COST IMPLICATIONS

CAPEX implications

- Cost associated with the design and construction of the additional assets (i.e. outside of BAU such as additional provision of open space, passive and active recreation spaces, community facilities and active transport infrastructure)

OPEX implications

- Cost associated with the maintenance of the assets will likely increase to the asset owner

PRIOR APPLICATION - PORTES DU TARN, TOULOUSE

- Les Portes du Tarn is located approximately 20km north-east of Toulouse, in South of France. The new industrial park has been developed based on the concepts of eco-industrial parks, industrial ecology and industrial synergies
- The park offers a range of high value services and amenities to tenants and workers that are above and beyond those traditionally provided in industrial areas. The masterplan for the precinct includes a range of open space and retail services, a food and beverage offering, public and private transport integration etc
- Similarly in BREP, services related to recreation and hospitality could be key attractors, but would need to be delivered small to start with and scaled up as the employment precinct is developed over time

High value amenity and landscape connectivity in Portes du Tarn. Photography by Mutabilis paysage & urbanisme.

IV. E / Streets and Public Realm

Initiative #7 - Passive irrigation and WSUD in streets

MECHANISM TYPE

Design guidance / placemaking

This initiative includes on lot and in-street WSUD to contribute beyond standard outcomes for stormwater management as required by Clause 53.18, with a focus on low cost measures that use hardstand (e.g. car park) run-off to support passive irrigation of landscape zones.

This includes designing streetscape cross-sections to include 'in-street' WSUD such as bio-retention swales where beneficial. Detail of which street typologies would employ WSUD approaches would be determined through the co-design / separate process.

The goal is to increase passive irrigation to vegetation, provide additional urban cooling and to pre-treat stormwater prior to being discharged into major stormwater retention assets, with the private and public realm working together.

POLICY ALIGNMENT

The Built Environment Climate Change Adaptation Action Plan 2022-2026, Water for Victoria (2016) and Precinct Structure Planning Guidelines (2021) seek to support development that integrates the urban water cycle into its urban design and manages stormwater in a way that minimises environmental damage, alleviates pressure on potable water systems and improves recreational and aesthetic outcomes. The Victorian State funds regional programs to this effect.

This is echoed by regional and local strategies, including the Coliban Water Urban Water Strategy 2022 which supports the use of water sources other than potable water to reduce pressure on the drinking water system including recycled water, raw water and stormwater and Greater Bendigo's Water Sensitive Urban Design local policy and Stormwater management planning provision which seeks to ensure stormwater in urban development, including retention and reuse, is managed to mitigate the impacts of stormwater on the environment, property and public safety, and to provide cooling, local habitat and amenity benefits.

RESPONSIVENESS TO PHYSICAL & TECHNICAL CONTEXT

Integrating the urban water cycle into urban design is particularly relevant to the BREP due to the proposed industrial use and development of the precinct (which is generally accompanied by high levels of impervious services and therefore runoff), the distance to existing potable water and sewerage assets, its topography, and the proximity of residential areas and key environmental assets.

When well-managed, stormwater can become an alternative source of water which can be treated and used in irrigation. WSUD interventions also seek to slow stormwater runoff so that it can be filtered and benefit the health of vegetation. Importantly their inclusion in the design of BREP will increase the overall water resilience of the precinct, alleviate the risk of localised flooding and create an opportunity for water flows to support further habitat enhancement in association with surface flows.

STAKEHOLDER NEEDS ALIGNMENT

- Provides clarity in regard to roles and responsibility for the whole lifecycle of proposed assets, which is crucial to plan and cost for it appropriately and ensure assets deliver as planned. This includes the asset design, construction, handover, ongoing management/maintenance, and end of life / renewal
- Provides significant opportunity for improvements in private roads which are common in industrial development and may be managed through alternative governance arrangements (such as developers who hold a whole precinct and lease the buildings or by a precinct operational management entity)

BENEFITS

Social

- Amenity and Liveability
- Urban temperature regulation
- Connection to nature
- Social capital (including community resilience)
- Sense of place

Environmental

- Stormwater quality improvement
- Flood mitigation
- Biodiversity and habitat enhancement
- Vegetation health
- Climate hazard exposure reduction

Economic

- Productivity (e.g. worker wellness)

Financial

- Land/asset value
- Tenant / investment attraction
- Competitive advantage

IV. E / Streets and Public Realm

Initiative #7 - Passive irrigation and WSUD in streets (cont.)

MECHANISM TYPE

Design guidance / placemaking

LAND TENURE & SPATIAL REQUIREMENTS

This initiative can be rolled-out in both the private and public realm. It requires dedicated space in cross sections and plans.

ISSUES AND CONSTRAINTS

- The system needs to be designed, constructed and maintained according to best practice
- While the concepts behind WSUD systems and passive irrigation are relatively simple, a considerable amount of careful engineering is required to deliver functioning and low maintenance systems. Design and construction mistakes can dramatically reduce performance and increase maintenance requirements particularly on steep sites, in very flat areas and when treatment footprints become smaller than optimal
- The maintenance of stormwater treatment assets also often comprises a combination of engineering, landscape, ecological or horticultural components. A number of skilled people are therefore generally required to effectively manage and operate the assets
- It is also important that asset owners, managers, maintenance staff understand the intended purpose and function of the WSUD assets and how to maintain them (procedures, frequency, material required, etc)
- The function of the assets also needs to be well communicated to precinct tenants and the community more broadly to ensure shared ownership of the assets, which is a key component of their long term viability especially where the assets are included in private roads

COST IMPLICATIONS

CAPEX implication

- Cost of asset design and construction

OPEX implication

- Cost of asset maintenance and end-of-life / renewal, including upskilling
- Savings from reduced stormwater assets elsewhere
- Savings from lower risk of localised flooding (on site and nearby residential land)

PRIOR APPLICATION - LOGIS ECO-INDUSTRIAL PARK, VIC

- Logis Eco Industrial Park is a premium masterplanned industrial business park located in Dandenong, Victoria
- The industrial park's design has incorporated Water Sensitive Urban Design principles through the installation of a large central wetland reserve, providing passive irrigation to riparian vegetation and cleaning excess stormwater before it enters the adjacent Dandenong Creek
- WSUD is further supported through the industrial park's Design Guidelines, including requirements around planting native and drought-tolerant vegetation and minimum on-lot permeability requirements

Fig 20. Maximising passive irrigation at LOGIS Eco Industrial Park. Photography by Plus Architecture.

IV. E / Streets and Public Realm

Initiative #8 - Alternative road cross sections with sustainable materials

MECHANISM TYPE

Design guidance / placemaking

This initiative involves a dedicated process for developing improved road cross sections, which not only enable the green and blue outcomes, but support the inclusion of alternative materials and road construction methods which use recycled products and reduce embodied carbon.

POLICY ALIGNMENT

The Climate Change Act (Vic) 2017 sets in place a zero net emission target of 2050 for Victoria. Reduction in GHG emissions in the construction sector and the transition to a circular economy are key to all relevant state policies including Victoria's Climate Change Strategy (2021), the Built Environment Climate Change Adaptation Action Plan 2022-2026 and Recycling Victoria: A New Economy (2021).

This is also a focus at the regional and local level. A key aspiration of both the Loddon Mallee Circular Economy Plan and the City of Greater Bendigo Climate Change and Environment Strategy 2021- 2026 is for the region and municipality to become a recognised leader in the circular economy in Victoria, including through the design, manufacture and use of recycled materials and products for the construction sector. This also aligns with the local ESD policy (Clause 15.01-2L) which seeks best practice in ESD from the design stage through to construction and operation.

RESPONSIVENESS TO PHYSICAL & TECHNICAL CONTEXT

As a greenfield development, the BREP will require considerable investment in infrastructure to service its future use and development. Decisions can lock in embodied and operational emissions for the lifetime of assets, and enhance or impede the ability to respond to changing climate impacts over time. This presents a key opportunity to optimise the road cross section design and materiality as to optimise its performance and reduce its overall carbon footprint.

Alternative road sections can integrate permeable surfaces in nature strips, curbs, medians. Replacing other hard surfaces such as roads and footpaths with recycled materials is beneficial, particularly noting the large number of street types required.

Industrial subdivisions often have private roads. Private roads can be an excellent location for innovation in street cross section, infrastructure materials and construction methods as any risk is held in the privately held land holding, but all can leverage the learnings.

STAKEHOLDER NEEDS ALIGNMENT

- Provides guidance for developers regarding use of reused/ sustainable materials in civil infrastructure, can be applied to road infrastructure elsewhere
- Assists in locking in expectations for vegetation and WSUD assets in streetscapes which can be implemented through Design Guidelines

BENEFITS

Social

- Health and wellbeing
- Amenity and Liveability
- Urban temperature regulation
- Connection to nature
- Safety
- Accessibility and inclusion
- Sense of place

Environmental

- Emissions reduction - embodied
- Stormwater quality improvement
- Biodiversity and habitat enhancement
- Vegetation health
- Soil health
- Climate hazard exposure reduction

Economic

- Travel efficiency

Financial

- Land/asset value
- Lower building / infrastructure renewal costs
- Tenant / investment attraction

IV. E / Streets and Public Realm

Initiative #8 - Alternative road cross sections with sustainable materials (cont.)

MECHANISM TYPE

Design guidance / placemaking

LAND TENURE & SPATIAL REQUIREMENTS

This initiative can be rolled-out precinct-wide. It may require dedicated spatial allocation (ie modification to crossovers throughout precinct)

ISSUES AND CONSTRAINTS

- Council engineers will require consultation to ensure that cross-sections and infrastructure materials selection meet technical standards and do not cause issues with maintenance, noting Council will become the land manager
- Materials and construction methods are constantly evolving and will continue to do so over the course of project delivery

COST IMPLICATIONS

CAPEX implications

- Subject to taking a dematerialisation approach to optimising street cross sections, capital cost savings are available
- Comparable cost in asset construction (recycled materials can be cost-competitive with traditional civil materials), but must be planned for over a longer timeframe

OPEX implications

- Higher cost of landscape maintenance.
- Reduced or comparable cost of other asset maintenance

PRIOR APPLICATION

Refer to Initiative #17 for a case study example of recycled content in road infrastructure.

Fig 21. WSUD features at Cape Paterson. Photography by Kim Landy.

IV. F / Energy

Good design enables opportunities to decrease energy consumption, reduces reliance on fossil fuels and future-proof our communities to the impacts of climate change.

The primary objective is to reduce stationary energy emissions, through the promotion of energy efficiency, renewable energy procurement, on-site generation and storage.

Achieving a highly energy efficient building in an industrial setting is strongly related to balancing daylight as buildings are often only conditioned for the office component.

An additional consideration in the context of industrial development is the energy intensity of the industrial function. Whereas manufacturing for example will be highly energy intensive, warehousing is the exact opposite.

The following pages highlight contextually-relevant energy initiatives that have been identified as most impactful in delivering the sustainability vision for the BREP. This includes:

- Initiative #9 - EV ready precinct
- Initiative #10 - Precinct solar generation, with energy storage installed to match generation

Fig 22. Rooftop solar PV systems can be designed for the specific needs of individual tenants. Photography by Navin Tar.

IV. F / Energy
Initiative #9 - EV ready precinct

MECHANISM TYPE

Capital investment

This initiative involves the provision of dedicated early vehicle charging infrastructure at a precinct level, to improve the uptake of all electric fleet options for precinct tenants (forklifts, trolleys, vans, other commercial vehicles). There is strong opportunity (subject to further feasibility) for this site to also support fast charging for road transport given its position on the Calder Highway as the key road transport route to Mildura and Swan Hill.

This would be supported by guidance on future proofing tenancies with their own enabling infrastructure for charging and an electrical network that can support high levels of EV penetration.

POLICY ALIGNMENT

The State government is committed to net-zero emissions and a climate-resilient Victoria by 2045. This includes a renewable energy target of 50% of our electricity to come from renewable sources by 2030. The pledge has a dual focus: switching to clean-energy sources and uses (renewable electricity, hydrogen, cleaner gas and electric vehicles) and managing energy demand, including through improved energy efficiency across the economy. This is echoed in the Climate Change Act 2017 (VIC) and Victoria's Climate Change Strategy (2021) and Zero Emissions Vehicle Roadmap (2017). It also with the Structure Plan 2.0 Guidelines which supports adaptability to accommodate new industry sectors and community needs including roll-out of EVs in the future.

This is also a focus at the regional and local level. The Stronger Greater Bendigo 2030: Economic Development Strategy 2020 - 2030 includes transitioning to a regionally owned new energy economy as a key strategic direction. Other relevant planning policies include to encourage renewable energy generation, storage and distribution (Clause 11.02-2S -Structure planning). Transport integration is embedded across several other transport policies.

RESPONSIVENESS TO PHYSICAL & TECHNICAL CONTEXT

In the context of the BREP, incorporating enabling infrastructure for EV integration is a key opportunity. As a gateway to north-western Victoria and stop point between Melbourne and Mildura or Swan Hill, the development of the BREP needs to leverage its location and provide enabling infrastructure such as commercial vehicle EV charging stations to ensure it becomes an attractive hub in regional freight movement.

The precinct should also seek to achieve economies of scale in transport. This could be achieved by providing EV sharing infrastructure for various vehicle sizes.

This initiative would be designed to support businesses to adopt EVs as part of their transport fleet, with the incentive being the proximity of this infrastructure to the freeway. This initiative could be implemented through upfront investment of EV charging infrastructure, with a third party responsible for billing of EV use (e.g. Chargefox).

The site has good connectivity to the electricity network, and its scale further promotes opportunities for onsite renewable energy generation (i.e. solar), including transitional uses as the precinct develops. If coupled with solar PV generation (such as through proposed transitional uses), the EV charging would have access to local renewable electricity.

STAKEHOLDER NEEDS ALIGNMENT

- Addresses the needs of various users in the precinct (i.e. personal use for workers, transportation of goods and services via commercial transport)

BENEFITS

Social

- Accessibility and inclusion

Environmental

- Emissions reduction - operational

Economic

- Local economy
- Industry development / Knowledge capital
- Supply chain resilience
- Investment certainty/catalyst
- Travel efficiency

Financial

- Operational costs - resource use (fuel / energy)
- Tenant / investment attraction
- Competitive advantage

IV. F / Energy
Initiative #9 - EV ready precinct (cont.)

MECHANISM TYPE

Capital investment

LAND TENURE & SPATIAL REQUIREMENTS

This initiative can be rolled-out precinct-wide and requires dedicated spatial allocation, with a location near the future highway alignment required to maximise its benefits.

ISSUES AND CONSTRAINTS

- Ability to invest in EV charging infrastructure for heavy vehicles (ie trucks) is uncertain, as it may require a combination of technology solutions to address the higher demands of heavy vehicles
- The National Select Committee on Electric Vehicles highlighted in their recommendations the need to coordinate with infrastructure across the regions to gain the greatest uptake
- The NCC has recently been updated to include provision for 20% of industrial car parks to be EV ready, so on-site provision of EV enabling infrastructure is considered resolved
- Both micro-grids and solar PV system can support charging infrastructure to be zero emissions
- The distribution network service provider needs to be engaged to understand the impacts of provision of electric vehicle charging on capacity of local electricity network

COST IMPLICATIONS

CAPEX implications

- Cost of designing/ allocating land for use associated with EV charging infrastructure
- Upfront cost of purchasing and installing EV charging infrastructure (both public and private charging)

OPEX implications

- Reduced cost for operating electric vehicles (ie avoidance of costs associated with fossil fuel consumption)

PRIOR APPLICATION - EV-CHARGING INFRASTRUCTURE IN THE PORT OF ROTTERDAM, THE NETHERLANDS

- The Port of Rotterdam is one of the busiest ports in Europe, experiencing a significant increase in logistics movement. To reduce emissions associated with the expansion of the logistics industry, the Municipality of Rotterdam has adopted policies and initiatives aimed at installing electric charging infrastructure for vans and trucks
- Through a partnership with TotalEnergies, Rotterdam has announced funding for up to 30 public fast DC chargers and an entire AC charging network for taxis and logistics delivery vans in the Port of Rotterdam. The EV charging infrastructure is located throughout the city and the Port of Rotterdam with varying charging speeds (50kW to 300kW) – depending on the location, grid power availability and the need for charging speed
- While the Port of Rotterdam is a different environment to the BREP, there is an opportunity for public-private partnerships to assist business owners to transition away from conventional combustion fuel vehicles

Fig 23. Topgolf Partners with Volta to add Electric Vehicle Charging Stations to Select Properties. Photography by Business Wire.

IV. F / Energy
Initiative #10 - Precinct solar generation with energy storage

MECHANISM TYPE

Capital investment

Precinct solar generation on rooftops alone may have sufficient capacity to support the entire precinct energy demand. This is likely to be very uneven across the precinct however, where logistics uses have low demand and electricity intensive manufacturing uses have high demand. This initiative proposes to optimise this arrangement so that overall, the precinct is (combined with storage) can target net zero on an annual basis.

Pairing precinct solar generation with on-site battery storage would allow for energy to be stored during times of low demand and released at times of peak demand. It also has the potential to support demand for adjacent land uses such as residential.

This would allow the precinct to meet a target net zero on an annual basis, but is highly dependent on the energy intensity and the daily energy profile. If the energy intensity is very low the opportunity to be carbon positive will exist for the precinct.

POLICY ALIGNMENT

The State government is committed to net-zero emissions and a climate-resilient Victoria by 2045. This includes a renewable energy target of 50% of our electricity to come from renewable sources by 2030. The pledge has a dual focus: switching to clean-energy sources and uses (renewable electricity, hydrogen, cleaner gas and electric vehicles) and managing energy demand, including through improved energy efficiency across the economy. This is echoed in the Climate Change Act 2017 (VIC), Victoria's Climate Change Strategy (2021), the Built Environment Climate Change Adaptation Action Plan 2022-2026 and the Gas Substitution Roadmap (2022) which provides a blueprint for the State to transition away from fossil gas and towards zero emissions energy.

This is also a focus at the regional and local level. The Loddon Mallee Climate Ready Plan seeks to support a decarbonised, sustainable economy and increase community resilience to disaster through the development of microgrids with energy storage. Stronger Greater Bendigo 2030: Economic Development Strategy 2020 - 2030 includes transitioning to a regionally owned new energy economy as a key strategic direction. Other relevant planning policies include to encourage renewable energy generation, storage and distribution (Clause 11.02-2S -Structure planning) and facilitate development in renewable energy, waste to energy, carbon sequestration and other new energy opportunities (Clause 19.01-2R - Renewable energy - Loddon Mallee South).

RESPONSIVENESS TO PHYSICAL & TECHNICAL CONTEXT

The site has good connectivity to the electricity network and its scale further promotes opportunities for onsite renewable energy generation (i.e. solar), including transition uses as the precinct develops.

Precinct solar generation on rooftops alone may have enough capacity to support the entire precinct energy demand. There is also an opportunity for excess energy to be stored for use in future peak time. Subject to the amount of energy able to be stored, opportunity for excess energy to be consumed by surrounding residential uses, subject to detailed planning at the electricity network level.

Significant government ownership allows the potential for retaining land in large ownership parcels which increases potential for micro-grid / embedded network viability. This allows innovative models of sharing electricity, whereby low demand users with large rooftops could generate renewable electricity and benefit by selling electricity within a private electricity network to higher demand users.

STAKEHOLDER NEEDS ALIGNMENT

- Provides cost-effective solution for energy supply, particularly in terms of electricity rates for future residents/ business owners
- Promotes climate resiliency and improved business continuity for future tenants / residents particularly during extreme weather
- Takes pressure off state energy infrastructure, if implemented in accordance with battery storage)
- Provides an opportunity to strengthen involvement of Djaara in the design and operation of the site (e.g. Djaara-led renewable energy and storage initiatives)

BENEFITS

Environmental

- Emissions reduction - operational

Economic

- Investment certainty/catalyst

Financial

- Land/asset value
- Operational costs - resource use (fuel / energy / water)

IV. F / Energy
Initiative #10 - Precinct solar generation with energy storage (cont.)

MECHANISM TYPE

Capital investment

LAND TENURE & SPATIAL REQUIREMENTS

This initiative can be rolled-out precinct-wide. It requires dedicated space for any ground mounted solar or precinct battery storage.

ISSUES AND CONSTRAINTS

- Impact on local electricity network (e.g. voltage frequency issues) especially for industrial areas that have very low weekend demand
- Complexity of governance arrangements to administer any electricity sharing model for mutual benefit
- Requires flexibility and detailed engagement with DNSP to ensure that network infrastructure investments can support increased solar penetration without adding cost. This will require demand management including storage (and potentially optimisation of day time electric vehicle charging) to be part of the local solution

COST IMPLICATIONS

CAPEX implications

- Upfront cost of installing solar PV infrastructure and storage

OPEX implications

- Reduced cost for energy (ie avoidance of costs associated with fossil fuel consumption)

PRIOR APPLICATION - NAMBEELUP KAADADJAN PEEL BUSINESS PARK, WA

- The Nambeelup Kaadadjan Peel Business Park is an industrial precinct located 75km south of Perth in WA
- The Business Park is powered by a 1.2MW ground-mounted solar farm and supported by a 2.5MW battery storage system, providing more than 50% of the park's energy requirements and an average 30% reduction in business owners' energy bills when compared to energy from the main grid
- Opportunities remain to expand the site's solar PV and battery capacities as the need arises, due to the flexibility of the park's on-site microgrid system (Refer to Initiative #1)

Fig 24. On-site solar generation at Peel Business Park, WA. Photography by DevelopmentWA.

IV. G / Ecology

Retaining and enhancing the natural environment is key to developing a climate resilient precinct. This will not only provide a positive environmental outcome, but offer significant liveability benefits to future users and capture the economic benefit of healthy ecosystems.

These benefits are known as ecosystem services. Key ecosystem services include: habitat for biodiversity, urban temperature regulation, runoff mitigation, food supply and recreational and aesthetic benefits.

Consistent with its agricultural use, the BREP is currently largely cleared of vegetation, with most tree density consisting of roadside vegetation, a number of scattered trees and vegetation patches. Building on existing assets, such as remnant tree copses and roadside vegetation and assets adjacent to the precinct such as Wilsons Hill Bushland Reserve to the west and Bullock Creek to the east provide the platform for significant biodiversity and urban cooling enhancement.

The following pages highlight contextually-relevant ecology initiatives that have been identified as most impactful in delivering the sustainability vision for the BREP. This includes:

- Initiative #11 - Biodiversity enhancement

Fig 25. Retaining and enhancing the natural environment is key to developing a climate resilient precinct. Malone Park. Photography by Goldfields Guide.

IV. G / Ecology
Initiative #11 - Biodiversity enhancement

MECHANISM TYPE

Land use planning control

This initiative seeks to ensure the planning and design of the precinct landscape capitalises on opportunities to enhance the biodiversity of the site, whether through protection of existing remnant vegetation and waterways, integration with the open space network or landscaping design (e.g. species selection).

POLICY ALIGNMENT

The Climate Change Act (2017), Victoria's Climate Change Strategy (2021) and the Built Environment Climate Change Adaptation Action Plan 2022-2026 recognise the importance of protecting Victoria's biodiversity and natural environment. This includes a focus on phasing out native forest logging, investing in ecological restoration projects and increasing urban greening in urban areas through minimum tree canopy targets. These documents acknowledge the multi-faceted benefits of enhancing Victoria's natural environment for people and biodiversity, including urban cooling, access to nature, increased amenity, and the need to mitigate the impacts of urban development on local ecosystems.

Biodiversity enhancement is also a key focus of relevant regional and local documents, including the Loddon Mallee South Regional Growth Plan and Climate Ready Plan, A Stronger Greater Bendigo 2030, and the Climate Change and Environment Strategy 2021-2026. This last document identifies specific targets for local ecosystem regeneration (e.g. 150% net gain in vegetation and biodiversity in Council projects by 2036). It also identifies the key role to be played by Traditional Owners in biodiversity enhancement and repair through the 'Healing Country Together' flagship project, including through co-design processes and conservation activities with the wider community aimed at achieving reconciliation and community stewardship.

RESPONSIVENESS TO PHYSICAL & TECHNICAL CONTEXT

The site is largely absent of native vegetation due to its historic use as agricultural land, with only fragmented areas of roadside vegetation, scattered trees and patches of native vegetation remaining.

There is a significant opportunity to enhance the site's biodiversity and ecological systems through the development of the BREP by prioritising locally indigenous vegetation in all new public realm landscaping, and avoiding the further removal of native vegetation and scattered trees on-site.

The site's proximity to Wilsons Hill Conservation and Bushland Reserves, as well as the Bullock Creek corridor, provides significant opportunities to contribute to the municipality's urban forest coverage and vegetation corridors. This is further supported by the identified channels running through the site, which could be rehabilitated and enhanced as part of the BREP development. The end result could be a high-quality development that champions ecological regeneration and nature positivity (reversing impacts of historic native vegetation removal on-site).

STAKEHOLDER NEEDS ALIGNMENT

- Contributes to the Council's urban forest coverage, tree canopy targets and long-term net gain targets for biodiversity
- Supports tenant / investment attraction and climate resilience objectives (e.g. urban temperature regulation)
- Provides an opportunity to strengthen involvement of Djaara in land management practices on site and ensure a cultural landscape lens is applied to biodiversity initiatives (e.g. Djaara-led land management practices to build ecological resilience and enhance biodiversity)

BENEFITS

Social

- Amenity and liveability
- Urban temperature regulation
- Connection to nature
- Social capital (including community resilience)
- Sense of place

Environmental

- Biodiversity and habitat enhancement
- Vegetation health
- Soil health

IV. G / Ecology
Initiative #11 - Biodiversity enhancement (cont.)

MECHANISM TYPE

Land use planning control

Financial

- Land/asset value
- Tenant / investment attraction
- Competitive advantage

LAND TENURE & SPATIAL REQUIREMENTS

This initiative can be rolled-out precinct wide. It may require the allocation of additional land in streets that service a biodiversity connection function. Where possible, it should be prioritised along drainage corridors and vegetation corridors. Other initiatives respond to the need for additional private land greening.

ISSUES AND CONSTRAINTS

- Re-establishing native ground cover and grassland on previously degraded land can be costly and time-consuming. It would also require concerted effort to ensure vegetation re-establishes as desired. Consultation with ecologists and experienced land managers would be required
- Obtaining locally indigenous plant species can be difficult to achieve at large-scale, due to limited plant stock. This would require coordination with local nurseries and the staging of planting activities, unless a nursery function is adopted as an interim use
- Biodiversity enhancement activities will need to be designed effectively to ensure that no new bushfire or grassfire hazards are introduced to the BREP site which put future workers and residents at risk
- The design of the precinct should use streets and linear reserves to connect existing assets where possible

COST IMPLICATIONS

CAPEX implications

- Upfront costs associated with the design of landscaping and plant species selection/ purchase

OPEX implications

- Ongoing costs associated with management of newly planted vegetation to ensure it establishes and grows effectively

PRIOR APPLICATION - LOGIS ECO-INDUSTRIAL PARK, VIC

- LOGIS Eco-Industrial Park is a premium masterplanned industrial business park located in Dandenong, Victoria
- Previously containing contaminated land and largely disused, the industrial park provides high-quality amenity to workers through the inclusion of shared paths, large open space areas and carefully designed boulevards to allow circulation through the site. The park also encourages both active and passive recreation of workers and the surrounding community through the development of sporting fields and cafés
- Urban greening and biodiversity enhancement are central to the park's design, with open space accounting for more than 14% of the site's overall area (approx.18 hectares). A large, central park has been installed incorporating 89% of the existing protected tree stock and more than 4,000 new trees. In line with ecological restoration and WSUD project commitments, a central wetland reserve has also been included to purify stormwater before it enters Dandenong Creek

Fig 26. Aerial view of the LOGIS Eco Industrial Park. Photography by Plus Architecture.

IV. H / Integrated Water Management

Integrated Water Management (IWM) is a collaborative approach to the way we plan for and manage all elements of the water cycle. This includes managing and protecting the health of waterways, wastewater management, alternative and potable water supply and stormwater management·

Investing in recycled water initiatives and harvesting more stormwater for irrigation and other fit-for-purpose uses is critical to ensuring the future water security. Along with water efficiency initiatives in the design process, demand on potable water can be reduced to support long term water efficiency outcomes.

Given the physical context of the BREP, the long distances to existing potable water and drainage assets and their capacity, water resilience and self-sufficiency are a key area of focus in this development.

The following pages highlight contextually-relevant IWM initiatives that have been identified as most impactful in delivering the sustainability vision for the BREP. This includes:

- Initiative #12 - Roofwater harvesting

- Initiative #13 - Local waste water processing

Fig 27. Investing in recycled water initiatives for irrigation and other fit-for-purpose uses is critical to ensuring the future water security of the BREP. Photography by Aerofloat.

IV. H / Integrated Water Management
Initiative #12- Roofwater harvesting

MECHANISM TYPE

Capital investment

This initiative involves stormwater from rooftops is collected and transferred to local raw water storage ponds (or tanks) before being distributed back to uses within the precinct or adjacent. For BREP, an adjacent use such as the Marong Golf Course or the animal intensive industry could potentially be a long term customer for roof top water.

Water harvested from roof tops generally needs less treatment compared with other surface water runoff. The ability to augment potable water supplies means the cost and carbon emissions associated with water supply from the conventional supply sources via Coliban Water can be avoided. The water volumes from the available catchment from industrial shed rooftops is likely to far outstrip non-potable water demand unless highly water intensive uses locate in the precinct.

POLICY ALIGNMENT

The State government is committed to lead climate change adaptation across Victoria's water system and achieve net-zero emissions in the water sector before 2050. Beyond emissions, the State government is also committed to implementing strategies and programs to alleviate climate impacts, including disruptions to reticulated water and waste water.

The Built Environment Climate Change Adaptation Action Plan 2022-2026, Water for Victoria (2016) and Precinct Structure Planning Guidelines (2021) seek to promote innovation in the water sector and support development that is resilient, liveable and integrates the urban water cycle into its urban design to minimise environmental damage and improve recreational and aesthetic outcomes. This includes the use of alternative water (stormwater and recycled water) within the built environment to support drought resilience and urban cooling.

This is also echoed by regional and local strategies, including the Loddon Campaspe Economic Growth Strategy, Loddon Mallee Climate Ready Plan, Coliban Water Urban Water Strategy 2022, City of Greater Bendigo Climate Change and Environment Strategy 2021- 2026 and the Greater Bendigo's Water Sensitive Urban Design local policy. Loddon Campaspe Economic Growth Strategy in particular recognises that existing water and waste infrastructure restrictions may inhibit further regional development and that innovation for 'on-site' closed loop water/waste solutions may address potential economic growth limitations where water authorities require significant infrastructure renewal to enable development

RESPONSIVENESS TO PHYSICAL & TECHNICAL CONTEXT

Given the physical context of the BREP, the long distances to existing potable water and drainage assets and their capacity, water resilience and self-sufficiency are a key area of focus in this development.

Existing potable water supply and drainage assets are all at capacity or nearing capacity. In addition to building the connection to existing assets, a significant upsizing of assets would therefore also be required to service the development, which adds a layer of complexity in terms of potential timing and consequential costs.

Providing a local alternative water supply for servicing both the development and broader area would therefore be advantageous in lowering development and operational costs, reducing reliance on existing assets and improving overall resilience.

Noting the considerable amount of roof space in industrial/ commercial development and that generally little to no treatment is needed to filter water harvested from roof tops when compared with other surface water runoff, this initiative is particularly favourable in the BREP context. Adjacent uses such as the Marong Golf Course or the animal intensive industry could potentially also become long term customers.

STAKEHOLDER NEEDS ALIGNMENT

- Provides clarity and certainty in regard to overall precinct vision, sustainability ambitions and infrastructure to be provided
- Delivers on local, regional, state and federal targets may be able to leverage other investment, including financial return from water supply to surrounding uses
- May unlock capital and operational savings for land developers and contractors by reducing reliance on existing water infrastructure
- Helps build strong partnerships between existing local and state government, businesses, industries and institutions

IV. H / Integrated Water Management
Initiative #12 - Roofwater harvesting (cont.)

MECHANISM TYPE

Capital investment

BENEFITS

Social

- Amenity and Liveability
- Connection to nature
- Safety

Environmental

- Potable water reduction Stormwater quality improvement Flood mitigation Biodiversity and habitat enhancement
- Vegetation health
- Climate hazard exposure reduction

Economic

- Supply chain resilience

Financial

- Operational costs - resource use (fuel / energy / water)

LAND TENURE & SPATIAL REQUIREMENTS

This initiative can be rolled-out precinct-wide. It requires dedicated space for water storage (public or private land to be determined).

ISSUES AND CONSTRAINTS

- Uncertainty in demand forecast (both within the precinct and with surrounding uses). No water demand study has been undertaken to underpin the investment
- Will require strong partnerships between water authorities, landowners, developers, etc and certainty from customers external to the precinct
- Distribution of financial benefit is complex

COST IMPLICATIONS

CAPEX implications

- Cost associated with the design and construction of the rainwater collection system, including roofs capable of incorporating the system
- Savings in precinct development costs from avoiding the need to upsize existing water assets

OPEX implications

- Cost associated with the maintenance of the rainwater collection system
- Savings from reducing reliance on existing assets and improving overall resilience
- Revenue from potentially selling the water to nearby uses

PRIOR APPLICATION - WARRNAMBOOL ROOFTOP WATER HARVESTING INITIATIVE, VIC

- The Warrnambool Roof Water Harvesting Initiative is an exemplar of large-scale integrated water management, capturing fresh rainwater from roofs for use as drinking water by the community
- Water is collected from roofs in nearby subdivisions and transported by a designated pipeline to Brierly Basin. From here, it is mixed with raw water from the Otways and treated to a drinking water standard
- This initiative has reduced excess urban stormwater from entering waterways and reduces pressure on the water supply catchment of the Gellibrand River - enabling improved environmental flows
- While the BREP does not involve residential development, the fundamentals of the initiative are applicable and the precinct has great potential for roofwater harvesting (i.e. large building footprints with large roof spaces from which roofwater can be harvested and that will not require treatment to be suitable for a wide range of uses)

Fig 28. Warrnambool Roof Water Harvesting Initiative. Photography by Wannon Water.

IV. H / Integrated Water Management
Initiative #13 - Local waste water processing

MECHANISM TYPE

Capital investment

Due to the significant distances to sewage connection, this initiative responds with a precinct level solution to waste water that treats it locally and then redistributes it as a resource if feasible. It involves dedicated space for treatment with appropriate buffer distances to sensitive uses with further feasibility required to determine capacity and benefit versus linking to existing Coliban Water assets.

POLICY ALIGNMENT

The State government is committed to lead climate change adaptation across Victoria's water system and achieve net-zero emissions in the water sector before 2050. Beyond emissions, the State government is also committed to implementing strategies and programs to alleviate climate impacts, including disruptions to reticulated water and waste water.

The Built Environment Climate Change Adaptation Action Plan 2022-2026, Water for Victoria (2016) and Precinct Structure Planning Guidelines (2021) seek to promote innovation in the water sector and support development that is resilient, liveable and integrates the urban water cycle into its urban design to minimise environmental damage and improve recreational and aesthetic outcomes. This includes the use of alternative water (stormwater and recycled water) within the built environment to support drought resilience and urban cooling.

This is also echoed by regional and local strategies, including the Loddon Campaspe Economic Growth Strategy, Loddon Mallee Climate Ready Plan, Coliban Water Urban Water Strategy 2022, City of Greater Bendigo Climate Change and Environment Strategy 2021- 2026 and the Greater Bendigo's Water Sensitive Urban Design local policy. Loddon Campaspe Economic Growth Strategy in particular recognises that existing water and waste infrastructure may inhibit further regional development and that innovation for 'on-site' closed loop water/waste solutions may address potential economic growth limitations where water authorities require significant infrastructure renewal to enable development.

RESPONSIVENESS TO PHYSICAL & TECHNICAL CONTEXT

Given the physical context of the BREP, the long distances to existing potable water and drainage assets and their capacity, water resilience and self-sufficiency are a key area of focus in this development.

Existing potable water supply and drainage assets are also at capacity or nearing capacity. In addition to building the connection to existing assets, a significant upsizing of assets would therefore also be required to service the development, which adds a layer of complexity in terms of potential timing and consequential costs.

Providing a local alternative wastewater treatment service could be have a lower capital and operational cost, given these distances.

The largest proportion of water sector emissions are direct emissions from sewerage treatment, this approach allows the opportunity for reducing these through local control.

STAKEHOLDER NEEDS ALIGNMENT

- Provides certainty as to local infrastructure connection early in the staging of the precinct
- Could lead to lower capital infrastructure costs and lower wastewater costs compared with connection to distant wastewater treatment services
- Provides an opportunity to strengthen involvement of Djaara in land/water management practice

BENEFITS

Environmental

- Emissions reduction - operational
- Stormwater quality improvement
- Potable water reduction

Economic

- Local economy
- Industry development / Knowledge capital
- Employment
- Supply chain resilience

Financial

- Operational costs avoided
- Potential Capital cost reduction

IV. H / Integrated Water Management
Initiative #13 - Local waste water processing (cont.)

MECHANISM TYPE

Capital investment

LAND TENURE & SPATIAL REQUIREMENTS

This initiative can be rolled-out precinct-wide. It requires dedicated space for treatment with appropriate buffer distances from sensitive uses (depending on treatment type).

ISSUES AND CONSTRAINTS

- Governance of local wastewater treatment would be complex
- Requires partnership between / approval from relevant authorities, including Coliban Water, VPA, DTP/DEECA and Council through the Structure Plan process
- Uncertain cost benefit until feasibility is undertaken (dependent on staging, water demand, resolution of costs that would be avoided)
- Buffer distances required may impact surrounding sensitive uses, however the location of waste water treatment could be prioritised to reduce or remove this impact completely

COST IMPLICATIONS

CAPEX implications

- Cost associated with the design and construction of the asset and connections
- Savings in precinct development costs from avoiding the need to connect to distant wastewater treatment

OPEX implications

- Cost associated with maintenance of the asset and connections
- Potentially lower operating costs

PRIOR APPLICATION - HAWASSA INDUSTRIAL PARK, ETHIOPIA

- Hawassa Industrial Park is the largest textile and garment and the first zero-emissions industrial park in Africa.
- The park has a centralised zero liquid discharge (ZLD) water treatment system which employs a combination of technologies to facilitate circulation of 100 percent treated wastewater in the industrial park, with minimal loss through open tanks and sludge, thereby generating clean water suitable for reuse, drastically reducing freshwater consumption and helping industries meet wastewater discharge standards and regulations
- Whilst the industrial uses in BREP are likely to be very different, the motivation behind introducing a system at Hawassa Industrial Park remains the same, i.e. to minimise the environmental damage by treating wastewater locally. In the BREP, the additional benefit is that it also has the potential to significantly reduce infrastructure costs given the distances to existing waste water treatment.

Fig 29. Hawassa Industrial Park, Ethiopia. Photography by Zhang Jiangxi.

IV. I / Urban Heat

Studies show that air temperature in built up areas, particularly after sunset, can be as much as 7 degrees warmer than the air in neighbouring, less built up regions. This is called the urban heat island (UHI) effect.

UHI can affect the environment and impact quality of life, disrupt transport operations, increase energy demand, damage infrastructure, degrade vegetation and wildlife health, and has even been linked to increased crime rates.

In the context of the BREP, the site would currently already be exposed to significant levels of heat, due largely to the absence of significant vegetation and canopy cover.

Given that land development can exacerbate heat by replacing natural surfaces with non-permeable, high thermal mass materials, there is a need to design the built environment to instead provide shade, reflect heat and where possible embrace and retain water to deliver urban cooling benefits.

The following pages highlight a contextually-relevant urban heat initiative identified as most impactful in delivering the sustainability vision for the BREP. This includes:

- Initiative #14 - Urban heat reduction targets

Fig 30. Investing in urban greening and overall worker amenity is critical in providing a quality business environment where extreme heat is mitigated through landscape and building design. Photography by Greater Bendigo City Council.

IV. I / Urban Heat

Initiative #14 - Urban heat reduction targets

MECHANISM TYPE

Land use planning control

A number of targets could be put in place to alleviate urban heat impacts in the precinct, including:

- An urban heat reduction target set to meet the relevant Green Star Credit Criteria, with a minimum proportion of the total project site area, in plan view, comprising of building or landscaping elements that reduce the impact of heat island effect (e.g. vegetation, water bodies, high SRI materials). A target of at least 50% is recommended for public realm and 75% for private realm
- A canopy cover target of 30% for non-building areas to further drive this outcome and provide an opportunity to provide multiple benefits, including being a catalyst for private investment

POLICY ALIGNMENT

Victoria's Climate Change Strategy (2021) and Built Environment Climate Change Adaptation Action Plan 2022-2026 recognise heat vulnerability as a key issue in our built environment, with extreme heat set to intensify with climate change (increase in frequency, duration and intensity of heatwaves). Reducing urban heat exposure, including through precinct design and infrastructure, as well as targets and standards such as minimum tree canopy cover will be key in reducing heat absorption on streets, pavements and other surfaces and protecting communities from heat vulnerability.

Alleviating heat vulnerability is also a key focus of Water for Victoria (2016) which seeks to promote urban cooling through development that integrates the urban water cycle into its urban design. It also supports the collaboration between water corporations, local governments and water users to understand their needs and identify areas of heat stress and promote urban cooling in priority areas.

Heat reduction objectives are also included at the local level, including in Greening Greater Bendigo 2020-2070 and Clause 11.02-2L (Structure planning - Greater Bendigo) which requires development to consider the impacts of development on heat loading in the urban environment and potential heat reduction. Greening Greater Bendigo 2020-2070 also seeks to increase the quantity and quality (i.e. health) of trees across urban areas and townships. It sets ambitious targets in this regard; 25% tree cover across urban Bendigo by 2030, 35% by 2050 and 45% by 2070.

RESPONSIVENESS TO PHYSICAL & TECHNICAL CONTEXT

Consistent with its agricultural use, the site is currently largely cleared of vegetation, with most tree density consisting of roadside vegetation, a number of scattered trees and vegetation patches. The site would currently be exposed to significant levels of heat, due largely to the absence of significant vegetation and canopy cover. Given that land development can exacerbate heat by replacing natural surfaces with non-permeable, high thermal mass materials, there is a need to design the built environment and streetscape to instead provide shade, reflect heat and where possible embrace and retain water to deliver urban cooling benefits.

Investing in urban greening and overall worker amenity is critical in providing a quality business environment where extreme heat is mitigated through landscape and building design and adequate shelter provided for pedestrian movements including through places of respite from harsh conditions and 'cool routes' (i.e. active transport routes between destinations that provide protection from direct heat such as through a physical shade structure or relatively uninterrupted canopy cover). This is key in ensuring the health and wellbeing of tenants and avoiding a loss of productivity due to uncomfortable conditions.

This opportunity aligns with various complementary initiatives which seek to build on existing assets to increase canopy cover, enhance biodiversity, provide active transport connections, minimise environmental damage, alleviate pressure on existing infrastructure and improve recreational and aesthetic outcomes.

STAKEHOLDER NEEDS ALIGNMENT

- Promotes climate resilience amongst future workers (ie extreme weather - heatwaves)
- Provides clarity and certainty in regard to sustainability ambitions and building / landscaping design requirements to be factored into the development

BENEFITS

Social

- Health and wellbeing
- Amenity and Liveability
- Urban temperature regulation
- Safety
- Accessibility and inclusion

Initiative #14 - Urban heat reduction targets (cont.)

MECHANISM TYPE

Land use planning control

Environmental

- Biodiversity and habitat enhancement
- Stormwater quality improvement
- Climate hazard exposure reduction

LAND TENURE & SPATIAL REQUIREMENTS

This initiative can be rolled-out precinct-wide. Some elements would require dedicated space via cross-sections and public open space such as landscaping/canopy elements (vegetation, water bodies etc); buildings elements such as materials with high SRI would not.

ISSUES AND CONSTRAINTS

- Requirements of urban heat reducing treatments have the potential risk of competing with other design considerations (e.g. introduction of high reflectance materials when trying to minimise glare)
- Absence of mature trees in precinct means there will be a lapsed period of time before tree canopy coverage can mitigate urban heat. Will require other urban heat reducing treatments to be incorporated into the precinct design (i.e. materials with greater solar reflectivity, less heat capacity and improved surface permeability)
- Adequate irrigation must be provided to ensure the growth of greenery and to improve the cooling benefits received from evapotranspiration
- Road cross-sections that reduce extent of road pavement etc or apply different materials will require stakeholder agreement including Council
- At a site level, not all materials yet disclose the solar reflectance index (SRI)
- The targets could be implemented through Design Guidelines or appropriate planning controls. These targets are consistent with the Sustainable Subdivisions Framework and the proposed ESD targets

COST IMPLICATIONS

CAPEX implications

- Negligible cost of implementing urban heat mitigation initiatives (ie materials with higher SRI, increasing tree canopy coverage/ vegetation, establishment of waterbodies)
- Cost savings are available where hard landscaped surfaces are replaced with soft landscaping

OPEX implications

- Reduced costs associated with cooling buildings and spaces (due to lower outdoor ambient conditions)

PRIOR APPLICATION - THE YARDS INDUSTRIAL ESTATE, NSW

- Located in Kemps Creek, New South Wales, the YARDS is a 77-hectare masterplanned industrial estate that has set a new Australian benchmark as the first industrial estate to achieve a 6-Star Green Star Communities rating from the Green Building Council of Australia (GBCA)
- As part of its 6 Star Green Star rating, the estate's design was required to implement measures to reduce urban heat to obtain credits under the Environment Category. The YARDS' design was able to effectively meet the Green Star credit criteria by maximising the incorporation of street trees, integrated landscaping throughout the site and establishing a designated native bush re-generation zone
- The YARDS' design response was not only able to show that urban temperatures would be reduced through urban greening; the enhanced landscaping and regeneration zone will also support and enhance the use of the site by local biodiversity, providing multi-faceted benefits for workers and the environment

Fig 31. Extreme heat poses increasingly deadly risks to outdoor workers. Photography by Bisnow.

IV. J / Circular Economy

Circular economy shifts the traditional linear economy of take, make, waste to one where the value of resources is maintained in a circular process.

With landfills in Greater Bendigo and across Victoria quickly reaching capacity, and once abundant resources becoming more scarce as demand continues to increase, there is consideration of how to use less, while seeking opportunities to reuse materials through effective recycling.

In the context of the BREP, this means applying circular economy principles to energy, waste and material management across the precinct life cycle; from precinct-wide design strategies and investments to tenancy operation and ways of working.

The ultimate goal is to maximise environmental and economic benefit for the BREP and its tenants, as well as for nearby land, Marong township and the region more broadly.

The following pages highlight contextually-relevant circular economy initiatives that have been identified as most impactful in delivering the sustainability vision for the BREP. This includes:

- Initiative #15 - Circular economy demonstration precinct
- Initiative #16 - Target for construction waste diversion
- Initiative #17 - Recycled and lower embodied carbon precinct infrastructure

Fig 32. Ritchie Technology (Rtec™) is a research and development company dedicated to the innovation and development of new technologies in the plastic recycling industry. Photography by Geelong Advertiser.

IV. J / Circular Economy

Initiative #15 - A circular economy demonstration precinct

MECHANISM TYPE

Capital investment

This opportunity includes development of a precinct level road map to drive a transition to a local circular economy, identifying key drivers such as construction and organic waste chains. As a precinct with significant growth in jobs, a circular approach can create value through material reuse strategies and save materials and create jobs through increased productivity. For BREP, this is a dedicated piece of work beyond this Sustainable Development Opportunities Report which is most beneficial once the target land uses are clearer.

POLICY ALIGNMENT

The Climate Change Act (Vic) 2017 sets in place a zero net emission target of 2050 for Victoria. Reduction in GHG emissions in the construction sector and the transition to a circular economy are key to all relevant state policies including Victoria's Climate Change Strategy (2021) and the Built Environment Climate Change Adaptation Action Plan 2022-2026. Recycling Victoria: A New Economy (2021) in particular seeks to support the shift to a circular economy in Victoria and drive innovation in new technologies through strong incentives to reduce and recycle waste, including funding streams, training, stronger landfill levies, etc. This includes a strong focus on minimising waste from the construction and operation of the building stock. The State Government has committed to diverting 80 per cent of waste from landfill by 2030, with an interim target of 72 per cent by 2025.

This is also a focus at the regional and local level. A key aspiration of both the Loddon Mallee Circular Economy Plan is for the region and municipality to become a recognised leader in the circular economy in Victoria. The creation of a circular economy demonstration precinct also aligns with three flagship projects of the Greater Bendigo Climate Change and Environment Strategy in particular, including: Flagship project 4 - The Greater Bendigo Climate Collaboration, Flagship project 5 - Showcase Sustainable Developments and Flagship project 6 - Building a Circular Greater Bendigo.

RESPONSIVENESS TO PHYSICAL & TECHNICAL CONTEXT

The BREP will require a staged development over a long timeframe resulting in undeveloped/unused land existing for a long period. There is an opportunity for large landowners in the precinct to support the development of a zero carbon and circular economy for the City and surrounding region.

This could for example include a dedicated strategy accompanied with the allocation of land (temporarily or permanently) to support the following initiatives:

- Research and innovation in solving/mitigating urban challenges experienced locally or in the region, particularly in regard to water, energy, transport, waste
- The storage and processing of surplus waste / resources arising out of the construction of the precinct, existing land uses (on-site and surrounding) and future industrial activity. This would allow for the sorting of high value materials that could be reused in civil construction or other end uses and provide sufficient time 'lag' for the resource to be created through an industrial activity and the next 'life' of the material beginning
- A new hub for students to gain practical experience and develop an understanding of industrial practice outside of the educational setting

STAKEHOLDER NEEDS ALIGNMENT

- Strongly aligns with State and local Government investment focus, with investment like this driving ambition and de-risking investment
- Fosters collaboration regionally, particularly in regard to industrial synergies, circular economy and waste management
- Takes pressure off state waste systems, and creates value through reducing externalities associated with waste treatment for higher value uses

BENEFITS

Social

- Social capital (including community resilience)

Environmental

- Emissions reduction - operational
- Emissions reduction - embodied
- Resource recovery - diversion from landfill

Economic

- Local economy

IV. J / Circular Economy
Initiative #15 - A circular economy demonstration precinct (cont.)

MECHANISM TYPE

Capital investment

- Industry development / Knowledge capital
- Employment
- Supply chain resilience
- Investment certainty/catalyst

Financial

- Operational costs avoided (e.g. landfill levy costs)
- Tenant / investment attraction
- Competitive advantage

LAND TENURE & SPATIAL REQUIREMENTS

This initiative can be rolled-out in the private realm. It may require dedicated space, though could be a transitional use/development.

ISSUES AND CONSTRAINTS

- Land use planning zoning and overlay restrictions could prevent establishment of some uses in the precinct
- May require buffer distances of up to 1km to sensitive uses depending on the types of circular economy processes
- Requirement for extensive consultation and consideration as part of roadmap development
- Would require at least some State and Local Government investment in infrastructure and would benefit from university partnerships
- Local circular economy markets are still being established, although food manufacturing and agriculture represent potential waste streams

COST IMPLICATIONS

CAPEX implications

- Upfront costs associated with feasibility
- Upfront costs associated with establishment of infrastructure
- to support waste stream and circular systems (ie arrangements with third-party waste companies, business which can utilise waste/ recycling as part of their own production systems)
- Upfront investment in any site-specific circular economy infrastructure (ie green waste/ composting, water reuse)

OPEX implications

- Operational costs in communication to inform businesses on the circular systems set up for the precinct
- Ongoing operational costs of waste/ circular economy systems (in long term this is positive through increased local processing capacity)

PRIOR APPLICATION - YARRABILBA CIRCULAR ECONOMY STRATEGY

- The Yarrabilba masterplanned community aims to be the first circular economy community in Australia, through creation and implementation of a site-specific circular economy strategy
- The strategy was undertaken to guide both the construction and operation of the precinct. During construction, recycled concrete, timber and bricks were used to develop the precinct's homes and infrastructure, along with the re-use on-site natural resources (rocks, soil and water) to minimise the development's environmental impacts
- Shared community facilities have been created to effectively re-use waste and other resources, including a large-scale commercial composting facility and a Materials Processing and Trade Centre
- While Yarrabilba and the BREP have different land-uses, there is an opportunity to investigate a circular economy strategy for the BREP to re-use waste and resources during the construction and operation of the precinct

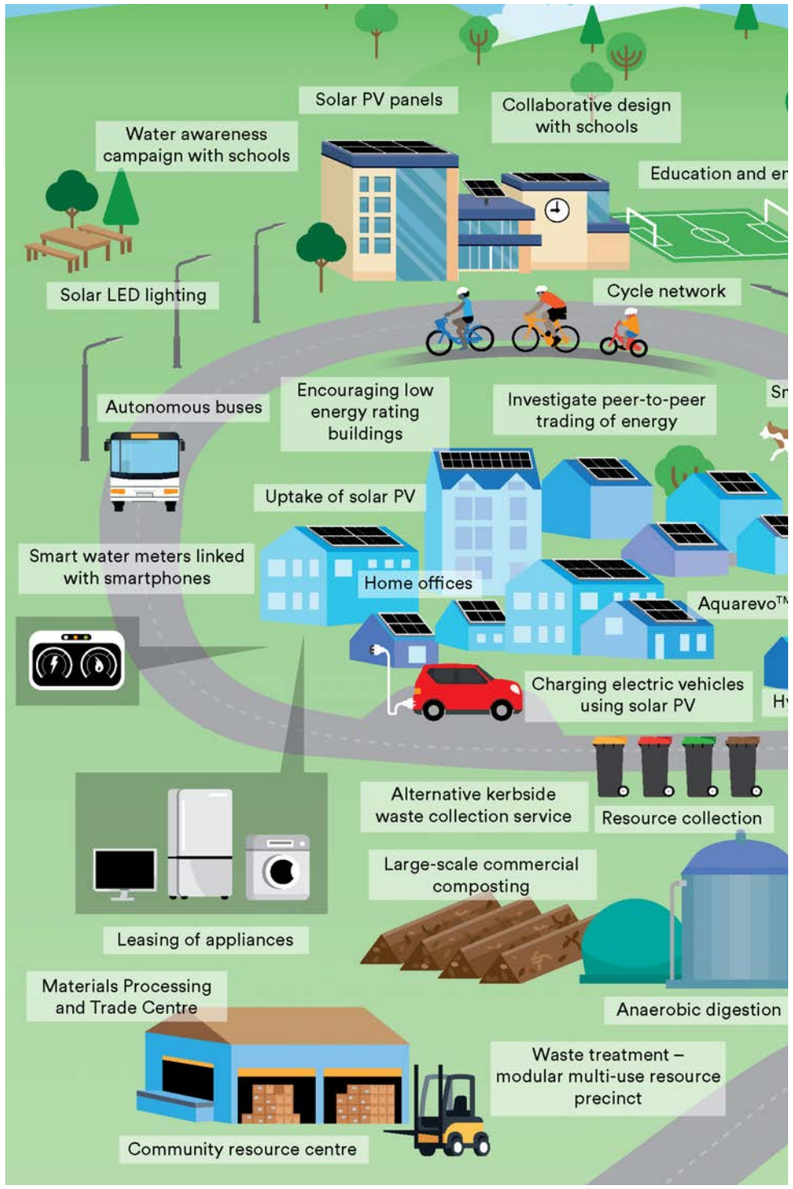

Fig 33. Infographic in the Yarrabilba Circular Economy Strategy. Image by Lendlease

IV. J / Circular Economy

Initiative #16 - Target for construction waste diversion from landfill

MECHANISM TYPE

Land use planning control

Commitment to developing and implementing a Construction Waste Management Plan for the project construction and demolition waste with targets of at least 90% representing exceptional performance.

POLICY ALIGNMENT

Climate Change Act, Victoria's Climate Change Strategy, Built Environment Climate Change Adaptation Action Plan 2022-2026, Recycling Victoria: A New Economy seek to support the shift to a circular economy in Victoria and drive innovation in new technologies through strong incentives to reduce and recycle waste, including funding streams, training, stronger landfill levies, etc. This includes a strong focus on minimising waste from the construction and operation of the building stock.

This is also a focus at the regional level, with strategies such as the Loddon Mallee Circular Economy Plan and Loddon Campaspe Economic Growth Strategy recognising the untapped opportunities to reduce landfill and increase the recovery and reprocessing of materials by improving the circular economy within the region.

Building a circular Bendigo is also a flagship project within the City of Greater Bendigo Climate Change and Environment Strategy 2021- 2026, with Council seeks to exceed Victorian Government's targets of 80% waste diversion from landfill and 15% per capita reduction in waste production.

RESPONSIVENESS TO PHYSICAL & TECHNICAL CONTEXT

With the existing regional landfill (Eaglehawk landfill) due to reach capacity in 2023 and the local ambition to exceed the Victorian Government's target of 80% waste diversion from landfill, a high construction waste diversion target is recommended.

The location on a key transport route makes it relatively accessible for moving recycled material to regional processing facilities.

STAKEHOLDER ALIGNMENT

- Provides clarity and certainty in regard to overall precinct vision, sustainability ambitions and infrastructure to be provided, development process and delivery; including developers, architects, local contractors, etc
- Delivers on local, regional, state and federal targets may be able to leverage other investment
- May unlock savings for land developers and builders associated through the value of recycled materials

BENEFITS

Environmental

- Emissions reduction - embodied
- Resource recovery - diversion from landfill

Economic

- Local economy
- Industry development / Knowledge capital
- Employment
- Supply chain resilience
- Investment certainty/catalyst

Financial

- Capital costs reduction

IV. J / Circular Economy

Initiative #16 - Target for construction waste diversion from landfill (cont.)

MECHANISM TYPE

Land use planning control

LAND TENURE & SPATIAL REQUIREMENTS

Precinct-wide, with potential higher percentage of landfill diversion sought in the Council land.

It does not require dedicated spatial allocation in the precinct, however additional storage space on site during construction is beneficial for construction waste separation.

ISSUES AND CONSTRAINTS

- Risk that material and design choices aren't considered prior to reduce the volume of waste created through construction (ie strategies such as standard material lengths, pre-fabrication etc)
- Potential that waste contractors / resource recovery businesses are not able to recycle all construction waste streams locally. This may also result in added vehicle emissions to procure services from outside local area / or link to recycled material markets across Victoria
- Further analysis of local materials recycling capability prior to Stage 1 rolling out would be beneficial to ensure that private or public investment is able to address any gaps

COST IMPLICATIONS

CAPEX implications

- There is expected to be no quantifiable impact on CAPEX, as additional building and infrastructure costs should be offset by the value of the recycled waste streams and avoidance of the landfill levy

OPEX implications

- N/A

PRIOR APPLICATION - THE ROZELLE INTERCHANGE, WESTCONNEX, SYDNEY

- WestConnex is Australia's largest road project. The Rozelle Interchange is a new underground motorway interchange which will provide connectivity to the M4-M5 Link Tunnels and the City West Link, and underground bypass of Victoria Road between Iron Cove Bridge and Anzac Bridge. It will also provide a connection to the future Western Harbour Tunnel, deliver new active transport options and transform the under-utilised site into up to 10 hectares of open space
- A joint venture of John Holland and CPB (JHCPB) has been contracted to design and construct the project.
- From the commencement of construction to March 2021, JHCPB has diverted 21,866.38 m3 of construction waste from landfill (90%) and reused 4,207,883 tonnes of spoil (97%). Project spoil has been reused both on site for civil works and at various approved offsite reuse sites
- JHCPB is also currently investigating the use of recycled materials in concrete, including crushed waste glass as replacement to virgin sand in concrete and flowable fill, and recycled polypropylene fibres in lieu of steel reinforcement in non-structural concrete elements

Fig 35. Rozelle Interchange, artistic impression. Image by TSA

Fig 34. Construction Waste. Source Unknown.

IV. J / Circular Economy

Initiative #17 - Recycled and lower embodied carbon precinct infrastructure

MECHANISM TYPE

Land use planning control / Capital investment

This initiative involves undertaking an evaluation of the embodied carbon impact of the top 4 to 6 materials involved in civil infrastructure for the precinct and meeting a 30% reduction in embodied carbon associated with those materials. Five infrastructure materials: asphalt, concrete, steel, aggregates and pipes account for approximately 97 per cent of embodied carbon, with asphalt and concrete being the most significant contributors.

The use of low embodied carbon materials is suggested to be underpinned by a commitment to adopt recycled materials and construction methods for the project where they are demonstrated to meet technical performance requirements. This will include for example recycled plastics / glass in roads and drainage infrastructure, public realm infrastructure such as seating etc.

POLICY ALIGNMENT

The Climate Change Act (Vic) 2017 sets in place a zero net emission target of 2050 for Victoria. Reduction in GHG emissions in the construction sector and the transition to a circular economy are key to all relevant state policies including Victoria's Climate Change Strategy (2021), the Built Environment Climate Change Adaptation Action Plan 2022-2026 and Recycling Victoria: A New Economy (2021). This is also a focus at the regional and local level.

A key aspiration of both the Loddon Mallee Circular Economy Plan and the City of Greater Bendigo Climate Change and Environment Strategy 2021- 2026 is for the region and municipality to become a recognised leader in the circular economy in Victoria, including through the design, manufacture and use of recycled materials and products for the construction sector. This also aligns with the local ESD policy (Clause 15.01-2L) which seeks best practice in ESD from the design stage through to construction and operation.

RESPONSIVENESS TO PHYSICAL & TECHNICAL CONTEXT

For an industrial precinct, embodied carbon includes the roads, buildings and other infrastructure. The BREP as a greenfield development and requires considerable investment in infrastructure to service its future use and development. The provision of precinct infrastructure could therefore be a major source of embodied carbon if not properly managed and provides a key opportunity for lower embodied materials, including recycled content to be used.

The location on key transport route makes it relatively accessible for materials with lower embodied carbon and high recycled content.

Industrial development often creates private roads which can be excellent, lower risk opportunities for innovation.

STAKEHOLDER NEEDS ALIGNMENT

- Provides clarity and certainty in regard to overall precinct vision, sustainability ambitions and infrastructure to be provided, development process and delivery; including developers, architects, local contractors, etc
- Delivers on local, regional, state and federal targets may be able to leverage other investment. Land developers and contractors may unlock savings associated with the value of dematerialisation
- Helps build strong partnerships between existing local and state government, businesses, industries and institutions

BENEFITS

Environmental

- Emissions reduction - embodied
- Resource recovery - diversion from landfill

Economic

- Local economy
- Industry development / Knowledge capital
- Employment
- Supply chain resilience
- Investment certainty/catalyst

Financial

- Land/asset value
- Competitive advantage
- Operational costs - maintenance
- Operational costs avoided (e.g. landfill levy costs)
- Lower building / infrastructure renewal costs

IV. J / Circular Economy

Initiative #17 - Recycled and lower embodied carbon precinct infrastructure (cont.)

MECHANISM TYPE

Land use planning control / Capital investment

LAND TENURE & SPATIAL REQUIREMENTS

This initiative can be rolled-out precinct-wide. It does not require dedicated spatial allocation in the Structure Plan.

ISSUES AND CONSTRAINTS

- Risk that low-carbon, high-value materials are deemed unsatisfactory by Council engineers (which may require early consultation and alignment with other approved documents such as the Sustainable Infrastructure Guidelines - or mention of recycled materials in Structure Plan). This does include potentially lower durability or shorter operational phases before replacement; however many lower embodied carbon or recycled materials are more durable than standard materials
- Potential risk of materials substitution during construction (e.g. by sub-contractors) resulting in non-compliant materials, however, this risk can be managed through contractor education and contractual obligations
- Materials and construction methods are constantly evolving and will continue to do so over the course of project delivery
- Other stakeholders such as utility providers will likely need to be engaged if recycled materials focus was to include underground infrastructure such as water pipes

COST IMPLICATIONS

CAPEX implications

- Upfront costs associated with design of infrastructure may increase due to the use of non-standard infrastructure, however this will be able to leverage the learnings from big build projects (Recycled First) to reduce cost of testing specific solutions for infrastructure
- Reducing embodied carbon through dematerialisation (i.e. where efficient designs lead to less material being used) may lower costs associated with infrastructure delivery (an example is narrower road pavement or consolidated crossovers)

OPEX implications

- Comparable / potentially reduced cost of asset maintenance noting some low embodied carbon alternatives actually extend operational phases before replacement so can represent a further saving

PRIOR APPLICATION - RECYCLED ASPHALT IN THE CRAIGIEBURN ROAD UPGRADES, VIC

- Addressing the rapid population growth in Melbourne's Northern Growth Corridor, the City of Hume has undertaken necessary infrastructure upgrades to the Craigieburn Road and Mickleham Road intersection through the use of Reconophalt - asphalt containing recycled content that would have otherwise ended up in landfill
- The 1-kilometre stretch of road was upgraded in 2022 using more than 3 and a half thousand tonnes of Reconophalt, equivalent to 250,000 crushed bottles (unsuitable for re-manufacturing), 800,000 plastic bags and more than 18,000 old ink toner cartridges
- In addition to the benefits of using recycled content, Reconphalt has also been found to be more durable over time and cost-competitive with traditional forms of asphalt
- The Craigieburn Road upgrade is a practical example of the Victorian Government's Recycled First Policy and promotes the use of recycled content in other Victorian major road upgrades

Fig 36. Using Reconophalt during upgrades to the Craigieburn-Mickleham Road intersection. Photography by Big Build.

IV. K / Additional initiatives

We note that the initiatives listed in this sub-chapter were also considered as part of this work.

These have not been further analysed in this report due to the initiatives either being covered by separate technical inputs being prepared for the site, not sitting within the remit of a Structure Plan or having been identified as of lower priority at this stage in the project.

They have been included within the Discussion Paper for completeness and should be further considered through the Structure Plan process and subsequent project stages as appropriate.

OPPORTUNITY AREA	INITIATIVE	DESCRIPTION
Governance	**Marketplace for surplus waste, energy and water**	A marketplace, established by Council or other third party facilitates excess or surplus resources (waste products from industrial processes) to be purchased as inputs into other industrial processes. The same marketplace could also facilitate excess generated electricity and/or non-potable water to be traded locally. This would be enabled by a digital platform capable of linking demand and supply of surplus resources on commercial terms.
	Density targets for different land uses	This initiative imposes discretionary planning controls to apply minimum density targets for built form for different land uses to respond to what is generally very inefficient industrial development to date in the region. The environmental benefit is to improve the worker density and the use of limited resources (land)
	Climate Adaptation and Resilience Plan	This would deliver a formal Climate Risk Assessment and Adaptation Plan for the precinct which would influence the next phase of design (both public realm and buildings). It includes investigation of future climate scenarios, assessment of risks and impacts and design review based on results.
	Tenancy diversification and curation strategy	This initiative requires a dedicated strategy around tenancy diversification and curation to achieve a healthy industrial ecology. This includes potentially restricting uses establishing which are not synergistic with the vision for the precinct and specifically targeting tenants which benefit the intended industrial ecology. It could be led by one or more key stakeholders including Development Victoria, Council or partner developers. The strategy will firstly focus on anchor tenants that can be an attractor for other businesses.
	Seamless servicing	This initiative involves businesses gaining facilitated connection to critical infrastructure and starting small within a precinct without the complexity of arranging/ optimising a range of services to commence business operation. This approach in some settings has included telecommunications offering exceptional high speed internet. The intention is that as the business scales, they can move to larger premises within the same precinct.
	Operational Monitoring	This initiative involves a regulatory requirement for building owners to publicly disclose their operational performance. The initiative would place the onus on building owners to report on operational performance annually in a consistent way, allowing a zero carbon target to be monitored, and a third party to provide assistance with optimising resource use. The initiative could also feed strongly into the proposed marketplace for surplus energy, non-potable water and resources arising from industrial process waste.

IV. K / Additional initiatives

OPPORTUNITY AREA	INITIATIVE	DESCRIPTION
Governance	**Circular Economy Innovation Zone**	This initiative would provide spatial allocation and financial support for innovation within the precinct, with the goal of clustering ideas and small businesses capable of developing new ideas and products. Ideally, an innovation zone allow for some subsidisation of operational costs (rent, utilities) to allow research and development in particular of processes that can build the circular economy locally. A R&D partnership with La Trobe or other regional university could add further value along with a dedicated State or other funding stream for feasibility studies. It would also provide an opportunity for students to gain practical experience and develop an understanding of industrial practice outside of the educational setting.
	Supply chain aggregation for tenants	Demand aggregation allows a third party to aggregate demand of common business inputs such as electricity, storage solutions, communication services (Saas, gigabit economy etc) to provide economies of scale to tenants and facilitate change to more responsible supply chain. This initiative could also help support the proposed marketplace concept for surplus resources
	Cultural heritage	Elevating the culture of Traditional Owners and involvement of the Dja Dja Wurrung community through increased engagement and partnerships, and acknowledging the relevance and significance of culture and heritage that delivers a genuine acknowledgement of country.
Site Layout & Liveability	**The creation of an active transport priority network**	An active transport priority network will require adequate footpaths, shared-paths and bike lanes (each where appropriate) alongside rest-nodes and landscape amenity to ensure network is safe and manageable during climate events (such as heatwaves). For the employment precinct, the primary initiative will involve creating strong walking and cycling connections back to central amenity, which would include food and beverage, health and wellbeing, open space etc.
Energy	**Aggregated renewables procurement**	This initiative involves a facilitated aggregation of electricity demand at a precinct level to purchase renewable electricity collectively. The opportunity here is to aggregate the demand of several (likely large) customers through a partnership and use the aggregated demand to procure renewable energy over the longer term at a price comparable to 'black electricity'. This could be part of a larger governance mechanism for Supply chain aggregation for tenants.
	Energy supply contracting (ESC)	This initiative involves third party supply of energy services within the precinct, with a set of turnkey services and financing for interventions related to sourcing and distribution of energy (i.e. electricity or heat supply) to provide customers with low-cost, efficient, reliable, and clean energy supply. In this context this may also extend to the ownership and operation of key assets such as roof top solar and battery storage, which can be locally optimised - potentially as a non-for-profit entity acting on behalf of land owners and tenants.
	Biomass / biogas	This initiative involves creating energy from organic waste locally. Organic waste is fed into a digester where bacteria cause the material to break down. This process generates biogas, which is cleaned to remove odours and impurities. The gas is then used directly or sent to a generator to produce energy. Other examples of feedstock that could be used to produce biogas include water treatment plants and agricultural processors. Feed stock is considered an opportunity locally.
	District energy scheme (embedded networks and micro-grids)	This initiative could work in tandem with Energy Supply Contracting (ESC) and involves providing energy at a precinct level through the use of an embedded network or micro-grid to allow sharing of electricity across property boundaries or potentially across different electricity meters within a consolidated property boundary. This may have particular application for large land holdings where built form, servicing and roads etc can be created and held in long term ownership without subdividing. An embedded network is a type of district energy scheme which allows energy to be generated, consumed, stored and shared behind the meter.

IV. K / Additional initiatives

OPPORTUNITY AREA	INITIATIVE	DESCRIPTION
Ecology	**Integrated open space corridors**	This initiative includes the development and enhancement of key natural corridors through the precinct. Enhancement of open space corridors supports a range of benefits including potential integration with active transport, improved amenity, ecological connectivity and stormwater quality. For BREP, this principally involves connecting existing stands of remnant vegetation and creek lines to the Wilsons Hill Bushland Reserve. These corridors can support biodiversity enhancement based on the pre 1750 EVC's for the precinct.
IWM	**On-Lot stormwater capture and reuse**	This initiative uses existing planning policy to increase capture, storage and re-use of stormwater generated on site in accordance with Clause 53.18. This planning mechanism would be triggered by a planning application for development of built form or subdivision. This would (depending on scale) require STORM or MUSIC assessment tools to demonstrate on lot compliance with the standard from both the particular provision and the ESD perspective (consistent with Clause 15)
Circular Economy	**Alternative waste treatment facility**	This initiative involves creating energy from organic waste locally. Organic waste is fed into a digester where bacteria cause the material to break down. This process generates biogas, which is cleaned to remove odours and impurities. The gas is then used directly or sent to a generator to produce energy. Other examples of feedstock that could be used to produce biogas include water treatment plants and agricultural processors. Feed stock is considered an opportunity locally.
	Resource hubs	This initiative includes allocation of land for the purposes of storage and processing of surplus waste / resources arising out of industrial activity in the precinct. The resource hub would allow for sorting of high value materials that can be reused in civil construction or other end uses. The space allows sufficient time 'lag' for the resource to be created through an industrial activity and the next 'life' of the material beginning. This initiative would work best co-located and financially connected with the Marketplace for surplus waste, energy and water and the Circular Economy Innovation Zone.
	Aggregated waste collection	This initiative includes a precinct waste management plan approach where land / building owners, tenants are bound to a single waste contractor and waste collection requirements - allowing more waste streams to be collected through efficiencies, targeting greater than 80 per cent of waste diverted from landfill by 2030 (consistent with Recycling Victoria Strategy state wide target). The entity who procures the waste contractor could be synergised with other precinct services such as energy or waste water processing. This model also allows innovative waste pricing, which incentivises positive waste behaviour.

V. Implementation Plan

V. A / Delivery Mechanisms & Planning implementation

The role of the Implementation Plan is to provide a roadmap to the successful delivery of sustainable ambitions for the BREP. For each initiative, this Plan:

- **Clearly identifies key delivery roles, partnerships and implementation considerations**
- **Highlights actions or delivery mechanisms recommended to be pursued in the various stages of the development to facilitate the desired ESD outcomes**

Importantly, we note that the suite of planning tools to be deployed to guide the development of the BREP as a whole has not yet been resolved. This plan therefore focuses on planning implementation options and considerations rather than specific planning solutions which need to be considered more broadly than in regard to sustainability. These suggestions are the professional opinion of HIP V. HYPE and subject to further review and testing by the VPA.

Similarly, as the urban structure for BREP is not resolved, the information provided as part of the Sustainability Initiatives Plan included at the end of this chapter is preliminary only and would need to be revisited based on the urban structure and staging being resolved.

DELIVERY MECHANISMS

The vision for the BREP cannot be delivered through the Victorian Planning System or planning tools alone, and would require a range of mechanisms to be employed to deliver the desired outcomes. The effectiveness of these mechanisms will depend on the nature of the opportunity area being pursued and timing (i.e. development stage).

Development stages adopted in the Implementation plan include:

- Structure Plan & planning scheme implementation
- Sub-precinct Masterplan or Development Plan
- Planning application
- Precinct development and operation
- Other (matters that transcend development stages)

Delivery mechanisms that were considered as part of this project and can be employed within those development stages include:

- Capital investment
- Land use planning controls
- Design guidance / placemaking
- Operational investment
- Finance, governance and operational model

We note that:

- Capital investment can occur at any one of the first three development stages
- Land use planning controls can be delivered through the first or second development stages
- Design guidance can be developed throughout all stages but is most impactful if prepared prior to precinct development
- Operational investments may be resolved beforehand but applied to the precinct development and operational phase
- A “technological watch” is recommended for a limited number of future changes in technology and market conditions (e.g. electricity market) that may facilitate improved outcomes over the delivery timeframe of the BREP

PLANNING IMPLEMENTATION

Early planning stages are crucial in the delivery of zero carbon and climate resilient built environments, with decisions locking in embodied and operational emissions for the lifetime of assets, and impacting the ability to respond to a changing climate over time. Planning tools and instruments were therefore carefully considered as part of this work, including:

- Structure Plan
  - + Objectives, which can be used to sign post a desired outcome
  - + Requirements, which must be delivered
  - + Guidelines, which should be delivered
  - + Plans and diagrams, which provide additional design guidance
- Planning scheme
  - + Policy (site-specific or general), which must be taken into account and given effect to by planning authorities
  - + Controls (site-specific or general) including zones, overlays and particular provisions
- Planning application
  - + Application requirements, which must be provided to the satisfaction of the RA
  - + Planning permit conditions, which must be complied with prior to the subdivision or buildings and works certification
  - + Private agreements and title encumbrances which place limitations lot titles (e.g. mortgages, easements, leases and restrictive covenants via S173)
- Other
  - + Private or public-led design guidelines, which can have varying statutory weights depending on avenues pursued
  - + Developer / tenant / investor initiated sustainability outcomes, which can involve third parties and are not typically planning-led

Fig 37. Co-locating wildflowers and solar panels can attract pollinators. Photography by Hollie Blaydes.

V. B / Governance
Initiative #1 - Zero carbon target

IMPLEMENTATION CONSIDERATIONS

- Transparency in reporting processes between landowners and tenants will be critical to support ongoing carbon neutral status
- A single entity with control and responsibility for managing the carbon neutral status may be preferable
- A platform that allows tenants to report on their environmental performance easily would also be highly advantageous
- Formal certification could be sought, with multiple accreditation pathways available such as Climate Active
- Businesses and industries seeking to locate in the BREP could be encouraged to implement their own carbon neutral strategies and seek certification for their individual buildings or operations. Individual certifications would complement and feed into the reporting required at the precinct-level

KEY DELIVERY ROLES & PARTNERSHIPS

- Key stakeholders include:
  - + Developers
  - + Land / business owners
  - + Tenants
  - + Precinct-wide operational management entity (if established)
  - + Third-party certifier, if formal certification is pursued
- The key delivery role would be to lead the initial pursuit and ongoing requirements associated with the carbon neutral status. This could be led by a precinct operational management entity or initiated by one or multiple landowners working in collaboration
- It requires buy-in from major precinct landholders to be as rolling out this initiative will require upfront investment in zero / low emissions energy supply, transport options and waste management (with the understanding that the benefits will accrue over time) and require ongoing contributions to maintain the carbon neutral status through monitoring and reporting of individual environmental performance

IMPLEMENTATION ACTIONS

Structure Plan & planning scheme implementation

- Establish this initiative as a priority for the development of the BREP through technical reports, the Structure Plan and co-design process
  - + The development of a zero-carbon precinct can be included in the Structure Plan vision and as an overarching objective
  - + Other objectives and requirements under the Structure Plan need to align with this overarching goal (i.e. energy, water, transport and waste), then be supported by performance-based requirements in the Structure Plan for the design, construction and operation of the precinct (both at the subdivision and building level)
- Undertake a dedicated process either as part of the co-design process or separately, to establish a clear emissions boundary and resolve governance arrangements
- Ensure the initiative is followed through at the Planning Scheme Amendment Stage (policy and control)

Sub-precinct masterplan & development plan

- Ensure the initiative is followed through at the sub-precinct masterplan or development plan stage in particular through the enabling infrastructure (solar PV generation, electric vehicle charging etc.)

Planning application

- Ensure the initiative is followed through at the planning application stage by requiring delivery on the net zero target to be demonstrated via the preparation of a SMP/SSMP to the satisfaction of the Responsible Authority via permit conditions

Precinct development & operation

- Continue to maintain the carbon neutral status through monitoring and reporting carbon emissions and continuously seek to improve performance based on the data gathered (either through precinct-wide operational management entity or developer group)
- The use of green leases is also recommended to ensure that environmental goals, targets and systems put in place are also followed through by tenants
- The ongoing arrangements for delivery against the target ongoing will require some operational investment in addition to the structuring of a governance model to ensure roles and responsibilities are well understood

V. B / Governance
Initiative #2 - Sustainable design guidelines

IMPLEMENTATION CONSIDERATIONS

We note that Design Guidelines could be established either for the whole precinct as an incorporated or reference document or via a requirement for developers to draft Guidelines that include design requirements and targets to the satisfaction of the responsible authority.

KEY DELIVERY ROLES & PARTNERSHIPS

- Key stakeholders include:
  - Land owners
  - Developers
  - Council and Victorian Government (VPA)
- Key delivery roles would include the preparation of the Design Guidelines, their formal adoption / implementation and ensuring they are being adhered to and functioning as planned. This will require further coordination, however will ensure a unified vision and 'buy-in' from the various landowners
- Depending on whether the Design Guidelines are prepared as part of the Structure Plan process or separately through private agreement, the drafting could be led by:
  - The VPA in collaboration with Council (as the municipal authority), with landowners having the opportunity to provide feedback through the co-design and public exhibition phases
  - One or multiple landowners and third party consultants
- Ensuring Design Guidelines are being adhered can also be done by a number of stakeholders depending which implementation avenue is pursued (e.g. Council if implemented via planning instrument, and land owners or a review board or operational management entity if implemented via private agreement)

IMPLEMENTATION ACTIONS

Structure Plan & planning scheme implementation

- Establish this initiative as a priority for the development of the BREP through technical reports, the Structure Plan and co-design process:
  - The need for consistency of development across the precinct and ensure the public realm and built form outcomes are of the highest standards can be included in the Structure Plan vision / objectives and reflected through requirements and guidelines relating to siting and design, open space and biodiversity, transport, IWM, etc.
  - The preparation of Design Guidelines to achieve this objective can be included in the Structure Plan as a requirement, with elements that need to be covered in the Design Guidelines clearly outline in the Structure Plan (including where other initiatives outlined in this document are relevant)

Sub-precinct masterplan & development plan

- Ensure the initiative is followed through at the sub-precinct masterplan or development plan stage, ie that all masterplans or development plans developed are consistent with Design Guidelines

Planning application

- Ensure the initiative is implemented through the planning application process / detailed design by requiring the Design Guidelines to be prepared prior to a subdivision application being submitted and demonstrate accordance with
- The Design Guidelines could then be implemented as a Private agreements / title encumbrances as part of the subdivision planning permit process. Once an encumbrance on land titles, it will need to be responded to and implemented as part of any proposed buildings and works
- Any Encumbrance will need to be in place prior to the sale of lots which are then going to be subdivided, however Design Guidelines could still be refined as part of or post a sale, by mutual agreement

Precinct development & operation

- Roll-out the initiative in combination with precinct development
- Monitor the success of the initiative during the precinct operation phase, and maintain flexibility for Design Guidelines to be updated through mutual agreement as best practice evolves
- As the initiative relates to design, no additional finance, governance and operational models or operational investments are required beyond the public or private resourcing of assessments of subdivision and buildings and works applications against the Design Guidelines

V. B / Governance
Initiative #3 - Interim land uses / leases

IMPLEMENTATION CONSIDERATIONS

- Interim land uses would need to align with underlying planning controls and not conflict with surrounding uses or would otherwise not be possible without a permit
- Further options analysis on transitional uses would be beneficial (market testing for solar providers for example, including network capacity analysis)
- Interim use of the land would likely be set up between the landowner and a 'tenant'
- If solar PV is a preferred interim land use, optimisation of locations with grid connection or ability to support existing / new uses with lower cost electricity supply is a critical determinant

KEY DELIVERY ROLES & PARTNERSHIPS

- Key stakeholders include:
  - + Landowners
  - + Developers
  - + Council
  - + Interim land users (tenants)
- Interim land users will be responsible to landowners regarding maintenance of the land during the interim stages of BREP's construction
- However, ultimate legal responsibility over the land will remain vested in the landowner (ie compliance with environmental regulations, ensuring bushfire protection)

IMPLEMENTATION ACTIONS

<u>Structure Plan & planning scheme implementation</u>

- Establish this initiative as a priority for the development of the BREP through technical reports, the Structure Plan and co-design process
  - + The Structure Plan can acknowledge the long-term nature of the proposed development and support an objective to maximise the value of interim land uses
  - + The structure plans layout will also have implications upon what types of uses, when and where they can establish as interim uses could only be considered for later stages of development (the urban structure may highlight areas suitable for interim land uses)
  - + A selection of higher value interim land uses can be included a guideline in the Structure Plan or further investigation supported. This would require further coordination, however would ensure a unified vision and 'buy-in' from the various landowners. Interim land uses can only be included as guidelines and cannot be imposed as they could be constrained by existing use rights, zoning and overlays
- Ensure that supported interim land uses are not prohibited through planning controls implemented at the Planning Scheme Amendment stage

<u>Planning application</u>

- Planning permits must include sufficient certainty that interim land uses can transition to highest and best use after a defined period

V. B / Governance
Initiative #4 - Precinct operational management entity

IMPLEMENTATION CONSIDERATIONS

- Through an ongoing precinct management, environmental management systems as well as energy, water, waste / resource management and other important monitoring and networking and financing functions can be undertaken

KEY DELIVERY ROLES & PARTNERSHIPS

- Key stakeholders include:
  - + Landowners
  - + Business owners
  - + Council
  - + Third-party (acting as operational management entity)
- A partnership would exist between the operational management entity and a range of other service providers (including Council) regarding the various systems being managed at the precinct scale (environment, waste, water/ resource etc)
- Agreements would exist between the operational management entity and landowners and business owners in relation to the services provided to the precinct by the operational management entity

IMPLEMENTATION ACTIONS

Structure Plan & planning scheme implementation

- This initiative cannot be dealt with as part of a **Structure Plan** or planning permit requirements, however:
  - + The Structure Plan can support amplifying environmental and economic benefits of the development as a key objective and note that an operational entity could be favourable to this objective
  - + The benefits of a precinct operational management entity could also be the subject of further engagement and co-design processes with landowners

Other

- Investigate and resolve a preferred legal structure to create an operational management entity
- Roles and responsibilities of the entity would be clearly set up as part of a clear, transparent Governance Framework, following recommended market testing with potential future tenants
- The governance framework would include resolving elements such as:
  - + Legal structure and draft agreements with land owners / tenants
  - + Relationship between services delivered by the operational management entity and State or Local Government service delivery
  - + Costs, timing and other arrangements with land owners / tenants
  - + Optional versus mandatory subscription to precinct services

Fig 38. Shared paths at the Yards. Photography by Frasers Property.

V. C / Site Layout & Liveability
Initiative #5 - Integrated Transport Planning

IMPLEMENTATION CONSIDERATIONS

- An integrated transport assessment for the precinct is being undertaken separately and this advice is limited to the relationship between integrated transport planning and the sustainable development of the BREP
- Beyond public and active transport, the provision of dedicated, early EV charging infrastructure at a precinct level would improve the uptake of all-electric fleet options for precinct tenants and would also support the transition to lower emissions transport (refer to initiative #9)

KEY DELIVERY ROLES & PARTNERSHIPS

- Key stakeholders include:
  - + Developers
  - + Landowners
  - + Business owners / tenants
  - + Council / Victorian Government (as future asset owners)
  - + Future workers in BREP site
- Alternative street designs favouring active transport options will be required to be approved by Council / DTP as the future asset owners
- Following the development of an Integrated Transport Plan or similar through the Structure Plan process, the operational management, monitoring and evaluation of the transport network will be vested in the relevant regulatory authorities (i.e. Council, DTP etc)
- Business owners / tenants can encourage the use of public and active transport through their own green travel planning

IMPLEMENTATION ACTIONS

Structure Plan & planning scheme implementation

- Establish this initiative as a priority for the development of the BREP through technical reports, the Structure Plan and co-design process
  - + Reducing car dependency and private transport emissions can be included as an objective in the Structure Plan
  - + This can be supported by dedicated integrated transport planning as part of the Structure Plan process, and associated public and active transport plans
  - + Street cross-sections delivered through the Structure Plan can provide allocation for and improve the amenity for active transport
  - + The Structure Plan can also outline the preferred location of interchange between micro-mobility and public transport (e.g. bus stop locations integrating with scooter charging), as well EV charging stations

Sub-precinct masterplan & development plan

- Ensure the initiative is followed through at the sub-precinct masterplan / development plan stage (local infrastructure)

Planning application

- Ensure the initiative is followed through at the planning application stage by requiring delivery against the integrated transport plans and cross-sections to be demonstrated to the satisfaction of the Responsible Authority

Precinct development & operation

- Roll-out the initiative in combination with precinct development
  - + To be effective, the staging of the transport infrastructure should, where possible, support Day 1 options for public and active transport before car dependent travel behaviour is locked-in (e.g. interim potentially subsidised routes from Marong / Bendigo to the development)
- Monitor the success of this initiative and upgrade or scale-up infrastructure as necessary

V. D / Streets & Public Realm

Fig 39. Business Park workers amenity . Source Unknown.

V. D / Streets and Public Realm

Initiative #6 - Landscape uplift and increased amenity

IMPLEMENTATION CONSIDERATIONS

- Ownership and maintenance of assets will need to be carefully planned so as to not burden the City of Greater Bendigo (where those assets are transferred)
- Achieving improved worker amenity outcomes will require dedicated space to be set aside in the early stages of the project, with spatial requirements and ultimate location to be influenced by staging of development
- Commercial benefit can be leveraged by linking privately delivered services such as convenience retail, recreation and food and beverage to public open space and other services

KEY DELIVERY ROLES & PARTNERSHIPS

- Key stakeholders include:
  - + Developers
  - + Landowners
  - + Council
- Following development of the open space and community facilities plan through the Structure Plan operations of public open space or community facilities will be vested in Council
- Developers will need to deliver against the landscape objectives of Design Guidelines to meet landscape uplift and increased amenity requirements in streetscapes
- Where the structure plan designates public open space or other community infrastructure this would be delivered by developers as part of precinct development (cost burden potentially equalised through an ICP)
- Council will need to maintain public land assets following development

IMPLEMENTATION ACTIONS

Structure Plan & planning scheme implementation

- Establish this initiative as a priority for the development of the BREP through technical reports, the Structure Plan and co-design process:
  - + Structure Plan should highlight increased worker amenity as key objective
  - + Spatial allocation will be addressed as part of structure plan (passive open space, links to linear open spaces in areas of high amenity i.e. pocket parks and designation of other key community infrastructure
  - + Open space and community infrastructure should ideally be located close to smaller parcel sizes and greater job densities
- Ensure the initiative is followed through at the Planning Scheme Amendment Stage (policy and control)
  - + Zoning to allow recreational services and supporting retail will need to be implemented through the Structure Plan

Sub-precinct masterplan & development plan

- Ensure the initiative is followed through at the sub-precinct masterplan / development plan stage
  - + Open space provision should link to encumbered land used for drainage purposes if possible to improve efficiencies and maximise benefit
  - + Ancillary commercial uses such as food and beverage, gymnasiums etc should preferentially locate close to higher built form and jobs density

Planning application

- Ensure the initiative is implemented through the planning application process / detailed design
  - + Landscape uplift can be required to be demonstrated via landscape masterplan and detailed landscape plan at the permit planning stage, including detailed information in regard to planting palette and canopy cover (permit condition)

Precinct development & operation

- Monitor the success of this initiative and upgrade or scale-up infrastructure, and modify community infrastructure programming as necessary

V. D / Streets and Public Realm

Initiative #7 - Passive irrigation and WSUD in streets

IMPLEMENTATION CONSIDERATIONS

- The role and responsibility of all stakeholders in the lifecycle of the assets needs to be made clear early in the project
- This includes private land owners where streets are retained in private ownership
- Integration with transport advice to ensure that swept paths for larger vehicles are optimised with regard to WSUD assets and canopy trees

KEY DELIVERY ROLES & PARTNERSHIPS

- Key stakeholders include:
  - Developers
  - Designers
  - Construction contractors
  - Asset owner (e.g. Council or private landholder)
  - Maintenance teams
- At a precinct level, development of a strategic, partnership approach to embedding WSUD into the street design could also include a partnership with:
  - Greater Bendigo City Council engineers and landscape teams
  - Innovation Victoria / Department of Jobs, Skills, Industry and Region (for piloting new low tech stormwater management systems before scaling up)
  - University (for research and development and monitoring)
- Greater Bendigo City Council engineers and landscape teams to evolve their preferred road reserve cross-sections through IDM updates or similar

IMPLEMENTATION ACTIONS

Structure Plan & planning scheme implementation

- Establish this initiative as a priority for the development of the BREP through technical reports, the Structure Plan and co-design process:
  - Objective to be included in the Structure Plan and linked to the IWM strategy to be developed for the whole precinct. Greater detail would then need to be provided at the precinct design / subdivision stages
  - Structure Plan cross sections and the proposed Design Guidelines can reinforce the principles, but due to the long term timeframe for development should be flexible to ongoing innovation
- The Planning Scheme Amendment should ensure in line with existing policy (Clause 53.18)

Sub-precinct masterplan & development plan

- Ensure the initiative is followed through at the sub-precinct masterplan / development plan stage
- The masterplan and development plan stage can be used to demonstrate how a variety of WSUD treatments could be implemented

Planning application

- Ensure the initiative is implemented through the planning application process / detailed design
  - This initiative uses existing planning policy to increase capture, storage and re-use of stormwater generated on site in accordance with Clause 53.18. This planning mechanism applies to application for subdivision and buildings and works
  - Depending on the scale, it requires a STORM or MUSIC assessment to be undertaken to demonstrate on-lot compliance with the standard from both the particular provision and ESD perspective (consistent with Clause 15)
  - Design Guidelines and other initiatives in this report can help reinforce outcomes, including increasing on-lot permeability, urban heat reduction etc

Precinct development & operation

- Roll-out the initiative in combination with precinct development
- Technological Watch - During precinct operation, monitor the success of this initiative and update design guidance for passive irrigation and WSUD as best practice evolves

V. D / Streets and Public Realm

Initiative #8 - Alternative road cross sections with sustainable materials

IMPLEMENTATION CONSIDERATIONS

- A working group to collaborate on supply chain considerations and technical standards would be beneficial for early stages
- Recycled material and alternative green-blue infrastructure would be required to meet standards relating to road infrastructure construction. This would require consultation with Council/ DTP as well as engineering teams and technical experts
- This initiative assist in meeting targets for embodied carbon reduction recommended in Initiative #17

KEY DELIVERY ROLES & PARTNERSHIPS

- Key stakeholders include:
  - + Landowners
  - + Developers
  - + Civil and landscape contractors
  - + Recycled material manufacturers
  - + Council/ Victorian Government (i.e. DTP)
- Responsibility of the developer/ landowner to implement design with the civil contractor and control supply chain for materials and implementation of the design of blue-green infrastructure
- Council and potentially DTP will be responsible for assessing designs as part of a subdivision application
- Developers (via civil and landscape contractors) will be responsible for installation of recycled material in BREP infrastructure
- Ultimate responsibility over the maintenance of the infrastructure will be transferred to the relevant regulatory authority (i.e. Council, DTP etc) but in some locations will be withheld in private roads

IMPLEMENTATION ACTIONS

Structure Plan & planning scheme implementation

- Establish this initiative as a priority for the development of the BREP through technical reports, the Structure Plan and co-design process:
  - + An objective relating to the use of low embodied carbon and recycled materials should be embedded in the Structure Plan along with already recommended objectives relating to the role of green and blue infrastructure within streets
  - + Undertake a dedicated co-design process with agency involvement to resolve cross-sections which will be embedded in the Structure Plan documentation, noting these can only be recommended not mandated
  - + Set up a working group to resolve any local supply chain considerations and technical standards with government and industry representatives

Sub-precinct masterplan & development plan

- Ensure the initiative is followed through at the sub-precinct masterplan / development plan stage

Planning application

- Ensure the initiative is implemented through the planning application process / detailed design
  - + By requiring submission of information on low embodied carbon and recycled materials in road reserves to be demonstrated via the preparation of a SMP/SSMP to the satisfaction of the Responsible Authority via permit conditions (noting that a functional layout plan may refine this detail)
  - + Can be further implemented and reinforced through the proposed Design Guidelines mechanism, noting that flexibility for change over time is critical

Precinct development & operation

- Ultimate materiality to be negotiated at time of delivery between Council and the developer as part of the planning and detailed design processes
- Roll-out the initiative in combination with precinct development
- Technological watch - Monitor the success of new materials and construction techniques and refresh the list of approved low embodied carbon and recycled materials as best practice and technology evolves

Fig 40. Solar panels installation. Photography by ABC News..

V. E / Energy
Initiative #9 - EV ready precinct

IMPLEMENTATION CONSIDERATIONS

- Integrated transport planning is still in development for the precinct
- Further feasibility is recommended to understand cost / benefit and parameters of a regionally beneficial charging hub, the alignment and traffic forecasting is critical to this decision
- Land allocation should occur as part of Structure Plan, however investment could be staged and scale with demand
- Partnership approach with commercial provider may limit risk to Government

KEY DELIVERY ROLES & PARTNERSHIPS

- Key stakeholders include:
  - Landowners
  - Developers
  - Council
  - Victorian Government (DTP)
  - EV charging infrastructure manufacturers/ suppliers
  - Distribution network service provider (DNSP)
  - Charging point operators
- It will be the responsibility of the landowner / developer to coordinate the design of EV charging infrastructure when on private land
- Major infrastructure may be delivered by a combination of government in partnership with commercial provider
- There is an opportunity for an agreement between (1) the party responsible for upfront investment of EV charging infrastructure and (2) a third party responsible for billing EV use

IMPLEMENTATION ACTIONS

Structure Plan & planning scheme implementation

- Undertake further feasibility to understand the costs and benefits of a regional charging hub
- Establish this initiative as a priority for the development of the BREP through technical reports, the Structure Plan and co-design process:
  - Include 'supporting local opportunity for electric / low emissions vehicle charging' as an objective in the Structure Plan
  - Spatial allocation of land to support EV charging at a regional scale at the Structure Plan level is also recommended, subject to resolution of the preferred Calder Highway alignment, traffic volume forecasting
  - Electrical infrastructure staging can support regional charging hub if proved feasible
- Ensure the initiative is followed through at the Planning Scheme Amendment Stage (policy and control)
  - Spatial allocation maintained and use and development of land for EV charging station not prohibited

Sub-precinct masterplan & development plan

- Ensure the initiative is followed through at the sub-precinct masterplan / development plan stage (spatial allocation)

Planning application

- National Construction Code 2022 updates have introduced new requirements for electric vehicle charging for non-residential development, so additional site level requirements are not recommended

Precinct development & operation

- Roll-out the initiative in combination with precinct development
  - The provision of services can be staged and scaled with demand
  - The precinct operational management entity may provide further services over time with an associated financial / operational model
- During precinct operation, monitor the success of this initiative and upgrade or scale-up infrastructure as necessary

V. E / Energy

Initiative #10 - Precinct solar generation with energy storage

IMPLEMENTATION CONSIDERATIONS

- Roles and responsibilities for optimising the precinct solar approach need to be established in early planning
- Early understanding of any electricity network capacity opportunities / constraints is critical
- Staging and grouping of land uses will dictate sub-precinct level opportunities for storage / sharing electricity between tenants
- Land use mix of the industrial / employment land is important to understanding whether there will be surplus electricity

KEY DELIVERY ROLES & PARTNERSHIPS

- Key stakeholders include:
  - + Landowners
  - + Developers
  - + Council/ Victorian Government
  - + Building contractors
  - + Solar installers
  - + Distribution network service provider
- Government / Precinct operational management entity to lead feasibility into precinct / sub-precinct battery storage, sharing, embedded network / micro-grid that may support / optimise high levels of solar penetration, potentially through the utilities work stream of technical reports
- The landowner/ developers/ builder would be responsible for design, consultation (i.e. authorities and related consultants) on private land

IMPLEMENTATION ACTIONS

Structure Plan & planning scheme implementation

- Establish this initiative as a priority for the development of the BREP through technical reports, the Structure Plan and co-design process
  - + The development of a zero-carbon precinct can be included in the Structure Plan vision and as an overarching objective
  - + This can then be supported by performance-based requirements in the Structure Plan for the design, construction and operation of the precinct (both at the subdivision and building level), such as target solar PV benchmarks for industrial buildings
  - + The Utilities Plan can also acknowledge potential impact of higher levels of solar penetration

Planning application

- Applications for buildings and works should demonstrate how solar PV provision is optimised and meets targets in Design Guidelines and / or planning policy

Precinct development & operation

- Roll-out the initiative in combination with precinct development
- During precinct operation, monitor the success of this initiative and upgrade or scale-up infrastructure as necessary

Other

- Micro-grid, embedded network, storage and sharing opportunities are beyond the scope of the Structure Plan / Planning policy and require further feasibility
- This can be undertaken in parallel to the structure plan process or at the sub-precinct masterplan / development plan stage
- Financial, governance and operational models to support can also be resolved as part of this process

Fig 41. Permeable Pavement. Photography by Porous Lane.