# Table of Contents

Acknowledgements ................................................................................................................. 3
How to use the Plan .................................................................................................................. 4
  Input from the community .................................................................................................... 4
  Steps for data input .............................................................................................................. 4
Part 1. Introduction .................................................................................................................. 5
  Plan Purpose ....................................................................................................................... 5
  Plan Vision .......................................................................................................................... 5
  Outputs .................................................................................................................................. 6
  Goal ....................................................................................................................................... 6
Part 2. Western Port Biosphere Reserve – Background and future context ............... 7
  Location .................................................................................................................................. 7
  Biodiversity values and environmental services ................................................................. 7
  Threats to biodiversity values and environmental services ................................................ 9
  Opportunities ....................................................................................................................... 11
  Current Projects .................................................................................................................. 12
Part 3. Biodiversity significance mapping ............................................................................. 14
Part 4. Evaluation and monitoring ......................................................................................... 16
  Risk assessment ................................................................................................................... 16
  Monitoring .......................................................................................................................... 18
Annexure 1. Weighting given to important aspects for production of Map 1. ........... 19
Annexure 2: Significance maps for each Council area ...................................................... 21
Annexure 3: Priority biolinks ............................................................................................... 26
Annexure 4: Biolink priorities for the Growing Connections project and areas where project works have occurred............................................................... 27
Annexure 5 – Growing Connections Implementation Plan ............................................. 28
References ............................................................................................................................... 35
Acknowledgements

The authors wish to acknowledge the contributions of Cecelia Witton, EO Western Port Biosphere Reserve, members of the Growing Connections Project Implementation Committee and Western Port Biosphere Reserve Research Committee, local government Councils and agencies, the numerous community groups and individuals that provided input and Joey Chua, formerly from DEPI, in the development this plan.

Development of this plan was part of the Growing Connections project which is supported by the Australian Government.
How to use the Plan

Part 1 introduces the reader to the purpose and goals of the Western Port Biosphere Biodiversity Plan (Plan).

Part 2 provides background information that will help in decision-making for appropriate land management of the Western Port Biosphere.

Part 3 is the mapping component of the Plan which outlines the areas of significance and priority across the landscape.

Part 4 describes evaluation and monitoring of the Plan.

Input from the community

The Plan will ultimately be an online, ‘living’ document that will provide an aggregate picture of biodiversity restoration in the Western Port Biosphere. It will have links to other plans and strategies and maps that include projects implemented by community members, NGOs and Government agencies. This information will be linked to the Port Phillip and Westernport Catchment Management Authority (PPWPCMA) Regional Catchment Strategy (see Figure 1).

The Plan is built on maps (Annexure 2) that show where adopting particular goals and action priorities are likely to produce the most effective and desired outcomes.

To further build on these maps, details of past, current and future on-ground works by all groups, organisations, and agencies across the Biosphere will be required. The continued contribution to the Western Port Biosphere mapping will ensure a comprehensive, landscape scale picture that measures change in biodiversity values and facilitates co-operation between stakeholders.

Steps for data input

(An online portal is currently under development. This section will be continually updated online once the portal is complete)

1. Open www.biosphere.org.au/tbc
2. Complete survey form
3. Draw polygon for large areas, circle small areas on map to identify location of on-ground works.
4. Download or provide a link of relevant plans (Optional)
5. Once you have provided information requested online, please inform Chris Chambers by email on chris@biosphere.org.au

Annexure 4, which illustrates biolink priorities for the Growing Connections project and areas where project works have occurred, is an example of mapping as a result of survey data input.
Part 1. Introduction

The Western Port Biosphere Biodiversity Plan (Plan) is an outcome of The Western Port Biosphere Reserve Foundation’s Growing Connections project. A pseudonym, for the Connecting and Improving Habitat Corridors Regionally to Create a Biodiverse Resilient Western Port Biosphere project, the Growing Connections project was made possible with support from the Australian Government.

The Plan is based on the principles of UNESCO’s *Man and the Biosphere Program* (MAB), which aims to identify and assess the changes in the biosphere resulting from human and natural activities and the effects of these changes on humans and the environment. MAB promotes the exchange and transfer of knowledge on environmental problems and solutions to increase people’s ability to efficiently manage natural resources for the well-being of both human populations and the environment.

The Plan is intended to harness cooperation between agencies, community groups, and individuals across the Western Port Biosphere and guide actions that create and enhance biolinks for the protection and enhancement of Biodiversity. Mansergh and Cheal 2007 described biolink zones as identified parts of the landscape where the functional ecological connectivity for biodiversity is enhanced and/or restored to provide space for species (and consequently ecological communities) to self-adapt their distributions and abundances under changing climates through natural processes including: dispersal; re-colonisation; regeneration and restoration of ecological function. Biolinks may include core patches of native vegetation, vegetation corridors, stepping stones and buffers around sensitive areas, and areas relatively free of invasive vertebrate pests.

The Plan has been driven by community expectations and willingness to participate in envisioning an improved living landscape. It has also been directed and informed by targeted scientific research and analyses, which is combined into one concise plan.

The audience for the Plan is all Western Port Biosphere community members (residents, businesses, NGOs); biodiversity management related agencies and local and State government. The plan should be of importance to other agencies planning infrastructure (transport, utilities etc.) in the region and, given the amalgam of community and science, to other conservation groups across Australia. It will be a ‘living document’ that will undergo periodic review and update to ensure that projects are directed by the most relevant and up to date science, best practice management techniques and knowledge gained by agencies, community groups, and individuals.

Plan Purpose

The Plan is the basis for prioritisation of landscape scale on-ground works to improve biodiversity, ecosystem function and resilience to disturbance. The maps contained in section 3 and annexure 1 are designed to guide organisations and landholders in the Western Port Biosphere Reserve to identify where they can pursue common goals and achieve the most effective outcomes for land, water and biodiversity conservation at the landscape scale.

The existing maps are predicated on the requirement of focused management actions to control invasive plants and animals and to protect threatened species (see Part 3. Biodiversity significance mapping). However, as a ‘living document’, these maps are expected to change as stakeholders (community members and organisations) build on them with their knowledge and by identifying where on-ground works are being implemented.

Plan Vision

The Western Port Biosphere Reserve will be a biodiverse, ecosystem functioning landscape that has the capacity to adapt to disturbance.

It is envisaged that this plan will provide direct input into the Port Phillip Catchment Management Authorities Regional Catchment Strategy (RCS) through providing landscape scale priority setting for what they have titled ‘Naturelinks’. The RCS will provide a broad scale catchment based picture of the priorities while this plan will focus on the biosphere landscape. Through providing this clear picture across the landscape it is hoped that organisations focussing on smaller scale areas will link their plans to this plan to ensure cohesion across all scales of planning. This is presented in figure 1.
**Outputs**

The outputs of the Plan will be maps that provide a ‘blueprint’ for future planning and working together. These maps will:

- identify the key areas of significance and gaps in potential biolinks in the landscape, and
- provide information about who is doing what on-ground work and where,
- acquire data on threatened and invasive species populations.

**Goal**

The goal of the Plan is that it be embraced by all key stakeholders in the Western Port Biosphere to achieve the Plan’s vision. Success will look like:

In five years:

- Stakeholder adoption of the Plan to solve problems through:
  - employment of the Plan’s mapping in their environmental decision-making and actions, which will result in better public and biodiversity benefit;
  - co-ordination between stakeholders of on-ground biodiversity protection and enhancement works, and
  - integration with other plans, for example, land use objectives, management plans, landcare project plans, funding proposals, etc.
  - Plan acknowledged within the PPWPC Regional Catchment Strategy and the Plan’s mapping incorporated into their Naturelinks mapping.

In 20 years:

- An increase in native vegetation cover, especially within identified biolinks
- Structurally characteristic patches of native vegetation, corridors and stepping stones and buffers around sensitive areas
- a decline in pest animals
- an increase in threatened species abundance
Part 2. Western Port Biosphere Reserve – Background and future context

The Western Port Biosphere Reserve Foundation’s vision is that the Western Port Biosphere Reserve will be a place where people attain an enduring relationship with the natural world and contribute to the needs of society as a whole by showing a way to a more socially, environmentally and economically sustainable future. This Plan is consistent with the Foundation’s commitment to:

- conserve and improve biological diversity;
- build and share knowledge, facilitate, monitor and utilise research, and
- foster, encourage and facilitate project partnerships.

Location

The Western Port Biosphere Reserve (Stage 1) encompasses the Mornington Peninsula, the waters and Islands of Western Port, and the southern part of the Western Port water catchment in Victoria, Australia. It comprises all of the Mornington Peninsula shire Local Government Area (LGA), parts of the Shires of Bass Coast and Cardinia, and parts of the Cities of Frankston and Casey and French Island. In an area of approximately 2100 square kilometres, (686 square kilometres of marine area and 1456 square kilometres of terrestrial area), the total permanent population within Stage 1 is 180,000, with a seasonal population of approximately 270,000.

Following further community consultation and acceptance by the Victorian Government, all relevant local governments and other key stakeholders, a second stage proposed to be nominated to UNESCO would increase the size of the Western Port Biosphere Reserve to about 3400 square kilometres and encompass the entire boundaries of the 5 LGAs. In the interim, the Western Port Biosphere Foundation and Growing Connections function to service to the entire Stage 2 area.

Biodiversity values and environmental services

The Western Port Biosphere supports management of natural systems at a landscape level, breaking down government and agency management boundaries and jurisdictions and applying protection and management where it is most needed, promoting a wide range of values, including:

- areas of local, state, national and international conservation significance;
- fertile agricultural land that supports large scale primary industries for supply nationally and internationally and small scale primary production with associated cottage industries, and
- many other attractions that provide significant opportunities for outdoor recreation and make a substantial contribution to the tourism industry.

The Western Port Biosphere includes numerous biological communities over an extensive geographical range that is centred on Western Port. Western Port is characterised by the diversity, extent and often unusual nature of its vegetation and animal communities (Shapiro 1975). It includes a mosaic of terrestrial vegetation communities, wetlands (both saline and freshwater), river estuaries, coastal ecosystems, islands, intertidal communities and a range of marine habitats. Within these habitats a mosaic of subtly different microhabitats occur resulting in a system of great biological diversity. Several international treaties for conservation apply specifically to Western Port, its islands and surrounding landforms: the Ramsar convention on Wetlands of International importance, the Japan–Australia Migratory Birds Agreement, JAMBA, China–Australian Migratory Birds Agreement, CAMBA and Republic of Korea Migratory Bird Agreement (ROKAMBA).

Listings under the Environment, Protection and Biodiversity Act (EPBC) include:

- Four Nationally Important Wetlands, 2 of which are Ramsar Wetlands of International Importance;
- Sixty three Migratory Species;
- Four Threatened Ecological Communities:
  - Giant Kelp Marine Forests of South East Australia – Endangered
  - Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains – Critically Endangered
  - Subtropical and Temperate Coastal Saltmarsh – Vulnerable
  - White Box - Yellow Box – Blakely’s Red Gum Grassy Woodland and Derived Native Grassland – Critically Endangered, and
Sixty five Threatened Species as per table below.

Table 1. Western Port Biosphere Reserve fauna listed under the Environment, Protection and Biodiversity Act.

<table>
<thead>
<tr>
<th>Type</th>
<th>Critically Endangered</th>
<th>Endangered</th>
<th>Vulnerable</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plants</td>
<td>1</td>
<td>7</td>
<td>10</td>
<td>18</td>
</tr>
<tr>
<td>Mammals</td>
<td>6</td>
<td>4</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Birds</td>
<td>2</td>
<td>9</td>
<td>16</td>
<td>27</td>
</tr>
<tr>
<td>Reptiles</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>1 Insect</td>
<td>3 Fish</td>
<td>1 Shark</td>
<td>1 Frog</td>
</tr>
</tbody>
</table>

Terrestrial

Seventy two Ecological Vegetation Classes (EVC) are currently recognised in the Western Port Biosphere. The Western Port Biosphere is within the South-east Coastal Bioregion of Australia (Interim Biogeographic Regionalisation for Australia (IBRA)). Parts of three Sub-bioregions, classified by the Victorian Department of Environment, Land, Water & Planning (DELWP) occur in the Western Port Biosphere Reserve (http://www.depi.vic.gov.au/environment-and-wildlife/biodiversity/evc-benchmarks).

The Gippsland Plain Lowland areas Sub-bioregion, covering the majority of the Western Port Biosphere, is characterised by lowland alluvial and coastal plains formed from erodible Tertiary sediments and Quaternary alluvial deposits. According to the IBRA less than one percent of this Sub-Bioregion is largely intact. The main EVCs include Coast Banksia Woodland, Coastal Saltmarsh, Mangrove Shrubland, Sand Heathland, Heathy Woodland, Swamp Scrub, Lowland Forest, Grassy Woodland and Swampy Riparian Woodland.

The northern-most portion of Cardinia Shire is within the Highlands – Southern Fall Mountains and foothills Sub-bioregion where EVCs include Wet Forest, Grassy Forest, Grassy Woodland, Gully Woodland, Shubby Foothill Forest, and Valley Heathly Forest. It is a fragmented landscape but connection to Bunyip State Park and other parks in neighbouring LGAs contribute to an overall high site condition.

Highly fragmented patches of Lowland Forest, Herb-rich Foothill Forest, Gully Woodland and Heathy Woodland on the lower slopes of the Strzelecki Hills Sub-bioregion are in the north-east of Bass Coast Shire.

Coastal and Marine

Five Marine National Parks, classified Category II under the IUCN classification (IUCN 1994) and totalling an area of nearly 8,000 hectares are gazetted under the Victorian National Parks Act (1975). The Yaringa Marine, French Island Marine and Churchill Island Marine National Parks protect intertidal mudflats fringed by one of the most extensive areas of salt marsh and mangrove communities in Victoria. Approximately 400 hectares of the Port Phillip Heads National Park is within the Western Port Biosphere, the habitats include seagrass meadows, deep and shallow reefs and rocky shores. The Bunurong Marine National Park and Bunurong Marine Park features rugged sandstone cliffs, rocky headlands, intertidal rock platforms, sandy coves and intertidal and subtidal reefs.

There are about 1,000 hectares of saltmarsh in Western Port that could possibly represent one of the most floristically diverse coastal saltmarshes in the world (Boon 2011), and a similar area of mangroves. Although the Western Port coast has suffered local historical losses as a result of infilling and drainage, agricultural, urban and industrial development, it retains a massive area of intact coastal marsh (Sinclair & Boon 2012).

The expansive intertidal mudflats and seagrass beds and surrounding saltmarsh and mangroves of Western Port are of State and regional significance, providing foraging habitat and roosting sites for migratory birds and over-wintering habitat for a large number of bird species, including the critically endangered Orange-bellied Parrot. Mangroves and saltmarshes provide important breeding grounds for birds, fish and other
marine and estuarine species. They protect against erosion and provide filtration of runoff from the land (Boon, et al.).

Although their global area is one to two orders of magnitude smaller than that of terrestrial forests, the contribution of vegetated coastal habitats per unit area to long-term carbon sequestration is much greater, in part because of their efficiency in trapping suspended matter and associated organic carbon during tidal inundation (McLeod et al. 2011). Conserving and rehabilitating them could possibly contribute substantially to reducing atmospheric CO₂ and help balance regional emissions.

**Threats to biodiversity values and environmental services**

The Western Port Biosphere Reserve will be required to accommodate some of Melbourne’s future growth. Many visitors to the area appreciate its beauty and proximity to Melbourne and seek out holiday or permanent accommodation, thereby adding to the impact of urbanism, which has the potential to drastically diminish some of the intrinsic values of the area. Agricultural activities in the region contribute substantially to the State’s economy, but, if not practiced sustainably, will threaten the biodiversity values and ecological services of the Biosphere. Improved sustainable land-use practices and planning are imperative if we are to ensure that the world-class Western Port Biosphere Reserve’s conservation areas and assets are protected. Knowledge and understanding of the threats to biodiversity values and environmental services is the first step in mitigating them.

**Terrestrial**

**Climate change**

Coastal managers and communities face the challenges of future climate change, sea-level rise and increases in the frequency and intensity of natural disaster events concurrently with increased development demands and environmental protection. Sea-level rise will likely lead to salinization of soils and saltwater intrusion into estuarine and freshwater habitats, with effects on ecosystems and agriculture (NCCARF 2011), and climatic changes will not only alter the occurrence and distribution of native species, but also that of diseases, pests and weeds, and the resulting impacts on vegetation communities and habitat fauna.

**Vegetation Clearing**

Less than one third of pre-European vegetation remains in the region as a result of land-use change that includes clearing for urban development, agriculture, extractive industries and infrastructure. Around 40 per cent of the region’s native vegetation is located in parks or reserves managed for conservation purposes. Another 30 per cent is on other publicly owned land and 30 per cent on private property. Vegetation quality is highest in conservation reserves, the quality generally being poorer on private land because of small patch size, loss of understorey and weed invasion. Fragmented patches are vulnerable to continuing weed invasion and incremental damage (Port Phillip and Westernport Catchment Management Authority, 2015. www.ppwrcs.vic.gov.au/assets-areas/whole-region/native-vegetation/introduction ).

**Urbanization**

Urbanization directly removes or modifies habitat and reduces the quality and diversity of remaining habitat, simplifying its structure by fragmentation and modification of natural environmental processes. Increased threat from domestic animals and fences forming barriers come with increased urbanisation. The effects of urban development on biodiversity may also extend into neighbouring landscapes and affect species and ecological processes in adjacent ecosystems.

Melbourne’s south East Growth corridor extends into the Casey and Cardinia LGAs and comprises areas of important biodiversity. Scattered threatened fauna species exist throughout the Growth corridor, including the Southern Brown Bandicoot, listed as Near Threatened under the Flora and Fauna Guarantee Act and Endangered under the EPBC Act and the Growling Grass Frog, listed as Endangered under the Flora and Fauna Guarantee Act and Vulnerable under the EPBC Act.

**Invasive Species**

Invasive species threaten native biodiversity with their ability to change and destroy habitats and ecosystems. They disrupt ecosystem functioning, threatening river and stream areas and wetlands.

**Environmental Weeds**

Western Port Biosphere Reserve Biodiversity Plan
Environmental weeds out-compete native plants for nutrients, water and space. They can choke naturally open spaces and change the structural make-up of vegetation communities. This, in turn, alters resources for animals and results in changes in the faunal composition. Weeds can also harbour pests and diseases that native plants are unable to withstand.

Based on an assessment process that prioritises the control of environmental weeds, 32 plants have been declared Weeds of National Significance (WONS) in Australia (www.environment.gov.au/biodiversity/invasive/weeds/weeds/lists/wons.html). Twenty two of these occur within the Western Port Biosphere.

**Vertebrates pests**

Predation by feral cats, predation by the Red Fox and competition and land degradation by rabbits and pigs are all registered as key threatening processes under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

- Fox
  - The fox is a significant contributor to native animal decline and undermines recovery efforts for threatened species. It has played a major role in the decline of ground-nesting and shore birds, small to medium sized mammals, such as the Southern Brown Bandicoot, and reptiles.
- Feral cats
  - Also a significant contributor to native animal decline, feral cats are found in all habitat types. They are carnivores, generally preying on small mammals, but also catch birds, reptiles, amphibians, fish and insects.
- Rabbits
  - Rabbits modify natural plant communities and, in turn, the faunal compositions they support. They compete with native herbivores for food and reduce biomass and plant diversity through overgrazing, which also inhibits the regeneration of native vegetation.
- Pigs
  - Predation, habitat loss, competition and disease transmission by feral pigs impact on native ecosystems, particularly in association with wetlands and riparian ecosystems. Their movement, rooting, wallowing, trampling, tusking or rubbing trees, and consumption of water, animals, plants and soil organisms affect species composition, succession, and nutrient and water cycles.

Other vertebrate pests in Western Port include deer that, like rabbits and hares, modify natural plant communities and, in turn, the faunal compositions they support and compete with native herbivores for food. Starlings and Indian Mynas compete with native birds for nesting hollows and food. Tolerating a wide range of temperatures and water conditions, such as salinities from freshwater to marine, the Eastern Gambusia, (Mosquito fish) is a major aquatic pest species.

**Disease**

Fauna

Invasive animals in Australia have the potential to harbour or transmit many diseases that could seriously harm livestock, domestic animals, native fauna or people. Feral animals can carry the same diseases as domestic animals, so they are a constant source of reinfection for livestock and wildlife.

Flora

Dieback caused by the root-rot fungus *Phytophthora cinnamomi*, listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is known to exist in the Biosphere. Phytophthora root rot, is a disease that affects many native plants and ecosystems.

Myrtle rust, first detected in Australia in late April 2010 on the NSW central coast, has spread rapidly and has been detected in the Biosphere. This disease affects trees and shrubs in the Myrtaceae family of plants, which includes Eucalyptus and Melaleuca. Their spores can be spread via contaminated clothing, infected plant material, on equipment and by animal movement and wind dispersal. These characteristics make rust diseases extremely difficult to eradicate.

**Fire**
The management of fire within a modified and fragmented landscape is extremely important to sustaining biodiversity and maintaining vital environmental services.

Appropriate timing and frequency of fire results in the maintenance of flora diversity, habitat structure and important habitat resources for fauna species. Alternatively, the inappropriate timing and frequency of fire can result in significant losses of flora diversity, reduced fauna habitat diversity and result in local extinctions of important species, and indeed, ironically, increased fire risk.

Peri-urban landscapes, like much of the biosphere, are prone to frequent and intense bush fires, which results in the death of plant species that do not re-grow after a fire event before they fully mature and produce seed to enable recruitment. This reduces species diversity and alters vegetation structure. Fire also often provides opportunities for fast growing weeds to establish before native vegetation can regenerate and enhanced opportunities for predation by pest animals such as foxes and cats and browsing of regrowth by rabbits and deer.

Prescribed burning and fuel reduction works can significantly threaten the habitat of flora and fauna species resulting in biodiversity decline. The inappropriate administration of prescribed burning, or the ongoing exclusion or suppression of fire pose a major threat to biological diversity and can result in increased biomass accumulation increasing fire threat.

**Marine and Coastal Environments**

**Climate Change**

Climate change is likely to have a strong impact on mangroves, salt marshes and other tidal wetlands. Their position in the intertidal zone exposes them to a multitude of ocean and atmospheric climate change drivers which leads to high vulnerability to climate change (Lovelock et al. 2009).

It is predicted that higher temperatures will increase bushfire risk along the coast, and increased sea temperatures, changing sea currents and further acidification of the ocean will affect the marine environment (Lee, 2011). With much of the shoreline sloping very gently, Western Port will be vulnerable to rising sea levels and will likely experience amongst the highest climate impacts across the state.

**Catchment Run-off**

The marine and coastal environments are influenced by activities within the catchment, such as agricultural and urban development that have potential to discharge detrimental chemicals and nutrients through waterway discharge, stormwater runoff, seepage from un-sewered towns and agricultural run-off where incorrect fertilising practices cause unused fertiliser run-off into rivers, groundwater or directly into the sea.

**Sedimentation and erosion**

The greatest threats to mangroves in the Western Port Biosphere Reserve come from land use changes and related changes to sediment deposition and nutrients and toxicants (Dittmann, 2011). Increased transport of particles suspended in water from urban run-off and erosion results in turbid water blocking sunlight and sedimentation smothering coastal vegetation. Wallbrink et al. (2003) suggests that sediments from catchment erosion will continue to be a problem for Western Port if further rehabilitation and stabilisation programs are not undertaken.

Uncontrolled access by vehicles and stock causes the spread of weeds, soil compaction and erosion fragmenting coastal vegetation communities.

**Environmental Weeds**

In Victoria 118 exotic plant species have been recorded in coastal saltmarsh (Boon et al. 2011), including a large number of highly problematic weed species in the upper parts of the saltmarsh. *Spartina* is known to occur in Western Port, especially in the northern parts around the inlets and in the western parts around the Bass River, where it is considered a very serious weed. *Spartina* can be twice as productive as saltmarsh taxa, and they use less water to achieve the same rate of primary production (Boon et al. 2011). They are therefore likely to have a competitive advantage under the predicted climate change conditions.

**Opportunities**

Over the last four decades Victorians have increasingly valued biodiversity for its intrinsic and utilitarian values (e.g. sustainability, ecosystem services). It is fundamental to our evolving sense of place and the
interconnectedness of life. Future opportunities available to Western Port Biosphere Reserve and the Growing Connections project are predicated on continuation of this historic trend of these changing values. These values manifest in a variety of ways - economic changes (National Parks are now integral to regional economies); agricultural production becoming more environmentally sensitive and sustainable; Government planning, regulations and programs, and increased community involvement and support in nature protection and enhancement. It is now generally recognised that the established reserve system, although necessary, will not be sufficient to conserve all our biodiversity, particularly under changing climate conditions.

These land-use changes will manifest themselves differently across the landscape but will happen in a vastly different social context than the original clearing of the early 20th century. The Western Port Biosphere Reserve aims to create an integrated balance between urbanisation, agriculture and maintenance of rural character and landscape quality. With biodiversity and the natural environment now being incorporated into most land-use change and management decisions and within this socio-economic context, Western Port Biosphere Reserve has some unique opportunities. Our increased understanding of the ecology of the landscape, through scientific, Koori and community knowledge will continue to grow, as will groups such as Landcare that seek to include biodiversity and habitat enhancement as a fundamental driver. These activities operate to help ameliorate some of the threats described above.

Education is fundamental to the Western Port Biosphere Reserve Charter, which is well placed to promote and nurture future opportunities. Growing Connections has some excellent programs using science (e.g. photo monitoring) and participatory revegetation projects to help increase the community understanding of our environment. Further, Growing Connection’s articulated and mapped 20 year vision of what the community wants the landscape to look like merged with scientific research (see Map 1) is unique for such a regional scale project. This provides a tangible landscape tapestry where future opportunities can find a long-term useful expression.

**Current Projects**

**Growing Connections**

The Western Port Biosphere Reserve Foundation, with funding support from the Australian, using the pseudonym Growing Connections, is delivering the Connecting and Improving Habitat Corridors Regionally to Create a Biodiverse Resilient Western Port Biosphere project.

Growing Connections aims to achieve:

- Increased cooperative and strategic management through collaboration with local government, State government agencies, Indigenous land managers, community groups and individuals.
  - A Western Port Biosphere Biodiversity Plan that will include biodiversity indicators and a six year chart of progress.
- Enhanced ecosystem function and increased resilience through revegetation and habitat rehabilitation.
  - Expanded biodiversity reserve network and habitat links.
- A clear statement of the additional sequestered carbon as a result of the project’s on-ground activities.
  - Collaboration with local and state government and universities to share data and maps and monitor progress in the native vegetation extent and carbon stocks and to develop a carbon capture monitoring and recording program and guidelines.
- Improved and integrated management of vertebrate pests
- Collaboration with stakeholders to develop integrated pest control for Southern Brown Bandicoot across Melbourne’s Growth Area.

**Ramsar Protection Program**

The Ramsar Protection Program aims to protect two Ramsar sites of international importance – the Port Phillip Bay western shoreline and Bellarine Peninsular and the Western Port site. Partner organisations, receiving Caring for our Country funding to implement the program in Western Port include the Port Phillip and Westernport Catchment Management Authority, Parks Victoria, Phillip Island Nature Park, Mornington Peninsula Shire, City of Casey, Arthur Rylah Institute for Environmental Research, and Western Port Biosphere Reserve. Other stakeholders include Government, NGO and community group representatives and landholders.
The program aims to reduce threats to the site, such as pest plants and animals, and increase community understanding of the importance of wetlands and how to protect them. The focus is on habitats above the low tide mark from saltmarshes and mangroves to the fringing woodlands.

**The Southern Brown Bandicoot Program**

The Southern Brown Bandicoot Regional Recovery Group, established in 2011 by action under the Biosphere Foundation, comprised of scientists, community representatives and Government agency staff with an interest in bandicoot conservation.

One of the projects being implemented by the Foundation and supported by the recovery group is a camera trapping program with the aim of determining the presence/absence if bandicoots and other native and introduced fauna. Running since 2010, several thousand photographs of animals have been captured in and around the Western Port Biosphere. In the future, the program will be used to scientifically estimate changes in distribution and abundance of fauna to give us a better understanding of native and introduced animals.
Part 3. Biodiversity significance mapping

This plan set out to identify the areas of biodiversity significance across the landscape and to prioritise works into these areas. The approach taken was to include all views on significance from scientific studies, council plans and strategies, community group plans, and community input from ‘drawing lines on maps’. All this information was combined onto a single map to show the overall ‘significance’ of an area.

The process that was followed to undertake this work was refined and followed by the Project Implementation Committee of the Growing Connections project with expert input where required. The process was as follows;

- Identify the categories of information we wanted (linear strips, council plans etc)
- Identify what datasets exist for each of these categories
- Identify data that needs to be collected
- Identify what is of importance within these data sets
- Prioritise each data set against the others.

The information that was collected through this process is shown in Annexure 1.

The prioritised data was brought together through the use of the Department of Environment, Land, Water, and Planning’s EnSym program which produced map 1 which shows the combined ‘significance’ of biodiversity across the Biosphere.

This mapping will be updated annually to incorporate any new plans, strategies, or priorities that have been identified during the preceding year.
Map 1.
This map can be found on the website, www.biosphere.org.au. More detailed maps focusing on each council area and French Island are also available online and in Annexure 2.
Part 4. Evaluation and monitoring

Risk assessment

Risk management should be a core element of any biodiversity and land management program. Biodiversity plans present various risks and thereby provide a complex and often inter-related mix of risks and opportunities that land managers need to address.

To help anticipate and determine strategies for the risks associated with achieving the goals of the Plan, a risk matrix (Table 2) has been used to determine the overall rating of each risk (Table 3) based on an identified level of likelihood and consequence to produce a rating (severe, high, medium or low). Risk is defined as the combination of the probability (or likelihood) and consequence of an event. This gives rise to the widely used concept of risk: Risk = Probability x Consequence.

The process of assessing and managing risks is aimed at reducing the likelihood that these negative events will occur and increasing the likelihood that positive outcomes will be realised.
Table 3. List of possible risks and their risk ratings identified by the level of likelihood and consequence, and contingencies to reduce the rating scores and achieve better outcomes.

<table>
<thead>
<tr>
<th>Risk/Threat Description</th>
<th>Likelihood</th>
<th>Consequence</th>
<th>Rating</th>
<th>Current Controls/Contingency</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Limited stakeholder (individuals, community groups, and NGO and Government agencies) data input</td>
<td>POSSIBLE</td>
<td>CRITICAL</td>
<td>SEVERE</td>
<td>Stakeholders invited to forums to facilitate networking and inform of the benefits to them and the environment of participating. Work with participating stakeholders to find out what attracted them to participating and what difficulties that may have had in participating.</td>
</tr>
<tr>
<td>2. Limited stakeholder employment of the Plan’s mapping in their environmental decision-making and actions, and integration with other plans.</td>
<td>POSSIBLE</td>
<td>MODERATE</td>
<td>MEDIUM</td>
<td>Further forums where case studies are presented by participating stakeholders to highlight benefits of incorporating the Plan into their mainstream activities.</td>
</tr>
<tr>
<td>3. Co-ordination between stakeholders of on-ground biodiversity protection and enhancement works.</td>
<td>UNLIKELY</td>
<td>MAJOR</td>
<td>MEDIUM</td>
<td>Further forums where case studies are presented by participating stakeholders and participants are encouraged to log on to website to keep up-to-date on where works are being implemented and by whom.</td>
</tr>
<tr>
<td>4. No increase in native vegetation cover, especially within identified biolinks, structurally characteristic patches of native vegetation, corridors and stepping stones and buffers around sensitive areas.</td>
<td>UNLIKELY</td>
<td>CRITICAL</td>
<td>HIGH</td>
<td>Continuous review of mapping to identify gaps in on-ground works. Maintain communication with stakeholders to better coordinate works. Further forums where case studies are presented by participating stakeholders and participants are encouraged to log on to website to keep up-to-date on where works are being implemented and by who.</td>
</tr>
<tr>
<td>5. No decline in pest animal populations.</td>
<td>UNLIKELY</td>
<td>CRITICAL</td>
<td>HIGH</td>
<td>Continuous review of mapping to identify gaps in on-ground works. Maintain communication with stakeholders to better coordinate works. Further forums where case studies are presented by participating stakeholders and participants are encouraged to target works where gaps are identified. Keep up-to-date on successes and failures within the Western Port Biosphere and Australia-wide. Evaluate possible reasons and review methods.</td>
</tr>
<tr>
<td>6. No increase in threatened species abundance</td>
<td>POSSIBLE</td>
<td>HIGH</td>
<td>SEVERE</td>
<td>Western Port Arc established to facilitate a coordinated approach to pest monitoring control. Keep up-to-date on successes and failures within the Western Port Biosphere and Australia-wide. Evaluate possible reasons and review methods.</td>
</tr>
</tbody>
</table>
Monitoring

The maps will be updated routinely as groups, organisations, and agencies across the Western Port Biosphere input data on the website.

This data will identify:

- hectares of on-ground works implemented in the Western Port Biosphere Reserve;
- hectares within identified ‘significant areas’;
- hectares within identified biolinks, and
- number of organisations inputting data

From the data, we will evaluate if the community is adopting the Plan’s vision and, if so, areas that require further on-ground works.

Annual forums with community members, groups, organisations and agencies across the Biosphere will be held with the purpose of evaluating progress toward the Plan’s vision and a co-ordinated approach to achieving the Plan’s goals will be deliberated.

Stakeholder adoption of the Plan to solve problems through the 5 year goals below will be evaluated:

- employment of the Plan’s mapping in their environmental decision-making and actions, which will result in better public and biodiversity benefit;
- co-ordination between stakeholders of on-ground biodiversity protection and enhancement works;
- integration with other plans, for example, land use objectives, management plans, landcare project plans, funding proposals, etc., and
- Plan acknowledged within the PPWPC Regional Catchment Strategy and the Plan’s mapping incorporated into their Naturelinks mapping.

Successes and failures toward achieving the 20 year goals, below, will be examined for possible adjustments required to reach the targets:

- An increase in native vegetation cover, especially within identified biolinks
- Structurally characteristic patches of native vegetation, corridors and stepping stones and buffers around sensitive areas
- a decline in pest animals
- an increase in threatened species abundance
### Annexure 1. Weighting given to important aspects for production of Map 1.

<table>
<thead>
<tr>
<th>Data Set</th>
<th>Application of data</th>
<th>Justification of application</th>
</tr>
</thead>
<tbody>
<tr>
<td>May 3 workshop</td>
<td>All categories (biolink and Assets) = 1</td>
<td>The information gathered during this workshop should be treated as all equal in value with no one area identified being of greater value than another.</td>
</tr>
<tr>
<td>All plans and strategies</td>
<td>All categories = 1 (except where weighting has been applied by the author)</td>
<td>All plans and strategies developed should be treated equally however if a weighting has been applied to the data by the author then this weighting should follow through to this analysis.</td>
</tr>
</tbody>
</table>
| Rail lines | Inactive rail lines = 1  
Active rail lines = 0.5 | Rail lines provide a good linear connection across the landscape which much of the time is uninterrupted. Inactive rail lines provide a greater opportunity due to the lack of train traffic and ability to undertake revegetation without many constraints placed on rail corridors by passing trains. |
| Power easements | Major transmission lines = 1  
Smaller lines = 0 | Major power easements provide long uninterrupted linear corridors through the landscape while minor power easements do not. There is limited opportunity to undertake works in power easements however works are not impossible. |
| Nature Print 2.0 | Top category = 1  
Second category = 0.95  
Third category = 0.9  
Forth category = 0.6  
Fifth category = 0.2 | Natureprint is a data set developed through DSE and ARI that models suitability and derived importance of an area of the landscape using the characteristics and requirements of vast numbers of faunal species. Categories outside of the top five are noticeably devoid of vegetation. |
| Native vegetation cover | 50ha+ = 1  
20-50ha = 0.9  
5-20ha = 0.6  
2-5ha = 0.2  
<2ha = 0 | This layer can be used as a fine scale selection tool to prioritise based on the ‘size of patch’. The assumption of the scoring is that the larger the patch the more significant and important it is. |
| VROTS (fauna and flora) (Victorian Rare or Threatened Species) | Endangered = 1  
Vulnerable = 0.9  
Rare = 0.8  
Depleted = 0.5  
Least concern = 0.1 | Inclusion of this data will allow for sites that have confirmed recording of rare and threatened species to be given preference over those that are devoid of known sightings. |
| EVCBCS 1750 | Endangered = 1  
Vulnerable = 0.9  
Rare = 0.8  
Depleted = 0.5  
Least concern = 0.1 | This data set currently does not exist but may be developed for this project by combining attributes from the Extant EVC data to the 1750 data. Scoring this data in such a way will allow for area being replanted to have the conservation statues of the EVC taken into account in the prioritisation. |
| Waterways (value taken from hierarchy attribute) | High = 1  
Low = 0 | Waterways provide opportunities for linear linkages through the landscape and also allow for multiple benefits such as river health and sediment reduction outcomes. |
| Landscape Importance (LSIMP) | High = 1  
Medium = 0.8  
Low 0.3 (for both remnant patches and connectivity) | This data set was developed by DSE and looks at the relative importance of areas of bushland and the level of current connectivity. It is similar to Natureprint but appears to be more appropriate at a smaller scale. |
Priority tree

Below is a diagrammatical representation of the prioritisation that was undertaken in the preparation of the map for the Western Port Biosphere Biodiversity Plan. Names in bold are raw data as outlined in the table above, while names in italics are an amalgamation of two layers of data derived using the weightings as per table above. The basic principal is that as you move up the tree you move from data that is used as a broad brush across the landscape to more site specific criteria and you move from data that is more derived or modelled to data that is more definite.
Annexure 2: Significance maps for each Council area

Map 2

Biodiversity Significance within Bass Coast and French Island

Legend
- Growing Connections Boundary
- Local Government Boundary
- Significance
  - Very Low
  - Low
  - Medium
  - High
  - Very high

0 2.5 5 10 Kilometers
Map 4

Biodiversity Significance within the City of Casey

Legend
- Growing Connections Boundary
- Local Government Boundary
- Significance
  - Very Low
  - Low
  - Medium
  - High
  - Very high

0 1.75 3.5 7 Kilometers
Annexure 3: Priority biolinks
Annexure 4: Biolink priorities for the Growing Connections project and areas where project works have occurred.
Annexure 5 – Growing Connections Implementation Plan

Introduction
This section of the Western Port Biosphere Biodiversity Plan outlines the activities being undertaken as part of the Growing Connection Project. The broad objectives of the project are to:

- Improve ecological and environmental resilience and enhance biodiversity across the landscape through targeted investment in revegetation and remnant vegetation protection and management.
- Facilitate an increase in the cooperation and collaboration between community, conservation groups, agencies, and governments.
- Undertake a robust monitoring program designed to evaluate the outcomes of the project and drive greater efficiency in pest control
- Monitor the amount of carbon sequestered as part of the program
- Develop technology to increase efficiency in program management
- Undertake targeted pest control

These broad objectives have been broken down into 5 outcomes. These are described below, including detail of actions that are being undertaken in the delivery of each.
Outcome 1 – Increased cooperative and strategic management through collaboration with local government, State government agencies, Indigenous land managers, community groups and individuals.

Outputs:

- A communication and engagement plan that demonstrates how we will develop an inclusive governance structure and collaborate with Gov., NGO and community members.
- Expanded biodiversity investment made through other funding programs and leveraging in-kind support
- A Western Port Biosphere Biodiversity Plan developed with community collaboration that will include a six year chart of progress and will guide future investment.
- An adaptive management structure developed through a dependable MERI Plan
- Report on progress and review draft Western Port Biosphere Biodiversity Plan at 5 project partner/community workshops.

<table>
<thead>
<tr>
<th>Action No.</th>
<th>Action</th>
<th>Timeframe For completion</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1</td>
<td>Western Port Biosphere Biodiversity Plan Workshop to identify community knowledge in asset areas and possible biolink</td>
<td>May 2013</td>
</tr>
<tr>
<td>1.2</td>
<td>Develop a Communication plan for the Growing Connections Project</td>
<td>February 2014</td>
</tr>
<tr>
<td>1.3</td>
<td>Western Port Biosphere Biodiversity Plan Workshop follow up to present results of combined mapping to the community.</td>
<td>March 2014</td>
</tr>
<tr>
<td>1.4</td>
<td>Support the nomination of Tootgarook Wetlands as a Ramsar Wetland</td>
<td>Ongoing</td>
</tr>
<tr>
<td>1.5</td>
<td>Monitor in kind contributions made by partner organisations</td>
<td>Ongoing</td>
</tr>
<tr>
<td>1.6</td>
<td>Formation of Project implementation Committee including representatives from key partner organisations</td>
<td>Ongoing</td>
</tr>
<tr>
<td>1.7</td>
<td>Facilitate an annual ‘Biodiversity forum’ to provide an update on the progress of this project and encourage knowledge sharing and further cooperation between organisations.</td>
<td>Ongoing</td>
</tr>
</tbody>
</table>
**Outcome 2 – Enhanced ecosystem function and increased resilience across the Biosphere.**

**Outputs:**
- Expanded biodiversity reserve network and habitat links and improved health of waterways and 2 RAMSAR sites:
  - 541 ha revegetation - 40ha directly plus 501 in collaboration with partners;
  - 2,623 ha remnant restoration – 62ha directly plus 2561ha in collaboration with partners;
  - in collaboration with Friends of Tootgarook Wetlands, a nomination for Tootgarook wetlands as a Ramsar site submitted.

The works undertaken for this outcome have been identified through community consultation using the significance mapping outlined in Annexures 2 and 3.

<table>
<thead>
<tr>
<th>Action No.</th>
<th>Action</th>
<th>Timeframe For completion</th>
<th>Partner</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1</td>
<td>3ha of revegetation and 8ha of remnant vegetation protection in foreshore reserve near Eastern end of Bungower road</td>
<td>June 2013</td>
<td>Parks Victoria</td>
</tr>
<tr>
<td>2.2</td>
<td>2ha of remnant vegetation protection adjacent to works in action 2.2</td>
<td>June 2013</td>
<td>Mornington Peninsula Shire</td>
</tr>
<tr>
<td>2.3</td>
<td>4ha of revegetation and 6ha of remnant vegetation protection across two sites managed by the City of Casey on the northern coastline of Western Port</td>
<td>June 2013</td>
<td>City of Casey</td>
</tr>
<tr>
<td>2.4</td>
<td>45ha of remnant vegetation protection in the high quality Holden Proving Ground</td>
<td>June 2014</td>
<td>Bass Coast Landcare Network</td>
</tr>
<tr>
<td>2.5</td>
<td>Undertake a control burn and monitor changes to flora and fauna within a site in Blind Bight</td>
<td>June 2017</td>
<td>City of Casey</td>
</tr>
<tr>
<td>2.6</td>
<td>Undertake 5ha of revegetation and 40ha of remnant vegetation protection adjacent to Cardinia Creek between Cardinia Reservoir and Beaconsfield</td>
<td>June 2014</td>
<td>Cardinia Creek Landcare Group</td>
</tr>
<tr>
<td>2.7</td>
<td>Undertake 5.6ha of revegetation and 3.6ha of remnant vegetation protection in the vicinity of ‘bandicoot corner’</td>
<td>June 2014</td>
<td>Cardinia Environment Coalition</td>
</tr>
<tr>
<td>2.8</td>
<td>Undertake 4ha of remnant vegetation protection within the Cranbourne recreation reserve</td>
<td>June 2014</td>
<td>Cranbourne Racing Centre and Recreation Reserve C’of Mgmt</td>
</tr>
<tr>
<td>2.9</td>
<td>Undertake 1.5ha of revegetation and 5.3ha of remnant vegetation protection across two council managed reserves</td>
<td>June 2014</td>
<td>Frankston City Council</td>
</tr>
<tr>
<td>2.10</td>
<td>Undertake 6ha of revegetation and 2ha of remnant vegetation protection within the Wonthaggi State Coal Mine Historic Reserve.</td>
<td>June 2014</td>
<td>Friends of Wonthaggi Heathland and Coastal Reserve.</td>
</tr>
<tr>
<td>2.11</td>
<td>Undertake 4ha of remnant vegetation protection within Woods reserve, and provide assistance to neighbouring landholders.</td>
<td>June 2014</td>
<td>Habitat Restoration Fund</td>
</tr>
<tr>
<td>2.12</td>
<td>Undertake 2.3ha of revegetation and 14.8ha of remnant vegetation protection along the Mornington Tourist Railway corridor</td>
<td>June 2014</td>
<td>Mornington Railway Preservation Society</td>
</tr>
<tr>
<td>2.13</td>
<td>Undertake 34.83ha of revegetation and 54.13ha of remnant vegetation protection at Summerlands Peninsula</td>
<td>June 2014</td>
<td>Phillip Island Nature Parks</td>
</tr>
<tr>
<td>2.14</td>
<td>Undertake 5ha of revegetation and 25ha of</td>
<td>June 2014</td>
<td>Southern Ranges Environment</td>
</tr>
<tr>
<td></td>
<td>Description</td>
<td>Date</td>
<td>Responsible Party</td>
</tr>
<tr>
<td>---</td>
<td>------------------------------------------------------------------------------</td>
<td>------------</td>
<td>------------------------------------------------------</td>
</tr>
<tr>
<td>2.15</td>
<td>Undertake 6ha of remnant vegetation protection along the puffing billy rail corridor between Gembrook and Emerald</td>
<td>June 2014</td>
<td>Alliance</td>
</tr>
<tr>
<td>2.16</td>
<td>Undertake 7.5ha of revegetation and 4ha of remnant vegetation protection in 12 different sites that link various high value assets across the Biosphere</td>
<td>June 2014</td>
<td>Western Port Catchment Landcare Network</td>
</tr>
<tr>
<td>2.17</td>
<td>88ha of remnant vegetation protection in the High Quality Holden Proving Ground</td>
<td>December 2015</td>
<td>Bass Coast Landcare Network</td>
</tr>
<tr>
<td>2.18</td>
<td>Undertake 15ha of revegetation and 30ha of remnant vegetation protection adjacent to Cardinia Creek between Cardinia Reservoir and Beaconsfield</td>
<td>December 2015</td>
<td>Cardinia Creek Landcare Group</td>
</tr>
<tr>
<td>2.19</td>
<td>Undertake 2ha of revegetation at Allotment 2019 which is in the vicinity of 'bandicoot corner'</td>
<td>December 2015</td>
<td>Cardinia Environment Coalition</td>
</tr>
<tr>
<td>2.20</td>
<td>Undertake 4ha of remnant vegetation protection within Woods reserve, and provide assistance to neighbouring landholders.</td>
<td>December 2015</td>
<td>Habitat Restoration Fund</td>
</tr>
<tr>
<td>2.21</td>
<td>Undertake 2.4ha of revegetation and 7.1ha of remnant vegetation protection along the Mornington Tourist Railway corridor</td>
<td>December 2015</td>
<td>Mornington Railway Preservation Society</td>
</tr>
<tr>
<td>2.22</td>
<td>Undertake 10ha of revegetation and 51ha of remnant vegetation protection along the southern coast of Phillip island, including work at Cape Woolamai, surf beach to smith’s beach, and Berry’s beach.</td>
<td>December 2015</td>
<td>Phillip Island Nature Parks</td>
</tr>
<tr>
<td>2.23</td>
<td>Undertake 1ha of revegetation of swamp scrub to link to the coastal reserve on the Bass river delta/Anderson’s coast</td>
<td>December 2015</td>
<td>Bass Coast Landcare</td>
</tr>
<tr>
<td>2.24</td>
<td>Revegetation of 1.58ha and remnant vegetation protection across 2.5ha of Toomuc creek streamside reserve</td>
<td>December 2015</td>
<td>Toomuc Valley Landcare Group</td>
</tr>
<tr>
<td>2.25</td>
<td>Undertake 7ha of remnant vegetation protection and 0.3ha of revegetation within the Bunyip River streamside reserve</td>
<td>December 2015</td>
<td>Cardinia Shire Council</td>
</tr>
<tr>
<td>2.26</td>
<td>Undertake 15ha of remnant vegetation protection and 0.4ha of revegetation on French Island</td>
<td>December 2015</td>
<td>French Island Landcare Group</td>
</tr>
<tr>
<td>2.27</td>
<td>Where appropriate continue building on gains made through on ground works to date</td>
<td>June 2017</td>
<td></td>
</tr>
<tr>
<td>2.28</td>
<td>Undertake projects within priority areas (as identified in annexure 2 and 3) through delivery partners</td>
<td>June 2017</td>
<td></td>
</tr>
</tbody>
</table>
Outcome 3 – A clear statement of the additional sequestered carbon as a result of the project’s on-ground activities.

Outputs:

- develop a feasibility study on establishing a baseline for native vegetation extent and carbon stocks;
- collaborate with local and state governments and universities to share data and maps and monitor progress in the native vegetation extent and carbon stocks, and
- establish guidelines and a program for monitoring and recording carbon capture achieved through on-ground works.

<table>
<thead>
<tr>
<th>Action No.</th>
<th>Action</th>
<th>Timeframe For completion</th>
<th>Partner</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.1</td>
<td>Undertake a literature review of possible options for practical solutions in measuring the carbon captured through on-ground activities.</td>
<td>May 2013</td>
<td>Cooperative Research Centre for Spatial Information</td>
</tr>
<tr>
<td>3.2</td>
<td>Select the appropriate tool for the measured required.</td>
<td>May 2013</td>
<td></td>
</tr>
<tr>
<td>3.3</td>
<td>Collect data required to undertake calculations for the measurement of the carbon captured.</td>
<td>Ongoing Until June 2017</td>
<td></td>
</tr>
</tbody>
</table>
Outcome 4 – Improved and integrated management of vertebrate pests

Outputs:

- Western Port Ark program with participation from land managers established to:
  - share results of pest control programs;
  - integrate mapping and analyses;
  - explore new control and monitoring techniques, and
    - Participation in DSE project to develop integrated pest control for Southern Brown Bandicoot across Melbourne’s Growth Area.
    - 9,086ha landscape fox control in collaboration with partners.
    - 125ha vertebrate pest management achieved through on-ground works

<table>
<thead>
<tr>
<th>Action No.</th>
<th>Action</th>
<th>Timeframe for completion</th>
<th>Partner</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.1</td>
<td>Undertake fox control on Quail Island</td>
<td>June 2013</td>
<td>Parks Victoria</td>
</tr>
<tr>
<td>4.2</td>
<td>Commission the development of a pest management control strategy for the Western Port Biosphere</td>
<td>March 2015</td>
<td>Ecology Australia</td>
</tr>
<tr>
<td>4.3</td>
<td>Facilitate the formation of the ‘Western Port Arc’ which will drive best practice and broad scale coordination in pest control across the landscape.</td>
<td>First Meeting Jan 2014.</td>
<td>Numerous</td>
</tr>
<tr>
<td>4.4</td>
<td>Undertake fox and cat control surrounding the Royal Botanic Gardens Cranbourne</td>
<td>December 2015</td>
<td>Royal Botanic Gardens Cranbourne</td>
</tr>
<tr>
<td>4.5</td>
<td>Select sites for future pest control works through guidance from the Pest Control Strategy</td>
<td>March 2015</td>
<td>Royal Botanic Gardens Cranbourne</td>
</tr>
<tr>
<td>4.6</td>
<td>Implement pest control works in selected sites through partner organisations or direct contracts with pest controllers.</td>
<td>March 2015 – June 2017</td>
<td></td>
</tr>
</tbody>
</table>
Outcome 5 – A rigorous monitoring program that measures biodiversity gains across the Biosphere.

**Outputs:**

- A Technical Working Group comprising researchers and relevant stakeholders established to:
  - Investigate biodiversity indicators, and
  - Establish baseline indicators for:
    - Native vegetation extent and quality;
    - Ground dwelling fauna, including key vertebrate pests;
    - Avian fauna;
    - Soil health;
    - Freshwater, and
    - Combine results into a single biosphere wide GIS database.
- Electronic data training for agency staff and volunteers
- A workshop on new monitoring and recording tools for revegetation and vertebrate pest management works.

<table>
<thead>
<tr>
<th>Action No.</th>
<th>Action</th>
<th>Timeframe For completion</th>
<th>Partner</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.1</td>
<td>Design, develop, and implement in the field data collection for key areas of works (monitoring, pest control, and vegetation works)</td>
<td>June 2015</td>
<td>CRCSI</td>
</tr>
<tr>
<td>5.2</td>
<td>Design and develop an internal GIS environment to increase effectiveness and efficiency of the Biosphere in our mapping activities</td>
<td>March 2015</td>
<td>CRCSI</td>
</tr>
<tr>
<td>5.3</td>
<td>Design and develop an online GIS system for sharing spatial information with the broader community.</td>
<td>March 2015</td>
<td>CRCSI</td>
</tr>
<tr>
<td>5.4</td>
<td>Undertake spatial analysis of the Biosphere in order to understand the levels of landscape change that have occurred over the previous decades.</td>
<td>TBC</td>
<td>CRCSI</td>
</tr>
<tr>
<td>5.5</td>
<td>Undertake a targeted yet broad scale monitoring program using best practice methods and experimental design, utilising motion sensing camera technology, to research the links between Southern Brown Bandicoots and their predators.</td>
<td>June 2017</td>
<td>D. Nicholls Ecology Australia SBB technical reference group</td>
</tr>
<tr>
<td>5.6</td>
<td>Gather monitoring data from partner organisations for key species in the landscape which will be used to establish a picture of biodiversity health across the Biosphere.</td>
<td>June 2017</td>
<td>Various.</td>
</tr>
</tbody>
</table>
References


CSIRO. 2013 Marine and Coastal Biogeochemistry Carbon Cluster Project. www.csiro.au


Mornington Peninsula and Western Port Biosphere Reserve 2002 Biosphere Nomination (Stage1). *Submission to UNESCO Paris*. www.biosphere.org.au


Port Phillip and Westernport Catchment Management Authority. 2015 Port Phillip & Western Port Regional Catchment Strategy.

