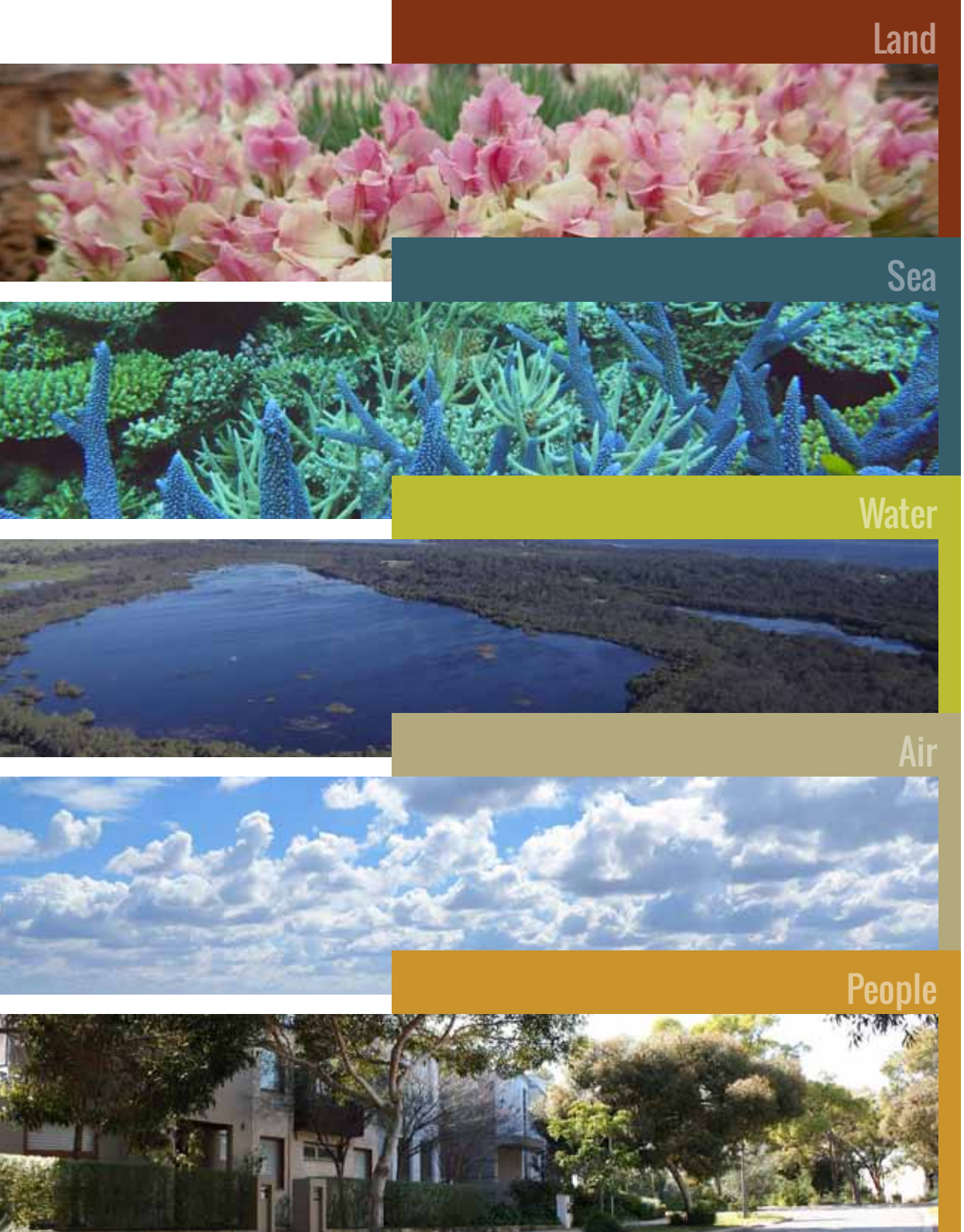

Environmental Protection Authority

Annual Report 2015-2016

Letter to the Minister

Hon Albert Jacob

Minister for Environment

In accordance with section 21 of the *Environmental Protection Act 1986*, I submit for presentation to Parliament, the Annual Report of the Environmental Protection Authority for the year ended 30 June 2016.

Dr Tom Hatton

CHAIRMAN, EPA

6 October 2016

The recommended reference for this publication is:

Environmental Protection Authority 2016, *Environmental Protection Authority 2015–16 Annual Report*, EPA, Perth, Western Australia.

This report is available in alternative formats upon request.

National Relay Service (To assist persons with hearing and voice impairment)
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Environmental Protection Authority

Annual Report

2015-2016

October 2016

Perth, Western Australia

Message from the Chairman

On behalf of the Environmental Protection Authority (EPA), I am pleased to present this Annual Report to the Minister for Environment and to the Western Australian Parliament.

It is an opportunity to take stock of what has been achieved this past year and to foreshadow our priorities as we advance our new Strategic Plan 2016–2019.

The challenges implicit in providing sound environmental advice on developments in WA are considerable, given the immense scale, variety and complexity of its landscapes. This has been the case since the EPA was established in 1972 and this year's assessment of a number of significant proposals, as well as a judicial challenge to our advice, is no exception.

Last year's slowing economy saw a drop in new referrals to the EPA, with an increased focus on proposals to expand existing facilities and infrastructure.

We completed 18 environmental impact assessments, half of which were in the Pilbara. We note the increased complexity of many of the 50 proposals currently under assessment, in part due to multiple assessments in the uranium and metropolitan transport sectors invloving a great many environmental factors and high public interest.

We also completed projects evaluating the effectiveness of past EPA advice on proposals and on planning schemes. Both evaluations found that the EPA's public advice is considered crucial and effective, and that proponents and planners followed it in practice. Further evaluation projects on the effectiveness of our advice on mine closure and on managing cumulative impacts are nearing completion.

The judicial challenge to the EPA's internal policy guidance prompted a thorough, independent review of our policy framework. The recommendations of that review, which were made public, were to simplify and clarify our policies and guidelines, and we accept these recommendations in their entirety. While the original judicial challenge was later overturned on appeal, the EPA maintains its commitment to the principle that our internal policies should be clear and readily understood. Our policy reform program, due for completion this year, will underpin our commitment to increase the soundness, transparency and robustness of our advice.

The policy review highlighted the EPA's role under the *Environmental Protection Act 1986*, to provide advice to protect the environment and to consider only the environmental impacts of a proposal, not the potential economic and social benefits that might accrue from it. The Minister for Environment when considering the EPA's advice can take these latter factors into account.

In the year ahead, the EPA sees a more general need to provide contemporary advice on WA's environment where historical impacts may have a significant bearing upon future development. A key element of our new Strategic Plan 2016–2019 is to foster strategic and regional consideration of potential short and long-term environmental impacts. That is, we intend to give greater attention to providing contemporary overviews and advice on issues such as cumulative environmental impacts and associated recommendations for strategic response. This work will also provide

a contextual background to proponents and stakeholders when future development proposals in the region are brought forward.

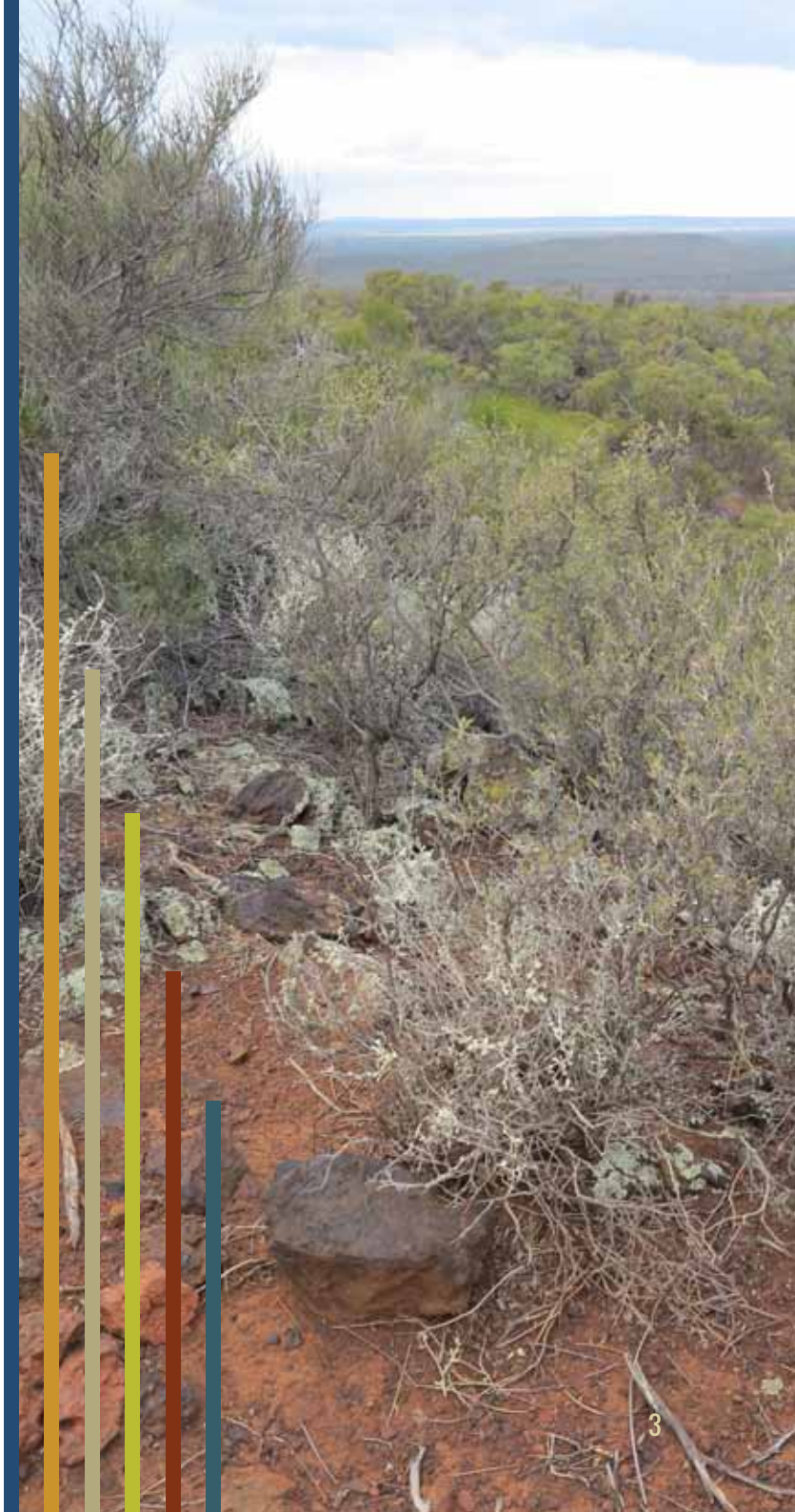
Late last year we issued our interim advice on the Commonwealth and State governments' Strategic Assessment of the Perth and Peel regions – *Perth and Peel @ 3.5 million: environmental impacts, risks and remedies*. We anticipate finalising this advice when the proposed planning is completed.

A key focus this year relates to the challenges associated with formulating advice with limited available information. For example, we will direct attention to the lack of data on the scale and extent of land clearing, one of the biggest threats to biodiversity. We will continue to support science collaborations in the marine and terrestrial environs, and to seek the counsel of stakeholders and technical experts.

The Office of the EPA continues to improve the foundations for our assessments and advice. This past year presented some particularly difficult and complex challenges with respect to the nature of proposals under assessment, in addition to the accelerated need to redraft the EPA's internal guidelines and policies and to help evaluate our performance. Their ongoing commitment, productivity and professionalism is outstanding.

DR TOM HATTON

Chairman



Darwinia masonii on Iron Hill ridge facing south. Mt Gibson site visit 2016

Photo: Helena Mills, Office of the EPA

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About the EPA

Salmon Gum woodland Quairading Community

Photo: Helena Mills, Office of the EPA

About the EPA

EPA Strategic Plan

The EPA released its Strategic Plan 2016–2019 on 1 July 2016. The plan sets out four strategies that build on the achievements of the past and provides the focus for the next three years.

The first three strategies – *provide sound advice*, *provide robust advice*, and *provide transparent advice* – reflect a focus on building public confidence in environmental impact assessments. This involves broadening the scientific advice accessed by the EPA, ensuring its policy and procedures sustain both merit and legal review, and regularly evaluating the environmental outcomes of its advice. These strategies also underscore the EPA's view that engaging with stakeholders and the broader community is fundamental.

The fourth strategy – *foster strategic and regional consideration of potential short and long-term environmental impacts* – reflects the EPA's desire to develop and publish contemporary scientific assessments and advice on key environments under pressure. The EPA has broader responsibilities to promote environmental awareness and protect the environment, and one way it achieves this is through the provision of public advice under section 16(e) of the EP Act.

Over the next few years, the EPA will provide further advice on the Strategic Assessment of the Perth and Peel Regions, and anticipates further strategic advice on other cumulative or emerging environmental issues of importance to Western Australia. Providing general advice to the WA public and Government on pressure points and areas of emerging concern in this State will remain a focus this coming year.

Focus for the EPA 2016-2017

This past year has brought perhaps the greatest challenges – and opportunities – for the EPA to date. Despite significant work since 2009 to improve practices and procedures, an independent legal and governance review earlier this year set out clear recommendations for a root-and-branch update of the EPA's policy framework.

The EPA agreed with this advice and immediately began a stock-take of its policies and, despite winning an appeal against the judicial ruling that prompted the review, remains committed to implementing the new policy framework.

In the coming year, the EPA will continue to focus on improving practices and procedures, protecting the environment through sound, robust and transparent advice and increasing community confidence in its work.

The EPA will also continue to focus on improving environmental outcomes by considering the cumulative impacts of development. Tracking the cumulative load or impact rather than advising on a project-by-project basis will greatly benefit the environment.

Bilateral agreement with the Commonwealth

In October 2014, WA signed a new Bilateral Agreement with the Commonwealth of Australia, made under section 45 of the *Environment Protection and Biodiversity Conservation Act 1999 (Cth)* relating to environmental assessment, which began on 1 January 2015. The agreement allows WA to assess proposals likely to have a significant impact on Matters of National Environmental Significance (MNES) on behalf of the Commonwealth.

A separate Commonwealth assessment is no longer required if the EPA assesses a proposal under the agreement, thereby avoiding process duplication for proponents.

A proposal likely to have a significant impact on MNES is referred to the Commonwealth to determine whether or not it is a controlled action. For proposals assessed under the Bilateral Agreement, the EPA must provide in its assessment report enough information about impacts on MNES for the Commonwealth to make an informed decision on whether or not to approve the action under the EPBC Act.

During the year, the EPA finalised the assessments of the Yoongarillup Mineral Sands Project (Report 1552, published 13 July 2015) and the Christmas Creek Iron Ore Mine Expansion (Report 1567, published 25 May 2016) under the Bilateral Agreement.

Considering referrals

On average, more than 80 development proposals are referred to the EPA each year, the vast majority of which are submitted directly by proponents.

Under the Act, the EPA can receive third-party referrals of proposed developments. Criteria established through the Act guide decisions on whether or not formal assessment is required. The criteria relate to the environmental values

likely to be impacted and the likely extent of those impacts. Referred proposals are formally assessed where those values and impacts may be significant. These determinations are a matter of judgment, often involving many months of investigation, consultation and analysis. Last year the EPA received six third-party referrals, one of which resulted in a full public environmental review. Two others, though not formally assessed, generated public EPA advice.

The EPA this year began incorporating a fuller description of the background to its published determinations and associated advice. This is designed to improve public understanding of EPA process and due diligence in its consideration of referrals.

To better reflect this process, the EPA has changed the way it communicates the Chairman's determinations, providing explanation of the preliminary investigations and inquiries conducted ahead of any determination to assess or not to assess.

The EPA often prepares public advice on referrals not assessed and this continues to be published on the EPA's website with the Chairman's Determinations each Monday.

The EPA's policy framework

Legal and governance review

In May 2016, the EPA welcomed the findings of the Independent Legal and Governance Review into Policies and Guidelines for Environmental Impact Assessments under the *Environmental Protection Act 1986*. Led by Mr Peter Quinlan SC and assisted by Mr Eric Heenan and Ms Sunili Govinnage, all eminent legal professionals, it was an opportunity to closely examine the EPA's suite of policies and guidelines.

The review team concluded that there were:

- too many policy instruments;
- no clear hierarchy or logical numerical order to the instruments;
- several 'types' of instruments with different purposes, objectives and outcomes; and
- a range of 'genres' of content within the different types of instruments.

It noted that efforts by the EPA to address these issues had been incremental and built on a policy framework that was not ideal.

The team recommended a more radical 'root-and-branch' approach. Rather than trying to make the changes incrementally by building on existing structures and policy instruments, a coherent policy framework needed to be established from the ground up.

It recommended that this be divided into three categories: one for the process and procedures of environmental impact assessments; one for dealing with the substantive aspects of environmental impact assessments; and one for policies and advice not included in the environmental impact assessment function.

The EPA has adopted the review findings and established a work program for initial implementation by the end of 2016. This will coincide with the launch of a new EPA website, which has been structured to reflect and reinforce the new policy framework, providing clarity and consistency to proponents, consultants, other stakeholders and the general public.

The EPA is strongly of the view that the new policy suite will contribute to achieving the objectives of the EPA's new strategic plan, specifically to increase public confidence in its processes by ensuring the soundness, robustness and transparency of its advice.

The EPA would like to acknowledge and thank the Review Team and the stakeholders who contributed to the review through submissions or face-to-face interviews. This input contributed greatly to the quality of the review report.

Evaluation

Introduction to the Evaluation Program

The EPA indicated in its 2014-15 Annual Report that it was seeking a greater focus on rigorous evaluation of outcomes associated with its decisions. It highlighted a series of evaluation projects that it endorsed to take place in the 2015-16 financial year.

Four evaluation projects were established:

- Project 1 - Review the content and effectiveness of public advice provided by the EPA – Proposals.
- Project 2 – Review the content and effectiveness of public advice provided by the EPA – Schemes and Scheme Amendments.
- Project 3 – Review mine closure plans.
- Project 4 – Review the environmental condition of Weeli Wolli Creek, Pilbara Region.

Projects 1 and 2 have been completed and are summarised below. Projects 3 and 4 are ongoing and the outcomes will feature in the EPA's next annual report.

Review the content and effectiveness of public advice provided by the EPA – for Development Proposals

Public advice is provided when the EPA determines that the environmental impacts of a referred proposal are not so significant as to warrant assessment, but where the provision of advice may influence environmental outcomes.

For each evaluation, the effectiveness of each of a set of historical proposals – representing a range of areas, industry sectors, and environmental factors – was measured against five criteria: proponent awareness of the public advice issued by the EPA; application of the public advice by the proponent; application of the public advice by relevant Decision Making Authorities (DMAs); the appropriateness of the public advice in relation to the environmental outcomes sought; and an analysis of the effectiveness of the public advice in achieving environmental outcomes.

The key findings of the evaluation were:

- Public advice is an effective method for advising proponents and DMAs on how to protect the environment and meet the EPA's objectives.
- In each proposal the proponents and DMAs applied the recommendations of the public advice.
- Proponents outlined timing, certainty of process and efforts to reduce regulatory overlap as key focus areas for improving public advice.
- Interviewed proponents perceived a greater focus on the administration of environmental impact assessment processes than on environmental outcomes.

Review of the content and effectiveness of public advice provided by the EPA – for Schemes and Scheme Amendments

The majority of schemes or scheme amendments (referred to collectively as schemes) referred to the EPA are not assessed. This is because the EPA considers they are unlikely to have a significant effect on the environment. Advice is provided to the responsible authority in order to influence environmental outcomes and ensure that any environmental issues can be addressed later in the planning process.

For each evaluation, each of a set of historical schemes was measured against the following criteria:

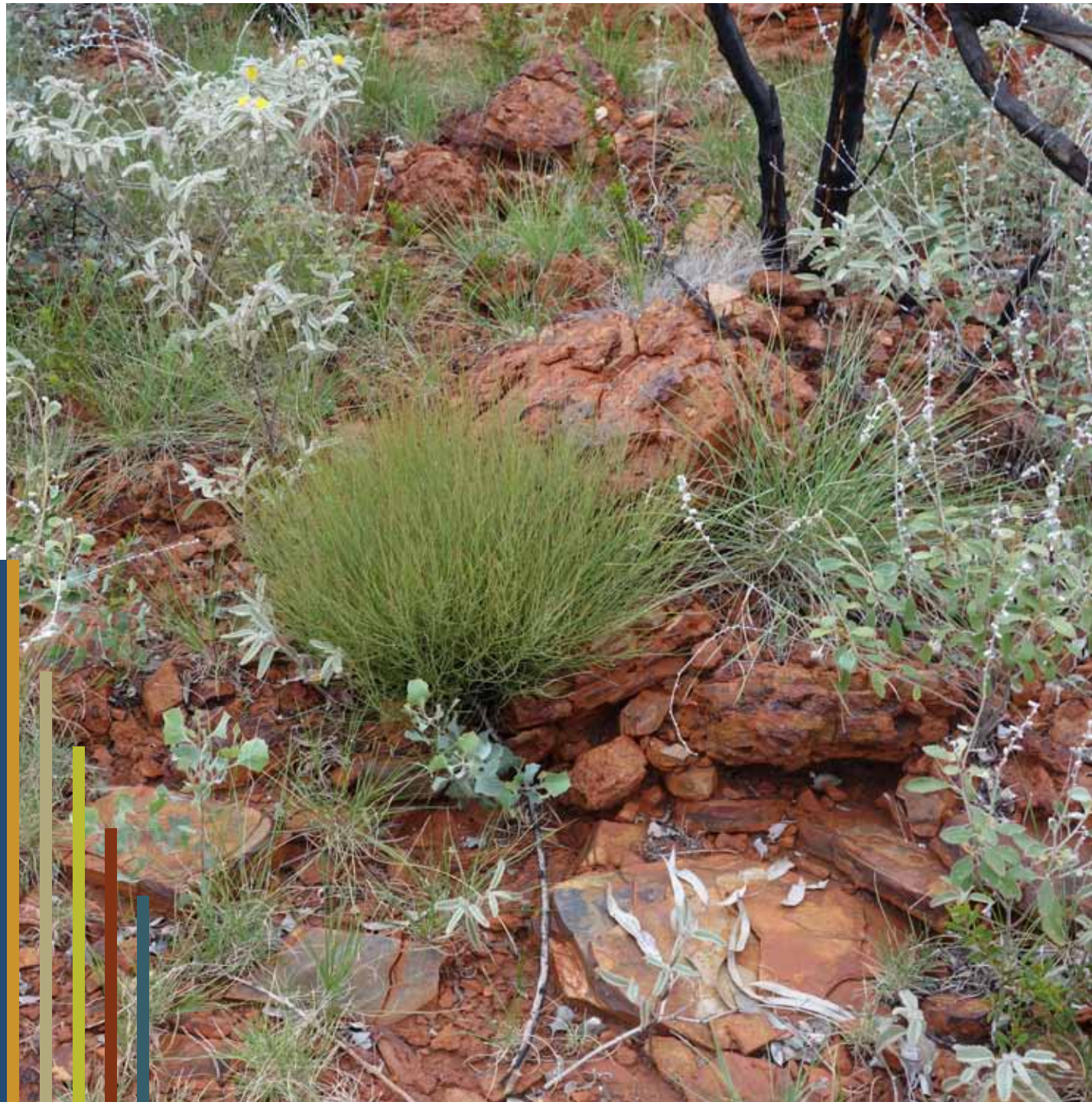
- Whether the EPA advice contained practical and technically appropriate recommendations that could be readily implemented by the responsible authority;
- Whether the recommendations of the advice were adopted by the responsible authority;
- The environmental benefits achieved through implementation of the advice; and
- Any environmental impacts that were not considered through the advice.

Key findings from the evaluation were that:

- The EPA's advice is important for all stakeholders and a critical component of the planning process.
- The EPA should continue to provide environmental advice for scheme referrals that are not assessed, where there are environmental issues that can be managed through the planning process.

- Updating the EPA advice templates could achieve improvements to process, documentation, form and content of the advice.
- There is a perception that "Not Assessed" means there are no environmental issues. The development of a fact sheet on the EPA referral and assessment process for planning schemes may assist in addressing this.
- Guidance should be provided on the process and circumstances under which an assessed scheme proposal should be referred to the EPA.
- The EPA's advice has contributed to the achievement of good environmental outcomes through the planning process.

The reports for both these evaluation projects are available on the EPA website.



Synostemon hamersleyensis

In 2004, an unusual, small straggling leafless shrub was collected during a vegetation survey in the Pilbara. The closest species resembling the specimen occurs in a small area of tropical north-eastern Queensland, around 2,800 km away. After collaboration between the environmental consultant who found the species and a taxonomist, the Pilbara specimen was recognised as a new species and formally described in 2015 as *Synostemon hamersleyensis*. It is also listed by Department of Parks and Wildlife as a Priority 1 species.

Photo: © Jeremy Naaykens

Western Australia's environmental challenges

Western Australia is an old, geologically stable land where ancient lineages remain, resulting in high numbers of species – a significant proportion of which occur nowhere else – and it is in this setting that the EPA makes recommendations to the Minister for Environment on significant proposals.

Two of Australia's four marine-based World Heritage areas are off the WA coast and five of the State's national biodiversity hotspots occur in the hyper-diverse South West. The remaining three are in the Pilbara, Kimberley and Carnarvon Basin regions. The presence of "biodiversity hotspots" is a mixed honour; hotspots recognise both significant biodiversity and significant threats to it.

Much of the State is grazed by domestic stock or supports other agricultural practices, while a variety of natural resources are extracted from the land and ocean. Historical and contemporary land uses in the Wheatbelt and Swan Coastal Plain have produced some of WA's most intensively cleared landscapes. WA also supports some of the world's largest intact Mediterranean woodlands (the Great Western Woodlands) and tropical savannah (regions in the Kimberley).

WA is still very much a scientific frontier, with many new species being discovered in the marine, terrestrial and subterranean environments. Within the context of high biodiversity, widely varied climate and land-use history, and incomplete knowledge, the EPA works to ensure that development in WA occurs with care and consideration of its unique environment.

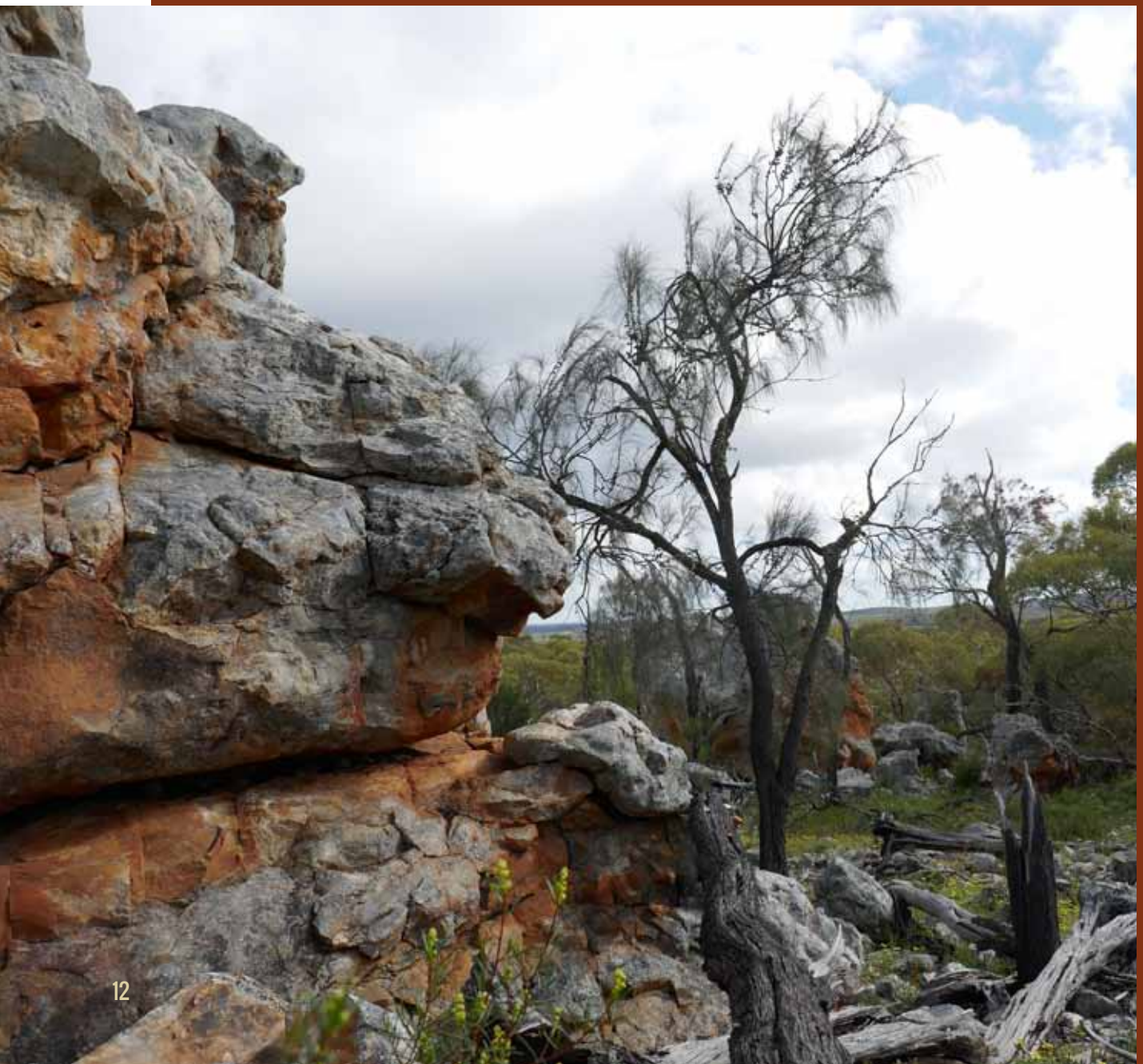
In this annual report, the EPA provides comment and analysis against its five broad themes of Sea, Land, Water, Air and People. The EPA's environmental factors and objectives sitting under these themes are considered when undertaking assessments and providing strategic advice.

The EPA's environmental factors and objectives

An environmental factor is a part of the environment that may be impacted by an aspect of a proposal. The EPA examines those environmental factors that are relevant to any specific proposal through the environmental impact assessment (EIA) process under the five themes of Land, Sea, Water, Air and People.

The objective for each factor is the desired goal that, if met, will indicate that the proposal is not expected to have a significant impact on the environmental value of that factor.

Land



Jingemia cave, Watheroo National Park

Photo: Helena Mills, Office of the EPA

Land

Western Australia is a vast state of more than 2.5 million km², accounting for a third of the continent. Much of the land surface is ancient and flat. Some of the soils and rocks of the Yilgarn are the oldest in the world, due to minimal glaciation and low rates of erosion. In these old stable places, flora and fauna have continued to evolve, resulting in high numbers of species.

WA spans over 2,000 km of latitude and features a wide range of climatic zones – from the tropic regions of the north, to the arid expanses of the interior and temperate regions of the south – experiencing droughts, floods, tropical cyclones, severe storms and bushfires.

It is home to diverse ecosystems ranging from the Kimberley gorges in the tropical north to the tall forests in the cooler, wetter South-West and the spinifex and mulga of the arid interior. WA has more than 11,000 known native vascular plants and in the last year alone, 144 native species names were added to the Census of Western Australian Plants database.

The diversity of WA's terrestrial animals is similarly extraordinary, with over 1,300 vertebrates (mammals, birds, reptiles and frogs) and 5,000 invertebrates (such as insects, worms, snails and spiders).

Many new species are being discovered as a result of environmental impact assessment surveys.

EPA objectives

Flora and Vegetation

To protect flora and vegetation so that biological diversity and ecological integrity is maintained

Landforms

To maintain the variety and integrity of physical landforms so that environmental values are protected

Subterranean Fauna

To protect subterranean fauna so that biological diversity and ecological integrity is maintained

Terrestrial Environmental Quality

To maintain the quality of land and soils so that environmental values are protected

Terrestrial Fauna

To protect terrestrial fauna so that biological diversity and ecological integrity is maintained

Key issue: Native vegetation clearing report card

Clearing of native vegetation is a key threat to WA's biodiversity. The EPA is particularly concerned by the cumulative impact of clearing in the Perth, Peel, Wheatbelt and Pilbara regions.

Increasing urban expansion along the Swan Coastal Plain is a principal cause of clearing in the Perth and Peel regions. As a result, only 29 per cent of the Swan Coastal Plain portion of Perth and Peel remains naturally vegetated. The Wheatbelt is one of the most heavily cleared areas in WA due to long-term agricultural activities, leading to issues such as land salinization and soil erosion.

The EPA has identified an increase in the scale, rate and pattern of clearing for mining and infrastructure development in the Pilbara. Records show that between 1997 and 2013[1] more than 2,300 square km of Pilbara land was approved for clearing under the EP Act, with approximately 72 per cent of that area approved in the past five years.

The full extent of clearing in WA is not easily evaluated as no single government agency or department reports on the total approved clearing of native vegetation statewide.

The primary legislation regulating native vegetation clearing is the *Environmental Protection Act 1986* but multiple agencies are involved in assessing clearing applications, including the EPA and the departments of Environment Regulation and Mines and Petroleum. Many activities under other laws do not require clearing approval. These include subdivision approval by the Western Australian Planning Commission and local government authorities, and development approval by development assessment panels under the *Planning and Development Act 2005*, as well as clearing for bush-fire mitigation.

With multiple agencies involved and no single, consistent mechanism for recording approved clearing there is currently no reliable means to determine how much native vegetation has been approved to clear, or how much is cleared in any given year, State-wide.

In 2010, the WA Local Government Association's Perth Biodiversity Project analysed aerial photography and found that 6,812 ha of native vegetation was cleared in the Perth Metropolitan area between 2001 and 2009. This equates to an annual clearing average of 851 ha − more than twice the area of Kings Park. The actual rate of clearing varies across the State. A more comprehensive and publicly available dataset would provide ongoing information on the annual extent and causes of approved clearing.

The EPA considers that an accurate understanding of the extent of clearing of native vegetation would provide a context for the value of existing remnant vegetation and a measure of its cumulative impacts. This information would provide an essential knowledge base for assessments, improving policy and decision making, and conservation outcomes.

References and further reading

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1 No readily available data are available on clearing between 1960 – 1997

Discovering new species through biodiversity survey

The size and remoteness of WA means large areas of the State have not been subject to scientific investigation or cataloguing of biodiversity. New species continue to be discovered through the taxonomic assessment of collections, biological surveys and the assessment of development proposals. Recently, it was found that one in 10 plants collected in the Kimberley during the wet season was new to science. Rates of discovery and identification of new flora species in WA in the past decade compare with Third World countries, such as Papua New Guinea.

In order to provide the best advice, based on the best scientific knowledge, the EPA requires proponents to undertake surveys to produce inventories of the biodiversity of areas they propose to disturb and the immediate surrounding area. Scientists conducting these are sometimes the first to survey the areas. Such information is important in reducing uncertainty around the significance of new species and potential species extinction. The EPA is strongly focused on providing scientifically thorough advice. Consistent quality flora and fauna studies are essential to EPA process.

Discovery of new species is a frequent occurrence in environmental impact assessment (EIA). While this may create an increased level of risk and uncertainty for the EPA and proponents, very few proposals result in intractable issues at a late stage of the assessment. In the absence of information, new species are generally treated as potentially

Cochlospermum macnamarae

While conducting a flora survey for a new rail line, environmental consultants made collections of a *Cochlospermum* (related to Kapok Bush) from a remote part of the Pilbara. A preliminary investigation revealed a significant botanical discovery. It was the first record of the *Cochlospermum* genus for the Pilbara bioregion, and a new species altogether.

The species was named after the former Director General of the Department of Environment and Conservation, Keiran McNamara, to acknowledge the legacy of his support for conservation. *Cochlospermum macnamarae* is listed as a Priority 1 species – poorly known and from only a few locations that are potentially threatened, and in urgent need of further survey.

Photo: © Daniel Brassington, Western Botanical

rare, but may become regarded as widespread as more information is gathered.

The main responsibility for taxonomy and investigation of new species rests with the Department of Parks and Wildlife's WA Herbarium and the WA Museum, however universities and the Kings Park Botanic Gardens and Parks Authority also investigate these issues and publish new species names based on taxonomic research.

When a potentially new species is found in EIA, the proponent enlists the help of taxonomic experts and the WA Herbarium or WA Museum. The herbarium or museum typically allocates a preliminary name (e.g. *Lepidosperma* sp. Parker Range) to enable the EPA to assess the likely significance of any impact while the taxonomy is resolved.

The discovery of new species is likely to continue to be reported in EIA as biological investigations are undertaken in areas that have not been subject to detailed survey. The WA Herbarium has found that approximately 40 per cent of new flora species recorded are rare. This has increased over time.

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Telford IRH and Naaykens J 2015. Synostemon hamersleyensis *(Phyllanthaceae), a new species endemic to the Pilbara, Western Australia.* Nuytsia 25:31-37

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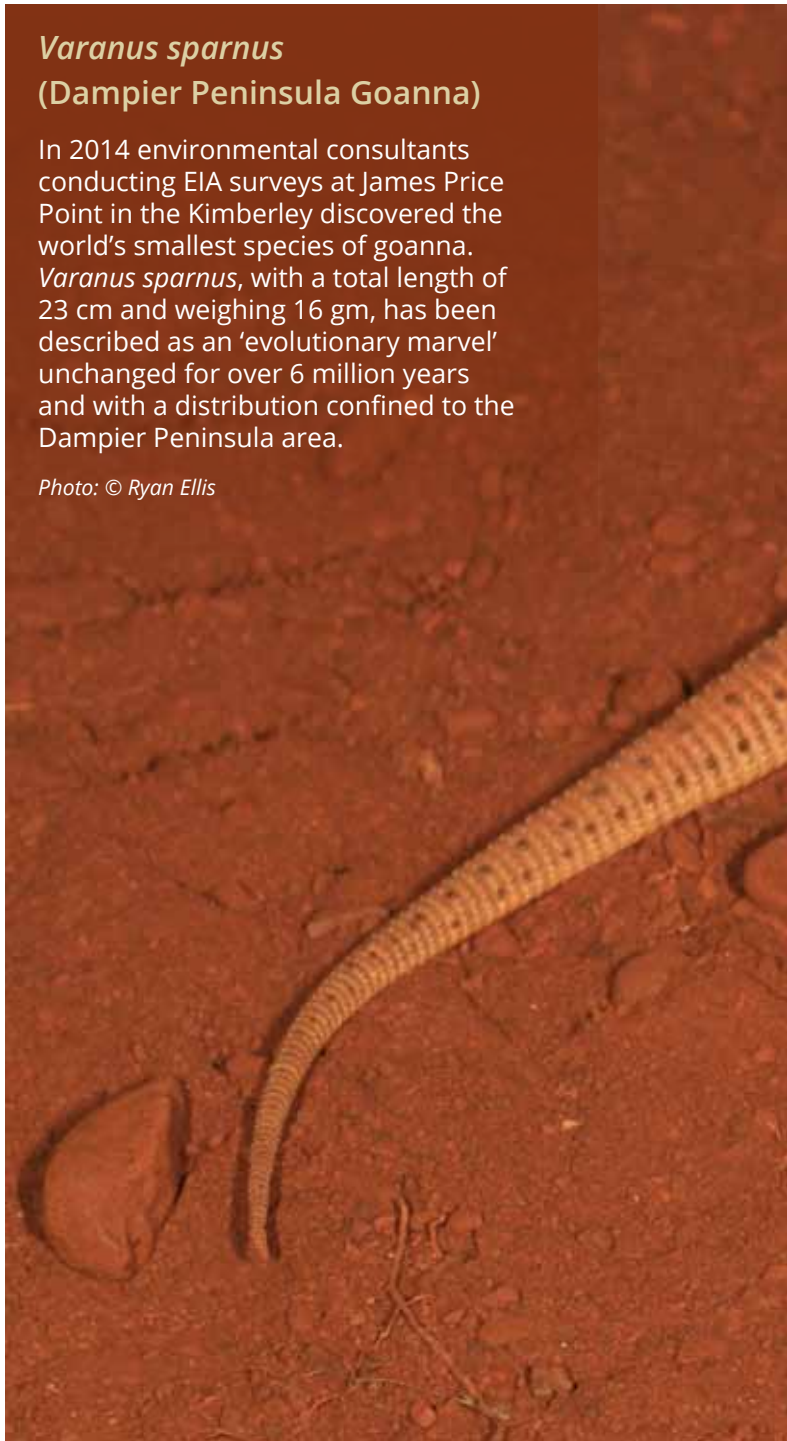
Varanus sparnus (Dampier Peninsula Goanna)

In 2014 environmental consultants conducting EIA surveys at James Price Point in the Kimberley discovered the world's smallest species of goanna. *Varanus sparnus*, with a total length of 23 cm and weighing 16 gm, has been described as an 'evolutionary marvel' unchanged for over 6 million years and with a distribution confined to the Dampier Peninsula area.

Photo: © Ryan Ellis



Discovery of new species is a frequent occurrence in environmental impact assessment

Key issue: Subterranean fauna

Little is known of WA's largely unseen subterranean fauna, but due to extraordinary species richness and high levels of short-range endemism it has global significance. It is estimated that there are over 4,000 species in WA and only 10 per cent of those known have been formally described.

Subterranean fauna, which live their entire lives below ground, fall into two groups: troglofauna, which live above the water table in caves, very small cracks or pores in rock; and stygofauna, which live underwater. Most are invertebrates such as arachnids, crustaceans, worms and insects, but there are a few vertebrates including a gudgeon fish, an eel and a blind snake.

Areas that support subterranean fauna include the banded iron formations of the Pilbara, aquifers associated with calcretes of the Yilgarn, and the karst systems of Cape Range. The significance of subterranean communities in the State has been recognised through the listing of nine Threatened Ecological Communities and 80 Priority Ecological Communities, each supporting subterranean fauna.

Many subterranean fauna habitats coincide with areas targeted for mineral development by virtue of the prospectivity of the geological formations which host these habitats; potential impacts to subterranean fauna have been assessed in over 70 proposals to date.

Threats to subterranean fauna include loss and fragmentation of habitat from mineral extraction and loss of aquatic habitat, changes to water quality and chemistry, and changes to hydrology as a result of dewatering for mining and borefield extraction.

Determining the likely impact of proposed development on subterranean fauna is often more complex and challenging than for other aspects of biodiversity. Biological surveys for environmental impact assessment frequently identify new species, many of which are only known from the proposed development area. With many of the species new to science there is little information available on their taxonomy, biology, distribution, habitat or ecological function.

Despite increasing knowledge about WA subterranean fauna, much information gained through surveys for impact assessment is not shared. Specimens are sometimes retained in private collections rather than being stored in the Western Australian Museum. Consequently, a species recorded in one project area and thought to be new may have been recorded elsewhere. With no record of this species in the State collection its existence is not publicly documented. This means the significance of any impact on such species may be over-stated.

The Western Australian Museum is the official repository for the State's faunal collections. The collection consists of several million specimens, of which a significant fraction are entered into databases and delivered on-line (e.g. Atlas of Living Australia - the national biodiversity database managed by CSIRO).

The EPA expects that all specimens, and their accompanying data including DNA sequences, be offered to the WA Museum for inclusion in State collections. This enables identifications to be verified, and ensures safe and permanent storage of biodiversity data. The data can be compared to existing databases of named and unnamed species to determine whether the same species have been previously recorded. This information can then be used

to determine whether proposal impacts on a species, recorded during EIA, are significant and assists in achieving timely assessments and improved conservation outcomes.

Specimens collected during surveys and investigations associated with EIAs are important to building this understanding and in the EPA's view should be widely available. This includes lodgment of specimens with the WA Museum and submission of genetic data to public access databases such as GenBank.

Such sharing of information would help close knowledge gaps surrounding subterranean fauna and lead to improved efficiencies and timelines in the EIA and approvals process.

References and further reading

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Opposite: *Milyeringa veritas*, the blind gudgeon, is listed as Vulnerable under the *Wildlife Conservation Act 1950*

Photo: © Douglas Elford, Western Australian Museum

Right top: A blind cave eel

Photo: @ Biota

Right bottom: *Bamazomus sp.*

Photo: © Douglas Elford, Western Australian Museum

Pressure point: Carnaby's cockatoos

The iconic Carnaby's cockatoo, familiar to many Western Australians, is a large and conspicuous black cockatoo with distinctive white patches on the tail. While often seen in noisy flocks, it is an endangered species found only in the South-West.

Populations have declined by 50 per cent over the past 45 years and the downward trend continues. The species distribution range has contracted by 30 per cent, largely as a result of widespread native vegetation clearing across agricultural and Perth regions since the 1940s. Due to the reduction in number and range of Carnaby's cockatoo, the species is listed as a Specially Protected Fauna under the *Wildlife Conservation Act 1950* (State) and listed as Endangered under the *Environment Protection and Biodiversity Act 1999* (Commonwealth).

As a result of habitat fragmentation, two broad subpopulations of Carnaby's cockatoo are recognised:

- a western subpopulation, which moves between the northern Wheatbelt and the coast on the Swan Coastal Plain; and
- an eastern subpopulation, which moves between the southern Wheatbelt and the south coastal region.

The number of birds that can be supported in the two subpopulations is dependent on suitable feeding, roosting and breeding habitat.

Carnaby's cockatoo feeding on *Banksia*

Photo: © Tony Kirkby, Western Australian Museum

Carnaby's cockatoo breeds in areas in the Wheatbelt and in Jarrah forest and moves towards coastal areas to forage during non-breeding periods.

In the Wheatbelt, breeding habitat has been extensively cleared, with remaining trees suitable for breeding located in remnant patches or as individual isolated trees. Clearing of nearby critical foraging habitat intensifies stress on adult birds forced to fly greater distances for food, and can determine nesting success. Ensuring the availability of adequate breeding trees and suitable nesting hollows is a long-term priority for protection of the species.

In non-breeding areas, Carnaby's cockatoo is impacted by the loss of suitable foraging habitat. Clearing of native vegetation for the expansion of the Perth metropolitan area has impacted the availability of feeding and foraging habitat on the Swan Coastal Plain. However, the creation of the pine plantations in Gnangara, Pinjar and Yanchep has likely masked the true effect of loss of natural food sources provided by native vegetation. For example, the value of food provided by one hectare of pine plantation is significantly greater than the value of food in an equivalent area of native vegetation. Ensuring adequate available food throughout the year in the context of an expanding demand for residential land in the Perth and Peel regions is a short-term priority for protection of the species.

The Strategic Assessment of the Perth and Peel Regions (also known as the Green Growth Plan) provides the State with a unique opportunity to consider the potential consequences of growth on the environment at a regional scale, rather than through isolated project-by-project assessment. In its preparation of plans for the strategic assessment, the State has determined that a major contributor to the potential impact on Carnaby's cockatoo is related to the harvesting (and non-replacement) of pine plantations. The EPA considers that while there is limited breeding habitat in the Perth and Peel regions, this habitat as well as areas of older native vegetation with suitable mature trees (with the potential to form hollows in the future), should also be a target for protection through the strategic assessment.

A key supporting mechanism for any conservation actions proposed under the strategic assessment is adequate monitoring and adaptive management. In the EPA's interim advice, we emphasised that monitoring and evaluation efforts for the strategic assessment outcomes will need to go beyond the existing regulatory compliance functions, and that new mechanisms may be needed to evaluate the effectiveness of commitments. Given the assessment's length and scale, safeguards should be put in place to ensure that conservation actions deliver real benefits for the species.

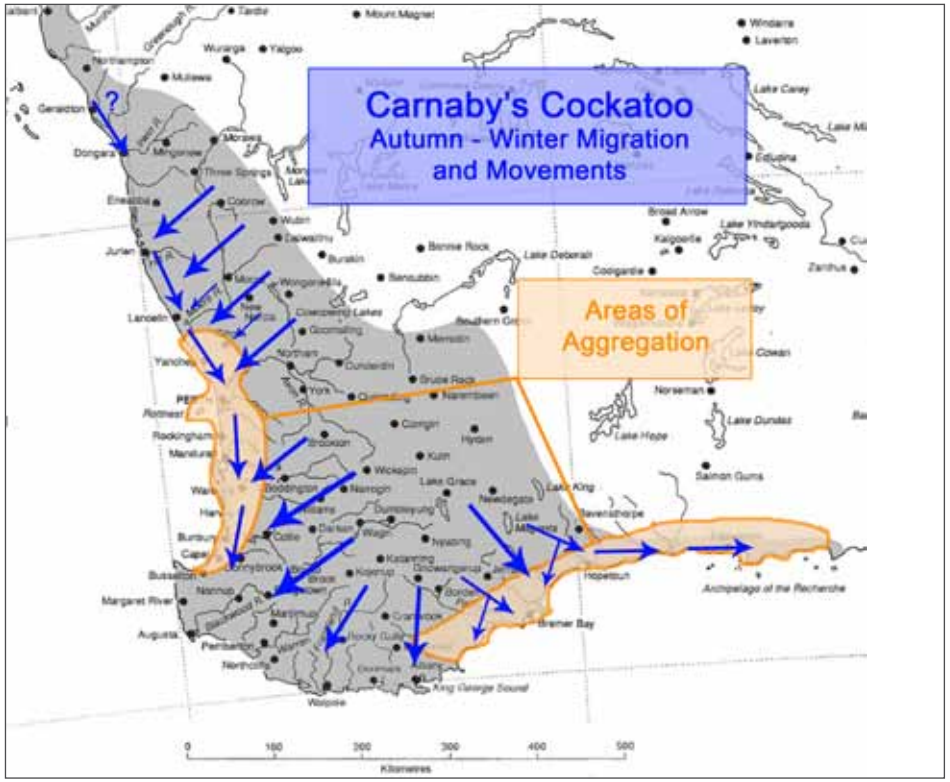

Figure 1: Carnaby's cockatoo Autumn-Winter migration and movements in south-west Western Australia. *Source - Western Australian Museum*

Sea

Humphead wrasse (*Cheilinus undulatus*)

Photo: © Stephen B. Goodwin, AIMS

Sea

Western Australia has a vast coastline over 20,781 km, with 12,889 km of mainland coast and 7,892 km of island coast. The adjacent coastal waters cover more than 117,000 km^2 – almost a third of Australia's maritime exclusive economic zone. These include climatic regimes ranging from cold temperate on the south coast, warm temperate in the lower west coast, sub-tropical in the Gascoyne, arid tropical in the Pilbara and wet tropical in the Kimberley and Timor Sea.

A wide range of marine environments coupled with relative isolation has resulted in very high marine life diversity, much of it found nowhere else. Two of Australia's four marine-based World Heritage areas are off the State's coast. The waters off the Kimberley are among those least impacted by human activity globally.

These ecosystems support a diverse range of specially protected and culturally and commercially important species, including prawns, fish, seabirds and marine turtles, as well as marine mammals such as sea lions, dugong, dolphins and whales.

In terms of benthic communities, there have been losses of seagrass meadows in the south of the State due to nutrient pollution and coastal infrastructure development. Losses of tropical benthic communities such as mangroves and corals in the northwest have occurred mainly due to port and coastal infrastructure developments. To date, these losses have been relatively small compared to the overall extent of the benthic habitats in these regions.

The environmental quality of WA's marine environment is generally very good. Areas of reduced environmental quality are mainly localised and related to discharges of treated wastewater, contaminated storm-water flows and groundwater seepage, shipping and port operations and large-scale marine aquaculture operations. Apart from quite localised areas associated with treated sewage outlets, no areas within the State's coastal waters exclude community recreation or the consumption of caught or grown seafood due to pollution.

The main sources of acute pressure on marine fauna are also localised and associated with coastal infrastructure development. Key impacts of concern include loss of critical habitat (e.g. from dredging), injury, death or behavioural disturbance (e.g. from underwater noise, light, vibration and vessel movements).

Coastal structures such as solid breakwaters can alter the natural processes that shape the coast and cause localised erosion/accretion. Left unmanaged, they can threaten coastal ecosystems, marine fauna that utilise the coastline (e.g. seabird and turtle nesting beaches), the integrity of man-made structures and potentially reduce the recreational and social values of the coastal zone.

A priority for the EPA is the ongoing broadening of its marine science knowledge base by supporting studies, investigations and research into contemporary issues and knowledge gaps related to environmental protection. This enhances the EPA's capacity to provide

EPA objectives

Benthic Communities and Habitat

To protect benthic communities and habitat so that biological diversity and ecological integrity is maintained

Coastal Processes

To maintain the geophysical processes that shape coastal morphology so that the environmental values of the coast are protected.

Marine Environmental Quality

To maintain the quality of water and sediment so that environmental values are protected

Marine Fauna

To protect marine fauna so that biological diversity and ecological integrity is maintained

scientifically thorough and balanced advice on emerging issues.

The EPA therefore strongly supports sharply focused scientific programs such as The Blueprint for Marine Science initiative and the Dredging Science and Kimberley nodes of the Western Australian Marine Science Institution.

The State Government last year made a commitment to support and grow the WA aquaculture industry. This includes the establishment of aquaculture zones, facilitating investment and streamlining and reducing regulation. The EPA continues to closely work with the Department of Fisheries in establishing aquaculture zones in keeping with the object of the EP Act. The EPA's strategic assessment of the Kimberley Aquaculture Development Zone has significantly reduced the time that proponents spend seeking necessary environmental approvals, and the EPA is currently assessing a strategic proposal at the Houtman Abrolhos Islands for a Mid-West Aquaculture Development Zone.

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A Marine Science Blueprint for WA

Resolving knowledge gaps around the WA marine environment is critical to the development of more effective and less costly environmental management strategies and improved conservation management outcomes. The *Blueprint for Marine Science 2050* report has been developed to achieve this end by facilitating collaboration between government, industry and the community.

The report, released in 2015, identified more than 100 priority areas for investigation or development to facilitate evidence based conservation management efforts, engineering enhancements, and new-project delivery. It is based on consultation with more than 200 experts and science end-users. Through the Premier's Roundtable for Marine Science Discussions, leaders from regulator, government, industry and community sectors agreed on the need for a collaborative approach to research. This would ensure targeted investment, and remove duplication while reducing costs. It would also add value and build credibility between stakeholders and within the community. Roundtable participants have subsequently committed to a collaborative approach through the Blueprint for Marine Science *Implementation Strategy 2016–2018*.

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Longer-term impacts of large-scale climatic events

In its 2014-15 Annual Report, the EPA discussed the importance of understanding natural variability, acknowledging its critical role in the planning and management of marine related development and the sustainability of healthy and biodiverse marine ecosystems. The EPA referred to coral bleaching and subsequent mortality on reefs in the inner west Pilbara where coral cover dropped from approximately 45 per cent to about five per cent. Underwater video of coral reefs shot in 2009 – before the higher-than-average sea surface temperatures (SST) and subsequent cyclonic activity of 2010–2011, and again in 2012 – can be viewed on the EPA website.

Study and analysis subsequently revealed that the SST was 4–5°C higher in the Gascoyne than the long-term average and that the marine heat-wave event resulted in higher temperatures throughout the water column to depths of at least 100 m. The summers of 2012–2013 and 2013–2014 were also 2–3°C warmer than the long-term average These events resulted in immediate and large-scale fish kills of commercially and recreationally important species and their chronic effects are still being felt by the marine system along the Gascoyne and west coasts.

In the Gascoyne, the recruitment of commercial species such as juvenile scallops, brown tiger prawns and blue swimmer crabs were all extremely low after the 2011 heat-wave event. This may be not just a direct result of higher-than-average temperatures impacting reproduction and recruitment success, but also due to impacts on the habitats necessary for certain life stages. For example, Exmouth Gulf tiger prawn recruitment and catches are significantly correlated with total cover of macroalgae and seagrass. The heat wave resulted in defoliation, flowering collapse and seed abortion in the seagrass meadows within Shark Bay and Exmouth Gulf.

Scallops in Shark Bay have also recorded significant mortalities plus poor growth and condition of survivors, which has resulted in reduced spawning biomass and spawning success. In consultation with industry, the Department of Fisheries closed the fishery between 2012 and 2014. A partial opening in 2015 allowed the stock to rebuild. Similarly, the blue swimmer crab fishery in Shark Bay was closed as a result of poor recruitment.

When it reopened in 2013–2014, allowable catches were significantly reduced to enable the stock to recover.

Further south, some areas near Kalbarri saw nearly 100 per cent mortality of abalone. Again, the fishery was closed to protect the remaining abalone and allow the population to recover. However, abalone recovery is notoriously problematic due to highly localised recruitment and therefore an experimental re-stocking program is underway. In the metropolitan area, the heat wave slowed the growth of abalone stocks by about a third. This sub-lethal effect resulted in reduced spawning (due to smaller adult size) and fewer legal sized abalone available for commercial and recreational fishers alike. The Department of Fisheries reduced the allowable catches of commercial and recreational fishers to assist the spawning biomass to recover.

Increased sea temperatures also impacted habitats further south. In Jurien Bay, there was a reduction in *Ecklonia* kelp cover and in other canopy species, with a 100 km southerly reduction in the range of the macroalgae *Scytothalia dorycarpa*. As the habitat changed, there was also a change in fish and invertebrate communities, including the presence of butterfly fish (*Chaetodon assarius*) and other tropical fish species. There is some evidence that, since 2012, the fish communities are returning to a more temperate suite of species. However, there is little evidence that the canopy seaweeds are recovering to pre-heat wave status (Wernberg et al. 2016).

Similar to the impacts in Shark Bay, the heat-wave event may also be partly responsible for reduced seagrass shoot density in Cockburn Sound. This may in turn have contributed to reduced recruitment and availability of blue swimmer crabs in the Sound. To allow the blue swimmer crab population to recover the Department of Fisheries has reduced fishing pressures and enforced fishery closures.

However, warmer temperatures along the South Coast in recent years have resulted in increased blue swimmer crab numbers in this region.

A November 2015 fish-kill event in the southern end of Cockburn Sound was also likely exacerbated by increased water temperature. The Department of Fisheries Fish Kill Incident Report suggested that a combination of low dissolved oxygen concentrations and a bloom of a planktonic alga from the genus *Chaetoceros* may have been responsible and that a combination of higher-than-normal water temperature and high nutrient availability could have potentially contributed to the unusual algal bloom.

Range extensions in the metropolitan area were also recorded for tropical fish species such as Spanish mackerel and dolphin fish, much to the delight of recreational anglers. Increased numbers of tropical rabbit fish were reported in Cockburn Sound and this species has maintained a small presence since 2012. Record recruitment of tropical damselfishes occurred in 2011 at Rottnest Island with good recruitment reported in 2012. In addition, the first sightings of seven other tropical fish species were reported in the metropolitan region, well south of their normal ranges, while mud crabs were reported in the Swan River.

If ocean warming continues, it is likely that this 'tropicalisation' of temperate areas will continue, altering communities, local ecology and ecological processes. Management agencies are responsive enough to deal with short-term changes. However, long-term changes may require more flexible and adaptable management, supported by appropriate investment in monitoring and assessment, including community involvement (e.g. RedMap, www.redmap.org.au). This would support the continuation of an adequate marine reserve system, commercial and recreational fishing and other community values of the marine environment. The EPA recognises the importance of considering the longer term consequences of these marine heat-wave events in combination with the more localised impacts of coastal developments through the EIA process.

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Opposite: Blue swimmer crab (*Portunus armatus,* formerly known as *P. pelagicus*)

Photo: © Department of Fisheries

If ocean warming continues, it is likely that this 'tropicalisation' of temperate areas will continue, altering communities, local ecology and ecological processes.

Mangrove rehabilitation guidelines for Port Hedland

Mangrove forests are diverse communities that provide food and shelter for a range of animals. They are also very resilient to physical forces and protect coastlines from the effects of waves and storm surges. Loss of these habitats is recognised globally as a key threat to the marine environment. Mangrove communities occupy the area between land and sea in many tropical and sub-tropical environments. As a result many marine and terrestrial animals are dependent on the habitat that they provide. Crabs, molluscs and filter feeders utilise the areas around the base of the mangroves while birds, various reptiles, bats and insects occupy the canopy. In a flood tide, fish graze on algae and detrital matter or predate other marine animals. At low tide terrestrial animals and birds feed on marine life exposed by receding waters.

Impact on mangrove communities is an important consideration in the EPA's environmental impact assessment of marine related development.

Port Hedland is the world's largest bulk export port and has been the focus of a number of developments to expand the iron ore export facilities in recent years. Most of these developments have resulted in some level of impact to mangrove or other primary producer habitats within the port boundaries. To address these incremental impacts the Minister for Environment set environmental conditions requiring rehabilitation of mangrove areas that have been cleared to accommodate temporary infrastructure such as access corridors.

In response, and to highlight the importance of mangrove communities, the Pilbara Ports Authority has released guidelines for mangrove rehabilitation and restoration. The Mangrove Rehabilitation Guidelines suggest best-practice methods to maximise opportunities for success and add rigor to rehabilitation initiatives.

Information on mangrove rehabilitation in the Pilbara is limited. The Pilbara Ports Authority has recommended the establishment of a register/database that would include all Pilbara mangrove rehabilitation/restoration projects and contain information on mangrove habitat, methods used, program success and recovery times. The EPA strongly supports this initiative and believes it should lead to ongoing improvement and better outcomes for future arid-zone mangrove restoration and rehabilitation projects.

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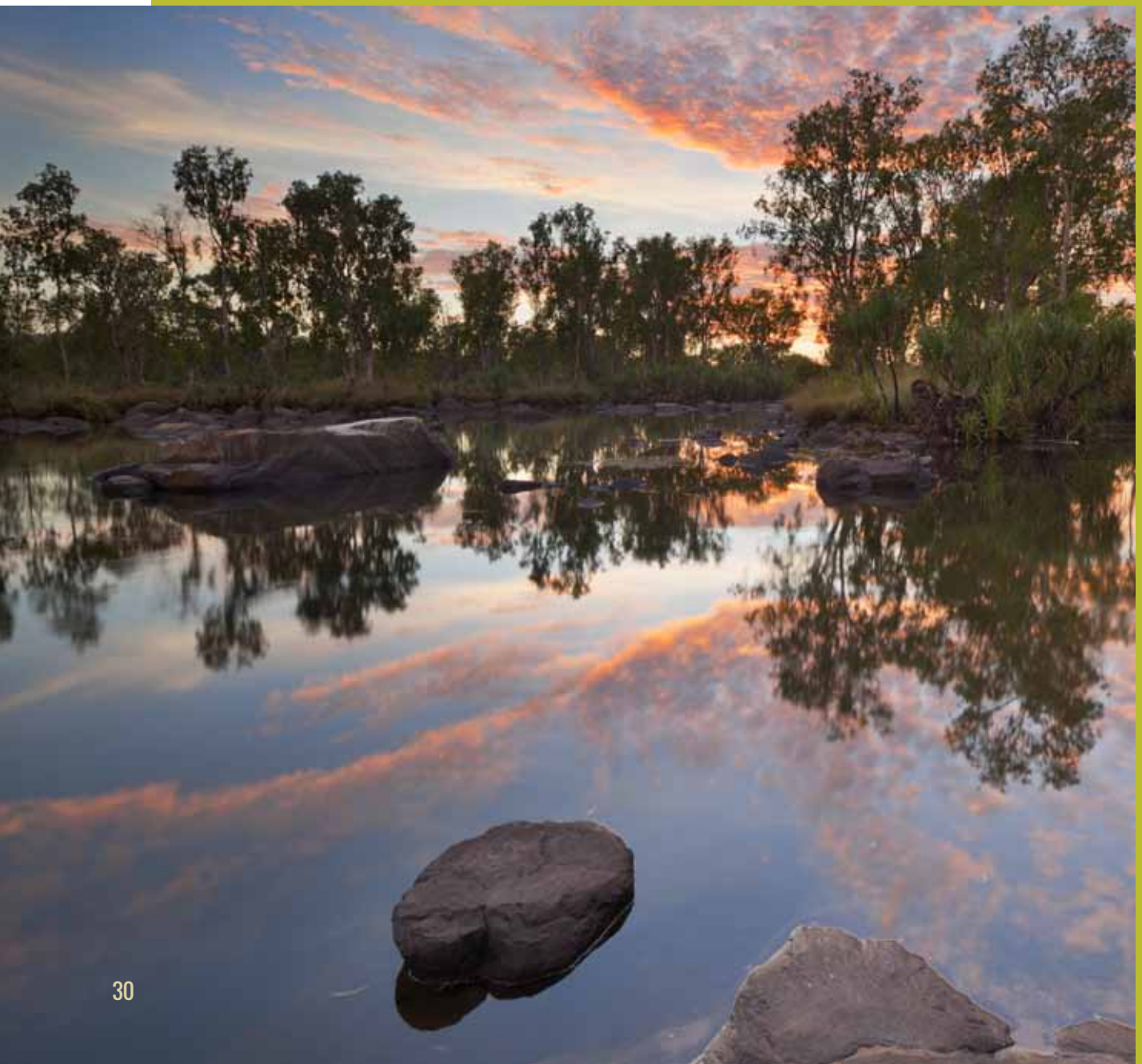
Impact on mangrove communities is an important consideration in the EPA's environmental impact assessment of marine related development.

Mangroves at Nickel River, Pilbara

Photo: Marine Ecosystems Branch, Office of the EPA



Water

Billabong in the Kimberley

Photo: © Sara Winter iStock 18908797

Water

Western Australia has diverse surface and groundwater resources, including rivers, estuaries, wetlands and superficial and confined aquifers. Its water resources support many water-dependent ecosystems, such as wetlands and springs, and are integral to social, cultural and recreational activities. Ground and surface water resources are the basis for community water supply and support State economic development. Current water resource use should not compromise existing and future uses, including ecosystem maintenance.

The south-west of WA has experienced a substantial decline in rainfall over the past 40 years, and the consensus among climate scientists is that further decline should be expected.

Reduced rainfall and lower groundwater levels will continue to impact on native vegetation, wetlands, and other groundwater dependent ecosystems, as well as reducing water available for use. Declining water availability will place increased pressure on existing water resources supporting potable, industrial and agricultural water supplies. It is important that new water sources are developed to meet increasing demand. Balancing various human demands while providing water for ecosystems, waterways and estuaries will continue to be a challenge.

Water resources are becoming increasingly important in supporting economic growth, particularly in regional areas such as the Kimberley, Gascoyne, Midlands and South West.

The State Government's *Water for Food* initiative aims to improve regional economic growth through significantly increasing irrigated agriculture across WA. Finding the right balance between water use and the protection of the many environmental values that water resources support is critical.

The EPA continues to keep a watch on activities that have the potential to impact water resources and the significant values they support. This includes the development of shale and tight onshore unconventional gas deposits. A key issue for the EPA is the need for greater understanding of the various sedimentary basins and aquifer systems which may be impacted by resource development.

The EPA is aware of community concern around water use and potential risks to water quality from hydraulic fracturing in association with unconventional gas development.

A 2015 parliamentary inquiry into unconventional gas development was supportive of the EPA's process for assessing proposals and its role in providing advice to the Minister for Environment. The Parliamentary Inquiry into the *Implications for Western Australia of Hydraulic Fracturing for Unconventional Gas* tabled its report in Parliament on 17 November 2015. The Office of the EPA and the Department of Mines and Petroleum have a Memorandum of

EPA objectives

Hydrological Processes

To maintain the hydrological regimes of groundwater and surface water so that environmental values are protected

Inland Waters Environmental Quality

To maintain the quality of groundwater and surface water so that environmental values are protected

Understanding to address concerns raised by the Inquiry on the referral of proposals involving hydraulic fracturing. There is now a trigger for inter-agency consultation during the pre-referral stage of proposed hydraulic fracturing exploration and development activities. This will mean proposals likely to have a significant effect on the environment and to require referral to the EPA can be more easily identified.

Below: The Fitzroy River winds through Geikie Gorge.

Photo: © Annabelle Sandes, Kimberley Media 2010

Key issue: Water for food

The *Water for Food* program was launched in 2004 to significantly increase fresh food and animal protein production in WA. The program involves identifying additional water and land resources to enable a significant increase in irrigated agricultural areas across the State. There is a focus on both new irrigated agriculture precincts and the expansion of existing areas.

Eleven projects − from the Kimberley to the South Coast − have been established, including groundwater investigations, irrigation trials, facilitating access to land tenure in the extensive land use zone, and identifying new water-supply options.

Concern has been expressed to the EPA about the potential scale of irrigated agriculture in the Kimberley region, and the impact that a significant increase in water use may have for the Fitzroy River and its catchment. The Fitzroy River is recognised for its high environmental and cultural values. It remains one of northern Australia largest free flowing rivers, with no regulation of flow and low levels of consumptive water use.

An EPA briefing on the program by officers of the Department of Water during 2015–2016 covered the department's approach to West Kimberley water allocation. This included local-scale planning and licensing to ensure environmental water needs and values are maintained, and investment in science to better understand environmental values and water requirements.

The EPA understands that past planning for the West Kimberley identified a lack of community support for large-scale irrigated agricultural precincts. A so-called 'mosaic'-style approach to agriculture − recognising the multiple values and objectives of the community − is preferred. The EPA will continue to monitor the development of the *Water for Food* program in the Kimberley and elsewhere to ensure that the planning process has regard to the region's significant environmental and cultural values. While no strategic environmental impact assessment of the program is proposed by the lead agencies, the EPA expects that any major individual agricultural developments with potentially significant impacts will be referred.

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Pressure point: Perth's water supply

Perth's water resources are at a critical point. New resources are needed to support a growing population without significantly impacting on the important environmental and cultural values of water-dependent ecosystems.

Water security is critical to Perth's ongoing expansion. A growing population, together with a drying climate and reduced rainfall, puts significant strain on water availability. An expanding city requires water for households and businesses as well as public open-space irrigation, industry and agriculture. At the same time, the values of water dependent environments must be maintained. This is a particular challenge where traditional groundwater and surface water sources are fully committed.

Looking to the future, the Water Corporation's report *Water Forever: Towards Climate Resilience* provides a range of options to secure Perth's public water supplies to the year 2060. Groundwater and desalination will continue to be an important component of Perth's water supply, and there will be a continued emphasis on water-use efficiency to reduce demand.

The Water Forever report identifies strategies to reduce water use by 25 per cent, increase wastewater recycling to 60 per cent, and develop new water sources.

Artificial recharge of aquifers is a new water source under development. By recharging aquifers, additional water can be abstracted for use, or groundwater levels can be enhanced to support environmental values such as wetlands.

This process includes the treatment of waste or drainage water to a standard appropriate for return to a suitable aquifer. Projects are currently underway or in development to artificially recharge the deep confined aquifers in Perth (for public water supplies) and the superficial unconfined aquifers within the urban areas around Perth (to support non-potable uses). Artificial recharge presents opportunities as well as some potential environmental impacts.

In 2013, the EPA considered a referral of the first stage of the Water Corporation's Perth Groundwater Replenishment Scheme to replenish recycled wastewater at Beenyup. The anticipated impacts on the environment from the proposal were not so significant as to warrant formal EPA assessment.

The Water Corporation's managed aquifer recharge has been trialed successfully at the Beenyup Wastewater Treatment Plant. Wastewater is pre-treated through several

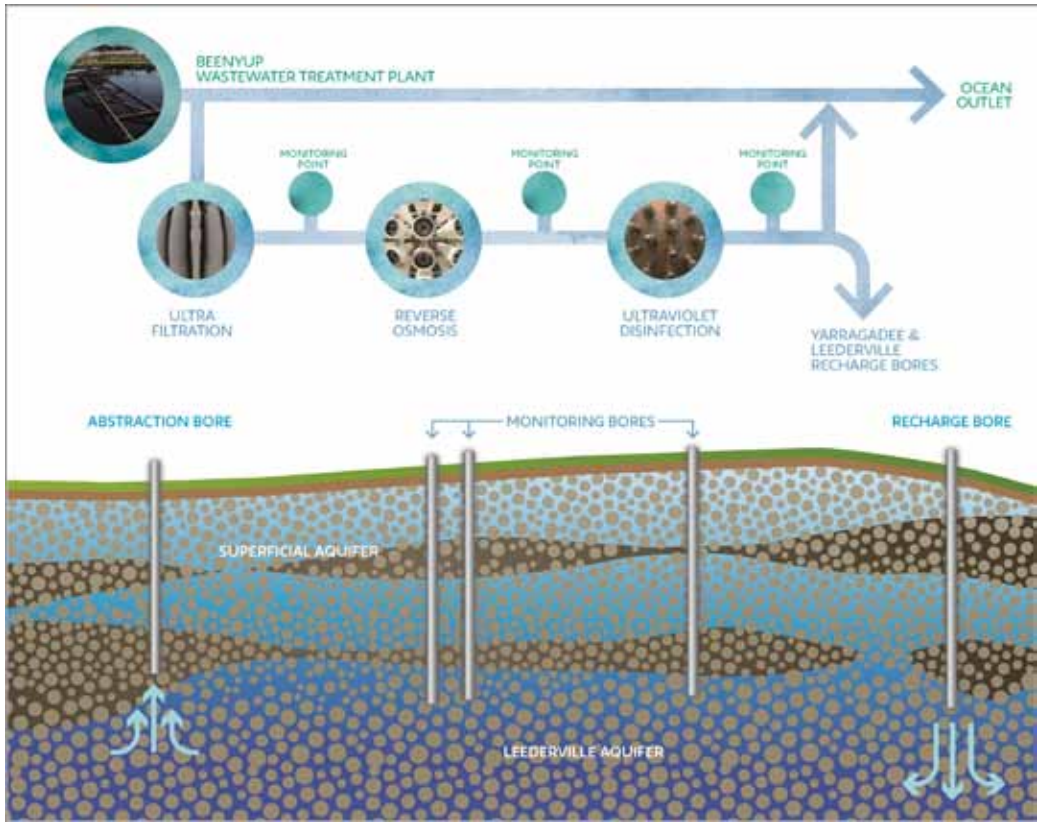

Figure 2: The water recycling process: recharge to the Yarragadee and Leederville aquifers.
Source: Water Corporation

processes before being recharged to the aquifer to ensure that the groundwater quality is maintained or improved. Such managed aquifer recharge has the potential to increase the water available for subsequent abstraction from the aquifer.

The EPA made recommendations in its interim advice, *Perth and Peel @ 3.5 million Environmental impacts, risks and remedies*, on the need to support alternative fit-for-purpose water supply to address Perth's increasing water needs. It recommended the continued implementation of measures to reduce water use, increase water recycling and develop alternative fit-for-purpose water sources. It specifically supported the Water Corporation's continued development of managed aquifer recharge into confined aquifers of the Gnangara Mound.

The first stage of the scheme is on track and due for completion at the end of this year. It will have the capacity to recharge 14 billion litres of recycled water annually into Perth's groundwater supplies.

On 14 July 2016, the Minister for Water announced the expansion of the replenishment scheme at Beenyup. The Water Corporation's 10-year water supply plan for Perth will take its next step with the doubling of the Groundwater Replenishment Scheme, recharging up to 28 billion litres annually. The expanded scheme promises greater certainty for Perth's Integrated Water Supply Scheme, as it continues to be impacted by a rapidly drying climate.

The EPA understands that Department of Water feasibility studies are also underway on aquifer recharge for non-potable purposes. This includes the irrigation of public open space as well as improving groundwater quality, and will benefit the environmental values of groundwater-dependent ecosystems.

The continued successful implementation of managed aquifer recharge has the potential to secure Perth's long-term water supplies for both human use and the region's unique environment. The EPA will watch closely for potential impacts of managed aquifer recharge on sensitive receptors, including water quality and quantity.

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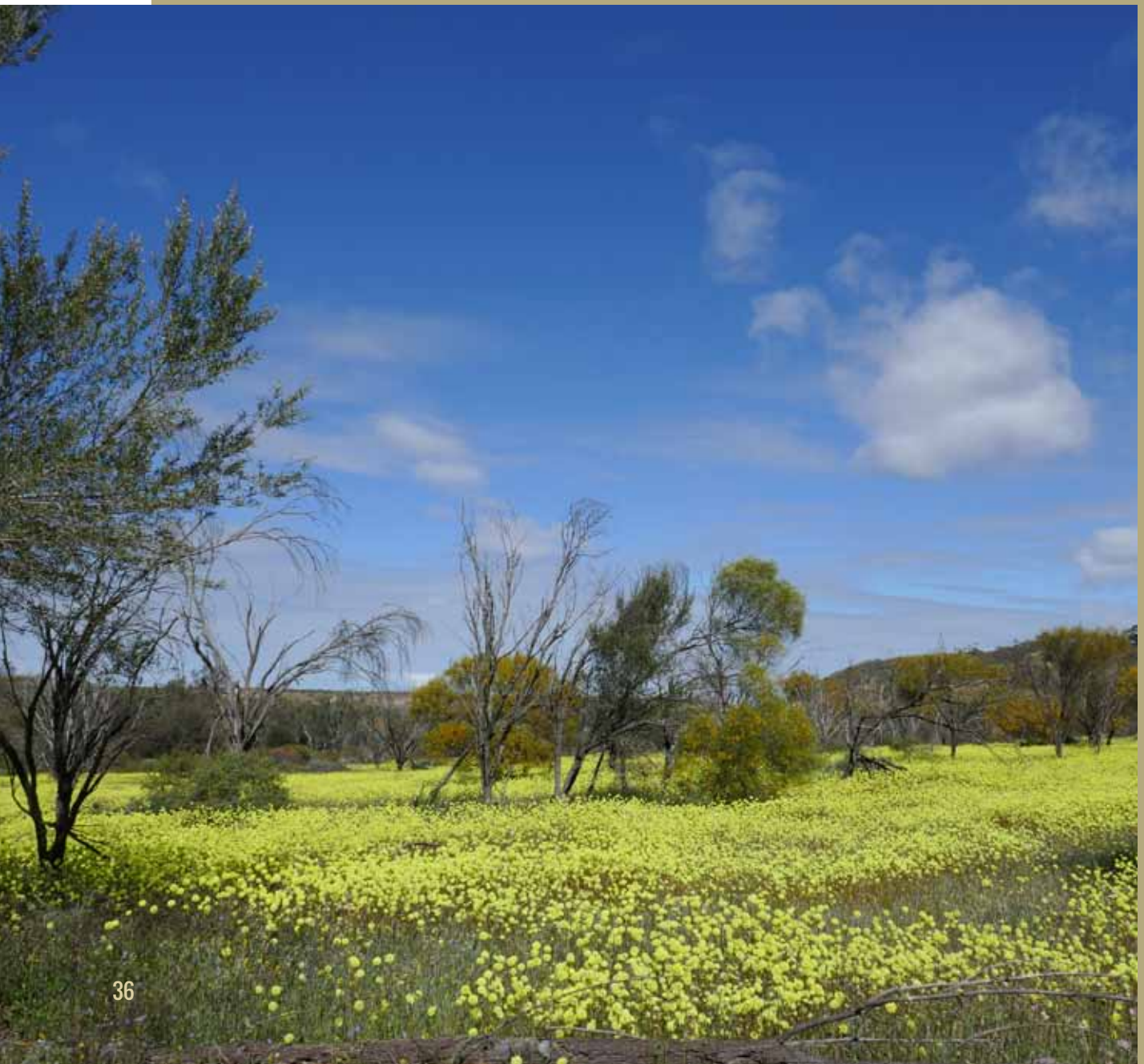
Opposite: The wetlands of Yanchep National Park support important Swan Coastal Plain ecosystems.

Photo: © Quennie Chua, iStock 7120270

Air



Coalseam Conservation Park, River Bend

Photo: Helena Mills, Office of the EPA

Air

The quality of the air we breathe is important for our environment, health and amenity. Maintaining a high standard in Perth and major Western Australian centres as populations expand, continues to be an important issue for the EPA. As well, minimising emissions that contribute to climate change is a wide and direct value to the environment and thus ourselves.

It is well recognised that poor air quality can adversely affect human health and the environment. Air quality can be impacted by both human activity and natural processes. Common air pollutants include airborne particles (or particulate matter), oxides of nitrogen, oxides of sulfur, ground level ozone, reactive organic compounds (also known as volatile organic compounds) and greenhouse gases (including carbon dioxide, carbon monoxide and methane). Significant sources of pollutants from human activity include combustion of fossil fuels and wood, motor vehicles, release of hydrocarbons from oil and gas refining, emissions from industrial processes and particulate matter associated with mining, land clearing and bushfires. Natural sources of pollutants include wind erosion, bushfires and volatile organic compounds from vegetation.

WA has a good regulatory framework for managing air quality, but the future impact of urban growth must be supported by good science. The Perth and Peel Strategic Assessment provides a unique opportunity to improve knowledge of current and future emission sources to inform land use planning and transport strategies by:

- updating the Perth Emissions Inventory to include current and future major air emission sources in the Perth and Peel regions;
- updating the Perth Air Quality Management Plan and expanding to include the Peel region; and
- establishing a permanent air-quality monitoring station in the Perth central business district and in Mandurah.

These actions would address knowledge gaps about air-quality in the Perth and Peel regions over time and could be used as a model framework for understanding air-quality issues in other major centres in WA.

The Ambient Air National Environmental Protection Measure (NEPM) standard was established in 1998 under the *National Environment Protection Council Act 1994* to provide a common national goal to best protect human health and wellbeing from the adverse impacts of air pollution. The NEPM is concerned with the broad air quality within airsheds and is not intended for regulating point-source emissions, such as those from direct industrial sources.

In 2011, the Ambient Air Quality NEPM was reviewed and, on 29 April 2014, Environment Ministers across the country signaled their intent to vary the Ambient Air quality NEPM based on the latest scientific understanding of

EPA objective

Air Quality

To maintain air quality and minimise emissions so that environmental values are protected

the health risks arising from airborne pollution. On 15 December 2015, at the meeting of Environment Ministers, the National Clean Air Agreement was endorsed. The agreement aims to address the impacts on human health and the environment and ensure that the community continues to enjoy clean air.

It will deliver actions to reduce air pollution and establish a process for jurisdictions to work cooperatively to address emerging air-quality issues. The three initial actions under the agreement include measures to reduce air pollution from wood heaters, the introduction of emission standards for new non-road spark ignition engines (such as garden equipment and marine outboard motors), and the strengthening of national ambient air-quality reporting standards for airborne fine particles.

Last year, the EPA published its first guidance (EPB 24) on the consideration of greenhouse gas emissions and projected climate change in Western Australia. In accordance with the objectives under the EP Act to protect the environment and to prevent, control, and abate pollution and environmental harm, the EPA believes that its guiding principle of encouraging best practice to minimise greenhouse gas emissions as low as reasonably practicable remains important. In the absence of other regulatory requirements to minimise emissions, the EPA will continue to scrutinise greenhouse gas emissions intensive proposals that are subject to environmental impact assessment.

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Key Issue: Perth's Air Quality - need for air quality modeling to link to transport planning

Transport emissions are a significant source of air pollution in the Perth and Peel regions and are particularly difficult to regulate. Vehicles are the largest single source of volatile organic compounds and oxides of nitrogen. These react in the presence of sunlight to cause photochemical smog, as well as contributing significantly to particulate matter emissions and other air pollutants.

The issue of transport-emissions impacts on Perth's air quality is not new. The *Perth Air Quality Management Plan* (AQMP) of 2000 identified strategies to tackle these emissions. While many of its initiatives continue to be implemented, the issue remains problematic.

Traffic congestion is a major contributor to air emissions, creating hotspots of poor air quality, typically in areas with high building density. Poorly designed high-density areas prevent the dispersion of air pollutants. This underlines the challenge of reducing urban sprawl through higher housing density while also maintaining Perth's good air quality.

The current long-term land use and transport planning undertaken through the Strategic Assessment of the Perth and Peel Regions presents an opportunity to highlight this ongoing issue in the context of Perth's increasing population, projected to reach 3.5 million people in the next 15 to 20 years.

Vehicle emissions and strategies to reduce network congestion are becoming an increasingly important element of traffic

management decision-making. Effective management of vehicle emissions is a key issue to address for expanding the Perth and Peel regions. There is considerable need for strategies that focus on the three factors affecting transport emissions: increasing vehicle numbers, increased distance travelled, and traffic congestion.

A practical method for undertaking air-quality assessment for the planning of major road networks and strategic transport routes needs to be identified. The EPA believes the best way forward in this regard is for the Department of Environment Regulation to work with the departments of Transport and Planning to determine how air-quality data could best inform land-use and transport decision-making processes.

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Peak hour congestion on the Mitchell Freeway, north of Perth.
Photo: © John Kirk, iStock 55321230

Success story: Gidji roaster close down, air quality improvements

Gold in the Kalgoorlie region is bound to various sulfide minerals such as pyrite. A process known as 'roasting', which extracts gold by treating sulfide gold concentrate in circulating fluid bed roasters at 650°C, releases sulfur dioxide and mercury into the air.

In the 1980s, industrial processes in the Goldfields contributed to high concentrations of sulfur dioxide (SO_2) resulting in poor air quality in the towns of Kalgoorlie and Boulder, with significant health impacts for the surrounding community. Sulfur dioxide can cause breathing problems, irritating the nose, throat and airways, particularly for those with asthma or similar conditions. The major sources of sulfur dioxide in the Kalgoorlie region at the time were the three in-town gold roasters at Boulder, along the Golden Mile, and at the Kalgoorlie Nickel Smelter to the south of the city.

In 1988, an Environmental Protection Policy (EPP) established limits and standards of sulfur dioxide concentration. The EPP has since been reviewed a number of times, with more stringent air-quality objectives and the addition of complementary regulations setting out the conditions of a licence. This has allowed industry to comply with the EPP ambient sulfur dioxide concentrations over an agreed and specified timeframe through phased investment in pollution control technologies.

The Gidji roaster in operation

Photo: courtesy of Kalgoorlie Consolidated Gold Mines

In 1989, the so-called 'Gidji roaster' replaced the three in-town roasters, and at the time it reduced sulfur dioxide levels in residential areas. To ensure these emissions met stricter air-quality standards regular shut downs were required.

In its 2012–13 annual report, the EPA noted the dramatic improvement in sulfur dioxide levels in Kalgoorlie-Boulder over the previous decade as a direct result of the introduction of the *Environmental Protection (Goldfields Residential Areas) (Sulfur Dioxide) Policy 2003*. The EPP includes a maximum sulfur dioxide concentration which is not to be exceeded at any time, and is enforced through the licensing of sulfur dioxide emitting industries.

Over the past decade Gidji has contributed more than three-quarters of the total mercury and sulfur dioxide facility emissions in the Kalgoorlie airshed.

Long recognised as the largest contributor of mercury emissions in Australia (Figure 3) the roaster was also the second largest contributor of sulfur dioxide emissions, behind the Mount Isa Mines operations in Queensland (Figure 4).

As part of an ongoing emissions reduction project, Kalgoorlie Consolidated Gold Mines Pty Ltd (KCGM) trialed alternative sulfide gold concentrate treatment options, including ultra-fine grinding mills. Using very small ceramic balls to grind the concentrate and expose the trapped gold to the downstream cyanide-leaching process, the process is slightly less efficient at extracting gold, but does not emit sulfur dioxide or mercury to the air and can be operated 98 per cent of the time, so is considered a viable alternative to the roasting process. As a result of these trials KCGM

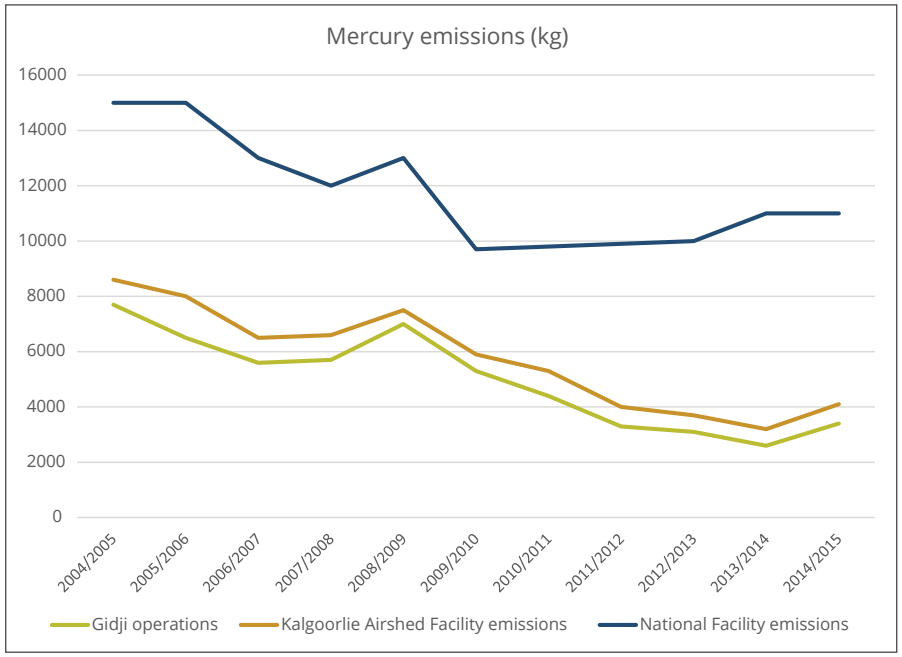

Figure 3: Comparison of mercury emissions from the Gidji operations facility with all reported facility emissions for the Kalgoorlie airshed and National facility emissions. National facility emissions include emissions from all facilities required to report under the National Pollutant Inventory, but does not include diffuse (non-industrial) sources or emissions from facilities that are under the reporting threshold. The Gidji roasters were the largest source of mercury air emissions in Australia and accounted for over 80% of mercury emissions in the Kalgoorlie airshed. *Data sourced from the National Pollutant Inventory http://www.npi.gov.au/*

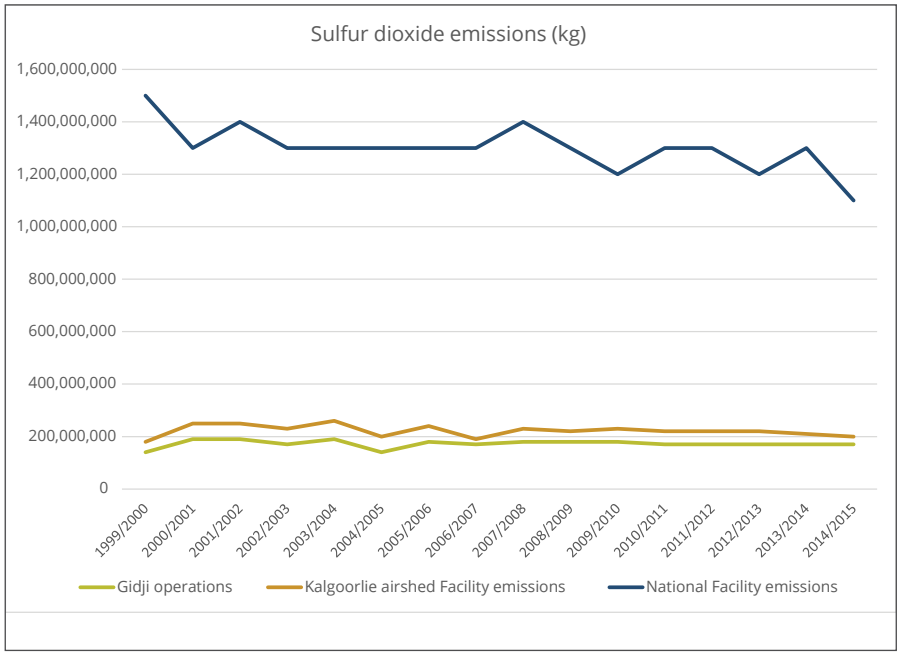

Figure 4: Comparison of sulfur dioxide (SO2) emissions from the Gidji operations facility with all reported facility emissions for the Kalgoorlie airshed and National facility emissions. National facility emissions include emissions from all facilities required to report under the National Pollutant Inventory, but does not include diffuse (non-industrial) sources or emissions from facilities that are under the reporting threshold. The Gidji roasters were the largest single source of sulfur dioxide in the Kalgoorlie airshed and the second largest in Australia. Data sourced from the National Pollutant Inventory http://www.npi.gov.au/

completely replaced the Gidji roasters in 2015 with an ultra-fine grinding mill, which will have considerable improvements for air quality and community health in Kalgoorlie-Boulder.

The EPA recognises that there has been a long history of ongoing work between KCGM and regulators to ensure that emissions from the Gidji roasters were adequately managed to meet air quality standards. The EPA encourages continuous improvement in environmental performance in all industries that have the potential to impact air quality and human health.

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People

Street trees providing shade.

Photo: Emily Laslett

People

Engagement with the natural environment is important for our health and wellbeing. Our cities, towns and recreational opportunities in WA are shaped by the environment.

The EPA considers impacts to people when evaluating proposals and planning schemes.

The EP Act defines environment as "living things, their physical, biological and social surroundings and the interactions between all of these".

Maintaining the quality of the environment for people is an important consideration when assessing the potential impacts of proposals and planning schemes. Human health, amenity, and heritage are all considered.

Land use planning decisions have the potential to affect, protect, and promote population health through environmental and social elements.

Direct contact with plants, animals, natural landscapes, and wilderness throughout urban environments improves physical and psychological health. Experiencing nature in the city can reduce stress and improve health and wellbeing.

Green spaces in local public areas provide community access to nature and can also protect significant biodiversity values such as wetlands and threatened flora and ecological communities.

EPA objectives

Social Surroundings

To ensure that social surroundings are not materially affected

Human Health

To ensure that human health is not materially affected

Urban Heat Island Effect

Due to the effects of a changing climate, temperatures in Perth are predicted to increase. Current methods for developing our city will exacerbate the trend. The EPA is concerned about the impact of increasing heat in our cities on human health. Greening urban areas is an important part of mitigating this impact.

The so-called 'urban heat island effect' describes the higher ambient air temperatures in urban areas compared to the surrounding natural landscape. Temperatures in the urban environment can be between 10 and 15 degrees Celsius hotter during the day and 5–10 degrees hotter at night.

Replacing natural surfaces with buildings, roads, paving and car parks is known to be the main cause of the effect. For example, roads can comprise up to 30 per cent of land space in urban areas and are among the largest contributors of heat. Built surfaces comprise a high percentage of non-reflective and water-resistant materials and tend to absorb a significant amount of heat. Natural surfaces, however, comprise vegetation and moisture-trapping soils, which utilise a large proportion of the absorbed radiation and release water vapor that contributes to cooling the air in their vicinity.

The effect is most noticeable in summer and is expected to intensify further with the increasing temperatures brought by a changing climate, increased hard-surface areas, and the loss of green space in urban areas. Research has identified that the elderly, young and sick, and people from lower socio-economic areas are at most risk from new or worsened health issues and increased mortality due to heat.

There is overwhelming evidence that the best mitigation for the urban heat island effect is to increase green spaces and canopy cover in urban areas. Natural areas typically have a cooling effect in urban environments due to both evapotranspiration and shading.

The EPA believes planning and designing our urban areas to connect with nature is important in order to achieve amenity benefits, community connectedness, and improved wellbeing. The role and importance of biodiversity in delivering health benefits and wellbeing should be considered as a key component in the design of the Western Australian Planning Commission's Green Network. The network links green spaces, water systems, biodiversity corridors, and tree-lined streets to deliver economic and social benefits by minimising the urban heat island effect and adding multiple environmental benefits.

The role and importance of biodiversity in delivering health and wellbeing benefits is central to the design of quality green spaces. Increasing demand for space to accommodate an increase in population and associated services places pressure on green spaces.

There are concerns about the amount of recreational space in the newly developed

suburbs of Perth. The Western Australian Planning Commission's *Liveable Neighbourhoods* policy requires that 10 per cent of subdivisions are reserved for public open space, which is not only used for active recreation but also for conserving the environment. Planning at both the regional and local level is at the core of addressing environmental issues related to the urban heat island effect.

The EPA encourages future urban subdivisions and developments (both infill and new) to retain trees where possible, rather than follow the current practice of blanket clearing, and that additional trees should be planted to increase canopy cover, including street trees on verges.

For the Green Network to be successful there is a need for cross-government support and implementation. A green network needs to include recreational space, and conservation areas for plants and animals and for human connection to nature. While some local governments have prepared greening or urban forest strategies it has not been addressed across the whole region.

Through its interim strategic advice for Perth and Peel @3.5 million, the EPA recommended the WAPC and local governments take steps to counteract the air quality, human health and amenity implications from the urban heat island effect through a greening strategy for the Perth and Peel regions. The EPA remains of the view that implementation of this recommendation through initiatives such as the Green Network will lead to positive outcomes such as an increased green canopy and green spaces in both new and existing urban areas.

New urban development that has been blanket cleared before building (facing page) will be impacted more by the urban heat effect than areas with mature trees forming canopy cover (above)

Photos: Liesl Rohl, Office of the EPA (facing); Emily Laslett (above)

The EPA encourages future urban subdivisions and developments ... to retain trees where possible, rather than follow the current practice of blanket clearing

Case study: Port Hedland Health Risk Assessment

In its 2013–14 Annual Report, the EPA reported that, for a number of years, it held concerns about the potential health effects of high dust levels in Port Hedland, particularly West End areas close to port operations and iron ore stockpiles.

During 2015–16, the Department of Health released the Port Hedland Air Quality Health Risk Assessment for Particulate Matter (HRA). The HRA concluded that there is sufficient evidence of potential impacts on human health from dust to warrant the development of a strategic plan to reduce community exposure. Further, the HRA noted that while the risks are not urgent, the close proximity of port operations to residential areas means that increased port activity and further expansion will place additional pressure on dust management initiatives by industry and the government. The EPA understands that the Port Hedland Dust Taskforce is preparing advice to State Government on an appropriate regulatory and land use planning response to this issue.

The EPA will continue to monitor dust issues in Port Hedland as well as work with the Port Hedland Dust Taskforce on this issue.

References and further reading

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Other issues

Strategic use of offsets

Environmental offsets – activities used to counterbalance the significant residual environmental impact of a development proposal – are regularly used in the environmental impact assessment (EIA) process.

Offsets compensate for significant residual environmental impacts, after all steps have be taken to avoid or mitigate impacts, and are used to improve the environment around the development. They are considered and applied on a project-by-project basis to counterbalance impacts on specific environmental values. In some areas in the State, such as the Pilbara, numerous developments with similar significant residual impacts occur within a specific area. These areas provide an opportunity to ensure that individual environmental offsets are considered within a strategic offsets framework. Such an approach can ensure that offsets for individual proposals are complementary and contribute to biodiversity outcomes at a strategic scale.

For example, if multiple proposals are impacting on a certain environmental value, each one could contribute an offset relating to a broader common outcome. An example might be the strengthening of an ecological link rather than the more piecemeal protection and rehabilitation of isolated patches of habitat.

The following examples demonstrate how the EPA has encouraged a strategic approach to offsets through individual proposal offset conditions.

Pilbara Strategic Conservation Fund

In 2012, the EPA proposed a strategic conservation initiative for the Pilbara region to provide a mechanism for pooling offset funds to achieve biodiversity conservation outcomes. The approach was designed to overcome significant constraints in the project-by-project application of offsets in the Pilbara. At the same time, it would provide an opportunity to maximize the value of environmental offsets and ensure strategic and coordinated conservation activities in the region.

In July 2016, the State Government formally adopted the approach and will establish the Pilbara Strategic Conservation Fund. About 24 resource and infrastructure projects approved under Part IV of the Environmental Protection Act 1986 are conditioned to contribute to such a fund in order to deliver offsets in a strategic way. The EPA commends the WA Government for its commitment to implementing this initiative and anticipates future evaluations of its effectiveness.

WA Marine Science Institution (WAMSI)

The WAMSI Dredging Science Node is an outstanding example of the strategic use of environmental offsets.

Over the past decade the level of dredging activities in WA − and their sheer scale − has been unprecedented. Their very size meant that impacts on the marine environment were likely, particularly for benthic communities and marine fauna.

At the same time, there was a very high degree of uncertainty regarding the potential extent, severity and duration of impacts on the marine environment. This uncertainty stemmed from a fundamental lack of scientific knowledge regarding the generation of sediments through dredging; the extent of turbidity plumes and sediment deposition fields associated with the dredging and the ecological effects of the turbidity and sedimentation on marine communities.

Funds of $19 million were pooled from the environmental offsets of three separate dredging proposals into a single coordinated research program. This enabled research at a scale that would otherwise not have been possible. At the same time, such a depth and breadth of research is necessary in order to address key areas of uncertainty associated with marine dredging projects. Eighty-one scientists from ten collaborating research organisations are working across nine integrated research themes in this world-class marine research project.

The program is enhancing government and private-sector capacity to predict and manage the environmental impacts of dredging in WA. Its outcomes will increase the confidence, timeliness and efficiency of the assessment, and approval and regulatory processes associated with dredging projects.

The Perth and Peel Strategic Assessment

In August 2015 the EPA released *Perth and Peel @3.5 million: environmental impacts risks and remedies*. This interim strategic advice provided vital input to the Perth and Peel strategic assessment undertaken by the State and Commonwealth governments.

The EPA's advice covered the critical environmental areas of water and air quality, impacts to human health, and biodiversity matters such as wetlands and bushland conservation.

The draft Strategic Assessment of the Perth and Peel Regions (the Green Growth Plan) was released in December 2015 for a four-month public comment period. The EPA was pleased to note that the majority of its recommendations relating to environmental factors were addressed in some form in the draft commitments.

The EPA understands that the assessment is being finalised by the Department of Premier and Cabinet to provide to the Commonwealth for assessment under the Environment Protection and Biodiversity Conservation Act 1999. Responding to public submissions and finalising the development footprints is a significant undertaking, and the EPA is expecting fewer predicted impacts on the environment – both on a site-by-site basis and cumulatively.

In order to understand and comment on the overall picture for the environment of the Perth and Peel regions for the next 30 years, the EPA believes that the most appropriate time to provide the Minister with its final advice on the outcomes of the strategic assessment will be after the State has publicly released the final strategic conservation plan, associated action plans and the impact assessment reports.

This will allow the EPA to consider proposed impacts from the development footprints, and the State's proposed avoidance, mitigation, and offset strategies to minimise the environmental impact of the future development.

The EPA will then consider its ongoing role in environmental impact assessment in the Perth and Peel regions and advise the Minister accordingly. Until that time the EPA will continue its usual function under Part IV of the *Environmental Protection Act 1986*.

Aerial view of central Mandurah

Photo: Courtesy of the Peel Harvey Catchment Centre

The Authority

EPA Chairman Dr Tom Hatton at the Extension Hill minesite during a site visit to the Mt Gibson Range, March 2016.

Photo: Robert Hughes, Office of the EPA

The Members

Dr Tom Hatton

Chairman

Dr Hatton has a Bachelor of Science (summa cum laude) and Master of Science in Natural Resources from Humboldt State University, and a doctorate from the College of Natural Resources at Utah State University.

Following post-doctoral studies in mathematics at the University of New South Wales he joined the CSIRO as an environmental scientist, working on the many water-related challenges facing Australia. Over a 25-year career at the CSIRO, he directed the Water for a Healthy Country Flagship as well as the Wealth from Oceans Flagship, Australia's largest water and marine research portfolios, delivering research directly underpinning the efficient and responsible development of Australia's natural resources while ensuring the conservation of the environmental and social values. In 2014, Tom retired as CSIRO Group Executive for Energy, responsible for national facilities and capabilities in renewable and non-renewable energy, and mining research and development.

In 1999, Tom was awarded the inaugural WE Wood Award for scientific excellence in the field of salinity research, and the Utah State University Alumni Professional Achievement Award. In 2008, Tom received the CSIRO Chairman's Medal and the Australian Public Service Medal for his contributions to the management of Australia's water resources.

Dr Hatton chaired the Western Australian Marine Parks and Reserves Authority (2012-2015) and chaired the 2011 Australian State of the Environment Committee. He is an adjunct professor at the University of Western Australia and serves on their Oceans Institute Advisory Board, as well as the International Centre for Radio Astronomy Research Board. He serves on the Board of the Western Australia Parks Foundation.

Mr Robert Harvey

Deputy Chairman

Mr Robert Harvey has degrees in engineering and a Masters in Business Administration from The University of Western Australia (UWA).

Mr Harvey began his career as an engineer in the then Water Authority, specialising in resource management, planning and policy. His last position in the Authority was as Director Water Resources Planning. He was Executive Director of the Department of Justice from 1999 to 2003. In the Department he was responsible for community corrections, juvenile justice and correctional policy.

From 2003 to 2009 Mr Harvey was Pro Vice-Chancellor and Dean of Business and Law at Edith Cowan University. He was a member of the Water Corporation Board from 2007 to 2012. On behalf of the Board of the Water Corporation, he convened a scientific panel to review the State's 50 year water plan – Water Forever.

He is the Regional Director for the Winston Churchill Memorial Trust.

In 2010 Mr Harvey was appointed as a member of the Western Australian Planning Commission.

Mr Harvey joined the Board as Deputy Chairman in 2012. He was reappointed in 2015.

Ms Elizabeth Carr

Ms Elizabeth Carr is a non-executive director with senior management experience in Investment Banking (Macquarie Group), Technology (IBM) and government sectors (WA, NSW, USA). With over 20 years board experience in the private, government, education and community sectors, her current roles include – Chair South Metropolitan TAFE (WA), Chair Macular Disease Foundation Australia (until September 2016), Chair St Catherine's Aged Care Services (NSW), Chair Seton Villa Disabilities (NSW), and Chair of the Department of Family and Community Services (NSW) Audit and Risk Committee. She is also a Director icare NSW, Director Kokoda Track Foundation, Director St Mary's Anglican Girls School (WA), Member of the Harvard Club of Australia Council and a member of a number of NSW government Audit and Risk Committees.

Ms Carr has a Bachelor of Arts (Hons) from UWA and a Masters in Public Administration from Harvard University and a Diploma (and Fellow) from the Australian Institute of Company Directors. She undertakes annual professional development, including with Harvard University.

She received Rotary's Paul Harris Fellow Award for services to the community in 2002, and St Mary's Anglican Girls School Woman of Distinction – Career Award in 2010. Ms Carr's term began in October 2011, and she was reappointed to the Board in 2014.

Mr Glen McLeod

Glen is an environmental and town planning lawyer with over 39 years of experience. He has held senior positions in major Australian, English and American law firms. In July 2012 he established his independent niche firm, Glen McLeod Legal where he practices in the areas of environmental and town planning law.

He is a member of the WA Environmental Protection Authority and the Waste Authority, the Chair of the International Bar Association's Environmental, Health and Safety Committee and a member of the WA Law Society's Environment Town Planning and Local Government Committee.

He is an Adjunct Professor at Murdoch University where he teaches units in environmental and town planning law. He is a member of the Advisory Group to the Murdoch Dean of Law and is a Fellow of the Royal Society of Arts. He was recently the recipient of the 2016 WA Law Society's Lawyer of the Year Award.

Glen is the General Editor of the national loose leaf publication Planning Law in Australia and an editor of the Local Government Law Journal.

Glen's term began in October 2013.

Dr Jim Limerick

Dr Limerick has extensive experience in strategic policy and planning, and was awarded the Australian Public Service Medal in 2008.

He is currently a member of the advisory board to the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) and the chair of the Fremantle Port Authority. He was formerly a member of the WA Planning Commission and the WA Technology and Industry Advisory Council and, until 2008, he was Director General of the former Department of Industry and Resources.

Dr Limerick has a PhD and B.Sc. (Hons) in metallurgy from the University of New South Wales and a Graduate Diploma in Business from Curtin University. He is a graduate member of the Australian Institute of Company Directors.

He was appointed to the Board on 5 November 2015 for a three-year term.

EPA meetings and stakeholder engagement

The EPA met 11 times during 2015–2016. During these meetings, the EPA met with proponents to discuss assessments. As part of our ongoing commitment to stakeholder engagement, the EPA also conducted site visits, forums, invited public submissions on assessments and regularly met with our Stakeholder Reference Group.

Site visits

Site visits are an opportunity for the EPA to gain a first-hand appreciation of the environmental setting and constraints of proposals, to listen to community concerns, and to discuss aspects of proposals in the field with subject matter experts, leading to more informed environmental advice being provided to the Minister for Environment.

In July 2015, the Chairman visited the site of the proposed Christmas Creek Iron Ore Mine Expansion near Fortescue Marsh in the Pilbara.

In August, EPA members and staff of the Office of the OEPA were given a guided tour of post-mining rehabilitation of the Rocla Quarry at Lexia, 23 kilometres north of Perth. Rocla Quarry Products has been undertaking research into best practice rehabilitation techniques in mining landscapes for some 20 years. The work in rehabilitating banksia woodland has been done in partnership with the Botanical Gardens and Parks Authority. The site visit provided the EPA with important context in relation to the requirements for successful rehabilitation on the Swan Coastal Plain.

In September, accompanied by representatives of Rio Tinto (RTIO) and the OEPA, two EPA Members took a helicopter tour of the Yandicoogina operations, Marillana Creek, Weeli Wolli Creek, and Fortescue Marsh. They then undertook an on-ground inspection of the Yandicoogina operations, mining near Marillana Creek, a wetland rehabilitation trial and ex-pit rehabilitation.

Accompanied by representatives of Cliffs and the OEPA, EPA Members flew over the BIF Ranges of the greater Mount Manning area in November. They then travelled on-ground to the Windarling W3 pit to view the adjacent *Tetratheca paynterae* ssp. *paynterae* population. Members undertook further on-ground inspection of rehabilitation sites at Koolyanobbing, followed by an inspection of the F Deposit proposal area and the adjacent *Tetratheca erubescens* population.

Also in November, the Chairman was accompanied by RTIO, OEPA and Department of Water representatives to examine RTIO's management of groundwater discharge to Weeli Wolli Creek to minimise impacts on the creek and its riparian vegetation. This visit was undertaken as part of the EPA evaluation program discussed on page 9 of this report.

Accompanied by representatives of Main Roads WA and the OEPA, the EPA Members travelled the proposed alignment of the Swan Valley Section of the Perth-Darwin Highway in mid-March. The visit was undertaken to ensure that the alignment minimised impacts to flora and vegetation, fauna habitat and to parks and reserves.

Later in March, EPA members gained an aerial view of the Mount Gibson Range in the Mid West, and then toured the Range from the

DATE	PAUL VOGEL	TOM HATTON	ROBERT HARVEY	ELIZABETH CARR	GLEN McLEOD	JIM LIMERICK
16/7/15						
20/8/15						
15/10/15						
7/12/15						
21/1/16						
18/2/16						
17/3/16						
21/4/16						
6/5/16						
19/5/16						
23/6/16						
Meeting participation	**3**	**10**	**10**	**11**	**10**	**8**

ground, visiting the current Extension Hill minesite and the Iron Hill proposal site. Of particular interest was the translocation trial of *Darwinia masonii* on Iron Hill East.

In May, the Chairman, officers from the OEPA and the Department of Water, and representatives from Fortescue Metals Group toured the Solomon Sustaining Tonnes proposal area, south of Tom Price. They visited Kings Lookout, Zalamea Pools, Kangeenaria Creek, Western Queens and Weelmurra Pools to gain an understanding of the local context for rehabilitation, groundwater abstraction and management of pools and creeks.

During May and June, EPA members visited the sites of three proposed uranium projects: Cameco's Yeelirrie Uranium Mine, an extension to Toro Energy's Wiluna Uranium Project, and Vimy Resources' Mulga Rock Uranium Project.

(L-R) Deputy Chairman Robert Harvey, Chairman Dr Tom Hatton and Member Jim Limerick examining *Atriplex* at the site of the proposed Yeelirrie Uranium Project

Photo: Robert Hughes, Office of the EPA

DATE	DESTINATION / PROPONENT	EPA MEMBERS
23/7/15	Christmas Creek Iron Ore Mine Expansion *Fortescue Metals Group Ltd*	Paul Vogel
17/8/15	Rocla Quarry, Gaskell Avenue, Lexia *Rocla Quarry Products (WA)*	Paul Vogel Robert Harvey Elizabeth Carr Glen McLeod Tom Hatton
9-10/9/15	Yandicoogina Pocket and Billiard South Iron ore Mine, Central Pilbara Region *Hamersley Iron-Yandi Pty Limited (subsidiary of RTIO)*	Robert Harvey Elizabeth Carr
19/11/15	Yilgarn Operations - Koolyanobbing Range F Deposit, Shire of Yilgarn *Cliffs Asia Pacific Iron Ore Pty Ltd*	Tom Hatton Robert Harvey Elizabeth Carr Glen McLeod Jim Limerick
25/11/15	Weeli Wolli Creek *Rio Tinto Iron Ore*	Tom Hatton
16/3/16	Perth-Darwin National Highway (Swan Valley Section) *Main Roads WA*	Tom Hatton Elizabeth Carr Jim Limerick
22/3/16	Mt Gibson Range Mine Operations – Iron Hill Deposits *Mount Gibson Mining Limited*	Tom Hatton Jim Limerick
5/5/16	Yeelirrie Uranium Mine, Shire of Wiluna *Cameco Australia Pty Ltd*	Tom Hatton Robert Harvey Elizabeth Carr Jim Limerick
26/5/16	Solomon Sustaining Tonnes, south of Tom Price *Fortescue Metals Group Ltd*	Tom Hatton
3/6/16	Wiluna Uranium Project *Toro Energy Limited*	Tom Hatton Glen McLeod
10/6/16	Mulga Rock Uranium Project *Vimy Resources Limited*	Tom Hatton Elizabeth Carr Jim Limerick

Stakeholder Reference Group

The EPA's Stakeholder Reference Group (SRG) met four times during the year to provide input to the EPA on matters of policy, process and performance. The core membership of the SRG is:

Conservation, health and water

Conservation Council of WA

The Wilderness Society of WA

Department of Parks and Wildlife

Department of Environment Regulation

Environmental Defenders Office WA (Inc)

World Wildlife Fund

Department of Health

Department of Water

Resources industry

Association of Mining and Exploration Companies

Australian Petroleum Production and Exploration Association

Chamber of Commerce and Industry of WA

Chamber of Minerals and Energy of WA

Department of Mines and Petroleum

Department of State Development

Other industry

Urban Development Institute of Australia WA Division Inc

WA Local Government Association

Department of Planning

Environmental Consultants Association (WA) Inc.

Environment Institute of Australia & New Zealand

The membership may also include individuals invited at the request of the EPA Chairman who have relevant experience in environmental protection and related matters.

Public consultation

Providing opportunities for public participation is an integral part of environmental impact assessment and developing sound environmental protection policies in Western Australia. The EPA publishes all documents open for public comment on its consultation hub at https://consultation.epa.wa.gov.au and prefers submissions to be made through the hub.

People can subscribe to the consultation hub to be notified of new items by email.

During 2015–2016 the EPA called for public comment and submissions on assessments 49 times, with a total of 475[1] responses. The consultation hub was also used to invite comment on the EPA's current website to inform the design and development of its new site, due to be launched in December 2016.

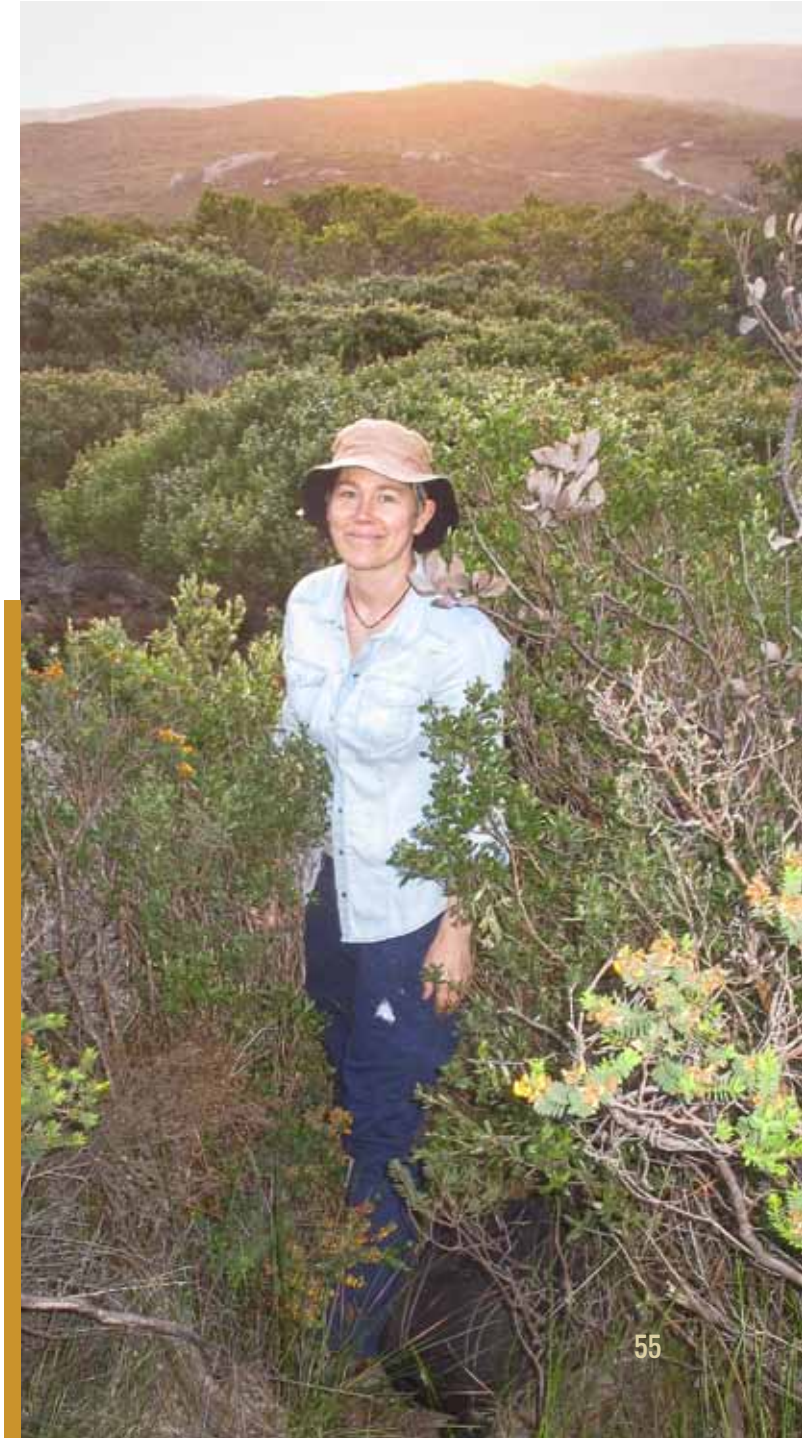
1. This figure does not include proforma or campaign responses. There were 11,000 proforma submissions on assessments..

Student support

In April, Anke Seidlitz (pictured right) was awarded Murdoch University's annual EPA Prize for best grade point average in core units of Conservation and Wildlife Biology by a graduating student.

Anke has now completed her Honours project on plant-flower-visitor networks, studying a Jarrah forest understorey network near Denmark and comparing her findings with global networks to look for common trends.

Having achieved a first class Honours, Anke is looking for work and contemplating further post-graduate studies.



Environmental Non-Government Organisation Forum

The EPA conducted its annual Environmental Non-Government Organisation (ENGO) forum on 11 November 2015 at the State Library. Representatives of the Environmental Defender's Office, the Urban Bushland Council, the PEW Charitable Trust, the Wildflower Society of WA, and the Wilderness Society attended.

The forum is an opportunity for all five EPA members to meet with ENGO representatives and discuss key topics of interest.

Several issues were raised at the forum and the EPA committed to reporting on these expectations. The table on the following pages lists actions taken on each of the issues.

The EPA looks forward to our next ENGO forum in November 2016.

Eucalyptus pyriformis in Watheroo National Park

Photo: Helena Mills, Office of the EPA

KEY ISSUES RAISED BY ENGOS	EPA ACTIONS
1. Consideration of environmental matters in the development of the Kimberley (including: *Water for Food*; Cumulative impacts in the Fitzroy River catchment, for example, coal mining, fracking, use of surface and groundwater).	• Requested, and were provided, briefings on progress of the *Water for Food* program, and have flagged with agencies our intention to keep a watching brief on any significant proposals arising from that program. • Termination of Rey Resources proposal to mine and export coal from the Kimberley, by agreement with the company. • Public Environment Review for assessment of the Thunderbird Mineral Sands proposal outside Derby.
2. Greater awareness of the broad impacts of climate change on the current and future state of the marine and terrestrial environment, for example, variations in sea water temperatures along the Western Australian coast.	• Drying south-west climate included as a significant consideration in revision of the EPA's Hydrological Processes Factor guideline. • Recent marine heat events highlighted in 2015–2016 EPA Annual Report.
3. Better oversight and reporting (including monitoring/accounting data) on clearing in both urban and rural environs, particularly on the Swan Coastal Plain.	• Interim s16 advice on the Green Growth Plan for Perth-Peel Region emphasising the need to monitor and evaluate implementation compliance. • Call for state-wide accounting and reporting on vegetation clearing in 2015–2016 EPA Annual Report.
4. Greater recognition for the South West of WA as a global biodiversity hotspot.	• The EPA has continued to highlight the importance of the biodiversity of the South West in its 2015–2016 EPA Annual Report.
5. Further consideration of cumulative pressures on the Swan Coastal Plan (including fire, acid sulfate soils, clearing, plant disease (*Phytophthora*), weeds, climate change and loss of habitat for threaten fauna, such as Carnaby's Cockatoo).	• The EPA continues to help inform, and ultimately advise on, the Green Growth Plan for the Perth-Peel Region. • Understanding the cumulative impacts on State and Commonwealth environmental matters from proposed development across the Perth and Peel regions affords the opportunity to address most of these concerns in a more strategic, comprehensive manner than we have had to date.
6. Completion/fulfilment of conservation commitments/plans (namely, Bush Forever, Yilgarn Band Ironstone Formation, Western Woodlands, Kimberley parks).	• Earlier this year, the EPA reviewed the historic commitments to conservation reserves, and brought this synthesis to the attention of the Government. • The EPA continues to push for clarity and secure reservation of Bush Forever sites in the metropolitan area, as part of the Green Growth Plan. • Where relevant, the EPA has included in its advice on development proposals the completion of conservation commitments, such as those associated with Mt Gibson in the Yilgarn.
7. Increased transparency of environmental impact assessment processes and in shaping policy, particularly with regards to stakeholder access to the proponent's response to submissions where there are delays in the assessment process.	• The draft EPA policy reforms include changes to the Administrative Procedures that allow the publication of responses to submission ahead of finalisation and publication of our advice. • The reforming of our administrative procedures and factor guidelines has included consultation with stakeholders through our Stakeholder Reference Group. • Greater explanation in our decisions regarding level of assessment is now included in our published advice.

KEY ISSUES RAISED BY ENGOS	EPA ACTIONS
8. Greater recognition and protection of the State's geo-heritage.	
9. An evaluation of the effectiveness of offsets in counterbalancing impacts to biodiversity, particularly where there is 'lag effect' in restoring environmental values in the short-term.	• The EPA is currently monitoring the development of the Pilbara Strategic Conservation Fund, with a particular interest in assuring that our advice on offsets (and their expected benefits) are both appropriately implemented and their effectiveness audited. • The EPA has, or will soon be, completing four projects evaluating the effectiveness of our advice. Given that the WA State Offsets Policy is only a few years old, we have deferred an evaluation project on historical offsets for a subsequent evaluation. • The EPA is highly engaged in the offsets implicit or explicit in the Green Growth Plan for the Perth-Peel region.
10. Greater influence in the setting of direction for rangeland policy, particularly with regard to the past commitments to reserve pastoral leases with high conservation values.	• The EPA was represented on the Rangeland Working Group that was advising on rangelands policy reforms considered by the WA State Government. This process has now ceased. • As for the conservation commitments in the rangelands, see our response to (6) above.

Appendices

Appendix: Public reports and recommendations to the Minister for Environment

Public Environmental Review

REPORT NO.	TITLE	PROPONENT	RELEASE DATE
1552	Yoongarillup Mineral Sands Project	Doral Mineral Sands Pty Ltd	13/7/15
1554	Hazelmere Wood Waste to Energy Plant	Eastern Metropolitan Regional Council	27/7/15
1561	Browse Liquefied Natural Gas Precinct*	Minister for State Development	26/10/15
1567	Christmas Creek Iron Ore Mine Expansion	Fortescue Metals Group Ltd	25/5/16
1568	Wingellina Nickel Project	Hinckley Range Pty Ltd	20/6/16
1569	Perth- Darwin National Highway (Swan Valley Section) †	Commissioner for Main Roads Western Australia	4/7/16

* Prepared under *Environmental Protection Act 1986* Delegation No.34 (22 January 2014) by the Browse Delegates.

† Transmitted to the Minister for Environment on 29 June 2015.

Assessment on Proponent Information - Category A

REPORT NO.	TITLE	PROPONENT	RELEASE DATE
1553	Forrestfield Airport Link	Public Transport Authority	13/7/15
1557	Orebody 32 Above Water Table Iron Ore Mine Project	BHP Billiton Pty Ltd	17/8/15
1558	Marandoo Iron Ore Project - Revised Proposal	Hamersley Iron Pty Ltd	17/8/15
1559	Orebody 31 Iron Ore Mine Project	BHP Billiton Iron Ore Pty Ltd	7/9/15
1562	Baby Hope Proposal	Hamersley HMS Pty Limited	16/11/15
1565	Western Turner Syncline Iron Ore Project – Revised Proposal	Hamersley Iron Pty Limited	11/4/16

Changes to Conditions - s46 Reports

REPORT NO.	TITLE	PROPONENT	RELEASE DATE
1555	Cataby Mineral Sands Project - inquiry under s46 of the *Environmental Protection Act 1986* to amend Ministerial Statement 720	Iluka Resources Limited	10/8/15
1556	Port Kennedy Regional Recreation Centre – Becher Point, Stage 1 proposal - inquiry under s46 of the *Environmental Protection Act 1986* to amend Ministerial Statements 105 & 359	Western Australian Beach and Golf Resort Pty Ltd	10/8/15
1560	Argyle Diamond Mine, Underground Project – inquiry under s46 of the *Environmental Protection Act 1986* to amend Ministerial Statement 711	Argyle Diamonds Limited	7/10/15
1563	West Pilbara Iron Ore Project Stage 1 – Mine and Rail Proposal – inquiry under s46 of the *Environmental Protection Act 1986* to amend Ministerial Statement 881	API Management Pty Limited	30/11/15
1564	Jimblebar Iron Ore Project – inquiry under s46 of the *Environmental Protection Act 1986* to amend Ministerial Statement 857	BHP Iron Ore Pty Ltd	4/4/2016
1566	Gidji Gold Processing Plant near Kalgoorlie – inquiry under s46 of the *Environmental Protection Act 1986* to amend Ministerial Statements 28 & 77	Kalgoorlie Consolidated Gold Mines Pty Ltd	16/5/16

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Acknowledgements

This report was prepared by the Strategic Policy and Planning Division, Office of the Environmental Protection Authority.

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